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Chapter 1 Safety Requirement and Cautions

To ensure safety of your health, equipment and property, please read this chapter carefully before using solar pump inverter and act in compliance with the instructions when installing, debugging, running and overhauling solar pump inverter.

1.1 Safety Definition

● Installation

1. Only qualified personnel can operate the equipment. Before operating, be sure to carefully read the manual about safety, installation, operation and maintenance. The safe operation depends on the proper processes of choosing models, carrying, installation, operation and maintenance.
2. Please install solar pump inverter on metal or other nonflammable material, and keep it away from the combustible material. Otherwise there is danger of fire;

● Wiring

- Danger**
1. Wire is connected only when the main circuit is cut off, otherwise there is a danger of shock.
 2. Wire is connected by professional person only. Otherwise there is a danger of shock.
 3. Earth must be reliable. Otherwise there is a danger of shock.
 4. AC power supply should not be connected with output ports U, V, W, otherwise there is a danger of damage to frequency inverter.
 5. No drop of bolt, spacer, metal stick, conducting wire or other things into the inner of frequency inverter; Otherwise there is a danger of fire or damage to frequency inverter.

● Electrification

- Danger**
1. Please make sure that voltage grade of power supply is consistent with frequency inverter's voltage and then check whether the wiring is correct and firm, and whether there is short circuit in peripheral equipment's circuit. Otherwise it will damage frequency inverter and other equipment.
 2. Before solar pump inverter is connected to the input power supply, make sure that the cover

- has been well fixed. Otherwise it will cause electric shock.
- After electrified, it is forbidden to open the cover, make wiring, and check up; Otherwise, it will cause the danger of electric shock.
 - After electrified, it is forbidden to contact internal wiring board and its parts. Otherwise it will cause the danger of electric shock.
 - Do not operate or touch frequency inverter with wet hand. Otherwise there is danger of damage to frequency inverter and electric shock.

●Operation

Danger
<ol style="list-style-type: none"> Before running, please check and confirm the application range of the machine and equipment once more; Otherwise it will cause accidents. Please don't touch the cooling fan and braking resistance to check the temperature; Otherwise there is a danger of getting burn. Unprofessional workers are banned to check the signals in the running stage; Otherwise it will cause injuries and damage the equipment.

●Maintenance

Danger
<ol style="list-style-type: none"> Please don't maintain and repair the equipment with electric; Otherwise it will cause electric shock. Before maintaining and repairing solar pump inverter, please make sure the indicator lights of power supply have completely turned off; Otherwise it may cause electric shock and damage solar pump inverter. Persons who have not passed specialized train are not allowed to conduct solar pump inverter maintenance; Otherwise it may cause electric shock and damage solar pump inverter.

Chapter 2 Specification and Basic Operation

2.1 Technical Specification

Solar pump inverter power(KW)	Pump		Max solar power input (KW)	Max DC input voltage V	Recommend Voc voltage (V)	Rated output current (A)	Output frequency(Hz)
	Rated power (KW)	Rated voltage (V)					
SI22-D1 series, DC60-400VDC input, 3 phase 110-230VAC output, suitable for 110VAC pump							
0.75	0.75	110	1.0	400	175-380	7A	0-320
1.5	1.5	110	1.95	400	175-380	10A	0-320
SI22-D3 series, D60V-400V input, 3 phase 220-240VAC output, suitable for 220VAC pump							
0.75	0.75	220	1.0	450	360-430	4A	0-320
1.5	1.5	220	1.95	450	360-430	7A	0-320
2.2	2.2	220	2.86	450	360-430	10A	0-320

Note: SI22 products can also drive single phase pump and please select the current-matched model.

2.2 Product Model

SI22 - D1 - 1R5G

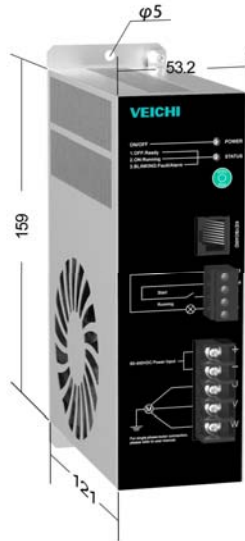
Product Series	
SI	Solar Pump Inverter
22	Series No.

Type	
D3	DC311V, suitable for driving AC220V pump
D1	DC156V, suitable for driving AC110V pump

Power	
Code	Suitable Pump
R75G	0.75kw
1R5G	1.5kw
2R2G	2.2kw

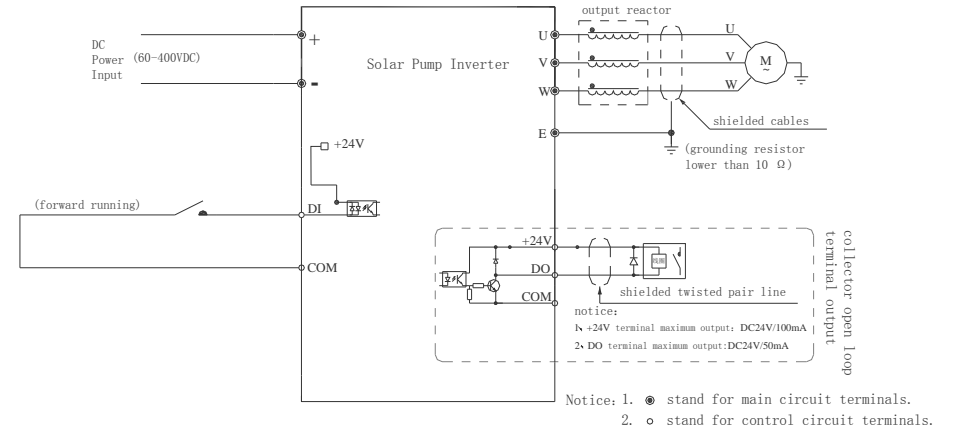
Note: Maximum power of D1: 1.5kw;
Maximum power of D3: 2.2kw.

2.3 Appearance and Dimension



2.4 Solar Pump Controller Wiring

● Standard Wiring for three phase motor



● Connection for single phase motor






With Capacitor: L, N connecting with U, W Without Capacitor: connecting with U, V, W

Note: The first connection solution for better performance is recommended.

2.5 Basic Operation

● Indicator and Key

Icon	Name	Function
	Power	ON: The power is 60-400VDC. OFF: Power is abnormal.
	Status	OFF: It is ready to run; ON: It is running; BLINKING: Fault or alarm comes
	Start/Stop	OFF Status: Press it to run ON Status: Press it to stop BLINKING Status : Press it to reset

● Trial Run

- (1) Please double check the cable connection according to user manual.
- (2) Press "Start/Stop" button to run it, and check whether the pump rotary direction is correct. ;If the direction is correct ,please go to step(4) ;Otherwise ,please go to step (3) .
- (3) Press "Start/Stop" button to stop it and change any two cables to adjust the direction ; Press "Start/Stop" button and then it will run smoothly.
- (4) Default setting for Start/Stop will store the operation command while power off. So it will automatically run or stop along with sunrise or sunset.

● Quick Troubleshooting

- (1) Power is still off when connecting power: please check the input voltage is 60-400VDC or check cable connections of solar array.
- (2) Status indicator is blinking: please reset it by pressing "START/STOP" for 1 second. Otherwise, please ask for support.

Chapter 3 Parameters List

- “●” : Stands for parameters can modify during running
“○” : Stands for parameters can't modify during running
“×” : Stands for parameter read only, can't modify
“-” : Stands for factory parameters, only for factory
“※” : Stands for relative with AC drive models.

★ Basic Function Parameter

Function code	Function name	Setting range and definition	Default setting	property	Comm. Add
F0.00	Control mode	1 :AM linear VF control without PG 6 : Voltage vector control without PG for PMSM	1	○	0x000
F0.02	Running control mode	0 : Key board control 1 : Terminal control	0	○	0x002
F0.03	Main frequency source X reference	0 :digital reference of keyboard 1 : Potentiometer of key board 8 : PID control reference	0	○	0x003
F0.08	Digital frequency reference	0.00 ~ maximum frequency	50.00Hz	●	0x008
F0.09	Maximum frequency	0.00 ~ 320.00Hz	50.00Hz	○	0x009
F0.11	Upper limit frequency	Lower limit frequency ~ Maximum frequency	50.00Hz	●	0x00B
F0.12	Lower limit frequency	Upper limit frequency	0.00Hz	●	0x00C
F0.14	Acceleration time 1	0.01 ~ 650.00s	Per model	●	0x00E
F0.15	Deceleration time 1	0.01 ~ 650.00s	Per model	●	0x00F
F0.16	Rotation direction	0 : As same as forward 1 : Runs in reverse 2 : Forbidden reverse	0	●	0x010
F0.17	Carrier frequency	0.6 ~ 15.0kHz	Per model	●	0x011
F0.19	Factory setting	0 : No operation 1 : Restore to default(motor	0	○	0x013

		parameters don't restore) 2 : Clear fault record 3 : Restore to default(motor parameters restore)			
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★ Switch Terminal Parameters

Function code	Function name	Setting range and definition	Default setting	property	Comm. Add
F2.00	DI function define	0 : No function 1 : Forward 2 : Reverse 6 : Free stop 7 : Emergency stop 8 : Fault reset 9 : Output fault reset 10 : Water full detection fault 11 : Water full detection fault Reset	1	●	0x200
F2.29	DO	0 : No output 1 : Frequency running 2 : Frequency in reverse 3 : Fault and trip alarm 1(alarm during fault reset period)	1	●	0x21D

★ Motor Parameters

Function code	Function name	Setting range and definition	Default setting	property	Comm. Add
F5.00	Motor type	0 : Asynchronous motor (AM) 1 : Permanent magnet motor (PM)	0	×	0x500
F5.01	Poles of motor	2 ~ 48	4	○	0x501
F5.02	Rated power of motor	0.4 ~ 1000.0kW	Per model	○	0x502
F5.03	Rated frequency of motor	0.01 ~ maximum	Per model	○	0x503
F5.04	Rated speed of motor	0 ~ 65000rpm	Per model	○	0x504

F5.05	Rated voltage of motor	0 ~ 1500V	Per model	○	0x505
F5.06	rated current of motor	0.1 ~ 2000.0A	Per model	○	0x506
F5.07	Motor no load current	0.01 ~ 650.0A	Per model	○	0x507
F5.08	Stator resistance (asynchronous motor)	0.001 ~ 65.000	Per model	○	0x508
F5.09	Rotor resistance (asynchronous motor)	0.001 ~ 65.000	Per model	○	0x509
F5.10	Leakage inductive inductance (asynchronous motor)	0.1 ~ 6500.0mH	Per model	○	0x50A
F5.11	Mutual inductive inductance (asynchronous motor)	0.1 ~ 6500.0mH	Per model	○	0x50B
F5.12	Motor auto tuning	0 : No operation 1 : Rotation auto tuning 2 : Stationary auto tuning	0	○	0x50C
F5.21	Stator resistance Of synchronous motor	0.001 ~ 65.000	Per model	○	0x515
F5.22	Shaft D inductance of synchronous motor	0.01mH ~ 655.35mH	Per model	○	0x516
F5.23	Shaft Q inductance of (synchronous motor)	0.01mH ~ 655.35mH	Per model	○	0x517
F5.24	Back EMF of synchronous motor of	0.1V ~ 1000.0V	Per model	○	0x518
F5.25	Encoder installation angle of PM	0.0° ~ 360.0°	Per model	○	0x519
F5.26	Inject frequency at high speed	50.0Hz ~ 1000.0Hz	300.0Hz	○	0x51A
F5.27	Inject voltage at high speed	0.1% ~ 100.0%	20.0%	○	0x51B
F5.28	Back EMF identify current	0.1% ~ 100.0%	80.0%	○	0x51C

Note: If you need a detailed description of parameters, please download "AC100 Vector Inverter manual" from <https://www.veichi.org/>

★ Photovoltaic Pump Special Parameters

Function code	Function name	Setting range and definition	Default setting	property	Comm . Add
FE.00	Solar pump drive control mode	0 : Variable frequency control mode 1 : CVT mode for solar 2 : MPPT mode for solar	2	○	0xE00
FE.01	Running control mode	0 : Stop 1 : Running 2 : Sleep 3 : Low speed protection 4 : Dry run protection 5 : Over current protection 6 : Minimum power protection	Read only		0xE01
FE.02	VOC voltage(display)	0.0 ~ 999.9V	Read only		0xE02
FE.03	CVT target voltage	70.0 ~ 95.0%	81.0%	●	0xE03
FE.04	MPPT upper limit voltage	20.0 ~ 200.0%	100.0%	●	0xE04
FE.05	MPPT lower limit voltage	20.0 ~ 200.0%	50.0%	●	0xE05
FE.06	Frequency adjusting gain	0.1 ~ 500.0%	10.0% (AM) 40.0% (PMSM)	●	0xE06
FE.07	MPPT search interval	0.1 ~ 100.0	1.0s	●	0xE07
FE.08	MPPT regulating gain	0 ~ 9999	100	●	0xE08
FE.09	Quick-drop frequency gain	0 ~ 20	2	●	0xE09
FE.10	Frequency adjusting filter time	0.001 ~ 2.000 s	0.001	●	0xE0A
FE.11	Go to sleep mode voltage	0 ~ 1000V	0V	●	0xE0B
FE.12	Wake up restore voltage	0 ~ 1000V	400V	●	0xE0C
FE.13	Sleeping stop restore waiting time	0.0 ~ 3000.0s	10.0s	●	0xE0D
FE.14	Low speed protection detect frequency	0.00 ~ 300.00Hz	10.00Hz	●	0xE0E

FE.15	Low speed protection detect time	0.0 ~ 3000.0s	10.0s	●	0xE0F
FE.16	Low speed protection restore working time	0.0 ~ 3000.0s	10.0s	●	0xE10
FE.17	Dry run protection detect current	0.0 ~ 999.9A	0.0A	●	0xE11
FE.18	Dry run protection detect time	0.0 ~ 3000.0s	10.0s	●	0xE12
FE.19	Dry run auto restore working time	0.0 ~ 3000.0s	10.0s	●	0xE13
FE.20	Over current point setting	0.0 ~ 999.9A	0.0A	●	0xE14
FE.21	Over current protection detect time	0.0 ~ 3000.0s	10.0s	●	0xE15
FE.22	Over current protection auto restore working time	0.0 ~ 3000.0s	10.0s	●	0xE16
FE.23	Input minimum power protection power point setting	0.00 ~ 650.00kw	0.00kw	●	0xE17
FE.24	Minimum power protection detect time	0.0 ~ 3000.0s	10.0s	●	0xE18
FE.25	Minimum power protection auto restore working time	0.0 ~ 3000.0s	10.0s	●	0xE19
FE.26	Fault alarm restore mode	0 : Auto reset;1 : Reset by manual LED0 : Low speed protection LED1 : Dry run LED2 : Over current protection LED3: Minimum power protection	0000	●	0xE1A
FE.27	Water fulfilled detect time	0.0s ~ 3000.0s	10.0s	●	0xE1B
FE.28	Water fulfilled restore time	0.0s ~ 3000.0s	10.0s	●	0xE1C
FE.29	reserve			●	0xE1D
FE.30	DC current revise offset	0.00 ~ 99.99A	0.01A	●	0xE1E
FE.31	DC current revise proportion gain	0.0 ~ 999.9%	100.0%	●	0xE1F
FE.32	Power curve point 0	0.00 ~ 99.99kw	0.50kw	●	0xE20
FE.33	Power curve point 1	0.00 ~ 99.99kw	1.00kw	●	0xE21
FE.34	Power curve point 2	0.00 ~ 99.99kw	1.50kw	●	0xE22
FE.35	Power curve point 3	0.00 ~ 99.99kw	2.00kw	●	0xE23
FE.36	Power curve point 4	0.00 ~ 99.99kw	2.50kw	●	0xE24

FE.37	Flow curve point 0	0.0 ~ 999.9m3/h	0.0 m3/h	●	0xE25
FE.38	Flow curve point 1	0.0 ~ 999.9m3/h	5.0 m3/h	●	0xE26
FE.39	Flow curve point 2	0.0 ~ 999.9m3/h	10.0 m3/h	●	0xE27
FE.40	Flow curve point 3	0.0 ~ 999.9m3/h	15.0 m3/h	●	0xE28
FE.41	Flow curve point 4	0.0 ~ 999.9m3/h	20.0 m3/h	●	0xE29
FE.42	Flow calculating revise offset	0.0 ~ 999.9m3	0.0m3	●	0xE30
FE.43	Flow calculating revise gain	0.0 ~ 999.9%	100.0%	●	0xE31
FE.44	Power per day/ generated power per day reset period	0.0 ~ 24.0h	7.0h	●	0xE32
FE.45	Reserved			●	0xE33
FE.46	Photovoltaic pump function selection 1	0 : Invalid 1 : Valid LED0 : Constant torque frequency limit selection LED1 : Reserved LED2 : Voltage rising update Voc voltage LED3: Fast frequency falling function	1100H	●	0xE34
FE.47	Fast frequency falling threshold	3.0% ~ 15.0%	5.0%	●	0xE35
FE.48	Constant torque frequency limit coefficient	80.0% ~ 150.0%	100.0%	●	0xE36
FE.49	Sudden voltage increase threshold	0.0% ~ 20.0%	5.0%	●	0xE37
FE.50	Reserved			●	0xE38

★ Photovoltaic Pump Special Monitor Parameters

Function code	Function name	Setting range and definition	Default setting	property	Comm . Add
C-00	Frequency reference	0.01Hz	Read only		2100H

C-01	Output frequency	0.01Hz	Read only		2101H
C-02	Output current	0.1A	Read only		2102H
C-04	Output voltage	0.1V	Read only		2104H
C-10	Output power	0.01kw	Read only		210AH
C-11	DC bus voltage	0.1V	Read only		210BH
C-30	DC current	0.01A	Read only		211EH
C-31	Flow speed	0.1 m3/h	Read only		211FH
C-32	Voc voltage	0.1 V	Read only		2120H
C-33	Flow per day	0.1 m3	Read only		2121H
C-34	Cumulative total flow(low position)	0.1m3	Read only		2122H
C-35	Cumulative total flow(high position)	0.1km3	Read only		2123H
C-36	Generated power per day	0.01kwh	Read only		2124H
C-37	Cumulative total generated power (low position)	0.01kwh	Read only		2125H
C-38	Cumulative total generated power (high position)	0.1Mwh	Read only		2126H

Chapter 4 Operation Guidance

4.1 Asynchronous Motor Pump Drive Operation Guidance

1) Wiring:

- Confirmed the solar pump drive if mating with motor.
- Correctly connecting "+" "-" of solar panel to corresponding "+" "-" pole of inverter wiring terminals. Otherwise it will cause inverter damage.
- Connect motor wire and ground wire to corresponding U, V, W, E terminals.

2). Parameters setting and trial run: (Please directly press START/STOP button with optional keyboard)

- Set F0.00 to 1, F0.02 for 0, and F0.09, F0.11, F0.14, F0.15 parameters setting according to application site.
- Set motor(pump) parameters according to nameplate of pump
- Set solar pump MPPT mode FE.001 for 1 or 2
- Press FWD button for trail running, and confirm the motor running direction.

3) Common problems

- Q : Well-lit conditions, the pump is running, but the water is very small.
A : Check if the pump motor direction is reversed.
- Q : Well-lit conditions, the drive is in standby mode 0.00Hz
A : Check FE.01, observe what protection status is the drive in currently, check whether the parameters set is reasonable;
- Q : Well-lit conditions, frequency severe beating during operation.
A : Reasonably adjust FE.06 value, the adjustment is recommended to be in the vicinity of the default, too big or too small will cause frequency oscillation;

4.2 Synchronous Motor Pump Drive Operation Guidance

1) Wiring:

- Confirm if the solar pump drive matches with the motor.
- Connecting "+" "-" of solar panel to corresponding "+" "-" of inverter wiring terminals. Otherwise it

will cause inverter damage.

- Connect motor wire and ground wire to corresponding U, V, W, E terminals.

2) Parameters setting and trial run:

- Set F0.00 to 6, F0.02 for 0, and F0.09=100.00, F0.11=100.00; F0.14, F0.15 can be set according to demand.
- Set motor (pump) parameters according to nameplate of pump. Then Set F5.12 for 1, the keypad will show T-00, press FWD to start motor auto tuning. This process takes about three minutes;

Note: 1. If you can disconnect the motor and load, self-learning would be better;

2. The self-learning need to be done with enough sunshine and when the solar panels can provide enough energy.

- Set solar pump MPPT mode FE.001 for 1 or 2
- Press FWD button for trail running, and confirm the motor running direction.

3) Common problems and solutions

- Q : Well-lit conditions, the pump is running, but the water is very small.
A : Check if the pump motor direction is reversed.
- Q : Well-lit conditions, the drive is in standby mode 0.00Hz
A : Check FE.01, observe what protection status is the drive in currently, check whether the parameters set is reasonable;
- Q : DC current is incorrectly displayed.
A : Adjust FE.30, FE.31 for calibration.
- Q : Well-lit conditions, frequency severe beating during operation.
A : Reasonably adjust FE.06 value, the adjustment is recommended to be in the vicinity of the default, too big or too small will cause frequency oscillation;
- Q : The current fluctuation is huge when the pump is running.
A : Check C-39, adjusting the value of F5.24, so the C-39 displays the value from 0-10;

4.3 PV Water Pump Features

A. Dormancy Function

During the photovoltaic pump operation, the inverter will go into sleep state when the DC voltage provided by solar panels is lower than FE.11 (sleep voltage threshold) due to objective factors, while the keyboard warning "A.LPn"; when DC voltage provided by solar panels rises back to FE.12 (sleep recovery voltage) point, start timing and after FE.13 (sleep shutdown waiting time), the drive starts running;

B. Low-frequency Protection Function

During the operation of the photovoltaic pump, for some reason, the output frequency is lower than FE.14 (low frequency detection frequency), and after FE.15 (under frequency detection time) time, enters into the standby protection state, while the keyboard warning "A.LFr"; after entering into the standby protection state and after FE.16 (frequency protection automatic recovery) time, automatically resume to running state;

C. Dry Run Protection

During the operation of the photovoltaic pump, for some reason, the output current is less than FE.17 (dry protection current detection), and after FE.18 (dry protection detection time) time, enters into standby protection state, while the keyboard warning "A.LuT"; after entering into the standby protection state and after FE.19 (dry protection automatic recovery)time, automatically resume to running state;

D. Over-current Protection

During the operation of the photovoltaic pump, for some reason, the output current is greater than FE.20(dry protection current detection), and after FE.21 (over current protection detection time) time, enters into standby protection state, while the keyboard warning " A.oLd "; after entering into the standby protection state and after FE.22 (over current automatic recovery)time, automatically resume to running state;

E. Minimum Power Protection

During the operation of the photovoltaic pump, for some reason, the output power is less than FE.23(minimum power protection value), and after FE.24 (minimum power protection detection time) time, enters into standby protection state, while the keyboard warning "A.LPr"; after entering into the standby protection state and after FE.25 (minimum power automatic recovery)time, automatically resume to running state;

F. Full Water Protection

Detect the water full alarm and low water level through two X terminals, realizing automatic level control. Wherein FE.27 is the water overflow protection detection time and FE.28 is full water protection exit time, and X 3 terminal is defined as full solar water detection alarm, and X4 terminal is defined as full solar water detection alarm reset, the warning signal is shown as "A.Ful". If for water floating switch, please contact for technical support.

G. Alarm Recovery Mode: 0: automatic recovery; 1: manual recovery

This option is for low frequency protection, dry protection, over-current protection, minimum power function; you can select the alarm restoration by FE.26. When you select 0 for automatic recovery, during fault warning displaying, you can also press the "RESET" button to stop operation; during fault warning displaying, you can press the "RESET" button to manually clear, you can also press "RESET" button to achieve stop operation.

H. PQ Curve Function

This model provides a self-defined PQ curve for users to set up five groups of PQ corresponding points according to the pump cases, to achieve real-time traffic speed, daily flow, cumulative flow, generating capacity, cumulative electricity consumption; of which by default, daily flow and generating capacity are calculated based on 7h in a day.

I. Status Check

When the photovoltaic pump is running, you can check FE.01 to confirm the current operating status.