Contents

Chapter 1 Safety Requirement and Cautions

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

1.1 Safety Definition

Danger: it will cause danger of serious injuries and even death while operating against the rules.

Caution: it will cause danger of light injuries or equipment destruction while operating against the rules.

Note: some information is useful while operating and use frequency VFD.

1.2 Safety Requirements and Cautions

●Before Installation

Danger
1.The solar pump shall be installed in restricted access cabinet or area and is accessed by qualified electric service personnel only.

Danger
1.To reduce the risk of electric shock, do not perform any servicing other than that specified in the operating instructions unless you are qualified to do so.

●Installation

Danger
1. Please install the frequency VFD on metal or other nonflammable material, and keep it away from the combustible material. Otherwise there is danger of fire. 2. No unauthorized modification to the frequency VFD; Otherwise there is danger of damaged. 3. Normal frequency VFD, which is not explosion-proof, can not be installed where with explosive gas or dust; Otherwise there is danger of explosion.

Attention
1. When two frequency VFDs are installed in the same control cabinet, pleas pay attention to the installing place to guarantee the effective heat dissipation. 2. When carrying the frequency VFD, ease support its bottom.

●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 VFD. 5. No drop of bolt, spacer, metal stick, conducting wire or other things into the inner of frequency VFD; Otherwise there is a danger of fire or damage to frequency VFD.

Attention
1. If the damage to frequency VFD or other equipment is caused by improper wiring and utilization or unauthorized alteration, the user should shoulder all responsibilities.
2. Please make sure all wirings meet EMC requirement and satisfy safety standard in the local area; Please refer to recommendations in this manual or national standards of wire diameter to avoid accidents.
3. Static electricity on human body would seriously damage internal MOS transistor, etc. No touch the printed circuit boards, IGBT or other internal devices without anti-static measure, otherwise it will cause the malfunction of frequency VFD.
4. Please don't connect phase shifter capacitance or LC/RC noise filter to the output circuit of frequency VFD; Otherwise it will damage the frequency VFD.
5. Please don't connect the magnetic switch or magnetic contactor to the output circuit of frequency VFD; When frequency VFD is in the operation with load, magnetic switch or magnetic contactor can make VFD over-current protection function act. It will damage frequency VFD seriously.
6. Please don't disassemble the panel cover, it only needs to disassemble the terminal cover when wiring.
7. It is forbidden to do any pressure test on frequency VFD, otherwise it will damage the frequency VFD.

●Before Electrification

Danger
1. Please make sure that voltage grade of power supply is consistent with frequency VFD'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 VFD and other equipment.
2. Before the frequency VFD is connected to the input power supply, make sure that the cover has been well fixed. Otherwise it will cause electric shock.
3. For the frequency VFDs whose storage time is over 1 year, when electrification, the voltage should be raised by booster from low to high. Otherwise it will damage the frequency VFD.

Attention
1. Check if all periphery fittings are wired properly according to the handbook; Otherwise it will cause accidents.

●After Electrification

Danger
1. After electrified, it is forbidden to open the cover, make wiring, and check up; Otherwise, it will cause the danger of electric shock.
2. After electrified, it is forbidden to contact internal wiring board and its parts. Otherwise it will cause the danger of electric shock.
3. Do not operate or touch frequency VFD with wet hand. Otherwise there is danger of damage to frequency VFD and electric shock.

Attention
1. Please set the parameter of frequency VFD cautiously; Otherwise it will damage equipment.

●Operation

| Danger |
|---|
| 1. Before running, please check and confirm the application range of the machine and equipment once more; Otherwise it will cause accidents. |
| 2. Please don't touch the cooling fan and braking resistance to check the temperature; Otherwise there is a danger of getting burn. |
| 3. Unprofessional workers are banned to check the signals in the running stage; Otherwise it will cause injuries and damage the equipment. |

Attention
1. Please don't turn off the equipment by switching off power; Please cut off the power supply after the electric machine stops running; Otherwise it will damage the frequency VFD.
2. Please avoid anything dropping into the equipment when the frequency VFD is running; Otherwise it will cause electric shock.

●Maintenance

Danger
1. Please don't maintain and repair the equipment with electric; Otherwise it will cause electric shock.
2. Before maintaining and repairing the frequency VFD, please make sure the indicator lights of power supply have completely turned off; Otherwise it may cause electric shock and damage the frequency VFD.
3. Persons who have not passed specialized train are not allowed to conduct the frequency VFD maintenance; Otherwise it may cause electric shock and damage the frequency VFD.

●Installation Instruction in IP54 Cabinet
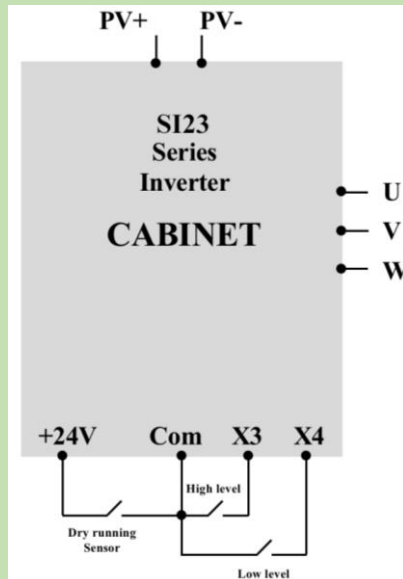
Note: 1. This VFD should be installed in IP54 cabinet by the professional engineers as the above pictures.

2. The whole controller should be maintained regularly by the professional engineers or authorized persons.

1.3 Cautions in Using

1. In application of this series frequency VFD, you have to confirm all machine insulation to prevent damage to the equipment. Moreover, when the motor working in tough environment, please periodic inspect the electrical insulation to ensure the safety of the system work.

2. If the motor adapter is not consistent with frequency VFD's rating current (The rating current of the motor is far smaller than that of frequency VFD), please adjust the protective value to ensure safe running.

3. In occasions such as load raises, usually there is negative torque and frequency VFD breaks off for over-current or over-voltage. In this case, you should consider choosing the matching brake unit.

4. Frequency VFD, in a certain output frequency range, can meet the mechanical resonance of the load equipment. To avoid it, you can set up jumping frequency.

5. As output voltage of the VFD is pulse-wave type, if there is capacity which can improve power factor or pressure-sensitive resistance which used for thunder-proof in the voltage output side, the frequency VFD will break off or its parts will be damaged, so it is necessary to dismantle them. Moreover, it is proposed not install switch parts like air switch and contactor (if it is necessary to install switch on output side, please make sure the output electricity of frequency VFD is zero when the switch is working).

6. At over 1,000 meters altitude, the VFD's heat dissipation function worsened due to the thin air, it is necessary to use less.

7. The VFD output voltage is pulse wave type. If using digital multi-meter measurement, deviation of the reading will be great. And the deviation is different by using different type of digital multi-meter. Under normal circumstances, while RMS 380V, digital multi-meter reading is around 450V.

8. Solar panel can be connected in the series or parallel. For rated voltage 380V controller, we suggest working voltage between 480V and 560V while MPPT. What means the solar panel open circuit voltage should be between 600V and 700V.

1.4 Technical Specification

Solar pump VFD specification

Items		specifications
Power input	Voltage, frequency	DC Input: D5:250VDC～800VDC
Output	Output voltage	Output under rated condition: 3 phase, 0Vac～380Vac, deviation<10%
	Output frequency range	G/P type: rated output frequency 50Hz (0~600Hz frequency conversion)
	Output frequency accuracy	Max frequency ±0.5%
	Overload capacity	G type: 150% rated current/1 min, 180% rated current/10s, 200% rated current/0.5s P type: 120% rated current/1 min, 140% rated current/10s, 150% rated current/0.5s
Main control performance	Motor type	Three-phase asynchronous motor; Permanent magnet synchronous motor (sine
	Control mode	V/F control, Open loop vector control, Closed loop vector control
	Modulation	Optimizing Space Voltage Vector PWM Modulation
	Carrier frequency	1.0kHz～16.0kHz

	Speed control	VC without PG: rated load 1:100; VC with PG: rated load 1:1000
	Steady speed	VC without PG: ≤2% rated synchronized speed; VC with PG: ≤0.05% rated
	Starting torque	VC without PG: 150% rated torque at 0.5Hz; VC with PG: 0Hz, 200% rated torque
	Torque response	VC without PG:<20ms; VC with PG: <10ms
	Frequency	Digital setting: max frequency×±0.01%; Analog setting: max frequency×±0.2%
	Frequency	Digital setting: 0.01Hz; Analog setting: max frequency×0.05%
Basic functions	Torque control	Torque setting calculation, torque mode speed limit
	DC braking	Starting frequency:0.00Hz～50.00Hz; Braking time:0.0s～60.0s; Braking
	Torque boost capacity	Automatic torque boost 0.0%～100.0%; Manual torque boost 0.0%～30.0%
	V/F curve	Four modes: linear torque characteristic curve, self-set V/F curve, torque reduction characteristic curve (1.1 to 2.0 power), square V/F curve
	Acceleration/Deceleration curve	2 modes: linear Acceleration/Deceleration and S curve Acceleration/Deceleration. 4 sets of ACC/DEC, time unit 0.01s selectable, longest time: 650.00s.
	Rated output voltage	Using the power supply voltage compensation function, the rated voltage of the motor is 100%, which can be set within the range of 50 to 100% (the output cannot exceed the input voltage).
	Voltage auto-adjustment	While power supply voltage fluctuates, it can auto-keep constant output voltage.
	Auto energy-saving	While under V/F control mode, according to load situation, auto-optimize output voltage to save energy.
	Auto-limit current	Auto-limit the current while running to prevent over current break trouble.
	Instant power off treatment	Uninterrupted operation through bus voltage control during instantaneous power loss.
	Standard functions	PID control, speed track, power off restart, jump frequency, upper/lower frequency limit control, program operation, multi- speed, RS485, analog output, frequency impulse output.
	Frequency setting channels	Keyboard digital setting, Analog voltage/current terminal AI1, Analog voltage/current terminal AI2, Communication given and multi-channel terminal selection, Main and auxiliary channel combination, expansion card, supporting different modes switch.
	Feedback input channel	Voltage/Current Terminal AI1, Voltage/Current Terminal AI12, Communication given, Low-speed pulse input PUL, extension card.
	Running command channel	Operation panel given, external terminal given, communication given, expansion card given.
	Input command signal	Start, stop, FWD/REV, JOG, multi-step speed, free stop, reset, ACC/DEC time selection, frequency given channel selection, external fault alarm.
	External output signal	1 relay output, 1 collector output, 1 AO output: 0V～10V output or 4mA～20mA output.
Protection function		Overvoltage, under-voltage, current limit, over-current, overload, electric thermal relay, overheat, overvoltage stall, data protection, rapid speed protection, input/output phase failure protection.
Keyboard display	LED display	Built-in keyboard: single line 5- digital tube display	monitor 1 VFD status quantity
		External keyboard: double line 5- digital tube	Monitor 2 VFD status quantities

	Parameter copy	Upload and download function code information of the VFD for fast parameter copying.
	Status monitor	Output frequency, given frequency, output current, input voltage, output voltage, motor speed, PID feedback, PID given value, module temperature etc. monitor parameters.
	Error alarm	Over-voltage, under-voltage, over-current, short circuit, phase failure, overload, overheat, overvoltage stall, current limit, or Data protection compromised, current fault health, historical fault record .
Environment	Install place	The altitude is less than 1000 meters, and the derating is more than 1000 meters. The derating is 1% for every 100 meters. No condensation, icing, rain, snow, hail, etc., solar radiation is less than 700W/m², air pressure 70 kPa～106kPa.
	Temperature, humidity	-10°C～+50°C, derating can be used above 40 °C, the maximum temperature is 60 °C (no-load operation), 5%~95%RH(no condensation) 5% to 95% RH (no condensation).
	Vibration	9Hz～200Hz,5.9m/s²(0.6G)
	Operation temperature	-10°C～+50°C
	Storage temperature	-30°C～+60°C
	Installation	Wall hanging
	Application	Indoor control system.
	Over voltage category	OVC II
	Pollution degree	PD 2
	Protection class	Class I
	Ingress Protection	IP20
	Cooling method	Forced air cooling

Note：The solar pump vfd is intended for installation within a closed electrical operating area.

Model Naming

SI23 – D5 – 004 G –A

Product Series	
SI	Solar Pump VFD
23	Series No.

Type	
D1	DC156V,suitable for driving AC110V pump
D3	DC311V,suitable for driving AC220V pump
D5	DC540V,suitable for driving AC380V pump
T3	DC540V,suitable for driving AC380V pump

Power	
Code	Suitable Pump
004	0.75kw
5R5	1.5kw
7R5	2.2kw

Type	
Code	Suitable Pump
G	Heavy Load
P	Light Load

Logo	
A	VEICHI Logo
	Blank Logo

System Specification

Solar pump VFD 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)					
SI23-D1 series,60VDC-400VDC input, 3 phase 110VAC-230VAC output							
0.75	0.75	110	1.0	400	175~380	7A	0-600
1.5	1.5	110	1.95	400	175~380	10A	0-600
SI23-D3 series,150VDC-450VDC input, 3 phase 220VAC-240VAC output							
0.75	0.75	220	1.0	450	360~430	4A	0-600
1.5	1.5	220	1.95	450	360~430	7A	0-600
2.2	2.2	220	2.86	450	360~430	10A	0-600
4	4	220	5.4	450	360~430	16A	0-600
5.5	5.5	220	8	450	360~430	20	0-600
7.5	7.5	220	10	450	360~430	30	0-600
11	11	220	14.3	450	360~430	42	0-600
15	15	220	19.5	450	360~430	55	0-600
18.5	18.5	220	23.4	450	360~430	70	0-600
22	22	220	28.6	450	360~430	80	0-600
30	30	220	39	450	360~430	110	0-600
37	37	220	48.1	450	360~430	130	0-600
45	45	220	58.5	450	360~430	160	0-600
55	55	220	71.5	450	360~430	200	0-600
SI23-D5 series, 250VDC-780VDC input, 3 phase 380VAC-460VAC output							
0.75	0.75	380	1.0	780	620~750	3.0	0-600
1.5	1.5	380	2.2	780	620~750	4.0	0-600
2.2	2.2	380	3.3	780	620~750	6.0	0-600
4	4	380	5.6	780	620~750	10	0-600
5.5	5.5	380	8	780	620~750	13	0-600
7.5	7.5	380	10	780	620~750	17	0-600
11	11	380	14.3	780	620~750	25	0-600
15	15	380	19.5	780	620~750	32	0-600
18.5	18.5	380	23.4	780	620~750	38	0-600
22	22	380	28.6	780	620~750	45	0-600
30	30	380	39	780	620~750	60	0-600
SI23-T3 series,350VDC-780VDC input,3phase 380VAC-440VAC output							
37	37	380	48.1	780	620~750	75	0-600
45	45	380	58.5	780	620~750	90	0-600
55	55	380	71.5	780	620~750	110	0-600
75	75	380	97.5	780	620~750	150	0-600
90	90	380	121.5	780	620~750	180	0-600
110	110	380	148.5	780	620~750	210	0-600
132	132	380	178.2	780	620~750	250	0-600
160	160	380	216	780	620~750	310	0-600
185	185	380	249.75	780	620~750	340	0-600
200	200	380	270	780	620~750	380	0-600
220	220	380	297	780	620~750	415	0-600
250	250	380	337.5	780	620~750	470	0-600

| 280 | 280 | 380 | 378 | 780 | 620~750 | 510 | 0-600 |
315	315	380	425.25	780	620~750	600	0-600
355	355	380	479.25	780	620~750	670	0-600
400	400	380	540	780	620~750	750	0-600
450	450	380	607.5	780	620~750	810	0-600
500	500	380	675	780	620~750	860	0-600
560	560	380	756	780	620~750	990	0-600
630	630	380	850.5	780	620~750	1100	0-600
710	710	380	958.5	780	620~750	1260	0-600

1.5 Cautions in Disposal

When you dispose frequency VFD, please pay attention to:

1. Electrolytic capacitor: the electrolytic capacitor of main circuit or the printing plate may explode when they are burned.

2. Plastic: plastic incineration may generate toxic gases.

3. Dispose method: please dispose as industrial waste.

Chapter 2 Installation and Wiring

## 2.1 Dimension of VFD

Overall Dimension of VFD (Plastic)
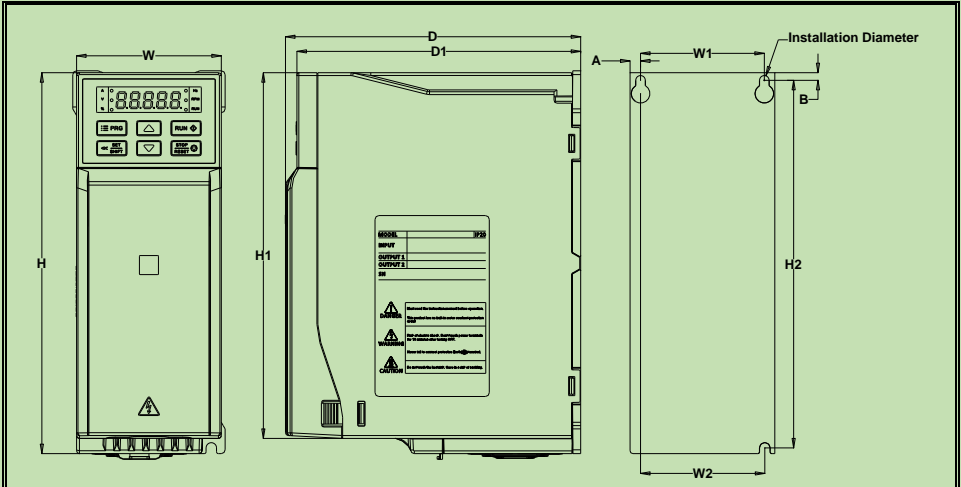
MODEL	Overall Dimension(mm)					Installation Dimension(mm)					Aperture
	W	H	H1	D	D1	W1	W2	H2	A	B	
SI23-D3-R75G-A	76	200	192	155	149	65	65	193	5.5	4	φ3-M4
SI23-D3-1R5G-A											
SI23-D3-2R2G-A	100	242	231	155	149	84	86.5	231.5	8	5.5	φ3-M4
SI23-D3-004G-A											
SI23-D5-R75G-A	76	200	192	155	149	65	65	193	5.5	4	φ3-M4
SI23-D5-1R5G-A											
SI23-D5-2R2G-A											
SI23-D5-004G-A	100	242	231	155	149	84	86.5	231.5	8	5.5	φ3-M4
SI23-D5-5R5G-A											
SI23-D5-7R5P-A											
SI23-D5-7R5G-A	116	320	307.5	175	169	98	100	307.5	9	6	φ3-M5
SI23-D5-011P-A											
SI23-D5-011G-A											
SI23-D5-015P-A											
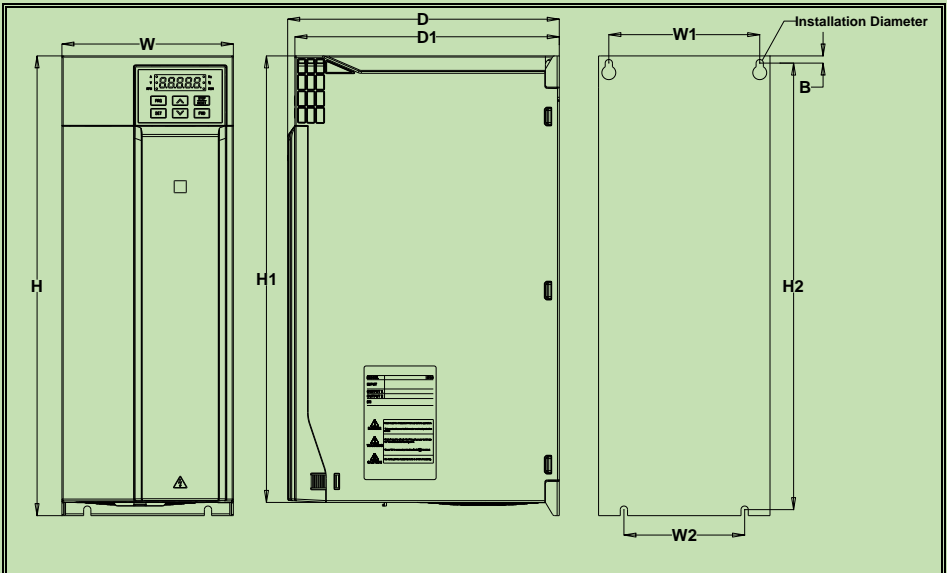
MODEL	Overall Dimension(mm)					Installation Dimension(mm)				Aperture
	W	H	H1	D	D1	W1	W2	H2	B	
SI23-D5-015G-A	142	383	372	225	219	125	100	372	6	φ4-M5
SI23-D5-018P-A										
SI23-D5-018G-A										
SI23-D5-022P-A										
SI23-D5-022G-A										
SI23-D5-030P-A										
SI23-D5-030G-A	172	430	/	255	219	150	150	416.5	7.5	φ4-M5
SI23-T3-037P-A										
SI23-T3-037G-A										
SI23-T3-045P-A										

Overall Dimension of VFD (Steel)
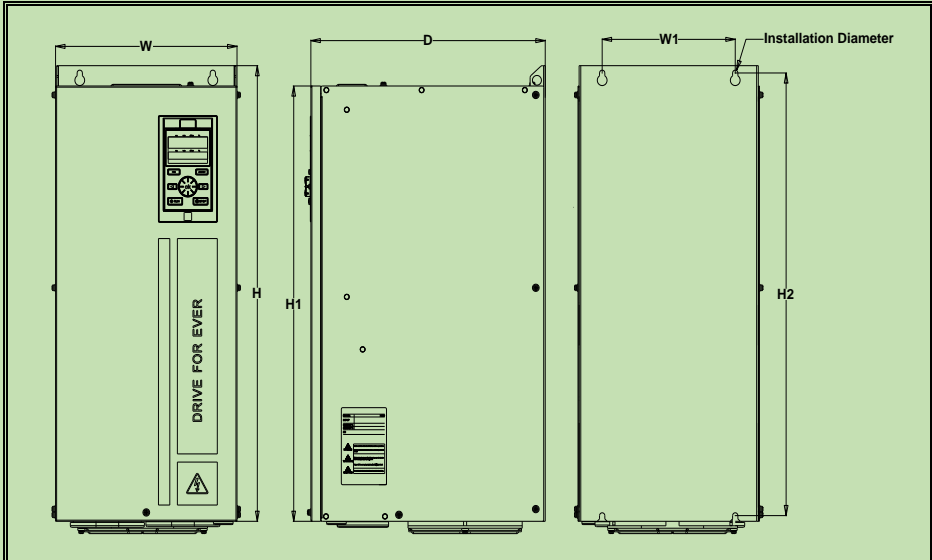
MODEL	Overall Dimension(mm)				Installation Dimension(mm)		Aperture
	W	H	H1	D	W1	H2	
SI23-T3-045G-A	240	560	535	310	176	544	φ4-M6
SI23-T3-055P-A							
SI23-T3-055G-A							
SI23-T3-075P-A							
SI23-T3-075G-A							
SI23-T3-090P-A							
SI23-T3-090G-A	270	638	580	350	195	615	φ4-M8
SI23-T3-110P-A							
SI23-T3-110G-A							
SI23-T3-132P-A							
SI23-T3-132G-A	350	738	680	405	220	715	φ4-M8
SI23-T3-160P-A							
SI23-T3-160G-A							
SI23-T3-185P-A							
SI23-T3-185G-A	360	940	850	480	200	910	φ4-M16
SI23-T3-200P-A							
SI23-T3-200G-A							
SI23-T3-220P-A							
SI23-T3-220G-A							
SI23-T3-250P-A							
SI23-T3-250G-A	370	1140	1050	545	200	1110	φ4-M16
SI23-T3-280P-A							

SI23-T3-280G-A							
SI23-T3-315P-A							
SI23-T3-315G-A	400	1250	1140	545	240	1213	φ4-M16
SI23-T3-355P-A							
SI23-T3-355G-A							
SI23-T3-400P-A							
SI23-T3-400G-A							
SI23-T3-450P-A							
SI23-T3-450G-A	460	1400	1293	545	300	1363	φ4-M16
SI23-T3-500P-A							
SI23-T3-500G-A							
SI23-T3-560P-A							
SI23-T3-560G-A							
SI23-T3-630P-A							

Dimension of VFD (Cabinet)
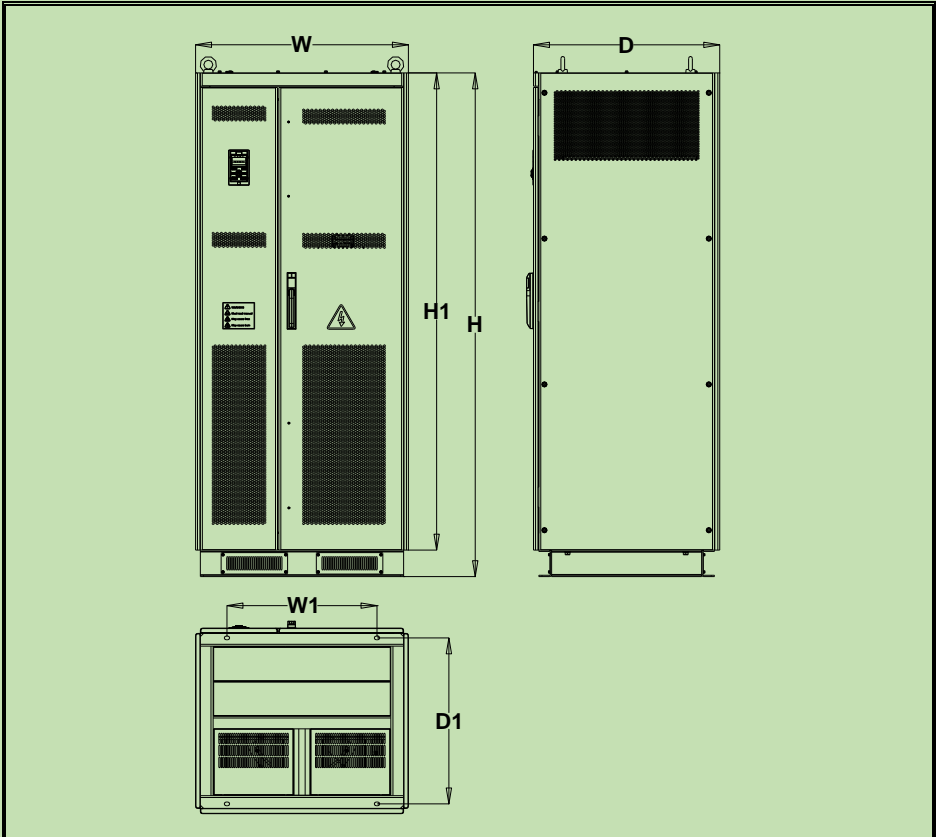
MODEL	Overall Dimension(mm)				Installation		Aperture
	W	H	H1	D	W1	H2	
SI23-T3-630G-A	800	1900	1800	700	564	626	φ14
SI23-T3-710P-A							
SI23-T3-710G-A							
SI23-T3-800P-A							

2.2 Solar Pump Controller Wiring

● **Standard Connection Diagram**
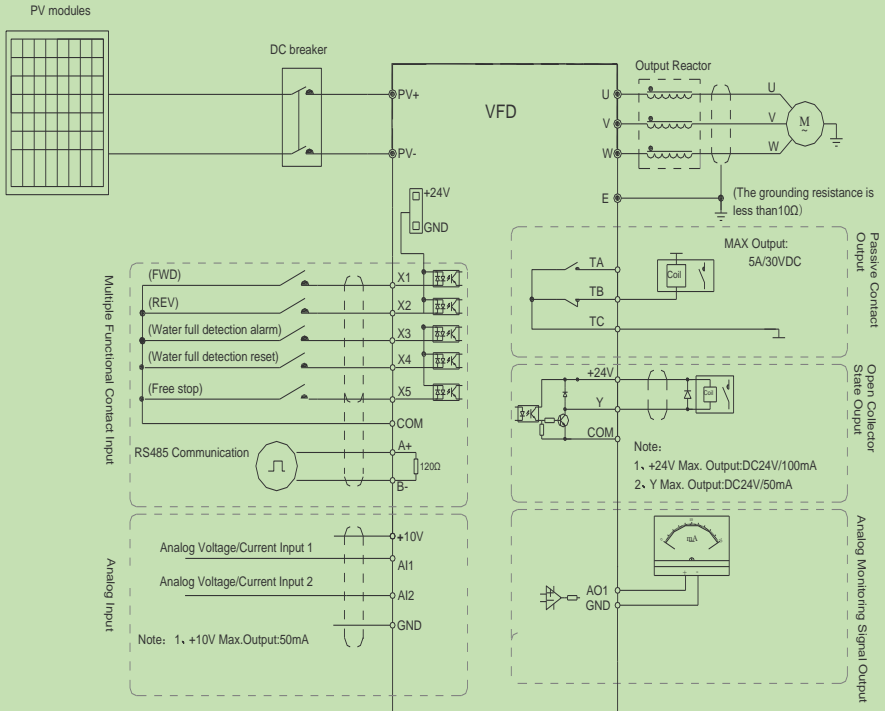
Note: 1.When connect solar panel, please connect PV+/PV-.

2.The communication interface of the PCE is considered as DVC A. The external signal communication interface is considered as SELV. The compatibility shall be considered when the communication interfaces are connected.

● Auxiliary Terminal Output Capacity

Terminal	Function Definition	Max Output
+10V	10V auxiliary power supply output, constitutes loop with GND.	50mA
A0	Analog monitor output, constitutes loop with GND.	Max output 2mA as frequency, voltage signal
+24V	24V auxiliary power supply output, constitutes loop with COM.	100mA
Y	Collector open circuit output; can set the action-object by program.	DC24V/50mA
TA/TB/TC	Passive connector output; can set the action-object by program.	5A/30VDC

● Function Specification of Switch Terminals

Switch Terminal	Selecting Position	Function Specification
RS485 OFF ☐☐ ON AO-F OFF ☐☐ ON AO-I OFF ☐☐ ON AO-U OFF ☐☐ ON AI1 U ☐☐ I AI2 U ☐☐ I	RS485 Terminal Resistor	RS485 Communication :connect with 120Ω terminal resistor
	AO-F Output- frequency	0kHz～100kHz frequency output
	AO-I Output- Current	0mA～20mA current output or 4mA～20mA current output
	AO-U Output- Voltage	0V～10V voltage output
	AI1 Input- Current/Voltage	AI1: Input 0mA～20mA or 0V～10V
	AI2 Input- Current/Voltage	AI2: Input 0mA～20mA or 0V～10V

2.3 Recommended main circuit components specification

Model	Contactor Specification	Circuit Breaker Specification
SI23-D5-R75G-A	10A	10A
SI23-D5-1R5G-A	10A	10A
SI23-D5-2R2G-A	16A	15A
SI23-D5-004G-A	16A	20A
SI23-D5-5R5P-A	25A	20A
SI23-D5-5R5G-A	25A	20A
SI23-D5-7R5P-A	25A	30A
SI23-D5-7R5G-A	25A	30A
SI23-D5-011P-A	32A	40A
SI23-D5-011G-A	32A	40A
SI23-D5-015P-A	40A	50A
SI23-D5-015G-A	40A	50A
SI23-D5-018P-A	50A	60A
SI23-D5-018G-A	50A	60A
SI23-D5-022P-A	50A	75A
SI23-D5-022G-A	50A	75A
SI23-D5-030P-A	63A	100A
SI23-D5-030G-A	63A	100A
SI23-T3-037G-A	80A	125A
SI23-T3-045G-A	100A	150A
SI23-T3-055G-A	125A	175A
SI23-T3-075G-A	160A	200A
SI23-T3-090G-A	220A	250A
SI23-T3-110G-A	220A	300A
SI23-T3-132G-A	250A	400A
SI23-T3-160G-A	300A	500A
SI23-T3-185G-A	400A	600A
SI23-T3-200G-A	400A	700A
SI23-T3-220G-A	630A	800A
SI23-T3-250G-A	630A	1000A
SI23-T3-280G-A	630A	1200A
SI23-T3-315G-A	630A	1200A
SI23-T3-355G-A	800A	1400A

SI23-T3-400G-A	1000A	1600A
SI23-T3-450G-A	1000A	2000A
SI23-T3-500G-A	1000A	2000A
SI23-T3-560G-A	1200A	2000A
SI23-T3-630G-A	1200A	2000A
SI23-T3-710G-A	1400A	2000A

2.4 Main circuit wiring of solar VFD

Model	Specifications of Screws for Main Circuit Terminal (mm)	Recommended Fixed Torque (N·m)	Specifications of Recommended Copper Core Cable (mm2) (AWG)
SI23-D1-R75G-A	M3	0.8~1.0	2.5mm2(12)
SI23-D1-1R5G-A	M3.5	1.2~1.5	4mm2(10)
SI23-D3-R75G-A	M3	0.8~1.0	2.5mm2(12)
SI23-D3-1R5G-A	M3	0.8~1.0	2.5mm2(12)
SI23-D3-2R2G-A	M3.5	1.2~1.5	4mm2(10)
SI23-D3-004G-A	M3.5	1.2~1.5	4mm2(10)
SI23-D3-5R5G-A	M4	1.2~1.5	10mm2(7)
SI23-D3-7R5G-A	M6	4~6	16mm2(5)
SI23-D3-011G-A	M6	4~6	16mm2(5)
SI23-D3-015G-A	M6	4~6	25mm2(3)
SI23-D3-018G-A	M6	4~6	25mm2(3)
SI23-D3-022G-A	M6	4~6	25mm2(3)
SI23-D3-030G-A	M8	8~10	35mm2(2)
SI23-D3-037G-A	M8	8~10	50mm2(1)
SI23-D3-045G-A	M8	8~10	50mm2(1)
SI23-D3-055G-A	M8	8~10	70mm2(2/0)
SI23-D5-R75G-A	M3	0.8~1.0	1.5mm2(14)
SI23-D5-1R5G-A	M3	0.8~1.0	2.5mm2(12)
SI23-D5-2R2G-A	M3	0.8~1.0	2.5mm2(12)
SI23-D5-004G-A	M3.5	1.2~1.5	4mm2(10)
SI23-D5-5R5P-A	M3.5	1.2~1.5	6mm2(9)
SI23-D5-5R5G-A	M3.5	1.2~1.5	6mm2(9)
SI23-D5-7R5P-A	M4	1.2~1.5	6mm2(9)
SI23-D5-7R5G-A	M4	1.2~1.5	6mm2(9)
SI23-D5-011P-A	M4	1.2~1.5	10mm2(7)
SI23-D5-011G-A	M4	1.2~1.5	10mm2(7)
SI23-D5-015P-A	M6	4~6	10mm2(7)
SI23-D5-015G-A	M6	4~6	10mm2(7)
SI23-D5-018P-A	M6	4~6	16mm2(5)
SI23-D5-018G-A	M6	4~6	16mm2(5)
SI23-D5-022P-A	M6	4~6	16mm2(5)
SI23-D5-022G-A	M6	4~6	16mm2(5)
SI23-D5-030P-A	M6	4~6	25mm2(3)

SI23-D5-030G-A	M6	4~6	25mm2(3)
SI23-T3-037G-A	M6	4~6	25mm2(3)
SI23-T3-045G-A	M8	8~10	35mm2(2)
SI23-T3-055G-A	M8	8~10	35mm2(2)
SI23-T3-075G-A	M8	8~10	50mm2(1)
SI23-T3-090G-A	M8	8~10	50mm2(1/0)
SI23-T3-110G-A	M8	8~10	70mm2(2/0)
SI23-T3-132G-A	M12	14~16	95mm2(3/0)
SI23-T3-160G-A	M12	14~16	95mm2(4/0)
SI23-T3-185G-A	M12	14~16	120mm2
SI23-T3-200G-A	M12	14~16	150mm2
SI23-T3-220G-A	M12	14~16	150mm2
SI23-T3-250G-A	M12	14~16	185mm2
SI23-T3-280G-A	M12	14~16	185mm2
SI23-T3-315G-A	M16	20~23	240mm2
SI23-T3-355G-A	M16	20~23	240mm2
SI23-T3-400G-A	M16	20~23	300mm2
SI23-T3-450G-A	M16	20~23	400mm2
SI23-T3-500G-A	M16	20~23	400mm2
SI23-T3-560G-A	M16	20~23	500mm2
SI23-T3-630G-A	M16	20~23	500mm2
SI23-T3-710G-A	M16	20~23	500mm2

Chapter 3 Keyboard layout and functions specification

● **Keyboard Appearance**

● **Key Function**

Key	Name	Function
≡ PRG	Menu key	Enter menu while standby or running. Presses this key to return while modify parameter. While standby or running, press for 1 sec to enter condition monitoring interface.
<< SET SHIFT	Confirm/Shift key	Press to modify parameter while in menu interface. Press again to confirm after modifying; Press this key for 1 Sec to shift digit, and long press to cycle. Each digit flashes three time to shift to next digit.
▲ ▼	Up/down key	Select parameter group in menu interface. Modify parameter in modify state. Modify given frequency, ID given while at standby or monitoring state (While given frequency, PID are set by keyboard and **[F4.09]** needs to be set.
RUN ◇	Run key	While run/stop is controlled by keyboard, press this key, VFD forward runs, and the indicator is always on. While reverse, the indicator sparks.
STOP RESET ◇	Stop/reset key	Machine stops if press it while run/stop is controlled by keyboard. Its efficiency range is defined by **[F4.08]**. VFD resets if press it in fault state (no reset if fault is not solved).

Chapter 4 Fault Diagnosis and Solution

This chapter describes the VFD fault, alerts, and operation of the failure on the VFD, the display information on VFD and countermeasures.

Fault Information and Description in Detail

Keypad display	Fault code	Fault type	Possibility reason	Troubleshooting
E.LU2	E.LU2	Under voltage at runs	●Power voltage too low ●DC main contactor don't close	●Check input power to solve ●Ask support
E.oU1	E.oU1	Over voltage at acceleration	●Power voltage fluctuation over limit ●Too start rotating motor	●Check power grid ●Restart until motor is stop completely, or set [F1.00] set for 1 or 2
E.oU2	E.oU2	Over voltage during deceleration	●Deceleration time too small ●The driving load too heavy ●Power voltage fluctuation over limit	●Prolong deceleration time ●Reduce the load, or select bigger capacitor drive, or connect braking unit ●Check input power
E.oU3	E.oU3	Overvoltage at constant speed	●The input voltage is too high ●An external force drives the motor during deceleration	●Adjust the voltage to normal range ●Cancel the external force or install the braking resistor
E.oU4	E.oU4	Over voltage at stop	●Voltage fluctuate above limit	●Check the input voltage
E.oC1	E.oC1	Over current during acceleration	●Acceleration time is too short ●To start rotating motor ●V/F setting not correct or torque boost setting too big ●Solar drive capacitor is too small	●Prolong acceleration time ●Restart motor when it on still, or set F1.00 for 1 or 2 ●Reset V/f curve or torque boost setting
E.oC2	E.oC2	Over current during deceleration	●The output circuit is grounded or short circuited. ●Motor auto-tuning is not performed ●The acceleration time is too short ●Manual torque boost or V/F curve is not appropriate ●The voltage is too low	●Eliminate external faults ●Perform the motor auto tuning ●Increase the acceleration time ●Adjust the manual torque boost or V/F curve ●Adjust the voltage to normal range ●Select rotational speed tracking restart or start the motor after it stops

			●The startup operation is performed on the rotating motor ●A sudden load is added during acceleration ●The AC drive model is of too small power class	●Remove the added load. ●Select an AC drive of higher power class
$E.oC3$	E.oC3	Over current at constant speed	●The output circuit is grounded or short circuited ●Motor auto-tuning is not performed ●The voltage is too low ●A sudden load is added during operation ●The AC drive model is of too small power class	●Eliminate external faults ●Perform the motor auto tuning ●Adjust the voltage to normal range ●Remove the added load ●Select an AC drive of higher power class
$E.oL1$	E.oL1	Motor overload	●Boost torque is too big under VF control ●ACC. and DEC. time is too short ●Motor parameters setting is improperly ●Restart motor which in counter rotate ●The grid voltage is too lower ●Load is too big or motor block load ●AC drive selected is too load	●Reduce boost torque ●Increase the ACC./DEC. time ●Reset motor parameters ●Reduce current limit and adopt speed tracking ●Check grid voltage ●Check load condition ●Change bigger power AC drive
$E.oL2$	E.oL2	AC drive overload	●Boost torque is too big under VF control ●ACC. and DEC. time is too short ●Motor parameters setting is improperly ●Restart motor which in counter rotate ●The grid voltage is too lower ●Load is too big or motor block load ●AC drive selected is too load	●Reduce boost torque ●increase the ACC./DEC. time ●reset motor parameters ●Reduce current limit and adopt speed tracking ●Too check grid voltage ●Too check load ●change bigger power AC drive

E. SC	E.SC	System abnormal	●Deceleration is too short ●Short circuit of solar drive output or phase output short circuit to ground ●Module damage ●EMC interface	●Prolong acceleration time ●To check peripheral equipment ●Ask to support ●Check the wiring layout, cable ground
E.oH1	E.oH1	VFD over-heat	●Temperature is too high ●Air channel is blocked ●Fan connection parts is loose ●Fan is damaged ●Temperature detection circuit fault	●Make the environment meet the requirement ●Clear the air channel ●Check and reconnect the wire ●Change the same new fan ●Seek support from factory
E.oH2	E.oH2	Rectifier over-heat	●Temperature is too high ●Air channel is blocked ●Fan connection parts is loose ●Fan is damaged ●Temperature detection circuit fault	●Make the environment meeting the requirement ●Clear the air channel ●Check and reconnect the wire ●Change the same new fan ●Seek support from factory
E.TE1	E.TE1	Motor static detection fault	●Detection overtime ●Start static detection while motor is running ●Capacitance difference is too big between motor and VFD ●Motor parameter setting mistake	●Check motor connection wire ●Detect after motor stopping totally ●Change VFD model ●Reset parameter according to nameplate
E.TE2	E.TE2	Motor rotation detection fault	●Detect while motor is running ●Detect with load ●Detection overtime ●Capacitance difference is too big between motor and VFD ●Motor parameter setting mistake	●Detect after motor stop totally ●Re-detect without load ●Check motor connection wire ●Change VFD model ●Reset parameter according to nameplate
E.EEP	E.EEP	Memory fault	●Electromagnetic disturb in memory period ●EEPROM damage	●Resume load and save ●Seek support from factory
L iFE	LiFE	Reserved		

$E.iLF$	E.iLF	Input phase loss	●3-phase input power open phase	●Check 3-phase power supply and the phase ●Check 3-phase power supply wiring
$EoLF$	E.oLF	Output phase loss	●3-phase output power open phase	●Check 3-phase output voltage and current ●Check wiring
$EGnd$	E.Gnd	Output earth terminal short circuit.	●Check wiring and insulation	●Output earth
$EHAL$	E.HAL	Current detection fault	●Detect circuit fault ●Phase imbalance	●Seek support from factory ●Check motor and wiring
$EPAn$	E.PAn	Keyboard connect fault	●Keyboard wire fault ●Keyboard component damage	●Check keyboard wire ●Seek support from factory
$E.CE$	E.CE		●Unsuitable baud rate setting ●Communication wire breaks ●Communication format does not match upper machine.	●Set suitable baud rate setting ●Check communication wire. ●Make sure right communication format	●RS485communication fault
$ECPE$	E.CPE	Parameter copy fault	●Parameter copy communication is fault ●Copy keyboard does not match the VFD	●Check wire ●Select the specified external keyboard model

Alarm Information and Description in Detail

Keypad display	Alarm code	Alarm type	Possibility reason	Troubleshooting
	A.LPn	Dormancy Protection	●Solar voltage is too low	●Check the solar power ●Check F21.11/F21.12/F21.13 settings
	A.LFr	Low Frequency Protection	●Output frequency is too low ●Solar power is not enough	●Check the solar power ●Check F21.14/F21.15/F21.16 settings
	A.LuT	Dry Run Protection	●Current is very low ●Pump load is very low ●Water is not enough in borehole	●Please check the water level in borehole ●Check F21.17/F21.18/F21.19 settings

22

	A.Old	Pump Over Current Protection	●Current is higher than set	●Check the pump load ●Check F21.20/F21.21/F21.22 settings
	A.LPr	Minimum Power Protection	●Output power is very low	●Check the solar power ●Check F21.23/F21.24/F21.25 settings
	A.FuL	Water Fulfilled Protection	●Water tank is fulfilled	●Please check the water tank ●Check F21.27/F21.28
	A.LU1	Bus voltage too low	Check the value of the input voltage	

Chapter 5 Parameters List

This chapter just provides function parameter table. Specifications refer to SI23 technical manual.

● **Environment setting**

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F00.03(0x0003)	Initialization	V/F SVC FVC Set the VFD initialization method 0: Not initialized 11: Select the set value according to the purpose to carry out the parameters (excluding the motor parameters) 22: All parameters are initialized 33: Clear the fault record	0 (0～33)	
F00.04(0x0004)	Keyboard parameter copy	V/F SVC FVC 0: No function 11: Upload parameters to the keyboard 22: Download parameters to the VFD	0 (0～9999)	
F00.05(0x0005)	User password	V/F SVC FVC Used to set the user password.	0 (0～65355)	

● **Basic parameters**

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F01.00(0x0100)	Motor control mode	V/F SVC FVC The way the motor is controlled. 0: AM-VF; VF control 1: AM-SVC; Open loop vector control, current closed loop control 10: PM-VF; VF control 11: PM-SVC; Open-loop vector control 12: PM-FVC; Closed-loop vector control 16: SRM-SVC; Open-loop vector control	0 (0～20)	
F01.01(0x0101)	Run command channel	V/F SVC FVC Used to select the channel that the drive accepts the run and stop commands and the direction of travel. 0: Keyboard control (external keyboard priority) 1: Terminal control 2: RS485 communication control 3: Reserved	0 (0～3)	

F01.02(0x0102)	Frequency reference source channel A	V/F SVC FVC The frequency converter sets the given source of the frequency. 0: Keyboard digital given frequency 1: Keyboard analog potentiometer given 2: Current/voltage analog AI given 3: Reserved 4: Reserved 5: Terminal pulse PUL given 6: RS485 communication given 7: Terminal UP/DW control 8: PID control given 9: Program Control (PLC) given 10: Option card 11: Multi-speed speed given	0 (0～11)	
F01.09(0x0109)	Keyboard digital given frequency	V/F SVC FVC Used to set and modify the keyboard digital setting frequency.	50.00Hz (0.00Hz～upper limit frequency setting)	
F01.10(0x010A)	Maximum frequency	V/F SVC FVC The maximum frequency that the frequency converter can set.	50.00Hz (upper limit frequency～600.00Hz)	
F01.12(0x010C)	Upper limit frequency digital setting	V/F SVC FVC The upper line frequency is given when F01.11 is set to 0.	0.00Hz (0.00Hz～upper limit frequency digital setting)	
F01.13(0x010D)	Lower limit frequency	V/F SVC FVC Given a lower frequency limit, the given frequency is limited.	0.00Hz (0.00Hz～upper limit frequency digital setting)	
F01.22(0x0116)	Acceleration time 1	V/F SVC FVC The time required for the output frequency to accelerate from 0.00 Hz to the time reference frequency. 1s～65000s(F01.21 = 0) 0.1s～6500.0s(F01.21 = 1) 0.01s～650.00s(F01.21 = 2)	Model setting (0.01s～650.00s)	
F01.23(0x0117)	Deceleration time 1	V/F SVC FVC The time it takes for the output frequency to decelerate from the time reference frequency to 0.00 Hz.	Model setting (0.01s～650.00s)	

F01.40(0x0128)	Carrier frequency	V/F SVC FVC Used to set the switching frequency of the VFD IGBT.	4.0kHz (1.0kHz～ 16.0kHz)	

● **Motor Parameters**

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F02.00(0x0200)	Motor type	V/F SVC FVC Set the type of motor 0: Asynchronous motor (AM) 1: Reserved	0 (0～1)	
F02.01(0x0201)	Pole number	V/F SVC FVC Set the number of motor stages.	4 (2～98)	
F02.02(0x0202)	Motor rated power	V/F SVC FVC Set the rated power of the motor.	Model setting (0.1kW～ 1000.0kW)	
F02.03(0x0203)	Motor rated frequency	V/F SVC FVC Set the rated frequency of the motor.	Model setting (0.01Hz～ Maximum frequency)	
F02.04(0x0204)	Motor rated speed	V/F SVC FVC Set the rated speed of the motor.	Model setting (0rpm～ 65000rpm)	
F02.05(0x0205)	Motor rated voltage	V/F SVC FVC Set the rated voltage of the motor.	Model setting (0V～1500V)	
F02.06(0x0206)	Motor rated current	V/F SVC FVC Set the rated current of the motor.	Model setting (0.1A～3000.0A)	
F02.07(0x0207)	Motor parameter auto-tuning selection	V/F SVC FVC After the parameter auto-tuning is completed, the set value of [F02.07] will be automatically set to "0". 0: No operation 1: Rotary self-tuning 2: Static self-tuning 3: Stator resistance self-tuning	0 (0～3)	
F02.50(0x0232)	Motor online learning function selection	V/F SVC FVC 0: Invalid 1: Power-on self-learning 2: Run the initial segment self-learning 3: Self-learning in operation	0 (0～3)	

● **Vector Control**

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F03.02(0x0302)	ASR (speed loop)proportional gain 1	SVC Set the ASR (speed loop) proportional gain 1.	10.00 (0.01～100.00)	
F03.03(0x0303)	ASR (speed loop) integration time 1	SVC Set the ASR (speed loop) integration time 1.	0.100s (0.000s～6.000s)	
F03.06(0x0306)	ASR (speed loop)proportional gain 2	SVC Set the ASR (speed loop) proportional gain 2.	10 (0.01～100.00)	
F03.07(0x0307)	ASR (speed loop) integration time 2	SVC Set the ASR (speed loop) integration time 2.	0.100s (0.000s～6.000s)	
F03.10(0x030A)	Current loop D-axis proportional gain	SVC Set the current loop D-axis proportional gain.	1.000 (0.001～4.000)	
F03.11(0x030B)	Current loop D-axis integral gain	SVC Set the current loop D-axis integral gain.	1.000 (0.001～4.000)	
F03.12(0x030C)	Current loop Q-axis proportional gain	SVC Set the current loop Q-axis proportional gain.	1.000 (0.001～4.000)	
F03.13(0x030D)	Current loop Q-axis integral gain	SVC Set the current loop Q-axis integral gain.	1.000 (0.001～4.000)	

● **V/F Control**

Parameter (address) adjustable attribute	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F04.00(0x0400)	Linear VF curve selection	V/F Used to select the type of V/F curve to meet different load features. 0: Straight line VF curve 1-9: Respectively, a power VF curve of 1.1-1.9 10: Square VF curve 11: Custom VF curve	0 (0～11)	
F04.01(0x0401)	Torque boost	V/F 0.0%: automatic torque boost 0.1%～30.0%: manual torque boost	0.0% (0.0%～30.0%)	

● **I/O Terminals**

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F05.00(0x0500)	Terminal X1 function selection	V/F SVC FVC See the function of terminal X for details.	1 (0～63)	
F05.01(0x0501)	Terminal X2 function selection	V/F SVC FVC See the function of terminal X for details.	2 (0～63)	
F05.02(0x0502)	Terminal X3 function selection	V/F SVC FVC See the function of terminal X for details.	4 (0～63)	
F05.03(0x0503)	Terminal X4 function selection	V/F SVC FVC See the function of terminal X for details.	8 (0～63)	
F05.50(0x0532)	AI lower limit	V/F SVC FVC Define the signal received by the terminal. The voltage signal below this value is processed by the limit value.	0.0% (0.0%～100.0%)	
F05.51(0x0533)	AI lower limit corresponding setting	V/F SVC FVC Set the percentage of the corresponding set value	0.0% (-100.0%～100.0%)	
F05.52(0x0534)	AI upper limit	V/F SVC FVC Define the signal received by the terminal. The voltage signal above this value is processed according to the upper limit value.	100.00% (0.00%～100.00%)	
F05.53(0x0535)	AI upper limit corresponding setting	V/F SVC FVC Set the percentage of the corresponding set value.	100.00% (0.00%～100.00%)	
F06.00(0x0600)	AO output mode selection	V/F SVC 0: 0V～10V 1: 4.00mA～20.00mA 2: 0.00mA～20.00mA 3: Reserved 4: Reserved	0 (0～4)	
F06.01(0x0601)	AO output selection	V/F SVC FVC 0: Given frequency 1: Output frequency 2: Output current 3: Input voltage 4: Output voltage 5: Mechanical speed	0 (0～19)	

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
		6: Given torque 7: Output torque 8: PID given 9: PID feedback amount 10: Output power 11: Bus voltage 12: VS input value 13: AI input value 14: AS input value 15: PUL input value 16: Module temperature 1 17: Module temperature 2 18: 485 communication given 19: Virtual terminal vY1		
F06.20(0x0614)	Output terminal polarity selection	V/F SVC FVC 0: Positive polarity 1: Negative polarity LED "0" digit: Y terminal LED "00" digit: Relay output terminal 1 LED "000" digit: Reserved LED "0000" digit: Reserved	0000 (0000～1111)	
F06.21(0x0615)	Output terminal Y	V/F SVC FVC See terminal Y function	1 (0～63)	
F06.22(0x0616)	Relay 1 output (TA-TB-TC)	V/F SVC FVC See terminal Y function	4 (0～63)	

● **Start/Stop Control**

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F07.05(0x0705)	Direction of rotation	V/F SVC FVC LED "0" digit: Reverse the running direction. 0: The direction is unchanged 1: Direction reversal LED "00" digit: No direction of operation. 0: Allow forward and reverse commands 1: Only forward commands are allowed 2: Only reverse command is allowed LED "000" digit: Frequency Control Command Direction. 0: The frequency control direction is invalid. 1: Frequency control direction is valid LED "0000" digit: Reserved.	0000 (0000～1111)	

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F07.06(0x0706)	Power failure restart action selection	V/F SVC FVC 0: Invalid 1: Valid	0 (0～1)	
F07.10(0x070A)	Stop mode	V/F SVC FVC 0: Deceleration stop 1: Free stop	0 (0～1)	

● **Protection Parameters**

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F10.00(0x0A00)	Overcurrent suppression	V/F SVC FVC The automatic limiting output current does not exceed the set overcurrent suppression point to prevent overcurrent faults from being triggered by excessive current. 0: Inhibition is always valid 1: Acceleration/deceleration is valid, constant speed is invalid	0 (0～1)	
F10.01(0x0A01)	Overcurrent suppression point	V/F SVC FVC Set the load current limit level, 100% corresponds to the rated motor current.	160.0% (0.0%～300.0%)	
F10.12(0x0A0C)	Bus overvoltage suppression point	V/F SVC FVC Set bus voltage value for trigger overvoltage suppression function.	T3: 780 S2: 370 (T3: 650～760 S2: 340～380) Also subject to overvoltage limit	T3 overvoltage point: 820V (750～840) S2 overvoltage point: 400V (360～410)
F10.16(0x0A10)	Bus undervoltage suppression	V/F SVC FVC When the bus voltage is lower than the undervoltage suppression point, the operating frequency is automatically adjusted to suppress the bus voltage from decreasing, preventing the undervoltage fault. 0: Off 1: On	0 (0～1)	
F10.17(0x0A11)	Bus undervoltage suppression point	V/F SVC FVC Set bus voltage value for trigger undervoltage suppression function.	T3: 430 S2: 240 (T3: 350～450 S2: 180～260) Also subject to overvoltage limit	T3 overvoltage point: 820V (750～840) S2 overvoltage point 400V (360～410)

F10.18(0x0A12)	Bus undervoltage suppression gain	V/F SVC Set the response effect of undervoltage suppression.	100.0% (0.0%～500.0%)	
F10.19(0x0A13)	Bus undervoltage protection point	V/F SVC The lower limit voltage allowed by the set bus voltage. Below this value, the VFD reports an undervoltage fault.	T3: 320 S2: 190 (T3: 300～400 S2: 160～240) Also subject to overvoltage limit	T3 overvoltage point: 820V (750～840) S2 overvoltage point 400V (360～410)
F10.20(0x0A14)	Input and output phase loss protection options	V/F SVC FVC Set whether the input and output phase loss protection functions are enabled. LED "0" digit: Output phase loss protection. 0: Off 1: On LED "00" digit: Input phase loss protection. 0: Off 1: On, detected the input missing phase report warning A.ILF, continue to run 2: Turn on, detect input missing phase report fault E.ILF, free stop	021 (000～121)	
F10.22(0x0A16)	Ground short circuit protection option	V/F SVC FVC Set whether the VFD output and the VFD cooling fan ground short circuit protection function are enabled. LED "0" digit: Output short circuit protection. 0: Off 1: On LED "00" digit: Fan to ground short circuit protection. 0: Off 1: On	11 (00～12)	
F10.23(0x0A17)	Fan ON/OFF control selection	Set the VFD cooling fan operation mode. 0: The fan runs after the VFD is powered on. 1: After the shutdown, the fan operation is related to temperature, and the operation is running. 2: After the shutdown, the fan stops after F10.24, and the operation is related to temperature.	1 (0～2)	

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F10.50(0x0A32)	Failure self-recovery	V/F SVC FVC Set the number of fault self-recovery that is allowed to be performed. Note: A value of 0 indicates that the fault self-recovery function is turned off; otherwise it indicates that the function is enabled.	0 (0～10)	
F10.51(0x0A33)	Failure self-recovery interval	V/F SVC FVC Set the waiting time before the VFD resets to the time before each reset.	1.0s (0.0s～100.0s)	
F10.52(0x0A34)	Numbers of failures recovered	V/F SVC FVC Indicates the number of self-recovery faults that have been performed. This parameter is a read-only parameter.	0	

● **Operation Parameters**

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F11.00(0x0B00)	Key lock selection	V/F SVC FVC 0: Not locked. 1: Keyboard function parameter modification lock. 2: Function parameters and non-start stop button lock. 3: Function parameters and button full lock.	0 (0～3)	
F11.01(0x0B01)	Key lock password	V/F SVC	0 (0～65535)	
F11.11(0x0B0B)	Parameter 1 showed up on first line of the keyboard	V/F SVC FVC LED "0" and "00" digit: Setting yy setting in monitoring parameter number Cxx.yy 00～63. LED "000" and "0000" digit: Monitoring parameter number Cxx.yy xx setting 00～07.	0000 (0000～0763)	
F11.12(0x0B0C)	Parameter 2 showed up on first line of the keyboard	V/F SVC FVC LED "0" and "00" digit: Setting yy setting in monitoring parameter number Cxx.yy 00～63. LED "000" and "0000" digit: Monitoring parameter number Cxx.yy xx setting 00～07.	0001 (0000～0763)	
F11.13(0x0B0D)	Parameter 3 showed up on first line of the	V/F SVC FVC LED "0" and "00" digit: Setting yy setting in monitoring parameter number Cxx.yy	0002 (0000～0763)	

	keyboard	00～63. LED "000" and "0000" digit: Monitoring parameter number Cxx.yy xx setting 00～07.		
F11.14(0x0B0E)	Parameter 4 showed up on first line of the keyboard	V / F SVC LED "0" and "00" digit: Monitor parameter number Cxx.yy YY setting 00～63. LED "000" and "0000" digit: Monitoring parameter number Cxx.yy XX setting 00～07.	0011 (0000～0763)	
F11.20(0x0B14)	Keyboard display item settings	V/F SVC FVC LED "0" digit: Output frequency display selection. 0: Target frequency 1: Operating frequency LED "00" digit: Reserved. 0: Invalid 1: Active power to remove stator resistance loss LED "000" digit: Power Display Dimensions. 0: Power display percentage (%) 1: Power display kilowatt (kW) LED "0000" digit: Reserved	0000 (0000～1111)	

● **Communication Parameters**

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F12.00(0x0C00)	Master-slave choice	V/F SVC FVC 0: Slave 1: Host	0 (0～1)	
F12.01(0x0C01)	Modbus communication address	V/F SVC FVC	1 (1～247)	
F12.03(0x0C03)	Modbus data format	V/F SVC FVC 0: (N, 8, 1) no parity, Data bits: 8, Stop position: 1 1: (E, 8, 1) even parity, Data bits: 8, Stop position: 1 2: (O, 8, 1) odd parity, Data bits: 8, Stop position: 1	0 (0～5)	

| | | 3: (N, 8, 2) no parity,
Data bits: 8,
Stop position: 2
4: (E, 8, 2) even parity,
Data bits: 8,
Stop position: 2
5: (O, 8, 2) odd parity,
Data bits: 8,
Stop position: 2 | | |

● **Monitoring parameters**

Parameter code (address)	Function Description	Content	Signal level of multi-function analog output	Notes
C00.00 (0x2100)	Given frequency	V/F SVC	10V corresponds to the maximum frequency	
C00.01 (0x2101)	Output frequency	V/F SVC	10V corresponds to the maximum frequency	
C00.02(0x2102)	Output current	V/F SVC	10V corresponds to the rated current of the double motor (5A)	
C00.03 (0x2103)	Input voltage	V/F SVC	10V corresponds to 380V	
C00.04 (0x2104)	The output voltage	V/F SVC	10V corresponds to the rated voltage of the motor 360V	
C00.05 (0x2105)	Mechanical speed	V/F SVC	10V corresponds to the maximum frequency of mechanical speed	
C00.08 (0x2108)	PID given	V/F SVC	10V corresponds to 100%	
C00.09 (0x2109)	PID feedback	V/F SVC	10V corresponds to 100%	
C00.10 (0x210A)	Output Power	V/F SVC		
C00.11 (0x210B)	Bus voltage	V/F SVC	5V corresponding rated bus voltage	
C00.12 (0x210C)	Module temperature 1	V/F SVC	10V corresponds to 100℃	
C00.14 (0x210E)	Input terminal X is on	V/F SVC		
C00.15 (0x210F)	Output terminal Y is on	V/F SVC		
C00.16(0x2110)	Analog AI input value	V/F SVC	10V corresponds to 10V	
C00.20 (0x2114)	Analog output AO	V/F SVC		
C00.23 (0x2117)	Power-on running time	V/F SVC		
C00.24 (0x2118)	Accumulated running time of the machine	V/F SVC		
C00.25 (0x2119)	VFD power level	V/F SVC		
C00.26 (0x211A)	VFD rated voltage	V/F SVC		
C00.27 (0x211B)	VFD rated current	V/F SVC		
C00.28 (0x211C)	Software version	V/F SVC		

● **Fault Monitor**

Parameter code (address)	Function Description	Content		Signal level of multi-function analog output	Notes
C01.00 (0x2200)	Fault type diagnostic information	V/F	SVC		
C01.01 (0x2201)	Troubleshooting information	V/F	SVC		
C01.02 (0x2202)	Fault operating frequency	V/F	SVC		
C01.03 (0x2203)	Fault output voltage	V/F	SVC		
C01.04 (0x2204)	Fault output current	V/F	SVC		
C01.05 (0x2205)	Fault bus voltage	V/F	SVC		
C01.06 (0x2206)	Faulty module temperature	V/F	SVC		
C01.07 (0x2207)	Faulty VFD status	V/F	SVC		
C01.08 (0x2208)	Fault input terminal status	V/F	SVC		
C01.09 (0x2209)	Fault output terminal status	V/F	SVC		

● **I/O Terminals Function Table**

X	Functional interpretation	X	Functional interpretation	X	Functional interpretation
0	No function	21	PID control pause	42	Counter clock input terminal
1	Forward running	22	PID characteristic switching	43	Counter clear terminal
2	Reverse run	23	PID parameter switching	44	DC brake command
3	Three-wire operation control	24	PID given switch 1	45	Pre-excitation command
4	Forward turn	25	PID given switch 2	46	Reserved
5	Reverse jog	26	PID given switch 3	47	Reserved
6	Free parking	27	PID feedback switching 1	48	Command channel switch to
7	Emergency pull over	28	PID feedback switching 2	49	Command channel switch to
8	Fault reset	29	PID feedback switching 3	50	Command channel switch to
9	External fault input	30	Program run (PLC) pause	51	Command channel switch to
10	Frequency increment (UP)	31	Program run (PLC) restart	52	Run prohibition
11	Frequency decrement (DW)	32	Acceleration/deceleration time	53	Forward prohibition
12	Frequency increment	33	Acceleration/deceleration time	54	Reverse prohibition
13	Channel A switches to	34	Suspension acceleration	55	Reserved
14	Switch the frequency channel combination to A	35	Swing frequency input	56	Reserved
15	Switch the frequency channel combination to B	36	Swing frequency pause	57	Zero servo command
16	Multi-speed terminal 1	37	Swing frequency reset	58	Run output blocking
17	Multi-speed terminal 2	38	Keyboard button and display	80	Water fulfilled detection alarm
18	Multi-speed terminal 3	39	X4 frequency measurement	81	Water fulfilled detection reset

19	Multi-speed terminal 4	40	Timer trigger terminal	82	Hybrid input
20	PID control canceled	41	Timer clear terminal	83	Dry run protection input
Y	**Functional interpretation**	**Y**	**Functional interpretation**	**Y**	**Functional interpretation**
0	No output	14	Lower limit frequency is reached	28	Underload pre-alarm output 2
1	The VFD is running	15	Program run cycle is completed	29	VFD is warning
2	VFD running in reverse	16	The running phase of the	30	Communication address
3	The VFD is running in	17	PID feedback exceeds the upper	31	VFD overheat warning
4	Fault trip alarm 2 (no alarm	18	PID feedback is below the lower	32	Motor overheat alarm output
5	Fault trip alarm 2 (no alarm	19	PID feedback sensor	33	Frequency (speed) is
6	External downtime	20	Meter length arrives	34	Any frequency (speed) is
7	VFD is under-voltage	21	Timer time is up	35	Frequency detection 1
8	The VFD is ready for	22	Counter reaches maximum	36	Frequency detection 2
9	Output frequency level	23	Counter reaches the set value	37	Frequency (speed) is
10	Output frequency level	24	Energy consumption braking	38	Any frequency (speed) is
11	Arrived at a given frequency	25	PG feedback disconnection	39	Solar pump alarm output
12	Zero speed operation	26	Emergency stop	40	Reserved
13	Upper limit frequency is	27	Overload pre-alarm output 1	41	Reserved

● **Photovoltaic Pump Special Parameters**

Parameter (address)	Function Description	Range of settings and definition	Factory default (setting range)	Notes
F21.00(0x5500)	Solar pump drive control mode	LED0 Mode selection 0:Variable frequency control mode 1:CVT mode for solar 2:MPPT mode for solar LED00 Operation selection 0: Continuous Operation 1:Inermittent Operation 2: Pump Cleanr LED000 Reserved LED0000 Motor selection 0:Three-phase Motor 1:Single-phase Motor	0002	
F21.01(0x5501)	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 7:Water fulfilled protection	Read Only	
F21.02(0x5502)	VOC voltage (display)	0.0V～999.9V	Read only	
F21.03(0x5503)	CVT target voltage	70.0%～95.0%	81.0%	
F21.04(0x5504)	MPPT upper limit voltage	20.0%～200.0%	100.0%	
F21.05(0x5505)	MPPT lower limit voltage	20.0%～200.0%	50.0%	
F21.06(0x5506)	Frequency adjusting gain	0.1%～500.0%	10.0% (AM) 40.0% (PMSM)	
F21.07(0x5507)	MPPT search interval	0.1s～100.0s	1.0s	
F21.08(0x5508)	MPPT regulating gain	0～9999	100	
F21.09(0x5509)	Quick-drop frequency gain	0～20	2	
F21.10(0x550A)	Frequency adjusting filter time	0.001s～2.000s	0.001	

F21.11(0x550B)	Go to sleep mode voltage	0V～1000V	0V	
F21.12(0x550C)	Wake up restore voltage	0V～1000V	400V	
F21.13(0x550D)	Sleeping stop restore waiting time	0.0s～3000.0s	10.0s	
F21.14(0x550E)	Low speed protection detect frequency	0.00Hz～300.00Hz	10.00Hz	
F21.15(0x550F)	Low speed protection detect time	0.0s～3000.0s	10.0s	
F21.16(0x5510)	Low speed protection restore working time	0.0s～3000.0s	10.0s	
F21.17(0x5511)	Dry run protection detect current	0.0A～999.9A	0.0A	
F21.18(0x5512)	Dry run protection detect time	0.0s～3000.0s	10.0s	
F21.19(0x5513)	Dry run auto restore working time	0.0s～3000.0s	10.0s	
F21.20(0x5514)	Over current point setting	0.0A～999.9A	0.0A	
F21.21(0x5515)	Over current protection detect time	0.0s～3000.0s	10.0s	
F21.22(0x5516)	Over current protection auto restore working time	0.0s～3000.0s	10.0s	
F21.23(0x5517)	Input minimum power protection power point setting	0.00kW～650.00kW	0.00kW	
F21.24(0x5518)	Minimum power protection detect time	0.0s～3000.0s	10.0s	
F21.25(0x5519)	Minimum power protection auto restore working time	0.0s～3000.0s	10.0s	
F21.26(0x551A)	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	

F21.27(0x551B)	Water fulfilled detect time	0.0s～3000.0s	10.0s	
F21.28(0x551C)	Water fulfilled restore time	0.0s～3000.0s	10.0s	
F21.29(0x551D)	reserve			
F21.30(0x551E)	DC current revise offset	0.00A～99.99A	0.01A	
F21.31(0x551F)	DC current revise proportion gain	0.0%～999.9%	100.0%	
F21.32(0x5520)	Power curve point 0	0.00kW～99.99kW	0.50kW	
F21.33(0x5521)	Power curve point 1	0.00kW～99.99kW	1.00kW	
F21.34(0x5522)	Power curve point 2	0.00kW～99.99kW	1.50kW	
F21.35(0x5523)	Power curve point 3	0.00kW～99.99kW	2.00kW	
F21.36(0x5524)	Power curve point 4	0.00kW～99.99kW	2.50kW	
F21.37(0x5525)	Flow curve point 0	0.0m³/h～999.9m³/h	0.0m³/h	
F21.38(0x5526)	Flow curve point 1	0.0m³/h～999.9m³/h	5.0m³/h	
F21.39(0x5527)	Flow curve point 2	0.0m³/h～999.9m³/h	10.0m³/h	
F21.40(0x5528)	Flow curve point 3	0.0m³/h～999.9m³/h	15.0m³/h	
F21.41(0x5529)	Flow curve point 4	0.0m³/h～999.9m³/h	20.0m³/h	
F21.42(0x552A)	Flow calculating revise offset	0.0m³～999.9m³	0.0m³	
F21.43(0x552B)	Flow calculating revise gain	0.0%～999.9%	100.0%	
F21.44(0x552C)	Power per day/ generated power per day reset period	0.0h～24.0h	7.0h	
F21.45(0x552D)	Reserved			
F21.46(0x552E)	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	
F21.47(0x552F)	Fast frequency falling threshold	3.0%～15.0%	5.0%	
F21.48(0x5530)	Constant torque frequency limit coefficient	80.0%～150.0%	100.0%	

Function code	Function name	Setting range and definition	Default setting	
F21.49(0x5531)	Sudden voltage increase threshold	0.0%～20.0%	5.0%	
F21.50(0x5532)	Reserved			
F21.51(0x5533)	Reserved			
F21.52(0x5534)	Reserved			
F21.53(0x5535)	Functional selection	LED0: Inermittent Operation Storage 0:None; 1:Storaged LED00:Stop Mode When Alarm 0:Slow down 1:Free stop LED000:Reserved LED0000:Reserved	0000	
F21.54(0x5536)	Times of Inermittent Operation	0～1000	0	
F21.55(0x5537)	Start time of Inermittent Operation	0min～3000min	0	
F21.56(0x5538)	Stop time of Inermittent Operation	0min～3000min	0	
F21.57(0x5539)	Pump Clean Frequency	0.00Hz～300.00Hz	25.00Hz	
F21.58(0x553A)	FWD Running Time	0s～3000s	30s	
F21.59(0x553B)	REV Running Time	0s～3000s	30s	
F21.60(0x553C)	Cycle Times	0～60	5	
F21.61(0x553D)	Power Limitation	0.0～1000.0	0.0	
F21.62(0x553E)	Power Limitation Kp	0.0～100.0	1.0	
F21.63(0x553F)	Power Limitation Ki	0.0～100.0	1.0	

● **Photovoltaic Pump Special Monitor Parameters**

Function code	Function name	Setting range and definition	Default setting
C04.00(0x2500)	Frequency reference	0.01Hz	Read only
C04.01(0x2501)	Output frequency	0.01Hz	Read only
C04.02(0x2502)	Output current	0.1A	Read only
C04.03(0x2503)	Cycle Times 1		Read only
C04.04(0x2504)	Cycle Times 2		Read only
C04.05(0x2505)	Reserved		Read only
C04.06(0x2506)	Operation Time	1min	Read only
C04.07(0x2507)	Stop Time	1min	Read only
C04.08(0x2508)	Reserved		Read only
C04.09(0x2509)	Reserved		Read only

C04.10(0x250A)	Output power	0.01kW	Read only
C04.11(0x250B)	DC bus voltage	0.1V	Read only
C04.12(0x250C)	Module temperature 1	0.1℃	Read only
C04.13(0x250D)	Status of MPPT		Read only
C04.14(0x250E)	Solar Panel Operation Point	0.1%	Read only
C04.15(0x250F)	Solar Panel Voc	0.1V	Read only
C04.16(0x2510)	Frequency Searching Period		Read only
C04.17(0x2511)	Solar Target Frequency	0.10Hz	Read only
C04.30(0x251E)	DC current	0.01A	Read only
C04.31(0x251F)	Flow speed	0.1m³/h	Read only
C04.32(0x2520)	Voc voltage	0.1V	Read only
C04.33(0x2521)	Flow per day	0.1m³	Read only
C02.34(0x2522)	Cumulative total flow(low position)	0.1m³	Read only
C02.35(0x2523)	Cumulative total flow(high position)	0.1km³	Read only
C02.36(0x2524)	Generated power per day	0.01kWh	Read only
C02.37(0x2525)	Cumulative total generated power (low position)	0.01kWh	Read only
C02.38(0x2526)	Cumulative total generated power (high position)	0.1MWh	Read only

Chapter 6 Operation Guidance

6.1 Asynchronous Motor Pump Drive Operation Guidance

1) Wiring

a. Confirmed the solar pump drive if matching with motor.

b. Correctly connecting "+""-" of solar panel to R, T wiring terminals. Otherwise it will cause VFD damage.

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

2) Parameters setting and trial run

a. Set F01.00 to 0, F01.02 for 0, and F01.22, F01.23 parameters setting according to application site.

b. Set motor(pump) parameters according to nameplate of pump.

c. Set solar pump MPPT mode F21.00 for 1 or 2.

d. Press FWD button for trail running, and confirm the motor running direction.

3) Common problems

a. Q:Well-lit conditions, the pump is running, but the water is very small.

  A:Check if the pump motor direction is reversed.

b. Q:Well-lit conditions, the drive is in standby mode 0.00Hz.

  A:Check F21.01, observe what protection status is the drive in currently, check whether the parameters set is reasonable.

c. Q:DC current is incorrectly displayed.

  A:Adjust F21.30, F21.31 for calibration.

d. Q:Well-lit conditions, frequency severe beating during operation.

  A:Reasonably adjust F21.06 value, the adjustment is recommended to be in the vicinity of the default, too big or too small will

  cause frequency oscillation.

6.2 Synchronous Motor Pump Drive Operation Guidance

1) Wiring

a. Confirm if the solar pump drive matches with the motor.

b. Connecting "+""-" of solar panel to R, T wiring terminals. Otherwise it will cause VFD damage.

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

2) Parameters setting and trial run

a. Set F01.00 to 0, F01.02 for 0, and F01.22, F01.23 can be set according to demand.

b. Set motor (pump) parameters according to nameplate of pump. Then Set F02.07 for 1, the keypad will show T-00, press

START 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.

c. Set solar pump MPPT mode F21.00 for 1 or 2.

d. Press FWD button for trail running, and confirm the motor running direction.

3) Common problems and solutions

a. Q:Well-lit conditions, the pump is running, but the water is very small.

  A:Check if the pump motor direction is reversed.

b. Q:Well-lit conditions, the drive is in standby mode 0.00Hz.

　A:Check F21.01, observe what protection status is the drive in currently, check whether the parameters set is reasonable.

c. Q:DC current is incorrectly displayed.

　A:Adjust F21.30, F21.31 for calibration.

d. Q:Well-lit conditions, frequency severe beating during operation.

　A:Reasonably adjust F21.06 value, the adjustment is recommended to be in the vicinity of the default, too big or too small will cause frequency oscillation.

6.3 PV Water Pump Features

1) Sleep Function

　　During the photovoltaic pump operation, the VFD will go into sleep state when the DC voltage provided by solar panels is lower than F21.11 (sleep voltage threshold) due to objective factors, while the keyboard warning "A.LPn"; when DC voltage provided by solar panels rises back to F21.12 (sleep recovery voltage) point, start timing and after F21.13 (sleep shutdown waiting time), the drive starts running.

2) Low-frequency Protection Function

　　During the operation of the photovoltaic pump, for some reason, the output frequency is lower than F21.14 (low frequency detection frequency), and after F21.15 (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 F21.16 (frequency protection automatic recovery) time, automatically resume to running state.

3) Dry Run Protection

　　During the operation of the photovoltaic pump, for some reason, the output current is less than F21.17 (dry protection current detection), and after F21.18 (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 F21.19 (dry protection automatic recovery)time, automatically resume to running state.

4) Over-current Protection

　　During the operation of the photovoltaic pump, for some reason, the output current is greater than F21.20(over current point setting), and after F21.21 (over current protection detect) time, enters into standby protection state, while the keyboard warning "A.oLd"; after entering into the standby protection state and after F21.22 (over current protection auto restore working)time, automatically resume to running state.

5) Minimum Power Protection

　　During the operation of the photovoltaic pump, for some reason, the output power is less than F21.23(minimum power protection value), and after F21.24 (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 F21.25 (minimum power automatic recovery)time, automatically resume to running state.

6) Full Water Protection

　　Detect the water full alarm and low water level through two X terminals, realizing automatic level control. Wherein F21.27

is the water overfill protection detection time and F21.28 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".

7) 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 F21.26. 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.

8) 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.

9) Status Check

When the photovoltaic pump is running, you can check F21.01 to confirm the current operating status.