Operation Manual

Goodrive100-PV Series
Solar Pump VFD

SHENZHEN INVT ELECTRIC CO., LTD.

Contents

1 Safety precautions

Please read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the VFD. If ignored, physical injury or death may occur, or damage may occur to the devices.

If any physical injury or death or damage to the devices occurs for ignoring to the safety precautions in the manual, our company will not be responsible for any damages and we are not legally bound in any manner.

1.1 Safety definition

Danger:	Serious physical injury or even death may occur if not follow relevant requirements
Warning:	Physical injury or damage to the devices may occur if not follow relevant requirements
Note:	Physical hurt may occur if not follow relevant requirements
Qualified electricians:	People working on the device should take part in professional electrical and safety training, receive the certification and be familiar with all steps and requirements of installing, commissioning, operating and maintaining the device to avoid any emergency.

1.2 Warning

Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment, and advice on how to avoid the danger. Following warning symbols are used in this manual:

Symbols	Name	Instruction	Abbreviation
 Danger	Danger	Serious physical injury or even death may occur if not follow the relative requirements.	
 Warning	Warning	Physical injury or damage to the devices may occur if not follow the relative requirements.	
 Forbid	Electrostatic discharge	Damage to the PCBA board may occur if not follow the relative requirements.	
 Hot sides	Hot sides	Sides of the device may become hot. Do not touch.	
Note	Note	Physical hurt may occur if not follow the relative requirements.	**Note**

1.3 Safety guidelines

- Only qualified electricians are allowed to operate on the VFD.
- Do not carry out any wiring and inspection or changing components when the power supply is applied. Ensure all input power supply is disconnected before wiring and checking and always wait for at least the time designated on the VFD or until the DC bus voltage is less than 36V. Below is the table of the waiting time:

VFD model		Minimum waiting time
1PH 220V	0.4kW-2.2kW	5 minutes
3PH 220V	1.5kW-7.5kW	5 minutes
3PH 380V	0.75kW-110kW	5 minutes
3PH 380V	132kW-200kW	15 minutes

- Do not refit the VFD unauthorized; otherwise fire, electric shock or other injury may occur.

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

- The electrical parts and components inside the VFD are electrostatic. Take measurements to avoid electrostatic discharge during relevant operation.

1.3.1 Delivery and installation

- Please install the VFD on fire-retardant material and keep the VFD away from combustible materials.
- Do not operate on the VFD if there is any damage or components loss to the VFD.
- Do not touch the VFD with wet items or body, otherwise electric shock may occur.

Note:

- Select appropriate moving and installing tools to ensure a safe and normal running of the VFD and avoid physical injury or death. For physical safety, the erector should take some mechanical protective measurements, such as wearing safety shoes and working uniforms.
- Do not carry the VFD by its cover. The cover may fall off.
- Ensure to avoid physical shock or vibration during delivery and installation.
- Install away from children and other public places.
- The leakage current of the VFD 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 (L,N) are AC power supply input terminals. U, V and W are output terminals. Please connect the input power cables and motor cables with proper techniques; otherwise the damage to the VFD may occur.

1.3.2 Commissioning and running

	• Disconnect all power supplies applied to the VFD before the terminal wiring and wait for at least the designated time after disconnecting the power supply. • High voltage is present inside the VFD during running. Do not carry out any operation except for the keypad setting. • The VFD cannot be used as “Emergency-stop device”. • If the VFD is used to break the motor suddenly, a mechanical braking device shall be provided.

Note:

- Do not switch on or off the input power supply of the VFD frequently.
- For VFDs that have been stored for a long time, check and fix the capacitance and try to run it again before utilization.
- Cover the front board before running, otherwise electric shock may occur.

1.3.3 Maintenance and component replacement

	• Only qualified electricians are allowed to perform the maintenance, inspection, and components replacement of the VFD. • Disconnect all power supplies to the VFD before the terminal wiring. Wait for at least the time designated on the VFD after disconnection. • Take measures to avoid screws, cables and other conductive materials to fall into the VFD during maintenance and component replacement.

Note:

- Please select proper torque to tighten screws.
- Keep the VFD, parts and components away from combustible materials during maintenance and component replacement.
- Do not carry out any isolation voltage-endurance test on the VFD and do not measure the control circuit of the VFD by megameter.

1.3.4 Scrap treatment

	● There are heavy metals in the VFD. Deal 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.

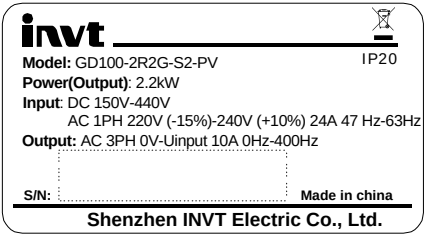
2 Product overview

2.1 Unpacking inspection

Check as follows after receiving products:

1.	Check that there are no damage and humidification to the package. If not, please contact with local agents or INVT offices.
2.	Check the information on the type designation label on the outside of the package to verify that the drive is of the correct type. If not, please contact with local dealers or INVT offices.
3.	Check that there are no signs of water in the package and no signs of damage or breach to the VFD. If not, please contact with local dealers or INVT offices.
4.	Check the information on the type designation label on the outside of the package to verify that the name plate is of the correct type. If not, please contact with local dealers or INVT offices.
5.	Check to ensure the accessories (including user's manual and control keypad) inside the device is complete. If not, please contact with local dealers or INVT offices.

2.2 Product nameplate



Note: This is a nameplate example of a standard VFD product. The CE/TUV/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 VFD nameplate and simplified nameplate.

GD100 – 5R5G – 4 5 – PV

① ② ③④ ⑤

Field	No.	Description	Content
Abbreviation of product series	①	Abbreviation of product series	GD is short for Goodrive.
Rated power	②	Power range + Load type	5R5G—5.5kW G—Constant torque load
Voltage class	③	Voltage class	4: AC 3PH 380V (-15%)–440(+10%) 2: AC 3PH 220V (-15%)–240(+10%) S2: AC 1PH 220V (-15%)–240(+10%) SS2: AC 1PH input/output 220V (-15%)–240(+10%)
Protection level	④	Protection level	Protection level. 5—IP54 **The protection level of a standard VFD is IP20, but this field is not displayed.**
Industrial code	⑤	Industry code	PV: Photovoltaic water pump series products

2.4 Product specifications

Model	-SS2	-S2	-2	-4
AC input voltage (V)	220 (-15%)–240 (+10%) (1PH)		220 (-15%)–240 (+10%) (3PH)	380 (-15%)–440 (+10%) (3PH)
Max. DC voltage (V)	440	440	440	800
Start-up voltage (V)	200	200	200	300
Min. working voltage (V)	150	150	150	250
Recommended DC input voltage range (V)	200–400	200–400	200–400	300–750
Recommended MPP voltage (V)	330	330	330	550

2.5 Product ratings

Series	Model	Rated output power (kW)	Rated input current (A)	Rated output current (A)	Max. DC input current (A)
-SS2 model 1PH 220V Input/output	GD100-0R4G-SS2-PV	0.4	6.5	4.2	9
	GD100-0R7G-SS2-PV	0.75	9.3	7.2	9
	GD100-1R5G-SS2-PV	1.5	15.7	10.2	12

Series	Model	Rated output power (kW)	Rated input current (A)	Rated output current (A)	Max. DC input current (A)
(0.4-2.2 kW)	GD100-2R2G-SS2-PV	2.2	24	14	12
-S2 model 1PH 220V input (0.4-2.2 kW)	GD100-0R4G-S2-PV	0.4	6.5	2.5	9
	GD100-0R7G-S2-PV	0.75	9.3	4.2	9
	GD100-1R5G-S2-PV	1.5	15.7	7.5	12
	GD100-2R2G-S2-PV	2.2	24	10	12
-2 model 3PH 220V (1.5-7.5kW)	GD100-1R5G-2-PV	1.5	7.7	7.5	12
	GD100-2R2G-2-PV	2.2	11	10	12
	GD100-004G-2-PV	4	17	16	20
	GD100-5R5G-2-PV	5.5	25	20	30
	GD100-7R5G-2-PV	7.5	33	30	40
-4 model 3PH 380V (0.75-200kW)	GD100-0R7G-4-PV	0.75	3.4	2.5	9
	GD100-1R5G-4-PV	1.5	5.0	4.2	9
	GD100-2R2G-4-PV	2.2	5.8	5.5	12
	GD100-004G-4-PV	4.0	13.5	9.5	16.5
	GD100-5R5G-4-PV	5.5	19.5	14	23.9
	GD100-7R5G-4-PV	7.5	25	18.5	30.6
	GD100-011G-4-PV	11	32	25	39.2
	GD100-015G-4-PV	15	40	32	49
	GD100-018G-4-PV	18.5	47	38	50
	GD100-022G-4-PV	22	51	45	60
	GD100-030G-4-PV	30	70	60	81
	GD100-037G-4-PV	37	80	75	90
	GD100-045G-4-PV	45	98	92	130
	GD100-055G-4-PV	55	128	115	150
	GD100-075G-4-PV	75	139	150	200
	GD100-090G-4-PV	90	168	180	250
	GD100-110G-4-PV	110	201	215	300
	GD100-132G-4-PV	132	265	260	360
	GD100-160G-4-PV	160	310	305	430
	GD100-185G-4-PV	185	345	340	500
	GD100-200G-4-PV	200	385	380	550

3 Installation guidelines

The chapter describes the mechanical installation and electric installation.

- Only qualified electricians are allowed to carry out what described in this chapter. Please operate as the instructions in Safety precautions. Ignoring these may cause physical injury or death or damage to the devices.
- Ensure the power supply of the VFD is disconnected during the operation. Wait for at least the time designated after the disconnection if the power supply is applied.
- The installation and design of the VFD should be complied with the requirement of the local laws and regulations in the installation site. If the installation infringes the requirement, our company will exempt from any responsibility. Additionally, if users do not comply with the suggestion, some damage beyond the assured maintenance range may occur.

3.1 Mechanical installation

3.1.1 Installation environment

The installation environment is the safeguard for a full performance and long-term stable functions of the VFD. Check the installation environment as follows:

Environment	Conditions
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 VFD when the ambient temperature exceeds 50°C. • To improve reliability, do not use the VFD in the places where the temperature changes rapidly. • When the VFD 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 VFD 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 VFD. Otherwise, the VFD may be damaged.

Environment	Conditions
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 VFD 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 VFD (do not install the VFD 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 VFD vertically to ensure good heat dissipation performance.

Note:

- The VFD 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.

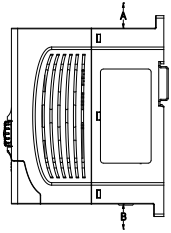
3.1.2 Installation direction

The VFD may be installed on the wall or in a cabinet.

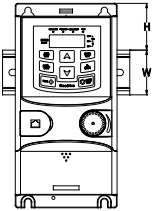
The VFD needs be installed in the vertical position. Check the installation site according to the requirements below. See ***Appendix D Dimension drawings*** for frame details.

3.1.3 Installation mode

(1) The VFDs ≤ 2.2kW support wall mounting and rail mounting.



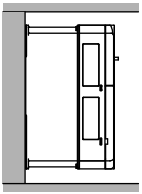
a) Wall mounting



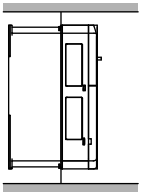
b) Rail mounting

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

(2) The VFDs ≥ 4kW support wall mounting and flange mounting.



a) Wall mounting



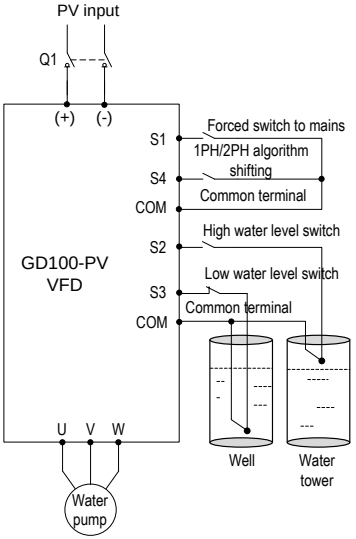
b) Flange mounting

1. Mark the locations of installation holes. For details about the holes, see the VFD dimension diagram in the appendix.
2. Fix the screws or bolts into the marked locations.
3. Lean the VFD against the wall.
4. Fasten the tightening screws on the wall.

3.2 Standard wiring

3.2.1 Main circuit terminals

The figure below shows the standard wiring of the VFD.



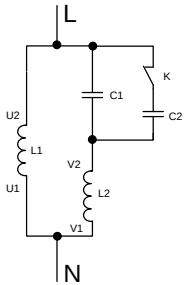
- The DC breaker Q1 must be installed as the protection switch for PV input.
- In parallel connection, the combination box special for PV must be used.
- When the distance between the PV input component and VFD exceeds 10 meters, Type-II surge protection devices must be configured at the DC side.
- When the distance between the pump and VFD exceeds 50 meters, it is recommended to configure output reactors. See appendix A.4 for the output reactor model selection.
- The VFD 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 (L, N)	AC input	3PH (1PH) AC input terminals, connected to the grid **Note:** Use the screws equipped with the VFD for wiring.
(+), (-)	PV input	Solar cell panel input terminals
U, V, W	VFD output	3PH/1PH AC output terminals, connected to the pump motor **Note**: 1PH motors must connect to terminals U and W.
⏚	Safety grounding	Safety protection grounding terminal. Each VFD must be grounded

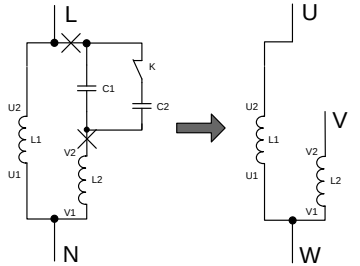
Description for -SS2 single-phase output models

1) Generally, the output terminals U and W of the VFD connect to the phase cables of the single-phase motor.

2) If the single-phase pump cannot be started, the two-phase control method must be used, and the start-up and running capacitors (if any) of the motor must be removed. The figure below shows the internal wiring of the common single-phase motor. In the figure, L1, L2, C1, and C2 indicate the running winding, start-up winding, running capacitor, and start-up capacitor. When the motor speed exceeds 75% of the rated speed, the start-up capacitor is switched off.



Internal wiring of the single-phase motor winding after removing the starting and running capacitor:



U1 and V1 are the common terminals of the windings. Connect them to the output terminal W of the solar pump VFD. Connect U2 to the output terminal U of the VFD. Connect V2 to the output terminal V of the VFD. (**Note:** Use the screws equipped with the VFD.) Connect S4 of the VFD to COM in short circuited manner.

3.2.2 Control circuit terminals

Category	Terminal symbol	Terminal name	Terminal function
Power supply	24V	24V power supply	It provides the power of 24V±10% and maximum current of 200mA. It functions as the working power supply of digital input and output or externally connects to the sensor power supply.
	COM	Common terminal	
Digital input	S1	Forced switch to power frequency	Terminal feature parameters: 1. Internal impedance: 3.3kΩ 2. Acceptable voltage input: 12–24V 3. Maximum input frequency: 1kHz S1: Forcible switch 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 switch of the normally open contact by default. S3: It connects to the low-water switch of the normally closed contact.
	S2	Full-water alarm	
	S3	Empty-water alarm	
	S4	Single/two phase algorithm switching	

Category	Terminal symbol	Terminal name	Terminal function
			S4: A high electrical level corresponds to the single-phase algorithm. A low electrical level corresponds to the two-phase algorithm.
Communication	RS485+ RS485-	485 communication	485 communication terminals, using the Modbus protocol
	422TX+ 422TX- 422RX+ 422RX-	422 communication	Communication terminals special for the boost module.
Relay output	RO1A (ROA)	Normally open contact of relay 1	1. Contact capacity: 3A/AC250V, 1A/DC30V 2. They cannot be used for high frequency switch output. During the application of auto power frequency & PV switching, the AC input contactor coil is controlled by the normally closed contact of the relay.
	RO1B (ROB)	Normally closed contact of relay 1	
	RO1C (ROC)	Common terminal of relay 1	

4 Keypad operation guidelines

4.1 Keypad introduction

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

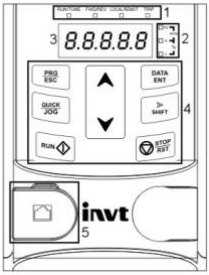


Figure 4–1 Keypad diagram for VFDs of ≤ 2.2kW

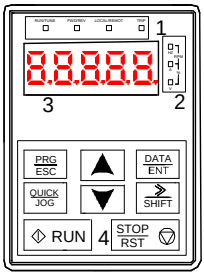
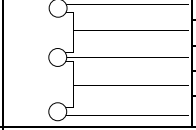


Figure 4–2 Keypad diagram for VFDs of ≥ 4kW

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

No.	Item	Description	
1	Status indicator	RUN/TUNE	VFD running status indicator. Off: The VFD is stopped.

<table>
<tr><th>No.</th><th>Item</th><th colspan="4">Description</th></tr>
<tr><td rowspan="4"></td><td rowspan="4"></td><td></td><td colspan="3">Blinking: The VFD is autotuning parameters.
On: The VFD is running.</td></tr>
<tr><td>FWD/REV</td><td colspan="3">Forward or reverse running indicator.
Off: The VFD is running forward.
On: The VFD is running reversely.</td></tr>
<tr><td>LOCAL/REMOT</td><td colspan="3">Indicates whether the VFD is controlled through the keypad, terminals, or communication.
Off: The VFD is controlled through the keypad.
Blinking: The VFD is controlled through terminals.
On: The VFD 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 rowspan="6">2</td><td rowspan="6">Unit indicator</td><td colspan="4">Mean the unit displayed currently</td></tr>
<tr><td rowspan="5">  </td><td>Hz</td><td>Frequency unit</td></tr>
<tr><td>RPM</td><td>Rotating speed unit</td></tr>
<tr><td>A</td><td>Current unit</td></tr>
<tr><td>%</td><td>Percentage</td></tr>
<tr><td>V</td><td>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>v</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="3">Press it to enter or exit level-1 menus or delete a parameter.</td></tr>
<tr><td>DATA ENT</td><td>Confirmation</td><td colspan="3">Press it to enter menus in cascading mode or</td></tr>
</table>

No.	Item	Description		
			key	confirm the setting of a parameter.
		▲	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 VFD in stopped or running state or to select digits to change during parameter setting.
		RUN	Run key	Press it to run the VFD when using the keypad for control.
		STOP RST	Stop/ Reset key	Press it to stop the VFD 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 VFD 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 VFD is in stopped state, the keypad displays stopped-state parameters, as shown in Figure 4-3.

When the VFD 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 VFD 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 VFD 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 VFD by using the keypad. For details about function code descriptions, see the function code list.

4.3.1 Modifying function codes

The VFD 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)

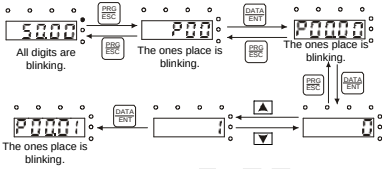
Note: When performing operations on the level-3 menu, you can press the PRG/ESC or DATA/ENT key to return to the level-2 menu. If you press the DATA/ENT key, the set value of the parameter is saved to the control board first, and then the level-2 menu is returned, displaying the next function code. If 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.



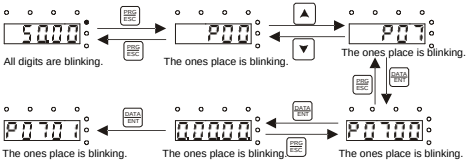
Note: When setting the value, you can press SHIFT and ▲+▼ to modify the value.

Figure 4–4 Modifying a parameter

4.3.2 Setting a password for the VFD

The VFD 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.

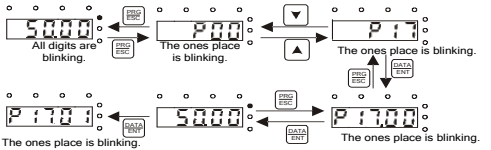


Note: When setting the value, you can press SHIFT and ▲+▼ to modify the value.

Figure 4–5 Setting a password

4.3.3 Viewing VFD status

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



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

Figure 4–6 Viewing a parameter

5 Commissioning guidelines

- Cut off all power supplies connected to the VFD before terminal wiring, and wait for at least the time designated on the VFD after disconnecting the power supplies.
- High voltage presents inside the VFD during running. Do not carry out any operation on the VFD during running except for keypad setup.
- By default, the VFD 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 VFD:

1. The VFD 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 VFD.
5. The motor type, voltage, and power match the VFD type, voltage, and power.

5.2 Trial run

Close the DC circuit breaker, and the VFD 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 VFD runs automatically after being powered on. To set parameters, do as follows: If the VFD has not been powered on, power on the VFD, and press QUICK/JOG within 10s to enter the keypad-based control mode (LOCAL/REMOT off). If the VFD 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 VFD power.

5.4 Advanced settings

Note: The default settings of the VFD 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.

5.4.2 Special settings for single phase motors

a) When the single phase motor is in poor running performance, you can adjust P04 group VF curve settings. Set P04.00=1 and set P04.03–P04.08 to appropriate values according to commissioning conditions. Increase the voltage if the motor cannot start and decrease the voltage if the current is large.

b) When the light is normal and the system starts slowly, increase initial voltage differential value of P15.28 appropriately.

c) For single phase motors with two-phase control (capacitor-removing):

① The max. voltage needs to be less than 1/1.6 of the bus voltage. It is recommended to set the rated voltage (P02.04) less than 200V, or limit the max. voltage output by multi-dot V/F curve.

② Observe the currents of the windings through P17.38 and P17.39, the switched current is the combination current of the two windings. The impedances of the windings are different, so the currents are different at the same voltage output.

③ P04.35 can be used to change the output currents of the main and secondary windings. It is recommended that qualified engineers perform adjustment since the voltage adjustment is associated with motor design parameters. Otherwise, the motor performance may be impacted.

6 Function parameter list

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

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

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

Note: The VFD 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 0 No need to install encoders. Applicable to scenarios with requirements for low frequency, great torque, 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 VFD can drive multiple motors. **Note:** Before using a vector control mode, enable the VFD to perform motor parameter autotuning first.	2	◎
P00.01	Channel of running commands	Used to select the channel of running VFD control commands. The VFD control commands include the start, stop, forward run, reverse run, jog, and fault reset commands.	1	○

Function code	Name	Description	Default	Modify
		0: Keypad (LOCAL/REMOT off) The commands are controlled through keypad keys, such as the RUN and STOP/RST keys. The running direction can be changed through setting the multi-function shortcut key QUICK/JOG to FWD/REV shifting function (P07.02=3). In running state, you can press both RUN and STOP/RST to enable the VFD 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 VFD. 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 VFD which is lower than or equal to the maximum 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 that of the output frequency of the VFD. The VFD runs at the lower limit frequency if	0.00Hz	◎

Function code	Name	Description	Default	Modify
		the set frequency is lower than the lower limit. **Note:** Max. output frequency ≥ Upper limit frequency ≥ Lower limit 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 VFD speeds up from 0Hz to the Max. output frequency (P00.03). DEC time means the time needed if the VFD speeds down from the Max. output frequency to 0Hz (P00.03). The VFD has four groups of ACC/DEC time which can be selected by P05. The factory default ACC/DEC time of the VFD is the first group. Setting range of P00.11 and P00.12: 0.0–3600.0s	Depend on mode	○
P00.12	DEC time 1		Depend on mode	○
P00.13	Running direction	0: Run at the default direction. The VFD runs in the forward direction. FWD/REV indicator is off. 1: Run at the opposite direction. The VFD runs in the reverse direction. FWD/REV indicator 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. 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.	0	○

Function code	Name	Description	Default	Modify
		Do not change the setting of the 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: Rotation autotuning Comprehensive motor parameter autotuning. It is recommended to use rotation autotuning when high control accuracy is needed. 2: Static autotuning 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 VFD lowers output frequency based on the DEC mode and the defined DEC time; when the frequency drops to 0Hz, the VFD stops.	0	○

Function code	Name	Description	Default	Modify
		1: Coast to stop. When a stop command takes effect, the VFD 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	○

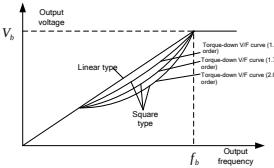
P02 group Parameters of motor 1

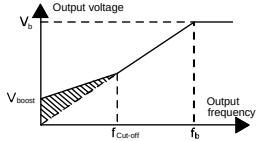
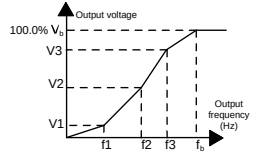
Function code	Name	Description		Default	Modify
P02.00	Motor type	0: Asynchronous motor (AM) 1: Reserved		0	◎
P02.01	Rated power of AM	0.1–3000.0kW	Used to set AM parameters. To ensure the control performance, set P02.01–P02.05 correctly according to the information on the nameplate of the AM. The VFD 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	Depend on model	◎
P02.02	Rated frequency of AM	0.01Hz–P00.03		50.00 Hz	◎
P02.03	Rated speed of AM	1–36000rpm		Depend on model	◎
P02.04	Rated voltage of AM	0–1200V		Depend on model	◎

Function code	Name	Description		Default	Modify
P02.05	Rated current of AM	0.8–6000.0A	motor configuration of the VFD. If the power of the motor is greatly different from that of the standard motor configuration, the control performance of the VFD degrades significantly. **Note:** Resetting the rated power (P02.01) of the motor can initialize the parameters P02.02–P02.10.	Depend on model	◎
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.	Depend on model	○
P02.07	Rotor resistance of AM	0.001–65.535Ω		Depend on model	○
P02.08	Leakage inductance of AM	0.1–6553.5mH		Depend on model	○
P02.09	Mutual inductance of AM	0.1–6553.5mH		Depend on model	○
P02.10	Non-load current of AM	0.1–6553.5A		Depend on model	○

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: Multi-dots V/F curve	4	◎

Function code	Name	Description	Default	Modify
		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: Customized V/F(V/F separation); in this mode, V can be separated from f and f can be adjusted through the frequency given channel set by P00.06 or the voltage given channel set by P04.27 to change the feature of the curve. **Note:** In the following figure, Vb is the motor rated voltage and fb is the motor rated frequency. 		
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	0.0%	○
P04.02	Torque boost cut-off		20.0%	○

Function code	Name	Description	Default	Modify
		boost is too large, the motor will run at over-excitation, which may cause increased output current and motor overheating, thus decreasing the efficiency. When torque boost is set to 0.0%, the VFD 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%		
P04.03	V/F frequency point 1 of motor 1	If P04.00 =1, the user can set V//F curve by P04.03–P04.08. V/F is set to the motor load. **Note:** V1＜V2＜V3; f1＜f2＜f3. If the low-frequency voltage is high, overtemperature and burning may occur and the overcurrent stall and protection may occur to the VFD. 	0.00Hz	○
P04.04	V/F voltage point 1 of motor 1		00.0%	○
P04.05	V/F frequency point 2 of motor 1		00.00 Hz	○

Function code	Name	Description	Default	Modify
P04.06	V/F voltage point 2 of motor 1	Setting range of P04.03: 0.00Hz–P04.05 Setting range of P04.04: 0.0%–110.0% (rated voltage of motor1) Setting range of P04.05: P04.03–P04.07 Setting range of P04.06: 0.0%–110.0% (rated voltage of motor1) Setting range of P04.07: P04.05–P02.02 (rated frequency of motor1) or P04.05–P02.16 (rated frequency of motor1) Setting range of P04.08: 0.0%–110.0% (rated voltage of motor1)	00.0%	○
P04.07	V/F frequency point 3 of motor 1		00.00 Hz	○
P04.08	V/F voltage point 3 of motor 1		00.0%	○
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 △f of the motor. Setting range: 0.0–200.0%	0.0%	○
P04.34	Two phase control selection of single-phase motor	Ones: Reserved Tens: 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	S1 terminals function selection	0: No function 1: Run forward 2: Run reversely 3: Three-wire running control 4: Jog forward 5: Jog reversely 6: Coast to stop 7: Reset faults 8: Pause running 9: External fault input 10: Increasing frequency setting (UP) 11: Decreasing frequency setting (DOWN) 12: Cancel the frequency change setting 13: Shift between A setting and B setting 14: Shift between combination setting and A setting 15: Shift between combination setting and B setting 16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 20: Multi-step speed pause 21: ACC/DEC time 1 22: ACC/DEC time 2 23: Simple PLC stop reset 24: Simple PLC pause 25: PID control pause 26: Traverse pause (stop at the current frequency) 27: Traverse reset (return to the center frequency) 28: Counter reset 29: Disable torque control	42	◎
P05.02	S2 terminals function selection		43	◎
P05.03	S3 terminals function selection		44	◎
P05.04	S4 terminals function selection		45	◎
P05.05	S5 terminals function selection		1	
P05.09	HDI terminals function selection		46	◎

<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>30: Disable ACC/DEC
31: Counter trigger
32: Reserved
33: Cancel the frequency change setting
34: DC brake
35: Reserved
36: Switch the running command channel to keypad
37: Switch the running command channel to terminal
38: Switch the running command channel to communication
39: Pre-magnetized command
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</td><td></td><td></td></tr>
<tr><td>P05.10</td><td>Input terminal polarity</td><td>0x000–0x10F<table><tr><td>BIT8</td><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>HDI</td><td>S4</td><td>S3</td><td>S2</td><td>S1</td></tr></table></td><td>0x000</td><td>◎</td></tr>
</table>

P06 group Output terminals

Function code	Name	Description	Default	Modify
P06.03	RO1 output	0: Disable 1: Running 2: Running forward 3: Running reversely	30	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P06.04</td><td>RO2 output</td><td>4: Jogging
5: VFD in fault
6: Frequency level detection FDT1
7: Frequency level detection FDT2
8: Frequency reached
9: Zero-speed running
10: Upper limit frequency reached
11: Lower limit frequency reached
12: Ready for running
13: Pre-magnetizing
14: Overload prealarm
15: Underload prealarm
16: Simple PLC stage completed
17: Simple PLC cycle completed
18: Set count value reached
19: Defined count value reached
20: External fault is valid
21: Reserved
22: Running time reached
23: Modbus communication virtual terminal output
24–26: Reserved
27: In weak light
28–29: Reserved
30: Switches to PV input mode</td><td>5</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>0.000–50.000s</td><td>10.000s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P06.11	RO1 switch-off delay	0.000–50.000s	10.000s	○
P06.12	RO2 switch-on delay	0.000–50.000s	0.000s	○
P06.13	RO2 switch-off delay	0.000–50.000s	0.000s	○

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	○

Function code	Name	Description	Default	Modify
P07.02	User password	0: No function 1: Jogging running. Press QUICK/JOG to begin the jogging running. 2: Switch the display state by the shifting key. Press QUICK/JOG to shift the displayed function code from right to left. 3: Switch between forward rotations and reverse rotations. Press QUICK/JOG to shift the direction of the frequency commands. This function is only valid in the keypad commands channels. 4: Clear UP/DOWN settings. Press QUICK/JOG to clear the set value of UP/DOWN. 5: Coast to stop. Press QUICK/JOG to coast to stop. 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 parameters) **Note:** Press QUICK/JOG to shift between forward rotation and reverse rotation, the VFD does not record the state after shifting during powering off. The VFD will run according to parameter P00.13 during next powering on.	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.	1	○

Function code	Name	Description	Default	Modify
		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		
P07.11	Boost module temperature	When the VFD is configured with the boost module, this function code displays the temperature of this module. This function code is valid only in the AC mode. This function code is invalid in the PV mode. -20.0–120.0°C		●
P07.12	VFD module temperature	-20.0–120.0°C		●
P07.15	VFD electricity consumption high-order bits	Used to display the electricity consumption of the VFD. VFD electricity consumption = P07.15*1000 + P07.16 Setting range of P07.15: 0–65535kWh (*1000) Setting range of P07.16: 0.0–999.9 kWh		●
P07.16	VFD electricity consumption low-order bits			●
P07.27	Current fault type	0: No fault 1: VFD unit U-phase protection (OUt1) 2: VFD unit V-phase protection (OUt2) 3: VFD 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: VFD overload (OL2) 13: Phase loss on input side (SPI) 14: Phase loss on output side (SPO)		●
P07.28	Previous fault type			●
P07.29	Previous 2 fault type			●
P07.30	Previous 3 fault type			●
P07.31	Previous 4 fault type			●
P07.32	Previous 5 fault type			●
P07.57	Previous 6 fault type			●
P07.58	Previous 7 fault type			●

Function code	Name	Description	Default	Modify
P07.59	Previous 8 fault type	15: Boost module overheat (OH1) 16: VFD module overheat (OH2) 17: External fault (EF) 18: RS485 communication fault (CE) 19: Current detection fault (ItE) 20: Motor antotune fault (tE) 21: EEPROM operation error (EEP) 22: PID feedback disconnection (PIDE) 23: Braking unit fault (bCE) 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 (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 module (OV) **Note:** Faults 38aul are only detected in boost. The boost module stops working immediately after detecting a fault, while returning the fault information to the VFD module in the next data returning. Alarms: Light-weak pre-alarm (A-LS) Underload pre-alarm (A-LL) Full-water pre-alarm (A-tF) Empty-water pre-alarm (A-tL)		●
P07.60	Previous 9 fault type			●
P07.61	Previous 10 fault type			●
P07.62	Previous 11 fault type			●
P07.63	Previous 12 fault type			●
P07.64	Previous 13 fault type			●
P07.65	Previous 14 fault type			●
P07.66	Previous 15 fault type			●
P07.67	Previous 16 fault type			●
P07.68	Previous 17 fault type			●
P07.69	Previous 18 fault type			●
P07.70	Previous 19 fault type			●
P07.71	Previous 20 fault type			●

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: 0: Software protection against input phase loss disabled 1: Software protection against input phase loss enabled LED tens: 0: Software protection against output phase loss disabled 1: Software protection against output phase loss enabled LED hundreds: Reserved 000–111	Depend on model	○
P11.01	Frequency decrease at sudden power loss	0: Disable 1: Enable	0	○
P11.02	Frequency decrease ratio at sudden power loss	Setting range: 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 VFD begins to decrease the running frequency according to P11.02 to make the motor in power generation state. The regenerative power	0.00Hz/s	○

<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>can maintain the bus voltage to ensure normal running of the VFD until the recovery of power.
<table>
<tr><th>Voltage class</th><td>220V</td><td>400V</td></tr>
<tr><th>Frequency decrease point</th><td>260V</td><td>460V</td></tr>
</table></td><td></td><td></td></tr>
</table>

P15 group Functions special for solar VFD

Function code	Name	Description	Default	Modify
P15.00	Solar VFD 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 system becomes stable. **Note:** This parameter is invalid when terminal function 43 is valid.	1	◎
P15.02	Vmpp voltage given through keypad	0.0–6553.5 Vdc 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	○

Function code	Name	Description	Default	Modify
P15.03	PI control deviation limit	0.0–100.0% (100.0% corresponds 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: absolute value	0.0%	○
P15.04	PID output upper limit frequency	P15.05–100.0% (100.0% corresponds to P00.03) P15.04 is used to limit the Max. value of target frequency, and 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% corresponds to P00.03) P15.05 is used to limit the Min. value of target frequency, and 100.0% corresponds to P00.03. After PI adjustment, the target frequency cannot be less than the lower limit.	20.0%	○
P15.06	KP1	0.00–100.00 Proportion coefficient 1 of the 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 Proportion coefficient 2 of target frequency. A greater value indicates stronger effect and faster adjustment.	35.00	○

Function code	Name	Description	Default	Modify
P15.09	KI2	0.00–100.00 Integral coefficient 2 of the target frequency. A greater value indicates stronger effect and faster adjustment.	35.00	○
P15.10	PI switching point	0.0–6553.5Vdc If the absolute value of PV voltage minus reference value 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 1: AI1(the water-level signal is input through AI1, not supported currently) 2: AI2 (the water-level signal is input through AI2, not supported currently) 3: AI3 (the water-level signal is input through AI3, not supported currently) If the function code is 0, the water-level signal is controlled by the digital input. See 43 and 44 functions of S terminals in group P05 for detailed information. If the full-water signal is valid, the system will report the alarm (A-tF) and sleep after the time of P15.14. During the alarm, the full-water signal is invalid and the system will clear the alarm after the time of P15.15. If the empty-water signal is valid, the system will report the alarm (A-tL) and sleep after the time of P15.16. During the alarm, the empty-water signal is invalid and the system will clear the alarm after the time of P15.17. If the function code is 1–3, it is the reference of water-level control analog signal. For details, see P15.12 and P12.13.	0	◎
P15.12	Full-water level threshold	0.0–100.0% This code is valid when P15.11 water level control is based on analog input. If the detected water level control analog signal is less than the water level threshold P15.12	25.0%	○

Function code	Name	Description	Default	Modify
		and keeps in the state after the delay time P15.14, the system reports A-tF and sleeps. If the delay time is not reached, the signal is bigger than the water level threshold, the time will be cleared automatically. When the measured water level control analog signal is less than the water level threshold, the delay time will be counted again. 0 is full water and 1 is no water. During the full-water alarm, if the detected water level signal is higher than the threshold of P15.12 and the delay counts, the alarm is cleared after the time set by P15.15 is reached in this continuous state continues. During the non-continuous application, the delay timing will clear automatically.		
P15.13	Empty-water level threshold	0.0–100.0% This code is valid when P15.11 water level control is based on analog input. If the detected water level control analog signal is greater than the water level threshold P15.13 and keeps in the state after the delay time P15.16, the system reports A- tL and sleeps. If the delay time is not reached (that means non-continuous), the delay time is automatically cleared. When the detected water level control analog signal is less than the water level threshold, the delay counts. During the empty-water alarm, if the detected water level control analog signal is less than the water level threshold P15.13 and delay counts, the empty-water alarm is cleared after the delay time set by P15.17 in this continuous state. In the non-continuous state, the delay time is automatically cleared.	75.0%	○

Function code	Name	Description	Default	Modify
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 VFD 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 underload running	0.0%: Automatic detection on underload 0.1–100.0% 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	00.00%	○

Function code	Name	Description	Default	Modify
		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	○
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	100.0s	○

Function code	Name	Description	Default	Modify
		undervoltage point or the PV voltage is lower than 70V, the system directly reports the weak-light alarm without any delay. ● If P15.32=0, in weak-light condition, the system automatically switch to the power-frequency input mode.		
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	●
P15.26	Min. reference voltage in max. power tracking	0.00.0 po 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.	0.70	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></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. voltage reference</th><th>Max. Vmppt</th></tr><tr><td>-SS2</td><td>400</td><td>400</td></tr><tr><td>-S2</td><td>400</td><td>400</td></tr><tr><td>-2</td><td>400</td><td>400</td></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 adjustment is the actual PV voltage, and the upper/lower limit adjustment range is P15.30. That is:
Maximum/Minimum reference Max./Min. reference voltage = (Actual PV voltage ± P15.30
This will be automatically updated to P15.26 and P15.27.</td><td>1.0s</td><td>○</td></tr>
<tr><td>P15.30</td><td>Auto adjustment range of Vmppt upper/lower limit</td><td>5.0–100.0V
Range in which Vmppt upper/lower limit can be automatically adjusted.</td><td>30.0V</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P15.31	Vmppt max. value	P15.27–6553.5V During the max. power tracking, the upper limit of the solar panel reference voltage 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 frequency input	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 the relay output. If the value is 0, it is invalid. For VFDs without boost modules, the switching voltage is determined by the external voltage detection circuit. For VFDs with boost modules, the switching voltage is 70V.	70.0V	○
P15.34	Threshold for switching to PV input	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.	100.0V	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></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>-SS2</td><td>140V</td></tr><tr><td>-S2</td><td>140V</td></tr><tr><td>-2</td><td>140V</td></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.
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</td><td>0</td><td>◎</td></tr>
</table>

P17 group Status viewing

Function code	Name	Description	Default	Modify
P17.38	Current of the main winding	It is the 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 the 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 VFDs

Function code	Name	Description	Default	Modify
P18.00	PV reference voltage	MPPT is implemented at the VFD side. This value is determined at the VFD side.		●
P18.01	Actual PV voltage	It is transferred from the boost module or equal to the bus voltage.		●
P18.02	MPPT min. reference voltage display	The value displays the mini. voltage reference during max. power tracking. It equals the solar cell panel open-circuit voltage multiplied P15.26.		●
P18.04	Present inductive current	It is transferred from the boost module. This function code is 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: kW		●
P18.10	Device configuration display	0x00–0x11 LED ones: 0: PV power supply 1: AC grid power supply LED tens: 0: Detect that the system is configured with the boost module.		●

Function code	Name	Description	Default	Modify
		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 (VFD 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	○

Function code	Name	Description	Default	Modify
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	○
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 the PI parameters of this group. Otherwise, the boost voltage loop uses the 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 sends its version information to the VFD module.	0.00	●

Note:

- The duration from when the VFD 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 after the VFD encounters a fault:

1. Check to ensure there is nothing wrong with the keypad. If not, please contact with the local INVT office.
2. If there is nothing wrong, please check P07 and ensure the corresponding recorded fault parameters to confirm the real state when the current fault occurs by all parameters.
3. See the following table for detailed solution and check the corresponding abnormal state.
4. Eliminate the fault and ask for relative help.
5. Check to eliminate the fault and carry out fault reset to run the VFD.

Fault code	Fault type	Possible cause	Solution
OUt1	VFD 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 the ACC time. ● Replace the power unit. ● Check drive wires. ● Check whether there is strong interference surrounding the peripheral device.
OUt2	VFD unit V-phase protection		
OUt3	VFD unit W-phase protection		
OV1	Overvoltage during acceleration	● The input voltage is abnormal. ● There is large energy feedback. ● No braking components. ● Dynamic brake is disabled.	● Check the input power. ● Check whether the loaded DEC time is too short or the VFD 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 VFD is too low. ● The load transients or is abnormal. ● There is to-ground short	● Increase the ACC time. ● Check the input power. ● Select the VFD with larger power. ● Check whether there is short circuit (to-ground or inter-wire) in the load or the rotation is not smooth. ● Check the output wiring.
OC2	Overcurrent during deceleration		
OC3	Overcurrent during constant speed running		

Fault code	Fault type	Possible cause	Solution
		circuit or output phase loss. ● There is strong external interference. ● The overvoltage stall protection is disabled.	● 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 disabled.	● Check the grid input power. ● Check the setting of related function codes.
OL1	Motor overload	● The grid voltage is too low. ● The rated current of the motor 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	VFD 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 a VFD 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	VFD module overheat		

Fault code	Fault type	Possible cause	Solution
EF	External fault	● SI external fault input terminals 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 capability.
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 VFD 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 VFD mode. ● 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.
PIDE	PID feedback disconnection	● PID feedback is disconnected. ● The PID feedback source disappears.	● Check the PID feedback signal wires. ● Check the PID feedback source.
END	Running time reached	● The actual running time of the VFD is longer than the internal set running	● Ask the supplier to adjust the preset running time.

Fault code	Fault type	Possible cause	Solution
		time.	
OL3	Electronic overload	● The VFD reports overload pre-alarm according to the setting.	● Check the load and overload pre-alarm threshold.
ETH1	To-ground short-circuit fault 1	● VFD output is short connected to the ground. ● There is a fault in the current detection circuit.	● Check whether the motor wiring is proper. ● 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 VFD 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	● The VFD reports underload pre-alarm according to the setting.	● Check the load and underload pre-alarm threshold.
tSF	Hydraulic probe damage	● 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 or DEC is too fast. ● The power of the VFD is too low. ● The load transients or is abnormal. ● There is to-ground short	● Increase the ACC/DCC time. ● Select the VFD with larger power. ● Check if the load is short circuited (to-ground short

Fault code	Fault type	Possible cause	Solution
		circuit.	circuit or line-to-line short circuit) or the rotation is not smooth.
PVOV	PV overvoltage	● The solar cell panel input voltage 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,

Fault code	Fault type	Possible cause	Solution
			check whether terminals are wired correctly.
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 VFDs ≤ 2.2KW support the installation of the boost module (PP100-3R2-PV) to improve the utilization of the solar modules. The figure below shows the wiring method.

1. Connect PV+ and PV- of the boost module to the positive input terminal and negative input terminal of the modules respectively.
2. Connect the output terminals (+) and (-) of the boost module to the input terminals (+) and (-) of the pump VFD.
3. Connect 422-communication receiving terminal RX of the boost module to 422-communication sending terminal TX of the pump VFD. Connect 422-communication sending terminal TX of the boost module to 422-communication receiving terminal RX of the pump VFD. Use twisted pairs for wiring.
4. If the wiring is connected, switch on the breaker Q1 at the DC side for automotive running.

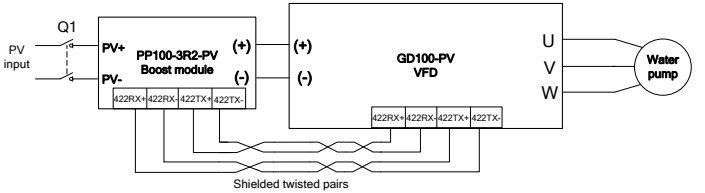


Figure A–1 Connection between the boost module and the VFD

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)	220V VFD: 350; 380V VFD: 570

Status indicator description:

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

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

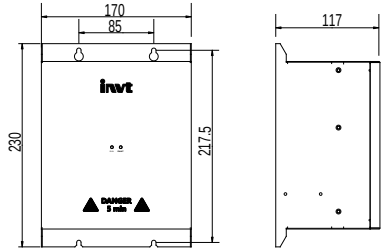


Figure A–2 Installation dimensions of the boost module

A.2 GPRS module and monitoring APP

The pump VFD supports an optional GPRS module to implement remote monitoring, and the GPRS module connects to the VFDs through 485 communication. The running state of the VFD can be monitored in real time on the APP in the mobile phone or web page.

Method for connecting the GPRS module to the VFD:

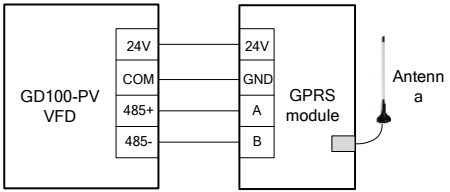


Figure A–3 Connection between the GPRS module and the VFD

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 Power 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 VFD, check the insulation conditions of the cable according to local regulations.

Recommended power cable sizes for standard VFD models:

Model	Recommended cable size (mm^2)		Terminal screw	Tightening torque (Nm)
	(+)/(-), R/S/T, U/V/W	PE		
GD100-0R4G-S2-PV	1.5	1.5	M4	0.8
GD100-0R7G-S2-PV	1.5	1.5	M4	0.8
GD100-0R4G-SS2-PV	1.5	1.5	M4	0.8
GD100-0R7G-4-PV	1.5	1.5	M4	0.8
GD100-1R5G-4-PV	1.5	1.5	M4	0.8
GD100-2R2G-4-PV	1.5	1.5	M4	0.8
GD100-1R5G-S2-PV	2.5	2.5	M4	0.8
GD100-2R2G-S2-PV	2.5	2.5	M4	0.8
GD100-0R7G-SS2-PV	2.5	2.5	M4	0.8
GD100-1R5G-SS2-PV	2.5	2.5	M4	0.8
GD100-2R2G-SS2-PV	2.5	2.5	M4	0.8
GD100-004G-4-PV	2.5	2.5	M4	1.2–1.5
GD100-5R5G-4-PV	2.5	2.5	M4	1.2–1.5

Model	Recommended cable size (mm^2)		Terminal screw	Tightening torque (Nm)
	(+)/(-), R/S/T, U/V/W	PE		
GD100-1R5G-2-PV	2.5	2.5	M4	1.2–1.5
GD100-2R2G-2-PV	2.5	2.5	M4	1.2–1.5
GD100-7R5G-4-PV	4	4	M5	2–2.5
GD100-004G-2-PV	4	4	M5	2–2.5
GD100-011G-4-PV	6	6	M5	2–2.5
GD100-5R5G-2-PV	6	6	M5	2–2.5
GD100-015G-4-PV	10	10	M5	2–2.5
GD100-7R5G-2-PV	10	10	M5	2–2.5
GD100-018G-4-PV	16	16	M5	2–2.5
GD100-022G-4-PV	25	16	M5	2–2.5
GD100-030G-4-PV	25	16	M6	4–6
GD100-037G-4-PV	35	16	M6	4–6
GD100-045G-4-PV	35	16	M8	10
GD100-055G-4-PV	50	25	M8	10
GD100-075G-4-PV	70	35	M8	10
GD100-090G-4-PV	95	50	M12	31–40
GD100-110G-4-PV	120	70	M12	31–40
GD100-132G-4-PV	185	95	M12	31–40
GD100-160G-4-PV	240	95	M12	31–40
GD100-185G-4-PV	120*2P	150	M12	31–40
GD100-200G-4-PV	120*2P	150	M12	31–40

Note:

- For the cable selection for IP54 models, see the cables applicable to the models with the same power as model IP54 in this table.
- 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 VFD 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 VFD 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 a VFD 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 VFD. If the distance between the VFD and motor is 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:

VFD model	Output reactor
GD100-1R5G-2-PV	OCL2-004-4
GD100-2R2G-2-PV	OCL2-004-4
GD100-004G-2-PV	OCL2-5R5-4
GD100-5R5G-2-PV	OCL2-7R5-4
GD100-7R5G-2-PV	OCL2-015-4
GD100-0R7G-4-PV	OCL2-1R5-4
GD100-1R5G-4-PV	OCL2-1R5-4
GD100-2R2G-4-PV	OCL2-2R2-4
GD100-004G-4-PV	OCL2-004-4
GD100-5R5G-4-PV	OCL2-5R5-4
GD100-7R5G-4-PV	OCL2-7R5-4
GD100-011G-4-PV	OCL2-011-4
GD100-015G-4-PV	OCL2-015-4
GD100-018G-4-PV	OCL2-018-4
GD100-022G-4-PV	OCL2-022-4
GD100-030G-4-PV	OCL2-037-4
GD100-037G-4-PV	OCL2-037-4
GD100-045G-4-PV	OCL2-045-4
GD100-055G-4-PV	OCL2-055-4

VFD model	Output reactor
GD100-075G-4-PV	OCL2-075-4
GD100-090G-4-PV	OCL2-110-4
GD100-110G-4-PV	OCL2-110-4
GD100-132G-4-PV	OCL2-160-4
GD100-160G-4-PV	OCL2-200-4
GD100-185G-4-PV	OCL2-200-4
GD100-200G-4-PV	OCL2-200-4

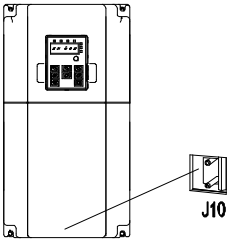
Note:

- 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

Goodrive100-PV series VFDs 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 VFD.



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 VFDs

Solar pump VFD 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
GD100-0R4G-SS2-PV	250	11*1	300	9*1
GD100-0R7G-SS2-PV	250	11*1	300	9*1
GD100-1R5G-SS2-PV	250	11*1	300	9*1
GD100-2R2G-SS2-PV	250	11*1	300	9*1
GD100-0R4G-S2-PV	250	11*1	300	9*1
GD100-0R7G-S2-PV	250	11*1	300	9*1
GD100-1R5G-S2-PV	250	11*1	300	9*1
GD100-2R2G-S2-PV	250	11*1	300	9*1
GD100-1R5G-2-PV	250	11*1	300	9*1
GD100-2R2G-2-PV	250	11*1	300	9*1
GD100-004G-2-PV	250	11*2	300	9*2
GD100-5R5G-2-PV	250	11*3	300	9*3
GD100-7R5G-2-PV	250	11*4	300	9*4
GD100-0R7G-4-PV	250	18*1	300	15*1
GD100-1R5G-4-PV	250	18*1	300	15*1
GD100-2R2G-4-PV	250	18*1	300	15*1
GD100-004G-4-PV	250	20*1	300	16*1
GD100-5R5G-4-PV	250	18*2	300	15*2
GD100-7R5G-4-PV	250	18*2	300	15*2
GD100-011G-4-PV	250	18*3	300	15*3
GD100-015G-4-PV	250	18*4	300	15*4
GD100-018G-4-PV	250	18*5	300	15*5
GD100-022G-4-PV	250	18*6	300	15*6
GD100-030G-4-PV	250	18*8	300	15*8
GD100-037G-4-PV	250	18*9	300	15*9
GD100-045G-4-PV	250	18*11	300	15*11
GD100-055G-4-PV	250	18*14	300	15*14
GD100-075G-4-PV	250	18*19	300	15*19

Solar pump VFD 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
GD100-090G-4-PV	250	18*22	300	15*22
GD100-110G-4-PV	250	18*27	300	15*27
GD100-132G-4-PV	250	18*38	300	15*38
GD100-160G-4-PV	250	18*46	300	15*46
GD100-185G-4-PV	250	18*53	300	15*53
GD100-200G-4-PV	250	18*57	300	15*57

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

PP100-3R2-PV + Solar pump VFD	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
GD100-0R4G-SS2-PV	12	250	4*1	300	3*1
GD100-0R7G-SS2-PV	12	250	5*1	300	4*1
GD100-1R5G-SS2-PV	12	250	8*1	300	7*1
GD100-0R4G-S2-PV	12	250	4*1	300	3*1
GD100-0R7G-S2-PV	12	250	5*1	300	4*1
GD100-1R5G-S2-PV	12	250	8*1	300	7*1
GD100-1R5G-2-PV	12	250	8*1	300	7*1
GD100-2R2G-2-PV	12	250	13*1	300	11*1
GD100-0R7G-4-PV	12	250	5*1	300	4*1
GD100-1R5G-4-PV	12	250	8*1	300	7*1
GD100-2R2G-4-PV	12	250	13*1	300	11*1

Appendix C Power frequency & PV switching solution

C.1 Solution introduction

Generally, VFDs 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.

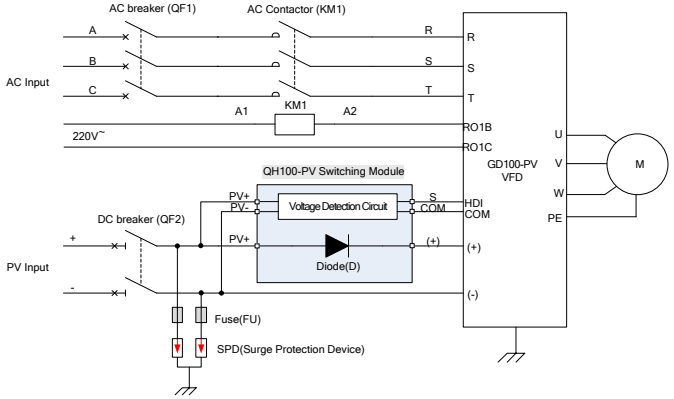


Figure C–1 VFD power frequency & PV switching solution

See 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 Models 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

Field	Sign	Description	Content
Rated current	②	Power range for adaptive VFD	055A—applies to VFDs of ≤ 15kW 110A—applies to VFDs of 18.5–37kW
Voltage class	③	Voltage class	4: AC 3PH 380V (-15%)–440 (+10%) 2: AC 3PH 220V (-15%)–240 (+10%)
Industry 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 VFD.
S, COM	Voltage detection signal	ON/OFF signal, corresponding PV voltage greater/less than preset threshold, connecting to terminals HDI and COM of the VFD.

C.1.1.3 Installation dimensions

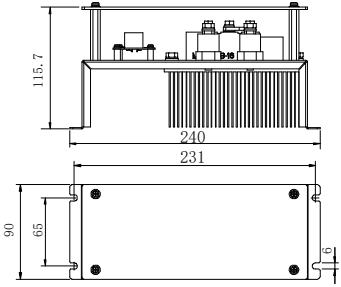


Figure C–2 Installation dimensions of the switching module (unit: mm)

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

Model	AC breaker (A)	DC breaker	AC contactor (A)	SPD	Fuse	Diode I_{FAV}/ V_{RRM}
GD100-0R4G-S2-PV-AS	16	16A/ 1000VDC	16	Type II, 1000V DC	30A	25A/1600V
GD100-0R7G-S2-PV-AS	16		16			
GD100-0R4G-SS2-PV-AS	16		16			
GD100-1R5G-2-PV-AS	16		16			
GD100-1R5G-S2-PV-AS	25		25			
GD100-0R7G-SS2-PV-AS	16		16			
GD100-2R2G-S2-PV-AS	40		40			
GD100-1R5G-SS2-PV-AS	25		25			
GD100-2R2G-SS2-PV-AS	40		40			
GD100-0R7G-4-PV-AS	10		12			
GD100-1R5G-4-PV-AS	10		12			
GD100-2R2G-4-PV-AS	10		12			
GD100-004G-4-PV-AS	25		25			55A/ 1600V
GD100-5R5G-4-PV-AS	25	25A/ 1000VDC	25			
GD100-2R2G-2-PV-AS	25		25			
GD100-004G-2-PV-AS	25		25			
GD100-7R5G-4-PV-AS	40		40			
GD100-5R5G-2-PV-AS	40	63A/ 1000VDC	40			
GD100-011G-4-PV-AS	50		50			
GD100-7R5G-2-PV-AS	50		50			
GD100-015G-4-PV-AS	63		63			
GD100-018G-4-PV-AS	63	100A/ 1000VDC	63			110A/ 1600V
GD100-022G-4-PV-AS	100		95			
GD100-030G-4-PV-AS	100		95			
GD100-037G-4-PV-AS	125	125A/ 1000VDC	115			

Model	AC breaker (A)	DC breaker	AC contactor (A)	SPD	Fuse	Diode I_{FAV}/ V_{RRM}
GD100-045G-4-PV-AS	200	160A/ 1000VDC	170			160A/ 1600V
GD100-055G-4-PV-AS	200	250A/ 1000VDC	170			250A/ 1600V
GD100-075G-4-PV-AS	250		205			
GD100-090G-4-PV-AS	315	350A/ 1000VDC	245			350A/ 1600V
GD100-110G-4-PV-AS	350		265			
GD100-132G-4-PV-AS	350	400A/ 1000VDC	330			400A/ 1600V
GD100-160G-4-PV-AS	400	550A/ 1000VDC	400			550A/ 1600V
GD100-185G-4-PV-AS	500		500			
GD100-200G-4-PV-AS	500	600A/ 1000VDC	500			600A/ 1600V

C.2 IP54 protection-level VFDs

INVT provides IP54 protection-level VFDs, which are divided into two types: One type implements auto power frequency & PV switching and the other type does not implement auto switching.

The following figure shows the dimensions of the VFD.

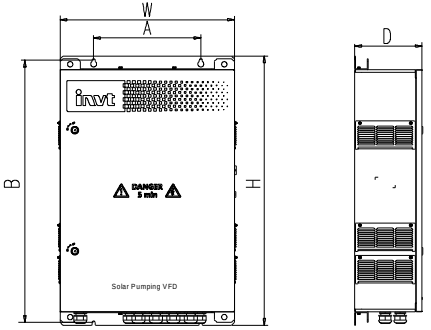


Figure C–3 Dimensions of IP54 VFD

Dimensions of IP54 VFD (unit: mm):

Power (kW)	Model	W	H	D	A	B
37	GD100-037G-45-PV-AS	650	1000	250	400	975
30	GD100-030G-45-PV-AS					
22	GD100-022G-45-PV-AS					
18.5	GD100-018G-45-PV-AS					
15	GD100-015G-45-PV-AS	550	900	225	400	875
11	GD100-011G-45-PV-AS					
7.5	GD100-7R5G-45-PV-AS					
	GD100-7R5G-25-PV-AS					
5.5	GD100-5R5G-45-PV-AS					
	GD100-5R5G-25-PV-AS					
4	GD100-004G-45-PV-AS					
	GD100-004G-25-PV-AS					
2.2	GD100-2R2G-45-PV-AS	550	700	200	400	675
	GD100-2R2G-S25-PV-AS					
	GD100-2R2G-SS25-PV-AS					
1.5	GD100-1R5G-45-PV-AS					
	GD100-1R5G-S25-PV-AS					
	GD100-1R5G-SS25-PV-AS					
0.75	GD100-0R7G-45-PV-AS					
	GD100-0R7G-S25-PV-AS					
	GD100-0R7G-SS25-PV-AS					
0.4	GD100-0R4G-S25-PV-AS					
	GD100-0R4G-SS25-PV-AS					

Note:

- The VFDs that do not implement auto switching do not have the suffix -AS.
- The VFDs ≤ 2.2kW are equipped with the boost module as standard configuration, supporting auto switching.
- For -S25 and -SS25 models equipped with the boost module, the DC input voltage

cannot be greater than 440V. For -45 models equipped with the boost module, the DC input voltage cannot be greater than 600V.

C.3 Wiring description

The following figures show the wiring terminals of IP54 VFDs.

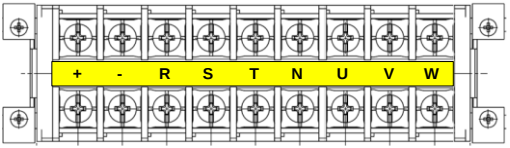


Figure C–4 Wiring terminals of 4-37kW models

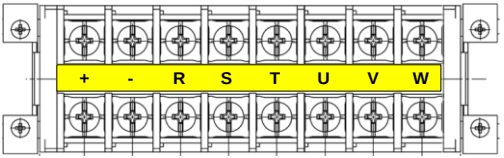


Figure C–5 Wiring terminals of -4 models for VFDs ≤ 2.2kW

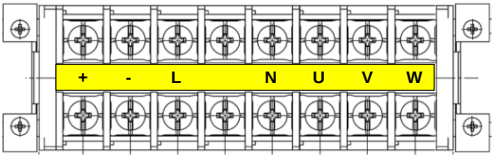


Figure C–6 Wiring terminals of -S2/-SS2 models for VFDs ≤ 2.2kW

Terminal function description:

Symbol	Terminal name	Description
R, S, T	AC input	3PH 380V/220V AC input terminals, connected to the grid
N		Neutral wire. For VFD 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
L, N	AC input	1PH 220V AC input terminals, connected to the grid
(+), (-)	PV DC input	Input terminals of photovoltaic panels.
U, V, W	VFD output	3PH/1PH AC output terminals, connected to pump motor. **Note**: 1PH motors must connect to terminals U and W.
⏚	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.

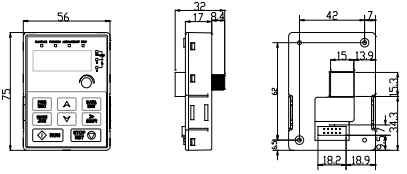
C.4 Parameter setting method

Connect the external PV voltage detection signal to HDI terminal (auto switching by default). Ensure that the PV voltage detection threshold is 300V for the -4 models and it is 200V for the -2/-S2/-SS2 models.

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

Appendix D Dimension drawings

D.1 External keypad structure

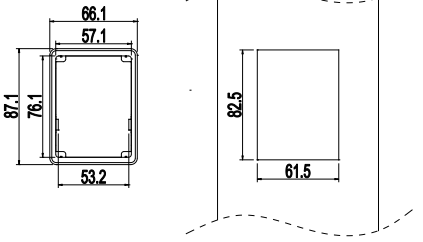


Keypad structure

Installation hole

Note: The VFD models of 380V 2.2kW and lower support an optional extermal keypad, and the keypad of VFD models of 380V 4kW 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 VFD at most.



Installation bracket

Installation dimension

D.2 Dimensions of 0.4-2.2kW models

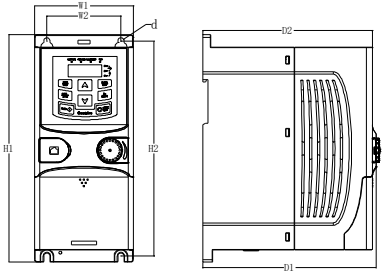


Figure D–1 Wall mounting

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

Model	W1	W2	H1	H2	D1	D2	Installation hole diameter (d)
GD100-0R4G-S2-PV	80.0	60.0	160.0	150.0	123.5	120.3	Ø 5
GD100-0R7G-S2-PV	80.0	60.0	160.0	150.0	123.5	120.3	Ø 5
GD100-0R4G-SS2-PV	80.0	60.0	160.0	150.0	123.5	120.3	Ø 5
GD100-1R5G-S2-PV	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5
GD100-2R2G-S2-PV	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5
GD100-0R7G-SS2-PV	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5
GD100-1R5G-SS2-PV	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5
GD100-2R2G-SS2-PV	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5
GD100-0R7G-4-PV	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5
GD100-1R5G-4-PV	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5
GD100-2R2G-4-PV	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5

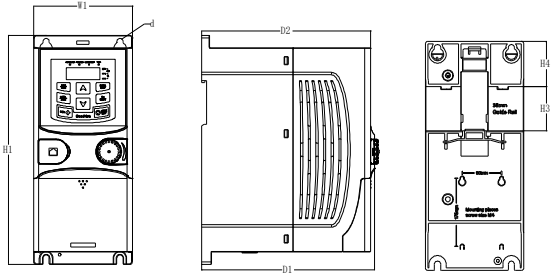


Figure D–2 Rail mounting

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

Model	W1	H1	H3	H4	D1	D2	Installation hole diameter (d)
GD100-0R4G-S2-PV	80.0	160.0	35.4	36.6	123.5	120.3	Ø 5
GD100-0R7G-S2-PV	80.0	160.0	35.4	36.6	123.5	120.3	Ø 5
GD100-0R4G-SS2-PV	80.0	160.0	35.4	36.6	123.5	120.3	Ø 5
GD100-1R5G-S2-PV	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5
GD100-2R2G-S2-PV	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5
GD100-0R7G-SS2-PV	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5
GD100-1R5G-SS2-PV	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5
GD100-2R2G-SS2-PV	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5
GD100-0R7G-4-PV	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5
GD100-1R5G-4-PV	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5
GD100-2R2G-4-PV	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5

D.3 Dimensions of 1.5-200kW models

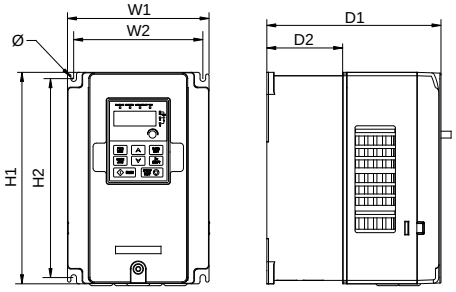


Figure D–3 Wall mounting

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

Model	W1	W2	H1	H2	D1	D2	Installation hole diameter (d)
GD100-1R5G-2-PV	146.0	131.0	256.0	243.5	167.0	84.5	Ø 6
GD100-2R2G-2-PV	146.0	131.0	256.0	243.5	167.0	84.5	Ø 6
GD100-004G-4-PV	146.0	131.0	256.0	243.5	167.0	84.5	Ø 6
GD100-5R5G-4-PV	146.0	131.0	256.0	243.5	167.0	84.5	Ø 6
GD100-7R5G-4-PV	170.0	151.0	320.0	303.5	196.3	113.0	Ø 6
GD100-011G-4-PV	170.0	151.0	320.0	303.5	196.3	113.0	Ø 6
GD100-015G-4-PV	170.0	151.0	320.0	303.5	196.3	113.0	Ø 6
GD100-004G-2-PV	170.0	151.0	320.0	303.5	196.3	113.0	Ø 6
GD100-5R5G-2-PV	170.0	151.0	320.0	303.5	196.3	113.0	Ø 6
GD100-7R5G-2-PV	170.0	151.0	320.0	303.5	196.3	113.0	Ø 6
GD100-018G-4-PV	200.0	185.0	340.6	328.6	184.3	104.5	Ø 6
GD100-022G-4-PV	200.0	185.0	340.6	328.6	184.3	104.5	Ø 6
GD100-030G-4-PV	250.0	230.0	400.0	380.0	202.0	123.5	Ø 6
GD100-037G-4-PV	250.0	230.0	400.0	380.0	202.0	123.5	Ø 6

Model	W1	W2	H1	H2	D1	D2	Installation hole diameter (d)
GD100-045G-4-PV	282.0	160.0	560.0	542.4	238.0	138.0	Ø 9
GD100-055G-4-PV	282.0	160.0	560.0	542.4	238.0	138.0	Ø 9
GD100-075G-4-PV	282.0	160.0	560.0	542.4	238.0	138.0	Ø 9
GD100-090G-4-PV	338.0	200.0	554.0	534.0	326.2	--	Ø 9.5
GD100-110G-4-PV	338.0	200.0	554.0	534.0	326.2	--	Ø 9.5
GD100-132G-4-PV	500.0	360.0	870.0	850.0	360.0	--	Ø 11
GD100-160G-4-PV	500.0	360.0	870.0	850.0	360.0	--	Ø 11
GD100-185G-4-PV	500.0	360.0	870.0	850.0	360.0	--	Ø 11
GD100-200G-4-PV	500.0	360.0	870.0	850.0	360.0	--	Ø 11

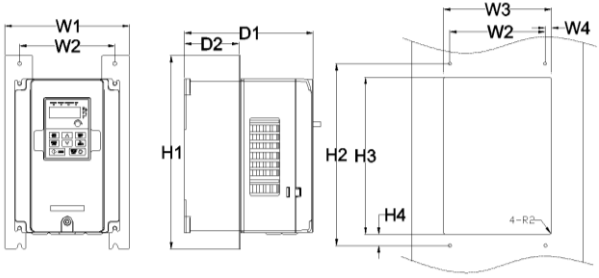


Figure D–4 Flange installation

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

Model	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Installation hole diameter	Nut specs
GD100-004G-4-PV	170.2	131	150	9.5	292	276	260	6	167	84.5	Ø 6	M5
GD100-5R5G-4-PV	170.2	131	150	9.5	292	276	260	6	167	84.5	Ø 6	M5
GD100-7R5G-4-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	Ø 6	M5

Model	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Installation hole diameter	Nut specs
GD100-011G-4-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	Ø 6	M5
GD100-015G-4-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	Ø 6	M5
GD100-1R5G-2-PV	170.2	131	150	9.5	292	276	260	6	167	84.5	Ø 6	M5
GD100-2R2G-2-PV	170.2	131	150	9.5	292	276	260	6	167	84.5	Ø 6	M5
GD100-004G-2-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	Ø 6	M5
GD100-5R5G-2-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	Ø 6	M5
GD100-7R5G-2-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	Ø 6	M5
GD100-018G-4-PV	266	250	224	13	371	250	350.6	20.3	184.6	104	Ø 6	M5
GD100-022G-4-PV	266	250	224	13	371	250	350.6	20.3	184.6	104	Ø 6	M5
GD100-030G-4-PV	316	300	274	13	430	300	410	55	202	118.3	Ø 6	M5
GD100-037G-4-PV	316	300	274	13	430	300	410	55	202	118.3	Ø 6	M5
GD100-045G-4-PV	352	332	306	13	580	400	570	80	238	133.8	Ø 9	M8
GD100-055G-4-PV	352	332	306	13	580	400	570	80	238	133.8	Ø 9	M8
GD100-075G-4-PV	352	332	306	13	580	400	570	80	238	133.8	Ø 9	M8
GD100-090G-4-PV	418.5	361	389.5	14.2	600	559	370	108.5	329.5	149.5	Ø 9.5	M8
GD100-110G-4-PV	418.5	361	389.5	14.2	600	559	370	108.5	329.5	149.5	Ø 9.5	M8
GD100-132G-4-PV	500	360	480	60	870	850	796	37	358	178.5	Ø 11	M10
GD100-160G-4-PV	500	360	480	60	870	850	796	37	358	178.5	Ø 11	M10
GD100-185G-4-PV	500	360	480	60	870	850	796	37	358	178.5	Ø 11	M10
GD100-200G-4-PV	500	360	480	60	870	850	796	37	358	178.5	Ø 11	M10

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

Appendix E Further information

E.1 Product and service quiries

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 to find a list of INVT offices.

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202211 (V1.0)