About this manual

This chapter provides an overview of the contents, purpose, compatibility, and the intended audience of this manual. This MPPT solar pump inverter is an enhancement of the AC pumps frequency inverter/VFD firmware, which special for compatible AC/DC power supply input for drive 1/3 phase Ac pumps.

1. Solar pump system and solar pump inverter introduction.

1.1 Solar pump system advantages

Save environment

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

Easy installation and easy using

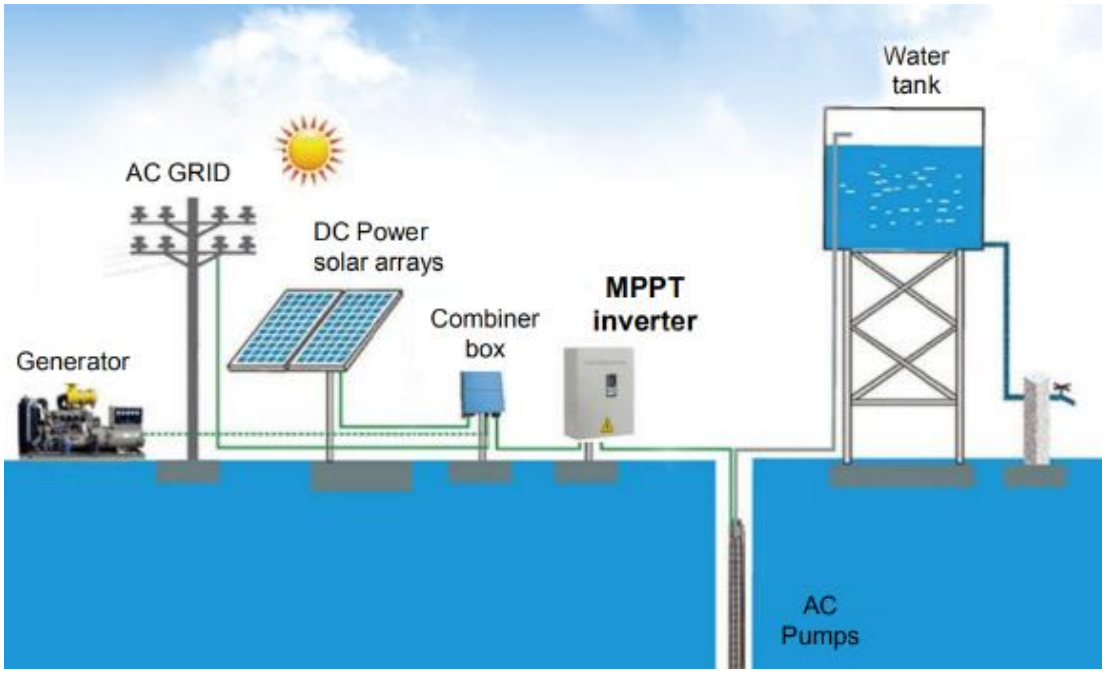
Easy install and operation and little parameters Configuring. end user ,who never used inverter before, can Install and operation it very well.

Reduce operational risk

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

1.2 Solar pump system constitution

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



Solar pump inverter system constitution diagram

1.3 MPPT Solar pump inverter features

This MPPT solar pump inverter is a low voltage AC drive of 0.3 to 100KW above rating designed to operate with energy drawn from solar panel or photovoltaic cells (PV). The inverter is customized to operate in dual supply mode, so the grid connected supply is used in the absence of energy from PV cells. This drive functions with the latest in technology maximum power point tracking (MPPT) algorithm to derive maximum power from the PV cells at any instant.

1.4 MPPT solar Pump inverter has following functions:

- Maximum power point tracking (MPPT) with fast response speed and stable operation efficiency> 99.6%;
- Suits for most 3 phase AC pumps and AC PMSM high efficiency pumps.
- The working voltage of solar panel can set by manual or MPPT automatically tracking
- Compatible with dual power input, AC grid and DC power supply input.
- Built in automatic sleep-wake up function,
- Dry run (under load) protection
- Motor maximum current protection
- Low input power protection
- Lowest stop frequency protection
- The PQ (power/flow) performance curve enables calculating the flow output from the pump
- Digital control for fully automatic operation, data storage and protective functions
- Intelligent power module (IPM) for the main circuit
- LED display operating panel and support remote control
- Low water probe sensor, and water level control function
- Strong lightning protection
- Ambient temperature for using: -10 to +50˚C.

2. MPPT solar pump inverter model features

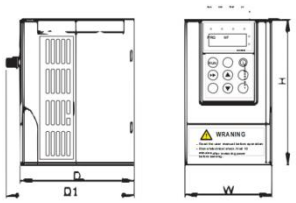
SN	Inverter(KW)	Rate current	Output voltage (3PH VAC)	Applicable for pumps	MPPT voltage (VDC)
Mini type 220v series : 150 to 450 VDC or 220VAC input, Vmp 310V					
1	0.75KW-M	3.8A	0-220VAC	0.75KW	260 to 375
2	1.5KW-M	7A	0-220VAC	1.5KW	260 to 375
3	2.2KW-M	9A	0-220VAC	2.2kw	260 to 375
	Mini type 380v series :250 to 800 VDC or 380/ 440VAC input, Vmp540V/620V				
1	0.75KW-M	2.3A	0 to 380V/440V	0.75KW	486 to 750
2	1.5KW-M	3.8A	0 to 380V/440V	1.5KW	486 to 750
3	2.2KW-M	5.1A	0 to 380V/440V	2.2KW	486 to 750
4	4KW-M	9A	0 to 380V/440V	4.0KW	486 to 750
General type: 220V model, 150 to 450 VDC or 220VAC input, Vmp 310V					
7	0.75KW	3.8A	0-220VAC	0.75KW	260 to 375
8	1.5KW	7A	0-220VAC	1.5KW	260 to 375
9	2.2KW	9A	0-220VAC	2.2KW	260 to 375
10	4KW	17A	0-220VAC	4.0KW	260 to 375
General type: 380V model,250 to 800 VDC or 380/ 440VAC input, Vmp540V/620V					
11	0.75kw	2.3A	0 to 380V/440V	0.75KW	486 to 750
12	1.5KW	3.8A	0 to 380V/440V	1.5KW	486 to 750
13	2.2KW	5.1A	0 to 380V/440V	2.2KW	486 to 750
14	4KW	9A	0 to 380V/440V	4.0KW	486 to 750
15	5.5KW	13A	0 to 380V/440V	5.5KW	486 to 750
16	7.5KW	17A	0 to 380V/440V	7.5KW	486 to 750
17	11KW	25A	0 to 380V/440V	11KW	486 to 750
18	15KW	32A	0 to 380V/440V	15KW	486 to 750
19	18KW	37A	0 to 380V/440V	18KW	486 to 750
20	22KW	45A	0 to 380V/440V	22KW	486 to 750
21	30KW	60A	0 to 380V/440V	30KW	486 to 750
22	37KW	75A	0 to 380V/440V	37KW	486 to 750
23	45KW	93A	0 to 380V/440V	45KW	486 to 750
24	55KW	110A	0 to 380V/440V	55KW	486 to 750
25	75KW	150A	0 to 380V/440V	75KW	486 to 750
26	90KW	180A	0 to 380V/440V	90KW	486 to 750
27	110KW	220A	0 to 380V/440V	110KW	486 to 750
30	132KW-400KW	**	0 to 380V/440V	200-400	486 to 750

3. MPPT solar pump inverter technical specification

**MPPT solar pump inverter specification when PE-00=1&2	
Recommended MPPT voltage range	Vmp 131 to 350 VDC for 110V pump (80V to 350VDC input, 3PH 0 to 110VAC output) Vmp 260 to 355VDC for 220V pump(150V to 450VDC input, 3PH 0 to 220VAC output) Vmp 486 to 650 VDC for 380V pump (250V to 800VDC input, 3PH 0 to 380/460output)
Recommended input Voc and Vmpp voltage	Voc 180(VDC), Vmpp 155(VDC) for 110V AC pumps Voc 380(VDC), Vmpp 310(VDC) for 220V AC pumps Voc 650(VDC), Vmpp 520(VDC) for 380V AC pumps
Motor type	Control for permanent magnet synchronous motor (PMSM) and asynchronous motor pumps.(IM), all 3 phase water pumps.
Rated output voltage	1/3-Phase,110V/160V/220V. 3-phase, 220V/380V/460V
Output frequency	0~maximum frequency 600Hz.
MPPT efficiency	Above 99.8%,
Ambient temperature range	G-type for submersible pumps, 150% rated current for 60s, 180% rated current for 2s . P type for general pumps, 120% rated current for 60s, 150% rated current for 2s
Solar pump control special performance	MPPT (maximum power point tracking), CVT (constant voltage tracking), auto/manual operation, dry run protection, low stop frequency protection, minimum power input, motor maximum current protection, flow calculating, energy generated calculating and water tank level detected
Protection function	Phase loss protection, phase short circuit protection, ground to phase circuit protection , input and output short circuit protection. Stall protection, lightning protection
Protection degree	IP20, Air force cooling
Running mode	MPPT or CVT
Altitude	Below 1000m; above 1000m, derated 1% for every additional 100m.
Enhanced version of AC drive	CE,,IEC, Design based on vector control motor AC drive, more specification please refer to vector control drive (VFD) operation manual
Technical specification of variable frequency inverter when PE-00=0(solar pump disable)	
voltage, frequency	1 phase 220V, 3 phase, 220V,380V, 460V, 0-50/60Hz
Control mode	0: VF control ; 1: Open loop vector control mode 2: Close loop vector control mode
Maximum frequency	0-320Hz in vector control mode, 0~3200Hz in VF control mode
Multiple-functions	PID Control, Carrier Frequency Adjustable, Current Limiter, Speed Search, Momentary Power Loss Restart,16 Step Speed (Max), 3-Wire connection, Slip Compensation, Frequency Jump, DC braking, Upper/Lower Frequency, Torque control, Compatible for PMSM and IM, built in RS485, counting, fault information checking, fully fault protection function, frequency combination reference.

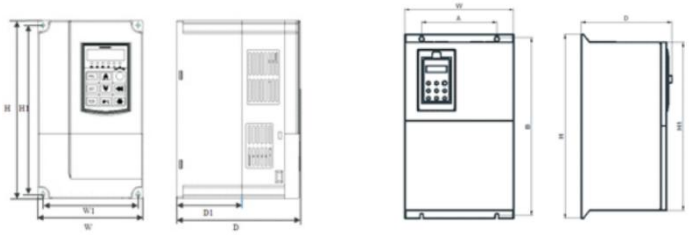
4. MPPT solar pump inverter dimensions

4.1 Mini type inverter, small size 0.75kw to 2.2kw for 220V, 0.75kw to 4.0kw for 380V



Voltage level	Power (KW)	Output current(A)	W (MM)	H (MM)	D (MM)	D1 (MM)	Mounting aperture (MM)
单相 220V	0.4	2.5	85	143	116	126	4.5
	0.75	5					
	1.5	7					
	2.2	10	100	151	120	130	
三相 380V	0.75	3					
	1.5	4					
	2.2	5					
	3.7	8.5	125	220	166	176	
	5.5	13					
	7.5	17					

4.2 General type inverter, 0.75kw-110kw inverter Dimension



General MPPT solar pump inverter

Model	Hole location (mm)			Inverter dimension (mm)			Hole D (mm)	N.W
	A	B	H1	H	W	D		(kg)
Single phase 220V input，50/60Hz								
0.75 to 2.2kw, 220V	106.5	175	/	185	118	153.8	4.5	2.1
4.0kw, 220V	148	235.5	/	247	160	175	5.5	4
3 phase 380V input，50/60Hz								
0.75kw to .40kw	106.5	175	/	185	118	153.8	4.5	2.1
5.5kw to 11kw	148	235.5	/	247	160	175	5.5	4
15kw to 22kw (plastic cover)	205	305	/	320	220	197.3	6.5	7
15kw to 22kw (metal cover)	170	400	/	415	230	205	6.5	12
30kw, 37kw	200	465	/	480	260	215	8	17
45kw, 55kw	180	550	/	575	320	310	8	36
75kw to 110kw	240	595	/	620	380	310	10	51

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

5. Operation control panel description

5.1 Buttons meaning of keypad

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

5.2 Working status indicating

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

5.3 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.

5.4 Function code operation

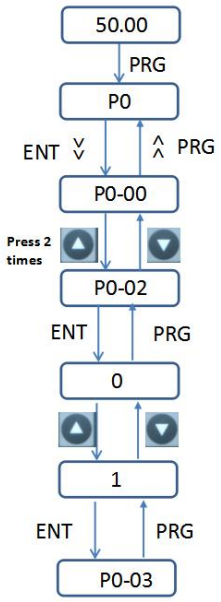
There are 3 level menu in respectively.

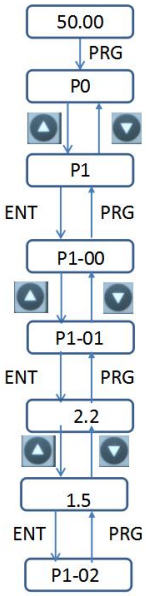
1. Function code parameters（First level menu）

2. Function code name（The second level menu）
3. Setting value of function code (the third level menu ）
Note: If in the third level menu, you can press PRG or ENTER key to return second menu.
The difference is that press ENTER key will keep setting parameter in CPU board of inverter and then return to second menu, press PRG key an return second menu directly without parameters store.

Example of keypad operation

1. Modify command source for terminals control
Modify command source for terminals control, the pump will be start once DI1 and GND switch ON. If DI1 and GND keep turn on status, the inverter will start automatically at morning and turn off automatically at evening.
2, Modify motor rated power in P1-01. If your rated power of inverter is much bigger than rated motor, please set P1-01 per motor nameplate for better motor protection.





Set P0-02=1 guiding Set P1-02=1.5 guiding

5. 5 Monitor parameters inquiry.

There two ways to inquiry monitoring parameters.

Press “  ”to inquiry inverter working status parameters such as output freqeuncy, output current, output voltage, DC voltage ans so on.
User also can go to U group parameters to inquiry relative parameters.
Example: Press PRG to return monitoring display window and find to U group, user can get running frequency with U0-00, DC bus voltage from U0-02...

5.6 Fault reset

Solar pump inverter will display relative fault information if there are any alarm occurs.
User can reset it by “STOP/RESET” or external terminals (P4-02=9, fault reset by DI3 terminals turn on). Once reset, drive place on standby status.If inverter place in fault reset and without any reset, it located in protection status and can’t working.

6. MPPT solar pump inverter installation

6.1 Mechanical installation

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

Note: Installation Environment Requirements

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

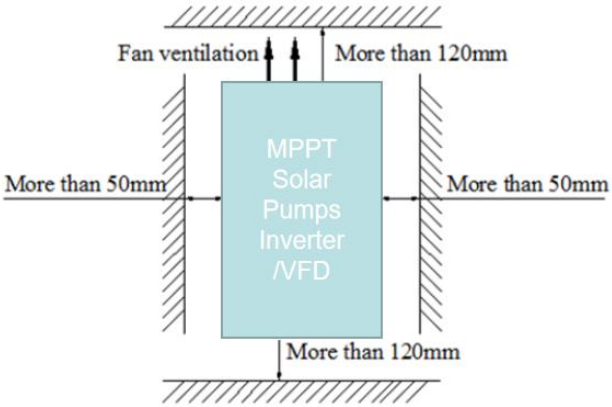
2. Heat dissipation, Install the solar drive on the surface of an incombustible object, and ensure that there is sufficient space around for heat dissipation. Install the solar pump inverter vertically on the support using screws.

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

4.Free from direct sunlight, high humidity and condensation

5.Free from corrosive, explosive and combustible gas

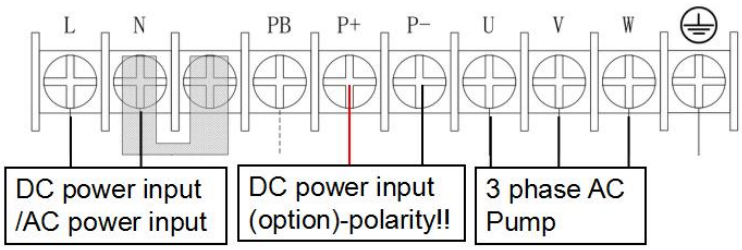
6.Free from oil dirt, dust and metal powder



Solar pump inverter installation space requirement.

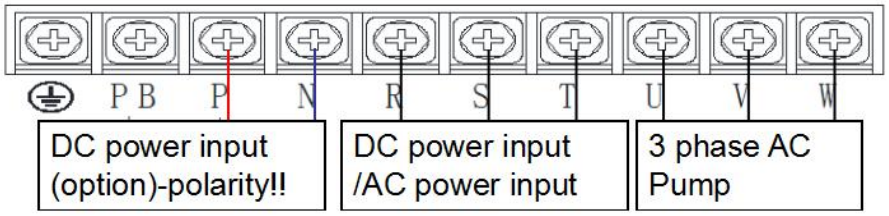
6.2 Installation and wiring

Diagram1. Single phase 220V input main circuit loop connection



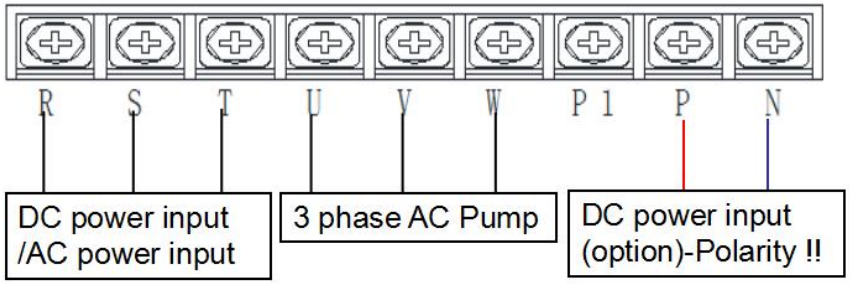
1 phase AC power input 220V main circuit loop connection

Diagram 2. 3 phase 380V main circuit loop connection for below 22kw inverter



3 phase AC power input for below 22 kw inverter

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



3 phase AC power input for above 22 kw inverter

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

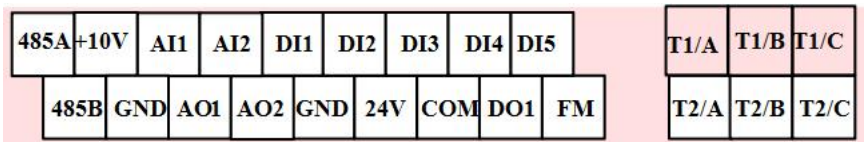
• Do not use an asymmetrically constructed motor cable.
• Route the motor cable, input power cable and control cables separately.
• Make sure that the maximum cable lengths are not exceeded. For detailed information, see the user's manual.
• Noted the polarity connection when connecting from P+ and N

6.3 Main circuit terminals description

Terminals symbol	Function description
L, N	Single phase AC or DC power input terminals.
R,S,T	3 phase AC input terminals, R&T for DC power input terminals
U, V, W	Power output terminals for 3 phase AC pumps connection.
P, N	DC bus terminals, also can use to connect DC power if need, but please polarity distinguish.
P, PB	Braking resistor connection terminals (it mustn't connect DC power input, otherwise it will cause inverter damaged serious)
P1, P	DC chock connecting terminals.
⏚	Grounding terminals

6.4 Control circuit terminals

Control circuit terminals layout

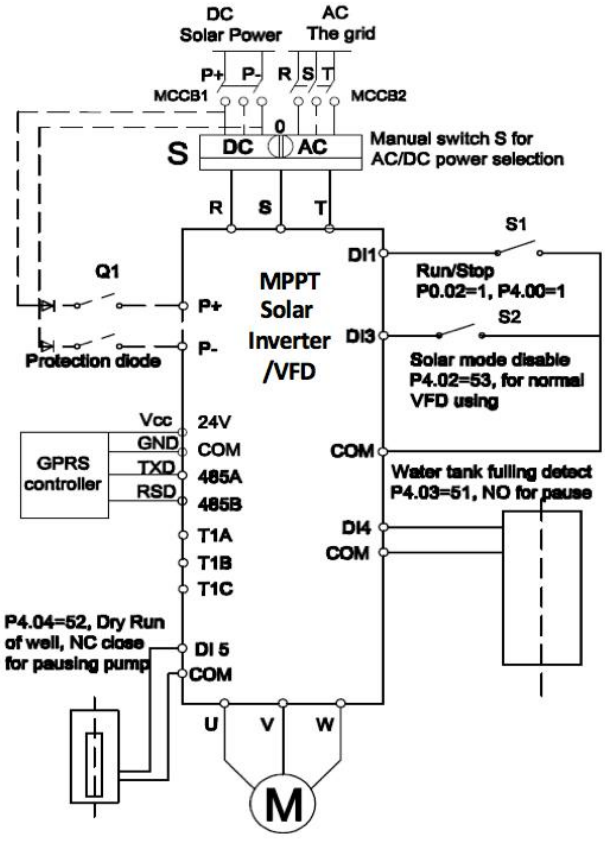


Control circuit terminals explain in detail:

Type	symbol	Name of terminals	Specification and explanation
Communication	485A	485+	RS485 communication port，compatible with Modbus
	485B	485-	
Digital input and output	DI1～DI4	Digital input	Sink or source input option set by jumper, input resistance is 2.5K, Optocoupler isolation input, jumper J9
power supply Reference ground	10V	Analog power supply	Output current: 20mA; Accuracy: 2%
	GND	Analog Ground	Analog reference ground
	24V	User power supply	Accuracy：±15%
	COM	Digital ground	Digital reference ground
Status relay output	T1/A，T1/B，T1/C	Relay 1	TA/TB normal close、TA/TC normal open；Driving capability: 25VAc，3A，COSØ=0.4；30Vdc，1A
	T2/A，T2/B，T2/C	Relay 2	TA/TB normal close、TA/TC normal open；Driving capability: 25VAc，3A，COSØ=0.4；30Vdc，1A

7. MPPT solar pump inverter wiring guiding

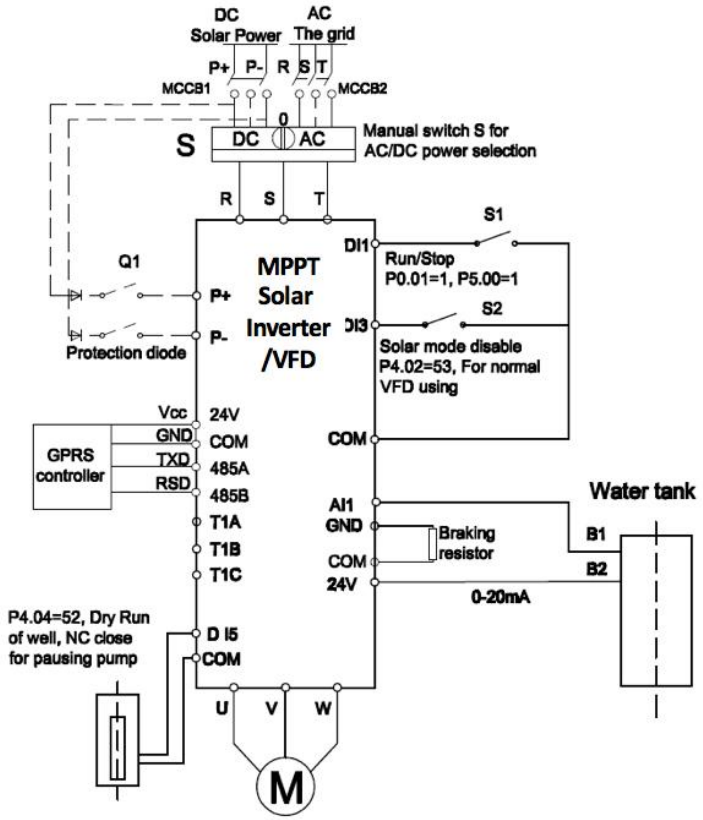
Wiring as below attached pictures. It is accepted dual power AC/DC mode connecting input.
User can able to install a power switchover to selection which mode power input as conditions.
1. Wiring P+ and P- of DC solar power to R, T terminals, or 1/3 phase cables of AC power supply to R, T (R, S, T) of inverter.(1 phase 220VAC AC inupt connect to L, N of inverter).
2. Built a Run/Stop switch **S1** to start pumping whensettingP0.02 for 1 ,that inverter works in terminals control mode. This inverter can achieve auto start at morning when sun light radiation is good, auto stop when sun set when sunlight radiation is low.
3. Built a switch 2 to disable solar pump control mode when connecting AC grid input.
The inverter can be used fora variable speed drive (VFD) for pumps speed adjusting as need
The output frequency can be adjusted by **P0-03 f**requency reference mode setting. The MPPT function is closed when turn off switch 2 and set P4-02=53. The solar pump control mode function also can be disable by parameters setting PE-00=0.
4. Connect 2 wires of float ball sensor to DI4 and COM for water tank level fulling detecting, and set P4-03=51(float ball NO relay alarm). When water level reached to sensor detecting, the normal open (NO) relay point will be activated, invereter will stop pumping, and sent a A.FuL alarm.
5. Connect 2 wires of sensor of dry run sensor of well to DI5 and GND, and set P4-04=52 (dry run NC relay alarm).
It will sent alarm A.LLd and stop pumping when lack of water in well for dry run protection.



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

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

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



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

Note:

1. It is also available to connect DC solar power supply to P+(positive), P- (negative) to inveter, but please make sure to confirmed the polarity connection. Positive of DC power supply to P+ terminal, and negative of DC power supply to P- terminal. It will cause inverter serious damage seriously when wrong polarity connection.
2. It is forbidden to connect power supply to output terminals U, V, W of inverter, otherwise it will damage inverter seriously.
3.Confirm the running direction of motor if corrector not. If not correct, please change the any two phase order of U, V, W wiring.
4. The total power of solar arrays input should be large than 1.3 to 1.5 times of rated of pumps.and the rated power of inverter must be large than rated power of pumps.
5. It must to perform motor auto tuning for PMSM high speed and high efficiency pumps. Regarding for driving PMSM, the motor auto tuning is very important. The user can check parameters of P1-20, after auto tuning if has been modification, if these parameters is not correct for pumps, please modify it according to pumps specification.

8. Solar arrays input voltage selection.

The voltage should follow the DC rectifier AC voltage law, DC=1.41*AC (V)

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

Solar arrays selection tables.

Consider to solar panels efficiency, as our experience, the total solar power input should be bigger 1.5 times of rated power of pumps.

Solar panel spec.:280w, 38Voc (Open circuit voltage), 31Vmp (Voltage at Pmax)				
Inverter models	Power of pump	Connection in series (PCS) (Vmp)	Connect in parallel (Strings) Power	Total (PCS)
110VAC	0.75kw to 1.0kw	4 or 5 PCS	1 strings	5*1=5
220VAC	0.75kw to 1.5kw	10PCS	1 strings	10*1=10
220VAC, Max 450vdc	2.2kw	11PCS	1 strings	11*1=11
380VAC	0.75kw to 2.2kw	18PCS	1 strings	18*1=18
380VAC	3.7kw	19PCS	1 strings	19*1=19
380VAC	5.5kw	18PCS	2 strings	18*2=36
380VAC	7.5kw	19pcs	2 strings	19*2=38
380VAC	11kw	18pcs	3 strings	18*3=54
380VAC	15kw	19pcs	4strings	18*4=76
380VAC	18kw	18pcs	6 strings	18*6=108
380VAC	22kw	18pcs	7 strings	18*7126
380VAC	30kw	18pcs	9 strings	18*9=162
380VAC	37kw	18pcs	12strings	18*9=21
380VAC	45kw	18pcs	14strings	18*14=252
380VAC	55kw	18pcs	17strings	18*17=306
380VAC	75kw	18pcs	23strings	18*23=414
380VAC	90kw	18pcs	28strings	18*28=504
380VAC	110kw	18pcs	33strings	18*33=594

Above data only for reference, the better performance of system, the more power solar energy input. Means it need to bigger investment for solar arrays.

9. MPPT solar pump inverter commissioning steps.

1. Wiring DC power supply to R, T terminals of inverter. (also can able to connect power supply to P+ and P-,but please take great attention for polarity connecting. Positive to P+, Negative to P-.
2.Check actual Voc (open loop circuit voltage) of solar arrays by multi-meter, or monitor **U0-12** parameters that display Voc value in keypad. Set PE-03 with actual Voc value.
3.Confirmed PE-00 if set for 1or 2 for MPPT working in solar pump control model.
4. Set P1-00 to P1-05 motor group parameters for getting better pumps protection.
5. Press the RUN button to start inverter (keypad control mode is in default setting, P0-02=0),to check output frequency, output voltage if good or not. The output frequency should be increase from 0 to 50/60hz, and output voltage should be balanced when frequency reach to rated frequency of pumps.
6.If output frequency and output voltage is normal, please stop inverter, and then switch off power, after that connect pump to U, V, W of inverter. (connect U, W for 1 phase pumps).
7. Press the RUN to start inverter to check water flow if correct, if water flow is small when reach to high speed, please check the pump running direction if correct or not. Please rewire any two order of U, V, W if pump running direction is not correct.

Options operation if need.

8. Set lowest stop frequency PE-19 for pumps low speed running protection if need.
9. Set PE-22, PE-23, PE-24 and PE-48 parameters to active dry run function.
10. Set pump over current protection function if need by PE-26 and PE-27 setting
11. Set PE-36 to PE-47curve parameters as pumps PQ curve for getting accuracy flow indicating.
12.Water tank fulling detecting with digital switch of ball float sensor or analog signal senor.
A.Set PE-31=0,and connect 2 wires to DI4 and COM, and set P4-03=51. when water level reach to setting to activate normal open (NO) switch turn on, it will stop pumping and sent water full alarm.
B, set PE-31=AI1 and connect2 wires of analog sensor (0/4-20mA) to 24VDC and AI1 terminals, and short circuit GND and COM for loop. Set the parameters PE-32 to PE-35.
If need auto restart function please set P0-02=1to make inverter control by terminals, and switch on DI1 and COM, also need confirm P4-00=1 (terminals function for Forward)

Note:

1). If the input Voc, Vmp DC voltage is too low, it will cause inverter can't work properly due to there are no built any voltage booster circuits or transformer parts inside of inverter.
2). The output AC voltage is related to DC voltage input, the output AC voltage range is 0 ~DC voltage/1.41, also is limited by motor rated voltage setting P1-02 parameter value.
3). Please select one bigger power inverter for driving single phase pumps, because the running current of 1 phase pumps is much bigger than 3 phase pumps.For example, take 1.5kw inverter for 1 phase 220AV, 0.75kw pump, 0.75kw inverter for 1 phase 220VAC, 0.4kw pump.
4). Please consider to install output reactor, Dv/dt reactor, sine wave reactor when long distance from pump inverter.
5). PE-04, PE-05 parameters can use to increase the MPPT function gain, the bigger setting, the stronger MPPT, but it also can cause output frequency a little fluctuation when PE-00=1,
PE-12 and PE-13 parameters use to increase the MPPT gain when PE-00=2.
6). Please refer Appendix 2 for getting more information for driving PMSM high speed pumps.

10. Simple parameter list

Table Symbol Description:

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

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

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

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

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

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

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

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

		4：potentiometer of keypad 5：PULSE train（DI5） 6：multiple steps frequency 7：Simple PLC 8：PID 9：Communication Ten digit: Frequency source is bound by terminals Hundreds digit: Frequency source is bound by communication Thousands of digit: Automatic run Binding frequency source selection		
P0-28	Serial communication protocol selection	0：Modbus protocol	0	√
P1 First motor parameters group				
P1-00	**Motor type**	**0: General asynchronous motor 1: Variable frequency asynchronous motor 2: Permanent magnet synchronous motor**	**0**	×
P1-01	**Rated power of motor**	**0.1KW～1000.0KW**	**Per model**	×
P1-02	**Rated voltage of motor**	**1V～2000V**	**Per model**	×
P1-03	**Rated current of motor**	**Inverter power <= 55KW：0.01A～655.35A Inverter power > 55KW：0.1A～6553.5A**	**Per model**	×
P1-04	**Rated frequency of motor**	**0.01Hz～Maximum frequency**	**Per model**	×
P1-05	**Rated speed of motor**	**1rpm～65535rpm**	**Per model**	×
P1-06	Asyn. Motor Stator resistance	Inverter power <= 55KW：0.001Ω～65.535Ω Inverter power > 55KW: 0.0001Ω～6.5535Ω	Auto tuning	×
P1-07	Asyn. motor rotor resistance	Inverter power <= 55KW：0.001Ω～65.535Ω Inverter power > 55KW : 0.0001Ω～6.5535Ω	Auto tuning	×
P1-08	Asyn. motor Motor leakage inductance	Inverter power <= 55KW：0.01mH～655.35mH Inverter power > 55KW：0.001mH～	Auto tuning	×

		65.535mH		
P1-09	Asyn. motor mutual inductance	Inverter power <= 55KW：0.1mH～6553.5mH Inverter power > 55KW：0.01mH～655.35mH	Auto tuning	×
P1-10	Asyn. otor no-load current	Inverter power <= 55KW: 0.01A～P1-03 Inverter power > 55KW：0.1A～P1-03	Auto tuning	×
P1-16	**Synchronous motor stator resistance**	**Inverter power <= 55KW：0.001Ω～65.535Ω Inverter power > 55KW：0.0001Ω～6.5535Ω**	**Auto tunin**	×
P1-17	**Synchronous motor D-axis inductance**	**Inverter power <= 55KW0.01mH～655.35mH Inverter power > 55KW : 0.001mH～65.535mH**	**Auto tuning**	×
P1-18	**Synchronous motor Q axis inductance**	**Inverter power <= 55KW：0.01mH～655.35mH Inverter power > 55KW : 0.001mH～65.535mH**	**Auto tuning**	×
P1-20	**Synchronous motor back electromotive force**	**0.1V～6553.5V**	**Auto tuning**	×

P4 group Input terminals				
P4-00	**DI1 terminals function selection**	0: No operation 1: Forward running or running command 2: Reverse running REV or forward/reverse running direction selection (note: when set for 1 or 2 parameter, please reference to P4-11 function introduction) 3: 3 line control mode 4: Forward Jog（FJOG） 5: Reverse Jog（RJOG） 6: Terminal UP 7: Terminal DOWN **8: Free stop** **9: Fault reset（RESET）** **10: Run pause** 11: External fault normal open input 16: Acceleration/ deceleration selection terminals 1 17: Acceleration/ deceleration selection terminals 2	1	×
P4-01	**DI2 terminals function selection**		2	×
P4-02	**DI3 terminals function selection**		53	×
P4-03	**DI4 terminals function selection**		51	×
P4-04	**DI5 terminals function selection**		52	×
P4-05	Reserve		0	×
P4-06	Reserve		0	×
P4-07	Reserve		0	×
P4-08	Reserve		0	×
P4-09	Reserve		0	×

		18: Frequency source switch 19: UP/DOWN setting reset (terminals or keypad) 20: Running command terminals switch 21: Acceleration/deceleration forbidden 37: Control command switchover terminal2 39: Switcover between frequency source X and preset frequency 40: Switcover between frequency source Y and preset frequency 41: Motor selection terminals 1 42: Motor selection terminals 2 43: PID paramater switchover 44: User define fault 1 45: User define fault 2 46: Speed control /Torque control swithover 47: Emergency stop 48: External parking terminal 2 49: DC braking in deceleration 50: current running time rest **51: Water tank fulling detect 1/ single point detect** **52: Water tank fulling detect 2/ single point detect** **53: MPPT tracking stop/ solar pump control disable.**		
P4-10	DI filter time	0.000s～1.000s	0.010s	√
P4-11	Terminals command mode	0: Two line control 1 1: Two line control 2 2: 3 line control 1 3: 3 line control 2	0	×
P4-12	Terminals UP/DOWN Change ratio	0.001Hz/s～65.535Hz/s	1.00Hz/s	√
P4-35	DI1 Relay time	0.0s～3600.0s	0.0s	×
P4-36	DI2 Relay time	0.0s～3600.0s	0.0s	×
P4-37	DI3 Relay time	0.0s～3600.0s	0.0s	×
P4-38	DI terminal effective mode choose 1	0: Enable in High level 1:Enable in low level Digits：DI1 Ten's：DI2 Hundred's: DI3 Thousand's:DI4	00000	×

		Ten thousand's: DI5		
P4-39	DI terminal effective mode choose 2	0:Enable in High level 1: Enable in low level Digits: DI6 Ten's: DI7 Hundred's: DI8 Thousand's: DI9 Ten thousand's: DI10	00000	×
P5 Group Output terminals				
P5-00	FM terminals output mode selection	0: High speed pulse output (FMP) 1: Digital output (FMR)	0	√
P5-01	FMR output function selection	0: No output 1: Frequency inverter running 2: Fault output (Free stop fault) 3: FDT1 Frequency level detect output 4:Frequency reach 5: Zero speed running (no output when stop) 6: Motor overload pre-alarm 7: Inverter overload pre-alarm 12: Cumulative run time arrives 15: Ready to run 16: AI1>AI2 17: Upper limit frequency arrives 18: Lower limit frequency arrives (relative to running) 17: Upper limit frequency arrives 18: Lower limit frequency arrives 19: Under voltage status output 20: Communication setting 22: Positioning approach (Reserve) 23: Zero speed running 2(output when in stop as well) 24: Accumulated power up time arrives 25: Frequency level detection FDT2 output 26: Output when frequency 1 reaches 27: Output when frequency 2 reaches 28: Output when current 1 reaches 29: Output when current 2 reaches 30: Output when timing up 31: AI1 input over limit 32: Under loading 33: reverse running	0	√
P5-02	Relay 1 function selection		2	√
P5-03	Relay 2 function selection		0	√
P5-04	DO1 output function selection		1	√
P5-05	Extension card DO2 Output selection		4	√

		34: Zero current state 35: Module temperature arrives 36: Output current is exceeded 37: Lower frequency arrival (output when stop as well) 38: Alarm output (all faults) 39: Motor over temperature warning 40: Current running time arrives 41: Fault output (for free stop failure and under voltage is not output)		
P5-06	FMP output function selection	0: Running frequency 1: Setting frequency 2: Output current 3: Output torque (Absolute value of torque) 4: Output power 5: Output voltage 6: Pulse input (100% corresponds to 100.0Hz) 7: AI1 8: AI2 9: Keyboard potentiometer 10: Length 11: Count value 12: Communication settings 13: Motor speed 14: Output current (100.0% corresponds to 1000.0A) 15: Output voltage (100.0% corresponds to 1000.0V) 16: Output torque (torque actual value)	0	√
P5-07	AO1 output function selection		0	√
P5-08	AO2 output function selection		1	√
P5-09	FMP maximum frequency	0.01kHz～100.00kHz	50.00kHz	√
P5-10	AO1 zero bias coefficient	-100.0%～+100.0%	0.0%	√
P5-11	AO1 gain	-10.00～+10.00	1.00	√
P5-12	AO2 zero bias	-100.0%～+100.0%	0.0%	√
P5-13	AO2 gain	-10.00～+10.00	1.00	√
P5-17	FMR output relay time	0.0s～3600.0s	0.0s	√
P5-18	RELAY1 output relay time	0.0s～3600.0s	0.0s	√
P5-19	RELAY2 output relay time	0.0s～3600.0s	0.0s	√
P5-20	DO1 output relay time	0.0s～3600.0s	0.0s	√

P5-21	DO2 output relay time	0.0s～3600.0s	0.0s	√
P5-22	DO output terminal valid state selection	0: Positive logic 1: Negative logic Bits: FMR Ten's bit: RELAY1 Hundreds's bit: RELAY2 Thousands's bits: DO1 Ten thousands's bits: DO2	00000	√
P6 Group start and stop control				
P6-00	Starting mode	0: Directly start 1: start after speed tracking 2: Pre-excitation start (AC asynchronous machine)-	0	√
P6-01	Speed tracking mode	00: starts from stop frequency 1: starts at zero speed 2: Starting from the maximum frequency	0	×
P6-02	The speed of speed tracking	1～100	20	√
P6-03	**Starting speed**	**0.00Hz～10.00Hz**	**0.00Hz**	√
P6-10	Stop mode	0: Deceleration stop 1: free parking	0	√
P7 Group keyboard and display				
P7-01	**MF.K function button option**	**0: MF.K is invalid** **1: Switchover between Operation panel command channel and remote command channel (terminal command channel or communication command channel)** **2: Forward and reverse switching** **3: Forward Jog** **4: Reverse Jog**	**0**	×
P7-02	**STOP/RESET function**	**0: STOP/RES button enable only in operation panel control mode** **1: STOP/RES button enable in any control mode**	**1**	√
P7-03	LED display parameters 1 in running mode	0000～FFFF Bit00: Running frequency 1(Hz) Bit01: Setting frequency (Hz) Bit02: DC bus voltage (V) Bit03: Output voltage (V) Bit04: Output current (A) Bit05: Output power (KW) Bit06: Output torque (%)	1F	√

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

		(kHz))		
P7-06	Load speed display factor	0.0001～6.5000	1.0000	√
P7-07	Heat sink of Inverter IGBT model temperature	0.0℃～100.0℃	-	●
P7-08	Heat sink of Inverter Rectifier temperature	0.0℃～100.0℃	-	●
P7-09	Cumulative run time	0h～65535h	-	●
P7-10	Products serial No.	-	-	●
P7-11	Software version No.	-	-	●
P7-12	The number of decimal places of load speed Displays	0: 0 decimal places 1: 1 decimal place 2: 2 decimal places 3: 3 decimal places	1	√
P7-13	Accumulated time since power on	0～65535 hour	-	●
P7-14	Cumulative power consumption	0～65535 KWh	-	●

P8-18	**Start protection selection**	**0: Disable** **1: Enable**	**0**	√
P8-48	Cooling fan control	0: Working in running 1: Working after power up 2:Working by temperature(45℃/40℃) 3:Solar Mode, working if Vpn > PE-16)	3	√
P8-49	Wake up frequency	Sleep frequency (P8-51)～Maximum （P0-10)	0.00Hz	√
P8-50	Wake up delay time	0.0s～6500.0s	0.0s	√
P8-51	Sleep frequency	0.00Hz～Wake up frequency （P8-49)	0.00Hz	√
P8-52	Sleep relay time	0.0s～6500.0s	0.0s	√
P8-53	Current running arrival time setting	0.0～6500.0 mins	0.0Min	√
P9 Group Fault and protection				
P9-00	**Motor overload protection selection**	**0: Prohibited** **1: Allow**	**1**	√
P9-01	Motor overload protection gain	0.20～10.00	1.00	√
P9-02	Motor overload pre-warning coefficient	50%～100%	80%	√
P9-03	Overvoltage stall gain	0～100	100	√
P9-04	Overvoltage stall protection voltage	120%～150%	135%	√
P9-05	Over-current stall gain	0～100	20	√
P9-06	Overcurrent stall protection current	100%～200%	150%	√
P9-07	Ground short circuit protection options when power on	0: Invalid 1: Valid	1	√
P9-09	**Number of automatic reset times**	**0～20**	**0**	√
P9-10	DO (digital output) when fault alarm auto reset	0: No action 1: Action	0	√
P9-11	Fault auto reset interval time	0.1s～100.0s	1.0s	√
P9-12	Input phase loss/ contactor pull protection selection	Bit: Input phase loss protection selection Ten: Contactor pull protection options 0: Prohibited	11	√

		1: Allow		
P9-13	Output phase loss protection	0: Prohibited 1: Allow	1	√
P9-14	First failure alarm type	0: No fault 1: Reserved 2: Over current in acceleration 3: Over current in deceleration 4: Over current in constant speed during 5: Over voltage in acceleration 6: Over voltage in deceleration 7: Over voltage in constant speed during 8: Buffer resistance overload 9: Under voltage 10: Inverter overload 11: Motor overload 12: Input phase loss	–	●
P9-15	Second fault alarm type	13: Output phase loss 14: IGBT Module overheating 15: External fault 16: Communication error 17: Contactor is abnormal 18: Current detection is abnormal 19: Motor tuning abnormal 20: Encoder / PG card is abnormal 21: Parameter read and write exception 22: Inverter hardware abnormality 23: Motor to ground short circuit 24: Reserved 25: Reserved	–	●
P9-16	The third (latest one) type of failure	26: Running time arrives 27: User defined fault 1 28: user defined fault 2 29: Power-up time arrives 30: Under load 31: PID feedback is missing in running 40: Fast current limit timeout 41:Motor switch in running 42: The speed deviation is too big 43: Motor over speed 45: Motor overtemperature 51: Initial position error	–	●
P9-17	Frequency at when the third (last) failure frequency	–	–	●

P9-18	Current at when the third (last) failure frequency	–	–	●
P9-19	DC bus voltage at when the third (last) failure frequency	–	–	●
P9-20	Input terminals status at when the third (last) failure frequency	–	–	●
P9-21	Output terminals status at when the third (last) failure frequency	–	–	●
P9-22	Inverter status when the third (last) failure frequency	–	–	●
P9-23	Power up time when the third (last) failure frequency	–	–	●
P9-24	Running time when the third (last) failure frequency	–	–	●
P9-27	Frequency at when the second failure	–	–	●
P9-28	Current at when the second failure	–	–	●
P9-29	DC bus voltage at when the second failure	–	–	●
P9-30	Input terminals status at when the second failure	–	–	●
P9-31	Output terminals status at when the second failure	–	–	●
P9-32	Inverter status at when the second failure	–	–	●
P9-33	Power up time when the second failure	–	–	●
P9-34	Running time when the second failure	–	–	●
P9-37	Frequency at when the third failure	–	–	●
P9-38	Current at when the third failure	–	–	●
P9-39	DC bus voltage at when the third failure	–	–	●
P9-40	Input terminals status at when the third failure	–	–	●

P9-41	Output terminals status at when the third failure	–	–	●
P9-42	Inverter status at when the third failure	–	–	●
P9-43	Power up time when the third failure	–	–	●
P9-44	Running time when the third failure	–	–	●
P9-47	Fault protection action selection 1	Bit: Motor overload (11) 0: Free stop 1: Stop by stop mode setting 2: Continue to run Ten: Input missing (12) Hundreds: Output phase loss (13) Thousands of bits: external failure (15) Million: communication anomaly (16)	00000	√
P9-48	Fault protection action selection 3	Bit: Encoder / PG card exception (20) 0: Free stop Ten: Function code read and write exception (21) 0: Free stop 1: Stop by stop mode setting Hundred places: reserved Thousands: Motor overheating (25) Million: run time arrival (26)	00000	√
P9-49	Fault protection action selection 3	Bit: User defined fault 1 (27) 0: Free stop 1: Stop by stop mode 2: Continue to run Ten: User Defined Fault 2 (28) 0: Free Stop 1: Stop by stop mode 2: Continue to run Hundreds: Power-up time arrives (29) 0: Free stop 1: Stop by stop mode 2: Continue to run Thousands of bits: (30) 0: Free stop 1: Deceleration stop 2:Skip to 7% of the rated motor frequency to continue running, restore to run with setting frequency after no missing load	00000	√

		Million: PID feedback lost in running (31) 0: Free parking 1: Stop by stop mode 2: Continue to run		
P9-50	Fault protection action selection 4	Bit: the speed deviation is too large (42) 0: Free stop 1: Stop by stop mode 2: Continue to run Ten: Motor over speed (43) Hundred places: initial position error (51)	00000	√
P9-54	Running frequency of continue running when fault alarm	0: Run at the current operating frequency 1: Run at set frequency 2: Run at the upper limit frequency 3: Run at the lower limit frequency 4: Run at an abnormal standby frequency	0	√
P9-55	An abnormal standby frequency	0.0%～100.0% (100.0% corresponds to the maximum frequency P0-10)	100.0%	√
P9-56	Motor temperature sensor type	0: No temperature sensor 1：PT100 2：PT1000	0	√
P9-57	Motor overheat protection threshold	0℃～200℃	110℃	√
P9-58	otor overheat pre-warning threshold	0℃～200℃	90℃	√
P9-59	Working action of Instantaneous power fail selection	0: Invalid 1: Deceleration 2: Deceleration stop	0	√
P9-60	Judgment voltage of instantaneous power fail pause	80.0%～100.0%	90.0%	√
P9-61	Voltage recovery judgment time when instantaneous power fail	0.00s～100.00s	0.50s	√
P9-62	Judgment voltage of instantaneous power failure action	60.0%～100.0%(Standard bus voltage)	80.0%	√
P9-63	Load miss protection	0: Disable 1: Enable	0	√
P9-64	Load miss detection level	0.0～100.0％	10.0%	√
P9-65	Load miss detection time	0.0～60.0s	1.0s	√
P9-67	Over speed detection	0.0％～50.0％(Max frequency)	20.0%	√

P9-68	Over speed detection time	0.0s: No detect 0.1～60.0s	1.0s	√
P9-69	Detection value of the speed deviation is too big	0.0%～50.0%(Max frequency)	20.0%	√
P9-70	Detection time of speed deviation is too big.	0.0s: No detect 0.1～60.0s	5.0s	√
Pd Group communication				
Pd-00	Communication baud rate	bit：MODBUS 0：300BPS 1：600BPS 2：1200BPS 3：2400BPS 4：4800BPS 5：9600BPS 6：19200BPS 7：38400BPS 8：57600BPS 9：115200BPS Ten: Profibus-DP 0：115200BPs 1：208300BPs 2：256000BPs 3：512000Bps Hundred places: reserved	6005	√
Pd-01	MODBUS data format	0: No parity (8-N-2) 1: Even check (8-E-1) 2: Odd parity (8-O-1) 3: No parity (8-N-1) (MODBUS active)	0	√
Pd-02	Local address	0：Broadcast address 1～249 (MODBUS、Profibus-DP、CANlink enable)	1	√
Pd-03	MODBUS respond relay	0～20ms (MODBUS enable)	2	√
Pd-04	Serial communication timeout	0.0：Disable 0.1～60.0s (MODBUS, Profibus-DP, CANopen enable)	0.0	√

PE group Solar Pump inverter control parameters				
PE-00	Solar pump control mode	0:Disable of solar pump control 1: Enable (Algorithm-1, High fficiency) 2: Enable (Algorithm-2, High stability) User can use terminal to disable solar pump control mode, make inverter work as motor variable speed control. See Digital terminal definition 53: MPPT/Solar control disable. (set P4-02=53, switch on DI3 and COM) Terminal control is prior.	2	X
PE-01	Solar pump control mode option	1 Bit: Vmpp mode selecting 0: Vmp set by PE-02 manually (CVT) 1: MPPT automatically Ten: Voc (open loop voltage of PV) detect mode 0: Voc set by PE-03 manually 1: Voc detect automatically Hundred: Auto running by keypad 0: Disable 1: Auto start/stop in keypad control mode. Inverter will automatically start when power on after 5 seconds only on keypad control mode.	H.001	√
PE-02	CVT voltage set by manual	0 -100%	80%	√
PE-03	**Voc (open loop voltage) set manually**	0.0V-1000.0V	650V/ 380V	V
PE-04	DC bus voltage stability Proportional gain	0.0% - 999.9%	100.0%	√
PE-05	DC bus voltage stability Integral gain	0.0% - 999.9%	100.0%	√
PE-06	DC bus voltage stability differential gain	0.0% - 999.9%	5%	√
PE-07	Initial point of fast frequency drop	0.0 - 100.0%	5.0%	√
PE-08	Stop point of fast frequency drop	0.0 - 100.0%	50.0%	
PE-09	Weak magnetic limit multiples	0.0- 9.9	1.2	
PE-10	Mppt search upper limit voltage	0.0% - 100.0%	90%	√

PE-11	Mppt search lower limit voltage	0.0% - 100.0%	75%	√
PE-12	MPPT search gain	0% - 500%	100%	√
PE-13	MPPT search interval	0.0 - 10.0sec	2.0sec	√
PE-14	Stabilizer filtering time (solar pump control mode2)	0-1000ms	50ms	√
PE-15	Stabilizer voltage threshold (solar pump control mode2)	10.0V – 100.0V	10.0V	√
PE-16	Sleep voltage threshold	0.0 – 1000.0V	250.0V/ 150.0V	√
PE-17	Wake up voltage threshold	0.0 – 1000.0V	350.0V/ 250.0V	√
PE-18	Awake waiting time	0 – 30000sec	60sec	√
PE-19	Stop frequency setting when low speed	0.00Hz ～300.00Hz	10.00Hz	√
PE-20	Detecting time of low frequency protection	0 – 30000sec	20sec	√
PE-21	Low speed protection auto reset delay time	0 – 30000sec	60sec	√
PE-22	Dry run protection detecting current	0.0 – 999.9A	0.0A	√
PE-23	Dry run protection detecting time	0 – 30000sec	10sec	√
PE-24	Dry run protection auto reset relay time	0 – 30000sec	60sec	√
PE-25	Detecting current of over current protection	0.0 – 999.9A	0.0A	√
PE-26	Detecting time of over current protection	0 – 30000sec	10sec	√
PE-27	Over current auto reset delay time	0 – 30000sec	60sec	√
PE-28	Minimum power protection value	0.00kw – 650.00kw	0.00kw	√
PE-29	Detecting time of minimum power protection	0 – 30000sec	10sec	√
PE-30	Minimum power protection auto reset delay time	0 – 30000sec	60sec	√
PE-31	Water tank fulling level detecting method	Digit: Water fulling detect mode 0: Single point detect 1: 2 points detect 2: AI1 analog 3: AI2 analog Ten: Single point detect 51# function	H0.0.0	√

		logic detection selecting Hundred: Single point detect 52# function logic detection selecting. 0: Normal Open, work when open, stop when switch on 1: Normal close, work when close, stop when open. Note:Single point detecting,when DI4 set for 51(in default setting),adopt 5sec hysteresis detecting. 2 points detecting,DI4 set for 51,DI5 set for 52, both points should be activated at the same time to make water fulling function useful.		
PE-32	Water fulling level detecting threshold of analogtype,	0 – 100.0%	25.0%	√
PE-33	Water fulling level reach protection detecting time	0 – 30000sec	10sec	√
PE-34	Water fulling level protection exit relay time	0 – 30000sec	10 sec	√
PE-35	Water level sensor probe damage threshold	0 – 100.0%	0.0%	√
PE-36	DC current correction factor	0.0 – 200.0%	100.00%	√
PE-37	DC current correction bias	-100.00A – 100.00A	0.00A	√
PE-38	Power point 0 of PQ Current	0.0kw – 999.9kw	0.5kw	√
PE-39	Power point 1 of PQ Current	0.0kw – 999.9kw	1.0kw	√
PE-40	Power point 2 of PQ Current	0.0kw – 999.9kw	1.5kw	√
PE-41	Power point 3 of PQ Current	0.0kw – 999.9kw	2.0kw	√
PE-42	Power point 4 of PQ Current	0.0kw – 999.9kw	2.5kw	√
PE-43	Flow point 0 of PQ curve	0.0 – 999.9m^3/h	0.0 m^3/h	√
PE-44	Flow point 1 of PQ curve	0.0 – 999.9m^3/h	5.0 m^3/h	√
PE-45	Flow point 2 of PQ curve	0.0 – 999.9m^3/h	10.0m^3/h	√
PE-46	Flow point 3 of PQ curve	0.0 – 999.9m^3/h	15.0m^3/h	√
PE-47	Flow point 4 of PQ curve	0.0 – 999.9m^3/h	20.0m^3/h	√
PE-48	Initiating frequency of dry	0.00 – 320.00Hz	0.0Hr	√

	run protection			
PE-49	Sleep power detecting selection When PE-49=0, the sleep mode activating as voltage, When PE-49 not set for 0, inveter if go to sleep mode as sleep power detecting.	0.0% - 100.0%	0.0%	√
PE-50	Detecting time of sleep power	0 – 30000sec	60sec	√
PE-51	Sleep frequency	0.00Hz ～300.00Hz	10.00Hz	√
PP Group Function code management				
PP-00	User password	0～65535	0	√
PP-01	Parameter initialization	0: On operation 1: Restore parameters to factory setting except motor parameters 2: Clear record information	0	√
PP-02	Function parameter group display selection	Bit: U group monitoring parameters 0: Not displayed 1: Display Ten: Advanced parameters 0: Not displayed 1: display	01	×
PP-03	Personality parameter group show selection	Bit: User custom parameter group display selection 0: Not displayed 1: Display Ten: User Change Parameter Group Display Selection 0: Not displayed 1: Display	00	√
PP-04	Function code modification attribute	0： Enable modification 1: Not allow to modify	0	√
PP-05	Distributor unlock password	0 – 65535		
PP-06	Factory unlock password	0 – 65535		
PF Distributor password setting				
PF-06	Distributor password setting	0 – 65535		
PF-07	Distributor allow total running time	0 – 65535Hr	Maximum 7.4 Year	

Solar pump control parameters description

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

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

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

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

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

PE group solar pump control parameters group explanation:

PE-00	Solar pump control mode	0: Disable 1: Enable (Algorithm-1, High efficiency) 2: Enable (Algorithm-2, High stability)	2

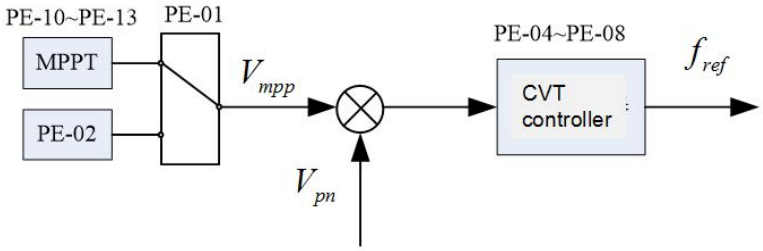
This parameters use to enable or disable solar pump control mode, When it set to 1 or 2, the solar pump control function will be activated, when it set to 0, the inverter work as general variable frequency without solar control function. The output frequency can be set but not vary with sunshine radiation.

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

PE-01	Vmpp voltage reference mode	Bit: Vmpp mode selecting 0: CVT set by PE-02 manually 1: MPPT auto mode Ten: Voc (open loop voltage of PV) detect mode 0: Voc set by PE-03 manually 1: Voc automatically detect Hundred: Auto running by keypad 0: Disable 1: Auto start/stop even in keypad control mode. Inverter will automatically start when power on after 5 seconds under keypad	H0.0.1.

		control mode (P0-02=0)	
PE-02	CVT voltage setting value	0 -100%	80%
PE-03	Voc (open loop voltage) setting	0.0V-1000.0V	650V/ 380V

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



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

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

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

In some cloudy case, the inverter can't get enough solar energy from PV arrays, so we program inverter drop frequency quickly, make pump in generating mode, feedback energy to inveter to maintain DC bus voltage.
PE-07=0, frequency quick drop function is disable.

PE-09	Weak magnetic limit multiples	0.0- 9.9	1.2
PE-10	MPPT search upper limit voltage	0.0% - 100.0%	90%
PE-11	MPPT search lower limit voltage	0.0% - 100.0%	75%
PE-12	MPPT search gain	0% - 500%	100%

PE-13	MPPT search interval	0–0 - 10.0sec	2.0sec
PE-14	Stabilizer filtering time (sold pump control mode 2)	0-1000ms	50ms
PE-15	Stabilizer voltage threshold (solarpump control mode2)	10.0V – 100.0V	10.0v

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

PE-16	Sleep voltage threshold	0.0 - 1000.0V	250V/150V
PE-17	Wake up voltage threshold	0.0 - 1000.0V	350V/250V
PE-18	Awake waiting time	0 - 30000sec	60sec

PE-16 to FE-18 use to set solar pump inverter if go to sleep mode when input DC voltage is too low, and wake up automatically when DC bus voltage recovery again.

When the DC voltage is lower than FE-16 setting value for a system default time, it will go to sleep and sent out A.SLP alarm code. When DC bus voltage raises again and higher than PE-17 value for a FE-18 setting time, the inverter will be wake up to work again.

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

If the output frequency is lower than PE-19 for a low speed detecting time PE-20,the solar pump inverter will stop to running and sent out A.LFr alarm.

Once the output frequency is greater than PE-19 for PE-21(automatic recover time), the inverter will restore to working.

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

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

Once the current is bigger than PE-22 again for PE-24 (recover time of dry run), the inverter will restore to working.

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

PE-25,PE-26, PE-27parameters are used to set motor over current protection.

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

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

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

PE-31	Water tank fulling level detecting method	Digit: Water fulling detect mode 0: 1 point detect 1: 2 points detect 2: AI1 analog 3: AI2 analog Ten: Single point detect 51# function logic detection selecting Hundred: Single point detect 52# function logic detection selecting. 0: Normal Open, work when open, stop when switch on 1: Normal close, work when close, stop when open.	H0.00
PE-32	Water fulling level detecting threshold of analog	0 - 100.0%	25.0%
PE-33	Water fulling level reach protection detecting time	0 - 30000sec	10sec
PE-34	Water fulling level protection exit relay time	0 - 30000sec	60sec
PE-35	Water level sensor probe damage threshold	0 - 100.0%	0.0%

PE-31 parameter is used to set detecting method of water tank leveling.
point digital terminal water tank fulling detecting is default setting. There are normal open and

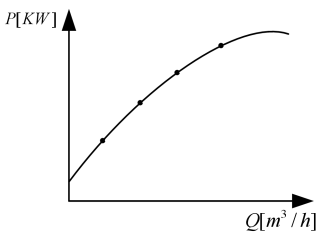
normal close for selection.
For water well dry run detection, we can select normal close of digital function.
For water tank fulling detection, we can select normal open of digital function.
If select 2 points digital terminals fulling detect, please see below explanation:
Any 2 terminals (DI4 and DI5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

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

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

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

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



PE-48	Initiating frequency of dry run protection	0.00 - 320.00Hz	0.0Hz	√
PE-49	Sleep power setting	0.0% - 100.0%	0.0%	√

PE-50	Detecting time of sleep power	0 - 30000sec	60sec	√
PE-51	Sleep frequency	0.00Hz ～300.00Hz	10.00Hz	√

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

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

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

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

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

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

Note:

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

* Torque booster value is 1.0% in default(P3-01);

* Over excitation function is disable in default (P3-1=0);

* Input/ output phase missing is disable（P9-12,P9-13 both parameters set to 0）;

* Over current , over voltage suppression function is disable in default（P9-03, P9-05=0）;

* Digital terminals programmable function are set for forward running, fault reset, solar pump control disable, water tank fulling detect 1, water tank fulling detect 2.

*Automatic fault reset is activated in default，when P9-09=20, automatically reset times is infinite

* Auto start when power on with terminal control for forwarding , (P0-02=1), DI1 short circuit connect to COM .

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

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

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

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

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

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

11. Monitor parameters of solar pump control

Monitor parameters	Monitoring contents	Unit	Address
U0-00	Output frequency	0.01Hz	7000H
U0-01	Preset frequency	0.01Hz	7001H
U0-02	DC voltage of PV arrays	0.1V	7002H
U0-03	Output voltage	1V	7003H
U0-04	Output current	0.01A	7004H
U0-05	Power of PV arrays	0.1KW	7005H
U0-06	Current of PV arrays	0.01A	7006H
U0-07	DI input status	1	7007H
U0-08	DO output status	1	7008H
U0-09	AI1	0.01V	7009H
U0-10	AI2	0.01V	700AH
U0-11	Motor (pump) speed	1rpm	700BH
U0-12	PV open loop circuit voltage (Voc)	0.1V	700CH
U0-13	Flow rate of pump	0.1m^3/hr	700DH
U0-14	Day flow	0.1m^3	700EH
U0-15	Flow accumulation (low-order digit)	0.1m^3	700FH
U0-16	flow accumulation（low-order digit)	0.1Km^3	7010H
U0-17	Day generated power	0.1kwh	7011H
U0-18	Generated accumulation (low-order digit)	0.1kwh	7012H
U0-19	Generated accumulation (high-order digit)	0.1Mwh	7013H
U0-20	The rest running time	0.1Min	7014H
U0-24	Pump running speed	r/min	7018H
U0-25	Current power up time	1min	7019H
U0-26	Current running time	0.1min	701AH
U0-45	Fault information	1	702DH
U0-61	Inverter working status	1	703DH

12. Troubleshooting and Countermeasures

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

Troubleshooting table

Related alarm code

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

Alarm code	Alam description	Possible reason	Countermeasures
Err01	Inverter unit protection	1, The inverter output circuit short circuit 2, the motor and inverter wiring is too long 3, the module overheating 4. The inverter wiring is loose 5, The circuit board abnormal 6, inverter module exception	1, Excluding the external fault 2, Install the reactor or output filter 3, Check the air duct is blocked; 4, Plug all the cable 5, Seek technical support
Err02	Over current in acceleration	1, Motor to ground short circuit 2, Not perform auto tuning 3, The acceleration time is too short 4, Torque boost is not appropriate 5, The grid voltage is low 6, Loading suddenly in acceleration 7, The using Inverter capacity (rated power is small	1, Excluding the external fault 2, Perform motor ID auto tuning 3, Increase the acceleration time 4, Adjust the torque boost or V / F curve 5, Adjust voltage of power supply to normal 6, Adjust the load 7, Select big power inverter instead
Err03	Over current in deceleration	1, Output short circuit or output to ground 2, No performance ID auto tuning for carrying vector control 3, The deceleration time is too short 4, The voltage is low 5, Loading suddenly when deceleration 6, No installing of brake unit and brake resistor	1, Excluding the external fault 2, Perform motor ID auto tuning 3, Increase the acceleration time 4, Adjust voltage of power supply to normal 5, Cancel the suddenly adding load 6, Install braking unit or braking resistor
Err04	Over current in constant speed running	1, The inverter output short circuit or phase to ground 2, No performance ID auto tuning for carrying vector control 3, The voltage of grid is low 4, Whether there is a sudden load in running 5, The using Inverter capacity (rated power is small	1, Excluding the external fault 2, Perform motor ID auto tuning 3, Cancel the sudden loading 4, Cancel the suddenly adding load 5. Select big power inverter instead
Err05	Over voltage in acceleration	1, The input voltage is high 2, The acceleration process there is an external drag motor running 3, The acceleration time is too short 4, No brake unit and brake resistor	1, Adjust voltage to the normal range Cancel the additional force or install braking resistor 3, Increase the acceleration time

			4, Install the braking unit or braking resistor
Err06	Deceleration over-voltage	1, The input voltage is high 2, The process of deceleration there is an external drag motor running 3, Deceleration time is too short 4, No brake unit and brake resistor	1, Adjust voltage to normal range 2, Cancel the additional force or install braking resistor 3, Increase acceleration time 4, Install the braking unit or braking resistor
Err07	Over voltage in constant speed	1, Input voltage is high 2. ,The process of deceleration there is an external drag motor running	1. Increase voltage go normal range 2. Cancel external force or install braking resistor
Err08	Fault of control section power supply	1. Input voltage is out of limit	Adjust voltage to normal range
Err09	Under voltage fault	1, Instantaneous power failure 2, Input voltage is out of limit DC bus voltage is abnormal 4, rectifier bridge and buffer resistance is not normal	1, Reset the fault 2, Adjust the voltage to the normal range 3, seek technical support
Err10	Inverter over load	1.. If load is too big, or motor is blocked or not 2. Using inverter capacity is too small	1. Reduce the load and check the motor and machine condition 2. Select bigger one capacity of motor
Err11	Motor overload	1, The motor protection parameter P9-01 set is appropriate 2, The load is too large or motor is blocked 3, Using the power of inverter too small	Set correct parameter Reduce load or check motor and driving machine Select bigger power inverter
Err12	Input phase loss	1, Three-phase input power is not normal 2, The driving board exception 3, Lightning board abnormalities 4, The main control board exception	1, Check and eliminate the problems in the external lines 2, Seek technical support
Err13	Output phase loss	1, The inverter wiring is damaged 2, 3 phase output is not balance of inverter when motor running 3, Driving board is abnormal 4, IGBT model is abnormal	1, Excluding the external fault 2, Check the motor three-phase winding is normal and troubleshooting 3, seek technical support
Err14	IGBT module is over heat	1, The ambient temperature is too high 2, Air duct blockage 3, The fan is damaged	1, Reduce the ambient temperature 2, Clean up the duct 3, Replace the fan 4, Replace the thermistor

		4, IIGBT module thermistor is damage 5, The inverter module is damaged	5, Replace the inverter module
Err15	External device fault	1, Through the multi-function terminal DI input external fault signal 2, Through the virtual IO function input external fault signal	1, Reset to factory setting 2, Reset to factory setting
Err16	Communication fail	1, The host computer is not working properly 2, The communication line is not normal 3, Communication parameters PD group settings are not correct	1, Check the host computer wiring 2, Check the communication cable 3, Set the communication parameters correctly
Err17	Contactor failure	1, The driving board and power supply is not normal 2, Contactor is not normal	1, Replace the drive board or power board 2, Replace the contactor
Err18	Current detection failure	1, Check the Hall device exception 2, The driving board exception	1, Replace the Hall device 2, Replace the driver board
Err19	Motor tuning fault	1, The motor parameters are not set by nameplate 2, Parameter identification process timeout	Set motor parameters according to motor nameplate
Err20	Encoder fault	1, The encoder model does not match 2, The encoder connection error 3, The encoder is damaged 4, PG card exception	1, Check the encoder parameters 2, Excluding line wiring failure 3, Replace the encoder 4, Replace the PG card
Err21	EEPROM read and write failures	1, EEPROM IC broken	1, Replace the controller board
Err22	Inverter hardware failure	1, there is over-voltage 2, there is over-current	1, Troubleshooting as over voltage 2, Troubleshooting as over current
Err23	Short to ground	1, Motor to ground short circuit	1, Change motor cable or motor
Err26	The cumulative run time arrives	1, The cumulative run time is over the set the value	1, Clear the record with parameters initialization
Err27	User Defined Fault 1	1, User define fault signal 1 with multi-function terminals. 2, User define fault signal 1 with virtual IO function	1, Reset 2, Reset
Err28	User Defined Fault 2	1 , User define fault signal 2 with multi-function terminals. 2, User define fault signal 2 with virtual IO function	1, Reset 2, Reset

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

Note:

The PH380 solar pump inverter can able to record the three latest three fault code, fault information such as output frequency, current, voltage, DC voltage, input terminals status and output terminals status with P9-14 to P9-44.These information can help user to resolve problem.

13. Routine Inspection and Maintenance

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

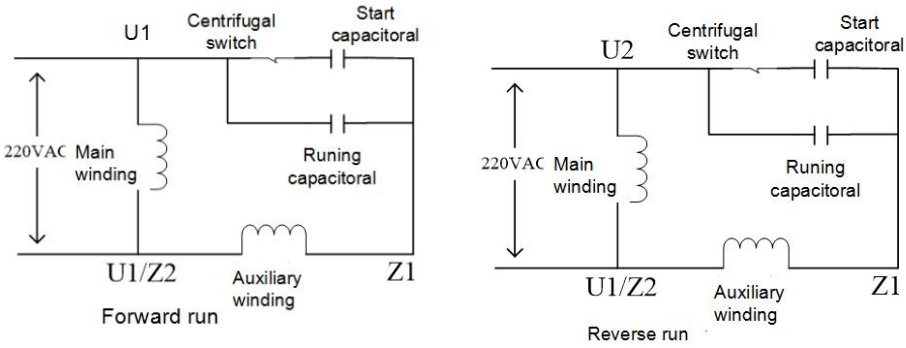
Requirement of Inspection and Maintenance

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

Appendix 1. Solar Pump Inverter For Driving 1 Phase 220V Pumps Notes

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

1. Working principle of 1 phase motor (pumps)



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

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

3. Start capacitor capacitance value is generally larger than the running capacitor, can improve the starting torque;

The start capacitors will be disconnect when motor rotation speed reaches a certain value via a centrifugal switch, and there are no build starting capacitor for some light load starting motor.

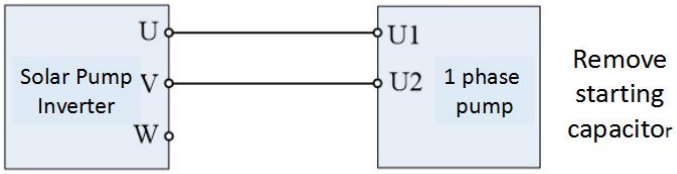
2. MPPT solar pump inverter for driving single-phase motor:

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

There are 2 driving modes for using inverter to drive 1 phase motor. It is select by P0-01 parameters, for 1 phase output mode or 3 phase output mode. It can able to adjust the output voltage ratio through P0-20 when working on 3 phase output mode.

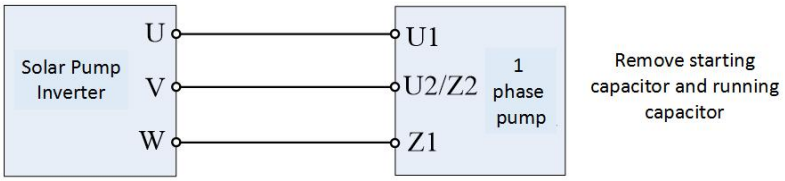
It is also request to set motor group parameters(P1 group) when driving 1 phase motor or pumps. And also can adjust the output torque capacity with P3-01 parameters.

2.1. 2 wire output mode (P0-01 = 3): The mode wiring as follows:



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

2.2. 3 wires output mode (P0-01 = 4): This mode wiring as shown below



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

$Udc/\sqrt{2}$, only can reaches $Udc/2$ (P0-20=1.0).

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

Appendix 2 MPPT Solar pump inverter for PMSM pumps supplementary instructions.

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

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

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

The vector control is superior to the scalar (V/f) control in terms of motor control performance such as low frequency torque, stability, current waveform and so on. However, the scalar control is not sensitive to the motor back EMF parameter (P1-20). The vector control requires accurate setting or identification of the motor back electromotive force; Both control algorithms need to obtain accurate stator resistance, inductance parameters (P1-16 ~ P1-18);

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

For driving permanent magnet synchronous motor, it need to set the following motor nameplate parameters:

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

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

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

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

P1-37 set to 11: permanent magnet motor static auto tuning if load is unable to disconnect (back

EMF by nameplate parameters automatically calculated)

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

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

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

The Procedure of operation for PMSM driving.

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

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

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

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

Appendix 3. Selection of Peripheral Electrical Device.

1. Selection of peripheral electrical devices

Inverter Model	MCCB	Contactor	Cable of Input Side Main Circuit	Cable of Output Side Main Circuit	Cable of Control Circuit
	(A)	(A)	(mm2)	(mm2)	(mm2)
Single-phase 220 V					
220V, 0.75kw	10	12	0.75	0.75	0.5
220V,1.5kw	16	18	1.5	1.5	0.5
220V,2.2kw	25	25	2.5	2.5	0.5
220V,4.0kw	32	32	4	4	0.75
Three-phase 380 V					
380V, 0.75kw	4	9	0.75	0.75	0.5
380V, 1.5kw	6	9	0.75	0.75	0.5
380V,2.2kw	10	12	0.75	0.75	0.5
380V,4.0kw	16	18	1.5	1.5	0.5
380V,5.5kw	20	25	2.5	2.5	0.75
380V,7.5kw	25	25	4	4	0.75
380V,11kw	32	32	6	6	0.75
380V, 15kw	40	40	6	6	0.75
380V, 18.5kw	50	50	10	10	1
380V,22kw	50	50	10	10	1
380V, 30kw	63	63	10	10	1

380V, 37kw	80	80	25	25	1
380V, 45kw	100	115	35	35	1
380V, 55kw	125	125	50	50	1
380V, 75kw	160	185	70	70	1
380V, 93kw	200	225	95	95	1
380V, 110kw	225	225	120	120	1

2. Out put reactor (OCR)

This reactor is used for suppress the capacitive charging current of connection cable between inverter and motor, and passivating the voltage rising rated of PWM as well. It is mounted at the output side of frequency inverter. When the distance of cable between inverter and motor over a value, suggest installed output rector to compensate recharge current of line capacitive.

Product application

1. Limit DV/DT to 500V/us
2. Limit the over voltage of motor .
3. Reduce the leakage current of motor
4. Reduce the interference generated by contactor which mount between filter and motor.
5. If the distance from pump to inverter over than 150M, less than 300M, suggest install output reactor.

3. DV/dT fi lters with VFDs Introduction

A dV/dT filter is a device that controls the voltage spikes generated by variable frequency drives (VFDs) and long motor lead lengths. This voltage spike event is generally known as the reflected wave phenomenon . This resulting reflected wave can cause very high voltages on the motor leads, which can lead to damage and premature failure of the motor winding insulation (even with inverter duty rated motors), particularly within the first few turns.

Taking these factors into account will assist in the performance of the dV/dT filter in the application and the protection of the motor from dangerous reflected wave voltages up to 1000 feet from the VFD. (VFD means inverter)

4.Sine Wave Filter (SFR)

Sine Wave Filter are designed to provide a Sine Wave output voltage when driven from Variable Frequency Drives or other types of PWM inverters with switching frequencies from 2kHz to 8kHz.

For Variable Frequency Drive (VFD) applications, Sine Wave Filters eliminate the problem of motor/cable insulation failures, heating, and audible noise. Sine Wave Filters also reduce electromagnetic interference (EMI) by eliminating the high dV/dt associated with inverter output waveform. Bearing currents are also reduced, especially in larger motors above 50 kW.

The perfect solution for:

• Applications with older motors
• Aggressive environments
• Applications with frequent braking
• 690 V above applications with general purpose motors
• Motor cable length between 350 and 3000 meters

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