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Chapter 1. About this manual (Version4)

Solar water pumping solution is a fully automatic system designed to provide water at affordable cost for people with limited or no access to electricity. It uses the most advanced SG320 Solar variable speed drive to regulate the speed of a 1/3-phase AC motor depending upon the solar energy available from the solar panel.

This chapter provides an overview of the contents, purpose, compatibility, and the intended audience of this manual. This supplement manual intends to serve as a quick start guide for installing, commissioning and operating the SG320 solar pump inverter. This manual includes all the required parameter settings and program features specific to the solar pump inverters.

READ AND FOLLOW ALL INSTRUCTIONS

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

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

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

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

Safety and Caution

1.1. General Warnings

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

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

Should the available personnel be lacking the necessary qualification, they must be trained and instructed accordingly. If necessary, the operator may require the manufacturer/supplier to provide such training. Furthermore the operator/user must make sure that the personnel fully understands the contents of the manual.

Dangers of Ignoring the Safety Symbols – Ignoring the safety directions and symbols may pose a danger to humans as well as to the environment and the equipment itself. Non-observance may void any warranties. Non-observance of safety directions and symbols may for example entail the following: Failure of important functions of the equipment/plant; failure of prescribed methods for maintenance and repair; endangerment of persons through electrical, mechanical and chemical effects; danger to the environment because of leakage of hazardous material; danger of damage to equipment and buildings.

Safety-oriented Operation – The safety directions contained in the manual, existing national regulations for the prevention of accidents as well as internal guidelines and safety-regulations for the operator and user must be observed at all times.

General Safety Directions for the Operator/User– If hot or cold equipment parts pose a danger then they must be protected by the operator/user against contact with people. Protective covers for moving parts (e.g. couplings) must not be removed when the equipment is running. Leaks (e.g. at the shaft seal) of hazardous pumping media

(e.g. explosive, toxic, hot liquids) must be disposed of in such a way that any danger to personnel and the environment is removed. All government and local regulations must be observed at all times. Any danger to persons from electrical energy must be excluded by using good installation practices and working to local regulations.

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

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

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

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

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

1.2 Purchase Inspection

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

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

1.3. Installation

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

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

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

1.4 Connection

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

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

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

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

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

1.5 Operation

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

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

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

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

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

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

Chapter2. Solar pumping system introduction

2.1. Solar Pumping System overview

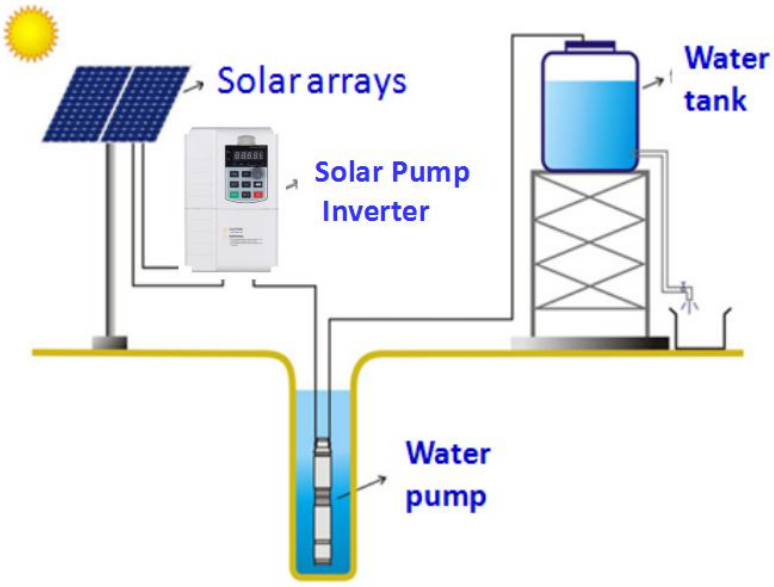
Solar pumping systems can be applied to all forms of daily use, water pumping for drinking water supply for remote villages and farms without connection to the water grid, for agricultural use such as livestock watering, agricultural irrigation, forestry irrigation, pond management, desert control, and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

In recent years, with the promotion of the utilization of renewable energy resources, solar pumping systems are more and more used in municipal engineering, city centre 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 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.



Solar pump drive/ inverter system

2.2.Solar pump inverter features:

Save in energy costs and maximize productivity

Solar water pumping system operate on direct current. The output of solar power system varies throughout the day and with changes in weather conditions. Photovoltaic module, the power source for solar pumping, have no moving parts, requires no maintenance and last for decades. A properly designed solar pumping system will be efficient, simple and reliable. Solar powered pumping systems are used principally for three applications town and city water supply, livestock watering and irrigation

Save environment

Harnessing the power of sun provides an environmentally friendly pumping without producing any CO2 emissions Easy install and operation and little parameters Configuring. end user ,who never used drive 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.

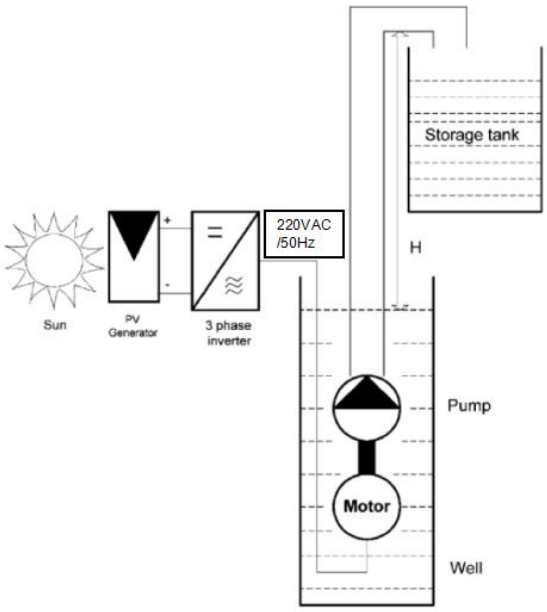
Reduce operational risk

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

2.3.Applications of solar pump system.

Providing clean, environmentally safe water for livestock in sufficient quantities continues to be a major concern for farmers and ranchers. Abundant water in remote locations in needed to insure that grasslands are grazed evenly.

- ✧ Ground water lowering,
- ✧ Irrigation systems
- ✧ Industrial Application
- ✧ Drip irrigation& sprinkler
- ✧ Tank/ cistern filling
- ✧ Wildlife refuge, Fountains
- ✧ Rural water supply for ranches, cabins, and cottages



Solar pump inverter system (DC-AC)

Chapter3. Solar pump inverter overview

The SG320 series solar pump inverter is a low voltage AC drive of 0.3 to 400KW 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.

3.1 Product Features

The solar pump inverter operates in local control mode and in remote control mode identical to the ordinary S300/S320 AC drive.

• Local control—interfaces through the operation pane (keypad)

• Remote control—interfaces through external terminals control or gprs communication.

Several advantages of SG300/320 solar pump inverter

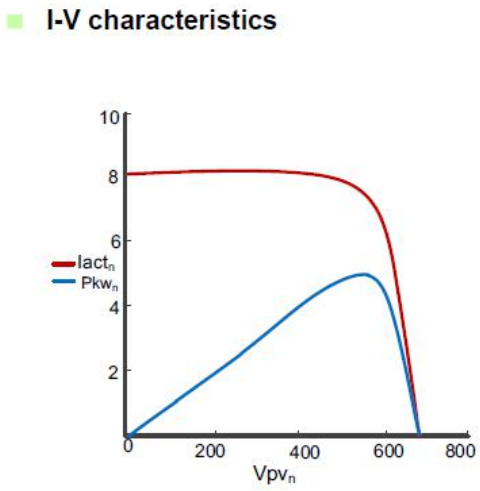
- ✧ Maximum power point tracking (MPPT) with fast response speed and stable operation
- ✧ Enable to drive for 1 phase AC pumps or 3 phase AC pumps
- ✧ Enable to drive for PMSM high speed and high efficiency pumps without motor ID auto tuning
- ✧ Dry run (under load) protection, lowest speed auto tuning , Pumps maximum current protection, Minimum power input protection...
- ✧ The PQ (power/flow) performance curve enables to calculate the flow output from the pump
- ✧ Dual mode AC and DC power supply input is available
- ✧ Digital signal of water level sensor and analog signal of water level sensor for water tank fulling detect.
- ✧ Dedicated hardware design with dual CPU, independent air duct design
- ✧ Import IGBT module such as Infineon, Fuji,TYCO to ensure good quality
- ✧ Enhanced lightning protection module
- ✧ GPRS remote control module for distance monitoring, control, parameters modification, and history data record..
- ✧ Efficiency is higher than 99.5%, power factory not less than 0.96 for below 15kw inverter.

3.2. Solar pump inverter operation theory

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

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

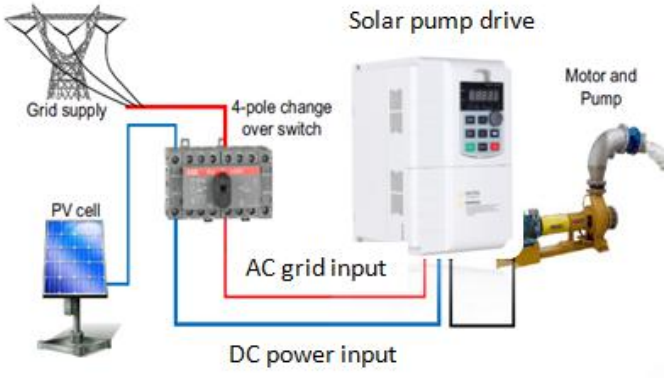
When the output voltage is zero, the PV cells create short circuit current. If the PV cells are not connected to any load, the output voltage is equal to the open circuit voltage. The maximum power point is obtained at the knee of the I-V curve. See the I-V characteristics shown below.



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

3.3. SG320 series solar pump inverter compatible with dual supply mode

The solar pump inverter operates in dual supply mode either with a three phase input supply from the grid or with DC input supply from PV cells. A four-pole changeover switch enables switching between the two supply modes. At a given time only one supply (PV cell or grid) will be connected to the drive.



Note: Please note the polarity connecting when wire to P+ and P- terminals of inverter.

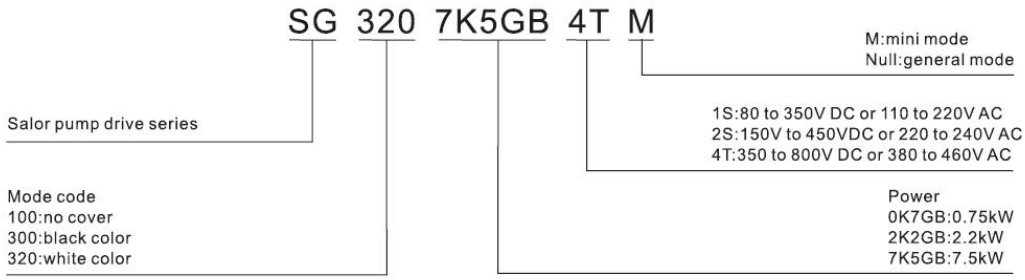
For 3 phase Ac pumps, connect cables of pumps to U, V, W.

For 1 phase AC pumps, please connect to U, W terminals if didn't removed start capacitors.

Connect to U, V, W if start capacitors have been removed.

3.4. SG320 series solar pump inverter model description

The nameplate of solar pump inverter



3.5. SG300/320 solar pump inverter models list:

Model	Input voltage	Output for pumps	Power	Pictures
SG100-2S	150 to 400VDC, or 220 to 240VA	3 PH 220V to 240VAC	0.75kw	
SG320-2S-M	90 to 400VDC, or 220 to 240VA	3 PH 220V to 240VAC	0.75—1.5kw, 4A, 7A	
SG320-4T-M	250 to 800VDC 380 to 460VAC	3 PH 380V to 460VAC	0.75—2.2kw, 2.5A-5.1A	
SG320-2S	150 to 450VDC 220 to 240VA	3 PH 220V to 240VAC	0.75—4kw; 4-16A	
SG320-4T	250 to 900VDC 380 to 460VAC	3 PH 380V to 460VAC	0.75—15kw	
SG320-4T	250 to 900VDC 380 to 460VAC	3 PH 380V to 460VAC	18kw, 22kw, 30kw (plastic shell is option)	
SG320-4T	350 to 800VDC 380 to 460VAC	3 PH 380V to 460VAC	18—400kw (steel cover)	

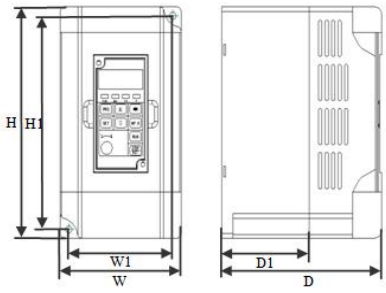
3.6. SG300/320 series solar pump inverter technical specification

**solar pump inverter specification when FA-00 set to 1&2 for solar pumping controlling function.	
Recommended MPPT voltage range	Vmp 131 to 350 VDC for 1S (90V to 350VDC input, 3PH 110 to 220VAC output) Vmp 260 to 355VDC for 2S (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 Vmp (voltage at Max Power point voltage)	VOC 184(VDC), Vmpp 155(VDC) for 1S model or 110V AC pumps VOC 372(VDC), Vmpp 310(VDC) for 2S model or 220V AC pumps VOC 648(VDC), Vmpp 540(VDC) for 4T model or 380V AC pumps
Motor type	Control for permanent magnet synchronous motor and asynchronous motor pumps. 1 phase or 3 phase 220VAC pumps.
Rated output voltage	3-Phase,110V/160V/220V. 3-phase, 220V/380V/460V
Output frequency range	0~maximum frequency 600Hz. Resolution 0.01 Hz
MPPT efficiency	99.7%, more efficiency if use to drive PMSM pumps
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.
Standard AC input backup circuit	CE, Design based on vector control drive S300 and S3200 series, more specification please refer to S300 or S320 vector control drive operation manual
Auto stop and auto restart	Control by external switch, float switch, Rs485 communication. It will auto start at morning when get enough power from sunlight, and stop at sunset when power is less from solar panel under terminals control mode
Technical specification when it used for speed and torque controlling of motor as FA-00 set to 0.	
voltage, frequency	Single phase 220V, 3 phase, 220V,380V, 660V and 1140V. Input Power 0.75kw to 37kw.
Control mode	0: VF control ; 1: Vectorized VF control ; 2： Open loop vector control 1 ; 3: High performance open loop vector control 2
Maximum frequency	0-650Hz
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. Models and specification

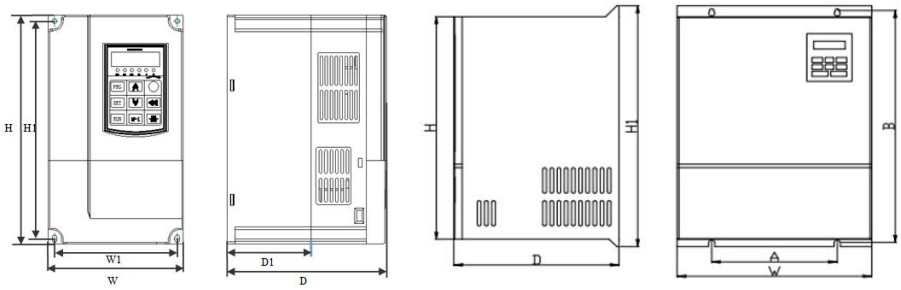
SN	Models	Rate current (A)	Output voltage (VAC)	Applicable for pumps	External of drive size(mm)	MPPT voltage (VDC)	Weight
Mini type 1S series : Vmp154VDC or 110VAC input, 0-110VAC output							
1*	SG300-0K75GB-1S-M	7A	0-110VAC	0.75KW	143*86*114	154	1
2*	SG320-1K5GB-1S-M	8.5A	0-110VAC	1.5KW	185*125*159	154	2.5
Mini type 2S series : Vmp 310VDC or 220VAC input, 1/3 phase 0-220VAC output							
1	SG100-0K75GB-2S	4A	0-220VAC	0.75KW	170*110*70	310	1
2	SG300-0K75GB-2S-M	4A	0-220VAC	0.75KW	143*86*114	310	1
3	SG300-1K5GB-2S-M	7A	0-220VAC	1.5KW	143*86*114	310	1
Mini type 4T series: Vmp540 to 650VDC or 380 to 460VAC input, 3 phase 0-380/460VAC output							
4	SG300-0K7GB-4T-M	2.5A	0-380/460V	0.75KW	143*86*114	540/650	1
5	SG300-1K5GB-4T-M	3.7A	0-380/460V	1.5KW	143*86*114	540/650	1
6	SG300-2K2GB-4T-M	5A	0-380/460V	2.2KW	143*86*114	540/650	1
General type 2S series: Vmp 310VDC or 220VAC input, 1/3 phase 0-220VAC output							
7	SG320-0K7GB-2S	4A	0-220VAC	0.75KW	185*125*159	310	2.0
8	SG320-1K5GB-2S	7A	0-220VAC	1.5KW	185*125*159	310	2.0
9	SG320-2K2GB-2S	10A	0-220VAC	2.2KW	185*125*159	310	2.5
10	SG320-4K0GB-2S	16A	0-220VAC	4.0KW	245*150*177	310	3.5
General type 4T series: Vmp540 to 650VDC or 380 to 460VAC input, 3 phase 0-380/460VAC output							
11	SG320-0K7GB-4T	2.5A	0-380/460VAC	0.75KW	185*125*159	540/650	2
12	SG320-1K5GB-4T	3.7A	0-380/460VAC	1.5KW	185*125*159	540/650	2
13	SG320-2K2GB-4T	5A	0-380/460VAC	2.2KW	185*125*159	540/650	2
14	SG320-4K0GB-4T	10A	0-380/460VAC	4.0KW	185*125*159	540/650	2.5
15	SG320--5K5GB-4T	13A	0-380/460VAC	5.5KW	245*150*177	540/650	3.5
16	SG320-7K5GB-4T	17A	0-380/460VAC	7.5KW	245*150*177	540/650	4
17	SG320-011GB-4T	25A	0-380/460VAC	11KW	247*160*178	540/650	5
18	SG320-015GB-4T	32A	0-380/460VAC	15KW	247*160*178	540/650	5
19	SG320-018GB-4T	37A	0-380/460VAC	18KW	335*217*190	540/650	10
20	SG320-022GB-4T	45A	0-380/460VAC	22KW	335*217*190	540/650	19
21	SG320-030GB-4T	60A	0-380/460VAC	30KW	463*285*225	540/650	19
22	SG320-037GB-4T	75A	0-380/460VAC	37KW	463*285*225	540/650	29
23	SG320-045GB-4T	90A	0-380/460VAC	45KW	600*385*270	540/650	29
24	SG320-055GB-4T	110A	0-380/460VAC	55KW	600*385*270	540/650	29
25	SG320-075GB-4T	150A	0-380/460VAC	75KW	600*385*270	540/650	43
26	SG320-090GB-4T	180A	0-380/460VAC	90KW	700*473*307	540/650	47
27	SG320-110GB-4T	220A	0-380/460VAC	110KW	700*473*307	540/650	90
28	SG320-132GB-4T	260A	0-380/460VAC	132KW	930*579*375	540/650	100
29	SG320-160GB-4T	320A	0-380/460VAC	160KW	930*579*375	540/650	130
30	SG320-**GB-4T	**	0-380/460VAC	200-400	**	540/650	**

3.8. SG320 series solar pump inverter dimensions



Mini type Fig 1

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



General type Fig 2

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

Power (3 phase 380V output)							
	W	H1	H	D	A	B	Hole
SG320-018GB-4T	217	335	305	150	140	323	Φ6
SG320-022GB-4T							
SG320-030GB-4T	285	463	432	225	235	447	Φ8
SG320-037GB-4T							
SG320-045GB-4T	385	600	550	270	260	580	Φ10
SG320-055GB-4T							
SG320-075GB-4T	473	700	660	307	343	678	ϕ10
SG320-90GB-4T							
SG320-110GB-4T	579	930	880	375	449	905	ϕ10
SG320-132GB-4T							
SG320-160GB-4T							
185kw to 280kw	650	1060	983	377	420	1030	ϕ12
315kw to 500kw (options)	800	1358	1203	400	520	1300	ϕ14

Chapter 4. Operation control panel description

4.1 Press function key description

Key symbol	Name	Function description
PRG	Menu key	Enter menu or exit
SET	Confirm key	Enter to menu step by step and confirm the setting value
⩓	UP increase key	Data and function code increase
⩔	DW reduce 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
RUN	Running key	Us to start drive in keypad control mode
MF.K	Multiple function key	Programmed by F4-31 setting. Default setting is reverse running
STOP RESET	Stop and reset	In running status, this key can use to stop operation (F0-02). Reset malfunction in alarm mode.

4.2. Indicator description

Symbol	Indicator description
Hz	Unit of frequency （Hz）
A	Unit of current (Amp)
V	Unit of voltage （V）
FWD	Forward run indicator
REV	Reverse run indicator FWD，REV both flash in stand for DC braking
ALM	Fault indicator (alarm for over current, over voltage but that don’t reach the level of fault limit)

KEYPAD Size: 94.5*70m

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 SET key to return second menu.

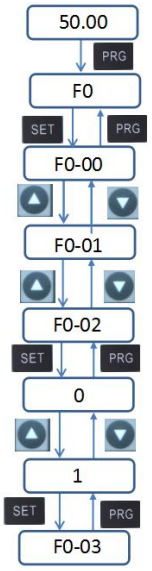
The difference is that press SET key will keep set parameter in controller board and then return to second menu, press PRG key an return second menu directly without parameters store.

Example: Parameters value modification example.

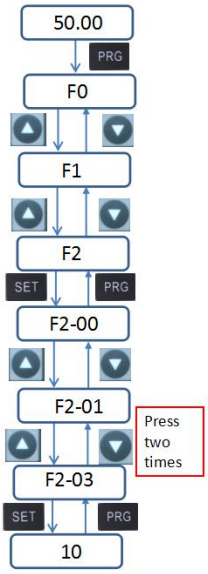
Modify F0-02=1 for terminals control to activate start automatically at morning when enough good sunlight, and

stop automatically at evening when poor sunlight.

Change motor current for 10A as motor nameplate. Set F2-03=10A



SET F0-02=1



SET F2-03=10 A

4.5. Monitor parameters inquiry.

There two ways to inquiry monitoring parameters.

1. Press "◀◀ " to inquiry 6 solar pump control common parameters (It is set by fF4-26,F4-27 , F4-28)(Output frequency, output current, output voltage, DC voltage, Dc current and input power)

2.User also can go to d parameters to inquiry relative parameters.

Example: Inquiry d-02 (output current value of drive), see below fig.

4.6. Common parameters display

Press shift button of keypad can display output current, output frequency, output voltage, DC bus voltage, DC bus current and input power 6 parameters in circulation in monitor status.

4.7. 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 (F5 group setting). 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.

Note: Solar pump inverter perform itself initialize when power on.

The system of drive will initialization by himself when power on. The LED of keypad display -SGd- when DC bus of dive from low to high.

When DC bus reach start point, LED will display the frequency reference and flash all the time, means this inverter is placed on standby status.

Chapter 5. SG320 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 on installation and maintenance of S300/S3200 Drives, see S300/S3200 User's manual.

Safety instructions

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

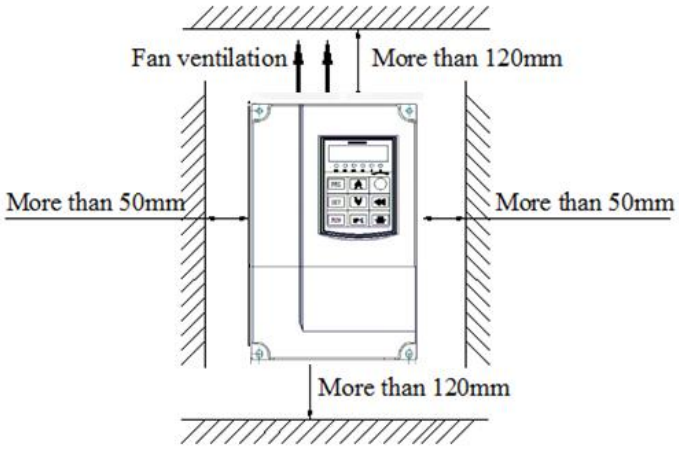
• Never work on the inverter, the braking chopper circuit, the motor cable or the motor when input power is applied to the inverter.

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

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

5.2 Mechanical installation

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



Note: Installation Environment Requirements

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

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

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

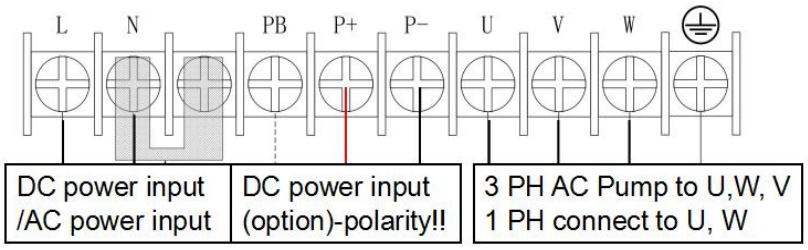
4. Free from direct sunlight, high humidity and condensation

5. Free from corrosive, explosive and combustible gas

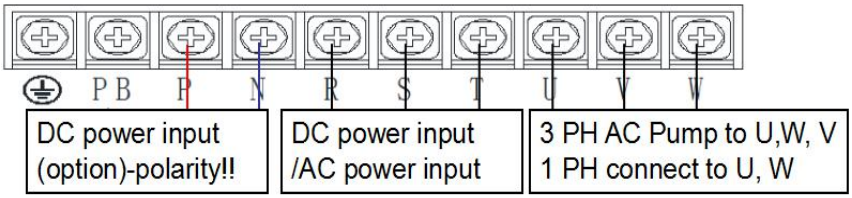
6. Free from oil dirt, dust and metal powder

5.3. Installation and wiring

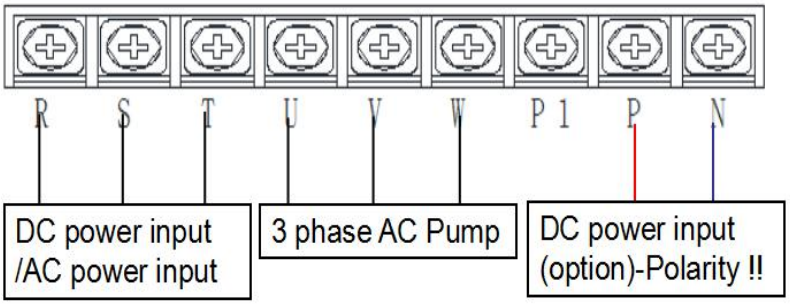
AC/DC power input wiring and pumps cable connecting.



Single phase AC input model



1/3 phase AC input model (2S/4T) 0.75kw to 15kw



3 phase AC input model big power (4T), above 18kw.

Note: R, T (L, N) terminals of inverter also can be used to connect solar DC power from PV without polarity consideration.

1. There are 2 modes to set VOC (open loop voltage) to inverter.

When FC00=1 (Default setting), user need to set actual Voc value to FC01 parameters before pressing RUN button to start inverter, If not, the output frequency might be 0.5Hz all the time if actual Voc much less than default setting.

For example, the Fc-01 setting is 660VDC for 4T solar pump inverter, if you actually input VOC is 500VDC, so you have to set Fc.01=500VDC.

The Fc01 setting is 360VDC for 2S solar pump inverter, if your actually input VOC is 250VDC,

Please set Fc01=250VDC. Otherwise inverter can't work properly.

When FC00=0, the Inverter can be able to detect VOC automatically when power on, and D25 will indicate the detected value of Voc (open loop circuit voltage)

2. Power of solar arrays also can connect to P+, and N-, please pay more attention for polarity. P+ must to connect to positive, N- must to connect negative. Otherwise the inverter will be damaged.

3. Do not use an asymmetrically constructed motor cable.

4. Route the motor cables, input power cable and control cables separately.

5. Make sure that the maximum cable lengths are not exceeded. For detailed information, see the user's manual.

5.4. Main circuit terminals description

Terminals symbol	Function description
P +	Positive terminals of DC bus voltage
P -	Negative terminals of DC bus voltage
PB	P, PB connect braking resistor
R, S, T	AC input connecting or DC input connect Please wire to R, T when connection DC power from solar arrays.(Recommend)
U, V, W	Connect to AC pumps, Wire to U, V, W for 3 phase AC pumps Wire to any two phase of U, V, W for 1phase pumps
E	Grounding terminals

5.5. Connection procedure

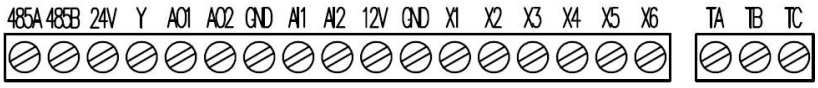
1. Strip the input power cable. Ground the bare shield of the cable (if any) 360 degrees under the grounding clamp. Fasten the grounding conductor (E) of the input power cable under the screw of the grounding clamp. Connect the phase conductors to the R,T terminals from PV solar panel.

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

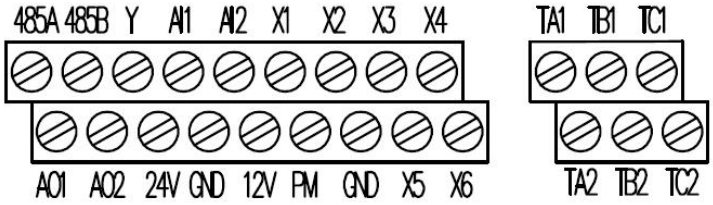
3. Secure the cables outside the drive mechanically.

5.6 .Control circuit terminals

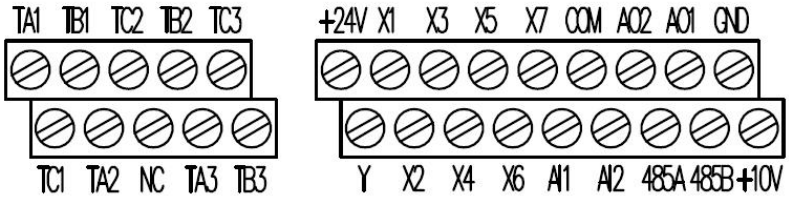
5.6.1 Control circuit terminals diagram



SG320-M Mini model 0.75kw to 1.5kw



SG320, 0.75kw to 15kw models



SG320 18.5kw above models

5.6.2. Control circuit terminals function description

Type	Terminals symbol	Terminals function	Remark
Power supply output	12V	12V/10mA power supply	
	GND	Common point (12, GND) of frequency reference voltage signal , analog current signal input negative point	
	24V	Output 24V/50mA power supply (24V, GND)	
Analog input	AI1	Analog voltage signal input terminals 1	0 ~ 10V
	AI2	Analog voltage signal input terminals 2	0 ~ 10V, 0-20mA select by
Digital input terminals	PM	Terminal active level selection	If PM connect with power supply point, the multi-function terminals and GND turn ON is activate, if PM connect with GND, the multi-function terminals and power supply points is activate.
	X1	Multi-function input terminals 1	
	X2	Multi-function input terminals 2	
	X3	Multi-function input terminals 3	
	X4	Multi-function input terminals 4	
	X5	Multi-function input terminals 5	
	X6	Multi-function input terminals 6, also can used for high speed pulse trains input terminals	
Analog output	AO1	Programmable voltage and current signal output terminal (Defined by F5-34 ~ F5-36	Output voltage 0 ~ 10V, current 0 ~ 20mA
	AO2	Programmable frequency, voltage output (defined by F5-39 ~ F5-43 parameter)	Maximum output high frequency is 50Hz, 10V ,Output type select by SW1
Transistor Output	Y	Programmable open collector output point, set by parameter F5-27	The maximum load current 50mA, maximum withstand voltage of 24V
Programmable relay output	TA-TB-TC1 TA-TB-TC2	Programmable relay output, set by parameter F5-28 F5-29	Contact capacity: AC250V 1A, Resistive load
RS485 communication	485A 485B	RS485 communication	

5.6.3. Jumper pin Description

SW1 DIP switch (DIP means slide switch)

SW1 use to select 0-10V or 0-20mA type for AO2 port. AO1 only for 0-10V

SW2 use to select 0-10V or 0-20mA type for AI2 port. AI1 only for 0-10V

SW2 DIP switch use to select RS485 ON/OFF

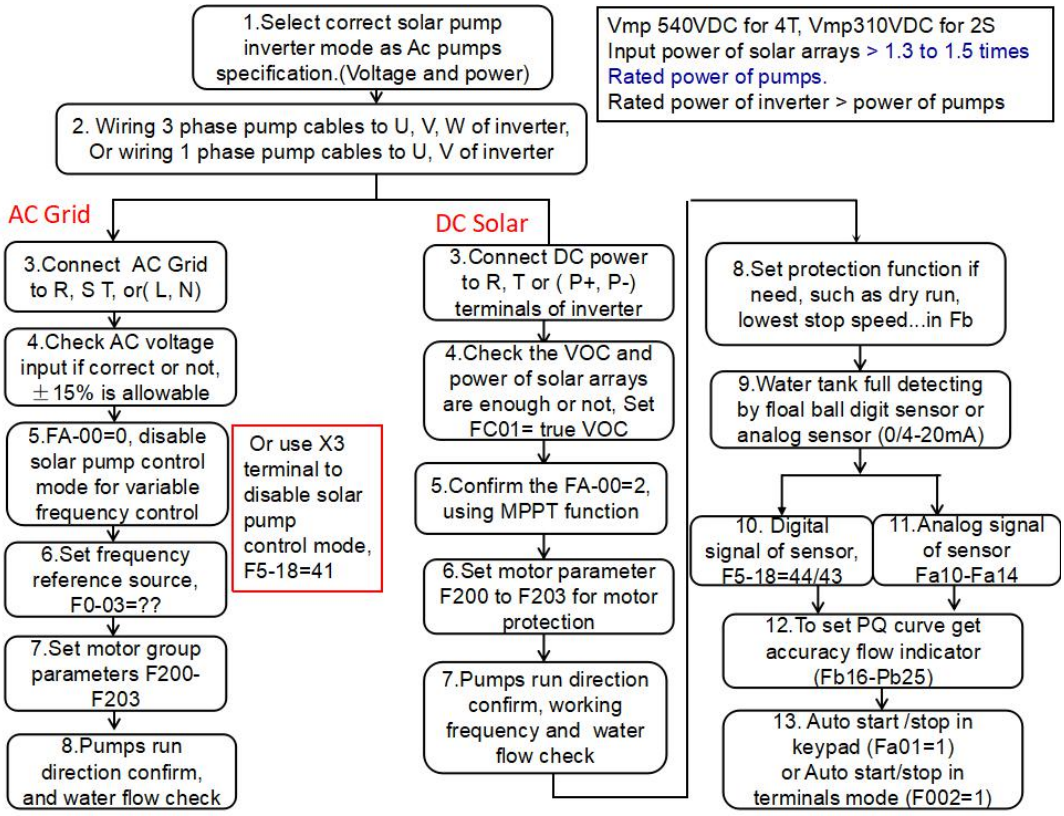
For -M mini inverter.

Slip for 24V connection PM or PM connect to GND.

Chapter 6. Solar pump inverter commissioning

6.1. Wiring and commission steps

Flow chart of solar pump inverter commissioning.



SG320 solar pump Inverter trial run flow chart

6.2. Commissioning steps

6.2.1. 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.

It is also much related with the quality and efficiency of solar panels.

6.2.2. Input voltage, total power solar arrays 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 SG320 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.

Solar arrays selection table for inverter and pumps. Take solar panels Voc38VDC, Vmp 31VDC, 265W.

Please check if enough DC voltage for system, Voc and Vmp. If the input 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.

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

6.2.3. Install solar pump inverter to system

1. Wiring DC power to R, T terminals of inverter, and check how much Voc (open loop circuit voltage) input by multimeter, or get Voc from d25 monitor parameters before press RUN button, and then set Fc-01=actual Voc.
2. Confirmed the Fa-00=2 (MPPT). This parameters must set for 1 or 2, for 1 phase 110/220VAC pumps, it must set for 1(CVT). otherwise the inverter can't work properly. Please don't connect pumps for trail running first.
3. Set F2-00 to F2-05 motor group parameters as nameplate of pumps. Double check for f2-01, f2-02, f2-02 voltage, frequency and current parameters.
4. Press the RUN button to start inverter when connecting without pump, to check if output frequency, output voltage. 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.
5. If output frequency and output voltage is normal, please stop inverter, and switch off power, and then connect pump to U, V, W of inverter. (connect U, W for 1 phase pumps).
6. 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.
7. Set lowest stop frequency Fb-03 for pumps low speed running protection if need.
8. Set Fb-06, fb07, fb08 dry run function for pump running under lack of water protection if need
9. Set pump over current protection function if need by Fb-09, Fb-10, Fb-11.

10. Set Fb-16 to Fb-25 PQ curve parameters as pumps PQ curve for getting accuracy flow indicating.

11. If need water tank fulling detection function, please take float ball digital type switch or 0/4-20mA analog sensor for installation. Refer more information in 6.3 section of manual.

12. If need auto restart function please set fa01=1 under keypad control mode, or set f002=1 and switch on X1 and GND terminals, also need confirm F5-16=1 (terminal function for Forward), F1-15=1(terminals activated once switch on power).

Note: 1). If the input Voc, Vmp DC voltage is not correct, 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 F2-01 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 F2-01=220VAC, the AC output voltage will be 0~220VAC vary with sunlight radiation. The inverter can able to suppress AC voltage output with F2-01 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, refer more in detail in appedix .

For driving PMSM pump commissioning.

There are 2 running modes for driving PMSM high efficiency pump.

F0-01=0, VF control mode, F2-00=1. This control mode is easy operation but performance is not perfect due to V/f control mode.

F0-01=2, (open loop vector control mode), it can get more high accuracy control but it need performance motor auto tuning. if the performance of PMSM pump is not good in V/f control mode, please perform motor ID auto tuning first and make it run in vector control mode.

How to perform auto tuning for driving PMSM?

1). Set sensorless vector control mode for driving PMSM, F0-01=2

2). Set PMSM motor parameter, F2-00=1, F2-11 (rated frequency of PMSM), F2-12 (rated voltage of PMSM), F2-13 (rated current of PMSM), F2-14 (rated back EMF or PMSM), F2-15 (stator resistance of PMSM). The frequency, current and voltage is important parameters, it need to set.)

3). Set F2-10=1 or 2 to perform PMSM ID auto tuning. If the motor is easy to remove from pump, please set F2-10=1, if the motor is difficult to remove from pump, please set F2-10=2.

Press the RUN button to perform motor trial running and observe the running frequency and the water yield. If the sunlight radiation is good, and frequency goes up, but water flow is very small. Might the direction of pumps running is not correct, please to change any two phase motor wiring.

Note: 1. If the output frequency is fluctuation, please set Fa-05 (frequency adjust gain) value smaller, and Fa-07 (MPPT control period) value bigger.

2,. If the A. LUO (under voltage) is occur often, user can set Fa05 value bigger, (Fa05=100), set Fa-07=1, and F0-12 (acceleration time bigger,) F0-13 (deceleration time smaller, close to 0.8s).

3. IF over current and over load alarm occurs, please kindly to check if pump has been blocked by foreign material, and select bigger power inverter. If the distance from pump to inverter over than 150 meter, please consider select bigger power inverter, and consider to install AC reactor after inverter U, V, W output terminals.

6.3. Solar pump inverter wiring with dual mode AC grid and solar DC power input.

Wiring as below Fig attached. 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.

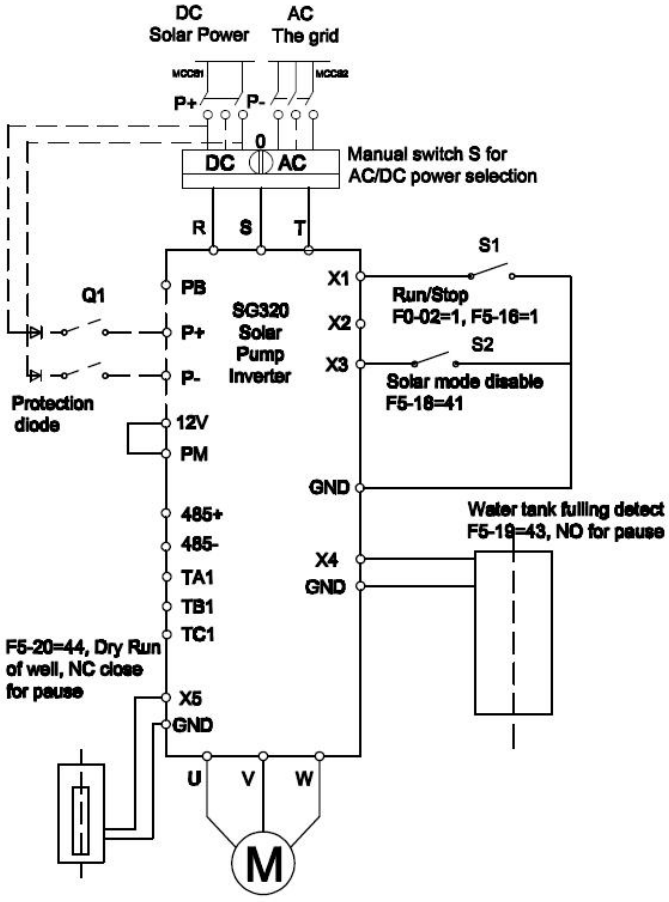
1. Wiring P+ and P- of DC solar power to R, T terminals, or 1/3 phase cables of AC power supply to R, T (R, S, T) of inverter. Connect 1 phase 220VAC AC input L, N to R and T terminals of inverter.

2. Built a Run/Stop switch S1 to start pumping when setting start mode as terminals control mode F0-02=1. if need to achieve auto restart when DC power is good at the morning, auto stop when DC power is loss at sunset, please select this mode, and also to confirm F1-15=1(terminals command is activated when power on).

3. Built a switch 2 to disable solar pump control mode when selecting AC power mode input. The inverter can be use as variable speed drive (VFD) for pumps speed adjusting as need when solar pump function is disable. The output frequency can be adjusted by F0-03 frequency reference mode setting. The MPPT function is closed when turn off switch 2. (F5-18-41). This solar pump control mode function also can disable by parameters setting fa00=0.

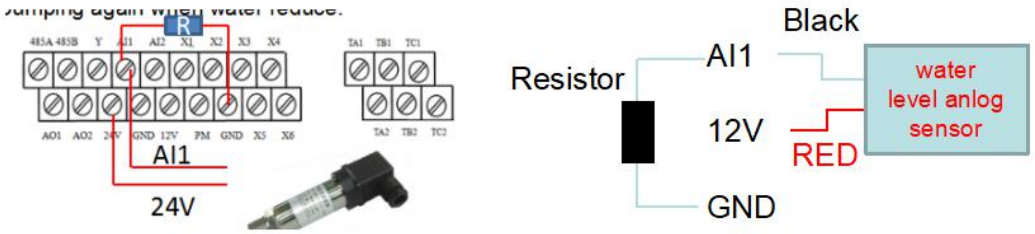
4. Connect 2 wires of float ball sensor to X4 and GND for water tank level fulling detecting, and set F5-19=43 (float ball NO relay alarm). When water level reached to sensor detecting, the normal open (NO) relay point will be activated, inveretr stop pumping, and sent a A.Fb.C alarm. It will restore to running status after Fc-08 relay time.

5. Connect 2 wires of sensor of dry run sensor of well to X5 and GND, and set F5-20=44 (dry run NC relay alarm). It will sent alarm A.Fb.O and stop pumping when lack of water in well.

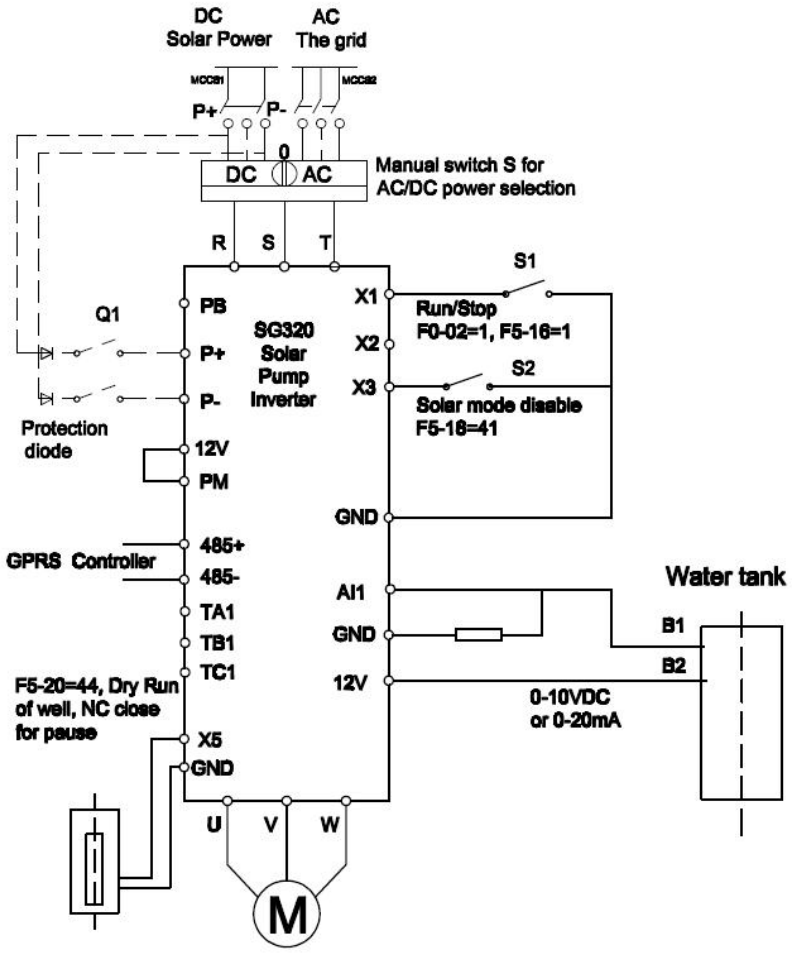


Wiring 1. System wiring/ float ball for water tank

6. 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 12VDC terminals of inverter, and connect a resistor between AI1 and GND. Please find wiring in below attached pictures. Set Fa10 to Fa14 group parameters to activate water leveling detecting.



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 when wrong polarity connection.



Wiring 2. System wiring/ analog sensor for water tank

6.4. 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:

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. 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.

1.F0. parameters for basic running control

Code	Name	Description	Unit	Default setting	Property
F0-00	Model selection	0: General purpose 1: P type (variable torque load)	1	0	×
F0-01	Control mode	0: VF control 1: Vectorized VF control 2: Open loop vector control 1 3: High performance open loop vector control 2	1	0	×
F0-02	Running command channel selection	0: Operation panel (keypad) 1: External terminals 2: RS485terminals	1	1	☆
F0-03	Main frequency reference source A	0: Potentiometer of keypad 1: UP, DOWN of keypad. 2: AI1 (0-10V) 3: AI2 (0-10V/0-20mA) 5: PID close loop reference 6: Multi-segment speed control 7: Simple PLC 8: UP/DW of terminals 9: Communication 11: High speed pulse trains	1	0	☆
F0-04	Auxiliary frequency reference source B	0: Potentiometer of keypad 1: AI1 (0- 10V) 2: AI2 （0-10V） 3: F0-07 4: High speed pulse trains reference 5: Multiple segment speed	1	1	☆
F0-05	The reference source selection of auxiliary frequency source B	0: Upper limit frequency 1: Main frequency source A	1	0	☆

F0-06	The operation of frequency source A and B combination setting	0: Main frequency source A 1: Auxiliary frequency source B 2: A+B 3: MAX（A，B） 4: MIN（A，B） 5: A-B	1	0	☆
F0-07	UP and Down key of keypad setting	0~Upper limit frequency	0.01	50.00	☆
F0-08	Upper limit frequency	5.00~650.00 Hz	0.01	50.00	×
F0-09	Lower limit frequency	0.00Hz ~ F0-08	0.01	0.50	×
F0-10	Running mode under low limit frequency	0: Running with lower limit frequency 1: Stop 2: Sleep mode in stand by	1	0	×
F0-11	Wake up time in sleep mode	0.0~6000.0 S	0.1	0.0	×
F0-12	Acceleration time 1	0.1~6000.0 s	0.1	*	☆
F0-13	Deceleration time 1	0.1~6000.0s	0.1	*	☆
F0-14	Carrier frequency	1 ~ 10KHz	1	*	☆
F0-15	Ac drive running direction	0: Runs as forward direction 1: Runs as reverse direction 2: Reverse direction is forbidden	1	0	☆
F0-16	Parameters display in standby mode	0~39 （corresponding with D group parameters）	1	3	☆
F0-17	Factory restore to factory setting	0: No operation 11: Parameters initialization 22: Clear fault record	1	0	×
F0-18	Parameters modify protection	0: No protection 1: Disable modify	1	0	×
F0-19	STOP operation range	0: Enable on keypad operation mode 1: Enable on all command mode	1	0	×

2.F1 parameters for start and stop parameters

Code	Name	Description	Unit	Default setting	Property
F1-00	Start up mode	0: Start up with starting frequency 1: Start up after DC braking 2: Start up with speed tracking	1	0	×
F1-01	Starting frequency	0.00~10.00Hz	0.01	0.50	×
F1-02	Starting frequency holding time	0.0~20.0s	0.1	0.0	×
F1-03	DC braking current when starting	0~150.0%	1	50.0	×
F1-04	DC braking time when starting	0.0~30.0s	0.1	0.0	×

F1-05	Stop mode	0: Deceleration to stop 1: Free stop	0	1	☆
F1-06	Dc braking start frequency when stop	0.00~50.00Hz	0.01	3.00	×
F1-07	Dc braking current when stop	0~150.0%	1	50.0	×
F1-08	DC braking holding time when stop	0.0~60.0s	0.1	0.0	×
F1-09	Speed tacking arithmetic Selection	0: Minimum current arithmetic 1: Voltage/frequency arithmetic.	1	0	×
F1-10	Waiting time of speed tacking	0.0 ~ 10.0s	0.1	1.0	×
F1-11	Speed tacking search time	3.0 ~ 100.0s	0.1	6.0	×
F1-12	Current setting of speed tacking finished	1.00 ~ 50.00%	0.01	15.00	×
F1-13	Starting voltage when braking	105.0~140.0%	0.1	123.0	☆
F1-14	Final voltage when braking	105.0~150.0%	0.1	128.0	☆
F1-15	Terminals running command detect when power on	0: Running command is disable when power on 1: Running command enable when power on	1	0	×
F1-16	Stop speed	0.00~100.00%	0.01	1.00	☆
F1-17	Stop speed detect mode	0: Detect as speed reference 1: Detect as actual speed (for vector control)	1	1	☆

3.F2 motor parameters group

Code	Name	Description	Unit	Default setting	Property
F2-00	Motor type	0: Asynchronous motor 1: Permanent magnet synchronous motor	1	0	×
F2-01	Motor rated voltage	1~700V	1	*	×
F2-02	Motor rated frequency	5.00~600.00Hz	0.01	50.00	×
F2-03	Motor rated current	0.1~3000.0A	0.1	*	×
F2-04	Rated slip frequency	0.00~5.00Hz	0.01	*	×
F2-05	Poles pair	1~50	1	2	×
F2-06	No load current	10.0~ 80.0%	0.1	*	×
F2-07	Stator resistor	0.00~50.00%	0.01	*	×
F2-08	Rotor resistance	0.00~50.00%	0.01	*	×
F2-09	Leakage inductance	0.00~50.00%	0.01	*	×
F2-10	Motor parameter auto-tuning	0: No operation 1: static auto tuning	1	0	×

		2: Completely auto tuning			
F2-11	Rated frequency of PMSM	5.00~600.00Hz	0.01	50.00	×
F2-12	Rated voltage of PMSM	1~700V	1	*	×
F2-13	Rated current of PMSM	0.1~3000.0A	0.1	*	×
F2-14	Rated back EMF of PMSM	1~700V	1	*	×
F2-15	Stator resistance of PMSM	0.00~50.00%	0.01	*	×
F2-16	Active damping detection time	2~100	1	10	×
F2-17	Active damping 1	0~1000	1	100	×
F2-18	Active damping 2	0~1000	1	100	×
F2-19	Active damping switching frequency	0.00~100.00Hz	0.01	100.00	×
F2-20	Active damping limiter	0.00~3.00Hz	0.01	1.00	×

* PMSM stands for Permanent magnet synchronous motor

4.F3 group parameters for Vector control and V/f control

Code	Name	Description	Unit	Default setting	Property
F3-00	ASR low speed proportional coefficient	0.01 ~ 30.00	0.01	0.60	☆
F3-01	Low ASR integral coefficient	0.01 ~ 10.00	0.01	1.00	☆
F3-02	ASR switching frequency 1	1.00~7.50Hz	0.01	5.00	☆
F3-03	ASR high speed proportional coefficient	0.01 ~ 30.00	0.01	0.60	☆
F3-04	High ASR integral coefficient	0.01 ~ 10.00	0.01	1.00	☆
F3-05	ASR switching frequency 2	8.00~50.00Hz	0.01	10.00	☆
F3-06	Current loop proportional coefficient	0.01~10.00	0.01	0.20	×
F3-07	Current loop integral coefficient	1~100	1	10	×
F3-08	Slip compensation coefficient	50~200%	1	100	×
F3-09	Speed feedback filter time constant	1~100 millisecond	1	6	×
F3-10	Torque limit	0~200%	1	150	×
F3-11	Cross compensation coefficient	0.00 ~ 0.50	0.01	0.20	×
F3-12	Closed-loop voltage proportional coefficient	0~ 1.00	0.01	0.20	×
F3-13	Voltage closed-loop integral coefficient	0~ 1.00	0.01	0.20	×
F3-14	Magnetic field control proportional coefficient	10~1000	1	50	×
F3-15	Magnetic field control integral coefficient	1~500	1	50	×
F3-16	Current reference filter time constant	1~100millisecond	1	10	×
F3-17	Whether torque control	0: Torque control disable 1: Torque control enable	1	0	☆

F3-18	Torque reference	0: Torque reference set by F3-19 1: AI1 2: AI2 3: Multi-segment speed 4: RS485 5: HDI	1	0	☆
F3-19	Torque reference by keypad setting	0.0 ~ 200.0%	0.1	50.0	☆
F3-20	Torque reference direction	0: Forward direction 1: Reverse direction	1	0	☆
F3-21	Upper limit frequency reference source set selection	0: Upper limit frequency 1: AI1 2: AI2 3: Multi-segment speed 4: RS485 5: HDI 6: Potentiometer of keypad	1	0	☆
F3-22	V/F curve selection	0: Standard V/F curve，V/F=constant 1: Square V/f curve 2: User defined V/f curve	1	0	×
F3-23	Custom curve F1	0.0 ~ 100.0%	0.1	0.0	×
F3-24	Custom curve V1	0.0 ~ 100.0%	0.1	0.0	×
F3-25	Custom curve F2	0.0 ~ 100.0%	0.1	0.0	×
F3-26	Custom curve V2	0.0 ~ 100.0%	0.1	0.0	×
F3-27	Custom curve F3	0.0 ~ 100.0%	0.1	0.0	×
F3-28	Custom curve V3	0.0 ~ 100.0%	0.1	0.0	×
F3-29	Torque boost	0.0~20.0%	0.1	2.0	×
F3-30	Low frequency oscillation suppression strength	0~1000	1	100	×
F3-31	High frequency oscillation suppression strength	0~1000	1	0	×
F3-32	High and low frequency turning point	5.00 ~ 50.00 Hz	0.01	20.00	×
F3-33	V / F control slip compensation coefficient	0~200%	1	0	×

5.F4 group parameters for auxiliary running control

Code	Name	Description	Unit	Default setting	Property
F4-00	Forward /reverse dead time	0.0~5.0s	0.1	0.1	☆
F4-01	Skip frequency 1	0.00 ~Upper limit frequency	0.01	0.00	☆
F4-02	Skip frequency 1 range	0.00 ~5.00Hz	0.01	0.00	☆
F4-03	Skip frequency 2	0.00 ~ Upper limit frequency	0.01	0.00	☆
F4-04	Skip frequency 2 range	0.00 ~5.00Hz	0.01	0.00	☆

F4-05	Skip frequency 3	0.00 ~ Upper limit frequency	0.01	0.00	☆
F4-06	Skip frequency 3 range	0.00 ~5.00Hz	0.01	0.00	☆
F4-07	Jog frequency	0.00~ Upper limit frequency	0.01	5.00	☆
F4-08	Jog acceleration time	0.1~6000.0s	0.1	10.0	☆
F4-09	Jog deceleration time	0.1~6000.0s	0.1	10.0	☆
F4-10	Acceleration time 2	0.1~ 6000.0S	0.1	*	☆
F4-11	Deceleration time 2	0.1~ 6000.0S	0.1	*	☆
F4-12	Acceleration time 3	0.1~ 6000.0S	0.1	*	☆
F4-13	Deceleration time 3	0.1~ 6000.0S	0.1	*	☆
F4-14	Acceleration time 4	0.1~ 6000.0S	0.1	*	☆
F4-15	Deceleration time 4	0.1~ 6000.0S	0.1	*	☆
F4-16	Acceleration /deceleration mode	0: Linear, 1: S curve	1	0	×
F4-17	Terminal UP/DW rate	0.01~100.00Hz/s	0.01	1.00	☆
F4-18	FDT 1 (frequency detect level) setting	0.00~upper limit frequency	0.01	50.00	☆
F4-19	FDT 1 lag detection value	0.0~100.0%	0.1	5.0	☆
F4-20	FDT 2 (frequency detect level) setting	0.00~upper limit frequency	0.01	50.00	☆
F4-21	FDT 2 lag detection value	0.0~100.0%	0.1	5.0	☆
F4-22	Frequency arrival detection range	0 0.00~20.00Hz	0.01	1.00	☆
F4-23	PWM modulation	Unit 's digit: if over modulation 0: Not modulation 1: Modulation Ten's digit: Modulation mode 0: 3 phase modulation at low speed, 2 phase modulation at high speed Hundred's digit: Low speed deal with 0: when the low carrier frequency large than 3Khz, runs with within 3Khz. 1: Carrier frequency runs with previous setting	1	0	×
F4-24	AVR (auto voltage regulation)	0: no operation 1: Enable 2: Disable in deceleration	1	0	×
F4-25	Drop control	0.0~10.00Hz	0.01	0.0	×
F4-26	Operation monitoring items selection	0 ~ 3939: Low bit and high bit each stands for one d parameters. 3 parameters can determined 6 monitor parameters, press Shift key to circulation display in running.	1	0100	☆
F4-27	Operation monitoring items selection 2		1	0502	☆
F4-28	Operation monitoring items selection 3		1	3226	☆
F4-29	Speed display coefficient	0.1~999.9%	0.1	100.0	☆

F4-301	Linear speed display coefficient	0.01~99.99	0.01	1.00	☆
F4-31	Multifunction key MF.K set	0: REV 1: Jog forward 2: Jog Reverse 3: Running command switchover	1	0	×

6.F5 group parameters for external terminals input and output

F5-00	AI1minimum input	0.00~10.00V	0.01	0.00	☆
F5-01	AI1 minimum input corresponding value	-100.00~100.0%	0.1	0.0	☆
F5-02	AI1 maximum input	0.00~10.00V	0.01	10.00	☆
F5-03	AI1 maximum input corresponding value	-100.00~100.0%	0.1	100.0	☆
F5-04	AI1filter time constant value	0.01~50.00s	0.01	0.10	☆
F5-05	AI2 minimum input	0.00~10.00V	0.01	0.00	☆
F5-06	AI2 minimum input corresponding value	-100.00~100.0%	0.1	0.0	☆
F5-07	AI2 maximum input	0.00~10.00V	0.01	10.00	☆
F5-08	AI1 maximum input corresponding value	-100.00~100.0%	0.1	100.0	☆
F5-09	AI2 filter time constant value	0.01~50.00s	0.01	0.10	☆
F5-10	PLUSE minimum input	0.00~50.00KHz	0.01	0.00	☆
F5-11	PLUSE minimum input corresponding value	-100.00~100.0%	0.1	0.0	☆
F5-12	PLUSE maximum value	0.00~50.00KHz	0.01	50.00	☆
F5-13	PLUSE Maximum value corresponding value	-100.00~100.0%	0.1	100.0	☆
F5-14	PULSE filter time constant value	0.01~50.00s	0.01	0.10	☆
F5-15	External terminal command control mode	0: Two lines control mode 1 1: Two lines control mode 2 2: Three lines control mode 1 3: Threes lines control mode 2	1	1	×
F5-16	X1terminals function selection (0~39)	0: No function 1: FWD Forward command		1	×
F5-17	X2 terminals function selection (0~50)	2: REV Reverse command 3: External fault input (normally open)		2	×
F5-18	X3 terminals function selection (0~50)	4: DC braking 5: Emergency stop input (solar pump		5	×
F5-19	X4 terminals function selection (0~50)	pause) 6: Fault reset input		41	×
F5-20	X5 terminals function	7: Multi-speed input 1		1	×

	selection（0~50）	8: Multi-speed input 2			
F5-21	X6 terminals function selection（0~50）	9: Multi-speed input 3 10: Multi-speed input 4 11: Three-line control 12: Terminal UP 13: Terminal DOWN 14: Terminal reset 15: Acceleration and deceleration selection terminal 1 16: Acceleration and deceleration selection terminal 2 17: PLC Pause running 18: PLC state reset (modes 1, 2) 19: Forward jog 20: reverse jog 21: Traverse suspend operation 22: Traverse reset 23: PID suspend operation 24: Interior timer enable 25: The internal timer is cleared 26: Counter trigger input 27: Counter Reset (reset to 0) 28: Frequency reference given A and B switchover 29: Frequency reference given A and A + B switchover 30: Frequency reference given B and A + B switchover 31: deceleration to stop 32: Torque control prohibition 33: Length counter input 34: The length of the counter is cleared 35: Command given source is forcibly set by keypad 36: Command given source is forcibly set by terminal 37: Command given source is forcibly set by the communication. 38: PID parameters 39: External fault normally closed input 40: Pulse input (only valid for X6) 41: Solar control prohibition 42: Shift button of keypad function define. 43: Normal open input for pause with		10	×

		show A.FBO when connecting float switch (water tank or water well using) 44. Normal close input for pause with show A.FBC when connecting float switch (water tank or water well using)			
F5-27	Y transistor output selection	0: No function	1	1	☆
F5-28	Relay 1 output selection	1: Run state	1	1	☆
F5-29	Relay 2 output selection	2: Fault output 3: Frequency arrival 4: detection frequency FDT1 arrival 5: detection frequency FDT2 arrival 6: Zero speed running 7: Lower limit frequency arrival 8: Upper limit frequency arrival 9: Counter reaches the specified value (greater than the specified value, output ON) 10: Counter reach final value (equal to the final value, output a ON clock cycle counter signal) 11: Internal timer reaches (Output a ON timer unit signal) 12: Running time is reached (greater than the set time Output ON) 13: PLC a segment operation is completed (Output a 0.5s ON signal) 14: PLC run cycle is complete (Output a 0.5s ON signal) 15: Over-torque warning 16: Drive standby 17: Length arrive 18: Place in sleep mode 19: AI1 input over limit 20: Module temperature reaches	1	1	☆
F5-29 to F5-33	reserve	reserve	reserve	reserve	reserve
F5-34	AO1 output selection	0: Frequency reference 1: Run Frequency 2: Output current 3: DC bus voltage 4: Output voltage 5: output power (100% corresponds to 200% of rated power) 6: Torque current	1	0	☆

		7: AI1 8: AI2 9: Reserved 10: High-speed pulse input 11: RS485 set 12: Length 13: count value 14 to 20 Reserved			
F5-35	AO1 analog output corresponding to 0%	0.0~100.0%, output 0~10V, 100.00% corresponding to 10V, output 0~20mA, 100.00% corresponding to 20mA.	0.1	0.0	☆
F5-36	AO1 analog output corresponding to 100.00%	0.0~100.0%	0.1	100.0	☆
F5-39	AO2 output type selection	0: Analog 1：HDO pulse trains output	1	0	☆
F5-40	HDO pulse train upper limit	0.10~50.00KHz	0.01	50.00	☆
F5-41	AO2 output selection	As same as AO1 selection	1	1	☆
F5-42	AO2 analog output corresponding to 0%	0.0~100.0%，when output 0~10V，100.0% corresponding to 10V；when output is high speed pulse train ，100.0% correspond to 50.00KHz	0.1	0.0	☆
F5-43	AO2 analog output corresponding to 100.00%	0.0~100.0%	0.1	100.0	☆

7.F6 group parameters for PID control

Code	Name	Description	Unit	Default setting	Property
F6-00	Select PID reference command source	0: Potentiometer of keypad 1: Fb.0 reference 2: F6.01 reference 3: AI1 4: AI2 5: RS485 6: PLUSE trains 7: Multiple-speed steps	1	0	☆
F6-01	PID reference	0~100.0%	0.1	50.0	☆
F6-02	PID feedback channel selection	0：AI1 1：AI2 2：HDI 3：RS485	1	0	☆
F6-03	Regulation characteristics	0: Positive 1: Negative	1	0	☆
F6-04	Proportional gain	0.0~50.0	0.1	5.0	☆
F6-05	Integration time constant	0.1~100.0s	0.1	10.0	☆
F6-06	Differential Gain	0.0~5.0	0.1	0.0	☆
F6-08	Preset frequency	0.0 ~ 100.0% upper limit frequency	0.1	50.0	☆
F6-09	Preset frequency holding	0.0 ~ 3000.0S	0.1	0.0	☆

	time				
F6-10	Feedback disconnection detection threshold	0.0 ~ 100.0%	0.1	5.0	☆
F6-11	Feedback disconnection judgment time	0.0~3000.0s，0.0 means not perform disconnect judge.	0.1	0.0	☆
F6-12	PID limited negative output	0~100.0%	0.1	0.0	☆
F6-13	Twice the maximum output deviation	0.00~100.00%	0.01	1.00	☆

8.F7 group parameters for multi-speed and simple PLC control

Code	Name	Description	Unit	Default setting	Property
F7-00	Programmable multiple segment speed running setting	Unit’ digit： 0: Single segment running finished stop 1: Single segment running finished and keep the finial setting 2: cycle running continue Ten’ s digit 0: Running time unit is second 1: Running time unit is minute Hundred’s digit: Reserve Thousand’s digit: restart selection 0: Every restart from 0 segment point 1: Every restart from break off point frequency.	1	2	×
F7-01	Multi-speed frequency 0	0.0 ~ 100.0%	0.1	10.0	☆
F7-02	Multi-speed frequency 1	0.0 ~ 100.0%	0.1	20.0	☆
F7-03	Multi-speed frequency 2	0.0 ~ 100.0%	0.1	30.0	☆
F7-04	Multi-speed frequency 3	0.0 ~ 100.0%	0.1	40.0	☆
F7-05	Multi-speed frequency 4	0.0 ~ 100.0%	0.1	50.0	☆
F7-06	Multi-speed frequency 5	0.0 ~ 100.0%	0.1	70.0	☆
F7-07	Multi-speed frequency 6	0.0 ~ 100.0%	0.1	80.0	☆
F7-08	Multi-speed frequency 7	0.0 ~ 100.0%	0.1	100.0	☆
F7-09	Multi-speed frequency 8	0.0 ~ 100.0%	0.1	10.0	☆
F7-10	Multi-speed frequency 9	0.0 ~ 100.0%	0.1	20.0	☆
F7-11	Multi-speed frequency 10	0.0 ~ 100.0%	0.1	30.0	☆
F7-12	Multi-speed frequency 11	0.0 ~ 100.0%	0.1	40.0	☆
F7-13	Multi-speed frequency 12	0.0 ~ 100.0%	0.1	50.0	☆
F7-14	Multi-speed frequency 13	0.0 ~ 100.0%	0.1	70.0	☆
F7-15	Multi-speed frequency 14	0.0 ~ 100.0%	0.1	80.0	☆
F7-16	Multi-speed frequency 15	0.0 ~ 100.0%	0.1	100.0	☆
F7-17	Speed 0 running time	0.0~3000.0	0.1	10.0	☆

F7-18	Speed 0 running direction and acceleration/deceleration	Unit's digit：0：Forward 1: Reverse Ten' s digit： 0: Acceleration/deceleration 1 1: Acceleration/deceleration 2 2: Acceleration/deceleration 3 3: Acceleration/deceleration 4	1	0	☆
F7-19	Speed 1 running time	0.0~3000.0	0.1	10.0	☆
F7-20	Speed 1 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-21	Speed 2 running time	0.0~3000.0	0.1	10.0	☆
F7-22	Speed 2 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-23	Speed 3 running time	0.0~3000.0	0.1	10.0	☆
F7-24	Speed 3 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-25	Speed 4 running time	0.0~3000.0	0.1	10.0	☆
F7-26	Speed 4 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-27	Speed 5 running time	0.0~3000.0	0.1	10.0	☆
F7-28	Speed 5 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-29	Speed 6 running time	0.0~3000.0	0.1	10.0	☆
F7-30	Speed 6 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-31	Speed 7 running time	0.0~3000.0	0.1	10.0	☆
F7-32	Speed 7 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-33	Speed 8 running time	0.0~3000.0	0.1	10.0	☆
F7-34	Speed 8 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-35	Speed 9 running time	0.0~3000.0	0.1	10.0	☆
F7-36	Speed 9 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-37	Speed 10 running time	0.0~3000.0	0.1	10.0	☆
F7-38	Speed 10 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-39	Speed 11 running time	0.0~3000.0	0.1	10.0	☆
F7-40	Speed 11 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-41	Speed 12 running time	0.0~3000.0	0.1	10.0	☆
F7-42	Speed 12 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆

F7-43	Speed 13 running time	0.0~3000.0	0.1	10.0	☆
F7-44	Speed 13 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-45	Speed 14 running time	0.0~3000.0	0.1	10.0	☆
F7-46	Speed 14 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆
F7-47	Speed 15 running time	0.0~3000.0	0.1	10.0	☆
F7-48	Speed 15 running direction and acceleration/deceleration	As same as speed 1 description	1	0	☆

9. F8 group parameters for communication

Code	Name	Description	Unit	Default setting	Property
F8-00	Baud selection	0：300bps 1：600bps 2：1200bps 3：2400bps 4：4800bps 5：9600bps 6：19200bps 7：38400bps	1	5	☆
F8-01	Data format	0: No parity 1: Odd 2: Even parity	1	0	☆
F8-02	Address	0~247 0: Broadcast address does not return data	1	1	☆
F8-03	The machine response delay	0~100ms	1	5	☆
F8-04	Timeout judgment time	0.0~100.0s； 0.0 means time out	0.1	0.0	☆
F8-05	Master-Slave Select	0: Slave port 1: Master port	1	0	☆
F8-06	RS485 frequency reference scale factor	0~999.9%	0.1	100.0	☆
F8-07	Writing operation if return data	0: Return 1: No reture	1	0	☆

10. Advanced F9 group parameters

Code	Name	Description	Unit	Default setting	Property
F9-00	Swing frequency amplitude	0.0~100.0%	0.1	0.0	☆
F9-01	Kick frequency amplitude	0.0~50.0%	0.1	0.0	☆
F9-02	Triangular wave rise time	0.1~3600.0s	0.1	5.0	☆
F9-03	Triangular wave fall time	0.1~3600.0s	0.1	5.0	☆
F9-04	Specify the value of the counter	0~65535	1	1000	☆
F9-05	Counter final value	0~65535	1	2000	☆
F9-06	Setting length	0~65535meter	1	1000	☆
F9-07	The number of pulses per meter	0.1~6553.5	0.1	100.0	☆

F9-08	Internal timer timer unit	0.01~99.99s	0.01	1.00	☆
F9-09	internal timer cycle period	1~65535	1	10	☆
F9-10	Setting the running time	0~65535hour	1	65535	☆
F9-101	X1 switch-on delay time	0.0~3600.0S	0.1	0.0	☆
F9-12	X1 off delay time	0.0~3600.0S	0.1	0.0	☆
F9-13	X2 switch-on delay time	0.0~3600.0S	0.1	0.0	☆
F9-14	X2 off delay time	0.0~3600.0S	0.1	0.0	☆
F9-15	X3 switch-on delay time	0.0~3600.0S	0.1	0.0	☆
F9-16	X3 off delay time	0.0~3600.0S	0.1	0.0	☆
F9-17	Y1 output delay time	0.0~3600.0S	0.1	0.0	☆
F9-18	Relay 1 output delay time	0.0~3600.0S	0.1	0.0	☆
F9-19	Relay 2 output delay time	Relay 1 output delay time	0.1	0.0	☆

11. Fa group parameters for solar pump control

Code	Name	Description	Unit	Default setting	Property
Fa-00	Select solar pump control mode	0: Variable frequency drive control (AC grid input) 1:CVT (constant voltage tracking) 2: MPPT (maximum power point tracking)	1	2	×
Fa -01	Auto/ manual switch over	0:Manual by keypad control 1:Automatically running by keypad control (Inveter can start automatically when power condition is good) 2: RS485 communication	1	0	☆
Fa -02	CVT object voltage	0.0~100.0% of VOC	0.1	80.0	☆
Fa -03	MPPT upper limit voltage	0.0~200.0% of VOC	0.1	90.0	☆
Fa -04	MPPT lower limit voltage	0.0~200.0% of VOC	0.1	75.0	☆
Fa -05	Frequency adjust gain	1~1000	1	40	☆
Fa -06	Frequency adjusting allowable deviation	1~5	1	3	☆
Fa -07	MPPT Control period	0.01~10.00S	0.01	0.30	×
Fa-08	Dc current correction offset	0.00~50.00A	0.01	0.00	☆
Fa -09	Dc current correction gain	0.0~999.0%	0.1	100.0	☆
Fa -10	Water level detect control	0: Disable 1: AI1 takes as water level detect signal 2: AI2 takes as water level detect signal Only FA-10 not 0 set, the FA-11 to FA-14 is enable	1	0	☆
Fa -11	Water level threshold	0.0~100.0%	0.1	25.0	☆
Fa -12	Full water delay	0.0~3000.0S If the detected water level less than FA-11, and lasting for FA-12 delay time. it will give	0.1	60.0	☆

		out water full alarm and display A.Ful, and go to sleep. If the time is not reached, the signal is bigger than water level threshold, the time will be reset automatically.			
Fa -13	Empty water delay	0.0~3000.0S After full water level alarmed, if the detected valued greater than FA-11, and lasting more than FA-13 delay time, system restore to running state from sleep mode.	0.1	600.0	☆
Fa -14	Hydraulic detection probe damage threshold	0.0~100.0% 0.0: No detected If the detected water level signal large than FA-14, the solar pump inverter consider water probe is damaged and sent alarm directly and go to sleep.	0.1	0.0	☆

12. Fb group parameters for solar pump protection and monitoring

Code	Name	Description	Unit	Default setting	Property
Fb-00	Sleep voltage threshold	0~1000V	1	*	☆
Fb-01	Restore running state voltage threshold	0~1000V	1	*	☆
Fb-02	Awake waiting time	0.0~3000.0S	0.1	120.0	☆
Fb-03	Stop frequency when low speed	0.00~300.00Hz	0.01	5.0	☆
Fb-04	Stop delay time when reach stop frequency	0.0~3000.0S	0.1	30.0	☆
Fb-05	Automatic recovery time in stop frequency protection mode	0.0~3000.0S	0.1	120.0	☆
Fb-06	Dry run protection current threshold (under-load protection)	0.0~100.0A	0.1	0	☆
Fb-07	Dry run detect delay time	0.0~3600.0S	0.1	60.0	☆
Fb-08	Automatic recover time in dry run protection mode	0.0~3000.0S	0.1	120.0	☆
Fb-09	Motor over current protection threshold	0~3000.0A	0.1	*	☆
Fb-10	Over current detect delay time	0.0~3000.0S	0.1	30.0	☆
Fb-11	Automatic recovery time in over current protection mode	0.0~3000.0S	0.1	30.0	☆
Fb-12	Minimum power input	0.00~100.00KW	0.01	0.00	☆

	protection threshold				
Fb-13	Minimum power input detect delay time	0.0~3000.0S	0.1	10.0	☆
Fb-14	Automatic recovery time in minimum power input protection mode	0.0~3000.0S	0.1	10.0	☆
Fb-15	Alarm action mode	0: Sending alarm and automatically rest 1: Reset by manual Unit's digit: Low stop frequency Ten's digit: Dry run (under load) Hundred's digit: Motor over current protection Thousand's digit: Minimum power input protection	1	0000	☆
Fb-16	PQ CURVE P0 (Input power of pump at point 0)	0.00~100.00KW	0.01	0.50	☆
Fb-17	PQ CURVE P1 (Input power of pump at point 1)	0.00~100.00KW	0.01	1.00	☆
Fb-18	PQ CURVE P2 (Input power of pump at point 2)	0.00~100.00KW	0.01	1.50	☆
Fb-19	PQ CURVE P3 (Input power of pump at point 3)	0.00~100.00KW	0.01	2.00	☆
Fb-20	PQ CURVE P4 (Input power of pump at point 4)	0.00~100.00KW	0.01	2.50	☆
Fb-21	PQ CURVE Q 0 (Flow rate at point 0)	0.0~1000.0m3/h	0.1	0.0	☆
Fb-22	PQ CURVE Q 1 (Flow rate at point 1)	0.0~1000.0m3/h	0.1	5.0	☆
Fb-23	PQ CURVE Q 2 (Flow rate at points 2)	0.0~1000.0m3/h	0.1	10.0	☆
Fb-24	PQ CURVE Q 3 (Flow rate at point 3)	0.0~1000.0m3/h	0.1	15.0	☆
Fb-25	PQ CURVE Q 4 (Flow rate at point 4)	0.0~1000.0m3/h	0.1	20.0	☆
Fb-26	Today flow / generated energy day reset period	0.0~24.0hour	0.1	8.0	☆
Fb-27	Flow measured offset	0.00~1000.0m3/h	0.1	0.0	☆
Fb-28	Flow measured gain	0.0~100.0%	0.1	100.0	☆
Fb-29	Cumulative flow/ generated energy reset setting	0: No operation 1: Flow reset 2: Generated energy reset 3: Both flow and generated energy reset	0	0	×
FC group enhanced function of solar pump control parameters					

Fc-00	Open circuit voltage (VOC) detect mode	0: Self detect when power on 1: Set by user with Fc-01 value	0	1	*
Fc-01	User VOC voltage setting by manual	0-1000V	0	660	*
Fc-02	Deceleration time 2 when work for solar pump control	0.1~6000.0s	1.0	*	☆
FC-03	Pump efficiency	0.0~100.0%	0.1	100.0	☆
FC-04	Power parameter display filter time	0.01~100.002	0.01	2.00	☆
FC-05	Single phase pumps control method	0: For pumps that attached capacitance. 1: For pumps that removed capacitance.	0	0	*
Fc-06	Auxiliary winding coefficient	1-500%	100%	0	*
Fc-07	Parameters modify protection password. (User password)	0~99999	0	0	*
Fc-08	Restore time of float switch connecting (NO,NC input) This function will be disable after restore set time when remove float switch connecting	10-100s	10s		

13. Fd group parameters for protection

Code	Name	Description	Unit	Default setting	Property
Fd-00	Current limit value	100.0~200.0%	0.1	*	☆
Fd-01	Frequency drop time when over current	1.0~200.0s	0.1	5.0	☆
Fd-02	Over voltage limit	110.0~145.0%	1	130.0	☆
Fd-03	Overvoltage suppression gain	0~10	1	2	☆
Fd-04	Phase loss protection	Unit's digit: Input phase limit 0: No protection 1: Protection Ten's digit: Output phase limit 0: No protection 1: Protection	1	11	☆
Fd-05	Motor overload protection	20.0~100.0%	0.1	100.0%	☆
Fd-06	Pre-alarm value of over torque	20.0~200.0%	0.1	*	☆
Fd-07	Over torque detect delay time	0.0~60.0s	0.1	0.1	☆
Fd-08	Fault auto reset times	0~5	1	0	☆
Fd-09	Failure self-reset interval time	0.1~600.0s	0.1	1.0	☆
Fd-10	Fault relay output during reset	0: No output 1: Output	1	0	☆

Fd-11	AI1 input voltage low limit	0.00~10.00V	0.01	2.00	☆
Fd-12	AI1input voltage upper limit	0.00~11.00V	0.01	8.00	☆
Fd-13	Module temperature reaches	25.0~90.0℃	0.1	70.0	☆
Fd-14	Previous two faults	0~30	1	0	×
Fd-15	Previous faults	0~30	1	0	×
Fd-16	Current fault	0~30	1	0	×
Fd-17	Output frequency at current fault	0 ~Upper limit frequency	0.01	0.00	×
Fd-18	Output current at current fault	0 ~ 3000.0A	0.1	0.0	×
Fd-19	DC bus voltage at current fault	0 ~ 800V	1	0	×

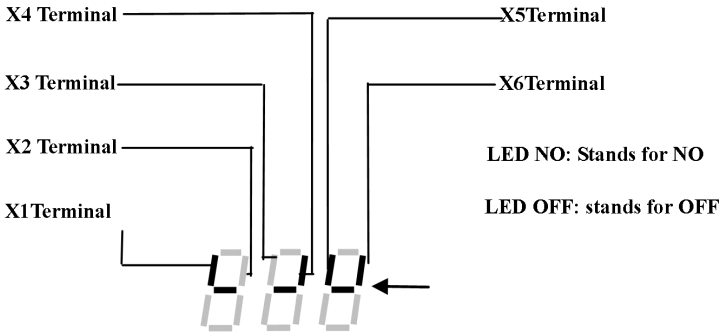
Chapter 8. Monitor parameters D group

Press shift button of keypad can display output current, output frequency, output voltage, DC bus voltage, DC bus current and input power 6 parameters in circulation in monitor status.

Monitor code	Contents	Mini. Unit	Address
d-00	Current output frequency	0.01Hz	1000H
d-01	Current output voltage	1V	1001H
d-02	Current output current	0.1A	1002H
d-03	Current frequency reference	0.01Hz	1003H
d-04	Current output frequency 2	0.01Hz	1004H
d-05	DC bus voltage value	1V	1005H
d-06	Module temperature	0.1℃	1006H
d-07	PID reference value	0.1%	1007H
d-08	PID feedback	0.1%	1008H
d-09	Speed	RPM	1009H
d-10	Running liner frequency	0.01*	100AH
d-11	External pulse train input	0.01KHz	100BH
d-12	RS485 reference		100CH
d-13	Reserve		100DH
d-14	AI1	0.1V	100EH
d-15	AI2	0.1V	100FH
d-16	DI terminals status		1010H
d-17	DO terminals status		1011H
d-18	Single continuous run time	1H	1012H
d-19	Total running time	1H	1013H
d-20	External pulse count value		1014H
d-21	Internal timer count		1015H
d-22	Actual length	m	1016H
d-23	Pressure reference	MPa	1017H
d-24	Actual pressure	MPa	1018H
d-25	Open circuit voltage	1V	1019H
d-26	DC bus current	0.01A	101AH
d-27	MPPT tracking voltage	0.1%	101BH
d-28	Calculate flow rate	0.1m3/h	101CH
d-29	Today flow	0.1m3	101DH
d-30	Cumulative flow 1	0.1m3	101EH
d-31	Cumulative flow 2	1Km3	101FH
d-32	Input power	0.01KW	1020H
d-33	Today generated energy	0.1KWH	1021H
d-34	Cumulative generated energy 1	0.1KWH	1022H
d-35	Cumulative generated energy 2	1MWH	1023H
d-36	Working status	1	1024H

d-37	Rated voltage of Drive	1V	1025H
d-38	Rated current of Drive	0.1A	1026H
d-39	Software version		1027H

XI input terminals status description: The last three to five digital display digital input status



2）DO Terminals status：Th e lowest bit stands for Y, the second bit stands for relay output 1, the high bit stands for relay output 2.

Y is the lowest position, the output relay 1 followed by 2 relay outputs as a binary number consisting of the highest level, is converted into a decimal display.

3） d-36 working status display introduction:

0： Stop mode

1: Running

2: A.Luo means on low voltage sleep mode , it can restore after 2 min.

When input power or input voltage is too small. This alarm possibility will happen.

3: A.LFr means on low stop frequency sleep mode, it can restore when output frequency is rising.

4:A.LCr means on dry run protection

5: A.OCr means on motor over current mode.

6: A.Lpr means on minimum power input mode

7: A.FuL water full sleep mode.

8. A.FBO, connecting normal open float switch

9. AFBC, connecting normal close float switch

Below parameters are related to solar pump inverter.

d-00	Current output frequency	0.01Hz
d-01	Current output voltage	1V
d-02	Current output current	0.1A
d-05	DC bus voltage value	1V
d-26	DC bus current	0.01A
d-32	Input power	0.01KW

Note. Press the Shift button of keypad can display d-00, d-01,d-02, d-05, d-26, d-32, etc 6 common monitoring parameters in circulation.

d-25	Open circuit voltage	1V
d-27	MPPT tracking voltage	0.1%
d-28	Calculate flow rate	0.1m3/h
d-29	Today flow	0.1m3
d-30	Cumulative flow 1	0.1m3
d-31	Cumulative flow 2	1Km3
d-32	Input power	0.01KW
d-33	Today generated energy	0.1KWH
d-34	Cumulative generated energy 1	0.1KWH
d-35	Cumulative generated energy 2	1MWH
d-36	Working status	1
d-37	Rated voltage of Drive	1V
d-38	Rated current of Drive	0.1A
d-39	Software version	

Chapter 9 . Parameters description in detail

Some parameters description which may relative with solar pump control.

F0-00	Model selection	0： General purpose 1： P type (variable torque load)	1	0	×

0: Suitable for driving general purpose constant torque heavy load w

For solar submersible pump need select G type models because large torque in deep well.

1: suitable fr driving fans pumps, etc variable torque light load

The power of P type mode for fans, pumps light load lower than G constant torque model one range.

Note: This value can't change after factory leaving.

For some fans pumps application, such as boost fans, deep well pump, which load is heavy. Select the AC Drive should according to the actual current.

The tolerance capacitors of G type: 150% rated current for 1 minutes, 180% rated current for 2 seconds.

The tolerance capacitors of Ptype: 120% rated current for 1 minutes, 150% rated current for 2 seconds.

F0-01	Control mode	0: VF control 1: Vectorized VF control 2:Open loop vector control 1 3: High performance open loop vector control 2	1	0	×

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: Vectorized VF control,

Do vectorized for V/F control to enhanced control accuracy, stability of control and improved the torque output at low speed. Not sensitive to motor parameters.

2: Open loop sensorless vector control 1:

Unique method vector control, vector control versatility relatively strong, has steady performance, but the dynamic indicators worse than the high performance open loop vector control 2, insensitive to motor parameters. Please select this option when driving PMSM high efficiency pumps.

3: High performance sensorless vector control 2

It uses a rotor field oriented vector control, with high static and dynamic performance control, sensitive to motor parameters. This control mode suits for high performance general purpose application without encoder, such as machine, centrifugal machine, drawbench, injection mold machine, etc. one drive only allow to control one motor.

Please configure motor group parameters carefully, and performance ID auto tuning when apply this control mode.

F0-02	Running command channel selection	0: Operation panel (keypad) 1: External terminals 2: RS485terminals	1	1	☆

Selects AC Drive running command input channel,

The AC Drive control command includes starting, stop, forward, reverse, jog function.

0: Keypad (operation panel); The running command is controlled by RUN, STOP, JOG (through F4-13) 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, see P0.18, F5-16 ~ F5-21 function code in detail.

When F1-05=1, inverter start immediately once switch on power supply.

2: communication command

The running command is given by communication, see the communication protocol F8 group description.

F0-03	Main frequency reference source A	0: Potentiometer of keypad 1: UP, DOWN of keypad. 2: AI1 (0-10V) 3: AI2 (0-10V/0-20mA) 5: PID close loop reference 6: Multi-speed control 7: Simple PLC 8: UP/DW of terminals 9: Communication 11: High speed pulse trains	1	0	☆
F0-04	Auxiliary frequency reference source B	0: Potentiometer of keypad 1: AI1 (0- 10V) 2: AI2 （0-10V） 3: F0-07 (UP and Down of keypad reference setting) 4: High speed pulse trains reference 5: Multi-segment speed	1	1	☆
F0-05	The reference source selection of auxiliary frequency source B	0: Upper limit frequency 1: Main frequency source A	1	0	☆
F0-06	The operation of frequency source A and B combination setting	0: Main frequency source A 1: Auxiliary frequency source B 2: A+B 3: MAX（A，B） 4: MIN（A，B） 5: A-B	1	0	☆

There are two frequency reference source of main and auxiliary reference (A and B). The user can select frequency reference according actual application request.

These parameters is disable in solar pump control mode, because the output frequency is controlled by inner MPPT algorithm.

F0-08	Upper limit frequency	5.00~650.00 Hz	0.01	50.00	×
F0-09	Lower limit frequency	0.00Hz ~ F0-08	0.01	0.50	×
F0-10	Running mode under low limit frequency	0: Running with lower limit frequency 1: Stop 2: Sleep mode in stand by	1	0	×

F3-21	Upper limit frequency reference source set selection	0: Upper limit frequency 1: AI1 2: AI2 3: Multi-segment speed 4: RS485 5: HDI 6: Potentiometer of keypad	1	0	☆

The upper limit frequency is upper limit value of output frequency of AC Drive.

When frequency reference is set by the external analog reference, multiple speed and simple PLC, the given value is percent %, their reference value is upper limit frequency.

Uses F3-21 to set the value of upper limit frequency source.

In solar pump control, if sunlight radiation is good, output is 50Hz. The user can limit frequency output according application request with this F0-08 and F3-21 parameters configuration.

F0-09, lower limit frequency used to defined lower limit output frequency of AC drive.

F0-10 running mode selection used to select stop, running and go to sleep mode when output frequency is lower than F0-09.

Note: If F0-10 set for 1, Ac drive stop when output frequency lower than F0-09. It request confirm STOP command again to start Ac drive when control by terminals or RS485 mode, when starting command is open.

If control by keypad or pulse terminals control, it need trigger starting signal again to start AC drive. In terminals control mode, only terminals signal is disable, and enable again to make AC drive start again.

F0-12	Acceleration mode 1	0.1~6000.0 s	0.1	*	☆
F0-13	Deceleration mode 1	0.1~6000.0s	0.1	*	☆

Acceleration time is the output frequency from 0Hz to rated frequency ramp up time in AC input mode, F0-12 parameter uses to program MPPT acceleration time in solar pump MPPT mode (Fa00=2)

Deceleration time is the output frequency reduce from rated frequency to 0Hz ramp down time.

F0-12 parameter uses to program MPPT Deceleration time in solar pump MPPT mode (Fa00=2)

If user can set Fc-02 deceleration time 2 to define actual deceleration time from rated frequency to 0Hz.

F0-14	Carrier frequency	1 ~ 10KHz	1	*	☆

Carrier frequency mainly affects the operation of the audio noise and thermal effects.

When the ambient temperature is high, the motor load is heavy, it should be appropriate to reduce the carrier frequency in order to improve the thermal characteristics of the Ac drive.

F0-15	Ac drive running direction	0: Runs as forward direction 1: Runs as reverse direction 2: Reverse direction is forbidden	1	0	☆

This parameters used to changed the AC drive output phase, thereby to check the motor running direction as well.

0: Running direction as same as setting

1: Running direction is reverse as setting.

2: Reverse running direction is forbidden.

If the output frequency is big, but output water yield is low in good sunlight condition, please used this parameters to change pump running direction or change motor wiring phase.

F0-17	Factory restore to factory setting	0: No operation 11: Parameters initialization 22: Clear fault record	1	0	×

To modify the parameters of the AC drive to factory default.

0: No operation

11: Parameters initialization, restore all parameters setting back to default setting.

22: Clear fault records

Note: Set F0-00 (AC drive modes G/P type selection properly) according to the actual situation before initialization. This parameters can't be restore.

F0-18	Parameters modify protection	0: No protection 1: Disable modify	1	0	×

0: No protection

1: All parameters under protection, can't modify. But F0-07 in monitor status can changed by UP and DOWN button of keypad.

F1-00	Start up mode	0: Start up with starting frequency 1: Start up after DC braking 2: Start up with speed tracking	1	0	×

0: Start up with starting frequency F1-01 setting.

1: Performance DC braking first, and then start from starting frequency for application which need starting from still.

2: Start up with speed tracking for fans application.

F1-15	Terminals running command detect when power on	0: Running command is disable when power on 1: Running command enable when power on	1	0	×

0: Start running command is disable when power on.

If the running command selection source is terminal control when AC drive power on. even if terminals command is enable, the AC drive will not response to start, to avoid bring damaged when AC drive staring suddenly. If need start system, user have to disable terminals first and then start it.

1: Starting running command is enable.

Ac drive starts immediately when power on if terminals command is enable.

F2-00	Motor type	0: Asynchronous motor 1: Permanent magnet synchronous motor	1	0	×
F2-01	Motor rated voltage	1~700V	1	*	×
F2-02	Motor rated frequency	5.00~600.00Hz	0.01	50.00	×
F2-03	Motor rated current	0.1~3000.0A	0.1	*	×
F2-04	Rated slip frequency	0.00~5.00Hz	0.01	*	×
F2-05	Poles pair	1~50	1	2	×
F2-06	No load current	10.0~ 80.0%	0.1	*	×

When the asynchronous motor is first time using, the user need to configuration these motor parameters according to nameplate of motor.

Performance sensorless vector control with selecting F0-01 for 2 or3. It must performance motor auto tuning first.

If driving solar PMSM (permanent magnet synchronous motor) pumps, it must perform motor ID auto tuning first. Select F2-10 for 1 or 2 to performance auto tuning.

Before performance auto tuning need configuring F2-11 to F2-15 PMSM parameters.

F2-10	Motor parameter auto-tuning	0: No operation 1: Static auto tuning 2: Completely auto tuning	1	0	×
F2-11	Rated frequency of PMSM	5.00~600.00Hz	0.01	50.00	×
F2-12	Rated voltage of PMSM	1~700V	1	*	×
F2-13	Rated current of PMSM	0.1~3000.0A	0.1	*	×
F2-14	Rated back EMF of PMSM	1~700V	1	*	×
F2-15	Stator resistance of PMSM	0.00~50.00%	0.01	*	×

F2.07 ~ F2.09 these parameters in generally can't find in nameplate of motor. Please perform motor auto tuning to get these parameters. only get f2.07 ~ f2.09 from static auto-tuning.

If the load can easy disconnect from motor, please to performance completely auto tuning to get accuracy motor parameters.

If the load can't disconnect from motor, set F2-10 for 1 to performance auto tuning.

F3-29	Torque boost	0.0~20.0%	0.1	2.0	×

To compensate the low frequency torque characteristics of V/F control, you can boost the output voltage of AC drive at low frequency by modifying F3-29. If the torque boost is set to too large, the motor may overheat, and the AC drive may suffer over current.

If set it for 0, it will performance auto torque boost.

F4-29	Speed display coefficient	0.1~999.9%	0.1	100.0	☆
F4-301	Linear speed display coefficient	0.01~99.99	0.01	1.00	☆
F4-31	Multi-function key MF.K set	0: REV 1: Jog forward 2: Jog Reverse 3: Running command switchover	1	0	×

F4-29 Speed display coefficient that used for correct the speed display.

F4-31 used to define the function of multiple function key on keypad.

F5-15	External terminal command control mode	0: Two lines control mode 1 1: Two lines control mode 2 2: Three lines control mode 1 3: Threes lines control mode 2	1	1	×
F5-16 To F5-21	X1 to X6 terminals function selection (0~39)	1: FWD Forward command 5: Emergency stop input (solar pump pause) 41: Solar control prohibition			

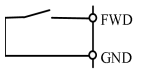
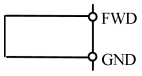
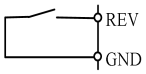
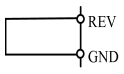
The F5-15 parameter used to select terminals control mode, there are 4 control modes in drives.

FWD stands for running in forward direction control by external terminal, and marks for FWD.

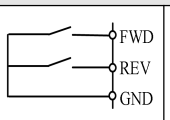
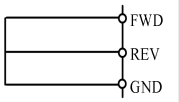
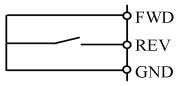
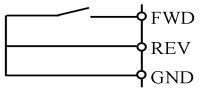
REV stands for running in reverse direction control by external terminal, and marks for REV.

0: Two line control mode 1

Construction	Stop	Running	Forward	Reverse

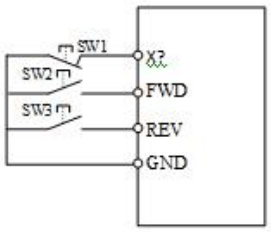
Terminals status				

1：Two lines control mode 2

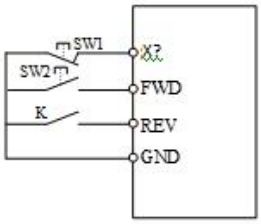
Construction	Stop command		Forward	Reverse
Terminals status				

2：Three lines control mode 1

It is must defined one input terminal for 3 lines control mode (one of terminals of F5-16 ~ F5-21 set for 11). Refer to the 3 lines control mode as following wiring.



a) 3 lines control mode 1



b) 3 lines control mode 2

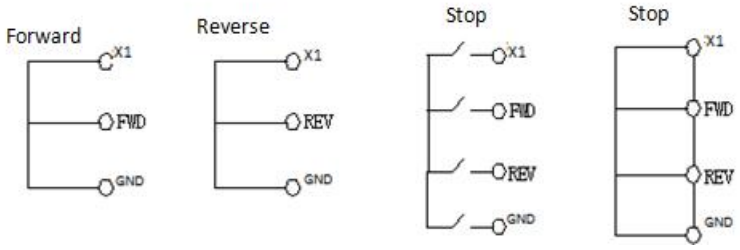
3 lines control mode wiring

X? is programmed for 3 line control, we can take one terminals of X1 ~ X6 (F5-16 ~ F5-21) set for 11. Sw1 is drive stop trigger switch. SW2 is forward trigger switch, and SW3 is reverse trigger switch.

3: 3 lines control mode 2.

X? is programmed for 3 line control, we can take one terminals of X1 ~ X6 (F5-16 ~ F5-21) set for 11. SW1 is stop trigger switch, SW2 is forward trigger switch, K is reverse selection switch.

If selection X1 for 3 lines control mode, see below wiring diagram.



3 lines control mode description

There are X1 to X6 programmable digital input terminals in this drive, used F5-16 to F5-21 parameters to express it. Each terminal can be define 41 functions.

In solar pump control mode, 1: FWD Forward command, 5: Emergency stop input (solar pump pause) and 41: Solar control prohibition are popular in using.

When one of X1 to X6 is set for 41 (solar control prohibition), the solar pump control function is disable, and AC drive variable frequency mode is activated, as same as FA.00 set for 0.

FA group parameters for solar pump control

FA-00	Select solar pump control mode	0: variable frequency drive control (AC grid input) 1:CVT (constant voltage tracking) 2: MPPT (maximum power point tracking)	1	2	×
FA-01	Auto restart / manual start selection mode in keypad	0: Start inverter by manual of keypad. 1: Auto restart is available in keypad control mode	1	0	☆
FA-02	CVT object voltage	0.0~100.0% of VOC	0.1	80.0	☆

FA-00 parameter uses to select AC drive (VFD) variable frequency control mode or solar pump control. There are two solar pump control modes, which are constant voltage tracking (CVT) and maximum power point tracking (MPPT). MPPT solar pump control mode is default setting.

In very good sunlight radiation area, user can select CVT mode for better frequency stable output, because the DC bus voltage is control target in this mode. FA-02 (CVT object voltage) is used to set target control voltage of DC bus. The suggest value setting is 75% to 90%.

When connecting 1 phase pumps please set Fa00=1. (CVT)

FA-01 Auto/manual restart selection is use to set if auto restart or manual restart under keypad control mode . There are two methods can use to set auto restart when power on. (1), switch on X1 and GND and set terminal start mode with parameters f0-02=1 (2), Even in keypad control mode, set Fa-01=1.

FA-03	MPPT control upper limit voltage	0.0~100.0% open loop circuit voltage	0.1	90.0	×
FA-04	MPPT control lower limit voltage	0.0~100.0% open loop circuit voltage	0.1	75.0	×
FA-05	Frequency adjusting gain	1~5000	1	40	×
FA-06	Frequency adjusting allowable deviation	1~5	1	3	×
FA-07	MPPT Control period	0.01~10.00S	0.01	0.30	×

Uses FA-03 and FA-04 to define MPPT upper limit and lower limit voltage. in generally, the default setting 75% to 90% is good for working.

For 3 phase 380V output control, the MPPT voltage Vmp is 540V.

For 3 phase 220V output control, the MPPT voltage Vmp is 310V.

The Vmp should be stay during with FA04 to FA03. If the range between Fa03 to Fa04 is smaller, the MPPT calculation will be strong and quick, the water outcome will be better, but might cause output frequency fluctuating.

If the d25 VOC showing is not correct in morning and cause inverter can’t start automatically well, please set Fa-03 value bigger.

If the d25 (Voc detecting value) is detected correctly especially in the earlier morning, and will cause auto restart improperly. The user can set bigger value of Fa-03 to avoid this problem.

FA-05 (Frequency adjusting gain) parameter uses to define MPPT performance is fast or slow during operation. If this value is smaller, the MPPT performance is weak, and might cause ALU fault in bad sunshine condition, if this

value set too bigger, the MPPT performance will be strong , the output frequency might seems a little fluctuation. User can set this value bigger to get better MPPT performance to minimized ALu possibility occurs. But the bigger setting might cause OU(over voltage) or output frequency fluctuating. Please adjust this parameter according on site situation.

FA-06 (Frequency adjusting allowable deviation), change this parameters will effect output frequency stability with MPPT function. if change it bigger, the output frequency might seems a little fluctuation.

In generally, no need change this parameters.

We suggest user modify FA-05 parameter first, and don't changed FA-06 setting in generally case.

FA-07 parameter uses to limit MPPT searching period. No need to modify in generally case.

FA-08	Dc current correction offset	0.00~50.00A	0.01	0.00	☆
FA-09	Dc current correction gain	0.0~100.0%	0.1	100.0	☆

FA-08 and FA-09 both parameters uses to correct DC output current display.

Because the output DC current is calculating by software, it need parameters to correct it when it not correct.

FA-10 to FA-14 parameters use to set water tank level detecting, it compatible analog signal input.

Fb group parameters for solar pump protection and monitoring

Fb-00	Sleep voltage threshold	0~1000V	1	*	☆
Fb-01	Restore running voltage threshold	0~1000V	1	*	☆
Fb-02	Awake waiting time	0.0~3000.0S	0.1	120.0	☆

Fb-00∽Fb-02 uses to programmed solar pump inverter go to dormant state when input DC voltage is low, and wake up automatically when DC bus voltage is raise again.

When the DC voltage lower than Fb-00 set value for a system default time, it will go to stop sleep mode and sent out an alarm with A.Luo code display in keypad.

When DC bus voltage raises again and higher than Fb-01 value for a Fb-02 setting time, the drive will recover to running state.

Fb-03	Stop frequency when low speed running	0.00~300.00Hz	0.01	20.00	☆
Fb-04	Stop delay time when reach Fb-03 setting.	0.0~3000.0S	0.1	30.0	☆
Fb-05	Automatic recovery time in stop frequency protection mode	0.0~3000.0S	0.1	120.0	☆

If the output frequency is lower than Fb-03 (stop frequency when low speed) for Fb-04 (stop frequency delay time), the solar pump inverter will go into stop mode to protection pumps.

Once the output frequency is greater than Fb-03 (stop frequency) for Fb-05(automatic recover time), the drive will recover to running status again If Fb-15 (Alarm action mode) unit's digit is 0 in default setting. If Fb-15 unit's digit is set for 1, need to reset it by press STOP/RESET button by manual.

Fb-06	Dry run protection current threshold (under-load protection)	0.0~100.0A	0.1	1.0	☆
Fb-07	Dry run detect delay time	0.0~3000.0S	0.1	60.0	☆
Fb-08	Automatic recover time in dry run protection mode	0.0~3000.0S	0.1	120.0	☆

If the output current is lower than Fb-05 (Dry run current) for Fb-07 (dry run detect delay time), the drive will go to dry run protection mode.

Once the current is bigger than Fb-07 again for Fb-08 (recover time of dry run time, the drive will restore to running status if Fb-15 (Alarm action mode) ten's digit is 0 in default setting.

If Fb-15 ten's digit is set for 1, need to reset it by press STOP/RESET button by manual.

Fb-09	Motor over current protection threshold	0~3000.0A	0.1	*	☆
Fb-10	Over current detect delay time	0.0~3000.0S	0.1	30.0	☆
Fb-11	Automatic recovery time in over current protection mode	0.0~3000.0S	0.1	30.0	☆

Fb-09 to Fb-11 parameters used to set motor over current protection.

If the over current is bigger than Fb-09 for Fb-10 time, the drive will go to stop mode for providing motor protection.

Once the current is lower than Fb-09 for Fb-11 recover time, the drive will recover to work again if the hundred's digit of Fb-15 set for 0 in default.

If Fb-15 hundred 's digit is set for 1, need to reset it by press STOP/RESET button by manual.

Fb-12	Minimum power input protection threshold	0.00~100.00KW	0.01	0.00	☆
Fb-13	Minimum power input detect delay time	0.0~3000.0S	0.1	10.0	☆
Fb-14	Automatic recovery time in minimum power input protection mode	0.0~3000.0S	0.1	10.0	☆

Fb-12 to Fb-15 parameters used to set minimum power input power protection.

When the input power from solar panel is lower than Fb-13 (minimum power input) for Fb-13 time, the drive will be stop.

Once the input power larger than Fb-12 for Fb-14 time, the drive will start working again if thousand's digit of Fb-15 set for 0 in default.

If Fb-15 thousand 's digit is set for 1, need to reset it by press STOP/RESET button by manual.

Fb-15	Alarm action mode	0: Sending alarm and automatically rest 1: Reset by manual Unit's digit: Low frequency stop mode Ten's digit: Dry run (under load) Hundred's digit: Motor over current protection Thousand's digit: Minimum power input protection	1	0000

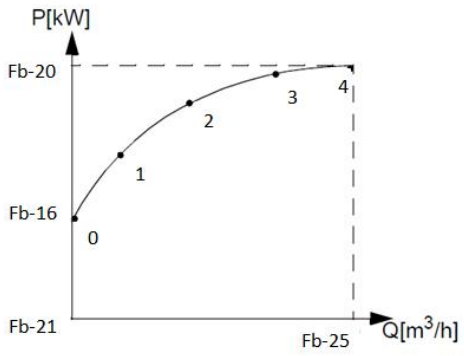
Fb-15 uses to set low frequency stop mode, dry run mode, motor over current and minimum input power protection, etc 4 kinds protection mode if set by automatically or manual.

Fb-16 to Fb-29 parameters provide flow calculation from PQ curve programming.

Flow calculation

The flow calculation function provides a reasonably accurate calculation of the flow without the installation of a separate flow meter. The function defines the flow estimate using the pump performance curve and drive actual load. The PQ (power/flow) performance curve enables calculating the flow output from the pump. The performance curve is provided by the pump manufacturer. The user saves five operating points (P,Q) of the performance curve to drive parameters.

PQ curve



The solar pump inverter records and stores the flow rate on each day and provides the required data for current day and current year.

Note:

• Do not use the flow calculation function outside the normal operating range of the pump.

• Do not use the flow calculation function for invoicing purposes.

• Ensure that power and flow points are in incremental order with non-zero values.

Fb-16 to Fb-20 use to define input power of pump at points 1...5 on the PQ performance curve.

Fb-21 to Fb-25 use to define flow rate at points 1...5 on the PQ curve respectively.

Fb-27	Flow measured offset	0.00~1000.0m3/h	0.1	0.0	☆
Fb-28	Flow measured gain	0.0~100.0%	0.1	100.0	☆
Fb-29	Cumulative flow/ generated energy reset setting	0: No operation 1: Flow reset 2: Generated energy reset 3: Both flow and generated energy reset	0	0	×

Fb-27 and Fb-28 use to correct flow calculating for difference pumps.

Fb-29 used to cumulative low and generated energy reset.

Fc-00	Open circuit voltage (VOC) detect mode	0: Self detect when power on 1: Set by user with Fc-01 value	1	0	*
Fc-01	User VOC voltage setting by manual	0-1000V	0	660	*
Fc-02	Deceleration time 2 when work for solar pump control	0.1~6000.0s	1.0	*	☆

The Fc-00 is options for selecting VOC (voltage open loop circuit) voltage detecting by automatically or be set by manual.

If Fc-00 set to 0, it means solar pump inverter will detect VOC by itself when power on. it will take 30s to detect correct VOC value of solar pump.

If Fc-00 set to 1. The user can set VOC by manual. Because the VOC is depend on solar pump arrays. The user can set actual VOC voltage to Fc-01 parameter.

Fc-02 deceleration time 2 parameter use to define deceleration time of stop of drive when press STOP button or switch off terminal control.

Note: The default value of FC-01 is 660V, we suggest user set it according his measured by multi-meter. The correct VOC setting can bring better MPPT performance of inverter.

The VOC automatically detected by inverter itself maybe not accuracy in earlier morning when Fc-00=0. (the VOC of solar arrays is small at earlier morning, and voltage will rise after a while).

If this problem cause can’t automatically start well in morning, please set Fa-03=130. (MPPT upper limit voltage).

FC-05	If remove capacity for driving single phase motor	0 : Normal control with starting capacitance. 1: Normal control without starting capacitance.	0	0	*

SG320 solar pump inverter also can used for driving single phase pumps with special design software algorithm.

If the capacity is difficult to remove from pumps, please sent FC05=0, connect two cable of pumps to any tow of U, V, W terminals.

If the capacity can remove from pumps, please set Fc05=1, and connect 3 cable to U, V, W.

Fc-07	Parameters modify protection password	0~99999	0	0	*
Fc-08	Restore time of float switch connecting (NO,NC input)	10-100s	10s		

User can set a password into fc-07 to prevent parameters wrong set by other peoples, the parameters can't modify when setup a password to Fc-07 for 20s. The user can enter setting password to process parameters modification if need.

FC-08 for restore time of removing float switch connecting to water tank or well.

This alarm AfbO and AfbC will be remove after Fc-08 setting time once remove the float switch NO or NC.

Chapter 10. Troubleshooting and countermeasures

The below table listed SG300 sereis solar pump inverter all types of faults possibly occurs. Before contacting manufacturer for technical support, you can first determine the fault type through following table description and records your done treating process and phenomena. if the fault can not be resolved, please seek for the manufacturer service support.

Fault code	Fault description	Possible reason	Countermeasures	Address
A.Luo	Under voltage sleep mode	When the working DC voltage is lower than Fb-00, this alarm will be activated	1. To check if enough power of solar arrays input 2. To check if input Voc is enough 3. To set Fa -05 for bigger to increase the MPPT gain, also increase the Fa-07 value	
A.LFr	Stop frequency sleep mode	The output frequency is lower than Fb-03 setting	Set Fb-03 for lower value	
A.LCr	Dry run protection	The output current is lower than Fb-06	St Fb-06 value for lower	
A.Lpr	Minimum power input mode	The total power input of solar arrays is lower than Fb-12	Set Fb-12 for lower value	
A.FuL	Water level fulling	Water level fulling	To check if water tank is fulling	
A.FBO	Normal open float switch for water tank fulling	The normal open of float ball switch is activated	If the terminal set for 43, and switch is turn on	
AFBC	Normal close float switch for well dry run	The normal close of float ball switch is activated	If the terminal set for 44, and the switch is turn off	
E. SC	Output short circuit	1:Output short circuit or grounding short circuit 2: The load too heavy	1.Check the output connection 2. seek for service support	01H
E. OC1	Over current in acceleration	1. Acceleration time is too short 2. too high torque boost or VF curve setting is not correct	1. Extend the acceleration time 2. low the torque boost voltage, and adjust the V/F curve.	02H
E. OC2	Over current in deceleration	The deceleration time is too short	Extend the deceleration time	03H
E.OC3	Over current in running	The load changed suddenly or fluctuation is too big	Reduce the load fluctuation	04H
E.OC4	Soft ware over current	As same as E.OC1，E.OC2，E.OC3 description	As same as E.OC1，E.OC2，E.OC3	05H
E.232.	Inner communication fault	Hardware problem	Seek for manufacturer support	06H
E.Gnd	Grounding fault	1: Output grounding of motor or drive, 2: Input and output connection of drive	1. Check the connection 2. check the motor if aging or	07H

			insulation is not good	
E.OU1	Over voltage in acceleration	1.Input voltage is too high 2. Power supply open and close frequently	Check the Dc input voltage or AC grid condition	08H
E. OU2	Over voltage in deceleration	1.Deceleration time is too short 2. Input voltage is abnormal	1.Extend deceleration time 2. Check the input voltage 3. Install braking unit or resistor	09H
E.OU3	Over voltage in running	1. Power supply is abnormal 2. load feedback energy	1. Check the voltage of power supply 2. Install braking unit or resistor	0AH
E. UL	Under voltage	1. Output connection is loss 2. Load suddenly missing	1. Check the output wiring 2. Check the drive load	0EH
E.OL1	Over load of drive	1. Load is too big 2. Acceleration is too short 3.Torque boost voltage is high, and VF curve is not properly 4.Input voltage is too low	1. reduce the load or change bigger power drive for instead 2. Extend the acceleration time 3. Low the torque boost voltage, and adjust the V/F curve. 4. Check the grid voltage	0FH
E.OL2	Motor overload	1. The load is too big 2. Acceleration time is too short 3. Protection coefficient setting is is too small 4. Torque boost voltage is high, and VF curve is not properly	1. reduce the load 2. Extend the acceleration time 3. Low the torque boost voltage, and adjust the V/F curve. 4.set the motor protection coefficient bigger	10H
E.CUr	Current detect is correct	1. Current detect parts or circuit is problem 2. Auxiliary power supply has problem	Seek for manufacturer support	11H
E. LU	Under voltage	1. Power supply voltage is abnormal 2. power supply is fluctuation	1. check the power supply 2. separate power supply 3. added the solar panel to increase Dc voltage input.	12H
E.EF1	External equipment normal open terminal fault	External fault input terminal of the drive signal input	Check the signal source and related equipment	13H
E.EF2	External equipment normal close terminal fault	External fault input terminal of the drive signal input	Check the signal source and related equipment	14H
E.OH	Drive over heat	1. duct obstruction 2. The ambient temperature is too high 3. Fan damage	1. Clean the duct or improved ventilation 2. Reduce the carrier frequency 3. Replace the fan	15H
E.SP1	Input phase loss	1. Input voltage phase loss	1. Check the connection	16H

		2. Input voltage is too low	2. Check power supply of phase loss	
E.SP0	Output phase loss	The connection between drive and motor is broken	Check the wiring	17H
E.EEP	Memory fault	Hard ware problem	See for support	18H
E.End	Running time is reached	The allowable running time setting is reach	Contact vendor	19H
E. PID	PID feedback fault	1. PID feedback single is broken 2. sensor has problem 3. feedback signal parameters setting is not correct	1. Check the feedback channel 2. Check whether the fault sensor 3. Verify the feedback signal meets the set requirements	1AH
E.485	RS485 communication fault	Send and receive data error occurs in serial communication	1. Check the connection 2. Seek for support	1BH
E.doG	EMC interference	Since the ambient electromagnetic interference caused by malfunction	Install the absorb circuit	1CH
E.232	Inner upper communication fault	Hardware problem	Seek for support from vendor	1DH

Note:

The series drive records the latest three times fault occurs code and output parameters of drive when latest fault occurs. Query information to help find the cause of the fault.

Charter 11. Routine Inspection and Maintenance

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

Requirement of Inspection and Maintenance

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

Warranty card

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

Appendix 1. RS485 communication protocol

1. Communication protocol

SG320 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

SG320 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

SG320 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 SG320 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

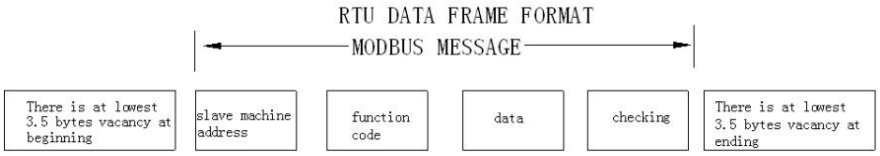
The ModBus protocol communication data format of SG320 series solar pump inverter is RTU (remote terminal unit) mode. Communication data format is as follows:

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

Initiation bit	Bit1	Bit2	Bit3	Bi4T	Bit5	Bit6	Bit7	Bit8	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 06H： Write slave parameters
Data region DATA(N-1) … DATA(0)	The data with 2*N bytes, main content of this part communication, which get from data exchange
CRC CHK low bit	Verification code： CRC verify value
CRC CHK high bit	
Frame end	The transmission time of 3.5 bytes in silent

6. Command code and communication data description

6.1. Command code

Command code: 03H (0000 0011), read N words (Maximum 5 words can be read)

For example: If the upper controller want to read F0-04 parameters from 01 address drive, see the frame structure as following:

RTU Host machine order information

Frame start	The transmission time of 3.5 bytes in silent
ADDR of slave address region	01H
Executive command CMD	03H
High bit of starting address	F0H
Low bit of starting address	04H
High bit of number of data	00H
Low bit of number of data	01H
CRC CHK low bit	F6H
CRC CHK high bit	CBH
Frame end	The transmission time of 3.5 bytes in silent

RTU slave address command information

Frame starting	The transmission time of 3.5 bytes in silent
Slave address ADDR	01H
Executive command CMD	03H
Byte of data is read	02H
High bit of F0-04 parameter	00H
Low bit of F0-04 parameter	01H
CRC CHK low bit	79H
CRC CHK high bit	84H
Frame end	The transmission time of 3.5 bytes in silent

Command code: 06H (000 0110), write a word to a address of parameter. For example, write 20.00 to F0-07 of 01H address slave machine. (actual write data is 2000, the corresponding hex data is 7D0H.)

RTU host machine command information

Frame starting	The transmission time of 3.5 bytes in silent
Slave address ADDR	01H
Executive command CMD	06H
High bit of starting address	F0H
Low bit of starting address	07H
High bit of number of data	07H
Low bit of number of data	D0H
Low bit CRC CHK	08H
High bit CRC CHK	A7H
Frame end	The transmission time of 3.5 bytes in silent

RTU slave machine command information

Frame starting	3 The transmission time of 3.5 bytes in silent
Slave address ADDR	01H
Executive command CMD	06H
High bit of starting address	F0H
Low bit of starting address	07H
High bit of number of data	07H
Low bit of number of data	D0H
CRC CHK low bit	08H
CRC CHK high bit	A7H
Frame end	The transmission time of 3.5 bytes in silent

There are two starting address representation, such as: FX.YZ parameters can be expressed as FX YZ (high front and low in the post), it can also be expressed as 0X YZ. When the operation command 06, the host computer using the first address of the representation, the written data stored in the E2PROM, using the second address representation, only change the data in RAM, you can reduce the number of operations of E2PROM.

PC either read command (03) or write command (06), an exception may occur at this time, the drive will return an error code.

RTU slave returns an error message

Frame start	3.5 bytes transmission time in silent
Slave address region ADDR	XX
Abnormal Tips	86H
Exception code high bit	00
Exception code low bit	0X
CRC CHK low bit	XX
CRC CHK high bit	XX
Frame end	3.5 bytes transmission time in silent

Exception code Meaning Description:

01H: Invalid command

02H: Invalid address

03H: Invalid Data

04H: CRC error

05H: Parameter can not be modified

6.2 Communication Frame check mode

Error checking mode frame includes checking two parts, namely byte parity bit (odd / even parity) and the entire frame of data check (CRC check)

6.2.1 byte checksum

Users can select different bit Parity necessary, you can select no parity.

Odd meanings: one before data transfer additional odd parity bits used to represent the data transmission of "1" the number is odd or even, odd, the parity bit "0", otherwise set "1", for holding the parity data unchanged.

Even parity meanings: one before the data transmission of additional parity bits to represent the number of transferred data "1" is odd or even, is even, parity bit "0", otherwise set "1", for holding the parity data unchanged.

For example, the need to transmit "11001110", the data contains five "1", if even parity, the parity bit "1", if odd parity, the odd parity bit is "0", the transmission data When, after the position of parity check bit computing on the frame, the receiving device must also be parity, and if found inconsistent with the preset data parity accepted, it is considered communication error occurred.

6.2.2 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)
{
    int    i;
    unsigned int crc_value=0xffff;
    while(data_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);
}
```

In the ladder logic, CKSM CRC value calculated according to the frame content is calculated using the look-up table, this method procedure is simple, fast speed, but with a larger program ROM space, program space requirement, please use caution.

6.4 Address of the definition

This part is the definition of communication data address for controlling the operation of the drive, drive status to obtain information and inverter function parameter settings.

Address of the function parameters has been described in the foregoing, such as: FX.YZ parameters can be expressed as FX YZ (high front and low in the post), it can also be expressed as 0X YZ. When the operation command 06, the host computer using the first address of the representation, the written data stored in the E2PROM, using the second address representation, only change the data in RAM, you can reduce the number of operations of E2PROM.

Address explanation other functions

Function description	Address definition	Data Meaning Comments	R/W Property
Monitor parameters	1000H 1001H 1015H	d-00 d-01 d-21	R
Data command	2000H	0000H：Stop 0001H：forward 0002H：reverse 0003H：fault reset	W
Running status	3000H	0001H：in forward 0002H: in reverse 0003H：standby 0004H: in fault	R
Frequency reference	4000H	The percentage corresponding to the upper limit frequency , upper frequency corresponding to 10000	W
Drive fault	5000H	Returns fault number (see Chapter 5)	R

For example:

A. Read data of parameters

1.Read F0-04 data （F0-04=4)

Pc sending: 0103f0040001f6cb

Receive: 01 03 02 00 04 B9 87

2. read F0-17 data F0-17=0)

Pc sending：0103f0110001e70f

Receive：01 03 02 00 00 B8 44

3. Read F1-17 data（F1-17=1)

Pc sending： 0103f1110001e6f3

Receive： 01 03 02 00 01 79 84

4. Read F2-09 dat （F2-09=8.00)

Pc sending： 0103f209000166b0

Receive： 01 03 02 03 20 B9 6C

5. Read 5 data d-00 begins

Pc sending： 0103100000058109

Receive：01 03 0A 00 00 00 00 00 00 13 88 00 00 A0 18

6. Read 10 data d-00 begins

Pc sending： 01031000000Ac10d

Receive： 01 03 0A 00 00 00 00 00 00 13 88 00 00 A0 18

7. Read 10 data d-05 begins

Pc sending： 01031005000Ad10c

Receive： 01 03 0A 02 45 00 F7 03 E8 00 00 00 00 6D 04

8. Reading drive status (fault)

PC sending：0103300000018b0a

Receiving：01 03 02 00 04 B9 87

Read fault information (E.Lu Brown)

PC sending：010350000001950a

receiving：01 03 02 00 12 38 49

2. write data

1, write F0-02 = 2

PC Sending: 0106f00200029acb

Receive: 01 06 F0 02 00 02 9A CB

2,Start drive

PC Sending: 01062000000143ca

Receive: 01062000000143ca

3. Stop

PC Sending: 010620000000820a

Receive: 010620000000820a

4, reverse

PC Sending: 01062000000203cb

Receive: 01062000000203cb

5, set frequency reference 10.00Hz (20.00%)

PC Sending: 0106400007d09fa6

Receive: 0106400007d09fa6

Set frequency 20.00Hz (40.00%)

PC Sending: 010640000fa09982

Receive: 010640000fa09982

6, Reset

PC Sending: 010620000003c20b

Receive: 010620000003c20b

Appendix 2. Selection of Peripheral Electrical Devices

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					
SG100-2S-0.7GB	10	12	0.75	0.75	0.5
SG320-2S-1.5GB	16	18	1.5	1.5	0.5
SG320-2S-2.2GB	25	25	2.5	2.5	0.5
SG320-2S-4.0GB	32	32	4	4	0.75
Three-phase 380 V					
SG320-4T-0.7GB	4	9	0.75	0.75	0.5
SG320-4T-1.5GB	6	9	0.75	0.75	0.5
SG320-4T-2.2GB	10	12	0.75	0.75	0.5
SG320-4T-4.0GB/5.5PB	16	18	1.5	1.5	0.5
SG320-4T-5.5GB/7.5PB	20	25	2.5	2.5	0.75
SG320-4T-7.5GB/11PB	25	25	4	4	0.75
SG320-4T-11GB/15PB	32	32	6	6	0.75
SG320-4T-15GB/18.5PB	40	40	6	6	0.75
SG320-4T-18.5G/22P	50	50	10	10	1
SG320-4T-22G/30P	50	50	10	10	1
SG320-4T-30G/37P	63	63	10	10	1
SG320-4T-37G/45P	80	80	25	25	1
SG320-4T-45G/55P	100	115	35	35	1
SG320-4T-55G/75P	125	125	50	50	1
SG320-4T-75G/90P	160	185	70	70	1
SG320-4T-90G/110P	200	225	95	95	1
SG320-4T-110G/132P	225	225	120	120	1
SG320-4T-132G/160P	315	330	120	120	1
SG320-4T-160G/185P	350	400	150	150	1
SG320-4T-185G/200P	350	400	150	150	1
SG320-4T-200G/220P	400	400	185	185	1
SG320-4T-220G/250P	500	500	240	240	1
SG320-4T-250G/280P	500	500	120 *2	120 *2	1
SG320-4T-280G/315P	630	630	120 *2	120 *2	1
SG320-4T-315G/355P	630	630	150 *2	150 *2	1
SG320-4T-355G/400P	700	800	185*2	185*2	1
SG320-4T-400G/450P	800	800	240*2	240*2	1
SG320-4T-450G/500P	800	800	240*2	240*2	1
SG320-4T-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 waveforms. 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.

Appendix 3. DC input voltage booster

It is use to booster low voltage input to high voltage to meet solar pumps system application which need high voltage using for investment cost saving.

For example, For 1/3 phase 220VAC pumps, it should be request Vmp (working voltage) is 310VDC, Voc (open loop voltage) is 370VDC.

For 3 phase 380VAC pumps, it should be request Vmp 540VDC, and Voc 648VDC.

To order to get high voltage output from solar panels, we always connect solar panels in serial.

for 37voc solar panels, we need do 10 pcs solar panels connection in serial to get 370VDC, and need do 17 pcs solar panels connection in serial to get 629VDC.

And it will cause big investment for small power solar pumps system, and also make it difficult to promote this very good green energy solar pump system solution for people who need more water but less of grid power.

We design and develop DC voltage booster device for increase low voltage to high voltage for save solar panels using,for money save.

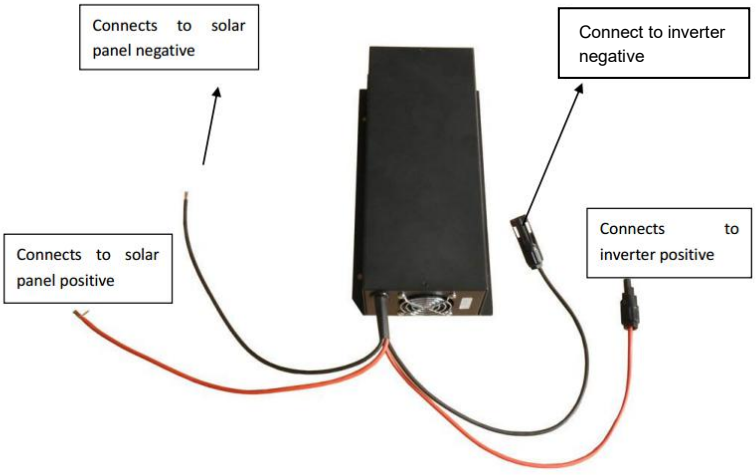
There are 3 models DC voltage booster can help us reduce solar panels investment.

LV40-70 design for "L" (3phase 220Vac) inverter, input voltage range :40 to 70Vdc,Output will be 240V to 420VDC.

LV60-90 design for"L" (3phase 220Vac) inverter, input voltage range :60 to 90Vdc, Output will be 300VDC to 450VDC.

LV60-90 design for"H" (3phase 380Vac) inverter, input voltage range :60 to 90Vdc, Output will be 480VDC to 720VDC.

Low voltage booster device is specially for small power solar pump inverter with low current and high voltage, especial for 0.75kw, 1.5kw 220V pumps, and 0.75kw, 1.5kw 380V pumps. Input voltage is DC60-90V or DC40-70 can work normally, output voltage is 5~7 times of input voltage. Output voltage changes according to input voltage so that solar pump inverter can track the maximum power of PV arrays.



Solar DC voltage booster models:

LV40-70 （ 40 to 70VDC input, 240V to 420VDC output)

LV60-90-2T (60-90VDC input, 300VDC to 450VDC output)

LV60-90-4T(60-90VDC input, 480V to 720VDC output)

This product has high efficiency. When power is under 200w, the efficiency is under 90%; when power above 200W, the efficiency can reach above 90%. Efficiency increase with power increase, maximum efficiency can reach 95%. Normally, this product doesn't need operation, normal working only need to connect the input wire and output wire correctly.

66VDC input, output 350VDC, for 3 phase 220VAC pumps

88VDC input, output 620VDC, for 3 phase 380VAC pumps