SOFT POWER

V70 series Solar pump drive user's manual

CONTENT

Chapter 1. About this manual

This chapter provides an overview of the contents, purpose, compatibility, and theintended audience of this manual. The V70 series solar pump drive is an enhancement of the S350 AC drivefirmware. This supplementmanual intends to serve as a quick start guide for installing, commissioning and operatingthe V70 solar pump inverter. This manual includes all the required parameter settingsand program features specific to the solar pump drive.

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 CAUTIONS

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 understand 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 cause 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 thenthey must be protected by the operator/user againstcontact with people. Protective covers for movingparts (e.g. couplings) must not be removed when theequipment is running. Leaks (e.g. at the shaft seal) ofhazardous pumping media (e.g. explosive, toxic, hotliquids) must be disposed of in such a way that any dangerto personnel and the environment is removed. Allgovernment and local regulations must be observed atall times. Any danger to persons from electrical energymust be excluded by using good installation practicesand working according to local regulations.

Safety Directions for Maintenance, Inspection and Assembly Work– It is the user's responsibilityto make sure that all maintenance, inspection and assemblywork is performed exclusively by authorized andqualified experts sufficiently informed through carefulperusal of the Operating Instructions.The accident preventionregulations must be observed. All work on theequipment should be done when it is not operationaland ideally electrically isolated. The sequence for shuttingthe equipment down is described in the manual and must be strictly observed. Pumps or pump unitshandling hazardous liquids must be decontaminated.Immediately upon completion of the work, all safety andprotective equipment must be restored and activated.

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

Unauthorized Changes and Manufacturing of Spare Parts– Any conversion or changes of theequipment may only be undertaken after consultingthe manufacturer. Original spare parts and accessoriesauthorized by the manufacturer guarantee operationalsafety. Using non-authorized parts may void any liabilityon the part of the manufacturer.

Unauthorized Operation– The operational safetyof the equipment delivered is only guaranteed if theequipment is used in accordance with the directionscontained in this manual. Limits stated in the datasheets may not be exceeded under any circumstances.

Transportation and Intermediate Storage– Prolongedintermediate storage in an environment of highhumidity and fluctuating temperatures must be avoided.Moisture and condensation may damage windings andmetal parts. Non-compliance will avoid 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.

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 be 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 thefirst 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, thedrive should be derated for use. Output current should be derated by 10% for every 1,500 m increment of altitude

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

Chapter2.Solar pumping system introduction

2.1. Solar Pumping System overview

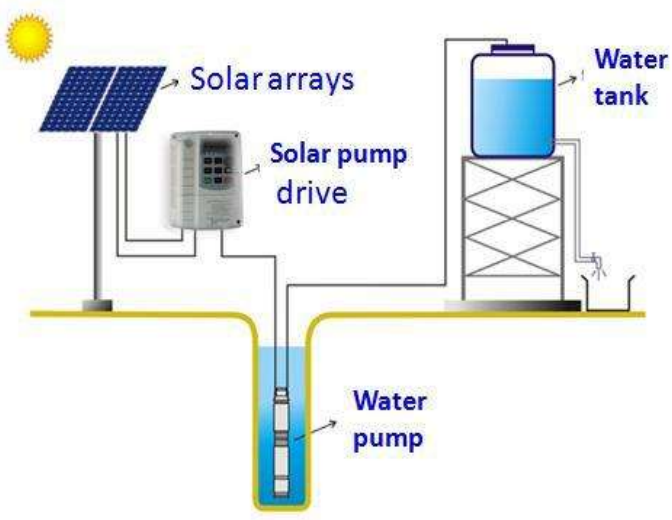
Solar pumping systems can be applied to allforms of daily use, water pumping for drinking water supplyfor remote villages and farms without connection to thewater grid, for agricultural use such as livestock watering,agricultural irrigation, forestry irrigation, pond management,desert control, and industrial use such as wastewatertreatment etc.

In recent years, with the promotion of theutilization of renewable energy resources, solar pumpingsystems 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 panel, a pump and asolar pump drive. Based on the design philosophy thatit is more efficient to store water rather than electricity,there is no energy storing device such as storage battery inthe system. The system is prepared to be combined with aelevated water storage, e.g. water tower or an uphill tankinstallation.

The PV generator, an aggregation of PV modules connectedin series and in parallel, absorbs solar irradiation andconverts it into electrical energy, providing power for thewhole system. The pump drive controls and adjusts thesystem operation and converts the DC produced by the PVmodule into AC to drive the pump, and adjusts the outputfrequency in real-time according to the variation of sunlightintensity to realize the maximum power point tracking(MPPT). The pump, driven by 3-phase AC motor, can drawwater from deep wells, rivers and lakes and pour it intostorage tanks or reservoirs, or be connected directly to theirrigation system, fountain system, etc. According to theactual system demand and installation condition, differenttypes of pumps such as centrifugal pump, axial flow pump,mixed flow pump or deep well pump can be used.

Solar pump system constitution.



System wiring diagram

2.2.Solar pump drive features:

Save in energy costs and maximize productivity

Solar pump drives ensure reliable powersupply throughout the day with on and off-gridcompatibility.

Save environment

Harnessing the power of sun provides an environmentally friendly pumping withoutproducing any CO2 emissions

Easy install and operation and little parameters configuration, end user who never used drive before, caninstall and operate it very well.

Reduce maintenance costs

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

Reduce operational risk

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

Chapter3. Solar pump drive overview

The V70 series solar pump driveis a low voltage AC drive of 0.4 to 100KWpower range designed to make use of energy drawn from solar panel or photovoltaic cells (PV). The driveiscustomized to operate in dual supply mode, so the grid connected supply is used in theabsence of energy from PV cells. Thisdrivefunctions with the latest in technologymaximum power point tracking (MPPT) algorithm to derive maximum power from the PVcells at any instant.

The driveis specifically designed to meet the requirements of pump manufacturers andthe original equipment manufacturers (OEM).

3.1 Product Features

Control modes

The solar pump driveoperates in local control mode and in remote control modeidentical to the ordinary V70AC drive.

- Local control—interfaces through the operation panel (keypad)
- Remote control—interfaces through external terminals control.

Note: Ensure that the driveis in local control before starting or stopping the inverterusing the control panel.

✓ Maximum power point tracking (MPPT) with fastresponse speed and stable operation

✓ Dry run (under load) protection

✓ Motor maximum current protection

✓ Input power protection

✓ Low stop frequency protection

✓ The PQ (power/flow) performance curveenables calculating the flow output from the pump

✓ Digital control for fully automatic operation, datastorage and protective functions

✓ Intelligent power module (IPM) for the main circuit

✓ LED display operating panel and support remote control

✓ Dual mode AC and DC power supply input is available

✓ Low water probe sensor, and water level control function

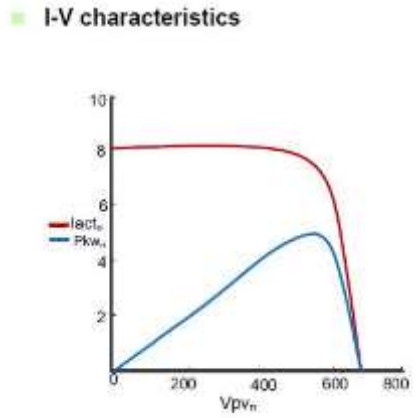
✓ Ambient temperature for using: -10 to +50˚C.

3.2. Solar pump drive operation theory

The solar pump driveuses the maximum power point tracking (MPPT) control programto improve the efficiency of solar energy systems. The output of the photovoltaic (PV) cellis proportional to its area and intensity, while the output voltage is limited by p-n junctionfrom 0.6 to 0.7 V. Therefore when the output voltage is constant, output power isproportional to intensity and surface area. The current and voltage at which the PV cellgenerates maximum power is known as the maximum power point.

The MPPT controller follows different strategies to derive the maximum power fromthe PVarray. The internal MPPT algorithm is used to derive maximum power from the PV cell atany instant. This is achieved by modifying the operating voltage or current in the PV celluntil the maximum power is obtained.

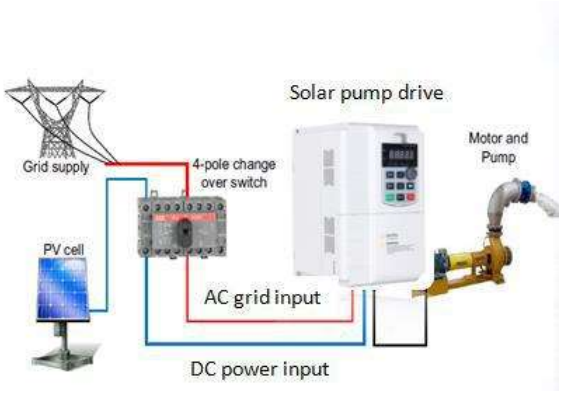
When the output voltage is zero, the PV cells create short circuit current. If the PV cells arenot connected to any load, the output voltage is equal to the open circuit voltage. Themaximum power point is obtained at the knee of the I-V curve. See the I-V characteristicsshown below.



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 changeslogarithmically with intensity. Since the voltage variation is small with respect to intensitychanges, maximum power varies proportionally with intensity

3.3. V70 series solar pump drive compatible withdual supply mode

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



Note: Use two poles of the changeover switch in series to ensure that the voltage appliedacross each pole is half of the full DC voltage

3.4. V70 series solar pump drive model description

The user can learn the specification from the nameplate.

V70 - T3 – 2R2GB- M

1 2 3 4

Mark	Description	Contents
1	Products model	SOFT POWER for solar pump V70 for Mode code.
2	Voltage specification	1: = 80 to 350 V DC or 110 to 220VACinput 2: = 150 to 400 V DC or 200 to 240 V ACinput 3: = 250 to 800 V DC or 380 to 480 V ACinput S：single phase output T: three phase output
3	Drive power	7R5GB stand for 7.5kw, submersible pump type 1R5GB stands for 1.5kw, submersible pumps type 7R5GP stands for 7.5kw, general pumps type
4	Size mode	M:mini mode Null: general mode

3.5.V70 series solar pump drive technical specification

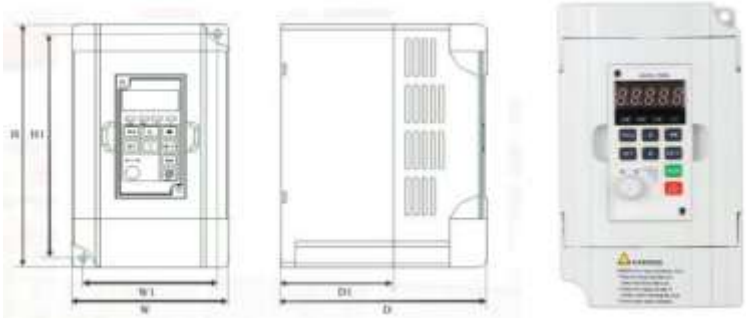
Recommended MPPT voltage range	80 ~350V DC input for 110V/160V/220V pumps, 0.75kw 150~400VDC for 220VAC/240V pumps with 0.75Kw to 4kw 250~800VDC, for 380VAC pumps with1.5kw to 160kw
Recommended input voltage	170Vmp DC for 110V AC pumps. 260Vmp DC for 160V AC pumps 350Vmp DC for 220V AC pumps, 620Vmp DC for 380V AC pumps
Motor type	Control for permanent magnet synchronous motor and asynchronous motor pumps
Maximum DC power input	1. 450VDC for 220AC output 2. 800VDC for 380V AC output
Rated output voltage	1phase, 110V/160V/220V. 3phase, 220V/380V/480V
Output frequency range	0~50/60Hz
MPPT efficiency	99%,
Ambient temperature range	-10~+50˚C
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, etc
Protection function	Stall protection, phase loss protection, phase short circuit protection , ground to phase short circuit protection , input and output short circuit protection, over-temperature protection, etc
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 driveV70, more specification please refer to V70 vector control drive operation manual

3.6. Models and specification

SN	Models	Rate current (A)	DC input range (VDC)	Output voltage (VAC)	Applicable for pumps **(KW)**	Installation size (mm)	IGBT module	Fig
Mini type: 80 to 350 VDC or 110 to 240VAC								
1	V70-T1-0R7GB-M	7.5A	80to350	110to160	0.75KW	143*86*114	IPM	Fig 1
Mini type:150 to 400 VDC or 220 to 240VAC								
2	V70-T2-0R7GB-M	4.0A	150 to 450	220to240	0.75KW	143*86*114	IPM	Fig 1
3	V70-T2-1R5GB-M	7.5A	150 to 450	220to240	1.5KW	143*86*114	IPM	Fig 1
Mini type: 250 to 800 VDC or 380 to 440 VAC								
4	V70-T3-0R7GB-M	2.5A	250 to 900	380to440	0.75KW	143*86*114	module	Fig 1
5	V70-T3-1R5GB-M	3.7A	250 to 900	380to440	1.5KW	143*86*114	module	Fig 1
6	V70-T3-2R2GB-M	5.0A	250 to 900	380to440	2.2KW	143*86*114	module	Fig 1
General type: 150 to 400 V DC or 200 to 240 V AC								
7	V70-T2-0R7GB	4.0A	150 to 450	220to240	0.75KW	185*118*157	module	Fig 2
8	V70-T2-1R5GB	7.5A	150 to 450	220to240	1.5KW	185*118*157	module	Fig 2
9	V70-T2-2R2GB	10A	150 to 450	220to240	2.2KW	185*118*157	module	Fig 2
10	V70-T2-4GB	16A	150 to 450	220to240	4.0KW	247*160*178	module	Fig 2
General type: 250 to 800 VDC or 380 to 480VAC								
11	V70-T3-0R7GB	2.5A	250 to 900	380to440	0.75KW	185*118*157	module	Fig 2
12	V70-T3-1R5GB	3.7A	250 to 900	380to440	1.5KW	185*118*157	module	Fig 2
13	V70-T3-2R2GB	5.0A	250 to 900	380to440	2.2KW	185*118*157	module	Fig 2
14	V70-T3-4GB	10A	250 to 900	380to440	4.0KW	185*118*157	module	Fig 2
15	V70-T3-5R5GB	13A	250 to 900	380to440	5.5KW	247*160*178	module	Fig 2
16	V70-T3-7R5GB	17A	250 to 900	380to440	7.5KW	247*160*178	module	Fig 2
17	V70-T3-11GB	25A	250 to 900	380to440	11KW	247*160*178	module	Fig 2
18	V70-T3-15GB	33A	250 to 900	380to440	15KW	247*160*178	module	Fig 2
19	V70-T3-18GB	38A	250 to 800	380to440	18.5KW	388*226*196	module	Fig 3
20	V70-T3-22GB	45A	250 to 800	380to440	22KW	388*226*196	module	Fig 3
21	V70-T3-30GB	60A	250 to 800	380to440	30KW	438*257*202	module	Fig 3
22	V70-T3-37GB	75A	250 to 800	380to440	37KW	438*257*202	module	Fig 3
23	V70-T3-45GB	91A	250 to 800	380to440	45KW	557*307*267	module	Fig 3
24	V70-T3-55GB	110A	250 to 800	380to440	55KW	557*307*267	module	Fig 3
25	V70-T3-75GB	150A	250 to 800	380to440	75KW	627*377*280	module	Fig 3
26	V70-T3-90GB	180A	250 to 800	380to440	90KW	627*377*280	module	Fig 3
27	V70-T3-110GB	210A	250 to 800	380to440	110KW	627*377*280	module	Fig 3
28	V70-T3-132GB	250A	250 to 800	380to440	132KW	930*579*375	module	Fig 3
29	V70-T3-160GB	310A	250 to 800	380to440	160KW	930*579*375	module	Fig 3

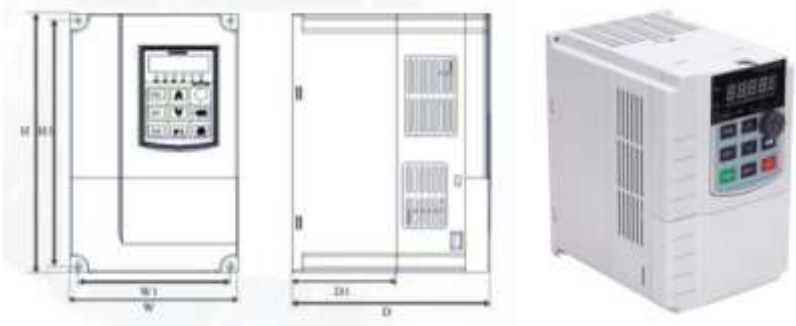
3.7. V70 series solar pump drive dimensions

Power	H	H1	W	W1	D	D1	Hole
0.4~1.5KW	143	132	86	74	114	62.5	Ø4.5



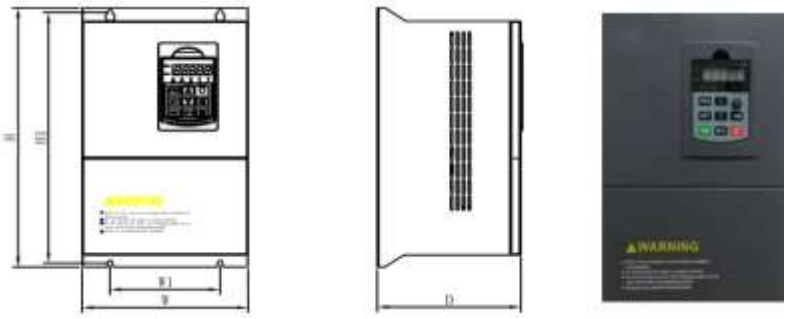
Mini typeFig 1

Power	H	H1	W	W1	D	D1	hole
0.75~4KW	185	175	118	105	157	80	Ø5
5.5kw -15kw	247	235	160	147	178	101	Ø5



General type Fig 2

Power	H	H1	W	W1	D	hole
18.5-22KW	388	375	226	150	196	Ø6
30kw -37kw	438	425	257	160	202	Ø6
45-55KW	557	537	307	230	267	Ø8
75-110KW	627	600	377	240	280	Ø8



General type Fig 3

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.
RUN	Running key	Use to start drive in keypad control mode
MF. K	Multiple function key	Programmed by F4-31 setting. Default 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)

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 set parameter in controller board and then return to the second menu, press PRG key an return second menu directly without parameters storing.

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

F4-26,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 drive 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 drive place in fault status and without any reset, it is located in protection status and can't working.

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

The system of drive will initialize by itself 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 drive place on standby status.

Chapter 5. V70 series solar pump driveinstallation

5.1 About this chapter

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

Safety instructions

WARNING! All electrical installation and maintenance work on the drivemustbe carried out by qualified electricians only. Follow the safety instructions listedbelow.

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

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

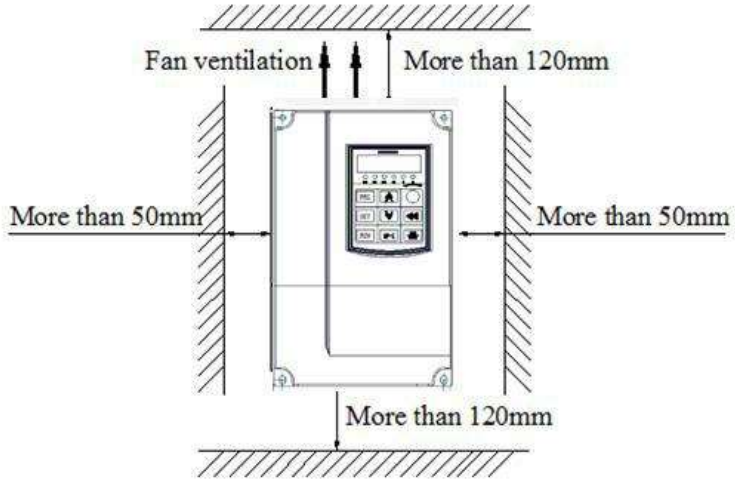
• A rotating permanent magnet motor generates a dangerous voltage. Always ensure tolockthe motor shaft mechanically before connecting a permanent magnet motor to theinverter,and before doing any work on a drivesystem connected to a permanentmagnet motor.

5.2 Mechanical installation

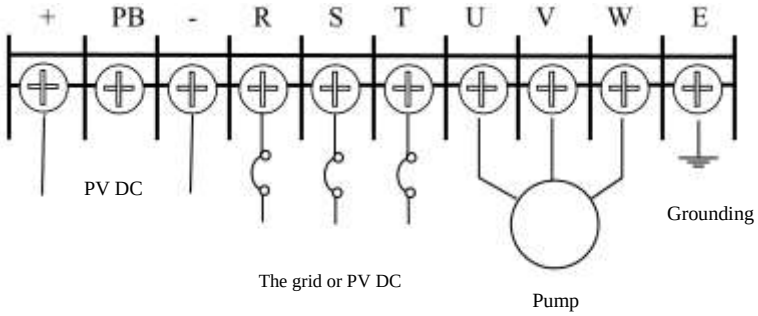
In back mounting, fasten the driveto the wall with screws using four mounting holes.

Note: Installation Environment Requirements

1. Ambient temperature, the surroundingenvironment temperature take great effect for service life span of solar pump drive, don't allow surrounding temperature over than allowable temperature above (-10° C to +50° C)
2. Heat dissipation, install the solardrive on the surface of an incombustible object, andensure that there is sufficient space around for heat dissipation.Install the solar pumpdrive 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



R, T terminals of drive received solar DC power from PV.

Note:

- Do not use an asymmetrically constructed motor cable.
- Route the motor cable, input power cable and control cables separately.
- Make sure that the maximum cable lengths are not exceeded. For detailedinformation, see the user's manual.

5.4Main circuit terminals description

Terminals symbol	Function description
+ -	Positive andnegativeterminals of DC bus voltage
PB	P, PB connect braking resistor
R,S,T	AC input connecting or DC input connect
U,V,W	Connect to motor
E	Grounding terminals

5.5.Connection procedure

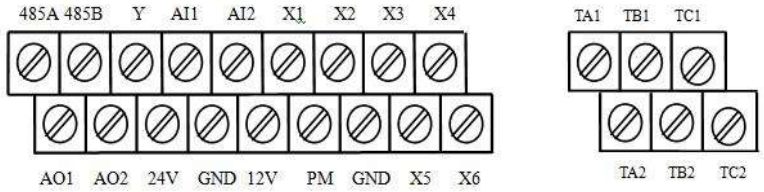
1. Strip the input power cable. Ground the bare shield of the cable (if any) 360 degreesunder the grounding clamp. Fasten the grounding conductor (E) of the input powercable under the screw of the grounding clamp. Connect the phase conductors to theR,T terminals from PV solar panel.

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

4. Secure the cables outside the drive mechanically.

5.6 .Control circuit terminals

5.6.1 Control circuit terminals diagram



5.6.2. Control circuit terminalsfunction description

Type	Terminals symbol	Terminals function	Remark
Power supply output	12V	12V/100mA power supply	
	GND	Frequency reference voltage signal common point(12, GND), 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
Digital input terminals	PM	Terminal active level selection	If PM connect with power supply point, the multi-function terminals and GND connecting is active.If PM connect with GND, the multi-function terminals and power supply points connecting is active.The function defined by parameter （F5-16～F5-21）
	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 input terminals	
Analog output	AO1	Programmable voltage and current signal output terminal (Defined by F5-34 ~ F5-36 parameters)	Output voltage 0～10V
	AO2	Programmable frequency, voltage and current output (Defined by F5-39 ~ F5-43 parameters).	Maximum output high frequency is 50KHz, output voltage 0~10V, current 0~20mA
ProgrammabletransistorOutput	Y	Programmable open collector output, set by parameter F5-27	The maximum load current 50mA, maximum withstand voltage of 24V
Programmable relay output	TA-TB-TC 1 TA-TB-TC 2	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 Description

SW1 Dial switch

Switch on the 0 ~ 10V, while setting [F5-39] = 0,AO2 output 0 ~ 10V.

Switch on the 4 ~ 20mA, while setting [F5-39] = 0,AO2 output 0 ~ 20mA.

Switch on the PWM, while setting [F5-39] = 1, AO2 output pulse signal.

SW2 Dial switch

Switch on the 0 ~ 10V, AI2input 0 ~ 10V.

Switch on the 4 ~ 20mA, AI2input 0 ~ 20mA.

Chapter 6. Solar pump drivecommissioning guide

6.1 Wiring and commission steps

6.1.1 Commissioning steps

1. Wiring according to the diagram and check the wiring if correct or not

2. Check the solar power input DC voltage if matching rated of drive. (4T series need Voc 620DCV, 2T series need Voc 350V)

3. Switchover to solar DC power input if DC voltage is correct.

4. Parameters setting and motor trial starting.

(a) Solar pump control parametersisFA,Fband FC group. Only two parameters need to be confirmed by first time using.

FA-00=2 for MPPT function in default. If FA-00 is 0, it only allow for AC grid input, not solar power input.

FA-01=0 means for operating by manual with keypad in default. If needs run automatically, please set FA-01 for 1.

(b) Set motor group parametersF2-00 to F2-05 according motor nameplate for asynchronous induction motor.

(c) Perform motor trial running with press RUN key to starts pump 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 motor wiring phase.

(d) Set the low stop frequency protection, low voltage sleep protection, dry run (under-load) protection, motor maximum protection and water tank level function if need according user request.

(e) If the output frequency is a little fluctuation, user can set FA-05 (Frequency adjust gain) to smaller, and set FA-07to smaller value. Otherwise if E. LU alarm occurs frequently, please set FA-05 bigger, and increase the FA-07 value.

(f) If solar pump drive runs well, and system working is stable, the commissioning is finished. Set FA-01 to 1 for automatically running control. The solar pump system can work with MPPT function according sunlight radiation automatically.

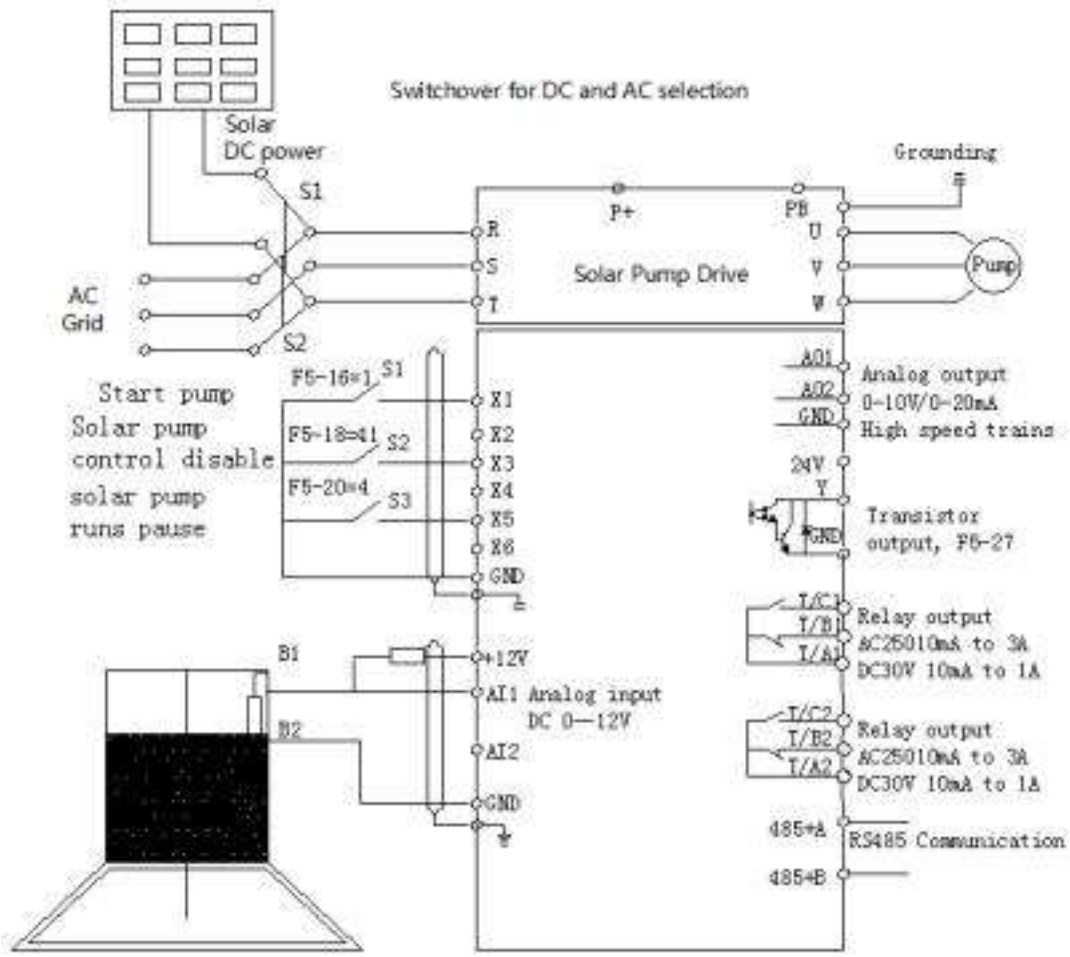
Note: If user need start pumps with AC grid input, please connect AC power supply to R, S,T. and set FA-00 for 0, or switch on X? (X3 and GND short circuit connection) to disable solar pump control function.

6.2 Excluded functions

The following features of V70 solar pump drive firmware are not supported in the solar pump inverter.

- Frequency input
- Sequential programming
- Jogging
- Constant speed
- speed slip compensation
- Mechanical brake

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



Note.1:

1. Use a switch over to select solar power DC input or AC grid input. Only allow one power input at the same time.

2. Switch on X1, and F5-16 set for 1, it will use to start pumps.

3. Switch on X2 to disable solar pump control when AC grid input.

4. If external fault or water is enough, user can switch X3 to make system pause.

5.AI and GND analog input ports can receive water level detect analog signal to control water level.

Note.2

Note: The required input solar panel voltage is 1.15 times of solar drive DC bus voltage.

For example: In T3 series, recommend 540V*1.15=621V;
In T2 series, recommend 311*1.15=357V.

The required power of solar arrays is 1.3 times of rated power of drives, shouldn't less than 1.2 times of rated power of inverter.

For example, 7R5G, the required power is 7500*1.3=9750w.

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 wordsstands 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: 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	☆
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 mode 1**	**0.1~6000.0 s**	**0.1**	*****	☆
F0-13	**Deceleration mode 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 isforbidden	1	0	☆
F0-16	**Parameters display in standby mode**	**0~39 （corresponding with d parameters）**	**1**	**3**	☆
F0-17	**Factory restore to factory setting**	**0: No operation** **11: Parametersinitialization** **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**	**1**	**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 arithmeticSelection	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	d-axis inductance ofPMSM	0.00~300.00%	0.01	15.00	×
F2-17	q-axis inductance ofPMSM	0.00~300.00%	0.01	15.00	×
F2-18	Speed estimation gain1	0.00~650.00	0.01	1.25	×
F2-19	Speed estimation gain2	0.00~650.00	0.01	1.25	×
F2-20	Whether weak magnetic flux of PMSM	0: NO 1:Yes	1	0	×
F2-21	PMSM control mode	0: torque 1:speed control	1	0	×

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	Low speed ASR proportional coefficient	0.01 ~ 30.00	0.01	0.60	☆
F3-01	Low speedASR 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	High speedASR proportional coefficient	0.01 ~ 30.00	0.01	0.60	☆
F3-04	High speedASR 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	1~1000	1	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	1~100millisecond	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	Magneticfield 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	FDT1 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	00.00~20.00Hz	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: Three phase modulation at low speed, two phase modulation at high speed 1: Allways three phase modulation Hundred's digit: Low speed deal with 0: When the low speedcarrier 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 itemsselection**	**0～3939: Low two bit and high two bit, each stands for one d parameters. 3 parameters can determine 6**	**1**	**0100**	☆
F4-27	**Operation monitoring itemsselection 2**		**1**	**0502**	☆

F4-28	**Operation monitoring itemsselection 3**	**monitor parameters, press Shift key to circulation display in running.**	**1**	**3226**	☆
F4-29	Speed display coefficient	0.1~999.9%	0.1	100.0	☆
F4-30	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

Code	Name	Description	Unit	Default setting	Property
F5-00	AI1minimum input	0.00~10.00V	0.01	0.00	☆
F5-01	AI1minimum 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	AI2maximum 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	0.10	☆
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（0~50）**	0: No function **1: FWD Forward command** 2: REV Reverse command 3: External fault input (normally open) 4: DC braking **5: Emergency stop input(solar pump pause)**		1	×
F5-17	X2 terminals function selection（0~50）			2	×
F5-18	X3 terminals function selection（0~50）			7	×
F5-19	X4 terminals function selection（0~50）			8	×

F5-20	**X5 terminals function**	6: Fault reset input 7: Multi-speed input 1		1	×
F5-21	X6 terminals function selection（0~50）	8: Multi-speed input 2 9: multispeed 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: Switch display parameter** **43:Normally Open point alarm**		10	×

		44: Normally closed point alarm			
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 asegment 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	☆
F5-34	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 7: AI1 8: AI2 9: Reserved 10: High-speed pulse input 11: RS485 set 12: Length	1	0	☆

		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 2：F6.01 reference 3：AI1 4：AI2 5：RS485 6：PLUSE trains 7：multi-speed	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: Positive1: 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 time	0.0 ~ 3000.0S	0.1	0.0	☆
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 multi 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	As same as speed 1 description	1	0	☆

	acceleration/deceleration				
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	1	5	☆

		2 ：1200bps 3 ：2400bps 4 ：4800bps 5 ：9600bps 6 ：19200bps 7 ：38400bps			
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 return	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	X2switch-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	**X3switch-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	1	2	×

		tracking)			
FA-01	Auto runselection	0: Manual by keypad control 1: Automatically running	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	95.0	☆
FA-04	MPPT lower limit voltage	0.0~100.0% of Voc	0.1	50.0	☆
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	1.00	×
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-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 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.	0.1	60.0	☆
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 drive 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	5.00	☆
Fb-04	stop delay time when reachstop 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	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	☆
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 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-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)	0.00~300.00KW	0.01	0.50	☆
Fb-17	PQ CURVE P1 (Input power of pump at point 1)	0.00~300.00KW	0.01	1.00	☆
Fb-18	PQ CURVE P2 (Input power of pump at point 2)	0.00~300.00KW	0.01	1.50	☆
Fb-19	PQ CURVE P3 (Input power of pump at point 3)	0.00~300.00KW	0.01	2.00	☆
Fb-20	PQ CURVE P4 (Input power of pump at point 4)	0.00~300.00KW	0.01	2.50	☆
Fb-21	PQ CURVE Q 0 (Flow rate at	0.0~3000.0m^3/h	0.1	0.0	☆

	point 0)				
Fb-22	PQ CURVE Q 1 (Flow rate at point1)	0.0~3000.0m^3/h	0.1	5.0	☆
Fb-23	PQ CURVE Q 2 (Flow rate at points 2)	0.0~3000.0m^3/h	0.1	10.0	☆
Fb-24	PQ CURVE Q 3 (Flow rate at point 3)	0.0~3000.0m^3/h	0.1	15.0	☆
Fb-25	PQ CURVE Q 4 (Flow rate at point 4)	0.0~3000.0m^3/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	0.00~1000.0m^3/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	×

13. FC group parameters for supplementarysolar pump control

Code	Name	Description	Unit	Default setting	Property
FC-00	Open circuit voltage (Voc) detect mode	0 ： Self detect when power on 1:Set by user with Pc-01 value	1	1	×
FC-01	User Voc setting by manual	0~1000	1	660	×
FC-02	Deceleration time2 when work For solar pump control	0.1~6000.0S	0.1	5.0	☆
FC-03	Pump efficiency	0.1~100.0%	1	100.0	☆
FC-04	Power display filter time	0.01~100.00S	1	2.00	☆
FC-05	Single phase pump control method.	0: Normal control with starting capacitance. 1: Control method without starting capacitance. The connection method: U ,W : L N (the leading out terminals of single phase motor) V : the terminal of capacitance	1	0	×
FC-06	Auxiliary winding coefficient	0.1~500.0%	0.1	100.0	×
FC-07	User password	0~9999 0:passwordless access.	1	0	☆
FC-08	Floatball alarm (A.Fb.C and A.Fb.o) selfreset delay time	0.1~100.0S	0.1	10.0	☆

14. 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	×

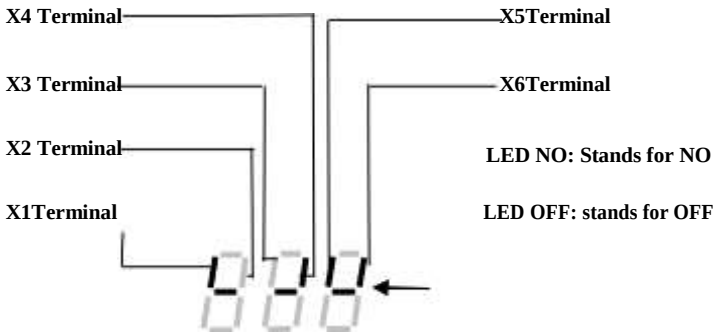
D Group parameters for working status monitor

Note : 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
d-00	**Current output frequency**	**0.01Hz**
d-01	**Current output voltage**	**1V**
d-02	**Current output current**	**0.1A**
d-03	Current frequency reference	0.01Hz
d-04	Current output frequency 2	0.01Hz
d-05	**DC bus voltage value**	**1V**
d-06	Module temperature	0.1℃
d-07	PID reference value	0.1%
d-08	PID feedback	0.1%
d-09	**Speed**	**rmp**
d-10	Running liner frequency	0.01*
d-11	External pulse train input	0.01KHz
d-12	RS485 reference	
d-13	Reserve	

d-14	AI1	0.1V
d-15	AI2	0.1V
d-16	DI terminals status	
d-17	DO terminals status	
d-18	Single continuous run time	1H
d-19	Total running time	1H
d-20	External pulse count value	
d-21	Internal timer count	
d-22	Actual length	m
d-23	Pressure reference	MPa
d-24	Actual pressure	MPa
d-25	**Open circuit voltage**	**1V**
d-26	**DC bus current**	**0.01A**
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**	

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 ,

3: **A.LFr**means on low stop frequency sleep mode,
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.

Chapter 8. Parametersdescription 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

For solar submersible pump we need select G type models becauseof large torque in deep well. 1:Suitable for 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 minute, 180% rated current for 2 seconds.

The tolerance capacitors of Ptype: 120% rated current for 1 minute, 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 onedrive for more than one motors, and motorauto-tuning cannot be performed or the motor's parameterscan 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 steadyperformance, but the dynamic indicators worse than the high performance open loop vector control 2, insensitive to motor parameters.

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 purposeapplication without encoder, such as machine, centrifugal machine, drawbench, injectionmold 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, MF.K(through F4-31) 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 F0-15, F5-15～F5-21 function code in detail.

2: communication command

The running command is given by communication, see the communication protocolF8 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 parametersareinvalid 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.

Use 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. Itrequestconfirm STOP command again to start Ac drive when control by terminals or RS485 mode, when starting command is open.

If controlledby keypad or pulse terminals, 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 time1	0.1~6000.0 s	0.1	*	☆
F0-13	Deceleration time1	0.1~6000.0s	0.1	*	☆

Acceleration time is the output frequency from 0Hz to motor rated frequency ramp up time.

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

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 isforbidden	1	0	☆

This parameter is used to change the AC drive output direction, 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: Parametersinitialization 22: Clear fault record	1	0	×

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

0: No operation

11: Parametersinitialization, restore all parameters setting back to default setting.

22: Clear fault records

Note: Set F0-00 (ACdrive modes G/P type selection properly) according to the actual situation before initialization. This parameter 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 canchanged 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 still 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	1	×

0: Start running command is invalid 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 (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 auto tuning first.

Select F2-10 for 1 or 2 to performance auto tuning.

Before performance auto tuning need configuringF2-11 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	*	×

F2-06～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 voltageof AC driveat low frequency by modifying F3-29.If the torque boost is set to too large, the motor may overheat, and the AC drive may sufferovercurrent.

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

F4-29	Speed display coefficient	0.1~999.9%	0.1	100.0	☆
F4-30	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	×

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.

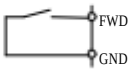
F5-15	External terminal command control mode	0: Two lines control mode 1 1: Two lines control mode 2 2: Three lines control mode 1 3: Threes lines control mode 2	1	1	×
F5-16 to F5-21	X1 to X6 terminals function selection（0~44）	1: FWD Forward command 2: REV Reverse command 5: Emergency stop input(solar pump pause) 41: Solar control prohibition 42:Switch display parameter 43:Normally open point alarm (A.Fb.o) 44:Normally closed point alarm (A.Fb.C)	1		×

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

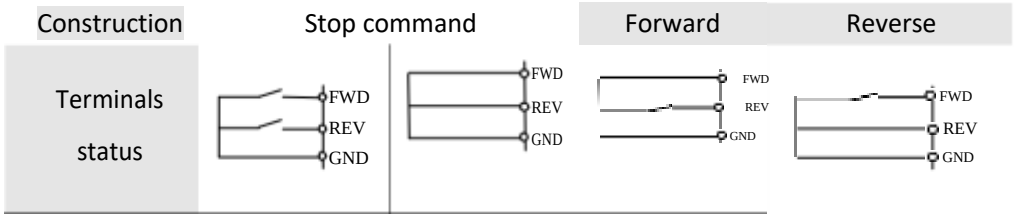
FWD stands for running in forward direction control by external terminal, and marks for FWD.

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

0：Two line control mode 1

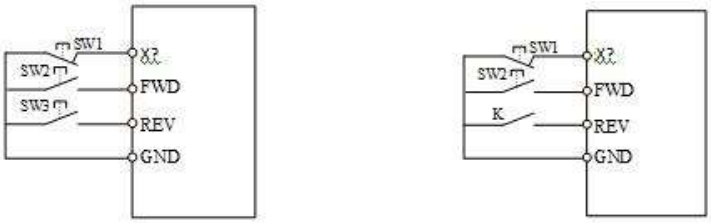
Construction	Stop	Running	Forward	Reverse
Terminals status				

1：Two lines control mode 2



2：Three lines control mode 1

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



a) 3 lines control mode 1

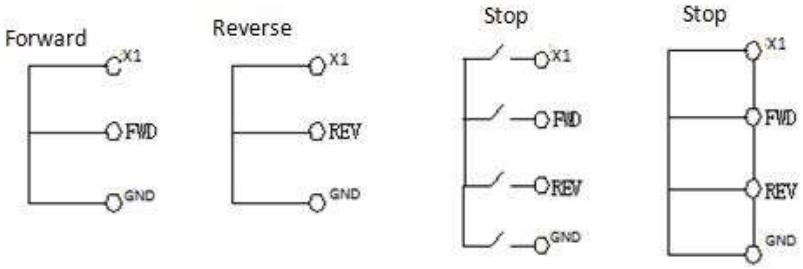
b) 3 lines control mode 2

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 to 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 to 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 defined 44 functions.

In solar pump control mode, 1: FWD Forward command5: 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)	1	2	×

		2: MPPT(maximum power point tracking)			
FA-01	Auto runselection	0: No run every time power on when keypad control(F0-02=0) 1: Auto run every time power on when keypad control(F0-02=0)	1	0	☆

FA-00 parameter is used to select AC drive 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%.

FA-01 Auto runselection is used to set autorun every time power on when keypad control(F0-02=0). In the first time using after installation, suggestingselect FA-01 for 0, drive control by manual with keypad. Once the commissioning is finished and tested well, we can switch to auto terminal control(F0-02=1) or to auto run every time power on when keypad control(FA-01=1).

In the auto terminal control mode, one programmable digital terminal from X1 to X6 should set for 1 (forward running control).

Compare to F0-02 parameter setting, this parameter has priority level, and make F5-16 and F5-20 set to 1 (FWD running control) as the same time.

Once X1 short circuit to GND (X1 and GND is ON) or X5 short circuit GND (X5 and GND is ON), the drive system will be work automatically.

FA-02	CVT object voltage	0.0~100.0% of Voc	0.1	80.0	☆
FA-03	MPPT control upper limit voltage	0.0~200.0% open loop circuit voltage	0.1	95.0	×
FA-04	MPPT control lower limit voltage	0.0~100.0% open loop circuit voltage	0.1	50.0	×
FA-05	Frequency adjusting 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	1.00	×

Uses FA-03 and FA-04 to define MPPT upper limit and lower limit voltage.In generally, the default setting 50% to 95% is OK.

FA-05 (Frequency adjusting gain) parameter is usedformaking MPPT performance quick or slow during operation. If this value is big, the MPPT performance is quickly, and might cause the output frequency a little fluctuation. if this value is set too small,and might causeA.Luo fault in bad sunlight condition. User can set this value bigger, but not larger than 200 in good sunlight condition area. In generally, the default 40 setting is OK.

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 seem 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	0.0~999.9%	0.1	100.0	☆

FA-08 and FA-09 both parameters are used for correcting DC output current display.

Because the output DC current is calculated by software, it needs parameters to correct it when it is 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 state voltage threshold	0~1000V	1	*	☆
Fb-02	Awake waiting time	0.0~3000.0S	0.1	120.0	☆

Fb-00∽Fb-02 is usedformaking solar pump drive go to sleep state when input DC voltageis low, and wakes up automatically when DC bus voltage raises again.

When the DC voltage lower than Fb-00 value for a system default time, it will go to stop sleep mode and sent out an alarm with A.Luo code display in the 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	0.00~300.00Hz	0.01	5.00	☆
Fb-04	stop delay time when reachstop 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	☆

If the output frequency is lower than Fb-03 (stop frequency when low speed) for Fb-04 (stop frequency delay time), the solar pump drive will go into stop mode to protection pumps. After 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.IfFb-15 unit's digit is set to 1, needs 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	0.0	☆
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-06 (Dry run current) for Fb-07 (dry run detect delay time), the drive will go to dry run protection mode.

After Fb-08 (recover time of dry run), the drive willrestore 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 to 1, needs 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 is used for setting motor over current protection.

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

AfterFb-11 recover time, the drive will recover to work again if the hundred's digit of Fb-15 set to 0 in default.If Fb-15 hundred 's digit is set to 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	0.0~3000.0S	0.1	10.0	☆

	protection mode				

Fb-12 to Fb-15 parameters is used for setting 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.

AfterFb-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 to 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

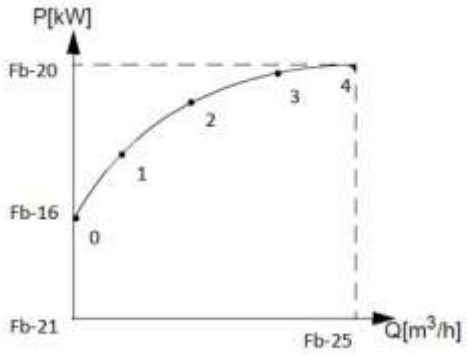
Fb-15 is used for setting low frequency stop mode, dry run mode, motor over current and minimum input power protection, etc 4 kinds of protectionreset mode, automatically or manual.

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

Flow calculation

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

PQ curve



The solar pump driverecords and stores the flow rate on each day and provides therequired data for current day flow rate and total flow rate.

Note:

- Do not use the flow calculation function outside the normal operating range of thepump.
- 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 PQperformance curve.
Fb-21 to Fb-25 use to define flow rate at points 1...5 on the PQ curverespectively.

Fb-27	Flow measured offset	0.00~1000.0m^3/h	0.1	0.0	☆
Fb-28	Flow measured gain	0.0~999.9%	0.1	100.0	☆
Fb-29	Cumulative flow/ generated	0: No operation	0	0	×

	energy reset setting	1: Flow reset 2: Generated energy reset 3: Both flow and generated energy reset			

Fb-27 and Fb-28 are used forcorrectting flow calculating for difference pumps.
Fb-29 used to cumulative flow and generated energy reset.

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	

User also can learn solar drive working status from above list. See the flow calculating from d-28 to d-31 parameters, see the generated energy from d-33 to d-35. User also can check the solar drive working status from D-36.

0：Stop mode
1: Running
2: **A.LUo** means on low voltage sleep mode ,
3: **A.LFr**means on low stop frequency sleep mode,
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.

Chapter9. Troubleshooting and Countermeasures

The below table listsall types of faults of V70 series solar pump drive possibly. Before contacting manufacturer for technical support, you can first determine the fault type through following table description and record your treating process and phenomena. If the fault can not be resolved, please seek for the manufacturer service support.

Troubleshooting table

Fault code	Fault description	Possible reason	Countermeasures	Value
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	1
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.	2
E. OC2	Over current in deceleration	The deceleration time is too short	Extend the deceleration time	3
E.OC3	Over current in running	The load changed suddenly or fluctuation is too big	Reduce the load fluctuation	4
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	5
E.232.	Inner communication fault	Hardware problem	Seek for manufacturer support	6
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 insulation is not good	7
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	8
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	9
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	10
E. UL	Under voltage	1. Output connection is loss 2. Load suddenly missing	1. Check the outputwiring 2. Check the drive load	14
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	15

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	16
E.CUr	Current detect is correct	1. Current detect parts or circuit is problem 2. Auxiliary power supply has problem	Seek for manufacturer support	17
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.	18
E.EF1	Externalequipment normal open terminal fault	External fault input terminal of thedrivesignal input	Check the signal source and related equipment	19
E.EF2	Externalequipment normal close terminal fault	External fault input terminal of the drive signal input	Check the signal source and related equipment	20
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	21
E.SP1	Input phase loss	1. Input voltage phase loss 2. Input voltage is too low	1. Check the connection 2. Check power supply of phase loss	22
E.SP0	Output phase loss	The connection between drive and motor is broken	Check the wiring	23
E.EEP	Memory fault	Hard ware problem	See for support	24
E.End	Running time is reached	The allowable running time setting is reach	Contact vendor	25
E.PID	PIDfeedback 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	26
E.485	RS485 communication fault	Send and receive data error occurs in serial communication	1. Check the connection 2. Seek for support	27
E.doG	EMC interference	Since the ambientelectromagnetic interference caused by malfunction	Install the absorb circuit	28
E.232	Inner upper	Hardware problem	Seek for support from	29

	communication fault		vendor	

Note:

The seriesdriverecords 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.

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