Operation Manual

110-PV Series

Solar Pumping VFD



Contents

Contents	
1 Safety precautions	1
1.1 Safety definition	1
1.2 Warning symbols	
1.3 Safety guidelines	
2 Product overview	
2.1 Unpacking inspection	
2.2 Name plate	
2.3 Type designation key	
2.4 Product specifications	
2.5 Rated specifications	
3 Installation guidelines	
3.1 Mechanical installation	
3.2 Standard wiring	
4 Keypad operation procedure	
4.1 Keypad operation procedure	
4.2 Keypad displaying	14 17
4.2 Reypad displaying	
5 Commissioning guidelines	20
5.1 Inspection before operation	
5.2 Trial run	
5.3 Parameter settings	
5.4 Advanced settings	
	77
6 Function parameters	
6.1 Common function parameters for solar pumping control	22
6.1 Common function parameters for solar pumping control	22 41
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution.	22 41 59
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use	22 41 59
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution	22 59 65
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution	22 59 65 65
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution	22 59 65 65 66
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use	22 59 65 65 66
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use. A.1 Boost module A.2 GPRS module and monitoring APP A.3 Cables A.4 Reactors A.5 Filters	22 59 65 65 66 67
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution	22 59 65 65 67 69
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use	22 65 65 66 67 70
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use	226565666771
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution	226565666771
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use	
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use. A.1 Boost module A.2 GPRS module and monitoring APP A.3 Cables A.4 Reactors A.5 Filters Appendix B Recommended solar modules B.1 Recommended configuration for solar pumping VFDs B.2 Recommended configuration for VFDs with the boost module Appendix C Power frequency & PV switching solution	
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution. Appendix A Options and use	
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use	
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution	
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use	
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use	
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution. Appendix A Options and use	22 41 41 65 65 65 66 67 70 71 71 72 73 77 78 79 80 80 81
6.1 Common function parameters for solar pumping control 6.2 Parameters of special functions 7 Fault diagnosis and solution Appendix A Options and use	22 41 59 65 65 66 67 71 72 73 73 78 80 80 81 83

i

1 Safety precautions

Please read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the variable-frequency drive (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 People working on the device should take part in professional electricians: 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 symbols

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
A Danger	Danger	Serious physical injury or even death may occur if not follow the relative requirements	A
Warning	Warning	Physical injury or damage to the devices may occur if not follow the relative requirements	\triangle
Do not	Electrostatic discharge	Damage to the PCBA board may occur if not follow the relative requirements	43
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:

/	4	\
_	T	_

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	132k\\\-200k\\\	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 VFD cannot meet the requirements of low voltage protection in IEC61800-5-1 if the altitude of installation site is above 2000m.
- ♦ 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 should 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 replacement of components



- 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



 $\ensuremath{\diamondsuit}$ 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:

- Check that there are no damage and humidification to the package. If not, please contact with local agents or 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 offices.
- 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 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 offices.
- 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 offices.

2.2 Name plate

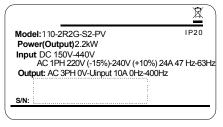


Figure 2-1 Name plate

Note: This is the example of 110-PV standard products and the CE\TUV\IP20 certifications are marked according to the reality.

2.3 Type designation key

The type designation contains information on the VFD. The user can find the type designation on the type designation label attached to the VFD or the simple name plate.

Key	Sign	Description	Remarks
Product abbreviation	1	Product abbreviation	110 is short for 110.
Rated power	2	Power range + Load type	5R5G—5.5kW G—Constant torque load
Voltage degree	3	Voltage degree	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	Industrial code	PV stands for solar pumping.

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
Lowest 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 Rated specifications

Series	Model	Rated output power (Kw)	Rated input current (A)	current (A)	Max. DC input current (A)
-SS2 model	110-0R4G-SS2-PV	0.4	6.5	4.2	9
1PH 220V	110-0R7G-SS2-PV	0.75	9.3	7.2	9

Series	Model	Rated output power (Kw)	Rated input current (A)	Rated output current (A)	Max. DC input current (A)
	110-1R5G-SS2-PV	1.5	15.7	10.2	12
(0.4-2.2 kW)	110-2R2G-SS2-PV	2.2	24	14	12
-S2 model	110-0R4G-S2-PV	0.4	6.5	2.5	9
1PH 220V	110-0R7G-S2-PV	0.75	9.3	4.2	9
input	110-1R5G-S2-PV	1.5	15.7	7.5	12
(0.4-2.2 kW)	110-2R2G-S2-PV	2.2	24	10	12
	110-1R5G-2-PV	1.5	7.7	7.5	12
-2 model	110-2R2G-2-PV	2.2	11	10	12
3PH 220V	110-004G-2-PV	4	17	16	20
(1.5-7.5kW)	110-5R5G-2-PV	5.5	25	20	30
	110-7R5G-2-PV	7.5	33	30	40
	110-0R7G-4-PV	0.75	3.4	2.5	9
	110-1R5G-4-PV	1.5	5.0	4.2	9
	110-2R2G-4-PV	2.2	5.8	5.5	12
	110-004G-4-PV	4.0	13.5	9.5	16.5
	110-5R5G-4-PV	5.5	19.5	14	23.9
	110-7R5G-4-PV	7.5	25	18.5	30.6
	110-011G-4-PV	11	32	25	39.2
	110-015G-4-PV	15	40	32	49
	110-018G-4-PV	18.5	47	38	50
-4 model	110-022G-4-PV	22	51	45	60
3PH 380V	110-030G-4-PV	30	70	60	81
(0.75-200kW)	110-037G-4-PV	37	80	75	90
	110-045G-4-PV	45	98	92	130
	110-055G-4-PV	55	128	115	150
	110-075G-4-PV	75	139	150	200
	110-090G-4-PV	90	168	180	250
	110-110G-4-PV	110	201	215	300
	110-132G-4-PV	132	265	260	360
	110-160G-4-PV	160	310	305	430
	110-185G-4-PV	185	345	340	500
	110-200G-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	Indoor
Environment temperature	The ambient temperature of VFD is -10 °C -50 °C while air temperature change should be less than 0.5 °C per minute. The VFD will be derated once ambient temperature exceeds 40 °C. It is not recommended to use the VFD if ambient temperature is above 50 °C. To ensure reliability, do not use the VFD if the ambient temperature changes frequently. Provide cooling fan or air conditioner to control the internal ambient temperature below the required one if the VFD is used in a close space such as in the control cabinet. When the temperature is too low, if the VFD needs to restart to run after a long stop, it is necessary to provide an external heating device to increase the internal temperature, otherwise damage to the devices may occur.
Humidity	RH≤90%. No condensation is allowed.
Storage temperature	-40°C-+70°C. The temperature change rate is less than 1°C/minute.

Environment	Conditions
	The installation site of the VFD should:
	Keep away from the electromagnetic radiation source;
	Keep away from contaminative air, such as corrosive gas, oil mist and
Running	flammable gas;
environment	Ensure foreign objects, such as metal power, dust, oil, water cannot
condition	enter into the VFD (do not install the VFD on the flammable materials
	such as wood);
	Keep away from direct sunlight, oil mist, steam, and vibration
	environment.
Pollution	Pollution degree 2
	When the altitude exceeds 1000m but is lower than 3000m, derate 1% for every additional 100m;
	When the altitude exceeds 2000m, configure an isolation transformer
Altitude	on the input end of the VFD.
	When the altitude exceeds 3000m but is lower than 5000m, contact
	our company for technical consultation. Do not use the VFD at an
	altitude higher than 5000m.
Vibration	$\leq 5.8 \text{m/s}^2 (0.6 \text{g})$
Installation	The VFD should be installed on an upright position to ensure
direction	sufficient cooling effect.

Note:

- 110-PV series VFDs should be installed in a clean and ventilated environment according to enclosure classification.
- Cooling air must be clean, free from corrosive materials and electrically 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 manner

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



a) Wall mounting

b) Rail mounting

Figure 3-1 Installation manners

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.



Figure 3-2 Installation manners

- 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 Terminals of main circuit

The figure below shows the standard wiring of VFD.

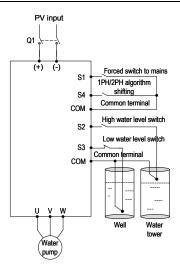


Figure 3-3 Standard wiring diagram

- ♦ 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.

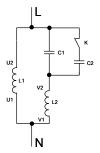


- When the distance between the pump and VFD exceeds 50 meters, it is recommended to configure output reactors. See appendix A.4 for the output reactor model selection.
- The VFD automatically runs after being powered on. If parameters need to be set, follow the parameter setting instructions in chapter 5.
- Before connecting the braking resistor cable, remove the yellow labels of PB, (+), and (-) from the terminal blocks. Otherwise, poor connection may occur.

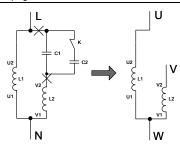
Terminal	Name	Function	
R, S, T	A.C. immed	3PH (1PH) AC input terminals, connected to the grid	
(L, N)	AC input	Note: Use the screws equipped with the VFD for wiring.	
(+), (-)	PV input	Solar cell panel input terminals	
		3PH/1PH AC output terminals, connected to the pump	
U, V, W	VFD output	motor	
		Note: 1PH motors must connect to terminals U and W.	
(<u>+</u>)	Safety	Safety protection grounding terminal. Each VFD must	
	grounding	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 pumping 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 Terminals of control circuit

Functions of control terminals

Category	Terminal symbol	Terminal name	Terminal function
	24V	24V power supply	It provides the power of 24V±10% and maximum
Power supply	СОМ	Common terminal	current of 200mA. It functions as the working power supply of digital input and output or externally connects to the sensor power supply.
	S 1	Forced switch to power frequency	Terminal feature parameters: 1. Internal impedance: 3.3kΩ 2. Acceptable voltage input:
Digital input	S2	Full-water alarm	12–24V 3. Maximum input frequency: 1kHz
	S3	Empty-water alarm	S1: Forcible switch to power frequency (Switching-on indicates switching to power

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

4 Keypad operation procedure

4.1 Keypad introduction

Keypads are used to control 110-PV series VFDs, read the state data and adjust parameters. If it is necessary to connect the keypad to other external device, you can use the standard RJ45 cable with crystal head as the external extension cable.



Figure 4-1 Keypad diagram for VFDs ≤ 2.2kW

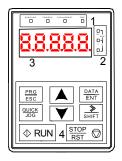


Figure 4-2 Keypad diagram for VFDs ≥ 4kW

Note: External keypads can be configured for VFDs ≤ 2.2kW. The keypads of VFDs ≥ 4kW can be used as external keypads.

Serial No.	Name	D	escription	
		RUN/TUNE	stopping state; VFD is in the pa	that the VFD is in the LED blinking means the arameter autotune state; the VFD is in the running
		FWD/REV		the VFD is in the forward ED on means the VFD is tation state.
1	State LED	LOCAL/REMOT TRIP	LED for keypa operation and control LED off means keypad operation means the VF operation state; is in the remote state. LED for faults LED on when the	and operation, terminals remote communication that the VFD is in the on state; LED blinking D is in the terminals LED on means the VFD communication control e VFD is in the fault state; mal state; LED blinking
		Mean the unit displayed currently		is in the pre-alarm state.
	Unit		Hz RPM	Frequency unit Rotating speed unit
2	LED	0	Α	Current unit
		0	% V	Percentage Voltage unit
3	Display zone	5-figure LED display displays var as set frequency and output frequ	ious monitoring d	-

Serial No.	Name						D	esc	ription				
			Display	Me	ean	Display	Mea	an	Display	Mean	Display	Mean	
			0		0	1	1		2	2	3	3	
			4		4	5	5		8	6		7	
			8		8	3	9		8	Α	8	В	
			Ε	-	С	ď	D		٤	Е	я	F	
			8		Н	10	-		E	L	c:	N	
			Ö		n	0	0		8	Р	- c	r	
			5		S	8	t		8	U	Ü	٧	
			- 12			_	-						
			PRG ESC		Р	rogrammiı	ng	En	ter or esc	ape fror	m the first	level me	nu
			ESC			key		and	d remove	the par	ameter qu	ickly.	
			DATA ENT			Entry key		En	ter the me	enu step	o-by-step.		
				Lift y Key		Confirm parameters.							
						UP key		Inc	rease dat	rease data or function code			
					C,			pro	gressivel	у.			
					ı	DOWN ke	v	De	crease da	ita or fu	nction cod	le	
						301111 NO	,		gressivel				
									U		elect the		
4	Buttons		≫ SHIFT		_				rameter nning mod		ly in sto	opping a	anu
4	Bullons		SHIFT		Ri	ght-shift k	ey		Ü		er modifyir	na diait	
											er modifica		
											operate or) in
			RUN 💠			Run key			y operatio				
								ľ			stop in ru	unning st	tate
			© STOP RST			Stop/		and	d it is limit	ed by fu	unction co	de P07.0)4.
			RST			Reset key	,	Thi	is key is	used	to reset	all con	itrol
								mo	des in the	fault a	larm state		
			QUICK JOG			Outok ka		Th	e function	of this	key is co	onfirmed	by
			JOG			Quick key	'	fun	nction code	e P07.0	2.		
_	Keypad	Ext	ternal key	pa	d po	rt. When	keyp	ads	s are valid	d, both	the local a	and exter	rnal
5	port	key	/pad LED	s a	re o	n.							

4.2 Keypad displaying

The keypad displaying state of 110-PV series VFDs is divided into stopping state parameter, running state parameter, function code parameter editing state and fault alarm state and so on

4.2.1 Displayed state of stopping parameters

When the VFD is in the stopping state, the keypad will display stopping parameters as shown in figure 4-2.

In the stopping state, various kinds of parameters can be displayed. Select the parameters to be displayed or not by P07.07. See the instructions of P07.07 for the detailed definition of each bit.

In the stopping state, there are 4 parameters that can be displayed. They are: set frequency, bus voltage, input terminals state, and output terminals state.

> /SHIFT can shift the parameters from left to right. QUICK/JOG (P07.02=2) can shift the parameters from right to left.

4.2.2 Displayed state of running parameters

After the VFD receives valid running commands, the VFD will enter into the running state and the keypad will display the running parameters. RUN/TUNE LED on the keypad is on, while the FWD/REV is determined by the current running direction which is as shown in figure 4-2. In the running state, there are 6 parameters that can be displayed. They are: running frequency, set frequency, bus voltage, output voltage, output current, and rotating speed. SHIFT can shift the parameters from left to right. QUICK/JOG (P07.02=2) can shift the parameters from right to left.

4.2.3 Displayed state of faults

If the VFD detects the fault signal, it will enter into the fault pre-alarm displaying state. The keypad will display the fault code by flicking. The TRIP LED on the keypad is on, and the fault reset can be operated by the STOP/RST on the keypad, control terminals or communication commands.

4.2.4 Displayed state of function codes editing

In the state of stopping, running or fault, press PRG/ESC to enter into the editing state (if there is a password, see P07.00). The editing state is displayed on two classes of menu, and the order is: function code group/function code number → function code parameter, press DATA/ENT into the displayed state of function parameter. On this state, press DATA/ENT to save the parameters or press PRG/ESC to escape.



Figure 4-3 Displayed state

4.3 Keypad operation

Operate the VFD via operation panel. See the detailed structure description of function codes in the brief diagram of function codes.

4.3.1 How to modify the function codes of the VFD

The VFD has three levels menu, which are:

- 1. Group number of function code (first-level menu)
- 2. Tab of function code (second-level menu)
- 3. Set value of function code (third-level menu)

Remarks: Press both the PRG/ESC and the DATA/ENT can return to the second-level menu from the third-level menu. The difference is: pressing DATA/ENT will save the set parameters into the control panel, and then return to the second-level menu with shifting to the next function code automatically; while pressing PRG/ESC will directly return to the second-level menu without saving the parameters, and keep staying at the current function code.

Under the third-level menu, if the parameter has no flickering bit, it means the function code cannot be modified. The possible reasons could be:

- This function code is not modifiable parameter, such as actual detected parameter, operation records and so on;
- 2) This function code is not modifiable in running state, but modifiable in stop state.

Example: Set function code P00.01 from 0 to 1.

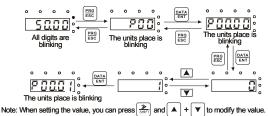


Figure 4-4 Sketch map of modifying parameters

4.3.2 How to set the password of the VFD

110-PV series VFDs provide password protection function to users. Set P07.00 to gain the password and the password protection becomes valid instantly after quitting 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, the operators cannot enter it.

Set P07.00 to 0 to cancel password protection function.

The password protection becomes effective instantly 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, the operators cannot enter it.

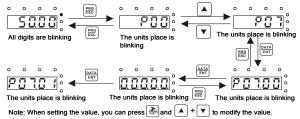


Figure 4-5 Sketch map of password setting

4.3.3 How to watch the VFD state through function codes

110-PV series VFDs provide group P17 as the state inspection group. Users can enter into P17 directly to watch the state.

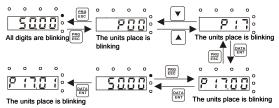


Figure 4-6 Sketch map of state watching

5 Commissioning guidelines



- 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 automatically runs once power on. If parameters need to be set, follow the guidelines in this chapter.

5.1 Inspection before operation

Before powering on the VFD, ensure that:

- a) The VFD is grounded reliably.
- b) The wiring is correct and reliable.
- c) The AC/DC breaker is selected correctly.
- d) The PV input voltage is in the allowed range of the VFD.
- e) The type, voltage, and power of the motor match those of the VFD.

5.2 Trial run

Close the DC breaker. The VFD automatically runs with a delay of 10 seconds. Check the water yield of the pump. If the water yield is normal, the trial run is successful. If the water yield is under the normal value, exchange any two motor cables, connect the cables, and perform trial run again.

5.3 Parameter settings

The VFD automatically runs by default once being powered on. If you want to set parameters, press QUICK/JOG within 10 seconds since the VFD power-on to switch to the keypad control mode (LOCAL/REMOT) is off) and then set parameters. If the running indicator is already on after the VFD is powered on, press STOP/RST to enter the parameter setting mode. After parameter setting, turn off and then turn on the power switch. The VFD runs again.

5.4 Advanced settings

Note: The default settings of the VFD for the water pump can apply to most conditions and the advanced settings are not required in most cases.

5.4.1 PI adjustment to the water yield

If the user requires large or low water yield, it is necessary to adjust PI (P15.06–P15.10) properly. The bigger PI parameters, the stronger the effect is, but the frequency fluctuation of the motor is bigger. In reserve, the lower the water yield is, the more stable the motor frequency is.

5.4.2 Special settings for single phase motors

- a) When the single phase motor is in bad running performance, the user can adjust P04 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 high.
- b) When the light is normal and the system starts slowly, increase P15.28 initial voltage differential value appropriately.
- c) For single phase motors with two-phase control (capacitor-removing):
- ① The maximum 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 maximum 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.
- 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 parameters

- "O": means the set value of the parameter can be modified on stop and running state;
- "©": means the set value of the parameter cannot be modified on the running state;
- "• ": means the value of the parameter is the real detection value which cannot be modified;

Note: The VFD implements auto checking and restriction on the parameter modification property. This prevents users from modifying parameters by misoperation.

6.1 Common function parameters for solar pumping control

Function code	Name	Detailed illustration of parameters	Default	Modify
P00 Group	Basic function gr	oup		
P00.00	Speed control mode	0: SVC 0 No need to install encoders. Suitable in applications which need low frequency, big torque for high accuracy of rotating speed and torque control. Relative to mode 1, it is more suitable for the applications which need small power. 1: SVC 1 1 is suitable in high performance cases with the advantage of high accuracy of rotating speed and torque. It does not need to install pulse encoder. 2: SVPWM control 2 is suitable in applications which do not need high control accuracy, such as the load of fan and pump, and suitable when one VFD drives multiple motors. Note: In vector control, the VFD must autotune motor parameters first.	2	©
P00.01	Run command channel	Select the run command channel of the VFD. The control command of the VFD	1	0

Function code	Name	Detailed illustration of parameters	Default	Modify
		includes: start, stop, forward/reverse		
		rotating, jogging and fault reset.		
		0: Keypad running command channel		
		("LOCAL/REMOT" light off)		
		Carry out the command control by RUN,		
		STOP/RST on the keypad. Set the		
		multi-function key QUICK/JOG to		
		FWD/REV shifting function (P07.02=3) to		
		change the running direction; press RUN		
		and STOP/RST simultaneously in running		
		state to make the VFD coast to stop.		
		1: Terminal running command channel		
		("LOCAL/REMOT" flickering)		
		Carry out the running command control by		
		the forward rotation, reverse rotation and		
		forward jogging and reverse jogging of the		
		multi-function terminals.		
		2: Communication running command		
		channel ("LOCAL/REMOT" on);		
		The running command is controlled by the		
		upper monitor via communication.		
		This parameter is used to set the		
		maximum output frequency of the VFD.		
	Max. output	Users need to pay attention to this		
P00.03	frequency	parameter because it is the foundation of	50.00Hz	0
	irequericy	the frequency setting and the speed of		
		acceleration and deceleration.		
		Setting range: P00.04–400.00Hz		

Function code	Name	Detailed illustration of parameters	Default	Modify
P00.04	Upper limit of the 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. Setting range: P00.05–P00.03 (Max. output frequency)		0
P00.05	Lower limit of the 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 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 the running frequency)	0.00Hz	0
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	Depend on mode	0
P00.12	DEC time 1	VFD speeds down from the Max. output frequency to 0Hz (P00.03). GD100-PV series VFDs have 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	0
P00.13	Running direction	0: Runs at the default direction. The VFD	0	0

Function code	Name	Detailed illustration of parameters	Default	Modify
	selection	runs in the forward direction. FWD/REV		
		indicator is off.		
		1: Runs at the opposite direction. The		
		VFD runs in the reverse direction.		
		FWD/REV indicator is on.		
		Modify the function code 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 function parameter comes back		
		to the default value, the motor's running		
		direction will come back to the factory		
		default state, too.		
		In pump application scenarios, the VFD		
		cannot run in the reverse direction. This		
		function code cannot be modified.		
		2: Forbid to run in reverse direction: It can		
		be used in some special cases if the		
		reverse running is disabled.		
		0: No operation		
	Motor parameter	1: Rotation autotuning		
P00.15	autotuning	Comprehensive motor parameter	0	0
		autotune.		
		It is recommended to use rotation		

Function code	Name	Detailed illustration of parameters	Default	Modify
		autotuning when high control accuracy is		
		needed.		
		2: Static autotuning		
		It is suitable in the cases when the motor		
		cannot de-couple form the load. The		
		autotuning for the motor parameter will		
		impact the control accuracy.		
		3: Static autotuning 2 (No autotuning for		
		non-load current and mutual inductance)		
		0: No operation		
		1: Restore the default value		
	Function	2: Clear fault records		
		Note:		
P00.18		The function code will restore to 0 after	0	0
1 00.10	restore parameter	finishing the operation of the selected		•
		function code.		
		Restoring to the default value will cancel		
		the user password. Use this function with		
		caution.		
P01 Group	Start-up and stop	control		
		0: Decelerate to stop. After the stop		
		command becomes valid, the VFD		
		decelerates to reduce the output		
P01.08	Stop mode	frequency during the set time. When the	0	0
		frequency decreases to 0Hz, the VFD		
		stops.		
		1: Coast to stop. After the stop command		
		becomes valid, the VFD ceases the output		

Function code	Name	Detailed illusti	ration of parameters	Default	Modify
		immediately. And	the load coasts to stop		
		at the mechanical	inertia.		
		0: The terminal	running command is		
P01.18	Operation	invalid when power	ering on.	1	0
1 01.10	protection	1: The terminal ru	unning command is valid)
		when powering or	n.		
P01.21	Restart after	0: Disabled		1	0
101.21	power off	1: Enabled		ļ	0
P02 Group	Motor 1 paramete	ers			
P02.00	Motor type	0: Asynchronous	motor	0	0
P02.00	Motor type	1: Reserved		U	0
	Rated power of		Set the parameter of	Depend	
P02.01	asynchronous	0.1–3000.0kW	the asynchronous	on model	0
	motor		motor.		
	Rated frequency		In order to ensure the		
P02.02	of asynchronous	0.01Hz-P00.03	controlling	50.00	0
	motor		performance, set the	Hz	
	Rated rotating		P02.01–P02.05		
	speed of		according to the name	Donond	
P02.03	asynchronous	1–36000rpm	plate of the asynchronous motor.	on model	0
	motor		GD100-PV series		
	Rated voltage of		VFDs provide the		
P02.04	asynchronous	0–1200V	function of parameter	Denend	0
	motor		autotuning. Correct		
	Rated current of		parameter autotuning		
P02.05	asynchronous	0.8–6000.0A	comes from the correct	Depend	0
	motor	212 2000.071	setting of the motor	on model	

Function code	Name	Detailed illustr	ration of parameters	Default	Modify
code			name plate. In order to ensure the controlling performance, please configure the motor according to the standard principles, if the gap between the motor and the standard one is huge, the features of the VFD will decrease. Note: Resetting the rated power (P02.01) of the motor can initialize the motor parameters P02.02—		
P02.06	Stator resistor of asynchronous motor	0.001–65.535Ω	P02.10. After the motor parameter autotuning finishes, the set values	Depend on model	0
P02.07	Rotor resistor of asynchronous motor	0.001–65.535Ω	of P02.06-P02.10 will be updated automatically. These	Depend on model	0
P02.08	Leakage inductance of asynchronous motor	0.1–6553.5mH	parameters are basic parameters controlled by vectors which directly impact the	Depend on model	0

Function	Name	Detailed illustr		Default	Madif.
code	Name	Detailed illusti	ration of parameters	Default	Modify
P02.09	Mutual inductance of asynchronous motor	0.1–6553.5mH	features. Note: Users cannot modify the parameters	on model	0
P02.10	Non-load current of asynchronous motor	0.1–6553.5A	freely.	Depend on model	0
P04 Group	SVPWM control				
P04.00	V/F curve setting	of GD100-PV ser need of different I 0: Straight line V/constant torque Ic 1: Multi-dots V/F c 2: Torque-stepdo (1.3 order) 3: Torque-stepdo (1.7 order) 4: Torque-stepdo (2.0 order) Curves 2–4 apply as fans and wa adjust according loads to get the b 5: Customized V/mode, V can be can be adjusted given channel s	F curve; applying to the bad curve own characteristic curve own characteristic curve own characteristic curve own characteristic curve to the torque loads such that the features of the	4	©

Function code	Name	Detailed illustration of parameters	Default	Modify
		change the feature of the curve.		
		Note: V_b in the below picture is the motor		
		rated voltage and $f_{\mbox{\scriptsize b}}$ is the motor rated		
		frequency.		
		Colored Virgine Linear type Linear type Transmission (17 min) Transmission (17 min) Transmission (17 min) Transmission (17 min) Transmission (18 min) Tr		
P04.01	Torque boost	Torque boost to the output voltage for the	0.0%	0
P04.02	Torque boost close	features of low frequency torque. P04.01 is for the Max. output voltage Vb. P04.02 defines the percentage of closing frequency of manual torque to fb. Torque boost should be selected according to the load. The bigger the load is, the bigger the torque is. Too big torque boost is inappropriate because the motor will run with over magnetic, and the current of the VFD will increase to add the temperature of the VFD and decrease the efficiency. When the torque boost is set to 0.0%, the VFD is automatic torque boost. Torque boost threshold: below this frequency point, the torque boost is valid, but over this frequency point, the torque boost is invalid.	20.0%	0

Function code	Name	Detailed illustration of parameters	Default	Modify
		Output voltage Vector of February 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	0.00Hz	0
P04.04	V/F voltage point 1 of motor 1	low-frequency voltage is high, overtemperature and burning may occur and the overcurrent stall and protection	00.0%	0
P04.05	V/F frequency point 2 of motor 1	may occur to the VFD. 100.0% V _b	00.00 Hz	0
P04.06	V/F voltage point 2 of motor 1	V1	00.0%	0
P04.07	V/F frequency point 3 of motor 1	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%	00.00 Hz	0
P04.08	V/F voltage point 3 of motor 1	(rated voltage of motor1) Setting range of P04.07: P04.05–P02.02	00.0%	0

Function code	Name	Detailed illustration of parameters	Default	Modify
		(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)		
		This function code is used to compensate		0
		the change of the rotation speed caused		
		by load during compensation SVPWM		
		control to improve the rigidity of the motor.		
		It can be set to the rated slip frequency of		
		the motor which is counted as below:		
D04.00	V/F slip	∆ f=f _b -n*p/60		
P04.09	compensation gain	Of which, fb is the rated frequency of the		
		motor, its function code is P02.01; n is the		
		rated rotating speed of the motor and its		
		function code is P02.02; p is the pole pair		
		of the motor. 100.0% corresponds to the		
		rated slip frequency∆ f.		
		Setting range: 0.0–200.0%		
	Two phase control selection of single-phase motor	Ones: Reserved	0x00	0
P04.34		Tens: Voltage of the secondary winding (V		
		phase) reverse		
		0: Not reversed; 1: Reversed		
		Setting range: 0-0x11		
P04.35	Voltage ratio of V	0.00–2.00	1 40	0
	and U	0.00-2.00		Ŭ
P05 Group	Input terminals			
P05.00	HDI input type	0: High-speed pulse input. See P05.49-P05.54.	1	0

Function code	Name	Detailed illustration of parameters	Default	Modify
		1: HDI switch input		
P05.01	S1 terminals function selection	0: No function	42	0
		1: Forward rotation operation		
D0# 00	S2 terminals function selection	2: Reverse rotation operation	43	0
P05.02		3: 3-wire control operation		
	S3 terminals	4: Forward jogging	44	
P05.03		5: Reverse jogging		0
	function selection	6: Coast to stop		
505.04	S4 terminals	7: Fault reset		0
P05.04	function selection	8: Operation pause	45	
	S5 terminals function selection	9: External fault input	1	
P05.05		10: Increasing frequency setting (UP)		
		11: Decreasing frequency setting (DOWN)		
	HDI terminals function selection	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		
P05.09		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		

Function code	Name	Detailed illustration of parameters	Default	Modify
		25: PID control pause		
		26: Traverse pause (stop at the current		
		frequency)		
		27: Traverse reset (return to the center		
		frequency)		
		28: Counter reset		
		29: Torque control prohibition		
		30: ACC/DEC prohibition		
		31: Counter trigger		
		32: Reserved		
		33: Cancel the frequency change setting		
		34: DC brake		
		35: Reserved		
		36: Shift the command to the keypad		
		37: Shift the command to terminals		
		38: Shift the command to communication		
		39: Pre-magnetized command		
		40: Clear the power		
		41: Keep the power		
		42: Forced switch to power frequency		
		input (Switching-on indicates switching to		
		power frequency input; switching-off		
		indicates the input mode is controlled by		
		the keypad.)		
		43: Full water signal		
		44: Non-water signal		
		45: Two-phase control mode of the		
		single-phase motor		

Function code	Name	Detai	led illus	tration o	of param	eters	Default	Modify
		46: PV \	oltage d	igital inp	ut when	no boost		
		module	is app	lied (in	auto	switching		
		mode)						
		47–63: I	Reserve	t				
	Polarity selection	0x000-0)x10F					
P05.10	of the input	BIT8	BIT3	BIT2	BIT1	BIT0	0x000	0
	terminals	HDI	S4	S3	S2	S1		
P06 Group	Output terminal	s					T.	
		0: Invali	d					
P06.03	Relay RO1 output selection	1: In ope	eration				30	0
	Selection	2: Forwa	ard rotati	on opera	ition			
		3: Reve	rse rotati	on opera	ation			
		4: Joggi	ng opera	ition				
		5: VFD 1	fault					
		6: Frequ	ency de	gree test	FDT1			
		7: Frequ	ency de	gree test	FDT2			
		8: Frequ	iency arr	ival				
		9: Zero	speed ru	nning				
			er limit fr	equency	arrival			
P06.04	Relay RO2 output selection	11: Low	er limit fr	equency	arrival		5	0
	selection	12: Rea	dy for op	eration				
		13: Pre-	magnetiz	zing				
		14: Ove	rload ala	rm				
		15: Und	erload al	arm				
		16: Com	pletion o	of simple	PLC sta	ige		
		17: Com	pletion o	of simple	PLC cy	cle		
		18: Sett	ing coun	t value a	rrival			
		19: Defi	ned cour	nt value a	arrival			

Function code	Name	Detailed illustration of parameters	Default	Modify
		20: External fault valid		
		21: Reserved		
		22: Running time arrival		
		23: Modbus communication virtual		
		terminals output		
		24–26: Reserved		
		27: Weak light		
		28 - 29: Reserved		
		30: Shift to PV mode (If the system works		
		in PV mode, relay output is high.)		
		The function code is used to set the pole		
		of the output terminal.		
		When the current bit is set to 0, output		
	Polarity selection	terminal is positive.		
P06.05	of output	When the current bit is set to 1, output	0	0
	terminals	terminal is negative.		
		BIT1 BIT0		
		RO2 RO1		
		Setting range: 0–F		
P06.10	Switch on delay of RO1	0.000–50.000s	10.000s	0
P06.11	Switch off delay of RO1	0.000–50.000s	10.000s	0
P06.12	Switch on delay of RO2	0.000–50.000s	0.000s	0
P06.13	Switch off delay of RO2	0.000–50.000s	0.000s	0

P07 Group Human-Machine Interface 0: No function 1: Jogging running. Press QUICK/JOG to begin the jogging running.					
Jogging running. Press QUICK/JOG to begin the jogging running.					
2: Shift the display state by the shifting key. Press QUICK/JOG to shift the displayed function code from right to left. 3: Shift 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: Shift the running commands source. Press QUICK/JOG to shift the running commands source. 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	•				

Function code	Name	Detailed illustration of parameters	Default	Modify
P07.03	QUICK/JOG the shifting sequence of running command	When P07.02=6, set the shifting sequence of running command channels. 0: Keypad control→terminal control →communication control 1: Keypad control←→terminals control 2: Keypad control←→communication control 3: Terminals control←→communication control	1	0
P07.04	STOP/RST stop function	Select the stop function by STOP/RST. STOP/RST is effective in any state for the keypad reset. 0: Only valid for the keypad control 1: Both valid for keypad and terminals control 2: Both valid for keypad and communication control 3: Valid for all control modes	1	0
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°		•
P07.12	Inverter module temperature	-20.0–120.0°		•
P07.15	MSB of VFD	Display the power used by the VFD.		•

Function code	Name	Detailed illustration of parameters	Default	Modify
	power	VFD power consumption = P07.15*1000 +		
	consumption	P07.16		
	LSB of VFD	Setting range of P07.15: 0-65535 (*1000)		
P07.16	power	Setting range of P07.16: 0.0–999.9		•
	consumption	Unit: kWh		
P07.27	Current fault type	0: No fault		•
P07.28	Previous fault	1: Inverter unit U phase protection (OUt1)		
P07.20	type	2: Inverter unit V phase protection (OUt2)		•
P07.29	Previous 2 fault	3: Inverter unit W phase protection (OUt3)		
P07.29	type	4: ACC overcurrent (OC1)		•
P07.30	Previous 3 fault	5: DEC overcurrent (OC2)		
P07.30	type	6: Constant-speed overcurrent (OC3)		•
D07.21	Previous 4 fault	7: ACC overvoltage (OV1)		
P07.31	type	8: DEC overvoltage (OV2)		
P07.32	Previous 5 fault	9: Constant-speed overvoltage (OV3)		
P07.32	type	10: Bus undervoltage (UV)		
D07.57	Previous 6 fault	11: Motor overload (OL1)		
P07.57	type	12: VFD overload (OL2)		•
D07.50	Previous 7 fault	13: Input side phase loss (SPI)		
P07.58	type	14: Output side phase loss (SPO)		•
D07.50	Previous 8 fault	15: Overheat of the boost module (OH1)		
P07.59	type	16: Overheat fault of the inverter module		•
507.00	Previous 9 fault	(OH2)		
P07.60	type	17: External fault (EF)		•
D07.04	Previous 10 fault	18: 485 communication fault (CE)		
P07.61	type	19: Current detection fault (ItE)		•
	Previous 11 fault	20: Motor antotune fault (tE)		_
P07.62	type	21: EEPROM operation fault (EEP)		•

Function code	Name	Detailed illustration of parameters	Default	Modify
P07.63	Previous 12 fault	22: PID response offline fault (PIDE)		
P07.03	type	23: Braking unit fault (bCE)		
P07.64	Previous 13 fault	24: Running time arrival (END)		
F07.04	type	25: Electrical overload (OL3)		
D07.65	Previous 14 fault	26 - 31:Reserved		
P07.65	type	32: Grounding short circuit fault 1 (ETH1)		
D07.00	Previous 15 fault	33: Grounding short circuit fault 2 (ETH2)		
P07.66	type	34: Speed deviation fault (dEu)		•
	Previous 16 fault	35: Maladjustment (STo)		_
P07.67	type	36:Underload fault (LL)		•
	Previous 17 fault	37: Hydraulic probe damage (tSF)		_
P07.68	type	38: PV reverse connection fault (PINV)		•
	Previous 18 fault	39: PV overcurrent (PVOC)		
P07.69	type	40: PV overvoltage (PVOV)		•
	Previous 19 fault	41: PV undervoltage (PVLV)		
P07.70	type	42: Fault on communication with the boost		•
	•	module (E-422)		
		43: Bus overvoltage detected on the boost		
		module (OV)		
		Note: Faults 38 - 40 can be detected in		
		boost. The boost module stops working		
D07.74	Previous 20 fault	once after detecting a fault. The boost		_
P07.71	type	module sends back the fault information to		•
		the inverter module in the next data send		
		back.		
		Alarms:		
		Weak light alarm (A-LS)		
		Underload alarm (A-LL)		

Function code	Name	Detailed illustration of parameters	Default	Modify
		Full water alarm (A-tF)		
		Water-empty alarm (A-tL)		
P08 Group Enhanced functions				
P08.28	Times of fault reset	0–10	5	0
P08.29	Interval time of automatic fault reset	0.1–3600.0s	10.0s	0

6.2 Parameters of special functions

Function code	Name	Detailed illustration of parameters	Default	Modify
P11 Group	Protective parame	eters		
P11.00	Phase loss protection	0x000–0x011 LED ones: 0: Input phase loss software protection disabled 1: Input phase loss software protection enabled LED tens: 0: Output phase loss software protection disabled 1: Output phase loss software protection disabled 1: Output phase loss software protection enabled LED hundreds: Reserved 000–111	Depend on model	0
P11.01	Frequency decrease at	0: Disable 1: Enable	0	0

Function code	Name	Detailed illustration of parameters	Default	Modify
	sudden power			
	loss			
		Setting range: 0.00Hz–P00.03/s		
		After the power loss of the grid, the bus		
		voltage drops to the sudden frequency		
		decrease point, the VFD begin to		
		decrease the running frequency at		
	Frequency	P11.02, to make the VFD generate		
P11.02	decrease ratio at	power again. The returning power can	0.00Hz/s	0
	sudden power loss	maintain the bus voltage to ensure a		
		rated running of the VFD until the		
		recovery of power.		
		Voltage degree 220V 400V		
		Frequency decrease 260V 460V		
P15 Group	Special functions	for PV inverters		
		0: Invalid		
		1: Enable		
D45.00	PV inverter	0 means the function is invalid and the		
P15.00	selection	group of parameters cannot be used	1	0
		1 means the function is enabled, and		
		P15 parameters can be adjusted		
		0: Voltage reference		
		1: Max. power tracking		
P15.01	Vmpp voltage	0 means to apply voltage reference	1	0
P 15.01	reference	mode. The reference is a fixed value		0
		and given by P15.02.		
		1 means to apply the reference voltage		

Function code	Name	Detailed illustration of parameters	Default	Modify
		of Max. power tracking. The voltage is		
		changing until the system is stable.		
		Note: If terminal 43 is valid, the function		
		is invalid.		
		0.0-6553.5 V DC		
		If P15.01 is 0, the reference voltage is		
	Vmpp voltage	given by P15.02. (During test, reference		
P15.02	keypad reference	voltage should be lower than PV input	250.0V	0
		voltage; otherwise, the system will run		
		at lower limit of frequency).		
		0.0-100.0% (100.0% corresponds to		
		P15.02)		
		If the ratio percentage of real voltage to		
		reference voltage, which is abs(bus		
		voltage-reference voltage)*100.0%/		
P15.03	PI control deviation	reference voltage, exceeds the	0.0%	0
		deviation limit of P15.03, PI adjustment		
		is available; otherwise, there is no PI		
		adjustment and the value is defaulted to		
		be 0.0%.		
		abs: absolute value		
		P15.05-100.0% (100.0% corresponds		
		to P00.03)		
P15 04		P15.04 is used to limit the Max. value of		
	Upper frequency	target frequency, and 100.0%	100.0%	0
	of PI output	corresponds to P00.03.		_
		After PI adjustment, the target		
		frequency cannot exceed the upper		
		limit.		

Function code	Name	Detailed illustration of parameters	Default	Modify
P15.05	Lower frequency of PI output	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%	0
P15.06	KP1	0.00–100.00 Proportion coefficient 1 of the target frequency The bigger the value is, the stronger the effect and faster the adjustment is.	5.00	0
P15.07	KI1	0.00–100.00 Integral coefficient 1 of the target frequency The bigger the value is, the stronger the effect and faster the adjustment is.	5.00	0
P15.08	KP2	0.00–100.00 Proportion coefficient 2 of the target frequency The bigger the value is, the stronger the effect and faster the adjustment is.	35.00	0
P15.09	KI2	0.00–100.00 Integral coefficient 2 of the target frequency The bigger the value is, the stronger the effect and faster the adjustment is.	35.00	0

Function code	Name	Detailed illustration of parameters	Default	Modify
P15.10	PI switching point	0.0–6553.5Vdc If the absolute value of bus voltage minus the reference value is bigger than P15.10, it will switch to P15.08 and P15.09; otherwise it is P15.06 and P15.07.	20.0V	0
P15.11	Water level control	0: Digital input of the water-level control 1: Al1(the water-level signal is input through Al1, not supported currently) 2: Al2 (the water-level signal is input through Al2, not supported currently) 3: Al3 (the water-level signal is input through Al3, 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	0	

Function code	Name	Detailed illustration of parameters	Default	Modify
		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.		
		0.0–100.0%		
		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 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		
	Full-water level	threshold, the time will be cleared		
P15.12	threshold	automatically. When the measured	25.0%	0
	unconord	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		

Function code	Name	Detailed illustration of parameters	Default	Modify
		timing will clear automatically.		
		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		
	Empty-water level	automatically cleared. When the		
P15.13	threshold	detected water level control analog	75.0%	0
		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.		
		0–10000s		
P15.14	Full water delay	Time setting of full water delay (This	5s	0
		function code is still valid when the		_
		digital indicates the full-water signal.)		

Function code	Name	Detailed illustration of parameters	Default	Modify
P15.15	Wake-up delay in full water state	0–10000s Time setting of wake-up delay in full-water state (This function code is still valid when the digital indicates the full-water signal.)	20s	0
P15.16	Empty-water delay	0–10000s Time setting of empty-water delay (This function code is still valid when the digital indicates the empty-water signal.)	5s	0
P15.17	Wake-up delay in empty-water state	0–10000s Time setting of wake-up delay in empty-water state (This function code is still valid when the digital indicates the empty-water signal.)	20s	0
P15.18	Hydraulic probe damage	0.0–100.0% 0.0%: Invalid. If it is not 0.0%, when the signal is longer than P15.18, it will report tSF fault directly and stop.	0.0%	0
P15.19	Operation time of water pump underload	0.0–1000.0s This parameter is used to set the operation time of water pump underload. Under the continuous underload operation, underload prealarm (A-LL) will be reported if the operation time is reached.	60.0s	0
P15.20	Current detection value of underload operation	0.0%: Automatic underload detection 0.1–100.0% If it is 0.0%, it is determined by the	00.00%	0

Function code	Name	Detailed illustration of parameters	Default	Modify
		underload detection of the pumping		
		VFD.		
		If it is not 0.0%, it is determined by		
		P15.20. 100.0% corresponds to the		
		rated current of the motor.		
		If the target frequency and the absolute		
		value of the ramp frequency is less than		
		or equal to P15.22, and the current is		
		less than P15.20, after the time set by		
		P15.19, underload fault is reported.		
		Otherwise, it will be operated normally.		
		If the state is not continuous, the delay		
		counting will be cleared automatically.		
		0.0-1000.0s		
		This parameter is used to set the		
		underload reset delay.		
		The operation time and reset time are		
		counted at the same time during		
	Underload reset	underload, and it is generally bigger		
P15.21	delay	than P15.19 so as to ensure underload	120.0s	0
	uoluy	prealarm is reported after underload		
		delay operation time is reached. After		
		the time set by P15.21-P15.19, it is		
		reset. If the value is the same as		
		P15.19, it is automatically reset when		
		underload prealarm is reported.		
P15.22	Lag frequency	0.00–200.00Hz	0.30Hz	0
1 13.22	threshold	P15.22 is the lag frequency threshold)

Function code	Name	Detailed illustration of parameters	Default	Modify
		for the analysis of underload operation.		
		If the target frequency and the absolute		
		value of the ramp frequency is less than		
		or equal to P15.22, the current will be		
		compared.		
		0.0-3600.0s		
		Delay time of weak light		
		If the output frequency is less than or		
		equal to the lower limit of PI output		
		frequency and the state lasts for the set		
	Delay time of weak	value, it will report A-LS and sleep. If the		
		state is not continuous, the delay		
P15.23	light	counting will be cleared automatically.	100.0s	0
	ligit	Note: If the bus voltage is lower than		
		the undervoltage point or the PV voltage		
		is lower than 70V, it will report the weak		
		light alarm without any delay time.		
		If P15.32=0, the system will switch to		
		the power frequency input when the		
		light is weak.		
		0.0–3600.0s		
		Delay time of wake-up at weak light		
	Delevitime	If the weak light alarm is reported, after		
P15.24	Delay time of wake-up at weak	the delay time of wake-up, the alarm will	300.0s	0
	light	be cleared and it will run again.	300.08	
	ngin	When P15.32=0, if the PV voltage is		
		higher than P15.34, after the delay time,		
		it will switch to PV input mode.		

Function code	Name	Detailed ill	ustration of p	parameters	Default	Modify
P15.25	Initial reference voltage display	0.0–2000.0\	1		0	•
P15.26	Min. voltage reference during max. power tracking	minimum v maximum preference du Solar cell p P15.26. Sol voltage = P1 Track the monormoof Min. v P15.27 mu voltage re difference, the maximum verange. P15	n code is use voltage refer ower tracking. uring max. pov anel open-circlar cell pane 5.25+ P15.28 aximum power oltage reference. The ference are ference. The ference ference oltage needs 1.26 and P15 cording to site.	ence during Min. voltage ver tracking = cuit voltage I open-circuit r in the range ence—P15.27 er than Min. e less the acking is. The to be in the 5.27 can be	0.70	0
P15.27	Max. voltage reference during max. power tracking	power tracki Valid in MP the tracked r	PT Max. trac	king voltage		0

Function code	Name	Detailed illustration of parameters	Default	Modify
P15.28	Adjustment of initial reference voltage	0.0–200.0V MPPT begins to change from the reference voltage Initial reference voltage =PV voltage-P15.28	5.0V	0
P15.29	Adjustment of upper and lower limit time of Vmppt	0.0–10.0s When P15.29 is set to 0.0, the automatic adjustment is invalid. If it is not 0.0, the upper and lower limits of Vmppt will be adjusted automatically at the inveral set by P15.29. The medium value is the current PV voltage and the limit is P15.30: Maximum/Minimum reference voltage=Current PV voltge±P15.30 and it will update to P15.26 and P15.27 at the same time.	1.0s	0
P15.30	Adjustment of upper and lower limits of Vmppt	5.0–100.0V Adjustment of the upper and lower limits	30.0V	0
P15.31	Max. value of Vmppt	P15.27–6553.5V During the maximum power tracking, the upper limit of the solar cell panel reference voltage will not exceed the value set by 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	0

Function code	Name	Detailed illustration of parameters	Default	Modify
P15.32	PV input and power frequency input selection	0: Automatic shift 1: Power frequency input 2: PV input If the value is 0, the system will switch between PV input and power frequency input according to the detected PV voltage and threshold; If the value is 1, the system will force to switch to power frequency input; If the value is 2, the system will force to switch to PV input. Note: When the terminal input 42 is	2	•
P15.33	Threshold to switch to power frequency input	valid, the function code will be invalid. 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 the boost module, the switching point voltage is determined by the external voltage detection circuit. For VFDs with the boost module, the switching point voltage is 70V.	70.0V	0
P15.34	Threshold to switch to PV input	P15.33–400.0V If PV voltage is greater than the threshold, it can switch to PV input through the relay output after the time	100.0V	0

Function code	Name	Detailed illustration of parameters	Default	Modify
		set by P15.24. To prevent frequent		
		switching, this threshold must be		
		greater than P15.33.		
		If the value is 0.0, it is invalid.		
		The default value depends on model.		
		The pump flow is $\mathcal{Q}_{\mathcal{N}}$ if the pump		
P15.35	Rated pump flow	runs at the rated pump frequency and	0.0	0
		rated lift. Unit: cubic meter/hour.		
		The pump lift is $H_{\scriptscriptstyle N}$ if the pump runs		
P15.36	Rated pump lift	at the rated frequency and rated	0.0	0
		current. Unit: meter		
		When the PV voltage is less than the		
		preset voltage, the system reports the		
		PV undervoltage (UV) fault.		
		The default value depends on the		
		model.		
D45.05	Voltage setting at	Model PV UV point	70.0	
P15.37	PV undervoltage	-SS2 140V	70.0	0
	point	-S2 140V		
		-2 140V		
		-4 240V		
		Any model with the boost module 70V		
		Setting range: 0.0–400.0		
		This function code is provided for users		
P15.39	Model	to change models. For example, if the	0	0
		user wants to use model -4 (default after		

Function code	Name	Detailed illustration of parameters	Default	Modify
		factory delivery) as model -2, P15.39		
		must be set to 2.		
		0: -SS2 220V; single-phase input;		
		single-phase output		
		1: -S2 220V; single-phase input;		
		three-phase output		
		2: -2 220V; three-phase input;		
		three-phase output		
		3: -4 380V; three-phase input;		
		three-phase output		
		Setting range: 0-3		
P17 Group	State viewing			
		It is the current of the main winding		
P17.38	Current of the	when applying capacitance-removing to	0.0A	
F17.30	main winding	control the single phase motor.	0.0A	
		0.00-100.00A		
		It is the current of the secondary		
	Current of the	winding when applying		
P17.39	secondary winding	capacitance-removing to control the	0.0A	•
	secondary winding	single phase motor.		
		0.00-100.00A		
P18 Group	State viewing sp	ecial for solar inverters		
	5)/ (MPPT is implemented at the inverter		
P18.00	PV reference	side. This value is determined at the		•
	voltage	inverter side.		
D40.04	Current PV	It is transferred from the boost module		
P18.01	voltage	or equal to the bus voltage.		
P18.02	Display of MPPT	The value displays the minimum voltage		•

Function code	Name	Detailed illustration of parameters	Default	Modify
	min. reference voltage	reference during maximum power		
	voltage	tracking. It equals the solar cell panel		
		open-circuit voltage multiplied P15.26.		
	Current inductive	It is transferred from the boost module.		
P18.04	current	This function code is valid only in AC		•
	Current	mode and invalid in PV mode.		
P18.07	PV input power	Reserved. Unit: kW		•
P18.08	Previous PV input power	Reserved		•
P18.09	Previous PV voltage	Reserved		•
		0x00-0x11		
		Ones on LED		
		0: PV power supply		
	Device	1: AC grid power supply		
P18.10	configuration	Tens on LED		•
	display	0: Detection indicates the system		
		contains the boost module.		
		1: Detection indicates the system does		
		not contain the boost module.		
P18.11	Current pump flow	Unit: cubic meter/hour	0.0	•
P18.12	Current pump lift	Unit: meter	0.0	•
	MSBs in total	This function code displays the 16 most		
P18.13	pump flow	significant bits (MSBs) in the total pump	0	•
	e e e	flow. Unit: cubic meter		
		This function code displays the 16 least		
P18.14	LSBs in total pump	significant bits (LSBs) in the total pump	0.0	•
	now	flow. Unit: cubic meter. Total pump flow = P18.13*65535 + P18.14		
	l	-1 10.10 00000 11 10.14		

Function	Name	Detailed illustration of parameters	Default	Modify
code				,
		Setting this value to 1 can reset the total		
	Total pump flow	pump flow. P18.13 and P18.14 will		
P18.15	resetting	accumulate the flow after resetting.	0	0
		After the resetting succeeds, P18.15 is		
		automatically set to 0.		
P19 Group	Voltage boost (in	verter module communicates with boo	st modul	е
through 485)	1		1	1
P19.00	Boost voltage loop KP	0.000-65.535	0.500	0
P19.01	Boost voltage loop KI	0.000–65.535	0.080	0
P19.02	Boost current loop KP	0.000–65.535	0.010	0
P19.03	Boost current loop KI	0.000–65.535	0.010	0
P19.04	Upper limit of the output current of boost voltage loop	Upper limit output of mppt voltage loop PI, upper limit of the boost current loop reference current P19.05–15.0A		0
P19.06	Bus reference voltage	This function code is set to the bus reference voltage at PV input when the system contains the boost module. By default, this function code is set to 350V for models of 220V and 570V for models of 380V. 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	0.500	0

Function code	Name	Detailed illustration of parameters	Default	Modify
		voltage loop uses this group PI parameter. Otherwise, the boost voltage loop uses the first group PI parameter.		
		Setting range: 0.000–65.535		
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	0
P19.10	Boost software version	Once being powered, the boost module sends its version information to the inverter side.		•

Note:

- The time when the pump VFD operated to the lower limit of PI output frequency after VFD start-up 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 at the same time, the VFD will count the delay time for each fault independently. If the delay time of a fault is reached, the fault is reported. The delay time counting of the other two faults keeps. If the reported fault is resolved but 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:

- Check to ensure there is nothing wrong with the keypad. If not, please contact with the local
 office.
- 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	Solutions
OUt1	Inverter unit U phase protection	 The acceleration is too fast. This phase IGBT is damaged internally. 	Increase the acceleration
OUt2	Inverter unit V phase protection	3. Interference causes misoperation.	time. 2. Change the power unit.
OUt3	Inverter unit W phase protection	5. The load transients or is	Check whether the peripheral equipment has strong
OV1	ACC overvoltage		Check the input power. Check if the DEC time of the
OV2	DEC overvoltage		load is too short or the VFD
OV3	Constant-speed overvoltage	 The input voltage is abnormal. There is large energy feedback. No braking components. Braking energy is not open. 	components. 3. Install the braking
OC1	ACC overcurrent	The acceleration or deceleration is too fast.	Increase the ACC time. Check the input power.

Fault code	Fault type	Possible cause	Solutions
OC2	DEC overcurrent	2. The voltage of the grid is too low.	Select the VFD with a larger power.
ОСЗ	Constant-speed overcurrent	too low. 4. The load transients or is abnormal. 5. The grounding is short circuited or the output is phase loss. 6. There is strong external interference.	circuited) or the rotation is not smooth.
		protection is not open.	function codes.
UV	Bus undervoltage	supply is too low.	 Check the input power of the supply line. Check the setting of relative
		protection is not open.	function codes.
OL1	Motor overload	supply is too low. 2. The motor setting rated current is incorrect.	 Check the power of the supply line. Reset the rated current of the motor. Check the load and adjust the torque lift.
OL2	VFD overload	1. The acceleration is too fast. 2. The rotating motor is reset. 3. The voltage of the power supply is too low. 4. The load is too heavy. 5. The motor power is too small.	Increase the ACC time. Avoid the restarting after stopping. Check the power of the supply line. Select a VFD with bigger
SPI	Input phase loss	Phase loss or fluctuation of input R,S,T	2. Check installation distribution.
SPO	Output phase loss		Check the output distribution. Check the motor and cable.

Fault code	Fault type	Possible cause	Solutions
		phase of the load)	
OH1	Rectifier overheat	 Air duct jam or fan damage Ambient temperature is too 	1. Dredge the wind channel or
	Inverter module	high.	change the fan.
OH2	overheat	3. The time of overload	2. Decrease the environment
		running is too long.	temperature.
EF	External fault	SI external fault input terminals action	Check the external device input.
CE	Communication error	incorrect.	Set proper baud rate. Check the communication connection distribution Set proper communication address. Change or replace the connection distribution or improve the anti-interference capability.
ItE	Current detection fault	The connection of the control board is not good. Assistant power is bad Hall components is broken The magnifying circuit is abnormal.	Check the connector and repatch. Change the Hall. Change the main control panel.
tE	Autotuning fault	The motor capacity does not comply with the VFD capability. The rated parameter of the motor is not set correctly. The offset between the parameters from autotune and the standard parameter is huge Autotune overtime	Set the rated parameter according to the motor name
EEP	EEPROM fault	Error of controlling the write and read of the parameters	 Press STOP/RST to reset. Change the main control

Fault code	Fault type	Possible cause	Solutions
		2. Damage to EEPROM	panel.
PIDE	PID feedback fault	PID feedback is offline. The PID feedback source disappears.	Check the PID feedback signal Check the PID feedback source.
END	Time arrival of factory setting	The actual running time of the VFD is above the internal setting running time.	Ask for the supplier and adjust the setting running time.
OL3	Electrical overload	The VFD will report overload pre-alarm according to the set value.	Check the load and the overload pre-alarm point.
ETH1	Grounding short	The grounding of the VFD	
	circuit fault 1	output terminal is short	Check whether the motor wiring
ETH2	Grounding short circuit fault 2	circuited. The current detection circuit is faulty. The actual motor power sharply differs from the VFD power.	is proper. Change the Hall. Change the main control panel. Set motor parameters correctly.
dEu	Velocity deviation fault	The load is too heavy or stalled.	Check the load and ensure it is normal. Increase the detection time. Check whether the control parameters are normal.
STo	Maladjustment fault	The control parameters of the synchronous motors not set properly. The autotuning parameter is not correct. The VFD is not connected to the motor.	Check the load and ensure it is normal. Check whether the control parameter is set properly or not. Increase the maladjustment detection time.
LL	Electronic	The VFD will report the	Check the load and the
LL	underload fault	underload pre-alarm	underload pre-alarm point.

Fault code	Fault type	Possible cause	Solutions
		according to the set value.	
tSF	Hydraulic probe damage	Hydraulic probe damage	Change the damaged hydraulic probe.
PINV	PV reverse connection fault	Incorrect PV wiring	Change the wiring direction of the positive and negative terminals and connect the cables again.
PVOC	PV overcurrent	deceleration is too fast. 2. The VFD power is too low. 3. The load transients or is abnormal.	Increase the ACC or DCC time. Select the VFD with a larger power. Check if the load is short circuited (the grounding short circuited or the wire short circuited) 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 that are wired in series. Check and reset the model.
PVLV	PV undervoltage	The power of the solar cell panel series is too low or it is cloudy and rainy weather. The motor start-up current is too high.	Increase the number of solar cell panels or perform the test in the normal sun light. Change the motor.
E-422	Fault on communication with boost module 422	Improper contact with the communication cables	Check the four communication cables of 422 and ensure that they are connected properly.
OV	Bus overvoltage detected at the boost module side	The sun light changes suddenly.	Adjust the boost PI parameters. Enlarge the values of P19.07 and P19.08.
A-LS	Weak light alarm	The sun light is weak or the solar cell panel configuration	The equipment automatically runs when the light becomes

Fault code	Fault type	Possible cause	Solutions
		is insufficient.	strong. Check whether the solar cell panel configuration is proper.
A-LL	Underload alarm	The reservoir is empty.	Check the reservoir.
A-tF	Full-water alarm	The reservoir is full.	If the user has set the full-water alarm function, the equipment automatically stops when the full-water alarm time reaches the specified time. In this situation, the user does not need to perform any operation. Otherwise, check whether terminals are wired incorrectly.
A-tL	Empty-water alarm	The reservoir is empty.	If the user has set the empty-water alarm function, the equipment automatically stops when the empty-water alarm time reaches the specified time. In this situation, the user does not need to perform any operation. Otherwise, check whether terminals are wired incorrectly.

Appendix A Options and use

A.1 Boost module

The pumping 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.

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

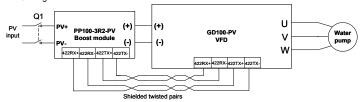


Figure A-1 Connection between the boost module and VFD

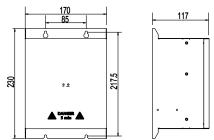
Boost module specifications

Model	PP100-3R2-PV
Input	
Max. input power (W)	3200
Max. DC voltage (V)	600
Start-up voltage (V)	80
Min. working voltage (V)	70
Max. input current (A)	12
Output	
Output voltage (V)	350/570 (automatically determined by the pumping VFD)

Inetri	uction	of I	I Ene

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 dimensions of the boost module.



A.2 GPRS module and monitoring APP

The pumping VFDs support the installation of the GPRS module to implement remote monitoring. The GPRS module connects to the VFDs through 485 communication. The VFD operation state can be monitored on the APP in the mobile phone or web page in real time. Method for connecting the GPRS to the VFD:

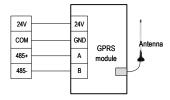


Figure A-2 Connecting the GPRS module to the VFD

For more information, see the GPRS/GPS adaptor operation guide matching the GPRS module or contact the local office. When consulting, provide the product models and serial numbers.

A.3 Cables

A.3.1 Power cables

Dimension the input power and motor cables according to local regulations.

Note: A separate PE conductor is required if the conductivity of the cable shield is not sufficient for the purpose.

A.3.2 Control cables

The relay cable needs the cable type with braided metallic screen.

Keypads need to be connected with network cables. The network cables must be shielded in complicated electromagnetic environments.

Communication cables must be shielded twisted pairs.

Note:

- Run analog and digital signals in separate cables.
- Check the insulation of the input power cable according to local regulations before connecting to the drive.

Recommended power cables for standard VFD models

Model	Recommended cable (mm²)	size	Terminal	Tightening torque
	(+)/(-), R/S/T, U/V/W	PE	screw	(Nm)
110-0R4G-S2-PV	1.5	1.5	M4	0.8
110-0R7G-S2-PV	1.5	1.5	M4	0.8
110-0R4G-SS2-PV	1.5	1.5	M4	0.8
110-0R7G-4-PV	1.5	1.5	M4	0.8
110-1R5G-4-PV	1.5	1.5	M4	0.8
110-2R2G-4-PV	1.5	1.5	M4	0.8
110-1R5G-S2-PV	2.5	2.5	M4	0.8
110-2R2G-S2-PV	2.5	2.5	M4	0.8
110-0R7G-SS2-PV	2.5	2.5	M4	0.8
110-1R5G-SS2-PV	2.5	2.5	M4	0.8
110-2R2G-SS2-PV	2.5	2.5	M4	0.8
110-004G-4-PV	2.5	2.5	M4	1.2–1.5
110-5R5G-4-PV	2.5	2.5	M4	1.2–1.5
110-1R5G-2-PV	2.5	2.5	M4	1.2–1.5

Model	Recommended cable (mm²)	size	Terminal	Tightening torque	
	(+)/(-), R/S/T, U/V/W	PE	screw	(Nm)	
110-2R2G-2-PV	2.5	2.5	M4	1.2–1.5	
110-7R5G-4-PV	4	4	M5	2–2.5	
110-004G-2-PV	4	4	M5	2–2.5	
110-011G-4-PV	6	6	M5	2–2.5	
110-5R5G-2-PV	6	6	M5	2–2.5	
110-015G-4-PV	10	10	M5	2–2.5	
110-7R5G-2-PV	10	10	M5	2–2.5	
110-018G-4-PV	16	16	M5	2–2.5	
110-022G-4-PV	25	16	M5	2–2.5	
110-030G-4-PV	25	16	M6	4–6	
110-037G-4-PV	35	16	M6	4–6	
110-045G-4-PV	35	16	M8	10	
110-055G-4-PV	50	25	M8	10	
110-075G-4-PV	70	35	M8	10	
110-090G-4-PV	95	50	M12	31–40	
110-110G-4-PV	120	70	M12	31–40	
110-132G-4-PV	185	95	M12	31–40	
110-160G-4-PV	240	95	M12	31–40	
110-185G-4-PV	120*2P	150	M12	31–40	
110-200G-4-PV	120*2P	150	M12	31–40	

Note:

- For the cable selection for model IP54, see the cables applicable to the models with the same power as model IP54 in this table.
- It is appropriate to use the recommended cable size under 40°C and rated current. The wiring distance should be no more than 100m.
- If the control cable and power cable must cross, the angle between them must be 90°.
- If the inside of the VFD is moist, the insulation resistance will decrease. If there is moisture
 in the VFD, dry up the VFD and measure the humidity again.

A.4 Reactors

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 our technical support technicians.

Output reactor model selection

VFD power	Output reactor
110-1R5G-2-PV	OCL2-004-4
110-2R2G-2-PV	OCL2-004-4
110-004G-2-PV	OCL2-5R5-4
110-5R5G-2-PV	OCL2-7R5-4
110-7R5G-2-PV	OCL2-015-4
110-0R7G-4-PV	OCL2-1R5-4
110-1R5G-4-PV	OCL2-1R5-4
110-2R2G-4-PV	OCL2-2R2-4
110-004G-4-PV	OCL2-004-4
110-5R5G-4-PV	OCL2-5R5-4
110-7R5G-4-PV	OCL2-7R5-4
110-011G-4-PV	OCL2-011-4
110-015G-4-PV	OCL2-015-4
110-018G-4-PV	OCL2-018-4
110-022G-4-PV	OCL2-022-4
110-030G-4-PV	OCL2-037-4
110-037G-4-PV	OCL2-037-4
110-045G-4-PV	OCL2-045-4
110-055G-4-PV	OCL2-055-4
110-075G-4-PV	OCL2-075-4

VFD power	Output reactor
110-090G-4-PV	OCL2-110-4
110-110G-4-PV	OCL2-110-4
110-132G-4-PV	OCL2-160-4
110-160G-4-PV	OCL2-200-4
110-185G-4-PV	OCL2-200-4
110-200G-4-PV	OCL2-200-4

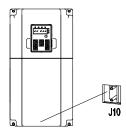
Note:

- The rated derate voltage of the output reactor is 1%±15%.
- Above options are external, and the customer should specify the model when purchasing.

A.5 Filters

C3 filters are built in 110-PV series VFDs with rated power of equal to or greater than 4kW. Jumper J10 determines the connection.

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



Note: After the filter is added, EMI input meets requirements for level C3.

Appendix B Recommended solar modules

B.1 Recommended configuration for solar pumping VFDs

	Open-circuit voltage degree of solar module					
	37:	±1V	45	±1V		
Solar pumping VFD model	Module power±5Wp	Modules per string * strings	Module power±5Wp	Modules per string * strings		
110-0R4G-SS2-PV	250	11*1	300	9*1		
110-0R7G-SS2-PV	250	11*1	300	9*1		
110-1R5G-SS2-PV	250	11*1	300	9*1		
110-2R2G-SS2-PV	250	11*1	300	9*1		
110-0R4G-S2-PV	250	11*1	300	9*1		
110-0R7G-S2-PV	250	11*1	300	9*1		
110-1R5G-S2-PV	250	11*1	300	9*1		
110-2R2G-S2-PV	250	11*1	300	9*1		
110-1R5G-2-PV	250	11*1	300	9*1		
110-2R2G-2-PV	250	11*1	300	9*1		
110-004G-2-PV	250	11*2	300	9*2		
110-5R5G-2-PV	250	11*3	300	9*3		
110-7R5G-2-PV	250	11*4	300	9*4		
110-0R7G-4-PV	250	18*1	300	15*1		
110-1R5G-4-PV	250	18*1	300	15*1		
110-2R2G-4-PV	250	18*1	300	15*1		
110-004G-4-PV	250	20*1	300	16*1		
110-5R5G-4-PV	250	18*2	300	15*2		
110-7R5G-4-PV	250	18*2	300	15*2		
110-011G-4-PV	250	18*3	300	15*3		
110-015G-4-PV	250	18*4	300	15*4		
110-018G-4-PV	250	18*5	300	15*5		
110-022G-4-PV	250	18*6	300	15*6		
110-030G-4-PV	250	18*8	300	15*8		
110-037G-4-PV	250	18*9	300	15*9		
110-045G-4-PV	250	18*11	300	15*11		
110-055G-4-PV	250	18*14	300	15*14		
110-075G-4-PV	250	18*19	300	15*19		

	Open-circuit voltage degree of solar module					
	375	±1V	45±1V			
Solar pumping VFD model	Module power±5Wp	Modules per string * strings	Module power±5Wp	Modules per string * strings		
110-090G-4-PV	250	18*22	300	15*22		
110-110G-4-PV	250	18*27	300	15*27		
110-132G-4-PV	250	18*38	300	15*38		
110-160G-4-PV	250	18*46	300	15*46		
110-185G-4-PV	250	18*53	300	15*53		
110-200G-4-PV	250	18*57	300	15*57		

B.2 Recommended configuration for VFDs with the boost module

	Max. DC Open-circuit voltage degree of solar modu							
PP100-3R2-PV +	input current	3	7±1V	45±1V				
Solar pumping VFD	(A)	Module	Modules per	Module	Modules per			
	` ′	power±5Wp	string * strings	power±5Wp	string * strings			
110-0R4G-SS2-PV	12	250	4*1	300	3*1			
110-0R7G-SS2-PV	12	250	5*1	300	4*1			
110-1R5G-SS2-PV	12	250	8*1	300	7*1			
110-0R4G-S2-PV	12	250	4*1	300	3*1			
110-0R7G-S2-PV	12	250	5*1	300	4*1			
110-1R5G-S2-PV	12	250	8*1	300	7*1			
110-1R5G-2-PV	12	250	8*1	300	7*1			
110-2R2G-2-PV	12	250	13*1	300	11*1			
110-0R7G-4-PV	12	250	5*1	300	4*1			
110-1R5G-4-PV	12	250	8*1	300	7*1			
110-2R2G-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 to power frequency and PV. If such simultaneous connection is required, switching control circuit must be configured externally.

The figure below shows the solution for reference.

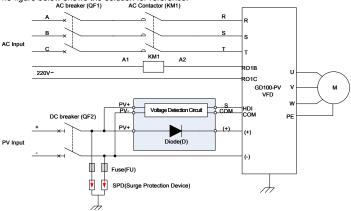


Figure C-1 VFD power frequency & PV switching solution

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. C.1.2 details the models.

C.1.1 110-PV switching module

C.1.1.1 Models and specifications

Key	Sign	Description	Remarks
Product		Product	QH100 series power frequency&PV
abbreviation	1	abbreviation	switching module
Rated	2	VFD power	055A: applies to VFDs ≤15kW

Key	Sign	Description	Remarks	
current			110A: applies to VFDs 18.5–37kW	
Voltage		\/oltogo dograo	4: AC 3PH 380V (-15%)-440 (+10%)	
degree		Voltage degree	2: AC 3PH 220V (-15%)-240 (+10%)	
Industrial	(1)	Industrial code	PV stands for solar pumping.	
code	moustrial code	PV stands for solar pumping.		

C.1.1.2 Terminals of QH100-PV switching module

Terminal	Name	Function
PV+	PV input	Connects to the voltage detection board input and diode module positive pole.
PV –	PV input	Connects to the voltage detection board input.
(+)	Switching module output	Connects to the diode module negative pole.
S, COM	Voltage detection signal	Switching on/off signal, corresponding to PV voltage higher/lower than the threshold. Connects to VFD terminals HDI and COM.

C.1.1.3 Installation dimensions

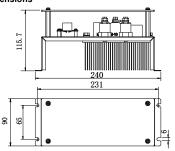


Figure C-2 Switching module installation dimensions (unit: mm)

Note: To ensure the secure running, add external ventilation and heat dissipation measures.

C.1.2 Model selection reference for low-voltage apparatus

	AC	DC	AC			Diode
Model	breaker	breaker	contactor	SPD	Fuse	I _{FAV} /
	(A)	(A)	(A)			V _{RRM}
110-0R4G-S2-PV-AS	16		16			
110-0R7G-S2-PV-AS	16		16			
110-0R4G-SS2-PV-AS	16		16			
110-1R5G-2-PV-AS	16		16			
110-1R5G-S2-PV-AS	25		25			
110-0R7G-SS2-PV-AS	16		16			25A/16
110-2R2G-S2-PV-AS	40	16A/ 1000VDC	40			00V
110-1R5G-SS2-PV-AS	25		25			
110-2R2G-SS2-PV-AS	40		40			
110-0R7G-4-PV-AS	10		12			
110-1R5G-4-PV-AS	10		12			
110-2R2G-4-PV-AS	10		12	Type II,	30A	
110-004G-4-PV-AS	25		25			
110-5R5G-4-PV-AS	25		25	1000V DC		
110-2R2G-2-PV-AS	25	25A/	25	DC		
110-004G-2-PV-AS	25	1000VDC	25			
110-7R5G-4-PV-AS	40		40			55A/ 1600V
110-5R5G-2-PV-AS	40		40			16000
110-011G-4-PV-AS	50	63A/	50			
110-7R5G-2-PV-AS	50	1000VDC	50			
110-015G-4-PV-AS	63		63			
110-018G-4-PV-AS	63		63			
110-022G-4-PV-AS	100	100A/ 1000VDC	95			110A/
110-030G-4-PV-AS	100		95			1600V
110-037G-4-PV-AS	125	125A/ 1000VDC	115			

	AC	DC	AC			Diode
Model	breaker	breaker	contactor	SPD	Fuse	I _{FAV} /
	(A)	(A)	(A)			V _{RRM}
110-045G-4-PV-AS	200	160A/	170			160A/
110-045G-4-FV-A3	200	1000VDC	170			1600V
110-055G-4-PV-AS	200	250A/	170			250A/
110-075G-4-PV-AS	250	1000VDC	205			1600V
110-090G-4-PV-AS	315	350A/	245			350A/
110-110G-4-PV-AS	350	1000VDC	265			1600V
440 4000 4 BV 40	350	400A/	330			400A/
110-132G-4-PV-AS	330	1000VDC	330			1600V
110-160G-4-PV-AS	400	550A/	400			550A/
110-185G-4-PV-AS	500	1000VDC	500			1600V
110-200G-4-PV-AS	500	600A/	500			600A/
110-200G-4-PV-AS	300	1000VDC	300			1600V

IP54 protection-level VFDs

Our company 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 figure below shows the VFD dimensions.

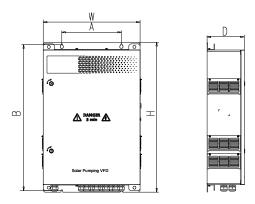


Figure C-2 IP54 VFD dimensional drawing IP54 VFD dimensions (unit: mm)

Power (kW) Model н D Α В 37 110-037G-45-PV-30 110-030G-45-PV-650 1000 250 400 975 22 110-022G-45-PV-18.5 110-018G-45-PV-15 110-015G-45-PV-11 110-011G-45-PV-110-7R5G-45-PV-7.5 550 900 225 400 875 110-7R5G-25-PV-110-5R5G-45-PV-5.5 110-5R5G-25-PV-

Power (kW)	Model	W	Н	D	Α	В
4	110-004G-45-PV-AS					
4	110-004G-25-PV-AS					
	110-2R2G-45-PV-AS					
2.2	110-2R2G-S25-PV-AS					
	110-2R2G-SS25-PV-AS					
	110-1R5G-45-PV-AS					
1.5	110-1R5G-S25-PV-AS					
	110-1R5G-SS25-PV-AS	550	700	200	400	675
	110-0R7G-45-PV-AS					
0.75	110-0R7G-S25-PV-AS					
	110-0R7G-SS25-PV-AS					
0.4	110-0R4G-S25-PV-AS					
0.4	110-0R4G-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, supporting auto switching.
- For -S25 and -SS25 models with the boost module, the DC input voltage cannot be greater than 440V. For -45 models with the boost module, the DC input voltage cannot be greater than 600V.

C.3 Wiring terminals

The following figures show the wiring terminals of different models for IP54 VFDs.

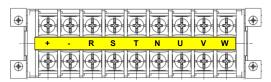


Figure C-3 Wiring terminals of 4-37kW models

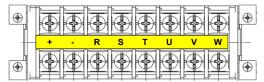


Figure C-4 Wiring terminals of -4 models for VFDs ≤2.2kW

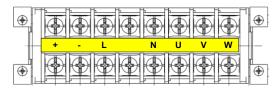


Figure C-5 Wiring terminals of -S2/-SS2 models for VFDs \leq 2.2kW

Wiring terminal functions

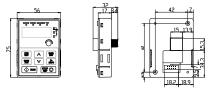
Terminal	Name	Function				
R, S, T		3PH 380/220V AC input terminals, connected to the grid				
N	AC input	Neutral wire. For 4-37kW models, use 3PH 4-wire distribution system and connect the neutral wire to terminal N.				
L, N	AC input	1PH 220V AC input terminals, connected to the grid				
(+), (-)	PV input	Solar cell panel input terminals				
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 grounding	Safety grounding terminal. Each VFD must be grounded properly. Note: It is at the bottom of the chassis.				

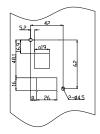
C.4 Parameter setting method

Connect the external PV voltage detection signal to the 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



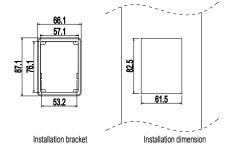


Keypad structure

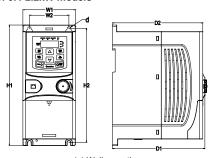
Installation hole

Note: The external keypad is optional for the VFDs (380V; ≤2.2kW) and the standard keypad of VFDs (380V; ≥4kW) can be used as the external keypad.

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

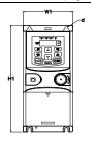


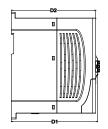
2 Dimensions of 0.4-2.2kW models

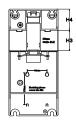


(a) Wall mounting
Dimensions in wall mounting (unit: mm)

Model	W1	W2	H1	H2	D1	D2	Installation hole (d)
110-0R4G-S2-PV	80.0	60.0	160.0	150.0	123.5	120.3	5
110-0R7G-S2-PV	80.0	60.0	160.0	150.0	123.5	120.3	5
110-0R4G-SS2-PV	80.0	60.0	160.0	150.0	123.5	120.3	5
110-1R5G-S2-PV	80.0	60.0	185.0	175.0	140.5	137.3	5
110-2R2G-S2-PV	80.0	60.0	185.0	175.0	140.5	137.3	5
110-0R7G-SS2-PV	80.0	60.0	185.0	175.0	140.5	137.3	5
110-1R5G-SS2-PV	80.0	60.0	185.0	175.0	140.5	137.3	5
110-2R2G-SS2-PV	80.0	60.0	185.0	175.0	140.5	137.3	5
110-0R7G-4-PV	80.0	60.0	185.0	175.0	140.5	137.3	5
110-1R5G-4-PV	80.0	60.0	185.0	175.0	140.5	137.3	5
110-2R2G-4-PV	80.0	60.0	185.0	175.0	140.5	137.3	5





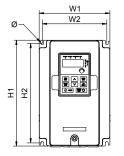


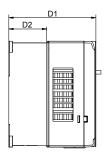
(b) Rail mounting

Dimensions in rail mounting (unit: mm)

Model	W1	H1	Н3	H4	D1	D2	Installation hole (d)
110-0R4G-S2-PV	80.0	160.0	35.4	36.6	123.5	120.3	5
110-0R7G-S2-PV	80.0	160.0	35.4	36.6	123.5	120.3	5
110-0R4G-SS2-PV	80.0	160.0	35.4	36.6	123.5	120.3	5
110-1R5G-S2-PV	80.0	185.0	35.4	36.6	140.5	137.3	5
110-2R2G-S2-PV	80.0	185.0	35.4	36.6	140.5	137.3	5
110-0R7G-SS2-	80.0	185.0	35.4	36.6	140.5	137.3	5
110-1R5G-SS2-	80.0	185.0	35.4	36.6	140.5	137.3	5
110-2R2G-SS2-PV	80.0	185.0	35.4	36.6	140.5	137.3	5
110-0R7G-4-PV	80.0	185.0	35.4	36.6	140.5	137.3	5
110-1R5G-4-PV	80.0	185.0	35.4	36.6	140.5	137.3	5
110-2R2G-4-PV	80.0	185.0	35.4	36.6	140.5	137.3	5

D.3 Dimensions of 1.5-200kW models



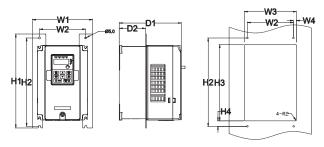


(a) Wall mounting

Dimensions in wall mounting (unit: mm)

Model	W1	W2	H1	H2	D1	D2	Installation
							hole (d)
110-1R5G-2-PV	146.0	131.0	256.0	243.5	167.0	84.5	6
110-2R2G-2-PV	146.0	131.0	256.0	243.5	167.0	84.5	6
110-004G-4-PV	146.0	131.0	256.0	243.5	167.0	84.5	6
110-5R5G-4-PV	146.0	131.0	256.0	243.5	167.0	84.5	6
110-7R5G-4-PV	170.0	151.0	320.0	303.5	196.3	113.0	6
110-011G-4-PV	170.0	151.0	320.0	303.5	196.3	113.0	6
110-015G-4-PV	170.0	151.0	320.0	303.5	196.3	113.0	6
110-004G-2-PV	170.0	151.0	320.0	303.5	196.3	113.0	6
110-5R5G-2-PV	170.0	151.0	320.0	303.5	196.3	113.0	6
110-7R5G-2-PV	170.0	151.0	320.0	303.5	196.3	113.0	6
110-018G-4-PV	200.0	185.0	340.6	328.6	184.3	104.5	6
110-022G-4-PV	200.0	185.0	340.6	328.6	184.3	104.5	6
110-030G-4-PV	250.0	230.0	400.0	380.0	202.0	123.5	6
110-037G-4-PV	250.0	230.0	400.0	380.0	202.0	123.5	6
110-045G-4-PV	282.0	160.0	560.0	542.4	238.0	138.0	9
110-055G-4-PV	282.0	160.0	560.0	542.4	238.0	138.0	9

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



(b) Flange installation

Dimensions in flange installation (unit: mm)

Model	W1	W2	W3	W4	H1	H2	Н3	H4	D1	D2	Installation hole	Nut specs
110-004G-4-PV	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5
110-5R5G-4-PV	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5
110-7R5G-4-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5
110-011G-4-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5
110-015G-4-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5
110-1R5G-2-PV	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5
110-2R2G-2-PV	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5
110-004G-2-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5
110-5R5G-2-PV	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5

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

Note: In flange installation mode, select flange installation boards.

Appendix E Further information

E.1 Product and service inquiries

Address any inquiries about the product to your local offices, quoting the type designation and serial number of the unit in question.