GTAKE

MANUAL DE USUARIO

SRL

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GTAKE ARGENTINA

Preface

Thank you for choosing GTAKE **SLR03 Series Solar Water Pump Drives**. This user manual presents a detailed description of SLR03 series with respect to product features, structural characteristics, functions, installation, parameter settings, troubleshooting, etc. Be sure to carefully read through the safety precautions before use, and use this product on the premise that personnel and equipment safety is ensured.

IMPORTANT NOTES
● Please assure the intactness of product enclosure and all safety covers before installation. Operation must conform to the requirements of this manual and local industrial safety regulations and/or electrical codes. ● Contents of this manual may be subject to appropriate modification as a result of product upgrade, specification change and update of the manual. ● In the event of damage or loss of user manual, users may ask local distributors, offices or our Technical Service Department for a new one. ● If any item as stated in this manual is not clear, please contact our Technical Service Department. ● If any anomaly occurs after power up or during the operation, it is essential to stop the machine and identify the fault or seek technical services as soon as possible. ● Telephone number of our Technical Service Department: (+86) 0755-86392601.

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Chapter 1 Product Information

1.1 Model Explanation

Model shown on product nameplate indicates the series name, applicable type of power supply, power class and the version of software and hardware, etc. via the combination of numbers, symbols and letters.

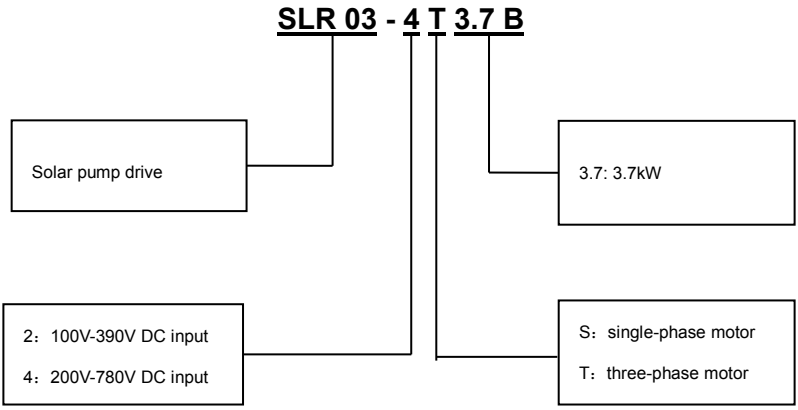


Fig. 1-1 Product model explanation

ATTENTION:

2S stands for input voltage 200V AC-240V AC, 100VDC-390VDC

4T stands for input 380V AC-480V AC, 200VDC-780VDC

1.2 Nameplate Information

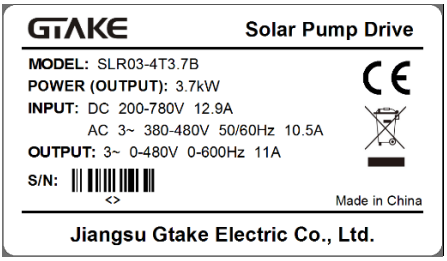


Fig. 1-2 Nameplate information

1.3 Information of Product Model

Table 1-1 SLR03 input voltage requirement

Drive model	SLR03-**2S**□□□	SLR03-**4T**□□□
AC input voltage (V)	220V monophase	400V triphase
Max. DC voltage (V)	390V	780V
Min. DC voltage (V)	100V	200V
Recommended DC input voltage (V)	100V~390V	200V~780V
Recommended solar panel voltage (V)	360V	620V

Table 1-2 SLR03 model and technical data

■SLR03-2S□□□ Three phase output

Drive model	Power rating (kW)	Rated output current (A)	Max. DC input current (A)	3-phase rated AC input current (A) *	Applicable motor (kW)
SLR03-2S0.4B	0.4	2.6	4	3.2	0.4
SLR03-2S0.75B	0.75	4.5	7.7	6.3	0.75
SLR03-2S1.5B	1.5	7.5	11	9	1.5
SLR03-2S2.2B	2.2	10	18.4	15	2.2

■SLR03-4T□□□ Three-phase input/output, heavy duty

Drive model	Power rating (kW)	Rated output current (A)	Max DC input current (A)	Max AC input current (A)	Applicable motor (kW)
SLR03-4T0.75B	0.75	3.8	4.2	3.5	0.75
SLR03-4T1.5B	1.5	4.8	6.1	5.0	1.5
SLR03-4T2.2B	2.2	8	7.4	6.0	2.2
SLR03-4T3.7B	3.7	11	12.9	10.5	3.7
SLR03-4T5.5B	5.5	16	17.9	14.6	5.5
SLR03-4T7.5B	7.5	21	25	20.5	7.5

1.4 Wiring Diagram

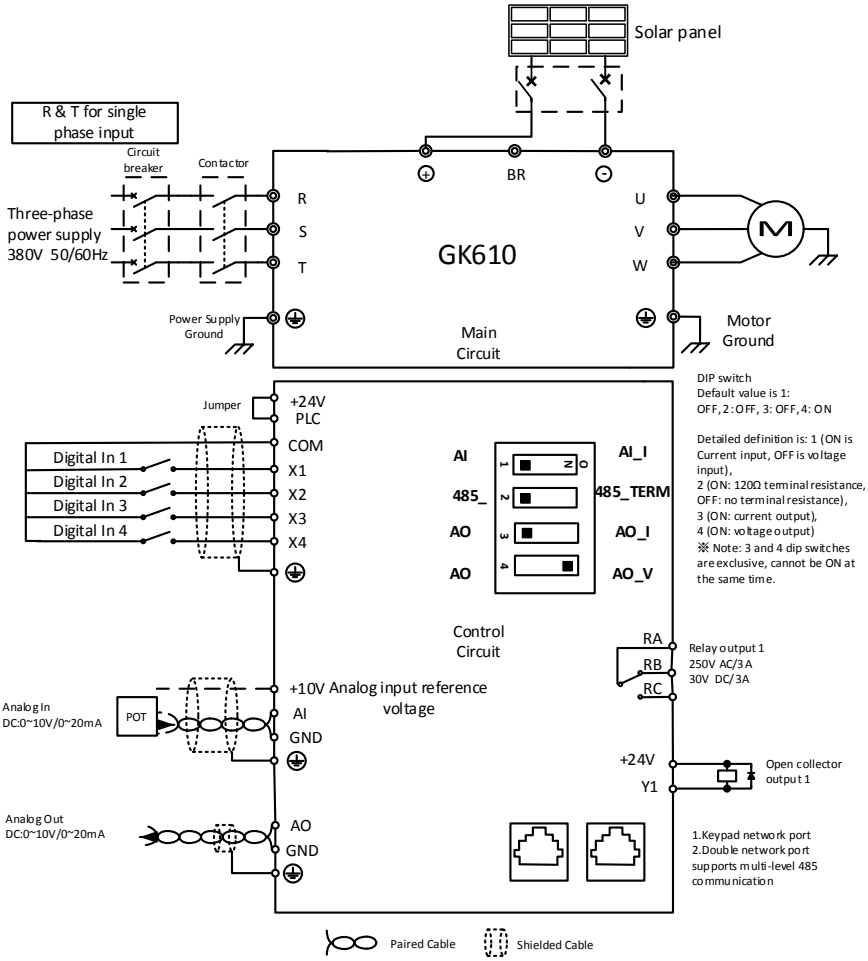


Fig. 1-3 Wiring diagram

SLR03 drive terminals have following default configuration.

X1	Stop (0) / Start (1)
X2	Solar mode (0) / Grid AC power supply constant speed mode (1)
X3	Solar mode (0) / Grid AC power supply constant pressure mode (1)
X4	Local control (0): control panel control / Remote control (1): terminal control
AI1	Actual water pressure feedback, occupied in AC constant pressure mode (i.e. X3 activated)
AO1	Output frequency

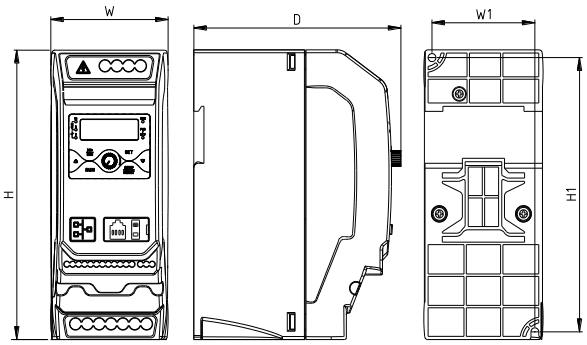
1.5 Technical Features of SLR03

Table 1-3 Technical Features of SLR03

DC power supply	DC input voltage	SLR03-2S□：100V DC~390V DC (360V DC recommended) SLR03-4T□：200V DC~780V DC (620V DC recommended)
	Max. input current	See Section 2.3
AC power supply	Rated AC input voltage	3-phase AC208V/AC220V/AC230V/AC240V/AC380V/AC400V/ AC415V/AC440V
	Frequency	50Hz/60Hz, tolerance ±5%
	Voltage range	Continuous voltage fluctuation ±10%, short fluctuation -15%~+10%, i.e. 200V: 170V~264V, 400V: 323V~484V
		Voltage out-of-balance rate <3%, distortion rate as per the requirements of IEC61800-2
	Rated input current	See Section 2.3
Power output	Applicable motor (kW)	See Section 2.3
	Rated	See Section 2.3

	current (A)	
	Output frequency (Hz)	0.00~ 600.00Hz; unit: 0.01Hz
	Overload capacity	150% - 1min, 180% - 10s, 200% - 0.5s every 10 mins
Control characteristics	V/f patterns	V/f control
	Range of speed regulation	1:100
	Speed accuracy	±0.5%
	Starting torque	0.5Hz: 180%
Protection functions	Refer to Chapter 7- Troubleshooting	
Environment	Place of operation	Indoors, no direct sunlight, free from dust, corrosive gases, flammable gases, oil mist, water vapor, water drop or salt, etc.
	Altitude	0-2000m. De-rate 1% for every 100m when the altitude is above 1000 meters
	Ambient temperature	-10℃-40℃. The rated output current should be derated 1% for every 1℃ when the ambient is 40℃-50℃
	Relative humidity	0~95%, no condensation
	Vibration	Less than 5.9m/s^2 (0.6g)
	Storage temperature	-40℃~+70℃
Others	MPPT Efficiency	Up to 99.9%
	IP grade	IP20
	Cooling method	Forced air cooling

1.6 Parts Drawing



Model	External and installation dimensions (mm)						Weight (kg)
	W	H	D	W1	H1	Mounting hole dia	
SLR03-2S0.4B	75	180	133	66	170.5	5	1.1
SLR03-2S0.75B							
SLR03-2S1.5B							
SLR03-2S2.2B							
SLR03-4T0.75B							
GK610-4T1.5B							
GK610-4T2.2B							
SLR03-4T3.7B							
SLR03-4T5.5B	100	224.5	152.5	88	214.5	5	1.8
SLR03-4T7.5B							

Chapter 2 Installation and Wiring

2.1 Installation Environment

1） Ambient temperature is in the range of -10℃~ 40℃.
2） Drive should be installed on surface of flame retardant object, with adequate surrounding space for heat dissipation.
3） Installation should be performed where vibration is less than 5.9m/s^2 (0.6g).
4） Protect from moisture and direct sunlight.
5） Protect the cooling fan by avoiding oil, dust and metal particles.
6） Do not expose to an atmosphere with flammable gases, corrosive gases, explosive gases or other harmful gases.
7） Prevent drilling residues, wire ends and screws falling into drive.
8） Ventilation part of the drive should be installed outside, away from harsh environment (e.g. textile facilities with fiber particles and chemical facilities filled with corrosive gases).

2.2 Main Circuit Terminals and Wiring

⚠ WARNING

- Wiring should be in strict accordance with this manual, otherwise hazard of electric shock or equipment damage exists.
- Since leakage current of the drive may exceed 3.5mA, for safety's sake, the drive and the motor must be grounded so as to avoid hazard of electric shock.
- Be sure to perform wiring in strict accordance with the drive terminal marks. Never connect three-phase power supply to output terminals U, V and W. Failure to comply will result in equipment damage.
- Only mount braking resistors at terminals ⊕ and BR when need. Failure to comply will result in equipment damage.
- Signal wires should be far away from main power lines to the best of possibility. If this cannot be ensured, vertical cross-arrangement shall be implemented, otherwise interference noise to control signal may occur.
- If motor cables are longer than 50m, it is recommended output AC reactor be used. Failure to comply may result in faults.

2.3 Control Terminal Wiring

WARNING

- AC 220V signal is prohibited from connecting to other terminals than control terminals RA, RB and RC. Failure to comply may result in equipment damage.
- Shielded cables are highly recommended and the cables should be as short as possible in order to avoid any faults caused by interference.

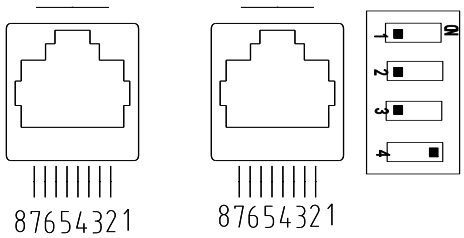
Table 2-1 Control terminal specification

Category	Terminal	Terminal designation	Specification
Analog input	+10V	Analog input reference voltage	Maximum output current 5mA The resistance of external potentiometer should be larger than 2kΩ
	GND	Analog ground	Isolated from COM interiorly
	AI	Analog input	0~20mA: input impedance 500Ω, maximum input current 25mA; 0~10V: input impedance 22kΩ, maximum input voltage 10V; Switch on control board for jumping from 0~20mA and 0~10V, factory default: 0~10V
Analog output	AO	Analog output	0~20mA: impedance 200Ω~500Ω 0~10V: input impedance ≥10kΩ, Switch on control board for jumping from 0~20mA and 0~10V, factory default: 0~10V
	GND	Analog ground	Isolated from COM interiorly
Digital input	+24V	+24V	24V±10%, Isolated from GND interiorly Maximum load: 200mA
	PLC	Digital input Common terminal	Used for switching between high and low levels, short-circuited with +24V when delivery, i.e. low value of digital input valid
	COM	+24V ground	Isolated from GND interiorly
	X1~X3	Digital input Terminals 1~3	Input: 24VDC, 5mA Range of frequency: 0~200Hz Range of voltage: 10V~30V

Category	Terminal	Terminal designation	Specification
	X4	high-speed pulse input	Pulse input: 0.1Hz~20kHz Range of voltage: 10V~30V
Digital output	Y1	Open collector output	Range of voltage: 0~24V; Range of current: 0~50mA
Relay output	RA/RB/ RC	Control board relay output	RA-RB: NC; RA-RC: NO
			Contact capacity: 250VAC/3A, 30VDC/3A
Communication 485 terminal	CN6/CN7	Communication 485	Standard network cable, maximum communication distance 3M recommended

2.4 Functions of communication 485 terminal

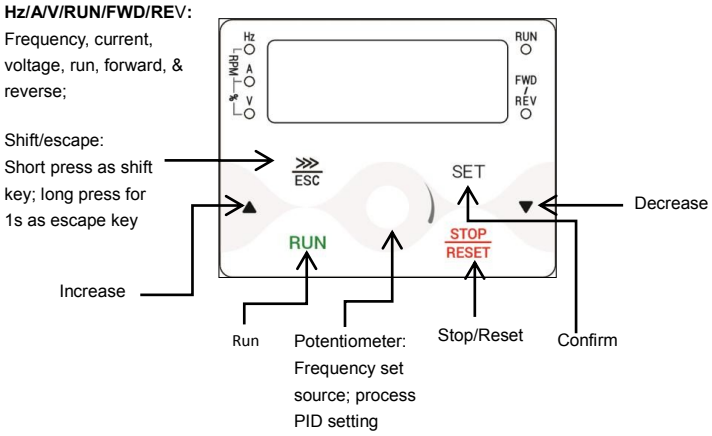
Pin	1	2	3	4	5	6	7	8
Definition	+5V	GND	485+	485-	485+	485-	GND	+5V



Attention:
The pin definitions of the two network ports are the same. If connecting to a 120Ω terminal resistor is needed, turn the DIP switch No. 2 to the ON side; a common network cable can be used to connect, and shielded network cables are highly recommended.

Chapter 3 Operation and Run Instructions

3.1 Key functions on keypad



3.2 Prompt Message Status

Prompt message status shall be displayed upon the completion of some operation. For instance, the "bASIC" prompt message would be displayed upon the completion of parameter initialization.

Table 3-1 Prompt characters

Prompt symbol	Meaning	Prompt symbol	Meaning
bASIC	When A0-01 is set to 0	CPyb1	Backup parameter value
dISP1	When A0-01 is set to 1	LoAd	Parameter upload to control panel
USEr	When A0-01 is set to 2	dnLd1	Parameter download from control panel (motor parameter excluded)
ndFLt	When A0-01 is set to 3	dnLd2	Parameter download from control panel (motor parameter included)
LoC-1	Control panel locked 1 (all locked)	P-SEt	Password has been set

LoC-2	Control panel locked 2 (all locked except RUN, STOP/RESET)	P-CLr	Password cleared
LoC-3	Control panel locked 3 (all locked except STOP/RESET)	TUNE	Motor parameter identification in process
LoC-4	Control panel locked 4 (all locked except shift >>)	LoU	Drive undervoltage
PrtCt	Control panel protection	CLr-F	Clear fault record
UnLoC	Control panel lock cleared	dEFt1	Restore to factory default parameters (motor parameter excluded)
rECy1	Read the backup parameter value to parameter	dEFt2	Restore to factory default parameters (motor parameter included)
SLP-S	Storing the current frequency as sleep frequency at F6-12	LLr-S	Operating the dry run protection program
LLr-F	Dry run protection program failed		

Table 3-2 shows meanings of the characters displayed on control panel.

Table3- 2 Meanings of displayed characters

Displayed character	Character Meaning	Displayed character	Character Meaning	Displayed character	Character Meaning	Displayed character	Character Meaning
	0		A		I		T
	1		b		J		t
	2		C		L		U
	3		c		N		v
	4		d		n		y
	5		E		o		-

Displayed character	Character Meaning	Displayed character	Character Meaning	Displayed character	Character Meaning	Displayed character	Character Meaning
	6		F		P		8.
	7		G		q		.
	8		H		r		
	9		h		S		

3.3 First-time Power up

Perform wiring in strict accordance with technical requirements as set forth in Chapter 3 - Installation and Wiring. The flow chart of first-time power up is as shown in below:

3.3.1 Flow chart of first-time power up of asynchronous motor

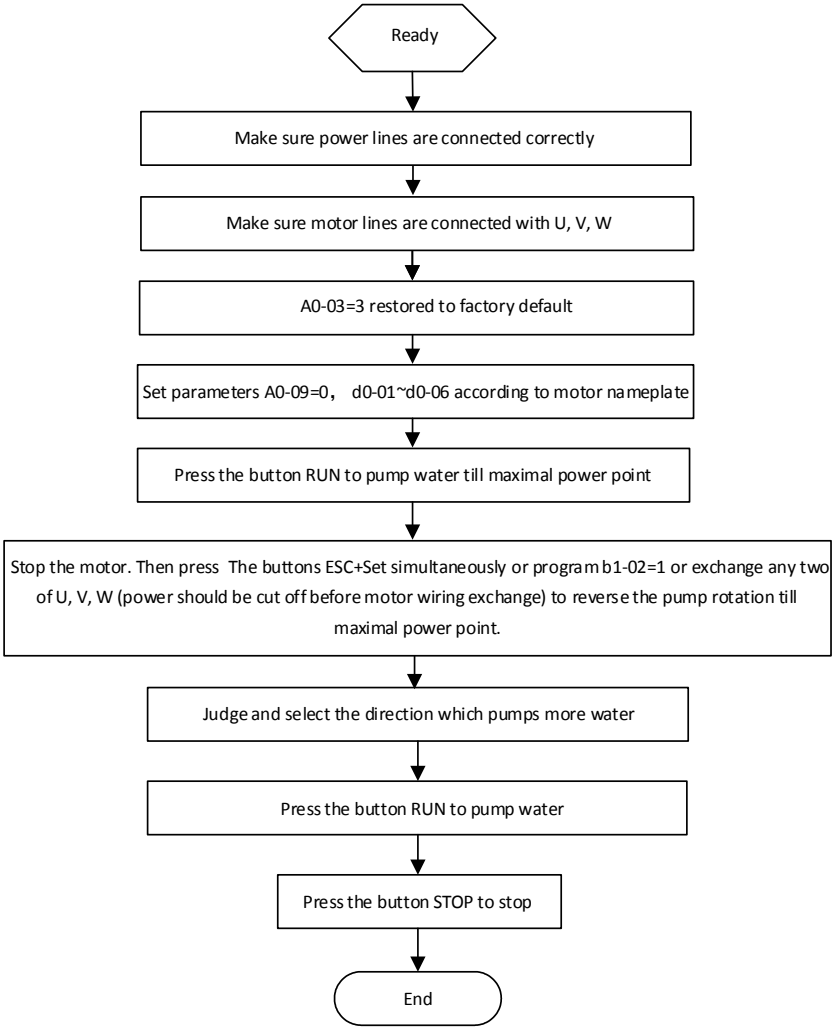


Fig. 3-1 Flow chart of first-time power up for asynchronous motor

3.3.2 Flow chart of first-time power up of synchronous motor

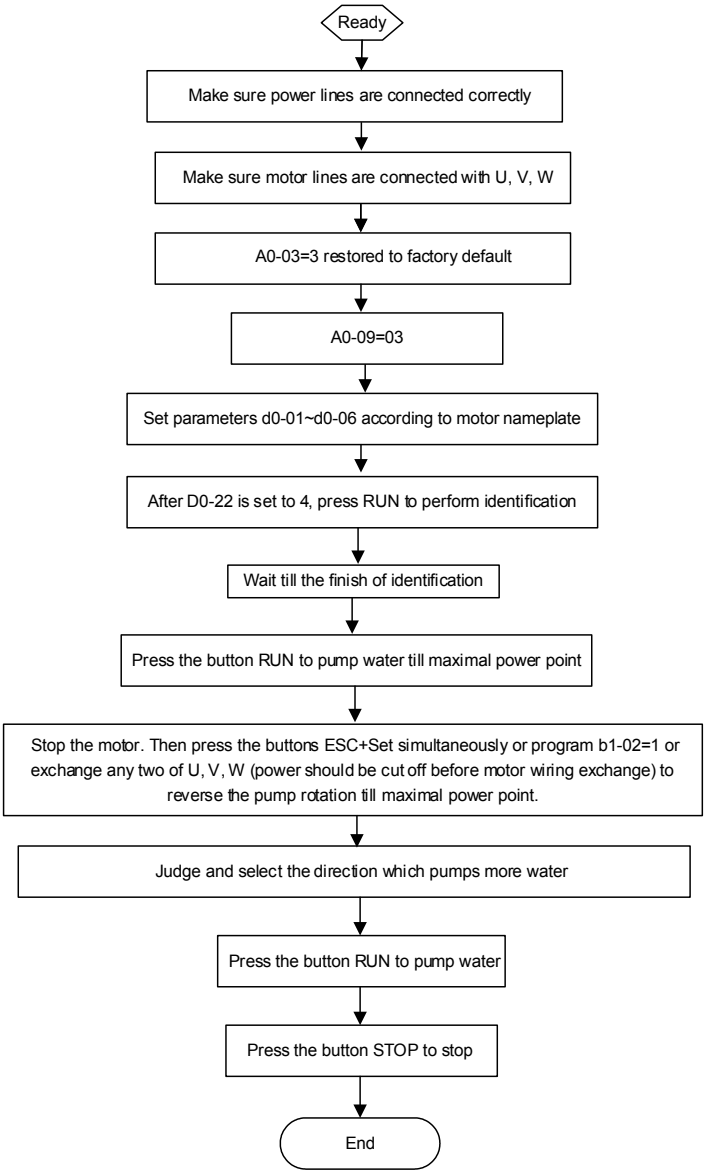


Fig. 3-2 Flow chart of first-time power up for synchronous motor

Chapter 4 Parameters Lists

SLR03 parameter groups are listed below:

Category	Parameter group	Reference page
Group A: system parameters and parameter management	A0: system parameters	
	A1: user-defined display parameters	
Group b: Run parameter setting	b0: frequency setting	
	b1: start/stop control	
	b2: Accel/Decel parameters	
Group C: input and output terminals	C0: digital input	
	C1: digital output	
	C2: analog and pulse input	
	C3: analog and pulse output	
Group d: motor and control parameters	d0: parameters of motor 1	
Group E: enhanced function and protection parameters	E0: enhanced function	
	E1: protection parameters	
Group F: application	F0: MPPT process PID adjustment	
	F1: Multi - step pressure	
	F5: AC constant water pressure PID	
	F6: Dedicated Parameters	
Group H: communication parameters	H0: MODBUS communication parameters	
Group U: monitoring	U0: status monitoring	
	U1: history fault	

ATTENTION:

Change attribute:

"△" means the value of this parameter can be modified in stop and run status of drive;

"×" means the value of this parameter cannot be modified when drive is running;

"◎" means this parameter is a measured value that cannot be modified;

Factory default: The value when restored to factory default. Neither measured parameter value nor recorded value will be restored.

Scope: the scope of setting and display of parameter values

Parameter	Designation	Scope	Factory default	Attr
Group A: System Parameters and Parameter Management				
Group A0: System Parameters				

Parameter	Designation	Scope	Factory default	Attr
A0-00	User password	0~FFFF	0000	△
A0-01	Parameter display	0: Display all parameters 1: Only display A0-00 and A0-01 2: Only display A0-00, A0-01 and user-defined parameters A1-00~A1-19 3: Only display A0-00, A0-01, and the parameters different from factory default	2	△
A0-02	Parameter protection	0: All parameter programming allowed 1: Only A0-00 and this parameter programming allowed	0	×
A0-03	Parameter restoration	0: No operation 1: Clear fault record 2: Restore all parameters to factory default (excluding motor parameters) 3: Restore all parameters to factory default (including motor parameters) 4: Restore all parameters to backup parameters	0	×
A0-04	Parameter backup	0: No operation 1: Backup all parameters	0	×
A0-05	Parameter copy	0: No operation 1: Parameter copied to control panel 2: Parameter copied (excluding motor parameters) to control board 3: Parameter copied (including motor parameters) to control board	0	×
A0-09	Motor control technique	Ones place: motor control technique 0: Asynchronous motor 3: Synchronous motor	00	×
Group A1: User-defined Display Parameters				
A1-00	User-defined display parameter 1	Setting range of thousands place: A, b, C, d, E, F, H, L, U Setting range of hundreds place: 0~9 Setting range of tens place: 0~9 Setting range of ones place:	A0-03	×
A1-01	User-defined display parameter 2		b0-08	×
A1-02	User-defined display parameter 3		b0-09	×
A1-03	User-defined display parameter 4		A0-09	×
A1-04	User-defined display parameter 5		d0-01	×
A1-05	User-defined display parameter 6		d0-02	×
A1-06	User-defined display parameter 7		d0-03	×
A1-07	User-defined display parameter 8		d0-04	×

Parameter	Designation	Scope	Factory default	Attr
A1-08	User-defined display parameter 9	0~9	d0-05	×
A1-09	User-defined display parameter 10		d0-06	×
A1-10	User-defined display parameter 11		d0-22	×
A1-11	User-defined display parameter 12		F6-01	×
A1-12	User-defined display parameter 13		F6-02	×
A1-13	User-defined display parameter 14		F6-05	×
A1-14	User-defined display parameter 15		F6-06	×
A1-15	User-defined display parameter 16		F6-08	×
A1-16	User-defined display parameter 17		F6-12	×
A1-17	User-defined display parameter 18		F6-13	×
A1-18	User-defined display parameter 19		F6-14	×
A1-19	User-defined display parameter 20		F6-16	×
Group b Run Parameter Setting				
Group b0 Frequency Setting				
b0-01	Master FREQ set	0: Digital setting (b0-02) + ∧ / ∨ adjustment on control panel 1: Digital setting (b0-02) + terminal UP/DOWN adjustment 2: Terminal analog input 3: Potentiometer analog input 4: Reserved 5: X4 pulse input 6: Solar mode 7~8: Reserved 9: AC constant pressure PID	6	×
b0-02	Master FREQ digital setting	Lower limit freq ~ upper limit freq	50.00Hz	△
b0-03	Auxiliary FREQ set	0: No setting 1: Digital setting (b0-04) + ∧/∨ adjustment on control panel 2: Digital setting (b0-04) + terminal UP/DOWN adjustment 3: Analog input AI1 4: Potentiometer analog input 5:Reserved 6: X4 pulse input 7~10: Reserved	2	×
b0-04	Auxiliary FREQ digital setting	Lower limit FREQ ~ upper limit FREQ	50.00Hz	△
b0-08	Maximum FREQ	Upper limit FREQ ~600.00Hz	50.00Hz	×
b0-09	Upper limit FREQ	Lower limit FREQ ~ maximum FREQ	50.00Hz	×
b0-10	Lower limit FREQ	0.00Hz~upper limit FREQ	0.00Hz	×

Parameter	Designation	Scope	Factory default	Attr
b0-11	Operation when set FREQ lower than lower limit FREQ	0: Run at lower limit FREQ 1: Run at 0 Hz 2: Stop	0	×
b0-12	Time-delay of stop when set FREQ lower than lower limit FREQ	0.0s ~ 6553.5s	0.0s	×
Group b1 Start/Stop Control				
b1-00	Run command	0: Control panel control 1: Terminal control 2: Communication control	0	×
b1-02	Run direction	0: Forward 1: Reverse	0	Δ
b1-03	Reverse disabled	0: Reverse enabled 1: Reverse disabled	0	×
b1-04	Dead time between forward and reverse	0.0s~3600.0s	0.0s	Δ
b1-05	Start method	0: From start FREQ 1: DC braking start 2: Flying start 1 3: Flying start 2	0	×
b1-06	Start FREQ	0.00Hz~upper limit FREQ	0.00Hz	×
b1-07	Holding time of start FREQ	0.0s~3600.0s	0.0s	Δ
b1-10	Flying start current	0.0~200.0%	100.0%	×
b1-11	Flying start Decel time	0.1s~20.0s	2.0s	×
b1-12	Flying start adjustment coeff	0.0~100.0%	1.0%	×
b1-13	Stop method	0: Ramp to stop 1: Coast to stop 2: Ramp to stop + DC brake	1	×
b1-14	Start frequency of DC brake stop	0.00Hz ~ upper limit frequency	0.00Hz	×
b1-15	DC brake current	0.0%~200.0%	0.0%	×
b1-16	DC Brake time	0.00s~30.00s	0.00s	×
b1-17	Overexcitation brake	0: Disabled 1: Enabled	1	×
b1-20	Auto restart when power up again after power loss	0: Disabled 1: Enabled	0	×
b1-21	Time delay of auto restart when power up again	0.0s~10.0s	0.0s	Δ
Group b2 Accel/Decel Parameters				
b2-01	Accel time 1	0s~600.00s/6000.0s/60000s	10.0s	Δ

Parameter	Designation	Scope	Factory default	Attr
b2-02	Decel time 1	0s~600.00s/6000.0s/60000s	0.2s	△
b2-03	Accel time 2	0s~600.00s/6000.0s/60000s	10.0s	△
b2-04	Decel time 2	0s~600.00s/6000.0s/60000s	0.2s	△
Group C Input and Output Terminals				
Group C0 Digital Input				
C0-00	Enabled condition of run command terminals when power up	0: Trigger edge detected + ON detected 1: ON detected	0	×
C0-01	Function of terminal X1	0: No function 1: JOG forward 2: JOG reverse 3: Run forward (FWD) 4: Run reverse (REV) 5: Three-wire control 6: Run suspended 7: External stop 8: Emergency stop 9~10: Reserved 11: Coast to stop 12: Terminal UP 13: Terminal DOWN 14: Clear UP/DOWN (including ∧/∨ key) adjustment 15~18: Reserved 19: Accel/Decel time determinant 1 20: Accel/Decel time determinant 2 21: Accel/Decel disabled(ramp stop not inclusive) 22: External fault input 23: Fault reset (RESET) 24: Pulse input (valid only for X4) 25: Motor 1/2 switchover 26: Reserved 27: Run command switched to control panel control 28: Run command switched to terminal control 29: Reserved 30: Frequency set mode shift 31: Master FREQ set switched to digital setting b0-02 32: Auxiliary FREQ set switched to	80	×
C0-02	Function of terminal X2		86	×
C0-03	Function of terminal X3		87	×
C0-04	Function of terminal X4		28	×

Parameter	Designation	Scope	Factory default	Attr
		digital setting b0-04 33: PID adjustment direction 34: PID paused 35: PID integration paused 36: PID parameter switch 37~38: Reserved 39: Pulse input for flow calculation 40: Flow calculation reset 41~67: Reserved 68: Run prohibited 69: Reserved 70: Analog input curve switching 71-79: Reserved 80: Start the motor 81-85 Reserved 86: AC constant speed mode 87: AC constant pressure control mode 88-99: Reserved		
C0-11	Filtering time of digital input terminal	0.000s~1.000s	0.010s	Δ
C0-12	Delay time of terminal X1	0.0s~3600.0s	0.0s	Δ
C0-13	Delay time of terminal X2	0.0s~3600.0s	0.0s	Δ
C0-14	Digital input terminal enabled status setting 1	Ones place: X1 0: Positive logic 1: Negative logic Tens place: X2 (same as ones place) Hundreds place: X3 (same as ones place) Thousands place: X4 (same as ones place)	0000	×
Group C1 Digital Output				
C1-00	Y1 output function	0: No output 1: Drive undervoltage	3	Δ
C1-02	Control board relay output function	2: Drive run preparation completed 3: Drive is running 4: Drive running at 0Hz (no output at stop) 5: Drive running at 0Hz (output at stop) 6: Run direction 7: FREQ attained 8: Upper limit FREQ attained 9: Lower limit FREQ attained	3	Δ

Parameter	Designation	Scope	Factory default	Attr
		10: Frequency detection FDT1 11: Frequency detection FDT2 12: Reserved 13: Torque limited 14: Fault output 15: Alarm output 16: Drive (motor) overloaded alarm 17: Drive overheat alarm 18: Zero current detection 19: X1 20: X2 21: Motor 1/ 2 indication 22~24: Reserved 25: Consecutive run time attained 26: Accumulative run time attained 27: Brake control 28~32: Reserved 33: Frequency attains to upper/lower limit frequency 34: Frequency attains target-frequency set by C2-29 35: Solar pressure limited mode 36: AC supply constant pressure mode 37: Solar speed limited mode 38: AC supply constant speed 39: MPPT attained 40: Solar weak sleep 41: Dry run protection sleep 42: Current voltage lower than the start threshold 43: Current pressure lower than minimum pressure 44: Low pressure sleep 45~99: Reserved		
C1-04	Y1 output time delay	0.0s~3600.0s	0.0s	Δ
C1-10	FDT1 upper value	0.00Hz~maximum FREQ	50.00Hz	Δ
C1-11	FDT1 lower value	0.00Hz~maximum FREQ	49.00Hz	Δ
C1-12	FDT2 upper value	0.00Hz~maximum FREQ	25.00Hz	Δ
C1-13	FDT2 lower value	0.00Hz~maximum FREQ	24.00Hz	Δ
Group C2 Analog and Pulse Input				
C2-00	Analog input curve	Ones place: AI1 input curve 0: Curve 1 (2 points)	0010	×

Parameter	Designation	Scope	Factory default	Attr
		1: Curve 2 (4 points) 2: Curve 3 (4 points) 3: Curve 2 and curve 3 switchover Tens place: Potentiometer input curve Hundreds place: Reserved Thousands place: Reserved		
C2-01	Curve 1 maximum input	Curve 1 minimum input ~ 110.0%	100.0%	▵
C2-02	Corresponding set value of curve 1 maximum input	-100.0%~100.0%	100.0%	▵
C2-03	Curve 1 minimum input	-110.0% ~ curve 1 maximum input	0.0%	▵
C2-04	Corresponding set value of curve 1 minimum input	-100.0%~100.0%	0.0%	▵
C2-05	Curve 2 maximum input	Range: input of curve 2 inflection point A~110.0%	100.0%	▵
C2-06	Set value corresponding to curve 2 maximum input	Range: -100.0%~100.0%	100.0%	▵
C2-07	Input of curve 2 inflection point A	Input of curve 2 inflection point B ~ curve 2 maximum input	0.0%	△
C2-08	Set value Cor. to input of curve 2 inflection point A	Range: -100.0%~100.0%	0.0%	▵
C2-09	Input of curve 2 inflection point B	Range: Curve 2 minimum input ~ Input of curve 2 inflection point A	0.0%	▵
C2-10	Set value corresponding to input of curve 2 inflection point B	Range: -100.0%~100.0%	0.0%	▵
C2-11	Curve 2 minimum input	Range: -110.0%~ input of curve 2 inflection point B	0.0%	▵
C2-12	Set value corresponding to curve 2 minimum input	Range: -100.0%~100.0%	0.0%	▵
C2-13	Curve 3 maximum input	Range: input of curve 3 inflection point A ~110.0%	100.0%	▵
C2-14	Set value corresponding to curve 3 maximum input	Range: -100.0%~100.0%	100.0%	▵
C2-15	Input of curve 3 inflection point A	Range: input of curve 3 inflection point B ~ curve 3 maximum input	0.0%	▵
C2-16	Set value corresponding to input of curve 3 inflection	Range: -100.0%~100.0%	0.0%	▵

Parameter	Designation	Scope	Factory default	Attr
	point A			
C2-17	Input of curve 3 inflection point B	Range: curve 3 minimum input~ input of curve 3 inflection point A	0.0%	Δ
C2-18	Set value corresponding to input of curve 3 inflection point B	Range: -100.0%~100.0%	0.0%	Δ
C2-19	Curve 3 minimum input	Range: -110.0%~ input of curve 3 inflection point B	0.0%	Δ
C2-20	Set value corresponding to curve 3 minimum input	Range: -100.0%~100.0%	0.0%	Δ
C2-21	AI1 terminal filtering time	0.000s~10.000s	0.1s	Δ
C2-22	Potentiometer filtering time	0.000s~10.000s	0.1s	Δ
C2-24	DI maximum input	Range: C2-26~50.0kHz	50.0kHz	Δ
C2-25	Set value corresponding to DI maximum input	Range: -100.0%~100.0%	100.0%	Δ
C2-26	DI minimum input	Range: 0.0kHz~C2-24	0.0kHz	Δ
C2-27	Set value corresponding to DI minimum input	Range: -100.0%~100.0%	0.0%	Δ
C2-28	DI filtering time	0.000s~1.000s	0.001s	Δ
C2-29	Target FREQ	0.00Hz~upper limit FREQ (enabled when C1-00 ~C1-03 is set to 34)	0.00Hz	Δ
Group C3 Analog and Pulse Output				
C3-00	AO output function	0: No output 1: Set FREQ 2: Output FREQ 3: Output current (to drive rated) 4: Output torque (absolute value) 5: Output voltage 6: Output power 7: Bus voltage 8: Reserved 9: Torque current 10: Magnetic flux current 11:AI1 12:Potentiometer 13:Reserved 14: Reserved 15:DI 16:Communication input percentage 17: Output FREQ before compensation	2	Δ

Parameter	Designation	Scope	Factory default	Attr
		18:Output current (relative to motor rated current) 19:Output torque (direction hinted) 20:Set torque (direction hinted) 21~99: Reserved		
C3-03	AO offset	-100.0%~100.0%	0.0%	×
C3-04	AO gain	-2.000~2.000	1.000	×
C3-05	AO filtering time	0.0s~10.0s	0.0s	△
Group d Motor and Control Parameters				
Group d0 Parameters of Motor 1				
d0-01	Power rating of motor 1	0.4kW~6553.5kW	Model dependent	×
d0-02	Rated voltage of motor 1	0V~480V (for drives 400V level)	380V	×
d0-03	Rated current of motor 1	0.0A~6553.5A	Model dependent	×
d0-04	Rated frequency of motor 1	0.00Hz~upper limit frequency	50.00Hz	×
d0-05	Pole number of motor 1	1~80	4	×
d0-06	Rated speed of motor 1	0~65535r/min	Model dependent	×
d0-07	Stator resistance R1 of motor 1	0.001Ω~65.535Ω	Model dependent	×
d0-08	Leakage inductance L1 of motor 1	0.1mH~6553.5mH	Model dependent	×
d0-09	Rotor resistance R2 of motor 1	0.001Ω~65.535Ω	Model dependent	×
d0-10	Mutual inductance L2 of motor 1	0.1mH~6553.5mH	Model dependent	×
d0-11	No-load current of motor 1	0.0A~6553.5A	Model dependent	×
d0-12	Flux weakening coeff 1 of motor 1	0.0000~1.0000	Model dependent	×
d0-13	Flux weakening coeff 2 of motor 1	0.0000~1.0000	Model dependent	×
d0-14	Flux weakening coeff 3 of motor 1	0.0000~1.0000	Model dependent	×
d0-22	Autotuning of motor 1	0: No autotuning 1: Static autotuning 2: Rotary autotuning 3: Reserved 4: Static autotuning of sync motor 5: No-load rotary autotuning of sync	0	×

Parameter	Designation	Scope	Factory default	Attr
		motor		
Group E Enhanced Function and Protection Parameters				
Group E0 Enhanced Function				
E0-00	Switching FREQ	≤15kW: 0.7kHz~16.0kHz, factory default: 8.0 kHz 18.5kW~45kW: 0.7kHz~10.0kHz, factory default: 4.0 kHz 55kW~75kW: 0.7kHz~8.0kHz, factory default: 3.0 kHz	Model dependent	△
E0-01	PWM optimization	Ones place: switching FREQ relation with temperature 0: Self-adaption 1: No adaption Tens place: PWM modulation mode 0: Five-segment and seven-segment self-switchover 1: Five-segment mode 2: Seven-segment mode Hundreds place: over-modulation adaption 0: Disabled 1: Enabled Thousands place: PWM switching FREQ relation with output frequency 0: Self-adaption 1: No adaption	0120	×
E0-02	Action when run time attained	Ones place: action when consecutive run time attained: 0: Run continued 1: Stop and fault reported Tens place: action when accumulative run time attained: 0: Run continued 1: Stop and fault reported Hundreds place: unit of run time 0: Second 1: Hour	000	×
E0-03	Consecutive run time	0.0s(h)~6000.0s(h)	0.0s(h)	×

Parameter	Designation	Scope	Factory default	Attr
	setting			
E0-04	Accumulative run time setting	0.0s(h)~6000.0s(h)	0.0s(h)	×
Group E1 Protection Parameters				
E1-00	Overvoltage stall	0: Prohibited 1: Allowed	1	×
E1-01	Overvoltage stall protection voltage	120%~150%	130%	×
E1-02	Undervoltage stall	0: Disabled 1: Enabled	0	×
E1-03	Overload alarm	Ones place: detection option: 0: Always detect 1: Detect at constant speed only Tens place: compared with: 0: Motor rated current 1: Drive rated current Hundreds place: drive action 0: Alarm but run continued 1: Alarm and coast to stop	000	×
E1-04	Overload alarm threshold	20.0%~200.0%	130.0%	Δ
E1-05	Overload alarm activation time	0.1s~60.0s	5.0s	Δ
E1-06	Protection action 1	Ones place: reserved Tens place: action at IGBT temperature measurement circuit fault (OH3): 0: Coast to stop 1: Alarm but run continued Hundreds place: abnormal EEPROM (EPr) : 0: Coast to stop 1: Alarm but run continued Thousands place: Reserved	0000	×

Parameter	Designation	Scope	Factory default	Attr
E1-07	Protection action 2	Ones place: abnormal power supply when running (SUE): 0: Coast to stop 1: Alarm but run continued Tens place: current detection circuit failed (CtC) 0: Coast to stop 1: Alarm but run continued Hundreds place: abnormal contactor (CCL): 0: Coast to stop 1: Alarm but run continued Thousands place: input supply fault /output phase loss (ISF, oPL): 0: Protection for neither input supply fault nor output phase loss 1: No protection for input supply fault, protection enabled for output phase loss 2: Protection enabled for input supply fault, no protection for output phase loss 3: Protection enabled both for input supply fault and output phase loss	3001	×
E1-08	Fault memory after power loss	0: Not memorized after power loss 1: Memorized after power loss	0	×
E1-09	Fault auto-reset times	0~20	0	×
E1-10	Auto-reset interval	2.0s~20.0s	2.0s	×
E1-11	Relay action on drive fault	Ones place: when undervoltage fault occurs 0: No action 1: Action enabled Tens place: when fault locked 0: No action 1: Action enabled Hundreds place: at interval of auto-reset 0: No action 1: Action enabled	010	×
E1-12	Cooling fan control	0: Auto run 1: Always run after power up	0	△

Parameter	Designation	Scope	Factory default	Attr
E1-13	Drive overheat alarm threshold	0.0℃~100.0℃	80.0℃	△
Group F Application				
Group F0 MPPT Process PID adjustment				
F0-00	PID setting	0~5：Reserved 6: The voltage calculated by MPPT	6	×
F0-02	PID feedback	0~8: Reserved 9: Solar dedicated PID feedback	9	×
F0-08	Proportional gain Kp1	0.0~200.0	60.0	△
F0-09	Integration time Ti1	0.000s~50.000s	0.500s	△
F0-10	Derivative time Td1	0.000s~50.000s	0.000s	△
F0-11	Proportional gain Kp2	0.0~100.0	50.0	△
F0-12	Integration time Ti2	0.000s~50.000s	0.500s	△
F0-13	Derivative time Td2	0.000s~50.000s	0.000s	△
F0-14	PID parameter switch	0: No switch, determined by parameters Kp1, Ti1 and Td1 1: Auto-switched on the basis of input offset 2: Switched by terminal 3. Auto switched by bus voltage fluctuation size.	3	×
Group F1 Multi - step pressure				
F1-00	Multi - stage pressure setting	0: Pressure set by F6-25,F6-26 1: Pressure set by X terminal	0	△
F1-01	Minimum pressure 0	0.00Mpa~9.99Mpa	0.00Mpa	△
F1-02	Multi – step pressure 0	0.00Mpa~9.99Mpa	0.30Mpa	△
F1-03	Minimum pressure 1	0.00Mpa~9.99Mpa	0.00Mpa	△
F1-04	Multi – step pressure 1	0.00Mpa~9.99Mpa	0.30Mpa	△
F1-05	Minimum pressure 2	0.00Mpa~9.99Mpa	0.00Mpa	△
F1-06	Multi – step pressure 2	0.00Mpa~9.99Mpa	0.30Mpa	△
F1-07	Minimum pressure 3	0.00Mpa~9.99Mpa	0.00Mpa	△
F1-08	Multi – step pressure 3	0.00Mpa~9.99Mpa	0.30Mpa	△
F1-09	Minimum pressure 4	0.00Mpa~9.99Mpa	0.00Mpa	△
F1-10	Multi – step pressure 4	0.00Mpa~9.99Mpa	0.30Mpa	△
F1-11	Minimum pressure 5	0.00Mpa~9.99Mpa	0.00Mpa	△
F1-12	Multi – step pressure 5	0.00Mpa~9.99Mpa	0.30Mpa	△
F1-13	Minimum pressure 6	0.00Mpa~9.99Mpa	0.00Mpa	△
F1-14	Multi – step pressure 6	0.00Mpa~9.99Mpa	0.30Mpa	△
F1-15	Minimum pressure 7	0.00Mpa~9.99Mpa	0.00Mpa	△
F1-16	Multi – step pressure 7	0.00Mpa~9.99Mpa	0.30Mpa	△
Group F5 AC constant pressure process PID				

Parameter	Designation	Scope	Factory default	Attr
F5-00	Pressure PID Setting	0: F5-01digital setting 1~3: Reserved 4: X4 pulse input 5: Reserved 6: F6-26 digital setting.	6	×
F5-01	PID digital setting	0.0%~100.0%	50.0%	Δ
F5-02	PID feedback	0~8: Reserved 9. Actual pressure feedback (AI1)	9	×
F5-03	PID adjustment	Ones place: output frequency 0: Must be the same direction as setting running direction 1: Opposite direction allowed Tens place: integration selection 0: Integral continued when frequency attains upper/lower frequency 1: Integral stopped when frequency attains upper/lower limit	10	×
F5-04	PID positive and negative adjustment	0: Positive adjustment 1: Negative adjustment	1	
F5-05	Filtering time of PID setting	0.00s~60.00s	0.00s	Δ
F5-06	Filtering time of PID feedback	0.00s~60.00s	0.00s	Δ
F5-07	Filtering time of PID output	0.00s~60.00s	0.00s	Δ
F5-08	Proportional gain Kp1	0.0~200.0	50.0	Δ
F5-09	Integration time Ti1	0.000s~50.000s	0.500s	Δ
F5-10	Derivative time Td1	0.000s~50.000s	0.000s	Δ
F5-11	Proportional gain Kp2	0.0~100.0	50.0	Δ
F5-12	Integration time Ti2	0.000s~50.000s	0.500s	Δ
F5-13	Derivative time Td2	0.000s~50.000s	0.000s	Δ
F5-14	PID parameter switchover	0: No switch, determined by parameters Kp1, Ti1 and Td1 1: Auto switched on the basis of input offset 2: Switched by terminal	0	×
F5-15	Input offset under PID auto switch	0.0%~100.0%	20%	Δ
F5-16	Sampling period T	0.001s~50.000s	0.002s	Δ
F5-17	PID offset limit	0.0%~100.0%	0.0%	Δ
F5-18	PID derivative limit	0.0%~100.0%	0.5%	Δ
F5-19	PID initial value	0.0%~100.0%	0.0%	×

Parameter	Designation	Scope	Factory default	Attr
F5-20	Holding time of PID initial value	0.0s~3600.0s	0.0s	Δ
F5-21	PID feedback loss detection value	0.0%~100.0%	0.0%	Δ
F5-22	PID feedback loss detection time	0.0s~30.0s	1.0s	Δ
F5-23	Maximum FREQ when opposite to command direction	0.00Hz~maximum frequency	50.00Hz	Δ
F5-24	PID computation option	0: No computation in stop status 1: Computation continued in stop status	0	Δ
Group F6 Dedicated Parameters				
F6-00	Solar power functionality	0: Deactivated 1: Activated	1	×
F6-01	Senior function setting	Ones place: MPPT mode 0: Precise MPPT 1: Reserved. Tens place: Dry run protection autotune 0: Disabled 1: Enabled Hundreds place: The function of the button RUN under control panel control. 0: Press the button RUN to run, while the run command is invalid after power loss. 1: Press the button RUN to run, while the run command is still valid after repower-up, unless press the button STOP to stop. Thousands place: Pump cleaning: 0: Disabled 1: Enabled	0100	×
F6-02	PV panel open circuit voltage	0.0V~1000.0V	430.0V(4T) 340.0V(2T/2S)	Δ
F6-03	MPPT voltage upper limit	F6-04~100%	90%	Δ
F6-04	MPPT voltage lower limit	0.0%~F6-03	70%	Δ
F6-05	Pump start voltage	0.0V~1000.0V	400.0V(4T) 200.0V(2T/2S)	Δ
F6-06	Pump stop voltage	0.0V ~1000.0V	200.0V(4T) 100.0V(2T/	Δ

Parameter	Designation	Scope	Factory default	Attr
			2S)	
F6-08	Restart time delay	0.0s~600.0s	30.0s	Δ
F6-09	Pump cleaning speed	0.00Hz~100.00Hz	30.00Hz	Δ
F6-10	Pump cleaning time	0s~300s	60s	Δ
F6-11	Reserved	Reserved	20s	Δ
F6-12	Sleep frequency	0.00Hz~50.00Hz	25.00Hz	Δ
F6-13	Solar weak sleep time delay	0s~1000s	10s	Δ
F6-14	Solar weak wake-up time delay	0s~6000s	30s	Δ
F6-15	Dry run protection time delay	0s-1000s	10s	Δ
F6-16	Dry run protection current threshold percent	0.0%-100.0%	80.0%	Δ
F6-17	Dry run reset time delay	0s~6000s	600s	Δ
F6-20	Water level threshold	Ones place: Select the source of full water level control 0: Digital signal 1: Reserved Tens place: Full water level control when the ones place is set to 0 0: Deactivated 1: Enabled	01	Δ
F6-21	Full water level threshold	0.0%~100.0%	0%	Δ
F6-22	Full water level time delay	0s~1000s	10s	Δ
F6-23	Full water reset delay	0s~1000s	10s	Δ
F6-24	Pressure sensor range	0.00Mpa~9.99Mpa	0.60Mpa	Δ
F6-25	Minimum pressure	0.00Mpa~9.99Mpa	0.00Mpa	Δ
F6-26	Pressure setting	0.00Mpa~9.99Mpa	0.30Mpa	◎
F6-27	Maximal pressure	0.00Mpa~9.99Mpa	0.45Mpa	Δ
F6-28	Reset time delay on maximal pressure stop	0s~1000s	10s	Δ
F6-29	Maximal frequency at pressure control	0.00Hz~600.00Hz	50.00Hz	Δ
F6-30	Low pressure sleep time delay	0s~1000s	10s	Δ
F6-31	Low pressure sleep reset delay time	0s~1000s	10s	Δ
F6-32	Stop frequency at constant pressure mode	0.00Hz~600.00Hz	20.00Hz	Δ
F6-33	Low frequency sleep time	0s~6000s	10s	Δ

Parameter	Designation	Scope	Factory default	Attr
	delay			
F6-34	Start pressure at constant pressure mode	0.00Mpa~9.99Mpa	0.10Mpa	Δ
F6-35	Low frequency sleep reset delay time	0s~6000s	30s	Δ
F6-36	Flow calculation	0: Calculation on pulse input 1: Calculation on PQ performance curve	0	×
F6-37	Flow of one pulse	0.0L~1000.0L	1.0L	Δ
F6-38	Flow calculation coeff	0.00~10.00	1.00	Δ
F6-39	Real-time flow rate measuring interval	0.00~10.00s	2.00s	Δ
F6-40	Calculation low speed	0.00~50.00Hz	10.00Hz	Δ
F6-41	PQ curve P1	0.0kW~6553.5kW	0.0kW	Δ
F6-42	PQ curve Q1	0.0m3/h~6553.5m3/h	0.0 m3/h	Δ
F6-43	PQ curve P2	0.0kW~6553.5kW	0.0kW	Δ
F6-44	PQ curve Q2	0.0m3/h~6553.5m3/h	0.0 m3/h	Δ
F6-45	PQ curve P3	0.0kW~6553.5kW	0.0kW	Δ
F6-46	PQ curve Q3	0.0m3/h~6553.5m3/h	0.0 m3/h	Δ
F6-47	PQ curve P4	0.0kW~6553.5kW	0.0kW	Δ
F6-48	PQ curve Q4	0.0m3/h~6553.5m3/h	0.0 m3/h	Δ
F6-49	PQ curve P5	0.0kW~6553.5kW	0.0kW	Δ
F6-50	PQ curve Q5	0.0m3/h~6553.5m3/h	0.0 m3/h	Δ
F6-51	MPPT mode selection	0: Constant MPPT voltage 1: Dynamical MPPT voltage	1	Δ
F6-52	Constant MPPT voltage	0.0V-1000.0V	360.0V(4T) 250.0V(2T/2S)	Δ
F6-54	Pre-MPPT sampling time	0.000s~5.000s	0.500s	Δ
F6-55	MPPT sampling time	0.000s~5.000s	1.000s	Δ
F6-58	Maximum MPPT step size	0.1V~20.0V	3.0V	Δ
F6-66	Bus voltage fluctuation threshold	0V~100V	8V	Δ
Group H **Communication Parameters**				
Group H0 MODBUS Communication Parameters				
H0-00	SCI port selection	0: Local 485 1: Keypad	0	×

Parameter	Designation	Scope	Factory default	Attr
H0-01	SCI port communication configuration	Ones place: baud rate 0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps 4: 57600bps 5: 115200bps Tens place: data format 0: 1-8-2-N format, RTU 1: 1-8-1-E format, RTU 2: 1-8-1-O format, RTU 3: 1-7-2-N format, ASCII 4: 1-7-1-E format, ASCII 5: 1-7-1-O format, ASCII Hundreds place: connection type 0: Direct cable connection (232/485) 1: MODEM (232) Thousands place: communication data handling at power loss 0: Not saved at power loss 1: Saved at power loss	0001	×
H0-02	Local address of SCI port communication	0~247, 0 is broadcast address	1	×
H0-03	Time out detection of SCI port communication	0.0s~1000.0s	0.0s	×
H0-04	Time delay of SCI port communication	0ms~1000ms	0ms	×
H0-05	Master/Slave option	0: PC controls this drive 1: As master 2: As slave	0	×
H0-06	Parameter store address when this drive working as master	0: b0-02 1: F0-01	0	×
H0-07	Proportional factor of received FREQ	0.0~1000.0	100.0	△
Group U Monitoring				
Group U0 Status Monitoring				
U0-00	Run FREQ	0.00Hz~600.00Hz	0.00Hz	◎
U0-01	Set FREQ	0.00Hz~600.00Hz	0.00Hz	◎
U0-02	Bus voltage	0V~65535V	0V	◎
U0-03	Output voltage	0V~65535V	0V	◎
U0-04	Output current	0.0A~6553.5A	0.0A	◎
U0-05	Output torque	-300.0%~300.0%	0.0%	◎
U0-06	Output power	0.0%~300.0%	0.0%	◎

Parameter	Designation	Scope	Factory default	Attr
U0-07	Master FREQ set source	0: Digital setting + adjustment through ∧/∨ on control panel 1: Digital setting + terminal UP/DOWN adjustment 2: Analog input AI1 3:Potentiometer input 4:Reserved 5: X4 pulse input 6: Process PID output 7: PLC 8: Multi-step FREQ 9: Communication	0	◎
U0-08	Auxiliary FREQ set source	0: No set 1: Digital setting + adjustment through ∧/∨ on control panel 2: Digital setting + terminal UP/DOWN adjustment 3: Analog input AI1 4: Potentiometer input 5: Reserved 6: X4 pulse input 7: Process PID output 8: PLC 9: Multi-step FREQ 10: Communication	0	◎
U0-09	Master FREQ setting	0.00Hz~600.00Hz	0.00Hz	◎
U0-10	Auxiliary FREQ setting	0.00Hz~600.00Hz	0.00Hz	◎
U0-11	Drive status	Ones place: run status 0: Accelerating 1: Decelerating 2: Constant speed run Tens place: drive status 0: Stop 1: Running 2: Autotuning	00	◎
U0-12	AI1 input voltage	0.00V~10.00V	0.00V	◎
U0-13	Potentiometer input voltage	-10.00V~10.00V	0.00V	◎
U0-15	AO output	0.0%~100.0%	0.0%	◎
U0-17	X4 HF pulse FREQ	0.0kHz~50.0kHz	0.0kHz	◎
U0-18	Digital input terminal status	00~7F	00	◎
U0-19	Digital output terminal status	0~7	0	◎

Parameter	Designation	Scope	Factory default	Attr
U0-20	PID set	0.0%~100.0%	0.0%	◎
U0-21	PID feedback	0.0%~100.0%	0.0%	◎
U0-22	PID input offset	-100.0%~100.0%	0.0%	◎
U0-23	PLC step	0~15	0	◎
U0-24	V/f separated target voltage	0.0%~100.0%	0.0%	◎
U0-25	V/f separated actual output voltage	0.0%~100.0%	0.0%	◎
U0-30	Cumulative power-up time	0h~65535h	0h	◎
U0-31	Cumulative run time	0h~65535h	0h	◎
U0-35	Terminal count value	0~65535	0	◎
U0-36	Run command log at LoU	0~1	0	◎
U0-37	Fault code log at LoU	0~100	0	◎
U0-38	Reserved	Reserved	Reserved	◎
U0-39	CtC fault source	0: No fault 1: U-phase current detection circuit fault 2: V-phase current detection circuit fault 3: W-phase current detection circuit fault	0	◎
U0-40	Higher-bit numbers of actual length	0~65	0	◎
U0-41	Lower-bit numbers of actual length	0~65535	0	◎
U0-42	Higher-bit numbers of control panel ∧/∨ stored value	-1~1	0	◎
U0-43	Lower-bit numbers of control panel ∧/∨ stored value	0.00~655.35 Hz	0.00Hz	◎
U0-44	Higher-bit numbers of terminal UP/DOWN stored value	-1~1	0	◎
U0-45	Lower-bit numbers of terminal UP/DOWN stored value	0.00~655.35 Hz	0.00Hz	◎
U0-47	MPPT target voltage	0V~1000.0V	0.0V	◎
U0-48	Actual bus voltage	0V~6553.5V	0.0V	◎
U0-49	Output power	0.00kW~655.35kW	0.00kW	◎
U0-50	Bus current	0.00A~655.35A	0.00A	◎
U0-51	Present step size	0.0V~10.0V	0.0V	◎
U0-52	High-place numeric of	0 km^3~65535 km^3	0 km^3	◎

Parameter	Designation	Scope	Factory default	Attr
	cumulated flow			
U0-53	Low-place numeric of cumulated flow	0.0 m^3~1000.0 m^3	0.0m^3	◎
U0-54	Flow of this power-up	0.0 m^3~6553.5 m^3	0.0 m^3	◎
U0-55	Real time flow rate	0.0 L/s~6553.5 L/s	0.0 L/s	◎
U0-56	Current water pressure	0.00 Mpa~655.35 Mpa	0.00 Mpa	◎
U0-57	Current water level	0.0%~100.0%	0.0 %	◎
Group U1 History Fault				
U1-00	History fault 1 (latest)	0: No fault 1: Accel overcurrent (oC1) 2: Constant-speed overcurrent (oC2) 3: Decel overcurrent (oC3) 4: Accel overvoltage (ov1) 5: Constant-speed overvoltage (ov2) 6: Decel overvoltage (ov3) 7: Module protection (FAL) 8: Autotuning failed (tUN) 9: Drive overloaded (oL1) 10: Motor overloaded (oL2) 11: Current detection abnormal (CtC) 12: Ground short-circuit protection at output side (GdP) 13: Input power supply fault (ISF) 14: Phase loss at output side (oPL) 15: Inverter module overloaded (oL3) 16: Module overheated (oH1) 17: Motor overheated (PTC) (oH2) 18: Module temperature detection disconnection (oH3) 19-21: Reserved 22: Control board flat cable connection abnormal (dLC) 23: Analog terminal functional mutex (TEr) 24: External equipment malfunction (PEr) 25: Reserved 26: Continuous run time attained (to2) 27: Accumulative run time attained (to3) 28: Power supply abnormal in running (SUE)	0	◎

Parameter	Designation	Scope	Factory default	Attr
		29: EEPROM read/write fault (EPr) 30: Contactor close fault (CCL) 31: Reserved 32: Control panel communication abnormal (PdC) 33: Parameter copy fault (CPy) 34: Reserved 35: Software version compatibility fault (SFt) 36: CPU interference as a fault (CPU) 37: Overcurrent reference fault (oCr) 38: 5V power supply out-of-limit (SP1) 39: 10V power supply out-of-limit (SP2) 40: AI input out-of-limit (AIP) 41: Undervoltage protection (LoU) 42-44: Reserved 45: PID feedback loss (PIo) 46: Reserved 47: Water tower full water (StF) 48: Dry run protection (LLr) 49: High water pressure (oPS) 50: Solar weak sleep (SLP) 51: Low water pressure (LoP)		
U1-01	Run frequency at fault 1	0.00Hz~600.00Hz	0.00Hz	◎
U1-02	Output current at fault 1	0.0A~6553.5A	0.0A	◎
U1-03	Bus voltage at fault 1	0V~10000V	0V	◎
U1-04	Temperature 1 of heat sink at fault 1	-40.0℃~100.0℃	0.0℃	◎
U1-05	Temperature 2 of heat sink at fault 1	-40.0℃~100.0℃	0.0℃	◎
U1-06	Input terminal status at fault 1	0~FFFF	0000	◎
U1-07	Output terminal status at fault 1	0~FFFF	0000	◎
U1-08	Cumulative run time at fault 1	0h~65535h	0h	◎
U1-09	Code of fault 2	Same as U1-00	0	◎
U1-10	Run frequency at fault 2	0.00Hz~600.00Hz	0.00Hz	◎
U1-11	Output current at fault 2	0.0A~6553.5A	0.0A	◎
U1-12	Bus voltage at fault 2	0V~10000V	0V	◎
U1-13	Temperature 1 of heat sink at fault 2	-40.0℃~100.0℃	0.0℃	◎

Parameter	Designation	Scope	Factory default	Attr
U1-14	Temperature 2 of heat sink at fault 2	-40.0℃~100.0℃	0.0℃	◎
U1-15	Input terminal status at fault 2	0~FFFF	0000	◎
U1-16	Output terminal status at fault 2	0~FFFF	0000	◎
U1-17	Cumulative run time at fault 2	0h~65535h	0h	◎
U1-18	Code of fault 3	Same as U1-00	0	◎
U1-19	Run frequency at fault 3	0.00Hz~600.00Hz	0.00Hz	◎
U1-20	Output current at fault 3	0.0A~6553.5A	0.0A	◎
U1-21	Bus voltage at fault 3	0V~1000V	0V	◎
U1-22	Temperature 1 of heat sink at fault 3	-40.0℃~100.0℃	0.0℃	◎
U1-23	Temperature 2 of heat sink at fault 3	-40.0℃~100.0℃	0.0℃	◎
U1-24	Input terminal status at fault 3	0~FFFF	0000	◎
U1-25	Output terminal status at fault 3	0~FFFF	0000	◎
U1-26	Cumulative run time at fault 3	0h~65535h	0h	◎

Chapter 5 Parameters Specification

SLR03 series solar pump drives are dedicated for asynchronous motors, synchronous motor, and BLDC, used at solar water pumps, supporting PV panel DC input or grid AC input. SLR03 drives can quickly capture and track the maximum power point according to the radiation intensity, and always maintain the maximum output power of the system in the speed non-limited mode. To meet the needs of different user groups, SLR03 are classified by two user modes: plug and play mode and expert mode.

Plug-and-Play Mode. This mode only requires correct basic wiring, motor parameter settings and solar mode parameter setting (or use the default). The inverters could operate in precise MPPT mode.

Plug and play mode supports precise MPPT, and basic protections for pump clogging as well as dry run protection and pump cleaning function by factory default program. As default, the inverter only display A0-01 A0-03, b0-08, b0-09, A0-09, d0-01, d0-02, d0-03, d0-04, d0-05, d0-06, d0-22, F6-01, F6-02, F6-05, F6-06, F6-08, F6-12, F6-13, F6-14 and F6-16. If more functions are needed, users can go to the expert mode via setting A0-01 to 0. All parameters are open to users under the expert mode.

Expert Mode. Under this mode, it realizes precise pump clogging function with the PV short-circuit module and current measuring unit. Moreover, expert mode also supports user-defined pump cleaning function, user defined dry run protection and a wider coverage of functions related to water supply, such as water level control, pipe system overpressure protection, flow calculation, multi-step pressure water supply, pressure limit mode under solar power supply, constant speed mode and constant pressure mode under AC power supply. Users need to first set A0-01 to 0 to access all parameter settings.

5.1 Plug-and-Play Mode

A0-03	Parameter restoration	Range: 0~4	Factory default: 0

0: No operation

1: Clear fault record

When this parameter is set to 1, all fault record of Group U1 will be cleared.

2: Restore all parameters to factory default (excluding motor parameters)

3: Restore all parameters to factory default (including motor parameters)

4: Restore all parameters to backup parameters

b0-08	Maximum frequency	Range: Upper limit frequency ~600.00Hz	Factory default: 50.00Hz
b0-09	Upper limit frequency	Range: Lower limit frequency ~ maximum frequency	Factory default: 50.00Hz

Maximum frequency of b0-08 is the maximum allowable output frequency of drive and is indicated by fmax in the figure.

B0-09 upper limit frequency is the user-defined maximum allowable run frequency and represented by fH in Fig. 5-1.

fN represents rated frequency of motor while VN means the rated voltage of motor.

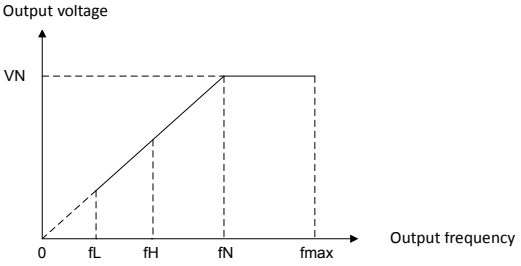


Fig. 5-1

A0-09	Type of motor	Range: 0~03	Factory default: 00

00: Ordinary async motor

03: Synchronous motor

d0-01	Motor power rating	Range: 0.4kW~6553.5kW	Factory default: model dependent
d0-02	Motor rated voltage	Range: 0V~480V	Factory default: 380V
d0-03	Motor rated current	Range: 0.0A~6553.5A	Factory default: model dependent
d0-04	Motor rated frequency	Range: 0.00Hz~upper limit frequency	Factory default: 50.00Hz
d0-05	Motor Pole number	Range: 1~80	Factory default: 4
d0-06	Motor rated speed	Range: 0~65535 r/min	Factory default: model dependent

Above-noted motor parameters must be correctly set according to motor nameplate. Please select the motor that suits the drive power rating, otherwise the control performance of the drive will drop dramatically.

d0-22	Autotuning of motor 1	Range: 0~5	Factory default: 0

Parameters for controlling the motor performance are automatically obtained through autotuning, and the result will be automatically saved upon the completion of autotuning. No matter it is async motor or sync motor, be sure to correctly input motor parameters d0-01~d0-06 before autotuning.

0: No autotuning

1: Static autotuning of async motor

Static autotuning applies to the cases where rotary autotuning cannot be favorably performed due to the fact that it is impossible to disengage the motor from its load. After d0-22 is set to 1 and confirmed, press the key RUN to start static autotuning. d0-22 will be restored to 0 upon the successful completion of autotuning. In this way, parameters d0-07~d0-09 are obtained.

2: Rotary autotuning of async motor

To perform rotary autotuning, it is essential to disengage the motor from its load. Autotuning is prohibited when motor is loaded. After d0-22 is set to 2 and confirmed, press RUN to perform static autotuning, upon the completion of which, the motor would accelerate to a fixed frequency in the set ramp-up time, maintaining a period of time, and then stop by ramp down according to the set ramp down time. In this way, the autotuning comes to an end, and d0-22 will be restored to 0. Parameters d0-07~d0-14 have be obtained after the successful completion of rotary autotuning. To perform rotary autotuning, please set appropriate ramp-up and ramp-down time (i.e. Accel/Decel time. If overcurrent or overvoltage fault occurs during autotuning, please prolong Accel/Decel time accordingly.

3: Reserved

4: Static autotuning of sync motor

Applies to parameter autotuning for sync motor. After d0-22 is set to 4 and confirmed, press the key RUN to start static autotuning. d0-22 will be restored to 0 upon the successful completion of autotuning. In this way, parameters d0-15~d0-17 are obtained.

5: No-load rotary autotuning of sync motor

Applies to parameter autotuning for sync motor. After d0-22 is set to 5 and confirmed, press the key RUN to start rotary autotuning. d0-22 will be restored to 0 upon the successful completion of autotuning. In this way, parameters d0-15~d0-18 are obtained. d0-19 is autotuning current for rotary autotuning, if motor cannot run during rotary autotuning, this current can be properly increased.

ATTENTION:

Please make sure the motor is in a stationary state before the autotuning, or autotuning cannot be performed normally.

Control panel displays "TUNE" and RUN indicator light is on during autotuning. RUN indicator light is off upon the completion of autotuning.

Once autotuning fails, the fault code "tUN" shall be displayed.

F6-01	Senior function setting	Range: 0000~1112	Factory default: 0100

Ones place: MPPT mode

0: Precise MPPT mode

1~5: Reserved

Tens place: Dry Run Protection autotune.

0: Disabled

1: Enabled

SLR03 drives are equipped with dry run protection as default at plug and play mode. Before programming dry run protection function, users need to confirm the drive can run at rated frequency because the drive needs to study the current at rated frequency during automatically programming the function of dry run protection, no matter the power supply is from solar panels or AC gird. After programming the autotune of the motor, set the tens place of F6-01 to 1 and press RUN to start the motor, the drive will immediately start programming the dry run protection. During this process, the drive displays LLr-S. When the programming is completed successfully, LLr-S disappears and the drive returns to normal working state. If the programming is failed or stopped in the progress, the drive will display LLr-F.

If users want to define the protection delay time, go to the expert mode, A0-01=0, to set F6-15, and F6-17.

Hundreds place: The function of the button RUN under control panel control.

0: Press **RUN** to run, while the run command is invalid after power loss.

1: Press **RUN** to run, while the run command is still valid after repower-up, unless pressing **STOP** to stop.

Under the control mode by the control panel, when the hundreds place is set to 1(the default), the inverter drives the motor to run as long as the solar intensity meets the requirement, no matter how many days and nights it goes through. If users choose to press **RUN** every time to restart the pump when the power is applied, the hundreds place should be set to 0.

Thousands place: Pump cleaning:

0: Disabled

1: Enabled

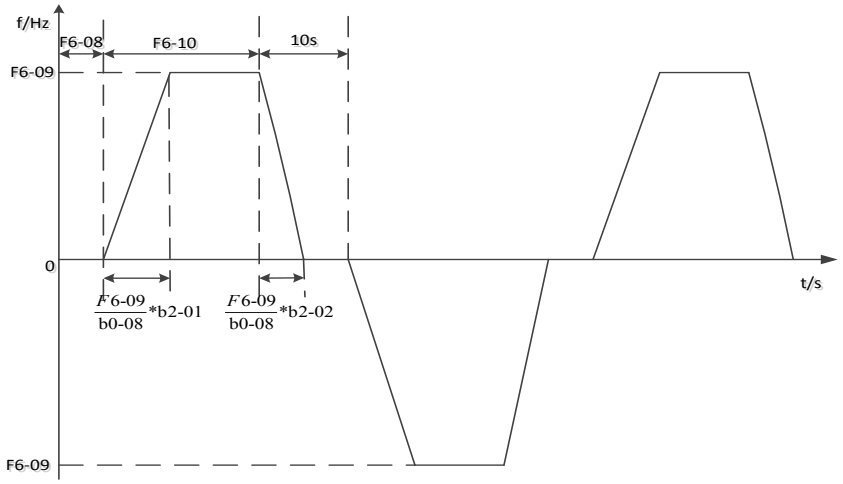


Fig. 5-2 Pump cleaning sequence

When the thousands place is set to 1, the pump will go to the cleaning mode after the pump starts. The function consists of a programmable sequence of forward and reverse running of the pump to shake off any residue on the impeller or piping. The pump runs forward at the speed set by F6-09 first, lasting the time set by F6-10, then follows reverse at the speed by

F6-09, and last the time by F6-10. The deceleration time plus the dead time between forward and reserve is 10 seconds. The cycle repeats three times and then the pump stops and the thousands place is stored to 0 automatically. If any intermediate fault occurs, the pump cleaning sequence stops.

*Note: Plug and play mode just supports the factory default cleaning speed and time. If users want to define the speed and time, go to the expert mode by setting A0-01=0, to set F6-09 and F6-10.

F6-02	PV panel open circuit voltage	Range: 0.0V~1000.0V	Factory default: 430.0V (4T model) 340.0V(2T/2S model)

This parameter value is automatically updated if it is not well programmed. Correct digital setting enables the system to have higher efficiency.

F6-05	Pump start voltage	Range: 0.0V~1000.0V	Factory default: 400.0V(4T model) 200.0 (2T/2S model)

Only when the actual output voltage of the PV panels is higher than this voltage, the pump has the precondition to get started.

F6-06	Pump stop voltage	Range: 0.0V~1000.0V	Factory default: 200.0V(4T model) 100.0V(2T/2S model)

When the actual voltage of the PV panels is lower than this voltage, the pump will stop.

F6-08	Restart time delay	Range: 0.0s~600.0s	Factory default: 30.0s

Before restarting, the inverter will detect the condition. When the starting condition meets the requirement and lasts the time set by F6-08, the pump starts. The next restart time is double of the previous startup and the maximum time delay is 10 minutes, so as to reduce the times of frequent restarts in critical radiation state. Only when the pump runs normally for 5 minutes or receives the run command again, the time delay will be restored to the set value in F6-08. However, when the tens place of F6-01 is set to 1 to prevent pump clogging; the re-start time is F6-08 set value always. When the input is AC, and X2 or X3 is active (X2: C0-02=86, AC constant speed mode. X3: C0-03=87, AC constant pressure mode), F6-08 is deactivated, i.e. starting time delay is 0.

F6-12	Sleep frequency	Range: 0.00Hz~50.00Hz	Factory default: 25.00Hz

When the runnig frequency is below the sleep frequency, and the time to maintain this state exceeds the solar weak sleep time delay defined by F6-13, the system gets into sleep state.

The motor stops its spinning and the drive control panel displays "SLP". When the solar weak wake-up time delay defined by F6-14 elapses, the system is woken up and gets into judgement state of restarting.
If this parameter is set to 0.00Hz, the solar weak sleep function is disabled.

F6-13	Solar weak sleep time delay	Range: 0s~1000s	Factory default: 10s

When the run frequency is lower than sleep frequency, and the time to maintain this state is longer than the solar weak sleep time delay, the control panel displays “SLP” and the system gets into sleep state. If this state is not continuous, the delay time will be cleared and recalculated.

F6-14	Solar weak wake-up time delay	Range: 0s~6000s	Factory default: 30s

In the state of solar weak sleep, the inverter will wake up to get into the judgmental state after the solar weak wake-up time delay elapses.

F6-16	Dry run protection current threshold	Range: 0.0%-100.0%	Factory default: 80.0%

5.2 Expert mode

Under this mode, It realizes precise pump clogging function with the PV short-circuit module and current measuring unit. Moreover, expert mode also supports user-defined pump cleaning function, user defined dry run protection and a wider coverage of functions related to water supply, such as water level control, pipe system overpressure protection, flow calculation, multi-step pressure water supply, pressure limit mode under solar power supply, constant speed mode and constant pressure mode under AC power supply. Users need to first set A0-01 to 0 to access all parameter settings.

Group A System Parameters and Parameter Management

Group A0 System Parameters

A0-00	Setting of user password	Range: 0~FFFF	Factory default: 0000

Setting of password:

A non-zero four-digital number could be set as a user password by entering this password into A0-00 and pressing ENT key to confirm once, then reenter and reconfirm it once again within 10 seconds. Once this password has been successfully set, the word "P-SEt" would be displayed. The password setting will take effect as long as there is no operation on control panel within 5 minutes, or cutting the power off and power up again.

Change password:

Access A0-00 after entering the original four-digit password (at this point, A0-00 displays 0000) and set the new password following the above-noted procedure.

Password clearance:

Access A0-00 after entering the original four-digit password (at this point, A0-00 displays 0000), enter 0000 twice and press ENT key to make confirmation. In this way, password is successfully cleared and the word "P-CLr" is displayed.

A0-01	Parameter display	Range: 0~3	Factory default: 0

This parameter sets the display/hide of parameters.

0: Display all parameters

1: Reserved

2: Only display A0-00, A0-01 and plug-and-play related parameters.

3: Reserved

A0-02	Parameter protection	Range: 0~1	Factory default: 0

0: All parameter programming allowed

1: Only A0-00 and this parameter programming allowed

A0-03	Parameter restoration	Range: 0~4	Factory default: 0

0: No operation

1: Clear fault record

When this parameter is set to 1, all fault record of Group U1 will be cleared.

2: Restore all parameters to factory default (excluding motor parameters)

3: Restore all parameters to factory default (including motor parameters)

4: Restore all parameters to backup parameters

A0-04	Parameter backup	Range: 0~1	Factory default: 0

0: No operation

1: Backup all parameters

A0-05	Parameter copy	Range: 0~3	Factory default: 0

0: No operation
1: Upload all parameters other than Group U to control panel
2: Download all parameters of control panel other than d0-01~d0-18 and d3-01~d3-18 to drive
3: Download all parameters of control panel to drive

A0-09	Motor control technique	Range: 00~03	Factory default: 00

◆ **Ones place: control technique of motor**

◆ 0: Asynchronous motor
3: Synchronous motor

Group b Run Parameter Setting

Group b0 Frequency Setting

b0-01	Master FREQ set	Range: 0~9	Factory default: 6

0: Digital setting (b0-02) + ∧/∨ adjustment on control panel
1: Digital setting (b0-02) + terminal UP/DOWN adjustment
2: Terminal analog input
3: Potentiometer analog input
4: Reserved
5: X4 pulse input
6: Solar mode.
Frequency is set by MPPT algorithm. See parameters in Group F0 and F6 if MPPT algorithm needs to be adjusted by experts.
7~8: Reserved
9: AC constant pressure PID control
When AC constant pressure mode is activated (X3 activated), frequency setting will be shifted to AC constant pressure PID control. Refer to related parameters in F5 group and F6 group.

When F6-00 is set to 0, the factory default of b0-01 will be shifted to 0 automatically. This parameter value restores to 6 automatically when F6-00 is set to 1 (solar mode). X2 terminal takes precedence over F6-00.

b0-02	Master FREQ digital setting	Range: lower limit frequency ~ upper limit frequency	Factory default: 50.00Hz

When master frequency setting b0-01 value is set to either 0 or 1, this parameter value will be

the initial value of master frequency setting.

b0-03	Auxiliary FREQ setting	Range: 0~10	Factory default: 2

When AC constant speed mode is activated (X2 activated), frequency setting will be shifted to auxiliary frequency setting (b0-03 and b0-04).

0: No setting

1: Digital setting (b0-04) + ∧/∨ adjustment on control panel

2: Digital setting (b0-04) + terminal UP/DOWN adjustment

3: Analog input AI1

4: Potentiometer analog input

6: X4 pulse input

b0-04	Auxiliary FREQ digital setting	Range: lower limit frequency ~ upper limit frequency	Factory default: 50.00Hz

When auxiliary frequency is set to either 1 or 2, this parameter value should be the initial value of auxiliary frequency setting.

b0-08	Maximum frequency	Range: Upper limit frequency ~600.00Hz	Factory default: 50.00Hz
b0-09	Upper limit frequency	Range: Lower limit frequency ~ maximum frequency	Factory default: 50.00Hz
b0-10	Lower limit frequency	Range: 0.00Hz ~ upper limit frequency	Factory default: 0.00Hz

Maximum frequency of b0-08 is the maximum allowable output frequency of the drive and is indicated by fmax in the figure.

b0-09 upper limit frequency is the user-defined maximum allowable run frequency and represented by fH in Fig. 5-3.

b0-10 lower limit frequency is user-defined minimum allowable run frequency and marked with fL in Fig. 5-3. In Fig. 5-3, fN represents rated frequency of motor while VN means the rated voltage of motor.

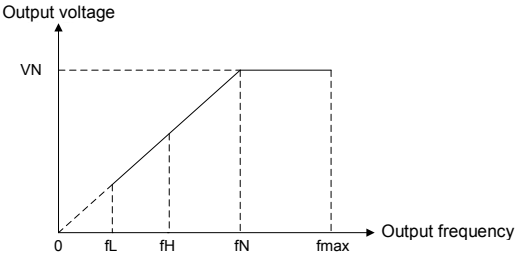


Fig. 5-3

ATTENTION:

- Maximum frequency, upper limit frequency and lower limit frequency should be set with caution in accordance with nameplate parameters of motor and operation requirements.
- Jog and motor parameter identification is free from limitations of upper and lower limit frequency.
- In addition to limitation of upper limit frequency and lower limit frequency, the output frequency is also subject to limitations of starting frequency, stop DC brake initial frequency, skip frequency and other parameter settings.
- The rank relation between maximum frequency, upper limit frequency and lower limit frequency is shown as Fig. 5-3.
- Upper and lower limit frequencies restrict actual output frequency to motor. If frequency setting is higher than upper limit frequency, the actual output would be upper limit frequency. In case frequency setting is lower than lower limit frequency, the actual output should be in accordance with the setting of b0-11.

b0-11	Operation when set FREQ lower than lower limit FREQ	Range: 0~2	Factory default: 0

0: Run at lower limit frequency

1: Run at 0Hz

2: Stop

b0-12	Time-delay of stop when set FREQ lower than lower limit FREQ	Range: 0.0s~6553.5s	Factory default: 0.0s

Group b1 Start/Stop Control

b1-00	Run command	Range: 0~2	Factory default: 0

This parameter sets run command source. Run commands include "start, stop, forward and reverse", etc.

0: Control panel control

Control run command through RUN, STOP/RESET and MF keys on control panel (set multifunction button MF to JOG by L0-00). Refer to Chapter 4 about the operation of control panel.

1: Terminal control

Control run command via DI terminals. Control panel control and terminal control can be switched by X4. X1 terminal controls the start and stop of motor under terminal control mode – X4 activated.

2: Communication control

Master device is able to control run command through built-in RS485 serial communication interface of the drive. Refer to parameters Group H0 and appendix at GK600 user manual for further information about programming.

b1-02	Run direction	Range: 0~1	Factory default: 0

This parameter applies to run command controlled by control panel, and disabled under terminal and communication control.

0: Forward

1: Reverse

Apart from this parameter programming, users can change the motor spinning direction under any run command via pressing ESC+ENT at the same time, or exchange the wiring of any two of U, V, W.

b1-03	Reverse disabled	Range: 0~1	Factory default: 0

0: Reverse enabled

1: Reverse disabled

b1-04	Dead time between forward and reverse	Range: 0.0s ~ 3600.0s	Factory default: 0.0s
b1-05	Start method	Range: 0~5	Factory default: 0

0: From start frequency

1: DC braking start

2: Flying start 1

3: Reserve

4: Flying start 3

5: Flying start 4

b1-06	Start FREQ	Range: 0.00Hz ~ upper limit frequency	Factory default: 0.00Hz
b1-07	Holding time of start FREQ	Range: 0.0s ~ 3600.0s	Factory default: 0.0s
b1-08	DC braking current at start	Range: 0.0%~200.0%	Factory default: 0.0%
b1-09	DC braking time at start	Range: 0.00s~30.00s	Factory default: 0.00s
b1-10	Flying start current	Range: 0~200.0%	Factory default: 100.0%
b1-11	Flying start Decel time	Range: 0.1s~20.0s	Factory default: 2.0s
b1-12	Flying start adjustment coeff	Range: 0.0~100.0%	Factory default: 1.0%

b1-13	Stop method	Range: 0~2	Factory default: 0

0: Ramp to stop

Upon the receipt of stop command, drive gradually decreases output frequency according to the set Decel time, and stop when frequency attains 0.

1: Coast to stop

Upon the receipt of stop command, drive will immediately lock the output and the motor will stop with its mechanical inertia.

2: Ramp to stop + DC brake

Upon the receipt of stop command, drive will decrease output frequency in accordance with the rate of Decel time setting. Once the output frequency attains set value of b1-14, DC brake will be activated, and the drive will stop after the finish of DC brake.

b1-14	Start frequency of DC brake stop	Range: 0.00Hz ~ upper limit frequency	Factory default: 0.00Hz
b1-15	DC brake current	Range: 0.0%~200.0%	Factory default: 0.0%
b1-16	DC Brake time	Range: 0.00s~30.00s	Factory default: 0.00s
b1-17	Overexcitation brake	Range: 0~1	Factory default: 1

0: Disabled

1: Enabled

b1-20	Auto restart when power up again after power loss	Range: 0~1	Factory default: 0
b1-21	Time delay of auto restart when power up again	Range: 0.0s~10.0s	Factory default: 0.0s

Group b2 Accel/Decel Parameters

b2-01	Accel time 1	Range: 0s~60000s	Factory default: 10.0s
b2-02	Decel time 1	Range: 0s~60000s	Factory default: 0.2s
b2-03	Accel time 2	Range: 0s~60000s	Factory default: 10.0s
b2-04	Decel time 2	Range: 0s~60000s	Factory default: 0.2s

Group C Input and Output Terminals

Group C0 Digital Input

C0-01	Function of terminal X1	Range: 0~99	Factory default: 80
C0-02	Function of terminal X2	Range: 0~99	Factory default: 86
C0-03	Function of terminal X3	Range: 0~99	Factory default: 87
C0-04	Function of terminal X4	Range: 0~99	Factory default: 28

Parameter setting of digital input is as shown in Table 5-1:

Table 5-1 Digital input function

Set value	Function	Set value	Function
0	No function	26	Reserved
1	JOG forward	27	Run command switched to control panel control
2	JOG reverse	28	Run command switched to terminal control
3	Run forward (FWD)	29	Reserved
4	Run reverse (REV)	30	Frequency set mode shift
5	Three-wire control	31	Master frequency set switched to digital setting b0-02
6	Run suspended	32	Auxiliary FREQ set switched to digital setting b0-04
7	External stop	33	PID adjustment direction
8	Emergency stop	34	PID paused
9	Reserved	35	PID integration paused
10	Reserved	36	PID parameter switch
11	Coast to stop	37	Reserved
12	Terminal UP	38	Reserved
13	Terminal DOWN	39	Pulse input for flow calculation
14	Clear UP/DOWN (including the buttons ∧/∨) adjustment	40	Flow calculation reset
15	Reserved	41~67	Reserved
16	Reserved	68	Run prohibited
17	Reserved	69	Reserved
18	Reserved	70	Analog input curve switching

Set value	Function	Set value	Function
19	Accel/Decel time determinant 1	71~99	Reserved
20	Accel/Decel time determinant 2	80	Start the motor
21	Accel/Decel disabled(ramp stop not inclusive)	81~85	Reserved
22	External fault input	86	AC constant speed mode
23	Fault reset (RESET)	87	AC constant pressure control mode
24	Pulse input (valid only for X4)	88-99	Reserved
25	Motor 1/2 switchover		

39: Pulse input for flow calculation

When X4 is set to 39 and F6-36 is set to 0 (default), the flow will be calculated on pulse input through X4. Refer to F6-37 and F6-38 for details.

40: Flow calculation reset

When this terminal is activated, flow calculation will be reset.

80: Start the motor

Under terminal control (b1-00=1 or X4 is activated), when this terminal is activated, the drive will run the motor.

81~85: Reserved

86: AC constant speed mode

When the power supply is AC (input from mains R, S, T), and this terminal is activated, the motor runs at a constant speed defined by b0-04.

87: AC constant pressure control mode

When the power supply is AC (input from mains R, S, T), and this terminal is activated, the system works at constant pressure mode. The pressure is defined by F5-00.

88~99: Reserved

C0-11	Filtering time of digital input terminal	Range: 0.000s~1.000s	Factory default: 0.010s
C0-12	Delay time of terminal X1	Range: 0.0s~3600.0s	Factory default: 0.0s
C0-13	Delay time of terminal X2	Range: 0.0s~3600.0s	Factory default: 0.0s
C0-14	Digital input terminal enabled status setting 1	Range: 0000~1111	Factory default: 0000

◆ Ones place: X1

0: Positive logic; ON when current flows through

1: Negative logic; ON when no current flows through

- Tens place: X2 (same as X1)
- Hundreds place: X3 (same as X1)
- Thousands place: X4 (same as X1)

◆ Group C1 Digital Output

C1-00	Y1 output function	Range: 0~99	Factory default: 3
C1-02	Control board relay output function	Range: 0~99	Factory default: 3

These parameters define the functions of digital output terminals Y1 & Y2, and control board relay. When used as high-speed pulse output, Y2/DO terminal's function are not set in C1-01 but in C3-02. Output terminal function selections are as follows:

Table 5-2 Digital output function

Value	Function	Value	Function
0	No output	21	Motor 1/2 indication
1	Drive undervoltage	22	Reserved
2	Drive run preparation completed	23	Reserved
3	Drive is running	24	Reserved
4	Drive running at 0Hz (no output at stop)	25	Consecutive run time attained
5	Drive running at 0Hz (output at stop)	26	Accumulative run time attained
6	Run direction	27	Brake control
7	Frequency attained	28~32	Reserved
8	Upper limit frequency attained	33	Frequency attains to upper/lower limit frequency
9	Lower limit frequency attained	34	Frequency attains target-frequency set by C2-29
10	Frequency detection FDT1	35	Solar pressure limited mode
11	Frequency detection FDT2	36	AC supply constant pressure mode
12	Reserved	37	Solar speed limited mode
13	Torque restricted	38	AC supply constant speed
14	Fault output	39	MPPT attained

Value	Function	Value	Function
15	Alarm output	40	Solar weak sleep
16	Drive (motor) overloaded alarm	41	Dry run protection sleep
17	Drive overheated alarm	42	Current voltage lower than the start threshold
18	Zero-current detection	43	Current pressure lower than minimum pressure
19	X1	44	Low pressure sleep
20	X2		

10: Frequency detection FDT1

Terminal outputs ON signal when output frequency exceeds C1-10 (FDT1 upper bound) and will not output OFF signal unless output frequency drops to below C1-11 (FDT1 lower bound).

11: Frequency detection FDT2

Terminal outputs ON when output frequency exceeds C1-12 (FDT2 upper bound) and will not output OFF unless output frequency drops to below C1-13 (FDT2 lower bound).

36: AC supply constant pressure mode

When the power supply is AC and works at constant pressure mode, this terminal is activated.

37: Solar speed limited mode

Under solar mode, when using control panel to program sleep frequency or dry run protection threshold current, this terminal is activated.

38: AC supply constant speed

Under AC power supply, when it works at constant speed mode, this terminal is activated

39: MPPT attained

When the drive reaches MPPT, this terminal is activated.

40: Solar weak sleep

When the system is in sleep due to solar weak, this terminal is activated.

41: Dry run protection sleep

When the drive is in dry run protection sleep, this terminal is activated.

42: Current voltage lower than the start threshold

When the solar panel voltage is lower than the system start voltage defined by F6-05, this terminal is activated.

43: Current pressure lower than minimum pressure

Current water pressure as shown in U0-56 is lower than minimum pressure defined by F6-25, this terminal is activated.

44：Low pressure sleep

When the pressure shown in U0-56 is lower than minimum pressure defined by F6-25 and this state lasts the time defined by F6-30, the system will sleep and this terminal is activated.

C1-04	Y1 output time delay	Range: 0.0s~3600.0s	Factory default: 0.0s
C1-10	FDT1 upper value	Range: 0.00Hz~maximum FREQ	Factory default: 50.00Hz
C1-11	FDT1 lower value	Range: 0.00Hz~ maximum FREQ	Factory default: 49.00Hz
C1-12	FDT2 upper value	Range: 0.00Hz~ maximum FREQ	Factory default: 25.00Hz
C1-13	FDT2 lower value	Range: 0.00Hz~ maximum FREQ	Factory default: 24.00Hz

Group C2 Analog and Pulse Input

C2-00	Analog input curve	Range: 0000~222	Factory default: 10

Curves of analog input AI1 are selected by this parameter.

- Ones place: AI1 input curve

0: Curve 1 (2 points)
1: Curve 2 (4 points)
2: Curve 3 (4 points)
3: Curve 2 and curve 3 switchover

- Tens place: Potentiometer input curve
- Hundreds place: Reserved
- Thousands place: reserved

C2-01	Curve 1 maximum input	Range: minimum input of curve 1 ~110.0%	Factory default: 100.0%
C2-02	Corresponding set value of curve 1 maximum input	Range: -100.0%~100.0%	Factory default: 100.0%
C2-03	Curve 1 minimum input	Range: -110.0% ~ curve 1 maximum input	Factory default: 0.0%
C2-04	Corresponding set value of curve 1 minimum input	Range: -100.0%~100.0%	Factory default: 0.0%
C2-05	Curve 2 maximum input	Range: input of curve 2 inflection point A~110.0%	Factory default: 100.0%
C2-06	Set value corresponding to curve 2 maximum input	Range: -100.0%~100.0%	Factory default: 100.0%

C2-07	Input of curve 2 inflection point A	Input of curve 2 inflection point B ~ curve 2 maximum input	Factory default: 0.0%

C2-08	Set value corresponding to input of curve 2 inflection point A	Range: -100.0%~100.0%	Factory default: 0.0%
C2-09	Input of curve 2 inflection point B	Range: Curve 2 minimum input ~ Input of curve 2 inflection point A	Factory default: 0.0%
C2-10	Set value corresponding to input of curve 2 inflection point B	Range: -100.0%~100.0%	Factory default: 0.0%
C2-11	Curve 2 minimum input	Range: -110.0%~ input of curve 2 inflection point B	Factory default: -100.0%
C2-12	Set value corresponding to curve 2 minimum input	Range: -100.0%~100.0%	Factory default: -100.0%
C2-13	Curve 3 maximum input	Range: input of curve 3 inflection point A ~110.0%	Factory default: 100.0%
C2-14	Set value corresponding to curve 3 maximum input	Range: -100.0%~100.0%	Factory default: 100.0%
C2-15	Input of curve 3 inflection point A	Range: input of curve 3 inflection point B ~ curve 3 maximum input	Factory default: 0.0%
C2-16	Set value corresponding to input of curve 3 inflection point A	Range: -100.0%~100.0%	Factory default: 0.0%
C2-17	Input of curve 3 inflection point B	Range: curve 3 minimum input~ input of curve 3 inflection point A	Factory default: 0.0%
C2-18	Set value corresponding to input of curve 3 inflection point B	Range: -100.0%~100.0%	Factory default: 0.0%
C2-19	Curve 3 minimum input	Range: -110.0%~ input of curve 3 inflection point B	Factory default: 0.0%
C2-20	Set value corresponding to curve 3 minimum input	Range: -100.0%~100.0%	Factory default: 0.0%
C2-21	AI terminal filtering time	Range: 0.000s~10.000s	Factory default: 0.1s

C2-22	Potentiometer input filter time	Range: 0.000s~10.000s	Factory default: 0.1s
C2-24	DI maximum input	Range: C2-26~50.0kHz	Factory default: 50.0kHz
C2-25	Set value corresponding to DI maximum input	Range: -100.0%~100.0%	Factory default: 100.0%
C2-26	DI minimum input	Range: 0.0kHz~C2-24	Factory default: 0.0kHz
C2-27	Set value corresponding to DI minimum input	Range: -100.0%~100.0%	Factory default: 0.0%
C2-28	DI filtering time	Range: 0.000s~1.000s	Factory default: 0.001s
C2-29	Target FREQ	Range: 0.00Hz～upper limit frequency	Factory default: 0.0Hz

Group C3 Analog and Pulse Output

C3-00	AO output function	Range: 0~99	Factory default: 2

Table 5-3

Parameter value	Function	Range
0	No output	No output
1	Set FREQ	0~maximum frequency
2	Output frequency	0~maximum frequency
3	Output current	0~2 times the rated current of inverter
5	Output voltage	0~2 times the rated voltage of motor
6	Output power	0~ 2 times the rated power
7	Bus voltage	0~1000V
11	AI1	0~10V/0~20mA
12	Potentiometer	-10V~10V
15	DI	0~50kHz
18	Output current (relative to motor rated current)	0~2 times of rated output current of the motor

C3-03	AO1 offset	Range: -100.0%~100.0%	Factory default: 0.0%
C3-04	AO1 gain	Range: -2.000~2.000	Factory default: 1.000
C3-05	AO1 filtering time	Range: 0.0s~10.0s	Factory default: 0.0s

Group d Motor and Control Parameters

Group d0 Motor Parameters

d0-01	Motor power rating	Range: 0.4kW~6553.5kW	Factory default: model dependent
d0-02	Motor rated voltage	Range: 0V~480V	Factory default: 380V
d0-03	Motor rated current	Range: 0.0A~6553.5A	Factory default: model dependent
d0-04	Motor rated frequency	Range: 0.00Hz~upper limit frequency	Factory default: 50.00Hz
d0-05	Motor Pole number	Range: 1~80	Factory default: 4
d0-06	Motor rated speed	Range: 0~65535 r/min	Factory default: model dependent

The motor parameters above from d0-00 to d0-06 shall beset correctly according to the motor nameplate. Please select the motor suitable to the drive power rating. Otherwise the control performance of the drive will drop dramatically.

d0-07	Stator resistance R1 of async motor 1	Range: 0.001Ω~65.535Ω	Factory default: model dependent
d0-08	Leakage inductance L1 of async motor 1	Range: 0.1mH~6553.5mH	Factory default: model dependent
d0-09	Rotor resistance R2 of async motor 1	Range: 0.001Ω~65.535Ω	Factory default: model dependent
d0-10	Mutual inductance L2 of async motor 1	Range: 0.1mH~6553.5mH	Factory default: model dependent
d0-11	No-load current of async motor 1	Range: 0.0A~6553.5A	Factory default: model dependent
d0-12	Flux weakening coeff 1 of async motor 1	Range: 0.0000~1.0000	Factory default: model dependent

d0-13	Flux weakening coeff 2 of async motor 1	Range: 0.0000~1.0000	Factory default: model dependent
d0-14	Flux weakening coeff 3 of async motor 1	Range: 0.0000~1.0000	Factory default: model dependent
d0-15	Stator resistance of sync motor 1	Range: 0.001Ω~65.535Ω	Factory default: 0.500Ω
d0-16	D-axis inductance of sync motor 1	Range: 0.01mH～655.35mH	Factory default: 9.00mH
d0-17	Q-axis inductance of sync motor 1	Range: 0.01mH～655.35mH	Factory default: 9.00mH
d0-18	Back EMF voltage of sync motor 1	Range: 0.0~1000.0V	Factory default: 380.0V
d0-19	Autotuning current of sync motor 1	Range: 0.0%～100.0%, 100% is motor rated current	Factory default: 35.0%
d0-22	Autotuning of motor 1	Range: 0~5	Factory default: 0

Parameters for controlling the motor performance are automatically obtained through autotuning, and the result will be automatically saved upon the completion of autotuning. No matter it is async motor or sync motor, be sure to correctly input motor parameters d0-01~d0-06 before autotuning.

0: No autotuning

1: Static autotuning of async motor

Static autotuning applies to the cases where rotary autotuning cannot be favorably performed due to the fact that it is impossible to disengage the motor from its load. After d0-22 is set to 1 and confirmed, press the key RUN to start static autotuning. d0-22 will be restored to 0 upon the successful completion of autotuning. In this way, parameters d0-07~d0-09 are obtained.

2: Rotary autotuning of async motor

To perform rotary autotuning, it is essential to disengage the motor from its load. Autotuning is prohibited when motor is loaded. After d0-22 is set to 2 and confirmed, press RUN to perform static autotuning, upon the completion of which, the motor would accelerate to a fixed frequency in the set ramp-up time, maintaining a period of time, and then stop by ramp down according to the set ramp down time. In this way, the autotuning comes to an end, and d0-22 will be restored to 0. Parameters d0-07~d0-14 have be obtained after the successful completion of rotary autotuning. To perform rotary autotuning, please set appropriate ramp-up and ramp-down time (i.e. Accel/Decel time. If overcurrent or overvoltage fault occurs during autotuning, please prolong Accel/Decel time accordingly.

3: Reserved

4: Static autotuning of sync motor

Applies to parameter autotuning for sync motor. After d0-22 is set to 4 and confirmed, press

the key RUN to start static autotuning. d0-22 will be restored to 0 upon the successful completion of autotuning. In this way, parameters d0-15~d0-17 are obtained.

5: No-load rotary autotuning of sync motor

Applies to parameter autotuning for sync motor. After d0-22 is set to 5 and confirmed, press the key RUN to start rotary autotuning. d0-22 will be restored to 0 upon the successful completion of autotuning. In this way, parameters d0-15~d0-18 are obtained. d0-19 is autotuning current for rotary autotuning, if motor cannot run during rotary autotuning, this current can be properly increased.

ATTENTION:

Please make sure the motor is in a stationary state before the autotuning, or autotuning cannot be performed normally.

Control panel displays "TUNE" and RUN indicator light is on during autotuning. RUN indicator light is off upon the completion of autotuning.

Once autotuning fails, the fault code "tUN" shall be displayed.

Group E Enhanced Function and Protection Parameters

Group E0 Enhanced Function

E0-00	Switching FREQ	Range: 0.7~16.0kHz	Model dependent

Power rating of the drives	Setting Range	Factory Default
≤15kW	0.7k~16k	8k
18.5kW~45kW	0.7k~10k	4k
55kW~75kW	0.7k~8k	3k
≥90kW	0.7k~3k	2k

E0-01	PWM optimization	Range: 0000~1121	Factory default: 0120

◆ Ones place: switching FREQ relation with temperature

0: Self-adaption

1: No adaption

◆ Tens place: PWM modulation mode

0: five-segment and seven-segment self-switchover

1: five-segment mode

2: seven-segment mode

◆ Hundreds place: over-modulation adaption

0: Disabled

1: Enabled

◆ Thousands place: PWM switching FREQ relation with output frequency

0: Self-adaption

1: No adaption

E0-02	Action when run time attained	Range: 000~111	Factory default: 000

◆ Ones place: action when consecutive run time attained

0: Run continued

1: Stop and fault reported

◆ Tens place: action when accumulative run time attained

0: Run continued

1: Stop and fault reported

◆ Hundreds place: unit of running time:

0: Second

1: Hour

E0-03	Consecutive run time setting	Range: 0.0~6000.0s(h)	Factory default: 0.0 s(h)

E0-04	Accumulative run time setting	Range: 0.0~6000.0s(h)	Factory default: 0.0 s(h)

Group E1 Protection Parameters

E1-00	Overvoltage stall	Range: 0~2	Factory default: 1

0: Invalid in all process

1: Valid in all process

2: Valid only for decelerating

E1-01	Overvoltage stall protection voltage	Range: 120%~150%	Factory default: 130%

E1-02	Undervoltage stall	Range: 0~1	Factory default: 0

0: Disabled

1: Enabled

E1-03	Overload alarm	Range: 000~111	Factory default: 000

◆ Ones place: detection option

0: Always detect

1: Detect at constant speed only
◆ Tens place: compared with
0: motor rated current
1: drive rated current
◆ Hundreds place: drive action
0: Alarm but run continued
1: Alarm and coast to stop

E1-04	Overload alarm threshold	Range: 20.0%~200.0%	Factory default: 130.0%

E1-05	Overload alarm activation time	Range: 0.1s~60.0s	Factory default: 5.0s

E1-06	Protection action 1	Range: 0000~1111	Factory default: 0000
E1-07	Protection action 2	Range: 0000~3111	Factory default: 3001

These two parameters set the protection action of the drive in the following abnormal status.

Specification of E1-06:
◆ Ones place: reserved
◆ Tens place: temperature measurement circuit fault (OH3)
0: Coast to stop
1: Alarm but run continued
◆ Hundreds place: abnormal EEPROM (EPr)
0: Coast to stop
1: Alarm but run continued
◆ Thousands place: abnormal terminal communication (TrC)
0: Coast to stop
1: Alarm but run continued

Specification of E1- 07:
◆ Ones place: abnormal power supply when running (SUE)
0: Coast to stop
1: Alarm but run continued
◆ Tens place: current detection circuit failed (CtC)
0: Coast to stop
1: Alarm but run continued
◆ Hundreds place: abnormal contactor (CCL)
0: Coast to stop

1: Alarm but run continued

◆ Thousands place: input supply fault /output phase loss (ISF, oPL)

0: Protection for neither input supply fault nor output phase loss

1: No protection for input supply fault, protection enabled for output phase loss

2: Protection enabled for input supply fault, no protection for output phase loss

3: Protection enabled both for input supply fault and output phase loss

ATTENTION:

Please set "protection action" with caution since inappropriate setting may extend the fault.

E1-08	Fault memory after power loss	Range: 0~1	Factory default: 0

0: Not memorized after power loss

1: Memorized after power loss

E1-09	Fault auto-reset times	Range: 0~20	Factory default: 0
E1-10	Auto-reset interval	Range: 2.0s~20.0s	Factory default: 2.0s

E1-11	Relay action on drive fault	Range: 000~111	Factory default: 010

◆ Ones place: when undervoltage fault occurs

0: No action

1: Action enabled

0: No action

1: Action enabled

◆ Hundred's place: at interval of auto- reset

0: No action

1: Action enabled

E1-12	Cooling fan control	Range: 0~1	Factory default: 0

0: Auto run

1: Always run after power up

E1-13	Drive overheat alarm threshold	Range: 0.0℃~100.0℃	Factory default: 80.0℃

Group F Application

Group F0 MPPT process PID adjustment

The purpose of process PID control is to make feedback value consistent with the set value.

F0-00	PID setting	Range: 0~6	Factory default: 6

Selects the setting source of PID control.
0~5: Reserved
6: MPPT calculated voltage

F0-02	PID feedback	Range: 0~9	Factory default: 9

Select the feedback source of PID control.
0~8: Reserved
9: Solar dedicated PID feedback

F0-08	Proportional gain Kp1	Range: 0.0~200.0	Factory default:60.0
F0-09	Integration time Ti1	Range: 0.000s~50.000s	Factory default: 0.500s
F0-10	Derivative time Td1	Range: 0.000s~50.000s	Factory default: 0.0s

Process PID is provided with two groups of proportion, integral and differential parameters set by F0-14. F0-08~F0-10 are the first group of parameters.

Proportional gain Kp: Dynamic response of the system can be quickened by increasing proportional gain Kp. However, excessive Kp value would bring about system oscillation. Only proportional gain control cannot eliminate steady state error.

Integration time: Dynamic response of the system can be quickened by reducing integration time Ti. However, excessively small Ti value would result in serious system overshooting and may easily bring about oscillation. Integral control can be used to eliminate steady state error but is unable to control sharp changes.

Differential time Td: It can predict the change trend of offset and thus can rapidly respond to the change, improving dynamic performance. However, this is vulnerable to interference. Please use differential control with caution.

F0-11	Proportional gain Kp2	Range: 0.0~100.0	Factory default: 50.0
F0-12	Integration time Ti2	Range: 0.0s~100.0s	Factory default: 0.5s
F0-13	Derivative time Td2	Range: 0.000s~50.000s	Factory default: 0.000s

Process PID is provided with two groups of proportion, integral and differential parameters set by F0-14. F0-11~ F0-13 are the second group of parameters.

F0-14	PID parameter switchover	Range: 0~3	Factory default: 3

Process PID is provided with two groups of proportional, integral and differential parameters, which is set by this parameter.

0: No switch. Determined by parameters Kp1, Ti1 and Td1

Always determined by Kp1, Ti1 and Td1 set at F0-08~F0-10.

1: Auto switched on the basis of input offset

When the offset between setting and feedback is less than the set value of F0-15, PID adjustment is determined by Kp1, Ti1 and Td1. When the offset between setting and feedback is bigger than the set value of F0-15, PID adjustment is determined by Kp2, Ti2 and Td2 set at F0-11~F0-13.

2: Switched by terminal

When digital input terminal "PID parameters switch" is OFF, it is determined by Kp1, Ti1 and Td1. When "PID parameters switch" is ON, it is determined by Kp2, Ti2 and Td2

3. Auto switched by bus voltage fluctuation

In MPPT mode, when the bus voltage fluctuation is less than the threshold set by F6-66, PID adjustment is determined by Kp1, Ti1 and Td1. Otherwise, it is determined by Kp2, Ti2 and Td2.

Group F1 Multi - step pressure

This function only works in AC constant pressure mode (X3 activated)

F1-00	Multi - pressure setting	Range: 0~1	Factory default: 0

0: Pressure set by F6-25, F6-26.

1: Pressure set by X terminal.

When this parameter is set to 1, the pressure is decided by the combined state of X1, X2 and X3, as shown in Table 5-4.

Table 5-4 Multi-step pressure determinant

	X1	X2	X3
Multi-step pressure 0	OFF	OFF	OFF
Multi-step pressure 1	ON	OFF	OFF
Multi-step pressure 2	OFF	ON	OFF
Multi-step pressure 3	ON	ON	OFF
Multi-step pressure 4	OFF	OFF	ON
Multi-step pressure 5	ON	OFF	ON
Multi-step pressure 6	OFF	ON	ON
Multi-step pressure 7	ON	ON	ON

F1-01	Minimum pressure 0	Range: 0.00Mpa~9.99Mpa	Factory default: 0.00Mpa

This parameter sets the minimum pressure 0. If the pressure is less than this parameter value, and lasts the time delay of minimum pressure sleep set by F6-30, the pump stops and inverter displays “LoP”.

Minimum pressure sleep function is disabled when F1-01 is set to 0.

F1-02	Multi-step pressure 0	Range: 0.00Mpa~9.99Mpa	Factory default: 0.30Mpa

Sets the system multi-step pressure 0.

F1-03	Minimum pressure 1	Range: 0.00Mpa~9.99Mpa	Factory default: 0.00Mpa
F1-04	Multi-step pressure 1	Range: 0.00Mpa~9.99Mpa	Factory default: 0.30Mpa
F1-05	Minimum pressure 2	Range: 0.00Mpa~9.99Mpa	Factory default: 0.00Mpa
F1-06	Multi-step pressure 2	Range: 0.00Mpa~9.99Mpa	Factory default: 0.30Mpa
F1-07	Minimum pressure 3	Range: 0.00Mpa~9.99Mpa	Factory default: 0.00Mpa
F1-08	Multi-step pressure 3	Range: 0.00Mpa~9.99Mpa	Factory default: 0.30Mpa
F1-09	Minimum pressure 4	Range: 0.00Mpa~9.99Mpa	Factory default: 0.00Mpa
F1-10	Multi-step pressure 4	Range: 0.00Mpa~9.99Mpa	Factory default: 0.30Mpa
F1-11	Minimum pressure 5	Range: 0.00Mpa~9.99Mpa	Factory default: 0.00Mpa

F1-12	Multi-step pressure 5	Range: 0.00Mpa~9.99Mpa	Factory default: 0.30Mpa
F1-13	Minimum pressure 6	Range: 0.00Mpa~9.99Mpa	Factory default: 0.00Mpa
F1-14	Multi-step pressure 6	Range: 0.00Mpa~9.99Mpa	Factory default: 0.30Mpa
F1-15	Minimum pressure 7	Range: 0.00Mpa~9.99Mpa	Factory default: 0.00Mpa
F1-16	Multi-step pressure 7	Range: 0.00Mpa~9.99Mpa	Factory default: 0.30Mpa

Group F5 AC constant pressure process PID

Pressure process PID control diagram is similar to MPPT PID adjustment at F0 group.

F5-00	Pressure PID setting	Range: 0~6	Factory default: 6

Selects the setting source of pressure PID control. It could be F6-26 digital setting (F5-00=6),
0:F5-01digital setting
1~3: Reserved
4: X4 pulse input
5: Reserved
6: F6-26 digital setting.

F5-01	PID digital setting	Range: 0.0%~100.0%	Factory default: 50.0%

When F5-00 is set to 0, this parameter value is taken as the set value of PID. 100% corresponds to the F6-24 parameter value, the maximum pressure.

F5-02	PID feedback	Range: 0~9	Factory default: 9

Sets the feedback source of PID control.
0~8: Reserved
9: Actual feedback pressure (AI1)

F5-03	PID adjustment	Range: 00~11	Factory default: 10

◆ Ones place: Output frequency

0: Must be the same direction as setting run direction

When PID frequency output direction is opposite to run command direction, PID output is 0.

1: Opposite direction allowed

PID frequency output direction can be opposite to run command direction, and PID output performs normally.

◆ Tens place: Integration selection

0: Integral continued when frequency attains upper/lower frequency

Under PID control, when output frequency attains upper/lower limit of frequency or parameter value of F5-23 (maximum frequency if it is opposite to command running direction), PID integral continues. This mode requires longer time of quitting saturation.

1: Integral stopped when frequency attains upper/lower limit

Under PID control, when output frequency attains upper/lower limit of frequency or parameter value of F5-23 (maximum frequency if it is opposite to command running direction), PID integral will cease. This mode can quit integral saturation status rapidly.

F5-04	PID positive and negative adjustment	Range: 0~1	Factory default: 1

0: Positive adjustment

1: Negative adjustment

This parameter can be used with digital input terminal “PID adjustment direction” to select positive or negative adjustment of PID.

Table 5-5 PID adjustment direction

F5-04	Terminal of PID adjustment direction	Adjustment
0	OFF	Positive
0	ON	Negative
1	OFF	Negative
1	ON	Positive

Positive adjustment: when feedback signal is smaller than PID setting, output frequency of the drive will rise to reach PID balance.
when feedback signal is bigger than PID setting, output frequency of the drive will drop to reach PID balance.

Negative adjustment: when feedback signal is smaller than PID setting, output frequency of the drive will drop to reach PID balance.
when feedback signal is bigger than PID setting, output frequency of the drive will rise to reach PID balance.

F5-05	Filtering time of PID setting	Range: 0.00s~60.00s	Factory default: 0.00s

F5-06	Filtering time of PID feedback	Range: 0.00s~60.00s	Factory default: 0.00s
F5-07	Filtering time of PID output	Range: 0.00s~60.00s	Factory default: 0.00s

Set the filtering time of PID setting, feedback and output.

F5-08	Proportional gain Kp1	Range: 0.0~200.0	Factory default: 50.0
F5-09	Integration time Ti1	Range: 0.000s~50.000s	Factory default: 0.500s
F5-10	Differential time Td1	Range: 0.000s~50.000s	Factory default: 0.000s

Process PID is provided with two groups of proportion, integral and differential parameters set by F5-14. F5-08~F5-10 are the first group of parameters.

Proportional gain Kp: Dynamic response of the system can be quickened by increasing proportional gain Kp. However, excessive Kp value would bring about system oscillation. Only proportional gain control cannot eliminate steady state error.

Integration time: Dynamic response of the system can be quickened by reducing integration time Ti. However, excessively small Ti value would result in serious system overshooting and may easily bring about oscillation. Integral control can be used to eliminate steady state error but is unable to control sharp changes.

Differential time Td: It can predict the change trend of offset and thus can rapidly respond to the change, improving dynamic performance. However, this is vulnerable to interference. Please use differential control with caution.

F5-11	Proportional gain Kp2	Range: 0.0~100.0	Factory default: 50.0
F5-12	Integration time Ti2	Range: 0.0s~50.0s	Factory default: 0.5s
F5-13	Differential time Td2	Range: 0.000s~50.000s	Factory default: 0.000s

Process PID is provided with two groups of proportion, integral and differential parameters set by F5-14. F5-11~ F5-13 are the second group of parameters.

F5-14	PID parameter switchover	Range: 0~2	Factory default: 0

Process PID is provided with two groups of proportional, integral and differential parameters, which is set by this parameter.
0: No switch. Determined by parameters Kp1, Ti1 and Td1

Always determined by Kp1, Ti1 and Td1 set at F5-08~F5-10.

1: Auto switched on the basis of input offset

When the offset between setting and feedback is less than the set value of F5-15, PID adjustment is determined by Kp1, Ti1 and Td1. When the offset between setting and feedback is bigger than the set value of F5-15, PID adjustment is determined by Kp2, Ti2 and Td2 set at F5-11~F5-13.

2: Switched by terminal

When digital input terminal "PID parameters switch" is OFF, it is determined by Kp1, Ti1 and Td1. When "PID parameters switch" is ON, it is determined by Kp2, Ti2 and Td2.

F5-15	Input offset under PID auto switch	Range: 0.0%~100.0%	Factory default: 20.0%

When F5-14 is set to 1, this parameter sets the switching point of the two groups of PID parameters. When the offset between setting and feedback is less than this set value, it is determined by Kp1, Ti1 and Td1. When the offset between setting and feedback is bigger than this set value, it is determined by Kp2, Ti2 and Td2.

F5-16	Sampling period T	Range: 0.001s~50.000s	Factory default: 0.002s

Sampling period aims at feedback. PID controller performs the sampling and compute once in each sampling period. The longer the sampling period T is, the slower the response time will be.

F5-17	PID offset limit	Range: 0.0%~100.0%	Factory default: 0.0%

If the offset between PID feedback and setting is more than this set value, PID regulator will implement regulation. If the offset between PID feedback and setting is less than this set value, PID will stop the regulation and the PID controller output will be kept unchanged. This function can improve the stability of PID performance.

F5-18	PID differential limit	Range: 0.0%~100.0%	Factory default: 0.5%

Sets differential output limit of PID control.

F5-19	PID initial value	Range: 0.0%~100.0%	Factory default: 0.0%
F5-20	PID initial value holding time	Range: 0.0s~3600.0s	Factory default: 0.0s

PID does not make adjustment when the drive starts its run, but outputs the value set by F5-19 and maintains the holding time set by F5-20, then starts PID adjustment. When F5-20 is set to 0, PID initial value is disabled. This function makes PID adjustment get into stable status fast.

F5-21	PID feedback loss detected value	Range: 0.0%~100.0%	Factory default: 0.0%
F5-22	PID feedback loss detected time	Range: 0.0s~30.0s	Factory default: 1.0s

When offset between feedback and setting of PID is bigger than set value of F5-21 and the lasting time attains the set time of F5-22, the drive reports fault "Plo". If F5-22 is set to 0, feedback loss detection is disabled.

F5-23	Cutoff FREQ when opposite to rotary set direction	Range: 0.00Hz~maximum frequency	Factory default: 50.00Hz

When rotary set direction is forward, while PID output is reverse, the maximum reverse frequency will be determined by F5-23.

When rotary set direction is reverse, while PID output is forward, the maximum forward frequency will be determined by F5-23.

F5-24	PID computation option	Range: 0~1	Factory default: 0

0: No computation in stop status

1: Computation continued in stop status

Group F6 Dedicated Parameters

F6-00	Solar power functionality	Range: 0~1	Factory default: 1

This parameter could activate or deactivate the solar power functionality. When F6-00 is set to 0, all parameters regarding solar function are deactivated.

0: Deactivated

1: Activated

F6-01	Senior function setting	Range: 0000~1112	Factory default: 0100

Ones place: MPPT mode

0: Precise MPPT

1~5: Reserved

Tens place: Dry Run Protection autotune.

0: Disabled

1: Enabled

SLR03 drives are equipped with dry run protection as default at plug and play mode. Before programming dry run protection function, users need to confirm the drive can run at rated frequency because the drive needs to study the current at rated frequency during automatically programming the function of dry run protection, no matter the power supply is from solar panels or AC gird. After programming the autotune of the motor, set the tens place of F6-01 to 1 and press RUN to start the motor, the drive will immediately start programming the dry run protection. During this process, the drive displays LLr-S. When the programming is completed successfully, LLr-S disappears and the drive returns to normal working state. If the programming is failed or stopped in the progress, the drive will display LLr-F.

If users want to define the protection delay time, go to the expert mode, A0-01=0, to set F6-15, and F6-17.

Hundreds place: The function of the button RUN under control panel control.

0: Press the button RUN to run, while the run command is invalid after power loss.

1: Press the button RUN to run, while the run command is still valid after repower-up, unless press the button STOP to stop.

Under control panel control mode, when the hundreds place is set to 1(the default), the inverter drives the motor to run as long as the solar intensity meets the requirement, no matter how many days and nights it goes through. If users choose to press the button RUN every time to restart the pump when the power is applied, the hundreds place should be set to 0.

Thousands place: Pump cleaning

0: Disabled

1: Enabled

When the thousands place is set to 1, pump will get into cleaning mode after the pump starts. The function consists of a programmable sequence of forward and reverse runs of the pump to shake off any residue on the impeller or piping. Pump runs forward at the speed set by F6-09 first, lasting the time set by F6-10, then follows reverse at the speed by F6-09, and last the time by F6-10. The deceleration time plus the dead time between forward and reserve is 10 seconds. The cycle repeats three times then pump stops and the thousands place is stored to 0 automatically. If any intermediate fault occurs, the pump cleaning function stops.

F6-02	PV panel open circuit voltage	Range: 0.0V~1000.0V	Factory default: 430.0V (4T model) 340.0 (2T/2S model)

This parameter value is automatically updated if it is not well programmed. Correct digital setting might enable the system to have higher efficiency.

F6-03	MPPT voltage upper limit	Range: F6-04~100.0%	Factory default: 85.0%
F6-04	MPPT voltage lower limit	Range: 0.0%~F6-03	Factory default: 70.0%

F6-03, F6-04 restrict MPPT algorithm boundary. Appropriate values pledge the MPPT stability and efficiency.

F6-05	Pump start voltage	Range: 0.0V~1000.0V	Factory default: 400.0V (4T model) 200.0V (2T/2S model)

Only when the actual output voltage of the PV panels is higher than this voltage, the pump has the precondition to get started.

F6-06	Pump stop voltage	Range: 0.0V~1000.0V	Factory default: 200.0V (4T model) 100.0V (2T/2S model)

When the actual voltage of the PV panels is lower than this voltage, the pump will stop.

F6-08	Restart time delay	Range: 0.0s~600.0s	Factory default: 30.0s

Before restart, the inverter will detect the condition. When the starting condition meets the requirement and lasts the time set by F6-08, the pump restarts. The next restart time is double of the previous startup and the maximum time delay is 10 minutes, so as to reduce the times of frequent restarts in the weak state. Only when the pump runs normally for 5 minutes or receiving the run command again, the time delay will be restored to the F6-08 set value. However, when the tens place of F6-01 is set to 1 to prevent pump clogging, the re-start time is F6-08 set value always. When the input is AC, and X2 or X3 is active (X2: C0-02=86, AC constant speed mode. X3: C0-03=87, AC constant pressure mode), F6-08 is deactivated, i.e. start time delay is 0.

F6-09	Pump cleaning speed	Range: 0.00~100.00Hz	Factory Default: 30.00
F6-10	Pump cleaning time	Range: 0~300s	Factory default: 60s

F6-09, F6-10 are activated only when thousands place of F6-01 is set to 1. For details, please refer to F6-01 thousands place and *Fig. 5-2 pump cleaning sequence.*

F6-12	Sleep frequency	Range: 0.00Hz~50.00Hz	Factory default: 25.00Hz

When run frequency is below sleep frequency, and the time to maintain this state exceeds solar weak sleep time delay defined by F6-13, the system gets into sleep state. The motor stops its spinning and the drive control panel displays "SLP". When solar weak wake-up time delay

defined by F6-14 elapses, the systme is woken up and gets into judgement state of restart.

If this parameter is set to 0.00Hz, solar weak sleep function is disabled.

F6-13	Solar weak sleep time delay	Range: 0s~1000s	Factory default: 10s

When run frequency is lower than sleep frequency, and the time to maintain this state is longer than solar weak sleep time delay, control panel displays “SLP” and the system gets into sleep state. If this state is not continuous, the time delay will be cleared and recalculated.

F6-14	Solar weak wake-up time delay	Range: 0s~6000s	Factory default: 30s

In the state of solar weak sleep state, the inverter will wake up to get into judgmental state after the solar weak wake-up time delay elapses.

F6-15	Dry run protection time delay	Range: 0-1000s	Factory default: 10s
F6-16	Dry run protection current threshold percent	Range: 0.0%-100.0%	Factory default: 80.0%
F6-17	Dry run reset time delay	Range: 0s~6000s	Factory default: 600s

F6-16 defines the dry run protection current threshold, a percentage to the current at normal water source. When the water is drying, the drive will start its dry run protection and stop the motor spinning. When this protection is activated, the drive displays LLr.

When the system has been stopped by dry run protection, it will reset this protection state automatically and get into restart judgement state after the time defined by F6-17 elapses.

F6-20	Water level control	Range: 00~11	Factory default: 01

Ones place: Select the source of full water level control

0: Digital signal

1: Reserved

Tens place: Full water level control when the ones place is set to 0

0: Deactivated

1: Activated

F6-21	Full water level threshold	Range: 0.0%~100.0%	Factory default: 0%
F6-22	Full water level time delay	Range: 0s~1000s	Factory default: 10s

The two parameters work only when F6-20 ones place is set to 1. When the water level

acquired by the analog signal is bigger than the full water level threshold defined by F6-21 and lasts the time set by F6-22, the pump will be stopped and the drive display “StF” as prompt message. Full water level control is disabled when F6-21 is set to 0.

F6-23	Full water reset delay	Range: 0s~1000s	Factory default: 10s

This parameter only works when F6-20 ones place is set to 1, when the water level acquired by the analog signal is lower than full water level threshold defined by F6-21 and lasts the time set by F6-23, the pump will wake up to work.

F6-24	Pressure sensor range	Range: 0.00Mpa~9.99Mpa	Factory default: 0.60Mpa

Sets the pressure sensor range. When the pressure signal input is AI, 10V corresponds to this parameter value.

F6-25	Minimum pressure	Range: 0.00Mpa~9.99Mpa	Factory default: 0.00Mpa

This parameter sets the lower limit of the pressure. If the actual pressure is less than this parameter value, lasting the low pressure sleep time delay set by F6-30, the pump will be stopped and the drive displays “LoP”.

Low pressure sleep function is disabled when F6-25 is set to 0.

F6-26	Pressure setting	Range: 0.00Mpa~9.99Mpa	Factory default: 0.30Mpa

Sets the pressure of the system. This function is applied at AC constant pressure control in PID control.

F6-27	Maximal pressure	Range: 0.00Mpa~9.99Mpa	Factory default: 0.45Mpa

When the pressure is bigger than maximal pressure value, the pump will be stopped immediately and the drive displays “oPS”.

F6-28	Reset time delay on maximal pressure stop	Range: 0s~1000s	Factory default: 10s

When the pump has been stopped due to maximal pressure, the system begins to judge, if the pressure is less than the maximum pressure set by F6-27, lasting the time set by this parameter, the system will reset. This function is usually used for pipe system pressure control, to avoid excessive water pressure from damaging the pipes.

F6-29	Maximal frequency at pressure control	Range: 0.00Hz~600.00Hz	Factory default: 50.00Hz

Under pressure PID control, this parameter sets the maximal output frequency

F6-30	minimum pressure sleep time delay	Range: 0s~1000s	Factory default: 10s

When the pressure is lower than the minimum pressure F6-25 and lasts the time set by F6-30, the pump stops and the drive displays “LoP”. This function is often used as dry run protection at a pressure sensor input, more accurate than the dry run protection set by F6-15, F6-16.

F6-31	minimum pressure sleep reset delay time	Range: 0s~1000s	Factory default: 10s

If the pump has been stopped because of low pressure, when the pressure is bigger than the minimum pressure and lasts the time set by F6-31, the system will wake up to work.

F6-32	Stop frequency at constant pressure mode	Range:0~600.00HZ	Factory default: 20.00 Hz
F6-33	Low frequency sleep time delay	Range:0~6000s	Factory default: 10 s
F6-34	Start pressure at constant pressure mode	Range: 0~9.99Mpa	Factory default: 0.1 Mpa
F6-35	Low frequency sleep reset delay time	Range: 0~6000s	Factory default: 30s

In AC constant pressure mode, when the frequency of VFD is lower than F6-32 and lasts the time set by F6-33, the VFD will stop. When the actually pressure is lower than F6-34 and lasts the time set by F6-35, the VFD will restart.

Flow calculation

SLR03 provides two kinds of flow calculation, flow calculation through pulse input or via setting PQ performance.

Via PQ performance, the flow calculation function provides a reasonably accurate calculation of the flow without mounting an external flow meter. The function defines the flow estimate using the pump performance curve and drive actual load. The PQ (power/flow) performance curve activates calculating the flow output from the pump. The performance curve is provided by the pump manufacturer. The user saves five operating points (P,Q) of the performance curve to drive parameters. Only after setting F6-36 till F6-47, F6-38, F6-39 and F6-40 have reasonable correct display. Refer to the PQ curve and set five operating points in sequence according to the *Fig. 5-4.*

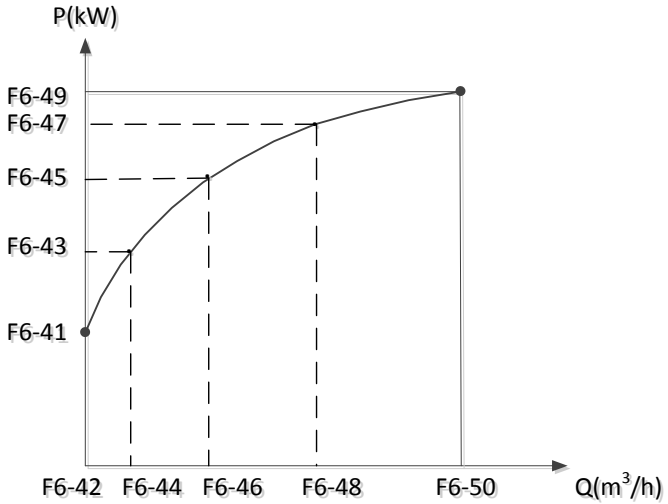


Fig. 5-4 PQ performance curve

The solar pump inverter provides the required flow data for current power-up and the accumulated.

ATTENTION:

- ✓ Ensure that power and flow points are in incremental order with non-zero values
- ✓ The data of flow can be reset via L0-00.

F6-36	Flow calculation	Range: 0~1	Factory default: 0

0: Calculated on pulse input （X4， C0-04=39）

1: Calculated on PQ performance curve

F6-37	Flow of one pulse	Range: 0.0~1000.0L	Factory default: 1.0L

Sets the flow of receiving one pulse.

F6-38	Flow calculation coeff	Range: 0.00~10.0	Factory default: 1.00

This coeff can be used to calibrate flow calculation.

F6-39	Real-time flow rate measuring interval	Range: 0.00~10.0 s	Factory default: 2.00s

Sets the time for measuring interval of real-time flow rate.

F6-40	Calculation low speed	Range: 0.00~50.00Hz	Factory default: 10.0Hz

When the working speed is lower than this parameter setting, the flow won't be calculated.

F6-41	PQ curve P1	Range: 0.0kW~6553.5kW	Factory default: 0.0kW

Defines the input power of pump in kW at point 1 on the PQ performance curve.

F6-42	PQ curve Q1	Range: 0.0m^3/h~6553.5m^3/h	Factory default: 0.0 m^3/h

Defines the flow rate at point 1 on the PQ curve.

F6-43	PQ curve P2	Range: 0.0kW~6553.5kW	Factory default: 0.0kW
F6-44	PQ curve Q2	Range: 0.0m^3/h~6553.5m^3/h	Factory default: 0.0 m^3/h
F6-45	PQ curve P3	Range: 0.0kW~6553.5kW	Factory default: 0.0kW
F6-46	PQ curve Q3	Range: 0.0m^3/h~6553.5m^3/h	Factory default: 0.0 m^3/h
F6-47	PQ curve P4	Range: 0.0kW~6553.5kW	Factory default: 0.0kW
F6-48	PQ curve Q4	Range: 0.0m^3/h~6553.5m^3/h	Factory default: 0.0 m^3/h
F6-49	PQ curve P5	Range: 0.0kW~6553.5kW	Factory default: 0.0kW
F6-50	PQ curve Q5	Range: 0.0m^3/h~6553.5m^3/h	Factory default: 0.0 m^3/h

F6-51	MPPT mode selection	Range: 0~1	Factory default: 1

0: Constant MPPT voltage

1: Dynamical MPPT voltage

The system works at dynamical MPPT voltage to target the best MPPT as default. When it is set to 0, the MPPT reference voltage will be fixed with better stability but lower efficiency.

F6-52	Constant MPPT voltage	Range: 0.0V-1000.0V	Factory default: 360.0V (4T model) 250.0V (2T model)

When F6-51 is set to 0, this parameter sets the constant MPPT voltage.

F6-54	Pre-MPPT sampling time	Range:0s~5.000s	Factory default: 0. 50s

F6-55	MPPT sampling time	Range:0s~5.000s	Factory default: 1.00s

When the input voltage is far from MPPT target voltage, F6-54 sets pre-MPPT algorithm sampling time. The shorter the F6-54 value, the faster the MPPT climbing but less stability. F6-55 sets MPPT sampling time. The shorter F6-55 value, the better the sensitivity but less stability. Users do not need to change the values of those two parameters usually.

F6-58	Maximum MPPT step size	Range:0.1V~20.0V	Factory default: 3.0V

This parameter sets the maximal MPPT step size. No need to adjust it usually.

F6-66	Bus voltage fluctuation threshold	Range: 0-100 V	Factory default: 8 V

When the bus voltage fluctuation is greater than this value frequently, bus voltage stabilizing program inside takes effect. There is no need to program this parameter for most of applications.

When the bus voltage fluctuation is less than this set value, the PID is determined by Kp1 (F0-08), Ti1(F0-09) and Td1(F0-10).

When the bus voltage fluctuation is larger than this set value, the PID is determined by Kp2 (F0-10), Ti2(F0-11) and Td2(F0-12). Refer to F0-14 for more selection of PID when required.

Group H Communication Parameters

Group H0 MODBUS Communication Parameters

Support universal Modbus protocol. Please refer to appendix for detailed description of communication protocol.

H0-00	SCI port selection	Range: 0~1	Factory default: 0

0: Local 485 port
1: Optional 232 port

H0-01	SCI port communication configuration	Range: 0000～1155	Factory default: 0001

◆ Ones place: baud rate
0: 4800bps
1: 9600bps
2: 19200bps
3: 38400bps
4: 57600bps
5: 115200bps

◆ Tens place: data format
0: 1-8-2-N format, RTU
1: 1-8-1-E format, RTU
2: 1-8-1-O format, RTU
3: 1-7-2-N format, ASCII
4: 1-7-1-E format, ASCII
5: 1-7-1-O format, ASCII
◆ Hundreds place: connection type
0: Direct cable connection (232/485)
1: MODEM (232) (reserved)
◆ Thousands place: communication data handling at power loss
0: Saved at power loss
1: Not saved at power loss

H0-02	Local address of SCI port communication	Range: 0~247	Factory default: 5

Sets the local address. 0 is broadcast address, while available addresses are 1~247.

H0-03	Time out detection of SCI port communication	Range: 0.0s~1000.0s	Factory default: 0.0s

This parameter sets communication error detection time. When it's set to 0, no communication error will be reported.

H0-04	Time delay of SCI port communication	Range: 0ms~1000ms	Factory default: 0ms

Sets time delay of this drive response to the master.

H0-05	Master/Slave option	Range: 0~2	Factory default: 0

0: PC controls this drive
1: As master
2: As slave

H0-06	Frequency setting address when master controlling slave	Range: 0~1	Factory default: 0

0: b0-02
1: F0-01

H0-07	Proportional factor of received frequency	Range: 0.0~1000.0%	Factory default: 100.0%

Group U Monitoring

Group U0 Status Monitoring

U0-00	Run frequency	Range: 0.00Hz~600.00Hz	Factory default: 0.00Hz
U0-01	Set frequency	Range: 0.00Hz~600.00Hz	Factory default: 0.00Hz
U0-02	Bus voltage	Range: 0V~65535V	Factory default: 0V
U0-03	Output voltage	Range: 0V~65535V	Factory default: 0V
U0-04	Output current	Range: 0.0A~6553.5A	Factory default: 0.0A
U0-05	Output torque	Range: -300.0%~300.0%	Factory default: 0.0%
U0-06	Output power	Range: 0.0%~300.0%	Factory default: 0.0%
U0-07	Master FREQ set source	Range: 0~9	Factory default: 0
U0-08	Auxiliary FREQ set source	Range: 0~10	Factory default: 0
U0-09	Master frequency setting	Range: 0.00Hz~600.00Hz	Factory default: 0.00Hz
U0-10	Auxiliary frequency setting	Range: 0.00Hz~600.00Hz	Factory default: 0.00Hz

U0-11	Drive status	Range: 0~22	Factory default: 00

◆ Ones place: Running status

0: Accelerating

1: Decelerating

2: Constant speed running

◆ Tens place: drive status

0: Stop

1: Running status

2: Motor parameters are being identified

U0-12	AI1 input voltage	Range: 0.00V~10.00V	Factory default: 0.00V
U0-13	Potentiometer input voltage	Range: -10.00V~10.00V	Factory default: 0.00V

U0-14	EAI input voltage	Range: 0.00V~10.00V	Factory default: 0.00V
U0-15	AO1 output	Range: 0.0%~100.0%	Factory default: 0.0%
U0-16	EAO output	Range: 0.0%~100.0%	Factory default: 0.0%
U0-17	X4 pulse frequency	Range: 0.0kHz~50.0kHz	Factory default: 0.0kHz

U0-18	Digital input terminal status	Range: 00~7F	Factory default: 00

Digital input terminals that correspond to the bits of U0-18 are as shown in Table 5-6:

Table 5-6

Ones place			
bit3	bit2	bit1	bit0
X4	X3	X2	X1

0 means terminal input status is OFF, while 1 means terminal input status is ON.

For example:

If 23 (i.e. 0010 0011) is displayed at U0-18, it means the input status of terminals X1, X2 is ON and that of the other terminals is OFF.

If 05 (i.e. 0000 0101) is displayed at U0-18, it means the input status of terminals X1 and X3 is ON while that of the other terminals is OFF.

U0-19	Digital output terminal status	Range: 0~7	Factory default: 0
U0-20	PID set	Range: 0.0%~100.0%	Factory default: 0.0%
U0-21	PID feedback	Range: 0.0%~100.0%	Factory default: 0.0%
U0-22	PID input offset	Range: -100.0%~100.0%	Factory default: 0.0%
U0-23	PLC step	Range: 0~15	Factory default: 0
U0-24	V/f separated target voltage	Range: 0.0%~100.0%	Factory default: 0.0%
U0-25	V/f separated actual output voltage	Range: 0.0%~100.0%	Factory default: 0.0%

U0-30	Cumulative power-up time	Range: 0h~65535h	Factory default: 0h

U0-31	Cumulative run time	Range: 0h~65535h	Factory default: 0h
U0-32	Heat sink temperature 1	Range: -40.0℃~100.0℃	Factory default: 0.0℃
U0-33	Heat sink temperature 2	Range: -40.0℃~100.0℃	Factory default: 0.0℃
U0-35	Terminal count value	Range: 0~65535	Factory default: 0
U0-36	Run command log at LoU	Range: 0~1	Factory default: 0
U0-37	Fault code log at LoU	Range: 0~100	Factory default: 0
U0-38	Reserved	Reserved	Reserved
U0-39	CtC fault source	Range: 0~3	Factory default: 0

0: No fault
1: U-phase current detection circuit fault
2: V-phase current detection circuit fault
3: W-phase current detection circuit fault

U0-40	Higher-bit numbers of actual length	Range: 0~65	Factory default: 0
U0-41	Lower-bit numbers of actual length	Range: 0~65535	Factory default: 0
U0-42	Higher-bit numbers of control panel ∧/∨ stored value	Range: -1~1	Factory default: 0
U0-43	Lower-bit numbers of control panel ∧/∨ stored value	Range: 0.00~655.35Hz	Factory default: 0.00Hz
U0-44	Higher-bit numbers of terminal UP/DOWN stored value	Range: -1~1	Factory default: 0
U0-45	Lower-bit numbers of terminal UP/DOWN stored value	Range: 0.00~655.35 Hz	Factory default: 0.00Hz
U0-47	MPPT target Bus voltage	Range: 0~1000 V	Factory default: 0
U0-48	Actual Bus voltage	Range: 0~6553.5V	Factory default: 0

U0-49	Output power	Range: 0~655.35 kW	Factory default: 0

U0-50	Bus current	Range: 0~50.00 A	Factory default: 0
U0-51	Present step size	Range: 0~10 V	Factory default: 0
U0-52	High-place numeric of cumulated flow	Range: 0m3~65535 km^3	Factory default: 0km^3
U0-53	Low-place numeric of cumulated flow	Range: 0.0m3~1000.0 m^3	Factory default: 0.0 m^3

The cumulated flow = [(U0-52) ×1000+ (U0-53)] m^3

U0-54	Flow of this power-up	Range: 0.0m3~6553.5 m^3	Factory default: 0.0 m^3

Displays the flow of current power-up. When the power is off, this parameter value will be cleared.

U0-55	Real time flow rate	Range: 0.0 L/s~6553.5 L/s	Factory default: 0.0L/s
U0-56	Current water pressure	Range: 0.00 Mpa~655.35 Mpa	Factory default: 0.00Mpa
U0-57	Current water level	Range: 0.0%~100.0%	Factory default: 0.00%

Group U1 History Fault

U1-00	History fault 1 (latest)	Range: 0~51	Factory default: 0
U1-01	Run frequency at fault 1	Range: 0.00Hz~600.00Hz	Factory default: 0.00Hz
U1-02	Output current at fault 1	Range: 0.0A~6553.5A	Factory default: 0.0A
U1-03	Bus voltage at fault 1	Range: 0V~10000V	Factory default: 0V
U1-04	Temperature 1 of heat sink at fault 1	Range: -40.0℃~100.0℃	Factory default: 0.0℃
U1-05	Temperature 2 of heat sink at fault 1	Range: -40.0℃~100.0℃	Factory default: 0.0℃
U1-06	Input terminal status at fault 1	Range: 0000~FFFF	Factory default: 0000
U1-07	Output terminal status at fault 1	Range: 0000~FFFF	Factory default: 0000
U1-08	Cumulative run time at fault 1	Range: 0h~65535h	Factory default: 0h

Check the information of the latest fault. See Chapter 7 for details of fault codes.

U1-09	Code of fault 2	Range: 0~51	Factory default: 0
U1-10	Run frequency at fault 2	Range: 0.00Hz~600.00Hz	Factory default: 0.00Hz
U1-11	Output current at fault 2	Range: 0.0A~6553.5A	Factory default: 0.0A
U1-12	Bus voltage at fault 2	Range: 0V~10000V	Factory default: 0V
U1-13	Temperature 1 of heat sink at fault 2	Range: -40.0℃~100.0℃	Factory default: 0.0℃
U1-14	Temperature 2 of heat sink at fault 2	Range: -40.0℃~100.0℃	Factory default: 0.0℃
U1-15	Input terminal status at fault 2	Range: 0000~FFFF	Factory default: 0000
U1-16	Output terminal status at fault 2	Range: 0000~FFFF	Factory default: 0000
U1-17	Cumulative run time at fault 2	Range: 0h~65535h	Factory default: 0h

Check the information of fault 2. See Chapter 7 for details of fault codes.

U1-18	Code of fault 3	Range: 0~51	Factory default: 0
U1-19	Run frequency at fault 3	Range: 0.00Hz~600.00Hz	Factory default: 0.00Hz
U1-20	Output current at fault 3	Range: 0.0A~6553.5A	Factory default: 0.0A
U1-21	Bus voltage at fault 3	Range: 0V~10000V	Factory default: 0V
U1-22	Temperature 1 of heat sink at fault 3	Range: -40.0℃~100.0℃	Factory default: 0.0℃
U1-23	Temperature 2 of heat sink at fault 3	Range: -40.0℃~100.0℃	Factory default: 0.0℃
U1-24	Input terminal status at fault 3	Range: 0000~FFFF	Factory default: 0000
U1-25	Output terminal status at fault 3	Range: 0000~FFFF	Factory default: 0000
U1-26	Cumulative run time at fault 3	Range: 0h~65535h	Factory default: 0h

The recorded fault sequence: fault 3, fault 2, fault 1 (the latest). See Chapter 7 for details of fault codes.

Chapter 6 Troubleshooting

6.1 Fault Causes and Troubleshooting

Once drive fault occurs, please identify the causes of fault carefully and make a detailed record of fault symptom. To seek services, please contact the dealer. Parameters U1-00, U1-09 and U1-18 are used to view the records of fault 1, fault 2 and fault 3. Faults are recorded with numeric codes (1~46), while the fault information that corresponds to each numeric fault code is specified in the table below.

Table 6-1 Table of Fault Codes

Fault code	Fault display	Fault description	Causes	Solutions
1	oC1	Accel overcurrent	Torque boost is too big under V/f control	Reduce torque boost value
			Start frequency is too high	Drop start frequency
			Accel time is too short	Prolong the Accel time
			Motor parameters are improperly set	Set the parameters correctly according to motor nameplate
			Overload is too heavy	Reduce the load
			Inappropriate V/f curve under V/f control	Set V/f curve correctly
			Restart the rotating motor	Reduce current limited value or flying start
			Overload is too heavy	Reduce the load
			Power rating of the drive is relatively small	Select appropriate drive power rating
			In voltage is too low	Check power grid voltage
			Load inertia is too big	Use dynamic brake
			Decel time is too short	Prolong the Decel time
			Input voltage is too low	Check power grid voltage
4	ov1	Accel overvoltage	Load inertia is too big	Use dynamic brake
			Abnormal input volt	Check power grid voltage

Fault code	Fault display	Fault description	Causes	Solutions
5	ov2	Constant-speed overvoltage	Load variation is too big	Check the load
			Abnormal input voltage	Check power grid voltage
			Output short circuit (phase-to-phase short circuit or output ground short circuit)	Check motor connection and output ground impedance
			Improper parameter setting of regulator under SVC control	Properly set regulator parameters
6	ov3	Decel overvoltage	Load inertia is too big	Use dynamic braking
			Abnormal input voltage	Check power grid voltage
			Output short circuit (phase-to-phase short circuit or output ground short circuit)	Check motor connection and output ground impedance
			Improper parameter setting of regulator under SVC control	Properly set regulator parameters
			Decel time is too short	Prolong the Decel time
8	tUN	Motor tune failed	Bad motor connection	Check motor connection
			Motor tune is performed in motor rotary status	Perform motor tune in motor stationary status
			Big error between real motor parameters and the setting	Set the parameters correctly according to motor nameplate
9	oL1	Drive overloaded	Torque boost is too big under V/f control	Reduce torque boost value
			Start FREQ is too high	Drop start frequency
			Accel/Decel time is too short	Prolong the Accel/Decel time
			Motor parameters are improperly set	Set the parameters correctly according to

Fault code	Fault display	Fault description	Causes	Solutions
				motor nameplate
			Load is too heavy	Reduce the load
			Inappropriate V/f curve under V/f control	Set V/f curve correctly
			Restart the rotary motor	Reduce current limited value or flying start
10	oL2	Motor overloaded	Torque boost is too big under V/f control	Reduce torque boost value
			Inappropriate V/f curve under V/f control	Set V/f curve correctly
			Motor parameters are improperly set	Set the parameters correctly according to motor nameplate
			Improper setting of motor overloaded protection time	Properly set the motor overloaded protection time
			Motor stalled or sharp variation of load	Identify the causes of motor stalling or check the load condition
			Long-time running of ordinary motor at low speed with heavy load	Select variable frequency motor
11	CtC	Current detection abnormal	Abnormal connection between control board and drive board	Check and re-connect
			Abnormal current detection circuit	Seek services
12	GdP	Output ground short-circuit protection	Output connection ground short circuit	Check motor connection and output ground impedance
			Motor insulation abnormal	Check the motor
			Output ground leakage current is too big	Seek services
13	ISF	Input power supply abnormal	Severe voltage imbalance among power supply phases	Check power grid voltage

Fault code	Fault display	Fault description	Causes	Solutions
			Abnormal bus capacitance	Seek services
14	oPL	Output phase loss	Motor cable connection abnormal	Check motor connection
			Imbalance among motor three phases	Check or replace the motor
			Incorrect setting of vector control parameters	Correctly set vector control parameters
16	oH1	Module (IGBT) thermal protection	Ambient temperature is too high	Drop ambient temperature
			Fan failed	Replace the fan
			Air duct blocked	Clear air duct
			Temperature sensor abnormal	Seek services
18	oH3	Module temperature detection disconnected	Temperature sensor not well connected with socket	Pull out and re-insert
			Ambient temperature is too low	Raise ambient temperature
			Module detection circuit failed	Seek services
			Thermistor failed	Seek services
23	TEr	Function conflict between analog terminals	Analog input terminals are set to the same function	Do not set analog inputs to the same function
24	PEr	External equipment error	External fault terminal is enabled	Check the status of external fault terminal
			Stall condition lasts too long	Check if the load is abnormal
26	to2	Consecutive run time attained	"Consecutive run time attained" enabled	See specification of Group E0
27	to3	Cumulative run	"Cumulative run time	See specification of Group

Fault code	Fault display	Fault description	Causes	Solutions
		time attained	attained" enabled	E0
28	SUE	Power supply abnormal at run	DC bus voltage fluctuation is too big or the power is lost	Check input power grid voltage and load
29	EPr	EEPROM read/write fault	Parameter read/write abnormal at control board	Seek services
31	TrC	Port communication abnormal	Improper setting of baud rate	Set properly
			Communication port disconnected	Reconnected
			Upper computer/device does not work	Make upper computer/device work
			Drive communication parameter error	Set properly
32	PdC	Control panel communication abnormal	Control panel disconnected	Reconnected
			Severe EMI	Check peripheral equipment or seek services
33	CPy	Parameter copy failure	Parameter uploading or downloading abnormal	Seek services
			No parameters stored at control panel	Seek services
35	SFt	Software version compatibility failure	Version of control panel is not consistent with that of control board	Seek services
36	CPU	Abnormal power loss	Abnormal power loss in last operation	RESET the fault
			Faulty control board	Seek services
37	oCr	Overcurrent benchmark error	SMPS failed	Seek services
			Control board failed	Seek services
38	SP1	5V supply	SMPS failed	Seek services

Fault code	Fault display	Fault description	Causes	Solutions
		out-of-limit	Control board failed	Seek services
39	bEF	EMF abnormalt	Not PMSM	Confirm motor type
			PMSM demagnetizing	Change motor
40	AIP	AI input out-of-limit	Control board failed	Seek services
			AI input is too high or low	Set AI input within correct range
41	LoU	Undervoltage protection	DC bus voltage is too low	Check input voltage if it is too low or the drive is the process of power loss
45	Plo	PID feedback lost	Abnormal PID feedback channel abnormal	Check the feedback channel
			Inappropriate setting of PID parameters	Set properly
47	Oc4	Overcurrent Protection	Short circuit between output phase or short circuit to ground	Check the motor wiring and output impedance to ground
			The inverter module is damaged	Seek service
48	Ov4	Overvoltage protection	Abnormal input voltage	Check the grid voltage
			The control board voltage detection circuit abnormal	Seek service
49	StF	Water tower full water	Water full level reached	See specification of F6-20 ~ F6-23
50	LLr	Dry run protection	Water source is drying	See specification of F6-15 ~ F6-17
51	oPS	High water pressure protection	The pipe water pressure is too high	See specification of F6-27 and F6-28
52	SLP	Solar weak sleep	The sunshine is too weak to pump water	See specification of F6-12~F6-14
53	LoP	Low water pressure	Water pressure is too low, another manner of	See specification of F6-25, F6-30 and F6-31

Fault code	Fault display	Fault description	Causes	Solutions
		protection	dry run protection	
54	CPL	Low frequency at constant pressure mode	Frequency is too low at constant pressure mode	See specification of F6-32~F6-35

ATTENTION:

When a fault occurs, please identify the causes and seek solutions according the guidance in the table. If the fault fails to be solved, do not apply power to the drive again. Contact the supplier for service in time.

Chapter 7 Maintenance

Ambient temperature, humidity, salt mist, dust, vibration, degradation of internal components may result in drive faults. Routine maintenance shall be performed during the use and storage.

ATTENTION:

Please make sure the power supply of the drive has been cut off, and DC bus voltage has discharged to 0V before the maintenance.

7.1 Routine Inspection

Please use the drive in the environment recommended by this manual, and perform routine inspection in accordance with the table below.

Inspection items	Inspection aspects	Inspection methods	Criteria
Operating environment	Temperature	Thermometer	-10℃~50℃
	Humidity	Hygrometer	5%~95% RH, condensation not allowed
	Dust, oil stains, moisture and water-drop	Visual inspection	No mud, oil stains and water drop
	Vibration	Observation	Smooth running. No abnormal vibration
	Gas	Smell, visual inspection	No peculiar smell and abnormal smoke
Drive	Noise	Listen	No abnormal noise
	Gas	Smell, visual inspection	No peculiar smell and abnormal smoke
	Appearance	Visual inspection	No defect and deformation
	Heat dissipation and temperature rise	Visual inspection	No dust and/or fiber particles in air duct, normal working of fans, normal air speed and volume, no abnormal temperature rise

Inspection items	Inspection aspects	Inspection methods	Criteria
Motor	Thermal status	Smell	No abnormal heating and scorching smell
	Noise	Listen	No abnormal noise
	Vibration	Observe, listen	No abnormal vibration and sound
Run status parameters	Power supply input current	Ammeter	In the range of requirement
	Power supply input voltage	Voltmeter	In the range of requirement
	Drive output current	Ammeter	In the range of requirement
	Drive output voltage	Voltmeter	In the range of requirement
	Temperature	Thermometer	The difference between U0-33 displayed temperature and ambient temperature does not exceed 40℃

7.2 Regular Maintenance

Users should perform regular inspection of the drive every 3~6 months, so as to eliminate the potential faults.

ATTENTION:

Please make sure power supply of the drive has been cut off, and DC bus voltage has been discharged to 0V prior to maintenance. Never leave screws, gaskets, conductors, tools and other metal articles inside the drive. Failure to comply may result in equipment damage. Never modify the interior components of the drive in any condition. Failure to comply may result in equipment damage.

Inspection items	Measures
Check if control terminal screws are loose	Tighten
Check if main circuit terminal screws are loose	Tighten
Check if ground terminal screws are loose	Tighten
Check if copper bar screws are loose	Tighten
Check if drive mounting screws are loose	Tighten

Inspection items	Measures
Check if there are defect on power cables and control cables	Replace the cables
Check if there is dust on circuit board	Clear it up
Check if air duct is blocked	Clear it up
Check if drive insulation is failed	Test the ground terminal with 500V megameter after all input and output terminals are short-circuited via conductors. Ground test on individual terminals is strictly prohibited since this may cause damage to inverter.
Check if motor insulation is failed	Remove input terminals U/V/W of motor from drive and test the motor alone with 500V megameter. Failure to comply may result in drive failure.
Check if the storage period of the drive is over two years	Carry out power-on test, during which, the voltage should be boosted to rated value gradually using a voltage regulator; be sure to run at no load for more than 5 hours.

7.3 Replacement of Vulnerable Parts

Vulnerable parts of drive include cooling fan, electrolytic capacitor, relay or contactor etc. The service lives of these parts are subject to environment and working conditions. To maintain a favorable operating environment is conducive to improving the service life of parts and components; routine inspection and maintenance also contributes to effective improvement of parts' service life. To prolong the service life of entire drive, the cooling fan, electrolytic capacitor, relay or contactor and other vulnerable parts should be subjected to routine inspection according to the table below. Please replace the abnormal parts (if any) in time.

Vulnerable parts	Service life	Cause of damage	Criteria
Fan	30,000~40,000h	Wear of bearing and degradation of blade	Check if fan blades have cracks Check if there is abnormal vibration and noise on working
Electrolytic capacitor	40,000~50,000h	Excessively high ambient temperature and excessively low air pressure result in electrolyte volatilization; degradation of electrolyte capacitor	Check if there is liquid leakage Check if safety valve projects Check if capacitance value is out of allowable range Check if insulation resistance is abnormal
Relay/ contactor	50,000~100,000 times	Corrosion and dust impairs the contacting effect of contact; excessively frequent contact action	Open/close failure False alarm of CCL fault

7.4 Storage

Storage environment should meet the requirements as set forth in the table below.

Items	Requirements	Recommended storage method and environment
Storage temperature	-40~+70℃	In case of long-term storage, areas with an ambient temperature of less than 30℃ are recommended Avoid the storage in areas where temperature shock may result in condensation and freezing
Storage humidity	5~95%	Product could be sealed with plastic film and desiccant
Storage environment	A space with low vibration and low content of salt where there is no direct exposure to sunlight, dust, no corrosive or flammable gas, oil stain, vapor and water drop	Product could be sealed with plastic film and desiccant

ATTENTION:

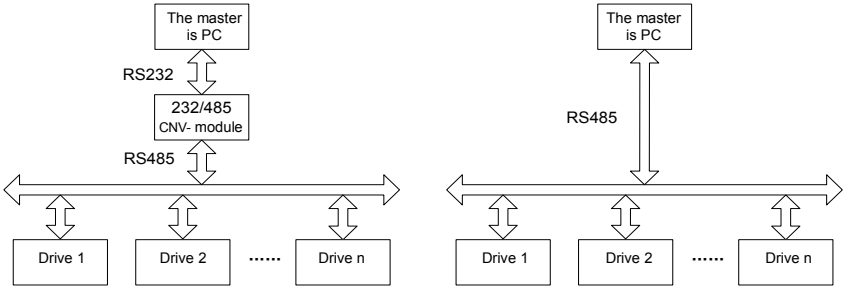
Since long-term storage may lead to the degradation of electrolytic capacitor, the inverter must be powered up once in case storage period exceeds 2 years. After applying the power, input voltage must be boosted to rated value gradually using a voltage regulator, and be sure to have the inverter operated at no load for more than 5 hours.

Appendix

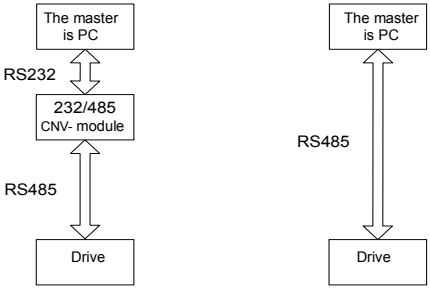
Appendix Communication Protocol

1. Networking Mode

The drives have two networking modes, single master/multiple slaves networking and single master/single slave networking.



Single master/multiple slaves networking diagram



Single master/single slave networking diagram

2. Interface Mode

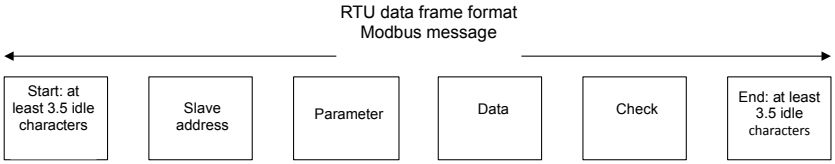
RS485 or RS232 interface: asynchronous, half-duplex. Default data format: 8-N-2 (8 data bits, no check, two stop bits), 9600 bps. See parameters of Group H0 for parameter setting.

3. Communication Mode

1） Drive is used as a slave for master-slave station-to-station communication. When master sends commands using broadcast address, the slave does not respond;
2） Native address, baud rate and data format of inverter are set through slave operating panel or serial communication;
3） Slave reports the current fault information in the latest response frame for master polling;
4） Drive employs RS-485 interface or extended RS-232 interface.

4. Protocol Format

Modbus protocol supports both RTU and ASCII mode.
RTU data frame format is shown as the figure below:



RTU:
In RTU mode, idle time between frames can be set through function code or comply with Modbus internal convention, for which the minimum interframe idle is as follows:

1） Frame header and end define the frame by making bus idle time equal to or longer than 3.5-byte time;
2） After the start of frame, the clearance between characters must be less than 1.5-character communication time, or the newly received characters will be treated as the header of the new frame;
3） Data check employs CRC-16 and the whole information participates in the check; the high and low bytes of check sum shall be sent after exchange. Please refer to examples at the end of protocol for details of CRC check;
4） The bus idle time of at least 3.5 characters (or set minimum bus idle time) shall be maintained between frames and needs not to accumulate the starting and ending idle time.

The data frame of which the request frame is "reading parameter value of b0-02 from slave 0x01" is as below:

Appendix Table 1

Address	Function code	Register address	Read words	Check sum
01	03	02 02	00 01	24 72

Response frame of slave 0x01 is as below:

Appendix Table 2

Address	Function code	Register address	Read words	Check sum
01	03	02	13 88	B5 12

ASCII:

1） Frame header is "0x3A" while the default frame end is "0x0D" "0x0A"; also, frame end can be configured and defined by user;

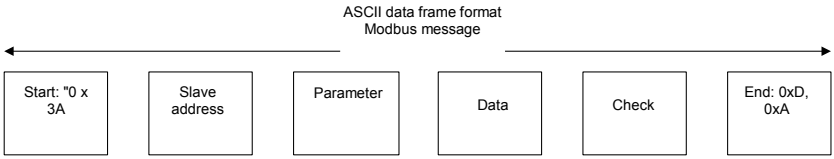
2） In ASCII mode, all data bytes other than frame header and end are sent in the form of ASCII code; high-4-bit byte and low-4-bit byte are sent successively;

3） In ASCII mode, the data is 7-bit long. For 'A'~'F', their uppercase ASCII codes are used;

4） Data is subjected to LRC check which covers the information portion from slave address to data;

5） Check sum is equal to the complement of sum of characters that participate in data check (abort the feed bit).

In ASCII mode, data frame format is as follows:



Examples of Modbus data frame in ASCII mode are as follows.

The writing of 4000 (0xFA0) into internal register 02 02 of slave 0x01 is shown in the table below.

LRC check = complement of (01+06+02+02+0x0F+0xA0) = 0x46

Appendix Table 3

	Header	Address		Parameter		Register address				Write-in content				LRC check		End	
Character	:	0	1	0	6	0	2	0	2	0	F	A	0	4	6	CR	LF
ASCII	3A	30	31	30	36	30	32	30	32	30	46	41	30	34	36	0D	0A

Different response delays can be set for drive through parameters so as to adapt to specific application requirements of various master stations; in RTU mode, the actual response delay is not less than 3.5 characters, while in ASCII mode, the actual response delay shall not be less

than 1ms.

5. Protocol Function

The uppermost function of Modbus is to read and write parameters, and different parameters determine different operation requests. Parameters operations supported by inverter Modbus protocol are as shown in the table below:

Appendix Table 4 Parameters

Parameter	Meaning of parameter
0x03	Read drive functional parameters and run status parameters
0x06	Over-write individual drive functional parameters or control parameters, which are not saved on power loss
0x08	Line diagnosis
0x10	Over-write multiple drive functional parameters or control parameters, which are not saved on power loss
0x41	Write individual drive functional parameters or control parameters, and save them to non-volatile storage unit
0x42	Parameter management

Functional parameters, control parameters and status parameters of the drive are all mapped to read-write register of Modbus. Read-write characteristics and range of parameters comply with the instructions of user manual of the drive. Group numbers of drive parameters are mapped as high byte of register address, while in-group indexes are mapped as low byte of register address. Drive control parameters and status parameters are all virtualized as drive parameter groups. The corresponding relations between parameter group numbers and their high bytes of register address are as shown in table below:

Appendix Table 5 High-byte register addresses mapped from parameter group numbers

Parameter group	Mapping register address, high byte	Parameter group	Mapping register address, high byte
A0	0x00	E1	0x12
A1	0x01	F0	0x13
b0	0x02	F1	0x14
b1	0x03	F2	0x15

Parameter group	Mapping register address, high byte	Parameter group	Mapping register address, high byte
b2	0x04	F3	0x16
C0	0x05	F4	0x17
C1	0x06	F5	0x18
C2	0x07	F6	0x19
C3	0x08	H0	0x1A
C4	0x09	H1	0x1B
d0	0x0A	H2	0x1C
d1	0x0B	L0	0x1D
d2	0x0C	L1	0x1E
d3	0x0D	U0	0x1F
d4	0x0E	U1	0x20
d5	0x0F	U2	0x21
d6	0x10	Drive control parameter group	0x62
E0	0x11	Drive status parameter group	0x63

For example, the register address of drive parameter b0-02 is 0x0202 while that of E0-07 is 0x1107.

In the following paragraphs, we present the formats and meanings of Modbus protocol parameters and data portion hereafter, i.e. to introduce the "parameter" and "data" related contents in above-noted data frame format. These two parts constitute the application layer protocol data unit of Modbus. The application layer protocol data unit mentioned below refers to these two parts. We take RTU mode for example to describe frame format below. The length of application layer protocol data unit should be doubled in ACSII mode.

Application layer protocol data units of various parameters are as follows:

Parameter 03: read register content

Request format is shown in appendix Table 5.

Appendix Table 5

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x03
Register address	2	0x0000~0xFFFF
Number of registers	12	0x0001~0x000C
Check	LRC or CRC	

Response format is shown in appendix table 7.

Appendix Table 7

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x03
Number of read bytes	1	2* number of registers
Register content	2* number of registers	
Check	LRC or CRC	

Parameter 0x06（0x41）: write register content (0x41 saved at power loss)
Request format is shown in appendix table 8.

Appendix Table 8

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x06
Register address	2	0x0000~0xFFFF
Register content	2	0x0000~0xFFFF
Check	LRC or CRC	

Response format is shown in appendix table 9.

Appendix Table 9

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x06
Register address	2	0x0000~0xFFFF
Register content	2	0x0000~0xFFFF
Check	LRC or CRC	

Some parameters of the drive are reserved and cannot be modified by communication setting. The list of these parameters is shown in appendix table 10.

Appendix Table 10

	Parameters	Remarks
(Parameter identification)	d0-22 d3-22	Communication not operable
(Parameter passing)	A0-05	Communication not operable
(User password)	A0-00	User password can not be set by communication, but the user password set by control panel can be unlocked by writing the same password from upper computer/device communication. Upper computer/device can view and modify parameters.

Parameter 0x08: communication line diagnosis.

Request format is shown in appendix table 11.

Appendix Table 11

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x08
Sub-parameter	2	0x0000~0x0030
Data	2	0x0000~0xFFFF
Check	LRC or CRC	

Response format is shown in appendix table 12.

Appendix Table 12

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x08
Sub-parameter	2	0x0000~0x0030
Data	2	0x0000~0xFFFF
Check	LRC or CRC	

Sub-parameters supported by line diagnosis are as set forth in the table below.

Appendix Table 13 Line diagnosis sub-parameter

Sub-PARA	Data (request)	Data (response)	Meaning of subfunction
0x0001	0x0000	0x0000	Reinitialize communication: make no-response mode disable.
	0xFF00	0xFF00	Reinitialize communication: make no-response mode disable.
0x0003	“New frame end” 00	“New frame end” 00	Set the frame end of ASCII mode and this "new frame end" will replace the original line feed symbol.(Note: new frame end shall not be greater than 0x7F and shall not be equal to 0x3A)
0x0004	0x0000	No response	Set no-response mode. Only response to reinitialization communication request. This is mainly used for isolating faulty equipment.
0x0030	0x0000	0x0000	Make slave no-response to invalid command and error command
	0x0001	0x0001	Make slave response to invalid command and error command

Parameter 0x10: write parameters continuously

Request format is shown in appendix table 14.

Appendix Table 14

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x10
Register address	2	0x0000~0xFFFF
Number of registers	2	0x0001~0x0004
Number of bytes of register content	1	2* number of operation registers
Register content	2* number of operation registers	

Check	LRC or CRC	

Response format is shown in appendix table 15.

Appendix Table 15

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x10
Register address	2	0x0000~0xFFFF
Number of registers	2	0x0001~0x0004
Check	LRC or CRC	

Parameter 0x42: parameter management

Request format is shown in appendix table 16.

Appendix Table 16

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x42
Sub-parameter	2	0x0000~0x0007
Data	2 (high byte is parameter group number, while low byte is parameter in-group index)	
Check	LRC or CRC	

Response format is shown in appendix table 17.

Appendix Table 17

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x42
Sub-parameter	2	0x0000~0x0007
Data	2	0x0000~0xFFFF
Check	LRC or CRC	

Sub-parameters supported by parameter management are set forth in the table 18.

Appendix Table 18 Parameter management sub-parameters

Sub-PARA	Data (request)	Data (response)	Meaning of subfunction
0x0000	Parameter group number and in-group index respectively possess high and low bytes	Upper limit of parameter	Read the upper limit of parameter
0x0001	Parameter group number and in-group index respectively possess high and low bytes	Lower limit of parameter	Read the lower limit of parameter
0x0002	Parameter group number and in-group index respectively possess high and low bytes	See specification below for details of parameter characteristics	Read the characteristics of parameter
0x0003	Parameter group number possesses high byte, while the lower byte is 0.	Maximum value of in-group index	Read the maximum value of in-group index
0x0004	Parameter group number possesses high byte, while the lower byte is 0.	The next parameter group number possesses high byte, while the lower byte is 0.	Read the next parameter group number
0x0005	Parameter group number possesses high byte, while the lower byte is 0.	The previous parameter group number possesses high byte, while the lower byte is 0.	Read the previous parameter group number

Status parameter group should not be modified and does not support the reading of upper and lower limits. Parameter characteristic is 2-byte long, and the bit definition is shown in the table below:

Appendix Table 19 Parameter characteristics

Characteristic parameter (BIT)	Value	Meaning
BIT1~BIT0	00B	Changeable in run

Characteristic parameter (BIT)	Value	Meaning
	01B	Not changeable in run, but changeable in stop
	10B	Read only
	11B	Factory parameters
BIT4~BIT2	000B	Accuracy: 1
	001B	Accuracy: 0.1
	010B	Accuracy: 0.01
	011B	Accuracy: 0.001
	100B	Accuracy: 0.0001
	Others	Reserved
BIT7~BIT5	000B	The unit is A
	001B	The unit is Hz
	010B	The unit is Ω
	011B	The unit is r/min
	100B	The unit is S
	101B	The unit is V
	110B	The unit is %
	111B	No unit
BIT8	0: decimal; 1: hexadecimal	Display format
BIT9	0: non-quick menu; 1: quick menu	Quick menu or not
BIT10	0: not uploaded; 1: uploaded	Uploaded to control panel or not
BIT13~BIT11	001B	Data width: 1
	010B	Data width: 2
	011B	Data width: 3
	100B	Data width: 4
	101B	Data width: 5
	110B	Data width: 6
	111B	Data width: 7
BIT14	Number of symbols available/not available	0: unsigned number; 1: directed number
BIT15	Reserved	Reserved

The response format is shown as table 20 when an error occurs.

Appendix Table 20

pplication layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x80 + parameter
Error code	1	
Check	LRC or CRC	

Error codes supported by Modbus protocol are listed in the table below:

Appendix Table 21 Error codes

Error codes	Meanings of error codes
0x01	Illegal parameter
0x02	Illegal register address
0x03	Data error, i.e. data are out of upper limit or lower limit
0x04	Slave operation failed, including errors caused by invalid data although there are in the range
0x05	Command is valid and being processed, mainly used for storing data to non-volatile storage
0x06	Slave is busy, please try again later; mainly used for storing data into non-volatile storage
0x18	Message frame error: including message length error and check error
0x20	Parameter is not changeable
0x21	Parameter is not changeable during the running
0x22	Parameter is under password protection

Drive control parameters are used for start, stop and run frequency setting. By detecting drive status parameters, run status and run mode can be obtained. Drive control parameters and status parameters are shown in appendix table 22.

Appendix Table 22 Control parameters

Register address	Parameter name	Save at power loss
0x6200	Control command word	No
0x6201	Master frequency setting	Yes
0x6202	Auxiliary frequency setting	Yes
0x6203	Master frequency setting	No
0x6204	Auxiliary frequency setting	No

Register address	Parameter name	Save at power loss
0x6205	Multi-step frequency setting	No
0x6206	Simple PLC frequency setting	No
0x6207	PID digital setting percentage (0~100.0%)	No
0x6208	PID feedback percentage (0~100.0%)	No
0x6209	Electric driven torque limit (0~200.0%)	No
0x620A	Brake torque limit (0~200.0%)	No
0x620B	Reserved	No
0x620C	Reserved	No
0x620D	Reserved	No
0x620E	Analog AO1 source setting	No
0x620F	Analog EAO source setting	No
0x6210	Digital DO output source setting	No
0x6211	Setting of slave frequency setting proportion (0~100.0%)	No
0x6212	Virtual terminal communication setting	No
0x6213	Accel time 1	Yes
0x6214	Decel time 1	Yes

Appendix Table 23 Status parameters

Register address	Parameter name
0x6300	Run status word 1
0x6301	Current run frequency
0x6302	Output current
0x6303	Output voltage
0x6304	Output power
0x6305	Rotary speed
0x6306	Bus voltage
0x6307	Output torque
0x6308	External counter
0x6309	High-bit words of actual length

Register address	Parameter name
0x630A	Low-bit words of actual length
0x630B	Status of digital input terminal
0x630C	Status of digital output terminal
0x630D	Setting of run frequency
0x630E	PID setting
0x630F	PID feedback
0x6310	Set length
0x6311	Set Accel time 1
0x6312	Set Decel time 1
0x6313	AI1 (unit: V)
0x6316	DI (unit: kHz)
0x6317	Fault 1
0x6318	Fault 2
0x6319	Fault 3 (the latest)
0x631A	Run display parameter
0x631B	Stop display parameter
0x631C	Setting of drive control mode
0x631D	Frequency setting mode
0x631E	Master frequency setting
0x631F	Digital setting of master frequency
0x6320	Auxiliary frequency setting
0x6321	Digital setting of auxiliary frequency
0x6322	Drive status word 2
0x6323	Current fault of the drive

Drive control bits are defined as below table 24.

Appendix Table 24 Control bits

Control bit	Value	Meaning	Function description
BIT0	0	Run command disabled	top the drive
	1	Run command enabled	tart the drive
BIT1	1	Reverse	et the run direction when run command enabled
	0	Forward	

Control bit	Value	Meaning	Function description
BIT2	1	Jog	
	0	Jog disabled	
BIT3	1	Reset command enabled	
	0	Reset command disabled	
BIT4	1	Coast to stop enabled	
	0	Coast to stop disabled	
BIT15~BIT5	000000B	Reserved	

ATTENTION:

When BIT0 and BIT2 coexist, jog takes precedence.

Drive status bits are shown in appendix table 25.

Appendix Table 25 Status word 1 bits

Status bit	Value	Meaning	Remarks
BIT0	1	Run	
	0	Stop	
BIT1	1	Reverse	
	0	Forward	
BIT3~BIT2	00B	Constant speed	
	01B	Accel	
	10B	Decel	
BIT4	0	Main setting not attained	
	1	Main setting attained	
BIT7~BIT5	Reserved		
BIT15~BIT8	0x00~0xFF	Fault code	0: drive normal. Non-0: drive at fault; Refer to relative specification of the fault codes in Chapter 7 in this user manual

Appendix Table 26 Status word 2 bits

Status bit	Value	Meaning	Remarks
BIT0	1	Jog	

Status bit	Value	Meaning	Remarks
	0	Non-jog	
BIT1	1	PID run	
	0	Non-PID run	
BIT2	1	PLC run	
	0	Non-PLC run	
BIT3	1	Run at multi-step frequency	
	0	Run at non-multi step frequency	
BIT4	1	Ordinary run	
	0	Non-ordinary run	
BIT5	1	Wobble frequency	
	0	Non-wobble frequency	
BIT6	1	Undervoltage	
	0	Normal voltage	
BIT7	1	Sensor-less vector control	
	0	Non-sensor-less vector control	
BIT8	0	Reserved	
BIT9	0	Reserved	
BIT10	1	Autotuning	
	0	Non-autotuning	
Others	0	Reserved	

6. Operation Instructions

0x03 reads multiple (including one) registers (default address is 0x01). Master enquiry:

Appendix Table 27

Address	Parameter	Register address	Number of registers	Check code
01	03	XX XX	000X	XX XX

Slave response:

Appendix Table 28

Address	Parameter	Total number of bytes	Data	Check code
01	03	2* number of registers	Bn~B0	XX XX

Register address: 0x00 00~0x63 22;
Number of registers: 0x00 01~0x00 0C;
Data: n is equal to (2 x the number of registers -1).
Application example:
Note: before using communication controlling drive, please check if hardware is properly connected; in addition, be sure to properly set the communication data format, baud rate and address.
Parameter 0x03 is used here to read values of 0x01 slave's control parameters b0-00, b0-01, b0-02 and b0-03. At this moment, b0-00 = 0, b0-01 = 0, b0-02 = 50.00, b0-03 = 0.

Appendix Table 29

	Address	PARAM	Register address	Number of registers	Number of data bytes	Data	Check sum
Request	01	03	02 00	00 04	None	None	44 B1
Response	01	03	None	None	08	0000,0000, 1388, 0000	11 79

Management of parameter 42H
Master enquiry:

Appendix Table 30

Address	Parameter	Sub-parameter	Data	Check code
01	42	XX XX	XX XX	XX XX

Slave response:

Appendix Table 31

Address	Parameter	Sub-parameter	Data	Check code
01	42	XX XX	B1~B0	XX XX

Register address: 0x00 00~0x21 06 and 0x62 00~0x63 22.
Sub-parameter: refer to the table of parameter managing sub-parameter.
Data: refer to the values of data as set forth in the table of parameter managing sub-parameter.
Example:
Parameter 0x42 is used here to read the upper limit value of 0x01 slave's control parameter b0-02 which is 600.00:

Appendix Table 32

	Address	Parameter	Sub-PARA	Data	Check sum
Request	01	42	00 00	02 02	F9 64
Response	01	42	00 00	EA 60	36 8D

0x06 (0x41 data storage) writes that individual parameter data is not saved.
Master enquiry:

Appendix Table 33

Address	Parameter	Register address	Data	Check code
01	06	62 00	B1 B0	XX XX

Slave response:

Appendix Table 34

Address	Parameter	Register address	Data	Check code
01	06	62 00	B1 B0	XX XX

Example:
Parameter 0x06 is used here to write 0x01 slave's control command (forward), i.e. to write 1 to register address 0x6200:

Appendix Table 35

	Address	Parameter	Register address	Number of registers	Number of data bytes	Data	Check sum
Request	01	06	62 00	None	None	00 01	57 B2
Response	01	06	62 00	None	None	00 01	57 B2

10H writes that the data of multiple registers are not saved.
Master enquiry:

Appendix Table 36

Address	Parameter	Register address	Number of registers	Number of data bytes	Data	Check code
01	10	XX XX	0001~0004	Number of 2* registers	XX XX	XX XX

Slave response:

Appendix Table 37

Address	Parameter	Register address	Number of registers	Check code
01	10	XX XX	Number of 2* registers	XX XX

Register address: 0x00 00~0x1E 04, 0x62 00~0x62 14
Number of registers: 0x00 01~0x00 04
Number of data bytes: 0x02~0x08
Data: n is equal to (2 x the number of registers -1).

Example:
Parameter 0x10 is used here to write the corresponding write data 1, 6 and 0 in control registers 0x6200, 0x6201 and 0x6202 of slave 0x01:

Appendix Table 38

	Address	Parameter	Register address	Number of registers	Number of data bytes	Data	Check sum
Request	01	10	62 00	00 03	06	0001,0006,0000	CE F8
Response	01	10	62 00	00 03	None	None	9F B0

08H: communication line diagnosis
Master enquiry:

Appendix Table 39

Address	Parameter	Sub-parameter	Data	Check code
01	08	XX XX	XX XX	XX XX

Slave response:

Appendix Table 40

Address	Function code	Subfunction code	Data	Check code
01	08	XX XX	Bn~B0	XX XX

Sub-parameter: table of line diagnosis sub-parameter.

Example:
Parameter 0x08 is used here to set the communication no-response mode of 0x01 slave:

Appendix Table 41

	Address	Parameter	Sub-PARA	Data	Check sum
Request	01	08	00 04	00 00	A1 CA
Response	01	08	00 04	00 00	A1 CA

Read error or warning
In case illegal parameter, illegal register address, data errors and other anomalies are detected during communication, slave response communication anomaly will occur. In such a case, the slave response will be in the following formats:
Slave response:

Appendix Table 42

Address	Parameter	Data	Check code
01	0x80+parameter	Error code	XX XX

Example:
Parameter 0x10 is used here to write the corresponding write data 1, 11, 4 and 100.00 in control registers 0x6200, 0x6201, 0x6202 and 0x6203 of 0x01 slave:

Appendix Table 43

	Address	Parameter	Register address	Number of registers	Number of data bytes	Data	Check sum
Request	01	10	62 00	00 04	08	0001,000B 0004 2710	DE 64
Response	01	90	None	None	None	20	0C 01

7. LRC/CRC Generation

In consideration of the demand for speed improvement, CRC-16 is usually realized in form mode. C-language source codes for realization of CRC-16 are given below. Please note that the high and low bytes have been exchanged in final result, that is to say, the result is the CRC check sum to be sent:

```
/* The function of CRC16*/
Uint16 CRC16(const Uint16 *data, Uint16 len)
{
    Uint16 crcValue = 0xffff;
    Uint16 i;
    while (len--)
    {
        crcValue ^= *data++;
        for (i = 0; i <= 7; i++)
        {
            if (crcValue & 0x0001)
            {
                crcValue = (crcValue >> 1) ^ 0xa001;
            }
            else
            {
                crcValue = crcValue >> 1;
            }
        }
    }
    return (crcValue);
}
```