Foreword

Thank you for choosing Powtran Technology PI160 series high performance frequency inverter. This product made by POWTRAN based on years of experience in professional production and sale, and designed for variety of industrial machinery, fan and water pump drive unit and IF heavy-dury grinding unit.

This manual provides user the relevant precautions on installation,operational parameter setting, abnormal diagnosis, routine maintenance and safe use. In order to ensure correct installation and operation of the frequency converter, please carefully read this manual before installing it.

For any problem when using this product, please contact your local dealer authorized by this company or directly contact this company, our professionals are happy to serve you.

The end-users should hold this manual,and keep it well for future maintenance & care,and other application occasions. For any problem within the warranty period,please fill out the warranty card and fax it to the our authorized dealer.

The contents of this manual are subject to change without prior notice. To obtain the latest information, please visit our website.

For more product information, please visit: Http://www.powtran.com.

Powtran

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Chapter 1 Inspection and safety precautions

POWTRAN frequency inverters have been tested and inspected before leaving factory. After purchasing, please check if its package is damaged due to careless transportation, and if the specifications and model of the product are consistent with your order requirements. For any problem, please contact your local authorized POWTRAN dealer or directly contact this company.

1-1.Inspection after unpacking

※   Check if that packing container contains this unit, one manual and one warranty card.

※   Check the nameplate on the side of the frequency inverter to ensure that the product you have received is the right one you ordered.

1-1-1.Instructions on nameplate
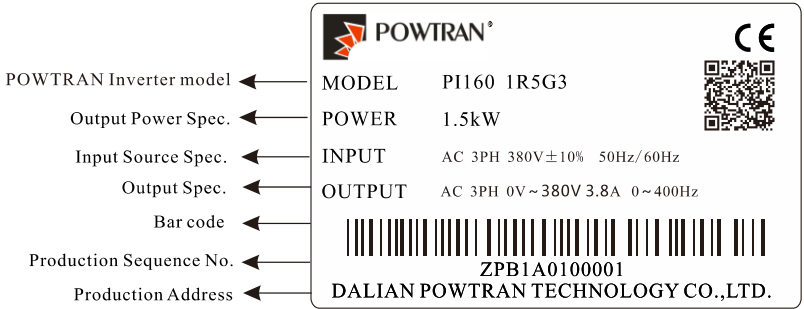
Figure 1-1:Nameplate description

1-1-2.Model designation
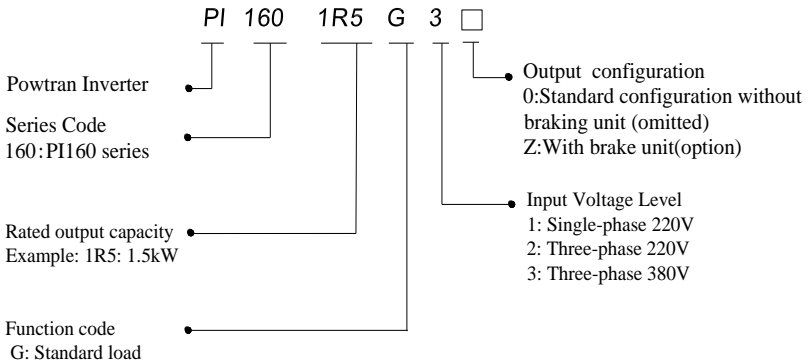
Figure 1-2:Model description

1-2.Safety precautions

Safety precautions in this manual are divided into the following two categories:

⚠ Danger: The dangers caused by failure to perform required operation, may result in serious body injury or even death;

⚠ Caution: The dangers caused by failure to perform required operation, may result in moderate injury or minor injury, and equipment damage;

Process	Type	Explanation
Before installation	Danger	★When unpacking, if control system with water, parts missed or component damaged are found, do not install! ★If packing list does not match the real name, do not install! ★Gently carry with care, otherwise there is the risk of damage to equipment! ★Please do not use the damaged driver or the frequency inverter with missed pieces, otherwise there is the risk of injury! ★Do not use your hand to touch the control system components, otherwise there is the risk of electrostatic damage!
When installing	Danger	★Please install the unit on the metal or flame retardant objects; away from combustible material. Failure to do so may cause a fire! ★Never twist the mounting bolts of the equipment components, especially the bolt with the red mark!
	Note	★Do not let the lead wires or screws fall into the driver. Otherwise which may cause damage to the driver! ★Keep the driver installed in the place where less vibration, avoid direct sunlight. ★When two or more converters are installed in a cabinet, please pay attention to the installation location, ensure the good heat dissipation effect.
When wiring	Danger	★Must comply with this manual's guidance, any construction shall be performed by a professional electrician, otherwise there would be the unexpected risk ! ★A circuit breaker must be set between the inverter and the power supply to separate them, otherwise it may cause a fire! ★Verify if power is a zero-energy status before wiring, otherwise there is a risk of electric shock! ★The inverter shall be grounded correctly according to standard specifications, otherwise there is a danger of electrical shock! ★Never connect the input power to the inverter output terminals (U, V, W) . Note that the mark of the terminals, do not incorrectly connect wires! Otherwise which may cause damage to the driver! ★Ensure that the distribution line meets the regional safety standards of EMC requirements. The diameter of used wire shall refer to the recommendations of this manual. Otherwise it may cause an accident! ★When connecting to braking resistor, the braking resistor must be connected to position between terminals (P, RB) of the inverter

Process	Type	Explanation
Before energizing	Note	★Please confirm whether the input power voltage is same as the inverter rated voltage; wiring positions of power input terminals (R,S,T) and output terminals (U,V,W) are correct or not; and note that if there is a short circuit in the peripheral circuit connected to driver, if the connected lines are tight, otherwise it may cause damage to the driver! ★Do not need to perform withstand voltage test for any part of the inverter,this product has been tested before leaving factory. Otherwise it may cause an accident!
	Danger	★The inverter's cover plate must close before power on. Otherwise it may cause an electric shock! ★Wiring of all external accessories must comply with the guidance of this manual,please correctly wiring in accordance with the circuit connection methods described in this manual. Otherwise it may cause an accident!
After energizing	Danger	★Do not open cover plate after energizing. Otherwise there is a risk of electric shock! ★Do not touch the driver and peripheral circuits with wet hands. Otherwise there is a risk of electric shock! ★Do not touch any input and output terminals of the inverter. Otherwise there is a risk of electric shock! ★The inverter automatically perform the safety testing for the external strong electrical circuit in the early stages of energizing, therefore never touch the driver terminals (U, V, W) or motor terminals, otherwise there is a risk of electric shock! ★If you need to identify the parameters, please pay attention to the danger of injury during motor rotation. Otherwise it may cause an accident! ★Please do not change the inverter manufacturer parameters. Otherwise it may cause damage to this unit!
During operation	Danger	★Do not touch the cooling fan and the discharge resistor to feel the temperature. Otherwise it may cause burns! ★Non-professional personnel is not allowed to detect signal when operating. Doing so may cause personal injury or damage to this unit!
	Note	★When the inverter is operating, you should avoid that objects fall into this unit.Otherwise cause damage to this unit! ★Do not start/stop the driver by switching on/off contactor. Otherwise cause damage to this unit!
When maintaining	Danger	★Do not perform repairs and maintenance for the live electrical equipment. Otherwise there is a risk of electric shock! ★The repairs and maintenance task can be performed only when the inverter voltage is lower than AC36V,generally that is two minutes after powering off. Otherwise, the residual charge from capacitor would cause personal injury! ★Non-well-trained professional personnel is not allowed to perform repairs and maintenance of inverter. Doing so may cause personal injury or damage to this unit! ★After replacing the inverter,parameter settings must be redone, all pluggable plugs can be operated only in the case of powering off!

1-3.Precautions

No.	Type	Explanation
1	Motor insulation inspection	Please perform motor insulation inspection for the first time use, re-use after leaving unused for a long time as well as regular check, in order to prevent damage to the inverter because of the motor's winding insulation failure. Wiring between motor and inverter shall be disconnected, it is recommended that the 500V voltage type megger should be adopted and insulation resistance shall be not less than 5MΩ.
2	Motor thermal protection	If the rated capacity of the selected motor does not match the inverter, especially when the inverter rated power is greater than the motor rated power,be sure to adjust the motor protection parameter values inside inverter or install thermal relay in the front of motor for motor protection.
3	Run over power frequency	This inverter can provide (0Hz to 400Hz) output frequency If the user is required to run at 50Hz or more, please consider the endurance of your mechanical devices.
4	Vibrations of mechanical device	Inverter output frequency may be encountered mechanical resonance point of the load device, you can set jump frequency parameter inside inverter to avoid the case.
5	Motor heat and noise	The inverter output voltage is PWM wave that contains a certain amount of harmonics, so the temperature rise,noise and vibration of motor show a slight higher than frequency power frequency operation.
6	Output side with piezoresistor or capacitor for improving power factor	The inverter output is PWM wave, if the piezoresistor for lightning protection or the capacitor for improving power factor is installed in the output side, which easily cause the inverter instantaneous overcurrent or even cause damage to the inverter. Please do not use.
7	Contactor or switch used in the inverter input/output terminals	If contactor is installed between power supply and inverter,the contactor is not allowed to start/stop the inverter. Necessarily need to use the contactor to control the inverter start/stop, the interval should not be less than one hour. Frequent charging and discharging may reduce the service life of the inverter capacitor. If the contactor or switch is equipped between output terminals and motor, the inverter should be turned on/off without output status,otherwise which easily lead to damage to the inverter module.
8	Use other than the rated voltage	PI series inverter is not suitable for use beyond the allowable operating voltage described in this manual,which easily cause damage to the parts inside inverter. If necessary, please use the corresponding transformer to change voltage.
9	Never change 3-phase input to 2-phase input	Never change PI series 3-phase inverter to 2-phase one for application. Otherwise it will lead to malfunction or damage to the inverter.
10	Lightning surge protection	The series inverter is equipped with lightning overcurrent protection device, so it has the ability of self-protection to lightning induction. For the area where lightning is frequent, user should also install the extra protection in the front of the inverter.
11	High altitude and derating application	When the inverter is used in areas over 1000m altitude,it is required to reduce frequency because the thin air will decrease the cooling effect of inverter. Please consult our technician for

No.	Type	Explanation
		details on the application.
12	Special use	If the user need to use methods other than the suggested wiring diagram provided in this manual, such as common DC bus, please consult our technician.
13	Precautions for scrap disposal of the inverter	It may explode when electrolytic capacitors on the main circuit and printed circuit board are burned. When burning plastic parts, it may produce toxic gases.Please disposing as industrial waste.
14	About adaptive motor	1) Standard adaptive motor shall be four-pole asynchronous squirrel-cage induction motor. Apart from the said motors, please select the inverter according to the motor rated current. 2) The cooling fan and the rotor shaft for non-inverter motor are coaxially connected, the fan cooling effect is reduced when the rotational speed is reduced, therefore, when the motor works in overheating occasions,a strong exhaust fan should be retrofitted or replace non-inverter motor with the inverter motor; 3) The inverter has built-in the adaptive motor standard parameters, according to the actual situation, please identify motor parameters or accordingly modify the default values to try to meet the actual value,otherwise it will operation affect and protection performance; 4) When short-circuit of cable or motor internal will activate the inverter alarm, even bombing. Therefore, firstly perform insulation short-circuit test for the initial installation of the motor and cable, routine maintenance often also need to perform such test. Note that the parts to be tested and the inverter shall be disconnected completely when testing.
15	Others	1) Never connect the AC power to the inverter output terminals (U, V, W) . 2) Properly fix and lock the panel before powering on, so as to avoid hurting the personal safety due to internal poor capacitors. 3) Never perform wiring, checking and other operations after power is turned on. 4) Do not touch the internal circuit board and its components in order to avoid the risk of electric shock after this unit is powered, 5) Do not touch internal circuit board and any parts after powering off and within five minutes after keyboard indicator lamp goes out,you must use the instrument to confirm that internal capacitor has been discharged fully,otherwise there is a danger of electric shock. 6) Body static electricity will seriously damage the internal MOS field-effect transistors, etc.,if there are not anti-static measures, do not touch the printed circuit board and IGBT internal device with hand, otherwise it may cause a malfunction. 7) The ground terminal of the inverter (E or $\perp$)shall be earthed firmly according to the provisions of the National Electrical Safety and other relevant standards. Do not shut down (power off) by pulling switch,and only cut off the power until the motor stopping operation. 8) It is required to add the optional input filter attachment so as to meet CE standards

1-4.Scope of applications

※   This inverter only applies to typical industrial three-phase AC asynchronous motor.

※   This inverter can only be used in those occasions recognized by this company, an unapproved use may result in fire, electric shock, explosion and other accidents.

※   If the inverter is used in such equipments (e.g: Equipments for lifting persons,aviation systems, safety equipment, etc.) and its malfunction may result in personal injury or even death. In this case,please consult the manufacturer for your application.

> **Only the well-trained personnel can be allowed to operate this unit, please carefully read the instructions on safety, installation, operation and maintenance before use. The safe operation of this unit depends on proper transport, installation, operation and maintenance!**

Chapter 2 Standard specifications

2-1.Technical specifications

Inverter model	Rated output power(kW)	Rated input current(A)	Rated output current(A)	Adaptive motor(kW)
Single phase supply voltage 220V + 10%				
PI160-0R4G1(Z)	0.4	5.4	2.5	0.4
PI160-0R7G1(Z)	0.75	8.2	4.0	0.75
PI160-1R5G1(Z)	1.5	14.0	7.0	1.5
PI160-2R2G1(Z)	2.2	23	10.0	2.2
Three phase supply voltage 220V + 10%				
PI160-0R4G2(Z)	0.4	4.1	2.5	0.4
PI160-0R7G2(Z)	0.75	5.3	4.0	0.75
PI160-1R5G2(Z)	1.5	8.0	7.0	1.5
PI160-2R2G2(Z)	2.2	11.8	10.0	2.2
Three phase supply voltage 380V±10%				
PI160-0R4G3Z	0.4	2.0	1.2	0.4
PI160-0R7G3Z	0.75	4.3	2.5	0.75
PI160-1R5G3Z	1.5	5.0	3.8	1.5
PI160-2R2G3Z	2.2	5.8	5.1	2.2
PI160-3R7G3Z	3.7	10	8.5	3.7

Note:220V series brake unit is optional accessory; 380V series brake unit is standard accessory.

2-2.Main circuit terminal screw specifications

Inverter model	Main circuit terminal screw specifications	Tightening torque (Nm)
PI160-0R4G1(Z)	M3	0.5～0.7
PI160-0R7G1(Z)		
PI160-1R5G1(Z)		
PI160-2R2G1(Z)		
PI160-0R4G2(Z)		
PI160-0R7G2(Z)		
PI160-1R5G2(Z)		
PI160-2R2G2(Z)		
PI160-0R4G3Z		

PI160-0R7G3Z			
PI160-1R5G3Z			
PI160-2R2G3Z			
PI160-3R7G3Z			

2-3.Standard specifications

	Items	Specifications
Power	Voltage and frequency levels	Single-phase 220V, 50/60Hz; Three-phase 220V, 50/60Hz; Three-phase 380V, 50/60Hz
	Allowable fluctuation	Voltage:±10%; Frequency:±5% Voltage unbalance rate is less than 3% , Aberration rate meet IEC61800-2 standard
Control system	Control system	High performance vector control inverter based on DSP
	Control method	V/F control, vector control W/O PG,
	Automatic torque boost function	Realize low frequency (1Hz) and large output torque control under the V/F control mode.
	Acceleration/deceleration control	Straight or S-curve mode. Four times available and time range is 0.0 to 6500.0s.
	V/F curve mode	Linear, square root/m-th power, customized definition V/F curve
	Over load capability	G type: Rated current 150% - 1 minute, rated current 180% - 2 seconds
	Maximum frequency	Vector control:0 to 300Hz V/F control:0 to 3200Hz
	Carrier Frequency	0.5 to 16kHz; automatically adjust carrier frequency according to the load characteristics.
	Input frequency resolution	Digital setting: 0.01Hz Analog setting: maximum frequency 0.01Hz
	Start torque	G type: 0.5Hz/150% (vector control W/O PG)
	Speed range	1:100 (vector control W/O PG)
	Steady-speed precision	Vector control W/O PG: ≤ ± 0.5% (Rated synchronous speed)
	Torque response	≤ 40ms (vector control W/O PG)
	Torque boost	Automatic torque boost; manual torque boost(0.1% to 30.0%)
	DC braking	DC braking frequency: 0.0Hz to max. frequency, braking time: 0.0 to 100.0 seconds, braking current value: 0.0% to 100.0%
	Jogging control	Jog Frequency Range: 0.00Hz to max. frequency; Jog Ac/deceleration time: 0.0s to 6500.0s
	Multi-speed operation	Achieve up to 16-speed operation through the control terminal
	Built-in PID	Easy to realize closed-loop control system for the process control.
	Automatic voltage regulation(AVR)	Automatically maintain a constant output voltage when the voltage of electricity grid changes
	Torque limit and control	"Excavator" feature - torque is automatically limited during the operation to prevent frequent over current trip; the closed-loop vector mode is used to control torque.

Personalization function	Self-inspection of peripherals after power-on		After powering on, peripheral equipment will perform safety testing, such as ground, short circuit, etc.
	Quick current limiting		The current limiting algorithm is used to reduce the inverter overcurrent probability, and improve whole unit anti-interference capability.
	Timing control		Timing control function: Time setting range(0m to 6500m)
	shuttle run		On line cutting machine operation mode, using a terminal to control the motor forward and reverse operation.
Running	**Input signal**	Running method	Keyboard/terminal/communication
		Frequency setting	8 frequency settings available, including adjustable DC(0 to 10V), adjustable DC(0 to 20mA), panel potentiometer, etc.
		Start signal	Rotate forward/reverse
		Multi-speed	At most 16-speed can be set(run by using the multi-function terminals or program)
		Emergency stop	Interrupt controller output
		Wobbulate run	Process control run
		Fault reset	When the protection function is active, you can automatically or manually reset the fault condition.
		PID feedback signal	Including DC(0 to 10V), DC(0 to 20mA)
	Output signal	Running status	Motor status display, stop, ac/deceleration, constant speed, program running status.
		Fault output	Contact capacity :normally closed contact AC 250V/7A
		Analog output	one-way analog output, 16 signals can be selected such as frequency, current, voltage and other, output signal range (0 to 10V / 0 to 20mA).
		Output signal	one-way output signal, there are 40 signals each way
	Run function		Limit frequency, jump frequency, frequency compensation, auto-tuning, PID control
	DC current braking		Built-in PID regulates braking current to ensure sufficient braking torque under no overcurrent condition.
	Running command channel		Three channels: Operation panel, control terminals and serial communication port. They can be switched through a variety of ways.
	Frequency source		Total 5 frequency sources: Digital, analog voltage, analog current, multi-speed and serial port. They can be switched through a variety of ways.
	Input terminals		7digital input terminals, compatible with active PNP or NPN input mode, one of them can be for high-speed pulse input(0 to 100 kHz square wave); 1 analog input terminal 0-10v or 0-20mA
	Output terminals		1 digital output terminal, one relay output terminal; 1 analog output terminals respectively for optional range (0 to 20mA or 0 to 10V), they can be used to set frequency, output frequency, speed and other physical parameters.
Protection function	Inverter protection		Overvoltage protection, undervoltage protection, overcurrent protection, overload protection, overheat protection, overcurrent stall protection, overvoltage stall protection, losing-phase protection (optional), communication error, PID feedback signal abnormalities,

	IGBT temperature display		Displays current temperature IGBT
	Inverter fan control		Can be set
	Instantaneous power-down restart		Less than 15 milliseconds: Continuous operation. More than 15 milliseconds: Automatic detection of motor speed, instantaneous power-down restart.
	Speed start tracking method		The inverter automatically tracks motor speed after it starts
	Parameter protection function		Protect inverter parameters by setting administrator Password and decoding
Display	LED display keyboard	Running information	Monitoring objects including: Running frequency, set frequency, bus voltage, output voltage, output current, output power, output torque, input terminal status, output terminal status, analog AI1 value, analog AI2 value, motor Actual running speed，PID set value percentage, PID feedback value percentage.
		Error message	At most save three error message, and the time, type, voltage, current, frequency and work status can be queried when the failure is occurred.
	LED display		Display parameters
	Key lock and function selection		Lock part or all of keys, define the function scope of some keys to prevent misuse.
Communic ation	Built-in RS485		Is completely isolated RS485 communication module, realize communication with PC connected to the Internet
Environment	Environment temperature		-10 ℃ to 40 ℃ (temperature at 40 ℃ to 50 ℃, please derating for use)
	Storage temperature		-20 ℃ to 65 ℃
	Environment humidity		Less than 90% R.H, no condensation.
	Vibration		Below 5.9m/s ^{2}(= 0.6g)
	Application sites		Indoor where no sunlight or corrosive, explosive gas and water vapor, dust, flammable gas, oil mist, water vapor, drip or salt, etc.
	Altitude		Below 1000m
	Pollution degree		2
	IP degree		IP20
Product standard	Product adopts safety standards.		IEC61800-5-1:2007
	Product adopts EMC standards.		IEC61800-3:2005
Cooling method			Forced air cooling

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Chapter 3 Keyboard

3-1.Keyboard description

Figure 3-1:Keyboard Schematic Diagram

3-2.Keyboard indicators

Indicator flag		Name	Meaning
Status Indicator	FWD	Forward running lamp	ON means that the inverter is forward operating.
	REV	Reverse running lamp	ON means that the inverter is reverse operating.
	Hz	Frequency Indicator	Frequency unit of the inverter
	A	Current Indicator	Current unit of the inverter

3-3.Description of operation panel keys

Sign	Name	Function
PRG	Parameter Setting/Exit Key	* Enter top menu parameter change status * Exit from function option change * Return to status display menu from sub-menu or function option menu
SHIFT	Shift Key	* Select circularly parameters under run or stop interface; select parameters when modifying the parameters.
▲	Ascending Key	* Data or function code ascending
▼	Decending Key	* Data or function code decending
RUN	Run Key	Used for running operation in the keyboard mode.
STOP RESET	Stop/Reset Key	* Press the key to stop running in running status; press the key to reset in fault alarm status, can be used to reset the operation, the key is subject to function code F6.00.
ENTER	Enter Key	* Enter into levels of menu screen,confirm settings.
	Keyboard potentiometer	* F0.02 is set to 4,keyboard potentiometer is used to set the running frequency.
ENTER + SHIFT		Simultaneously press two keys to lock or unlock the keypad.

3-4.Correspondence that LED displays symbols and characters \digits is as follows:

Display letters	Correspondi ng letters	Display letters	Correspondi ng letters	Display letters	Correspondi ng letters
0	0	1	1	2	2
3	3	4	4	5	5
6	6	7	7	8	8
9	9	A	A	b	B
C	C	d	d	E	E

F	F	H	H	I	I
L	L	N	N	n	n
o	o	P	P	r	r
S	S	t	t	U	U
T	T	$.$	.	$-$	-
y	y				

3-5.Examples of parameter settings

3-5-1.Instructions on viewing and modifying function code

PI160 inverter's operation pane is three levels menu for parameter setting etc.Three levels: function parameter group (Level 1)→function code(Level 2)→function code setting(Level 3). The operation is as following:
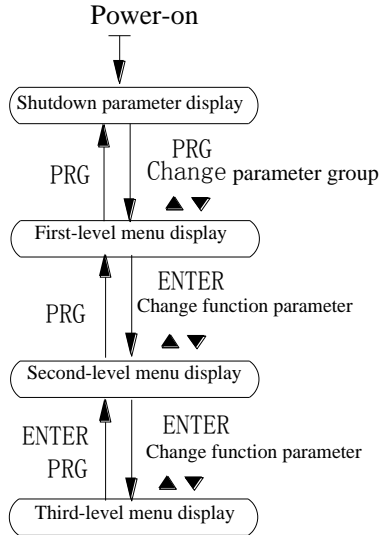
Figure 3-2 Display status and operation processes

Description: Return to the second-level menu from the third-level menu by pressing PRG key or ENTER key. The difference between the two keys : Press ENTER to return the second-level menu and save parameters setting before returning, and automatically transfer to the next function code; press PRG to return directly to the second-level menu, do not save parameters setting,and return to current function code .

Example 1 : frequency setting revise parameter

From F0.01 to 50.00Hz revise to 40.00Hz.

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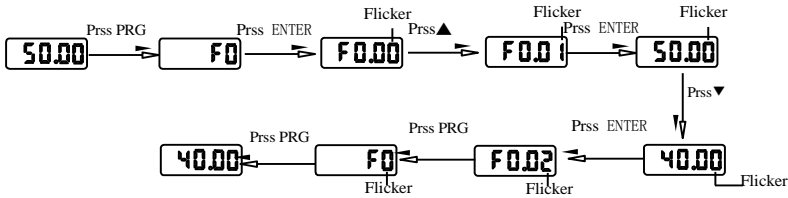
Example 2 :Restore factory settings
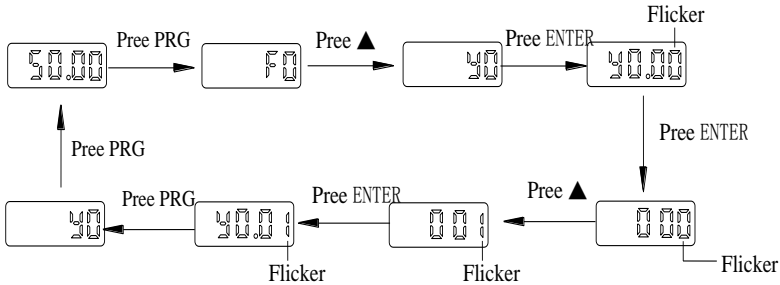
Without twinkling parameter position, the function code can not be modified in the level 3 menu. The reason maybe as following

1) The function code can not be modified itself, eg: Actual detecting parameters, running record parameters.

2) The function code can not be modified in the running status. It must be modified in the stop status.

3-5-2.The way to read parameter in various status

In stop or run status, operate shift key SHIFT to display a variety of status parameters respectively. Parameter display selection depends on function code F6.01 (Run parameter 1), F6.02 (Run parameter 2) and F6.03 (Stop parameter 3).

In stop status, there are variety stop status parameters that can be set to display/not display: Set frequency, bus voltage, DI input status, DO output status, analog input AI1 voltage, analog input AI2 voltage, panel potentiometer input voltage, Actual count value, Actual length value, PLC running step number, Actual speed display, PID settings, high-speed pulse input frequency and reserve, switch and display the selected parameter by pressing key orderly.

In running status,there are 5 running-status parameters:Running frequency,setting frequency,bus voltage,output voltage, output current default display, and other display parameters: Output power, output torque, DI input status, DO output status, analog input AI1 voltage, analog input AI2 voltage, panel potentiometer input voltage, Actual count value, Actual length value, linear speed, PID settings and PID feedback, etc, their display depends on function code F6.01 and F6.02 switch and display the selected parameter by pressing key orderly.

Inverter powers off and then powers on again, the displayed parameters are the selected parameters before power-off.

3-5-3.Password settings

The inverter has password protection. When y0.01 become not zero, it is the password and will be work after exit from function code modified status. Press PRG key again, will display"----". One must input the correct password to go to regular menu, otherwise, inaccessible.

To cancel the password protection function, firstly enter correct password to access and then set y0.01 to 0.

3-5-4.Motor parameter auto tunning

Choose vector control, one must input the motor's parameters in the nameplate accurately before running the inverter. PI9000 series frequency inverter will match the motor's standard parameters according to its nameplate. The vector control is highly depend on motor's parameters. The parameters of the controlled motor must be inputted accurately for the good control performance.

Motor parameter auto tunning steps are as follows:

Firstly select command source (F0.11=0) as the comment channel for operation panel, then input the following parameters according to the actual motor parameters (Selection is based on the current motor):

Motor Selection	Parameters
Motor	b0.00: motor type selection b0.01: motor rated power b0.02: motor rated voltage b0.03: motor rated current b0.04: motor rated frequency b0.05: motor rated speed

For asynchronous motors if the motor can NOT completely disengage its load, please select 1 (asynchronous motor parameter static auto tunning) for b0.27, and then press the RUN key on the keyboard panel;

If the motor can completely disengage its load, please select 2 (asynchronous motor parameter comprehensive auto tunning) for b0.27, and then press the RUN key on the keyboard panel, the inverter will automatically calculate the motor's following parameters:

Motor Selection	Parameters
Motor	b0.06:asynchronous motor stator resistance b0.07:asynchronous motor rotor resistance b0.08:asynchronous motor leakage inductance b0.09: Asynchronous motor mutUal inductance b0.10: Asynchronous motor no-load current

Complete motor parameter auto tunning.

Chapter 4 Installation and commissioning

4-1.Operating environment

1)、Environmental temperature -10℃ to 50℃ Above 40℃,the capacity will decrease 3% by each 1℃.So it is not advisable to use inverter above 50℃.

2)、Prevent electromagnetic interference, and away from interference sources.

3)、Prevent the ingress of droplets, vapor, dust, dirt, lint and metal fine powder.

4)、Prevent the ingress of oil, salt and corrosive gases.

5)、Avoid vibration. Maximum amplitude is less than 5.9 m/s (0.6 g)

6)、Avoid high temperature and humidity or exposure to rain, humidity shall be less than 90% RH (non-condensing).

7)、Altitude below 1000 meters.

8)、Never use in the dangerous environment of flammable, combustible, explosive gas, liquid or solid.

4-2.Installation direction and space

The inverter shall be installed in the room where it is well ventilated, the wall-mounted installation shall be adopted, and the inverter must keep enough space around adjacent items or baffle (wall). As shown below figure:
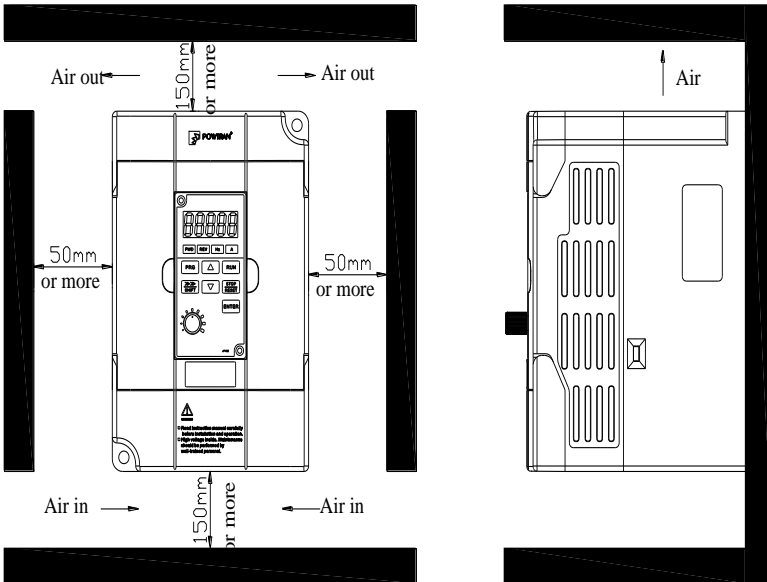
Figure 4-1.The installation direction and space

4-3.Wiring diagram

The wiring of inverter is divided into two parts of main circuit and control circuit. User must correctly connect in accordance with the wiring circuit as shown in the following figure.

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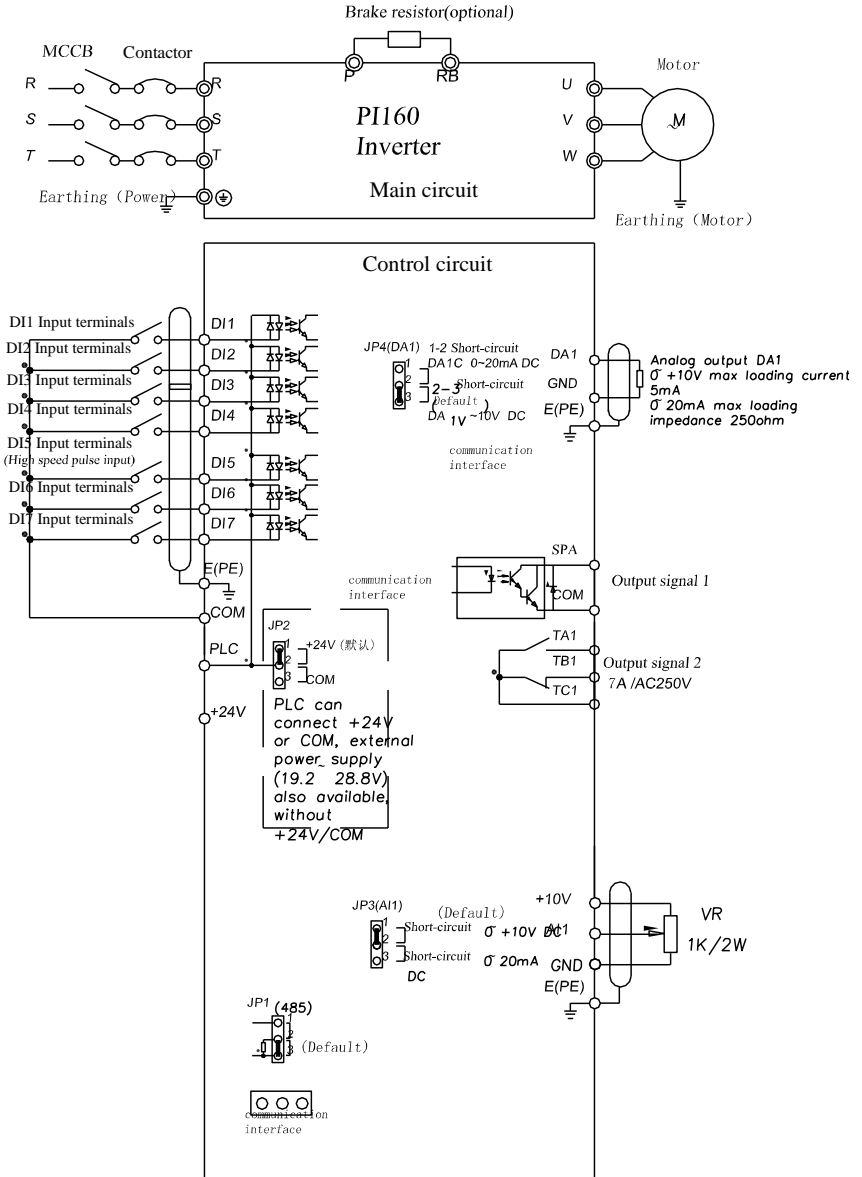
4-4.Main circuit terminal
4-4-1.Main circuit terminal arrange

Ground terminal   Main power input

Inverter output   Brake resistance
connecting terminal
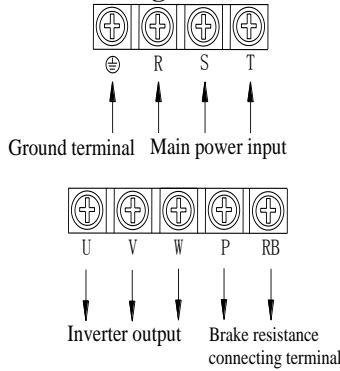
Figure 4-2.Main circuit terminal diagram

4-4-2.Function description of terminals

Terminals	Name	Description
R, S, T	Inverter input terminals	Connection point of AC input power supply, single-phase connects to S, T
⏚	Ground terminals	Ground terminals
P、RB	Braking resistor terminals	Connect to braking resistor
U、V、W	Inverter output terminals	Connect to three-phase motor

4-5.Control circuit terminals
4-5-1.Description of control circuit terminals

1. PI160MCB control circuit terminal

TA TC TB   DI1 DI2 DI3 DI4 DI5 DI6 DI7 SPA COM PLC 24V COM 10V AI1 GND DA1
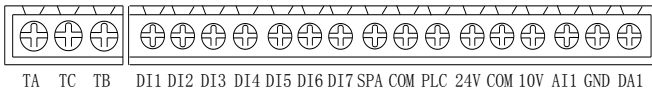
Figure 4-3.PI160 control circuit terminal

4-5-2.Control circuit terminal instruction

Category	Symbol	Name	Function
Power supply	+10V-GND	External +10 Power	Output +10V power supply, maximum output current:10mA Generally it is used as power supply of external potentiometer, potentiometer resistance range:1kΩ to 5kΩ.
	+24V-COM	External+24V power supply	Output +24V power supply, generally it is used as power supply of digital input and output terminals and external sensor. Maximum output current: 200mA

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	PLC	External power input terminal	When external signal is used to drive, please unplug JP1 jumpers,PLC must be connected to external power supply, and to +24V (default) .
Analog input	AI1-GND	Analog input terminal	1.Input range: (DC 0V to 10V/0 to 20mA), depends on the selected JP3 jumper on control panel. 2.Input impedance: 20kΩ with voltage input, 500Ω with current input.
Digital input	DI1	Multi function digital input terminal 1	1. Opto-coupler isolation, compatible with bipolar input 2. Input impedance: 3.3kΩ 3. Voltage range of level input : 24V ±20%, 4, DI1-DI7 drive type by JP2 control, when using external power source, please push off JP2 jumper on the control panel.
	DI2	Multi function digital input terminal 2	
	DI3	Multi function digital input terminal 3	
	DI4	Multi function digital input terminal 4	
	DI6	Multi function digital input terminal 6	
	DI7	Multi-function digital input terminals	Forward running
	DI15	High-speed pulse input terminals	In addition to DI1 ~ DI4, DI6 terminal function, also can be used as high-speed pulse input channel. Maximum input frequency of 100 KHZ.
Analog output	DA1-GND	Analog output terminals	The selected JP4 jumper on control panel determines voltage or current output. Output voltage range: 0V to 10V, output current range: 0mA to 20mA.
Digital output	SPA-COM	Digital output	Optical coupling isolation, bipolar output open collector output voltage range: 0 v ~ 24 v output current range: 0 ma ~ 50 ma.
Relay output	TA-TC	Often open terminal	Relay output, TA normally open, TB normally closed, TC common terminal, output function is determined by F2.03 setting. Contact capacity: 7A/AC250V
	TB-TC		
Built-in RS485	485+	485 differential signal +	485 communication interface port, 485 differential signal port, 485 communication interface standard use twisted pair or shielded wire. JP1 jumper to decide whether to connect terminal resistance.
	485-	485 differential signal -	

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4-6.Wiring precautions:

⚠**Danger**

   Make sure that the power switch is in the OFF state before wiring operation, or electrical shock may occur!
   Wiring must be performed by a professional trained personnel, or this may cause damage to the equipment and personal injury!
   Must be grounded firmly, otherwise there is a danger of electric shock or fire hazard !

⚠**Note**

Make sure that the input power is consistent with the rated value of inverter, otherwise which may cause damage to the inverter!

Make sure that the motor matches the inverter, otherwise which may cause damage to the motor or activate the inverter protection!

Do not connect power supply to U, V, W terminals, otherwise which may cause damage to the inverter!

※　The U, V, W output end of inverter can not install phase advancing capacitor or RC absorbing device. The inverter input power must be cut off when replacing the motor

※　Do not let metal chips or wire ends into inside the inverter when wiring,otherwise which may cause malfunction to the inverter.

※　Disconnect motor or switch power-frequency power supply only when the inverter stops output

※　In order to minimize the effects of electromagnetic interference,it is recommended that a surge absorption device shall be installed additionally when electromagnetic contactor and relay is closer from the inverter.

※　External control lines of inverter shall adopt isolation device or shielded wire.

※　In addition to shielding, the wiring of input command signal should also be aligned separately, it is best to stay away from the main circuit wiring.

※　If the carrier frequency is less than 3KHz, the maximum distance between the inverter and the motor should be within 50 meters; if the carrier frequency is greater than 4KHz, the distance should be reduced appropriately, it is best to lay the wiring inside metal tube.

※　When the inverter is additionally equipped with peripherals (Filter, reactor, etc.), firstly measure its insulation resistance to ground by using 1000 volt megger, so as to ensure the measured value is no less than 4 megohms.

※　When the inverter need to be started frequently, do not directly turn power off, only the control terminal or keyboard or RS485 operation command can be used to control the start/stop operation, in order to avoid damage to the rectifier bridge.

※　Do not connect the AC input power to the inverter output terminals (U, V, W) .

※　To prevent the occurrence of an accident,the ground terminal ($\perp$) must be earthed firmly (grounding impedance should be less than 10 ohms), otherwise the leakage current will occur.

※　The specifications on wires used by the main circuit wiring shall comply with the relevant provisions of the National Electrical Code.

※　The motor's capacity should be equal to or less than the inverter's capacity.

4-7.Spare circuit

When the inverter occurs the fault or trip, which will cause a larger loss of downtime or other unexpected faults. In order to avoid this case from happening, please additionally install spare circuit to ensure safety.

Note: The characteristics of spare circuit must be confirmed and tested beforehand, and its power-frequency shall be in accordance with the phase sequence of the inverter.

Interlocked AC contactor
of MCC1 and MCC2
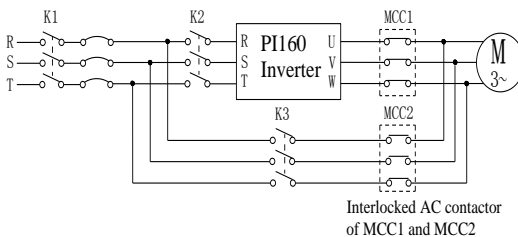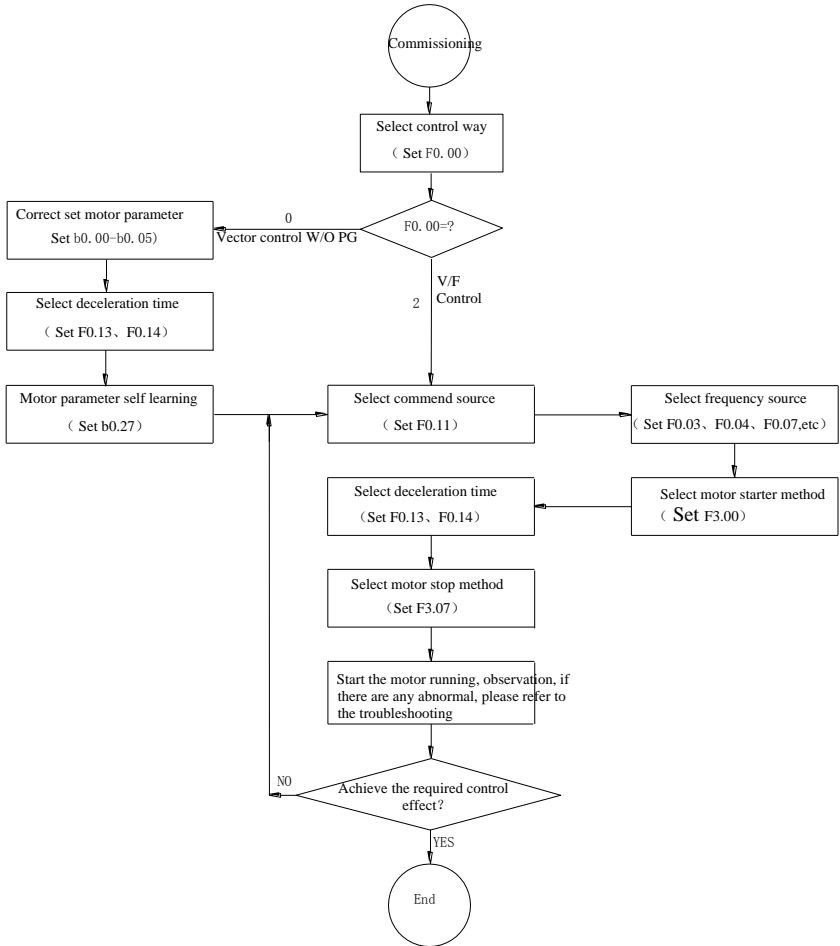
4-8.Commissioning

Figure 4-4.Commissioning

- **Firstly confirm that AC input power supply voltage shall be within inverter rated input voltage range before connecting power supply to the inverter.**
- **Connect power supply to the R, S and T terminals of the inverter.**
- **Select the appropriate operation control method.**

Chapter 5 Function parameter

5-1.Menu grouping

Note:

"★": In running status, can not modify the parameter setting

"●": The actual testing data, can not be modified

"☆": In stop and run statuses, both can be changed;

"▲": "Factory parameter", no change about it.

"_" means the factory parameter is related to power or model. Please check the details in the involved parameter introduction.

Change limit refers to whether the parameters are adjustable.

In PI160 frequency inverter,some of parameters are reserved by manufacturer,they are not listed in the parameter function, it might lead to disconnection between the parameters,about this,please don't try to revise to avoid the fault.

y0.01 is used for parameters protection password. Parament menu can be enter into only after inputting the right password in the function parament mode or user change parameter mode. When the y0.01 setted to 0, the password is canceled.

Parameter menu is not protected by password under user customized parameters mode.

F group is the basic function parameters,E group is to enhance function parameters, b group is a function of motor parameters, d group is the monitoring function parameters.

PI160 series inverter and some parameters for the manufacturer reserves ", the serial number of which is not listed in the function parameter list, lead to partial parameters of serial connection, for manual does not introduce parameters, please users don't try to change, avoid causing the error.

Code	Parameter name	Functional Description
d0	Monitoring function group	Monitoring frequency, current, etc
F0	Basic function group	Frequency setting, control mode, acceleration and deceleration time
F1	Input terminals group	Analog and digital input functions
F2	Output terminals group	Analog and digital output functions
F3	Start and stop control group	Start and stop control parameters
F4	V/F control parameters	V/F control parameters
F5	Vector control parameters	Vector control parameters
F6	Keyboard and display	To set key and display function parameters
F7	Auxiliary function group	To set Jog, jump frequency and other auxiliary function parameters
F8	Fault and protection	To set fault and protection parameters
F9	Communication parameter group	To set MODBUS communication function
FA	Torque control parameters	To set parameters under torque control mode
Fb	Control optimization parameters	To set parameters of optimizing the control

		performance
FC	Extend parameters group	Special application parameters setting
E0	Wobbulate, fixed-length and counting	To set Wobbulate, fixed-length and counting function parameters
E1	Multi-stage command, simple PLC	Multi-speed setting, PLC operation
E2	PID function group	To set Built-in PID parameters
E3	Virtual DI, Virtual DO	Virtual I/O parameter setting
E8	Special for Cutting machines	Cutting machines parameters setting
b0	Motor parameters	To set motor parameter
y0	Function code management	To set password, parameter initialization and parameter group display
y1	Fault query	Fault message query

5-1-1.d0 Group - Monitoring function

No.	Code	Parameter name	Setting range	Factory setting
1	d0.00	Running frequency	Actual output frequency	0.01Hz
2	d0.01	Set frequency	Actual set frequency	0.01Hz
3	d0.02	DC bus voltage	Detected value for DC bus voltage	0.1V
4	d0.03	Inverter output voltage	Actual output voltage	V
5	d0.04	Inverter output current	Effective value for Actual motor current	0.01A
6	d0.05	Motor output power	Calculated value for motor output power	0.1kW
7	d0.06	Motor output torque	Motor output torque percentage	0.1%
8	d0.07	DI input status	DI input status	-
9	d0.08	DO output status	DO output status	-
10	d0.09	AI1 voltage (V)	AI1 input voltage value	0.01V
11	d0.11	Panel potentiometer voltage	Panel potentiometer voltage	0.01V
12	d0.12	Count value	Actual pulse count value in counting function	-
13	d0.13	Length value	Actual length in fixed length function	-
14	d0.14	Actual operating speed	Motor actual running speed	-
15	d0.15	PID setting	Reference value percentage when PID runs	%
16	d0.16	PID feedback	Feedback value percentage when PID runs	%
17	d0.17	PLC stage	Stage display when PLC runs	-

18	d0.18	High-speed pulse input frequency	High-speed pulse input frequency display, unit: 0.01Khz	0.01kHz
19	d0.19	Feedback speed(unit:0.1Hz)	PG feedback speed, to an accuracy of 0.1hz	0.1Hz
20	d0.20	Remaining run time	Remaining run time display, it is for timing run control	0.1Min
21	d0.21	Linear speed	Display DI5 high-speed pulse sampling of the line speed, according to the actual sample pulse per minute and E0.07, calculated the value of the line speed.	1m/Min
22	d0.22	Current power-on time	Total time of current inverter power-on	Min
23	d0.23	Current run time	Total time of current inverter run	0.1Min
24	d0.24	High-speed pulse input frequency	High-speed pulse input frequency display, unit: 1Hz	1Hz
25	d0.25	Communication set value	Frequency, torque or other command values set by communication port	0.01%
26	d0.27	Master frequency display	Frequency set by F0.03 master frequency setting source	0.01Hz
27	d0.28	Auxiliary frequency display	Frequency set by F0.04 auxiliary frequency setting source	0.01Hz
28	d0.29	Command torque (%)	Observe the set command torque under the torque control mode	0.1%
29	d0.35	Inverter status	Display run, stand by and other statuses	-
30	d0.36	Inverter type	1.G type (Constant torque load type) 2.F type (Fans/pumps load type)	-
31	d0.37	AI1 voltage before correction	Input voltage value before AI1 linear correction	0.01V
32	d0.39	Panel potentiometer voltage before correction	Panel potentiometer oltage before linear correction	0.01V

5-1-2.F0 Group - Basic function group

No.	Code	Parameter name	Setting range	Factory setting	Change
33	F0.00	Motor control manner	0.Vector control W/O PG 1.Vector control W/ PG 2.V/F control	2	★
34	F0.01	Keyboard set frequency	0.00Hz to F0.19 (Maximum frequency)	50.00Hz	☆
35	F0.02	Frequency command resolution	1: 0.1Hz 2: 0.01Hz	2	★
36	F0.03	Frequency source	0 to 9	1	★

		master setting			
37	F0.04	Frequency source auxiliary setting	0 to 9	2	★
38	F0.05	Reference object selection for frequency source auxiliary setting	0. Relative to maximum frequency 1.Relative to master frequency source A	0	☆
39	F0.06	Frequency source auxiliary setting range	0% to 150%	100%	☆
40	F0.07	Frequency source superimposed selection	Units digit: frequency source selection Tens digit: Arithmetic relationship of master and auxiliary for frequency source	00	☆
41	F0.08	Frequency source offset frequency when superimposing	0.00Hz to F0.19(Maximum frequency)	0.00Hz	☆
42	F0.09	Shutdown memory selection for digital set frequency	0: W/O memory 1: W/ memory	1	☆
43	F0.10	Frequency command UP / DOWN reference when running	0: Running frequency 1: Set frequency	0	★
44	F0.11	Command source selection	0.Keyboard control (LED off) 1.Terminal block control (LED on) 2.Communications command control (LED flashes) 3. Keyboard control+ Communications command control 4. Keyboard control+ Communications command control+ Terminal block control	0	☆
45	F0.12	Binding frequency source for command source	Units digit: binding frequency source selection for operation panel command Tens digit: Terminal command binding frequency source selection (0 to 9, same as units digit) Hundreds digit: Communication command binding frequency source selection (0 to 9, same as units digit)	000	☆
46	F0.13	Acceleration time 1	0.00s to 6500s	Depends on models	☆
47	F0.14	Deceleration time 1	0.00s to 6500s	Depends on models	☆
48	F0.15	Ac/Deceleration time unit	0:1 second; 1:0.1 second 2:0.01 second	1	★

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49	F0.16	Ac/deceleration time reference frequency	0: F0.19(Maximum frequency) 1: Set frequency 2: 100Hz	0	★
50	F0.17	Carrier frequency adjustment as per temperature	0: NO 1: YES	0	☆
51	F0.18	Carrier Frequency	0.5kHz to 16.0kHz	Depends on models	☆
52	F0.19	Maximum output frequency	50.00Hz to 320.00Hz	50.00Hz	★
53	F0.20	Upper limit frequency source	0: F0.21 setting 1: AI1 2: AI2 3: Panel potentiometer setting 4: High-speed pulse setting 5: Communications reference	0	★
54	F0.21	Upper limit frequency	F0.23 (Lower limit frequency) to F0.19(Maximum frequency)	50.00Hz	☆
55	F0.22	Upper limit frequency offset	0.00Hz to F0.19 (Maximum frequency)	0.00Hz	☆
56	F0.23	Lower limit frequency	0.00Hz to F0.21 (Upper limit frequency)	0.00Hz	☆
57	F0.24	Running direction	0:Same direction 1: Opposite direction	0	☆
58	F0.26	AI analog resolution	0: 0.01Hz;　　　1: 0.05Hz; 2: 0.1Hz;　　　3: 0.5Hz	1	
59	F0.27	GF type	1.G type (Constant torque load type) 2.F type (Fans/pumps load type)	-	●

5-1-3.F1 Group Input terminals group

No.	Code	Parameter name	Setting range	Factory setting	Change
60	F1.00	DI1 terminal function selection		1	★
61	F1.01	DI2 terminal function selection		2	★
62	F1.02	DI3 terminal function selection	0 to 53	8	★
63	F1.03	DI4 terminal function selection		9	★
64	F1.04	DI5 terminal function selection		12	★
65	F1.05	DI6 terminal function selection		13	★
66	F1.06	DI7 terminal function selection	Forward running	0	★
67	F1.10	Terminal command mode	0: Two-wire type 1	0	★

			1: Two-wire type 2 2: Three-wire type 1 3: Three-wire type 2		
68	F1.11	Terminal UP / DOWN change rate	0.001Hz/s to 65.535Hz/s	1.000 Hz/s	☆
69	F1.12	Minimum input value for AI curve 1	0.00V to F1.14	0.30V	☆
70	F1.13	Minimum input setting for AI curve 1	-100.0% to +100.0%	0.0%	☆
71	F1.14	Maximum input for AI curve 1	F1.12 to +10.00V	10.00V	☆
72	F1.15	According to F1.14	-100.0% to +100.0%	100.0%	☆
73	F1.20	Minimum input value for panel potentiometer	-10.00V to F1.22	0.10V	☆
74	F1.21	According to F1.20	-100.0% to +100.0%	0.0%	☆
75	F1.22	Max input value for panel potentiometer	F1.20 to +10.00V	4.00V	☆
76	F1.23	According to F1.22	-100.0% to +100.0%	100.0%	☆
77	F1.24	AI curve selection	Units digit: AI1 curve selection Tens digit: AI2 curve selection Hundreds digit: Panel potentiometer curve selection	321	☆
78	F1.25	AI input setting selection	Units digit: Setting selection for AI1 less than minimum input Tens digit: Setting selection for AI2 less than minimum input, ditto Hundreds digit: Setting selection for panel potentiometer less than minimum input(0 to 1,ditto)	000	☆
79	F1.26	HDI Minimum input	0.00kHz to F1.28	0.00 kHz	☆
80	F1.27	According to F1.26 setting	-100.0% to +100.0%	0.0%	☆
81	F1.28	HDI Maximum input	F1.26 to 100.00kHz	50.00kHz	☆
82	F1.29	According to F1.28 setting	-100.0% to +100.0%	100.0%	☆
83.	F1.30	DI filter time	0.000s to 1.000s	0.010s	☆
84	F1.31	AI1 filter time	0.00s to 10.00s	0.10s	☆
85	F1.33	Filtering time of panel potentiometer	0.00s to 10.00s	0.10s	☆
86	F1.34	HDI Filter time	0.00s to 10.00s	0.00s	☆

87	F1.35	DI terminal valid mode selection 1	Units digit: DI1 0: High level active 1: Low level active Tens digit: DI2 Hundreds digit: DI3 Thousands digit: DI4 Ten thousands digit: DI5	00000	★
88	F1.36	DI terminal valid mode selection 2	Units digit: DI6 0: High level active 1: Low level active Tens digit: DI7 Hundreds digit: DI8 Thousands digit: DI9 Ten thousands digit: DI10	00000	★
89	F1.37	DI1 delay time	0.0s to 3600.0s	0.0s	★
90	F1.38	DI2 delay time	0.0s to 3600.0s	0.0s	★
91	F1.39	DI3 delay time	0.0s to 3600.0s	0.0s	★
92	F1.40	Define the input terminal repeat	0:Unrepeatable; 1:Repeatable	0	★

5-1-4.F2 Group - Output terminals group

No.	Code	Parameter name	Setting range	Factory setting	Change
93	F2.02	Relay 1 output function selection (TA1.TB1.TC1)	0～42	2	☆
94	F2.04	SPA output function selection (Collector open circuit output terminals)		1	☆
95	F2.07	DA1 output function selection	0～17	2	☆
96	F2.11	Relay output delay time	0.0s to 3600.0s	0.0s	☆
97	F2.13	SPA output delay time	0.0s to 3600.0s	0.0s	☆
98	F2.15	DO output terminal active status selection	Units digit: SPB switching quantity 0: Positive logic 1: Anti-logic Tens digit: Relay 1 Hundreds digit: Hundreds digit: Undefined Thousands digit: SPA Ten thousands digit: Relay 2	00000	☆
99	F2.16	DA1 zero bias coefficient	-100.0% to +100.0%	0.0%	☆
100	F2.17	DA1 gain	-10.00 to +10.00	1.00	☆

5-1-5.F3 Group - Start and stop control group

No.	Code	Parameter name	Setting range	Factory setting	Change
101	F3.00	Start-up mode	0: Direct startup 1: Speed tracking restart 2: Pre-excitation start (AC asynchronous motor)	0	☆
102	F3.01	Speed tracking mode	0: Start from stop frequency 1: Start from zero speed 2: Start from maximum frequency 3: Rotate speed tracking method3	0	★
103	F3.02	Speed tracking value	1 to 100	20	☆
104	F3.03	Start frequency	0.00Hz to 10.00Hz	0.00Hz	☆
105	F3.04	Hold time for start frequency	0.0s to 100.0s	0.0s	★
106	F3.05	Start DC braking current	0% to 100%	0%	★
107	F3.06	Start DC braking time	0.0s to 100.0s	0.0s	★
108	F3.07	Stop mode	0: Deceleration parking; 1: Free stop	0	☆
109	F3.08	Initial frequency of stop DC braking	0.00Hz to F0.19 (Maximum frequency)	0.00Hz	☆
110	F3.09	Waiting time of stop DC braking	0.0s to 100.0s	0.0s	☆
111	F3.10	Stop DC braking current	0% to 100%	0%	☆
112	F3.11	Stop DC braking time	0.0s to 100.0s	0.0s	☆
113	F3.12	Braking utilization rate	0% to 100%	100%	☆
114	F3.13	Ac/deceleration mode	0:Linear acceleration and deceleration 1:Scurve acceleration and deceleration A 2:Scurve acceleration and deceleration B	0	★
115	F3.14	Proportion of S curve start-section	0.0% to (100.0% to F3.15)	30.0%	★
116	F3.15	Proportion of S curve end-section	0.0% to (100.0% to F3.14)	30.0%	★

5-1-6.F4 Group - V/F control parameters

No.	Code	Parameter name	Setting range	Factory setting	Change
117	F4.00	V/F curve setting	0 to11	0	★
118	F4.01	Torque boost	0.0%(Automatic torque boost)	0.0%	★

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			0.1 to 30%		
119	F4.02	Torque boost cut-off frequency	0.00Hz to F0.19(Maximum frequency)	15.00 Hz	★
120	F4.03	Multipoint V/F frequency point 1	0.00Hz to F4.05	0.00Hz	★
121	F4.04	Multipoint V/F voltage point 1	0.0% to 100.0%	0.0%	★
122	F4.05	Multipoint V/F frequency point 2	F4.03 to F4.07	0.00Hz	★
123	F4.06	Multipoint V/F voltage point 2	0.0% to 100.0%	0.0%	★
124	F4.07	Multipoint V/F frequency point 3	F4.05 to b0.04 (Rated motor frequency)	0.00Hz	★
125	F4.08	Multipoint V/F voltage point 3	0.0% to 100.0%	0.0%	★
126	F4.09	Slip compensation coefficient	0% to 200.0%	0.0%	☆
127	F4.10	Overexcitation gain	0 to 200	64	☆
128	F4.11	Oscillation suppression gain	0 to 100	-	☆
129	F4.12	V/F separation voltage source	0 to 9	0	☆
130	F4.13	V/F separation voltage digital setting	0V to rated motor voltage	0V	☆
131	F4.14	V/F separation voltage rise time	0.0s to 1000.0s	0.0s	☆

5-1-7.F5 Group - Vector control parameters

No.	Code	Parameter name	Setting range	Factory setting	Change
132	F5.00	Proportion of speed loop G1	1 to 100	30	☆
133	F5.01	Speed loop low integral time T1	0.01s to 10.00s	0.50s	☆
134	F5.02	Switching frequency 1	0.00 to F5.05	5.00Hz	☆
135	F5.03	Proportion of speed loop G2	0 to 100	20	☆
136	F5.04	Speed loop high integral time T2	0.01s to 10.00s	1.00s	☆
137	F5.05	Switching frequency 2	F5.02 to F0.19 (Max.frequency)	10.00Hz	☆
138	F5.06	Speed loop integral attribute	0:Valid; 1:Invalid	0	☆
139	F5.07	Torque limit source under speed control mode	Options 0-5	0	☆
140	F5.08	Upper limit digital setting for lower torque under speed control mode	0.0% to 200.0%	150.0%	☆

141	F5.09	Vector control differential gain	50% to 200%	150%	☆
142	F5.10	Speed loop filter time constant	0.000s to 0.100s	0.000s	☆
143	F5.11	Vector control overexcitation gain	0 to 200	64	☆
144	F5.12	Excitation regulator proportional gain	0 to 60000	2000	☆
145	F5.13	Excitation regulator integral gain	0 to 60000	1300	☆
146	F5.14	Torque regulator proportional gain	0 to 60000	2000	☆
147	F5.15	Torque regulator integral gain	0 to 60000	1300	☆

5-1-8.F6 Group - Keyboard and display

No.	Code	Parameter name	Setting range	Factory setting	Change
148	F6.00	STOP/RESET key functions	0: STOP/RES key is enabled only under keyboard operation mode 1: STOP/RES key is enabled under any operation mode	1	☆
149	F6.01	Running status display parameters 1	0x0000 to 0xFFFF	001F	☆
150	F6.02	Running status display parameters 2	0x0000 to 0xFFFF	0000	☆
151	F6.03	Stop status display parameters	0x0000 to 0xFFFF	0033	☆
152	F6.04	Load speed display coefficient	0.0001 to 6.5000	3.0000	☆
153	F6.05	Decimal places for load speed display	0:0 decimal places 1:1 decimal places 2:2 decimal places 3:3 decimal places	1	☆
154	F6.06	Inverter module radiator temperature	0.0℃ to 100.0℃	-	●
155	F6.07	Total run time	0h to 65535h	-	●
156	F6.08	Total power-on time	0h to 65535h	-	●
157	F6.09	Total power consumption	0 to 65535 kwh	-	●
158	F6.10	Product number	Frequency inverter product number	-	●
159	F6.11	Software version number	Software version number of control board	-	●
160	F6.17	Power correction coefficient	0.00～10.00	1.00	☆
161	F6.18	Keyboard lock selection	0:Only RUN,STOP key is valid 1: All the key 2: Only RUN, STOP, UP, DOWN	1	☆

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			key is valid 3: Only STOP key is valid		

5-1-9.F7 Group - Auxiliary function group

No.	Code	Parameter name	Setting range	Factory setting	Change
162	F7.00	Jog running frequency	0.00Hz to F0.19(Maximum frequency)	6.00Hz	☆
163	F7.01	Jog acceleration time	0.0s to 6500.0s	5.0s	☆
164	F7.02	Jog deceleration time	0.0s to 6500.0s	5.0s	☆
165	F7.03	Jog priority	0:Invalid 1: Valid	0	☆
166	F7.04	Jump frequency 1	0.00Hz to F0.19 (Maximum frequency)	0.00Hz	☆
167	F7.05	Jump frequency 2	0.00Hz to F0.19(Maximum frequency)	0.00Hz	☆
168	F7.06	Jump frequency range	0.00Hz to F0.19 (Maximum frequency)	0.00Hz	☆
169	F7.07	Jump frequency availability	0: Invalid； 1: Valid	0	☆
170	F7.08	Acceleration time 2	0.0s to 6500.0s	Depends on models	☆
171	F7.09	Deceleration time 2	0.0s to 6500.0s	Depends on models	☆
172	F7.10	Acceleration time 3	0.0s to 6500.0s	Depends on models	☆
173	F7.11	Deceleration time 3	0.0s to 6500.0s	Depends on models	☆
174	F7.12	Acceleration time 4	0.0s to 6500.0s	Depends on models	☆
175	F7.13	Deceleration time 4	0.0s to 6500.0s	Depends on models	☆
176	F7.14	1/2 point of tangency acceleration time	0.00Hz to F0.19 (Maximum frequency)	0.00Hz	☆
177	F7.15	1/2 point of tangency deceleration time	0.00Hz to F0.19 (Maximum frequency)	0.00Hz	☆
178	F7.16	Forward/reverse rotation deadband	0.00s to 3600.0s	0.00s	☆
179	F7.17	Reverse rotation control	0: Enable; 1: Disable	0	☆
180	F7.18	Set frequency lower	0: Running at lower limit frequency	0	☆

		than lower limit frequency mode	1: Stop 2: Zero speed running		
181	F7.19	Droop control	0.00Hz to 10.00Hz	0.00Hz	☆
182	F7.20	Setting cumulative power-on arrival time	0h to 36000h	0h	☆
183	F7.21	Setting cumulative running arrival time	0h to 36000h	0h	☆
184	F7.22	Start protection selection	0: OFF 1: ON	0	☆
185	F7.23	Frequency detection value (FDT1)	0.00Hz to F0.19(Maximum frequency)	50.00Hz	☆
186	F7.24	Frequency detection hysteresis value (FDT1)	0.0% to 100.0% (FDT1 level)	5.0%	☆
187	F7.25	Frequency reaches detection width	0.00 to 100% (Maximum frequency)	0.0%	☆
188	F7.26	Frequency detection value (FDT2)	0.00Hz to F0.19 (Maximum frequency)	50.00Hz	☆
189	F7.27	Frequency detection hysteresis value (FDT2)	0.0% to 100.0% (FDT2 level)	5.0%	☆
190	F7.28	Random arrivals frequency detection value 1	0.00Hz to F0.19 (Maximum frequency)	50.00Hz	☆
191	F7.29	Random arrivals frequency detection width 1	0.00% to 100.0% (Maximum frequency)	0.0%	☆
192	F7.30	Random arrivals frequency detection value 2	0.00Hz to F0.19 (Maximum frequency)	50.00Hz	☆
193	F7.31	Random arrivals frequency detection width 2	0.00% to 100.0% (Maximum frequency)	0.0%	☆
194	F7.32	Zero current detection level	0.0% to 300.0% (Rated motor current)	5.0%	☆
195	F7.33	Zero current detection delay time	0.01s to 360.00s	0.10s	☆
196	F7.34	Overrun value of output current	0.0% (not detected) 0.1% to 300.0% (Rated motor current)	200.0%	☆
197	F7.35	Output current overrun detection delay time	0.00s to 360.00s	0.00s	☆
198	F7.36	Random arrivals current	0.0% to 300.0% (Rated motor current)	100%	☆

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199	F7.37	Random arrivals current 1 width	0.0% to 300.0% (Rated motor current)	0.0%	☆
200	F7.38	Random arrivals current 2	0.0% to 300.0% (Rated motor current)	100%	☆
201	F7.39	Random arrivals current 2 width	0.0% to 300.0% (Rated motor current)	0.0%	☆
202	F7.40	Module temperature arrival	0℃ to 100℃	75℃	☆
203	F7.41	Cooling fan control	0: Fan running only when running 1: Fan always running	0	☆
204	F7.42	Timing function selection	0: Invalid 1: Valid	0	★
205	F7.43	Timing run time selection	0: F7.44 setting 1: AI1 2: Reserve 3: Panel potentiometer	0	★
206	F7.44	Timing run time	0.0Min to 6500.0Min	0.0Min	★
207	F7.45	Current running reaches the set time.	0.0Min to 6500.0Min	0.0Min	★
208	F7.46	Awakens frequency	dormancy frequency(F7.48)to maximum frequency (F0.19)	0.00Hz	☆
209	F7.47	Awakens delay time	0.0s to 6500.0s	0.0s	☆
210	F7.48	Dormancy frequency	0.00Hz to awakens frequency(F7.46)	0.00Hz	☆
211	F7.49	Dormancy delay time	0.0s to 6500.0s	0.0s	☆
212	F7.50	AI1 input voltage protection lower limit	0.00V to F7.51	3.1V	☆
213	F7.51	AI1 input voltage protection upper limit	F7.50 to 10.00V	6.8V	☆

5-1-10.F8 Group - Fault and protection

No.	Code	Parameter name	Setting range	Factory setting	Cha nge
214	F8.00	Overcurrent stall gain	0 to 100	20	☆
215	F8.01	Overcurrent stall protection current	100% to 200%	150%	☆
216	F8.02	Motor overload protection selection	0: Disable 1: Enable	1	☆
217	F8.03	Motor overload protection gain	0.20 to 10.00	1.00	☆

218	F8.04	Motor overload pre-alarm coefficient	50% to 100%	80%	☆
219	F8.05	Overvoltage stall gain	0 to 100	0	☆
220	F8.06	Overvoltage stall protection voltage / energy consumption brake voltage	120% to 150%	130%	☆
221	F8.08	Output phase loss protection selection	0: Disable 1: Enable	1	☆
222	F8.09	Short to ground protection	0:Invalid; 1: Valid	1	☆
223	F8.10	Number of automatic fault reset	0 to 32767	0	☆
224	F8.11	Fault DO action selection during automatic fault reset	0: OFF 1: ON	0	☆
225	F8.12	Automatic fault reset interval	0.1s to 100.0s	1.0s	☆
226	F8.17	Fault protection action selection 1	Units digit: Motor overload (Err.11) 0: Free stop 1: Stop at the selected mode 2: Continue to run Tens digit: input phase loss (Err.12) (Same as units digit) Hundred digit: Output phase loss (Err.13) (Same as units digit) Thousand digit: External fault (Err.15) (Same as units digit) Ten thousands digit: Communication abnormal(Err.16)(Same as units digit)	00000	☆
227	F8.18	Fault protection action selection 2	Units digit: Encoder/PG card abnormal (Err.20) 0: Free stop 1:Switch to V/F and then stop at the selected mode 2:Switch to V/F and continue to run Tens digit: function code read and write abnormal (Err.21) 0: Free stop 1: Stop at the selected mode Hundreds digit: Reserved Thousands digit: Motor overheating (Err.25)(Same as F8.17 units digit) Ten thousands digit: Running time arrival(Err.26)(same as F8.17 units digit)	00000	☆

228	F8.19	Fault protection action selection 3	Units digit:User-defined fault 1(Err.27)(Same as F8.17 units digit) Tens digit: User-defined fault 2(Err.28)(Same as F8.17 units digit) Hundreds digit: Power-on time arrival (Err.29)(Same as F8.17 units digit) Thousands digit: Load drop (Err.30) 0: Free stop 1: Deceleration parking 2: Deceleration up to 7% of the rated motor frequency, and then continue running, automatically restore to the set frequency for when the load drop does not happen. Ten thousands digit: PID feedback loss when running (Err.31)(Same as F8.17 units digit)	00000	☆
229	F8.20	Fault protection action selection 4	Units digit: Too large speed deviation (Err.42)(Same as F8.17 units digit) Tens digit: Motor overspeed (Err.43) Hundreds digit: Initial position error (Err.51) (same as F8.17 units digit) Thousands digit: Reserved Ten thousands digit: Reserved	00000	☆
230	F8.24	Continue running frequency selection when failure happens	0: Running at current frequency 1: Running at set frequency 2: Running at upper limit frequency 3: Running at lower limit frequency 4: Running at abnormal spare frequency	0	☆
231	F8.25	Abnormal spare frequency	60.0% to 100.0%	100%	☆
232	F8.26	Momentary power cut action selection	0: Invalid; 1: Deceleration 2: Deceleration and stop	0	☆
233	F8.27	Recovery judgment voltage of momentary power cut	50.0% to 100.0%	90%	☆
234	F8.28	Recovery voltage judgment time of momentary power cut	0.00s to 100.00s	0.50s	☆
235	F8.29	Judgment voltage of momentary power cut action	50.0% to 100.0% (Standard bus voltage)	80%	☆
236	F8.30	Load drop protection selection	0: Invalid 1: Valid	0	☆

| 237 | F8.31 | Load drop detection level | 0.0 to 100.0% | 10% | ☆ |
| 238 | F8.32 | Load drop detection time | 0.0 to 60.0s | 1.0s | ☆ |

5-1-11.F9 Group - Communication parameter

No.	Code	Parameter name	Setting range	Factory setting	Change
239	F9.00	MODBUS Baud rate	0~9	5	☆
240	F9.01	Data format	0: No parity (8-N-2) 1: Even parity (8-E-1) 2: Odd parity (8-O-1) 3: No parity (8-N-1)	0	☆
241	F9.02	This unit address	1-250, 0 for broadcast address	1	☆
242	F9.03	Response delay	0ms-20ms	2ms	☆
243	F9.05	Data protocol selection	Units digit: MODBUS 0: Non-standard MODBUS protocol 1: Standard MODBUS protocol Tens digit: Reserve	31	☆
244	F9.06	Current resolution	0: 0.01A 1: 0.1A	0	☆

5-1-12.FA Group - Torque control parameters

No.	Code	Parameter name	Setting range	Factory setting	Change
245	FA.00	Speed/torque control mode selection	0: Speed control 1: Torque control	0	★
246	FA.01	Torque setting source selection under torque control mode	0: Keyboard setting (FA.02) 1: Analog AI1 setting 2: Analog AI2 setting 3: Panel potentiometer setting 4: High-speed pulse setting 5: Communications reference	0	★
247	FA.02	Torque figures set under torque control mode	-200.0% to 200.0%	150%	☆
248	FA.03	Torque control acceleration time	0.00s to 650.00s	0.00s	☆
249	FA.04	Torque control deceleration time	0.00s to 650.00s	0.00s	☆
250	FA.05	Torque control forward maximum frequency	0.00Hz to F0.19(Maximum frequency)	50.00Hz	☆
251	FA.06	Torque control backward	0.00Hz to F0.19 (Maximum	50.00Hz	☆

		maximum frequency	frequency)		
252	FA.07	Torque filter time	0.00s to 10.00s	0.00s	☆

5-1-13.Fb Group - Control optimization parameters

No.	Code	Parameter name	Setting range	Factory setting	Change
253	Fb.00	Fast current limiting manner	0: Disable　　　　1: Enable	1	☆
254	Fb.01	Undervoltage point setting	50.0% to 140.0%	100.0%	☆
255	Fb.02	Overvoltage point setting	200.0V to 2500.0V	-	★
256	Fb.03	Deadband compensation mode selection	0: No compensation 1: Compensation mode 1 2: Compensation mode 2	1	☆
257	Fb.04	Current detection compensation	0 to 100	5	☆
258	Fb.05	Vector optimization without PG mode selection	0: No optimization 1: Optimization mode 1 2: Optimization mode 2	1	★
259	Fb.06	Upper limiting frequency for DPWM switching	0.00Hz to 15.00Hz	12.00 Hz	☆
260	Fb.07	PWM modulation manner	0: Asynchronous 1: Synchronou	0	☆
261	Fb.08	Random PWM depth	0: Invalid 1 to 10: PWM carrier frequency random depth	0	☆

5-1-14.FC Group - Extended parameter group

No.	Code	Parameter name	Setting range	Factory setting	Change
262	FC.01	Proportional linkage coefficient	0.00 to 10.00	0	☆
263	FC.02	PID start deviation	0.0 to 100.0	0	☆

5-1-15.E0 Group - Wobbulate, fixed-length and counting

No.	Code	Parameter name	Setting range	Factory setting	Change
264	E0.00	Swing setting manner	0: Relative to center frequency 1: Relative to maximum frequency	0	☆
265	E0.01	Wobbulate range	0.0% to 100.0%	0.0%	☆
266	E0.02	Sudden jump frequency range	0.0% to 50.0%	0.0%	☆
267	E0.03	Wobbulate cycle	0.1s to 3000.0s	10.0s	☆
268	E0.04	Triangle wave rise time	0.1% to 100.0%	50.0%	☆

		coefficient			
269	E0.05	Set length	0m to 65535m	1000m	☆
270	E0.06	Actual length	0m to 65535m	0m	☆
271	E0.07	Pulse per meter	0.1 to 6553.5	100.0	☆
272	E0.08	Set count value	1 to 65535	1000	☆
273	E0.09	Specified count value	1 to 65535	1000	☆
274	E0.10	Reduction frequency pulse number	0: invalid; 1~65535	0	☆
275	E0.11	Reduction frequency	0.00Hz～F0.19(Max frequency)	5.00Hz	☆

5-1-16.E1 Group - Multi-stage command, simple PLC

No.	Code	Parameter name	Setting range	Factory setting	Change
276	E1.00	0-stage speed setting 0X	-100.0% to 100.0%	0.0%	☆
277	E1.01	1-stage speed setting 1X	-100.0% to 100.0%	0.0%	☆
278	E1.02	2-stage speed setting 2X	-100.0% to 100.0%	0.0%	☆
279	E1.03	3-stage speed setting 3X	-100.0% to 100.0%	0.0%	☆
280	E1.04	4-stage speed setting 4X	-100.0% to 100.0%	0.0%	☆
281	E1.05	5-stage speed setting 5X	-100.0% to 100.0%	0.0%	☆
282	E1.06	6-stage speed setting 6X	-100.0% to 100.0%	0.0%	☆
283	E1.07	7-stage speed setting 7X	-100.0% to 100.0%	0.0%	☆
284	E1.08	8-stage speed setting 8X	-100.0% to 100.0%	0.0%	☆
285	E1.09	9-stage speed setting 9X	-100.0% to 100.0%	0.0%	☆
286	E1.10	10-stage speed setting 10X	-100.0% to 100.0%	0.0%	☆
287	E1.11	11-stage speed setting 11X	-100.0% to 100.0%	0.0%	☆
288	E1.12	12-stage speed setting 12X	-100.0% to 100.0%	0.0%	☆
289	E1.13	13-stage speed setting 13X	-100.0% to 100.0%	0.0%	☆
290	E1.14	14-stage speed setting 14X	-100.0% to 100.0%	0.0%	☆
291	E1.15	15-stage speed setting 15X	-100.0% to 100.0%	0.0%	☆
292	E1.16	Simple PLC running mode	0: Stop after single running 1: Hold final value after single running 2: Circulating	0	☆
293	E1.17	Simple PLC power-down memory selection	Units digit: Power-down memory selection 0: Power-down without memory	11	☆

			1: Power-down with memory Tens digit: Stop memory selection 0: Stop without memory 1: Stop with memory		
294	E1.18	0 stage running time T0	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
295	E1.19	0 stage ac/deceleration time selection	0 to 3	0	☆
296	E1.20	1 stage running time T1	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
297	E1.21	1 stage ac/deceleration time selection	0 to 3	0	☆
298	E1.22	2 stage running time T2	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
299	E1.23	2 stage ac/deceleration time selection	0 to 3	0	☆
300	E1.24	3 stage running time T3	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
301	E1.25	3 stage ac/deceleration time selection	0 to 3	0	☆
302	E1.26	4 stage running time T4	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
303	E1.27	4 stage ac/deceleration time selection	0 to 3	0	☆
304	E1.28	5 stage running time T5	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
305	E1.29	5 stage ac/deceleration time selection	0 to 3	0	☆
306	E1.30	6 stage running time T6	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
307	E1.31	6 stage ac/deceleration time selection	0 to 3	0	☆
308	E1.32	7 stage running time T7	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
309	E1.33	7 stage ac/deceleration time selection	0 to 3	0	☆
310	E1.34	8 stage running time T8	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
311	E1.35	8 stage ac/deceleration time selection	0 to 3	0	☆
312	E1.36	9 stage running time T9	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
313	E1.37	9 stage ac/deceleration time selection	0 to 3	0	☆
314	E1.38	10 stage running time T10	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
315	E1.39	10 stage ac/deceleration time selection	0 to 3	0	☆

316	E1.40	11 stage running time T11	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
317	E1.41	11 stage ac/deceleration time selection	0 to 3	0	☆
318	E1.42	12 stage running time T12	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
319	E1.43	12 stage ac/deceleration time selection	0 to 3	0	☆
320	E1.44	13 stage running time T13	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
321	E1.45	13 stage ac/deceleration time selection	0 to 3	0	☆
322	E1.46	14 stage running time T14	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
323	E1.47	14 stage ac/deceleration time selection	0 to 3	0	☆
324	E1.48	15 stage running time T15	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
325	E1.49	15 stage ac/deceleration time selection	0 to 3	0	☆
326	E1.50	Simple PLC run-time unit	0: s (Seconds) 1: H (hours)	0	☆
327	E1.51	Multi-stage command 0 setting mode	0: Function code E1.00 reference 1: Analog AI1 reference 2: Analog AI2 reference 3: Panel potentiometer setting 4: High-speed pulse setting 5: PID control setting 6: Keyboard set frequency (F0.01) setting, UP/DOWN can be modified	0	☆

5-1-17.E2 Group - PID function

No.	Code	Parameter name	Setting range	Factory setting	Change
328	E2.00	PID setting source	0: E2.01 setting 1: Analog AI1 reference 2: Reserved 3: Panel potentiometer setting 4: High-speed pulse setting 5: Communications reference 6: Multi-stage command reference	0	☆
329	E2.01	PID keyboard setting	0.0% to 100.0%	50.0%	☆
330	E2.02	PID feedback source	0 to 5	0	☆
331	E2.03	PID action direction	0: Positive 1: Negative	0	☆
332	E2.04	PID setting feedback range	0 to 65535	1000	☆

333	E2.05	PID inversion cutoff frequency	0.00 to F0.19(Maximum frequency)	0.00Hz	☆
334	E2.06	PID deviation limit	0.0% to 100.0%	0%	☆
335	E2.07	PID differential limiting	0.00% to 100.00%	0.10%	☆
336	E2.08	PID reference change time	0.00s to 650.00s	0.00s	☆
337	E2.09	PID feedback filter time	0.00s to 60.00s	0.00s	☆
338	E2.10	PID output filter time	0.00s to 60.00s	0.00s	☆
339	E2.11	PID feedback loss detection value	0.0%: Not judged feedback loss 0.1% to 100.0%	0.0%	☆
340	E2.12	PID feedback loss detection time	0.0s to 20.0s	0.0s	☆
341	E2.13	Proportional gain KP1	0.0 to 200.0	80.0	☆
342	E2.14	Integration time Ti1	0.01s to 10.00s	0.50s	☆
343	E2.15	Differential time Td1	0.000s to 10.000s	0.000s	☆
344	E2.16	Proportional gain KP2	0.0 to 200.0	20.0	☆
345	E2.17	Integration time Ti2	0.01s to 10.00s	2.00s	☆
346	E2.18	Differential time Td2	0.000S to 10.000	0.000s	☆
347	E2.19	PID parameter switching conditions	0: No switching 1: Switching via terminals 2: Automatically switching according to deviation.	0	☆
348	E2.20	PID parameter switching deviation 1	0.0% to E2.21	20.0%	☆
349	E2.21	PID parameter switching deviation 2	E2.20 to 100.0%	80.0%	☆
350	E2.22	PID integral properties	Units digit: integral separation 0: Invalid;　　　 1: Valid Tens digit: whether stop integration when output reaches limit 0: Continue;　　　 1: Stop	00	☆
351	E2.23	PID initial value	0.0% to 100.0%	0.0%	☆
352	E2.24	PID initial value hold time	0.00s to 360.00s	0.00s	☆
353	E2.25	Maximum deviation of twice outputs(Forward)	0.00% to 100.00%	1.00%	☆
354	E2.26	Maximum deviation of twice outputs(backward)	0.00% to 100.00%	1.00%	☆
355	E2.27	Computing status after PID stop	0: Stop without computing 1: Stop with computing	1	☆

356	E2.29	PID Automatically reduced frequency selection	0:Invalid;1:Valid	1	☆
357	E2.30	PID stop frequency	0.00Hz～Maximum frequency (F0.19)	25	☆
358	E2.31	PID Detection time	0s～3600s	10	☆
359	E2.32	PID Detection times	10～500	20	☆

5-1-18.E3 Group – Virtual DI、Virtual DO

No.	Code	Parameter name	Setting range	Factory setting	Change
360	E3.00	Virtual VDI1 terminal function selection	0 to 50	0	★
361	E3.01	Virtual VDI2 terminal function selection	0 to 50	0	★
362	E3.02	Virtual VDI3 terminal function selection	0 to 50	0	★
363	E3.03	Virtual VDI4 terminal function selection	0 to 50	0	★
364	E3.04	Virtual VDI5 terminal function selection	0 to 50	0	★
365	E3.05	Virtual VDI terminal status set	Units digit:Virtual VDI1 Tens digit:Virtual VDI2 Hundreds digit:Virtual VDI3 Thousands digit:Virtual VDI4 Tens of thousands:Virtual VDI5	00000	★
366	E3.06	Virtual VDI terminal effective status set mode	Units digit:Virtual VDI1 Tens digit:Virtual VDI2 Hundreds digit:Virtual VDI3 Thousands digit:Virtual VDI4 Tens of thousands:Virtual VDI5	11111	★
367	E3.07	AI1 terminal as a function selection of DI	0 to 50	0	★
368	E3.10	AI as DI effective mode selection	Units digit:AI1 0:High level effectively 1:Low level effectively Tens digit: Hundreds digit: Reserved	000	★
369	E3.11	Virtual VDO1 output function selection	0 to 40	0	☆
370	E3.12	Virtual VDO2 output function selection	0 to 40	0	☆

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371	E3.13	Virtual VDO3 output function selection	0 to 40	0	☆
372	E3.14	Virtual VDO4 output function selection	0 to 40	0	☆
373	E3.15	Virtual VDO5 output function selection	0 to 40	0	☆
374	E3.16	VDO valid state	Units digit:: VDO1 0:Positive logic; 1:Negative logic Tens digit:VDO2 (the same position) Hundreds digit: VDO3 (the same position) Thousands digit: VDO4 (Same position) Tens of thousands digit: VDO5 (with a bit)	00000	☆
375	E3.17	VDO1 delay time	0.0s～3600.0s	0.0s	☆
376	E3.18	VDO2 delay time	0.0s～3600.0s	0.0s	☆
377	E3.19	VDO3 delay time	0.0s～3600.0s	0.0s	☆
378	E3.20	VDO4 delay time	0.0s～3600.0s	0.0s	☆
379	E3.21	VDO5 delay time	0.0s～3600.0s	0.0s	☆

5-1-19.E8 Group Cutting machine special group

No.	Code	Parameter name	Setting range	Factory setting	Change
380	E8.00	Cutting machine running mode	0:forbid；1:enable	0	★
381	E8.01	Reciprocating motion advance time	0.0～600.0s	4.0s	☆
382	E8.02	Reciprocating motion rewind time	0.0～600.0s	2.0s	☆
383	E8.03	0Hz frequency arrival detection	0: invalid；1:Valid	0	★
384	E8.04	High-frequency output pull-in the frequency	0～100%	99%	☆
385	E8.05	High-frequency output disconnect the frequency	0～100%	99%	☆
386	E8.06	Closure delay time	0.0～20.0s	0.0s	☆

5-1-20.b0 Group - Motor parameters

No.	Code	Parameter name	Setting range	Factory setting	Change
387	b0.00	Motor type selection	0: general asynchronous motor； 1: Asynchronous inverter motor	0	★

388	b0.01	Rated power	0.1kW～1000.0kW	Depends on models	★
389	b0.02	Rated voltage	1V～2000V	Depends on models	★
390	b0.03	Rated current	0.01A～655.35A	Depends on models	★
391	b0.04	Rated frequency	0.01Hz～F0.19(Maximum frequency)	Depends on models	★
392	b0.05	Rated speed	1rpm～36000rpm	Depends on models	★
393	b0.06	Asynchronous motor stator resistance	0.001Ω～65.535Ω	Motor parameters	★
394	b0.07	Asynchronous motor rotor resistance	0.001Ω～65.535Ω	Motor parameters	★
395	b0.08	Asynchronous motor leakage inductance	0.01mH～655.35mH	Motor parameters	★
396	b0.09	Asynchronous motor mutUal inductance	0.1mH～6553.5mH	Motor parameters	★
397	b0.10	Asynchronous motor no-load current	0.01A～b0.03	Motor parameters	★
398	b0.27	Motor parameter auto tunning	0:no operation 1:asynchronous motor parameters still auto tunning 2:asynchronous motor parameters comprehensive auto tunning	0	★

5-1-21.y0 Group - Function code management

No.	Code	Parameter name	Setting range	Factory setting	Change
399	y0.00	Parameter initialization	0:no operation 1:Restore default parameter values, not including motor parameters 2:clear history 3:Restore default parameter values, including motor parameters 4:backup current user parameters 501: Restore from backup user parameters	0	★
400	y0.01	User password	0～65535	0	☆
401	y0.02	Function parameter group display selection	Units digit: D group display selection 0: Not displays　　1: Displays Tens digit: E group display	11111	★

No.	Code	Parameter name	Setting range	Factory setting	Change
			selection(the same above) Hundreds digit: b group display selection(the same above) Thousands digit: y group display selection(the same above) Tens thousands digit: L group displayselection(the same above)		
402	y0.03	Personality parameter group display selection	Units digit:Reserve Tens digit :User's change parameter display selection 0:not display 1:display	00	☆
403	y0.04	Function code modification properties	0: modifiable 1: Not modifiable	0	☆

5-1-22.y1 Group - Fault query

No.	Code	Parameter name	Setting range	Factory setting	Change
404	y1.00	Type of the first fault	0: No fault 1: Inverter unit protection 2: Acceleration overcurrent 3: Deceleration overcurrent	-	●
405	y1.01	Type of the second fault		-	●
406	y1.02	Type of the third(at last) fault	4: Constant speed overcurrent 5: Acceleration overvoltage 6: Deceleration overvoltage 7: Constant speed overvoltage 8: Control power fault 9: Undervoltage 10: Inverter overload 11: Motor Overload 12: Input phase loss 13: Output phase loss 14: Module overheating 15: External fault 16: Communication abnormal 17: Contactor abnormal 18: Current detection abnormal 19: Motor self-learning abnormal 20: Encoder/PG card abnormal 21: Parameter read and write abnormal 22: Inverter hardware abnormal 26: Running time arrival 27: Custom fault 1 28: Custom fault 2 29: Power-on time arrival 30: Load drop 31: PID feedback loss when running 40: Fast current limiting timeout 43: Motor overspeed 45:Motor over temperature	-	●

			51:Initial position error COF:communication fault		
407	y1.03	Frequency of the third (at last) fault	-	-	●
408	y1.04	Current of the third (at last) fault	-	-	●
409	y1.05	Bus voltage of the third(at last) fault	-	-	●
410	y1.06	Input terminal status of the third(at last) fault	-	-	●
411	y1.07	Output terminal status of the third (at last) fault	-	-	●
412	y1.09	Power-on time of the third(at last) fault	-	-	●
413	y1.10	Running time of the third(at last) fault	-	-	●
414	y1.13	Frequency of the second fault	-	-	●
415	y1.14	Current of the second fault	-	-	●
416	y1.15	Bus voltage of the second fault	-	-	●
417	y1.16	Input terminal status of the second fault	-	-	●
418	y1.17	Output terminal status of the second fault	-	-	●
419	y1.19	Power-on time of the second fault	-	-	●
420	y1.20	Running time of the second fault	-	-	●
421	y1.23	Frequency of the first fault	-	-	●
422	y1.24	Current of the first fault	-	-	●
423	y1.25	Bus voltage of the first fault	-	-	●
424	y1.26	Input terminal status of the first fault	-	-	●

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425	y1.27	Output terminal status of the first fault	-	-	●
426	y1.29	Power-on time of the first fault	-	-	●
427	y1.30	Running time of the first fault	-	-	●

5-2.Function parameter description
5-2-1.d0 group Basic monitoring parameters

d0 parameters group is used to monitor the inverter running status information,user can view those information through the panel to facilitate on-site commissioning,also read parameters group value via communication for host computer monitoring.

For the specific parameters function code, name and the smallest unit , see Table 5-2.

Function code	Name	Unit
d0.00	Running frequency(Hz)	0.01Hz
Frequency inverter theory operation frequency		
d0.01	Set frequency(Hz)	0.01Hz
Actual set frequency		
d0.02	Bus voltage(V)	0.1V
Detected value for DC bus voltage		
d0.03	Output voltage (V)	1V
Actual output voltage		
d0.04	Output current (A)	0.01A
Effective value for Actual motor current		
d0.05	Output power (kW)	0.1kW
Motor output torque percentage		
d0.06	Output torque (%)	0.1%
Motor output torque percentage		
d0.07	DI input status	-

DI input status, this value is a hexadecimal digits. The table listed each input terminal status sequence for each bit:

0～10 bits	Input terminal status
0	Invalid
1	Valid
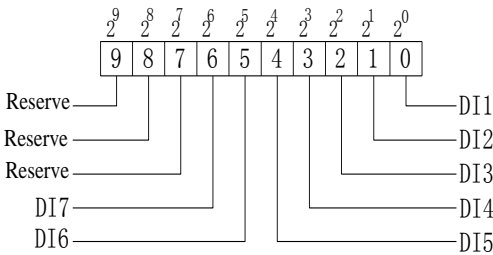
Figure 5-1:DI input terminal status sequence

| d0.08 | DO output status | - |

DO output status, this value is a hexadecimal digits. The table listed each output terminal status sequence for each bit:

0~10 bits	Output terminal status
0	Invalid
1	Valid
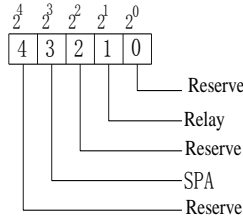
Figure 5-2:DO output terminal status sequence

d0.09	AI1 voltage(V)	0.01V
AI1 input voltage value		
d0.11	Panel potentiometer voltage (V)	0.01V
Panel potentiometer input voltage value		
d0.12	Count value	-
Actual pulse count value in counting function		
d0.13	Length value	-
Actual length in fixed length function		
d0.14	Actual speed	-
Motor Actual running speed display		
d0.15	PID setting	%
PID Reference value percentage under PID adjustment mode		
d0.16	PID feedback	%
Feedback value percentage under PID adjustment mode		
d0.17	PLC stage	-
Stage display when PLC program is running		
d0.18	High-speed pulse input pulse frequency (Hz)	0.01kHz
HDI(DI5) High-speed pulse input frequency display, unit: 0.01Khz		
d0.19	Feedback speed	0.1Hz
Frequency inverter actual output frequency		
d0.20	Remaining run time	0.1Min
Remaining run time display, it is for timing run control		
d0.21	Linear speed	1m/Min
Display DI5 high-speed pulse sampling of the line speed, according to the actual sample pulse per minute and E0.07, calculated the value of the line speed.		
d0.22	Current power-on time	1Min
Total time of current inverter power-on		
d0.23	Current run time	0.1Min
Total time of current inverter run		
d0.24	High-speed pulse input pulse frequency	1Hz
HDI(DI5) High-speed pulse input frequency display, unit: 1hz		
d0.25	Communication set value	0.01%
Frequency, torque or other command values set by communication port		
d0.27	Encoder feedback speed	0.01Hz

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Frequency set by F0.03 master frequency setting source		
d0.28	Auxiliary frequency setting display	0.01Hz
Frequency set by F0.04 auxiliary frequency setting source		
d0.29	Synchro rotor position	0.1%
Current position angle of synchronous motor rotor		
d0.35	Command torque (%)	-
Displays inverter running status information		
Data definition format is as follows:		

Bit0	0: Stop; 1: forward; 2: Reverse
Bit1	
Bit2	0:constant; 1:acceleration;2:deceleration
Bit3	
Bit4	0: bus voltage normal; 1: undervoltage

d0.36	Inverter type	-
1:G type: Suitable for constant torque load		
d0.37	AI1 voltage before correction	0.01V
d0.39	Panel potentiometer voltage before correction	0.01V

5-2-2.F0 group   Basic function group

Code	Parameter name	Setting range		Factory setting	Change Limit
F0.00	Motor control mode	Vector control without PG	0	2	★
		Reserved	1		
		V/F control	2		
0:Vector control W/O PG Refers to the open-loop vector control for high-performance control applications typically ,only one inverter to drive a motor. 2:V/F control Suitable for less precision control applications, such as fan and pump loads .One inverter can be used for several motors at the same time. Note:When vector control mode , the frequency inverter and motor capacity can not be vary widely.The AC drive's power can be bigger than motor's power two degree or smaller than motor's power one degree.If not, it may result in not very good performancecontrol ,or the drive system does not work normally .					
F0.01	Keyboard set Frequency	0.00Hz～F0.19 (Maximum frequency)		50.00Hz	☆
When "Digital Setting" or "Terminal UP/DOWN " is selected as frequency source, the parameter value is the initial value of the inverter frequency digital setting.					
F0.02	Frequency command resolution	0.1Hz	1	2	★
		0.01Hz	2		
This parameter is used to determine the resolution of all related frequency parameters. When the frequency resolution is 0.1Hz, PI9000 maximum output frequency can reach 3200Hz, when the frequency resolution is 0.01Hz , PI9000 maximum output frequency is 300.00Hz. Note: when modifying the function parameters, the number of decimal places of all related frequency parameters will change displayed, the frequency value will change accordingly.					
F0.03	Frequency source master setting	Keyboard set frequency (F0.01, UP/DOWN can be modified, power-down without memory)		0	1	★
		Keyboard set frequency (F0.01, UP/DOWN can		1		

		be modified, power-down with memory)			
		Analog AI1 setting	2		
		Reserved	3		
		Panel potentiometer setting	4		
		High-speed pulse setting	5		
		Multi-speed operation setting	6		
		Simple PLC program setting	7		
		PID control setting	8		
		Remote communications setting	9		

Select inverter master reference frequency input channels. There are 10 master reference frequency channels in all:

0: Keyboard set frequency (F0.01, UP/DOWN can be modified, power-down without memory)

Initial value for the set frequency is F0.01 "preset frequency" value. The set frequency value of the inverter can be changed by using the ▲ key and ▼ key on the keyboard (or multi-function input terminals UP, DOWN).

The Inverter powers down and then powers on again, the set frequency value will be recovered as F0.01 "digital preset frequency value".

1: Keyboard set frequency (F0.01, UP/DOWN can be modified, power-down with memory)

Initial value for the set frequency is F0.01 "preset frequency" value. The set frequency value of the inverter can be changed by using the ▲ key and ▼ key on the keyboard (or multi-function input terminals UP, DOWN).

The Inverter powers down and then powers on again, the set frequency value is same as the frequency of the last power-down.

Please note that F0.09 is for "digital set frequency stop memory selection ", F0.09 is used to select SAVE or CLEAR frequency correction when the inverter stops Besides, F0.09 is not related to the power-down memory but shutdown.

2: Analog AI1 setting

4: Panel potentiometer setting

Refers to that the frequency is determined by the analog input terminal, PI160 control panel provides one analog input terminals.Either 0V to 10V voltage input or 0mA to 20mA current input, it is selected by the jumper on the control board.The corresponding relationship between AI1 input voltage value and the target frequency can be set through F1 function code by user.Panel potentiometer analog input voltage of 0V to 5V.

5:High-speed pulse setting

Frequency reference is achieved via terminal pulse reference. Pulse reference signal specifications:Voltage range of 24±20%、frequency range of 0kHz～100kHz。Pulse reference only can be inputted from the multi-function input terminal DI5. The relationship between DI5 terminal input pulse frequency and its corresponding setting can be set by F1.26 to F1.29, the correspondence is based on a straight line between 2 points, the pulse input corresponds to the set 100.0%, it refers to the percent of F0.19 relative to maximum frequency.

6:Multi-speed operation setting

When multi-stage command operation mode is selected, the different input state combination of DI terminal correspond to the different set frequency value. PI160 can set up more than 4 multi-stage command terminals and 16 statuses, and any 16 "multi-stage commands "can be achieved correspondence through E1 group function code, the "multi-stage command" refers to the percent of F0.19 relative to maximum frequency. Under the mode, DI terminal function in F1 group parameters will be required to set as the multi-stage command.

7:Simple PLC program setting

Under the mode, the inverter operating frequency source can be switched between 1 to 16 any frequency commands, the user can set hold time and ac/deceleration time for 1 to 16 frequency command , the specific content refers to the related E1 group instructions.

8:PID control setting

　　Select process PID control output as the operating frequency. Generally it is used for closed-loop control, such as constant pressure closed-loop control, constant tension closed-loop control and other occasions. Select PID as the frequency source, you need to set E2 group "PID function"parameters.

　　9:Remote communications setting

　　PI160 supports Modbus communication.

F0.04	Frequency source Auxiliary setting	Keyboard set frequency (F0.01, UP/DOWN can be modified, power-down without memory)	0	2	★
		Keyboard set frequency (F0.01, UP/DOWN can be modified, power-down with memory)	1		
		Analog AI1 setting	2		
		Reserved	3		
		Panel potentiometer setting	4		
		High-speed pulse setting	5		
		Multi-speed operation setting	6		
		Simple PLC program setting	7		
		PID control setting	8		
		Remote communications setting	9		

　　The instruction for use refers to F0.03.

　　When the frequency source auxiliary setting is used as overlays reference (Select frequency source as master+auxiliary , master to master+auxiliary or auxiliary to master+auxiliary), you need to pay attention to:

　　1) When the frequency source auxiliary setting is set to digital reference, the preset frequency (F0.01) does not work, user can adjust frequency by using ▲, ▼ keys (or multi-function input terminals UP, DOWN) on the keyboard, adjust directly on the basis of master frequency source.

　　2)When the frequency source auxiliary setting is set to analog input reference (AI1,AI2, panel potentiometer) or pulse input reference, the frequency source auxiliary setting range for the set 100% can be set by F0.05 and F0.06.

　　3)When the frequency source is set to pulse input reference, it is similar to analog reference . Tip: Both master and auxiliary setting of frequency source can not be set in the same channel, ie F0.03 and F0.04 can not be set as the same value, otherwise easily lead to confusion.

F0.05	Reference object selection for frequency source auxiliary setting	Relative to maximum frequency	0	0	☆
		Relative to master frequency source 1	1		
		Relative to master frequency source 2	2		
F0.06	Frequency source auxiliary setting range		0%～150%	100%	☆

　　When the frequency source is set to "frequency overlay"(i.e. F0.07 is set to 1, 3 or 4),these two parameters are used to determine the range of adjustment of frequency source auxiliary setting.

　　F0.05 is used to determine the object corresponding to frequency source auxiliary setting range, either the maximum frequency or the frequency source master setting, If the frequency source master setting 1 is selected, so the frequency source auxiliary setting range will be subject to the change of the frequency source master setting, it applies for when auxiliary setting range is less than master setting range; If the frequency source master setting 2 is selected, so the frequency source auxiliary setting range will be subject to the change of the frequency source master setting, it applies for when auxiliary setting range is more than master setting range;

　　Recommendation: frequency source master setting (F0.03) shall adopt analog setting,frequency source auxiliary setting (F0.04) shall adopt digital setting.

		Units digit	Frequency source selection			
F0.07	Frequency source superimposed selection	Frequency source master setting		0	00	☆
		Arithmetic result of master and auxiliary(arithmetic relationship depends on tens digit)		1		
		switch between frequency source master setting and auxiliary setting		2		
		Switch between frequency source master setting and arithmetic result of master and auxiliary		3		
		Switch between frequency source auxiliary setting and arithmetic result of master and auxiliary		4		
		Tens digit	Arithmetic relationship of master and auxiliary for frequency source			
		Master+auxiliary		0		
		Master-auxiliary		1		
		Max(Master, auxiliary)		2		
		Min(Master, auxiliary)		3		
		Master*Auxiliary / Maximum frequency		4		

Frequency source reference is achieved by compounding frequency source master setting and frequency source auxiliary setting.

Units digit: frequency source selection:

0:Frequency source master setting

Frequency source master setting is used as command frequency

1: Arithmetic result of master and auxiliary is used as command frequency, for the arithmetic relationship of master and auxiliary, please see the instructions of function code"tens digit".

2: Switch between frequency source master setting and auxiliary setting, when multi-function input terminal 18 (Frequency switching) is invalid, the frequency source master setting is selected as command frequency. when multi-function input terminal 18 (Frequency switching) is valid, frequency source auxiliary setting is selected as command frequency.

3: Switch between the frequency source master setting and the arithmetic result of master and auxiliary, when multi-function input terminal 18 (Frequency switching) is invalid,the frequency source master setting is selected as command frequency. When multi-function input terminal 18 (Frequency switching) is valid, the arithmetic result of master and auxiliary is selected as command frequency.

4:Switch between the frequency source auxiliary setting and the arithmetic result of master and auxiliary, when multi-function input terminal 18 (Frequency switching) is invalid,the frequency source auxiliary setting is selected as command frequency. When multi-function input terminal 18 (Frequency switching) is valid, the arithmetic result of master and auxiliary is selected as command frequency.

Tens digit: Arithmetic relationship of master and auxiliary for frequency source

0: frequency source master setting + frequency source auxiliary setting

The sum of frequency source master setting plus frequency source auxiliary setting is used as command frequency Achieve frequency overlay reference function.

1:frequency source master setting - frequency source auxiliary setting

The difference of frequency source master setting minus frequency source auxiliary setting is used as command frequency

2:MAX (Master and auxiliary) take the largest absolute value in frequency source master setting and frequency source auxiliary setting as command frequency.

3:MIN (Master and auxiliary) take the smallest absolute value in frequency source master setting and frequency source auxiliary setting as command frequency. In addition,when the arithmetic result of master and auxiliary is selected as frequency source, you can set offset

frequency by F0.08 and overlay offset frequency to the arithmetic result of master and auxiliary, so as to respond flexibly to various needs.

4:Master*Auxiliary / Maximum frequency

Frequency source master setting*frequency source auxiliary setting / maximum frequency = Command frequency.

F0.08	Frequency source offset frequency when superimposing	0.00Hz to F0.19(Maximum frequency)		0.00Hz	☆

The function code is only valid when the arithmetic result of master and auxiliary is selected as frequency source.

When the arithmetic result of master and auxiliary is selected as frequency source, F0.08 is used as offset frequency, and it overlays with the arithmetic result of master and auxiliary as the set value of final frequency so that the frequency setting can be more flexible.

F0.09	Shutdown memory selection for digital set frequency	W/O memory	0	1	☆
		W/ memory	1		

This feature is only frequency source for the digital set.

"W/O memory" refers to that the digital set frequency value will recovered to F0.01(preset frequency) value when the inverter stops, and the frequency correction by the ▲/▼key on the keyboard or terminals UP, DOWN is cleared.

"W/ memory" refers to that the digital set frequency is reserved when the inverter stops,and the frequency correction by the ▲/▼ key on the keyboard or terminals UP, DOWN remains valid.

F0.10	Frequency command UP / DOWN reference when running	Running frequency	0	0	★
		Set frequency	1		

This parameter is valid only when the frequency source is the digital set value.

when determining the keyboard ▲ ▼ keys or terminal UP/DOWN action, the method to correct the set frequency that is, the target frequency decreases or increases on the basis of the operating frequency or the set frequency.

The obvious difference between two settings appears when the inverter is in the process of ac/deceleration, that is, if the inverter operating frequency is not same as the set frequency,the different choices of the parameters has very different effect.

F0.11	Command source selection	Keyboard control (LED off)	0	0	☆
		Terminal block control(LED on)	1		
		Communications command control (LED flashes)	2		
		Keyboard control + Communications command control	3		
		Keyboard control + Communications command control + Terminal block control	4		

Select inverter control command input channel. Inverter control commands include: Start, stop, forward, reverse and jog, etc.

0: Keyboard control ("LOCAL / REMOT" lights out); Operate command control by using RUN, STOP/RST Keys on the operation panel.

1: Terminal block control ("LOCAL / REMOT" lights up); Operate command control by using multi-function input terminals FWD, REV or FJOG

2:Communication command control("LOCAL / REMOT" flashes), Gives the run command from the host computer through the means of communication.Select this option, the optional communication card(Modbus card) is required .

3:Keyboard＋Communication command control；Operation panel and Communication command control at same time.

4:Keyboard＋Terminal block＋Communication command；Operation panel、Terminal block and Communication command control at same time.

F0.12	Binding	Units	Keyboard command binding frequency	000	☆

	frequency source for command source	digit	source selection			
		Not binded		0		
		Keyboard set frequency		1		
		Analog AI1 setting		2		
		Reserved		3		
		Panel potentiometer setting		4		
		High-speed pulse setting		5		
		Multi-speed setting		6		
		Simple PLC setting		7		
		PID setting		8		
		Communications reference		9		
		Tens digit	Terminal block command binding frequency source selection (0 to 9, same as units digit)			
		Hundreds digit	Communication command binding frequency source selection (0 to 9, same as units digit)			

Define the combination of 3 operation command channels and 9 frequency reference channels for easily synchronously switching.

The principle for above frequency source reference channel is same as frequency source master setting selection F0.03, please see the description of F0.03 function code. The different running command channel can be bundled with the same frequency reference channel. When command source has the available frequency source for bundling, in the valid period of command source , the set frequency source by F0.03 to F0.07 is no longer valid.

F0.13	Acceleration time 1	0.0s～6500s		-	☆
F0.14	Deceleration time 1	0.0s～6500s		-	☆

Acceleration time refers to the required time when the inverter accelerates from zero frequency to F0.16.

Deceleration time refers to the required time when the inverter decelerates from F0.16 to zero frequency.

PI160 provides four groups of ac/deceleration time, user can select by using the digital input terminal DI, as follows:

The first group:F0.13、F0.14；The second group:F7.08、F7.09；

The third group:F7.10、F7.11；The fourth group:F7.12、F7.13。

F0.15	Ac/Deceleration time unit	1second	0	1	★
		0.1second	1		
		0.01second	2		

To meet the demand of the various on-site, PI9000 provides three kinds of time unit: 1 second, 0.1 second and 0.01 second respectively.

Note: when modifying the function parameters, the number of decimal places that the four groups of ac/deceleration time displayed will change displayed, the ac/deceleration time will change accordingly.

F0.16	Ac/deceleration time reference frequency	Maximum frequency(F0.19)	0	0	★
		Set frequency	1		
		100Hz	2		

Ac/deceleration time refers to the required time from zero frequency to F0.16 or from F0.16 to zero frequency.When F0.16 selects 1, the ac/deceleration time depends on the set frequency, if the set frequency change frequently, and the acceleration of the motor is varied, please use with caution.

F0.17	Carrier frequency adjustment as per temperature	NO	0	0	☆
		YES	1		

The adjustment of carrier frequency refers to that the inverter automatically adjusts the carrier frequency according to the radiator temperature, so as to reduce the carrier frequency .when the radiator temperature rises, and to restore the carrier frequency when the radiator temperature reduces.

F0.18	Carrier Frequency	0.5kHz～16.0kHz	-	☆

This function is used for adjust the carrier frequency of frequncy inverter. by adjusting the carrier frequency can reduce motor noise, avoid the resonance point of the mechanical system, reduces line earth leakage current and reduce interference generated by frequency inverter.

When the carrier frequency is low,output current higher harmonic component increases,the motor loss increases and temperature rise..

When the carrier frequency is high, reduce the motor loss and temperature, but the frequency inverter loss increases, the temperature rise and interference increase.

The adjustment of carrier frequency will have impacts on the following performances:

Carrier Frequency	Low → high
Motor noise	Large → small
Output current waveform	Poor→ good
Motor temperature	High→low
Inverter temperature	Low→high
Leakage current	Small→ high
External radiation and interference	Small → large

Different power frequency inverter ,the factory setting of carrier frequency is different. User can modify the carrier frequency if needed. But note that: if the carrier frequency hinger than factory setting value it can cause the drive heatsink temperature increase. in this case the user needs to derating the frequency inverter, otherwise there is the danger of overheating the inverter alarm.

F0.19	Maximum output frequency	50.00Hz～320.00Hz	50.00Hz	★

If analog input, pulse input (DI5) or multi-stage command in PI9000 is selected as frequency source, the respective 100.0% is calibrated relative to the parameter.

When PI160 maximum output frequency reaches up to 3200Hz, in order to take into account the two indexes of frequency command resolution and frequency input range, the number of decimal places for frequency command can be selected by F0.02 .

When F0.02 selects 1, the frequency resolution is 0.1Hz, at this time F0.19 can be set in the range from 50.0Hz to 3200.0Hz; When F0.02 selects 2, the frequency resolution is 0.01Hz, at this time F0.19 can be set in the range from 50.00Hz to 320.00Hz.

F0.20	Upper limit frequency source	F0.21setting	0	0	★
		Analog AI1 setting	1		
		Reserved	2		
		Panel potentiometer setting	3		
		High-speed pulse setting	4		
		Communications reference	5		

Setting upper limit frequency. The upper limit frequency can be set from either digital setting (F0.21) or analog input channels. If the upper limit frequency is set from analog input,the set 100% of analog input is relative to F0.19.

To avoid the "Runaway", the setting of upper limit frequency is required, when the inverter reaches up to the set upper limit frequency value, the inverter will remain operation at the upper limit frequency, no further increase.

F0.21	Upper limit frequency	F0.23 (Lower limit frequency) to F0.19(Maximum frequency)	50.00Hz	☆
F0.22	Upper limit frequency offset	0.00Hz～F0.19(Maximum frequency)	0.00Hz	☆

When the upper limit frequency is set from the analog or the high-speed pulse, F0.22 will

be used as the offset of set value, the overlay of the offset frequency and F0.20 is used as the set value of the final upper limit frequency.

F0.23	Lower limit frequency	0.00Hz~F0.21(Lower limit frequency)	0.00Hz	☆

When the frequency command is lower than the lower limit frequency set by F0.23, the inverter can shut down, and then run at the lower limit frequency or the zero speed, the running mode can be set by F7.18.

F0.24	Running direction	Same direction	0	0	☆
		Opposite direction	1		

By changing the parameters, the motor steering can be achieved without changing the motor wiring, which acts as the adjustment of any two lines(U, V, W) of the motor to achieve the conversion of the motor rotation direction.

Tip: After the parameter is initialized, the motor running direction will be restored to its original status. When the system debugging is completed, please use with caution where the change of motor steering is strictly prohibited.

F0.26	AI analog accuracy	0.01Hz	0	1	☆
		0.05Hz	1		
		0.1Hz	2		
		0.5Hz	3		

AI Analog input frequency corresponding to the resolution.

F0.27	Inverter type	G type (Constant torque load type)	1	-	●

The parameters is only for user to view the factory model and can not be changed.
1: Suitable for constant torque load

5-2-3.F1 group   Input terminals

PI160 series inverter is equipped with 7 multi-function digital input terminals(of which DI5 can be used as a high-speed pulse input terminal)，and 1 analog input terminals.

Code	Parameter name	Setting range	Factory setting	Change Limit
F1.00	DI1 terminal function selection	0~53	1	★
F1.01	DI2 terminal function selection	0~53	2	
F1.02	DI3 terminal function selection	0~53	8	
F1.03	DI4 terminal function selection	0~53	9	
F1.04	DI5 terminal function selection	0~53	12	
F1.05	DI6 terminal function selection	0~53	13	

These parameters are used to set the digital multi-function input terminal, the optional functions are shown in the following table:

Set value	Function	Description
0	No function	The terminal for not use can be set to "no function" to prevent accidental operation.
1	Forward run (FWD)	External terminals are used to control the FWD/REV run mode of inverter.
2	Reverse run (REV)	
3	Three-wire operation control	This terminal is used to determine the inverter's three-wire control mode. For details, please refer to the instructions of function code F1.10 ("terminal command mode).
4	Forward JOG(FJOG)	FJOG means Forward JOG running, RJOG means Reverse JOG running. For Jog running frequency and Jog Ac/deceleration time, please refer to the description of the function code F7.00, F7.01,F7.02.
5	Reverse JOG(RJOG)	
6	Terminal UP	Modify frequency increment/decrement command when

7	Terminal DOWN	the frequency is referenced by external terminal. Adjust up/down the set frequency when the digital setting is selected as the frequency source.
8	Free stop	The inverter output is blocked, at the time, the parking process of motor is not controlled by the inverter. This way is same as the principle of free stop described in F3.07.
9	Fault reset (RESET)	The function make use of terminal for fault reset.It has same function with RESET key on the keyboard. This function can be used to realize remote fault reset.
10	Run pausing	The inverter slows down and stops, but all operating parameters are memorized. Such as PLC parameters, wobbulate frequency parameters, and PID parameters. This terminal signal disappears, the inverter reverts to the previous state of running before parking.
11	External fault normally open input	When the signal is sent to the inverter, the inverter reports fault Err.15, and performs troubleshooting according to fault protection action (For details, please refer to the function code F8.17).
12	Multi-speed terminal 1	
13	Multi-speed terminal 2	The setting of 16 stage speed or 16 kinds of other command can be achieved through the 16 states of the four terminals. For details, see Table 1
14	Multi-speed terminal 3	
15	Multi-speed terminal 4	
16	Ac/deceleration time selection terminal 1	The selection of 4 ac/deceleration times can be achieved through the 4 states of the two terminals. For details, see Table 2
17	Ac/deceleration time selection terminal 2	
18	Frequency source switching	Used to switch between different frequency sources. According to frequency source selection function code (F0.07) settings, the terminal is used to switch between two frequency sources.
19	UP/DOWN setting (terminal, keyboard)	When the frequency reference is the digital frequency, this terminal is used to clear the changed frequency value by terminal UP/DOWN or keyboard UP/DOWN, so that the reference frequency can recover to the set value of F0.01.
20	Run command switch Terminal 1	When the command source is set to the terminal control (F0.11 = 1), the terminal can be used to switch between terminal control and keyboard control. When the command source is set to the communication control (F0.11 = 2), the terminal can be used to switch between communication control and keyboard control.
21	Ac/deceleration prohibited	Ensure the inverter is free from external signals affect (except for shutdown command), maintain current output frequency.
22	PID pause	PID is temporarily disabled, the inverter maintains current output frequency, no longer performs PID adjustment of frequency source.
23	PLC status reset	When PLC pauses and runs again, this terminal is used to reset the inverter to the initial state of simple PLC.
24	Wobbulate pause	When the inverter outputs at center frequency.Wobbulate will pause

25	Counter input	Input terminal of the count pulse.
26	Counter reset	Clear counter status.
27	Length count input	Input terminal of the length count.
28	Length reset	Clear length
29	Torque control prohibited	When the inverter torque control is prohibited, the inverter will enter speed control mode.
30	High-speed pulse input(only valid for DI5)	DI5 is used as pulse input terminal.
32	Immediately DC braking	If the terminal is active, the inverter switches directly to DC braking status
33	External fault normally closed input	When the signal of external fault normally closed input is inputted into the inverter, the inverter will report fault Err.15 and shutdown.
34	Frequency change enable	If the function is set to be valid, when the frequency changes, the inverter does not respond to frequency changes until the terminal state is invalid.
35	PID action direction as reverse	If the terminal is valid, PID action direction opposites to the direction set by E2.03
36	External parking terminal 1	Under keyboard control mode, the terminal can beused to stop the inverter, same as STOP key on the keyboard.
37	Control command switch terminal 2	Used to switch between terminal control and communication control. If the command source is selected as terminal control, the system will be switched to the communication control mode when the terminal is active; vice versa.
38	PID integral pause	When the terminal is active, the PID integral adjustment function is paused, but the proportion and differential adjustments of PID are still valid.
39	Switch between Frequency source master setting and preset frequency	When the terminal is active, the frequency source A is replaced with the preset frequency (F0.01)
40	Switch between frequency source auxiliary setting and preset frequency	When the terminal is active, the frequency source B is replaced with the preset frequency (F0.01)
43	PID parameter switching	When DI terminal (E2.19 = 1) is used to switch PID parameters, if the terminal is invalid, PID parameters use E2.13 to E2.15; if the terminal is valid, PID parameters use E2.16 to E2.18
44	Custom fault 1	When custom fault 1 and custom fault 2 are active,the
45	Custom fault 2	inverter respectively alarm fault Err.27 and fault Err.28, and deals with them according to the mode selected by the fault protection action F8.19.
46	Speed control / torque control switching	Switch between speed control mode and torque control mode under vector control mode. If the terminal is invalid, the inverter will run at the mode defined by E0.00 (Speed/torque control mode); if the terminal is valid, the inverter will be switched to another mode.
47	Emergency parking	If the terminal is valid, the inverter will park at the fastest speed, and the current maintains at the set upper limit during the parking process. This function is used to meet

		the requirements that the inverter needs to stop as soon as possible when the system is in a emergency state.
48	External parking terminal 2	In any control mode (keyboard control, terminal control, communication control), the terminal can be used to decelerate the inverter until stop, at the time the deceleration time is fixed for deceleration time 4.
49	Deceleration DC braking	If the terminal is valid, firstly the inverter decelerates to the initial frequency of stop DC braking, and then switches directly to DC braking status.
50	Clear current running time	When the terminal is valid, the timing of the operation of the converter is cleared.
52	Disconnection control	Through the DI terminals enter the disconnection fault signal.When the DI terminal function to break the control function, and there is a signal input terminal, the inverter stops, and report break Err.24 fault.
53	Reciprocation investment	For details, please refer to the E8

Table 1 Function description of multi-stage command

The 4 multi-stage command terminals can be combined as 16 status, these 16 status have 16 command set values. As shown in Table 1:

K4	K3	K2	K1	Command setting	Parameters
OFF	OFF	OFF	OFF	0-stage speed setting 0X	E1.00
OFF	OFF	OFF	ON	1-stage speed setting 1X	E1.01
OFF	OFF	ON	OFF	2-stage speed setting 2X	E1.02
OFF	OFF	ON	ON	3-stage speed setting 3X	E1.03
OFF	ON	OFF	OFF	4-stage speed setting 4X	E1.04
OFF	ON	OFF	ON	5-stage speed setting 5X	E1.05
OFF	ON	ON	OFF	6-stage speed setting 6X	E1.06
OFF	ON	ON	ON	7-stage speed setting 7X	E1.07
ON	OFF	OFF	OFF	8-stage speed setting 8X	E1.08
ON	OFF	OFF	ON	9-stage speed setting 9X	E1.09
ON	OFF	ON	OFF	10-stage speed setting 10X	E1.10
ON	OFF	ON	ON	11-stage speed setting 11X	E1.11
ON	ON	OFF	OFF	12-stage speed setting 12X	E1.12
ON	ON	OFF	ON	13-stage speed setting 13X	E1.13
ON	ON	ON	OFF	14-stage speed setting 14X	E1.14
ON	ON	ON	ON	15-stage speed setting 15X	E1.15

When multi-speed is selected as frequency source, the 100.0% of function code E1.00 to E1.15 corresponds to maximum frequency F0.19. Multi-stage command is used for the function of multi-speed, also for PID reference source to meet the need to switch between different reference values.

Table 2 - function description of ac/deceleration time selection terminal.

Terminal 2	Terminal 1	Ac/deceleration time selection	Parameters
OFF	OFF	Acceleration time 1	F0.13、F0.14
OFF	ON	Acceleration time 2	F7.08、F7.09
ON	OFF	Acceleration time 3	F7.10、F7.11
ON	ON	Acceleration time 4	F7.12、F7.13

F1.06	DI7 terminal function select	Forward run		0	★
When DI7 terminal is valid,only support forward run command, the other is disabled.					
F1.10	Terminal command	Two-wire type 1	0	0	★

	mode	Two-wire type 2	1		
		Three-wire type 1	2		
		Three-wire type 2	3		

This parameter defines four different modes to control inverter operation through external terminals.0: Two-wire type 1.

This mode is the most commonly used two-wire mode. The forward/reverse operation of motor is determined by terminal DIx, DIy.

The terminal function is set as follows:

Terminals	Set value	Description
DIx	1	Forward run (FWD)
DIy	2	Reverse run (REV)

Of which, DIx and DIy are the multi-function input terminals of DI1 to DI10, the level is active.

K1	K2	Running command
0	0	Stop
0	1	Reverse
1	0	Forward
1	1	Stop
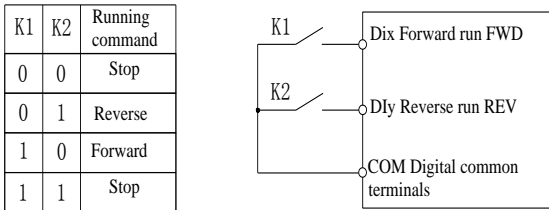
Figure 5-3:Terminal command mode:Two-wire mode 1

1: Two-wire type 2.In the mode, DIx terminal is used as running enabled, while DIy terminal is used to determine running direction.The terminal function is set as follows:

Terminals	Set value	Description
DIx	1	Forward run (FWD)
DIy	2	Reverse run (REV)

Of which, DIx and DIy are the multi-function input terminals of DI1 to DI10, the level is active.

K1	K2	Running command
0	0	Stop
0	1	Stop
1	0	Reverse
1	1	Forward
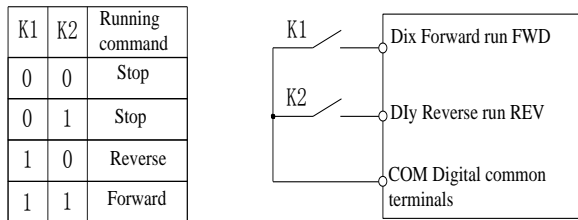
Figure 5-4:Terminal command mode:Two-wire mode 2

2:Three-wire control mode 1.In the mode, DIn is used as enabled terminal, while DIx, DIy terminal are used to control direction. The terminal function is set as follows:

Terminals	Set value	Description
DIx	1	Forward run (FWD)
DIy	2	Reverse run (REV)
DIn	3	Three-wire operation control

To run, firstly close DIn terminal, the forward or reverse of motor is controlled by the ascendant edge of DIx or DIy pulse.

To stop, you must disconnect DIn terminal signals Of which, DIx, DIy and DIn are the multi-function input terminals of DI1 to DI10, DIx and DIy are for active pulse, DIn is for active level.

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Figure 5-5:Terminal command mode:Two-wire mode 1

Of which: SB1: Stop button   SB2: Forward button   SB3: Reverse button

3:Three-wire control mode 2

In the mode, DIn is the enabled terminal, the running commands are given by DIx, the direction is determined by the state of DIy.

The terminal function is set as follows:

Terminals	Set value	Description
DIx	1	Forward run (FWD)
DIy	2	Reverse run (REV)
DIn	3	Three-wire operation control

To run, firstly close DIn terminal, the motor run signal is generated by the ascendant edge of DIx, the motor direction signal is generated by DIy status.

To stop, you must disconnect DIn terminal signals Of which, DIx, DIy and DIn are the multi-function input terminals of DI1 to DI10, DIx is for active pulse, DIy and DIn are for active level.
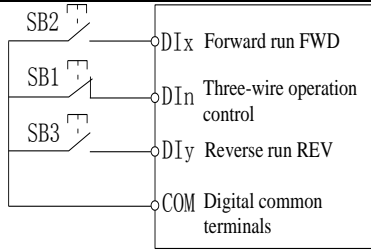

K	Running direction
0	Forward
1	Reverse
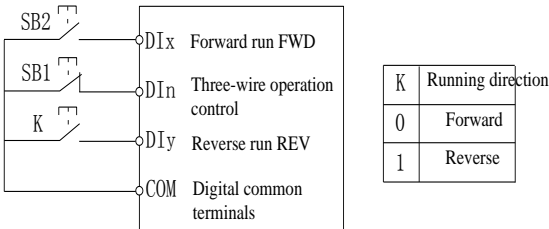
Figure 5-6:Terminal command mode:Three-wire mode 2

Of which:

SB1: Stop button   SB2: Run button

F1.11	Terminal UP / DOWN change rate	0.001Hz/s～65.535Hz/s	1.000Hz/s	☆

Used to set terminal UP/DOWN adjustment frequency, the rate of frequency change, i.e. frequency change amount per second.

When F0.02 (Frequency decimal point) is 2, the value range is 0.001Hz/s to 65.535Hz/s.

When F0.22 (Frequency decimal point) is 1, the value range is 0.01Hz/s to 655.35Hz/s.

F1.12	Minimum input value for AI curve 1	0.00V～F1.14	0.30V	☆
F1.13	Minimum input setting for F1.12	-100.0%～100.0%	0.0%	☆
F1.14	Maximum input value for AI curve 1	F1.12～+10.00V	10.00V	☆
F1.15	F1.14 corresponding setting	-100.0%～100.0%	100.0%	☆

The above function codes are used to set the relationship between analog input voltage and its representatives set value.

When the analog input voltage is more than the set Maximum Input (F1.14), the analog voltage takes the Maximum Input as the calculated value, Similarly, when the analog input voltage is less than the set Minimum Input (F1.12), according to the Setting Selection For AI Less Than Minimum Input (F1.25), the analog voltage takes Minimal Input or 0.0% as the

calculated value.

AI1 input filter time is used to set AI1 software filter time, when the on-site analog quantity is easily interfered, please increase the filter time to stabilize the detected analog quantity, but the greater filter time, the slower analog detection response, the proper setting method depends on the actual application.

In the different applications , the 100% of analog setting vary from the meaning of its corresponding nominal value,please refer to the description of each application for details.

Below two legends are for two typical settings.

Figure 5-7:The corresponding relationship between the simulation and the set amount

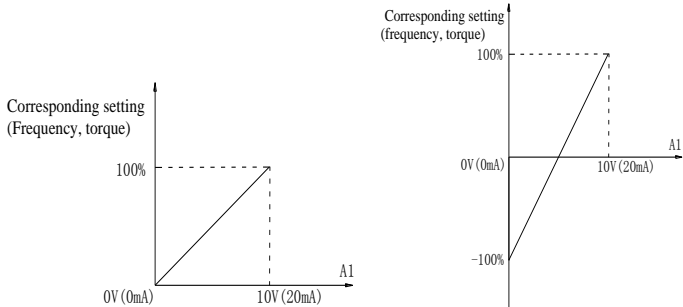| F1.20	Minimum input for panel potentiometer	0.00V～F1.22	0.10V	☆
F1.21	Minimum input setting for panel potentiometer	-100.0%～100.0%	0.0%	☆
F1.22	Maximum input for panel potentiometer	F1.20～+10.00V	4.00V	☆
F1.23	Maximum input setting for panel potentiometer	-100.0%～100.0%	100.0%	☆

For the function and use of curve 3, please refer to the description of curve 1.

F1.24	AI curve selection	Unit digit	AI1 curve selection		321	☆
		Curve 1(2 points，see F1.12～F1.15)		1		
		Reserve		2		
		Curve 3(2 points，see F1.20～F1.23)		3		
		Tens digit	Reserve			
		Hundreds digit	Panel potentiometer curve selection (1~3, same as units digit)			

Units digit, tens digit and hundreds digit of the function code are used to respectively select the corresponding set curves of analog input AI1、 reserve 、 panel potentiometer .

1 analog input can respectively select any one of 2 curves.

Curve 1 and curve 3 are 2-point curve, they are set in F1 group function code .

F1.25	Setting selection for AI input	Unit digit	Setting selection for AI1 less than minimum input		000	☆
		The corresponding minimum input setting		0		
		0.0%		1		
		Tens digit	Reserve			
		Hundreds digit	Setting selection for panel potentiometer less than minimum input (0 to 1, ditto)			

The function code is used to set analog quantity and its corresponding setting when the analog input voltage is less than the set Minimum Input.

Units digit and hundreds digit of the function code respectively correspond to the analog input AI1, panel potentiometer. If 0 is selected, when the analog input is less than the Minimum Input, the setting corresponding to the analog amount is the setting of minimum input of the function code curve (F1.13, F1.21).

	If 1 is selected, when the analog input is less than the minimum input, the setting corresponding to the analog amount is 0.0%.				
F1.26	HDI Minimum pulse input frequency	0.00kHz～F1.28		0.00kHz	☆
F1.27	HDI Minimum pulse input frequency setting	-100.0%～100.0%		0.0%	☆
F1.28	HDI Maximum pulse input frequency	F1.26～100.00kHz		50.00kHz	☆
F1.29	HDI Maximum pulse input frequency setting	-100.0%～100.0%		100.0%	☆
	This group function code is used to set the relationship between DI5 pulse frequency and its corresponding setting. Pulse frequency can be inputted into the inverter only through DI5 channel. The application on this group of functions is similar to curve 1, please refer to the description of curve 1.				
F1.30	DI filter time	0.000s～1.000s		0.010s	☆
	Set software filter time for DI terminals status. For the application that input terminals are vulnerable to interference and cause the accidental operation, you can increase this parameter so as to enhance the anti-interference ability. However, the increase of filter time will cause DI terminal slow response.				
F1.31	AI1 filter time	0.00s～10.00s		0.10s	☆
F1.33	Filtering time of panel potentiometer	0.00s～10.00s		0.10s	☆
F1.34	Filter time of pulse input	0.00s～10.00s		0.00s	☆

F1.35	DI terminal valid mode selection 1	Units digit	DI1 terminal active status setting		00000	★
		High level active		0		
		Low level active		1		
		Tens digit	DI2 terminal active status setting (0 to 1, as above)			
		Hundreds digit	DI3 terminal active status setting (0 to 1, as above)			
		thousands	DI4 terminal active status setting (0 to 1 , as above)			
		Ten thousands digit	DI5 terminal active status setting (0 to 1, as above)			
F1.36	DI terminal valid mode selection 2	Units digit	DI6 terminal active status setting		00000	★
		High level active	0			
		Low level active	1			
		Tens digit	DI7 terminal active status setting (0 to 1, as above)			
		Hundreds digit, thousands digit and ten thousands digit reserve				
	Used to set the digital input terminal active status mode. If high level is selected as active, it is active when the corresponding DI terminal and COM are connected, disconnected for inactive. If low level is selected as active, it is inactive when the corresponding DI terminal and COM are connected, disconnected for active.				
F1.37	DI1 delay time	0.0s～3600.0s		0.0s	★
F1.38	DI2 delay time	0.0s～3600.0s		0.0s	★
F1.39	DI3 delay time	0.0s～3600.0s		0.0s	★
	Used to set the inverter's delay time for the change of DI terminal status Currently only DI1, DI2, DI3 terminals can set the delay time function.				
F1.40	Define the input terminal repeat	0:Unrepeatable；1:Repeatable		0	★

> 0: unrepeatable Two different multi-function input terminals can not be set to the same function.
> 1:Repeatable Two different multi-function input terminals can be set to the same function

5-2-4.F2 group   Output terminals group

Code	Parameter name	Setting range	Factory setting	change
F2.02	Relay output function selection	0～42	2	☆
F2.04	SPA output function selection	0～42	1	☆

The above two function codes are used to select five digital output functions.
Multifunction output terminal function is described as follows:

Set value	Function	Explanation
0	No output	No output action
1	Inverter in service	The inverter is in operation with output frequency (zero), and outputs ON signal
2	Fault output (fault shutdown)	When the inverter occurs failure and stops, and outputs ON signal
3	Frequency level detection FDT1 output	Please refer to the instructions of function code F7.23,F7.24
4	Frequency arrival	Please refer to the instructions of function code 7.25
5	Zero speed running (Shutdown without output)	Outputs ON signal when the inverter is in operation with output frequency(zero) Outputs OFF signal when the inverter is in the sate of stop
6	Motor overload pre-alarm	Before motor overload protection action,it will output ON signal if it exceeds the pre-alarm threshold. Please refer to function code F8.02 to F8.04. for motor overload parameter setting.
7	Inverter overload pre-alarm	Outputs ON signal within 10s before inverter overload protection action
8	Set count value arrival	Outputs ON signal when the count value reaches the value set by E0.08.
9	Specified count value arrival	Outputs ON signal when the count value reaches the value set by E0.09. Please refer to the instructions of E0 group for counting function.
10	Length arrival	Outputs ON signal when the detected,ctual length exceeds the set length by E0.05.
11	PLC cycle completed	Outputs a width of 250ms pulse signal when simple PLC completes a cycle
12	Cumulative running time arrival	Outputs ON signal when the inverter's cumulative running time F6.07 exceeds the set time by F7.21.
13	Frequency being limited	Outputs ON signal when the rated frequency exceeds the upper limit frequency or the lower limit frequency, and the output frequency of inverter also reaches the upper limit frequency or the lower limit frequency.
14	Torque being limited	Outputs ON signal when the output torque reaches the torque limit value and the inverter is in the stall protection status under inverter speed control mode
15	Ready for operation	Outputs ON signal when the power supply of the inverter main circuit and control circuit has stabilized, and the inverter has not any fault information and is in the runnable status.
17	Upper limit frequency	Outputs ON signal when the operating frequency

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	arrival	reaches the upper limit frequency.
18	Lower limit frequency arrival (Shutdown without output)	Outputs ON signal when the operating frequency reaches the lower limit frequency Outputs OFF signal when the inverter is in the state of stop
19	Undervoltage status output	Outputs ON signal when the inverter is in the undervoltage condition
20	Communication setting	Please refer to communication protocol.
23	Zero speed running 2 (Shutdown with output)	Outputs ON signal when the inverter output frequency is 0. Outputs ON signal too when the inverter is in the state of stop
24	Accumulated power-on time arrival	Outputs ON signal when the inverter's accumulated power-on time(F6.08) exceeds the set time by F7.20.
25	Frequency level detection FDT2 output	Please refer to the instructions of function code F7.26, F7.27
26	Frequency 1 reaches output value	Please refer to the instructions of function code F7.28, F7.29
27	Frequency 2 reaches output value	Please refer to the instructions of function code F7.30, F7.31.
28	Current 1 reaches output value	Please refer to the instructions of function code F7.36., F7.37
29	Current 2 reaches output value	Please refer to the instructions of function code F7.38, F7.39
30	Timer reaches output value	Outputs ON signal when timer(F7.42)is active and after the inverter's current running time reaches the set time.
31	AI1 input exceed limit	Outputs ON signal when the analog input AI1 value is greater than F7.51 (AI1 input protection upper limit) or less than F7.50 (AI1 input protection limit)
32	Load droping	Outputs ON signal when the inverter is in the load drop status.
33	Reverse running	Outputs ON signal when the inverter is in the reverse running status.
34	Zero current status	Please refer to the instructions of function code F7.32, F7.33
35	Module temperature arrival	Outputs ON signal when the inverter module radiator temperature (F6.06) reaches the set temperature(F7.40).
36	Software current overrun	Please refer to the instructions of function code F7.34, F7.35
37	Lower limit frequency arrival(Stop with output)	Outputs ON signal when the operating frequency reaches the lower limit frequency Outputs ON signal too when the inverter is in the sate of stop
38	Alarm output	When the inverter occurs failure and continues to run, the inverter alarms output.
40	Current running time arrival	Outputs ON signal when the inverter's current running time exceeds the set time by F7.45.
41	Break fault	When inverter stop running because of break fault, it outputs active signal
42	High frequency output	When the output frequency larger than the closed set frequency of relay, it outputs active signal

F2.07	DA1 output function selection	0～17		2	☆
Analog output DA1 output range is 0V to 10V, or 0mA to 20mA. The range of pulse output					

or analog output and the corresponding calibration relation are shown in the following table:

Value	Function	Explanation
0	Running frequency	0 to maximum output frequency
1	Set frequency	0 to maximum output frequency
2	Output current	0 to 2 times rated motor current
3	Output torque	0 to 2 times rated motor torque
4	Output power	0 to 2 times rated power
5	Output voltage	0 to 1.2 times rated inverter voltage
6	High-speed pulse input	0.01kHz～100.00kHz
7	AI1	0V～10V(or 0～20mA)
10	Length	0 to maximum set length
11	Count value	0 to maximum count value
12	Communication setting	0.0%～100.0%
13	Motor speed	0 to speed with maximum output frequency
14	Output current	0.0A～100.0A
15	DC bus voltage	0.0V～1000.0V
17	Frequency source main set	0～max output frequency

F2.11	Relay output delay time	0.0s～3600.0s		0.0s	☆
F2.13	SPA output delay time	0.0s～3600.0s		0.0s	☆

Set the delay time from occurrence to Actual output for output terminal SPA and relay .

F2.15	DO output terminal active status selection	Units digit	Reserve		00000	☆
		Tens digit	Relay terminal active status setting(0～1, as above)			
		Positive logic		0		
		Anti-logic		1		
		Hundreds digit	Reserve			
		Thousands digit	SPA terminal active status setting(0～1, as above)			
		Tens thousands digit	Reserve			

To define the output logic for output terminal SPA and Relay

0: Positive logic:It is active status when the digital output terminal is connected with the corresponding common terminal, inactive when disconnected;

1: Anti-logic:It is inactive status when the digital output terminal is connected with the corresponding common terminal, active when disconnected;

F2.16	DA1 zero bias coefficient	-100.0%～+100.0%	0.0%	☆
F2.17	DA1 gain	-10.00～+10.00	1.00	☆

The above function codes are generally used for correcting the zero drift of analog output and the deviation of output amplitude. It also be used to custom analog output curve.

Take DAI as an example , calculation formula as follows:

y1 refers to the minimum output voltage value or current value of DA1; y2 refers to the maximum output voltage value or current value:y1=10V or 20mA*F2.16*100%；

$$y2=10V \text{ or } 20mA*(F2.16+F2.17);$$

Factory default F2.16=0.0%, F2.17=1, so the output 0~10v (or 0~ 20mA) is coreesponding to the minimum value to the maximum value of characterization of pahsical quantities.

Example 1:

Change the output 0～20mA to 4～20mA

According to the formula, minimum input current value:y1=20mA*F2.16*100%，

$$4=20*F2.16, \text{ work out } F2.16=20\%；$$

According to the formula , maximum input current value :y2=20mA*(F2.16+F2.17);

$$20=20*(20\%+F2.17)，\text{ work out } F2.17=0.8$$

Example 2:

Change the output 0~10V to 0~5V

According to the formula, minimum input voltage value: y1=10*F2.16*100%，

$$0=10*F2.16, \text{ work out } F2.16=0.0\%;$$

According to the formula, maximum input voltage value:y2=10*(F2.16+F2.17)；

$$5=10*(0+F2.17)，\text{ work out } F2.17=0.5$$

5-2-5.F3 group   Start and stop control group

Code	Parameter name	Setting range		Factory setting	change
F3.00	Start-up mode	Direct start up	0	0	☆
		Speed tracking restart	1		
		Pre-excitation start (AC asynchronous motor)	2		

0: Directly startup

If the start DC braking time is set to 0, the inverter starts running from the start frequency. If the start DC braking time is not set to 0, the inverter firstly performs DC braking and then starts running from the start frequency. Applicable for the small inertia load and the application that the motor may rotate when starting.

1: Speed tracking restart

The inverter firstly judges the speed and direction of motor, and then starts at the tracked motor frequency, smoothly starts the rotating motor without shocks. Applicable for the momentary power cut and restart with high inertia loads. To ensure the performance of Speed Tracking Restart, it is required to accurately set the parameters of motor b0 group.

2:Asynchronous motor pre-excitation start

Used to firstly create magnetic field before the motor running. Please refer to the instructions of function code F3.05, F3.06 for pre-excitation current and pre-excitation time.

If the pre-excitation time is set to 0, the inverter will cancel the pre-excitation process, and starts from the start frequency. If the pre-excitation time is not set to 0, the inverter will firstly perform pre-excitation process and then starts so as to improve the dynamic response performance of motor.

F3.01	Speed tracking mode	Start from stop frequency	0	0	★
		Start from zero speed	1		
		Start from maximum frequency	2		

For the shortest time to complete the process of speed tracking, select the speed mode for inverter tracking motor :

0: Track downward from the frequency that power outage happens,Usually select this mode.

1: Track upward from 0 frequency,for the case that power outage is for longer time and then restarts.

2: Track downward from maximum frequency,for the general power generation load.

F3.02	Speed tracking value	1～100	20	☆

When performing speed tracking restart, select speed tracking value.

Soft track:The larger the parameter value, the faster tracking. But if the value is set to too large, which may cause tracking unreliable.

F3.03	Start frequency	0.00Hz～10.00Hz	0.00Hz	☆
F3.04	Hold time for start frequency	0.0s～100.0s	0.0s	★

When the inverter starts, firstly run at the start frequency, the running time is the hold time for start frequency, afterwards run at the frequency reference.

The start frequency F3.03 is not limited by the lower limit frequency. But if the set target frequency is less than the start frequency, the inverter does not start and keeps in the standby

state.

The hold time for start frequency is inactive when switching between forward rotation and reverse rotation The hold time for start frequency is not included in the acceleration time, but the simple PLC run-time.

Example 1:

F0.03＝0 the frequency source is set to digital reference

F0.01＝2.00Hz the digital set frequency is 2.00Hz

F3.03＝5.00Hz the start frequency is 5.00Hz

F3.04＝2.0s the hold time for start frequency is 2.0s, at this time, the inverter will be in the standby state with the output frequency of 0.00Hz.

Example 2:

F0.03＝0 the frequency source is set to digital reference

F0.01＝10.00Hz the digital set frequency is 10.00Hz

F3.03＝5.00Hz the start frequency is 5.00Hz

F3.04＝2.0s the hold time for start frequency is 2.0s

At this point, the inverter accelerates to 5.00Hz for 2.0s, and then accelerates to the reference frequency of 10.00Hz.

F3.05	Start DC braking current	0%～100%	0%	★
F3.06	Start DC braking time	0.0s～100.0s	0.0s	★

Start DC braking, generally is used to stop and then restart the motor. Pre-excitation is used to create magnetic field for asynchronous motor and then start the motor to improve the response speed.

Start DC braking is only active when the start mode is the direct startup. The inverter firstly performs DC braking at the set start DC braking current, after the start DC braking time is passed, and then start running. If the DC braking time is set to 0, the inverter will directly start and neglect DC braking. The larger DC braking current, the greater braking force.

If the startup mode is the asynchronous motor pre-excitation start, the inverter firstly creates magnetic field at the preset pre-excitation current, after the set pre-excitation time is passed and then start running. If the pre-excitation time is set to 0, the inverter will directly start and neglect pre-excitation. Start DC braking current/pre-excitation current is the percentage of inverter rater current.

F3.07	Stop mode	0:deceleration parking ； 1:free stop	0	☆
F3.08	Initial frequency of stop DC braking	0.00Hz～F0.19(Maximum frequency)	0.00Hz	☆
F3.09	Waiting time of stop DC braking	0.0s～100.0s	0.0s	☆
F3.10	Stop DC braking current	0%～100%	0%	☆
F3.11	Stop DC braking time	0.0s～100.0s	0.0s	☆

Initial frequency of stop DC braking: if the operating frequency is reduced to the initial frequency when decelerating, DC braking process is started.

Waiting time of stop DC braking: if the operating frequency is reduced to the said initial frequency, the inverter firstly stops output for some time, and then DC braking process is started. In order to prevent overcurrent fault that DC braking may cause at the higher speeds.

Stop DC braking current: it indicates the percentage of the DC braking output current in the rated motor current. The larger this value, the stronger the DC braking effect, but the greater the heat of the motor and the inverter.

Stop DC braking time: If this value is 0, DC braking process is canceled. Please see the schematic diagram for the DC braking process.
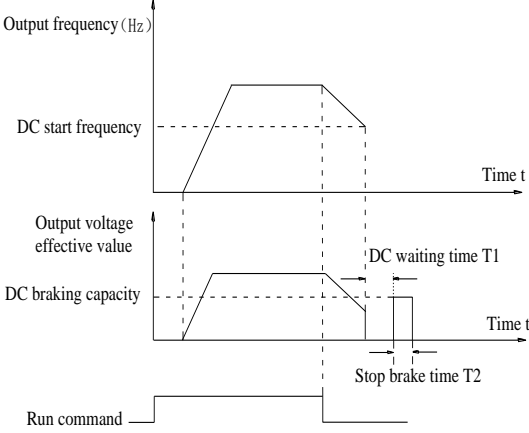
Figure 5-8:Schematic diagram of stop DC braking time

F3.12	Braking utilization rate	0%～100%		100%	☆
F3.13	Ac/deceleration mode	Linear acceleration and deceleration	0	0	★
		S curve acceleration and deceleration A	1		
		S curve acceleration and deceleration B	2		

Select the frequency change mode in the process of start/stop.

0: Linear acceleration and deceleration.The output frequency increases or decreases linearly. PI9000 provides four kinds of acceleration and deceleration time. You can select by the multi-function digital input terminals (F1.00 to F1.08).

1: S curve acceleration and deceleration A,The output frequency increases or decreases at the S curve. S-curve is used for the occasion that requires to gently start or stop, such as elevators, conveyor belts, etc.. The function code F3.14 and F3.15 respectively defined the proportion of S curve start-section and the proportion of S curve end-section.

2: S curve acceleration and deceleration B,In the mode of S curve acceleration and deceleration B, the motor rated frequency fb is always the inflection point of S curve. Usually used for the occasion of high-speed regional above the rated frequency that requires rapid acceleration and deceleration.

When the setting frequency is over than the motor's rated frequency, ac/deceleration time is:

$$t = \left[\frac{4}{9} \times \left(\frac{f}{f_b}\right)^2 + \frac{4}{9}\right] \times T$$

F is the setting frequency, fb is the rated frequency of motor, T is the acceleration time from 0 to the rated frequency fb.

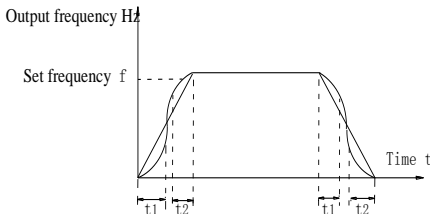| F3.14	Proportion of S curve start-section	0.0%～(100.0%~F3.15)	30.0%	★
F3.15	Proportion of S curve end-section	0.0%～(100.0%~F3.14)	30.0%	★

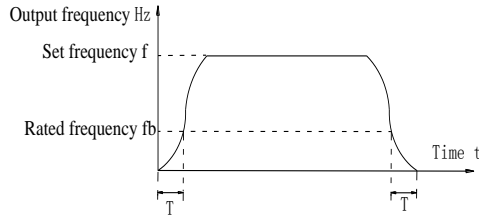Figure 5-9:Schematic diagram of S curve plus deceleration A

Figure 5-10:Schematic diagram of S curve plus deceleration B

The function code F3.14 and F3.15 respectively defined the proportion of start-section and the proportion of end-section for S curve acceleration and deceleration A，the two function code must meet: F3.14 + F3.15 ≤ 100.0%.

In the Figure of the S-curve acceleration and deceleration A, t1 is the time parameter defined by F3.14, the slope of the output frequency variation during this period is gradually increasing. t2 is the time parameter defined by F3.15, the slope of the output frequency variation during the period is gradually changed to 0. Within the time between t1 and t2, the slope of the output frequency variation is fixed, i.e. the linear acceleration and deceleration is achieved in this interval.

5-2-6.F4 group   V/F control parameters

This group of function code is only valid to V/F control, invalid to vector control.

V/F control is suitable for fans, pumps and other universal loads, or one inverter with multiple motors, or for the applications that inverter power is significantly different from the motor power.

Code	Parameter name	Setting range		Factory setting	Cha nge
F4.00	V/F curve setting	Linear V/F	0	0	★
		Multi-point V/F	1		
		Square V/F	2		
		1.2th power V/F	3		
		1.4th power V/F	4		
		1.6th power V/F	6		
		1.8th power V/F	8		
		Reserve	9		
		V/F completely separate	10		
		V/F half separate	11		

0: Linear V/F ,Suitable for ordinary constant torque load.

1: multi-point V/F ,Suitable for dehydrator, centrifuge and other special loads any V/F relationship curves can be obtained by setting parameters F4.03 to F4.08.

2: Square V/F ,Suitable for fans, pumps and centrifugal loads.

3 to 8: V/F relationship curve between linear V/F and square V/F.

10:VF separate completely mode. In this mode, the output frequency and output voltage is separated completely, no any relationship at all, the output frequency controlled by frequency source setting , but output voltage determined by F4.12 setting.(V/F separate voltage supply source) .V/F separated completely mode can suitable for in inductive heating, inverter power supply, torque motor, etc applications.

11: V/F semi-separate mode. V is proportional to F in this mode, but the proportional relationship can be set by F4.12 parameters, furthermore, the V and F proportion also relate to rated voltage of motor and rated frequency in b0 group. Assume that input voltage source is X (X value range from 0~100%), the output voltage V and output frequency F proportion relationship can be defined as : V/F=2*X*(rated voltage of motor)/(rated frequency of motor)

| F4.01	Torque boost	0.0%:automatic torque boost，0.1%～30.0%	0.0%	★
F4.02	Torque boost cut-off	0.00Hz～F0.19(Maximum frequency)	15.00Hz	★

	frequency			

Torque boost is mainly used to improve the characteristics of the torque low-frequency under V/F control mode. If the torque boost is too low, the motor will work at the lower speed and power. If the torque boost is too high, the motor will run with overexcitation, the inverter's output current increases and the efficiency is reduced.

It is recommended to increase this parameter when the motor works with heavy load but without enough torque. The torque boost can be reduced when the load is lighter. When the torque boost is set to 0.0, the inverter will automatically perform torque boost, the inverter can automatically calculates the required torque boost value according to the motor stator resistance parameters.

Torque boost cutoff frequency: Torque boost is valid below this frequency, invalid above the set frequency.
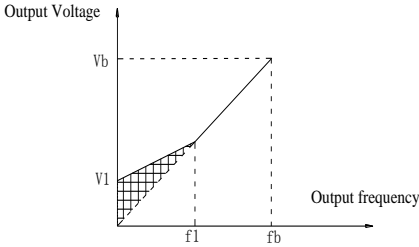
V1: Manual torque boost voltage   Vb: Maximum output voltage
f1: Manual torque boost cut-off frequency   fb: Rated operating frequency

Figure 5-11:Schematic diagram of manual torque boost voltage

F4.03	Multipoint V/F frequency point 1	0.00Hz～F4.05	0.00Hz	★
F4.04	Multipoint V/F voltage point 1	0.0%～100.0%	0.0%	★
F4.05	Multipoint V/F frequency point 2	F4.03～F4.07	0.00Hz	★
F4.06	Multipoint V/F voltage point 2	0.0%～100.0%	0.0%	★
F4.07	Multipoint V/F frequency point 3	F4.05～b0.04(rated motor frequency)	0.00Hz	★
F4.08	Multipoint V/F voltage point 3	0.0%～100.0%	0.0%	★

F4.03 to F4.08 six parameters are used to define multi-point V/F curve.

The multi-point V/F curve is set according to the load characteristics of motor, please be noted that the relationship between three voltage points and three frequency points must be meet: V1 <V2 <V3, F1 <F2 <F3. The setting of multi-point V/F curve is as shown in below figure.

In the sate of low frequency, if the voltage is set to a higher value, which may cause motor overheating even burned, the inverter may appear overcurrent stall or overcurrent protection.
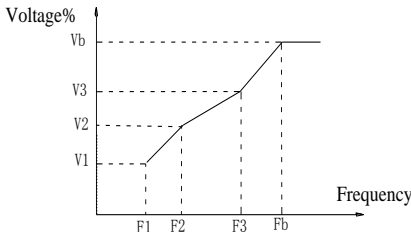
V1-V3: Voltage percentage of stage 1-3 to multi-speed V/F
F1-F3: Frequency percentage of stage 1-3 to multi-speed V/F
Vb: Rated motor voltage
Fb: Rated motor operating frequency

Figure 5-12:Schematic diagram of multi-point V/F curve setting				
F4.09	V/F Slip compensation coefficient	0%～200.0%	0.0%	☆

This parameter is valid only for asynchronous motors.

V/F slip compensation can compensate for the speed deviation of asynchronous motor when the load increases, so as to keep stable speed when the load changes.

If V/F slip compensation gain is set to 100.0%, it means that the compensated deviation is equal to the rated motor slip under the rated motor load mode, while the rated motor slip can be calculated through b0 group of motor rated frequency and rated speed.

When adjusting V/F slip compensation gain, generally it is based on the principle that the motor speed is same as the target speed. When the motor speed is different from target value, it is necessary to appropriately fine-tune the gain.

F4.10	V/F Overexcitation gain	0～200	64	☆

In the process of the inverter's deceleration, the over-excitation control can suppress the rise of bus voltage to avoid overvoltage fault. The greater overexcitation gain, the stronger the inhibitory effect.

For the occasions that the inverter's deceleration easily cause over pressure alarm, the overexcitation gain needs to be improved. But if overexcitation gain is too large, which easily lead to the increase of output current, you need to weigh in practical applications.

For the small inertia occasions that the inverter's deceleration will not cause voltage rise, it is recommended to et overexcitation gain as 0 ; the set value is also suitable for the occasions with braking resistor.

F4.11	V/F Oscillation suppression gain	0～100	0	☆

The method of selecting gain is take the value as smaller as possible with the premise that effectively suppressing oscillation, in order to avoid the adverse affect caused by V/F running. Please select 0 as the gain when the motor has not oscillation phenomenon. Only increase gain value when the motor has obvious oscillation , the greater gain, the more obvious the suppression of oscillation.

When using the function of oscillation suppression, which requires that the motor's rated current and no-load current parameters must be accurate, otherwise V/F oscillation suppression is ineffective.

F4.12	V/F separation voltage source	Digital setting (F4.13)	0	0	☆
		AI1	1		
		Reserve	2		
		Panel potentiometer	3		
		High-speed pulse setting (DI5)	4		
		Multistage instruction	5		
		Simple PLC	6		
		PID	7		
		Communication given	8		
		100.0% corresponding to the motor rated voltage (b0.02)			
F4.13	V/F separation voltage digital setting	0V to rated motor voltage	0V	☆
F4.14	V/F separation voltage rise time	0.0s～1000.0s	0.0s	☆

5-2-7.F5 group   Vector control parameter

F5 function code is only valid to vector control, invalid to V/F control

Code	Parameter name	Setting range	Factory setting	Change limit
F5.00	Proportion of speed loop G1	1～100	30	☆
F5.01	Speed loop integral T1	0.01s～10.00s	0.50s	☆
F5.02	Switching frequency 1	0.00～F5.05	5.00Hz	☆
F5.03	Proportion of speed loop G2	1～100	20	☆

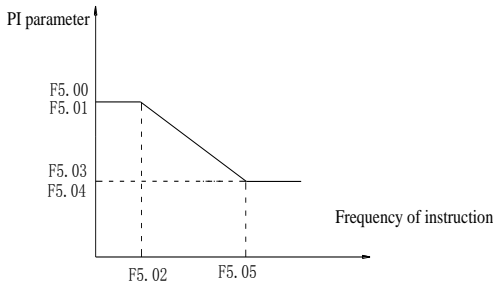| F5.04	Speed loop integral T2	0.01s～10.00s	1.00s	☆
F5.05	Switching frequency 2	F5.02～F0.19(Max frequency)	10.00Hz	☆

Figure 5-13:PI parameter diagram

Inverter working in different frequency can choose different speed ring PI parameters. Operating frequency is less than the switching frequency 1 (F5.02), speed ring PI control parameters for F5.00 and F5.01. Operating frequency is bigger than the switching frequency 2 (F5.05), speed in PI control parameters for F5.03 and F5.04. The speed ring PI parameters of switching frequency 1 and switching frequency 2 are for the two groups of PI parameter linear switching, as shown in figure:

By setting speed regulator proportion coefficient and the integral time, can adjust the speed of the vector control dynamic response characteristics.

Gain take large, quick response, but too large will produce oscillation; Gain take hours, response lag.

Integral time is too large, slow response, external interference control variation will worse;If integral time short, reaction quickly,too small happen oscillation.

Set this value to considering the control stability and response speed, if the factory parameters can't meet the requirements, adjust parameter based on the factory, first increase proportion to ensure the system is not oscillation; Then reduced integration time, make the system has faster response, small overshoot.

Note: if the PI parameters Settings unsuitable, may cause excessive speed overshoot. Even in overshoot back occurs when overvoltage fault.

F5.06	Speed loop integral	valid	0	0	☆
		Invalid	1		
F5.07	Torque limit source under speed control mode	Function code F5.08 setting	0	0	☆
		Analog AI1 setting	1		
		Reserve	2		
		Panel potentiometer setting	3		
		High-speed pulse setting	4		
		Communication setting	5		
F5.08	Limit digital setting	0.0%～200.0%	150.0%	☆

In speed control mode, the maximum value of inverter output torque is controlled by the torque upper limit source.

F5.07 is used to select the setting source of torque limit, when it is set by analog, high-speed pulse or communication, the set 100% corresponds to F5.08, the 100% of F5.08 is the inverter's rated torque.

F5.09	Vector control differential gain	50%～200%	150%	☆

For the sensorless vector control, the parameter can be used to adjust the motor speed and stability: if the speed of motor with load is low, increases the parameter and vice versa decreases.

F5.10	Speed loop filter time	0.000s～0.100s	0.000s	☆

Under vector control mode, properly increases the filter time when speed fluctuate wildly;

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but do not excessively increases, or the lag effect will cause shock.				
F5.11	Vector control overexcitation gain	0～200	64	☆

In the process of the inverter's deceleration, the over-excitation control can suppress the increase of bus voltage to avoid overvoltage fault. The greater overexcitation, the stronger the inhibitory effect.

For the occasions that the inverter's deceleration easily cause over pressure alarm , the overexcitation gain needs to be improved. But if overexcitation gain is too large, which easily lead to the increase of output current, you need to weigh in practical applications.

For the small inertia occasions that the inverter's deceleration will not cause voltage rise, it is recommended to set overexcitation gain as 0; the set value is also suitable for the occasions with braking resistor.

F5.12	Excitation regulator proportional gain	0～60000	2000	☆
F5.13	Excitation regulator integral gain	0～60000	1300	☆
F5.14	Torque regulator proportional gain	0～60000	2000	☆
F5.15	Torque regulator integral gain	0～60000	1300	☆

The regulator parameters of vector control current loop PI, the parameter will be obtained automatically after performing asynchronous motor parameters comprehensive auto tunning and generally do not need to modify it.

Note:the dimension that this current loop integral gain adopted is not the integration time, but the direct set integral gain. Therefore, if the setting of current loop PI gain is too large, which may cause the oscillation of entire control loop, in the event of oscillation, you can manually reduce PI proportional gain and integral gain.

5-2-8.F6 group   Keyboard and display

Code	Parameter name	Setting range		Factory setting	Change limits
F6.00	STOP/RESET key functions	STOP/RESET key is enabled only in keyboard operation mode	0	1	☆
		STOP/RESET key is enabled under any operation mode	1		
F6.01	Running status display paramters 1	0x0000 ～0xFFFF		001F	☆

Figure 5-14:Running status display parameters 1

If the above parameters need to be displayed in operation, firstly set its position to 1, and then set at F6.01 after converting the binary number to the hexadecimal number

e.g.:

Select monitor loading speed, set F6.01 No 14=1; Select monitor AI1 voltage, set F6.01 No 9=1. The rest be deduced by analogy. Hypothesis according to the requirement to all relative position is set to 1 after get the following data:

tag number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

number	0	1	1	1	1	0	1	0	0	1	0	0	1	1	1	1

To devide four data into a group , total four groups.

Position No.	15-12	11-8	7-4	3-0
Value	0111	1010	0100	1111

Then can check out the result 0x7A4F according to the below table (binary/ hexadecimal value table).

Binary	Hexadecimal	Binary	Hexadecimal	Binary	Hexadecimal	Binary	Hexadecimal
0000	0	0100	4	1000	8	1100	C
0001	1	0101	5	1001	9	1101	D
0010	2	0110	6	1010	A	1110	E
0011	3	0111	7	1011	B	1111	F

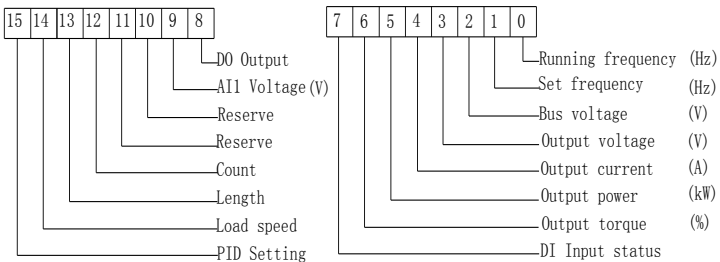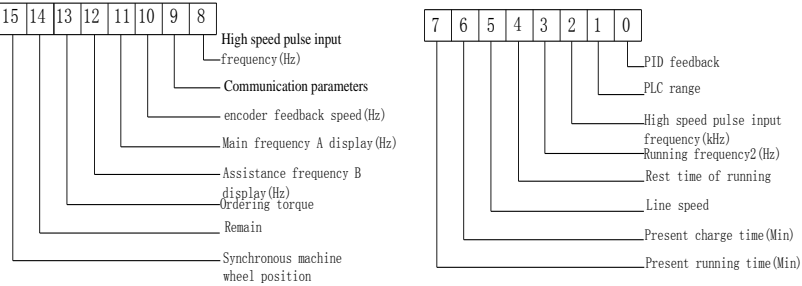| F6.02	Running status display parameters 2	0x0000 ～0xFFFF	0000	☆

Figure 5-15:Running status display parameters 2

If the above parameters need to be displayed in operation, firstly set its position to 1, and then set at F6.02 after converting the binary number to the hexadecimal number.

Running status display parameters, which is used to set the parameters that can be viewed when the inverter is in operation.

There are 32 parameters available for viewing, select desired status parameters according to F6.01, F6.02 binary parameter values, the display order starts from the lowest level of F6.01.

F6.03	Stop status display parameters	0x0001～0xFFFF	0013	☆
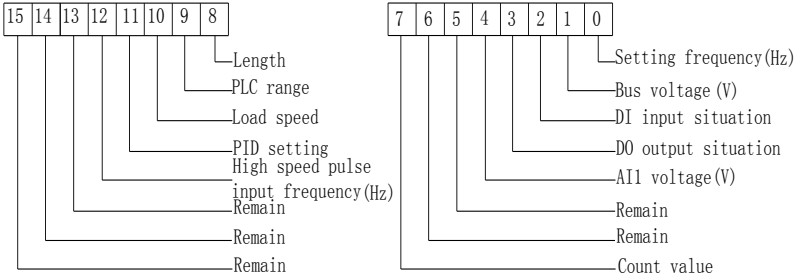
Figure 5-16:Stop status display parameters

If the above parameters need to be displayed on operation, firstly set its position to 1, and then set at F6.03 after converting the binary number to the dexadecimal number. Please see the detail of converting the binary number to the hexadecimal number.

F6.04	Load speed display coefficient	0.0001～6.5000	3.0000	☆

When load speed needs to be displayed , adjust the inverter's output frequency and load speed by using the parameter.

F6.05	Decimal places for load speed display	0 decimal place	0	1	☆
		1 decimal place	1		
		2 decimal places	2		
		3 decimal places	3		

Decimal places for load speed display The below example illustrates the calculation of load speed:

If the load speed coefficient(F6.04) is 2.000, the number of decimal places of load speed(F6.05) is 2 (two decimal places), when the inverter operating frequency reaches 40.00Hz, the load speed is : 40.00 * 2.000 = 80.00 (2 decimal places display) .If the inverter is shutdown, the load speed displays the speed relative to the set frequency, that is the "set load speed". If the set frequency is 50.00Hz, the load speed under the state of shutdown: 50.00 * 2.000 = 100.00 (2 decimal places display).

| F6.06 | Inverter module radiator temperature | 0.0℃～100.0℃ | - | ● |

Display the inverter module IGBT temperature.The different models of the inverter module vary IGBT overtemperature protection values.

| F6.07 | Total run time | 0h～65535h | - | ● |

Display the total run time of inverter. When the run time reaches the set time (F7.21), the inverter's multi-function digital output function (12) outputs ON signal.

| F6.08 | Total power-on time | 0～65535h | - | ● |

Display the total power-on time after factory. When the power-on time reaches the set time (F7.20), the inverter's multi-function digital output function (24) outputs ON signal.

| F6.09 | Total power consumption | 0～65535 Kwh | - | ● |

Display the total power consumption of inverter to date until now

F6.10	Product number	Inverter product number	-	●
F6.11	Software version number	Control panel software version number	-	●
F6.17	Power correction coefficient	0.00～10.00	1.00	☆

Frequency Inverter with motor running , the display output power(d0.05) is different with the actual output power, through the parameters , adjust the converter display power and the actual output power corresponding relation.

| F6.18 | Keyboard lock selection | 0: Only RUN, STOP key is valid
1: All the key
2: Only RUN, STOP, UP, DOWN key is valid
3: Only STOP key is valid | 1.00 | ☆ |

At the same time press ENTER+SHIFT key to achieve lock and unlock.

When the keyboard is locked, press the keyboard is locked key, the digital display tube will display "A." in the front, such as the keyboard shows 50, when the lock, press the keyboard "PGR" key, digital tube display "A.50.00" "

5-2-9.F7 group   Auxiliary function

Code	Parameter name	Setting range	Factory setting	Change limit
F7.00	Jog running frequency	0.00Hz～F0.19(Maximum frequency)	6.00Hz	☆
F7.01	Jog acceleration time	0.0s～6500.0s	5.0s	☆
F7.02	Jog deceleration time	0.0s～6500.0s	5.0s	☆

Defined the inverter's reference frequency and ac/deceleration time when jogging .In operation of Jog, the startup mode is fixed as direct startup mode (F3.00 = 0), the shutdown mode is fixed as deceleration parking mode (F3.07 = 0).

| F7.03 | Jog priority | Invalid | 0 | 0 | ☆ |
| | | Valid | 1 | | |

The parameter is used to set whether the priority of jog function is active or not. When it i

set to active, if the jog command is received by inverter in operation, the inverter will change to jog running status.

F7.04	Jump frequency 1	0.00Hz～F0.19 (Maximum frequency)		0.00Hz	☆
F7.05	Jump frequency 2	0.00Hz～F0.19 (Maximum frequency)		0.00Hz	☆
F7.06	Jump frequency range	0.00Hz～F0.19 (Maximum frequency)		0.00Hz	☆

When the set frequency is in the jump frequency range, the Actual operating frequency will run at the jump frequency close from the set frequency . The inverter can avoid mechanical resonance point of load by setting jump frequency.

PI160 can set two jump frequency points, if the two jump frequencies are set to 0, the jump frequency function will be canceled. For the principle schematic of jump frequency and its range, please refer to the following figure.
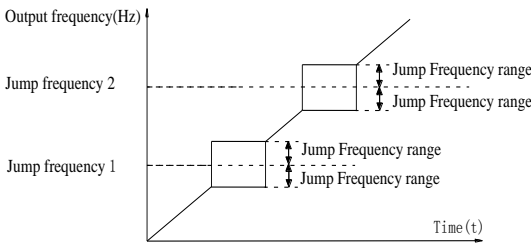

Figure 5-17:Schematic diagram of jump frequency

F7.07	Jump frequency availability during ac/deceleration process	invalid	0	0	☆
		valid	1		

The function code is used to set whether the jump frequency is active or not in the process of acceleration and deceleration.

If it is set to active, when the operating frequency is in the jump frequency range, the actual operating frequency will skip the set jump frequency boundary. The below figure below shows the jump frequency status in the process of acceleration and deceleration .
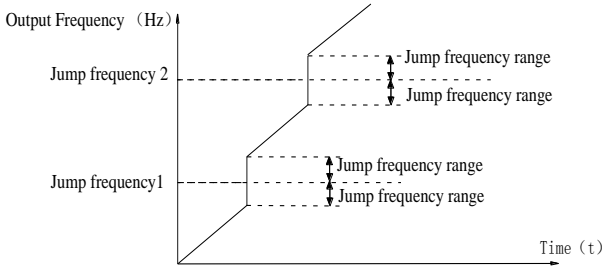
Figure 5-18:Schematic diagram of jump frequency availability in the process of acceleration and deceleration

F7.08	Acceleration time 2	0.0s～6500.0s	-	☆
F7.09	Deceleration time 2	0.0s～6500.0s	-	☆
F7.10	Acceleration time 3	0.0s～6500.0s	-	☆
F7.11	Deceleration time 3	0.0s～6500.0s	-	☆
F7.12	Acceleration time 4	0.0s～6500.0s	-	☆
F7.13	Deceleration time 4	0.0s～6500.0s	-	☆

PI160 provides 4 groups of deceleration time, respectively F0.13/F0.14 and the above 3 groups of deceleration time.

The 4 groups of deceleration time are defined exactly the same , please refer to the instructions of F0.13 and F0.14 . The 4 groups of deceleration time can be switched through defferent combinations of the multi-function digital input terminal DI, please refer to the instructions of function code F1.00 to F1.07 in the attachment 2 for the detailed application methods.

F7.14	Switching frequency point between acceleration time 1 and acceleration time 2	0.00Hz～F0.19 (Maximum frequency)	0.00Hz	☆
F7.15	Switching frequency point between deceleration time 1 and deceleration time 2	0.00Hz ~ F0.19 (Maximum frequency)	0.00Hz	☆

The function is active when motor 1 is selected and DI teminal is not selected to switch between ac/deceleration .it is used to automatically select ac/deceleration time by not DI terminal but the operating frequency range when the inverter is running.
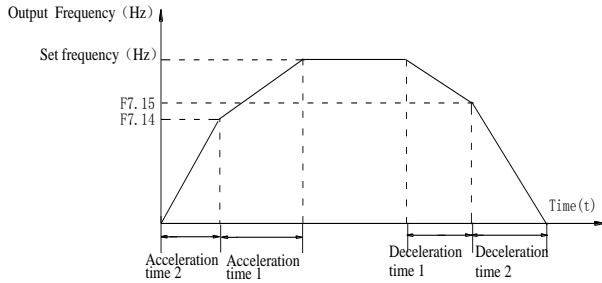

Figure 5-19:Schematic diagram of switching between acceleration and deceleration

For the above figure in the process of acceleration, if the operating frequency is less than F7.14, select acceleration time 1; otherwise select acceleration time 2.

For the above figure in the process of deceleration , if the operating frequency is more than F7.15, select deceleration time 2; otherwise select deceleration time 2.

F7.16	Forward/reverse rotation deadband	0.00s～3600.0s		0.0s	☆

It is the waiting time that the inverter reaches zero speed when the parameter is used to switch between forward and reverse rotation.
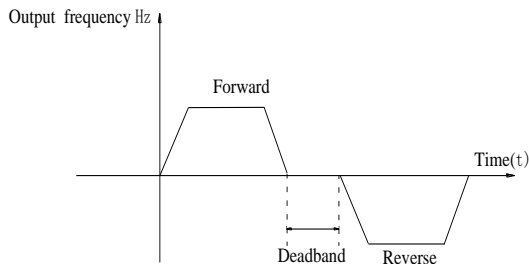
Figure 5-20:Schematic diagram of the deadband of forward and reverse

F7.17	Reverse rotation control	Allow	0	0	☆
		Prohibit	1		

For certain production equipments, the reverse rotation may result in damage to the equipment, the function can disable the reverse rotation. The factory default allows reverse rotation.

F7.18	Set frequency lower than lower limit frequency mode	Running at lower limit frequency	0	0	☆
		Stop	1		
		Zero speed running	2		

When the set frequency is lower than the lower limit frequency , the inverter operating status can be selected through the parameter. PI160 provides three modes of operation to meet the needs of a variety of applications.

F7.19	Droop control	0.00Hz～10.00Hz	0.00Hz	☆

This function is generally used for the load distribution that several motors drag the same one load.

The droop control means that the inverter output frequency is decreased as the load is increased , so that when several motors drag (work for) the same one load, each motor's output frequency much drops, which can reduce the load of the motor to balance evenly multiple motor's load.This parameter means the decreased value of output frequency when the inverter outputs the rated load.

F7.20	Setting cumulative power-on arrival time	0h～36000h	0h	☆

When the total power-on time (F6.08) reaches the time set by F7.20 , the inverter multifunction digital DO outputs ON signal.

F7.21	Setting cumulative running arrival time	0h～36000h	0h	☆

Used to set the running time of inverter.When the total power-on time (F6.07) reaches the set time F7.21, the inverter multifunction digital DO outputs ON signal

F7.22	Start protection	off	0	0	☆
		On	1		

This parameter relates to the security features of the inverter

If this parameter is set to 1 , and if the running command is active (e.g. the terminal running command is closed before power-on) when the inverter is in power-on, the inverter will not respond to the running command, you must firstly cancel the running command, when the running command is active again, the inverter will respond.

In addition, if the parameter is set to 1, and if the running command is active when the inverter resets fault, the inverter will not respond to the running command, you must firstly cancel the running command in order to eliminate running protection status.

The parameter is set 1, you can prevent the danger caused by that the inverter unknowingly responds to the running command in the event of power-on and fault reset.

F7.23	Frequency detection value FDT1	0.00Hz～F0.19 (Maximum frequency)	50.00Hz	☆
F7.24	Frequency detection hysteresis value FDT1	0.0%～100.0%(FDT1 level)	5.0%	☆

The inverter's multifunction output DO will output ON signal when the operating frequency is higher than the detected value, conversely DO output ON signal is canceled.

The above parameters is used to set the detected value of output frequency, and the hysteresis value after the output is canceled. Of which, F7.24 is the percentage of the hysteresis frequency in the detected value(F7.23). The below figure is the schematic diagram of FDT.

Figure 5-21:Schematic diagram of FDT level

F7.25	Frequency reaches detection	0.00～100%(Maximum frequency)	0.0%	☆

	width			

Output Frequency Hz

Set frequency

Detection amplitude

Time(t)

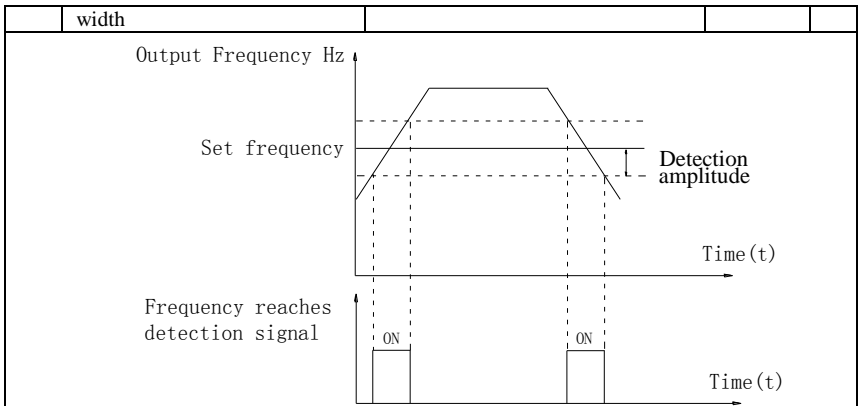Frequency reaches detection signal

ON   ON

Time(t)

Figure 5-22:Schematic diagram of frequency arrival detection amplitude

The inverter's multifunction output DO will output ON signal when the inverter's operating frequency is in a certain range of target frequency

This parameter is used to set the frequency arrival detection range, the parameter is the percentage of maximum frequency. The above figure is the schematic diagram of frequency arrival.

F7.26	Frequency detection value (FDT2)	0.00Hz～F0.19 (Maximum frequency)	50.00Hz	☆
F7.27	Frequency detection hysteresis (FDT2)	0.0%～100.0%(FDT2 level)	5.0%	☆

The frequency detection function is same as FDT1 exactly , please refer to the instructions of FDT1 or function codes F7.23, F7.24.

F7.28	Random arrivals frequency detection value 1	0.00Hz～F0.19 (Maximum frequency)	50.00Hz	☆
F7.29	Random arrivals frequency detection width 1	0.0%～100.0%(Maximum frequency)	0.0%	☆
F7.30	Random arrivals frequency detection value 2	0.00Hz～F0.19(Maximum frequency)	50.00Hz	☆
F7.31	Random arrivals frequency detection width 2	0.0%～100.0%(Maximum frequency)	0.0%	☆

When the inverter's output frequency randomly reaches the range of the detected value(positive or negative), the multi-function DO will output ON signal.

PI160 provides two groups of parameter to set frequency value and frequency detection range. The above figure is the schematic diagram of the function.

Running frequency

Random arrivals frequency

Frequency detection range
Frequency detection range

Time(t)

Random arrivals frequency detection signal DO or relay

ON   ON
OFF   OFF   OFF

Figure 5-23:Schematic diagram of random arrivals frequency detection

F7.32	Zero current detection level	0.0%～300.0%(rated motor current)	5.0%	☆

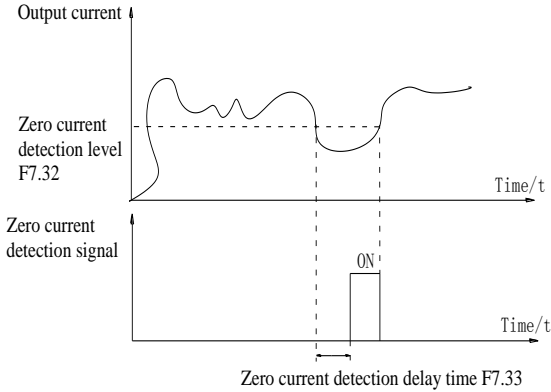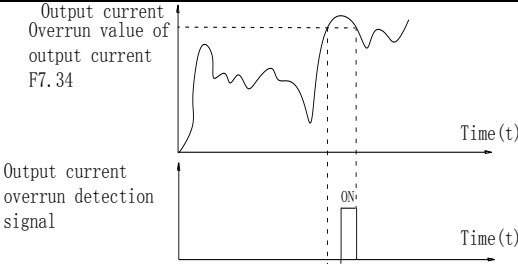| F7.33	Zero current detection delay time	0.01s～360.00s		0.10s	☆

Figure 5-24:Zero current detection delay time

When the inverter's output current is less than or equal to zero current detection level and lasts for longer than the delay time of zero-current detection, the inverter's multifunction DO will output ON signal. The figure is the schematic diagram of zero current detection.

F7.34	Overrun value of output current	0.0%(not detected) 0.1%～300.0%(rated motor current)	200.0%	☆
F7.35	Output current overrun detection delay time	0.01s～360.00s	0.00s	☆

Figure 5-25:Schematic diagram of Zero current

When the inverter's output current is less than or equal to zero current detection level and lasts for longer than the delay time of zero-current detection, the inverter's multifunction DO will output ON signal. The figure is the schematic diagram of zero current detection.

F7.36	Random arrivals current 1	0.0% to 300.0% (Rated motor current)	100%	☆
F7.37	Random arrivals current 1 width	0.0% to 300.0% (Rated motor current)	0.0%	☆
F7.38	Random arrivals current 2	0.0% to 300.0% (Rated motor current)	100%	☆
F7.39	Random arrivals current 2 width	0.0% to 300.0% (Rated motor current)	0.0%	☆

When the inverter's output current randomly reaches the range of the current detection width(positive or negative), the inverter multifunction DO will output ON signal.

PI160 provides two group of sets of parameter for Randomly Reaches Current and Detection Width, the figure is the functional diagram.
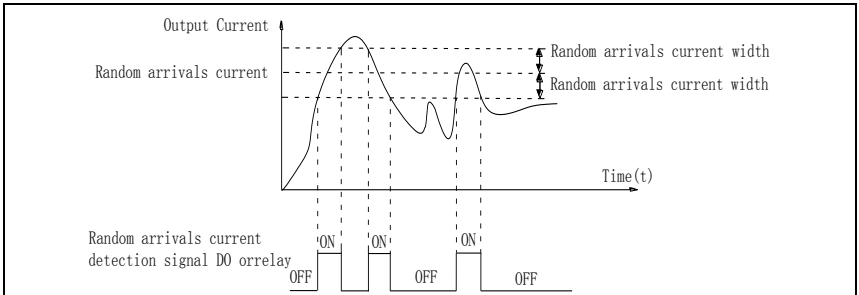
Figure 5-26:Schematic diagram of random arrivals current detection

F7.40	Module temperature arrival	0℃ to 100℃		75℃	☆
	When the inverter radiator temperature reaches the temperature, the inverter multifunction DO will output "Module Temperature Arrival" ON signal.				
F7.41	Cooling fan control	Fan running only when running	0	0	☆
		Fan always running	1		
	Used to select the cooling fan mode, if you select 0, the fan will run when the inverter is running, but in the stop state of inverter, if the radiator temperature is above 40 degrees, the fan will run, otherwise the fan will not run.If you select 1, when the fan will always running after power-on. Note:PI9100A fan without control.				
F7.42	Timing function selection	Invalid	0	0	☆
		Valid	1		
F7.43	Timing run time selection	F7.44 setting	0	0	☆
		AI1 setting	1		
		Reserve	2		
		Panel potentiometer setting	3		
		Analog input range 100% corresponds to F7.44			
F7.44	Timing run time	0.0Min to 6500.0Min		0.0Min	☆
	The group of parameters are used to complete the inverter timing run function. If F7.42 timing function is active, the inverter starts as the timer starts, when the set timing run time is reached, the inverter automatically shut down, at the same time the multi-function DO will output ON signal.Every time the inverter starts, the timer will time from 0, the remaining time can be viewed by d0.20. The timing run time is set by F7.43, F7.44 in minute.				
F7.45	Current running arrival time.	0.0Min to 6500.0Min		0.0Min	☆
	When current running time reaches this time, the inverter multi-function digital DO will output"Current Running Time Arrival "ON signal.				
F7.46	Awakens frequency	dormancy frequency(F7.48)to maximum frequency (F0.19)		0.00Hz	☆
F7.47	Awakens delay time	0.0s to 6500.0s		0.0s	☆
F7.48	Dormancy frequency	0.00Hz to awakens frequency(F7.46)		0.00Hz	☆
F7.49	Dormancy delay time	0.0s to 6500.0s		0.0s	☆
F7.50	AI1 input voltage protection lower limit	0.00V to F7.51		3.10V	☆
F7.51	AI1 input voltage protection upper limit	F7.50 to 10.00V		6.80V	☆
	When analog AI1 input is greater than F7.51, or when AI1 input is less than F7.50, the inverter multi-functional DO will output "AI1 input overrun"signal, so as to indicate whether the AI1 input voltage is within the set range or not.				

5-2-10.F8 group   Fault and protection

Code	Parameter name	Setting range		Factory setting	Change limits
F8.00	Overcurrent stall gain	0 to 100		20	☆
F8.01	Overcurrent stall protection current	100% to 200%		150%	☆
		In the process of the inverter acceleration and constant-speed-running, when the output current reachto the overcurrent stall protection current (F8.01), the inverter lower the output frequency; In the process of inverter deceleration, they slow down the rate of decline,then working frequency recover until the current less than overcurrent stall protection current (F8.01)			

In the process of the inverter acceleration and constant-speed-running, when the output current reachto the overcurrent stall protection current (F8.01), the inverter lower the output frequency; In the process of inverter deceleration, they slow down the rate of decline,then working frequency recover until the current less than overcurrent stall protection current (F8.01)

Overcurrent stall gain is used for adjusting inhibition overcurrent capability during ac/deceleration. The greater this value, the stronger inhibition overcurrent capability Under the premise that the overcurrent does not occur, the best is the smaller gain setting.

For the small inertia load, the overcurrent stall gain should be small, otherwise which cause the slower system dynamic response. For the big inertia load, the overcurrent stall gain should be large, otherwise the poor inhibitory effect may cause overcurrent fault.When the overcurrent stall gain is set to 0, the overcurrent stall function will be canceled.

F8.02	Motor overload protection	Prohibit	0	1	☆
		Allow	1		
F8.03	Motor overload protection gain	0.20 to 10.00		1.00	☆

F8.02 = 0: No motor overload protection function, there may be the risk of damage to the motor due to overheating, it is recommended that the thermal relay is installed between the inverter and the motor;

F8.02 = 1: The inverter will determine whether the motor is overloaded or not according to the inverse time curve of motor overload protection. Inverse time curve of motor overload protection: 220% x (F8.03) x rated motor current, if this lasts for 1 second, the alarm of motor will be prompted overload fault; 150% x (F8.03) ×rated motor current, if this lasts for 60 seconds, the alarm of motor overload will be prompted.

User shall correctly set the value of F8.03 according to the Actual motor overload capacity, if the value is set to too large , which may easily lead to motor overheating and damage while the inverter will not alarm!

F8.04	Motor overload pre-alarm coefficient	50% to 100%	80%	☆

This function is used in the front of motor overload fault protection, and sends a pre-alarm signal to the control system by DO. The warning coefficient is used to determine the extent of pre-alarm prior to motor overload protection. The higher the value, the smaller the extent of pre-alarm in advance.

When the cumulative amount of inverter output current is greater than the product of the inverse time curve of overload and F8.04, the inverter multi-function digital DO will output "Motor Overload Pre-Alarm" ON signal.

F8.05	Overvoltage stall gain	0 (no overvoltage stall) to 100	0	☆
F8.06	Overvoltage stall protection voltage / energy consumption brake voltage	120% to 150%(three-phase)	130%	☆

In the process of the inverter deceleration, when the DC bus voltage exceeds the overvoltage stall protection voltage/the energy consumption brake voltage, the inverter stops deceleration and maintains at the current operating frequency(if F3.12 is not set to 0, the braking signal is outputted the energy consumption brake can be implemented by an external braking resistor.) and then continues to decelerate upon decline of the bus voltage

Overvoltage stall gain is used for adjusting inhibition overvoltage capability during deceleration. The greater this value, the stronger inhibition overvoltage capability under the premise that the overvoltage does not occur, the best is the smaller gain setting.

For the small inertia load, the overvoltage stall gain should be small, otherwise which cause the slower system dynamic response. For the big inertia load, the overvoltage stall gain

should be large, otherwise the poor inhibitory effect may cause overvoltage fault.

When the overvoltage stall gain is set to 0, the overvoltage stall function will be canceled.

| F8.08 | Output phase loss protection selection | Prohibit | 0 | 1 | ☆ |
| | | Allow | 1 | | |

Select whether the output phase loss protection is done or not.

| F8.09 | Power-on short circuit to ground | Invalid | 0 | 1 | ☆ |
| | | Valid | 1 | | |

You can detect whether the motor is shorted to ground when the inverter is powered on.If this function is active, the inverter's UVW terminal will output voltage after power-on for a while.

| F8.10 | Number of automatic fault reset | 0 to 32767 | 0 | ☆ |

When the inverter selects automatic fault reset, it is used to set the number of times of automatic fault reset. If the set number of times is exceeded, the inverter remains a failed state.When set F8.10 (number of automatic fault reset) ≥ 1, inverter will run automatically when repower after instantaneous power-off. When fault self-recovery restart uptime over an hour later, it will restore the original setting of automatic fault reset.

| F8.11 | Fault DO action selection during automatic fault reset | OFF | 0 | 0 | ☆ |
| | | ON | 1 | | |

If the inverter automatic fault reset function is set, F8.10 can be used to set whether DO action is active or not during the automatic fault reset

| F8.12 | Automatic fault reset interval | 0.1s to 100.0s | 1.0s | ☆ |

It is the waiting time from the inverter fault alarm to automatic fault reset.

F8.17	Fault protection action selection 1	Units digit	Motor overload (Fault ID Err.11)		00000	☆
			Free stop	0		
			Stop at the selected mode	1		
			Continue to run	2		
		Tens digit	Input phase loss(Fault ID Err.12)(Same as units digit)			
		Hundreds digit	Output phase loss(Fault ID Err.13)(Same as units digit)			
		Thousands digit	External fault(Fault ID Err.15)(Same as units digit)			
		Ten thousands digit	Communication abnormal(Fault ID Err.16)(Same as units digit)			
F8.18	Fault protection action selection 2	Units digit	Reserve		00000	☆
		Tens digit	Function code fault(Fault ID Err.21)			
			Free stop	0		
			Switch to V/F and then stop at the selected mode	1		
		Hundreds digit	Reserve			
		Thousands digit	Reserve			
		Ten thousands digit	Running time arrival(Fault ID Err.26)(same as F8.17 units digit)			
F8.19	Fault protection action selection 3	Units digit	Custom fault 1 (Fault ID Err.27)(same as F8.17 units digit)		00000	☆
		Tens digit	Custom fault 2 (Fault ID Err.28)(same as F8.17 units digit)			

		Hundreds digit	Power-on time arrival(Fault ID Err.29)(same as F8.17 units digit)			
		Thousands digit	Load drop(Fault ID Err.30)			
		Free stop		0		
		Stop at the selected mode		1		
		Decelerate to 7% of the rated frequency of motor and continue to run, automatically return to the set frequency to run if the load drop does not happen.		2		
		Ten thousands digit	PID feedback loss when running(Fault ID Err.31)(same as F8.17 units digit)			
F8.20	Fault protection action selection 4	Units digit	Too large speed deviation (Fault ID Err.42)(same as F8.17 units digit)		00000	☆
		Tens digit	Motor overspeed(Fault ID Err.43)(Same as F8.17 units digit)			
		Hundreds digit	Initial position error(Fault ID Err.51)(same as F8.17 units digit)			
		Thousands digit	Reserve			
		Ten thousands digit	Reserve			

When "free stop" is selected, the inverter displays Err. *, and directly stops.When "Stop at the selected mode" is selected, the inverter displays Arr. *, firstly stops at the selected mode and then displays Err. * When "continue to run" is selected, the inverter continues to run and displays Arr. *, the operating frequency is set by F8.24.

		Running at current frequency	0		
F8.24	Continue running frequency selection when failure happens	Running at set frequency	1	0	☆
		Running at upper limit frequency	2		
		Running at lower limit frequency	3		
		Running at abnormal spare frequency	4		
F8.25	Abnormal spare frequency	60.0% to 100.0%		100	☆

When the inverter occurs faults during operation, and the troubleshooting mode for the fault is set to "continue to run", the inverter displays Arr. *, and runs at the operating frequency set by F8.24.
When "abnormal spare frequency" is selected, the value set by F8.25 is the percentage of the maximum frequency

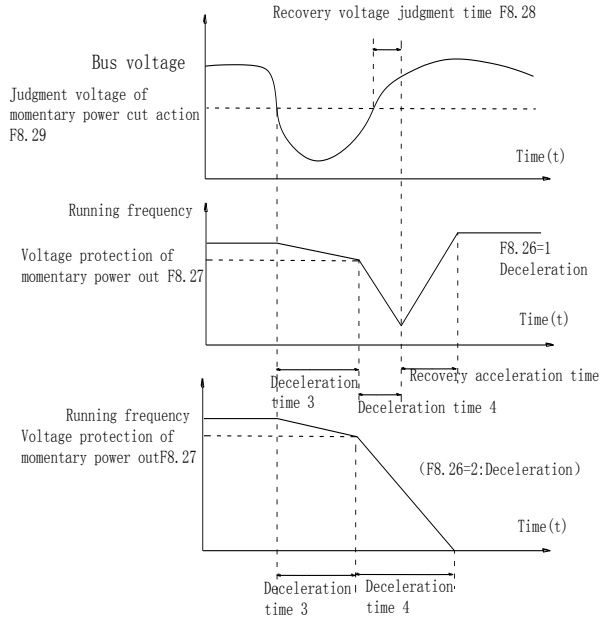|		Invalid	0		
F8.26	Momentary power cut action selection	Deceleration	1	0	☆
		Deceleration and stop	2		
F8.27	Voltage protection of momentary power cut	50.0% to 100.0%		90%	☆
F8.28	Recovery voltage judgment time of momentary power cut	0.00s to 100.00s		0.50s	☆
F8.29	Judgment voltage of momentary power cut no action	50.0% to 100.0% (Standard bus voltage)		80.0%	☆

Figure 5-27:Schematic diagram of momentary power cut action

This feature means that when the momentary power cut happens or the voltage suddenly reduces, the drive will reduce the output speed to compensate the reduced value of the inverter DC bus voltage by using load feedback energy, in order to maintain the inverter to continue running.

If F8.26 = 1, when the momentary power cut happens or the voltage suddenly reduces, the inverter will decelerate, when the bus voltage is back to normal, the inverter will normally accelerate to the set frequency to run. To determine whether the bus voltage returns to normal or not, check whether the bus voltage is normal and lasts for longer than the set time by F8.28.

If F8.26 = 2, when the momentary power cut happens or the voltage suddenly reduces, the inverter will decelerate till to stop.

F8.30	Load drop protection selection	Invalid	0	0	☆
		Valid	1		
F8.31	Load drop detection level	0.0% to 100.0% (Rated motor current)		10.0%	☆
F8.32	Load drop detection time	0.0s to 60.0s		1.0s	☆

If the load drop protection function is active, when the inverter output current is less than the load drop detection level (F8.31)and the duration is longer than the load drop detection time(F8.32), the inverter output frequency is automatically reduced to 7% of the rated frequency. During the load drop protection, if the load recovers, the inverter automatically resumes to the set frequency to run.

5-2-11.F9 group   Communications parameters

Code	Parameter name	Setting range		Factory setting	Change limits
F9.00	The baud rate is MODBUS	300BPS	0		
		600BPS	1		
		1200BPS	2		
		2400BPS	3		

		4800BPS	4		
		9600BPS	5		
		19200BPS	6		
		38400BPS	7		
		57600BPS	8		
		115200BPS	9		
F9.01	Data format	No parity (8-N-2)	0	0	☆
		Even parity (8-E-1)	1		
		Odd parity (8-O-1)	2		
		No parity(8-N-1)	3		
F9.02	This unit address	1 to 250, 0 for broadcast address		1	☆
F9.03	Response delay	0ms-20ms		2ms	☆
F9.04	Reserve				
F9.05	Data transfer format selection	Units digit	MODBUS	30	☆
		Non-standard MODBUS protocol	0		
		Standard MODBUS protocol	1		
		Tens digit	Profibus		
		PPO1 format	0		
		PPO2 format	1		
		PPO3 format	2		
		PPO5 format	3		
F9.06	Communication read current resolution	0.01A	0	0	☆
		0.1A	1		

5-2-12.FA group   Torque control parameters

Code	Parameter name	Setting range		Factory setting	Change limits
FA.00	Speed/torque control mode selection	Speed control	0	0	★
		Torque control	1		

Used to select the inverter control mode: Speed control or torque control.

PI160 multifunction digital terminal has two related functions on torque control: Torque control banned (Function29), and speed control / torque control switching (Function 46). The two terminals must use in conjunction with FA.00 so as to switch between speed control and torque control.

When the speed control / torque control switching terminal is invalid, the control mode is determined by FA.00, if the terminal is valid, the control manner is equivalent to the FA.00's value negated.

In any case, when the torque control ban terminal is valid, the inverter is fixed at speed control mode.

FA.01	Torque setting source selection under torque control mode	Keyboard setting (FA.02)	0	0	★
		Analog AI1 setting	1		
		Reservation			
		Panel potentiometer setting	3		
		High-speed pulse setting	4		
		Communications reference	5		
FA.02	Torque digital setting under torque control mode	-200.0% to 200.0%		150%	☆

FA.01 is used to select the torque setting source, there are five torque setting modes in all.

The torque setting adopts the relative value, the 100.0% corresponds to the rated torque of inverter. Setting range is from -200.0% to 200.0%, indicating that the maximum torque of inverter is 2 times of the rated torque of inverter.

The inverter will forward running, if the given torque is positive; and it will reverse if the

given torque is negative.

When the torque setting adopts mode 1 to 5, the 100% of communications, analog input and pulse input corresponds to FA.02.

FA.03	Torque control acceleration time	0.00s to 650.00s	0.00s	☆
FA.04	Torque control deceleration time	0.00s to 650.00s	0.00s	☆

Under the torque control mode, the difference between the motor output torque and load torque determines the change rate in speed of the motor and load, therefore, the motor speed may rapidly change, resulting in the problems such as noise or excessive mechanical stress. By setting the torque control ac/deceleration time, you can make a smooth change of motor speed.

But the occasions that needs the rapid response of torque, the torque control ac/deceleration time must be set to 0.00s. For example: when two hardwired motors drag the same one load, in order to ensure that the load is evenly distributed, you must set one inverter as the master unit that works under the speed control mode, the other inverter as the auxiliary unit that works under the torque control mode, the Actual output torque of the master unit is used as the torque command of the auxiliary, the torque of the auxiliary needs quickly follow the master unit, so the torque control ac/deceleration time of the auxiliary unit shall be set to 0.00s.

FA.05	Torque control forward maximum frequency	0.00Hz to maximum frequency (F0.19)	50.00Hz	☆
FA.06	Torque control reverse maximum frequency	0.00Hz to maximum frequency (F0.19)	50.00Hz	☆

Used to set the maximum operating frequency of inverter forward or reverse running under the torque control mode

Under the torque control mode, if the load torque is less than the motor output torque, the motor speed will continue to rise, in order to prevent "Runaway" and other accidents of mechanical systems, it is necessary to limit the maximum speed of motor under the torque control mode.

FA.07	Torque filter time	0.00s to 10.00s	0.00s	☆

5-2-13.Fb group   Control optimization parameters

Code	Parameter name	Setting range		Factory setting	Change limits
Fb.00	Fast current limiting manner	Disable	0	1	☆
		Enable	1		

Enable Quick Current Limiting function, which can minimize the overcurrent fault of inverter , and ensure the uninterrupted operation of inverter. If the drive is in the state of fast current limiting for a long period of time , the inverter may be damaged by overheating and others, this case is not allowed, so the inverter will alarm fault with fault ID Err.40, it indicates that the inverter exists overload and needs to be shut down.

Fb.01	Undervoltage point setting	50.0% to 140.0%	100.0%	☆

Used to set the voltage value of inverter undervoltage fault with fault ID Err.09 , the different voltage levels of inverter 100.0% corresponds to the different voltage points are as follows:

Single-phase 220V or three-phase 220V: 200V three-phase 380V: 350V.

Fb.02	Overvoltage point setting	200.0V to 2500.0V	810V	☆

The setting overvoltage point of the software has no influence on the setting overvoltage point of the hardware.The value of the voltage setted to the frequency inverter, different voltage level's factory defaults are as following:

Voltage level	Overvoltage point factory defaults
Single phase 220V	400.0V
Three phase 220V	400.0V
Three phase 380V	810.0V

Remark: Meanwhile, the factory defaults are the upper limit value of overvoltage protectation in frequency inverter. Only when Fb.02 setting value is smaller than all voltage

factory defaults, the new parameter setting takes effect. If it is higher than factory defaults will be the standard value.

Fb.03	Deadband compensation mode selection	No compensation	0	1	☆
		Compensation mode 1	1		
		Compensation mode 2	2		

Generally do not need to modify this parameter, only when the special requirements to the output voltage waveform quality is required or when the motor oscillation and other abnormal happen, you need to try to switch to select a different mode of compensation.The compensation mode 2 for high-power is recommended.

Fb.04	Current detection compensation	0 to 100	5	☆

Used to set the inverter's current sensing compensation, if the set value is too large, which may reduce the control performance. Generally do not need to be modified.

Fb.05	Vector optimization without PG mode selection	No optimization	0	1	☆
		Optimization mode 1	1		
		Optimization mode 2	2		

Fb.06	Upper limiting frequency for DPWM switching	0.00Hz to 15.00Hz	12.00Hz	☆

Fb.07	PWM modulation manner	Asynchronous	0	0	☆
		Synchronou	1		

Only valid for V/F control. Synchronous modulation refers to that the carrier frequency linearly change with the change of output frequency, in order to ensure the unchanged of their ratio(Carrier to noise ratio), generally it is used when the output frequency is higher, is conducive to ensure the output voltage quality.

Under the lower output frequency (100Hz) mode, generally the synchronize modulation is not required, because at the time the ratio of the carrier frequency to the output frequency is relatively high, the asynchronous modulation has more obvious advantages.When the operating frequency is higher than 85Hz, the synchronous modulation takes effect, the fixed mode is the asynchronous modulation below the frequency.

Fb.08	Random PWM depth	Random PWM invalid	0	0	☆
		PWM carrier frequency random depth	1 to 10		

By setting Random PWM, the monotonous and shrill motor sound can become softer and which helps reduce external electromagnetic interference. When Random PWM Depth is set to 0, Random PWM will be invalid. It will get different results by adjusting different Random PWM Depths.

5-2-14.FC group　　Extended parameter

Code	Parameter name	Setting range	Factory setting	Change limits
FC.01	Proportional linkage coefficient	0.00 to 10.00	0	☆

When proportional linkage coefficient is 0, proportional linkage function can not work.According to the setting by proportional linkage, communication address of master (F9.02) is set to 248, and communication address of slave is set to 1 to 247.Slave output frequency = Master setting frequency * Proportional linkage coefficient + UP/DOWN Changes.

FC.02	PID start deviation	0.0 to 100.0	0	☆

If the absolute value of deviation between PID setting source and feedback source is greater than of the parameter, the inverter starts only when PID output frequency is greater than the wake-up frequency to prevent the repetition of the inverter starts.If the inverter is operating, when PID feedback source is greater than setting source and the output frequency is less than or equal to (F7.48) sleep frequency, the inverter goes to sleep after (F7.49) delay time and performs free stop.

If the inverter is in the state of sleep and the current run command is valid, the absolute value of deviation between PID setting source and feedback source is greater than of PID start deviation (FC.02), when PID setting frequency is greater than or equal to F7.46 wake-up

frequency, the inverter will start after (F7.47) delay time.

If you want to use the function of PID start deviation, PID stop computing status must be set to active (E2.27 = 1).

5-2-15.E0 group   Wobbulate, fixed-length and counting

Wobbulate function is suitable for the textile, chemical, and other industries, as well as occasions that needs traverse and winding function. Wobbulate function means that the inverter output frequency swings up and down to set the frequency centering around the set frequency, the locus the operating frequency on the timeline is as shown in figure, which the swing amplitude is set by E0.00 and E0.01, when E0.01 is set to 0, the wobbulate will not work.
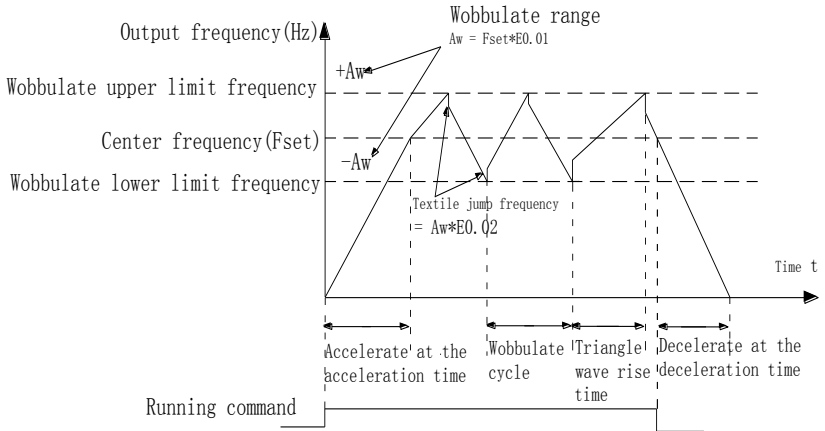

Figure 5-28:Schematic diagram of wobbulate operating

Code	Parameter name	Setting range		Factory setting	Change limits
E0.00	Swing setting manner	Relative to center frequency	0	0	☆
		Relative to maximum frequency	1		
This parameter is used to determine the baseline of the swing					
0: Relative to center frequency(F0.07 frequency source)					
For the variable swing system. The swing varies with the change of center frequency (the set frequency).					
1: Relative to maximum frequency(F0.19)					
For the fixed swing system, the swing is fixed					
E0.01	Wobbulate range	0.0% to 100.0%		0.0%	☆
E0.02	Sudden jump frequency range	0.0% to 50.0%		0.0%	☆
The parameter is used to determine the value of swing and the value of sudden jump frequency.					
When the swing is set to Relative To Center frequency(E0.00=0), Swing (AW) = frequency source (F0.07) ×swing amplitude((E0.01). When the swing is set to Relative To Maximum Frequency(E0.00=1), Swing (AW) = maximum frequency (F0.19) ×swing amplitude((E0.01).					
If the sudden jump frequency range is selected for wobbulate operation, the frequency percentage of sudden jump frequency range relative to swing, i.e.: Sudden jump frequency = Swing(AW)×Sudden jump frequency range(E0.02). When the swing is set to Relative To Center frequency(E0.00=0), the sudden jump frequency is the variable value. When the swing is set to Relative To Middle Frequency(E0.00=1), the sudden jump frequency is the fixed value.					
The frequency of wobbulate operation is restricted by the upper and lower frequencies.					
E0.03	Wobbulate cycle	0.1s to 3000.0s		10.0s	☆

E0.04	Triangle wave rise time coefficient	0.1% to 100.0%	50.0%	☆

Wobbulate cycle: The time of a complete wobbulate cycle.

Triangle wave rise time coefficient(E0.04), the time percentage of Riangle Wave Rise Time relative to Wobbulate Cycle(E0.03) Triangle wave rise time = Wobbulate cycle(E0.03) × Triangle wave rise time coefficient(E0.04), unit: Second(S). Triangle wave drop time = Wobbulate cycle(E0.03) ×(1 - Triangle wave rise time coefficient(E0.04)), unit: Second(S).

E0.05	Set length	0m to 65535m	1000m	☆
E0.06	Actual length	0m to 65535m	0m	☆
E0.07	Pulse per meter	0.1 to 6553.5	100.0	☆

The above function codes are used to fixed-length control.

The length information is sampled through the multi-function digital input terminal, the pulse number sampled by terminal divides the pulse per meter(E0.07), so then the Actual length(E0.06) can be computed out. When the Actual length is greater than the set length (E0.05), the multi-functional digital DO will output "Length Arrival" ON signal.

During the fixed-length control, the multifunction DI terminal can be used to reset length (DI function selects 28), please refer to F1.00 to F1.09 for details.

In some applications, the related input terminal function shall be set to "Length Count Input"(Function 27), when the pulse frequency is higher, DI5 port must be used .

E0.08	Set count value	1 to 65535	1000	☆
E0.09	Specified count value	1 to 65535	1000	☆

Figure 5-29:Schematic diagram of the set count value reference and the snecified count value

The count value needs to be sampled through the multi-function digital input terminal. In some applications, the related input terminal function shall be set to "Counter Input"(Function 25), when the pulse frequency is higher, DI5 port must be used .

When the count value reaches the set count value(E0.08), the multifunction digital DO will output "Set Count Value Arrival" ON signal, then the counter stops counting.

When the count value reaches the specified count value(E0.09), the multifunction digital DO will output "Specified Count Value Arrival" ON signal, then the counter continues to count, and then stop till the set count value.

The figure is the schematic diagram of E0.08 = 8 and E0.09 = 4.

E0.10	Reduction frequency pulse number	0:Invalid；1~65535	0	☆
E0.11	Reduction frequency	0.00Hz～F0.19(Max frequency)	5.00Hz	☆

Applications need to the corresponding input terminals function is set to "counter input"(Function 25), when set count (E0.08) = count (d0.12) + reduction frequency pulse number (E0.10), the converter automatically slow down to the set reduction frequency (E0.11) run.

Remark: To reset the Count value need to the corresponding input terminals function be set to "counter reset" (Function 26).

When count value (d0.12) is above reduction frequency pulse number, the converter can not run.

5-2-16.E1 group   Multi-stage command, simple PLC

Code	Parameter name	Setting range	Factory setting	Change limits
E1.00	0-stage speed setting 0X	-100.0% to 100.0%	0.0%	☆
E1.01	1-stage speed setting 1X	-100.0% to 100.0%	0.0%	☆

E1.02	2-stage speed setting 2X	-100.0% to 100.0%	0.0%	☆
E1.03	3-stage speed setting 3X	-100.0% to 100.0%	0.0%	☆
E1.04	4-stage speed setting 4X	-100.0% to 100.0%	0.0%	☆
E1.05	5-stage speed setting 5X	-100.0% to 100.0%	0.0%	☆
E1.06	6-stage speed setting 6X	-100.0% to 100.0%	0.0%	☆
E1.07	7-stage speed setting 7X	-100.0% to 100.0%	0.0%	☆
E1.08	8-stage speed setting 8X	-100.0% to 100.0%	0.0%	☆
E1.09	9-stage speed setting 9X	-100.0% to 100.0%	0.0%	☆
E1.10	10-stage speed setting 10X	-100.0% to 100.0%	0.0%	☆
E1.11	11-stage speed setting 11X	-100.0% to 100.0%	0.0%	☆
E1.12	12-stage speed setting 12X	-100.0% to 100.0%	0.0%	☆
E1.13	13-stage speed setting 13X	-100.0% to 100.0%	0.0%	☆
E1.14	14-stage speed setting 14X	-100.0% to 100.0%	0.0%	☆
E1.15	15-stage speed setting 15X	-100.0% to 100.0%	0.0%	☆

The multi-stage command can be used as frequency source, can also act as the set source of process PID. The dimension of multi-stage command is the relative values and its range is from -100.0% to 100.0%, when it acts as the frequency source, it is the percentage of maximum frequency; due to the PID reference is originally as a relative value, therefore the multi-stage command acts as the set source of PID and does not need dimension conversion.

The multi-stage command needs to switch according to the different states of multifunction digital DI, please refer to F1 group for specific instructions.

E1.16	Simple PLC running mode	Stop after single running	0	0	☆
		Hold final value after single running	1		
		Circulating	2		

The figure is the schematic diagram of Simple PLC as the frequency source. For Simple PLC as the frequency source, the positive or negative value of E1.00 to E1.15 determines the running direction, the negative value indicates that the inverter runs at the opposite direction.

As the frequency source, PLC operates in three modes, including:

0: Stop after single running

After the inverter completes a single cycle, it will automatically shut down , the running command must be given before restart.

1: Hold final value after single running

After the inverter completes a single cycle, it will automatically maintain the frequency and direction of the last stage.

2: Circulating

After the inverter completes a cycle, it will automatically start next cycle, and stop till the stop command is given.
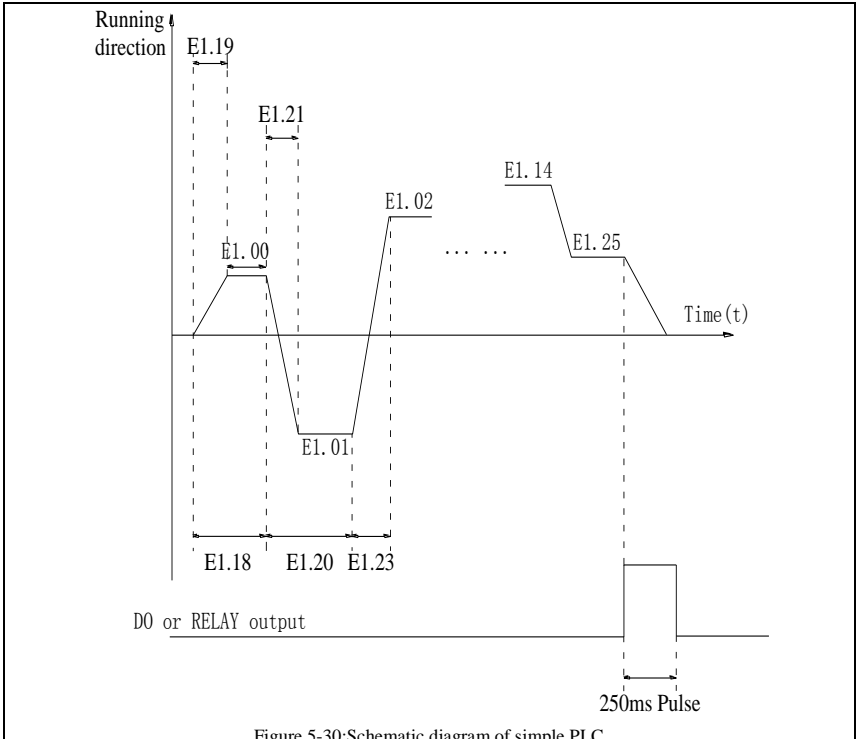
Figure 5-30:Schematic diagram of simple PLC

E1.17	Simple PLC power-down memory selection	Units digit	Power-down memory selection		11	☆
		Power-down without memory		0		
		Power-down with memory		1		
		Tens digit	Stop memory selection			
		Stop without memory		0		
		Stop with memory		1		

PLC "Power-Down With Memory" means that the PLC operating stage and frequency before power-down are memorized, and then it will continue to run from the position of the memorized stage in next power-on. If Power-Down Without Memory is selected, the PLC process will restart from the starting position for each power-on.

PLC "Stop With Memory" means that the PLC operating stage and frequency before stop are recorded, and then it will continue to run from the position of the recorded stage in next run. If Stop Without Memory is selected, the PLC process will restart from the starting position for each start.

E1.18	0 stage running time T0	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
E1.19	0 stage ac/deceleration time	0 to 3	0	☆
E1.20	1 stage running time T1	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
E1.21	1 stage ac/deceleration time	0 to 3	0	☆
E1.22	2 stage running time T2	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
E1.23	2 stage ac/deceleration time	0 to 3	0	☆
E1.24	3 stage running time T3	0.0s(h) to 6500.0s(h)	0.0s(h)	☆
E1.25	3 stage ac/deceleration time selection	0 to 3	0	☆
E1.26	4 stage running time T4	0.0s(h) to 6500.0s(h)	0.0s(h)	☆

E1.27	4 stage ac/deceleration time selection	0 to 3		0	☆
E1.28	5 stage running time T5	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.29	5 stage ac/deceleration time selection	0 to 3		0	☆
E1.30	6 stage running time T6	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.31	6 stage ac/deceleration time selection	0 to 3		0	☆
E1.32	7 stage running time T7	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.33	7 stage ac/deceleration time selection	0 to 3		0	☆
E1.34	8 stage running time T8	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.35	8 stage ac/deceleration time selection	0 to 3		0	☆
E1.36	9 stage running time T9	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.37	9 stage ac/deceleration time selection	0 to 3		0	☆
E1.38	10 stage running time T10	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.39	10 stage ac/deceleration time selection	0 to 3		0	☆
E1.40	11 stage running time T11	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.41	11 stage ac/deceleration time selection	0 to 3		0	☆
E1.42	12 stage running time T12	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.43	12 stage ac/deceleration time selection	0 to 3		0	☆
E1.44	13 stage running time T13	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.45	13 stage ac/deceleration time selection	0 to 3		0	☆
E1.46	14 stage running time T14	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.47	14 stage ac/deceleration time selection	0 to 3		0	☆
E1.48	15 stage running time T15	0.0s(h) to 6500.0s(h)		0.0s(h)	☆
E1.49	15 stage ac/deceleration time selection	0 to 3		0	☆
Multi-speed operation and deceleration time selection 0 to 3 , corresponding to the function code: 0: F0.13、F0.14; 1:F7.08、F7.09; 2:F7.10、F7.11; 3:F7.12、F7.13					
E1.50	Simple PLC run-time unit	s (Seconds)	0	0	☆
		H (hours)	1		
E1.51	Multi-stage command 0 reference manner	Function code E1.00 reference	0	0	☆
		Analog AI1 reference	1		
		Reserve			
		Panel potentiometer reference	3		
		High-speed pulse reference	4		
		PID control reference	5		
		Keyboard set frequency (F0.01) reference, UP/DOWN can be modified	6		
This parameter determines the multi-stage command 0 reference channel. The multi-stage command0 not only can select E1.00, but also there are a variety of other options so as to facilitate switching between the multi-stage command and the other reference manner.					

5-2-17.E2 group   PID function

PID control is a commonly used method of process control, a closed loop system is formed by the proportional, integral and differential operation of difference between the controlled value feedback signal and target value signal and by adjusting the inverter output frequency so as to stabilize the controlled value at the position of the target value.Suitable for flow control, pressure control and temperature control and other process control applications.
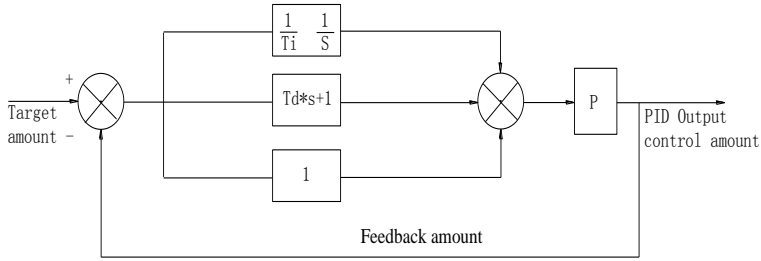
Figure 5-31:Flow diagram of process PID principle

Code	Parameter name	Setting range		Factory setting	Change limits
E2.00	PID reference source	E2.01 setting	0	0	☆`
		Analog AI1 reference	1		
		Reserve			
		Panel potentiometer reference	3		
		High-speed pulse setting	4		
		Communications setting	5		
		Multi-stage command setting	6		
E2.01	PID keyboard reference	0.0% to 100.0%		50.0%	☆

This parameter is used to select the process PID target value reference channel.

The set target value of process PID is a relative value, the setting range is from 0.0% to 100.0%. The feedback value of PID is also a relative value, the role of PID is to remain the same for the two relative values.

		Analog AI1 reference	0		
E2.02	PID feedback source	Reserve	1	0	☆
		Panel potentiometer setting	2		
		Reserve	3		
		High-speed pulse setting	4		
		Communications setting	5		

This parameter is used to select the process PID feedback signal channel.The feedback value of process PID is also a relative value, the setting range is from 0.0% to 100.0%.

E2.03	PID action direction	Positive	0	0	☆
		Negative	1		
E2.04	PID reference feedback range	0 to 65535		1000	☆

PID reference feedback range is a dimensionless unit for PID setting display(d0.15) and PID feedback display(d0.16).

The 100.0% of the relative value of PID reference feedback corresponds to a setting feedback range(E2.04). If E2.04 is set to 2000, when PID setting is 100.0%, PID setting display(d0.15) will be 2000.

E2.05	PID inversion cutoff frequency	0.00 to F0.19(Maximum frequency)	2.00Hz	☆

In some cases, only when the PID output frequency is negative (i.e.the inverter reverses), PID can control the reference value and the feedback value to the same states, but the excessive inversion frequency is not allowed in some occasions, E2.05 is used to the upper limit of determine inversion frequency.

E2.06	PID deviation limit	0.0% to 100.0%	0	☆

When the deviation between PID reference value and PID feedback value is less than E2.06, PID will stop regulating action. Thus, when the deviation is lesser, the output frequency will be stable, it is especially effective for some closed-loop control occasions.

E2.07	PID differential limiting	0.00% to 100.00%	0.10%	☆

The role of the differential is more sensitive in PID regulator, is likely to cause system

oscillation, generally the role is limited to a smaller range, E2.07 is used to set PID differential output range.

E2.08	PID reference change time	0.00s to 650.00s	0.00s	☆

The PID reference change time means the required time that PID reference value changes from 0.0% to 100.0%.When the PID reference changes, the PID reference value will change linearly according to the reference change time to reduce the adverse effects to the system caused by a sudden reference change.

E2.09	PID feedback filter time	0.00s to 60.00s	0.00s	☆
E2.10	PID output filter time	0.00s to 60.00s	0.00s	☆

E2.09 is used for filtering the PID feedback quantity, the filter helps reduce the influence of interference to the feedback quantity, but will bring the response performance of the process closed loop system.

E2.10 is used for filtering the PID output frequency, the filter will weaken the sudden change of the inverter output frequency, but it will also bring the response performance of the process closed loop system.

E2.11	PID feedback loss detection value	0.0%：Not judged feedback loss 0.1% to 100.0%	0.0%	☆
E2.12	PID feedback loss detection time	0.0s to 20.0s	0s	☆

This function code is used to determine whether the PID feedback is lost or not.When the PID feedback is less than the PID feedback loss detection value(E2.11), and the duration is longer than the PID feedback loss detection time(E2.12), the inverter will alarm fault ID Err.31, and troubleshoot according to the selected method.

E2.13	Proportional gain KP1	0.0 to 200.0	80.0	☆
E2.14	Integration time Ti1	0.01s to 10.00s	0.50s	☆
E2.15	Differential time Td1	0.000s to 10.000s	0.000s	☆

Proportional gain KP1:Used to decide the extent of the PID regulator, the greater KP1, the greater adjusting extent. This parameter 100.0 means that when the deviation of PID feedback value and reference value is 100.0%, the PID regulator will adjust the output frequency command to the maximum frequency.

Integration time Ti1: used to decide the extent of integral adjustment of the PID regulator. The shorter integration time, the greater extent of integral adjustment The integration time means that when the deviation of PID feedback value and reference value is 100.0%, the integration regulator will successively adjust to the maximum frequency for the time.

Differential time Td1: used to decide the extent that the PID regulator adjusts the deviation change rate. The longer differential time, the greater extent of adjustment The differential time means that the feedback value changes 100.0% within the time, the differential regulator will adjust to the maximum frequency.

E2.16	Proportional gain KP2	0.0 to 200.0		20.0	☆
E2.17	Integration time Ti2	0.01s to 10.00s		2.00s	☆
E2.18	Differential time Td2	0.000s to 10.000		0.000s	☆
E2.19	PID parameter switching conditions	No switching	0	0	☆
		Switching through DI terminal	1		
		Automatically switching according to deviation.	2		
E2.20	PID parameter switching deviation 1	0.0% to E2.21		20.0%	☆
E2.21	PID parameter switching deviation 2	E2.20 to 100.0%		80.0%	☆

In some applications, only one group of PID parameters can not meet the needs of the entire run, it is required to use different PID parameters under different conditions.

This group of function codes is used to switch between two groups of PID parameters. Which the setting method for regulator parameter(E2.16 to E2.18) is similar to the parameter(E2.13 to E2.15).The two groups of PID parameters can be switched by the multi-functional digital DI terminal, can also be switched automatically according to the PID deviation.If you select the multi-functional DI terminal, the multi-function terminal function

selection shall be set to 43 (PID parameter switching terminal), select parameter group 1 (E2.13 E2.15) when the terminal is inactive, otherwise select parameter group 2 (E2.16 to E2.18).

If you select the automatic switch mode, and when the absolute value of deviation between reference and feedback parameters is less than PID parameter switching deviation 1(E2.20), select parameter group 1 for PID parameter. When the absolute value of deviation between reference and feedback parameters is more than PID parameter switching deviation 2(E2.21), select parameter group 2 for PID parameter. If the deviation between reference and feedback parameters is between switching deviation 1 and switching deviation 2, PID parameter is the linear interpolation of the two groups of PID parameters , as shown in the figure.
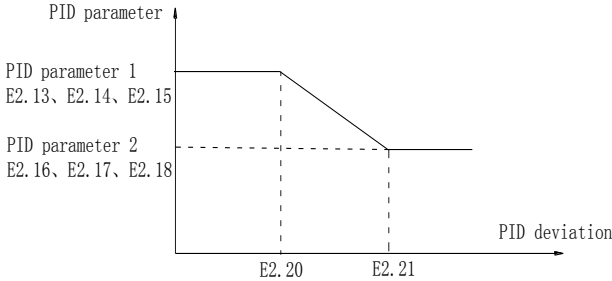
Figure 5-32:PID parameter switching

E2.22	PID integral properties	Units digit	Integral separation		00	☆
		Invalid		0		
		Valid		1		
		Tens digit	Whether stop integration when output reaches limit			
		Continue		0		
		Stop		1		

Integral separation:If the integral separation is set to active, when the integral pause of multifunction digital DI(Function 38) is active, PID integral will stop operations, at the time only the proportional and derivative actions of PID is active.If the integral separation is set to inactive, however the multifunction digital DI is active or inactive, the integral separation will be inactive. Whether stop integration when output reaches limit: you can select whether or not to stop the integral action after PID operation output reaches the maximum or the minimum value If you select to stop the integral action, the PID integral will stop the calculation, which may help to reduce the overshoot of PID.

E2.23	PID initial value	0.0% to 100.0%	0.0%	☆
E2.24	PID initial value hold time	0.00s to 360.00s	0.00s	☆

When the inverter starts, PID output is fixed at PID initial value(E2.23), and then continuous for the PID initial value hold time(E2.24), at last PID begins operation of the closed-loop adjustment.The figure is functional schematic of PID initial value.
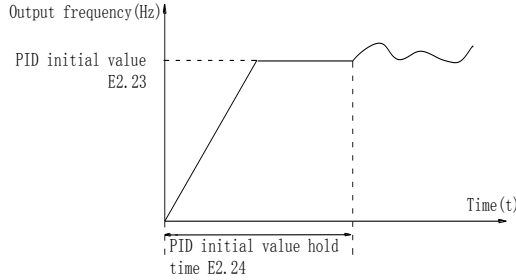
Figure 5-33:Functional schematic of PID initial value

This function is used to limit the deviation between two PID output beats(2ms/beats), in order to suppress the too fast changes of PID output so that stabilizing the inverter operation.

E2.25	Maximum deviation of twice outputs(Forward)	0.00% to 100.00%		1.00%	☆
E2.26	Maximum deviation of twice outputs(backward)	0.00% to 100.00%		1.00%	☆

E2.25 and E2.26 respectively corresponds to the maximum of the absolute value of output deviation when rotating forward and reverse.

E2.27	Computing status after PID stop	Stop without computing	0	0	☆
		Stop with computing	1		

Used to select whether to continue computing in the state of PID shutdown. Generally, PID will stop computing in the state of shutdown.

E2.29	PID Automatically reduced frequency selection	Invalid	0	1	☆
		Valid	1		

PID feedback value equal to the given value, the inverter frequency is reduced effectively. When the inverter frequency feeectively reduced, the frequency converter detection time interval E2.31 reduced frequency, every time decrease frequency of 0.5Hz, if in the process of reducing frequency feedback value is less than the given value, inverter speed up directly to the set value.

E2.30	PID Stop frequency	0Hz to Max. frequency (F0.19)	25Hz	☆

The function code is only used when the automatic frequency reduction (E2.29) is selected.

The feedback value of the transducer is equal to the given value, the number of PID detection starts counting, and every PID detection time (E2.31) counts a number of times. When the count is greater than or equal to the number of PID detection (E2.32), if the frequency of the inverter frequency is less than PID stop frequency (E2.30), then the frequency converter to slow down to 0Hz.

E2.31	PID detection time	0s ~ 3600s	10	☆

The PID Auto-reduced frequency is valid, used to detect the time of frequency decline.

E2.32	PID testing time	10 ~ 500	20	☆

This function is related to PID stop frequency setting, when the set detections time reached, inverter will slow down then stop.

5-2-18.E3 group   Virtual DI、Virtual DO

Code	Parameter name	Setting range	Factory setting	Change limit
E3.00	Virtual VDI1 terminal function selection	0 to 53	0	★
E3.01	Virtual VDI2 terminal function selection	0 to 53	0	★

E3.02	Virtual VDI3 terminal function selection	0 to 53	0	★
E3.03	Virtual VDI4 terminal function selection	0 to 53	0	★
E3.04	Virtual VDI5 terminal function selection	0 to 53	0	★

Virtual VDI1~VDI5 in functionally is complete same as control board DI , it can be treated as multi-function digital value input using,more details please refer toF1.00~F1.09 introduction.

E3.05	Virtual VDI terminal status set	Units digit	Virtual VDI1		00000	★
		invalid		0		
		valid		1		
		Tens digit	Virtual VDI2(0 to 1, same as above)			
		Hundreds digit	Virtual VDI3(0 to 1, same as above)			
		Thousands digit	Virtual VDI4(0 to 1, same as above)			
		Tens of thousands digit	Virtual VDI5(0 to 1, same as above)			
E3.06	Virtual VDI terminal effective status set mode	Units digit	Virtual VDI1		11111	★
		VD1 whether valid is decided by Virtual VDOX status		0		
		VD1 whether valid is decided by E3.05		1		
		Tens digit	Virtual VDI2(0 to 1, same as above)			
		Hundreds digit	Virtual VDI3(0 to 1, same as above)			
		Thousands digit	Virtual VDI4(0 to 1, same as above)			
		Tens of thousands digit	Virtual VDI5(0 to 1,same as above)			

Different from ordinary digital quantity input terminals, virtual VDI state can have two setting modes which is selected by E3.06.

When selecting VDI state is determined by the state of the corresponding virtual VDO, VDI is valid or invalid state depending on the VDO output valid or invalid, and VDIx only binding VDOx(x=1~5).

When choosing VDI state selection function code to set, through the binary bits of E3.05, respectively determine the state of virtual input terminals.

Example of how to use VDI.Example 1. Implement following function: "Inverter fault alarm and shuts down when AI1 input exceeds upper or lower frequency" .

Realize by following settings: Set VDI state decided by VDO, set VDI1 function as " user defined fault 1" (E3.00=44); set VDI1 terminal state effective mode decided by VDO1 (E3.06=xxx0); set VDO1 output function as "AI1 input exceeds upper & lower frequency" (E3.11=31); so when AI1 input exceeds upper or lower frequency, VDO1 state is ON, VDI1 input terminal state is effective, VDI1 receive user defined fault 1, inverter then alarm fault no. 27 and shuts down.

Example 2. Implement following function: "Inverter run automatically after power-on".Realize by following settings: Set VDI state decided by function code E3.05, set VDI1 function as "FORWARD" (E3.00=1); set VDI1 terminal state effective decided by function code (E3.06=xxx1); set VDI1 terminal state is effective (E3.05=xxx1); set command source as "terminal control" (F0.11=1); set protection selection as "no protection" (F7.22=0); so after inverter powered on and initialization complete, VDI1 detected effective, and it match forward running, then inverter starts running forwardly.

E3.07	AI1 terminal as a function selection of DI		0 to 50		0	★
E3.10	Effective mode selection when AI as DI	Units digit	AI1		000	★
		High level effectively		0		
		Low level effectively		1		
		Tens digit, Hundreds digit: Reserve				

This group function code is used when using AI as DI, when AI used as DI, and input voltage of AI is greater than 7V, AI terminal status will be high level, when input voltage of AI is lower than 3V, AI terminal status will be low level. For between 3V~ 7V hysteresis E3.10 is to determine that when the AI is used as DI, AI is made valid by means of the high level state, or the low level of valid states. As for AI as DI feature set, same as the ordinary DI Settings, please refer to the F1 group setting instructions related DI.Below figure is AI input voltage taken as an example, explains the relationship between input voltage of AI and the corresponding state of DI:

Figure 5-34:Judgment of effective state of AI terminal

E3.11	Virtual VDO1 output function selection	With the physical internal sub DIx	0	0	☆
		See F2 group physical DO output option	1 to 40		
E3.12	Virtual VDO2 output function selection	With the physical internal sub DIx	0	0	☆
		See F2 group physical DO output option	1to 40		
E3.13	Virtual VDO3 output function selection	With the physical internal sub DIx	0	0	☆
		See F2 group physical DO output option	1to40		
E3.14	Virtual VDO4 output function selection	With the physical internal sub DIx	0	0	☆
		See F2 group physical DO output option	1to40		
E3.15	Virtual VDO5 output function selection	With the physical internal sub DIx	0	0	☆
		See F2 group physical DO output option	1to40		
E3.16	VDO output terminal effective status selection	Units digit:	VDO1		00000	☆
		Positive logic		0		
		Negative logic		1		
		Tens digit	VDO2(0～1，same as above)			

		Hundreds digit	VDO3(0～1，same as above)		
		Thousands digit	VDO4(0～1，same as above)		
		Tens of thousands digit	VDO5(0～1，same as above)		
E3.17	VDO1 delay time	0.0s～3600.0s		0.0s	☆
E3.18	VDO2 delay time	0.0s～3600.0s		0.0s	☆
E3.19	VDO3 delay time	0.0s～3600.0s		0.0s	☆
E3.20	VDO4 delay time	0.0s～3600.0s		0.0s	☆
E3.21	VDO5 delay time	0.0s～3600.0s		0.0s	☆

VDO is similar to the DO output function, can be used to communicate and coordinate with VDIx implement some simple logic control

when VDOx output function selection of 0, VDO1 ~ VDO5 output state determined by DI1 ~ DI5 input status on the control panel, as VDOx with VDIx one-to-one correspondence

When selecting VDOx output function is not zero, the function of VDOx setting is the same with F2 group DO output parameters, please refer to the F2 group of related parameters

The output valid state of the VDOx can be set by E3.16, select is logic or logic

5-2-19.E8 group   Wire cutting machine group

Code	Parameter name	Setting range		Factory setting	Change limits
E8.00	Wire cutting machine running mode	forbid	0	0	★
		enable	1		

When set the wire cutting machine mode , if use terminal control (F0.11 = 1 or 4), you need to set up for a three line mode.

Note: under the E8.00=1 enable mode, the default values for some parameters are:

Code	Default value	Code	Default value	Code	Default value	Code	Default value
F0.03	6	F0.11	1	F0.13	0.8	F0.14	0.6
F1.02	12	F1.03	13	F1.04	14	F2.02	4
F2.11	0.6	F3.10	100	F3.11	0.2	E1.00	100
E1.01	40	E1.02	30	E1.03	20	E1.04	20

E8.01	Reciprocating motion ahead of time	0.0~600.0s	4.0s	☆

When cutting machine running mode, when the inverter DI terminal function set to 53 reciprocating motion input, and terminal is valid, this parameter is defined as the motor forward time in reciprocating mode.

E8.02	Reciprocating motion back time	0.0~600.0s	2.0s	☆

When cutting machine running mode, when the inverter DI terminal function set to 53 reciprocating motion input, and terminal is valid, this parameter is defined as the motor reverse time in reciprocating mode.

E8.03	0Hz Frequency to check out	invalid	0	0	★
		valid	1		

Set E8.04 high-frequency output frequency to check out the width, when choosing 0 Hz frequency reaches detection as invalid, the inverter in the 0 Hz run DO not output terminal

E8.04	The high frequency output	0~100%	99%	☆

This parameter based on a set frequency, when F2.02 or F2.04 choose 42 high frequency output, the output frequency is greater than or equal to the parameters set suction, the relay or SPA will action after E8.06 set time

E8.05	High frequency output frequency is disconnected	0~100%	99%	☆

This parameter based on a set frequency, when F2.02 or F2.04 choose high frequency output, output frequency in the parameter setting corresponding to the size of the disconnect frequency, relay or SPA is action. The parameter value is lower than E8.04 is valid			
E8.06	Closing delay time	0.0~20.0s	0.0 s ☆
When E8.04 arrives the high frequency output , frequency relay or SPA after E8.06 closing delay time, is action			

5-2-20.b0 group　　Motor parameters

Code	Parameter name	Setting range		Factory setting	Change limits
b0.00	Motor type selection	general asynchronous motor	0	0	★
		Asynchronous frequency conversion motor	1		
b0.01	Rated power	0.1kW~1000.0kW		-	★
b0.02	Rated voltage	1V~2000V		-	★
b0.03	Rated current	0.01A~655.35A		-	★
b0.04	Rated frequency	0.01Hz~F0.19(Maximum frequency)		-	★
b0.05	Rated speed	1rpm~36000rpm		-	★

The above B0.00 ~ b0.05 is parameters of motor nameplates, influence the accuracy of the parameter determination. Please follow the nameplate parameters setting of the machine. The fine performance of vector control, the need of motor parameters accurately. Accurate parameter identification is derived from the motor rated parameters is set up correctly.

In order to guarantee the performance of control according to the standard motor frequency converter, the motor rated current is limited the rated current of the inverter between 30% ~ 100%.The motor rated current can be set, but no more than rated current of the inverter. This parameter can be used to determine the frequency converter for motor overload protection capacity and energy saving operation.

To prevent self-cooled motor occurs at a low speed motor overheating or when the motor characteristics changed little and capacity change smaller than inverter rated capacity, also can use this function to be revised in order to achieve the purpose of protection of motor.

b0.06	Asynchronous motor stator resistance	0.001Ω~65.535Ω	-	★
b0.07	Asynchronous motor rotor resistance	0.001Ω~65.535Ω	-	★
b0.08	Asynchronous motor leakage inductance	0.01mH~655.35mH	-	★
b0.09	Asynchronous motor mutUal inductance	0.01mH~655.35mH	-	★
b0.10	Asynchronous motor no-load current	0.01A~b0.03	-	★

B0.06 ~ b0.10 is asynchronous motor parameters, these parameters are generally not on the motor nameplate, need through the inverter parameter self-learning. Among them, the "induction motor parameters of static self learning" can only get b0.06 ~ b0.08 three parameters, and "induction motor parameter self learning", besides can get here all five arguments can also get the encoder phase sequence, current loop PI parameters, etc.

Modify the motor rated power (b0.01) or motor rated voltage (b0.02), the inverter will automatically calculate and modify b0.06 ~ b0.10 parameter values, return the five parameters for commonly used standard Y series motor parameters.

If the site can't for asynchronous motor parameter self learning, can according to the parameters given by motor manufacturer, enter the corresponding parameters

b0.27	Motor parameter auto tunning	no operation	0	0	★
		Asynchronous motor parameters still auto tunning	1		
		synchronous motor parameters comprehensive auto tunning	2		

If the motor can release after load, in order to obtain better performance, please try to choose comprehensive self-learning; If you cannot release load, can only choose parameters of

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static self learning. To set the parameters according to load conditions, and then press the RUN button, the inverter will be parameter self learning. Parameters from the learning must be done in keyboard mode, terminal and communications operation mode cannot be parameter self learning.

0: No operation, namely parameters self-learning is prohibited.

1: Asynchronous motor parameters of static self learning. Prior to induction motor parameters of static self learning, it is necessary to properly set b0.00 ~ b0.05 motor type and motor nameplate parameters. Induction motor parameters of static self learning, inverter can obtain b0.06 ~ b0.08 three parameters.

2: Asynchronous motor parameter self learning in an all-round way. Induction motor parameter self learning process, the comprehensive frequency converter for static self learning first, and then according to the acceleration time F0.13 to motor rated frequency 80%, after a period of time, in accordance with the deceleration time F0.14 slow down and learn the end. The motor type and motor nameplate parameters b0.00 to b0.05 should be set correctly before the induction motor parameters are fully self-learning.

Induction motor parameter self learning comprehensively, inverter can obtain b0.06 ~ b0.10 five motor parameters, vector control current loop F5.12 ~ F5.15 PI parameters.

Note: The motor learning must be done in keyboard mode, terminal and communications operation mode cannot be machine self-learning.

5-2-21.y0 group　　Function code management

Code	Parameter name	Setting range		Factory setting	Change limits
y0.00	Parameter initialization	no operation	0	0	★
		restore default parameter values, not including motor parameters	1		
		clear history	2		
		restore default parameter values, including motor parameters	3		
		backup current user parameters	4		
		restore from backup user parameters	501		
1, restore the factory Settings, not including motor parameters 　　Set y0.00= 1, function of frequency converter parameters mostly recovery for the manufacturer factory, but the motor parameter, frequency instruction decimal point (F0.02) and fault recording information, total running time, the accumulative electric time, total power consumption is not restored. 　　2, remove record information 　　Remove converter fault recording information, total running time, the cumulative time, total power consumption. 　　3, parameter default values, including motor parameters. 　　4, backup the current user parameters 　　The parameters set the backup for the current user. The current backup function parameter setting values all down. To facilitate customer recovery after parameter adjustment disorder. 　　501 backup, restore the user parameters.Restore the backup before user preferences					
y0.01	User password	0～65535		0	☆
Y0.01 set any non zero number, password protection in effect. Next time when you enter the menu, you must enter the password correctly, otherwise cannot view and modify the function parameters, please keep in mind that set by the user's password. 　　Set y0.01 to 0, to clear set the user password, the password protection function is invalid.					
y0.02	Function parameter group display selection	Units digit	d group display selection	11111	★
		not displays	0		
		displays	1		
		Tens digit	E group display selection		

		not displays	0		
		displays	1		
		Hundreds digit	b group display selection		
		not displays	0		
		displays	1		
		Thousands digit	y1 group display selection		
		not displays	0		
		displays	1		
		Tens thousands digit	L group display selection		
		not displays	0		
		displays	1		
y0.03	User Parameters display	Units digit:Reserve Tens digit: user's change parameter display selection 0:not displays; 1:displays		00	☆
y0.04	Function code modification properties	modifiable	0	0	☆
		not modifiable	1		

User can set whether function code parameter can be modified or not, so as to prevent the risk that function parameters are altered unexpectedly.If the function code is set to 0, all function code can be modified; while it is set to 1, all function code can only be viewed, can not be modified.。

5-2-22.y1 group   Fault query

Code	Parameter name	Setting range	Factory setting	Change limits
y1.00	Type of the first fault	0～51	-	●
y1.01	Type of the second fault	0～51	-	●
y1.02	Type of the third(at last) fault	0～51	-	●

Record inverter recently three failure types, 0 for trouble-free. About the possible causes and solutions of each fault code, please refer to the relevant specification

Fault type table

NO.	Type of the fault	No.	Type of the fault
0	No fault	17	Contactor abnorma
1	Inverter unit protection	18	Current detection abnormal
2	Acceleration overcurrent	19	Motor self-learning abnormal
3	Deceleration overcurrent	21	Parameter read and write abnormal
4	Constant speed overcurrent	22	Inverter hardware abnormal
5	Acceleration overvoltage	26	Running time arrival
6	Deceleration overvoltag	27	Custom fault 1
7	Constant speed overvoltage	28	Custom fault 2
8	Control power failure	29	Power-on time arrival
9	Undervoltage	30	Load drop
10	Inverter overload	31	feedback loss when running
11	Motor Overload	40	Fast current limiting timeout
12	Input phase loss	41	Switch motor when running
13	Output phase loss	43	Motor overspeed
14	Module overheating	51	Initial position error
15	External fault	-	Communication fault COF

16	Communication abnormal		
y1.03	Frequency of the third fault	Frequency of the last fault	●
y1.04	Current of the third fault	Current of the last fault	●
y1.05	Bus voltage of the third fault	Bus voltage of the last fault	●
y1.06	Input terminal status of the third fault	Input terminal status of the third(at last) fault | BIT7	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0 | | DI7 | DI6 | DI5 | DI4 | DI3 | DI2 | DI1 | When the input terminal ON its corresponding secondary system is 1, OFF to 0, all DI state into decimal number display	●
y1.07	Output terminal status of the third fault	Output terminal status of the third(at last) fault | BIT3 | BIT2 | BIT1 | BIT0 | SPA Reserve Relay Reserve When the output terminal ON its corresponding secondary system is 1, OFF to 0, all DI state into decimal number display	●
y1.09	Power-on time of the third fault	Power-on time of the third(at last) fault	●
y1.10	Running time of the third fault	Running time of the third(at last) fault	●
y1.13	Frequency of the second fault	Frequency of the second(at last) fault	●
y1.14	Current of the second fault	Current of the second (at last) fault	●
y1.15	Bus voltage of the second fault	Bus voltage of the second (at last)fault	●
y1.16	Input terminal status of the second fault	Input terminal status of the second(at last) fault | BIT7 | BIT5 | BIT4 | BIT3 | BIT2 | BIT1 | BIT0 | | DI7 | DI6 | DI5 | DI4 | DI3 | DI2 | DI1 | When the input terminal ON its corresponding secondary system is 1, OFF to 0, all DI state into decimal number display	●
y1.17	Output terminal status of the second fault	Output terminal status of the second(at last) fault | BIT3 | BIT2 | BIT1 | BIT0 | SPA Reserve Relay Reserve When the output terminal ON its corresponding secondary system is 1, OFF to 0, all DI state into decimal number display	●
y1.19	Power-on time of the second fault	The current power-on time of the previous fault	●
y1.20	Running time of the second fault	The current running time of the previous fault	●
y1.23	Frequency of the first fault	The frequency before the previous fault	●

y1.24	Current of the first fault	The current before the previous fault	●
y1.25	Bus voltage of the first fault	The bus voltage before the previous fault	●
y1.26	Input terminal status of the first fault	The digital input terminal status before the previous fault , the order is: | BIT7	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
DI7	DI6	DI5	DI4	DI3	DI2	DI1	 When the input terminal is ON, the corresponding binary bits is 1, OFF is 0, all DI status are converted to the decimal number for display.	●
y1.27	Output terminal status of the first fault	Output terminal status of the first (at last) fault 	BIT3	BIT2	BIT1	BIT0	 SPA Reserve Relay Reserve When the output terminal ON its corresponding secondary system is 1, OFF to 0, all DI state into decimal number display	●
y1.29	Power-on time of the first fault	The current power-on time before the previous fault	●
y1.30	Running time of the first fault	The current running time before the previous fault	●

Chapter 6 Troubleshooting

6-1.Fault alarm and countermeasures

    PI160 series frequency inverter will stop output to protect the motor once fault happens when the inverter system is running . When the frequency inverter is in fault , relay contact will start , and the fault code will be displayed on the display panel of the inverter. The corresponding fault type and common solutions of fault code can be found in the table below. The listed items in the table are for your reference only, please don't repair or transform the inverter without authorization. If faults cannot be solved, please contact the agents or manufacturer to seek for technical support .

No	Failure type	Failure type	Possible causes	Solutions
1	Err.01	Inverter unit protection	1.The short circuit of inverter output happens 2.The wiring for the motor and the inverter is too long 3.Module overheating 4.The internal wiring of inverter is loose 5.The main control panel is abnormal 6.The drive panel is abnormal. 7.The inverter module is abnormal	1.Eliminate peripheral faults 2.Additionally install the reactor or the output filter 3.Check the air duct is blocked or not and the fan is working normally or not, and eliminate problems 4.Correctly plug all cables 5.Seek for technical support
2	Err.02	Acceleration overcurrent	1.The acceleration time is too short 2.Manual torque boost or V/F curve is not suitable 3.The voltage is low 4.The short-circuit or earthing of inverter output happens 5.The control mode is vector and without identification of parameters 6.The motor that is rotating is started unexpectedly. 7.Suddenly increase the load in the process of acceleration. 8.The type selection of inverter is small	1.Increase acceleration time 2.Adjust manual torque boost or V/F curve 3.Set the voltage to the normal range 4.Eliminate peripheral faults 5.Perform identification for the motor parameters 6.Select Speed Tracking Start or restart after stopping the motor. 7.Cancel the sudden load 8.Choose the inverter with large power level
3	Err.03	Deceleration overcurrent	1.The short-circuit or earthing of inverter output happens 2.The control mode is vector and without identification of parameters 3.The deceleration time is too short 4.The voltage is low 5.Suddenly increase the load in the process of deceleration. 6.Didn't install braking unit and braking resistor	1.Eliminate peripheral faults 2.Perform identification for the motor parameters 3.Increase the deceleration time 4.Set the voltage to the normal range 5.Cancel the sudden load 6.Install braking unit and brake resistor
4	Err.04	Constant speed overcurrent	1.The short-circuit or earthing of inverter output happens	1.Eliminate peripheral faults

No	Failure type	Failure type	Possible causes	Solutions
			2.The control mode is vector and without identification of parameters 3.The voltage is low 4. Whether suddenly increase the load when running 5.The type selection of inverter is small	2.Perform identification for the motor parameters 3.Set the voltage to the normal range 4.Cancel the sudden load 5.Choose the inverter with large power level
5	Err.05	Acceleration overvoltage	1.Didn't install braking unit and braking resistor 2.The input voltage is high 3.There is external force to drag the motor to run when accelerating. 4.The acceleration time is too short	1.Install braking unit and brake resistor 2.Set the voltage to the normal range 3.Cancel the external force or install braking resistor. 4.Increase acceleration time
6	Err.06	Deceleration overvoltage	1.The input voltage is high 2.There is external force to drag the motor to run when decelerating. 3.The deceleration time is too short 4.Didn't install braking unit and braking resistor	1.Set the voltage to the normal range 2.Cancel the external force or install braking resistor. 3.Increase the deceleration time 4.Install braking unit and brake resistor
7	Err.07	Constant speed overvoltage	1.There is external force to drag the motor to run when running 2.The input voltage is high	1.Cancel the external force or install braking resistor. 2.Set the voltage to the normal range
8	Err.08	Control power failure	1.The range of input voltage is not within the specification. 2.Report undervoltage fault frequently.	Adjust the voltage to the range of within the specification
9	Err.09	Under voltage fault	1.The momentary power cut 2.The inverter's input voltage is not within the specification 3.The bus voltage is not normal 4.The rectifier bridge and buffer resistance are abnormal 5.The drive panel is abnormal. 6.The control panel is abnormal	1.Reset fault 2.Adjust the voltage to the normal range 3.Seek for technical support
10	Err.10	Inverter overload	1.The type selection of inverter is small 2.Whether the load is too large or the motor stall occurs	1.Choose the inverter with large power level 2.Reduce the load and check the motor and its mechanical conditions
11	Err.11	Motor Overload	1.Power grid voltage is too low 2.Whether the setting motor protection parameters (F8.03) is appropriate or not 3.Whether the load is too large or the motor stall occurs	1.Check the power grid voltage 2.Correctly set this parameter. 3.Reduce the load and check the motor and its mechanical conditions

Chapter 6

No	Failure type	Failure type	Possible causes	Solutions
12	Err.12	Input phase loss	1.The drive panel is abnormal. 2.The lightning protection plate is abnormal 3.The main control panel is abnormal 4.The three-phase input power is not normal	1.Replace the drive, the power board or contactor 2.Seek for technical support 3.Check and eliminate the existing problems in the peripheral line
13	Err.13	Output phase loss	1.The drive panel is abnormal. 2.The lightning protection plate is abnormal 3.The main control panel is abnormal 4.The three-phase input power is not normal	1.Eliminate peripheral faults 2.Check the motor's three-phase winding is normal or not and eliminate faults 3.Seek for technical support
14	Err.14	Module overheating	1.The air duct is blocked 2.The fan is damaged 3.The ambient temperature is too high 4.The module thermistor is damaged 5.The inverter module is damaged	1.Clean up the air duct 2.Replace the fan 3.Decrease the ambient temperature 4.Replace the thermistor 5.Replace the inverter module
15	Err.15	External equipment fault	Input external fault signal through the multi-function terminal DI	Reset run
16	Err.16	Communication fault	1.The communication cable is not normal 2.The settings for communication expansion card F9.07 are incorrect 3.The settings for communication parameters F9 group are incorrect 4.The host computer is not working properly	1.Check the communication cable 2.Correctly set the communications expansion card type 3.Correctly set the communication parameters 4.Check the wiring of host computer
17	Err.17	Contactor fault	1.Input phase loss 2.The drive plate and the contact are not normal	1.Check and eliminate the existing problems in the peripheral line 2.Replace the drive, the power board or contactor
18	Err.18	Current detection fault	1.Check Hall device 2.The drive panel is abnormal.	1.Replace the drive panel 2.Replace hall device
19	Err.19	Motor parameter auto tunning fault	1.The motor parameters was not set according to the nameplate 2.The identification process of parameter is timeout	1.Correctly set motor parameter according to the nameplate 2.Check the lead wire from the inverter to the motor
20	Err.20	Disk code fault	1.The encoder is damaged 2.PG card is abnormal 3.The encoder model does not match 4.The encoder connection has error	1.Replace the encoder 2.Replace the PG card 3.Correctly set the encoder model according to the actual conditions 4.Eliminate the line fault
21	Err.21	EEPROM read	EEPROM chip is damaged	Replace the main control

No	Failure type	Failure type	Possible causes	Solutions
		and write fault		panel
22	Err.22	Inverter hardware fault	1.Overvoltage 2.Overcurrent	1.Eliminate overvoltage fault 2.Eliminate overcurrent fault
26	Err.26	Cumulative running time arrival fault	Cumulative running time arrival fault	Clear history information by using initialization function parameters
27	Err.27	Custom fault 1	Input custom fault 1 signal through the multi-function terminal DI	Reset run
28	Err.28	Custom fault 2	Input custom fault 2 signal through the multi-function terminal DI	Reset run
29	Err.29	Total power- on time arrival fault	Total power-on time reaches the set value	Clear history information by using initialization function parameters
30	Err.30	Load drop fault	The inverter running current is less than F8.31	Confirm whether the load is removed or not or the settings for parameter (F8.31, F8.32) accord with the Actual operating conditions
31	Err.31	PID feedback loss when running fault	PID feedback is less than the set value of E2.11	Check PID feedback signal or set E2.11 to an appropriate value
40	Err.40	Quick current limiting fault	1.Whether the load is too large or the motor stall occurs 2.The type selection of inverter is small	1.Reduce the load and check the motor and its mechanical conditions 2.Choose the inverter with large power level
41	Err.41	Switch motor when running fault	Change current motor through the terminal when the inverter is running	Switch motor after the inverter stops
43	Err.43	Motor over speed fault	1.The parameter was not identified 2.The setting for encoder parameters is incorrect 3.The setting for motor overspeed detection parameter(F8.13, F8.14) is unreasonable.	1.Perform identification for the motor parameters 2.Correctly set encoder parameters 3.Reasonably set the detection parameters
45	Err.45	Motor over temperature fault	1.The wiring of temperature sensor is loose 2.The motor temperature is too high	1.Detect the wiring of temperature sensor wiring and eliminate fault. 2.Decrease carrier frequency or take other cooling measures to cool motor
51	Err.51	Initial position error	The deviation between the motor parameters and the actual parameters is too large	Reconfirm the correct motor parameters, focus on whether the rated current is set to too small
-	COF	Communicatio	1. Keyboard interface control panel	1.Test the keyboard

Chapter 6

No	Failure type	Failure type	Possible causes	Solutions
		n failures	interface is bad; 2. Bad keyboard line or crystal joint; 3. Control panel or the keyboard hardware damage; 4. The keyboard line is too long, the scene caused interference.	interface, control panel interface is abnormal; 2.Test whether keyboard line, crystal joint exception; 3.Replace the control panel or keyboard; 4. Consultancy, for help

6-2.EMC (Electromagnetic compatibility)
6-2-1.Definition

Electromagnetic compatibility refers to the ability that the electric equipment runs in an electromagnetic interference environment and implements its function stably without interferences on the electromagnetic environment.

6-2-2. EMC standard

In accordance with the requirements of the Chinese national standard GB/T12668.3, the inverter must comply with the requirements of electromagnetic interference and anti-electromagnetic interference.

Our existing products adopt the latest international standards: IEC/EN61800-3: 2004 (Adjpstable Speed electrical Power drive systems Part 3: EMC requirements and Specific test methods), which is equivalent to the Chinese national standards GB/T12668.3. EC/EN61800-3 assesses the inverter in terms of electromagnetic interference and anti-electronic interference. Electromagnetic interference mainly tests the radiation interference, conduction interference and harmonics interference on the inverter (necessary for civil inverter)

Anti-electromagnetic interference mainly tests the conduction immunity, radiation immunity, surge immunity, EFTB(Electrical Fast Transient Burs) immunity, ESD immunity and power low frequency end immunity (the specific test items includes: 1. Immunity tests of input voltage sag, interrupt and change; 2.Commutation notch immunity; 3. harmonic input immunity ; 4. input frequency change; 5. input voltage unbalance; 6. input voltage fluctuation). The tests shall be conducted strictly in accordance with the above requirements of IEC/EN61800-3, and our products are installed and used according to the guideline of the Section 6-3 and can provide good electromagnetic compatibility in general industry environment.

6-3.EMC directive
6-3-1.Harmonic effect

The higher harmonics of power supply may damage the inverter. Thus, at some places where the quality of power system is relatively poor, it is recommended to install AC input reactor.

6-3-2.Electromagnetic interference and installation precautions

There are two kinds of electromagnetic interferences, one is the interference from electromagnetic noise in the surrounding environment to the inverter, and the other is the interference from the inverter to the surrounding equipments.

Installation Precautions:

1)The earth wires of the Inverter and other electric products shall be well grounded;

2)The power cables of the inverter power input and output and the cable of weak current signal (e.g. control line) shall not be arranged in parallel but in vertical if possible.

3)It is recommended that the output power cables of the inverter shall use shield cables or steel pipe shielded cables and that the shielding layer shall be grounded reliably, the lead cables of the equipment suffering interferences shall use twisted-pair shielded control cables, and the shielding layer shall be grounded reliably.

Chapter 6

4)When the length of motor cable is longer than 30 meters, it needs to install output filter or reactor.

6-3-3.Remedies for the interferences from the surrounding electromagnetic equipments to the inverter

Generally the electromagnetic interference on the inverter is generated by plenty of relays, contactors and electromagnetic brakes installed near the inverter. When the inverter has error action due to the interferences, the following measures is recommended:

1) Install surge suppressor on the devices generating interference;

2) Install filter at the input end of the inverter, please refer to Section 6.3.6 for the specific operations.

3) The lead cables of the control signal cable of the inverter and the detection line shall use the shielded cable and the shielding layer shall be grounded reliably.

6-3-4.Remedies for the interferences from the inverter to the surrounding electromagnetic equipments

These noise interferences are classified into two types: One is the radiation interference of the inverter, and the other is the conduction interference of the inverter. These two types of interferences cause that the surrounding electric equipments suffer from the affect of electromagnetic or electrostatic induction. Further, the surrounding equipment produces error action. For different interferences, please refer to the following remedies:

1) Generally the meters, receivers and sensors for measuring and testing have more weak signals. If they are placed nearby the inverter or together with the inverter in the same control cabinet, they easily suffer from interference and thus generate error actions. It is recommended to handle with the following methods: Away from the interference source as far as possible; do not arrange the signal cables with the power cables in parallel and never bind them together; both the signal cables and power cables shall use shielded cables and shall be well grounded; install ferrite magnetic ring (with suppressing frequency of 30 to 1, 000MHz) at the output side of the inverter and wind it 2 to 3 turns; install EMC output filter in more severe conditions.

2) When the interfered equipment and the inverter use the same power supply, it may cause conduction interference. If the above methods cannot remove the interference, it shall install EMC filter between the inverter and the power supply (Refer to Section 6.3.6 for the selection operation);

3) The surrounding equipment shall be separately grounded, which can avoid the interference caused by the leakage current of the inverter's grounding wire when common grounding mode is adopted.

6-3-5.Remedies for leakage current

There are two forms of leakage current when using the inverter. One is leakage current to the earth, and the other is leakage current between the cables.

1) Factors of affecting leakage current to the earth and its solutions:

There are the distributed capacitance between the lead cables and the earth. The larger the distributed capacitance, the larger the leakage current; the distributed capacitance can be reduced by effectively reducing the distance between the inverter and the motor. The higher the carrier frequency, the larger the leakage current. The leakage current can be reduced by reducing the carrier frequency. However, the carrier frequency reduced may result in the increase of motor noise.Please note that additional installation of reactor is also an effective method to solve leakage current problem.The leakage current may increase with the increase of circuit current. Therefore, when the motor power is higher, the corresponding leakage current will be higher too.

2) Factors of producing leakage current between the cables and its solutions:

There is the distributed capacitance between the output cables of the inverter. If the current passing lines has higher harmonic, it may cause resonance and thus result in leakage current. If the thermal relay is used, it may generate error action.The solution is to reduce the carrier frequency or install output reactor. It is recommended that the thermal relay shall not be installed in the front of the motor when using the inverter, and that electronic over current protection function of the

inverter shall be used instead.

6-3-6.Precautions on installing EMC input filter at the input end of power supply

1) Note: when using the inverter, please follow its rated values strictly. Since the filter belongs to Classification I electric appliances, the metal enclosure of the filter and the metal ground of the installing cabinet shall be well earthed in a large area, and have good conduction continuity, otherwise there may be danger of electric shock and the EMC effect may be greatly affected. Through the EMC test, it is found that the filter ground end and the PE end of the inverter must be connected to the same public earth end, otherwise the EMC effect may be greatly affected.

2) The filter shall be installed at a place close to the input end of the power supply as much as possible.

Chapter 7 Outline dimension

7-1 Dimension

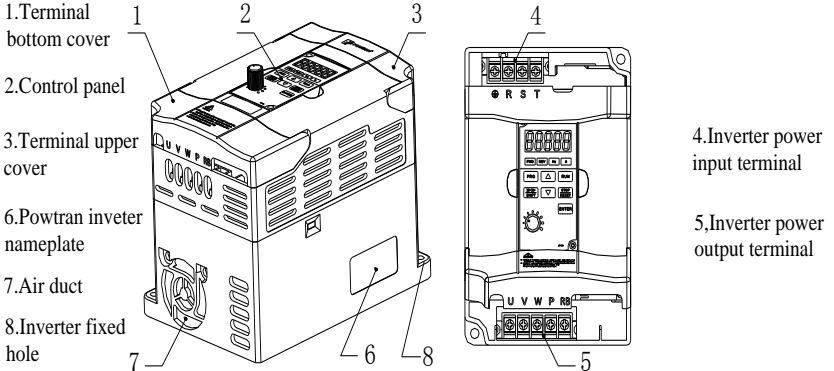### 7-1-1. Product outline drawing, installation dimension

1.Terminal bottom cover

2.Control panel

3.Terminal upper cover

6.Powtran inveter nameplate

7.Air duct

8.Inverter fixed hole

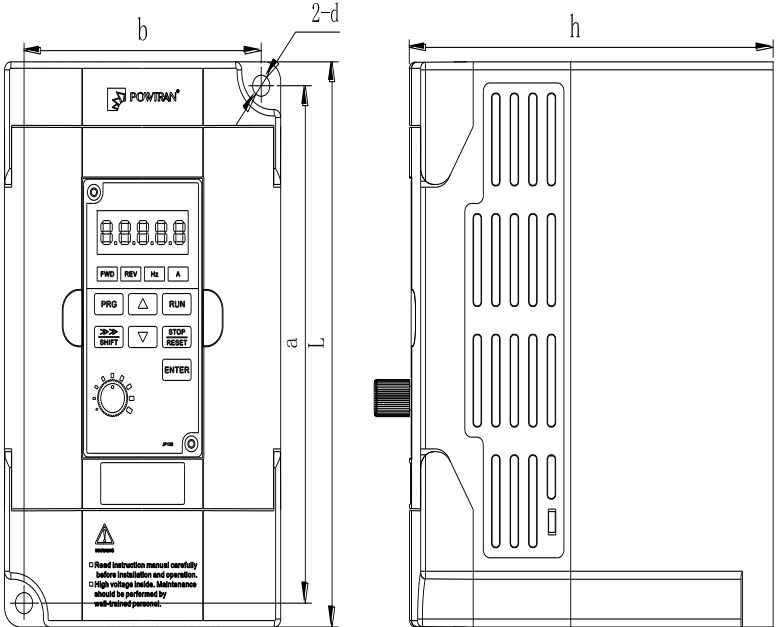4.Inverter power input terminal

5,Inverter power output terminal

Figure 7-1.Product appearance、Installation dimension

7-1-2. PI160 Series

Base No.	Power supply level	Type	Power (kW)	Dimensions(mm)				Installation Size(mm)			Approximate weight (kg)
				L	W	H	h	a	b	d	
1M2	Single phase 220V	G	0.4~0.75	142	85	122.8	112	130	73	φ5.3	0.8
	Three phase 220V	G	0.4~0.75								
1M3	Single phase 220V	G	1.5~2.2	151.6	100.6	127.5	116.6	139.7	88.7	φ5.3	1
	Three phase 220V	G	1.5~2.2								
	Three phase 380V	G	0.4~3.7								

7-1-3. **Keyboard dimension**

JP160 Dimension:
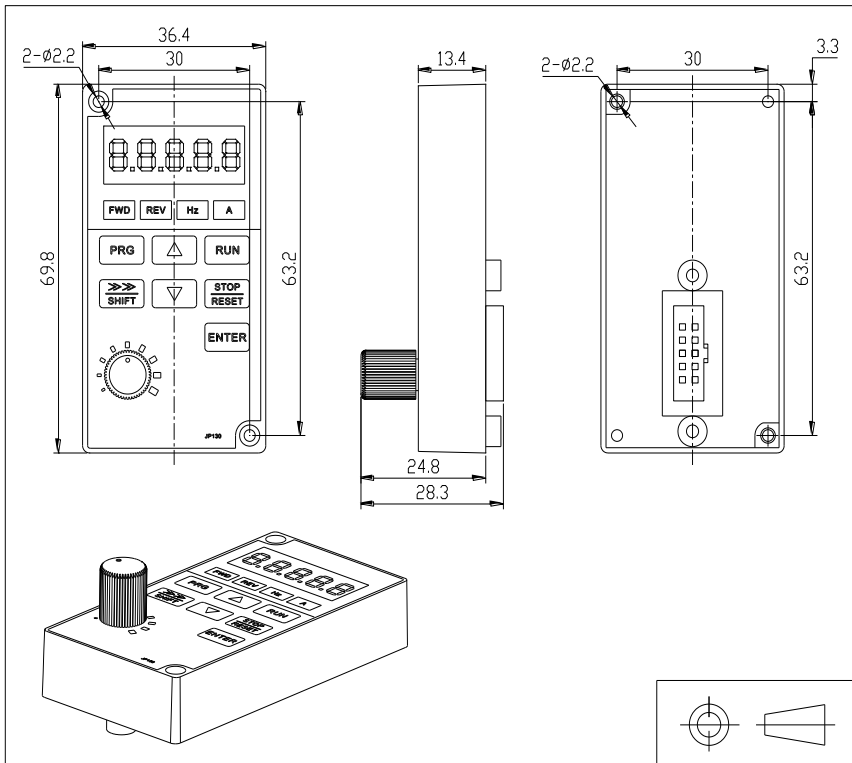
Chapter 8 Maintenance and repair

8-1.Inspection and maintenance

During normal use of the inverter, in addition to routine inspections, the regular inspections are required (e.g. the overhaul or the specified interval, and the interval shall not exceed 6 months), please refer to the following table to implement the preventive measures.

Check Date		Check Points	Check Items	Check to be done	Method	Criterion
Routine	Regular					
√		Display	LED display	Whether display is abnormal or not	Visually check	As per use status
√	√	Cooling system	Fan	Whether abnormal noise or vibration exists or not	Visually and audibly check	No abnormal
√		Body	Surrounding conditions	Temperature, humidity, dust, harmful gas.	Visually check with smelling and feeling	As per Section 2-1
√		Input/output terminals	Voltage	Whether input/output voltage is abnormal or not	Test R, S, T and U, V, W terminals	As per standard specifications
	√	Main circuit	Overall	Whether these phenomenon of loose fastenings, overheat, discharging, much dust, or blocked air duct exist or not	Visually check, tighten and clean	No abnormal
			Electrolytic capacitance	Whether appearance is abnormal or not	Visually check	No abnormal
			Wires and conducting bar	Whether they are loose or not	Visually check	No abnormal
			Terminals	If screws or bolts are loose or not	Tighten	No abnormal

"√" means routine or regular check to be needed

Do not disassemble or shake the device gratuitously during check, and never unplug the connectors, otherwise the system will not run or will enter into fault state and lead to component failure or even damage to the main switching device such as IGBT module.

The different instruments may come to different measurement results when measuring. It is recommended that the pointer voltmeter shall be used for measuring input voltage, the rectifier voltmeter for output voltage, the clamp-on ammeter for input current and output current, and the electric wattmeter for power.

8-2.Parts for regular replacement

To ensure the reliable operation of inverter, in addition to regular care and maintenance, some internal mechanical wear parts(including cooling fan, filtering capacitor of main circuit for energy storage and exchange, and printed circuit board) shall be regularly replaced. Use and replacement for such parts shall follow the provisions of below table, also depend on the specific application environment, load and current status of inverter.

Name of Parts	Standard life time
Cooling fan	1 to 3 years
Filter capacitor	4 to 5 years
Printed circuit board(PCB)	5 to 8 years

8-3.Storage

The following actions must be taken if the inverter is not put into use immediately(temporary or long-term storage) after purchasing:

※　It should be store at a well-ventilated site without damp, dust or metal dust, and the ambient temperature complies with the range stipulated by standard specification.

※　Voltage withstand test can not be arbitrarily implemented, it will reduce the life of inverter. Insulation test can be made with the 500-volt megger before using, the insulation resistance shall not be less than 4MΩ.

8-4.Capacitor
8-4-1 Capacitor rebuilt

If the frequency inverter hasn't been used for a long time, before using it please rebuilt the DC bus capacitor according the instruction. The storage time is counted from delivery.

Time	Operation instruction
Less than 1 year	No need to recharge
Between 1~2 years	Before the first time to use, the frequency inverter must be recharged for one hour
Between 2~3years	Use adjustable power to charge the frequency inverter: --25% rated power 30 minutes, -- 50% rated power 30minutes, -- 75% rated power 30minutes, --Last 100% rated power 30minutes,
More than 3 years	Use adjustable power to charge the frequency inverter: --25% rated power 2hours, --50% rated power 2 hours, -- 75% rated power 2hours, -- Last 100% rated power 2hours.

Instruction of using adjustable power to charge the frequency inverter:

The adjustable power is decided by the frequency inverter input power, for the single phase/3 phase 220v frequency inverter, we use 220v AC/2A Regulator. Both single phase and three phase frequency inverter can be charged by single phase Power Surge(L+ connect R,N connects T) Because it is the same rectifier，so all the DC bus capacitor will be charged at the same time.

You should make sure the voltage(380v) of high voltage frequency inverter, because when the capacitor being charged it almost doesn't need any current, so small capacitor is enough(2A)

The instruction of using resistor (incandescent lights) to charge frequency inverters:

When charge the DC bus capacitor of drive system by connecting power directly, then the time should not be less than 60 minutes. The operation should be carried on under the condition of normal temperature and without load, and moreover ,should be added resistor in the power supply cycle.

380V drive system: use 1K/100W resistor. When the power is less than 380v, 100w incandescent lights is also suitable. When using incandescent lights, the lights will extinct or become very weak.
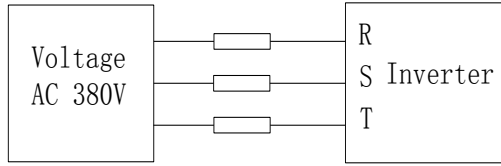
380V Drive equipment charging circuit example

8-5.Measuring and readings

※ If a general instrument is used to measure current, imbalance will exists for the current at the input terminal. generally, the deviation is not more than 10%, that is normal. If the deviation exceeds 30%, please inform the original manufacturer to replace rectifier bridge, or check if the deviation of three-phase input voltage is above 5V or not.

※ If a general multi-meter is used to measure three-phase output voltage, the reading is not accurate due to the interference of carrier frequency and it is only for reference.

Chapter 8

Chapter 9 Warranty

The product quality shall comply with the following provisions (overseas market):
1. Warranty terms

    1-1. The product from the ex-factory date, the warranty period of 18 months(except non-standard products), It is based on factory records.

    1-2. The product from the ex-factory date. if the product appear quality problem within the normal operating range. we provide free warranty under 18 months.

    1-3. The product from the ex-factory date, enjoy lifelong compensable service.

    If there is a contract, we will according to the priority principle of the contract.

2. Exceptions clause

    If belongs to the quality problems caused by following reasons products, we provide compensable service even though under the warranty. we will charge a maintenance fee.

    2-1. The user is not in accordance with the "products manual" is used method of operation

    caused the failure.

    2-2. Users without permission to alteration or repair caused by product failure.

    2-3. Users beyond the standard specifications require the use of the inverter caused by

    product failure.

    2-4. Users to buy and then fell loss or damage caused by improper handling.

    2-5.Because the user use adverse environment (Such as: Humid environment, Acid and alkaline corrosion gas and so on) lead to product failure.

    2-6. Due to the fault cause of earthquake, fire, lightning, wind or water disaster, abnormal

    voltage irresistible natural disasters.

    2-7. Damaged during shipping ,but users are not rejected goods.

3. The following conditions, manufacturers have the right not to be warranty.

    3-1. No product nameplate or product nameplate blurred beyond recognition.

    3-2. Not according to the purchase contract agreement to pay the money.

    3-3. For installation, wiring, operation, maintenance and other users can not describe the objective reality to the company's technical service center.

4. About the repair fee, according to our company latest price list as a standard.

5. When the products is broken, please complete the form and warranty card, shipping with the failure machine to our company.

6. Dalian Powtran Technology Co.,Ltd reserve the right to explain the terms of the event**.**

Appendix I RS485 communication protocol

I-1   Communication protocol

I-1-1   Communication content

This serial communication protocol defines the transmission information and use format in the series communication Including: master polling(or broadcast) format; master encoding method, and contents including: function code of action, transferring data and error checking. The response of slave also adopts the same structure, and contents including: Action confirmation, returning the data and error checking etc. If slave takes place the error while it is receiving information or cannot finish the action demanded by master, it will send one fault signal to master as a response.
Application Method

The inverter will be connected into a "Single-master Multi-slave" PC/PLC control network with RS485 bus.

Bus structure

(1) Interface mode

RS485 hardware interface

(2) Transmission mode

Asynchronous series and half-duplex transmission mode. For master and slave, only one of them can send the data and the other only receives the data at the same time. In the series asynchronous communication, the data is sent out frame by frame in the form of message

(3) Topological structure

Single-master and multi-slave system. The setting range of slave address is 0 to 247, and 0 refers to broadcast communication address. The address of slave for network must be exclusive.

I-1-2 Communications connection

(1)Interface mode: RS485 hardware interface

(2) Transmission mode:

Asynchronous serial, half duplex transmission mode. At the same time the host and slave can only have one send data and the other can only receive data. Data in the process of serial asynchronous communication, is in the form of a message, a frame of a frame to send.

(3)Topological structure:

Single host machine system. The set range from the machine address is 1~247, 0 for the broadcast communication address. The slave address in the network must be unique.

Single application

Picture I-3 , the MODBUS wiring diagram of single inverter and PC. Generally , because PC does not carry RS485 interface, So we need to change the RS232 interface or USB interface in PC to RS485 through coverter . Connect the A terminal of RS485 to 485+ terminal on terminal board ,and connect the B terminal of RS485 to 485- terminal on terminal board. It is better to use twisted-pair cable with shield for the connection. When using the RS232-485 converter, the cable between RS232 interface on PC and RS232 interface on RS232-RS485 converter should be short, not longer than 15m.The best way is to insert the RS232-RS485 converter on the PC. When using the USB-RS485 converter, the cable should be short too.

When all cable is in right position, choose the right terminal on PC, the terminal forconnecting RS232-RS485 converter, such as COM1, and set the basic parameters such as baud rate and data

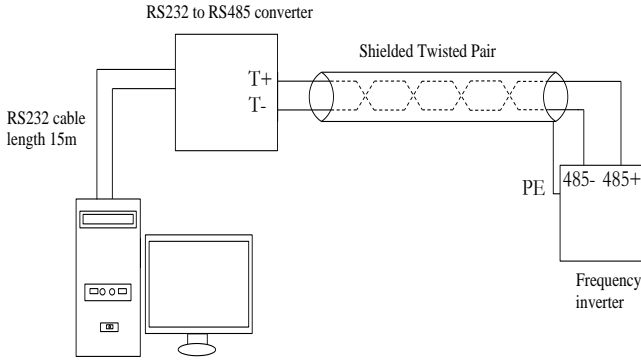validation according to the inverter communication parameters

Figure I-3: Single application schematic diagram

Multiple applications

Generally there are two connection ways for multiple application.(Terminal resistance is selected by the control panel JP1)

connection 1, connect a 120Ω 1/4 W terminal resistor on both side.Shown as Figure I-4.
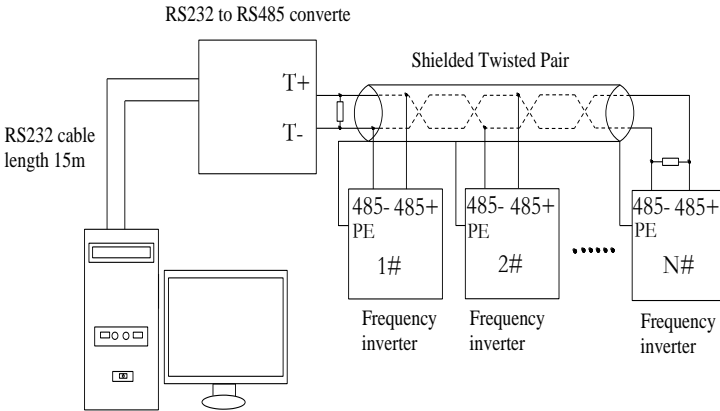

Figure I-4: Multiple applications schematic Figure 1

Connection 2, connect a 120Ω 1/4W terminal resistor on two devices(5# and 8#)which are farthest from the wire.Shown as picture I-5
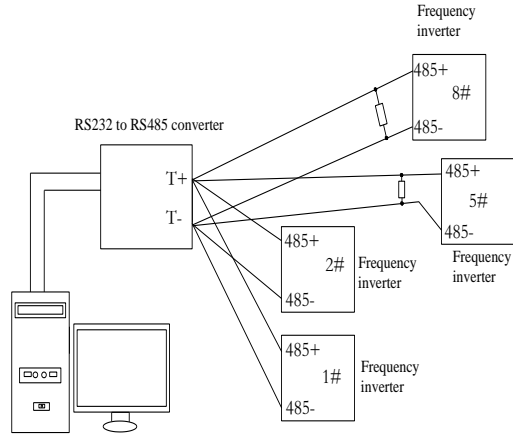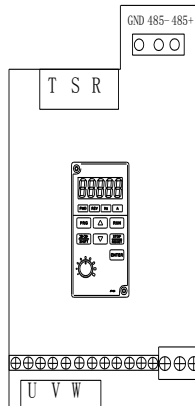
Figure I-5:Multiple applications schematic Figure 2

It is better to use shield cable for the multiple application. And make the basic parameters such as baud rate and data validation connecting with RS485 consistent , do not use one address repeatedly.

I-1-3 Protocol description

PI160 series inverter communication protocol is a asynchronous serial master-slave communication protocol, in the network, only one equipment (Master) can build a protocol (known as "Inquiry/Command") . Other equipment (Slave) only can response the "Inquiry/Command"of master by providing data or perform the corresponding action according to the"Inquiry/Command"of master. Here, the master refers to a Personnel Computer (PC), an industrial control device or a programmable logic controller (PLC),etc. and the slave refers to PI160 inverter. Master can communicate with individual slave, also send broadcasting information to all the lower slaves. For the single "Inquiry/Command"of master, slave will return a signal (that is a response) to master; for the broadcasting information sent by master, slave does not need to feedback a response to master.

PI160 series inverter's Modbus protocol communication data format is as follows: in RTU mode, messages are sent at a silent interval of at least 3.5 characters. There are diverse character intervals under network baud rate,which is easiest implemented (as shown in Figure T1-T2-T3-T4) .The first field transmitted is the device address.

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The allowable characters for transmitting are hexadecimal 0 ... 9, A ... F. The networked devices continuously monitor network bus, including during the silent intervals. When the first field (the address field) is received, each device decodes it to find out if it is sent to their own. Following the last transmitted character, a silent interval of at least 3.5 characters marks the end of the message. A new message can begin after this silent interval.

The entire message frame must be transmitted as a continuous stream. If a silent interval of more than 1.5 characters occurs before completion of the frame, the receiving device will flushes the incomplete message and assumes that the next byte will be the address field of a new message. Similarly, if a new message begins earlier than the interval of 3.5 characters following a previous message, the receiving device will consider it as a continuation of the previous message. This will result in an error, because the value in the final CRC field is not right.

RTUframe format :

Frame headerSTART	Time interval of 3.5characters
Slave address ADR	Communication address: 1 to 247
Command codeCMD	03: Read slave parameters；06: write slave parameters
Data contentDATA(N-1)	
Data contentDATA(N-2)	Data content: Address of function code parameter, numbers of function code parameter, value of function code parameter, etc.
………………………	
Data contentDATA0	
CRC CHK high-order	Detection Value:CRC value.
CRC CHK low-order	
END	Time interval of 3.5characters

CMD (Command) and DATA (data word description)

Command code: 03H, reads N words (Max.12 words), for example: for the inverter with slave address 01, its start address F0.02 continuously reads two values.

Master command information

ADR	01H
CMD	03H
Start address high-order	F0H
Start address low-order	02H
Number of registers high-order	00H
Number of registers low-order	02H
CRC CHK low-order	CRC checksum
CRC CHK high-order	

Slave responding information

When F9.05 is set to 0:

ADR	01H
CMD	03H
Byte number high-order	00H
Byte number low-order	04H
Data F002 Hhigh-order	00H
Data F002 Hlow-order	01H
Data F003 Hhigh-order	00H
Data F003 Hlow-order	01H
CRC CHK low-order	CRC checksum

CRC CHK high-order	

When F9.05is set to **1**:

ADR	01H
CMD	03H
Byte number	04H
Data F002 Hhigh-order	00H
Data F002 Hlow-order	01H
DataF003 Hhigh-order	00H
Data F003 Hlow-order	01H
CRC CHK low-order	CRC checksum
CRC CHK high-order	

Command Code: 06H, write a word. For example:Write 5000(1388H)into the address F013H of the inverter with slave address 02H.
Master command information

ADR	02H
CMD	06H
Data address high-order	F0H
Data address low-order	13H
Data content high-order	13H
Data content low-order	88H
CRC CHK low-order	CRC checksum
CRC CHK high-order	

Slave responding information

ADR	02H
CMD	06H
Data address high-order	F0H
Data address low-order	13H
Data content high-order	13H
Data content low-order	88H
CRC CHK low-order	CRC checksum
CRC CHK high-order	

I-2   Check mode

Check mode - CRC mode: CRC (Cyclical Redundancy Check) Use RTU frame format, the message includes an error- checking field that is based on the CRC method. The CRC field checks the whole content of message. The CRC field has two bytes containing a 16-bit binary value. The CRC value calculated by the transmitting device will be added into to the message. The receiving device recalculates the value of the received CRC, and compares the calculated value to the actual value of the received CRC field, if the two values are not equal,then there is an error in the transmission.

The CRC firstly stores 0xFFFF and then calls for a process to deal with the successive eight-bit bytes in message and the value of the current register. Only the 8-bit data in each character is

valid to the CRC,the start bit and stop bit, and parity bit are invalid.

During generation of the CRC, each eight-bit character is exclusive OR (XOR) with the register contents separately, the result moves to the direction of least significant bit (LSB), and the most significant bit (MSB) is filled with 0. LSB will be picked up for detection, if LSB is 1, the register will be XOR with the preset value separately, if LSB is 0, then no XOR takes place. The whole process is repeated eight times. After the last bit (eighth) is completed, the next eight-bit byte will be XOR with the register's current value separately again. The final value of the register is the CRC value that all the bytes of the message have been applied.

When the CRC is appended to the message, the low byte is appended firstly, followed by the high byte.   CRC simple functions is as follows:

unsigned int crc_chk_value(unsigned char *data_value,unsigned char length)

```
    {
        unsigned int crc_value=0xFFFF;

        int i;
        while(Length--)
        {
            crc_value^=*data_value++;
            for(i=0;i<8;i++)
            {
                if(Crc_value&0x0001)
                {
                    crc_value=(Crc_value>>1)^0xa001;
                }
                else
                {
                    crc_value=crc_value>>1;
                }
            }
        }
        return(Crc_value);
    }
```

I--3 Definition of communication parameter address

The section is about communication contents, it's used to control the operation, status and related parameter settings of the inverter. Read and write function-code parameters (Some functional code is not changed, only for the manufacturer use or monitoring): The rules of labeling function code parameters address:

The group number and label number of function code is used to indicate the parameter address:

High byte: F0 to Fb (F group), A0 to AF (E group), B0 to BF(B group),C0 to C7(Y group),70 to 7F (d group) low byte: 00 to FF

For example: Address F3.12 indicates F30C; Note: L0 group parameters: Neither read nor change; d group parameters: Only read, not change.

Some parameters can not be changed during operation, but some parameters can not be changed regardless of the inverter is in what state.When changing the function code parameters, please pay attention to the scope, units, and relative instructions on the parameter.

Besides, due to EEPROM is frequently stored, it will redUce the life of EEPROM, therefore

under the communication mode some function code do not need to be stored and you just change the RAM value.

If F group parameters need to achieve the function, as long as change high order F of the function code address to 0. If E group parameters need to achieve the function, as long as change high order A of the function code address to 4. The corresponding function code addresses are indicated below: High byte: 00 to 0F(F group), 40 to 4F (E group), 50 to 5F(B group),60 to 67(Y group)low byte:00 to FF

For example:

Function code F3.12 can not be stored into EEPROM, address indicates as 030C; function code E3.05 can not be stored into EEPROM, address indicates as 4305; the address indicates that only writing RAM can be done and reading can not be done, when reading, it is invalid address. For all parameters, you can also use the command code 07H to achieve the function. Stop/Run parameters section:

Stop/Run parameters section:

Parameter address	Parameter description
1000	Communication set value (-10000 to 10000) (Decimal)
1001	Runing frequency
1002	Bus voltage
1003	Output voltage
1004	Output current
1005	Output power
1006	Output torque
1007	Runing speed
1008	DI input flag
1009	DO output flag
100A	AI1 voltage
100D	Count value input
100E	Length value input
100F	Load speed
1010	PID setting
1011	PID feedback
1012	PLC step
1013	High-speed pulse input frequency,Unit:0.01kHz
1014	Feedback speed, Unit: 0.1Hz
1015	Remaining run time
1016	AI1 voltage before correction
1019	Linear speed
101A	Current power-on time
101B	Current running time
101C	High-speed pulse input frequency,Unit:1Hz

101D	Communication set value
101F	Master-frequency display
1020	Auxiliary frequency display

Note:

There are two ways to modify the settings frequencies through communication mode:

The first: Set F0.03 (Main frequency source setting) as 0/1 (keyboard set frequency), and then modify the settings frequency by modifying F0.01 (keyboard set frequency). Communication mapping address of F0.01 is 0xF001 (Only need to change the RAM communication mapping address to 0x0001).

The second:Set F0.03 (Main frequency source setting) as 9 (Remote communication set), and then modify the settings frequency by modifying (Communication settings). , mailing address of this parameter is 0x1000.The communication set value is the percentage of the relative value, 10000 corresponds to 100.00%, -10000 corresponds to -100.00%. For frequency dimension data, it is the percentage of the maximum frequency (F0.19); for torque dimension data, the percentage is F5.08 (torque upper limit digital setting).

Control command is input to the inverter: (write only)

Command word address	Command function
2000	0001: Forward run
	0002: Reverse run
	0003: Forward Jog
	0004: Reverse Jog
	0005: Free stop
	0006: Deceleration and stop
	0007: Fault reset

Inverter read status: (Read-only)

Status word address	Status word function
3000	0001: Forward run
	0002: Reverse run
	0003: Stop

Parameter lock password verification: (If the return code is8888H, it indicates that password verification is passed)

Password address	Enter password
C000	*****

Digital output terminal control: (write only)

Command address	Command content
2001	BIT0: SPA output control BIT1: RELAY2 output control BIT2 RELAY1 output control BIT3: Manufacturer reserves the undefined BIT4: Reserve

Analog output**DA1** control: (write only)

Command address	Command content
2002	0 to 7FFF indicates0％ to 100％

Analog output**DA2** control: (write only)

Command address	Command content
2003	0 to 7FFF indicates0％ to 100％

SPB high-speed pulse output control: (write only)

Command address	Command content
2004	0 to 7FFF indicates0％ to 100％

Inverter fault description:

Inverter fault address:	Inverter fault information:
8000	0000: No fault 0001: Inverter unit protection 0002: Acceleration overcurrent 0003: Deceleration overcurrent 0004: Constant speed overcurrent 0005: Acceleration overvoltage 0006: Deceleration overvoltage 0007: Constant speed overvoltage 0008: Control power failure 0009: Undervoltage fault 000A: Inverter overload 000B: Motor Overload 000C: Input phase loss 000D: Output phase loss 000E: Module overheating 000F: External fault 0010: Communication abnormal 0011: Contactor abnormal 0012: Current detection fault 0013: Motor parameter auto tunning fault 0015: Parameter read and write abnormal 0016: Inverter hardware fault 001A:Running time arrival 001B:Custom fault 1 001C: Custom fault 2 001D: Power-on time arrival 001E: Load drop 001F: PID feedback loss when running 0028: Fast current limiting timeout 002B: Motor overspeed 002D: Motor overtemperature 005C: Initial position error

Data on communication failure information description (Fault code):

Communication fault address	Fault function description
8001	0000: No fault 0001: Password error 0002: Command code error 0003: CRC check error 0004: Invalid address 0005: Invalid parameters 0006: Invalid parameter changes 0007: System locked 0008: EEPROM in operation

F9Group - Communication parameter description

	Baud rate	Default	6005
F9.00	Setting range	Units digit: MODUBUS baud rate 0: 300BPS 1: 600BPS 2: 1200BPS 3: 2400BPS 4: 4800BPS 5: 9600BPS 6: 19200BPS 7: 38400BPS 8: 57600BPS 9: 115200BPS	

This parameter is used to set the data transfer rate between the host computer and the inverter.

Note: The baud rate must be set to the same for the host computer and the inverter, otherwise communication can not be achieved. The larger baud rate, the faster communication speed.

	Data format	Default	0
F9.01	Setting range	0: No parity: Data format <8, N, 2> 1: Even parity: Data format <8, E, 1> 2: Odd parity: Data format <8, O, 1> 3: No parity: Data format <8-N-1>	

Note: The set data for the host computer and the inverter must be the same.

F9.02	This unit address	Default	1
	Setting range	1 to 247, 0 for broadcast address	

When the address of this unit is set 0, that is broadcast address, the broadcasting function for the host computer can be achieved.

The address of this unit has uniqueness (in addition to the broadcast address), which is the basis of peer-to-peer communication for the host computer and the inverter.

F9.03	Response delay	Default	2ms
	Setting range	0 to 20ms	

Response delay: it refers to the interval time from the end of the inverter receiving data to the start of it sending data to the host machine. If the response delay is less than the system processing time, then the response delay time is subject to the system processing time; If the response delay is longer than the system processing time, after the system finises the data processing, and continues to wait until the response delay time, and then sends data to the host computer.

F9.04	Reserved			
F9.05	Communication protocol selection		Default	0
	Setting range	0: Non-standard Modbus protocol 1: Standard Modbus protocol		

F9.05=1: Select standard Modbus protocol.

F9.05=0: when reading command, the number of bytes returned by slave is more 1 byte than standard Modbus protocol.

F9.06	Communication read current		Default	0
	Setting range	0: 0.01A 1: 0.1A		

Used to determine the current output units when communication reads output current.

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