Chapter 1. About this manual （V2）

This chapter provides an overview of the contents, purpose, compatibility, and the intended audience of this manual. The SG600 series solar pump inverter (hereinafter referred to as Inverter) is an enhancement of the S100 motor frequency inverter firmware, which special
This supplement manual intends to serve as a quick start guide for installing, commissioning and operating the SG600 solar pump inverter.
This manual includes all the required parameter settings and program features specific to the solar pump inverter.

READ AND FOLLOW ALL INSTRUCTIONS!

When installing and using this electrical equipment, basic safety precautions should always be followed, including the following:

 WARNING – To reduce the risk of injury, do not permit children to use this product unless they are closely supervised at all times.

 WARNING – To reduce the risk of electric shock, replace damaged cord immediately.

 WARNING – It must be assured that all grounding connections are properly made and that the resistances do meet local codes or requirements

Safety and Caution

1.1 General Warnings

The manual contains basic instructions which must be observed during installation, operation and maintenance. The manual should be carefully read before installation and start-up by the person in charge of the installation. The manual should also be read by all other technical personnel/ operators and should be available at the installation site at all times.

Personnel Qualification and Training – All personnel for the operation, maintenance, inspection and installation must be fully qualified to perform that type of job. Responsibility, competence and the supervision of such personnel must be strictly regulated by the user.

Should the available personnel be lacking the necessary qualification, they must be trained and instructed accordingly. If necessary, the operator may require the manufacturer/supplier to provide such training.

Furthermore the operator/user must make sure that the personnel fully understands the contents of the manual.

Dangers of Ignoring the Safety Symbols – Ignoring the safety directions and symbols may pose a danger to humans as well as to the environment and the equipment itself. Non-observance may void any warranties.

Non-observance of safety directions and symbols may for example entail the following: Failure of important functions of the equipment/plant; failure of prescribed methods for maintenance and repair; endangerment of persons through electrical, mechanical and chemical effects; danger to the environment because of leakage of hazardous material; danger of damage to equipment and buildings.

Safety-oriented Operation – The safety directions contained in the manual, existing national

regulations for the prevention of accidents as well as internal guidelines and safety-regulations for the operator and user must be observed at all times.

General Safety Directions for the Operator/User– If hot or cold equipment parts pose a danger then they must be protected by the operator/user against contact with people. Protective covers for moving parts (e.g. couplings) must not be removed when the equipment is running. Leaks (e.g. at the shaft seal) of hazardous pumping media (e.g. explosive, toxic, hot liquids) must be disposed of in such a way that any danger to personnel and the environment is removed. All government and local regulations must be observed at all times. Any danger to persons from electrical energy must be excluded by using good installation practices and working to local regulations.

Safety Directions for Maintenance, Inspection and Assembly Work– It is the user's responsibility to make sure that all maintenance, inspection and assembly work is performed exclusively by authorized and qualified experts sufficiently informed through careful perusal of the Operating Instructions. The accident prevention regulations must be observed. All work on the equipment should be done when it is not operational and ideally electrically isolated. The sequence for shutting the equipment down is described in the manual and must be strictly observed. Pumps or pump units handling hazardous liquids must be decontaminated. Immediately upon completion of the work, all safety and protective equipment must be restored and activated.

Before restarting the equipment, all points contained in chapter "Initial Start-up" must be observed.

Unauthorized Changes and Manufacturing of Spare Parts– Any conversion or changes of the equipment may only be undertaken after consulting the manufacturer. Original spare parts and accessories authorized by the manufacturer guarantee operational safety. Using non-authorized parts may void any liability on the part of the manufacturer.

Unauthorized Operation– The operational safety of the equipment delivered is only guaranteed if the equipment is used in accordance with the directions contained in this manual. Limits stated in the data sheets may not be exceeded under any circumstances.

Transportation and Intermediate Storage– Prolonged intermediate storage in an environment of high humidity and fluctuating temperatures must be avoided. Moisture and condensation may damage windings and metal parts. Non-compliance will void any warranty.

1.2 Purchase Inspection

 CAUTION: Properly check the delivery before installation. Never install the drive when you find it damaged or lack a component. Incomplete or defective installation might cause accidents.

 CAUTION: The submersible motor is a water filled AC machine. Always observe the instructions delivered together with the motor according to its water filling. These instructions can be found in the motor manual or on the motor body itself. Ignoring these instructions will shorten the product lifetime and damage the motor permanently.

1.3 Installation

 CAUTION: To ensure effective cooling, the drive must be installed vertically with at least 10 cm space above and below the casing.

 CAUTION: When installed in an indoor location sufficient ventilation must be ensured by a vent or ventilator or similar device. Do not install in a place which is exposed to direct sunlight.

 CAUTION: Do not let the drilling chips fall into the drive fin or fan during installation. This might affect the heat dissipation

1.4 Connection

 WARNING: The connection of the drive must be carried out by qualified personnel only. Unqualified handling might lead to shock, burn, or death.

 WARNING: Please double-check that input power has been disconnected before connecting the device, otherwise electrocution or fire can be caused.

 WARNING: The earth terminal must be reliably grounded, otherwise touching the drive shell might lead to a shock.

 WARNING: Selection of PV module type, motor load and drive must be adequate, or the equipment might get damaged.

 WARNING: Grounding of this electrical equipment is mandatory. Never run the pump system when the ground wire is not connected to proper ground. Ignoring this instruction can lead to electrocution.

1.5 Operation

 WARNING: The drive should only connected to power after correct wiring, or the drive might get damaged.

 WARNING: Do not modify the connection while the system is connected to power, or touching any part of it might cause electrocution

 CAUTION: Adjust partial control parameters according to the steps indicated by the manual before the first operation. Do not change the control parameters of the drive by random, or it might damage the equipment.

 CAUTION: The heat sink gets hot during operation. Do not touch it until it has cooled down again, or you might get burned.

 CAUTION: At altitudes of more than 1,000 m above sea level, the drive should be derated for use. Output current should be derated by 10% for every 1,500 m increment of altitude

 CAUTION: Never run the pump when it is not fully submerged in water. When the pump is installed the correct running direction can be determined by measuring the flow rates.

Chapter2. Solar pumping system introduction

2.1. Solar Pumping System overview

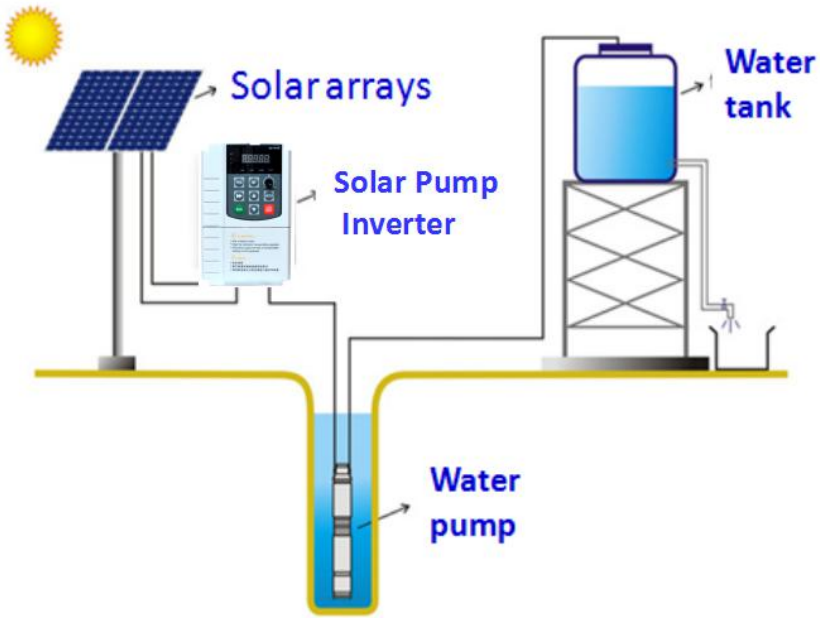
Solar pumping systems can be applied to all forms of daily use, water pumping for drinking water supply for remote villages and farms without connection to the water grid, for agricultural use such as livestock watering, agricultural irrigation, forestry irrigation, pond management, desert control, and industrial use such as waste water treatment etc.

In recent years, with the promotion of the utilization of renewable energy resources, solar pumping systems are more and more used in municipal engineering, city center squares, parks, tourist sites, resorts and hotels, and fountain systems in residential areas.

The system is composed of a PV generator, a pump and a solar pump inverter. Based on the design philosophy that it is more efficient to store water rather than electricity, there is no energy storing device such as storage battery in the system. The system is prepared to be combined with a elevated water storage, e.g. water tower or an uphill tank installation.

The PV generator, an aggregation of PV modules connected in series and in parallel, absorbs solar irradiation and converts it into electrical energy, providing power for the whole system. The pump drive controls and adjusts the system operation and converts the DC produced by the PV module into AC to drive the pump, and adjusts the output frequency in real-time according to the variation of sunlight intensity to realize the maximum power point tracking (MPPT). The pump, driven by 1/3-phase AC motor, can draw water from deep wells, rivers and lakes and pour it into storage tanks or reservoirs, or be connected directly to the irrigation system, fountain system, etc. According to the actual system demand and installation condition, different types of pumps such as centrifugal pump, axial flow pump, mixed flow pump or deep well pump can be used.

Solar pump system constitution. It includes solar panels arrays, solar pump inverter and AC pumps.



System connection diagram

2.2. Solar pump inverter features:

Save energy costs and maximize productivity

solar pump inverters ensure reliable power supply throughout the day with on and off-grid compatibility.

Save environment

Harnessing the power of sun provides an environmentally friendly pumping without producing any CO2 emissions

Easy install and operation and little parameters Configuring. end user ,who never used inverter **before, can Install and operation it very well.**

Reduce maintenance costs

The drives can be equipped with remote monitoring options, reducing maintenance trips to the site.

Reduce operational risk

Embedded pump-specific features such as dry run detection, minimum power input protection, maximum current protection, stop frequency running protection.

Chapter3. solar pump inverter overview

The SG600 series solar pump inverter is a low voltage AC drive of 0.3 to 100KW above rating designed to operate with energy drawn from solar panel or photovoltaic cells (PV).

The inverter is customized to operate in dual supply mode, so the grid connected supply is used in the absence of energy from PV cells. This drive functions with the latest in technology maximum power point tracking (MPPT) algorithm to derive maximum power from the PV cells at any instant.

The inverter is specifically designed to meet the requirements of pump manufacturers and the original equipment manufacturers (OEM).

3.1 Product Features

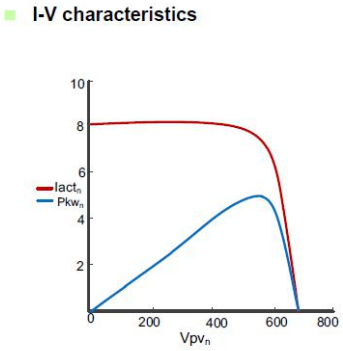
- ✧ Maximum power point tracking (MPPT) with fast response speed and stable operation efficiency> 99%;
- ✧ Suits for most 3 phase AC pumps and AC PMSM high efficiency pumps.
- ✧ The working voltage of solar panel can set by manual or MPPT automatically tracking
- ✧ Compatible with dual power input, AC grid and DC power supply input.
- ✧ Built in automatic sleep-wake up function,
- ✧ Dry run (under load) protection
- ✧ Motor maximum current protection
- ✧ Low input power protection
- ✧ Lowest stop frequency protection
- ✧ The PQ (power/flow) performance curve enables calculating the flow output from the pump
- ✧ Digital control for fully automatic operation, data storage and protective functions
- ✧ Intelligent power module (IPM) for the main circuit
- ✧ LED display operating panel and support remote control
- ✧ Low water probe sensor, and water level control function
- ✧ Strong lightning protection
- ✧ Ambient temperature for using: -10 to +50˚C.

3.2. Solar pump inverter operation theory

The solar pump inverter uses the maximum power point tracking (MPPT) control program to improve the efficiency of solar energy systems. The output of the photovoltaic (PV) cell is proportional to its area and intensity, while the output voltage is limited by p-n junction from 0.6 to 0.7 V. Therefore when the output voltage is constant, output power is proportional to intensity and surface area. The current and voltage at which the PV cell generates maximum power is known as the maximum power point.

The MPPT controller follows different strategies to derive the maximum power from the PV array. The internal MPPT algorithm is used to derive maximum power from the PV cell at any instant. This is achieved by modifying the operating voltage or current in the PV cell until the maximum power is obtained.

When the output voltage is zero, the PV cells create short circuit current. If the PV cells are not connected to any load, the output voltage is equal to the open circuit voltage. The maximum power point is obtained at the knee of the I-V curve. See the I-V characteristics shown below.

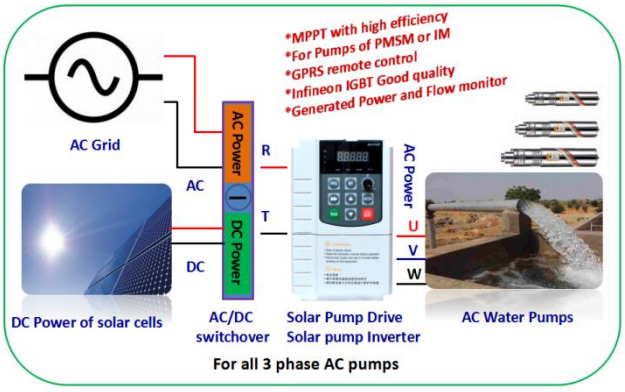


The I-V curve is not constant since intensity and temperature changes during day time. Under constant temperature, current changes linearly with intensity and voltage changes logarithmically with intensity. Since the voltage variation is small with respect to intensity changes, maximum power varies proportionally with intensity

3.3. SG600 series solar pump inverter compatible with dual supply mode

The solar pump inverter operates in dual power supply mode either with AC power grid supply or DC voltage from solar panels arrays.

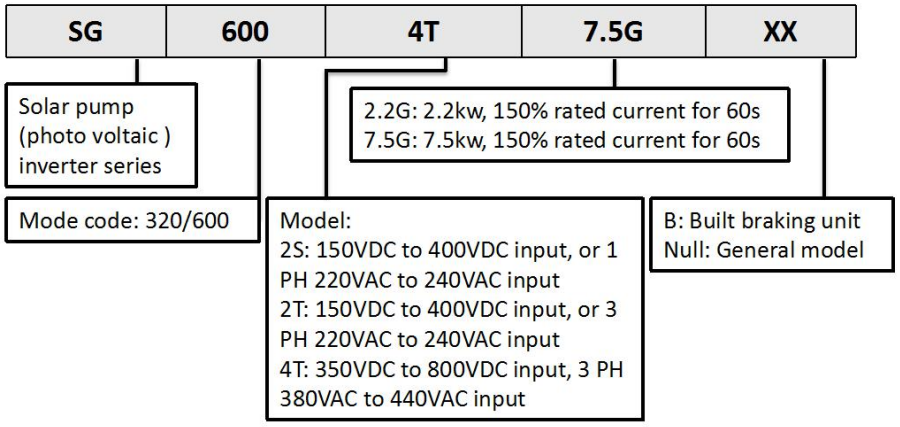
A four-pole changeover switch enables switching between the two supply modes. At a given time only one supply (PV cell or grid) will be connected to the inverter.



Note: Please note that polarity connecting for DC power input to P and N terminals.

3.4. SG600 series solar pump inverter model description

The nameplate of solar pump inverter



SG600 solar pump inverter voltage range

Model	Applicable for pumps	Working DC voltage	Over voltage point	Under voltage point	Suggest Vmp	Suggest Voc
SG600-2T	For 200V AC	150V – 350V	450V	100V	310VDC	355VDC
SG600-4T	For 400V AC	300V – 650V	800V	250V	540VDC	620VDC

Power, current and voltage specification (2S /2T 200VAC voltage, and 400VAC voltage)

Rated power/kw	2T 200V range Rated current /A	4T 400V range Rated current /A
0.4	2.1	None
0.7	3.8	2.1
1.5	5.1	3.8
2.2	9	5.1
3.7	13	10
5.5	25	13
7.5	32	17
11	45	25
15	60	32
18.5	75	37
22	91	45
30	110	60
37	152	75
45	176	91

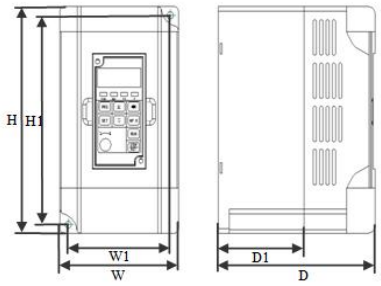
3.5. Models and specification

SN	Models	Rate current	Output voltage (3PH VAC)	Applicable for pumps	MPPT voltage (VDC)
Mini type 2T series : 150 to 450 VDC or 200 to 240VAC input,Voc 350VDC/336VDC					
1	SG600-0K75GB-2S-M	4A	0-240VAC	0.75KW	260 to 375
2	SG600-1K5GB-2S-M	7A	0-240VAC	1.5KW	260 to 375
3	SG600-2K2GB-2S-M	10A	0-240VAC	2.2kw	260 to 375
	Mini type 4T series : 350 to 800 VDC or 300 to 440VAC input, Voc 540VDC/616VDC				
4	SG600-0K7GB-4T-M	2.5A	380V-440V	0.75KW	486 to 750
5	SG600-1K5GB-4T-M	3.7A	380V-440V	1.5KW	486 to 750
6	SG600-2K2GB-4T-M	5A	380V-440V	2.2KW	486 to 750
General type: 2T series 150 to 450 VDC or 200 to 240VAC input, Voc 350VDC/336VDC					
7	SG600-0K7GB-2S	4A	220V/240V	0.75KW	260 to 375
8	SG600-1K5GB-2S	7A	220V/240V	1.5KW	260 to 375
9	SG600-2K2GB-2S	10A	220V/240V	2.2KW	260 to 375
10	SG600-4K0GB-2S	16A	220V/240V	4.0KW	260 to 375
General type: 350 to 800 VDC or 300 to 440VAC input, Voc 540VDC/616VDC					
11	SG600-0K7GB-4T	2.5A	380V-440V	0.75KW	486 to 750
12	SG600-1K5GB-4T	3.7A	380V-440V	1.5KW	486 to 750
13	SG600-2K2GB-4T	5A	380V-440V	2.2KW	486 to 750
14	SG600-4K0GB-4T	10A	380V-440V	4.0KW	486 to 750
15	SG600--5K5GB-4T	13A	380V-440V	5.5KW	486 to 750
16	SG600-7K5GB-4T	17A	380V-440V	7.5KW	486 to 750
17	SG600-011GB-4T	22A	380V-440V	11KW	486 to 750
18	SG600-015GB-4T	30A	380V-440V	15KW	486 to 750
19	SG600-018GB-4T	37A	380V-440V	18KW	486 to 750
20	SG600-022GB-4T	45A	380V-440V	22KW	486 to 750
21	SG600-030GB-4T	60A	380V-440V	30KW	486 to 750
22	SG600-037GB-4T	75A	380V-440V	37KW	486 to 750
23	SG600-045GB-4T	91A	380V-440V	45KW	486 to 750
24	SG600-055GB-4T	110A	380V-440V	55KW	486 to 750
25	SG600-075GB-4T	150A	380V-440V	75KW	486 to 750
26	SG600-090GB-4T	180A	380V-440V	90KW	486 to 750
27	SG600-110GB-4T	220A	380V-440V	110KW	486 to 750
28	SG600-132GB-4T	260A	380V-440V	132KW	486 to 750
29	SG600-160GB-4T	320A	380V-440V	160kw	486 to 750
30	SG600-**GB-4T	**	380V-440V	200-400	486 to 750

3.6. SG600 series solar pump inverter technical specification

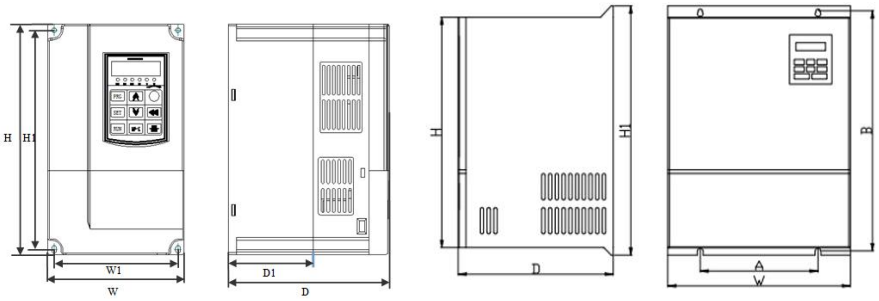
**Solar pump inverter specification when PE-00=0. (solar pump control is disable)	
Recommended MPPT voltage range	Vmp 131 to 350 VDC for 1s (80V to 350VDC input, 3PH 110 to 220VAC output) Vmp 260 to 355VDC for 2s/ 2T (150V to 350VDC input, 3PH 220 to 240VAC output) Vmp 486 to 650 VDC for 4T (250V to 800VDC input, 3PH 380 to 460VAC output)
Recommended input Voc and Vmpp voltage	Voc 180(VDC), Vmpp 155(VDC) for 1S model or 110V AC pumps Voc 355(VDC), Vmpp 310(VDC) for 2S model or 220V AC pumps Voc 620(VDC), Vmpp 540(VDC) for 4T model or 380V AC pumps
Motor type	Control for permanent magnet synchronous motor and asynchronous motor pumps.
Rated output voltage	1/3-Phase,110V/160V/220V. 3-phase, 220V/380V/460V
Output frequency range	0~maximum frequency 600Hz.
MPPT efficiency	97%,
Ambient temperature range	G-type for submersible pumps, 150% rated current for 60s, 180% rated current for 2s . P type for general pumps, 120% rated current for 60s, 150% rated current for 2s
Solar pump control special performance	MPPT (maximum power point tracking), CVT (constant voltage tracking), auto/manual operation, dry run protection, low stop frequency protection, minimum power input, motor maximum current protection, flow calculating, energy generated calculating and water tank level detected
Protection function	Phase loss protection, phase short circuit protection, ground to phase circuit protection , input and output short circuit protection. Stall protection, lightning protection
Protection degree	IP20, Air force cooling
Running mode	MPPT or CVT
Altitude	Below 1000m; above 1000m, derated 1% for every additional 100m.
Enhanced version of AC drive	CE, Design based on vector control motor AC drive, more specification please refer to S600 or S100 vector control drive operation manual
Technical specification of variable frequency inverter when PE00=0	
voltage, frequency	1 phase 220V, 3 phase, 220V,380V, 660V and 1140V. Input Power 0.75kw to 37kw. s
Control mode	0: VF control ; 1: Open loop vector control mode 2: Close loop vector control mode
Maximum frequency	0-320Hz in vector control mode, 0~3200Hz in VF control mode
Multiple-functions	PID Control, Carrier Frequency Adjustable, Current Limiter, Speed Search, Momentary Power Loss Restart,16 Step Speed (Max), 3-Wire connection, Slip Compensation, Frequency Jump, DC braking, Upper/Lower Frequency, Torque control, Compatible for PMSM and IM, built in RS485, counting, fault information checking, fully fault protection function, frequency combination reference.

3.7. SG600 series solar pump inverter dimensions



Mini type Fig 1

Power	H	H1	W	W1	D	D1	Hole
0.4~1.5KW	143	132	86	74	114	62.5	4.5



General type Fig 2

Power (3 phase 380V output)	H	H1	W	W1	D	D1	hole
0.75~4KW	185	175	118	105	157	80	Φ4.5
5.5~15kw	247	235	160	147	178	101	Φ5

Power (3 phase 380V output)	Inverter size				Install size/ hole		
	W	H1	H	D	A	B	Hole
SG600-018GB-4T	217	335	305	150	140	323	Φ6
SG600-022GB-4T							
SG600-030GB-4T	285	463	432	225	235	447	Φ8
SG600-037GB-4T							
SG600-045GB-4T	385	600	550	270	260	580	Φ10
SG600-055GB-4T							
SG600-075GB-4T	473	700	660	307	343	678	ϕ10
SG600-90GB-4T							
SG600-110GB-4T	579	930	880	375	449	905	ϕ10
SG600-132GB-4T							
SG600-160GB-4T							
185kw to 280kw	650	1060	983	377	420	1030	ϕ12
315kw to 500kw (option)	800	1358	1203	400	520	1300	ϕ14

Chapter 4. Operation control panel description

4.1 Press function key description

Key symbol	Name	Function description
	Menu key	Enter menu or
	Confirm key	Enter to menu step by step or confirm the setting value
	UP increase key	Data and function code increase
	Down decrease key	Data and function code reduce
	SHIFT	In the monitor status, press this key can select display monitoring parameter in circulation. Current output frequency,Current output voltage,Current output current,DC bus voltage value ,DC bus current ,Input power
	Running key	Us to run motor in keyboard control mode
	Multiple function key	The function of MF.K can be set P7.01 setting. Default setting is no function to program
STOP RESET	Stop and reset	In running status, this key can use to stop motor running (P0-02). Reset malfunction in alarm mode.

4.2. Working status indicating

Symbol	Indicator description
Hz	Unit of frequency（Hz）
A	Unit of current (Amp)
V	Unit of voltage（V）
RUN	Forward run indicator
DIR	Inverter runs in terminal control mode, when P0-02=1 setting
LOCAL	Inverter runs in keyboard control mode, when P0-02=0 setting
TRIP	Fault indicator, inverter will be trip when any alarm happens

4.3. Digital display area

5 digit LED display, it can use to display frequency reference, output frequency and kinds of monitoring data and fault alarm code.

4.4. Function code operation

There are 3 level menu in respectively.

1. Function code parameters（First level menu）
2. Function code name（The second level menu）
3. Setting value of function code (the third level menu ）

Note: If in the third level menu, you can press PRG or ENTER key to return second menu.

The difference is that press ENTER key will keep setting parameter in CPU board of inverter and

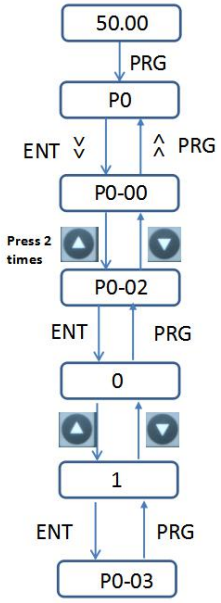
then return to second menu, press PRG key an return second menu directly without parameters store.

Example of keypad operation

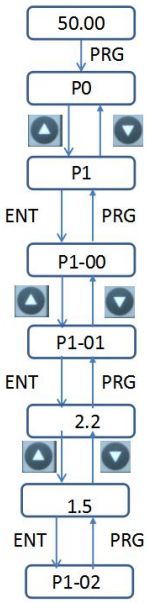
1. Modify command source for terminals control

Modify command source for terminals control, the pump will be start once X1 and GND switch ON. If X1 and GND keep turn on status, the inverter will start automatically at morning and turn off automatically at evening.

2, Modify motor rated power in P1-01. If your rated power of inveter is much bigger than rated motor, please set P1-01 per motor nameplate for better motor protection.



Set P0-02=1 guiding



Set P1-02=1.5 kw guiding

4.5. Monitor parameters inquiry.

There two ways to inquiry monitoring parameters.

Press “ ”to inquiry inverter working status parameters such as output freqeuncy, output current, output voltage, DC voltage ans so on.

User also can go to U group parameters to inquiry relative parameters.

Example: Press PRG to return monitoring display window and find to U group, user can get running frequency with U0-00, DC bus voltage from U0-02...

4.6. Fault reset

Solar pump inverter will display relative fault information if there are any alarm occurs.

User can reset it by “STOP/RESET” or external terminals (P402=9, fault reset by DI3 terminals turn on). Once reset, drive place on standby status.

If inverter place in fault reset and without any reset, it located in protection status and can’t working.

Chapter 5. SG600 series solar pump inverter installation

5.1 About this chapter

This chapter includes the basic information about the mechanical and electrical installation of solar pump inverter and also provides steps to quickly operate the inverter.

For general instructions about installation and maintenance of S100 frequency inverter, please refer toS100 operation manual.

Safety instructions

WARNING! All electrical installation and maintenance work on the drive must be carried out by qualified electricians only. Follow the safety instructions listed below.

• Never work on the inverter, the braking chopper circuit, the motor cable or the motor when input power is applied to the inverter.

• After disconnecting the input power, always wait for 5 minutes to let the intermediate circuit capacitors discharge. Always ensure by measuring that no voltage is actually present.

• A rotating permanent magnet motor generates a dangerous voltage. Always ensure to lock the motor shaft mechanically before connecting a permanent magnet motor to the inverter, and before doing any work on an drive system connected to a permanent magnet motor.

5.2 Mechanical installation

In back mounting, fasten the drive to the wall with screws using four mounting holes.

Note: Installation Environment Requirements

1. Ambient temperature, the surrounding environment temperature take great effect for service life span of solar pump inverter, don’t allow surrounding temperature over than allowable temperature above (-10°C to +50°C)

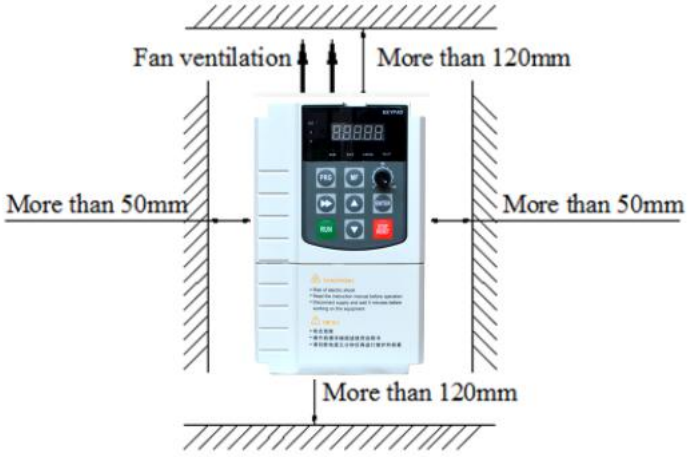
2. Heat dissipation, Install the solar drive on the surface of an incombustible object, and ensure that there is sufficient space around for heat dissipation. Install the solar pump inverter vertically on the support using screws.

3. vibration, it should be less than 0.6G, far away from the punching machine or the like.

4. Free from direct sunlight, high humidity and condensation

5. Free from corrosive, explosive and combustible gas

6. Free from oil dirt, dust and metal powder



Solar pump inverter installation space requirement.

5.3. Installation and wiring

5.3.1. Diagram of single phase 220V input main circuit loop connection

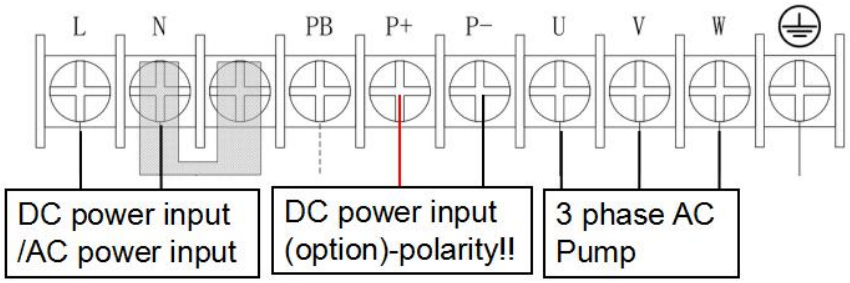


Fig 5.3-1. 1 phase AC power input 220V main circuit loop connection

5.3.2. Diagram 3 phase 380V main circuit loop connection for below 22kw inveter

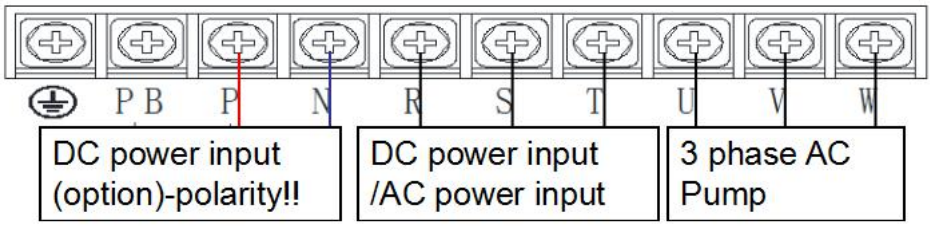


Fig 5.3-2. 3 phase AC power input for below 22 kw inverter

5.3.3. Diagram 3 phase 380V main circuit loop connection for above 30kw inverter.

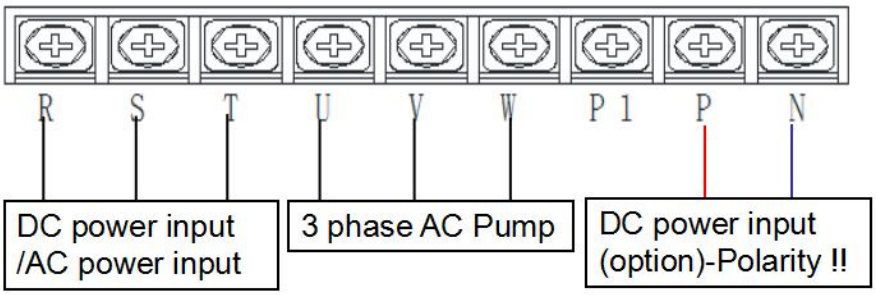


Fig 5.3-3. 3 phase AC power input for above 22 kw inverter

Note: R and T (L and N) terminals of inverter are used to connect DC power from solar panels. It is no request to distinguish polarity of DC power when connect R and T terminals. But please take great attention to polarity distinguishing when connecting DC power to P and N terminals. P+ must to connect to positive of power , N-must to connect negative of power. Otherwise inverter will be damaged.

- Do not use an asymmetrically constructed motor cable.
- Route the motor cable, input power cable and control cables separately.
- Make sure that the maximum cable lengths are not exceeded. For detailed information, see the user's manual.
- Noted the polarity connection when connecting from P+ and N

5.4 Main circuit terminals description

Terminals symbol	Function description
L, N	Single phase AC or DC power input terminals.
R,S,T	3 phase AC input terminals, R, T for DC power input terminals
U, V, W	Power output terminals for 3 phase AC pumps connection.
P, N	DC bus terminals, also can use to connect DC power if need, but please polarity distinguish.
P, PB	Braking resistor connection terminals
P1, P	DC chock connecting terminals.
⏚	Grounding terminals

5.5. Connection procedure

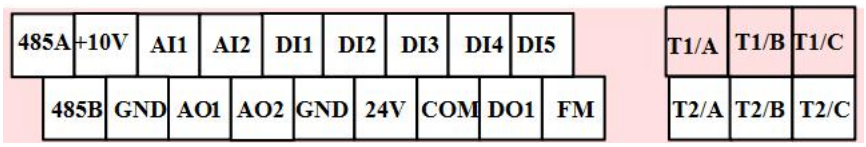
1. Strip the input power cable. Ground the bare shield of the cable (if any) 360 degrees under the grounding clamp. Fasten the grounding conductor (E) of the input power cable under the screw of the grounding clamp. Connect power cable to the R,T terminals from PV solar panel.

2. Strip the motor cable. Ground the bare shield of the cable 360 degrees under the grounding clamp. Twist the shield to form as short a pigtail as possible and fasten it under the screw of the grounding clamp. Connect the phase conductors to the U, V and W terminals.

4. Secure the cables outside the drive mechanically.

5.6 .Control circuit terminals

5.6.1 Control circuit terminals diagram



5.6.2. Control circuit terminals function description

Type	symbol	Name of terminals	Specification and explanation
Communication	485A	485+	RS485 communication port， compatible with Modbus
	485B	485-	
Digital input and output	DI1～DI4	Digital input	Sink or source input option set by jumper, input resistance is 2.5K, Optocoupler isolation input, jumper J9
	DI5	Digital input or high speed pulse trains input terminals	General digital input terminal characteristics Pulse trains input maximum frequency: 100KHz
	DO1	Digital output 1	Open collector output Maximum drive capability is 50mA
	FM	Digital output 2	Open collector output, maximum drive capability is 50mA, Can be selected as a pulse trainoutput, up to 100KHz

Analog input and output	AI1	Analog input 1	Input voltage range: 0V ~ 10V Input resistance: 22K
	AI2	Analog input 2	Input voltage range: 0 ~ 10V or 4 ~ 20mA Input resistance: 22K, jumper J8
	AO1	Analog output 1	Output range: 0 ~ 10V or 0 ~ 20mA,select by jumper J5
	AO2	Analog output 2	Output range: 0 ~ 10V or 0 ~ 20mA,select by jumperJ5
power supply Reference ground	10V	Analog power supply	Output current: 20mA; Accuracy: 2%
	GND	Analog Ground	Analog reference ground
	24V	User power supply	Accuracy：±15%
	COM	Digital ground	Digital reference ground
Status relay output	T1/A，T1/B，T1/C	Relay 1	TA/TB normal close、TA/TC normal open； Driving capability: 25VAc，3A，COSØ=0.4；30Vdc，1A
	T2/A，T2/B，T2/C	Reay 2	TA/TB normal close、TA/TC normal open； Driving capability: 25VAc，3A，COSØ=0.4；30Vdc，1A

Note: There are a short connection between DI1 and COM before factory leaving.

If main circuit breaker is switch on, and inverter is keep power up status, it will be start and stop automatically. This inverter will be started and operated according to steps below:

1), The powr switch of this inverter is on, DC circuit breaker is connected and the switch over to DC power supply of solar panels side.

2), The solar solar panels arrays generates power once sunrise, and power supply to inverter.

3), The inverter will detect Voc of solar panels and try to start pump, if the voltage is lower than sleep voltage, the inverter will go to sleep again. And inveter will be wake up after some time once the voltage rise to awake up voltage.

In a time,The pump will run in low speed, if the speed fail to reach lowest speed, inverter will stop to run and waiting to run.

Chapter 6. Operation and monitoring

Solar pump inverter for 3 phase AC pumps trial running

6.1. Wire according to the diagram, and check if enough capacity of input power and input voltage from solar panels.

Connecting power supply from solar arrays to R, T terminals of inverter. (or P+, P- (N) terminals).

Connecting AC grid power supply to R, S,T if need.

a), For 2S/2T model, which use to drive for 220VAC range AC pumps, it need Vmp is 310VDC, Voc is 350Voc,

b), For 4T model, which use to drive for 3800VAC range AC pumps, it need Vmp is 540VDC, Voc is 620VDC.

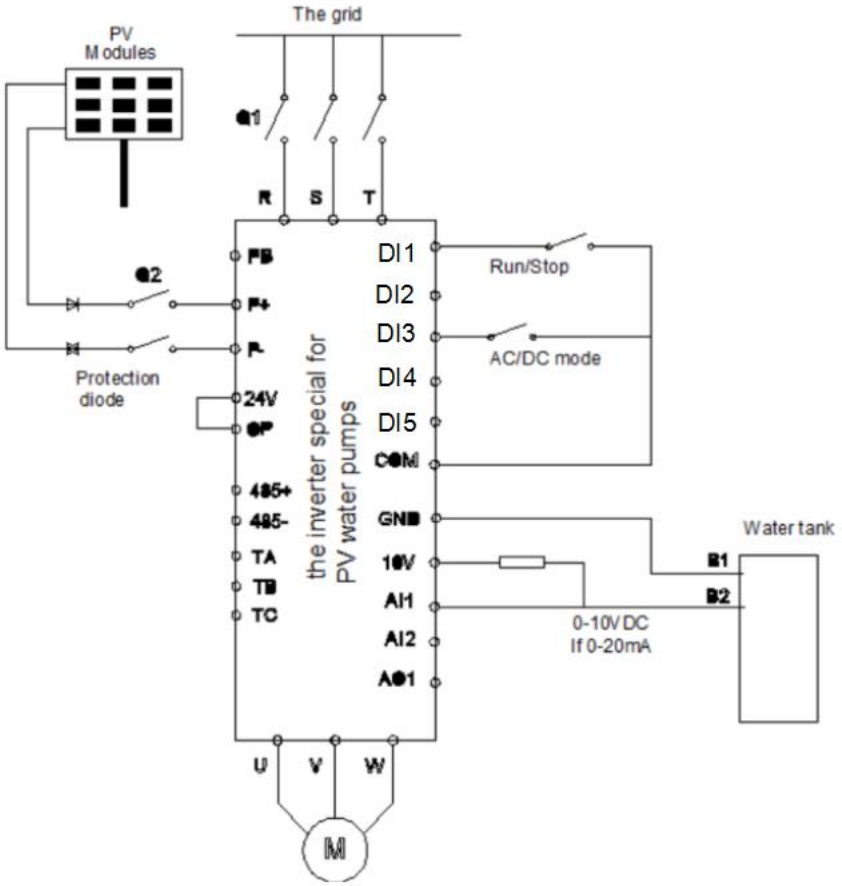
It must follow to voltage low of AC power rectifier to DC power.

Vmp=√2*220V=310VDC for 220VAC pumps, Voc=1.15=350VDC.

Vmp=√2*380V=540VDC for 380VAC pumps, Voc=1.15=620VDC.

Input total power of solar arrays should be large than 1.3 to 1.5 times of rated of pumps, and rated power of inverter should be large than or equip to rated of Ac pumps.

C). Don't switch on both power supply (AC and DC) at the same time without connecting diode before P+ and P- (N), terminals. Because there are no polarity reverse protection function for DC power supply input with P+ and P- (N) terminals.



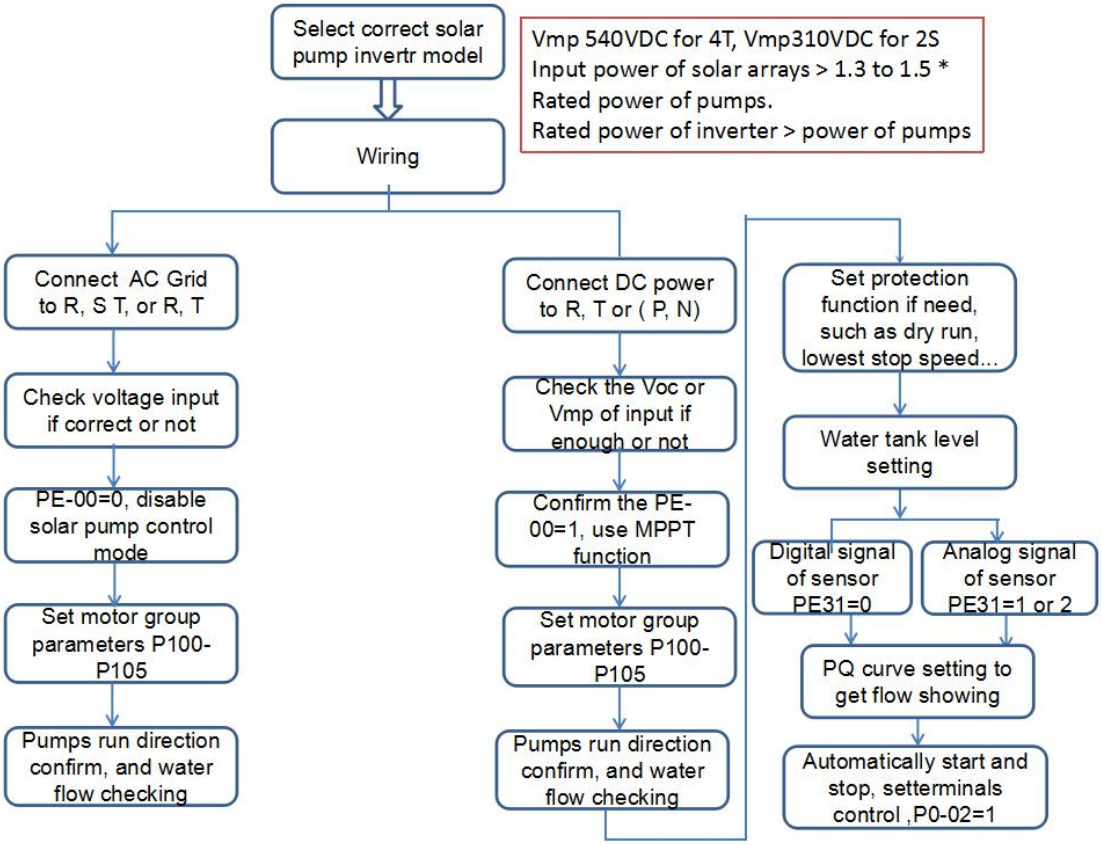
Solar Pump Inverter Connection

6.2. Confirm the wiring is correct and switch on Q2, power on Inverter.
6.3. Confirm that if the solar pumps control mode is activated, PE-00=1 MPPT is default setting.
6.4. Set the motor group parameters to P2 (P2.01 to P2.06) according to pumps nameplate.
6.5. Confirm the running command if set by keypad control (P0-02=0).
Press the RUN key to start inverter. RUN indicator is ON, and start to pump water.
6.6. Check if the pump running direction is correct or not, if wrong direction. Please change the two phase order of pumps connection, or set P8.13=0 (make direction in reverse).
6.7. Check the water flow, and output frequency if good or not, the user can be able to configure PE04 to PE13.
6.8. If need start/stop automatically function, please set command channel by terminals. P0-02=1
6.9. The user can configure some protections such as dry run, lowest stop frequency, flow PQ curve in PE16 to PE40.
6.A. For driving PMSM high efficiency pumps, user must select to open loop vector control mode (P0-01=1) for running. Before select open loop vector control mode, we should get motor accuracy parameter by performing motor auto tuning.

PMSM Motor auto tuning procedure.
1). Set P0.01=1 to select open loop sensorless vector control mode of PMSM.
2). Configure motor parameters group P1 (P1.00 to P1-20), and than set P1.37=11 for static motor auto tuning,(F2.27=12, rotational auto tuning is available as well). After the motor auto tuning, this inverter can use to drive for PMSM high efficiency pumps.

Note:
1. It is forbidden to connect power supply to output terminals U, V, W of inverter, otherwise it will damage inverter seriously.
2.Confirm the running direction of motor if correct or not. If not correct, please change the any two phase order of U, V, W wiring.
3. The total power of solar arrays input should be large than 1.3 to 1.5 times of rated of pumps.and the rated power of inverter must be large than rated power of pumps.
4. It must to perform motor auto tuning for PMSM high efficiency pumps.
Regarding for driving PMSM, the motor auto tuning is very important. The user can check parameters of P1-20, after auto tuning if has been modification, if these parameters is not correct for pumps, please modify it according to pumps specification.

Commission and operation flow chat



SG600 solar pump inverter operation flow chat

Note:

User can take this solar pump inveter for variable frequency inverter using. It can use to speed and torque control for AC motor. And all of function of variable frequency inverter is available for FE00=0.

User also can set Vmpp by manual to PE02 parameters when PE01=0,

3. Set dry run function with PE22 to PE22 parameters for pumps protection if not enough water in well.

Set lowest stop frequency function for pumps not allow to run in low speed protection with PE19 to PE2.

Set pumps over current protection with PE25 and PE26.

Set Min power input function to avoid solar pump system working in low power input. (PE28 to PE30).

Compatible with both digital and analog signal of transmitter for water tank fulling detection. (PE31 to PE 35)

User can get flow, day flow, generating energy and day generating energy information from inveter with PQ curve setting. (PE38 to PE39), and get monitor form U0 13 to U0 19

Provide GPRS remote control module for remote monitoring, remote control, history data record, parameters remote setting function.

Chapter 7. Simple parameter list

Table Symbol Description:

"√" - indicates that the parameter can be changed in the process of stopping and running.

"╳" - indicates that the parameter can be changed in stop mode, can not be changed during running;

"●" - Indicates that the initial parameters related to the drives model

Below list all parameters for AC drives, not only for solar pump control but also for motor speed and torque control. Blue and bold words stands for parameters which may relative to solar pump control function.

"*" Factory setting, it is not allow setting by user.

The parameters related to the PV control function are shown in blue bold

Function code	Name	Setting range	Factory setting	Modification
P0 Basic function parameters				
P0-00	**GP model display**	**1: G type（ Heavy duty）** **2: P type（pumps, fans load duty）**	**Per model**	●
P0-01	The first motor control mode	**0:VF control** 1:Sensorless vector control without PG card feedback 2: Sensor vector control with PG card feedback 3: single phase output for 1 phase pump 4: 3 phase output for 1 phase pump (if remove starting capacitor and running capacitor, please select 4. If only remove starting capacitor or difficult to remove starting and running capacitors. Please select 3).	0	╳
P0-02	Command mode	0: Keypad (LED OFF) 1:Terminal command (LED ON) 2: RS485 communication (LED flash)	0	√
P0-03	Main frequency reference source X	0: Set by P0-08 of keypad, UP/DOWN setting not saved after power down. 1: Set by P0-08 of keypad, UP/DOWN setting memorized power down. 2: Analog AI1 3: Analog AI2 4: Keypad potentiometer 5: PULSE trains frequency reference (DI5) 6: Multiple step command reference 7: Simple PLC 8. PID	0	╳

		9: RS485 communication		
P0-04	Auxiliary frequency reference source Y	As same as P0-03 (main frequency reference source X)	0	×
P0-05	The auxiliary frequency source Y range basic reference when superposition	0:Relative to the maximum frequency 1:Relative to frequency source X	0	√
P0-06	The auxiliary frequency source Y range when superposition	0%～150%	100%	√
P0-07	Frequency source selection when superposition	Unit's digit： frequency source selection 0: main frequency source 1:Arithmetic result of main and auxiliary operation (arithmetic relationship operation depends on ten's digit) 2: Switchover between main frequency X source and auxiliary source Y 3: Switchover between main source X and arithmetic operation between of main source X and auxiliary source Y. 4: Switchover between auxiliary source Y and arithmetic operation between of main source X and auxiliary source Y Ten's digit : The arithmetic operation relationship between main and auxiliary. 0: main + auxiliary 1: main – auxiliary 2: Maximum of X and Y 3: Minimum of X and Y	00	√
P0-08	Preset frequency	0.00Hz～Maximum（P0-10）	50.00Hz	√
P0-09	**Running direction**	**0: the same direction 1: the opposite direction**	**0**	**√**
P0-10	**Maximum frequency**	**50.00Hz～600.00Hz**	**50.00Hz**	×
P0-11	**Upper limit frequency source**	**0： P0-12 1： AI1 2： AI2 3： potentiometer of kaypad 4： PULSE trains 5： Rs485 communication**	**0**	×
P0-12	**Upper limit frequency source**	**Lower limit frequency P0-14～Maximum frequency P0-10**	**50.00Hz**	**√**
P0-13	**Upper limit frequency**	**0.00Hz～Maximum frequency P0-10**	**0.00Hz**	**√**

	offset			
P0-14	**Lower limit frequency**	**0.00Hz～Maximum frequency P0-12**	**0.00Hz**	**√**
P0-15	**Carrier frequency**	**0.5kHz～16.0kHz**	**Per model**	**√**
P0-16	**Carrier frequency auto adjusting with temperature**	**0: Not 1: Yes**	**1**	**√**
P0-17	**Acceleration time 1**	**0.00s～650.00s(P0-19=2) 0.0s～6500.0s(P0-19=1) 0s～65000s(P0-19=0)**	**Per model**	**√**
P0-18	**Deceleration time 1**	**0.00s～650.00s(P0-19=2) 0.0s～6500.0s(P0-19=1) 0s～65000s(P0-19=0)**	**Per model**	**√**
P0-19	Unit of acceleration /deceleration time	0：1s 1：0.1s 2：0.01s	1	×
P0-20	**The balance factory for 1 phase pump driving (3 phase output)**	**0.00 ～2.00**	**1.0**	×
P0-21	The offset of auxiliary frequency source when perform superposition	0.00Hz～Maximum frequency F0-10	0.00Hz	√
P0-22	Frequency resolution	1：0.1Hz 2：0.01Hz	2	×
P0-23	Memory selection when frequency reference is set by digital	0：Not save 1：save	0	√
P0-24	Motor parameter group	0：Motor parameters group 1 1：Motor parameters group 2	0	×
P0-25	The reference frequency of Acceleration/ deceleration time	0：Maximum frequency (P0-10) 1: setting frequency 2：100Hz	0	×
P0-26	UP/DOWN of reference	0: Running frequency 1: Set frequency	0	×
P0-27	Frequency source and command binding	Unit digit: Frequency source is bound by keypad command 0: No bonding 1: frequency is set by digital 2：AI1 3：AI2 4：potentiometer of keypad	0000	√

		5：PULSE train（DI5） 6：multi-step frequency 7：Simple PLC 8：PID 9：Communication Ten digit: Frequency source is bound by terminals Hundreds digit: Frequency source is bound by communication Thousands of digit: Automatic run Binding frequency source selection		
P0-28	Serial communication protocol selection	0：Modbus protocol	0	√
P1 First motor parameters group				
P1-00	**Motor type**	**0:general asynchronous motor 1: variable frequency asynchronous motor 3. Permanent magnet synchronous motor**	**0**	×
P1-01	**Rated power of motor**	**0.1KW～1000.0KW**	**Per model**	×
P1-02	**Rated voltage of motor**	**1V～2000V**	**Per model**	×
P1-03	**Rated current of motor**	**Inverter power <= 55KW：0.01A～655.35A Inverter power > 55KW：0.1A～6553.5A**	**Per model**	×
P1-04	**Rated frequency of motor**	**0.01Hz～Maximum frequency**	**Per model**	×
P1-05	**Rated speed of motor**	**1rpm～65535rpm**	**Per model**	×
P1-06	Asyn. Motor Stator resistance	Inverter power <= 55KW：0.001Ω～65.535Ω Inverter power > 55KW: 0.0001Ω～6.5535Ω	Auto tuning	×
P1-07	Asyn. motor rotor resistance	Inverter power <= 55KW：0.001Ω～65.535Ω Inverter power > 55KW : 0.0001Ω～6.5535Ω	Auto tuning	×
P1-08	Asyn. motor Motor leakage inductance	Inverter power <= 55KW：0.01mH～655.35mH Inverter power > 55KW：0.001mH～65.535mH	Auto tuning	×

P1-09	Asyn. motor mutual inductance	Inverter power <= 55KW：0.1mH～6553.5mH Inverter power > 55KW：0.01mH～655.35mH	Auto tuning	×
P1-10	Asyn. otor no-load current	Inverter power <= 55KW: 0.01A～F1-03 Inverter power > 55KW：0.1A～F1-03	Auto tuning	×
P1-16	**Synchronous motor stator resistance**	**Inverter power <= 55KW：0.001Ω～65.535Ω Inverter power > 55KW：0.0001Ω～6.5535Ω**	**Auto tunin**	×
P1-17	**Synchronous motor D-axis inductance**	**Inverter power <= 55KW0.01mH～655.35mH Inverter power > 55KW : 0.001mH～65.535mH**	**Auto tuning**	×
P1-18	**Synchronous motor Q axis inductance**	**Inverter power <= 55KW：0.01mH～655.35mH Inverter power > 55KW : 0.001mH～65.535mH**	**Auto tuning**	×
P1-20	**Synchronous motor back electromotive force**	**0.1V～6553.5V**	**Auto tuning**	×
P1-27	Number of encoder lines	1～65535	1024	×
P1-28	Encoder type	0：ABZ incremental encoder 1：UVW incremental encode 2：Rotary transformer 3：Sine and cosine encoders 4：Provincial line UVW encoder	0	×
P1-30	ABZ incremental encoder phase sequence	0：Forward 1：Reverse	0	×
P1-31	Encoder installation angle	0.0～359.9°	0.0°	×
P1-32	Reserve	0	0	×
P1-33	Reserve	0	0	×
P1-34	Number of pole pairs of rotary transformers	1～65535	1	×
P1-36	Speed feedback PG disconnection Detection time	0.0：on operation 0.1s～10.0s	0.0	×
P1-37	Auto tuning mode selection	0: no operation 1: Asynchronous motor still tunes 2: Asynchronous motor complete tuning 11: Synchronous motor tuning with load 12: Synchronous motor with no-load	0	×

		tuning		
P2 group The first motor vector control parameters				
P2-00	Speed loop proportional gain 1	1～100	30	√
P2-01	Speed loop integral time 1	0.01s～10.00s	0.50s	√
P2-02	Switching frequency 1	0.00～P2-05	5.00Hz	√
P2-03	Speed loop proportional gain 2	1～100	20	√
P2-04	Speed loop integral time 2	0.01s～10.00s	1.00s	√
P2-05	Switching frequency 2	P2-02～Maximum frequency	10.00Hz	√
P2-06	Slip compensation coefficient	50%～200%	100%	√
P2-07	Speed loop filter time constant	0.000s～0.100s	0.000s	√
P2-08	Vector control over excitation gain	0～200	64	√
P2-09	Upper limit of torque source selection in speed control mode	0：set by P2-10 1：AI1 2：AI2 3：Potentiometer of keypad 4：PULSE train 5：communication 6：MIN(AI1,AI2) 7：MAX(AI1,AI2) The full range of 1-7 option is correspond to P2-10	0	√
P2-10	Upper limit of torque digital setting in speed control mode	0.0%～200.0%	150.0%	√
P2-13	Excitation adjustment proportional gain	0～60000	2000	√
P2-14	Excitation adjustment integral gain	0～60000	1300	√
P2-15	Torque adjustment proportional gain	0～60000	2000	√
P2-16	Torque adjustment integral gain	0～60000	1300	√
P2-17	Speed loop integral attribute	Bit: integral separation 0：Disable 1：Valid	0	√
P2-18	Synchronous motor weak magnetic mode	0: weak magnetic 1: Direct calculation mode 2: Auto adjustment mode	1	√
P2-19	Synchronous magnetic weak depth	50%～500%	100%	√

P2-20	Maximum weak magnetic current	1%～300%	50%	√
P2-21	Weak magnetic auto adjusting gain	10%～500%	100%	√
P2-22	Weak magnetic integral factor	2～10	2	√
P3 group V/F control parameters				
P3-00	VF curve setting	0：Linear V / F curve 1：Multi-point V / F curve 2：Square V / F curve 3: 1.2 power V / F 4: 1.4 power V / F 6: 1.6 power V/F 8: 1.8 power V/f 10: VF completely separation mode 1 11:VF Semi-separated separation mode 2	0	×
P3-01	Torque booster	0.0%：（Automatic torque boost） 0.1%～30.0%	Per model	√
P3-02	Torque boost cut-off frequency	0.00Hz～Maximum frequency	50.00Hz	×
P3-03	Multipoint VF frequency point 1	0.00Hz～P3-05	0.00Hz	×
P3-04	Multipoint VF voltage point 1	0.0%～100.0%	0.0%	×
P3-05	Multipoint VF frequency point 2	P3-03～P3-07	0.00Hz	×
P3-06	Multipoint VF voltage point 2	0.0%～100.0%	0.0%	×
P3-07	Multipoint VF frequency point 3	P3-05～Motor rated frequency(F1-04)	0.00Hz	×
P3-08	Multipoint VF voltage point 3	0.0%～100.0%	0.0%	×
P3-09	VF Slip compensation gain coefficient	0.0%～200.0%	100.0%	√
P3-10	VF over excitation gain	0～200	100	√
P3-11	VF oscillation suppression gain	0～100	50	√
P3-13	VF separate voltage source	0： set by digital（F3-14） 1：AI1 2：AI2 3：Potentiometer of keypad 4：PULSE train（DI5） 5：Multiple speed command 6：Simple PLC 7：PID 8：Communication Note: 100.0% corresponds to the	0	√

		motor rated voltage		
P3-14	VF separate voltage digital setting	0V～Rated motor voltage	0V	√
P3-15	acceleration time of VF separate	0.0s～1000.0s Note: Indicates the deceleration time when 0V changes to the motor rated voltage	0.0s	√
P4 group Input terminals				
P4-00	**DI1 terminals function selection**	0： no operation 1: Forward running or running command 2: Reverse running REV or forward/reverse running direction selection (note: when set for 1 or 2 parameter, please reference to P4-11 function introduction) 3: 3 line control mode 4: Forward Jog（FJOG） 5: Reverse Jog（RJOG） 6: Terminal UP 7: Terminal DOWN **8: Free stop** **9: Fault reset（RESET）** **10: Run pause** 11: External fault normal open input 12: Multiple step terminals 1 13: Multiple step terminals 2 14: Multiple step terminals 3 15: Multiple step terminals 4 16: Acceleration/ deceleration selection terminals 1 17: Acceleration/ deceleration selection terminals 2 18: Frequency source switch 19: UP/DOWN setting reset (terminals or keypad) 20: Running command terminals switch 21: Acceleration/deceleration forbidden 22: PID pause 23： PLC status reset 24: Swing frequency pause 25: Counter input 26: Counter reset 27: length counting input 28: length reset	1	×
P4-01	**DI2 terminals function selection**		4	×
P4-02	**DI3 terminals function selection**		9	×
P4-03	DI4 terminals function selection		12	×
P4-04	DI5 terminals function selection		13	×
P4-05	Reserve		0	×
P4-06	Reserve		0	×
P4-07	Reserve		0	×
P4-08	Reserve		0	×
P4-09	Reserve		0	×

		29: Torque control forbidden 30: PULSE train frequency input (only for DI5 valid) 31: Reserve 32: Starting DC braking 33: External fault normal close input 34: Frequency change enable 35: Change PID direction 36: External parking terminal 1 37: Control commands switchover terminal 2 38: PID integral pause 39: Switcover between frequency source X and preset frequency 40: Switcover between frequency source Y and preset frequency 41: Motor selection terminals 1 42: Motor selection terminals 2 43: PID paramater switchover 44: User define fault 1 45: User define fault 2 46: Speed control /Torque control swithover 47: Emergency stop 48: External parking terminal 2 49: DC braking in deceleration 50: current running time res **51: Water tank fulling detect 1** **52: Water tank fulling detect 2** **(Install a height place aside from water fulling leveling to form a water fulling detection hysteresis.)** **53: MPPT tracking stop/ solar pump control disable.**		
P4-10	DI filter time	0.000s～1.000s	0.010s	√
P4-11	Terminals command mode	0: Two line control 1 1: Two line control 2 2: 3 line control 1 3: 3 line control 2	0	×
P4-12	Terminals UP/DOWN Change ratio	0.001Hz/s～65.535Hz/s	1.00Hz/s	√
P4-13	AI curve 1 minimum input	0.00V～P4-15	0.00V	√
P4-14	AI curve 1 minimum input corresponding	-100.0%～+100.0%	0.0%	√

	setting			
P4-15	AI curve 1 Max. input	P4-13～+10.00V	10.00V	√
P4-16	AI curve 1 Max input corresponding setting	-100.0%～+100.0%	100.0%	√
P4-17	AI1 filter time	0.00s～10.00s	0.10s	√
P4-18	AI curve 2 minimum input	0.00V～P4-20	0.00V	√
P4-19	AI curve 2 minimum input corresponding setting	-100.0%～+100.0%	0.0%	√
P4-20	AI curve 2 Max. input	P4-18～+10.00V	10.00V	√
P4-21	AI curve 2 Max input corresponding setting	-100.0%～+100.0%	100.0%	√
P4-22	AI2 filter time	0.00s～10.00s	0.10s	√
P4-23	AI curve 3 minimum input	-10.00V～P4-25	-10.00V	√
P4-24	AI curve 3 minimum input corresponding setting	-100.0%～+100.0%	-100.0%	√
P4-25	AI curve 3 Max. input	P4-23～+10.00V	10.00V	√
P4-26	AI curve 3 Max input corresponding setting	-100.0%～+100.0%	100.0%	√
P4-27	AI3 filter time	0.00s～10.00s	0.10s	√
P4-28	PULSE Min. input	0.00kHz～P4-30	0.00kHz	√
P4-29	PULSE Min. input corresponding setting	-100.0%～100.0%	0.0%	√
P4-30	PULSE Maximum input	P4-28～100.00kHz	50.00kHz	√
P4-31	PULSE Max. Input corresponding setting	-100.0%～100.0%	100.0%	√
P4-32	PULSE filter time	0.00s～10.00s	0.10s	√
P4-33	AI Curve selection	Units' digit：AI1 curve selection 1: Curve 1（2 point, see P4-13～P4-16） 2: Curve 2（2 point, see P4-18～P4-21） 3: Curve 3 (2 point, see P4-23～F4-26) 4: Curve 4（4 point, seeA6-00～A6-07） 5: Curve 5（4 point, see A6-08～A6-15） Ten's digit：AI2 curve selection，as above Hundred's digit: Curve set by potentiometer of keypad, as above	321	√

P4-34	When AI input is less than minimum setting selection	Units' digit: AI 1 is less than minimum input Set selection 0: Corresponds to the minimum input setting 1:0.0% Ten's digit: A2 is less than minimum input Set selection, as above Hundred's digit: Potentiometer less than Min. Input selection, as above	000	√
P4-35	DI1 Relay time	0.0s～3600.0s	0.0s	×
P4-36	DI2 Relay time	0.0s～3600.0s	0.0s	×
P4-37	DI3 Relay time	0.0s～3600.0s	0.0s	×
P4-38	DI terminal effective mode choose 1	0： Enable in High level 1： Enable in low level Digits： DI1 Ten's： DI2 Hundred's: DI3 Thousand's:DI4 Ten thousand's: DI5	00000	×
P4-39	DI terminal effective mode choose 2	0： Enable in High level 1： Enable in low level Digits： DI6 Ten's： DI7 Hundred's: DI8 Thousand's: DI9 Ten thousand's: DI10	00000	×
P5 Group Output terminals				
P5-00	FM terminals output mode selection	0: High speed pulse output (FMP) 1: Digital output (FMR)	0	√
P5-01	FMR output function selection	0: No output 1: Frequency inverter running 2: Fault output (Free stop fault) 3: FDT1 Frequency level detect output 4:Frequency reach 5: Zero speed running (no output when stop) 6: Motor overload pre-alarm 7: Inverter overload pre-alarm 8: Preset counting reach 9: Specify counting reach 10: Length reach 11: PLC cycle running finish 12: Cumulative run time arrives 13: Frequency limit	0	√
P5-02	Relay 1 function selection		2	√
P5-03	Relay 2 function selection		0	√
P5-04	DO1 output function selection		1	√
P5-05	Extension card DO2 Output selection		4	√

		14: Torque limit 15: Ready to run 16: AI1>AI2 17: Upper limit frequency arrives 18: Lower limit frequency arrives (relative to running) 17: Upper limit frequency arrives 18: Lower limit frequency arrives 19: Under voltage status output 20: Communication setting 21: Positioning finish (reserve) 22: Positioning approach (Reserve) 23: Zero speed running 2(output when in stop as well) 24: Accumulated power up time arrives 25: Frequency level detection FDT2 output 26: Output when frequency 1 reaches 27: Output when frequency 2 reaches 28: Output when current 1 reaches 29: Output when current 2 reaches 30: Output when timing up 31: AI1 input over limit 32: Under loading 33: reverse running 34: Zero current state 35: Module temperature arrives 36: Output current is exceeded 37: Lower frequency arrival (output when stop as well) 38: Alarm output (all faults) 39: Motor over temperature warning 40: Current running time arrives 41: Fault output (for free stop failure and under voltage is not output)		
P5-06	FMP output function selection	0: Running frequency 1: Setting frequency 2: Output current 3: Output torque (Absolute value of torque) 4: Output power 5: Output voltage 6: Pulse input (100% corresponds to 100.0Hz) 7: AI1 8: AI2	0	√
P5-07	AO1 output function selection		0	√
P5-08	AO2 output function selection		1	√

		9: Keyboard potentiometer 10: Length 11: Count value 12: Communication settings 13: Motor speed 14: Output current (100.0% corresponds to 1000.0A) 15: Output voltage (100.0% corresponds to 1000.0V) 16: Output torque (torque actual value)		
P5-09	FMP maximum frequency	0.01kHz～100.00kHz	50.00kHz	√
P5-10	AO1 zero bias coefficient	-100.0%～+100.0%	0.0%	√
P5-11	AO1 gain	-10.00～+10.00	1.00	√
P5-12	AO2 zero bias	-100.0%～+100.0%	0.0%	√
P5-13	AO2 gain	-10.00～+10.00	1.00	√
P5-17	FMR output relay time	0.0s～3600.0s	0.0s	√
P5-18	RELAY1 output relay time	0.0s～3600.0s	0.0s	√
P5-19	RELAY2 output relay time	0.0s～3600.0s	0.0s	√
P5-20	DO1 output relay time	0.0s～3600.0s	0.0s	√
P5-21	DO2 output relay time	0.0s～3600.0s	0.0s	√
P5-22	DO output terminal valid state selection	0: Positive logic 1: Negative logic Bits: FMR Ten's bit: RELAY1 Hundreds's bit: RELAY2 Thousands's bits: DO1 Ten thousands's bit;s: DO2	00000	√
P6 Group start and stop control				
P6-00	Starting mode	0: Directly start 1: start after speed tracking 2: Pre-excitation start (AC asynchronous machine)-	0	√
P6-01	Speed tracking mode	00: starts from stop frequency 1: starts at zero speed 2: Starting from the maximum frequency	0	×
P6-02	The speed of speed	1～100	20	√

	tracking			
P6-03	**Starting speed**	**0.00Hz～10.00Hz**	**0.00Hz**	**√**
P6-04	Starting speed keeping time	0.0s～100.0s	0.0s	×
P6-05	Start DC braking current / pre-excitation current	0%～100%	0%	×
P6-06	Start DC braking time / pre-excitation time	0.0s～100.0s	0.0s	×
P6-07	Acceleration and deceleration mode	0: Linear acceleration / deceleration 1: S curve acceleration / deceleration A 2: S curve acceleration and deceleration B	0	×
P6-08	S curve starting section time ratio	0.0%～(100.0%-P6-09)	30.0%	×
P6-09	S curve finishing section time ratio	0.0%～(100.0%-P6-08)	30.0%	×
P6-10	Stop mode	0: Deceleration stop 1: free parking	0	√
P6-11	start frequency when in stop with DC braking	0.00Hz～Maximum frequency	0.00Hz	√
P6-12	Waiting time of stop with DC braking	0.0s～100.0s	0.0s	√
P6-13	Braking current when Stop with DC braking	0%～100%	0%	√
P6-14	DC braking time when stop	0.0s～100.0s	0.0s	√
P6-15	Brake usage ratio	0%～100%	100%	√
P7 Group keyboard and display				
P7-01	**MF.K function button option**	**0: MF.K is invalid** **1: Switchover between Operation panel command channel and remote command channel (terminal command channel or communication command channel)** **2: Forward and reverse switching** **3: Forward Jog** **4: Reverse Jog**	**0**	×
P7-02	**STOP/RESET function**	**0: STOP/RES button enable only in operation panel control mode** **1: STOP/RES button enable in any control mode**	**1**	**√**
P7-03	LED display parameters	0000～FFFF	1F	√

	1 in running mode	Bit00: Running frequency 1(Hz) Bit01: Setting frequency (Hz) Bit02: DC bus voltage (V) Bit03: Output voltage (V) Bit04: Output current (A) Bit05: Output power (KW) Bit06: Output torque (%) Bit07: DI input status Bit08: DO output status Bit09: AI1 voltage (V) Bit10: AI2 voltage (V) Bit11: Voltage of potentiometer(V) Bit12: Counting Bit13: Length Bit14: Load speed display Bit15: PID setting		
P7-04	LED display parameters 2 in running mode	0000～FFFF Bit00: PID feedback Bit01: PLC stage Bit02: PULSE input pulse train frequency （kHz） Bit03: Running frequency 2（Hz） Bit04: Rest running time Bit05: AI1 before correction voltage (V) Bit06: AI2 before correction voltage (V) Bit07: operation panel potentiometer before correction voltage (V) Bit08: Line speed Bit09: Current power-on time (Hour) Bit10: Current running time (Min) Bit11: PULSE train input pulse frequency (Hz) Bit12: Communication setpoint Bit13: Encoder feedback speed (Hz) Bit14: Main frequency X display (Hz) Bit15: Auxiliary Frequency Y Display (Hz)	0	√
P7-05	LED display in stop mode	0000 ~ FFFF Bit00: Set frequency (Hz) Bit01: Bus voltage (V) Bit02: DI input status Bit03: DO output status Bit04: AI1 voltage (V) Bit05: AI2 voltage (V) Bit06: Operation panelpotentiometer voltage (V)	33	√

		Bit07: Count value Bit08: Length value Bit09: PLC stage Bit10: Load speed Bit11: PID setting Bit12: PULSE train input pulse frequency (kHz)）		
P7-06	Load speed display factor	0.0001～6.5000	1.0000	√
P7-07	Heat sink of Inverter IGBT model temperature	0.0℃～100.0℃	-	●
P7-08	Heat sink of Inverter Rectifier temperature	0.0℃～100.0℃	-	●
P7-09	Cumulative run time	0h～65535h	-	●
P7-10	Products serial No.	-	-	●
P7-11	Software version No.	-	-	●
P7-12	The number of decimal places of load speed Displays	0: 0 decimal places 1: 1 decimal place 2: 2 decimal places 3: 3 decimal places	1	√
P7-13	Accumulated time since power on	0～65535 hour	-	●
P7-14	Cumulative power consumption	0～65535 KWh	-	●
P8 group Auxiliary function				
P8-00	Jog running frequency	0.00Hz～Maximum frequency	2.00Hz	√
P8-01	Jog acceleration	0.0s～6500.0s	20.0s	√
P8-02	Jog deceleration	0.0s～6500.0s	20.0s	√
P8-03	Acceleration time 2	0.0s～6500.0s	Per model	√
P8-04	Deceleration time 2	0.0s～6500.0s	Per model	√
P8-05	Acceleration time 3	0.0s～6500.0s	Per model	√
P8-06	Deceleration time 3	0.0s～6500.0s	Per model	√
P8-07	Acceleration time 4	0.0s～6500.0s	Per model	√
P8-08	Deceleration time 4	0.0s～6500.0s	Per model	√

P8-09	Jumping frequency 1	0.00Hz～Maximum frequency	0.00Hz	√
P8-10	Jumping frequency 2	0.00Hz～Maximum frequency	0.00Hz	√
P8-11	Jump frequency range	0.00Hz～Maximum frequency	0.01Hz	√
P8-12	Dead zone time of forward to reverse	0.0s～3000.0s	0.0s	√
P8-13	Reverse running enable	0: Allow 1: Forbidden	0	√
P8-14	Running mode when setting frequency is less than the lower limit frequency	0: Run at lower limit frequency 1: stop 2: Zero speed running	0	√
P8-15	Drop control	0.00Hz～10.00Hz	0.00Hz	√
P8-16	Set the cumulative power-up arrival time	0h～65000h	0h	√
P8-17	Set the cumulative running arrival time	0h～65000h	0h	√
P8-18	**Start protection selection**	**0: Disable 1: Enable**	**0**	**√**
P8-19	Frequency detection value (FDT1)	0.00Hz～Maximum frequency	50.00Hz	√
P8-20	Frequency detection hysteresis (FDT1)	0.0%～100.0%（FDT1 voltage level）	5.0%	√
P8-21	Frequency arrival detection amplitude	0.0%～100.0%（Maximum frequency ）	0.0%	√
P8-22	Whether the jump frequency is valid during acceleration / deceleration	0: Invalid 1: Valid	0	√
P8-25	Swtich over point between acceleration time 1 to acceleration time 2	0.00Hz～Maximum frequency	0.00Hz	√
P8-26	Swtich over point between deceleration time 1 to deceleration time 2	0.00Hz～Maximum frequency	0.00Hz	√
P8-27	Terminal control prior	0 : Invalid 1: Valid	0	√
P8-28	Frequency detection value (FDT2)	0.00Hz～Maximum frequency	50.00Hz	√
P8-29	Frequency detection	0.0%～100.0%（FDT2 voltage level）	5.0%	√

	hysteresis (FDT2)			
P8-30	Any arrival frequency detection value 1	0.00Hz～Maximum frequency	50.00Hz	√
P8-31	Any arrival frequency detection amplitude 1	0.0%～100.0%（Maximum frequency）	0.0%	√
P8-32	Any arrival frequency detection value 2	0.00Hz～Maximum frequency	50.00Hz	√
P8-33	Any arrival frequency detection amplitude 2	0.0%～100.0%（Maximum frequency）	0.0%	√
P8-34	Zero current detection level	0.0%～300.0% 100.0% corresponds to the motor rated current	5.0%	√
P8-35	Zero current detection delay time	0.01s～600.00s	0.10s	√
P8-36	Output current over limit	0.0%（No detect） 0.1%～300.0%（Rated current）	200.0%	√
P8-37	Output current over limit detect relay time	0.00s～600.00s	0.00s	√
P8-38	Any arrival current 1	0.0%～300.0%(Motor rated current)	100.0%	√
P8-39	Any arrival current 1 detect amplitude	0.0%～300.0% (Motor rated current)	0.0%	√
P8-40	Any arrival current 2	0.0%～300.0% (Motor rated current)	100.0%	√
P8-41	Any arrival current 2 detect amplitude	0.0%～300.0% (Motor rated current)	0.0%	√
P8-42	Timing function selection	0: Invalid 1: Valid	0	√
P8-43	Timing of run time selection	0: Set by P8-44 1: AI1 2: AI2 3: Potentiometer of operation panel The range of analog input corresponds to P8-44	0	√
P8-44	Timing value setting of running time	0.0Min～6500.0Min	0.0Min	√
P8-45	Lower limit of AI1 input voltage protection	0.00V～P8-46	3.10V	√
P8-46	Upper limit of AI1 input voltage protection	P8-45～10.00V	6.80V	√
P8-47	IGBT Module temperature arrives	0℃～100℃	75℃	√
P8-48	Cooling fan control	0: Working in running	0	√

		1: Working after power up		
P8-49	Wake up frequency	Sleep frequency (P8-51)～Maximum（P0-10)	0.00Hz	√
P8-50	Wake up delay time	0.0s～6500.0s	0.0s	√
P8-51	Sleep frequency	0.00Hz～Wake up frequency （P8-49)	0.00Hz	√
P8-52	Sleep relay time	0.0s～6500.0s	0.0s	√
P8-53	Current running arrival time setting	0.0～6500.0 mins	0.0Min	√
P9 group Fault and protection				
P9-00	**Motor overload protection selection**	**0: Prohibited 1: Allow**	**1**	**√**
P9-01	Motor overload protection gain	0.20～10.00	1.00	√
P9-02	Motor overload pre-warning coefficient	50%～100%	80%	√
P9-03	Overvoltage stall gain	0～100	100	√
P9-04	Overvoltage stall protection voltage	120%～150%	135%	√
P9-05	Over-current stall gain	0～100	20	√
P9-06	Overcurrent stall protection current	100%～200%	150%	√
P9-07	Ground short circuit protection options when power on	0: Invalid 1: Valid	1	√
P9-09	**Number of automatic reset times**	**0～20**	**0**	**√**
P9-10	DO (digital output) when fault alarm auto reset	0: No action 1: Action	0	√
P9-11	Fault auto reset interval time	0.1s～100.0s	1.0s	√
P9-12	Input phase loss/ contactor pull protection selection	Bit: Input phase loss protection selection Ten: Contactor pull protection options 0: Prohibited 1: Allow	11	√
P9-13	Output phase loss protection	0: Prohibited 1: Allow	1	√
P9-14	First failure alarm type	0: No fault 1: Reserved 2: Over current in acceleration	—	●

		3: Over current in deceleration 4: Over current in constant speed during 5: Over voltage in acceleration 6: Over voltage in deceleration 7: Over voltage in constant speed during 8: Buffer resistance overload 9: Under voltage 10: Inverter overload 11: Motor overload 12: Input phase loss		
P9-15	Second fault alarm type	13: Output phase loss 14: Igbt Module overheating 15: External fault 16: Communication error 17: Contactor is abnormal 18: Current detection is abnormal 19: Motor tuning abnormal 20: Encoder / PG card is abnormal 21: Parameter read and write exception 22: Inverter hardware abnormality 23: Motor to ground short circuit 24: Reserved 25: Reserved	—	●
P9-16	The third (latest one) type of failure	26: Running time arrives 27: User defined fault 1 28: user defined fault 2 29: Power-up time arrives 30: Under load 31: PID feedback is missing in running 40: Fast current limit timeout 41:Motor switch in running 42: The speed deviation is too big 43: Motor over speed 45: Motor overtemperature 51: Initial position error	—	●
P9-17	Frequency at when the third (last) failure frequency	—	—	●
P9-18	Current at when the third (last) failure frequency	—	—	●
P9-19	DC bus voltage at when the third (last) failure	—	—	●

	frequency			
P9-20	Input terminals status at when the third (last) failure frequency	—	—	●
P9-21	Output terminals status at when the third (last) failure frequency	—	—	●
P9-22	Inverter status when the third (last) failure frequency	—	—	●
P9-23	Power up time when the third (last) failure frequency	—	—	●
P9-24	Running time when the third (last) failure frequency	—	—	●
P9-27	Frequency at when the second failure	—	—	●
P9-28	Current at when the second failure	—	—	●
P9-29	DC bus voltage at when the second failure	—	—	●
P9-30	Input terminals status at when the second failure	—	—	●
P9-31	Output terminals status at when the second failure	—	—	●
P9-32	Inverter status at when the second failure	—	—	●
P9-33	Power up time when the second failure	—	—	●
P9-34	Running time when the second failure	—	—	●
P9-37	Frequency at when the third failure	—	—	●
P9-38	Current at when the third failure	—	—	●
P9-39	DC bus voltage at when the third failure	—	—	●

P9-40	Input terminals status at when the third failure	—	—	●
P9-41	Output terminals status at when the third failure	—	—	●
P9-42	Inverter status at when the third failure	—	—	●
P9-43	Power up time when the third failure	—	—	●
P9-44	Running time when the third failure	—	—	●
P9-47	Fault protection action selection 1	Bit: Motor overload (11) 0: Free stop 1: Stop by stop mode setting 2: Continue to run Ten: Input missing (12) Hundreds: Output phase loss (13) Thousands of bits: external failure (15) Million: communication anomaly (16)	00000	√
P9-48	Fault protection action selection 3	Bit: Encoder / PG card exception (20) 0: Free stop Ten: Function code read and write exception (21) 0: Free stop 1: Stop by stop mode setting Hundred places: reserved Thousands: Motor overheating (25) Million: run time arrival (26)	00000	√
P9-49	Fault protection action selection 3	Bit: User defined fault 1 (27) 0: Free stop 1: Stop by stop mode 2: Continue to run Ten: User Defined Fault 2 (28) 0: Free Stop 1: Stop by stop mode 2: Continue to run Hundreds: Power-up time arrives (29) 0: Free stop 1: Stop by stop mode 2: Continue to run Thousands of bits: (30)	00000	√

		0: Free stop 1: Deceleration stop 2:Skip to 7% of the rated motor frequency to continue running, restore to run with setting frequency after no missing load Million: PID feedback lost in running (31) 0: Free parking 1: Stop by stop mode 2: Continue to run		
P9-50	Fault protection action selection 4	Bit: the speed deviation is too large (42) 0: Free stop 1: Stop by stop mode 2: Continue to run Ten: Motor over speed (43) Hundred places: initial position error (51)	00000	√
P9-54	Running frequency of continue running when fault alarm	0: Run at the current operating frequency 1: Run at set frequency 2: Run at the upper limit frequency 3: Run at the lower limit frequency 4: Run at an abnormal standby frequency	0	√
P9-55	An abnormal standby frequency	0.0%～100.0% (100.0% corresponds to the maximum frequency P0-10)	100.0%	√
P9-56	Motor temperature sensor type	0: No temperature sensor 1：PT100 2：PT1000	0	√
P9-57	Motor overheat protection threshold	0℃～200℃	110℃	√
P9-58	otor overheat pre-warning threshold	0℃～200℃	90℃	√
P9-59	Working action of Instantaneous power fail selection	0: Invalid 1: Deceleration 2: Deceleration stop	0	√
P9-60	Judgment voltage of instantaneous power fail pause	80.0%～100.0%	90.0%	√
P9-61	Voltage recovery judgment time when instantaneous power fail	0.00s～100.00s	0.50s	√
P9-62	Judgment voltage of instantaneous power	60.0%～100.0%(Standard bus voltage)	80.0%	√

	failure action			
P9-63	Load miss protection	0: Disable 1: Enable	0	√
P9-64	Load miss detection level	0.0～100.0%	10.0%	√
P9-65	Load miss detection time	0.0～60.0s	1.0s	√
P9-67	Over speed detection	0.0%～50.0%(Max frequency)	20.0%	√
P9-68	Over speed detection time	0.0s: No detect 0.1～60.0s	1.0s	√
P9-69	Detection value of the speed deviation is too big	0.0%～50.0%(Max frequency)	20.0%	√
P9-70	Detection time of speed deviation is too big.	0.0s: No detect 0.1～60.0s	5.0s	√
PA Group PID function				
PA-00	PID reference source	0: PA-01 1: AI1 2: AI2 3: Keyboard potentiometer 4: PULSE train setting (DI5) 5: Communication reference 6: Multi-step instructions reference	0	√
PA-01	PID value setting	0.0%～100.0%	50.0%	√
PA-02	PID feedback source	0： AI1 1: AI2 2: Keyboard potentiometer 3: AI1-AI2 4: PULSE pulse setting (DI5) 5: Communication reference 6: AI1 + AI2 7: MAX (| AI1 |, | AI2 |) 8: MIN (| AI1 |, | AI2 |)	0	√
PA-03	PID working direction	0: Positive effect 1: Reverse effect	0	√
PA-04	PID reference feedback range	0～65535	1000	√
PA-05	Proportional gain Kp1	0.0～100.0	20.0	√
PA-06	Integral time Ti1	0.01s～10.00s	2.00s	√

PA-07	Differential time Td1	0.000s～10.000s	0.000s	√
PA-08	PID reversal cutoff frequency	0.00～Maximum frequency	2.00Hz	√
PA-09	PID deviation limit	0.0%～100.0%	0.0%	√
PA-10	PID differential limiting	0.00%～100.00%	0.10%	√
PA-11	PID reference given change time	0.00～650.00s	0.00s	√
PA-12	PID feedback filter time	0.00～60.00s	0.00s	√
PA-13	PID output filter time	0.00～60.00s	0.00s	√
PA-14	Reserve	-	-	√
PA-15	Proportional gain Kp2	0.0～100.0	20.0	√
PA-16	Integral time Ti2	0.01s～10.00s	2.00s	√
PA-17	Derivative time Td2	0.000s～10.000s	0.000s	√
PA-18	PID parameter switching condition	0: Do not switch 1: Switch via DI terminal 2: Automatic switching according to the deviation	0	√
PA-19	PID parameter switching deviation 1	0.0%～PA-20	20.0%	√
PA-20	PID parameter switching deviation 2	FA-19～100.0%	80.0%	√
PA-21	PID initial value	0.0%～100.0%	0.0%	√
PA-22	PID initial value hold time	0.00～650.00s	0.00s	√
PA-23	The maximum value of positive deviations for two output	0.00%～100.00%	1.00%	√
PA-24	The maximum value of reverse deviations for two output	0.00%～100.00%	1.00%	√
PA-25	PID integral property	Bit: Integral separation 0: Invalid 1: Valid Ten:Whether to stop the integral working after outputting to the limit 0: Continue integral working 1: Stop integral working	00	√
PA-26	PID feedback loss detection value	0.0%:Do not judge feedback loss 0.1%～100.0%	0.0%	√

PA-27	PID Feedback loss detection time	0.0s～20.0s	0.0s	√
PA-28	PID calculating when stop	0： Don't execute calculating when stop 1: Execute PID calculating when stop	0	√
PB Group Wobble, Length and Count				
Pb-00	Wobble setting mode	0: Relative to center frequency 1: Relative to maximum frequency	0	√
Pb-01	Wobble amplitude	0.0%～100.0%	0.0%	√
Pb-02	Sudden jump frequency range	0.0%～50.0%	0.0%	√
Pb-03	Wobble cycle	0.1s～3000.0s	10.0s	√
Pb-04	Wobble of the triangular wave rise time	0.1%～100.0%	50.0%	√
Pb-05	Set length	0m～65535m	1000m	√
Pb-06	Actual length	0m～65535m	0m	√
Pb-07	Number of pulses per meter	0.1～6553.5	100.0	√
Pb-08	Set the count value	1～65535	1000	√
Pb-09	Specify the count value	1～65535	1000	√
PC Group multi-step instructions, simple PLC				
PC-00	Multi - step instructions 0	-100.0%～100.0%	0.0%	√
PC-01	Multi - step instructions 1	-100.0%～100.0%	0.0%	√
PC-02	Multi - step instructions 2	-100.0%～100.0%	0.0%	√
PC-03	Multi - step instructions 3	-100.0%～100.0%	0.0%	√
PC-04	Multi - step instructions 4	-100.0%～100.0%	0.0%	√
PC-05	Multi - step instructions 5	-100.0%～100.0%	0.0%	√
PC-06	Multi - step instructions 6	-100.0%～100.0%	0.0%	√
PC-07	Multi - step instructions 7	-100.0%～100.0%	0.0%	√
PC-08	Multi - step instructions 8	-100.0%～100.0%	0.0%	√
PC-09	Multi - step instructions 9	-100.0%～100.0%	0.0%	√
PC-10	Multi - step instructions 10	-100.0%～100.0%	0.0%	√
PC-11	Multi - step instructions 11	-100.0%～100.0%	0.0%	√
PC-12	Multi - step instructions 12	-100.0%～100.0%	0.0%	√
PC-13	Multi - step instructions 13	-100.0%～100.0%	0.0%	√
PC-14	Multi - step instructions 14	-100.0%～100.0%	0.0%	√
PC-15	Multi - step instructions 15	-100.0%～100.0%	0.0%	√
PC-16	Simple PLC running mode	0: Single run to end and stop 1: Single run to end and keep final value	0	√

		2: Continue to run in loop		
PC-17	Simple PLC power loss memory selection	Bit: Power off memory options 0: No memory power-off 1: Power off memory Ten: Stop memory selection 0: Stop no memory 1: Stop memory	00	√
PC-18	Simple PLC 0 step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-19	Accel/Decel time selection of 0 step of simple PLC	0～3	0	√
PC-20	Simple PLC 1st step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-21	Accel/Decel time selection of 1st step of simple PLC	0～3	0	√
PC-22	Simple PLC 2nd step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-23	Accel/Decel time selection of 2nd step of simple PLC	0～3	0	√
PC-24	Simple PLC 3rd step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-25	Accel/Decel time selection of 3rd step of simple PLC	0～3	0	√
PC-26	Simple PLC 4th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-27	Accel/Decel time selection of 4th step of simple PLC	0～3	0	√
PC-28	Simple PLC 5th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-29	Accel/Decel time selection of 5th step of simple PLC	0～3	0	√
PC-30	Simple PLC 6th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-31	Accel/Decel time selection of 6th step of simple PLC	0～3	0	√
PC-32	Simple PLC 7th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-33	Accel/Decel time selection of 7th step of simple PLC	0～3	0	√
PC-34	Simple PLC 8th step running time	0.0s(h)～6553.5s(h)	0.0s(h)	√
PC-35	Accel/Decel time selection of 8th step of simple PLC	0～3	0	√
PC-36	Simple PLC 9th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-37	Accel/Decel time selection of 9th step of simple PLC	0～3	0	√
PC-38	Simple PLC 10th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√

PC-39	Accel/Decel time selection of 10th step of simple PLC	0～3	0	√
PC-40	Simple PLC 11th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-41	Accel/Decel time selection of 11th step of simple PLC	0～3	0	√
PC-42	Simple PLC 12th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-43	Accel/Decel time selection of 12th step of simple PLC	0～3	0	√
PC-44	Simple PLC 13th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-45	Accel/Decel time selection of 13th step of simple PLC	0～3	0	√
PC-46	Simple PLC 14th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-47	Accel/Decel time selection of 14th step of simple PLC	0～3	0	√
PC-48	Simple PLC 15th step running time	0.0s(h)～6553.5s(h)	0.0s/h	√
PC-49	Accel/Decel time selection of 15th step of simple PLC	0～3	0	√
PC-50	Simple PLC run time unit	0：s（2） 1：h（hour）	0	√
PC-51	Multi-step instruction 0 step given mode	0: set by FC-00 1：AI1 2：AI2 3: Keyboard potentiometer 4: PULSE train 5: PID 6: Preset frequency (F0-08) is given, UP / DOWN can be modified	0	√
Pd Group communication				
Pd-00	Communication baud rate	bit：MODBUS 0：300BPS 1：600BPS 2：1200BPS 3：2400BPS 4：4800BPS 5：9600BPS 6：19200BPS 7：38400BPS 8：57600BPS 9：115200BPS Ten: Profibus-DP	6005	√

		0：115200BPs 1：208300BPs 2：256000BPs 3：512000Bps Hundred places: reserved		
Pd-01	MODBUS data format	0: No parity (8-N-2) 1: Even check (8-E-1) 2: Odd parity (8-O-1) 3: No parity (8-N-1) (MODBUS active)	0	√
Pd-02	Local address	0：Broadcast address 1～249 (MODBUS、Profibus-DP、CANlink enable)	1	√
Pd-03	MODBUS respond relay	0～20ms (MODBUS enable)	2	√
Pd-04	Serial communication timeout	0.0：Disable 0.1～60.0s (MODBUS, Profibus-DP, CANopen enable)	0.0	√
PE group Solar Pump inverter control parameters				
PE-00	Solar pump control mode	0:Disable 1: Enable Terminal controlling of solar pump control disable is priority	1	X
PE-01	Vmpp voltage reference	0: set by manual 1-9: MPPT algorithm automatic tracking	1	√
PE-02	Vmpp voltage setting value	0 - 1000.0V	500.0V /300.0V	√
PE-03	Reserve			
PE-04	CVT Proportional gain 1	0.0% - 999.9%	100.0%	√
PE-05	CVT Integral gain 1	0.0% - 999.9%	100.0%	√
PE-06	CVT Proportional gain 2	0.0% - 999.9%	100.0%	√
PE-07	CVT Integral gain 2	0.0 - 10.0sec	1.0sec	√
PE-08	CVT PI switch over point	0 - 1000.0V	0.0V	√
PE-09	Reserve			
PE-10	Mppt search upper limit voltage	0 - 1000.0V	600.0V /400.0V	√
PE-11	Mppt search lower limit voltage	0 - 1000.0V	300.0V	√

			/200.0V	
PE-12	MPPT search gain	0% - 500%	100%	√
PE-13	MPPT search interval	0.0 - 10.0sec	1.0sec	√
PE-14	Reserve	0	0	
PE-15	Reserve	0	0	
PE-16	Sleep voltage threshold	0.0 - 1000.0V	350.0V /220.0V	√
PE-17	Wake up voltage threshold	0.0 - 1000.0V	400.0V/ 280.0V	√
PE-18	Awake waiting time	0 - 30000sec	60sec	√
PE-19	Stop frequency setting when low speed	0.00Hz ～300.00Hz	10.00Hz	√
PE-20	Detecting time of low frequency protection	0 - 30000sec	10sec	√
PE-21	Low speed protection auto reset delay time	0 - 30000sec	60sec	√
PE-22	Dry run protection detecting current	0.0 - 999.9A	0.0A	√
PE-23	Dry run protection detecting time	0 - 30000sec	10sec	√
PE-24	Dry run protection auto reset relay time	0 - 30000sec	60sec	√
PE-25	Detecting current of over current protection	0.0 - 999.9A	0.0A	√
PE-26	Detecting time of over current protection	0 - 30000sec	10sec	√
PE-27	Over current auto reset delay time	0 - 30000sec	60sec	√
PE-28	Minimum power protection value	0.00kw - 650.00kw	0.00kw	√
PE-29	Detecting time of minimum power protection	0 - 30000sec	10sec	√
PE-30	Minimum power protection auto reset delay time	0 - 30000sec	60sec	√
PE-31	Water tank fulling level detecting method	0:Digital detect 1: AI1 analog 2: AI2 analog	0	√
PE-32	Water fulling level detecting threshold of analog	0 - 100.0%	25.0%	√
PE-33	Water fulling level reach protection detecting time	0 - 30000sec	10sec	√
PE-34	Water fulling level protection exit relay time	0 - 30000sec	60sec	√
PE-35	Water level sensor probe damage threshold	0 - 100.0%	0.0%	√

PE-36	DC current correction factor	0.0 - 200.0%	100.00%	√
PE-37	DC current correction bias	-100.00A - 100.00A	0.00A	√
PE-38	Power point 0 of PQ Current	0.0kw - 999.9kw	0.5kw	√
PE-39	Power point 1 of PQ Current	0.0kw - 999.9kw	1.0kw	√
PE-40	Power point 2 of PQ Current	0.0kw - 999.9kw	1.5kw	√
PE-41	Power point 3 of PQ Current	0.0kw - 999.9kw	2.0kw	√
PE-42	Power point 4 of PQ Current	0.0kw - 999.9kw	2.5kw	√
PE-43	Flow point 0 of PQ curve	0.0 - 999.9m^3/h	0.0 m^3/h	√
PE-44	Flow point 1 of PQ curve	0.0 - 999.9m^3/h	5.0 m^3/h	√
PE-45	Flow point 2 of PQ curve	0.0 - 999.9m^3/h	10.0m^3 /h	√
PE-46	Flow point 3 of PQ curve	0.0 - 999.9m^3/h	15.0m^3 /h	√
PE-47	Flow point 4 of PQ curve	0.0 - 999.9m^3/h	20.0m^3 /h	√
PE-48	Absolute time	0.0 - 23.9hr	0.0Hr	√
PE-49	Refresh time day flow / day generated energy	0.0 - 23.9hr	12.9hr	√
PP Group Function code management				
PP-00	User password	0～65535	0	√
PP-01	Parameter initialization	0: On operation 1: Restore parameters to factory setting except motor parameters 2: Clear record information	0	√
PP-02	Function parameter group display selection	Bit: U group monitoring parameters 0: Not displayed 1: Display Ten: Advanced parameters 0: Not displayed 1: display	01	×
PP-03	Personality parameter group show selection	Bit: User custom parameter group display selection 0: Not displayed 1: Display Ten: User Change Parameter Group Display Selection 0: Not displayed 1: Display	00	√
PP-04	Function code modification	0： Enable modification	0	√

	attribute	1: Not allow to modify		
PP-05	Distributor unlock password	0 - 65535		
PP-06	Factory unlock password	0 - 65535		
PF Distributor password setting				
PF-06	Distributor password setting	0 - 65535		
PF-07	Distributor allow total running time	0 - 65535Hr	Maximum 7.4 Year	

Chapter 8. Solar pump control parameters description

Some parameters description which may relative with solar pump control.

P0-01	Motor control mode		Factory setting	0
	Setting range	0	VF control	
		1	Open loop sensorless vector control	
		2	Close loop sensor vector control with PG card	

0: V/F control

No need install encoder, good compatibility and stable running. Suits for the applications, which no high request for loads, and one drive for more than one motors, and motor auto-tuning cannot be performed or the motor's parameters can be acquired through other methods, such as fans, pumps load.

Always select VF control for solar pump control application for asynchronous motor.

2: Open loop sensorless vector control

Open loop sensorless vector control mode suits for high performance general purpose application without encoder, such as machine, centrifugal machine, drawbench, injection mold machine, etc. one AC drive only allow to service one motor.

3: Close loop sensor vector control with PG card

That is vector control running mode with speed sensor, which is mainly used in the cases such as high accuracy speed control, torque control and simple servo control which have high requirements for control performance. When the control mode is selected, generally, PG should be installed on the motor's terminal, and the PG's parameters should be set up correctly.

P0-02	Running command source		Factory setting	0
	Setting	0	Keyboad/ keypad/ operation panel （LED turn off）	
		1	Terminals control （LED tun ON）	
		2	Communication （LED Flash）	

Solar pump inverter running command source selection.

User can start inverter by keyboard, terminals control or communication.

0: Keypad (operation panel); The running command is given by RUN, STOP, JOG ...by keypad.

1: External terminals; The running command controlled by multiple function terminals. It can achieved to forward, reverse, Jog, reverse running with two lines or three lines control. Refer to P4 input terminals command group. When DI1 and COM is short circuit connection and P4-00 set to 1 (set for forwarder running), the solar pump inverter can start in morning once received enough power from solar arrays automatically and stop at the evening when less of sunshine.

2: communication command

The running command is given by communication, see the communication protocol Pd group description. User must set it for 2 communication mode when GPRS remote controller using.

P0-03	Main frequency reference source		Factory setting	0
	Setting range	0	P0-08，UP/DOWN no memory when power fail	
		1	P0-08，UP/DOWN memory when power up	

		2	AI1
		3	AI2
		4	Potentiometer of keypad
		5	Pulse train (DI5)
		6	Multiple speed step
		7	PLC
		8	PID
		9	Communication

When PE00=0 solar pump control is disable, this parameters will be activated. User can select main frequency reference source by this parameters.

P0-09	Running direction		Factory setting	0
	Setting range	0	In the same direction	
		1	In the opposite direction	

By this parameter setting, User can change the motor running direction without wiring change.

P0-15	Carryier frequency	Factory setting	Per model
	Setting range	0.5kHz～16.0kHz	

It use to adjust the carrier frequency. By adjusting the carrier frequency can reduce the motor noise, to avoid the resonance point of the mechanical system, to reduce the line to ground leakage current and reduce the interference generated by the inverter

When the carrier frequency is low, the output current harmonic component increases, the motor loss increases, the motor temperature rise.

When the carrier frequency is high, the motor loss decreases, the motor temperature decreases, but the inverter loss increases, the inverter temperature increases, interference increases.

Adjusting the carrier frequency affects the following performance:

Carrier frequency	Low → High
Motor noise	Big → Small
Output current waveform	Low → Good
Motor temperature rise	High → Low
Inverter temperature rise	Low → High
Leakage current	Small → Big
External radiation interference	Small → Big

P1-00	Motor type		Factory setting	0
	Setting range	0	General asynchronous motor	
		1	Variable frequency asynchronous motor	
		2	Permanent magnet synchronous motor (PMSM)	
P1-01	Rated power		Factory setting	As per model
	Setting range		0.1KW～1000.0KW	
P1-02	Rated voltage		Factory setting	As per model

	Setting range	1V～2000V	
P1-03	Rated current	Factory setting	As per model
	Setting range	Power of inverter <= 55KW：0.01A～655.35A Power of inverter > 55KW ：0.1A～6553.5A	
P1-04	Rated power	Factory setting	As per model
	Setting range	0.01Hz～Max power of inverter	
P1-05	Rated speed	Factory setting	As per model
	Setting range	1rpm～65535rpm	

User need to set above motor parameters code according to motor nameplate in VF control or vector control mode. To get better vector control. In order to obtain better vector control performance, it is necessary to motor parameters auto tuning, and the accuracy of the adjustment results is closely related to the correct setting of the motor nameplate parameters.

Configure below permanent magnet synchronous motor parameters for perform motor auto tuning.

P1-16	Synchronous motor stator resistance	Factory setting	As per model
	Setting range	Frequency inverter power <= 55KW：0.001Ω～65.535Ω Frequency inverter power > 55KW : 0.0001Ω～6.5535Ω	
P1-17	Synchronous motor D-axis inductance	Factory setting	As per model
	Setting range	Frequency inverter power <= 55KW：0.01mH～655.35mH Frequency inverter power > 55KW: 0.001mH～65.535mH	
P1-18	Synchronous motor Q axis inductance	Factory setting	As per model
	Setting range	Frequency inverter power <= 55KW：0.01mH～655.35mH Frequency inverter power > 55KW: 0.001mH～65.535mH	
P1-20	Synchronous motor back electromotive force	Factory setting	As per model
	Setting range	0.1V～6553.5V	

P1-16 ~ P1-20 is the parameter of the synchronous motor. Some parameters on the nameplate of the synchronous motor will be provided. However, most motor name plates do not provide the above parameters, need to be tuned automatically by the inverter, and must select "synchronous machine no-load tuning " Because "synchronous motor no-load tuning" can get P1-16, P1-17, P1-18, P1-19 these four motor parameters, and "synchronous motor with a load tuning" can only get synchronous encoder encoder phase sequence, Installation angle and other parameters.

When the motor rated power (P1-01) or the motor rated voltage (P1-02) is changed, the inverter will automatically modify the value of P1-16 ~ P1-20.

The above synchronization machine parameters, can also be based on the manufacturer to provide data directly set the corresponding function code.

P1-37	Motor auto tuning		Factory setting	0
	Setting range	0	No operation	
		1	Asynchronous motor static tuning	
		2	Asynchronous motor complete tuning	
		11	Synchronous motor with load tuning	
		12	Synchronous motor with no load tuning	

0: No operation, not allow to do motor auto tuning
1: Asynchronous motor static tuning, suitable for asynchronous motor and load is not easy to disconnect, and can not carry out a complete tuning of the occasion.
Please set motor group parameters P1-00～P1-05 as motor nameplate correctly before asynchronous motor static tuning.P1-06～P1-08 these 3 parameters will be catch after auto tuning.
Auto tuning action: SET P1-37 to 1, and then press RUN keyp, inverter will perform auto tuning
2: Asynchronous motor complete tuning
To ensure the dynamic control performance of the frequency converter, select the complete tuning, the motor must be disconnected from the load to keep the motor empty.
During the complete tuning process, the inverter first performs the static tuning and then accelerates to 80% of the rated frequency of the motor according to the acceleration time P0-17. After a period of time, the inverter stops as P0-18 deceleration time and finish auto tuning.
12: if it is difficult to get nameplate of PMSM, please select PMSM no load tuning to get P1-16, P1-17, P1-18, P1-19 parameters, and check if P1-20 if correct as motor nameplate after motor auto tuning.

P7-06	Load speed display factor		Factory setting	1.0000
	Setting range		0.0001～6.5000	
P8-18	Start protection selection		Factory setting	0
	Setting range	0	No protection	
		1	Protection	

This parameter relates to the safety protection function of the inverter.
If the parameter is set to 1, if the inverter is running at the power-on time command (for example, the terminal running command is closed before power-on), the inverter does not respond to the running command. The run command must be removed once. After the run command is valid again The inverter responds.
In addition, if the parameter is set to 1, if the inverter fails to run the command at the time of the fault reset, the inverter does not respond to the run command. The run command must be removed to eliminate the running protection status.
Setting this parameter to 1 prevents the motor from responding to the risk of running commands when the power is turned on or when a fault is reset.
For the solar pump inverter, please set P8-18=0 to activated pumps run automatically.

P9-09	Number of automatic reset times		Factory setting	20
	Setting range	0～20		

When the inverter is selected to automatically reset the fault, it is used to set the number of automatic reset. After this number of times, the inverter remains faulty.

P9-09 set to 20 for solar pump control inverter.

P4 Group input terminals				
P4-00	DI1 digital input function	0: No function 1: Forward run FWD or run command 2: Reverse run REV or forward and reverse run direction 8: Free stop 9: Fault reset (RESET) 10: Run pause 51:Water tank fulling detect 1 52:Water tank fulling detect 2 53:MPPT tracking stop/ solar pump control disable	1	×
P4-01	DI2 digital input function		53	×
P4-02	DI3 digital input function		9	×
P4-03	DI4 digital input function		51	×
P4-04	DI5 digital input function		52	×

51 and 52 two digital input for water level fulling function activating.

Install a height place aside from water fulling leveling to form a water fulling detection hysteresis.

52: User can use to this function to disable solar pump control function by terminals.

When this function is activated, inverter will work variable frequency mode and exit of solar pump control mode.

PE group solar pump control parameters group explanation:

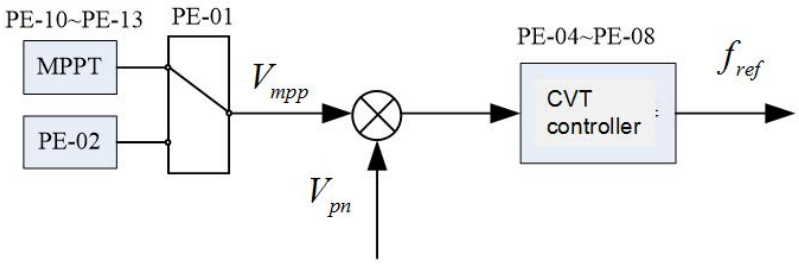
PE-00	Solar pump control mode	0: Disable 1: Enable	1

This parameters use to enable or disable solar pump control mode, When it set to 1, the solar pump control function will be activated, when it set to 0, the inverter work as general variable frequency without solar control function. The output frequency can be set but not vary with sunshine radiation.

Please check this setting when connecting to DC power of solar panels or PV arrays.

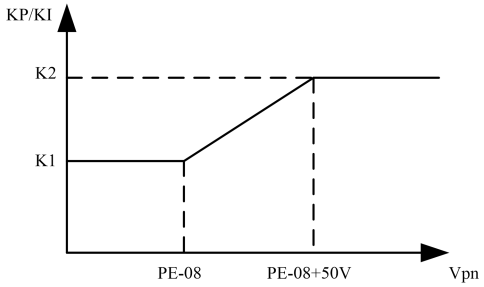
PE-01	Vmpp voltage reference mode	0: Set by manual 1: MPPT auto tracking	1
PE-02	Vmpp voltage setting value	0 - 1000.0V	500.0V/300 V

It is used to set Vmpp working voltage value of solar arrays. The output frequency is determined by CVT controller calculating after Vmpp programmed.



PE-04	CVT Proportional gain 1	0.0% - 999.9%	100.0%
PE-05	CVT Integral gain 1	0.0% - 999.9%	100.0%
PE-06	CVT Proportional gain 2	0.0% - 999.9%	100.0%
PE-07	CVT Integral gain 2	0.0% - 999.9%	1.0sec
PE-08	CVT PI switch over point	0 - 1000.0V	0.0V

These parameters used to set PI calculating of CVT controller. 2 groups CVT switching is according to Vmp of solar panels, the switchover point is set by PE-08. Only the first CVT group parameters are enable in default setting PE-08 set for 0.0V.



CVT controller calculating is the core of the solar pump working , if the output frequency is not stable, you can turn off the MPPT (set PE-01=0), and then adjust the proportional gain or integral gain until the frequency is stable; and then open the MPPT search again.

PE-10	Mppt search upper limit voltage	0 - 1000.0V	600.0V/400.0V
PE-11	Mppt search lower limit voltage	0 - 1000.0V	300.0V/200.0V
PE-12	MPPT searching gain	0% - 500%	100%
PE-13	MPPT searching interval	0.0 - 10.0sec	1.0sec

PE-10/PE-11 use to set Vmpp range, and PE-12 is used to set MPPT searching gain, and PE-13 is used to set MPPT searching interval time. When the output frequency is fluctuating after activated MPPT searching, The performance ca be improved by reducing PE-12 MPPT searching gain value and increase PE-13 the MPPT searching interval

PE-16	Sleep voltage threshold	0.0 - 1000.0V	350.0V
PE-17	Wake up voltage threshold	0.0 - 1000.0V	400.0V
PE-18	Awake waiting time	0 - 30000sec	60sec

PE-16 to FE-18 use to set solar pump inverter if go to sleep mode when input DC voltage is too low, and wake up automatically when DC bus voltage recovery again.
When the DC voltage is lower than FE-16 setting value for a system default time, it will go to sleep and sent out A.SLP alarm code. When DC bus voltage raises again and higher than PE-17 value for a FE-18 setting time, the inverter will be wake up to work again.

PE-19	Stop frequency setting when low speed	0.00Hz ～300.00Hz	10.00Hz
PE-20	Detecting time of low frequency protection	0 - 30000sec	10sec
PE-21	Low speed protection auto reset delay time	0 - 30000sec	60sec

If the output frequency is lower than PE-19 for a low speed detecting time Fb-04,the solar pump inverter will stop to running and sent out A.LFr alarm.
Once the output frequency is greater than PE-19 for PE-21(automatic recover time), the inverter will restore to working.

PE-22	Dry run protection current threshold (under-load protection)	0.0 - 999.9A	0.0A
PE-23	Dry run detect delay time	0 - 30000sec	10sec
PE-24	Automatic recover time in dry run protection mode	0 - 30000sec	60sec

If the output current is lower than PE-22 (Dry run current) for PE-23(dry run detect delay time), the inverter will go to dry run protection mode and sent out A.LLd alarm.
Once the current is bigger than PE-22 again for PE-24 (recover time of dry run), the inverter will restore to working.

PE-25	Motor over current protection threshold	0.0 - 999.9A	0.0A
PE-26	Over current detect delay time	0 - 30000sec	10sec
PE-27	Automatic recovery time in over current protection mode	0 - 30000sec	60sec

PE-25,PE-26, PE-27parameters are used to set motor over current protection.
If the over current is bigger than PE-25 for PE-26time, the drive will go to stop mode for providing motor protection and sent out A.OLd alarm.
Once the current is lower than PE-25 for PE-27 recover time, the inverter will recover to work again.

PE-28	Minimum power input protection threshold	0.00kw - 650.00kw	0.00kw
PE-29	Minimum power input detect delay time	0 - 30000sec	10sec
PE-30	Automatic recovery time in minimum power input protection mode	0 - 30000sec	60sec

PE-28,PE-29,PE30 parameters are used to set minimum power input power protection.
When the input power from solar panel is lower than PE-28 (minimum power input) for PE-29 time, the inverter will be stop to working and sent out A.LPr alarm.
Once the input power larger than PE-28 for PE-30 time, the inverter will start to working again automatically.

PE-31	Water tank fulling level detecting method	0: Terminals digital 1: AI1 2: AI2	0
PE-32	Water fulling level detecting threshold of analog	0 - 100.0%	25.0%
PE-33	Water fulling level reach protection detecting time	0 - 30000sec	10sec
PE-34	Water fulling level protection exit relay time	0 - 30000sec	60sec
PE-35	Water level sensor probe damage threshold	0 - 100.0%	0.0%

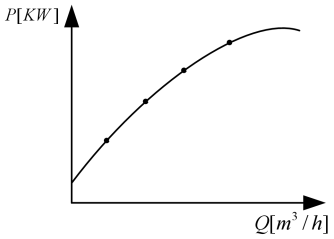
PE-31 parameter is used to set detecting method of water tank leveling.
The terminals digital for water tank fulling detecting is default setting.
Any 2 terminals (DI4 and DI5 are in default setting) can use to set for terminals digital detecting, the function code is 51/or 52. If both terminals are valid, it can able to activate water tank fulling protection, if both terminals are invalid, the water tank fulling is disable, only one terminals is valid, keep no changing of current working status.
PE-33/PE-34 are used to set water fulling detecting time and protection exit relay time.
PE-35 is used to set analog sensor damage detection threshold, when PE-31 is set for analog detecting, and feedback analog value larger than PE-35 setting threshold, and will judge the sensor is broken, submit A.Prb alarm as well, and inverter stop to working; The sensor probe detecting is disable when PE-31 set for 0.

PE-36	DC current correction factor	0.0 - 200.0%	100.00%
PE-37	DC current correction bias	-100.00A - 100.00A	0.00A

It us used to correct DC current showing of software calculated. U0-06 is DC current showing after corrected. The correction formula: U0-06= (estimated value* PE-36) + PE-37.

PE-38	Power point 0 of PQ Current	0.0kw - 999.9kw	0.5kw
PE-39	Power point 1 of PQ Current	0.0kw - 999.9kw	1.0kw
PE-40	Power point 2 of PQ Current	0.0kw - 999.9kw	1.5kw
PE-41	Power point 3 of PQ Current	0.0kw - 999.9kw	2.0kw
PE-42	Power point 4 of PQ Current	0.0kw - 999.9kw	2.5kw
PE-43	Flow point 0 of PQ curve	0.0 - 999.9m^3/h	0.0 m^3/h
PE-44	Flow point 1 of PQ curve	0.0 - 999.9m^3/h	5.0 m^3/h
PE-45	Flow point 2 of PQ curve	0.0 - 999.9m^3/h	10.0m^3/h
PE-46	Flow point 3 of PQ curve	0.0 - 999.9m^3/h	15.0m^3/h
PE-47	Flow point 4 of PQ curve	0.0 - 999.9m^3/h	20.0m^3/h

The set of parameters calculates the output flow rate (U0-13) based on the output power (U0-05),user can program PE-38 ~ PE-47 according to P-Q curve of pumps, and U0-13 flow rated can be calculated by software.



Note:

Solar pump inverter has following difference compare to general variable frequency inverter.

* Torque booster value is 1.0% in default(F3.01)；
* Over excitation function is disable in default (P3-1=0)；
* Input/ output phase missing is disable（P9-12,P9-13 both parameters set to 0）；
* Over current , over voltage suppression function is disable in default（P9-03, P9-05=0）；
* Digital terminals programmable function are set for forward running, fault reset, solar pump control disable, water tank fulling detect 1, water tank fulling detect 2.
* Automatic fault reset is activated in default，when P909=20, automatically reset times is infinite
* Auto start when power on with terminal control for forwarding , (P0-02=1), DI1 short circuit to COM .
* Below parameters setting in default are difference for 400VAC output voltage and 200VAC output voltage.

PE-02: Vmpp manual setting reference is：500V for 4T /300V for 2S

PE-10: MPPT searching upper limit：600V for 4T /400V for 2S

PE-11: MPP searching lower limit：300V for 4T /200V for 2S

PE-16: sleep voltage：350V for 4T /220V for 2S

PE-17: awake up voltage：400V/ for 4T / 280V for 2S

* Under voltage of 400VAC (4T) models is 250VDC, 200VAC (2S) model under voltage is 100VDC.
* When the DC bus voltage, output frequency, output current is not stable when inverter working, user can going to set PE-04 (CVT proportional gain 1) and PE-05 (CVT integral gain 1) both parameters to improve the performance, especially need to reduce the PE-5 value. PE-05 smaller when inverter rated power is bigger.

*When PE-01 is set to 0, the inverter working CVT (constant voltage tracking) mode, work with MPPT (maximum power point tracking) with PE-01 not 0 setting. The greater the periodic disturbance of the DC bus voltage (0.5V*PE-01), the bigger PE-01 value setting.

*If the MPPT tracking is not stable, or can't find the maximum power point, we can try to select CVT working mode with PE-01=0 setting, and set DC bus working voltage to PE-02.

* It is request to work with match GPS/GPRS The day flow (U0-14) and day generated energy (U0-17)

*Daily flow (U0-14) and daily power generation (U0-17) working need to cooperate with GPS / GPRS module, by the GPS / GPRS module to update the current time (PE-48) to calculate the daily flow and daily power generation,

Monitor parameters of solar pump control

Monitor parameters	Monitoring contents	Unit	Address
U0-00	Running frequency (Hz)	0.01Hz	7000H
U0-01	Setting frequency (Hz)	0.01Hz	7001H
U0-02	DC voltage of PV arrays (V)	0.1V	7002H
U0-03	Output voltage (V)	1V	7003H
U0-04	Output current (A)	0.01A	7004H
U0-05	Power of PV arrays(KW)	0.1KW	7005H
U0-06	Current of PV arrays（A）	0.01A	7006H
U0-07	DI input status	1	7007H
U0-08	DO output status	1	7008H
U0-09	AI1	0.01V	7009H
U0-10	AI2	0.01V	700AH
U0-11	KAI	0.01V	700BH
U0-12	PV open loop circuit voltage	0.1V	700CH
U0-13	Flow rate of pump	0.1m^3/hr	700DH
U0-14	Day flow	0.1m^3	700EH
U0-15	Flow accumulation（low-order digit)	0.1m^3	700FH
U0-16	flow accumulation（low-order digit)	0.1Km^3	7010H
U0-17	Day generated power	0.1kwh	7011H
U0-18	Generated accumulation （low-order digit)	0.1kwh	7012H
U0-19	Generated accumulation （high-order digit)	0.1Mwh	7013H

Related alarm code

Alarm showing	Alarm description	Alarm code
A.SLP	Sleep mode	81
A.LFr	Low frequency protection	82
A.LLd	Dry run/under load protection	83
A.OLd	Over current	84
A.LPr	Minimum power	85
A.FuL	Water tank fulling	86
A.Prb	Analog sensor problem failure	87
Err.98	Distributor running time reach	98
Err.99	Factory running time reach	99

Chapter9. Troubleshooting and Countermeasures

The below table listed SG600 sereis solar pump inverter all types of faults possibly occurs. Before contacting manufacturer for technical support, you can first determine the fault type through following table description and records your done treating process and phenomena. if the fault can not be resolved, please seek for the manufacturer service support.

Troubleshooting table

Fault code	Fault description	Possible reason	Countermeasures
Inverter unit protection	Err01	1, The inverter output circuit short circuit 2, the motor and inverter wiring is too long 3, the module overheating 4. The inverter wiring is loose 5, The circuit board abnormal 6, inverter module exception	1, Excluding the external fault 2, Install the reactor or output filter 3, Check the air duct is blocked; 4, Plug all the cable 5, Seek technical support
Over current in acceleration	Err02	1, Motor to ground short circuit 2, Not perform auto tuning 3, The acceleration time is too short 4, Torque boost is not appropriate 5, The grid voltage is low 6, Loading suddenly in acceleration 7, The using Inverter capacity (rated power is small	1, Excluding the external fault 2, Perform motor ID auto tuning 3, Increase the acceleration time 4, Adjust the torque boost or V / F curve 5, Adjust voltage of power supply to normal 6, Adjust the load 7, Select big power inverter instead
Over current in deceleration	Err03	1, Output short circuit or output to ground 2, No performance ID auto tuning for carrying vector control 3, The deceleration time is too short 4, The voltage is low 5, Loading suddenly when deceleration 6, No installing of brake unit and brake resistor	1, Excluding the external fault 2, Perform motor ID auto tuning 3, Increase the acceleration time 4, Adjust voltage of power supply to normal 5, Cancel the suddenly adding load 6, Install braking unit or braking resistor
Over current in constant speed running	Err04	1, The inverter output short circuit or phase to ground 2, No performance ID auto tuning for carrying vector control 3, The voltage of grid is low 4, Whether there is a sudden load	1, Excluding the external fault 2, Perform motor ID auto tuning 3, Cancel the sudden loading 4, Cancel the suddenly adding load 5. Select big power inverter instead

		in running 5, The using Inverter capacity (rated power is small	
Over voltage in acceleration	Err05	1, The input voltage is high 2, The acceleration process there is an external drag motor running 3, The acceleration time is too short 4, No brake unit and brake resistor	1, Adjust voltage to the normal range Cancel the additional force or install braking resistor 3, Increase the acceleration time 4, Install the braking unit or braking resistor
Deceleration overvoltage	Err06	1, The input voltage is high 2, The process of deceleration there is an external drag motor running 3, Deceleration time is too short 4, No brake unit and brake resistor	1, Adjust voltage to normal range 2, Cancel the additional force or install braking resistor 3, Increase acceleration time 4, Install the braking unit or braking resistor
Over voltage in constant speed	Err07	1, Input voltage is high 2. ,The process of deceleration there is an external drag motor running	1. Increase voltage go normal range 2. Cancel external force or install braking resistor
Fault of control section power supply	Err08	1. Input voltage is out of limit	Adjust voltage to normal range
Under voltage fault	Err09	1, Instantaneous power failure 2, Input voltage is out of limit DC bus voltage is abnormal 4, rectifier bridge and buffer resistance is not normal	1, Reset the fault 2, Adjust the voltage to the normal range 3, seek technical support
Inverter over load	Err10	1.. If load is too big, or motor is blocked or not 2. Using inverter capacity is too small	1. Reduce the load and check the motor and machine condition 2. Select bigger one capacity of motor
Motor overload	Err11	1, The motor protection parameter P9-01 set is appropriate 2, The load is too large or motor is blocked 3, Using the power of inveter too small	1. Set correct parameter 2. Reduce load or check motor and driving machine 3. Select bigger power inverter
Input phase loss	Err12	1, Three-phase input power is not normal 2, The driving board exception 3, Lightning board abnormalities 4, The main control board	1, Check and eliminate the problems in the external lines 2, Seek technical support

		exception	
Output phase loss	Err13	1, The inverter wiring is damaged 2, 3 phase output is not balance of inverter when motor running 3, Driving board is abnormal 4, Igbt model is abnormal	1, Excluding the external fault 2, Check the motor three-phase winding is normal and troubleshooting 3, seek technical support
IGBT module is over heat	Err14	1, The ambient temperature is too high 2, Air duct blockage 3, The fan is damaged 4, IIGBT module thermistor is damage 5, The inverter module is damaged	1, Reduce the ambient temperature 2, Clean up the duct 3, Replace the fan 4, Replace the thermistor 5, Replace the inverter module
External device fault	Err15	1, Through the multi-function terminal DI input external fault signal 2, Through the virtual IO function input external fault signal	1, Reset 2, Reset
communication fail	Err16	1, The host computer is not working properly 2, The communication line is not normal 3, Communication parameters PD group settings are not correct	1, Check the host computer wiring 2, Check the communication cable 3, Set the communication parameters correctly
Contactor failure	Err17	1, The driving board and power supply is not normal 2, Contactor is not normal	1, Replace the drive board or power board 2, Replace the contactor
Current detection failure	Err18	1, Check the Hall device exception 2, The driving board exception	1, Replace the Hall device 2, Replace the driver board
Motor tuning fault	Err19	1, The motor parameters are not set by nameplate 2, Parameter identification process timeout	Set motor parameters according to motor nameplate
Encoder fault	Err20	1, The encoder model does not match 2, The encoder connection error 3, The encoder is damaged 4, PG card exception	1, Check the encoder parameters 2, Excluding line wiring failure 3, Replace the encoder 4, Replace the PG card
EEPROM read and write failures	Err21	1, EEPROM IC broken	1, Replace the controller board
Inverter hardware failure	Err22	1, there is overvoltage 2, there is overcurrent	1, trouble shooting as over voltage 2, trouble shooting as over current
Short to ground	Err23	1, Motor to ground short circuit	1, Change motor cable or motor

The cumulative run time arrives	Err26	1, The cumulative run time is over the set the value	1, Clear the record with parameters initialization
User Defined Fault 1	Err27	1, User define fault signal 1 with multi-function terminals. 2, User define fault signal 1 with virtual IO function	1, Reset 2, Reset
User Defined Fault 2	Err28	1 , User define fault signal 2 with multi-function terminals. 2, User define fault signal 2 with virtual IO function	Reset Reset
The cumulative power up time arrives	Err26	1, The cumulative power up is over the set the value	1, Clear the record with parameters initialization
Load missing	Err30	1,The running current of inveter less than P9-64	Check the load condition
PID feedback loss	Err31	1, PID feedback value less than PA-26	Check the PID feedback signal or set PA-26 value correct
wave by wave current limit fault	Err40	1, The load is too large 2, The inverter selection is too small	1, Check the load 2, Zoom in the inverter power level;
Motor switchover fault	Err41	1. Change the current motor selection through the terminal during the inverter operation	Switch motor in stop mode of inverter
The speed deviation is too large	Err42	1, The encoder parameter setting is not correct 2, No perform motor auto tuning 3, The speed deviation is too large , P9-69, P9-60 setting is unreasonable	1, Correct set encoder parameters 2, Motor auto tuning 3, Set correct value for P9-69, P9-60 per filed condition

Note:

The SG600 solar pump inverter can able to record the three latest three fault code, fault information such as output frequency, current, voltage, DC voltage, input terminals status and output terminals status with P9-14 to P9-44.These information can help user resolve problem.

Charter 10. Routine Inspection and Maintenance

Affected by ambient temperature, humidity, dust, vibration and internal device aging of the controller, problems might occur during operation. To make the inverter run stably, a periodic inspection must be performed every year.

Requirement of Inspection and Maintenance

1. The inspection must be performed by professional technical personnel.
2. Before working on the controller, always cut off the power supply and wait, until the display turns off.
3. Avoid leaving any metal components in the controller, or else they might cause damage to the equipment.
4. An electric insulation test has been made on the controller before it has left factory. A withstand-voltage test is not necessary.
5. It is forbidden to use the megohmmeter to test in the control circuit.
6. When conducting insulation test on the motor, you have to disconnect the connection between motor and controller.

Warranty card

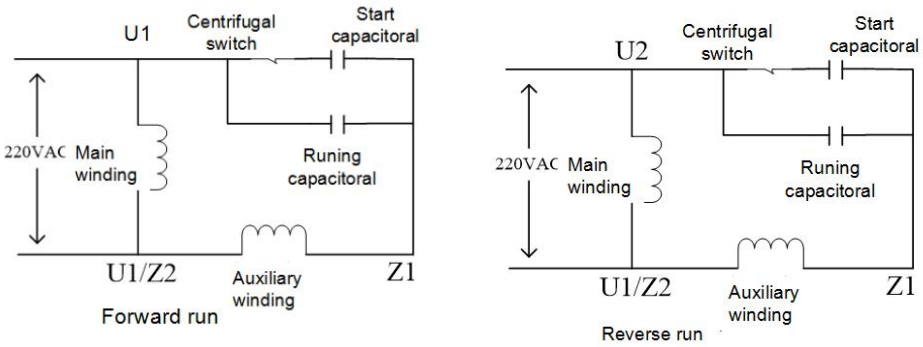
User name	
Company name and address	
Contact telephone	
Products mode	
Products series number	
Fault code	
Fault occurs time	
Fault description in detail	
Suggestion if you have	

Appendix 1.

SG600 Solar Pump Inverter For Driving 1 Phase 220V Pumps Notes

(Version 12.13 and his above version can use to drive 1 phase 220V pumps, check p7-11 software version value)

1. Working principle of 1 phase motor (pumps)



1. Single-phase motor is mainly composed of main winding (U1 / U2), auxiliary winding (Z1 / Z2), running capacitor, starting capacitor, centrifugal switch;

2. Single-phase (220VAC) power supply needs to be reversed, the need to exchange U1, U2 (or Z1 / Z2) wiring to achieve;

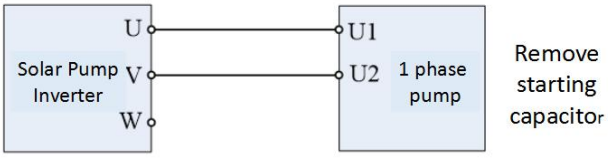
3. Start capacitor capacitance value is generally larger than the running capacitor, can improve the starting torque;
The start capacitors will be disconnect when motor rotation speed reaches a certain value via a centrifugal switch, and there are no build starting capacitor for some light load starting motor.

2. S100 drive single-phase motor:

P0-01	1st motor control mode	0: VF control 1: no PG vector (SVC) 2: PG vector (FVC) 3: Single-phase motor single-phase output mode 4: single-phase motor three-phase output mode	0
P0-20	Single - phase motor balance coefficient (Three-phase output)	0.0 - 2.0	1.0

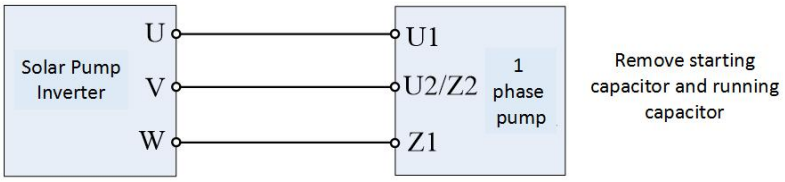
There are 2 driving modes for using inverter to drive 1 phase motor. It is select by P0-01 parameters, for 1 phase output mode or 3 phase output mode. It can able to adjust the output voltage ratio through P0-20 when working on 3 phase output mode.
It is also request to set motor group parameters(P1 group) when driving 1 phase motor or pumps.
And also can adjust the output torque capacity with P3-01 parameters.

2.1. Single-phase output mode (P0-01 = 3): The mode wiring as follows:



In this control mode, the start capacitor is removed. Connect the 2 wires cable of 1 phase pump to U and V, V and
W or U and W. It can get large adjusting speed range due to starting capacitor have been remove. Through increase the value of P3-01 can increase the start torque and improve the starting capacity.
It is not allow to change running direction in this control mode. Please change the cable wiring to change running direction if need.

2.2. Three-phase output mode (P0-01 = 4): This mode wiring as shown below



When selecting this mode, the starting and running capacitor must be remove. Adjusting the P0-20 value can able to change the UV/ WV voltage ratio (the bigger P0-20, the bigger WV, and smaller UV).
Because the the output voltage phase is difference 90°, so the output voltage can't reaches $Udc/\sqrt{2}$, only can reaches $Udc/2$ (P0-20=1.0).

The load driving capacity is not too strong compare to drive 3 phase AC pumps, and running current will be higher.
Please select one more rated power inverter for drive 1 phase pumps.
It is able to change running direction in this control mode by setting parameters.

Appendix 2:

SG600 Solar pump inverter for PMSM pumps supplementary instructions.

The documentation needs to be used in together with the operation manual of SG600, it is supplementary for manual.

SG600 has two motor control algorithms for driving permanent magnet synchronous motor, which set by P(1-00) and P 0-01 both parameters.

	P0-01=0 (VF scalar control)	P0-01=1 (Sensorless vector control)
P1-00=0/1 (IM)	Asynchronous motor VF control	Asynchronous motor vector control
P1-00=2 (PMSM)	Permanent magnet motor scalar V/F control	Permanent Magnet Motor Vector Control

The vector control is superior to the scalar (V/f) control in terms of motor control performance such as low frequency torque, stability, current waveform and so on. However, the scalar control is not sensitive to the motor back EMF parameter (P1-20). The vector control requires accurate setting or identification of the motor back electromotive force;

Both control algorithms need to obtain accurate stator resistance, inductance parameters (P1-16 ~ P1-18);

It is recommended sensorless vector control for driving solar PMSM pumps.

SG600 permanent magnet synchronous motor control need to set the following motor nameplate parameters:

P1-00	Motor type selection	0: General induction motor (AM) 1：Variable speed induction motor（AM） 2: Permanent magnet synchronous motor（PM）
P1-01	Rated motor power	0.1kW～1000.0kW
P1-02	Rated motor voltage	0V～2000V
P1-03	Rated motor current	0.01A～655.35A(Rated power of inverter <= 55kW) 0.1A～6553.5A(Rated power of inverter > 55kW)
P1-04	Rated motor frequency	0.00Hz～Maximum（P0-10）
P1-05	Rated motor speed	0rpm ～ 65535rpm

Permanent magnet motor model parameters are as follows: (obtained by parameter identification of motor auto tuning)

P1-16	Stator resistance	0.001Ω～65.535Ω(Rated power of inverter<=55kW) 0.0001Ω～6.5535Ω(Rated power of inverter>55kW)
P1-17	D-axis inductance	0.01mH～655.35mH(Rated power of inverter<=55kW)
P1-18	Q-axis inductance	0.001mH～65.535mH(Rated power of inverter>55kW)
P1-20	Back Electromotive Force	0.1V～6553.5V

Synchronous motor parameter identification: P1-16 ~ P1-20 motor model parameters can be obtained through parameter identification, the following steps:

P1-37 set to 11: permanent magnet motor static auto tuning if load is unable to disconnect (back EMF by nameplate parameters automatically calculated)

P1-37 set to 12: permanent magnet motor without load completely auto tuning, it request to remove the load first, and then take motor auto tuning.

If the control algorithm for the scalar control (P0-01 = 0), carry the static auto tuning is okay, do not need to remove the load; vector control need to obtain accurate back EMF parameters, if the application site is not easy to disconnect the load,user can can set Back electromotive force by manual.

(Note: When the P1-37 set to 1,2 for the asynchronous motor auto tuning; parameters from the learning, especially dynamic self-learning need to stabilize the power supply, the best use of AC electricity supply. Means we can do motor

auto tuning with AC power input first before using in solar system.)

Notes :

Vector control related parameters: it is no need to adjust vector control related parameters in generally. Please see the below list.

P2-00 ~ P2-05 for the speed loop PI parameters, vector control is effective; adjust the PI parameters can get better speed control effect;

P2-13 ~ P2-16 for the axis current loop PI parameters, vector effective; adjust the parameters of the group can improve the stability, current response;

P2-17 ~ P2-18 for the vector control observer (observer) parameters, adjust the observer gain can improve the stability;

P2-21: Start pull into the current size settings, vector / scalar algorithm is valid; increase the pull-in current can improve the low-frequency start torque;

P2-30 ~ P2-34 for the scalar control parameters: P2-30 oscillation suppression used to improve the stability; P2-32 excitation depth for the search to obtain the minimum current;

P2-00	Speed loop proportional gain 1	1～100	
P2-01	Speed loop integral time 1	0.01s～10.00s	
P2-02	Switching frequency 1	0.00～P2-05	
P2-03	Speed loop proportional gain 2	1～100	
P2-04	Speed loop integral time 2	0.01s～10.00s	
P2-05	Switching frequency 2	P2-02～Maximum frequency	
P2-06	Slip compensation coefficient	50%～200%	
P2-07	Speed loop filter time constant	0.000s～0.100s	
P2-08	Vector control over excitation gain	0～200	
P2-10	Current upper limit / torque upper limit	0.0%～200.0%	
P2-13	M-axis current loop proportional gain	0～20000	
P2-14	M-axis current loop integral gain	0～20000	
P2-15	T-axis current loop proportional gain	0～20000	
P2-16	T-axis current loop integral gain	0～20000	
P2-17	Observer gain	0.1% - 999.9%	
P2-18	Observe the filter time	0.1 - 100.0ms	
P2-19	AM pre-excitation gain	0 - 9999ms	
P2-20	PM open loop start mode	0: direct start; 1: position detection start 2: DC pull-in start	
P2-21	Pull in current	0.0% - 200.0%	
P2-22	MTPA gain	0.0% - 999.9%	
P2-23	MTPA filter	1ms - 9999ms	
P2-24	PMSM weak current limit	0.1% - 200.0%	

P2-25	PMSM Weak Magnetic Feedforward Gain	0.1% - 999.9%	
P2-26	PMSM weakening ratio gain	0 - 9999	
P2-27	PMSM weak Magnetic Integral Gain	0 - 9999	
P2-30	Oscillation suppression gain	0.1% - 100.0%	
P2-31	Current loop gain	0.1 - 20.0	
P2-32	Excitation depth	0.1% - 500.0%	
P2-33	Excitation control proportional gain	0 - 5000	
P2-34	Excitation control integral gain	0 - 5000	
P2-35	DC pull time	0 - 9999	
P2-36	DC pull-in transition frequency	0.0 - 100.0%	
P2-37	DC pull-in cut-off frequency	0.0 - 100.0%	

The Procedure of operation for PMSM driving.

1, Set P0-01=1 and P1-00=2 parameters for starting PMSM running.

2. Set PMSM motor parameters. P1-01 to P1-05, P1-16 to P1-20. (if the load is difficult to disconnect from motor, please set P1-20 BEF (Back Electromotive Force) accuracy from motor nameplate.

3. Set P1-37=12 to perform motor completely auto tuning if load is able to discount from motor, set P1-37=2 to perform motor static auto tuning if load is can't remove from the load.

4. If the performance is not good, please adjust some related parameter from P2-00 to P2-37.