SY6600 SERIES
HIGH-PERFORMANCE VECTOR INVERTER
OPERATION INSTRUCTION

Foreword

SY6600 series inverter is a new generation of high-performance vector inverter that is developed by Sanyu, representing the future development trend.

SY6600 series inverter is a vector-control general inverter that is independently researched, developed and produced by Shanyu, with the features of high quality, multi functions, large low-frequency torque, ultra silencing, etc.. It realizes the fast response of torque, strong load adaptability, stable operation, high accuracy, perfect reliability, and improves the power factor and efficiency to the largest extent.

SY6600 series inverter provides the automatic parameter tuning, zero-servo non-speed sensor, shift between vector control and V/F control, perfect user's password protection, shortcut menu design, rotation speed tracing, built-in PID controller, given and feedback signal disconnection monitoring and switchover, load-loss protection, fault signal tracing, automatic restart against fault, built-in braking unit, 25 fault protections, fault monitoring, abundant I/O terminals, various speed setting ways, automatic voltage adjustment, wobble frequency control and multi-speed control, it can meet the various loads' requirements of driving control. If the keyboard is operated, LED displays the running data and fault code, and LCD displays the Chinese state information and operation instructions, and copies the parameters and delivers them; the background adjustment and monitoring software can monitor the operation through the built-in standard RS485 interface; MODBUS bus protocol and expansion card can be compatible with PROFIBUS, DeviceNet and CAN open for field bus control. With the compact structure and unique style, the inverter is designed and tested according to the international standard, guaranteeing the reliability; in addition, its ample options are offered for your various configuration selections.

This manual provides the instructions about the type selection, installation, parameter setting, field adjustment, fault diagnose, daily maintenance, etc.. Before using SY6600 series general vector inverter, please read this manual carefully, to guarantee the correct use. The incorrect use may result in abnormal operation of inverter, fault, reduction of service life, even human injury accident, therefore, please read this manual repeatedly and fully understand it before using, and operate strictly according to the instruction.

This manual is the attached document delivered with the inverter, please preserve it well for future reference. Equipment-supporting customer shall deliver this manual with the equipment to the end user.

Contents

Chapter1 Safety points and precautions ····· 1
1.1 Safety points ····· 1
1.2 Precautions ····· 3
Chapter2 Product information ····· 5
2.1 Denomination rules ····· 5
2.2 Nameplate ····· 5
2.3 Type of SY6600 series inverter ····· 5
2.4 Technical specifications ····· 6
2.5 Outline&installation dimension ····· 8
2.6 Options ····· 9
2.7 Storage of inverter ····· 9
2.8 Guidance for selecting type ····· 9
Chapter3 Mechanical and electrical installation ····· 10
3.1 Mechanical installation ····· 10
3.2 Electrical installation ····· 11
3.3 Connection of peripheral equipment ····· 12
3.4 Connection way ····· 13
3.5 Main circuit terminal and connection ····· 14
3.6 Control terminal and connection ····· 15
3.7 Solutions for EMC problems ····· 17
Chapter4 Operation and display ····· 19
4.1 Introduction for operation and display interface ····· 19
4.2 Instruction for indicator lamp ····· 20
4.3 Function parameters setting ····· 20
4.4 Fast adjustment ····· 22
Chapter5 Function parameters table ····· 23
Chapter6 Instruction for parameters ····· 34
Chapter7 Fault diagnose and solutions ····· 73
7.1 Fault code table ····· 73
7.2 Usual fault and solution ····· 74
Chapter8 Maintenance ····· 75
8.1 Daily maintenance ····· 75
8.2 Regular maintenance ····· 75
8.3 Change of wearable parts of inverter ····· 75
8.4 Warranty for inverter ····· 75
Chapter9 Communication protocol ····· 76

This manual includes the operation instructions and attention.
In addition, please submit this manual to the end user.

Safety points

Before installing, operating, maintaining or examining the inverter, please read this manual and attached documents carefully for correct use. Only you fully understand the knowledge, safety information and all precautions about this inverter, you can use it, in this manual, the safety points are classified into "Danger" and "Caution".

Danger The danger caused by the operation not according to the requirements may result in severe injury, even the death.

Caution The danger caused by the operation not according to the requirements may result in medium or light injury and equipment damage.

1.1 Safety points:

1.1.1 Before installing:

Danger	• Don't install or operate the damaged inverter or the inverter lack of the parts, otherwise, the accident will cause any personal injury.

1.1.2 In installing:

Danger	• Mount the inverter at the flame-retardant material (such as the metal), and keep it away from the combustible material, otherwise, the fire will be caused.

Caution	• If more than two inverters are installed in a cabinet, please keep the good heat emission for the installation position (refer to Chapter 3 Mechanical and electrical installation)
	• Don't let the conductor head or screw drop into the inverter, otherwise, the inverter may be damaged.

1.1.3 In wiring:

Danger	• The inverter shall be operated by the professional electrician, otherwise, any electric shock will happen!
	• There must be a circuit breaker for isolating between inverter from power supply, otherwise, the fire will happen!
	• Before connecting, please make sure that the power is switched off, otherwise, you will suffer from the electric shock!
	• Please accord with the standard to perform the earthing operation, otherwise, you will suffer from the electric shock!

Caution	• Don't connect the input power line to the output terminals U, V and W, otherwise the inverter will be damaged!
	• Make sure the provided circuit reaches EMC requirements and local safety standard. Please refer to the suggestions in this manual for the diameter of used conductor, otherwise, any accident will happen!
	• The braking resistor can't be directly connected between (+) terminal and (-) terminal of DC bus, otherwise, the fire may happen!

1.1.4 Before energizing:

Danger	• Please make sure that the supply voltage is consistent with the rated voltage of inverter, the connection positions of input and output are correct, the peripheral circuits have no short circuit, and all circuits are connected firmly, otherwise, the inverter may be damaged!
	• Only the cover plate is closed, the inverter can be energized, otherwise, you will suffer from the electric shock!

Caution	• The inverter has been given the withstand voltage test before leaving the market, so, it needn't to be tested again, otherwise, some accidents may happen!
	• All periphery parts should be connected correctly according to this manual, otherwise, any accident may happen!

1.1.5 After energizing:

Danger	• After the inverter is energized, don't open the cover plate, otherwise, you will suffer from the electric shock!
	• Never touch the inverter and peripheral circuits with the wet hands, otherwise, the accident of electric shock will happen.
	• Don't touch the terminal of inverter, otherwise you will suffer from the electric shock!
	• At the beginning of being electrified, the inverter can conduct the safety check for the external strong current circuit automatically, at this moment, don't touch the terminals U, V and W of inverter or motor terminals, otherwise, the accident of electric shock will happen!

Caution	• If needing the parameter identification, please notice the danger that may be resulted from the motor rotation, otherwise, some injury accidents will happen!
	• Don't change the inverter parameters set by manufacturer randomly, otherwise, the equipment may be damaged.

1.1.6 In running:

Danger	• If selecting the restart function, please keep away from the mechanical equipment, otherwise, the human injury accident may happen!
	• Never touch the cooling fan and discharge resistor to sound the temperature, otherwise, you may be burned!
	• No layman is allowed to detect the signal when the equipment is running, otherwise, the human injury or equipment damage may happen!

Caution	• When the inverter is running, anything is not allowed to drop into, otherwise, it may be damaged!
	• Never adopt the making and breaking methods for contactor to control the start and stop of inverter, otherwise, it may be damaged!

1.1.7 In maintaining:

Danger	• Never maintain the equipment when the power is switched on, otherwise, you may suffer from the electric shock!
	• Only the "Charge" lamp of inverter goes out, the inverter can be maintained, otherwise, you may be injured by the residual capacitance of capacitor!
	• No layman is allowed to maintain the inverter, otherwise, the human injury or equipment damage may happen!

1. 2 Precautions

1. 2. 1 Examination for motor insulation

The motor should be given the insulation examination when it is used at first time and reused after long-time no service and when it is checked regularly, to prevent the inverter being damaged for poor insulation of motor windings. When conducting the check for insulation, must separate the motor wires from the inverter. It is suggested that 500V megohmeter should be used to measure, the measured insulation resistance should not be less than 5M.

1. 2. 2 Thermal protection for motor

When the rated capacity of motor doesn't match with that of inverter, especially, the rated power of inverter is larger than that of motor, please adjust the related motor-protection parameters inside the inverter or mount a thermal relay in front of motor additionally to protect the motor.

1.2.3 Running at above power frequency

The inverter can provide the output frequency of 0～600Hz. If user wants it to run at 50Hz above, please take the bearing capacity of mechanical device into the consideration.

1. 2. 4 Vibration of mechanical device

The inverter may meet the mechanical resonant points of load device at some power frequencies, which can be avoided through setting the hopping frequency parameters inside the inverter.

1. 2. 5 Motor heat and noise

Because the inverter output voltage is PWM wave, including the certain harmonic, the temperature rise, noise and vibration of motor will be increased slightly compared with that when the inverter runs at power frequency.

1. 2. 6 Varistor or capacitor for improving the power factor on the output side

Because the inverter outputs PWM wave, if the capacitor for improving the power factor or lightning-protection varistor is mounted on the output side, the instantaneous over current is easily produced to damage the inverter, please don't install them.

1. 2. 7 Contactors mounted at input and output terminals

If the contactor is mounted between the power supply and inverter input terminal additionally, it is not allowed to control the start and stop of inverter. If necessary, the interval of control should not be less than 1hour, because the frequent charge and discharge will easily reduce the service life of capacitor that is in the inverter. If the contactor is mounted between the output terminal and motor, please make sure that the inverter performs the making and breaking operation when it has no output, otherwise the inverter module will be damaged easily.

1. 2. 8 Use beyond the rated value

SY6600 series inverter should not be used beyond the permissible working voltage specified in this manual, otherwise, the inverter parts will be damaged. If necessary, please use the step-up or step-down device for transformation treatment.

1. 2. 9 Lighting impact protection

The inverter has the lightning over current protection device, so, it has a certain self-protection ability to resist the induction lightning. For the lighting frequent occurrence area, a protection device should be mounted in front of inverter.

1. 2. 10 Altitude and derating use

In the area where the altitude exceeds 1, 000m, the heat emission efficiency of inverter gets bad for the tenuous air, therefore, it is necessary to reduce the capacity. Please contact us for technology enquiry for this case.

1. 2. 11 Some special methods

If user needs the connection methods that are not specified in this manual, such as the common DC bus, please contact us.

1. 2. 12 Attentions against the rejection of inverter

The electrolytic capacitor at main circuit and the one at the printed board may be exploded when they are burned. The plastic part may produce the poisonous gas when it is burned, therefore, they shall be treated as the industrial rubbish.

1. 2. 13 Applicable motor

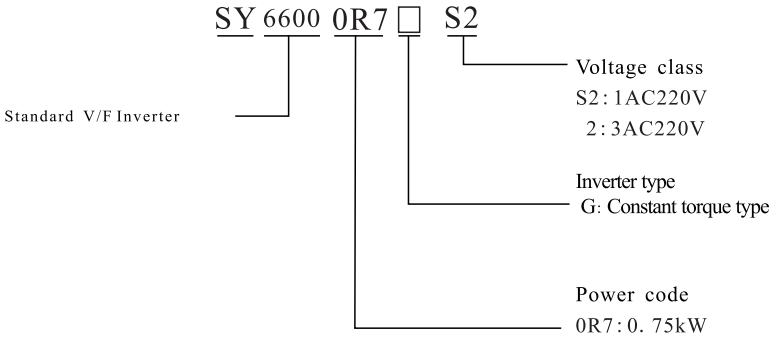
1. 2. 13. 1 The standard applicable motor is the four-pole squirrel cage asynchronous induction motor. If your motor is not the abovementioned one, please select the inverter according to the rated current of motor. If needing the drive of permanent magnet synchronous motor, please contact us.

1. 2. 13. 2 The cooling fan of non-frequency conversion motor is connected coaxially with the rotator, the cooling efficiency of fan is lowered with the rotation speed, therefore, a strong exhaust fan or frequency-conversion fan is mounted against too much heat.

1. 2. 13. 3 The inverter has provided the standard parameters of built-in motor, according to the actual situations, please perform the motor parameter identification or amend the default to accord with the actual value, otherwise, the running efficiency and protection performance will be influenced.

1. 2. 13. 4. If the cable or motor inner has the short circuit, the inverter will make the alarm or it will be exploded, please perform the insulation short-circuit test for the initially-installed motor and cable, and this test is also often conducted in daily maintenance. Please pay attention to that when conducting this test, please switch off the inverter and all tested parts.

2. 1 Denomination rules



2. 2 Nameplate

MODLE: SY6600-1R5G-S2
POWER: 1. 5KW
INPUT: 1PH AC220V 50Hz
OUTPUT: 7A 0～600Hz

SHANGHAI SANYU ELECTRONICS EQUIPMENT CO., LTD

2. 3 Type of SY6600 series inverter

220V series

Inverter model	Input voltage	Rated out put power (KW)	Rated input current (A)	Rated output current (A)	Applicable motor (KW)
SY6600-0R4G-S2	Single-phase 220V voltage range: -15%~+15%	0. 4	5. 4	2. 3	0. 4
SY6600-0R7G-S2		0. 75	8. 2	4. 5	0. 75
SY6600-1R5G-S2		1. 5	14. 2	7. 0	1. 5
SY6600-2R2G-S2		2. 2	23. 0	10. 0	2. 2

2. 4 Technical specifications

Item		Spec.
Basic spec.	Max frequency	600.00Hz
	Carrier frequency	1.0～15.0KHz
	Resolution of input frequency	Digital setting: 0. 01Hz Analog setting: Max frequency ×0. 1%
	Control mode	V/F control
	Starting torque	Type G: 0. 5Hz/150%
	Speed regulation range	1:100
	Speed stabilization accuracy	±0.5%
	Overload capacity	Type G: 150% of rated current for 60s; 180% of rated current for1s;
	Torque increase	Automatic torque increase Manual torque increase 0. 1%～30. 0%
	V/F curve	Two modes: Straight line type 2. 0 power
	Acc. /dec. curve	Straight-line or S-curve acceleration and decoration mode; two kinds of acceleration and deceleration time; range of acceleration and deceleration time: 0. 1～3600. 0s
Individual function	DC brake	DC braking frequency: 0. 0Hz～10. 00Hz; braking time: 0. 0～50. 0s; braking operation current: 0. 0～150. 0%
	Jogging control	Jogging frequency range: 0. 00Hz～P0. 13; jogging acceleration and deceleration time: 0. 0～3600. 0s
	Multi-speed running	16-segment speed control
	Built-in PID	Realizing the process closed loop control system conveniently
	Automatic voltage regulation (AVR)	When the mains voltage makes the change, it can automatically keep the output voltage constant.
	Common DC bus function	Realizing the functions of common DC bus for many inverters
	JOG Key	Programmable key: Jog/forward & reverse rotation switch over/clearing UP/DOWN setting
	Wobble frequency control for spinning	Multi triangular wave frequency control functions
	Timing control	Timing control function: Setting time range 0～65535h
	PLC function	Simple PLC function to meet customer requirements

Continued

Input/output characteristics	Running command channel	Three channels: Operation panel setting, control terminal setting, serial communication port setting
	Frequency source	Digital setting, analogy voltage setting, analog current setting, serial port setting, etc.
	Input terminal	Two analog input terminals, hereinto, No. 4 terminal is used for voltage input, and No. 5 terminal is used for voltage or current input.
	Output terminal	One open collector output Two relays output One analog terminal, 0/4～20mA or 0～10V available for it, can realize the output of analog quantities such as setting frequency and output frequency.
Display and operation	LED	Displaying parameters
	LCD	Option, displayed in Chinese
	Parameter locking	Preventing other persons setting the parameters
	Protection function	Short-circuit protection, input/output phase-failure protection, over-current protection, under-voltage protection, over-voltage protection, overload protection, over-heat protection, etc.
	Option	LCD operation panel, multi-function input/output expansion card, braking component, communication wire, etc.
Environment	Service location	Indoors, free from direct sunlight, dust, corrosive gas, combustible gas, oil mist, water vapor, drip or salt, etc.
	Altitude	Lower than 1.000m
	Ambient temp.	-10℃~+40℃(at 40℃~50℃, please use it by derating)
	Humidity	Less than 95%RH, no water condensation.
	Vibration	Less than 5.9m/s
	Storage temp.	-20℃~+60℃

2.5 Outline & installation dimension

2.5.1 Outline diagram

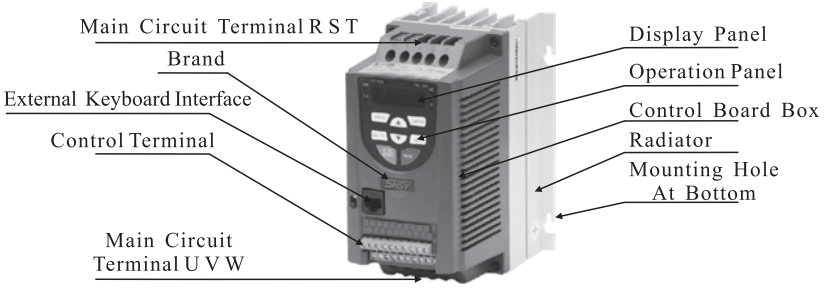


Fig. 2-1 Inverter outline diagram

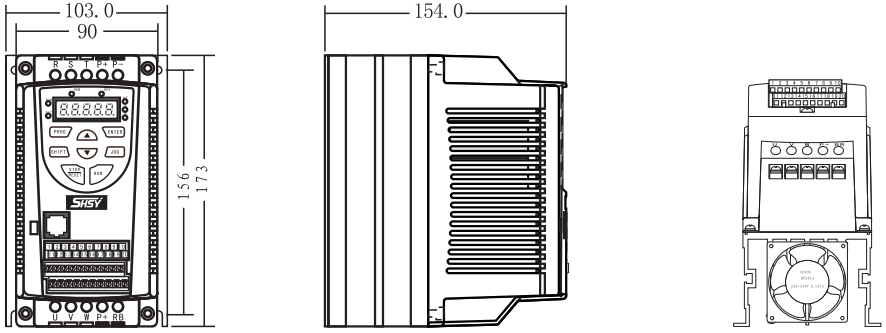


Fig. 2-2 Inverter outline & installation dimension diagram

2.5.2 Dimensions of mounting hole

Model of inverter (G: Constant-torque load)	Applicable motor (KW)	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Mounting hole dia. (mm)	G.W. (kg)
SY6600-0R4G-S2	0.4G	77.5	157	152.5	90	173	5	2
SY6600-0R7G-S2	0.75G							
SY6600-1R5G-S2	1.5G							
SY6600-2R2G-S2	2.2G							

2. 6 Options

Name	Instruction
Built-in braking unit	The single-phase 0. 752. 2KW of built-in braking unit, needing a built-out braking resistor additionally.
MODBUS communication wire	Rs485 communication interface
PROFIBUS-DP bus card	PROFIBUS-DP bus card
DeviceNET bus card	DeviceNET bus card
CANopen bus card	CANopen bus interface
Peripheral LCD operation panel	External LCD display and operation keyboard
Extension wire of peripheral LCD operation panel	Provision according to the requirements of site.

2. 7 Storage of inverter

After user purchases the inverter, please pay attention to following points for temporary storage and long-time storage.

1) Put the inverter with the original package into our packing case when it is stored.
2) The long-term storage will result in degradation of electrolytic capacitor, so, the inverter must be electrified once every two years, the electrified time should be 5hours at least, the input voltage should rise to the rated value step by step with the voltage regulator.

2.8 Guidance for selecting type

Common V/F control

When selecting the inverter, first, you must identify the system technical requirements of frequency-conversion speed regulation, application location of inverter, load characteristics, etc., and take the applicable motor, output voltage, rated output current, etc. into the consideration, then to select the machine type at your request and determine the running way.

Basic principle: The rated load current of motor should not exceed the rated current of inverter, in general, select the inverter according to the applicable motor capacity that is specified as the manual, please compare the rated current of motor with that of inverter. The overload capacity of inverter makes actually sense to the starting and braking operation. Whenever the inverter has the short-time over load, the load speed will be changed. If the speed accuracy is demanding, please take a higher class into account.

Fan and water pump type: The overload capacity is undemanding. Because the load torque is directly proportional to the square of speed, the load (except the rose fan) is very light when it runs at a low speed. And, these loads have no special requirements on the rotation accuracy, so, the square torque V/F is selected.

3. 1 Mechanical installation

3. 1. 1 Installation environment

1) Environment temperature: The ambient temperature has a large impact on the service life of inverter, the running environment temperature of inverter should not exceed such temperature range (-10℃～50℃).

2) The inverter is installed on the surface of flame-retardant object, it should have the enough space for ventilation, because it produces much heat easily when working. And, it should be vertically installed at the mounting rack with the screw.

3) Please install it in the firm area without easy vibration occurrence. The vibration should not be more than 0.6G. Especially, it should be kept away from the punch.

4) It is installed in the area free from the direct sunlight, dampness and drip.

5) It is installed in the area free from the corrosive, flammable, explosive gas, etc..

6) It is installed in the location free from the oil pollution, much dust and metallic dust.

3. 1. 2 Prompt for installation environment

Monomer installation diagram

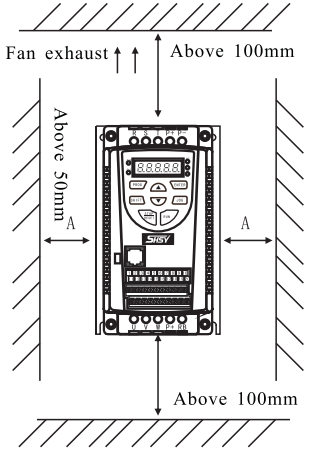


Fig. 3-1 Installation gap

Top and bottom installation diagram

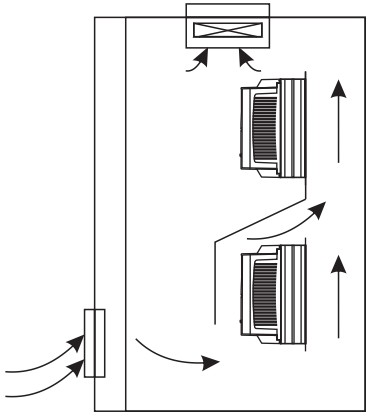


Fig. 3-2 Installation of multi inverters

Note: When the inverter is installed vertically, please mount a heat-insulated baffler shown as fig. 3-2.

Please pay attention to the following points about heat emission when performing the mechanical installation.

1) The inverter should be installed vertically, which enables the heat to emit upwards easily, but it should not be mounted reversely. If many inverters need to be installed in a cabinet, you'd better install them side by side. If the inverters need the top and bottom installation, please mount a heat-insulated baffler shown as fig. 3-2.

2) Make sure the inverter has the enough space for heat emission, the installation space is shown as fig. 3-1. However, when laying it, please consider the heat emission of other parts in the cabinet.

3) The mounting rack must be made of the flame-retardant material.

4) For the area with full metallic dust, it is suggested the installation outside the cabinet of radiator should be adopted, and, the space inside the full-seal cabinet should be as large as possible.

3.2 Electrical installation

3.2.1: Circuit breaker, cable and contactor

Model of inverter	Circuit breaker (A)	Input/output wire (Copper wire and cable)	Contactor (A)
SY6600-0R4G-S2	16	2.5	10
SY6600-0R7G-S2	16	2.5	10
SY6600-1R5G-S2	20	4	16
SY6600-2R2G-S2	32	6	20

3. 2. 2 AC input reactor

The input AC reactor can suppress the high-order harmonic wave of input current of inverter, and obviously improves the power factor of inverter. It is suggested that the input AC reactor should be used under following conditions:

1) The ratio of power capacity for inverter to the capacity of inverter reaches over 10:1.

2) The thyristor or power factor compensating device with the switching control is connected at the same power supply.

3) If the power factor on power side needs to be improved, the power factor can be increased to 0.75~0.85.0

AC input reactors of common specifications are shown as follwingtable.

Spec. &model	Model of inverter	Current (A)	Inductance (MH)	Voltage drop (V)
ACL-0010-EISC-E1M5	SY6600-0R4G-S2	10	1. 500	2%
ACL-0010-EISC-E1M5	SY6600-0R7G-S2	10	1. 500	2%
ACL-0015-EISH-E1M0	SY6600-1R5G-S2	15	1. 000	2%
ACL-0030-EISH-EM60	SY6600-2R2G-S2	30	0. 600	2%

3. 2. 3 AC output reactor

It can be used for suppressing the emission interference and inductance interference of inverter as well as the voltage fluctuation of motor; it also can prevent the wire on output side leaking the electricity and reduce the electricity leakage when multi motor runs in parallel and wire is laid at a long distance.

AC output reactor of common specifications are shown as following table.

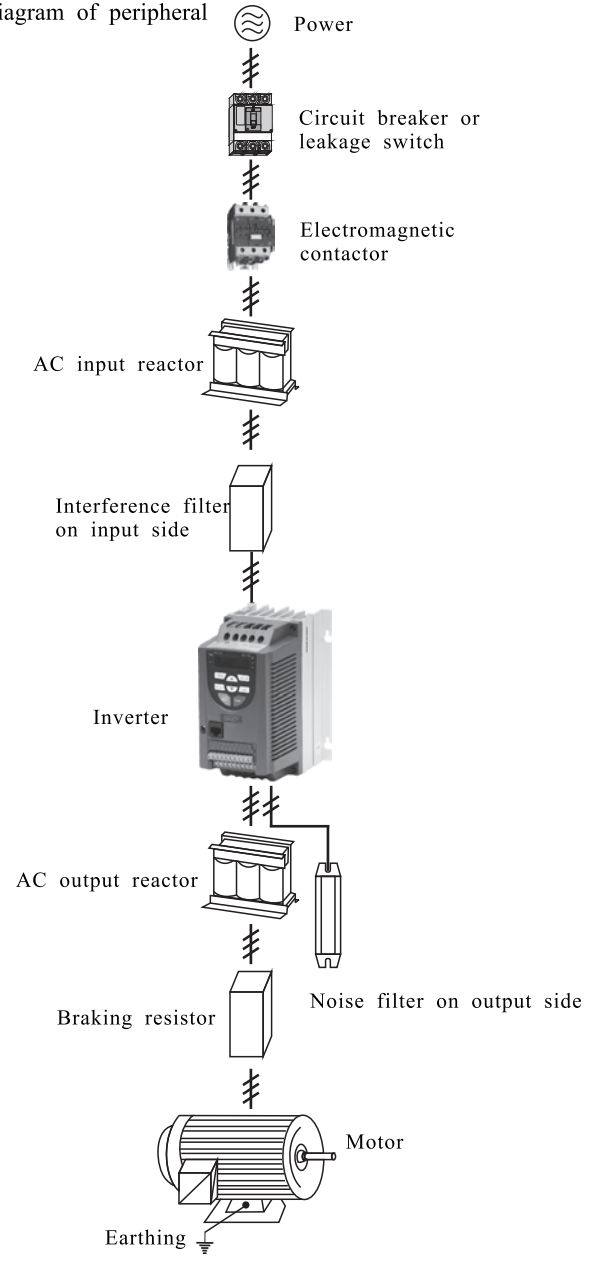
Spec. &model	Model of inverter	Current(A)	Inductance (MH)	Voltage drop (V)
AOL-0005-EISC-E1M5	SY6600-OR4G-S2	5	1. 500	0. 5%
AOL-0005-EISC-E1M5	SY6600-OR7G-S2	5	1. 500	0. 5%
AOL-0007-EISC-E1M0	SY6600-1R5G-S2	7	1. 000	0. 5%
AOL-0010-EISC-EM60	SY6600-2R2G-S2	10	0. 600	0. 5%

3. 2. 4 Braking unit and braking resistor

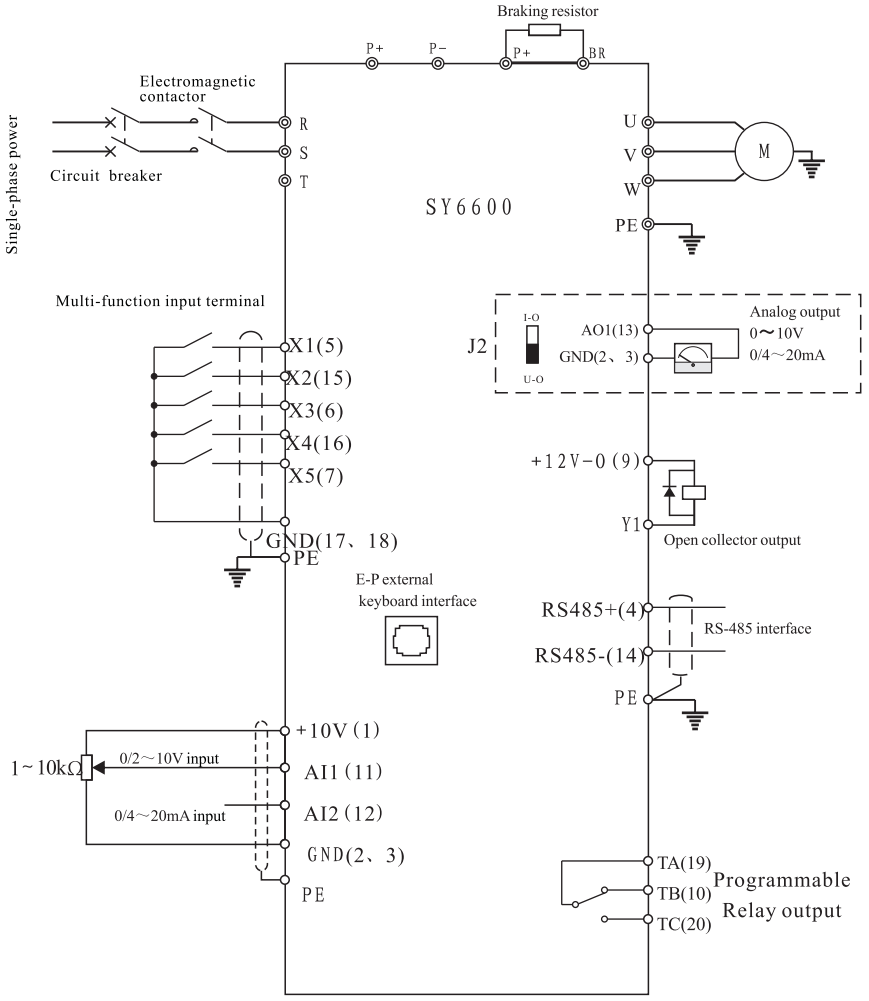
When the braking torque is 100%, the resistance and power of braking resistor of common specifications are shown as following table.

Voltage (V)	Model of inverter	Braking unit resistor	Braking power	Purchase
220V	SY6600-0R4G-S2	200Ω	80W	1
	SY6600-0R7G-S2	200Ω	80W	1
	SY6600-1R5G-S2	100Ω	260W	1
	SY6600-2R2G-S2	70Ω	260W	1

3. 3 Connection diagram of peripheral equipment



3. 4 Connection mode



Note: "J2" indicate the DIP switch, and the shadow part denotes the ex-factory position;
"U-O" indicates the voltage analog output; "I-O" indicates the current analog output.

3. 5 Main circuit terminal and connection

⚠Danger	● Only the power switch is in the "OFF" state, you can perform the wiring operation, otherwise, the accident of electric shock may happen!
	● The wiring operation must be performed by the professional electrician, otherwise, the equipment damage and human injury may happen!
	● Earthing must be reliable, otherwise, the accident of electric shock or fire will happen!

⚠Caution	● Make sure the input power is identical with the rated value of inverter, otherwise, the inverter may be damaged!
	● Ensure the inverter matches with the motor, otherwise, the motor may be damaged or inverter protection will be caused.
	● The power should not be connected with terminals U, V and W, otherwise, the inverter will be damaged.
	● The braking resistor may not be connected with DC bus P+ and P−, otherwise, the fire will happen!

3. 5. 1 Instruction for the main circuit terminals of three-phase inverter:

Terminal mark	Name	Description
R. S. T	R.S single-phase power input terminal	AC single-phase 220V power connection points
U. V. W	Inverter output terminal	Connecting to three-phase motor
P+.P-	Positive and negative terminals of DC bus	Common DC bus input point; connection point of external braking unit of 18. 5KW and above
P+.BR	Connection terminal of braking resistor	Connecting point of braking resistor of 15KW and below
PE(⏚)	Earthing terminal	Earthing terminal

3. 5. 2 Attentions for wiring:

1: Input power R, S and T:

The connection on the input side of inverter has no requirement of phase sequence.

2: DC bus P+ and P− terminals:

Note: After the power supply is just cut off, the DC bus P+ and P− terminals still have the residual voltage, only the lamp in the power panel goes out, and the voltage is less than 36V, you can touch the inverter, otherwise, the electric shock accident will happen.

3: Braking resistor connection terminals P+ and BR:

4: Inverter output side terminals U, V and W:

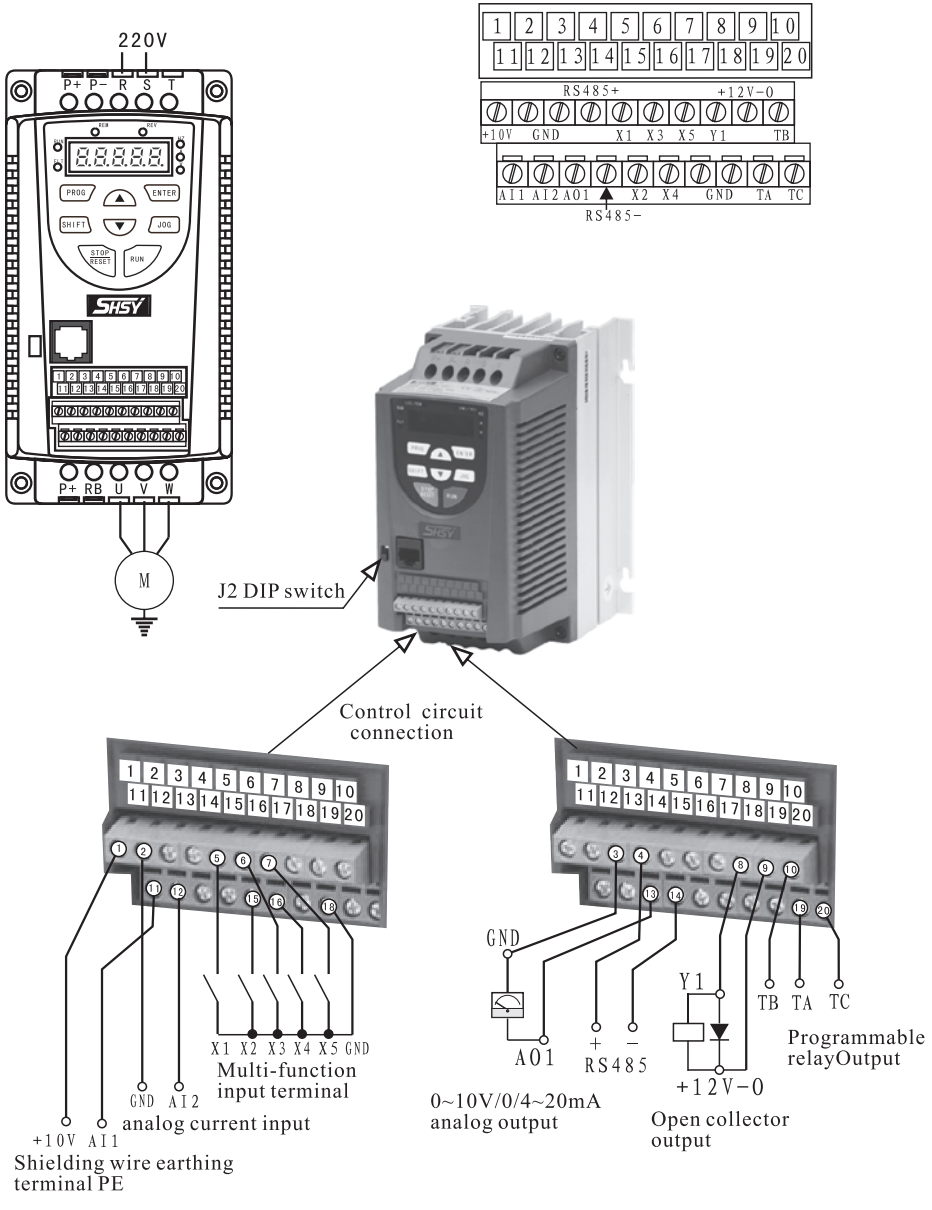
The capacitor or surge absorber should not connected on the output side of inverter, otherwise, the inverter will suffer from frequent protection or damage. If the motor cable is too long, the electric resonance will be easily produced for the effect of distributed capacitance, so as to cause the damage of motor insulation or produce large leakage current to make the inverter perform the over-current protection. If the motor cable is longer than 50m, the AC output reactor must be mounted additionally.

5: Earthing terminal

The terminal must be reliably earthed, the resistance of earthing wire should be less than 5Ω, otherwise, the equipment will work abnormally, even it will be damaged. Never commonly use the earthing terminal and power neutral line N terminal.

3. 6 Control terminal and connection:

3. 6. 1 Layout of control circuit terminal as follows:



3. 6. 2 Instruction for function of control terminals

Type	Symbol instruction	Terminal instruction	Function instruction
Power supply	+10V(1)	+10V power	Providing +10V power supply outside, No. 1 indicates 10V, No.2 and No.3indicates GND within the range of 10V, the max output current is 10mA for the working power of external potentiometer, the range of potentiometer resistance is 1~10KΩ.
	+12V-0(9)	+12V power	Providing +12 power supply outside, No. 9 indicates 12V, No. 17and No.18 indicates GND within the range of 10V; max output current sensor for the power supply of external is 200mA;
Analog input	AI1(11)	Analog input terminal 1	1. Input voltage range: DC 0/2~10V 2. Input reactance: 100KΩ
Analog input	AI2(12)	Analog input terminal 2	1. Input voltage range: DC 0/4~20mA 2. Input reactance: 500KΩ
Digital input	X1(5)	Digital input 1	X1、X2、X3、X4、X5 are the digital input terminals. GND（17、18） is the common terminal Optical coupler isolation Input reactance: 3.3KΩ Voltage range at level input: 9~15V
	X2(15)	Digital input 2	
	X3(6)	Digital input 3	
	X4(16)	Digital input 4	
	X5(7)	Digital input 5	
Analog output	A01(13)	Analog output	A01 indicates the 0/2~10V or 0/4~20mA analog input, GND indicates（2、3） within the range of 10V, the voltage and
Digital output	Y1(8)	Digital output	+12V-0 indicates 12V, Y1 indicates the digital output Optical coupler isolation, dual-polarity open collector output Output voltage range: 0~12V
Relay output	TA、TB、TC (19、10、20)	Relay output	TA、TB are normally open terminals TA、TC are normally close terminals
Auxiliary interface	E-P	External keyboard interface	External LED、LCD keyboard etc.
	RS-485 (4、14)	Communication interface	RS-485 communication 485+(4) 485-(14)

3. 6. 3 Instruction for the connection of control terminal

1) Analog input terminal:

The faint analog voltage signal is easily interfered by the external, so, the shielded cable is required, and the wire for connection should be as short as possible, not exceed 20m, as shown in fig. 3-3. Where some analog signal is seriously interfered, the filter capacitor or ferrite magnetic core should be mounted on the side of analog signal source, as shown in fig. 3-4.

2) Digital input terminal:

The shielded cable is required, and the wire for connection should be as short as possible, not exceed 20m

3) Digital output terminal:

When the digital output terminal needs the drive of relay, the absorber diode should be mounted on both sides of coils of relay, otherwise, DC 12V power will be damaged.

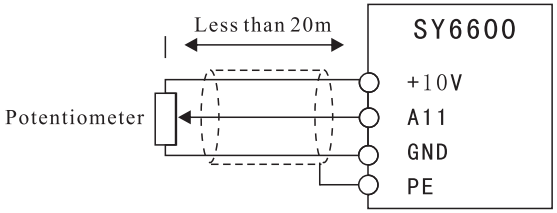


Fig. 3-3 Connection diagram of analog input terminal

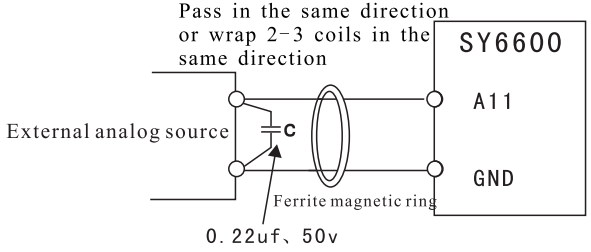


Fig. 3-4 Connection diagram of analog input terminal

3. 7 Solutions for EMC problems

3. 7. 1 Influence of harmonic

1) The high order harmonic of power supply will bring about the damage of inverter, therefore, it is suggested that AC input reactor should be mounted in the area where the power grid is quite bad.

2) Because there is high order harmonic appearing on the output side of the inverter output side, therefore, the capacitor for improving the power factor and surge suppressor may suffer from the electrical vibration on the output side, thus, the equipment will be damaged. Accordingly, the capacitor or surge suppressor should not be mounted on the output side.

3. 7. 2 Electromagnetic interference and solution

1 Two kinds of electromagnetic interference

One is the interference from the peripheral electromagnetic noise which leads to the error operation of inverter itself. This interference has the low impact, because the inverter has the internal treatment against it when being designed, with the strong ability to resist the interference. The other is the inverter impact on peripheral equipment.

Common solutions

①The earthing wires of inverter and other electrical products should be earthed well, and the earthing resistance should not be larger than 5Ω.

②The dynamo power line of inverter should not be laid with the control circuit in parallel, they can be vertically laid if available.

③Where the interference resistance is demanding, the power line from the inverter to motor uses the shielded cable, the shielded layer should be earthed reliably.

④The lead of interfered equipment should be shielded twisted pair, and the shielded layer should be earthed well.

2 Solutions against the interference from the peripheral electromagnetic equipment

The electromagnetic impact comes from many relays, contactors or electromagnetic brakes that are installed around the inverter. If the inverter performs the error operations for the interference from abovementioned equipment, the following solutions may be taken.

①A surge suppressor is mounted at the equipment that can produce the interference.

②The filter is mounted at the input terminal of inverter.

③The control signal wire of inverter and lead of detection circuit adopt the shielded cable, and the shielded layer should be earthed reliably.

3 Solutions against the inverter noise interference to peripheral equipment:

The noise comes from two operations: one is the emission of inverter itself, the other is the emission of lead from the inverter to motor. These two kinds of emission enable the surface of lead of peripheral electric equipment to suffer from the electromagnetic and static inductance, so that the equipment actuates the error operation. For abovementioned different interferences, the following methods can be taken for handling.

① The signal of metering meter, receiver and sensor are quite weak, if they are mounted near the inverter or installed with the inverter in the same control cabinet, they will be interfered easily and performs the error operation. The following methods may be taken to handle against the interference: keep them away the interference source as far as possible, don't lay the signal wire and power line in parallel, especially, don't bind them in parallel; adopt the shielded cable as the signal wire and power wire; mount the linear filter or wireless noise filter on the input and output side of inverter.

② When the interfered equipment and inverter use the same power supply, if the above methods are useless for eliminating the interference, the linear filter or wireless noise filter should be mounted between the inverter and power supply.

③The peripheral equipment should be earthed independently, thus, in commonly earthing, the interference from the leakage current that is produced by the earthing wire of inverter may be avoided.

4 Leakage current and solutions

The leakage current includes line-to-line leakage current and to-earth leakage current.

①Causes for impacting the to-earth leakage current and solutions

The distribution capacitance appears between the inverter and ground, the larger the distribution capacitance is, the larger the leakage current will be; this distribution capacitance may be reduced through efficiently reducing the distance from inverter to motor. And, the larger the carrier frequency, the larger the leakage current will be. This leakage current may be lowered by reducing the carrier frequency. However, please pay attention to that the reduction of carrier frequency will lead to the increase of motor noise. The installation of reactor is also an effective method for eliminating the leakage current. As the leakage current increases with the loop current, the larger power of motor will bring the larger leakage current.

②Causes for producing line-to-line leakage current and solutions

The distribution capacitance appears among the output wires of inverter, if the current passing through the circuit includes the high order harmonic, the resonance will be caused that will produce the leakage current. In this case, if the thermal relay is used, the inverter will actuate some error operations.

The solution is to reduce the carrier frequency or mount an output reactor. It is suggested the thermal relay should not be mounted in front of motor when using the inverter and the electronic overheat protection function should be used.

4. 1 Instruction for operation and display interface

Operation keyboard is the main unit of inverter receiving commands and displaying parameters. Shown in the following figure.

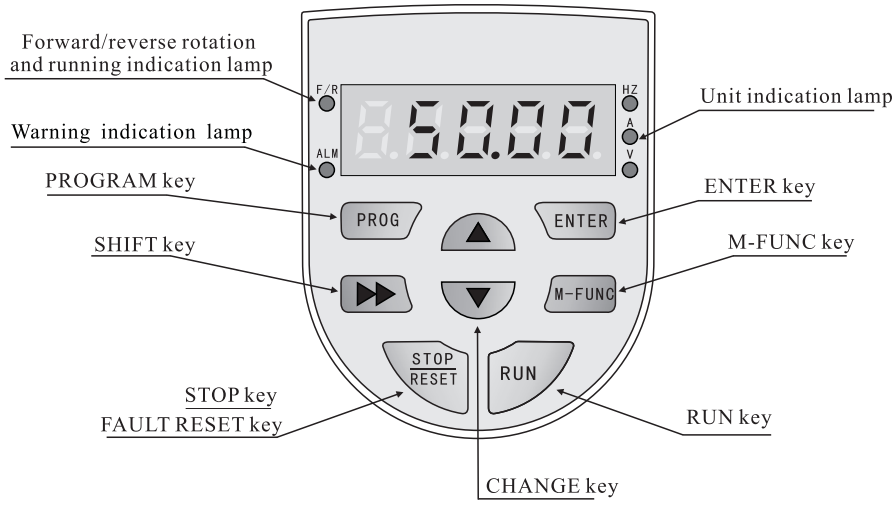


Fig. 4-1 Operation panel diagram

4. 1 Instruction for button function

Button symbol	Name	Function
▶▶	SHIFT key	In the state of modify data, this key can select the modify digit which is flashing. In the state of monitoring mode, press this key to switch the control parameters.
M-FUNC	M-FUNC key	According to the setting value of function code F1. 13's single-digit respectively select jogging(jog),forward and reverse rotation switch, clearance key▲▼frequency regulate quantity and other functions.
PROG	PROGRAM key	Used to change the operation mode of the keyboard to enter or exit the programming state.
▲	UP key	Increase the data or function codes
ENTER	ENTER key	Enter to next level menu or confirm data
RUN	RUN key	In the mode of keyboard operation, it is used for "RUN" control.
▼	DOWN key	Decrease the data or function codes
STOP RESET	STOP/RESET key	In keyboard running command mode, the inverter in normal operation, press this key to shutdown the inverter in set way; the converter in fault condition, press this key to reset and clear fault code of inverter.

4. 2 Instruction for indicator lamp

Indicator lamp Name	Indicator lamp Description	Symbol
Frequency indicator lamp	When LED displays frequency data, this indicator lamp is on	Hz
Current indicator lamp	When LED displays current date, this indicator lamp is on	A
Voltage indicator lamp	When LED displays voltage date, this indicator lamp is on	V
Fault indicator lamp	When LED displays fault date, this indicator lamp is on	ALM
Forward/Reverse rotation indicator lamp	When green light is on, inverter is in forward running mode. when red light is on, inverter is in reverse running mode. When red and green light is alternating on, inverter is in DC braking mode.	F/R

The inverter's LED control panel has 5 digit 8 LED digital tube, 3 indicator lamp units, 2 status indicator lamp. As shown in figure 1, digital tube displays inverter's monitor code, function code, fault code, etc.. Three indicator lamp units can be combined to seven indicator lamp units. Two status indicator lamps are Forward/Reverse rotation and Alarm status.

Instruction for indicator lamp:

Combination of indicator lamp	Meaning of LED display	Symbol
Hz+A	Rotation speed actual value	r/min
A+V	Speed actual value	m/s
Hz+V	Percentage of actual value	%
Hz+A+V	temperature	℃

LED digital tube display and combination of unit indicator lamp:

4.3 Function parameter setting

This inverter's function parameter system includes 16 groups of function code: F0～F9, FA, FB and monitor code d group that each function group contains several function codes. Function code used (function code group number + function code number) identifies, such as "F5.08" represents the eighth function code of the fifth function group.

LED keyboard display unit's menu structure: By selecting the function code on LED keyboard display unit, the function group number corresponds to the first level menu; the function code number corresponds to the second level menu; the function code data corresponds to the third level menu.

Function code setting examples:

Example 1: Modifying the running frequency from 50Hz to 40Hz (F0-03 modifies 50Hz to 40Hz)

1)Press PRG key into the program mode, LED digital tube displays the function parameter F0-00 which the flashing digit is on single-digit

2)Press ▶▶ key, the flashing moves in 100 digit, 10 digit and single digit. If 100 digit and 10 digit do not need to regulated, then press ▶▶ key to move flashing at single digit.

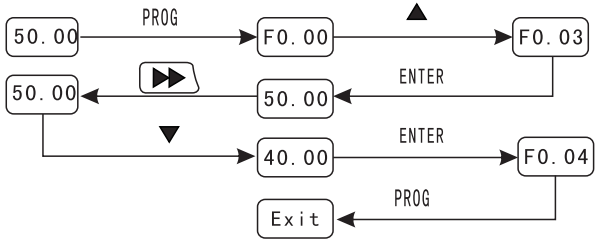
3)Press▲key, regulating "0" to "3" on single digit. LED digital tube displays as F0. 03.

4)Press ENTER key, the corresponding date of F0. 03 will be displayed (50. 00) and the unit frequency corresponding LED will turned on.

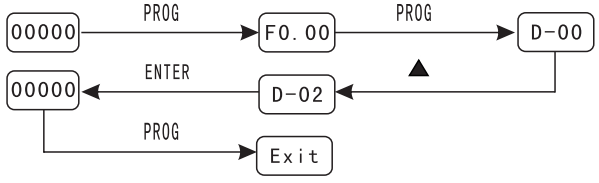
5)Press ▶▶ key, the flashing moves to the highest digit "5", then press ▼ once to regulate it as 40. 00.

6)Press Enter key, the value of F0. 03 will be stored and automatically displayed the next function code (F0. 04).

7)Press PRG key, exit from program mode.

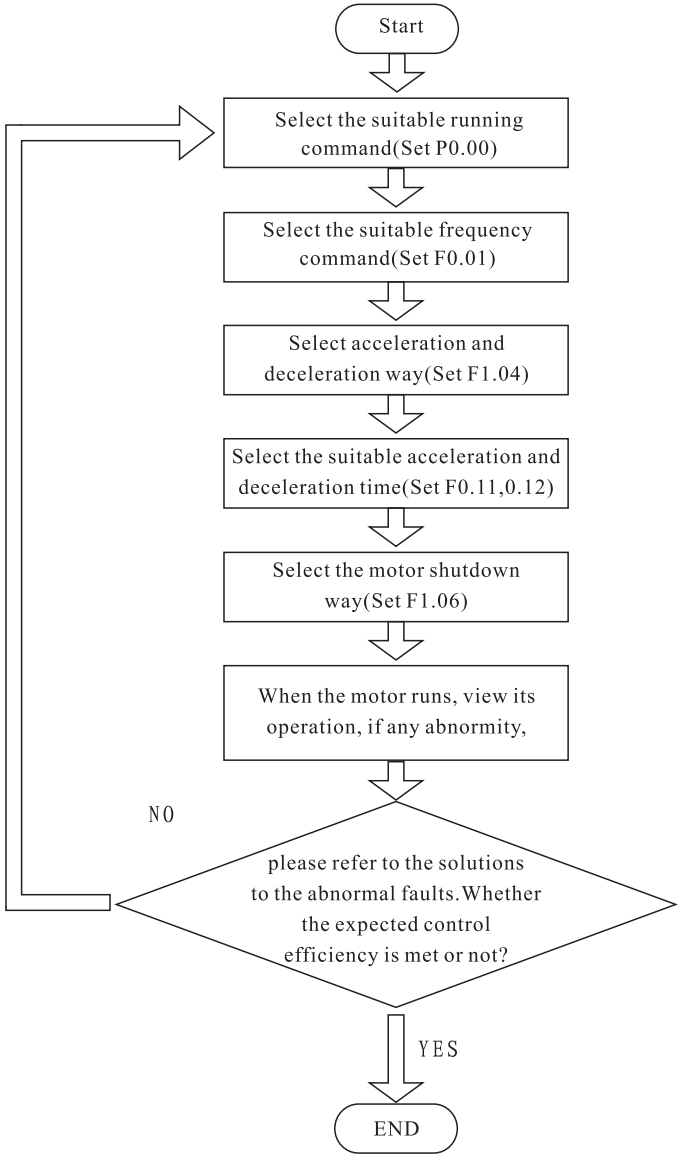


Example 2: Check monitor parameter items d-02 (output current)
Method One:
1) Press PRG key into the program mode, LED digital tube displays the function parameter F0-00 .Press it once more, LED digital tube displays the function parameter d-00, the flashing stays in single digit. Press ▲ key until the monitor code item displays as d-02.
2) Press Enter key, the data corresponding to d-02 will be displayed and the unit "Ampere" correspoinding LED (A)will turned on.
3)Press PRG key, exit from program mode.



Method Two:
1)In the control interface, directly press ⏩ key, LED digital tube displays monitor code d-00 first then displays the value of monitor code. The n d-02 monitor code and specific data will displayed by repeat press it.
2) Or in the specific monitor mode interface , press Enter key to the next monitor parameter item d-xx. Press ⏩ key, flashing will stay at monitor code's single digit. Press ▲ or ▼ to regulate until monitor code is d-02, then follow the method one 2) , 3) operation that can be realized.
Method Three:
1)Take Example 1's method regulates F3. 07 (running monitor parameter item selection) to 3
2) Press ENTER key, Store the value of F3. 07 and display the next function code.
3)Press PRG key, exit from program mode and back to main monitor interface.
4)The monitor interface is displaying the value of monitor code item d-02.

4.4 Fast adjustment



Fast adjustment flow chart

F0 Basic running parameters

Function code	Name	Setting range	Minimum unit	Factory	Amendment
F0.00	Running order channel selection	0:Keyboard command channel 1:Terminal command channel 2:Communication command channel	1	0	○
F0.01	Selection of frequency command settings	0:Keyboard potentiometer 1:Digital setting 1(press keyboard key ▲ /▼to regulate) 2:Digital setting 2(UP/DOWN terminals regulate) 3:Digital setting 3(Communication setting) 4:AI1 analog setting(0～10V) 5:AI2 analog setting(0～20mA) 6: Simple PLC 7:Multi-speed 8:PID control 9:Combination setting	1	1	○
F0.02	Digital Frequency control	0:Store data at power failure. 1:Without data storing at power failure. LED single digit: Digital frequency store data setting. LED 10-digit:Reservation of setting frequency after shutdown. 0:Shutdown setting frequency reserved. 1:Shutdown setting frequency is not reserved. LED 100-digit: Reserved LED 1000-digit: Reserved Note: It is valid when F0. 01=1, 2, 3	1	00	○
F0.03	Running frequency digital setting	0. 00～【F0. 05】	0.01Hz	50.00	○
F0.04	Max output frequency	MAX {50. 00, upper limit frequency} ～600. 00Hz	0.01Hz	50.00	×
F0.05	Upper limit frequency	【F0. 06】～【F0. 04】	0.01Hz	50.00	○
F0.06	Lower limit frequency	0. 00～【F0. 05】	0.01Hz	0.00	○
F0.07	Torque increase setting	0. 0～30. 0%	0.1%	Depend on the machine type	○
F0.08	Cut-off point of torque increase	0. 00～50. 00Hz	0.01Hz	10.00	○
F0.09	Slip frequency compensation factor	0. 0～150. 0%	0.1%	0.0%	○
F0.10	V/F curve setting	0:linear curve 1:quadratic curve	1	0	×
F0.11	Acceleration time	0. 1～3600. 0s	0. 1s	Depend on the machine type	○
F0.12	Deceleration time				
F0.13	Function key selection	LED single digit: M-FUNC function key selection. 0:JOG 1:Forward/reverse rotation switch 2:Clear / key frequency setting LED 10-digit:STOP/RESET function key selection. 0:Valid to all 1:Only valid to keyboard control 2:Only terminals control invalid 3:Only communication control invalid	1	00	×

F0. 14	Running direction selection	0:Forward direction 1:Reverse direction 2:Forbidden reverse operation	1	0	×
F0. 15	Carrier frequency	1. 0～15. 0KHz 0. 4～1. 5KW 8. 0KHz 2. 2～7. 5KW 6. 0KHz	0. 1KHz	Depend on the machine type	○

F1-Assistant running parameters

F1. 00	Start frequency	0. 00～50. 00Hz	0. 01Hz	3. 00	○
F1. 01	Holding time of start frequency	0. 0～10. 0s	0. 1s	0. 0	○
F1. 02	Start DC braking voltage	0～30%	1%	0%	○
F1. 03	Start DCbraking time	0. 0: DC braking not operated 0. 1～30. 0s	0. 1s	0. 0	○
F1. 04	Acceleration and deceleration mode	1:S-curve acceleration and deceleration 0:Straight acceleration and deceleration speed	1	0	×
F1. 05	Dead time of forward/reverse rotation	0. 1～10. 0s	0. 1s	0. 0	○
F1. 06	Shutdown ways	0:Deceleration shutdown 1:Shutdown freely	1	0	×
F1. 07	Initial frequency for shutdown DC braking	0. 00～50. 00Hz	0. 01Hz	0. 00	○
F1. 08	Shutdown DC braking voltage	0～30%	1%	0%	○
F1. 09	Shutdown DC braking time	0. 0～30. 0s	0. 1s	0. 0	○
F1. 10	Jogging operation frequency	0. 00～50. 00Hz	0. 01Hz	10. 00	○
F1. 11	Jogging acceleration time setting	0.1～3600.0s	0. 1s	10. 0	○
F1. 12	Jogging deceleratin time setting		0. 1s	10. 0	○
F1. 13	Acceleration time 1	0.1～3600.0s	0. 1s	10. 0	○
F1. 14	Deceleration time 1		0. 1s	10. 0	○
F1. 15	Jump frequency	0. 00～upper limit frequency【F0. 05】	0. 01Hz	0. 00	○
F1. 16	Jump frequency range	0. 00～10. 00Hz	0. 01Hz	0. 00	○
F1. 17	Reached solution of lower limit frequency	0:Lower limit frequency running 1:Zero speed running	1	0	×
F1. 18	Selection of setting algorithms of group frequency	LED single digit: First frequency source A 0:keyboard potentiometer 1:digital setting1 2:digital setting2 3: digital setting 3 4:AI1analog setting 5:AI2analog setting LED10-digit:Second frequency source B 0:keyboard potentiometer 1:digital setting1 2:digital setting2 3: digital setting 3 4:AI1analog setting 5:AI2analog setting	1	041	○

Function code	Name	Setting range	Minimum unit	Factory	Amendment
F1.18	Selection of setting algorithms of group frequency	LED100-digit:Combination algorithm 0:A+B 1:A-B 2:A-B take the absolute value 3:Two channels take the bigger value 4:Two channels take the small value 5:It is Valid when two channels are not zero, take A channel first.	1	041	○

F2 Motor parameters

F2.00	Motor rated voltage	0～260V	1V	220	×
F2.01	Motor rated current	0.1～99.9A	0.1A	Depend on the machine type	
F2.02	Motor rated speed	300～36000RPM	1RPM		×
F2.03	Motor rated frequency	1.00～600.00Hz	0.01Hz	50.00	×

F3-Control parameters and human-machine interface management

F3.00	Parameters initialization	0:None operation 1:Restore factory setting 2:Clear fault record	1		×
F3.01	Parameters write-in protection	0:Allow to modify all parameters (in shutdown mode all parameters can be modified, but in running process) 1:Only allow to modify frequency (F0.03) 2:Not allow to modify all parameters (except this function code)	1		○
F3.02	Reserved	0～65535	1	0	○
F3.03	Manufactory password	0.01～100.0	0.01	1.00	○
F3.04	Line speed factor	0.01～100.0	0.01	1.00	○
F3.05	Motor rotation speed display factor	0.01～100.0	0.01	1.00	○
F3.06	Close-loop display factor	0～13	1	0	○
F3.07	Monitor running parameters	1.00～655.35	0.01	XXX.XX	◆
F3.08	Primary control software edition	0～59m	1m	0	◆
F3.09	Cumulate running time	0～65535h	1h	0	◆
F3.10	Cumulate running time	0～65535h	1h	0	◆
F3.11	Cumulate conduction time	0～65535h			
F3.12	Reserved	Reserved			

F4- ON/OFF data input and output terminals

Function code	Name	Setting range	Minimum unit	Factory	Amendment
F4.00	Input terminal X1 function	1: Multi-speed selection SS1 2 : Multi-speed selection SS2 3 : Multi-speed selection SS3 4 : Multi-speed selection SS4 5 : Acceleration or deceleration time selection TT 6 : Forward jogging control 7 : Reverse jogging control 8 : Forward rotation control (FWD) 9 : Reverse rotation control (REV) 10 : Shutdown freely control 11 : Frequency increase control (UP) 12 : Frequency decrease control (DOWN) 13 : External failure input 14 : Three-line control 15 : DC braking control 16 : External rest signal input(RST) 17 : UP/DOWN terminal frequency clearance 18 : Forbidden acceleration/deceleration command 19 : Outer shutdown command 20 : Reserved 21 : Frequency switch to Ai2 22 : Frequency switch to a combination setting 23 : Reserved 24 : Reserved 25 : Reserved 26 : Reserved 27 : Rest Wobble frequency mode 28 : Operation compulsory to keyboard control 29: Operation compulsory to terminal control 30 : Operation compulsory to the communication control 31: Count trigger signal 32: Count clearance signal 33: Timing clearance signal 34: Timing trigger signal 35: Reserved	1	0	×
F4.01	Input terminal X1 function		1	0	×
F4.02	Input terminal X1 function		1	16	×
F4.03	Input terminal X1 function		1	8	×
F4.04	Input terminal X1 function		1	9	×
F4.05	FWD/REV terminal control mode	0:Two-line control mode 1 1:Two-line control mode2 2:Three-line control mode1 3:Three-line control mode2	1	0	×
F4.06	Terminal function detected selection when electrified	0:Teminal running command is invalid when electrified 1:Terminal running command is valid when electrified	1	0	×
F4.07	Terminal UP/DOWN frequency increment variable rate	0.01～99.99Hz/s	0.01Hz/s	1.00	○

F4- ON/OFF data input and output terminals

Function code	Name	Setting range	Minimum unit	Factory	Amendment
F4.08	Open collector output terminal Y1 set	0:Inverter running indication 1:Zero rotation signal of running inverter 2:Frequency/speed arrived signal (FDT) 3:Frequency/speed level check signal (FAR) 4:External fault stop 5:Output frequency reaches the upper limit 6:Output frequency reaches the lower limit 7:Reserved 8:Inverter overloaded alarm signal 9:Inverter is ready to run 10:Inverter fault 11:Under-voltage lock shutdown 12:Limit of wobble frequency UP/DOWN limit 13:Programmable multi-speed operation completion 14 : Programmable multi-speed operation in a complete period. 15 : Reserved 16: Count check output 17 : Count rest output 18 : Timing reached output 19 : Reserved	1	0	×
F4.09	Reserved				
F4.10	Programmable relay output		1	10	×
F4.11	FDT level setting	0.00~【F0.04】Max output frequency	0.01Hz	10.00	○
F4.12	FDT lag value	0.00~30.00Hz	0.01Hz	1.00	○
F4.13	Frequency arrival FAR check range	0.00~15.00Hz	0.01Hz	5.00	○

F5-Analog input and output parameters

F5.00	Ai1 input lower limit voltage	0.00~【F5.01】	0.01V	0.00	○
F5.01	Ai1 input upper limit voltage	【F5.00】~10.00V	0.01V	10.00	○
F5.02	Ai1 relate to lower limit setting	-100.0%~100.0%	0.1%	0.0%	○
F5.03	Ai1 relate to upper limit setting	-100.0%~100.0%	0.1%	100.0%	○
F5.04	Ai2 input lower limit current	0.00~【F5.05】	0.01mA	4.00	○
F5.05	Ai2 input upper limit current	【F5.04】~20.00mA	0.01mA	20.00	○
F5.06	Ai2 lower limit correspond setting	-100.0%~100.0%	0.1%	0.0%	○
F5.07	Ai2 upper limit correspond setting	-100.0%~100.0%	0.1%	100.0%	○
F5.08	Filtering time constant of analog signal	0.1~5.0s	0.1s	0.5	○
F5.09	Zero-pole frequency of the analog input function	LED Single digit: Ai1Zero-pole frequency function 0: Forbidden 1: Valid LED 10 digit: Ai2Zero-pole frequency function 0: Forbidden 1: Valid LED 100 digit: Reserved LED 1000 digit: Reserved	1	00	○

F5-Analog input and output parameters

Function code	Name	Setting range	Minimum unit	Factory	Amendment
F5.10	Ai1 corresponding zero-pole frequency threshold	0.00~10.00V	0.01V	5.00	○
F5.11	Ai1 zero-pole frequency hysteresis	0.00~【F5.10】/2	0.01V	0.50	○
F5.12	Ai2 corresponding zero-pole frequency threshold	0.00~20.00mA	0.01mA	10.00	○
F5.13	Ai2 zero-pole frequency hysteresis	0.00~【F5.12】/2	0.01mA	1.00	○
F5.14	A01 Multi-function analog output terminal selection	0. Output frequency (before slip compensation) 1. Output frequency (after slip compensation) 2. Setting frequency 3. Output current 4. Rotary speed of motor 5. Output voltage 6. Bus voltage 7. AI1 8. AI2	1	0	○
F5.15	Logic output selection range	0: 0~10V or 0~20mA 1: 2~10V or 4~20mA	1	0	○
F5.16	A01 Plus setting	0.0%~100.0%	0.1%	100.0%	○

F6-PID function parameters

F6.00	PID setting channel selection	0:Digital setting 1:Ai1 2:Ai2	1	0	×
F6.01	PID feedback channel selection	0: AI1, 1: AI2	1	0	×
F6.02	Digital quantity setting	0.00~10.00V	0.01V	0.00	○
F6.03	Gain feedback channel	0.01~10.00	0.01	1.00	○
F6.04	Gain feedback channel	0:Positive feature 1 : Negative feature	1	0	×
F6.05	Proportional gain P	0.01~10.00	0.01	1.00	○
F6.06	Integral time Ti	0.1~200.0s	0.1s	1.0	○
F6.07	Derivative timeTd	0.0: None derivative 0.1~10.0s	0.1s	0.0	○
F6.08	Sampling period T	0.00:Automatically 0.01~10.00s	0.01s	0.00	○
F6.09	Deviation limit	0.0~20.0%	0.1%	0.0%	○
F6.10	Preset closed-loop frequency	0.00~【F0.04】Max-output frequency	0.01Hz	0.00	○
F6.11	Preset closed-loop frequency holding time	0.0~6000.0s	0.1s	0.0	×
F6.12	Sleep threshold	0.00~10.00V	0.01V	10.00	○
F6.13	Wake threshold	0.00~10.00V	0.01V	0.00	○
F6.14	Wake/Sleep detection time	0.0~6553.5S	0.1S	150.0	○
F6.15	Reserved	Reserved			

F7 Programmable running parameters

Function code	Name	Setting range	Minimum unit	Factory	Amendment
F7.00	Programmable logic control (simple PLC running)	LED single digit: Running mode option 0: Single circulate 1: Preserve the final value after single circulate. 2: Series circulate LED 10-digit: PLC store data option at power failure 0: Without storing data 1: Store date LED 100-digit: Reserved LED 1000-digit: Reserved	1	00	×
F7.01	Multi-speed frequency 0	-100.0%~100.0%	0.1%	0.0%	○
F7.02	Multi-speed frequency 1	-100.0%~100.0%	0.1%	0.0%	○
F7.03	Multi-speed frequency 2	-100.0%~100.0%	0.1%	0.0%	○
F7.04	Multi-speed frequency 3	-100.0%~100.0%	0.1%	0.0%	○
F7.05	Multi-speed frequency 4	-100.0%~100.0%	0.1%	0.0%	○
F7.06	Multi-speed frequency 5	-100.0%~100.0%	0.1%	0.0%	○
F7.07	Multi-speed frequency 6	-100.0%~100.0%	0.1%	0.0%	○
F7.08	Multi-speed frequency 7	-100.0%~100.0%	0.1%	0.0%	○
F7.09	Multi-speed frequency 8	-100.0%~100.0%	0.1%	0.0%	○
F7.10	Multi-speed frequency 9	-100.0%~100.0%	0.1%	0.0%	○
F7.11	Multi-speed frequency 10	-100.0%~100.0%	0.1%	0.0%	○
F7.12	Multi-speed frequency 11	-100.0%~100.0%	0.1%	0.0%	○
F7.13	Multi-speed frequency 12	-100.0%~100.0%	0.1%	0.0%	○
F7.14	Multi-speed frequency 13	-100.0%~100.0%	0.1%	0.0%	○
F7.15	Multi-speed frequency 14	-100.0%~100.0%	0.1%	0.0%	○
F7.16	Multi-speed frequency 15	-100.0%~100.0%	0.1%	0.0%	○
F7.17	Stage 0 running time	0.0~6000.0s	0.1s	10.0	○
F7.18	Stage 1 running time	0.0~6000.0s	0.1s	10.0	○
F7.19	Stage 2 running time	0.0~6000.0s	0.1s	10.0	○
F7.20	Stage 3 running time	0.0~6000.0s	0.1s	10.0	○
F7.21	Stage 4 running time	0.0~6000.0s	0.1s	10.0	○
F7.22	Stage 5 running time	0.0~6000.0s	0.1s	10.0	○
F7.23	Stage 6 running time	0.0~6000.0s	0.1s	10.0	○
F7.24	Stage 7 running time	0.0~6000.0s	0.1s	10.0	○
F7.25	Stage 8 running time	0.0~6000.0s	0.1s	10.0	○
F7.26	Stage 9 running time	0.0~6000.0s	0.1s	10.0	○
F7.27	Stage 10 running time	0.0~6000.0s	0.1s	10.0	○
F7.28	Stage 11 running time	0.0~6000.0s	0.1s	10.0	○

F7 Programmable running parameters

Function code	Name	Setting range	Minimum unit	Factory	Amendment
F7.29	Stage 12 running time	0.06000.0s	0.1s	10.0	○
F7.30	Stage 13 running time	0.0~6000.0s	0.1s	10.0	○
F7.31	Stage 14 running time	0.0~6000.0s	0.1s	10.0	○
F7.32	Stage 15 running time	0.0~6000.0s	0.1s	10.0	○
F7.33	Reserved				
F7.34	Wobble frequency running parameters	LED single digit: Wobble frequency running control 0: Forbidden. 1: Valid. LED 10-digit: Start mode option of wobble frequency shutdown 0: Start from the last running state. 1: Restart. LED 100-digit: Store data at power failure of wobble frequency 0: Store wobble frequency state at power failure 1: Without storing wobble frequency state at power failure	1	000	×
F7.35	Center frequency of wobble frequency	0.00Hz~【F0.04】Max output frequency	25.00	0.01Hz	○
F7.36	Wobble preset frequency	0.00Hz~【F0.04】Max output frequency	10.00	0.01Hz	○
F7.37	Holding time of the preset wobble frequency	0.0~3600.0s	0.0	0.1s	×
F7.38	Wobble frequency range	0.0~50.0%	10.0%	0.1%	○
F7.39	Jump frequency	0.0~50.0%(related to wobble frequency range)	10.0%	0.1%	○
F7.40	Wobble frequency period	0.1~3600.0s	10.0	0.1s	○
F7.41	Triangular-wave rising time	0.0~100.0%(related to wobble frequency period)	50.0%	0.1%	○

F8-Protection parameters

F8.00	Motor overloaded protection factor	30%~110%	1%	100%	○
F8.01	Under-voltage protect level	200~280V	1V	220	○
F8.02	Over-voltage and lost speed protection option	0: Forbidden 1: Valid	1	1	×
F8.03	Over-voltage limit level	350~390V	1V	370	○
F8.04	Current limit operation selection	0: Only invalid in the constant speed 1: Valid in the whole course	1	1	×
F8.05	Current limit level	120%~200%	1%	160%	○
F8.06	Reserved				

F9-Advanced function parameters

Function code	Name	Setting range	Minimum unit	Factory	Amendment
F9.00	Braking threshold voltage	350%390V	1V	365	○
F9.01	Braking action ratio	10～100%	1%	50%	○
F9.02	Cooling fan control	0:Automatic control mode 1:Runs when electified.	1	0	○
F9.03	AVR function option	0:Forbidden 1:Valid in the whole course 2:Invalid only at deceleration	1	2	○
F9.04	Over-modulation option	0:Forbidden 1:Valid in the whole course 2:Only valid when the voltage is 5% lower than the rated value	1	0	×
F9.05	Frequency display resolution setting	0:To after two digit decimal point 1:To after one digit decimal point 2:To the single digit	1	0	○
F9.06	Zero-speed voltage control	0:Forbidden 1:Valid	1	1	×
F9.07	Counter reset value setting	【F9.08】～65535	1	1	×
F9.08	Counter detection value setting	0～【F9.07】	1	1	×
F9.09	Timing timer	0～65535S	1S	0	×
F9.10	Current reached value of timing setting	0～【F9.07】	1S	0	◆
F9.11 F9.12	Reserved				
F9.13	Carrier frequency auto-adjustment	0: Forbidden 1: Valid	1	0	×
F9.14	PWM mode	0:Mode 0 1:Mode 1	1	1	×

FA Communication parameters

FA.00	Communication address of inverter	0:Host-machine address 1～31: slave address of connected machines	1	1	×
FA.01	Communication configure	LED single digit:Baud rate selection 0:4800BPS 1:9600BPS 2:14400BPS 3:19200BPS 4:38400BPS 5:115200BPS LED 10-digit:Data format 0:None check 1:Even check 2:Odd check LED 100-digit:Reserved LED 1000-digit:Reserved	1	01	×
FA.02	Response operation of communication	0:Normal respond 1:Only respond to the received address 2:No respond	1	00	×
FA.03	Communication failure selection	0:Operate protection and stop freely 1:Warnning and keep constant running	1	00	×
FA.04	Check time of communication time override	0.0～100.0s	0.1s	10.0	×
FA.05	Communication response time delay	0～1000ms	1ms	5	×
FA.06	Series-run ratio	0.01～10.00	0.01	1.00	○
FA.07 FA.08	Reserved	Reserved			

FB Manufactory parameters

Function code	Name	Setting range	Minimum unit	Factory	Amendment
FB.00	Machine type selection	0～9 corresponding to 0.4KW、0.55KW、0.75KW、 1.1KW、1.5KW、2.2KW、3KW、 3.7KW、5.5KW、7.5KW Voltage class: single-phase or three-phase 220V	1	2	◇
FB.01	Dead time	2.3～6.0μS	0.1μS	5.5	◇
FB.02	Over-voltage point of software	【F8.03】～400V	1V	395	◇
FB.03	Current check factor 0	0.50～2.00	0.01	1.00	◇
FB.04	Current check factor 1	1.50～3.00	0.01	1.80	◇
FB.05	Reserved	Reserved			◇
FB.06	Voltage check factor	0.95～1.05	0.01	1.00	◇
FB.07	Reserved				◇
FB.08	Reserved	Reserved			◇
FB.09	Client code	*****	0	0	◇
FB.10	Special information clearance	0:Forbidden 1:Clear the accumulated running time and accumulated electrifying time	1	0	◇
FB.11	Ex-factory barcode 1	0～65535	1	00000	◇
FB.12	Ex-factory barcode 2	0～65535	1	00000	◇
FB.13	Ex-factory Date (month, day)	0～1231	1	0000	◇
FB.14	Ex-factory Date (year)	2009～2100	1	0000	◇
FB.15	Software protection code	*****	1	00000	◇

d-Monitoring parameters group

d-00	Output frequency(Hz)	0.00～600.00Hz	0.01Hz	0.00	◆
d-01	Frequency setting(Hz)	0.00～600.00Hz	0.01Hz	0.00	◆
d-02	Output current(A)	0.1～99.9A	0.1A	0.0	◆
d-03	Output voltage(V)	0～300V	1V	0	◆
d-04	Motor rotation speed (RPM/min)	0～36000RPM/min	1RPM/min	0	◆
d-05	Running speed (m/s)	0	1	0	◆
d-06	Bus voltage (V)	0～400V	1V	0	◆
d-07	Analog input AI1(V)	0.00～10.00V	0.01V	0.00	◆
d-08	Analog input AI2(mA)	0.00～20.00mA	0.01mA	0.00	◆
d-09	Input terminal status	0～1FH	1	0	◆
d-10	Output terminal status	0～1H	1	0	◆
d-11	Temperature of module(℃)	-20.0℃～100.0℃	0.1℃	0.0	◆
d-12	PID setting value	0.00～10.00V	0.01V	0.00	◆
d-13	PID feedback value	0.00～10.00V	0.01V	0.00	◆

D group-Monitoring parameters group

Function code	Name	Setting range	Minimum unit	Factory	Amendment
d-14	Second fault code	0 ~ 15	1	0	◆
d-15	Previous fault code	0 ~ 15	1	0	◆
d-16	Previous output frequency failure (Hz)	0.00 ~ 600.00Hz	0.01Hz	0.00	◆
d-17	Previous input current failure(A)	0.1 ~ 99.9A	0.1A	0.0	◆
d-18	Previous bus voltage failure(V)	0 ~ 400V	1V	0	◆
d-19	Previous temperature of module failure(℃)	-20.0℃ ~ 100.0℃	0.1℃	0.0	◆

Fault code table

Fault code	Name
E-00	None failure
E-01(OC_A)	Over-current during accelerating
E-02(OC_D)	Over-current during decelerating
E-03(OC_N)	Over-current during Constant running
E-04(OU_A)	Over-voltage during accelerating
E-05(OU_D)	Over-voltage during decelerating
E-06(OU_N)	Over-voltage during constant running
E-07(OU_S)	Over-voltage at shutdown
E-08(LU)	Under-voltage in running process
E-09(OC_P)	Power module failure
E-10(OH_1)	Radiator over-heated(temperature-sensitive resistance over-heated)
E-11(OL_1)	Inverter overloaded
E-12(OL_2)	Motor overloaded
E-13(EF)	External fault
E-14(ER485)	Rs485 communication fault

The amendment properties of function parameters (as the allowance of amendment and the condition of amendment):

" ○ " : represents the parameter setting values may be amendable when the inverter is in the shutdown and running state;

" × " : represents the parameter setting values are unallowable to be amended when the inverter is in the running state;

" ◆ " : represents the parameter is unallowable to be amended when it is the actual measured and recorded value.

F0-Basic operation parameters

Function code	Name	Setting range	Factory setting
F0.00	Running order channel selection	0 ~ 2	0

The control command of inverter includes the startup, shutdown, forward rotation, reverse rotation, jogging, fault rest, etc. .

0: Keyboard command channel

Conduct the operation command control by pressing the buttons of RUN, STOP/RESET, M-FUNC keys,in the keyboard panel.

1: Terminal command channel

Perform the running command control by the multi-function input terminal forward rotation, reverse rotaiton, forward jogging operation and reverse jogging operation.

2: Communication command channel

The running command is controlled by the communication of upper machine.

Attention: By amending the setting value of function code that can also change the command channel even in the running process. Please set it up carefully!

Function code	Name	Setting range	Factory setting
F0.01	Selection of frequency command settings	0 ~ 9	0

This function code is used to select the settings of inverter's running frequency.

0: Keyboard potentiometer

Perform keyboard potential device to regulate running frequency, the adjustment range is set up from 0 to max output frequency 【F0.04】.

1: Digital setting 1 (press keyboard key ▲/▼to regulate)

Use F0. 03 to set up frequency, in running process the running frequency can be adjusted by pressing UP and DOWN key on keyboard. After adjusting frequency value, it will be stored in F0. 03 at power failure. (Set F0.02=X1, set X value from 0 or 1 directly, then frequncey will not be stored.)

2: Digital setting 2(UP/DOWN terminals regulate)

Frequnecy can be adjusted by external UP/DOWN multi-function terminals. When UP terminal and COM terminal connected,frequency will increase; When DOWN terminal and COM terminal connected, frequency will decrease;When UP/DOWN terminals connects or disconnects with COM terminal, frequency will not be adjusted.If setting frequency stores at powerfailure ,then it will be stored in F0.03 at power failure. The speed rate of amending running frequency of UP/DOWN terminal can be setup from F4.07.

Notice:

Whether keyboard control or ternimal control to regulate, setting value is a superposition thus on the basis of F0. 03 and final frequency value is from lower limit frequency to max output frequency. Select X terminal to clear "UP/DPWN regulated frequency's quantity" to Zero. Select M-FUNC key on keyboard to clear setting of ▲/▼frequency.

3 : Digital setting 3(Communication setting)

RS485 communication interface is receiving frequency command from upper machine to set up frequnecy.

4 : AI1 analog setting (0~10V)

Frequency is set by AI1 analog input terminal;Input analog range: 0~10V; relatived setting see function code F5.00~F5.03。

5 : AI2 analog setting(0~20mA)

Frequency is set by AI2 analog input terminal;Input analog range: 0~ 10V/0~ 20mA; relatived setting see function code F5.04~F5.07。

6: Simple PLC

Select simple PLC mode. When frequnecy source is from simple PLC, use the setting value which is set from F7.01~F7.32 to determine the stage of running frequency and the stage of running time.

7 : Multi-speed

Select Multi-speed frequnecy setting mode, inverter will operate in multi-speed ways. Use the setting value of this function code from F4 group"X terminal is multi-speed selection" and F7 group"Multi-speed frequency" to determine corresponding relationship between quantity of multi-speed and setting frequency.

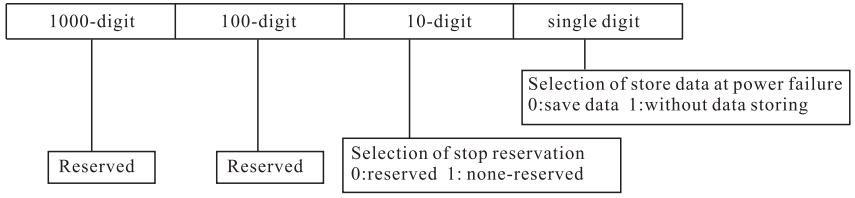
8 : PID control

Inverter operates the process PID control selected by this frequency setting mode. At this moment, it needs to set related function codes from F6 group "PID control parameter group",Inverter runs frequency which is PID functioned. Specified settings are shown in F6 group.

9 : Combination setting

Running frequency is set according to linear combination of frequency setting channels above.Please refer to function code F1. 18 for details.

Function code	Name	Setting range	Factory setting
F0.02	Digital Frequency control	0 ~ 11	00



LED single digit : Digital frequency store data setting

0 : Store data at power failure

Setting frequency at power failure or under-voltage, F0. 03 setting will automatically refresh actual frequency.

1 : Without data storing at power failure

Setting frequency at power failure or under-voltage, F0. 03 setting will preserve the original value.

LED 10-digit : Preservation of setting frequency after shutdown

0 : Shutdown setting frequency reserved

Frequency inverter stops, setting value of frequency is the final amendment.

1 : Shutdown setting frequency is not reserved

Frequency inverter stops, setting frequency sets back to F0. 03.

Notice:

This function is only valid at F0. 01=1、2、3 ..

Function code	Name	Setting range	Factory setting
F0.03	Running frequency digital setting	0. 00 ~ 【F0. 05】	10. 00

When frequency setting channel set up as digital setting 1,2, the function code value is the primary value of inverter's frequency.

Function code	Name	Setting range	Factory setting
F0.04	Max output frequency	MAX { 50. 00, upper limit frequency } ~600. 00Hz	50. 00
F0.05	Upper limit frequency	【F0. 06】~【F0. 04】	50. 00
F0.06	Lower limit frequency	0. 00~【F0. 05】	10. 00

Max output frequency is the highest frequency which inverter allowed to output and it is also the foundation of acceleration and deceleration setting. Shown in the figure Fmax; The basic running frequency is that inverter outputs max voltage corresponding to min frequency which is generally rated frequency of motor, as shown in the following figure fb;When inverter outputs basic running frequency which is max output voltage Vmax corresponding to output voltage which is motor rated voltage; shown in the figure Vmax;fH、fL separately defining upper- limit frequency and lower limit frequency, shown in the following figure :

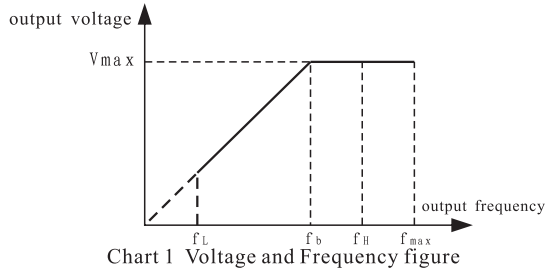


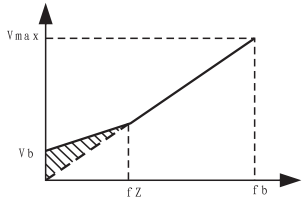
Chart 1 Voltage and Frequency figure

Attention:

1. Max output frequency . upper limit frequency and lower limit frequency shall be set up carefully according to the motor's introduction of nameplate. otherwise it might cause damage to equipment.
2. Limit range of upper limit frequency is effected to jogging (JOG) running. Limit range of lower limit frequency is not effected to jogging (JOG) running.
3. Except limits from upper limit frequency and lower limit frequency, inverter's output frequency is also limited by the value of start frequency , shutdown DC braking start frequency, jump frequency etc. .
4. The relation of max output frequency, upper limit frequency, lower limit frequency are shown in the figure 1, please pay attention to the sequence.
5. The actual output frequency to motor is limited by upper and lower limit frequency. When setiting frequency is higher than upper limit frequency, then it runs upper limit frequency. When setiting frequency is lower than lower limit frequency, then it runs lower limit frequency. When setting frequency is lower than starting frequency, then it runs zero-frequency.

Function code	Name	Setting range	Factory setting
F0.07	Torque increase setting	0. 0 ~ 30. 0%	Depend on the machine type
F0.08	Cut-off point of torque increas	0. 00~50. 00Hz	10. 00

Torque increase is increasing compensation of inverter's output voltage when inverter is running in low frequency. The reason of increase torque is to compensate motor's excitation current lack and improves torque's feature under low frequency running. Shown in the following figure:



V_b: Torque increase voltage V_{max}: Max output voltage

f_z: Cut-off frequency of torque increase f_b: Basic running frequency

Chart 2 Torque increase diagram

Attention:
This parameter which is set too high may cause motor overheated or over current protection. Under generally circumstance, as long as low frequency efforted then no use to set it up.

Function code	Name	Setting range	Factory setting
F0.09	Slip frequency compensation factor	0.0~150.0%	0.0

Slip frequency compensation function can compensate motor loading caused decrease of rotation. When motor overloaded speed is low then it should turn up the set value, if not, then turn down the set value. Shown in the following figure:

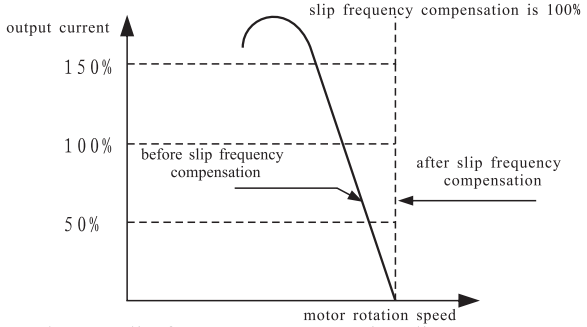


Chart3 Slip frequency compensation diagram

Function code	Name	Setting range	Factory setting
F0.10	V/F curve setting	0~1	0

0 : Linearity curves
Linearity curve is suitable for general constant torque load, output voltage and output frequency is in linearity curve relation. The following figure shows linearity curve.
1 : Quadratic curves
Quadratic curve is suitable for centrifugal loads such as fan, water pump, etc. . . output voltage and output frequency is in quadratic curve relation. The following figure shows quadratic curves.

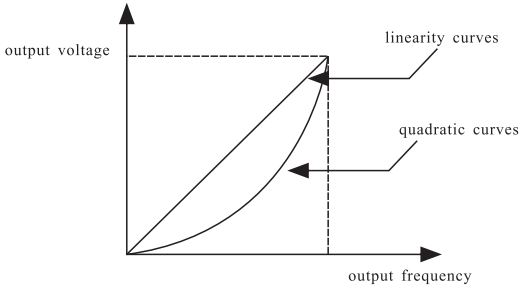


Chart 4 V/F Curve diagram

Function code	Name	Setting range	Factory setting
F0.11	Acceleration time	0.1~3600.0s	Depend on the machine type
F0.12	Deceleration time	0.1~3600.0s	Depend on the machine type

Acceleration time is the time of inverter accelerating from zero frequency to max output frequency, the following figure shown in T1. Deceleration time is the time of inverter decerating from max output frequency to zero frequency. The following figure shown in T2.
In this series of inverter, acceleration and deceleration time parameters are in two groups. One group is defined by function code F1.13、F1.14, the other is default setting time defined by F0.11、F0.12.If choose another group, use multi-function terminal to selected) (refer to F4 group function code). Acceleration and deceleration time of jogging (jog is set separately in F1.11、F1.12.

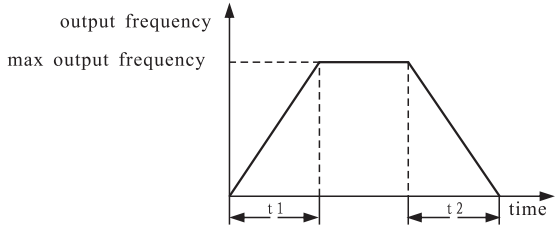
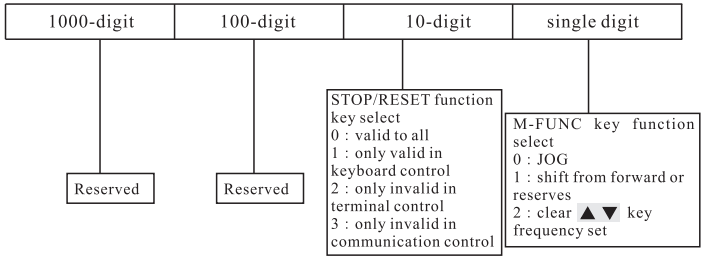


Chart 5 Acceleration and Deceleration time diagram

3.7KW or lower motors'ex-factory value of acceleration and deceleration time is 10.0s, 5.5KW or higher motors'ex-factory value is 20.0s.

Notice:
Accerleration time is only valid to normal process of increasing, not including start DC braking or holding time of start frequency. Deceleration time only avoid to normal process of decreasing, not including shutdown DC braking time.

Function code	Name	Setting range	Factory setting
F0.13	Function key selection	00~32	00



LED single digit : M-FUNC function key selection
0 : JOG
M - FUNC key is jogging control, the default direction set by F0.14.
1 : Forward/reverse rotation switch
M-FUNC key is used as direction switch key under running circumstance and it is invalid at shutdown mode. This switch key is only valid in keyboard control channel.
2 : Clear / key frequency setting
Clear setting value which set by ▲/▼key. Let frequency sets back to initial value before regulated by ▲/▼key.This function is only valid to keyboard ▲/▼key changes.

LED single digit : M-FUNC function key selection
0 : JOG
M - FUNC key is jogging control, the default direction set by F0. 14.
1 : Forward/reverse rotation switch
M-FUNC key is used as direction switch key under running circumstance and it is invalid at shutdown mode. This switch key is only valid in keyboard control channel.
2 : Clear ▲/▼ key frequency setting
Clear setting value which set by ▲/▼ key. Let frequency sets back to initial value before regulated by ▲/▼ key.This function is only valid to keyboard ▲/▼ key changes.
LED 10-digit : STOP/RESET function key selection
0 : Valid to all
In all command channels, this key can control inverter to shutdown.
1 : Only valid to keyboard control
Only F0. 00=0, then this key can control inverter to shutdown.
2 : Only terminals control invalid
Only F0. 00=0or1, then this key can control inverter to shutdown. It is invalid in terminals control mode.
3 : Only communication control invalid
Only F0. 00=0or2, then this key can control inverter to shutdown. It is invalid in comunincation control mode.

Notice :
The RESET function key is valid in all command channels.

Function code	Name	Setting range	Factory setting
F0.14	Running direction selection	0 ~ 2	0

0 : Forward direction
The system default setting and actual running direction are the same.
1 : Reverse direction
In this selection, the practical output sequence of inverter is contrary to the system default. In keyboard control mode, the function of keyboard RUN and FWD terminal are reverse direction control.
2 : Forbidden reverse operation

Notice :
This function code is valid to all command channels of operation direction.

Function code	Name	Setting range	Factory setting
F0.15	Carrier frequency	1. 0 ~ 15. 0KHz	Depend on the machine type

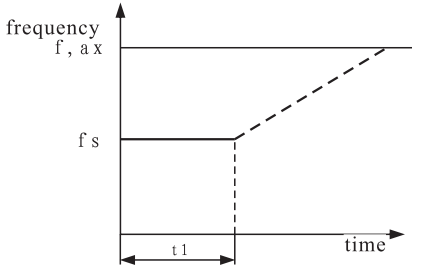
Power	0. 4~1. 5KW	2. 2~7. 5KW
Frequency	8. 0KHz	6. 0KHz

This function code is used to set carrier frequency of inverter's output PWM wave. Carrier frequency will effect noises while motor is running. When the circumstance requires silent operation, it may increase carrier frequency to decrease noises but it will also increase inverter's heat and electromagnetic interference.
When carrier frequency is higher than ex-factory value, then inverter will reduce the capacity in use. In general use downloaded wave increases 1KHz, current wave needs to reduce 5% around capacity.

F1-Assistant running parameters

Function code	Name	Setting range	Factory setting
F1.00	Start frequency	0. 00 ~ 50. 00Hz	3. 00
F1.01	Holding time of start frequency	0. 0~10. 0s	0. 0

Start frequency is inverter's start initial frequency, the following figure shown in fs. For some system it needs high starting torque and setting reasonable start frequency can be effectively to overcome the difficulties. Holding time of start frequency is the holding time of inverter in starting process with starting frequency. The



fs: starting frequency t1: holding time of starting frequency

Chart 6 Start frequency diagram

Notice :
Starting frequency is not limited by lower limit frequency. Jogging frequency is not limited by lower limit frequency but it is limited by start frequency.

Function code	Name	Setting range	Factory setting
F1.02	Start DC braking voltage	0~30%	0%
F1.03	Start DC braking time	0. 0~30. 0s	0. 0

Start DC braking voltage setting is corresponding to the percentage of inverter rated output voltage.
Start DC braking time is 0. 0s, None DC braking process. Shown in the following figure:

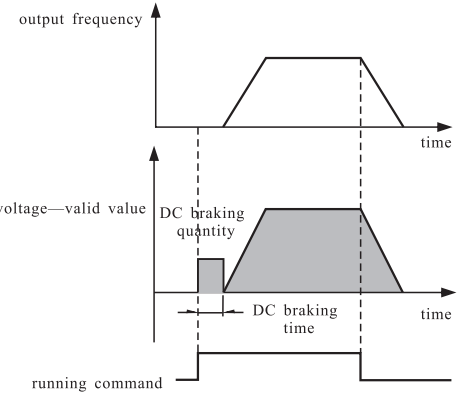


Chart 7 Start DC braking diagram

F1.04	Acceleration and deceleration mode	0~1	0

0 : Straight acceleration and deceleration speed

The relation between output frequency and time is in accordance with constant increase or decrease slope. Shown in the following figure.

1 : S-curve acceleration and deceleration

The relation between output frequency and time is in accordance with S-curve shape increase or decrease. At the moment of acceleration starts and speed reached,or deceleration starts and speed reached, set speed value to S-curve state, then it can smooth the operation of acceleration and deceleration which reduces the impact from overload. S-curve acceleration/deceleration mode is suitable for carrying a load of delivery, such as the lift, a belt conveyor, etc. Shown in the following figure

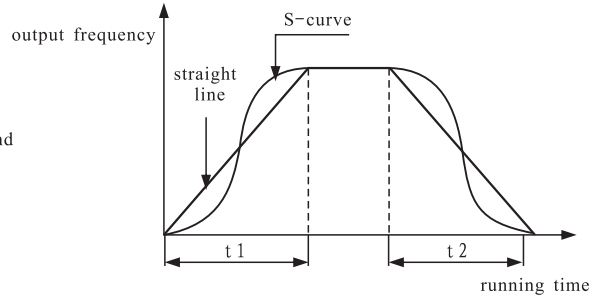


Chart 8 S-curve acceleration and deceleration diagram

F1.05	Dead time of forward/reverse rotation	0.1~10.0s	0.1

It is the transition time of inverter that outputs at zero frequency waiting while in the process of forward rotation transiting to reverse rotation or reverse rotation transiting to forward rotation.

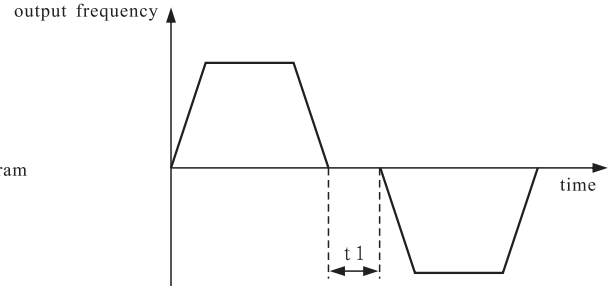


Chart 9 Dead time of forward/reverse rotation diagram

F1.06	Shutdown ways	0~1	0

0 : Deceleration shutdown

When shutdown command is effected, inverter will reduce output frequency gradually according to deceleration time and shutdown when frequency is reduced to zero. If shutdown DC braking command is effected after it reached shutdown DC braking frequency then it will start DC braking process and then shutdown.

1 : Shutdown freely

When shutdown command is effected, inverter will stop output and the loads will stop freely under the mechancial inertia.

F1.07	Initial frequency for shutdown DC braking	0.00~50.00Hz	0.00
F1.08	Shutdown DC braking voltage	0~30%	0%
F1.09	Shutdown DC braking time	0.0~30.0s	0.0

Shutdown DC braking voltage setting is compared to the percentage of inverter's rated output voltage. When shutdown time is 0.0s, then it has no DC braking process. Shown in the following figure

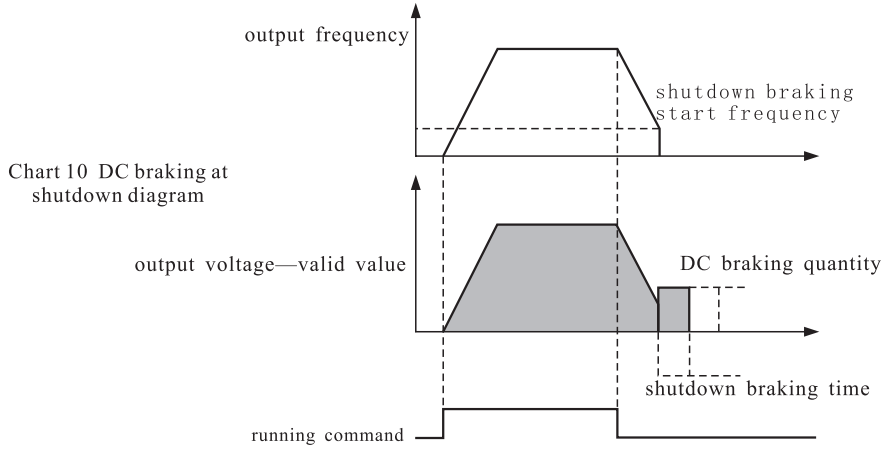


Chart 10 DC braking at shutdown diagram

F1.10	jogging operation frequency	0.00~50.00Hz	10.00

Setting frequency of jogging

F1.11	Jogging acceleration time setting	0.1~3600.0s	10.00
F1.12	Jogging deceleratin time setting		

The above codes define related parameters of jogging including jogging running frequency and Acc./Dec. time. This defination is same to the ordinarys.

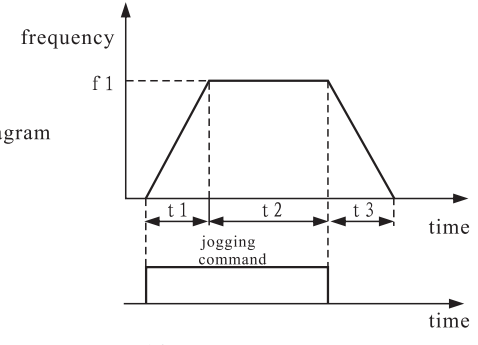


Chart11 Jogging operation diagram

10

Notice :
1. Keyboard、mutli-function terminals and RS485 communication ports can be perform jogging control.
2. Jogging running frequency is limited by upper limit frequency but not lower limit frequency. Jogging running is limited by start frequency and initial frequency of shutdown DC braking.

F1.13	Acceleration time 1	0.1~3600.0s	10.0
F1.14	Deceleration time 1		

Definitions of acceleration /deceleration time 1 and acceleration /deceleration time 0 （ F0. 11, F0. 12 ） are the same. Acceleration/deceleration time can be selected through multi-function terminals.(reference F4 group).

F1.15	Jump frequency	0.00~upper limit frequency【F0.05】	0.0
F1.16	Jump frequency range	0.0~10.0Hz	

This function code is allowed inverter to avoid the mechanical resonacne frequency point of load through setting jump frequency. Inverter sets a jump frequency point according to chart 11 that actual defination is that inverter's frequency can not be constantly stable in jump frequency's range, but an acceleration and deceleration process will pass through this range.

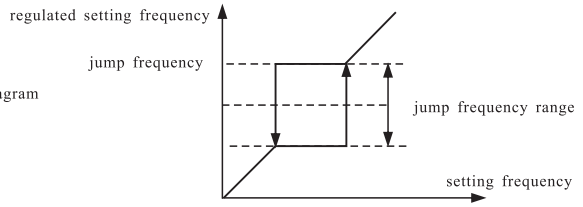
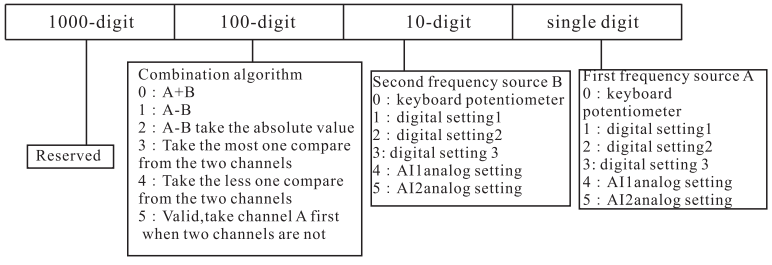


Chart 12 Jump frequency diagram

F1.17	Reached solution of lower limit frequency	0~1	0

0 : Lower limit frequency running
When setting frequency is lower than lower limit frequency （ F0. 06 ）, inverter runs lower limit frequency.
1 : Zero speed running
When setting frequency is lower than lower limit frequency （ F0. 06 ）, inverter runs zero speed

F1.18	Selection of setting algorithms of group frequency	000~555	041



LEDsingle digit： First frequency source A
0：keyboard potentiometer
1：digital setting1
2：digital setting2
3: digital setting 3
4：AI1analog setting
5：AI2analog setting
LED10-digit： Second frequency source B
0：keyboard potentiometer
1：digital setting1
2：digital setting2
3: digital setting 3
4：AI1analog setting
5：AI2analog setting
About frequency sources ofA、B see the reference F0. 01.
LED100-digit： Combination algorithm
0：A+B Frequency sources A+B and result is running frequency.
1：A-B Frequency sources A-B and result is running frequency, if result is negative then inverter operates reverse direction.
2：A-B take the absolute value
Frequency sources A-B and the absolute result is running frequency.
3：Two channels take the bigger value
Frequency sources A and B take the bigger value to operating frequency.
4：Two channels take the small value
Frequency sources A and B take the small value to operating frequency.
5：It is Valid when two channels are not zero, take A channel first.
Frequency sources A and B are not zeros, frequency source A as running frequency of inverter, if frequency source A is zero and source B is not zero, then source B is running frequency of inverter.

Motor parameter

F2.00	Motor rated voltage	0~260V	220
F2.01	Motor rated current	0.1~99.9A	Depend on the machine type
F2.02	Motor rated speed	300~36000RPM	
F2.03	Motor rated frequency	1.00~600.00Hz	50.00

Attention:
The above codes should be in accordance with motor nameplate's setting, Inverter's power configuration should match with motors. If the power is in big difference, the performance of inverter will decrease.

F3-Control parameters and human-machine interface management

F3.00	Parameters initialization	0~2	0

0：None operation
Inverter is on normal parameter reading and writing mode. Function code amending depends on user password setting and the state of running inverter.
1：Restore factory setting
All parameters according to machine type restore back to factory setting.
2：Clear fault record
Clear all fault record （ d-14 ～ d-18 ）. After operation completed, this funciton code will automatically clear values to 0.

F3.01	Parameters write-in protection	0～2	0

0：Allow to modify all parameters （in shutdown mode all parameters can be modified, but in running process some parameters can not be modified ）
1：Only allow to modify frequency(F0. 03)
2：Not allow to modify all parameters (except this function code) This function can prevent modifiying inverter's parameter setting from other person.

Notice：

The ex-factory setting of this function code is 0 which is allowed to modifiy. After completed data settings, you can use parameters write-in protection.

F3.02	Reserved		Reserved
F3.03	Manufactory password	65535	0

Manufactor parameter group of password, users can not access this function setting.

F3.04	Line speed factor	0. 01 ～100. 0	1. 00

This function code uses to correct speed scale display error, it has no effect to actual rotation speed.

F3.05	Motor rotation speed display factor	0. 01 ～100. 0	1. 00

This function code uses to correct rotation speed scale display error, it has no effect to actual rotation speed.

F3.06	Close-loop display factor	0. 01 ～100. 0	1. 00

The function code uses in close-loop control to correct display error of actual physical quantity （ pressure , flow etc . ） and given or feedback quantity (voltage, current) , it has no effect to close-loop

F3.07	Monitor running parameters	0～13	0

By modifying setting value of this function code, monitoring items of the main monitoring interface will be changed. Such as, F3. 07=3, namely when selecting output voltage （ D-03 ）, then default display items of main monitoring interface is current output voltage value.

F3.08	Primary control software edition	1. 00 ～655. 35	XXX. XX
F3.09	Cumulate running time	0 ～59m	0
F3.10	Cumulate running time	0 ～65535h	
F3.11	Cumulate conduction time		
F3.12	Reserved		

The above function codes define the cumulate running time and cumulate conduction time from ex-factory until now.

F4- ON/OFF data input and output terminals

F4.00	Input terminal X1 function	0～35	0
F4.01	Input terminal X2 function		16
F4.02	Input terminal X3 function		8
F4.03	Input terminal X4 function		9
F4.04	Input terminal X5 function		

Multi-functional input terminals X1～X5 can be easily selected only by taking F4. 00～F4.04 to set value so as to respectively define functions of X1 toX5.

0：Unused control terminal
1：Multi-speed selection SS1
2：Multi-speed selection SS2
3：Multi-speed selection SS3
4：Multi-speed selection SS4

By selecting those function terminals ON/OFF combinations, the maximum group of multi-speed is 16 .Shown in the following table ：

Multi-speed selectionSS1	Multi-speed selectionSS2	Multi-speed selectionSS3	Multi-speed selectionSS4	speed level
OFF	OFF	OFF	OFF	0
OFF	OFF	OFF	ON	1
OFF	OFF	ON	OFF	2
OFF	OFF	ON	ON	3
OFF	ON	OFF	OFF	4
OFF	ON	OFF	ON	5
OFF	ON	ON	OFF	6
OFF	ON	ON	ON	7
ON	OFF	OFF	OFF	8
ON	OFF	OFF	ON	9
ON	OFF	OFF	OFF	10
ON	ON	OFF	ON	11
ON	ON	OFF	OFF	12
ON	ON	OFF	ON	13
ON	ON	ON	OFF	14
ON	ON	ON	ON	15

These frequencies will be used in multi-speed running, take multi-speedrunning as an example ：
Set terminals x1, x2, x3, x4 as F4.00=1、F4.01=2、F4.02=3、F4.03=4, then X1～X4 terminals will operate multi-speed functions. shown in the following figure:

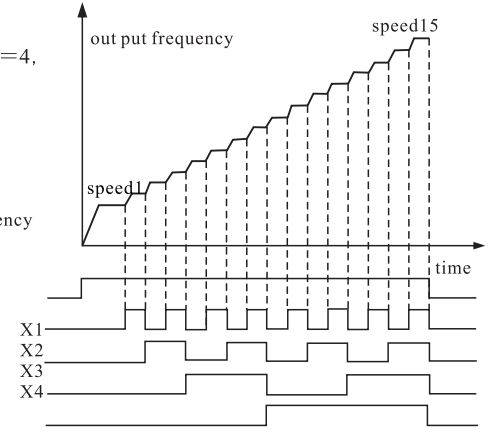


Chart 13 Multi-speed running diagram

5：Acceleration or deceleration time selection TT
By selecting multi-function terminal to accelerate and decelerate time, for example X1 terminal is 5, X1and COM is short-connect, acceleration and deceleration time will be time 1, disconnect X1 and COM acceleration and deceleration time will set back to default.
6：Forward jogging control
Terminal and COM is short-connect,inverter forward jogging running, only valid at F0. 00=1.
7：Reverse jogging control
Terminal and COM is short-connect,inverter reverse jogging running,only valid at F0. 00=1.
8：Forward rotation control（FWD）
Terminal and COM is short-connect, inverter rotate forward，only valid at F0. 00=1
9：Reverse rotation control（REV）
Terminal and COM is short-connect， inverter rotate reverse，only valid at F0. 00=1
10：Shutdown freely control
Terminal and COM is short-connect， inverter shutdown freely
11：Frequency increase control（UP）
Terminal and COM is short-connect，frequency increase，Only valid atF0. 01=2。
12：Frequency decrease control（DOWN）
Terminal and COM is short-connect，frequency decrease，Only valid atF0. 01=2。
13：External failure input
External failure input which external failure signal inputs through this terminal and it is convenient for inverter to monitoring failure of external device. External failure displayed as“E-13” when inverter receives signal from external device.
14：Three-line control
This terminal is the stop trigger switch of inverter, as refered to function code F4. 05 for details.
15：DC braking control
When terminal and COM is short-connect and machine is shutdown, inverter will start DC braking according to function code F1. 07～ F1. 08. When terminal is connectted, the braking is working and it is not related to DC braking time. When terminal is disconnectted the braking stops to work.
16：External rest signal input(RST)
When inverter occurs failure,then terminal and COM is short-connect that inverter will set to default. This function has the same functional as RESET key on keyboard.
17：UP/DOWN terminal frequency clearance
When terminal and COM is short-connect,frequency which is set by UP/DOWN terminal setting clears to zero.
18：Forbidden acceleration/deceleration command
When terminal and COM is short-connect, inverter will not be effected by any out come signals（ except the stop command）and keep current rotation speed.
19：Outer shutdown command
When terminals and COM is short-connect, inverter will shutdown in F1. 06's setting.
20：Reserved
21：Frequency switch to Ai2
When terminal and COM is short-connect, it will switch current frequency channel to AI2. When terminal and COM disconnect, frequency setting channel will be back to the value before the switch.
22：Frequency switch to a combination setting When terminal and COM is short-connect, it will constraint switch frequency setting channel to a combination frequency channel. F1. 18 for details. When terminal and COM disconnect, frequency setting channel will back to the value before the switch.
23：Reserved
24：Reserved
25：Reserved
26：Reserved
27：Rest wobble frequency mode
When terminals and COM is short-connect, inverter will suspend wobble frequency running. There will be will be two possible running state;
1> If it is set shutdown preserved, wobble frequency state will be store at power failure then it will run at the center frequency of wobble frequency.
2> If it is set shutdown without preserved, then it will run at start frequency. After it disconnects, it will run at wobble frequency again.
28：Operation compulsory to keyboard control
When terminal and COM is short-connect, running command is compulsory translated from current channel to keyboard control. When it disconnects,it will resume to pre-control channel.
29：Operation compulsory to terminal control
When terminal and COM is short-connect, running command is compulsory translated from current channel to terminal control. When it disconnects,it will resume to pre-control channel.
30：Operation compulsory to the communication control
When terminal and COM is short-connect, running command is compulsory translated from current channel to communication control. When it disconnects,it will resume to pre-control channel.

Notice :
When several running commands compulsory translate to terminals at the same time, it only responses to the channel set by F0. 00.

31：Count trigger signal. It receives counter's pulse signal which is receiving a pulse and the count value increase 1.（ only x5 terminal is valid ）The highest frequency of count pulse is 200hz.
32：Count clearance signal
When terminal and COM is short-connect, counter's counting value will be clear to zero.
33：Timing clearance signal
When terminal and COM is short-connect, the inner timing timer will be clear to zero.
34：Timing trigger signal
See function F9. 09 for details.
35：Reserved

F4.05	FWD/REV terminal control mode	0～3	0

The function code is defined that external terminals control inverter with four different methods.
0：Two-line control mode 1
Xm：Forward rotation command（FWD）, Xn：Reverse rotation command（REV）, Xm、Xn represent setting value from X1 to X5 which is defined FWD、REV function key with any two terminals. Under this control method, k1. k2, are independent controlling inverter's running and direction.

K2	K1	operation command
0	0	stop
1	0	reverse rotation
0	1	forward rotation
1	1	stop

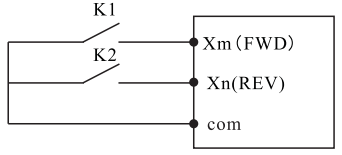


Chart14 Two-line control mode1 diagram

1：Two-line control mode2
Xm：Forward Rotation command（FWD）, Xn：Reverse Rotation command（REV）, Xm、Xn represent setting value from X1 to X5 which is defined FWD、REV function key with any two terminals. Under this control method,k1 is RUN、STOP switch , K2 is direction switch.

K2	K1	operation command
0	0	stop
1	0	stop
0	1	forward rotation
1	1	reverse rotation

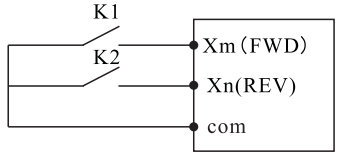
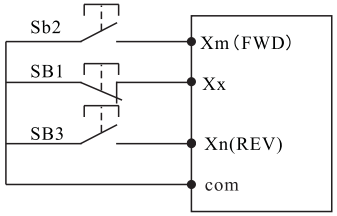


Chart 15 Two-line control mode2 Diagram

2：Three-line control mode1
Xm：Forward Rotation command（FWD）, Xn：Reverse Rotation command（REV）, Xx;Shutdown command，Xm、Xn、Xx represent setting value from X1to X5 which are separately difined FWD、REV、three-line operation control function with any other three terminals. Before Xx is connected, connectting Xm、Xn are invalid. When Xx is connected and pulse triggers Xm, inverter is forward rotating ;When pulse triggers Xn,inverter is reverse rotating. When Xx is disconnectted, inverter is shutdown.

Chart 16 Three-line control mode1 Diagram



3：Three-line control mode2：
Xm: running command, Xn ：running direction selection. Xx ：Stop command, Xm、Xn、Xx represent x1 to x5 to separately defined FWD, REV, three-lines operation control from any three terminals. Before Xx connected, connected Xm、Xn is invalid. When Xx connect, pulse triggered Xm, the inverter forward rotating; When pulse triggers Xn, it is invalid. Only Xm is connected and then pulse triggers Xn, then inverter is reverse rotating; When Xx is disconnectted, inverter is shutdown.

K1	running direction option
0	stop
1	stop

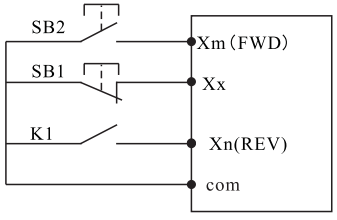


Chart 17 Three-line control mode2 diagram

Attention:
It can normally reverse rotating when REV terminal is long time connected, runs forward after disconnect.

F4.06	Terminal function detected selection when electrified	0～1	0

0：Teminal running command is invalid when electrified
In process of electrifed, inverter detected the operation command terminal is valid(connectted), inverter dose not start. Only terminal disconnected and then connect, inverter will start.
1：Terminal running command is valid when electrified
In process of electrified， inverter detected the operation command terminal is valid(connectted), inverter will start.

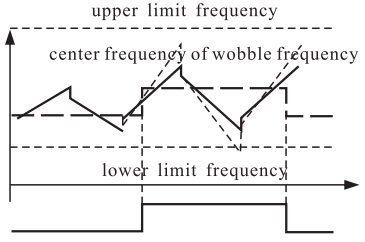
F4.07	Terminal UP/DOWN frequency increment variable rate	0. 01 ～99. 99Hz/S	1. 00

This function code was set up frequency of terminal UP/DOWN setting frequency amending speed, namely UP/DOWN terminal and COM port is short-connect for a second and quantity value of frequency changes.

F4.08	Open collector output terminal Y1 set	0～19	0
F4.09	Reserved	Reserved	Reserved
F4.10	Programmable relay output	0～19	10

0：Inverter running indication
When inverter is in the running process, it outputs indicate signal.
1：Zero rotation signal of running inverter
Inverter's output frequency is 0. 00hz, but it still in the running state of output signal
2：Frequency/speed arrived signal（FDT）Please refer to function code F4. 11, F4. 12。
3：Frequency/speed level check signal（FAR）Please refer to function code F4. 13
4：External fault stop
When inverter's external fault occurs, it outputs indication signal.
5：Output frequency reaches the upper limit
When inverter's output frequency reached the upper limit frequency, it outputs indication signal.
6：Output frequency reaches the lower limit
When inverter's output frequency reached the lower limit frequency, it outputs indication signal.
7：Reserved
8：Inverter overloaded alarm signal
When inverter's output current is higher than overloaded level, through the delay time of alarm it outputs indication signal.
9：Inverter is ready to run
When inverter is electrified and is ready to run, it can start directly with the operation command then terminal outputs indication signal. If inverter and bus voltage are all in normal state, the forbidden running terminal is invalid.
10：Inverter fault
When inverter fault occurs , it outputs indication signal.
11：Under-voltage lock shutdown
When DC bus's voltage is lower than under-voltage limit level, it outputs indication signal. Attention: inverter is shutdown when bus is under-voltage. the nixie tube displayed as “PoFF” Running at under-voltage, it displayed as ″lu″ fault then LED warnning light is on.
12：Limit of wobble frequency UP/DOWN limit
When wobble frequency function is selected, it uses the center frequency to count the range of wobble frequency, if the result is higher than upper limit frequencyF0. 05 or Lower than lower limit frequencyF0. 06, then it outputs indication signal. Shown in the following figure:

Chart 18 Rang of Wobble frequency diagram



Y1:wobble frequency exceed upper and lower threshold

13：Programmable multi-speed operation completion
After current operation completed of programmable multi-speed(PLC), it outputs a valid pulse signal with a width of 500ms.
14：Programmable multi-speed operation in a complete period.
After the completed period of programmable multi-speed, it outputs an effective pulses and width with 500ms.
15：Reserved
16;Count check output
When count value of current reaches, it outputs the indication signal until counter rest value reaches then it clears to zero. Please refer to functional code F9. 08.
17：Count rest output
When counter rest arrived, it outputs indication signal. Please refer to functional code F9. 07.
18：Timing arrived output
When timing time arrived, it outputs indication signal. Please refer to functional code F9. 09.
19：Reserved

Attention:

When Y1 outputs a valid signal which is a low current level (but need to use the resistance increase to 12v power) , when it is invalid output, it outputs a high resistance mode and relay output is the switch signal.

F4.11	FDT level setting	0.00～【F0.04】max output frequency	10. 00
F4.12	FDT lag value	0.00～30.00Hz	1. 00

When inverter outputs a frequency which is higher than FDT current level setting value that is a valid signal (low current level) . When output frequency is lower than FDT signal, it outputs a invalid signal (high resistance mode) .

Shown in the following figure:

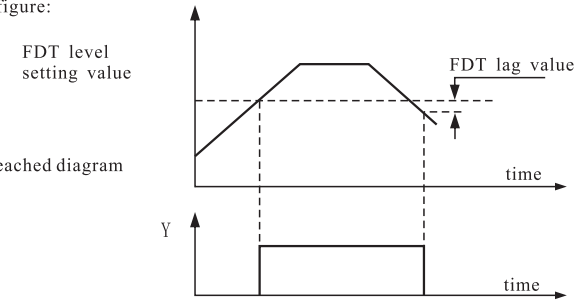


Chart19 Frequency reached diagram

F4.13	Frequency arrival FAR check range	0.00Hz～15.0Hz	5.00

This function code is complementarity of the third function from F4. 08to F4. 10, when inverter output frequency is in the width of plus-minus check, output terminal outputs the valid signal (Low level current) . Shown in the following diagram.

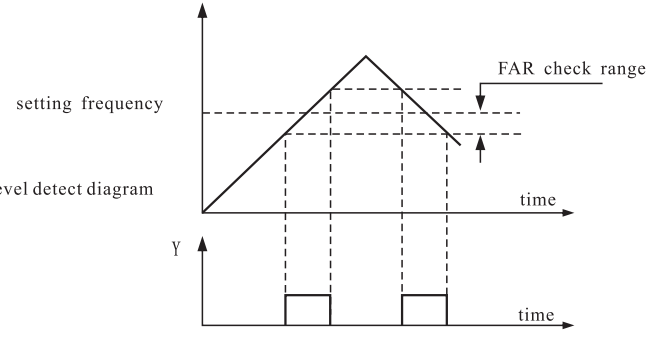


Chart20 Frequency level detect diagram

F5-Analog input and output parameters

F5.00	AI1 input lower limit voltage	0.00～【F5.01】	0.00
F5.01	Ai1 input upper limit voltage	【F5.00】～10.00V	10.00
F5.02	AI1 relate to lower limit setting	-100.0%～100.0%	0.0%
F5.03	Ai1 relate to upper limit setting	-100.0%～100.0%	100.0%
F5.04	AI2 input lower limit current	0.00～【F5.05】	4.00

F5-Analog input and output parameters

F5.05	AI2 input upper limit current	【F5. 04】～20. 00mA	20.00
F5.06	AI2 lower limit correspond setting	-100. 0%～100. 0%	0.0%
F5.07	AI2 upper limit correspond setting		100.0%

The above function codes defined the input range of analog input voltage channelAI1、AI2 and the corresponding percentage of setting frequency (corresponding to max output frequency) , AI1 is voltage input, AI2 can use JP1 jump selection to current or voltage input, The figures set by0～20. 00mA corresponding to 0 ～ 10v. the specific setting should be set according to input signal.

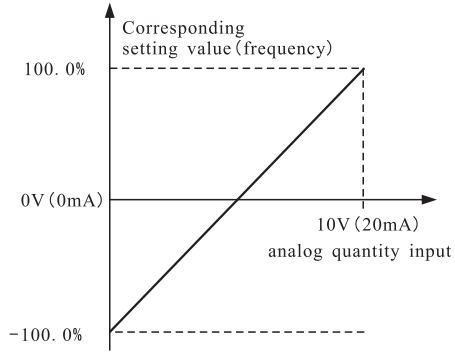
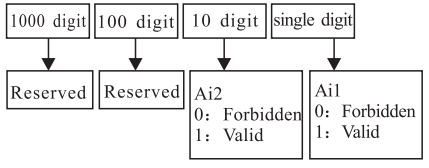


Chart21 Analog input relate to the frequency Diagram

F5.08	Filtering time constant of analog signal	0.1～5.0s	0.5

The system will filtering the external input analog signal according to setting time of filtering which is eliminating all interference signals. The time constant is bigger, the capability of anti-interference is greater but slow response with stable controlling. Whereas, the time constant is smaller, the capability of anti-interference is weaker but controlling is unstable. If it can not ensure the best value in practical application, it should adjust parameter values according to the response of delays and the stability of controlling.

F5.09	Zero-pole frequency of the analog input function	00～11	00



F5.10	AI1 corresponding zero-pole frequency threshold	0.00～10.00V	5.00
F5.11	AI1 zero-pole frequency hysteresis	0.00～【F5.10】/2	0.50
F5.12	Ai2 corresponding zero-pole frequency threshold	0.00～20.00mA	10.00
F5.13	AI2 zero-pole frequency hysteresis	0.00～【F5.12】/2	1.00

This function can be clearly specified analog input curve corresponding to voltatge/current thresholds of zero degree of frequency, and it is not only decided by upper/lower analog input or upper/lower frequency. Shown in the following figure(This analog input curve has a turning point of center frequency).

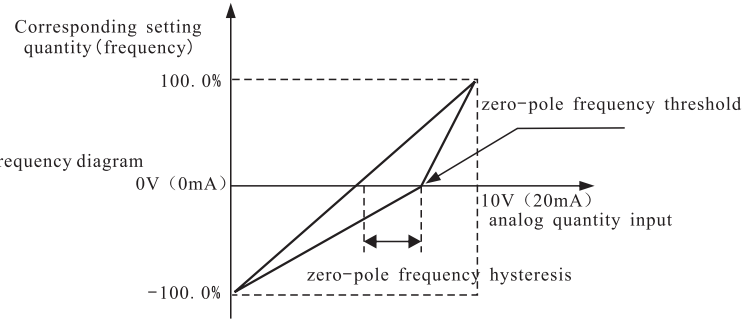


Chart 22 zero frequency diagram

Notice：

By setting the zero-pole frequency hysteresis that can avoid analog input signal to frequency of zero float around the null point frequent fluctuations。

F5.14	AO1 Multi-function analog output terminal selection	0～8	0

This function code defines the corresponding relations of multi-function analog output terminal and each physical quantities, as shown in the following table：

Project	Ao1	Range of setting
Output frequency(before slip compensation)	0V/0mA～AO1upper limit value 2V/4mA～AO1upper limit value	0.00～upper limit frequency
Output frequency(before slip compensation)	0V/0mA～AO1upper limit value 2V/4mA～AO1upper limit value	0.00～lower limit frequency
Setting frequency	0V/0mA～AO1upper limit value 2V/4mA～AO1upper limit value	0.00～setting frequency
Output current	0V/0mA～AO1upper limit value 2V/4mA～AO1upper limit value	0.0～2 times rated current
Rotary speed of motor	0V/0mA～AO1upper limit value 2V/4mA～AO1upper limit value	0～Motor synchronized
Output voltage	0V/0mA～AO1upper limit value 2V/4mA～AO1upper limit value	0～Max rated output voltage
Bus voltage	0V/0mA～AO1upper limit value 2V/4mA～AO1upper limit value	0～800V
AI1	0V/0mA～AO1upper limit value 2V/4mA～AO1upper limit value	0.00～10.00V
AI2	0V/0mA～AO1upper limit value 2V/4mA～AO1upper limit value	0.00～20.00mA

F5.15	Logic output selection range	0～1	0

This function code established output range of analog quantity
0：0～10Vor0～20mA
1：2～10Vor4～20mA
Voltage or current output is selected by JP2 jumper selection

F5.16	Ao1 Plus setting	0.0%～100.0%	100.0%

This function code defines the plus factor of analog output AO1. When factory value is 100%,output voltage/current range is 0～10V/0～20mA.

F6-PID function parameters

Through this function parameters' setting, it can form a complete control system of feedback. Analog feedback control system; AI1 inputs given quantity, AI2 inputs current which the controlled object quantity is through sensor to convert 4 ～ 20mA. Then two inputs pass through built-in PI regulator to form a analog close-loop control system. Shown in the following figure

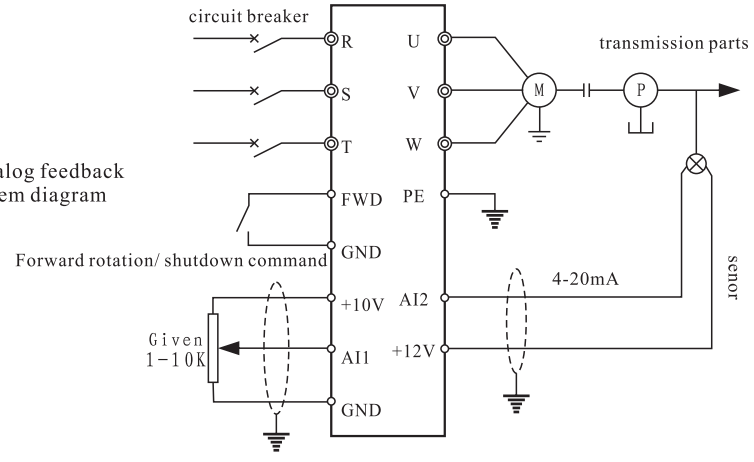
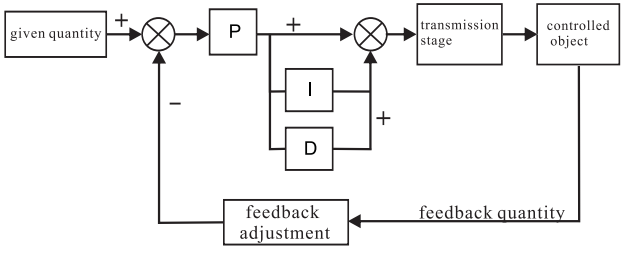


Chart 23 Analog feedback control system diagram

PID adjustment:



F6.00	PID setting channel selection	0～2	0

0：Digital setting
PID's setting value decided by the digital setting, and control by the function code F6. 02.
1：AI1 PID's setting value decided by the outer voltage signal AI1（0～10V）.
2：AI2 PID's setting value decided by the outer current signal AI2（0～20mA/0～10V）.

F6.01	PID feedback channel selection	0～1	0

0：AI1 PID feedback quantity decided by outter voltage signal AI1（0～10V）.
1：AI2 PID feedback quantity decided by outter current signal AI2（0～20mA/0～10V）.

Attention:
Given and feedback channel can not set to the same value, or the quantity of given and feedback are same the deviation will be 0, then PID can not working properly.

F6.02	Digital qunitity setting	0.00～10.00V	0.00

When using analog feedback, the function code operates by keyboard command to set close-loop control setting, only close-loop channel selected this digital setting（F6. 00=0）, this function code is valid.

Example: At constant pressure water supply close-loop control system, this function code should give full consideration of further pressure on the quantum and its output feedback signal's relations. For example, the piezometer range is 0 ～ 10Mpa, for 0～10V（0～20mA）voltageoutput, we need 6Mpa pressure, it can be given figures amount to 6. 00V, therefor PID adjusted stabile needing the pressure is 6Mpa.

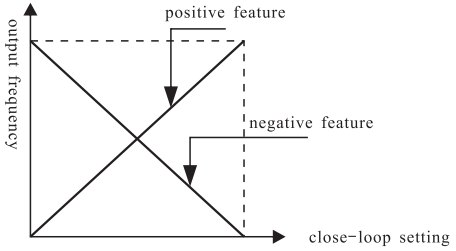
F6.03	Gain feedback channel	0.00～10.00V	1.00

When feedback and setting channel is not at the same level, using this function to adjust the feedback signal to gain.

F6.04	PID adjusting feature	0～1	0

0：Positive feature
When the feedback signal is larger than the given of PID, only when the output frequency of inverter is reduced that PID is able to reach balance. Such as PID control of winding tension and constant pressure water control.
1：Negative feature
When the feedback signal is larger than the given of PID, only when the output frequency of inverter is increased that PID is able to reach balance. Such as PID control of unwinding tension and central air conditioning.

Chart 24 positive and negative feature diagram



F6.05	Proportional gain P	0.01～10.00	1.00
F6.06	Integral time Ti	0.1～200.0s	1.0
F6.07	Derivative timeTd	0.0～10.0s	0.0

Proportional gain（Kp）:
It determines the regulating strength of the whole PID controller, the higher the P is, the larger the regulating strength is. When this parameter is 100, deviation between PID feedback quantity and given quantity is 100%, regulating amplitude of PID controller to the output frequency command is the max frequency（ignore the integral action or derivative action）. When the feedback and given have deviation, output and deviation are in proportion, if the deviation is constant, then the regulating quantity will be constant too. Proportional control is able to respond to the change of feedback rapidly, however, single proportional control is unable to get isochronous control. The larger the proportional gain is, the quicker the regulating speed of system is, but over-large would lead to oscillation. Regulating method is to set a rather long integral time and the value of given quantity, observe the steady-state error（static error）of feedback signal and given quantity, if the steady-state error is in the changing direction of given quantity（e. g. add the given quantity, feedback quantity will always be smaller than the given quantity after stabilization fo system). Continue to increase the proportional gain, on the contrary, reduce the proportional gain, repeat the above process until the steady-state error is in lower side（it is difficult to thoroughly eliminate the steady-state error）. Integral time（Ti）:
It determines the integral controlling speed of PID controller to the deviation between PID feedback quantity and given quantity. Integral time: when the deviation between PID feedback quantity and given quantity is 100%, integral controller（ignore the proportional action or derivative action）makes continuous regulation in this period, let the controlling quantity reach the max frequency. The shorter the integral time is, the higher the controlling strength is. When the feedback and given have deviation, accumulate the output regulating quantity continuously, if the deviation still exists, then continue to increase the steady-state error effectively. However, if the integral controller is too strong, it may have repeated over-adjustment, and the system would be unstable at all times until have repeated over-adjustment, and the system would be unstable at all times until oscillation occurs. Characteristics of oscillation caused by over-strong of integral action: feedback signal wobbles around the given quantity, amplitude enlarges gradually until oscillation occurs. Regulation of integral time usually is from low to high, regulate step to step to observe the regulating efficiency until reach the speed requirement of system stabilization.
Derivative time（Td）:
It determines the controlling strength of PID controller to the change rate of deviation between PID feedback quantity and given quantity. Derivative time: when the feedback quantity changes for 100% in this period, regulation quantity of derivative controller is the max frequency. The longer the derivative time is, the higher the controlling strength is.
When the deviation between feedback and given changes, regulating quantity of proportioning output and deviation change rate, this regulating quantity only is relative to the direction and magnitude of deviation change, and has no connection with the direction or magnitude of deviation itself. Function of derivative control is to regulate the feedback signal and restrain it from changing according to the change trend when the feedback signal changes. Please use the derivative control carefully, as it may enlarge the system interference, especially the interferences have high changing frequency.

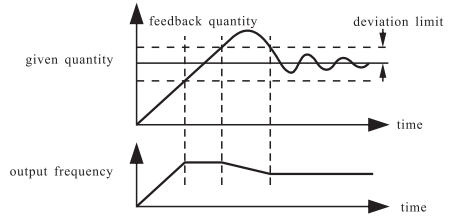
F6.08	Sampling period T	0.00～10.00s	0.00

0. 00：Automatically
It means the sampling period of feedback quantity, the controller carries out operation for one time during every sampling period. The larger the sampling period is, the slower the response is.

F6.09	Deviation limit	0.0～20.0%	0.0%

The permissible max deviation amount of PID system output value relative to the closed loop given value as shown in the diagram, within the deviation limit, PID controller stops regulating, It is able to regulate the accuracy and stability of PID system through setting this function code reasonably.

Chart 25 Deviation limit Diagram



F6.10	Preset closed-loop frequency	0.00～【F0.04】max output frequency	0.00
F6.11	Preset closed-loop frequency holding time	0.0～6000.0s	0.0

This function code defines that PID control is valid to operating the previous inverter's state of running frequency and running time. In some control system, the controlled object needs rapidly reach to the preset value, then inverter will set a constrain input frequency F6. 10 and a frequency holding time F6. 11 according to this function code which the controlled object closes to control target, then PID works to increase the responding speed . Shown in the following

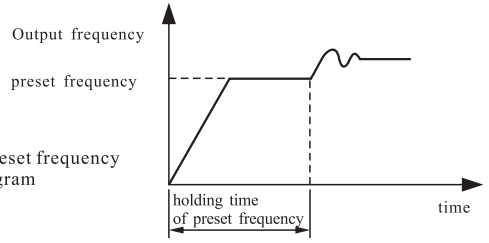


Chart 26 Close-loop preset frequency running diagram

F6.12	Sleep threshold	0.00～10.00V	10.00

This function code defines the feedback value of inverter from operation mode into sleep mode. If the actual feedback value is higher than the setting value and inverter output frequency reached the lower limit frequency then it will get into sleep mode （zero speed running） after passing through the extended holding time by F6.14

F6.13	Wake threshold	0.00～10.00V	0．00

This function code defines the limit feedback value of inverter from sleep to operation mode. If the actual feedback value is less than the setting value, then inverter will start to operate after disengaged from sleep mode which needs to pass through the extended holding time.(F6.14) Shown in the following figure.

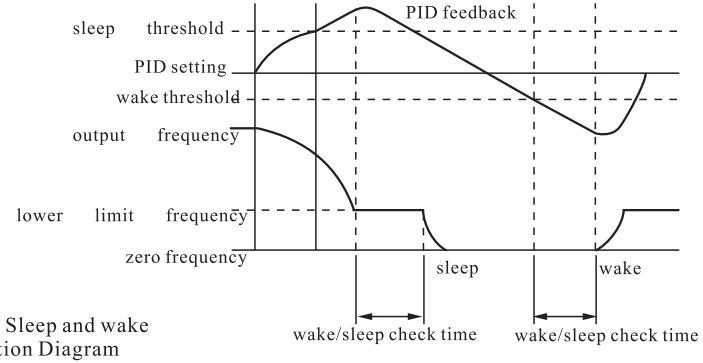


Chart27 Sleep and wake function Diagram

F6.14	Wake/Sleep detection time	0.0～6553.5S	150.0

The PID feedback value is constantly higher than the sleep threshold which the holding time is from low-limit frequency until to the sleep mode. Or inverter is in the sleep mode and the holding time is the PID feedback value constantly lower than the wake threshold until the time of wake. Shown in the figure 27

F6.15	Reserved		Reserved

F7 Programmable running parameters

F7.00	Programmable logic control（simple PLC running）	00～12	00

Simple PLC function is a multi-speed generator, inverter will automatically switch the running frequency and running direction according to the running time to meet the requirements of production process. Formerly this function was completed by the PLC (programmable controller), now inverter can completed the process by itself. Shown in the following figure;

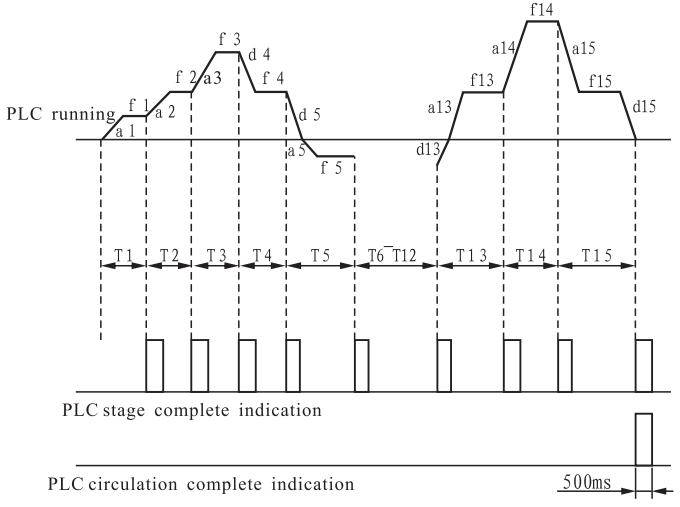
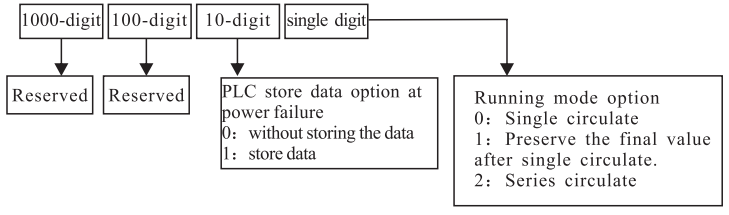


Chart 28 Simple PLC running diagram



LED single digit：Running mode option

0：single circulate

When inverter completes a single circulate and shutdown automatically, it will restart again by sending the operate command. If the running time is 0 in a period of time, the running process will jump over this period to the next directly.

Shown in the following

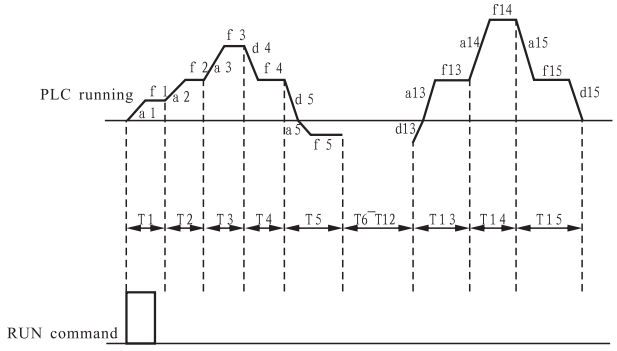


Chart 29 PLC single circulate diagram

Notice:

The multi-speed running time must set higher than acceleration time. At this parameter group only defined the range of running time , therefore knowing the multi-speed acceleration time conversion is important.

Multi-speed acceleration and deceleration time=｛(current multi-speed frequency －starting multi-speed frequency)÷max frequency ｝×acceleration/deceleration time （F0. 11，F0. 12）

Example: Max running frequency is 50Hz, acceleration time is 10s, deceleration time is 20s. The acceleration time is that system runs from 20Hz to 30Hz in multi-speed:

T1=｛（30Hz-20Hz）÷50Hz｝×F0. 10=2S

The deceleration time is that system runs from20Hz to 30Hz

T2=｛（30Hz-10Hz）÷50Hz｝×F0. 11=8S

1：Preserve the final value after single circulate

When inverter completed a single circulate, it will automatically store the last period of running frequency and running direction then keep running. Shown in the following;

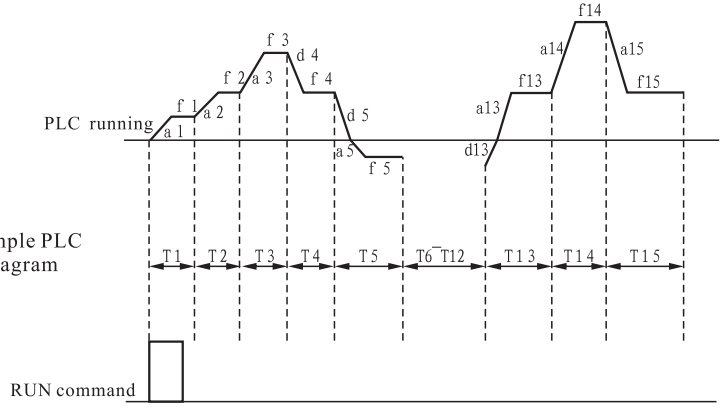


Chart 30 Simple PLC running diagram

2：Series circulate

When inverter completes a circulation, it will automatically start next circulation until the shutdown commands and the system stops. Shown in the following figure;

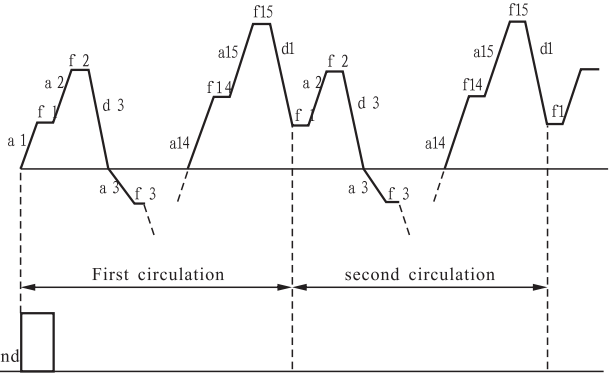


Chart 31 PLC continuous diagram

LED 10-digit： PLC store data option at power failure

0：Without storing data Do not store PLC running state at power failure and restart from the first stage after electrified.

1：Store date Store PLC running state at power failure which includes the moment stage of power failure、running frequency and the completed operating time. Restart after electrified then it will automatically into the stored stage from last power failure and complete the remaining time with stored frequency.

F7.01	Multi-speed frequency0	-100.0%～100.0%	0.0%
F7.02	Multi-speed frequency1		
F7.03	Multi-speed frequency2		
F7.04	Multi-speed frequency3		
F7.05	Multi-speed frequency4		
F7.06	Multi-speed frequency5		
F7.07	Multi-speed frequency6		
F7.08	Multi-speed frequency7		
F7.09	Multi-speed frequency8		
F7.10	Multi-speed frequency9		
F7.11	Multi-speed frequency10		
F7.12	Multi-speed frequency11		
F7.13	Multi-speed frequency12		
F7.14	Multi-speed frequency13		
F7.15	Multi-speed frequency14		
F7.16	Multi-speed frequency15		

The symbols of multi-speed decide the direction of rotation. Negative represents the reverse direction. Frequency set up as 100% corresponding to max output frequency F0. 04. Frequency input method decided by F0. 01. Start and stop command decided by F0. 00.

F7.17	Stage 0 running time	0.0～6000.0s	10.0
F7.18	Stage 1 running time		
F7.19	Stage 2 running time		
F7.20	Stage 3 running time		
F7.21	Stage 4 running time		
F7.22	Stage 5 running time		
F7.23	Stage 6 running time		
F7.24	Stage 7 running time		
F7.25	Stage 8 running time		
F7.26	Stage 9 running time		
F7.27	Stage 10 running time		
F7.28	Stage 11 running time		
F7.29	Stage 12 running time		
F7.30	Stage 13 running time		
F7.31	Stage 14 running time		
F7.32	Stage 15 running time		
F7.33	Reserved		

Those function codes above use to set up the running time of programmable multi-speed.

F7.34	Wobble frequency running parameters	000～111	000

Wobble frequency is applicable to industries of textile, chemical fiber and other occasions where require traversing and winding functions. The typical working state shows in the following diagram. The normal wobble frequency process: First, accelerating frequency to the preset wobble frequency (F7.36) according to the acceleration time, and holding for a while (F7.37), then transiting to center frequency of wobble frequency according to Acc./Dec time, after that running circulation of set wobble frequency range (F7.38)、jump frequency (F7.39)、wobble frequency period (F7.40) and triangular-wave rising time (F7.41) until the shutdown command operated.

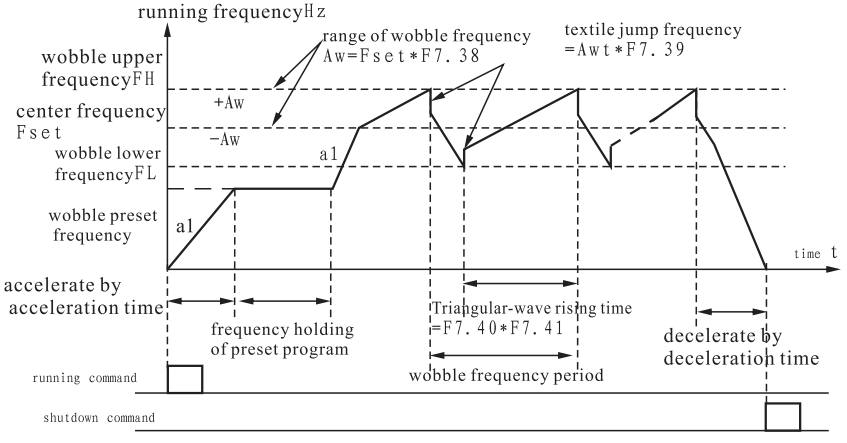
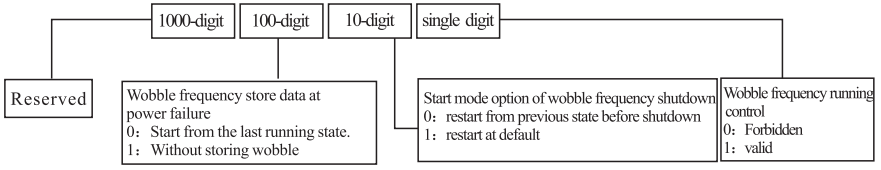


Chart 32 Wobble frequency diagram



LED single digit: Wobble frequency running control
0: Forbidden.
1: Valid.
This function code decides whether operated wobble frequency or not.
LED 10-digit: Start mode option of wobble frequency shutdown
0: Start from the last running state.
1: Restart.
LED 100-digit: Store data at power failure of wobble frequency
0: Store wobble frequency state at power failure
1: Without storing wobble frequency state at power failure
Storing wobble frequency state factor at power failure which is only valid under the "start from the last running state" mode.

Notice:

Compared to other frequency settings (F0.01). The wobble frequency control has the most priority.

F7.35	Center frequency of wobble frequency	0.00Hz～【F0.04】Max output frequency	25.00

The center frequency of wobble frequency is the center value of wobble running frequency, the actual running frequency range of wobble frequency is on the basis of center frequency adding a drift. 【F7.38】。

F7.36	Wobble preset frequency	0.00Hz～【F0.04】Max output frequency	10
F7.37	Holding time of the preset wobble frequency	0.0～3600.0s	0.0

The above code defines the running frequency and the running time at this frequency point, before inverter gets into the wobble frequency running mode or disengage from wobble frequency running mode. If the function code is F7.34=001, then inverter will start directly into the preset frequency of wobble frequency, after the holding time of preset wobble frequency then gets into the wobble frequency mode.

F7.38	Wobble frequency range	0.0～50.0%	10.0%

The function code is the ratio of frequency value.
AW=Max output frequency×F7.38

Notice:

Wobble frequency running is limited by upper/lower limit frequency; If the setting is incorrectly, the wobble frequency will work unstable.。

F7.39	Jump frequency	0.0～50.0% (related to wobble frequency range)	10.0%

The function code indicates the range that frequency reaches to the upper limit frequency of wobble frequency then rapid decrease in wobble frequency running process, indeed frequency reaches to lower limit frequency and then rapid increase. If it set up as 0 then there is no jump frequency.

F7.40	Wobble frequency period	0.1～3600.0s	10.0

It defines a completed period of time in the wobble frequency process of rise and decline.

F7.41	Triangular-wave rising time	0.0～100.0% (related to wobble frequency period)	50.0%

This function code defines the running time that is from the lower limit frequency to the upper limit frequency in wobble frequency running process. The running time is the acceleration time in the period of wobble frequency. Define the increase time of wobble frequency = F7. 40×F7. 41 (Second), decrease time= F7. 40×(1-F7. 41) (second).Certainly,Triangular-wave decline time is the difference of the period of wobble frequency and triangular-wave rising time.

Notice:

When user select the wobble frequency with the S curve acceleration/decelerationmode, the wobble frequency can run more smoothly.

F8-Protection parameters

F8.00	Motor overloaded protection factor	30%～110%	100%

It is efficient to protect different types of overloaded motor by setting motor's overloaded protection factor appropriately and limiting inverter's allowed output max current value. Motor overloaded protection factor is the percentage of motor rated current value and inverter rated output current. Voltage overloaded protection factor can be confirmed by the formula: Motor overloaded protect factor=Allowed max overloaded current=Inverter rated output current×100% At normal circumstances, the max overloaded current is motor's overloaded rated current.

If inverter's drive power class and motor matches, the motor overloaded protection factor can set up as 100%. Shown in the following

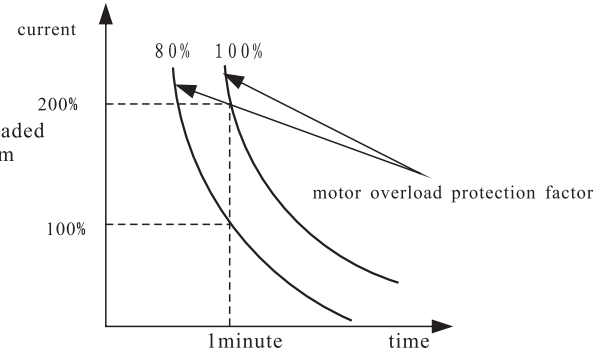


Chart 33 Motor over-loaded protection curve diagram

When inverter's capacity is higher than motor's capacity, setting appropriate motor's over-loaded protection factor is efficient to protect different types of overloaded motors. Shown in the following figure:

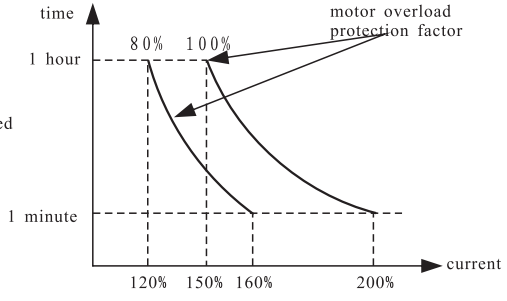


Chart 34 Motor over-loaded protect factor diagram

F8.01	Under-voltage protect level	200～280V	220

This function code stipulates the allowed lower limit voltage of DC bus when the inverter is running normally.

Attention:

When the voltage of power grid is on the low side, the motor's output torque will be decreased. Under circumstances of constant power overloaded and constant torque overloaded, it will decrease the reliability of inverter when the inverter's input and output current has increased which the Voltage of power grid is on the low side. Therefore inverter needs to reduce the rate while running under-voltage of power grid for longtime.

F8.02	Over-voltage and lost speed protection option	0～1	1

0: Forbidden

1: Valid

In the decelerating process, the impact caused by overloaded inertial may occur that motor's actual decreasing rate of rotating speed is lower than the output frequency's decreasing rate decrease, therefore motor will feedback to inverter with electric energy which causes the increasing voltage of inverter's DC bus. If not taking any mesures to it, tripping operation will happen.

Over-voltage lost speed protection: In the decelerating time, inverter checks the bus voltage comparing to the lost speed over-voltage point which is defined by the over-voltage limit level. If it is higher than the point, inverter's output frequency will stop decreasing. After recheck the bus voltage which is lower than the point, it will operate decelerating. Shown in the following

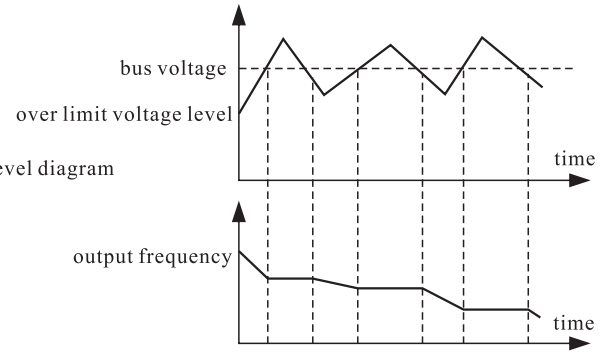


Chart 35 Over voltage level diagram

F8.03	Over-voltage limit level	350～390V	370

When the motor is in the decelerating process actualizing the voltage threshold of over-voltage lost speed protection. If inverter's internal DC pumping voltage is higher than this function code value, inverter will regulate the deceleration time which the output frequency slows decreasing down or stops decreasing until the bus voltage is lower than the range of over voltage limit level then it will restart the decelerating.

Attention:

1. It is suggested that lengthen the deceleration time when the lost speed point is too low.
2. Lost speed protection is invalid when over-voltage lost speed point is set up too high.

F8.04	Current limit operation selection	0～1	1

The current limit function is the motor current control which is automatic limiting the current higher than the current limit level（F8. 05） that is prevent from over-current caused tripping operation. This function is suitable for circumstances such as large inertia overloaded and acutely diversification overloaded. When inverter's output current is higher than the function code F8. 05 in the accelerating process, the inverter will automatic lengthen the acceleration time until the current drops to lower level of the setting range then it will continue accelerate to the target frequency value; When inverter's output current is higher than the function code F8. 05 in the constant running process, the inverter will automatic regulate the output frequency (decrease frequency unload) until the current limits to the setting range which is prevent from over-current caused tripping operation.

0：Only invalid in the constant speed

It is only valid when inverter is in the accelerate process and invalid in the constant running process. This function is suitable for circumstance that runs in constantly and forbidden to change the speed.

1：Valid in the whole course

Limit current function is valid in the whole.

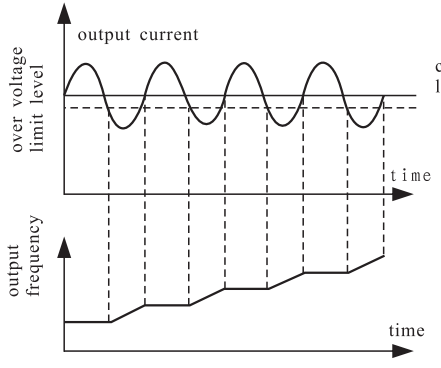


Chart 36 accelerateing over-current lost speed diagram

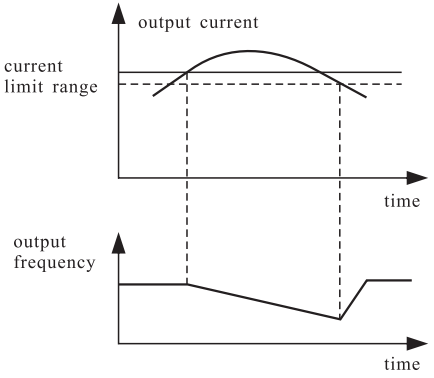


Chart37 constant speed over-current lost speed diagram

F8.05	Current limit level	120%～200%	160%

Current limit level defines the current threshold of automatic limiting movement which the setting value is corresponding to the percentage of inverter's rated current.

F8.06	Reserved		

F9-Advanced function parameters

F9.00	Braking threshold voltage	350～390V	365
F9.01	Braking action ratio	10～100%	50%

The function is used for defining the built-in brake unit voltage value of inverter. If the inverter's internal DC voltage above the energy consumption braking voltage then the built-in brake unit acts. If there is a braking resistance, it will go through the braking resistance to release inverter's internal voltage by pumping up until the DC voltage dropped down. When the DC side voltage decreases to a value then the buit-in braking unit shut down.

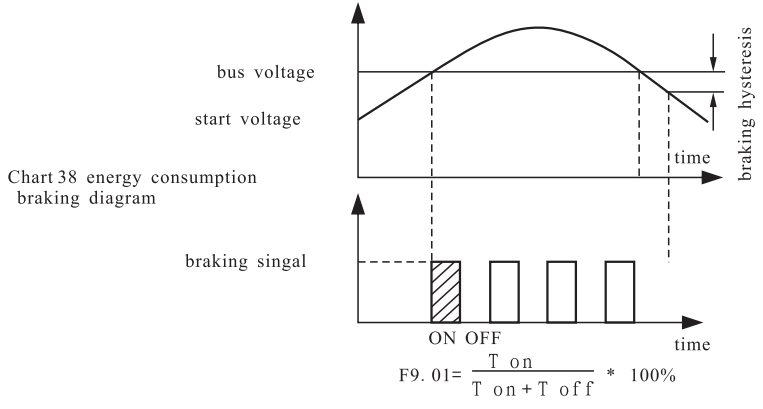


Chart 38 energy consumption braking diagram

F9.02	Cooling fan control	0～1	0

0：Automatic control mode

It runs constantly while in the running process. When inverter stops or the radiator is below 40 ℃, the cooling system is not working.

1：Runs when electified.

The pattern applys to some circumstance that fans can not stop working.

F9．03	AVR function option	0～2	2

0：Forbidden

1：Valid in the whole course

2：Invalid only at deceleration

AVR is to automatically adjust voltages. When inverter's input voltage and rated value have deviation, this function can maintain the output voltage constantly. This function is invalid when output voltage is greater than the input voltage. If AVR does not function on the decelerating process then the deceleration time is short and running current is high. If AVR functions, the motor deceleration is smoothly then the running current is lower and the deceleration time is longer.。

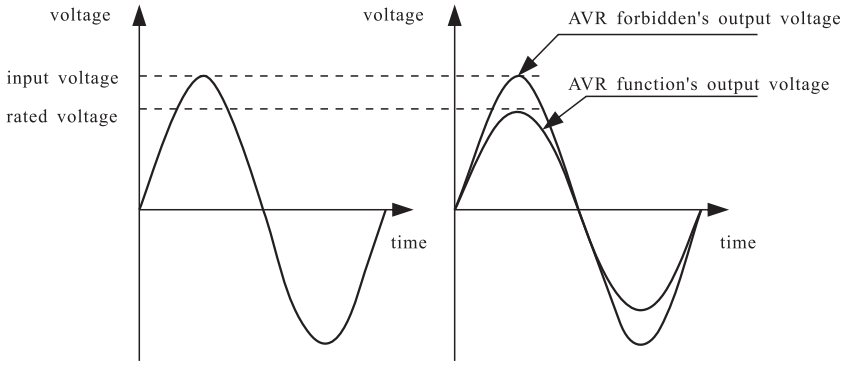


Chart 39 AVR function diagram

F9.04	Over-modulation option	0~2	0

Over-modulation indicates that inverter regulates the using rate of bus voltage to increase the output voltage when over-modulation is valid, output harmonic will increase.

0: Forbidden

1: Valid in the whole course

Over-modulation effectively all the time.

2: Only valid when the voltage is 5% lower than the rated value

When the voltage is less than 5% of rated value the modulation effectively. This function can increase output voltage, and thus improve the inverter's torque output ability.

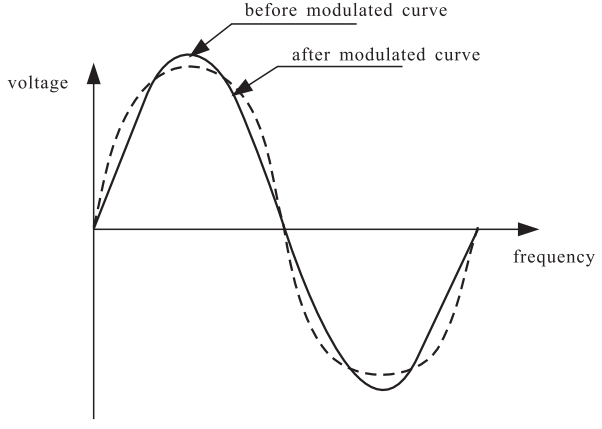


Chart 40 Modulation diagram

F9.05	Frequency display resolution setting	0 ~ 2	0

Using this code to select the frequency display's resolution.

0: To after two digit decimal point

1: To after one digit decimal point

2: To the single digit

F9.06	Zero-speed voltage control	0~1	1

By this code the motor can preserve some torque at zero speed.

0: Forbidden

1: Valid

F9.07	Counter reset value setting	【F9.08】~65535	1
F9.08	Counter detection value setting	0~【F9.07】	

This function code provides the counter resets values and testing value. A counter's pulses input by external terminals X5. When counting values reach to the value of F9. 07 then the relatived multi-function terminals (output the counter reset signal) output a width accordance to the external valid period signal and clear the counter to zero. When the counting value reach to the value of F9. 08, the relatived multi-function terminals (output counter detect signal) output valid signals. If continuing counting and passing over the value of F9. 07, the output valid signal will be removed which counter sets up to zero. Shown in the following figure: Set up programmable relay output signal as rest singal; set up open collector output terminal Y1 as detected output signal, set up F9. 07 as 6, F9. 08 as 3. When the detected value is 3 then the Y1 output the valid singal for good; when rest value is 6, relays output a period of pulse and counter sets up to zero, then Y1 and relays remove output signals.

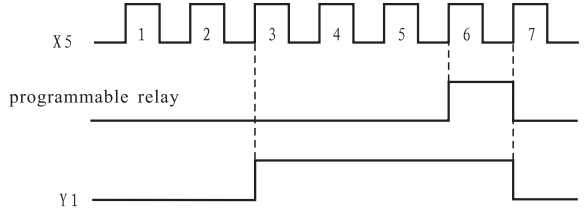


Chart 41 Settings of counter rest and check diagram

F9.09	Timing timer	0~65535S	0

This function code is use to set up the time of timer.

F9.10	Current reached value of timing setting	0~【F9.07】	0

Through this function that can check the current arrived time in the timing mode, but it is only for checking .

F9.11	Reserved	Reserved	Reserved
F9.12			
F9.13	Carrier frequency auto-adjustment	0~1	0
F9.14	PWM mode	0~1	1

Carrier frequency function can automatically reduce low speed torque pulse and increase output torque at low speed. PWM mode 0 has a relatively small nosie, but in the intermediate frequency may lead to the current to be oscillated. PWM mode 1 has a loud noise which slightly increases during the intermediate and high speed, but the current outputs smoothly. Please set up this function carefully by customer.

FA Communication parameters

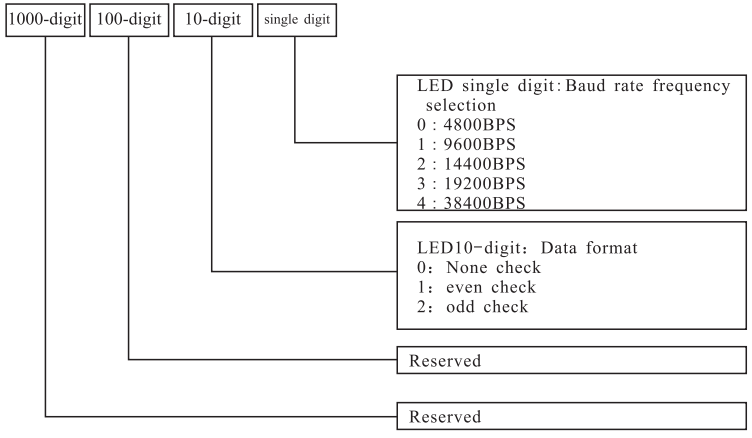
FA.00	Communication address of inverter	0～31	1

This function code uses to set up the communication address of RS485 which is a unique address.

0: Host-machine address It is the host when the inverter is in series-run controlling which controls other related inverter.

1～ 31: slave address of connected machines. The inverter receives data from upper machine (PLC、PC etc.) or receive the inverter's data as the host. The inverter only receive the data from the identifying address of upper machine or the host.

FA.01	Communication configure	00～25	01



LED single digit: Baud rate frequency selection
0:4800BPS 1:9600BPS
2:14400BPS 3:19200BPS
4:38400BPS 5:115200BPS
This parameter is used for setting data transmission rate between the upper machine and inverter. Notice, baud rate of upper machine and inverter must be the accordant, otherwise, the communication will be failed. The larger the baud rate is, the quicker the communication speed will be.
LED 10-digit: Data format
0: None check
1: Even check
2: Odd check
Data format of upper machine and inverter must be accordant, otherwise, the communication will be failed.
LED 100-digit: Reserved
LED 1000-digit: Reserved

FA.02	Response operation of communication	0～2	0

0: Normal respond
Respond to the address、read and write commands, parameters, and CRC check code etc.
1: Only respond to the received address
2: No respond

FA.03	Communication failure selection	0～1	0

0: Operate protection and stop freely
1: Warnning and keep constant running

FA.04	Check time of communication time override	0.0～100.0S	10.0

If the local machine is not receiving the correct data signal at the time period of this function code, it will read as communication failure and the communication failure settings decide to operate protection or keep running.

FA.05	Communication response time delay	0～1000ms	5

The function code is the interval time from accepting stop to sending response data to the upper machine. If the response time delay is shorter than the handling time of system, then the response time delay should be subject to the handling time of system.

FA.06	Series-run ratio	0.01～10.00	1.00

This function code is the frequency command factor from RS485 receive port, the actual running frequency of the local machine is this function code times the setting value from RS485 received port. In the series-run controlling mode, function code can set up several proportion of running frequency.

FA.07 FA.08	Reserved	Reserved	Reserved

FB Manufactory parameters

FB.00	Machine type selection	0～9 corresponding to 0.4KW、0.55KW、0.75KW、1.1KW、1.5KW、2.2KW、3KW、3.7KW、5.5KW、7.5KW Voltage class: single-phase or three-phase 220V	2
FB.01	Dead time	2.3～6.0μS	5.5
FB.02	Over-voltage point of software	【F8.03】～400V	395

The minimum voltage of inverter's over-voltage failure, when the bus voltage is over this minimum voltage then the protection will start (output the over-voltage failure)and shutdown the inverter freely.

FB.03	Current check factor0	0.50～2.00	1.00
FB.04	Current check factor1	1.50～3.00	1.80
FB.05	Reserved		Reserved
FB.06	Voltage check factor	0.95～1.05	1.00
FB.07 FB.08	Reserved		Reserved

FB.09	Client code	*****	0
FB.10	Special information clearance	0～1	

0：Forbidden
1：Clear the accumulated running time and accumulated electrifying time

FB.11	Ex-factory barcode1	0～65535	00000
FB.12	Ex-factory barcode2		
FB.13	Ex-factory Date (month,day)	0～1231	0000
FB.14	Ex-factory Date (year)	2009～2100	
FB.15	Software protection code	*****	00000

Monitoring parameters group

d.00	Output frequency(Hz)	0.00～600.00Hz	0.00
d.01	Frequency setting(Hz)		
d.02	Output current(A)	0.1～99.9A	0. 0
d.03	Output voltage(V)	0～300V	0
d.04	Motor rotation speed(RPM/min)	0～36000RPM/mi	
d.05	Running speed(m/s)	0	
d.06	Bus voltage(V)	0～400V	

The monitoring code above uses to monitor various running parameters of inverter.

d.07	Analog inputAI1(V)	0.00～10.00V	0.00
d.08	Analog inputAI2(mA)	0.00～20.00mA	

The monitoring code above uses to monitor the value of analog input.

d.09	Input terminal status	0～1FH	0.00
d.10	Output terminal status	0～1H	

The monitoring code above uses to monitor the status of the input and output terminal. Terminal input, output status are a hexadecimal display. Take the input terminal as an example;

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Reserved	Reserved	Reserved	X5	X4	X3	X2	X1

BIT digit as 1： terminals connected, 0 ： terminals disconnected.
A hexadecimal display “1F” as the input terminals are all connected.
The output terminals display as same as the input's.

d.11	Temperature of module (℃)	-20. 0℃～100. 0℃	0.0

The monitoring code uses to monitor the temperature of module.

d.12	PID setting value	0. 00～10. 00V	
d.13	PID feedback value	0. 00～10. 00V	

The monitoring code uses to monitor PID setting and feedback.

d.14	Second fault code	0～15	0
d.15	Last fault code	0～15	0
d.16	Last output frequency failure（Hz）	0. 00～600. 00Hz	0.00
d.17	Last input current failure（A）	0. 1～99. 9A	0.0
d.18	Last bus voltage failure（V）	0～400V	0
d.19	Last temperature of module failure(℃)	-20. 0℃～100. 0℃	0.0

The monitoring code uses to monitor various parameters when the failure occurs.

7. 1 Fault code table

Fault code	Name	Possible cause	Remedy
E-00	None fault		
E-01 (OC_A)	Over-current during acceleration running	Acceleraion time too short	Lengthen the acceleration time
		Voltage of power grid is on the low side	Check the input power supply
		Restart the rotating motor	Set up the DC braking first then start
		Power of inverter is on the low side	Select inverter of higher power
		V/F curve unsuitable	Adjust V/F curve increase torque
		Inertia of loads is large	Reduce overloaded inertia or lengthen the acceleration time
E-02 (OC_D)	Over-current during deceleration running	Decelerate too quickly	Lengthen the deceleration time
		Power of inverter is on the low side	Select inverter of higher power
		Inertia of loads is large	Decrease the inertia of the overloaded or lengthen the deceleration time
E-03 (OC_N)	Over-current during constant speed running	Input voltage is abnormal	Check the input power supply
		Loads have sudden change or abnormity	Check the loads or reduce sudden change of loads
		Power of inverter is on the low side	Select inverter of higher power
E-04 (OU_A)	Over-voltage during acceleration running	Input voltage is abnormal	Check the input power supply
		Restart the rotating motor	Set up DC braking first then start
E-05 (OU_D)	Over-voltage during deceleration running	Decelerate too quickly	Lengthen the deceleration time
		Feedback overloaded with energy	Consider using dynamic braking modules
		Input power supply is abnormity	Check the input power supply
E-06 (OU_N)	Over-voltage during constant speed running	Input voltage is abnormal	Check the input power supply
		Feedback overloaded with energy	Consider using dynamic braking modules
E-07(OU_S)	Over voltage of stopping	Input power supply is abnormal	Check the power grid voltage
E-08 (LU)	Under-voltage of running	Input voltage is abnormal	Check the power grid voltage
		DC loop relay or contractor disconnected	Ask for service
E-09 (OC_P)	Module fault	Inverter output short circuit or earthing	Check the wiring
		Inverter has instantaneous over-current	Refer to the countermeaures for over-current
		Air channel jammed or fan damaged	Dredge the wind channel or change the fan
		Control panel abnormity	Ask for service
		Overheated circumstance	Reduce the ambient temperature
E-10 (OH_1)	Over-heat of rectification module	Overheated circumstance	Reduce the ambient temperature
		Fan damaged	Change the fan
		Air channel jammed	Dredge the wind channel
E-11(OL_1)	Overloaded of inverter	V/F curve unsuitable	Adjust V/F curve increase torque

Fault code	Name	Possible cause	Remedy
E-11 (OL_1)	Overloaded of inverter	Acceleration time too short	Lengthen the acceleration time
		Heavy overload	Select inverter of higher power
E-12 (OL_2)	Overloaded of motor	V/F curve unsuitable	Adjust V/F curve increase torque
		Voltage of power grid is too low	Check the voltage of power grid
		Motor rotation blockage or load chnge is too large	Check the loads
		Motor overload protect factor set up incorrect	Set the motor overloaded protect factor correctly
E-13(EF)	External fault	External fault input terminal operates	Check the input of external equipment
E-14 (ER485)	Rs485 Communication fault	Parameter setting incorrect	Resetting parameter
		Rs485 Communication wiring incorrect	Rewiring

7.2Usual faults and solutions

During the operation of inverter, it may come across the following situations, please analyze according to the following methods:

No display after being electrified:

Use avometer to measure the input power supply of inverter, to see if it accords with the rated voltage of inverter. If there is something wrong with the power supply, please check and eliminate. Check the three-phase rectifier bridge to see if it is in good condition. If not, please ask for service.

Check if the lamp CHARGE is on, if not, the fault usually is on rectifier bridge or buffer resistor, if this lamp is on, then the fault usually is on the switching power supply. Please ask for service.

Air switch of power supply trips after power on:

Check if there is earthing or short-circuit situation among input power supplies, eliminate the problems.

Check if the rectifier bridge has been broken down, if it is, ask for service.

The motor is failed to run when the inverter has been put into operation:

Check if there is balanced three-phase output among U, V and W, if there is, then the motor line or motor itself is damaged, or motor is blocked due to mechanical cause, please eliminate the cause.

When there is output with unbalanced three-phase, then the drive board of inverter or output module may be damaged, please ask for service.

If there no output voltage, then the drive board or output module may be damaged, please ask for service.

The inverter displays normally after power on, but air switch of power supply trips after running:

Check if the interphase among the output modules has short-circuit situation, if there is, please ask for service. Check if there is short-circuit or earthing condition among motor lead wires, if there is, please eliminate.

If the trip phenomenon appears sporadically, and the motor is far away from the inverter, please consider adding an output AC reactor.

Warning
■ Maintenance personnel should carry out maintenance according to the specified methods. ■ Please ask for professional and qualified personnel to carry out the maintenance. ■ Before maintaining, please cut off the power supply of inverter first, and carry out maintenance 10min later. ■ Don't touch the elements and components on the PCB plate directly, otherwise, the static electricity may damage the inverter. ■ When the maintenance is finished, make sure that all the screws have been tightened.

8.1Daily maintenance

In order to protect the inverter from faults, guaranteeing normal running of equipment, and prolong service life of inverter, please carry out daily maintenance to the inverter, content of daily maintenance as follows:

Inspection item	Content
Temp./humidity	Make sure that the temperature is within 0℃~50℃, humidity is within 20~90%
Oil mist and dust	Make sure that no oil mist, dust or condensate water remain in the inverter
Inverter	Check if the inverter has abnormal heating or abnormal vibration
Fan	Make sure that the fan runs normally without any block situation
Input power supply	Make sure that the voltage and frequency of input power supply remain within the permissible range
Motor	Check if the motor has abnormal vibration, heating, abnormal noise, open-phase or other problems.

8.2Regular maintenance

In order to protect the inverter from faults, guaranteeing long-term high-performance and stable running, users must detect the inverter periodically (within half a year), detection content as follows:

Inspection item	Content	Elimination methods
Screws of external terminals	Whether the screws are loosened or not	Tighten them
PCB plate	Dust, dirt	Clear away foreign matters thoroughly with dry compressed air
Fan	Abnormal noise or vibration, whether cumulative time reaches 20000h or not	1.Clear away foreign matters 2.Change the fan
Electrolytic capacitor	If it changes color or has peculiar smell	Change the electrolytic capacitor
Radiator	Dust, dirt	Clear away foreign matters thoroughly with dry compressed air
Power components	Dust, dirt	Clear away foreign matters thoroughly with dry compressed air

8.3Change of wearable parts of inverter

Fan and electrolytic capacitor inside the inverter are wear parts, in order to guarantee long-term, safety and fault-free running of inverter, please change the wear parts regularly, changing time as follows:

Fan: it should be changed after 20000h of working

Electrolytic capacitor: it should be changed after 30000~40000h of working

8.4Warranty for inverter

Free maintenance only is for the inverter itself.

1. The company would be responsible for the inverter for any fault or damage on the inverter under normal operation for 12 months (since the date of leaving the factory), but require reasonable maintenance

cost for that exceeding 12 months;

2. Within 12 months, a certain maintenance cost would be required for the following situations:

1）The machine is damaged due to operation without according to the operating manual;

2）Damage caused by fire, flood, abnormal voltage or others;

3）Damage caused by using the inverter in abnormal condition;

Relevant service charge would be calculated according to the factory standard, and the agreement would have priority if there were.

Communication address

Setting range：0-31(Frequency inverter0-31， Device address1-31) When system uses RS-485 serial communication interface to controlling or monitoring, each inverter must set the communication address and the address must be unique which can not be repeated in the link network. Ex-factory setting：01 Ø setting address is 0 as a broadcast address that is sending broadcast data to other machine connected in the link network.

Communication transmission speed- Baud Rate The value of Baud Rate, please see parameter list Communication error handling Detail fault code, please see parameter list Communication overtime check This parameter setting is the check time of serial communication overtime

When it is in the parameter set period of time, without any data transfer, then it is the communication timeout. For specific time see

the following table:

Communication data format（RTU mode） Under RTU mode data format of any modbus fram is followed as:

3.5 bytes transmission time+slave address+function code+specific data+CRC CHK + 3.5 bytes transmission time

length:2bytes
length:Multi-bytes
length:1byte
length:1byte

The following list may be more intuitive, but the same meaning

STX	No signal input to maintain greater than or equal 3.5 bytes transmission time
Address	Communication address :8-bit binary address
Function	Function code：8-bit binary address
DATA(n-1)	Data content：n×8-bit Data，n＜＝2（two 16bit datas）
……	
DATA 0	CRC check code：
CRC CHK Low	16-bit CRC check code by the two 8-bit binary combination
CRC CHK High	No signal input to maintain greater than or equal 3.5 bytes transmission time
END	

The specific meaning in the table below：

Address：communication address，range: 0 - 31 （Decimal system）

00H: Broadcast to all inverters（Broadcast）, slave machine does not respond.

01H - 1FH：The specific address corresponding to a frequency inverter.

Function：Function code, also known as the command byte, there are 4 possibles：

03H：Read registers content, one or more.

06H：One data write to register

10H：Multi-data write to register

08H: Communication test, slave machine does not change the reply to

the received data DATA (n-1): specific data, the following will be applied

example.

RTU mode check code（CRC Check）

Example of function code corresponding to the communication frame：03H：read out content from register（max read：one parameter content） For example: inverter address is 1FH, read parameter values from the internal set parameters 0006H (F006) Asking frame data format：

Address	1FH
Function	03H
Starting data address	00H
	06H
Number of Data(Byte)	00H
	02H
CRC CHK Low	67H
CRC CHK High	B5H

Respond frame data format：

Address	1FH
Function	03H
Data[2Byte]	02H
Data content	10H
	88H
CRC CHK Low	1DH
CRC CHK High	E0H

Asking frame：
1FH+03H+00H+06H+00H+01H+67H+B5H
Specific meaning as followed：
Address：1FH ---- this device ID is 1FH
Function：03H ---- Write register contents
Starting data address：0006H ----Register address 0x0006, this parameters is from the register.
Number of Data(Byte)：0002H ----Read 2 bytes of data。
CRC CHK：refer to the last page of RTU mode check code（CRC Check）access method.
Respond frame：
1FH+03H+02H+10H+88H+ABH+D3H Specific meaning
as followed：：
Address：1FH ---- this device ID is 1FH
Function：03H ---- Write register contents 。
Data[2Byte]:02H----read 2 bytes of data, one word data.
Data content: 1088H ---- the read out content.
CRC CHK：refer to the last page of RTU mode check code（CRC Check）access method.

06H：write one data to register.
For example: the frequency inverter address 1FH, write to 5000 (1388H) to set the parameters of the internal inverter to 0006H。
Asking frame data format：

Address	1FH
Function	06H
Data address	00H
	06H
Data content	13H
	88H
CRC CHK Low	67H
CRC CHK High	23H

Respond frame data format：

Address	1FH
Function	06H
Data address	00H
	06H
Data content	13H
	88H
CRC CHK Low	67H
CRC CHK High	23H

Asking frame：
1FH+06H+00H+06H+13H+88H+67H+23H Specific meaning
as followed：
Address：1FH ---- this device ID is 1FH。
Function：06H ---- Write register contents。
Data address：0006H ----Register address 0x0006 that was content to register。
Data content：1388H ----Written content, 0x0006 write 1388H.
CRC CHK：refer to the last page of RTU mode check code（CRC Check）access method.
Respond frame：
1FH+06H+00H+06H+13H+88H+67H+23H Specific meaning
as followed：
Address：1FH ---- this device ID is 1FH
Function：06H ---- Write register contents。
Data address：0006H ---- Register address 0x0006 that was content to register。
Data content: 1388H ---- that was content write into register。
CRC CHK：refer to the last page of RTU mode check code（CRC Check）access method.

Communication protocol defines the parameters of the virtual address,

as the following table:

Define	Parameter address	Functional Description
Inverter internal setting parameter	GGnnH	Gg is parameter group, nn is parameter number. For example :04-01 expressed as the 0401H。
To inverter' s command	2000H	Command format, see the back of Appendix
Given frequency	2001H	Given the communication frequency

Appendix:

Example, 03command frame format as followed:

Read device1's parameter F1. 00

01	03	01	00	00	01	85	F6
Local address 01	03 command	read parameter F1. 00		The number of bytes read (Word)		CRC low bit check	CRC high bit check

Read device2's parameter F0. 00

02	03	00	00	00	01	84	39
Local address 02	03 command	read parameter F0. 00		The number of bytes read (Word)		CRC low bit check	CRC high bit check

Read device10's monitoring parameter D-05

0A	03	0D	05	00	01	97	DC
Local address 0A	03 command	read monitoring parameter D-05		The number of bytes read (Word)		CRC low bit check	CRC high bit check

Example, 06command frame format as followed:

Modify command channel to communication given:

01	06	00	00	00	02	08	0B
Local address 01	06 command	read parameterF1. 00		Read and write into the parameter		CRC low bit check	CRC high bit check

Running command:

01	06	20	00	00	01	43	CA
Local address 01	06 command	control command address		the number of bytes read (Word)		CRC low bit check	CRC high bit check

Forward jogging command:

01	06	20	00	00	02	03	CB
Local address 01	06 command	control command address		the number of bytes read (Word)		CRC low bit check	CRC high bit check

shutdown command:

01	06	20	00	00	03	C2	OB
Local address 01	06 command	control command address		the number of bytes read (Word)		CRC low bit check	CRC high bit check

Running frequency communication modify:

01	06	20	01	13	88	DE	9C
Local address 01	06 command	control command address		the number of bytes read (Word)		CRC low bit check	CRC high bit check

Broadcast running command:(make host address 0) see the following:

Running command:

00	06	20	00	00	01	84	0A
Broadcast address is00	06 command	control command address		the number of bytes read (Word)		CRC low bit check	CRC high bit check

Control command word format:

	Meaning
Bit0~2	001B :normal running
	010B: jogging running
	011B: shutdown
	100B: shutdown freely
	other: none-operation
Bit3	0:forward rotation
	1:reverse rotation
Bit4	0:none-operation
	1:rest
Reserved	

communications error recovery (Reserved)

Error in the communication process will return two error codes.

CRC check received frame can not be returned error code 04. For example, frame length is not correct, the command does not correct, address is not correct and CRC check error, etc.

RTU mode check code (CRC Check)

Check code start from Address and end at Data content.

The operation follows the rules:

Setp1: Make 16-bit register (CRC register) = FFFFH.

Setp2: Exclusive OR first 8-bit byte message instruction with low bit 16Exclusive OR , that write the result to CRC register.

Setp3: Move to right a bit of CRC register, fill 0 in high bit.

Setp4: Check shifted to the right of value if it is 0, the new value in step 3 into CRC register with the CRC within the A001H register. The results will write into CRC register.

Setp5: Repeat step3~step4, make 8-bit completing all the operations.

Setp6: Repeat step2~step5, take off one message instruction of 8-bit, until all message instruction are completed operation.

At the last the register value is the CRC check code. It is worth noting that the CRC check code placed in the message instruction.

The following is written using C language and example of CRC check calculation:

```
unsigned char* data ? // Message command index
unsigned char length ? // The length of the message instruction
 unsigned int crc_chk(unsigned char* data, unsigned char length)
{
int j;
unsigned int reg_crc=0xffff;
while(length--)
reg_crc ^= *data++;
for(j=0; j<8; j++)
{
if(reg_crc & 0x01)
{ /* LSB(b0)=1 */
reg_crc=(reg_crc>>1) ^ 0Xa001; }
Else
 {
 reg_crc=reg_crc >>1;
}
 }
 }
 return reg_crc; // Finally return the value of CRC registers.
 }
{
```