Operation Manual

Goodrive170-PV Series
Solar Pump Inverter

SHENZHEN INVT ELECTRIC CO., LTD.

Contents

1 Safety precautions

Read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the product. Otherwise, equipment damage or physical injury or death may be caused.

We shall not be liable or responsible for any equipment damage or physical injury or death caused due to your or your customers' failure to follow the safety precautions.

1.1 Safety definition

Danger: Severe personal injury or even death can result if related requirements are not followed.

Warning: Personal injury or equipment damage can result if related requirements are not followed.

Note: Actions taken to ensure proper running.

Trained and qualified professionals: People operating the equipment must have received professional electrical and safety training and obtained the certificates, and must be familiar with all steps and requirements of equipment installing, commissioning, running and maintaining and capable to prevent any emergencies.

1.2 Warning

Warnings caution you about conditions that can result in severe injury or death and/or equipment damage and advice on how to prevent dangers. The following table lists the warning symbols in this manual.

Symbol	Name	Description	Abbreviation
 Danger	Danger	Severe personal injury or even death can result if related requirements are not followed.	
 Warning	Warning	Personal injury or equipment damage can result if related requirements are not followed.	
 Forbid	Electrostatic discharge	PCBA board damage can result if related requirements are not followed.	
 Hot sides	Note Hot sides	The equipment base may become hot. Do not touch it.	
Note	Note	Actions taken to ensure proper running.	**Note**

1.3 Safety guidelines

- Only trained and qualified professionals are allowed to carry out related operations.
- Do not perform wiring, inspection or component replacement when power supply is applied. Ensure that all the input power supplies are disconnected before wiring and inspection, and always wait for at least the time designated on the inverter or until the DC bus voltage is less than 36V. The waiting time is shown as below.

Inverter model		Minimum waiting time
3PH 380V	2.2kW–45kW	5 minutes

- Do not refit the inverter unless authorized; otherwise fire, electric shock or other injury may result.

- The base of the radiator may become hot during running. Do not touch to avoid hurt.

- The electrical parts and components inside the inverter are electrostatic sensitive. Take measurements to prevent electrostatic discharge when performing related operations.

1.3.1 Delivery and installation

- Do not install the inverter on inflammables. In addition, prevent the inverter from contacting or adhering to inflammables.
- Do not operate on the inverter if there is any damage or components loss to the inverter.
- Do not touch the inverter with wet items or body; otherwise, electric shock may occur.

- Select appropriate moving and installing tools to ensure a safe and normal running of the inverter and avoid physical injury or death. To ensure personal safety, the installer must take mechanical protective measures, such as wearing exposure shoes and working uniforms.
- Do not carry the inverter by its front cover only as the cover may fall off.
- Ensure the inverter suffers no physical impact or vibration during moving and installation.
- Installation site must be away from children and other public places.
- The leakage current of the inverter may be above 3.5mA during operation. Ground with proper techniques and ensure the grounding resistor is less than 10Ω. The conductivity of PE grounding conductor is the same as that of the phase conductor (with the same cross sectional area).

- (+) and (-) are DC power supply input terminals, R, S, and T are AC power supply terminals, while U, V and W are the output motor terminals. Connect the input power cables and motor cables correctly; otherwise, damage to the inverter may occur.

1.3.2 Commissioning and running

- Cut off all power supplies connected to the inverter before terminal wiring, and wait for at least the time designated on the inverter after disconnecting the power supplies.
- High voltage presents inside the inverter during running. Do not carry out any operation on the inverter during running except for keypad setup.
- The inverter cannot be used as an "Emergency-stop device".
- If the inverter is used to brake the motor suddenly, a mechanical braking device shall be provided.

- Do not switch on or off the input power supply of the inverter frequently.
- For inverters that have been stored for a long time, check and fix the capacitance and try pilot run first before actual application.
- Close the front cover before running the inverter; otherwise, electric shock may occur.

1.3.3 Maintenance and component replacement

- Only well-trained and qualified professionals are allowed to carry out maintenance, inspection, and component replacement of the inverter.
- Disconnect all power supplies of the inverter before terminal wiring and wait for at least the designated time after disconnecting the power supply.
- Take proper measures to prevent screws, cables and other conductive objects from falling into the inverter during maintenance and component replacement.

- Use proper torque to tighten screws.
- Keep the inverter and its parts and components away from combustible materials during maintenance and component replacement.
- Do not carry out any insulation voltage-endurance test on the inverter or measure the control circuit of the inverter by megameter.

1.3.4 Scrap treatment

	● There are heavy metals in the inverter. Treat with it as industrial effluent.
	● When the life cycle ends, the product should enter the recycling system. Dispose of it separately at an appropriate collection point instead of placing it in the normal waste stream.

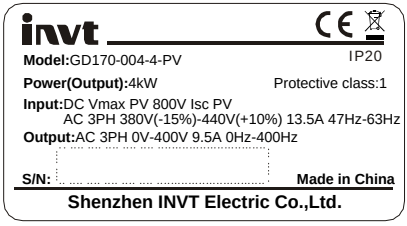
2 Product overview

2.1 Unpacking inspection

Check the following after receiving the product.

1. Whether the packing box is damaged or dampened.
2. Whether the model identifier on the exterior surface of the packing box is consistent with the purchased model.
3. Whether the interior surface of the packing box is abnormal, for example, in wet condition, or whether the enclosure of the inverter is damaged or cracked.
4. Whether the inverter nameplate is consistent with the model identifier on the exterior surface of the packing box.
5. Whether the accessories (including the manual and keypad) inside the packing box are complete.

2.2 Product nameplate



Note: This is a nameplate example of a standard inverter product. The CE/IP20 marking on the top right will be marked according to actual certification conditions.

2.3 Model designation code

A model designation code contains product information. You can find the model designation code on the inverter nameplate and simplified nameplate.

GD170 – 004 – 4 – PV
① ② ③ ④

Field	No.	Description	Content
Abbreviation of product series	①	Abbreviation of product series	GD is short for Goodrive.

Field	No.	Description	Content
Rated power	②	Power range + load type	004—4kW
Voltage class	③	Voltage class	4: AC 3PH 380V(-15%)–440(+10%)
Code	④	Industry code	PV: Photovoltaic water pump series products

2.4 Product specifications

Model	Parameters
AC input voltage (V)	380(-15%)–440 (+10%) (3PH)
Max. DC voltage (V)	800
Start-up voltage (V)	300
Min. working voltage (V)	250
Recommended DC input voltage range (V)	300–750
Recommended MPP voltage (V)	550

2.5 Product ratings

Series	Model	Rated output power (kW)	Rated input current (A)	Rated output current (A)	Max. DC input current (A)
3PH 380V series (2.2-45kW)	GD170-2R2-4-PV	2.2	5.8	5.5	12
	GD170-004-4-PV	4.0	13.5	9.5	16.5
	GD170-5R5-4-PV	5.5	19.5	14	23.9
	GD170-7R5-4-PV	7.5	25	18.5	30.6
	GD170-011-4-PV	11	32	25	39.2
	GD170-015-4-PV	15	40	32	49
	GD170-018-4-PV	18.5	47	38	50
	GD170-022-4-PV	22	51	45	60
	GD170-030-4-PV	30	70	60	81
	GD170-037-4-PV	37	80	75	90
	GD170-045-4-PV	45	98	92	130

3 Installation guidelines

This chapter introduces the mechanical and electrical installations of the inverter.

- Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. Please carry out operations according to instructions presented in Safety precautions. Ignoring these safety precautions may lead to physical injury or death, or equipment damage.
- Ensure the inverter power is disconnected before installation. If the inverter has been powered on, disconnect the inverter and wait for at least the time designated on the inverter, and ensure the POWER indicator is off.
- Installation must be designed and done according to applicable local laws and regulations. INVT does not assume any liability whatsoever for any installation which breaches local laws and regulations. If recommendations given by INVT are not followed, the inverter may experience problems that the warranty does not cover.

3.1 Mechanical installation

3.1.1 Installation environment

Installation environment is essential for the inverter to operate at its best in the long run.

Environment	Condition
Installation site	Indoors.
Ambient temperature	● -10°C–+50°C, and air temperature change shall be less than 0.5°C/minute. ● When the ambient temperature exceeds 40˚C, derate 1% for every increase of 1˚C. ● Do not use the inverter when the ambient temperature exceeds 50°C. ● To improve reliability, do not use the inverter in the places where the temperature changes rapidly. ● When the inverter is used in a closed space such as control cabinet, use a cooling fan or air conditioner for cooling, preventing the internal temperature from exceeding the temperature required. ● When the temperature is too low, if you want to use the inverter that has been idled for a long time, it is required to install an external heating device before the use to eliminate the freeze inside the

Environment	Condition
	inverter. Otherwise, the inverter may be damaged.
Humidity	● The relative humidity (RH) of the air is less than 90%. ● Condensation is not allowed.
Storage temperature	-40°C–70°C, with the air temperature change rate less than 1°C/minute.
Running environment	Install the inverter in a place: ● Away from electromagnetic radiation sources. ● Away from oil mist, corrosive gases and combustible gases. ● Without the chance for foreign objects such as metal powder, dust, oil and water to fall into the inverter (do not install the inverter onto combustible objects such as wood). ● Without radioactive substances and combustible objects. ● Without hazard gases and liquids. ● With low salt content. ● Without direct sunlight.
Pollution degree	Degree 2
Altitude	● Lower than 1000m; ● When the altitude exceeds 1000m, derate 1% for every increase of 1˚C. ● When the altitude exceeds 3000m, consult the local INVT dealer or office.
Vibration	Max. vibration acceleration: 5.8m/s^2 (0.6g).
Installation direction	Install the inverter vertically to ensure good heat dissipation performance.

Note:

- The inverter must be installed in a clean and well-ventilated environment based on the IP level.
- The cooling air must be clean enough and free from corrosive gases and conductive dust.

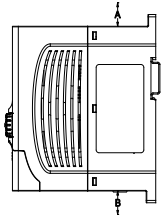
3.1.2 Installation direction

The inverter can be installed on the wall or in a cabinet.

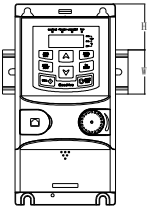
The inverter must be installed vertically. Check the installation position according to following requirements. See Appendix D “Dimension drawings”.

3.1.3 Installation mode

(1) The inverters of 2.2kW–4kW support wall mounting and rail mounting.



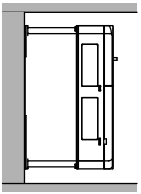
a) Wall mounting



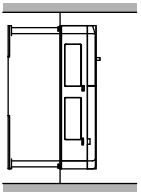
b) Rail mounting

Note: The minimum space of A and B is 100mm. H is 36.6mm and W is 35.0mm.

(2) The inverters of ≥ 5.5kW support wall mounting and flange mounting.



a) Wall mounting



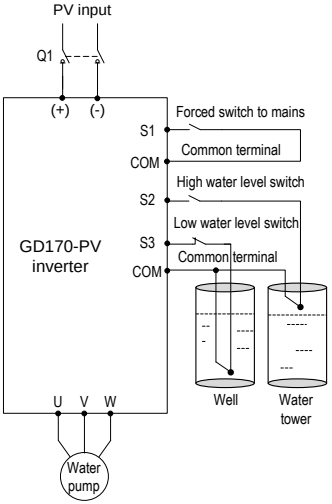
b) Flange mounting

1. Mark the position of the installation hole. See appendix for the position of installation hole.
2. Mount the screws or bolts onto the designated position.
3. Put the inverter on the wall.
4. Tighten the fixing screws on the wall.

3.2 Standard wiring

3.2.1 Main circuit terminals

The figure below shows the standard wiring diagram of the inverter.



- The DC breaker Q1 must be installed as the protection switch for PV input.
- In parallel connection, the combination box special for PV must be used.
- When the distance between the PV cell module and inverter exceeds 10 meters, Type-II surge protection devices must be configured at the DC side.
- When the distance between the pump and inverter exceeds 50 meters, it is recommended to configure output reactors. See appendix A.4 for the output reactor model selection.
- The inverter automatically runs after being powered on. If parameters need to be set, follow the parameter setting instructions in Chapter 5.

Terminal	Name	Function
R, S, T	AC input	3PH (1PH) AC input terminals, connected to the grid **Note:** Use the screws equipped with the inverter for wiring.
(+), (-)	PV DC input	Input terminals of photovoltaic panels.
U, V, W	Inverter output	3PH AC output terminals, connected to the pump motor in most cases.
⏚	Safety protection grounding	Grounding terminal for safe protection; each machine must be properly grounded.

3.2.2 Control circuit terminals

Category	Terminal	Name	Description
Power supply	24V	24V power supply	Used to externally provide 24V±10% power supply. Max. output current: 200mA Generally used as the the working power supply of digital input/output or the external sensor power supply
	COM	Common terminal	
Digital input	S1	Forcibly switches to power frequency	Terminal feature parameters: 1. Internal impedance: 3.3kΩ 2. 12–24V voltage input is acceptable 3. Max. input frequency: 1kHz S1: Forcibly switches to power frequency (Switching-on indicates switching to power frequency, and switching-off indicates input controlled by the keypad.) S2: It connects to the high water level switch of NO contact by default. S3: It connects to the low water level switch of NC contact by default.
	S2	Full-water alarm	
	S3	Empty-water alarm	

Category	Terminal	Name	Description
Communication	RS485+ RS485-	RS485 communication	RS485 communication terminals, using the Modbus protocol
Relay output	RO1A	NO contact of relay 1	1. Contact capacity: 3A/AC250V, 1A/DC30V 2. Do not use them as high-frequency switch outputs. 3. During the application of power frequency & PV auto switching, the power frequency input contactor coil is controlled by the NC contact of the relay.
	RO1B	NC contact of relay 1	
	RO1C	Common terminal of relay 1	

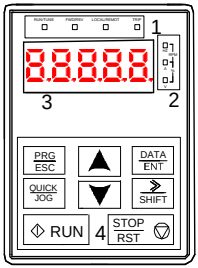
4 Keypad operation guidelines

4.1 Keypad introduction

The keypad is used to control the inverter, read inverter status, and set parameters. If you need to install the keypad on another position rather than on the inverter, use a keypad extension cable with a standard RJ45 crystal head.

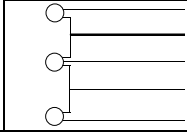
Figure 4-1 Keypad diagram for inverters of ≤ 2.2kW

Figure 4-2 Keypad diagram for inverters of ≥ 4kW



Note: The inverter models of 2.2kW support an optional extermal keypad, and the keypad of inverter models of ≥ 4kW can be installed on another device.

No.	Item	Description	
1	Status indicator	RUN/TUNE	Inverter running status indicator. Off: The inverter is stopped. Blinking: The inverter is autotuning parameters. On: The inverter is running.

<table>
<tr><th>No.</th><th>Item</th><th colspan="4">Description</th></tr>
<tr><td rowspan="3"></td><td rowspan="3"></td><td>FWD/REV</td><td colspan="3">Forward or reverse running indicator.
Off: The inverter is running forward.
On: The inverter is running reversely.</td></tr>
<tr><td>LOCAL/REMOT</td><td colspan="3">Indicates whether the inverter is controlled through the keypad, terminals, or communication.
Off: The inverter is controlled through the keypad.
Blinking: The inverter is controlled through terminals.
On: The inverter is controlled through remote communication.</td></tr>
<tr><td>TRIP</td><td colspan="3">Fault indicator
Off: in normal state
Blinking: in pre-alarm state
On: in fault state</td></tr>
<tr><td>2</td><td>Unit indicator</td><td colspan="4">Unit displayed currently
 
Hz — Frequency unit
RPM — Rotation speed unit
A — Current unit
% — Percentage
V — Voltage unit</td></tr>
<tr><td>3</td><td>Digital display zone</td><td colspan="4">Five-digit LED displays various monitoring data and alarm codes such as the frequency setting and output frequency.
<table>
<tr><th>Display</th><th>Means</th><th>Display</th><th>Means</th><th>Display</th><th>Means</th><th>Display</th><th>Means</th></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>2</td><td>2</td><td>3</td><td>3</td></tr>
<tr><td>4</td><td>4</td><td>5</td><td>5</td><td>6</td><td>6</td><td>7</td><td>7</td></tr>
<tr><td>8</td><td>8</td><td>9</td><td>9</td><td>A</td><td>A</td><td>b</td><td>B</td></tr>
<tr><td>C</td><td>C</td><td>d</td><td>D</td><td>E</td><td>E</td><td>F</td><td>F</td></tr>
<tr><td>H</td><td>H</td><td>I</td><td>I</td><td>L</td><td>L</td><td>n</td><td>N</td></tr>
<tr><td>n</td><td>n</td><td>o</td><td>o</td><td>P</td><td>P</td><td>r</td><td>r</td></tr>
<tr><td>S</td><td>S</td><td>t</td><td>t</td><td>U</td><td>U</td><td>u</td><td>v</td></tr>
<tr><td>-</td><td>.</td><td>-</td><td>-</td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Keys</td><td>PRG ESC</td><td>Programming key</td><td colspan="2">Press it to enter or exit level-1 menus or delete a parameter.</td></tr>
<tr><td>DATA ENT</td><td>Confirmation key</td><td colspan="2">Press it to enter menus in cascading mode or confirm the setting of a parameter.</td></tr>
</table>

No.	Item	Description		
		▲	UP key	Press it to increase data or move upward.
		▼	Down key	Press it to decrease data or move downward.
		SHIFT	Right-shifting key	Press it to select display parameters rightward in the interface for the inverter in stopped or running state or to select digits to change during parameter setting.
		RUN	Run key	Press it to run the inverter when using the keypad for control.
		STOP RST	Stop/ Reset key	Press it to stop the inverter that is running. The function of this key is restricted by P07.04. In fault alarm state, this key can be used for reset in any control modes.
		QUICK JOG	Multifunction shortcut key	The function of this key is determined by P07.02.
5	Keypad interface	External keypad interface. When the keypad is valid, the local keypad and external keypad light up simultaneously.		

4.2 Keypad display

The inverter keypad displays information such as the stopped-state parameters, running-state parameters, and fault status, and allows you to modify function codes.

4.2.1 Displaying stopped-state parameters

When the inverter is in stopped state, the keypad displays stopped-state parameters, as shown in Figure 4-3.

When the inverter is in stopped state, the keypad displays 4 stopped-state parameters, including set frequency, bus voltage, input terminal status, and output terminal status. You can press >>/SHIFT to shift parameters.

4.2.2 Displaying running-state parameters

After receiving a valid running command, the inverter enters the running state, and the keypad displays running-state parameters, with the RUN/TUNE indicator on. The on/off state of the FWD/REV indicator is determined by the actual running direction, as shown in Figure 4-3.

In the running state, there are 6 parameters that can be displayed. There are: running frequency, set frequency, bus voltage, output voltage, output current, and rotational speed. You can press the >>/SHIFT key to shift parameters.

4.2.3 Displaying fault information

After detecting a fault signal, the inverter enters the fault alarm state immediately, the fault code blinks on the keypad, and the TRIP indicator is on. You can perform fault reset by using the STOP/RST key, control terminals, or communication commands.

If the fault persists, the fault code is continuously displayed.

4.2.4 Editing function codes

You can press the PRG/ESC key to enter the editing mode in stopped, running, or fault alarm state (if a user password is used, see the description of P07.00). The editing mode contains two levels of menus in the following sequence: Function code group or function code number → Function code setting. You can press the DATA/ENT key to enter the function parameter display interface. In the function parameter display interface, you can press the DATA/ENT key to save parameter settings or press the PRG/ESC key to exit the parameter display interface.

Figure 4-3 Status display

4.3 Operation procedure

You can operate the inverter by using the keypad. For details about function code descriptions, see the function code list.

4.3.1 Modifying function codes

The inverter provides three levels of menus, including:

• Function code group number (level-1 menu)

• Function code number (level-2 menu)

• Function code setting (level-3 menu)

Note: When performing operations on the level-3 menu, you can press the PRG/ESC or DATA/ENT key to return to the level-2 menu. If you press the DATA/ENT key, the set value of the parameter is saved to the control board first, and then the level-2 menu is returned, displaying the next function code. If you press the PRG/ESC key, the level-2 menu is returned directly, without saving the set value of the parameter, and the current function code is displayed.

If you enter the level-3 menu but the parameter does not have a digit blinking, the parameter cannot be modified due to either of the following reasons:

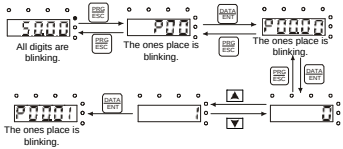
• It is read only. Read-only parameters include actual detection parameters and running

record parameters.

• It cannot be modified in running state and can be modified only in stopped state.

Example: Change the value of P00.01 from 0 to 1.

Figure 4-4 Modifying a parameter



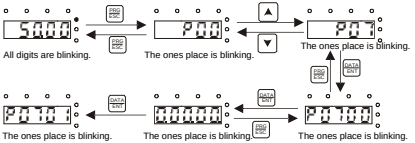
Note: When setting the value, you can press SHIFT and ▲+▼ to modify the value.

4.3.2 Setting a password for the inverter

The inverter provides password protection function to users. Set P07.00 to gain the password and the password protection becomes effective 1 minute later after retreating from the function code editing state. Press PRG/ESC again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the correct password, you cannot enter it.

To disable the password protection function, you need only to set P07.00 to 0.

Figure 4-5 Setting a password

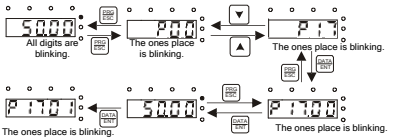


Note: When setting the value, you can press SHIFT and ▲+▼ to modify the value.

4.3.3 Viewing inverter status

The inverter provides group P17 for status viewing. You can enter group P17 for viewing.

Figure 4-6 Viewing a parameter



Note: When setting the value, you can press SHIFT and ▲+ ▼to modify the value.

5 Commissioning guidelines

- Cut off all power supplies connected to the inverter before terminal wiring, and wait for at least the time designated on the inverter after disconnecting the power supplies.
- High voltage presents inside the inverter during running. Do not carry out any operation on the inverter during running except for keypad setup.
- By default, the inverter runs automatically after being powered on. If you need to set parameters, comply with the procedure described in this chapter.

5.1 Check before running

Ensure the following before powering on the inverter:

1. The inverter has been grounded reliably.
2. The wire connection is correct and reliable.
3. The AC/DC breaker is selected correctly.
4. The solar DC input voltage is within the range allowed by the inverter.
5. The motor type, voltage, and power match the inverter type, voltage, and power.

5.2 Trial run

Close the DC circuit breaker, and the inverter runs automatically after a delay of about 10s. Observe the water output of the pump. If the water output is normal, the trial run is successful; if the water output is small, run again after swapping the connection of any two motor wires.

5.3 Parameter settings

By default, the inverter runs automatically after being powered on. To set parameters, do as follows: If the inverter has not been powered on, power on the inverter, and press QUICK/JOG within 10s to enter the keypad-based control mode (LOCAL/REMOT off). If the inverter has been powered on (Run indicator is on), press the STOP/RST key to enter the parameter setting interface. After the parameters are set, turn off and turn on the inverter power.

5.4 Advanced settings

Note: The default settings of the inverter can be adapted to most working conditions, and advanced settings are not required in most cases.

5.4.1 Water discharge speed PI adjustment

If you have higher requirements on the water discharge speed, you can adjust the PI parameters (P15.06–P15.10) appropriately. Setting the PI parameters to larger values will result in a faster water discharge speed, but the motor frequency fluctuates greatly; conversely, setting the PI parameters to smaller values will result in a slower water discharge speed, but the motor running frequency is relatively smooth.

6 Function parameter list

"○" indicates that the value of the parameter can be modified when the inverter is in stopped or running state.

"◎" indicates that the value of the parameter cannot be modified when the inverter is in running state.

"●" indicates that the value of the parameter is detected and recorded, and cannot be modified.

Note: The inverter automatically checks and constrains the modification of parameters, which helps prevent incorrect modifications.

6.1 Function parameters related to control

P00 group Basic functions

Function code	Name	Description	Default	Modify
P00.00	Speed control mode	0: SVC mode 0 No need to install encoders. Applicable to scenarios with requirements for low frequency, great torque, and high speed control accuracy. Relative to SVC mode 1, SVC mode 0 is more applicable to the scenarios requiring small power. 1: SVC mode 1 Applicable to high-performance scenarios, featuring high rotation and torque accuracy, without the need to install pulse encoders. 2: Space voltage vector control mode Applicable to scenarios without demanding requirements on control accuracy, such as fan and pump. One inverter can drive multiple motors. **Note:** Before using a vector control mode, enable the inverter to perform motor parameter autotuning first.	2	◎
P00.01	Channel of running commands	Used to select the channel of running inverter control commands. The inverter control commands include the start, stop, forward run, reverse run, jog,	1	○

Function code	Name	Description	Default	Modify
		and fault reset commands. 0: Keypad (LOCAL/REMOT off) The commands are controlled through keypad keys, such as the RUN and STOP/RST keys. In running state, you can press both RUN and STOP/RST to enable the inverter to coast to stop. 1: Terminal (LOCAL/REMOT blinking) The running commands are controlled through forward rotation, reverse rotation, forward jogging, and reverse jogging of multi-function input terminals. 2: Communication (LOCAL/REMOT on) The running commands are controlled by the upper computer in communication mode.		
P00.03	Max. output frequency	Used to set the max. output frequency of the inverter. Pay attention to this parameter because it is the foundation of the frequency setting and the speed of acceleration (ACC) and deceleration (DEC). Setting range: P00.04–400.00Hz	50.00Hz	◎
P00.04	Upper limit of running frequency	The upper limit of the running frequency is the upper limit of the output frequency of the inverter, which is lower than or equal to the max. output frequency. When the set frequency is higher than the upper limit of the running frequency, the upper limit of the running frequency is used for running. Setting range: P00.05–P00.03 (Max. output frequency)	50.00Hz	◎
P00.05	Lower limit of running frequency	The lower limit of the running frequency is the lower limit of the output frequency of the inverter. When the set frequency is lower than the lower limit of the running frequency, the lower limit of the running frequency is used for running.	0.00Hz	◎

Function code	Name	Description	Default	Modify
		Note: Max. output frequency ≥ Upper limit of frequency ≥ Lower limit of frequency Setting range: 0.00Hz–P00.04 (Upper limit of running frequency)		
P00.11	ACC time 1	ACC time means the time needed if the inverter speeds up from 0Hz to the max. output frequency (P00.03). DEC time means the time needed if the inverter speeds down from the max. output frequency (P00.03) to 0Hz. The inverter has four groups of ACC/DEC time, which can be selected by P05. The factory default ACC/DEC time of the inverter is the first group. Setting range of P00.11 and P00.12: 0.0–3600.0s	Model depended	○
P00.12	DEC time 1		Model depended	○
P00.13	Running direction	0: Run at the default direction. The inverter runs in the forward direction. FWD/REV is off. 1: Run at the opposite direction. The inverter runs in the reverse direction. FWD/REV is on. Modify P00.13 to shift the rotation direction of the motor. This effect equals to the shifting the rotation direction by adjusting either two of the motor lines (U, V and W). The motor rotation direction can be changed by QUICK/JOG on the keypad. For details, refer to parameter P07.02. **Note:** ● When the parameter is restored to the default value, the motor's running direction is restored to the default one. Exercise caution before using this function if the change of motor rotation direction is disallowed after commissioning. ● Do not change the setting of the	0	○

Function code	Name	Description	Default	Modify
		parameter because reverse running is not allowed in water pump application scenarios. 2: Disable reverse running. It can be used in some special scenarios where reverse running is disallowed.		
P00.15	Motor parameter autotuning	0: No operation 1: Rotary autotuning Comprehensive motor parameter autotuning. It is recommended to use rotating autotuning when high control accuracy is needed. 2: Static autotuning 1 Used in scenarios where the motor cannot be disconnected from load. 3: Static autotuning 2 Empty-load current and mutual inductance are not autotuned.	0	◎
P00.18	Function parameter restore	0: No operation 1: Restore default values 2: Clear fault records **Note:** ● After the selected operation is performed, the function code is automatically restored to 0. ● Restoring the default values may delete the user password. Exercise caution before using this function.	0	◎

P01 group Start and stop control

Function code	Name	Description	Default	Modify
P01.08	Stop mode	0: Decelerate to stop. When a stop command takes effect, the inverter lowers output frequency based on the DEC mode and the defined DEC time; when the frequency drops to 0Hz, the inverter stops. 1: Coast to stop. When a stop command	0	○

Function code	Name	Description	Default	Modify
		takes effect, the inverter stops output immediately. And the load coasts to stop according to mechanical inertia.		
P01.18	Terminal-based running command protection at power-on	0: The terminal running command is invalid at power-on 1: The terminal running command is valid at power-on	1	○
P01.21	Power-off restart selection	0: Disable restart 1: Enable restart	1	○

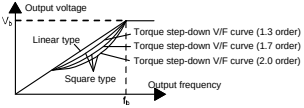
P02 group Parameters of motor 1

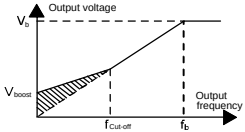
Function code	Name	Description		Default	Modify
P02.00	Motor type	0: Asynchronous motor (AM) 1: Synchronous motor (SM)		0	◎
P02.01	Rated power of AM	0.1–3000.0kW	Used to set AM parameters. To ensure the control performance, set P02.01–P02.05 correctly according to the information on the nameplate of the AM. The inverter provides the parameter autotuning function. Whether parameter autotuning can be performed properly depends on the settings of the motor nameplate parameters. In addition, you need to configure a motor according to the standard motor configuration of the	Model depended	◎
P02.02	Rated frequency of AM	0.01Hz–P00.03		50.00Hz	◎
P02.03	Rated speed of AM	1–36000rpm		Model depended	◎
P02.04	Rated voltage of AM	0–1200V		Model depended	◎
P02.05	Rated current of AM	0.8–6000.0A		Model depended	◎

Function code	Name	Description		Default	Modify
			inverter. If the power of the motor is greatly different from that of the standard motor configuration, the control performance of the inverter degrades significantly. **Note:** Resetting the rated power of the motor (P02.01) can initialize the parameters P02.02–P02.10.		
P02.06	Stator resistance of AM	0.001–65.535Ω	After motor parameter autotuning is properly performed, the values of P02.06–P02.10 are automatically updated. These parameters are the benchmark parameters for high-performance vector control, directly affecting the control performance. **Note:** Do not modify these parameters unless it is necessary.	Model depended	○
P02.07	Rotor resistance of AM	0.001–65.535Ω		Model depended	○
P02.08	Leakage inductance of AM	0.1–6553.5mH		Model depended	○
P02.09	Mutual inductance of AM	0.1–6553.5mH		Model depended	○
P02.10	No-load current of AM	0.1–6553.5A		Model depended	○
P02.15	Rated power of SM	0.1–3000.0kW	Used to set SM parameters. To ensure the control performance, set P02.15–P02.19 correctly according to the information on the nameplate of the AM. The inverter provides the parameter autotuning	Model depended	◎
P02.16	Rated frequency of SM	0.01Hz–P00.03 (Max. output frequency)		50.00Hz	◎
P02.17	Number of pole pairs of SM	1–128		2	◎
P02.18	Rated voltage of SM	0–1200V		Model depended	◎

Function code	Name	Description		Default	Modify
P02.19	Rated current of SM	0.8–6000.0A	function. Whether parameter autotuning can be performed properly depends on the settings of the motor nameplate parameters. In addition, you need to configure a motor according to the standard motor configuration of the inverter. If the power of the motor is greatly different from that of the standard motor configuration, the control performance of the inverter degrades significantly. **Note:** Resetting the rated power of the motor (P02.15) can initialize the parameters P02.02–P02.10.	Model depended	◎
P02.20	Stator resistance of SM	0.001–65.535Ω	After motor parameter autotuning is properly performed, the values of P02.20–P02.23 are automatically updated. These parameters are the benchmark parameters for high-performance vector control, directly affecting the control performance. **Note:** Do not modify these parameters unless it is necessary.	Model depended	○
P02.21	Direct-axis inductance of SM	0.01–655.35Mh		Model depended	○
P02.22	Quadrature-axis inductance of SM	0.01–655.35Mh		Model depended	○
P02.23	Counter-emf of SM	0–10000		300	○

P04 group Space voltage vector control

Function code	Name	Description	Default	Modify
P04.00	V/F curve setting	This group of function code defines the V/F curve of motor 1 to meet the needs of different loads. 0: Straight-line V/F curve, applicable to constant torque loads 1: Reserved 2: Torque-down V/F curve (power of 1.3) 3: Torque-down V/F curve (power of 1.7) 4: Torque-down V/F curve (power of 2.0) Curves 2–4 are applicable to the torque loads such as fans and water pumps. You can adjust according to the characteristics of the loads to achieve best performance. 5: Reserved **Note:** In the following figure, V_b is the motor rated voltage and f_b is the motor rated frequency. 	4	◎
P04.01	Torque boost	In order to compensate for low-frequency torque characteristics, you can make some boost compensation for the output voltage. P04.01 is relative to the max. output voltage V_b. P04.02 defines the percentage of cut-off frequency of manual torque boost to the rated motor frequency f_b. Torque boost can improve the low-frequency torque characteristics in space voltage vector control mode. You need to select torque boost based on the load. For example, larger load requires larger torque boost, however, if the torque boost is too large, the motor will run at	2.0%	○
P04.02	Torque boost cut-off		20.0%	○

Function code	Name	Description	Default	Modify
		over-excitation, which may cause increased output current and motor overheating, thus decreasing the efficiency. When torque boost is set to 0.0%, the inverter uses automatic torque boost. Torque boost cut-off threshold: Below this frequency threshold, torque boost is valid; exceeding this threshold will invalidate torque boost.  Setting range of P04.01: 0.0%: Automatic, 0.1%–10.0% Setting range of P04.02: 0.0% –50.0%		
P04.09	V/F slip compensation gain	Used to compensate for the motor rotating speed change caused by load change in the space voltage vector mode, and thus improve the rigidity of the mechanical characteristics of the motor. You need to calculate the rated slip frequency of the motor as follows: $\triangle f=f_b-n*p/60$ Of which, f_b is the rated frequency of the motor, corresponding to function code P02.01. n is the rated rotating speed of the motor, corresponding to function code P02.02. p is the number of pole pairs of the motor. 100.0% corresponds to the rated slip frequency $\triangle f$ of the motor. Setting range: 0.0–200.0%	0.0%	○
P04.10	Low-frequency oscillation control factor	In space voltage vector control mode, the motor, especially the large-power motor, may experience current oscillation at	10	○

Function code	Name	Description	Default	Modify
P04.11	High-frequency oscillation control factor	certain frequencies, which may cause unstable motor running, or even inverter overcurrent. You can adjust the two function codes properly to eliminate such phenomenon. Setting range of P04.10 and P04.11: 0–100 Setting range of P04.12: 0.00Hz–P00.03 (Max. output frequency)	10	○
P04.12	Vibration control threshold		30.00Hz	○
P04.34	Two phase control selection of single-phase motor	Ones place: Reserved Tens place: Reversal of the secondary winding (V-phase) voltage 0: Not reversed; 1: Reversed Setting range: 0–0x11	0x00	◎
P04.35	Voltage ratio of V-phase and U-phase	0.00–2.00	1.40	○

P05 group Input terminals

Function code	Name	Description	Default	Modify
P05.00	HDI input type	0: HDI is high-speed pulse input. See P05.49–P05.54. 1: HDI is digital input	1	◎
P05.01	Function of S1	0: No function 1: Run forward 2: Run reversely 3: Three-wire running control 4–5: Reserved 6: Coast to stop 7: Reset faults 8: Pause running 9: External fault input 10–35: Reserved 36: Switch the running command channel to keypad 37: Switch the running command channel to terminal	42	◎
P05.02	Function of S2		43	◎
P05.03	Function of S3		44	◎
P05.04	Function of S4		45	◎
P05.05	Function of S5		1	
P05.09	Function of HDI		46	◎

Function code	Name	Description	Default	Modify
		38: Switch the running command channel to communication 39: Reserved 40: Clear electricity consumption 41: Keep electricity consumption 42: Forcibly switches to power frequency (Switching-on indicates switching to power frequency, and switching-off indicates input controlled by the keypad.) 43: Full-water signal 44: Empty-water signal 45: Two phase control mode of single-phase motor 46: PV digital input without the boost module (used for automatic switching) 47–63: Reserved		
P05.10	Input terminal polarity	0x000–0x10F BIT8 BIT2 BIT1 BIT0 HDI S3 S2 S1	0x000	◎

P06 group Output terminals

Function code	Name	Description	Default	Modify
P06.03	RO1 output	0: Disable	30	○
P06.04	RO2 output	1: Running 2: Running forward 3: Running reversely 4: Jogging 5: Inverter in fault 6: Frequency level detection FDT1 7: Frequency level detection FDT2 8: Frequency reached 9: Reserved 10: Upper limit frequency reached 11: Lower limit frequency reached 12: Ready for running 13: Reserved	5	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>14: Overload pre-alarm
15–19: Reserved
20: External fault is valid
21: Reserved
22: Running time reached
23: Modbus communication virtual terminal output
24–63: Reserved
27: In weak light
28: Automatically switches from automatic switching mode to power frequency input mode
29: Forcibly switches to power frequency input mode
30: Switches to PV input mode</td><td></td><td></td></tr>
<tr><td>P06.05</td><td>Output terminal polarity selection</td><td>Used to set the polarity of output terminals.
When a bit is 0, the output terminal is positive.
When a bit is 1, the output terminal is negative.
<table><tr><th>BIT1</th><th>BIT0</th></tr><tr><td>RO2</td><td>RO1</td></tr></table>Setting range: 0–F</td><td>0</td><td>○</td></tr>
<tr><td>P06.10</td><td>RO1 switch-on delay</td><td>0.00–500.00s</td><td>10.00s</td><td>○</td></tr>
<tr><td>P06.11</td><td>RO1 switch-off delay</td><td>0.00–500.00s</td><td>10.00s</td><td>○</td></tr>
<tr><td>P06.12</td><td>RO2 switch-on delay</td><td>0.00–500.00s</td><td>0.00s</td><td>○</td></tr>
<tr><td>P06.13</td><td>RO2 switch-off delay</td><td>0.00–500.00s</td><td>0.00s</td><td>○</td></tr>
</table>

P07 group Human-machine interface

Function code	Name	Description	Default	Modify
P07.00	User password	0–65535 When you set the function code to a non-zero number, password protection is enabled. If you set the function code to 00000, the previous user password is cleared and password protection is disabled. After the user password is set and takes effect, you cannot enter the parameter menu if you enter an incorrect password. Please remember your password and save it in a secure place. After you exit the function code editing interface, the password protection function is enabled within 1 minute. If password protection is enabled, "0.0.0.0.0" is displayed when you press the PRG/ESC key again to enter the function code editing interface. You need to enter the correct user password to enter the interface. **Note:** Restoring the default values may delete the user password. Exercise caution before using this function.	0	○
P07.01	Parameter copy	0–4 0: No operation 1: Upload parameters from the local address to the keypad 2: Download parameters (including motor parameters) from the keypad to the local address 3: Download parameters (excluding group P02) from the keypad to the local address 4: Download parameters (only including group P02) from the keypad to the local address	0	◎

Function code	Name	Description	Default	Modify
		Note: After any operation among 1–4 is complete, the parameter restores to 0. The upload and download functions are not applicable to group P29. The function is valid only for an external keypad that is an optional part and provides the parameter copy function.		
P07.02	Function of QUICK/JOG	0: No function 1–5: Reserved 6: Switch command channels in sequence. Press QUICK/JOG key to switch the running command reference mode in sequence. 7: Quick commissioning mode (based on non-factory parameter settings)	6	○
P07.03	Sequence of switching running-command channels by pressing QUICK/JOG	When P07.02 =6, set the sequence of switching running-command channels by pressing this key. 0: Keypad→Terminal→Communication 1: Keypad←→Terminal 2: Keypad←→Communication 3: Terminal←→Communication	1	○
P07.04	Stop function validity of STOP/RST	Used to specify the stop function validity of STOP/RST. For fault reset, STOP/RST is valid in any conditions. 0: Valid only for keypad control 1: Valid both for keypad and terminal control 2: Valid both for keypad and communication control 3: Valid for all control modes	3	○
P07.11	Boost module temperature	When the inverter is configured with the boost module, P07.11 displays the temperature of the boost module. **Note:** P07.11 is valid only in AC mode invalid in PV mode. -20.0–120.0℃		●

Function code	Name	Description	Default	Modify
P07.12	Inverter module temperature	-20.0–120.0℃		●
P07.13	Control board software version	1.00–655.35		●
P07.14	Local accumulative running time	0–65535h		●
P07.15	Inverter electricity consumption high-order bits	Used to display the electricity consumption of the inverter. Inverter electricity consumption = P07.15*1000 + P07.16 Setting range of P07.15: 0–65535kWh (*1000) Setting range of P07.16: 0.0–999.9kWh		●
P07.16	Inverter electricity consumption low-order bits			●
P07.27	Present fault type	0: No fault 1: Inverter unit U-phase protection (OUt1) 2: Inverter unit V-phase protection (OUt2) 3: Inverter unit W-phase protection (OUt3) 4: Overcurrent during acceleration (OC1) 5: Overcurrent during deceleration (OC2) 6: Overcurrent during constant speed running (OC3) 7: Overvoltage during acceleration (OV1) 8: Overvoltage during deceleration (OV2) 9: Overvoltage during constant speed running (OV3) 10: Bus undervoltage (UV) 11: Motor overload (OL1) 12: Inverter overload (OL2) 13: Phase loss on input side (SPI)		●
P07.28	Last fault type			●
P07.29	2nd-last fault type			●
P07.30	3rd-last fault type			●
P07.31	4th-last fault type			●
P07.32	5th-last fault type			●
P07.57	6th-last fault type			●
P07.58	7th-last fault type			●
P07.59	8th-last fault type			●
P07.60	9th-last fault type			●
P07.61	10th-last fault type			●
P07.62	11th-last fault type			●
P07.63	12th-last fault type			●
P07.64	13th-last fault type			●
P07.65	14th-last fault type			●
P07.66	15th-last fault type			●

Function code	Name	Description	Default	Modify
P07.67	16th-last fault type	14: Phase loss on output side (SPO) 15: Boost module overheat (OH1) 16: Inverter module overheat (OH2) 17: External fault (EF) 18: RS485 communication fault (CE) 19: Current detection fault (ItE) 20: Motor autotuning fault (tE) 21: EEPROM operation error (EEP) 22–23: Reserved 24: Running time reached (END) 25: Electronic overload (OL3) 26–31: Reserved 32: To-ground short-circuit fault 1 (ETH1) 33: To-ground short-circuit fault 2 (ETH2) 34: Speed deviation fault (dEu) 35: Mal-adjustment fault (STo) 36: Underload fault (LL) 37: Hydraulic probe damage (tSF) 38: PV reverse connection fault (PINV) 39: PV overcurrent (PVOC) 40: PV overvoltage (PVOV) 41: PV undervoltage (PVLV) 42: Fault on 422 communication with the boost module (E-422) 43: Bus overvoltage detected on the boost side (OV) **Note:** Faults 38–40 are only detected in boost. The boost module stops working immediately after detecting a fault, while returning the fault information to the inverter module in the next data returning. Alarms: 60: Light-weak pre-alarm (A-LS) 61: Underload pre-alarm (A-LL)		●
P07.68	17th-last fault type			●
P07.69	18th-last fault type			●
P07.70	19th-last fault type			●
P07.71	20th-last fault type			●

Function code	Name	Description	Default	Modify
		62: Full-water pre-alarm (A-tF) 63: Empty-water pre-alarm (A-tL) **The inverter decelerates to stop when encountering the following faults:** (SPI): Phase loss on input side (CE): RS485 communication fault (EEP): EEPROM operation error (END): Running time reached (OL3): Electronic overload (LL): Underload fault (tSF): Hydraulic probe damage fault (E-422): 422 communication fault (boost module) **Note:** The prealarm will be not recorded into the fault but can be read by Modbus.		

P08 group Enhanced functions

Function code	Name	Description	Default	Modify
P08.28	Auto fault reset count	0–10	5	○
P08.29	Auto fault reset interval	0.1–3600.0s	10.0s	○

6.2 Function parameters special for solar pump

P11 group Protection parameters

Function code	Name	Description	Default	Modify
P11.00	Protection against phase loss	0x000–0x011 LED ones place: 0: Software protection against input phase loss disabled 1: Software protection against input phase loss enabled LED tens place: 0: Software protection against output phase loss disabled	Model depended	○

Function code	Name	Description	Default	Modify
		1: Software protection against output phase loss enabled LED hundreds place: (Reserved) 000–111		
P11.01	Voltage point for frequency drop at transient power-off	20.0%–120.0%	80.0%	○
P11.02	Frequency decrease ratio at sudden power loss	0.00Hz–P00.03/s If the bus voltage drops to the sudden frequency decreasing point due to the power loss of the grid, the inverter begins to decrease the running frequency according to P11.02 to make the motor in power generation state. The regenerative power can maintain the bus voltage to ensure normal running of the inverter until the recovery of power.	10.00Hz/s	○

P15 group Functions special for solar inverter

Function code	Name	Description	Default	Modify
P15.00	Solar inverter selection	0: Disable 1: Enable The value 0 indicates solar control is invalid, and this function group is not used. The value 1 indicates solar control is valid, this function group can be modified.	1	◎
P15.01	Vmpp voltage giving method	0: Voltage 1: Max. power tracking The value 0 indicates using the voltage giving method, the reference voltage is P15.02, and it is a fixed value. The value 1 indicates the reference voltage is given by tracking the max. power. The reference voltage keeps changing until the	1	◎

Function code	Name	Description	Default	Modify
		system becomes stable. **Note:** This parameter is invalid when terminal function 43 is valid.		
P15.02	Vmpp voltage given through keypad	0.0–6553.5Vdc When P15.01 is 0, this parameter determines the reference voltage. (During testing, the reference voltage value must be less than the PV input voltage. Otherwise, the system runs at the lower limit of frequency.)	250.0V	○
P15.03	PID control deviation limit	0.0–100.0% (100.0% corresponding to P15.02) PI adjustment is performed only when the ratio of the difference between the actual voltage and reference voltage to the reference voltage, which is abs (Actual voltage – Reference voltage) * 100.0% / (Reference voltage), exceeds P15.03. The default value is 0.0%. abs: The absolute value is used.	0.0%	○
P15.04	PID output upper limit frequency	P15.05–100.0% (100.0% corresponding to P00.03) P15.04 is used to limit the Max. value of target frequency. 100.0% corresponds to P00.03. After PI adjustment, the target frequency cannot exceed the upper limit.	100.0%	○
P15.05	PID output lower limit frequency	0.0%–P15.04 (100.0% corresponding to P00.03) P15.05 is used to limit the Min. value of target frequency. 100.0% corresponds to P00.03. After PI adjustment, the target frequency cannot be less than the lower limit.	20.0%	○

Function code	Name	Description	Default	Modify
P15.06	KP1	0.00–100.00 Proportional coefficient 1 of target frequency. A greater value indicates stronger effect and faster adjustment.	5.00	○
P15.07	KI1	0.00–100.00 Integral coefficient 1 of target frequency A greater value indicates stronger effect and faster adjustment.	5.00	○
P15.08	KP2	0.00–100.00 Proportional coefficient 2 of target frequency A greater value indicates stronger effect and faster adjustment.	35.00	○
P15.09	KI2	0.00–100.00 Integral coefficient 2 of target frequency A greater value indicates stronger effect and faster adjustment.	35.00	○
P15.10	PI switchover point	0.0–6553.5Vdc When the absolute value of PV voltage minus reference voltage is greater than P15.10, P15.08 and P15.09 are used. Otherwise, P15.06 and P15.07 are used.	20.0V	◎
P15.11	Water level control selection	0: Control through digital input The value 0 indicates the water level signal is controlled through digital input. For details, see S terminal functions 43 and 44 of P05. When the terminal input of full-water signal is valid, the system reports the full-water pre-alarm (A-tF) with a delay specified by P15.14 and then sleeps. In full-water alarm state, the full-water signal is invalid, the system clears the full-water alarm with a delay specified by P15.15 and then re-enters the running state. When the terminal input of empty-water signal is valid, the system reports the empty-water	0	◎

Function code	Name	Description	Default	Modify
		pre-alarm (A-tL) with a delay specified by P15.16 and then sleeps. In empty-water alarm state, the empty-water signal is invalid, the system clears the empty-water alarm with a delay specified by P15.17 and then re-enters the running state.		
P15.14	Full-water level delay	0–10000s Time setting on full-water level delay. (This parameter is still valid for digital full-water signal.)	5s	○
P15.15	Full-water level wake-up delay	0–10000s Time setting on full-water level wake-up delay. (This parameter is still valid for digital full-water signal.)	20s	○
P15.16	Empty-water level delay	0–10000s Time setting on empty-water level delay. (This parameter is still valid for digital empty-water signal.)	5s	○
P15.17	Empty-water level wake-up delay	0–10000s Time setting on empty-water level wake-up delay. (This parameter is still valid for digital empty-water signal.)	20s	○
P15.18	Hydraulic probe damage	0.0–100.0% If P15.18 is 0.0%, it indicates P15.18 is invalid. If P15.18 is not 0.0%, when the detected water level control analog signal is greater than the value set in P15.18, the (tSF) fault is reported and the inverter stops.	0.0%	○
P15.19	Water pump run time in underload state	0.0–1000.0s Duration in which the water pump runs in underload state. In continuous underload condition, the underload alarm (A-LL) is reported when the run time is reached.	60.0s	○
P15.20	Current detection value at	0.0%: Automatic detection on underload 0.1–100.0% The value 0.0% indicates it is determined	00.00%	○

Function code	Name	Description	Default	Modify
	underload running	by the underload detection mechanism of the inverter. A value rather than 0.0% indicates it is determined by P15.20. 100.0% corresponds to the motor rated current. When the absolute value of target frequency minus ramp frequency is less than or equal to P15.22 (lagging frequency threshold): If the actual current value at the actual frequency is continuously less than P15.20, the system reports the underload fault with a delay specified by P15.19. Otherwise, the system runs properly. In the non-continuous situation, the delay counter is automatically cleared.		
P15.21	Underload reset delay	0.0–1000.0s Underload reset delay. In underload state, the counting on the underload run time and that on the underload reset delay are performed synchronously. Generally, the value needs to be greater than P15.19 so that the system can report the underload alarm when the underload run time is reached and then reset can be performed when the time P15.21–P15.19 elapsed. If the value of P15.21 is the same as that of P15.19, auto reset is performed at the same time as the underload alarm is reported.	120.0s	○
P15.22	Lagging frequency threshold	0.00–200.00Hz P15.22 is the lagging frequency threshold, used to determine the underload run condition. Currents are compared only when the absolute value of target frequency minus ramp frequency is continuously less than or equal to this parameter.	0.30Hz	○

Function code	Name	Description	Default	Modify
P15.23	Weak-light delay	0.0–3600.0s Time setting on weak-light delay. When the output frequency is less than or equal to the PI output frequency lower limit and the delay counting is started, which reaches the weak-light delay time, the system reports the weak-light alarm (A-LS) and then sleeps. In the non-continuous situation, the delay counter is automatically cleared. **Note:** ● When the bus voltage is lower than the undervoltage point or the PV voltage is lower than 70V, the system directly reports the weak-light alarm without any delay. ● When P15.32=0, in weak-light condition, the system automatically switch to the power-frequency input mode.	100.0s	○
P15.24	Weak-light wake-up delay	0.0–3600.0s Time setting on weak-light wake-up delay. If the weak-light pre-alarm is reported, the system clears the pre-alarm with the weak-light wake-up delay and then re-enters the running state. When P15.32=0, if the PV voltage is greater than P15.34, the system switches from the power-frequency input mode to the PV input mode with the weak-light wake-up delay.	300.0s	○
P15.25	Initial actual reference voltage display	0.0–2000.0V	0	●

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P15.26</td><td>Min. reference voltage in max. power tracking</td><td>0.00–1.00
Used to set the min. reference voltage in max. power tracking. Min. reference voltage in max. power tracking = (Open-circuit voltage of photovoltaic panels) * P15.26. Open-circuit voltage of photovoltaic panels = P15.25 + P15.28
Track the max. power in the range of Min. reference voltage in max. power tracking–P15.27. P15.27 must be greater than the min. reference voltage. A smaller difference between them indicates a smaller range, which means faster tracking. The voltage corresponding to the max. power must be within the range. P15.26 and P15.27 must be adjusted according to the site situation.</td><td>0.70</td><td>○</td></tr>
<tr><td>P15.27</td><td>Max. reference voltage in max. power tracking</td><td>Min. reference voltage in max. power tracking–P15.31
It is the max. voltage tracked when MPPT max. power tracking is valid.
The factory value depends on the model.<table><tr><th>Model</th><th>Max. reference voltage</th><th>Vmppt max. value</th></tr><tr><td>-4</td><td>750</td><td>750</td></tr></table></td><td>400.0V</td><td>○</td></tr>
<tr><td>P15.28</td><td>Adjustment of initial reference voltage</td><td>0.0–200.0V
MPPT starts to be disturbed from the initial reference voltage.
Initial reference voltage = PV voltage − P15.28</td><td>5.0V</td><td>○</td></tr>
<tr><td>P15.29</td><td>Auto adjustment interval of Vmppt upper/lower limit</td><td>0.0–10.0s
When P15.29 = 0.0, auto adjustment of Vmppt upper/lower limit is invalid.
When it is not 0.0, Vmppt upper/lower limit is automatically adjusted at an interval specified by P15.29. The center after the</td><td>1.0s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
		adjustment is the actual PV voltage, and the upper/lower limit adjustment range is P15.30. That is: Max./Min. reference voltage = (Actual PV voltage ± P15.30 This will be automatically updated to P15.26 and P15.27.		
P15.30	Auto adjustment range of Vmppt upper/lower limit	10.0–100.0V Range in which Vmppt upper/lower limit can be automatically adjusted.	30.0V	○
P15.31	Vmppt max. value	P15.27–6553.5V During the max. power tracking, the solar panel reference voltage upper limit will not exceed the value of P15.31. The factory value depends on the model. By default, the value for the -4 models is 750V and the value for other models is 400V.	400.0V	○
P15.32	PV input and power frequency input selection	0: Automatic switching mode 1: Power frequency input mode 2: PV input mode If P15.32 is set to 0, the system switches between PV input and power frequency input according to the detected PV voltage and switching threshold. If P15.32 is set to 1, the system forcibly switches to power frequency input; If P15.32 is set to 2, the system forcibly switches to PV input. **Note:** P15.32 is invalid when terminal input function 42 is valid.	2	◎
P15.33	Threshold for switching to power	0.0V—P15.34 If PV voltage is lower than the threshold or the light is weak, it can switch to power frequency input through relay output.	70.0V	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td>frequency input</td><td>If P15.33 is set to 0, it is invalid.
For inverter models without boost modules, the switching voltage is determined by the external voltage detection circuit.
For inverter models with boost modules, the switching voltage is 70V.</td><td></td><td></td></tr>
<tr><td>P15.34</td><td>Threshold for switching to PV input</td><td>P15.33–400.0V
If PV voltage is greater than the threshold, the system can switch to PV input through relay output with the weak-light wake-up delay (P15.24). To avoid frequent switching, P15.34 shall be greater than P15.33. When P15.34 is set to 0.0, it is invalid.
The default value depends on model.</td><td>100.0V</td><td>○</td></tr>
<tr><td>P15.35</td><td>Rated pump flow</td><td>The pump flow is Q_N when the pump runs at the rated frequency and lift. Unit: cubic meter/hour</td><td>0.0</td><td>○</td></tr>
<tr><td>P15.36</td><td>Rated pump lift</td><td>The pump lift is H_N when the pump runs at the rated frequency and flow. Unit: meter</td><td>0.0</td><td>○</td></tr>
<tr><td>P15.37</td><td>Voltage setting at PV undervoltage point</td><td>When the PV voltage is less than the value of this parameter, the system reports the PV undervoltage fault.
The factory value depends on the model.<table><tr><th>Model</th><th>PV undervoltage point</th></tr><tr><td>-4</td><td>240V</td></tr><tr><td>Any model with the boost module</td><td>70V</td></tr></table>Setting range: 0.0–400.0</td><td>70.0</td><td>○</td></tr>
<tr><td>P15.39</td><td>Product model</td><td>This function code is provided for users to change models. For example, if the user wants to use model -4 (default after factory delivery) as model -2, P15.39 shall be set to 2.</td><td>0</td><td>◎</td></tr>
</table>

Function code	Name	Description	Default	Modify
		0: Model -SS2, 220V 1PH input and 1PH output 1: Model -S2, 220V 1PH input and 3PH output 2: Model -2, 220V 3PH input and 3PH output 3: Model -4, 380V 3PH input and 3PH output Setting range: 0–3		
P15.40	PQ curve fitting enabling	0: Disable 1: Enable Enable P15.40, and use the point between P15.41 and P15.50 for PQ curve fitting calculation. In this way, the flow calculation will be more accurate.	0	◎
P15.41	Power point 1 of PQ curve	It indicates the power point corresponding to the pump input power at the 1st point of the PQ curve.	0.0	◎
P15.42	Power point 2 of PQ curve	It indicates the power point corresponding to the pump input power at the 2nd point of the PQ curve.	0.0	◎
P15.43	Power point 3 of PQ curve	It indicates the power point corresponding to the pump input power at the 3rd point of the PQ curve.	0.0	◎
P15.44	Power point 4 of PQ curve	It indicates the power point corresponding to the pump input power at the 4th point of the PQ curve.	0.0	◎
P15.45	Power point 5 of PQ curve	It indicates the power point corresponding to the pump input power at the 5th point of the PQ curve.	0.0	◎
P15.46	Flow point 1 of PQ curve	It indicates the flow point corresponding to the pump flow at the 1st point of the PQ curve.	0.0	◎
P15.47	Flow point 2 of PQ curve	It indicates the flow point corresponding to the pump flow at the 2nd point of the PQ curve.	0.0	◎

Function code	Name	Description	Default	Modify
P15.48	Flow point 3 of PQ curve	It indicates the flow point corresponding to the pump flow at the 3rd point of the PQ curve.	0.0	◎
P15.49	Flow point 4 of PQ curve	It indicates the flow point corresponding to the pump flow at the 4th point of the PQ curve.	0.0	◎
P15.50	Flow point 5 of PQ curve	It indicates the flow point corresponding to the pump flow at the 5th point of the PQ curve.	0.0	◎
P15.51	Efficiency of pump	This function code indicates the overall efficiency of the pump.	80%	○

P17 group Status viewing

Function code	Name	Description	Default	Modify
P17.38	Current of the main winding	It is current of the main winding when applying capacitance-removing to control the single-phase motor. 0.00–100.00A	0.0A	●
P17.39	Current of the secondary winding	It is current of the secondary winding when applying capacitance-removing to control the single-phase motor. 0.00–100.00A	0.0A	●

P18 group Status viewing functions special for solar inverters

Function code	Name	Description	Default	Modify
P18.00	PV reference voltage	MPPT is performed at the inverter side. The value is given by the inverter side.		●
P18.01	Actual PV voltage	It is transferred from the boost module or equal to bus voltage.		●
P18.02	MPPT min. reference voltage display	The value displays the mini. voltage reference during max. power tracking. It equals to the solar cell panel open-circuit voltage multiplied P15.26.		●

Function code	Name	Description	Default	Modify
P18.04	Present inductive current	It is transferred from the boost module, and valid only in AC mode and invalid in PV mode.		●
P18.07	PV input power	Reserved. Unit: kW		●
P18.08	Previous PV input power	Reserved. Unit: kW		●
P18.09	Previous PV voltage	Reserved. Unit: V		●
P18.10	Device configuration display	0x00–0x11 LED ones place: 0: PV power supply 1: AC grid power supply LED tens place: 0: Detect that the system is configured with the boost module. 1: Detect that the system is not configured with the boost module.		●
P18.11	Actual pump flow	$Q = Q_N * f / f_N$ Unit: cubic meter/hour.	0.0	●
P18.12	Actual pump lift	$H = 0.9H_N * (f / f_N)^2$ Unit: meter.	0.0	●
P18.13	High-order bits in total pump flow	Used to display the 16 high-order bits of the total pump flow. Unit: cubic meter.	0	●
P18.14	Low-order bits in total pump flow	Used to display the 16 low-order bits of the total pump flow. Unit: cubic meter. Total pump flow = P18.13*65535 + P18.14	0.0	●
P18.15	Reset total pump flow	When it is set to 1, the total pump flow can be reset. P18.13 and P18.14 are cleared and then accumulated again. After the resetting succeeds, P18.15 is automatically changed to 0.	0	◎

P19 group Functions for voltage boost (inverter module communicates with boost module through RS485 communication)

Function code	Name	Description	Default	Modify
P19.00	Boost voltage loop KP	0.000–65.535	0.500	○
P19.01	Boost voltage loop KI	0.000–65.535	0.080	○
P19.02	Boost current loop KP	0.000–65.535	0.010	○
P19.03	Boost current loop KI	0.000–65.535	0.010	○
P19.04	Output current upper limit of boost voltage loop PI	Output upper limit of mppt voltage loop PI, upper limit of the boost current loop reference current. P19.05–15.0A	12.0A	○
P19.06	Bus reference voltage	This function code is used to set the reference voltage of bus voltage at PV input when the system is configured with the boost module. By default, the factory value for 220V models is 350V and the factory value for 380V models is 570V. Setting range: 300.0V–600.0V	350.0V	◎
P19.07	Boost voltage loop KP1	If the difference between the bus reference voltage and actual bus voltage is greater than 20V, the boost voltage loop uses PI parameters of this group. Otherwise, the boost voltage loop uses PI parameters of the first group. Setting range: 0.000–65.535	0.500	○

Function code	Name	Description	Default	Modify
P19.08	Boost voltage loop KI1	If the difference between the bus reference voltage and actual bus voltage is greater than 20V, the boost voltage loop uses PI parameters of this group. Otherwise, the boost voltage loop uses PI parameters of the first group. Setting range: 0.000–65.535	0.080	○
P19.10	Boost software version	Once being powered, the boost module firstly sends its version information to the inverter side.	0.00	●

Note:

- The duration from when the inverter starts to when it runs at the PI output frequency lower limit is determined by the ACC time.
- Delay time counting follows the rules if multiple fault conditions are met simultaneously: For example, if all fault conditions of weak light, full water, and underload are met simultaneously, the delay time for each fault is counted independently. When the delay time of a fault is reached, the fault is reported. The delay time counting for the other two faults is kept. If the reported faults is resolved bu the conditions of the other two faults persist, the delay time counting of the other two faults continues. If a fault condition is not met during counting, the delay time of this fault is cleared.

7 Fault diagnosis and solution

Do as follows if the inverter encounters a fault:

1. Check whether there is any exception on the keypad. If yes, contact the local INVT office.
2. If no, check function group P07 to view the fault record parameters and understand the actual condition.
3. See the following table for a detailed solution and check for exceptions.
4. Rectify the fault or ask for help.
5. Ensure the fault has been rectified, perform fault reset, and run the inverter again.

Fault code	Fault type	Possible cause	Solution
OUt1	Inverter unit U-phase protection	• Acceleration is too fast. • IGBT module is damaged. • Misacts are caused by interference. • Drive wires are poorly connected. • To-ground short circuit occurs.	• Increase ACC time. • Replace the power unit. • Check drive wires. • Check whether there is strong interference surrounding the peripheral device.
OUt2	Inverter unit V-phase protection		
OUt3	Inverter unit W-phase protection		
OV1	Overvoltage during acceleration	• The input voltage is abnormal. • There is large energy feedback. • No braking components. • Dynamic brake is not enabled.	• Check the input power. • Check whether the loaded DEC time is too short or the inverter starts when the motor is rotating. • Install the braking components. • Check the setting of related function codes.
OV2	Overvoltage during deceleration		
OV3	Overvoltage during constant speed running		
OC1	Overcurrent during acceleration	• Acceleration or deceleration is too fast. • The voltage of the grid is too low. • The power of the inverter is too low. • The load transients or is abnormal.	• Increase the ACC time. • Check the input power. • Select the inverter with larger power. • Check whether there is short circuit (to-ground or inter-wire) in the load or the rotation is not smooth.
OC2	Overcurrent during deceleration		
OC3	Overcurrent during constant speed running		

Fault code	Fault type	Possible cause	Solution
		• There is to-ground short circuit or output phase loss. • There is strong external interference. • The overvoltage stall protection is not enabled.	• Check the output wiring. • Check whether there is strong interference. • Check the setting of related function codes.
UV	Bus undervoltage	• The voltage of the grid is too low. • Overvoltage stall protection is not enabled.	• Check the grid input power; • Check the settings of related function code.
OL1	Motor overload	• The grid voltage is too low. • The motor rated current is set incorrectly. • Motor stall or load jumps violently.	• Check the grid voltage; • Reset the rated current of the motor; • Check the load and adjust torque boost.
OL2	Inverter overload	• Acceleration is too fast. • The rotating motor is reset. • The grid voltage is too low. • The load is too heavy. • The motor power is too small.	• Increase the ACC time. • Avoid the restarting after stop. • Check the grid voltage. • Select an inverter with larger power. • Select a proper motor.
SPI	Phase loss on the input side	• Phase loss or violent fluctuation occurred on input R, S, T.	• Check the input power; • Check the installation wiring.
SPO	Phase loss on output side	• Phase loss output occurs to U, V, W (or the three phases of the load are seriously asymmetrical)	• Check the output wiring; • Check the motor and cable.
OH1	Rectifier module overheating	• Air duct jam or fan damage occurs. • Ambient temperature is too high. • The time of overload running is too long.	• Dredge the vent duct or replace the fan. • Lower the ambient temperature.
OH2	Inverter module overheat		

Fault code	Fault type	Possible cause	Solution
EF	External fault	• SI external fault input terminal action.	• Check the external device input.
CE	RS485 communication fault	• The baud rate setting is incorrect. • A fault occurs to the communication wiring. • The communication address is incorrect. • Communication suffers from strong interference.	• Set a proper baud rate. • Check the communication interface wiring. • Set a proper communication address. • Replace or change the wiring to enhance the anti-interference capacity.
ItE	Current detection fault	• The control board connector is in poor contact. • Hall device is damaged. • An exception occurs on the magnifying circuit.	• Check the connector and re-plug. • Replace the Hall device. • Change the main control board.
tE	Motor autotuning fault	• The motor capacity does not match the inverter capacity. • Motor parameters are not set correctly. • The difference between the parameters obtained from autotuning and the standard parameters is great. • Autotuning timed out.	• Change the inverter model. • Set the motor type and nameplate parameters correctly. • Empty the motor load. • Check the motor wiring and parameter settings. • Check whether the upper limit frequency is higher than 2/3 of the rated frequency.
EEP	EEPROM operation fault	• Error in reading or writing control parameters. • EEPROM is damaged.	• Press STOP/RST for reset. Change the main control board.
END	Running time reached	• The actual running time of the inverter is longer than the internal set running time.	• Ask the supplier to adjust the preset running time.
OL3	Electronic overload fault	• The inverter reports overload pre-alarm according to the setting.	• Check the load and overload pre-alarm threshold.

Fault code	Fault type	Possible cause	Solution
ETH1	To-ground short-circuit fault 1	• Inverter output is short connected to the ground. • There is a fault in the current detection circuit.	• Check whether the motor wiring is normal. • Replace the Hall device. • Change the main control board.
ETH2	To-ground short-circuit fault 2		
dEu	Speed deviation fault	• The load is too heavy or stalled.	• Check the load and increase the detection time if the load is normal. • Check whether control parameters are set correctly.
STo	Mal-adjustment fault	• SM control parameters are set incorrectly. • Autotuned parameters are not accurate. • The inverter is not connected to the motor.	• Check the load and ensure the load is normal. • Check whether control parameters are set correctly. • Increase the maladjustment detection time.
LL	Electronic underload fault	• The inverter reports underload pre-alarm according to the setting.	• Check the load and overload pre-alarm threshold.
tSF	Hydraulic probe damage fault	• Hydraulic probe damage	• Replace the hydraulic probe
PINV	PV reverse connection fault	• PV wiring is incorrect.	• Change the wiring direction of positive and negative terminals, and perform the wiring again.
PVOC	PV overcurrent	• ACC/DEC is too fast. • The power of the inverter is too low. • The load transients or is abnormal. • There is to-ground short circuit.	• Increase the ACC/DEC time. • Select the inverter with a larger power. • Check if the load is short circuited (to-ground short circuit or line-to-line short circuit) or the rotation is not smooth.

Fault code	Fault type	Possible cause	Solution
PVOV	PV overvoltage	● Input voltage of the solar cell panel is too high. ● Model -4 is set as another model.	● Reduce the number of solar cell panels in series connection. ● Check and reset the model.
PVLV	PV undervoltage	● The power of the solar cell panels in series connection is too low or it is cloudy and rainy weather. ● The starting current of the motor is too high.	● Increase the number of solar cell panels or perform the test in the normal sunlight. ● Replace the motor.
E-422	Fault on 422 communication with the boost module	● Communication cables are in poor contact.	● Check four communication cables of 422 communication, ensuring that they are connected reliably.
OV	Bus overvoltage detected on the boost side	● The sunlight changes sharply.	● Adjust the boost PI parameters, and enlarge the values of P19.07 and P19.08.
A-LS	Weak-light pre-alarm	● The sunlight is weak or the solar panel configuration is insufficient.	● The device will automatically run when the light is sufficient. ● Check whether the solar panel configuration is sufficient.
A-LL	Underload pre-alarm	● The pumping pool has no water.	● Check the pumping pool.
A-tF	Full-water pre-alarm	● The pumping pool is full	● If you have configured the full-water pre-alarm function, the device automatically stops when the pre-alarm elapsed a period of time. Otherwise, check whether terminals are wired correctly.

Fault code	Fault type	Possible cause	Solution
A-tL	Empty-water pre-alarm	• The pumping pool has no water.	• If you have configured the empty-water pre-alarm function, the device automatically stops when the pre-alarm elapsed a period of time. Otherwise, check whether terminals are wired correctly.

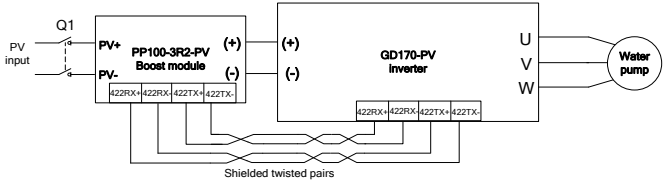
Appendix A Options

A.1 Boost module

The pump inverters of 2.2kW support an optional boost module (PP100-3R2-PV) to improve the utilization ratio of the PV cell module. The figure below shows the wiring method.

1. Connect PV+ and PV- of the boost module to positive and negative input terminals of the PV cell module respectively.
2. Connect output terminals (+) and (-) of the boost module to input terminals (+) and (-) of the pump inverter respectively.
3. Connect 422-communication receiving terminal RX of the boost module to 422-communication sending terminal TX of the pump inverter, connect 422-communication sending terminal TX of the boost module to 422-communication receiving terminal RX of the pump inverter, and use two sets of twisted pairs for wiring.
4. Ensure that the wiring is connected properly, and switch on the breaker Q1 at the DC side for automotive running.

Figure A-1 Connection between the boost module and the inverter



Boost module specifications:

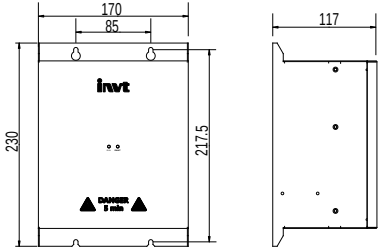
Model	PP100-3R2-PV
Input side	
Max. input power (W)	3200
Max. DC voltage (V)	600
Start voltage (V)	80
Min. working voltage (V)	70
Max. input current (A)	12
Output side	
Output voltage (V)	380V inverter: 570

Status indicator description:

Displayed status	Description
Green LED flickering	The boost module has been powered on, and the control circuit is working.
Green LED normally on	The boost module is running.
Red LED on	The boost module is faulty.

The following figure shows the installation dimension drawing of the boost module.

Figure A-2 Installation dimensions of the boost module

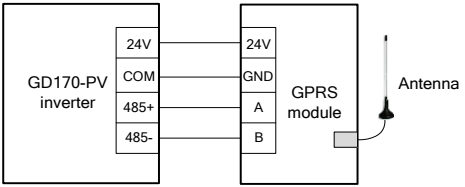


A.2 GPRS module and monitoring app

The pump inverter supports an optional GPRS module to implement remote monitoring, and the GPRS module connects to the inverter through RS485 communication. The running state of the inverter can be monitored in real time on the APP in the mobile phone or web page.

Method for connecting the GPRS module to the inverter:

Figure A-3 Connection between the GPRS module and the inverter



For details, see the *GPRS/GPS Adaptor Operation Manual* which comes with the GPRS module or contact the local INVT office. Provide the model and serial number of the product you query about.

A.3 Cable

A.3.1 Powe cable

The sizes of the input power cables and motor cables must comply with local regulations.

Note: If the electrical conductivity of the motor cable shield layer does not meet the requirements, a separate PE conductor must be used.

A.3.2 Control cable

A relay cable needs to carry the metal braided shield layer.

Keypads need to be connected by using network cables. In complicated electromagnetic environments, shielded network cables are recommended.

A shielded twisted-pair cable is recommended for a communication cable.

Note:

- Analog signals and digital signals cannot share a same cable, and their cables must be routed separately.
- Before connecting the input power cable of the inverter, check the insulation conditions of the cable according to local regulations.

Recommended power cable sizes for standard inverter models:

Inverter model	Recommended cable size (mm^2)		Terminal screw	Tightening torque (Nm)
	(+)/(-), R/S/T, U/V/W	PE		
GD170-2R2-4-PV	1.5	1.5	M4	0.8
GD170-004-4-PV	2.5	2.5	M4	1.2–1.5
GD170-5R5-4-PV	2.5	2.5	M4	1.2–1.5
GD170-7R5-4-PV	4	4	M5	2–2.5
GD170-011-4-PV	6	6	M5	2–2.5
GD170-015-4-PV	10	10	M5	2–2.5
GD170-018-4-PV	16	16	M5	2–2.5
GD170-022-4-PV	25	16	M5	2–2.5
GD170-030-4-PV	25	16	M6	4–6
GD170-037-4-PV	35	16	M6	4–6
GD170-045-4-PV	35	16	M8	10

Note:

- The cables recommended for the main circuit can be used in scenarios where the ambient temperature is lower than 40°C, the wiring distance is shorter than 100 m, and the current is the rated current.
- If a control cable and power cable must cross each other, ensure that the angle between them is 90 degrees.
- If the inside of motor is moist, the insulation resistance is reduced. If you suspect the inside of motor is moist, dry and re-measure the motor.

A.4 Reactor

When the distance between the inverter and motor is longer than 50 m, the parasitic capacitance between the long cable and ground may cause large leakage current, and overcurrent protection of the inverter may be frequently triggered. To prevent this from happening and avoid damage to the motor insulator, compensation must be made by adding an output reactor. When the inverter is used to drive multiple motors, take the total length of the motor cables (that is, sum of the lengths of the motor cables) into account. When the total length is longer than 50 m, an output reactor must be added on the output side of the inverter. When the distance between the inverter and motor ranges from 50 m to 100 m, select the reactor according to the following table. If the distance is longer than 100 m, contact INVT's technical support technicians.

Output reactor model selection:

Inverter model	Output reactor
GD170-2R2-4-PV	OCL2-2R2-4
GD170-004-4-PV	OCL2-004-4
GD170-5R5-4-PV	OCL2-5R5-4
GD170-7R5-4-PV	OCL2-7R5-4
GD170-011-4-PV	OCL2-011-4
GD170-015-4-PV	OCL2-015-4
GD170-018-4-PV	OCL2-018-4
GD170-022-4-PV	OCL2-022-4
GD170-030-4-PV	OCL2-037-4
GD170-037-4-PV	OCL2-037-4
GD170-045-4-PV	OCL2-045-4

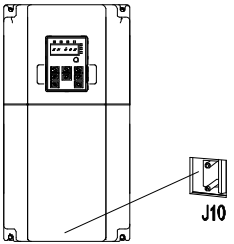
Note:

- The rated output voltage drop of output reactors is 1%±15%.
- All the options in the preceding table are externally configured. You need to specify whether the options are externally configured in your purchase order.

A.5 Filter

Goodrive170-PV series inverters of ≥ 4kW contain built-in C3 filters. You can use the jumper J10 to determine whether to connect it.

Connection method: Open the lower cover, find the location of J10, and insert the jumper terminals delivered with the inverter.



Note: The input EMI meets the C3 requirements after a filter is configured.

Appendix B Recommended solar module configuration

B.1 Recommended solar module configuration for solar pump inverters

Solar pump inverter model	Open-circuit voltage class of solar module			
	37±1V		45±1V	
	Module power ± 5Wp	Modules per string * Strings	Module power ± 5Wp	Modules per string * Strings
GD170-2R2-4-PV	250	18*1	300	15*1
GD170-004-4-PV	250	20*1	300	16*1
GD170-5R5-4-PV	250	18*2	300	15*2
GD170-7R5-4-PV	250	18*2	300	15*2
GD170-011-4-PV	250	18*3	300	15*3
GD170-015-4-PV	250	18*4	300	15*4
GD170-018-4-PV	250	18*5	300	15*5
GD170-022-4-PV	250	18*6	300	15*6
GD170-030-4-PV	250	18*8	300	15*8
GD170-037-4-PV	250	18*9	300	15*9
GD170-045-4-PV	250	18*11	300	15*11

B.2 Recommended solar module configuration for inverters with boost module

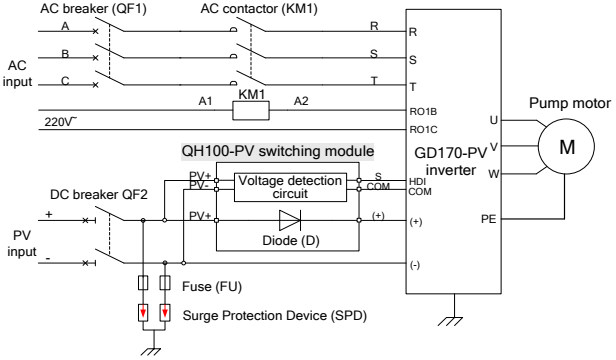
PP100-3R2-PV + Solar pump inverter	Max. DC input current	Open-circuit voltage class of solar module			
		37±1V		45±1V	
	(A)	Module power ± 5Wp	Modules per string * Strings	Module power ± 5Wp	Modules per string * Strings
GD170-2R2-4-PV	12	250	13*1	300	11*1

Appendix C Power frequency & PV switching solution

C.1 Solution introduction

Generally, inverters do not allow simultaneous connection of power frequency and PV. If such simultaneous connection is required, switching control circuit needs to be configured externally. The following figure shows a solution for reference.

Figure C-1 Inverter power frequency & PV switching solution



See section C.1.1 for specifications and model selection of QH100-PV switching module, whose necessary low-voltage apparatuses include QF1, KM1, QF2, FU, and SPD. See section C.1.2 for model selection information.

C.1.1 QH100-PV switching module

C.1.1.1 Model and specification

QH100 – 055A – 4 – PV

① ② ③ ④

Field	Sign	Description	Content
Product series abbreviation	①	Product series abbreviation	QH100 series power frequency & PV switching module
Rated current	②	Power range for adaptive inverter	055A—applies to inverters of ≤15kW 110A—applies to inverters of 18.5–37kW
Voltage class	③	Voltage class	4: AC 3PH 380V(-15%)–440(+10%)

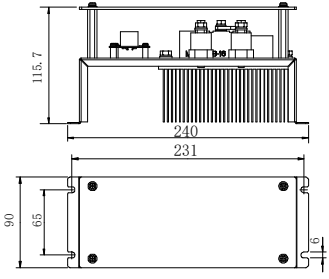
Field	Sign	Description	Content
Code	④	Industry code	PV: Photovoltaic water pump series products

C.1.1.2 Terminal description of QH100-PV switching module

Terminal	Terminal name	Description
PV +	PV input	Voltage detection board input, connecting to anode of PV input.
PV -	PV input	Voltage detection board input, connecting to cathode of PV input.
(+)	Switching module output	Cathode of diode module, connecting to (+) of the inverter.
S, COM	Voltage detection signal	ON/OFF signal, corresponding PV voltage greater/less than preset threshold, connecting to terminals HDI and COM of the inverter.

C.1.1.3 Installation and dimension

Figure C-2 Installation dimensions of the switching module (unit: mm)



Note: To ensure reliable operation of this product, external ventilation and heat dissipation measures are required.

C.1.2 Model selection reference for low-voltage apparatuses

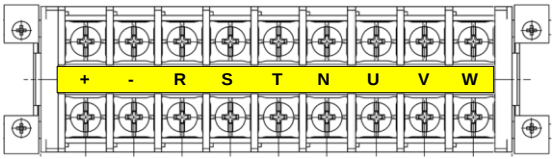
Inverter model	AC breaker (A)	DC Breaker	AC Contactor (A)	SPD	Fuse	Diode I_{FAV}/V_{RRM}
GD170-2R2-4-PV-AS	10	16A/ 1000VDC	12	Type II, 1000VDC	30A fast fuse	25A/1600V
GD170-004-4-PV-AS	25		25			55A/1600V

Inverter model	AC breaker (A)	DC Breaker	AC Contactor (A)	SPD	Fuse	Diode I_{FAV}/V_{RRM}
GD170-5R5-4-PV-AS	25	25A/ 1000VDC	25			
GD170-7R5-4-PV-AS	40		40			
GD170-011-4-PV-AS	50	63A/ 1000VDC	50			
GD170-015-4-PV-AS	63		63			
GD170-018-4-PV-AS	63	100A/ 1000VDC	63			110A/1600V
GD170-022-4-PV-AS	100		95			
GD170-030-4-PV-AS	100		95			
GD170-037-4-PV-AS	125	125A/ 1000VDC	115			
GD170-045-4-PV-AS	200	160A/ 1000VDC	170			160A/1600V

C.2 Wiring description

The following figures show the wiring terminals of the inverter.

Figure C-3 Wiring terminals



Terminal function description:

Symbol	Terminal name	Description
R, S, T	AC input	3PH AC (3PH 380V) input terminals, connected to the grid
N		Neutral wire For inverter models of 4-37kW, it is required to use three-phase four-wire distribution system and connect the neutral wire to terminal N.

Symbol	Terminal name	Description
(+)、(-)	PV DC input	Input terminals of photovoltaic panels.
U, V, W	Inverter output	3PH AC output terminals, connected to the pump motor.
⏚	Safety protection grounding	Grounding terminal for safe protection; each machine must be properly grounded. **Note:** The grounding terminal is located at the bottom of the chassis.

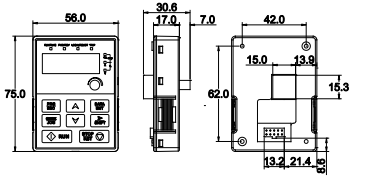
C.3 Parameter setting method

Connect the external PV voltage detection signal to HDI terminal (auto switching by default), and the PV voltage detection threshold is 300V.

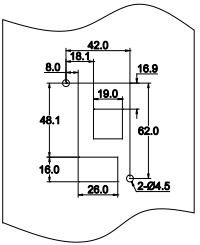
After the correct connection, set P15.32 to 0.

Appendix D Dimension drawings

D.1 External keypad structure



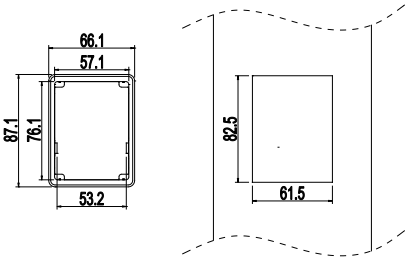
Keypad outline drawing



Keypad cut-out drawing (without bracket)

Note: The inverter models of 380V 2.2kW–4kW support an optional external keypad, and the keypad of inverter models of 380V 5.5kW and higher can be installed on another device.

If the keypad is externally installed on an optional bracket, it can be 20 meters away from the inverter at most.



Keypad adapter bracket Installation dimensions

D.2 Dimensions of 2.2–4 kW models

Figure D-1 Wall mounting

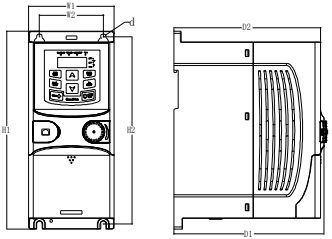


Table D-1 Wall-mounting dimensions (unit: mm)

Model	W1	W2	H1	H2	D1	D2	Installation hole diameter (d)
GD170-2R2-4-PV	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5
GD170-004-4-PV	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5

Figure D-2 Rail mounting

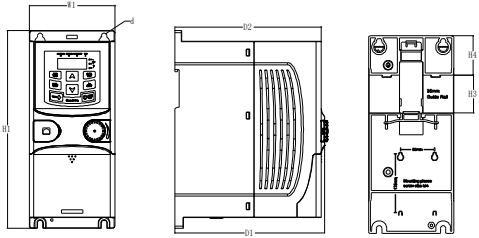


Table D-2 Rail-mounting dimensions (unit: mm)

Model	W1	H1	H3	H4	D1	D2	Installation hole diameter (d)
GD170-2R2-4-PV	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5
GD170-004-4-PV	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5

D.3 Dimensions of 5.5–45kW models

Figure D-3 Wall mounting

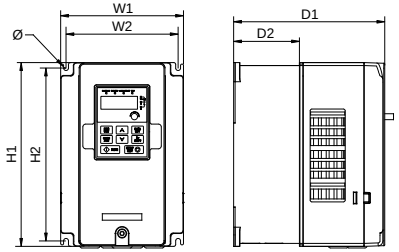


Table D-3 Wall-mounting dimensions (unit: mm)

Model	W1	W2	H1	H2	D1	D2	Installation hole diameter
GD170-5R5-4-PV	146.0	131.0	256.0	243.5	167.0	84.5	Ø 6
GD170-7R5-4-PV	146.0	131.0	256.0	243.5	167.0	84.5	Ø 6
GD170-011-4-PV	170.0	151.0	320.0	303.5	196.3	113.0	Ø 6
GD170-015-4-PV	170.0	151.0	320.0	303.5	196.3	113.0	Ø 6
GD170-018-4-PV	170.0	151.0	320.0	303.5	196.3	113.0	Ø 6
GD170-022-4-PV	200.0	185.0	340.6	328.6	184.3	104.5	Ø 6
GD170-030-4-PV	200.0	185.0	340.6	328.6	184.3	104.5	Ø 6
GD170-037-4-PV	250.0	230.0	400.0	380.0	202.0	123.5	Ø 6
GD170-045-4-PV	250.0	230.0	400.0	380.0	202.0	123.5	Ø 6

Figure D-4 Flange mounting

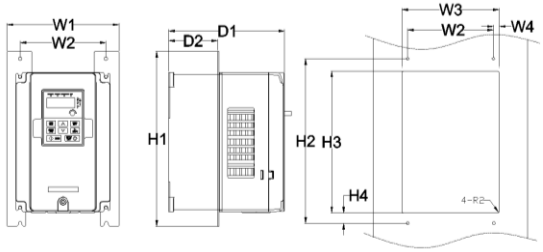


Table D-4 Flange-mounting dimensions (unit: mm)

Model	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Installation hole diameter	Nut specifications
GD170-5R5-4-PV	170.2	131	150	9.5	292	276	260	6	167	84.5	Ø 6	M5
GD170-7R5-4-PV	170.2	131	150	9.5	292	276	260	6	167	84.5	Ø 6	M5
GD170-011-4-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	Ø 6	M5
GD170-015-4-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	Ø 6	M5
GD170-018-4-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	Ø 6	M5
GD170-022-4-PV	266	250	224	13	371	250	350.6	20.3	184.6	104	Ø 6	M5
GD170-030-4-PV	266	250	224	13	371	250	350.6	20.3	184.6	104	Ø 6	M5
GD170-037-4-PV	316	300	274	13	430	300	410	55	202	118.3	Ø 6	M5
GD170-045-4-PV	316	300	274	13	430	300	410	55	202	118.3	Ø 6	M5

Note: The flange mounting plate shall be used for flange mounting.

Appendix E Further information

E.1 Product and service queries

If you have any queries about the product, contact the local INVT office. Please provide the model and serial number of the product you query about. You can visit www.invt.com.cn to find a list of INVT offices.

E.2 Feedback on INVT inverter manuals

Your comments on our manuals are welcome.Visit www.invt.com.cn, directly contact online service personnel or choose **Contact Us** to obtain contact information.

E.3 Documents on the Internet

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