Chapter1.About this manual (V3)

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 SG600 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 runningdirection can be determined by measuring the flow rates.

Chapter2. Solar pumping system introduction

2.1. Solar Pumping System overview

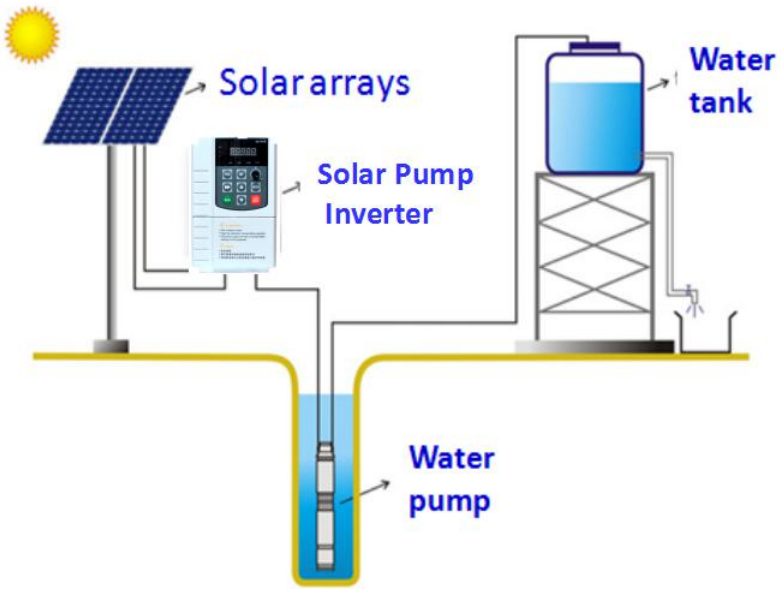
Solar pumping systems can be applied to all forms of daily use, water pumping for drinking water supply for remote villages and farms without connection to the water grid, for agricultural use such as livestock watering,agricultural irrigation, forestry irrigation, pond management,desert control, and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



Systemconstitute 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 with outproducing 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 inverteris 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

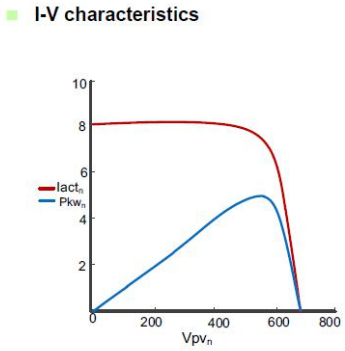
- Maximum power point tracking (MPPT) with fast response speed and stable operation efficiency> 99%;
- Suits for most 3 phase AC pumps and AC PMSM high efficiency pumps.
- The working voltage of solar panel can set by manual or MPPT automatically tracking
- Compatible with dual power input, AC grid and 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) cellis 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 isproportional 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.

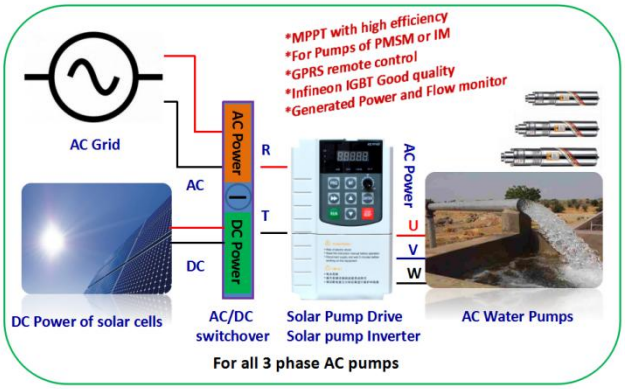


The I-V curve is not constant since intensity and temperature changes during day time.Under constant temperature, current changes linearly with intensity and voltage changes logarithmically with intensity. Since the voltage variation is small with respect to intensity changes, maximum power varies proportionally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

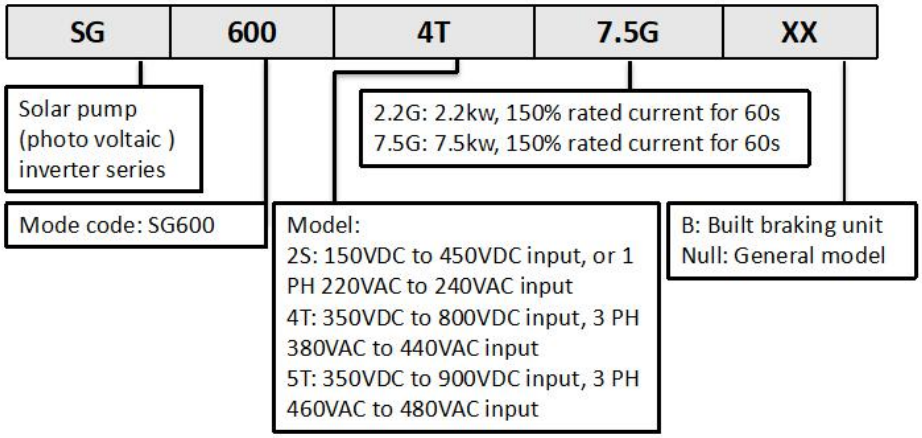
A four-pole changeover switch enables switching between the two supply modes. At a given time only one supply (PV cell or AC grid) will be connected to the inverter.



Solar pump inverter system constructing.

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	Input DC voltage	Over voltage point	Under voltage point	Suggest Vmp	Suggest Voc
SG600-2T	For 200V AC	150V – 450V	450V	100V	310VDC	380VDC
SG600-4T	For 400V AC	250V– 800V	800V	200V	520VDC	650VDC

Power, current and voltage specification (2S /2T 200VAC voltage, and 4T/400VAC voltage)

Rated power/kw	2S 200V range Rated current /A	4T 400V range Rated current /A
0.4	2.3	None
0.7	3.8	2.3
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 2S series : 150 to 450 VDC or 220/240VAC input, Vmp 310V,Voc 380V					
1	SG600-2S-0K7GB-M	3.8A	0-240VAC	0.75KW	260 to 375
2	SG600-2S-1K5GB-M	7A	0-240VAC	1.5KW	260 to 375
3	SG600-2S-2K2GB-M	9A	0-240VAC	2.2kw	260 to 375
	Mini type 4T series :4T,250 to 800 VDC or 380/ 440VAC input, Vmp520, Voc650				
1	SG600-4T-0K7GB-M	2.3A	380V-440V	0.75KW	486 to 750
2	SG600-4T-1K5GB-M	3.8A	380V-440V	1.5KW	486 to 750
3	SG600-4T-2K2GB-M	5.1A	380V-440V	2.2KW	486 to 750
4	SG600-4T-4K0GB-M	9A	380V-440V	4.0KW	486 to 750
General type: 2S, 150 to 450 VDC or 220/ 240VAC input, Vmp 310, Voc380					
7	SG600-2S-0K7GB	3.8A	220V/240V	0.75KW	260 to 375
8	SG600-2S-1K5GB	7A	220V/240V	1.5KW	260 to 375
9	SG600-2S-2K2GB	9A	220V/240V	2.2KW	260 to 375
10	SG600-2S-4K0GB	17A	220V/240V	4.0KW	260 to 375
General type: 4T,250/350 to 800 VDC or 380/ 440VAC input, Vmp520, Voc650					
11	SG600-4T-0K7GB	2.3A	380V-440V	0.75KW	486 to 750
12	SG600-4T-1K5GB	3.8A	380V-440V	1.5KW	486 to 750
13	SG600-4T-2K2GB	5.1A	380V-440V	2.2KW	486 to 750
14	SG600-4T-4K0GB	9A	380V-440V	4.0KW	486 to 750
15	SG600-4T-5K5GB	13A	380V-440V	5.5KW	486 to 750
16	SG600-4T-7K5GB	17A	380V-440V	7.5KW	486 to 750
17	SG600-4T-011GB	25A	380V-440V	11KW	486 to 750
18	SG600-4T-015GB	32A	380V-440V	15KW	486 to 750
19	SG600-4T-018GB	37A	380V-440V	18KW	486 to 750
20	SG600-4T-022GB	45A	380V-440V	22KW	486 to 750
21	SG600-4T-030G	60A	380V-440V	30KW	486 to 750
22	SG600-4T-037G	75A	380V-440V	37KW	486 to 750
23	SG600-4T-045G	91A	380V-440V	45KW	486 to 750
24	SG600-4T-055G	110A	380V-440V	55KW	486 to 750
25	SG600-4T-075G	150A	380V-440V	75KW	486 to 750
26	SG600-4T-090G	180A	380V-440V	90KW	486 to 750
27	SG600-4T-110G	220A	380V-440V	110KW	486 to 750
28	SG600-4T-132G	260A	380V-440V	132KW	486 to 750
29	SG600-4T-160G	320A	380V-440V	160kw	486 to 750
30	SG600-4T-**G	**	380V-440V	200-400	486 to 750

3.6.SG600 series solar pump inverter technical specification

**Solar pump inverter specification when PE-00=1&2	
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 380(VDC), Vmpp 310(VDC) for 2S model or 220V AC pumps Voc 650(VDC), Vmpp 520(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	Above 99.0%,
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 S600 vector control drive operation manual
Technical specification of variable frequency inverter when PE00=0(solar pump disable)	
voltage, frequency	1 phase 220V, 3 phase, 220V,380V, 660V, 0-50/60Hz
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.

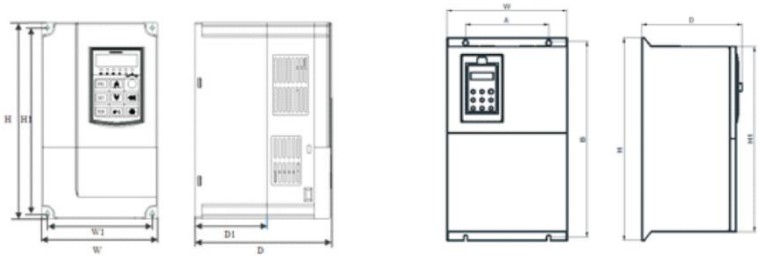
3.7.SG600 series solar pump inverter dimensions

3.7.1 Mini type inverter

Mini type Fig 1

Power/Model	H	H1	W	W1	D	D1	Hole
0.4~1.5KW	130	132	85	74	123.5	74	4.5
2.2kw	151	142	100	88	127	789	5.4

3.7.2 General type inveter



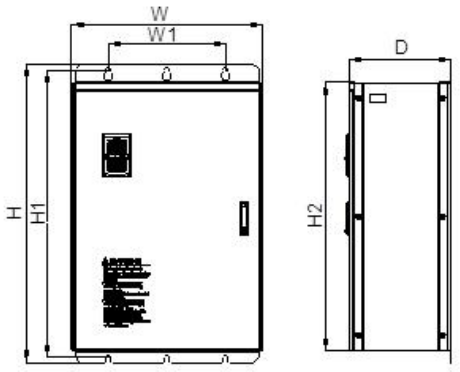
0.75kw-110kw inverter Dimension

Model	Hole location (mm)			Inverter dimension (mm)			Hole D (mm)	N.W
	A	B	H1	H	W	D		(kg)
Single phase 220V input，50/60Hz								
S600-2S-0.7GB	106.5	175	/	185	118	153.8	4.5	2.1
MS600-2S-1.5GB								
S600-2S-2.2GB								
S600-2S-4.0GB	148	235.5	/	247	160	175	5.5	4
3 phase 380V input，50/60Hz								
S600-4T-0.7GB	106.5	175	/	185	118	153.8	4.5	2.1
S600-4T-1.5GB								
S600-4T-2.2GB								
S600-4T-4.0GB/5.5PB								
S600-4T-5.5GB/7.5PB	148	235.5	/	247	160	175	5.5	4
S600-4T-7.5GB/11PB								
S600-4T-11GB/15PB								

**S600-4T-15GB/18.5	205	305	/	320	220	197.3	6.5	8
** S600-4T-18.5G/22P								
** S600-4T-22G/30P								
S600-4T-15GB/18.5PB	170	400	/	415	230	205	6.5	10
S600-4T-18.5G/22P								
S600-4T-22G/30P								
S600-4T-30G/37P	200	465	/	480	260	215	8	23
S600-4T-37G/45P								
S600-4T-45G/55P	180	550	/	575	320	310	8	30
S600-4T-55G/75P								
S600-4T-75G/90P	240	595	/	620	380	310	10	41
S600-4T-90G/110P								
S600-4T-110G/132P								

Note: ** 15kw, 18kw and 22kw have 2 construction, plastic and metal.

3.7.3.380V, 160kw-400kw without built in DC reactor



Models	W	H	D	H2	W1	H1	INSTALLATION Hole
S600-4T-132G/160P	500	780	340	708	350	755	ϕ11
S600-4T-160G/185P	650	1060	400	950	400	1023	ϕ16
S600-4T-185G/200P							
S600-4T-200G/220P							
S600-4T-220G/250P	750	1170	400	1050	460	1128	ϕ18
S600-4T-250G/280P							
S600-4T-280G/315P							
S600-4T-315G/355P	850	1280	450	1150	550	1236	ϕ20
S600-4T-355G/400P							
S600-4T-400G/450P							

Chapter4. 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.

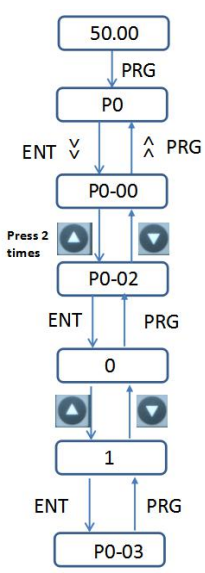
The difference is that press ENTER key will keep setting parameter in CPU board of inverter and then return to second menu, press PRG key an return second menu directly without parameters store.

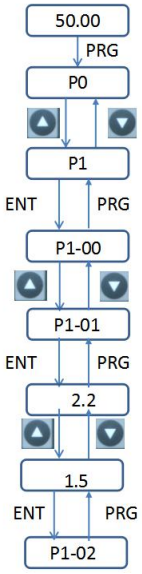
Example of keypad operation

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 inverter 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 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 S600 frequency inverter, please refer toS600 operation manual.

Safety instructions

WARNING! All electrical installation and maintenance work on the drivemustbe 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 intermediatecircuit capacitors discharge. Always ensure by measuring that no voltage is actuallypresent.

• A rotating permanent magnet motor generates a dangerous voltage. Always ensure tolockthe motor shaft mechanically before connecting a permanent magnet motor to theinverter,and before doing any work on an drivesystem connected to a permanentmagnet motor.

5.2 Mechanical installation

In back mounting, fasten the driveto 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)

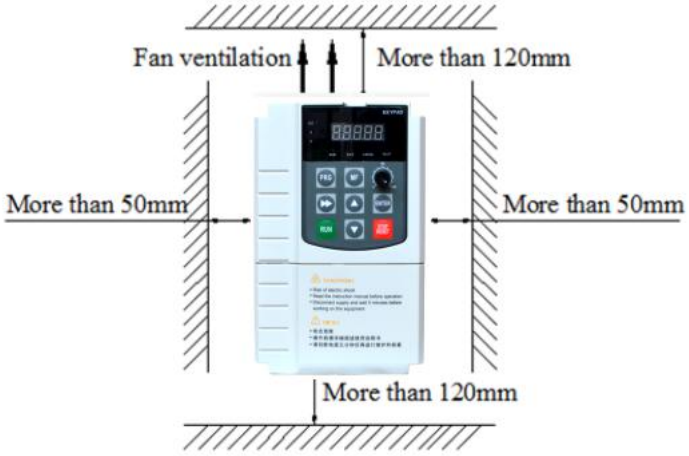
2. Heat dissipation, Install the solar drive on the surface of an incombustible object, and ensure that there is sufficient space around for heat dissipation.Install the solar pump inverter vertically on the support using screws.

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

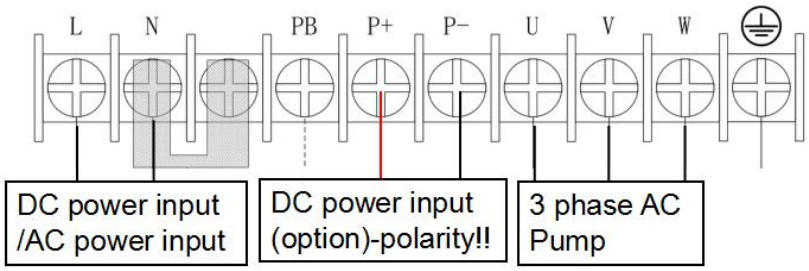


Fig 5.3-1. 1 phase AC power input 220V main circuit loop connection

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

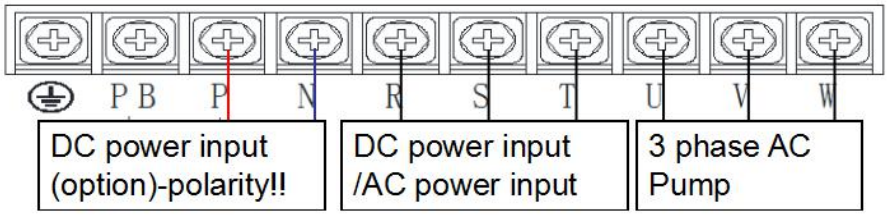


Fig 5.3-2. 3 phase AC power input for below 22 kw inverter

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

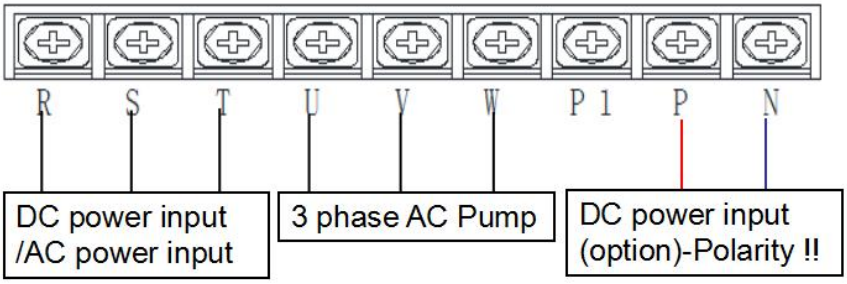


Fig 5.3-3. 3 phase AC power input for above 22 kw inverter

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.

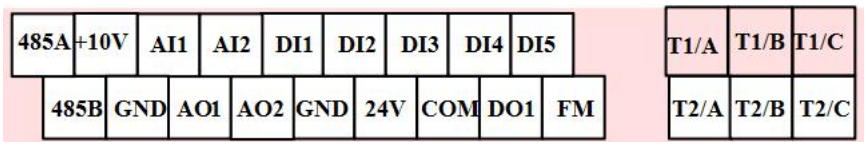
- Do not use an asymmetrically constructed motor cable.
- Route the motor cable, input power cable and control cables separately.
- Make sure that the maximum cable lengths are not exceeded. For detailedinformation, see the user's manual.
- Noted the polarity connection when connecting from P+ and N

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 degree sunder 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 itunder 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

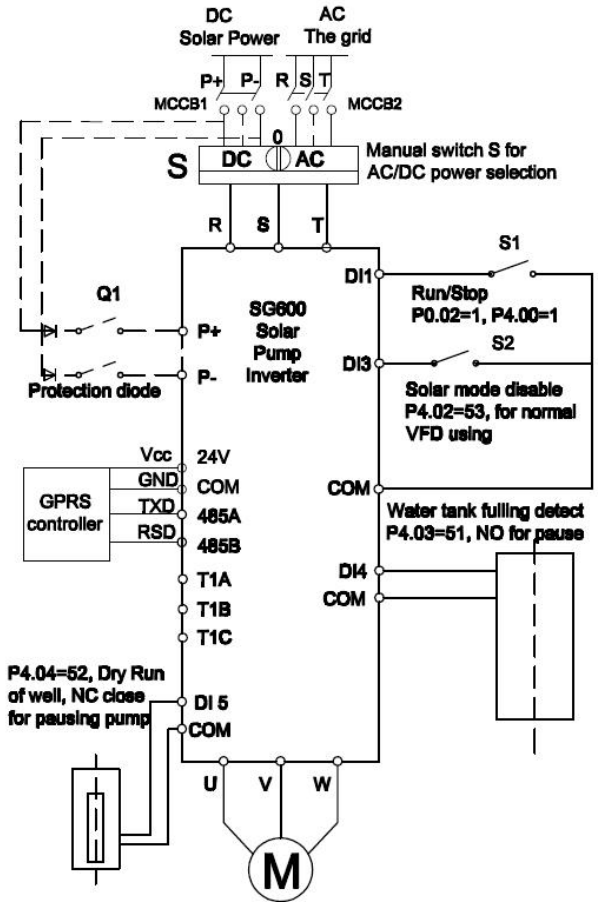
Type	symbol	Name of terminals	Specification and explanation
Communication	485A	485+	RS485 communication port，compatible with Modbus
	485B	485-	
Digital input and output	DI1～DI4	Digital input	Sink or source input option set by jumper, input resistance is 2.5K, Opto coupler isolation input, jumper J9
	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 train output, 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	Relay 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.

Chapter6. SG600 solar pump inverter wiring steps.

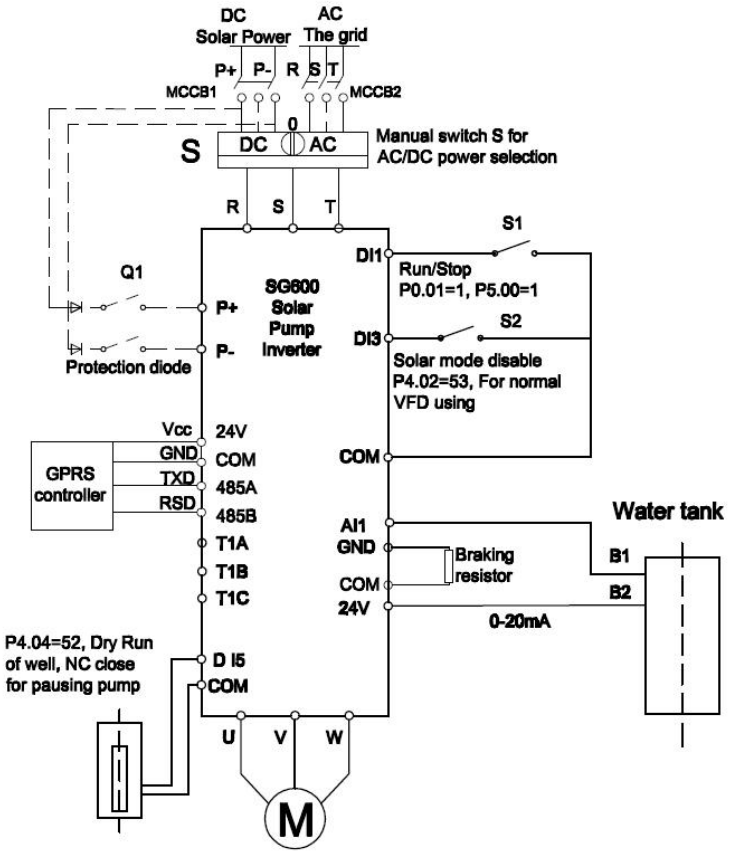
Wiring as below attached pictures. It is accepted dual power AC/DC mode connecting input.
User can able to install a power switchover to selection which mode power input as conditions.
6.1. Wiring P+ and P- of DC solar power to R, T terminals, or 1/3 phase cables of AC power supply to R, T (R, S, T) of inverter.(1 phase 220VAC AC inupt connect to L, N of inverter).
6.2. Built a Run/Stop switch **S1** to start pumping whensettingP0.02for 1,that inverterworks in terminals control mode.This inverter can achieve auto start at morning when sun light radiation is good, auto stop when sun set when sunlight radiation is low.
6.3. Built a switch 2 to disable solar pump control mode when connecting AC grid input.
The inverter can be used fora variable speed drive (VFD) for pumps speed adjusting as need The output frequency can be adjusted by**P0-03 f**requency reference mode setting. The MPPT function is closed when turn off switch 2 and set P4.02=53. The solar pump control mode function also can be disable by parameters setting PE00=0.
6.4. Connect 2 wires of float ball sensor to DI4 and COM for water tank level fulling detecting, and set P4.03=51(float ball NO relay alarm). When water level reached to sensor detecting, the normal open (NO) relay point will be activated, invereter will stop pumping, and sent a A.FuL alarm.
6.5. Connect 2 wires of sensor of dry run sensor of well to DI5 and GND, and set F4.04=52 (dry run NC relay alarm).
It will sent alarm A.LLd and stop pumping when lack of water in well for dry run protection.



SG600 solar pump wiring 1, digital switch for water tank fulling

6.7. It is also enable to connect analog (0-10VDC, or 0/4-20mA) water level sensor for water tank leveling detecting.

Connecting 2 wires of 0/4-20mA analog sensor to AI1 and 24VDC terminals of inverter,and short connect COM and GND terminals for constructing a loop circuit.



SG600 solar pump wiring 2, digital switch for water tank fulling

Note:

1. It is also available to connect DC solar power supply to P+(positive), P- (negative) to inveter, but please make sure to confirmed the polarity connection. Positive of DC power supply to P+ terminal, and negative of DC power supply to P- terminal. It will cause inverter serious damage seriously when wrong polarity connection.
2. It is forbidden to connect power supply to output terminals U, V, W of inverter, otherwise it will damage inverter seriously.
3.Confirm the running direction of motor if corrector not. If not correct, please change the any two phase order of U, V, W wiring.
4. 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.
5. It must to perform motor auto tuning for PMSM high speed and 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.

6.8. GPRS introduction and connection

User can option to buy a GPRS remote control module to monitor, control and modify inverter parameters by website. It has several function as below mentioned.

1). Working status monitoring and locating in google map.

2). Inverter control, start, stop, reset and command control mode.

3). Parameters read and write.

4). History data reading and export to excel file.

VCC connect to 24V
GND connect to GND
TXD/A connect to Rs485A
RXD/B connecto to Rs485B

Wiring and commissioning of GPRS

1). Connect Vcc of GPRS to 24V of inverter, GND to GND, TXD/A to Rs485A, TXD/B to Rs485B.

2). Check if power indicator turn now or not after connecting.

3). Install SIM which can able to access to internet to GPRS module.

4). Set APN, APN user and APN password to GPRS as SIM service provider.

If NET and DAT will be flash, means communication between inverter ans GPRS is successfully.

5). Login http://120.25.236.230:8010 to with user name and password to website control platform.

6). User can review inverter working status, such as output frequency, output current, Dc voltage, flow... in monitor area, start/stop inverter in control panel area,and parameters read/write in parameters area, to export history working data.

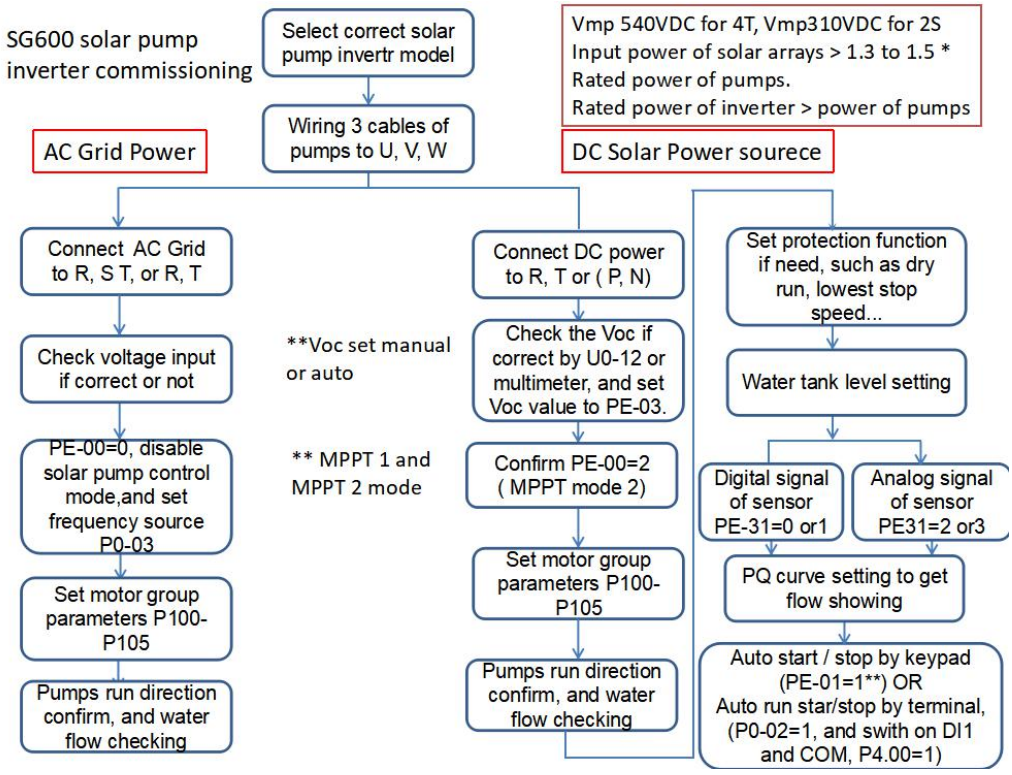
Note: User can modify APN with message as follow command.

1. Read APN message: sent “AT+WXAPN?” to SIM number,

2. Change APN message: set “ :AT+WXAPN=***T”to SIM number, *** stands for APN value.

Chapter 7. SG600 solar pump inverter operation and commissioning

Read below flow chat before commissioning



SG600 solar pump invertercommissioning flow chat

7.1.Select correct modes of solar pump inverter (voltage, power and current) as pumps nameplate and field requirement.

Please get field requirement more in detail, such as water head, water flow, distance from pump to inverter, pumps voltage, pumps rated current, maximum current of pumps, and working conditions.

The selecting rated current of inveter must be equal or bigger than rated of using pump.

The bigger power of inverter should be selected for long distance from pumps to inverter.

As experience, at least request 1.3 times bigger power input of solar arrays compare to rated power of pumps.

Notes. The performance of system is much related with the quality and efficiency of solar panels.

7.2. Input voltage, total power power solar arrays selection.

7.2.1 Input voltage selection.

Input voltage, power solar arrays selection				
Pumps model	Inverte models	Vmp	Voc	Total Power of solar arrays
110VAC pumps	1S	110*1.41=130VDC	156VDC	≧ (1.3 to 2.0) rated power of pumps It is also depend on the quality of solar panels. The more power input, the better performance.
220VAC pumps	2S	220*1.41=310VDC	372VDC	
380VAC pumps	4T (Max 800VDC)	380*1.41=540VDC	648VDC	
480VAC pumps	4T (Max 900VDC)	480*1.41=677VDC	812VDC	

Although SG600 inverter built in high efficiency MPPT tracking arithmetic, up to 99.2% MPPT efficiency, but also need to consider many factors of solar radiation. It is no certain rules to determine exactly how many piece solar panels exactly input for system. If the output frequency can't get to 50Hz/60Hz, please consider to connect more solar panels.

7.2.2 Solar arrays selection table for inverter and pumps. Connecting solar panels in series to get enough voltage input, and then calculating how much strings for getting enough power.
Take a solar panels Voc38VDC, Vmp 31VDC, 265Wfor exampling.
Please check if enough DC voltage input for system, Voc and Vmp.
If the input voltage is correct, the inverter will not work properly. If the output frequency is not high, lower than 50/60Hz even in good sunlight radiation, please check if enough solar panels have been connected. The total power should be at least bigger 1.3 times than of rated power of pumps.

Solar panel spec.:265w, 38Voc (Open circuit voltage), 31Vmp (Voltage at Pmax)				
Inverter models	Power of pump	Connection in series (PCS) (Vmp)	Connect in parallel (Strings) Power	Total (PCS)
1S (110VAC)	0.75kw to 1.0kw	4 or 5 PCS	1* strings	5*1=5
2S (220VAC)	0.75kw to 1.5kw	10PCS	1* strings	10*1=10
2S (220VAC), Max 450vdc	2.2kw	11PCS	1* strings	11*1=11
4T(380VAC)	0.75kw to 2.2kw	18PCS	1* strings	18*1=18
4T(380VAC) Max 900VDC	3.7kw	20PCS	1* strings	20*1=20
4T(380VAC)	5.5kw	18PCS	2* strings	18*2=36
4T(380VAC) Max 900VDC	7.5kw	20pcs	2* strings	20*2=40
4T(380VAC)	11kw	18pcs	3* strings	18*3=54
4T(380VAC) Max900VDC	15kw	20pcs	4* strings	20*4=80

7.2.3. Install steps for solar pump inverter
1. Wiring DC power supply to R, T terminals of inverter. (also can able to connect power supply to P+ and P-,but please take great attention for polarity connecting. Positive to P+,Negative to P-.
2.Check actual Voc (open loop circuit voltage) of solar arrays by multi-meter, or monitor U012 parameters that display Voc value in keypad. SetPE-03 with actualVoc value.
3.Confirmed PE-00 if set for 1or 2 for MPPT working in solar pump control model.
4. Set P1-00 to P1-05 motor group parameters for getting better pumps protection.
5. Press the RUN button to start inverter (keypad control mode is in default setting, P0-02=0),to check output frequency, output voltage if good or not. The output frequency should be increase from 0 to 50/60hz, and output voltage should be balanced when frequency reach to rated frequency of pumps.
6.If output frequency and output voltage is normal, please stop inverter, and then switch off power, after that connect pump to U, V, W of inverter. (connect U, W for 1 phase pumps).
7. Press the RUN to start inverter to check water flow if correct, if water flow is small when reach

to high speed, please check the pump running direction if correct or not. Please rewire any two order of U, V, W if pump running direction is not correct.
Options operation if need.
8. Set lowest stop frequency PE-19 for pumps low speed running protection if need.
9. Set PE-22, PE-23, PE-24and PE-48parameters to active dry run function.
10. Set pump over current protection function if need by PE-26 and PE-27 setting
11. Set PE-36 to PE-47curve parameters as pumps PQ curve for getting accuracy flow indicating.
12.Water tank fulling detecting with digital switch of ball float sensor or analog signal senor.
A.Set PE-31=0,and connect 2 wires to DI4 and COM, and set F4.03=51. when water level reach to setting to activate normal open (NO) switch turn on, it will stop pumping and sent water full alarm.
B, set PE-31=AI1 and connect2 wires of analog sensor (0/4-20mA) to 24VDC and AI1 terminals, and short circuit GND and COM for loop. Set the parameters PE-32 to PE35.
If need auto restart function please set P0-02=1to make inverter control by terminals, and switch on DI1 and COM, also need confirm P4-00=1 (terminal function for Forward)

Note: 1). If the input Voc, Vmp DC voltage is too low, it will cause inverter can't work properly due to there are no built any voltage booster circuits or transformer parts inside of inverter.
2). The output AC voltage is related to DC voltage input, the output AC voltage range is 0 ~DC voltage/1.41, also is limited by motor rated voltage setting P1-02 parameter value.
For example. If the DC voltage is 250VDC, the output AC voltage will be 0~177VAC vary with sunlight radiation, the maximum is 177VAC when output frequency is reach rated frequency of pump.
If the DC voltage Vmp is 430VDC, and set P1-02=220VAC, the AC output voltage will be 0~220VAC vary with sunlight radiation. The inverter can able to suppress AC voltage output with P1-02 parameters setting, but can't increase the AC output voltage.
3). Please select one bigger power inverter for driving single phase pumps, because the running current of 1 phase pumps is much bigger than 3 phase pumps.For example, take 1.5kw inverter for 1 phase 220AV, 0.75kw pump, 0.75kw inverter for 1 phase 220VAC, 0.4kw pump.
4). Please consider to install output reactor, Dv/dt reactor, sine wave reactor when long distance from pump inveter.
5). PE-04, PE-05 and PE-05 parameters can use to increase the MPPT function gain, thebigger setting, the stronger MPPT, but it also can cause output frequency a little fluctuation.
6). Please refer Appendix 2for getting more information for driving PMSM high speed pumps.

Chapter 8.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: 2 wires output for 1 phase pump 4: 3 wires 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	0	╳

		8. PID 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 keyboard** **4： PULSE trains** **5： Rs485 communication**	**3**	×
P0-12	**Upper limit frequency source**	**Lower limit frequency P0-14～Maximum frequency P0-10**	**50.00Hz**	**√**

P0-13	**Upper limit frequency offset**	**0.00Hz～Maximum frequency P0-10**	**0.00Hz**	√
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	0000	√

		3：AI2 4：potentiometer of keypad 5：PULSE train（DI5） 6：multiple steps 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 2: 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	Auto tuning	×

		Inverter power > 55KW：0.01mH～655.35mH		
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 tuning	0	×

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	Obeserver Gain	0.1% - 999.9%	30.0%	√
P2-18	Observer Filter Time	0.1 - 100.0ms	4.0ms	√
P2-19	AM motor pre-Flux time	0 - 9999ms	300ms	√

P2-20	PM sensorless start mode	0:Start directly 1: Detect flux pos before start 2: Dc-inject before start	2	×
P2-21	Dc-inject current	0.0% - 200.0%	30.0%	√
P2-22	MTPA gain	0.0% - 999.9%	80.0%	√
P2-23	MTPA filter time	1ms - 9999ms	100ms	√
P2-24	PM Flux weak current	0.1% - 200.0%	0	√
P2-25	Flux weak forward Gain	0.1% - 999.9%	0	√
P2-26	Flux weak feedback Gain	0 - 9999	1000	√
P2-27	Flux weak integralgain	0 - 9999	1000	√
P2-30	PM statbility Gain	0.1% - 100.0%	10.0%	√
P2-31	PM current Gain	0.1 - 20.0	3.0	√
P2-32	PM magnetic depth	0.1% - 500.0%	60.0%	√
P2-33	PM magnetic Gain	0 - 5000	1000	√
P2-34	PM magnetic integral	0 - 5000	1000	√
P2-35	Dc-inject time	0 - 9999	500	√
P2-36	Dc-inject low freq	0.0 - 100.0%	10.0%	√
P2-37	Dc-inject high freq	0.0 - 100.0%	20.0%	√
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 motor rated voltage	0	√
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**	1	×
P4-01	**DI2 terminals function selection**		2	×
P4-02	**DI3 terminals function selection**		53	×
P4-03	**DI4 terminals function selection**		51	×
P4-04	**DI5 terminals function selection**		52	×
P4-05	Reserve		0	×

P4-06	Reserve	**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 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 command switchover terminal2 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	0	×
P4-07	Reserve		0	×
P4-08	Reserve		0	×
P4-09	Reserve		0	×

		47: Emergency stop 48: External parking terminal 2 49: DC braking in deceleration 50: current running time res **51: Water tank fulling detect 1/ single point detect** **52: Water tank fulling detect 2/ single point detect** **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 setting	-100.0%～+100.0%	0.0%	√
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 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	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	√

		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 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)	0	√
P5-07	AO1 output function selection		0	√
P5-08	AO2 output function selection		1	√
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 bits: 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 tracking	1～100	20	√
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 1 in running mode	0000～FFFF 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	1F	√
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)	0	√

		Bit08: Line speed Bit09: Current power-on time (Hour) Bit10: Current running time (Min) Bit11: PULSE train input pulse frequency (Hz) Bit12: Communication set points Bit13: Encoder feedback speed (Hz) Bit14: Main frequency X display (Hz) Bit15: Auxiliary Frequency Y Display (Hz)		
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 panel potentiometer voltage (V) Bit07: Count value Bit08: Length value Bit09: PLC stage Bit10: Load speed Bit11: PID setting Bit12: PULSE train input pulse frequency (kHz)）	33	√
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	0.0%～100.0%（Maximum frequency ）	0.0%	√

	amplitude			
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 hysteresis (FDT2)	0.0%～100.0%（FDT2 voltage level）	5.0%	√
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 1: Working after power up 2:Working by temperature(45℃/40℃) 3:Solar Mode, working if Vpn > PE-14)	3	√
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	0: Invalid	1	√

	protection options when power on	1: Valid		
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	26: Running time arrives	—	●

	of failure	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	00000	√

		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) 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 failure action	60.0%～100.0%(Standard bus voltage)	80.0%	√
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	0～65535	1000	√

	range			
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	00	√

		1: Stop integral working		
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 2: Continue to run in loop	0	√
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	0	√

		2：AI2 3: Keyboard potentiometer 4: PULSE train 5: PID 6: Preset frequency (F0-08) is given, UP / DOWN can be modified		
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 0：115200BPs 1：208300BPs 2：256000BPs 3：512000Bps Hundred places: reserved	6005	√
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 of solar pump control 1: Enable (Algorithm-1, High fficiency) 2: Enable (Algorithm-2, High stability) User can use terminal to disable solar pump control mode, make inverter work as motor variable speed control. See Digital terminal definition 53: MPPT/Solar control disable. (set F4-02=53, switch on DI3 and COM) Terminal control is prior.	2	X
PE-01	Solar pump control mode option	1 Bit: Vmpp mode selecting 0: Vmp set by PE-02 manually (CVT) 1: MPPT automatically Ten: Voc (open loop voltage of PV) detect mode 0: Voc set by PE-03 manually 1: Voc detect automatically Hundred: Auto running by keypad 0: Disable 1: Auto start/stop in keypad control mode. Inverter will automatically start when power on after 5 secondsonlyon keypad control mode.	H.001	√
PE-02	CVT voltage set by manual	0 -100%	80%	√
PE-03	Voc (open loop voltage) set manually	0.0V-1000.0V	650V/ 380V	V
PE-04	DC bus voltage stability Proportional gain	0.0% - 999.9%	100.0%	√
PE-05	DC bus voltage stability Integral gain	0.0% - 999.9%	100.0%	√
PE-06	DC bus voltage stability differential gain	0.0% - 999.9%	5%	√
PE-07	Initial point of fast frequency drop	0.0 - 100.0%	5.0%	√
PE-08	Stop point of fast frequency drop	0.0 - 100.0%	50.0%	
PE-09	Weak magnetic limit multiples	0. 0– 9. 9	1.2	
PE-10	Mppt search upper limit voltage	0. 0% – 100. 0%	90%	√
PE-11	Mppt search lower limit voltage	0. 0% – 100. 0%	75%	√

PE-12	MPPT search gain	0% - 500%	100%	√
PE-13	MPPT search interval	0.0 - 10.0sec	2.0sec	√
PE-14	Stabilizer filtering time (solarpump control mode2)	0-1000ms	50ms	√
PE-15	Stabilizer voltage threshold (solarpump control mode2)	10.0V – 100.0V	10.0V	√
PE-16	Sleep voltage threshold	0.0 – 1000.0V	250. 0V/ 150. 0V	√
PE-17	Wake up voltage threshold	0.0 – 1000.0V	350. 0V/ 250. 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	20sec	√
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	Digit: Water fulling detect mode 0: Single point detect 1: 2 points detect 2: AI1 analog 3: AI2 analog Ten: Single point detect 51# function logic detection selecting Hundred: Single point detect 52#	H0.0.0	√

		function logic detection selecting. 0: Normal Open, work when open, stop when switch on 1: Normal close, work when close, stop when open. Note:Single point detecting,when DI4 setfor 51(in default setting),adopt 5sec hysteresis detecting. 2 points detecting,DI4 set for 51,DI5 set for 52, both points should be activated at the same time to make water fulling function useful.		
PE-32	Water fulling level detecting threshold of analogtype,	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	10 sec	√
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	Initiating frequency of dry run protection	0.00 – 320.00Hz	0.0Hr	√
PE-49	Sleep power detecting selection When PE-49=0, the sleep mode activating as voltage, When PE-49 not set for 0,	0.0% - 100.0%	0.0%	√

	inveter if go to sleep mode as sleep power detecting.			
PE-50	Detecting time of sleep power	0 – 30000sec	60sec	√
PE-51	Sleep frequency	0.00Hz ～300.00Hz	10.00Hz	√
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 attribute	0： Enable modification 1: Not allow to modify	0	√
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 9. 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	
		3	2 wires output for single phase pump	
		4	3 wires output for single phase pump	

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.

1: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.

2: 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.

3: 2 wires output for single phase pumps when capacitors can't removed.

4: 3 wires output for single phase pumps when starting capacitors

P0-02	Running command source		Factory setting	0
	Setting	0	Keyboard/ 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.

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 keypad, 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 (Algorithm-1, High efficiency) 2: Enable (Algorithm-2, High stability)	2

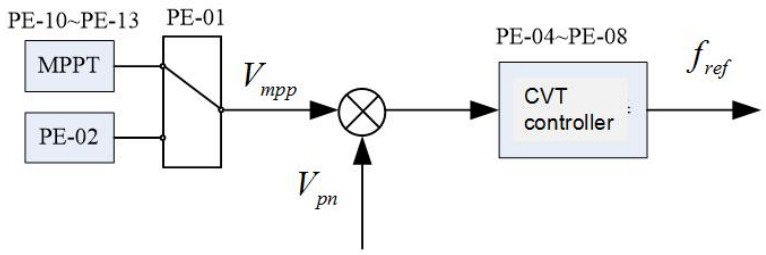
This parameters use to enable or disable solar pump control mode, When it set to 1 or 2, the solar pump control function will be activated, when it set to 0, the inverter work as general variable frequency without solar control function. The output frequency can be set but not vary with sunshine radiation.

There are two type Solar Pump conrtrol algorithm embed , and one (PE-00=1) is emphasized on efficiency, the other one(PE-00=2)is emphasized on stability;

PE-01	Vmpp voltage reference mode	Bit: Vmpp mode selecting 0: CVT set by PE-02 manually 1: MPPT auto mode Ten: Voc (open loop voltage of PV) detect mode	H0.0.1.

		0: Voc set by PE-03 manually 1: Voc automatically detect Hundred: Auto running by keypad 0: Disable 1: Auto start/stop even in keypad control mode. Inverter will automatically start when power on after 5 seconds under keypad control mode (P0-02=0)	
PE-02	CVT voltage setting value	0 -100%	80%
PE-03	Voc (open loop voltage) setting	0.0V-1000.0V	650V/ 380V

There are CVT and MPPT for solar pump control, user can set CVT or MPPT by PE-01 value.
If user set PE-01=***0, please set CVT value to PE-02.
If user set PE-01=***1, inveter carry out MPPT mode.
PE-01=**0*, if the ten digit set for 0, User need to set Voc value of PV to PE-03, the default setting 650VDC for 380VAC pumps, 350VDC for 220VAC pumps. Voc value is show by U0-12, so please set U0-12 value to FE-03.
PE-01=**1*, when the ten digit of PE-01 set for 1, the Voc will be detected automatically, and PE-03 is lower limit of auto detect value.
the inverter will detect Voc (open loop voltage of PV) automatically.
PE-01=*1**, the inverter can be able to start/stop automatically even in keypad control mode.



PE-04	DC bus voltage stability Proportional gain	0.0% - 999.9%	100.0%
PE-05	DC bus voltage stability Integral gain	0.0% - 999.9%	100.0%
PE-06	DC bus voltage stability differential gain	0.0% - 999.9%	0.0%

PE-04 to PE-06 use to adjust MPPT trackinggain ratio, and keep DC bus voltage in stability. The bigger value setting of PE-04 to PE-06, the stronger MPPT calculating. But it can cause outputfrequency a little fluctuation.

PE-07	Initial point of fast frequency drop	0–0 - 100.0%	5.00%
PE-08	Stop point of fast frequency drop	0–0 - 100.0%	50.00%

In some cloudy case, the inverter can't get enough solar energy from PV arrays, so we program inverter drop frequency quickly, make pump in generating mode, feedback energy to inveter to

maintain DC bus voltage.

PE-07=0, frequency quick drop function is disable.

PE-09	Weak magnetic limit multiples	0.0- 9.9	1.2
PE-10	Mppt search upper limit voltage	0.0% - 100.0%	90%
PE-11	Mppt search lower limit voltage	0.0% - 100.0%	75%
PE-12	MPPT search gain	0% - 500%	100%
PE-13	MPPT search interval	0–0 - 10.0sec	2.0sec
PE-14	Stabilizer filtering time (sold pump control mode 2)	0-1000ms	50ms
PE-15	Stabilizer voltage threshold (solarpump control mode2)	10.0V – 100.0V	10.0v

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	250V/150V
PE-17	Wake up voltage threshold	0.0 - 1000.0V	350V/250V
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	20sec
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	Digit: Water fulling detect mode 0: 1 point detect 1: 2 points detect 2: AI1 analog 3: AI2 analog Ten: Single point detect 51# function logic detection selecting Hundred: Single point detect 52# function logic detection selecting. 0: Normal Open, work when open, stop when switch on 1: Normal close, work when close, stop when open.	H0.00

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%

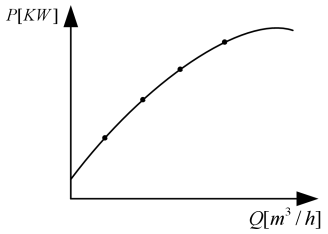
PE-31 parameter is used to set detecting method of water tank leveling.
point digital terminal water tank fulling detecting is default setting. There are normal open and normal close for selection.
For water well dry run detection, we can select normal close of digital function.
For water tank fulling detection, we can select normal open of digital function.
If select 2 points digital terminals fulling detect, please see below explanation:
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.



PE-48	Initiating frequency of dry run protection	0.00 - 320.00Hz	0.0Hz	√
PE-49	Sleep power setting	0.0% - 100.0%	0.0%	√
PE-50	Detecting time of sleep power	0 - 30000sec	60sec	√
PE-51	Sleep frequency	0.00Hz ～300.00Hz	10.00Hz	√

PE-48 parameters use to select dry run function starting frequency. Only the output frequency is higher than this setting, the dry run is activated.

The inverter if enter to sleep mode can able to detect sleep voltage and sleep power.

PE-49, PE-50 and PE-51 for power judge sleep mode.

When PE-49=0.0%, the inverter if enter sleep mode by judging sleep voltage PE-17.

When PE-49 is none 0.0%, the inverter if go to sleep by judging sleep power.

If the power less than PE-49 and output frequency is lower than PE-51 for PE-50 relay time , inverter will go to sleep mode.

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 connect to COM .

* Under voltage of 400VAC (4T) models is 250VDC, 200VAC (2S) model under voltage is 100VDC.

*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.

* The day flow and day generated energy period setting is 8hour per day.

Total flow=(U0-16 high bit)*1000+(U0-15)

Total generated energy=(U0-19 high bit)*1000+(U0-18)

Chapter 10, Monitor parameters of solar pump control

Monitor parameters	Monitoring contents	Unit	Address
U0-00	Output frequency	0.01Hz	7000H
U0-01	Preset frequency	0.01Hz	7001H
U0-02	DC voltage of PV arrays	0.1V	7002H
U0-03	Output voltage	1V	7003H
U0-04	Output current	0.01A	7004H
U0-05	Power of PV arrays	0.1KW	7005H
U0-06	Current of PV arrays	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	Motor (pump) speed	1rpm	700BH
U0-12	PV open loop circuit voltage (Voc)	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
U0-20	The rest running time	0.1Min	7014H
U0-24	Pump running speed	r/min	7018H
U0-25	Current power up time	1min	7019H
U0-26	Current running time	0.1min	701AH
U0-45	Fault information	1	702DH
U0-61	Inverter working status	1	703DH

Chapter11. Troubleshooting and Countermeasures

The below table listed SG600 series 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

Related alarm code of when working solar pump control mode.

Alarm showing	Alarm code	Alarm description	Countermeasures
A.SLP	81	Sleep mode	To check if enough total solar power input, the total power of solar arrays should bigger 1.3 times of rated power of pumps. 2.To check if enough DC Vmp, recommend 1.41 times DC voltage ofAC pumps voltage 3. Increase the PE-04 and PE-05MPPT gain value 4. To check PE-16sleep voltage if correct to set.
A.LFr	82	Low frequency protection	If the output frequency is lower PE-19 setting,this alarm will be activated for pumps protection, please set PE-19 for low value if need.
A.LLd	83	Dry run/under load protection	Set PE-22 for lower value to disable this alarm.
A.OLd	84	Over current/ over load protection	Set over current PE-25 for low or set for 0.
A.LPr	85	Minimum power	Set PE-28minimum power input protection for lower
A.FuL	86	Water tank fulling	To check if water is fulling
A.Prb	87	Analog sensor problem failure	To check if the sensor is broken or set PE-35for lower
Err.98	98	Distributor running time reach	Contact distributor
Err.99	99	Factory running time reach	Contact manufacturer

Fault code	Fault description	Possible reason	Countermeasures
Inverter unit	Err01	1, The inverter output circuit	1, Excluding the external fault

protection		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	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 in running 5, The using Inverter capacity (rated power is small	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
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	Set correct parameter Reduce load or check motor and driving machine 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 exception	1, Check and eliminate the problems in the external lines 2, Seek technical support
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	1, Reduce the ambient temperature 2, Clean up the duct

		3, The fan is damaged 4, IIGBT module thermistor is damage 5, The inverter module is damaged	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.	Reset Reset

		2, User define fault signal 2 with virtual IO function	
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 torecord 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 12.Routine Inspection and Maintenance

Affected by ambient temperature, humidity, dust, vibrationand internal device aging of the controller, problems mightoccur during operation. To make the inverter run stably, aperiodic inspection must be performed every year.

Requirement of Inspection and Maintenance

1. The inspection must be performed by professionaltechnical personnel.
2. Before working on the controller, always cut off thepower supply and wait, until the display turns off.
3. Avoid leaving any metal components in thecontroller, or else they might cause damage to the equipment.
4. An electric insulation test has been made on the controllerbefore it has left factory. Awithstand-voltagetest is not necessary.
5. It is forbidden to use the megohmmeter to test in thecontrol circuit.
6. When conducting insulation test on the motor, youhave to disconnect the connection between motorand controller.

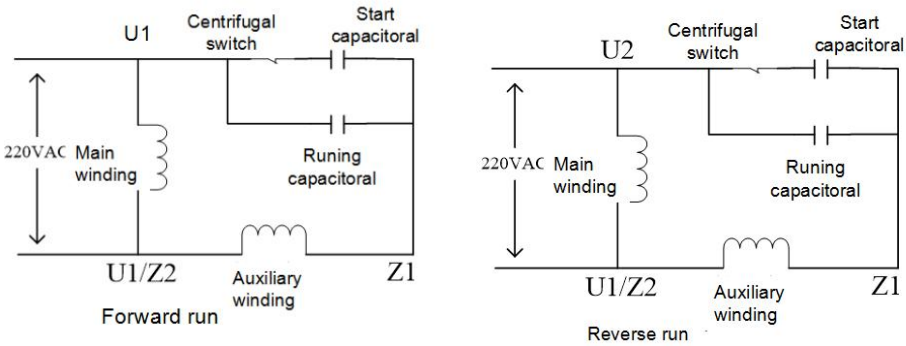
Warranty card

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)



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

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. S600 drive single-phase motor:

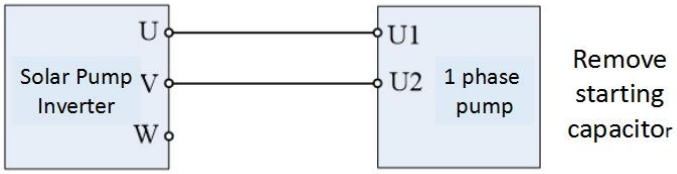
P0-01	1st motor control mode	0: VF control 1: Sensorless vector control (SVC) 2: PG sensor vector control (FVC) 3: 2 wires output for single phase pumps 4: 3 Wires for single phase pumps	0
P0-20	Single - phase motor balance coefficient (Three-phase output)	0.0 - 2.0	1.0

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.

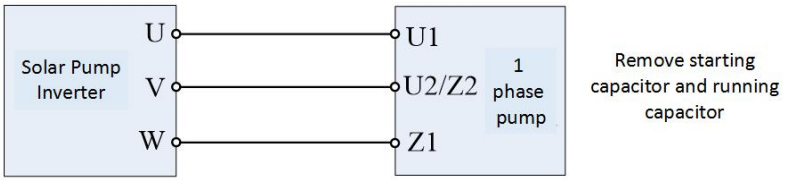
And also can adjust the output torque capacity with P3-01 parameters.

2.1. 2 wire 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. 3 wires 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 2SG600 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) 0.001mH～65.535mH(Rated power of inverter>55kW)
P1-18	Q-axis inductance	
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	0～20000	

	proportional gain		
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.

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.

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.

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

Appendix 3Communication protocol

SG600 series solar pump inverter can select the RS485 communication interface. The international standard ModBus communication protocol is adopted for master-slave communication. The consumer can carry out centralized control by PC/PLC, upper machine, main station solar pump inverter etc (Setting of the solar pump inverter control command, running frequency, relative function parameters modification, solar pump inverter working state and malfunction information monitoring etc.. to adapt to the special application requirements.

2. Protocol content

This ModBus protocol defines the information content and format of asynchronous transmission in series communication. It includes: host machine polling, broadcast and the format of slave machine response. Host machine data frame includes: slave machine address (or broadcast address), ask action code, data and fault check. Slave machine response is same structure: action check, back data and fault check. If slave machine meet fault while accept frame, or can't compete the action asked, fault information will be feed back to host machine.

3. Application mode

SG600 series solar pump inverter has control network for "single host machine and many slave machines" with R2S32/RS485.

Remote RS485 communication needs shield cable and shield grounding.

For long distance communication, we suggest to open J6 and add 120Ωresistance to prevent signal reflection.

4. Main line structure

1, Port mode: RS485 port

2, Transmission mode: Asynchronous series, half duplex transmission mode. At same time, one of the host machine and slave machine sends data, anther receives data. Data is sent one by one frame as report form in asynchronous series communication.

3, Topological structure: One host machine with several slave machines. Range of slave machine address is 1 to 247. O is broadcast address. Every slave machine address is only one. It is the base of ModBus series communication.

5. Protocol explain

SG600 series solar pump inverter communication protocol is main-slave ModBus communication protocol of asynchronous series. In the net, only the host machine can set up protocol "inquire/ order". Slave machines can only respond to host machine. Host machine means PC, main solar pump inverter, industrial control equipment or PLC…

Slave machines are SG600 solar pump inverters and other control equipments with same communication protocol. Host machine can communicate with only one slave machine or broadcast to all slave machines. Slave machine need feedback every "inquire/order" of host machine, but no need feedback broadcast.

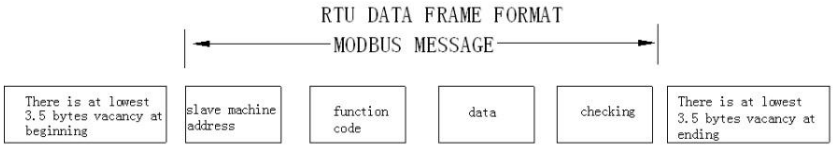
5.1 Communication frame structure

The ModBus protocol communication data format of SG600 series solar pump inverter is RTU (remote terminal unit) mode. Communication data format is as follows:

The byte composition: Include initiation bit, 8 data bit, check bit and stop bit.

Initiation bit	Bit 1	Bit 2	Bit 3	Bi4 T	Bit 5	Bit 6	Bit 7	Bit 8	No check bit Even check bit Odd check	stop bit

In RTU mode, it always starts after at least 3.5 byte transmission time which is easy realized under Baud rate. And next data is: slave machine address, operation order code, data and CRC check. Every domain transmission is hexadecimal 0...9， A...F. Network equipment detects the network bus unceasingly, including the interval time. While receiving the first domain (address information, each network equipments carry out decoding to judge whether the byte is for itself. While the final byte transmission is completed, there will be at least 3.5 bytes transmission time interval to indicate that this frame is over. Then a new information' transmission can begin



One frame message must be transmitted as a continued data flow. If there is a pause over 1.5 byte before the end, the receiving equipment will clear the half-baked information. And the next byte will be considered as the address domain of a new frame. Similarly, if the interval between a new frame start-up and the former frame is smaller than 3.5 byte time, the receiving equipment will think that it is the former one frame continuation. Because of the jumbled frame, finally CRC checking value is incorrect, what leads to the communication mistake.

RTU frame's standard structure

Frame start	The transmission time of 3.5 bytes in silent
Slave address ADDR	0~247(0 broadcast address)
Executive command MD	03H： Read slave parameters
Function code H	Inverter inside parameters, divided into functional code and non-functional patterns (such as operating status parameters, run the command, etc.) parameters, see the address definition. When transmitting, the high byte is preceded by the low
Function code L	
Function code H	The number of function codes read by this frame, if 1 is to read a function code. When transmitting, the high byte is preceded by the low byte in the post. This protocol can only rewrite a function code at once,
Function code L	
Data H	The data to be answered, or the data to be written, is transmitted when the high byte is preceded by the low byte in the post.
Date L	
CRC CHK high byte	Detection value: CRC16 check value. When transmitting, the high byte is preceded by the low byte in the post. The calculation method is described in the CRC check in this section.
CRC CHK low byte	
END	3.5 characters

CRC check mode --- CRC (Cyclical Redundancy Check)

Use RTU format, frame include Framing Error detection domain calculation method based on CRC. CRC field checks the contents of the entire frame. CRC field is two bytes, containing a 16-bit binary. After it is calculated by the transmission equipment is added to the frame. The receiving device receiving the frame recalculate the CRC, and compared with the value received in the CRC field, if not equal, then the transmission errors.

CRC is first stored in 0XFFFF, then calls a procedure in the frame byte and the value of the current register for processing. Only 8Bit data for each byte CRC is valid, the start and stop bits and the parity bits are invalid.

CRC generation process, each 8 bytes are separate and distinct register contents or (XOR), the result moves to the least significant bit direction, the most significant bits padded with 0s. LSB is extracted detect if LSB is 1, the preset value register individually and XOR, if LSB is 0, no. The whole process is repeated eight times. After the last (eight), the next 8-bit byte is exclusive content dissimilar or register. The final value of the register is CRC value of the frame in all bytes after the execution.

CRC This calculation method using the international standard CRC check rules, the user when editing CRC algorithm, can refer to the relevant standard CRC algorithm to write a CRC calculation program really meet the requirements.

CRC now offers a simple function to calculate the user's reference (C programming language):

```
unsigned int crc_cal_value(unsigned char *data_value, unsigned char data_length)
#define uint      unsigned int
#define uchar     unsigned char uint crc_chk_value(uchar *data_value , uchar length)
{
      uint crc_value ;
      int    i ;

      crc_value = 0xFFFF
      while(length --)
      {
            crc_value ^= *data_value ++ ;
            for(i=0;i<8;i++)
            {
                  if(crc_value & 0x0001)
                  {
                        crc_value = (crc_value >> 1) ^ 0xA001 ;
                  }else
                  {
                        crc_value = crc_value >> 1 ;
                  }
            }
      }
      return crc_value ;
}
```

Function Code Parameter Addressing Rules:

With the function code group number and label for the parameter address that rules:

High byte: P0 ~ PF (group F), 70 (U group); low byte: 00 ~ FF

For example, if the range function code P3-12 is to be used, the access address of the function code is represented as 0xF30C;

Note: PF group parameters: neither read nor change; U group: only read, can not change the parameters.

Some parameters can not be changed when the inverter is running. Some parameters can not be changed regardless of the state of the inverter. Change the function code parameters and pay attention to the range, unit and description of the parameters.

Function code	Communication access address	Communication Modifies the function code address in RAM
P0～PE group	0xF000～0xFEFF	0x0000～0x0EFF
U0 group	0x7000～0x70FF	Can’t modify

Note: Because EEPROM is frequently stored, will reduce the EEPROM's life, so some function code in the communication mode, no need to store, just change the value of RAM on it. If the P group parameters, to achieve this function, as long as the function code address high F to 0 can be achieved.

The corresponding function code address is as follows:

High byte: 00 ~ 0F (group F); low byte: 00 ~ PF

For example: Function code P3-12 is not stored in the EEPROM, the address is expressed as 030C; the address that can only write RAM, can not read the action, read, for the invalid address.

For all parameters, you can also use the command code 07H to achieve this function.

Shutdown / Run Parameters Section:

Monitor parameters	Monitoring contents	Unit	Address
U0-00	Output frequency	0.01Hz	7000H
U0-01	Preset frequency	0.01Hz	7001H
U0-02	Input DC voltage of PV arrays	0.1V	7002H
U0-03	Output voltage	1V	7003H
U0-04	Output current	0.01A	7004H
U0-05	Input power of PV arrays	0.1KW	7005H
U0-06	Current of PV arrays	0.01A	7006H
U0-07	DI input status	1	7007H
U0-08	DO output status	1	7008H
U0-09	AI1 of terminal	0.01V	7009H
U0-10	AI2 of terminal	0.01V	700AH
U0-11	Motor (Pump) speed	1rpm	700BH
U0-12	PV open loop circuit voltage (Voc)	0.1V	700CH
U0-13	Flow rate of pump	0.1m^3/hr	700DH
U0-14	Day flow (8H/day)	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 (8H/day)	0.1kwh	7011H
U0-18	Generated accumulation （low-order digit)	0.1kwh	7012H
U0-19	Generated accumulation （high-order digit)	0.1Mwh	7013H
U0-20	The rest running time	0.1Min	7014H
U0-24	Pumps speed	1 r/min	7018H
U0-25	Current power on time	1min	7019H
U0-26	Current running on time	0.1min	701AH
U0-45	Fault information	1	702DH
U0-61	Inverter working status	1	703DH

Inverter working status: 0: stop, 1: Forward running; 2: reverse running

3. For the data of the torque dimension, the percentage is P2-10 (torque upper limit digital setting).

Control command input to Invert: (write only)

Read the Inverter status: (read only)

Address of command	Command function
2000H	0001: Forward
	0002: Reverse
	0003: Jog forward
	0004: Jog Reverse
	0005: Free stop
	0006: Deceleration
	0007： Fault reset

Status word address	Status word function
3000H	0001: Forward run
	0002: Reverse run
	0003: Stop

Parameter lock password verification: (if returned to 8888H, that means that password verification)

Password address	Enter the contents of the password
1F00H	*****

Digital output terminal control: (write only)

Command address	Command contents
2001H	BIT0: DO1 output control BIT1: DO2 output control

	BIT2: RELAY1 output control BIT3: RELAY2 output control BIT4: FMR output control

Analog output AO1 control: (write only)

Command address	Command contents
2002H	0 ~ 7FFF means 0% ~ 100%

Analog output AO2 control: (write only)

Command address	Command contents
2003H	0 ~ 7FFF means 0% ~ 100%

Pulse (PULSE) Output Control: (write only)

Command address	Command contents
2004H	0 ~ 7FFF means 0% ~ 100%

Inverter fault description:

Inverter fault address	Inverter fault information	
8000H	0000: No fault 0001: Reserved 0002: Accelerated overcurrent 0003: Deceleration overcurrent 0004: constant speed overcurrent 0005: Accelerated overvoltage 0006: Deceleration overvoltage 0007: constant speed overvoltage 0008: Buffer resistance overload fault 0009: Undervoltage fault 000A: Inverter overload 000B: motor overload 000C: Input phase loss 000D: Output phase loss 000E: module overheat 000F: External fault 0010: communication error 0011: contactor is abnormal 0012: Current detection fault 0013: Motor tuning fault 0014: Encoder / PG card fault	0015: Parameter read and write exception 0016: Drive hardware failure 0017: Motor to ground short circuit fault 0018: Reserved 0019: Reserved 001A: Run time arrives 001B: user defined fault 1 001C: User Defined Fault 2 001D: Power-up time arrives 001E: Drop 001F: Runtime PID feedback lost 0028: Fast current limit timeout 0029: Motor is switched at runtime 002A: The speed deviation is too large 002B: motor speed 002D: motor overtemperature 005A: Encoder line setting error 005B: Missed encoder 005C: initial position error 005E: Speed feedback error

Information description data (fault code):

Communication fault address	Fault function description

8001H	0000: No fault 0001: Password is incorrect 0002: Command code error 0003: CRC check error 0004: Invalid address	0005: invalid parameter 0006: parameter change is invalid 0007: The system is locked 0008: operating in EEPROM

PD group communication parameter description

Pd-00	Baud rate	Factory default	6005
	Set range	Bit: MODBUS baud rate	
		0：300BPS 1：600BPS 2：1200BPS 3：2400BPS 4：4800BPS	5：9600BPS 6：19200BPS 7：38400BPS 8：57600BPS 9：115200BPS

Pd-01	Data Format	Factory default	0
	Set range	0: No parity: Data format <8, N, 2> 1: Even test: Data format <8, E, 1> 2: Odd parity: data format <8, O, 1> 3: No parity: Data format <8-N-1>	

Pd-02	Local address	Factory default	1
	Set range	1～247，0 is the broadcast address	

When the local address is set to 0, that is, broadcast address, to achieve the host computer broadcast function.

The local address is unique (except for the broadcast address), which is to achieve the host computer and the inverter point to point communication basis.

Pd-03	Response delay	Factory default	2ms
	Predetermined area	0～20ms	

Pd-04	Communication timeout	Factory default	0.0 s
	Set range	0.0 s（ invalid ） 0.1～60.0s	

When the function code is set to 0.0 s, the communication timeout parameter is invalid.

When the function code is set to a valid value, the system will report a communication error (Err16) if the interval between the next communication and the next communication exceeds the communication timeout period. Normally, it is set to invalid. If you set the secondary parameter in a continuous communication system, you can monitor the communication status.

Pd-05	Communication protocol selection	Factory default	0
	Set range	0: non-standard Modbus protocol 1: Standard Modbus protocol	

PD-05 = 1: Select the standard Modbus protocol.

PD-05 = 0: When reading a command, the number of bytes returned by the slave is one byte more than the standard Modbus protocol.

Pd-05	Communication read current resolution	Factory default	0
	Set range	0：0.01A 1：0.1A	

Used to determine the output unit of the current value when the communication reads the output current.

Example： forward running reverse running stop, and reset operation command word as following:

Button name:	RUN	Send instruction:	01 06 20 00 00 01 43 CA	Return instruction:	01 06 20 00 00 01 43 CA
Button name:	REV	Send instruction:	01 06 20 00 00 02 03 CB	Return instruction:	01 06 20 00 00 02 03 CB
Button name:	STOP	Send instruction:	01 06 20 00 00 05 42 09	Return instruction:	01 06 20 00 00 05 42 09
Button name:	RESET	Send instruction:	01 06 20 00 00 07 C3 C8	Return instruction:	01 06 20 00 00 07 C3 C8

Appendix 4Selection of Peripheral Electrical Devices of SG600

1. Selection of peripheral electrical devices

Inverer Model	MCCB	Contactor	Cable of Input Side Main Circuit	Cable of Output Side Main Circuit	Cable of Control Circuit
	(A)	(A)	(mm2)	(mm2)	(mm2)
Single-phase 220 V					
SG600-2S-0.7GB	10	12	0.75	0.75	0.5
SG600-2S-1.5GB	16	18	1.5	1.5	0.5
SG600-2S-2.2GB	25	25	2.5	2.5	0.5
SG600-2S-4.0GB	32	32	4	4	0.75
Three-phase 380 V					
SG600-4T-0.7GB	4	9	0.75	0.75	0.5
SG600-4T-1.5GB	6	9	0.75	0.75	0.5
SG600-4T-2.2GB	10	12	0.75	0.75	0.5
SG600-4T-4.0GB/5.5PB	16	18	1.5	1.5	0.5
SG600-4T-5.5GB/7.5PB	20	25	2.5	2.5	0.75
SG600-4T-7.5GB/11PB	25	25	4	4	0.75
SG600-4T-11GB/15PB	32	32	6	6	0.75
SG600-4T-15GB/18.5PB	40	40	6	6	0.75
SG600-4T-18.5G/22P	50	50	10	10	1
SG600-4T-22G/30P	50	50	10	10	1
SG600-4T-30G/37P	63	63	10	10	1
SG600-4T-37G/45P	80	80	25	25	1
SG600-4T-45G/55P	100	115	35	35	1
SG600-4T-55G/75P	125	125	50	50	1
SG600-4T-75G/90P	160	185	70	70	1
SG600-4T-90G/110P	200	225	95	95	1
SG600-4T-110G/132P	225	225	120	120	1
SG600-4T-132G/160P	315	330	120	120	1
SG600-4T-160G/185P	350	400	150	150	1
SG600-4T-185G/200P	350	400	150	150	1
SG600-4T-200G/220P	400	400	185	185	1
SG600-4T-220G/250P	500	500	240	240	1
SG600-4T-250G/280P	500	500	120 *2	120 *2	1
SG600-4T-280G/315P	630	630	120 *2	120 *2	1
SG600-4T-315G/355P	630	630	150 *2	150 *2	1
SG600-4T-355G/400P	700	800	185*2	185*2	1
SG600-4T-400G/450P	800	800	240*2	240*2	1
SG600-4T-450G/500P	800	800	240*2	240*2	1
SG600-4T-500G/560P	800	800	240*2	240*2	1

2. Out put reactor (OCR)

This reactor is used for suppress the capacitive charging current of connection cable between inverter and motor, and passivating the voltage rising rated of PWM as well. It is mounted at the output side of frequency inverter. When the distance of cable between inverter and motor over a value, suggest installed output rector to compensate recharge current of line capacitive.
Product application
1. Limit DV/DT to 500V/us
2. Limit the overvoltage of motor .
3. Reduce the leakage current of motor
4. Reduce the interference generated by contacter which mount between filter and motor.
5. If the distance from pump to inverter over than 150M, less than 300M, suggest install output reactor.

3. DV/dT fi lters with VFDs Introduction
A dV/dT filter is a device that controls the voltage spikes generated by variable frequency drives (VFDs) and long motor lead lengths. This voltage spike event is generally known as the reflected wave phenomenon . This resulting reflected wave can cause very high voltages on the motor leads, which can lead to damage and premature failure of the motor winding insulation (even with inverter duty rated motors), particularly within the first few turns.
Taking these factors into account will assist in the performance of the dV/dT filter in the application and the protection of the motor from dangerous reflected wave voltages up to 1000 feet from the VFD. (VFD means inveter)

4.Sine Wave Filter (SFR)
Sine Wave Filter are designed to provide a Sine Wave output voltage when driven from Variable Frequency Drives or other types of PWM inverters with switching frequencies from 2kHz to 8kHz. For Variable Frequency Drive (VFD) applications, Sine Wave Filters eliminate the problem of motor/cable insulation failures, heating, and audible noise. Sine Wave Filters also reduce electromagnetic interference (EMI) by eliminating the high dV/dt associated with inverter output waveform. Bearing currents are also reduced, especially in larger motors above 50 kW.
The perfect solution for:
- Applications with older motors
- Aggressive environments
- Applications with frequent braking
- 690 V above applications with general purpose motors
- Motor cable length between 350 and 3000 meters

Above reactor and filter can improve the inveter performance especial long distance from pump to inveter. If need more detail please contact us.