SPECIAL MOTOR DRIVEN SOLUTION PROVIDER

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Folinn®

Driving Follow Heart, Winning The Future

BD330 Series

High Performance Vector Inverter

Manual

Praface

Thanks for choosing the BD330 series of high-performance general inverters produced by Zhejiang new folinn electric co,ltd.

BD330 series of inverters are the general type inverters in vector control with high quality, multiple functions and low noises, developed independently by ourselves. They have various kinds of functions, such as motor self-tuning, revolving speed tracking, automatic energy conservation, instant halting for continuous operation, breakdown auto reboot, program run, PID water supply in constant voltage, standard MODBUS protocol 485 communication control, etc. They can satisfy all kinds of demands in speed governing of loading frequency conversion, and you can check current operating data and history failure records through keyboard.

BD330 series of inverters have compact structure, easy and flexible installation; the reasonable thermal design can guarantee reliability, while abundant accessories (signal conversion card of injection molding machine, one-with-more constant-voltage water supply card, I/O expansion card, etc.) are available for your choice.

We provide information of model selection, installation, parameter determination, field debugging, fault diagnosis and routine maintenance for users in this manual.

First use:

For those users who use this product for the first time, they shall carefully read this manual first. If you have any problems in some functions and usability, please consult with technical supporters of our company for help.

This manual is one of accessories. Please keep properly after using it for future use in overhauling and maintenance to the inverter.

Application scope of this manual:

This manual is applicable for all BD330 series of products from our company.

Version : 2015.V1.0

Attentions:

- While implementing wiring, please ensure power off.
- Electronic components inside the inverter are especially sensitive to static electricity, so any foreign matters shall not be placed inside the inverter or main circuit board shall be touched.
- After cutting off power, before the indicator light on display panel of the inverter puts out, it means high pressures still exist inside the inverter, and it is very dangerous. Please do not touch interior circuit and components
- Please ensure the grounding terminals of inverter ⏚ will be correctly made grounding.
- Input power cannot be connected to the output terminals of inverter, U, V and W.

Catalogue

Chapter 1 Safety and Attentions

Definition of Safety:

In this manual, safety precautions will be presented as following two categories:

danger Dangers caused by operations beyond requirements may lead to serious injury,and even death.

attention Dangers caused by operations beyond requirements may lead to moderate damages or minor injuries, as well equipment damages.

1.1 Safety Matters

Ⅰ. Before installing:

danger
Please do not use damaged and shot-part inverters. There are risks of being hurt.

Ⅱ. In installation:

danger
Please install it on metal and other inflaming retarding objects: to keep away from combustible, or it may give rise to fire alarm!

attention
★ More than two inverters shall be placed in a same cabinet. Please pay attention to the installation site (refer to Machinery and Electrical Installa -tion in Chapter 3) and guarantee heat dissipation effects. ★ Wires or bolts shall not fell into inverter, or it will lead to the damages of inverter!

Ⅲ. In wiring

danger
★ It shall be constructed by professional electric engineering personnel, or it will give rise to electric shock hazard! ★ Inverter and power supply shall be separated by breaker, or it will cause fire alarm! ★ Before wiring, please confirm power off, or it will cause electric shock hazard! ★ Please make ground connection as standard requests, or it will cause electric shock hazard!

attention
★ The input power line cannot be connected to output end, U, V, W, or it will damage inverter! ★ Please confirm the equipped wires will accord with EMC requirements and regional safety standards. For the adopted wire diameter, please refer to the suggestions in manual, or it will lead to accidents! ★ Brake resistor cannot be connected directly to the two ends of DC bus (+) and terminal(-), or it will cause fire alarm!

Ⅳ. Before power on

attention
★ Please confirm whether supply voltage class is in accord with the nominal voltage of inverter: whether connection location of input and output is correct, and pay attention to check whether short circuit phenomenon exists in peripheral circuit and whether the connected circuit is tight, or they will cause damages to inverter! ★ Power on is permissible only inverter is covered with plate, or it will give rise to an electric shock!

attention
★ Pressure-tight test is not necessary for inverter, and the product has been maked relevant test before leaving factory, or it will give rise to accidents! ★ Confirm whether all peripheral equipments have been connected correctly as the circuits provided in this manual, or it may give rise to accidents!

Ⅴ. After power on

danger
★ Please do not open the cover plate after power on, or it will give rise to electric shock hazard! ★ Do not touch inverter and peripheral circuit with wet hands, or it will give rise to electric shock hazard! ★ Do not touch inverter terminal, or it will give rise to electric shock hazard! ★ After power on, inverter will make security detection over external strong electricity circuit. For the time being, please do not touch U, V and W connection terminal or motor connection terminal of the inverter, or it will give rise to electric shock hazard!

attention

★ If you need to make parameter identification, please pay attention to the hurting dangers while motore is rotating, or it will give rise to accidents!

★ Please do not change manufacturer parameters of inverter at will, or it will cause damages to equipment!

Ⅵ. In service

danger

★ If you select restart function, please do not get close to mechanical equip -ment, or it will give rise to personal injury!

★ Please do not touch cooling fan and discharge resistance to sense tempera -ture, or it will give rise to burn!

★ Non-professional technicists shall not detect signal in service, or it will give rise to personal injuries or equipment troubles!

attention

★ When inverer is in service, anything shall be avoided falling into equipment, or it will cause damages to equipment!

★ Please do not try to control start-stop of inverter, or it will cause damages to equipment!

Ⅶ. In maintenance:

danger

★ Please do not make repair and maintenance over equipment in a charged state, or it will give rise to electric shock hazard!

★ Inverter can be put into maintenance and repair only you confirm the inver -ter charge light out, or the remaining electric charge of capacitance will cause damages to people!

★ Any people who are not trained professionally cannot make repair and maintenance, or it will cause personal injuries or equipment troubles!

1. 2 Attentions

Ⅰ. Motor insulation inspection

When motors are used for the first time, reused after a long-time placement, and in regular checking, insulation inspection is necessary first to prevent damaging inverter from the insulation failure of moter winding. In insulation inspection, moter connection wires shall be separated from inverter. 500V voltage type tramegger is recommended to guarantee the measured insulation resistance shall not less than 5MΩ.

Ⅱ. Moter thermal protection

If the selected motor mismatches with rated capacity of inverter, expecially rated power of inverter is larger than that of motor, please adjust parameter values related to motor protection inside inverter, or heat relay to protect motor.

Ⅲ. Power frequency operation

This inverter can prodive 0～200Hz output frequency. If you need to operate it over 50Hz, please consider tolerance of mechanical device.

Ⅳ. About motor heating and noise

As output voltage of inverter is PWM wave with definite harmonic waves, compared with power frequency operation, temperature rise, noise and vibration of moter increase more or less.

Ⅴ. Capacitive condition of outlet side with pressure-sensitive devices or ameliorative power factor

Output of inverter is PWM wave. If capacitance or piezoresistor for thunder prevention with improving power factors is installed at outlet side, it is easy to cause momentary overcurrent of inverter and even cause damages to inverter. Please do not use it.

Ⅵ. Contactor and other switching elements applied in input and output terminals of inverter

When you install contactor between power supply and input terminal of inverter, please do not try to control start-stop of inverter with this contactor. If you have to do this, please ensure the interval will not be less than one hour. Frequent charge-discharge operations will easily shorten service life of capacitor inside the inverter. If contactor and other switching elements are installed between output terminal and motor, you shall guarantee make-break operation is processed when inverter has no output, or it will cause module damages inside the inverter easily.

Ⅶ. Application except nominal voltage values

BD330 series of inverters are not appropriate to be applied beyond allowable operating voltage range required in this manual, or it will cause damages to components inside the inverters. If needed, please make voltage transformation treatment with corresponding boosting or dropping equipment.

Ⅷ. Change three-phase input to one-phase input

For those types without marks of one-phase input in BD330 series of inverters, one-phase input is not allowed to be adopted, or it will cause damages to inverters.

Ⅸ. Lightning impulse protection

Lightning stroke over-current protection device is installed in this series of inverters, and has self-defensive ability over inductive thunder. For some areas with frequent thunder, clients shall install protection devices at front end of inverter.

Ⅹ. Elevation and derating use

In those areas with over 1000m elevation, rarefied air causes a bad heat dissipation effect of inverter, and so derating use is necessary. About this circumstance, please seek for technology consulting from our company.

Ⅺ. Some special usages

If clients need the methods beyond the suggested wiring diagrams provided in this manual in use, such as DC bus, please consult our company.

Ⅻ. Attentions of inverter scrapping

When electrolytic capacitor of major circuit and electrolytic capacitor on printed board are incinerated, explosion may happen. And the incineration of plastic components will generate poisonous gas. Please dispose them as industrial refuse.

XIII. About adaptive motor

1. Standard adaptive motor is quadrupole squirrel-cage asynchronous induction motor. If it is not above-mentioned motor, please select inverter upon rated current of moter. If you need to drive permanent magnet synchronous motor, please consult our company;

2. The cooling fan of non variable frequency motor and rotor spindle are coaxially connected. While despinning, the fan cooling effect also declines at the same time. Hence, for overheated occasion of moter, you shall install strong exhaust fan or change variable frequency motor;

3. Inverters have built-in adaptive motor standard parameters. It is necessary to make motor parameter identification or amend default values to accord with actual values, or it will influence operation effects and protective values;

4. As short circuit existing inside cable or motor will cause inverter alarming, enen explosion. Therefore, please make insulation short-circuit test of initial installed motor and cable first. And the test also is necessary in routine maintenance.

Attention: Before such test, please switch off inverter and all tested parts first.

Chapter 2 Product Brief Introduction

2.1 Attentions of arrival inspection · Storage

Before leaving factory, these products all have been made strict quality testing, as well as collision avoidance, quake proof measure and other packaging treatments. But in transit, carrying or severe impact will cause damages to products. So after unpacking, please take following inspection items at once:

• Inspection before unpacking

Confirm whether damages are caused in transportational process.

• Inspection after unpacking

Check whether damages are caused in transportational process; whether the specifications and models on nameplate are in accord with your requirements, and whether service manual and other accessories are all in readiness. If you find any damanges or discrepancies, please contact with supplier for solvement without delay.

• Storage

Before installation, this product shall be placed inside the packing carton. If the manche will not be used temporarily, for this machine can accord with warranty conditions and future maintenance of our company, so in storage, please pay attention to following items:

1. Placed in a dry environment without dusts and dirts
2. The temperature of storage environment shall be controlled between -20℃ to +65℃.
3. The relative humidity of storage environment shall be controlled within the scope of 0% to 95%, and without moisture condensation.
4. Avoid being storaged in the environment with corrosive gas and liquid.
5. It will be better to package it properly and place it on shelf or table board.

• Transportation

In transportational process, it shall be kept in accord with following conditions:

1.The temperature shall be kept from -25℃ to +70℃.
2.Relative humidity shall be kept from 5% to 95%.
3.Barometric pressure must be maintained from 70kPa to 106kPa.

2.2 Inverter nameplate and specifications:

- Inverter nameplate:

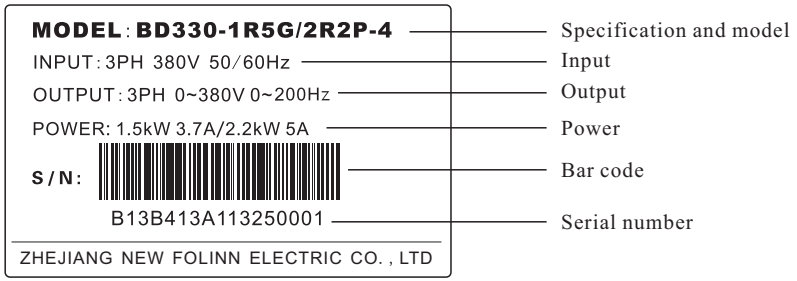
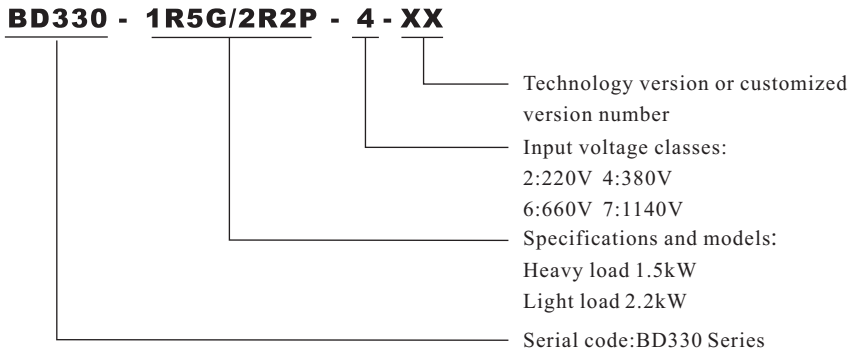


Figure 2-1 Product nameplate

- Specifications and models:



2.3 Specifications and models of inverters

Models	Rated power (kW)	Rated input current (A)	Rated output current (A)	Adaptive motor (KW)
Input 3PH 220V±15% 47Hz~63Hz				
BD330-0R5G-2	0.5	3.8	3.2	0.5
BD330-0R7G-2	0.75	4.9	4.1	0.75
BD330-1R5G-2	1.5	8.4	7.0	1.5
BD330-2R2G-2	2.2	11.5	10.0	2.2
BD330-3R7G-2	3.7	18	15	3.7
BD330-5R5G-2	5.5	24	23	5.5
BD330-7R5G-2	7.5	37	31	7.5
BD330-011G-2	11	52	45	11
BD330-015G-2	15	68	58	15
BD330-018G-2	18.5	84	71	18.5
BD330-022G-2	22	94	85	22
BD330-030G-2	30	120	115	30
BD330-037G-2	37	160	145	37
BD330-045G-2	45	198	180	45
BD330-055G-2	55	237	215	55
BD330-075G-2	75	317	283	75
BD330-093G-2	93	381	346	93

Models	Rated power (kW)	Rated input current (A)	Rated output current (A)	Adaptive motor (kW)
Input 3PH 380V±15% 47Hz~63Hz				
BD330-0R7G/1R5P-4	0.75/1.5	3.4/5.0	2.5/3.7	0.75/1.5
BD330-1R5G/2R2P-4	1.5/2.2	5.0/5.8	3.7/5.0	1.5/2.2
BD330-2R2G/3R7P-4	2.2/3.7	5.8/10.5	5.0/8.5	2.2/3.7
BD330-3R7G/5R5P-4	3.7/5.5	10.5/14.6	8.5/13	3.7/5.5
BD330-5R5G/7R5P-4	5.5/7.5	14.6/20.5	13/18	5.5/7.5
BD330-7R5G/011P-4	7.5/11	20.5/26	18/24	7.5/11
BD330-011G/015P-4	11/15	26/35	24/30	11/15
BD330-015G/018P-4	15/18.5	35/38.5	30/37	15/18.5
BD330-018G/022P-4	18.5/22	38.5/46.5	37/46	18.5/22
BD330-022G/030P-4	22/30	46.5/62	46/58	22/30
BD330-030G/037P-4	30/37	62/76	58/75	30/37

Models	Rated power (kW)	Rated input current (A)	Rated output current (A)	Adaptive motor (kW)
Input 3PH 380V±15% 47Hz～63Hz				
BD330-037G/045P-4	37/45	76/92	75/90	37/45
BD330-045G/055P-4	45/55	92/113	90/110	45/55
BD330-055G/075P-4	55/75	113/157	110/150	55/75
BD330-075G/093P-4	75/93	157/180	150/170	75/93
BD330-093G/110P-4	93/110	180/214	170/210	93/110
BD330-110G/132P-4	110/132	214/256	210/250	110/132
BD330-132G/160P-4	132/160	256/307	250/300	132/160
BD330-160G/187P-4	160/187	307/350	300/340	160/187
BD330-187G/200P-4	187/200	350/385	340/380	187/200
BD330-200G/220P-4	200/220	385/430	380/430	200/220
BD330-220G/250P-4	220/250	430/468	430/465	220/250
BD330-250G/280P-4	250/280	468/525	465/520	250/280
BD330-280G/315P-4	280/315	525/590	520/585	280/315
BD330-315G/350P-4	315/350	590/665	585/650	315/350
BD330-350G/400P-4	350/400	665/785	650/754	350/400
BD330-400G/500P-4	400/500	785/985	754/930	400/500
BD330-500G/630P-4	500/630	965/1210	930/1180	500/630
BD330-630G/710P-4	630/710	1210/1465	1180/1430	630/710

2.4 Public technical indicators of products

	Technical indicators	Description
Input	Input voltage range	One-phase 220V±15%, three-phase 220V±15%, three-phase 380V±15%.
	Input frequency range	47～63Hz
Output	Output voltage	0~rated input voltage
	Output frequency range	0~200Hz
Control performance	Control mode	sensorless vector control(SVC) , V/F Control
	V/F control	Three types: linear, multiple point and square type
	Operation command mode	Keyboard control, Terminal control, Serial communication control
	Frequency Reference Source	Digital,analog,pulse frequency,serial communication,multi-step speed,simple PLC and PID The combinaton of multi-modes and the different modes can be switched.
	Overload capacity	G type: 150% rated current 60s,180% rated current 10s P type: 120% rated current 60s, 150% rated current 10s
	Start torque	0.5Hz/150%(SVC)
	Speed adjusting range	1:100(SVC)
	Speed control accuracy	±0.5%(SVC)
	Carrier frequency	1.0 to 15.0kHz;automatically adjust carrier frequency according to the load characteristics
	Frequency resolution	Digital setting:0.01Hz. Anolog setting:maximum frequency x 0.1%
	Torque boost	Automatic torque boost; manual torque boost 0.1～30%
	Acceleration and deceleration mode	Linear,2 types Acceleration/deceleration times
	DC brake	Supports starting and stopping DC brake;
	Jogging Control	Jog frequency range:0.0Hz to max.frequency; Jog Acc/Dec time:0~3600.0s
	Simple PLC & multi -step speed operation	Built-in PLC or control terminal,16 steps speed can be set
	Built-in PID	Built-in PID control to easily realize the close loop control for the process parameters (such aspressure, temperature, flow, etc.)
	Automatic voltage regulation(AVR)	Automatically maintain a constant output voltage when the voltage of electricity grid changes
	Common DC bus	Common DC bus function: multiple inverters can use a common DC bus
	Traverse control	Traverse control function:multiple triangular pulse frequency control
	Length control	Setting length control
	Timing control	Setting time range:0~65535h
Terminals	Input terminals	6 programmable digital inputs,it can be extended to 3 digital inputs,1 high speed pulse input; 1 analog volatge input 0~10VDC; 1 volatge input 0~10VDC or current input 4~20mA
	Output terminals	1 open collector output ,it can be extened to 1 high speed pulse output ; 2 relay outputs,it can be extended 4 relay outputs; 2 analog output: 1 volatge output 0~10VDC,it can be extended to current output 4~20mA , 1 volatage output 0~10VDC or current output 4~20mA
Human machine interface	LED Display	Can display setting frequency, output frequency, output voltage, output current, etc.
Enviorment & Protection class	Protection class	IP20
	Humidity & temperature	90%RH or less (no-condensation),-10℃～+40℃.Inverter will be derated if ambien temperature exceeds 40℃
	Vibration	Under 20Hz 9.8m/s(1G),Over 20Hz5.88m/s(0.6G)
	Store environment	≤1000M,indoor(no corrosive gas and liquid)
	Store temperature	-20℃～60℃
	Cooling Mode	Forced air-cooling

2.5 All components schematic diagram of inverter

The following picture is all components and names of below 15KW plastic shell inverter

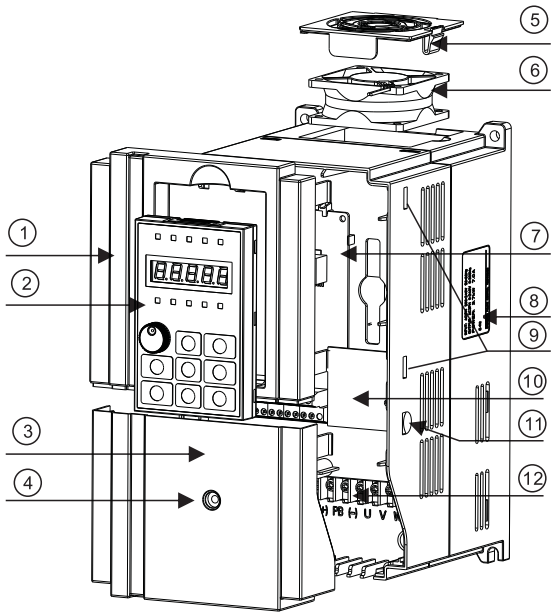


Figure 2-2 Schematic diagram of product structure

No.	Name	Description
①	Pre-cover	Used for install display keyboard and protect components
②	Keyboard	Used for amend and check inverter parameters, operation and other functions
③	Tail-hood	
④	Retaining screw of tail-hood	Used to fix tail-hood, and loosen this screw first while disassembly
⑤	Snap joint of fan	Used to fix fan, convenient to disassembly
⑥	Cooling fan	Internal heat dissipation of inverter
⑦	Control board	CPU board of inverter
⑧	Nameplate	
⑨	Snap joint of pre-cover	Used to fix pre-cover,total four on both left and right
⑩	Expansion board	Built-in multifunctional expansion board
⑪	Snap joint of tail-hood	Used to fix tail-hood,one on both left and right
⑫	Main loop terminal	

Chapter3 Machinery and Electrical Installation

3.1 Installation

1. Installation environment:

1) Environment temperature: Surrounding environment temperature has a great impact on lifetime of inverter, and the operation environment temperature of inverter shall not exceed allowable temperature range (-10℃～ 40℃).

2) While inverter is installed on the surface of inflaming retardants, and enough space around is necessary for heat dissipation. When inverter works, it will produce plenty of heats. And make vertical installation onto supporting holder with screw.

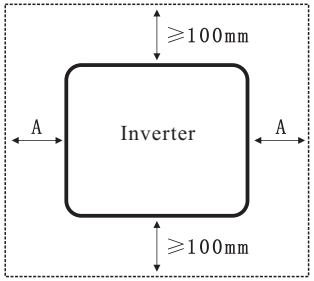
3) Please install it in some places that are not easy to vibrate. And the vibration shall not be larger than 0.6G. Especially pay attention to keep away from punching machine and other equipments.

4) Avoid to be installed where there are direct sunlights, moist surroundings and water drops.

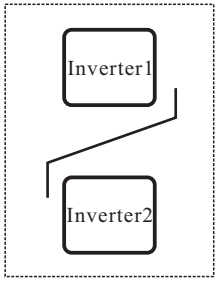
5) Avoid to be installed where there are corrosivity, inflammability and explosive gas.

6) Avoid to be installed where there are oil contamination, dirts and metal dusts.

2.Reminder of installation site:



Explanation: When power of inverter is not more than 22KW, it means taking no account of size A is permissible.When the power is over 22KW, A shall be larger than 50mm.



Explanation: When inverter is installed upside and underside,please install thermal insulation guide plate as picture shows.

Figure 3-1 Installation diagram of inverter

The focus of mechanical installation is the problem of heat dissipation.So please pay attention to following several points:

1) Please install inverter vertically,convenient for heat diffusion upward.But it cannot be inverted.If there are many inverters inside the cabinet,it will be better when they are installed side by side.When they need being installed upside and underside,please refer to the schematic diagram of picture 3-1 to install thermal insulation guide plate.

2) Refer to picture 3-1 for installation space. Guarantee heat dissipation space for inverter But in arrangement,please consider heat dissipation condition of other components inside the cabinet.

3) Installing support must be inflaming retarding materials.

4) For those application occasions with metal dusts, we advise to adopt radiator installation method outside the cabinet.The hermetic cabinet space shall be large enough.

3. 2 Electrical installation

1.Specification list of specification devices of main circuit and electric specification:

Inverter power (kw)	Adaptive motor (kw)	Inverter input side (RST)		Recommend wiring size			
		Air switch model	Cocontactor model	Power line (input line /output line)	DC reactor	Braking circuit	Control signal line (external connection line)
0.55	0.55	DZ20-100(16A)	CJ20-16	1.5	4	1.5	0.5 ~ 0.75
0.75	0.75			2.5		2.5	
1.5	1.5						
2.2	2.2	DZ20-100(32A)	CJ20-40	4	6	4	
3.7	3.7						
0.75	0.75	DZ20-100(16A)	CJ20-16	1.5	4	1.5	
1.5	1.5						
2.2	2.2			2.5		2.5	
3.7	3.7						
5.5	5.5	DZ20-100(32A)		4	6	4	
7.5	7.5						
11	11	DZ20-100(50A)	CJ20-40	6			
15	15			8	8		
18.5	18.5			10		6	
22	22	DZ20-100(63A)	CJ20-63		16		
30	30	DZ20-100(80A)		16			
37	37	DZ20-100(100A)	CJ20-100				
45	45			25	25	8	
55	55	DZ20-200(200A)	CJ20-160	35	25*2(50)		
75	75			50	35*2(70)	10	
93	93	DZ20-400(250A)	CJ20-250	70	50*2(95)	16	
110	110			50*2(95)		25	
132	132	DZ20-400(400A)	CJ20-400		70*2(150)		
160	160						
187	187	DZ20-630(500A)	CJ40-500	70*2(150)		16*2(35)	
200	200						
220	220	DZ20-630(600A)	CJ40-630	95*2(185)	95*2(185)	25*2(50)	
250	250						
280	280	DZ20-630(630A)	CJ40-800	120*2(240)	120*2(240)		
315	315	DZ20-1250(700A)					
400	400	DZ20-1250(1000A)	CJ40-1000	150*2(300)	150*2(300)	35*2(70)	
500	500	DZ20-1250(1250A)		185*2(370)	185*2(370)	50*2(100)	

2.Attentions for ancillary equipment wiring diagram and applications:

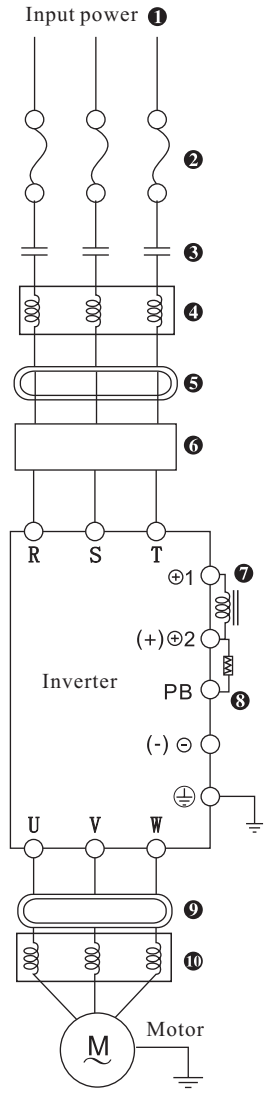


Figure3-2
Peripheral equipment wiring diagram

❶ Input power: voltage classes: 220V, 400V.

❷ Fuse protector or residual-current circuit breaker:
Please select fuse protector that accords with rated voltage and current classes. As power supply ON/OFF control of inverter, it has the function of protecting inverter. Please do not use it as Run/Stop switchover function of inverter.

❸ Electromagnetic contactor:
Please do not use electromagnetic contactor as the power switch of inverter,because it will reduce lifetime of inverter.

❹ AC electric reactor of input terminal:
It can restrain harmonic wave of power line,or when voltage unbalance of main power supply exceeds 3% (and power capacity exceeds 500KVA), and supply voltage changes acutely, it can improve power factor.

❺ Radio interference filter:
Nearby equipments, such as wireless receiver,may generate electromagnetic interference noise.Magnetic resistance rejector helps to decrease radio noise.

❻ EMI rejector :
Decrease the conductive noise on power line generated by inverter.

❼ Direct current reactor
Inverter >22kw reserves direct current reactor terminals, ⊕1,⊕2

❽ Brake unit/energy feedback,brake resistor
When large inertia load needs rapid halt, brake unit and brake resistance shall be installed into inverter.Inverter<30kw shall have built-in brake unit. Connect brake resistance to (+) and PB terminal.Brake unit shall be installed into inverter >22kw additionally,and proceeds braking with appropriate braking resistance.You also can install FOLINN PUF100 energy feedback unit to replace brake unit and brake resistance, and give reborn energy feedback to power grid.

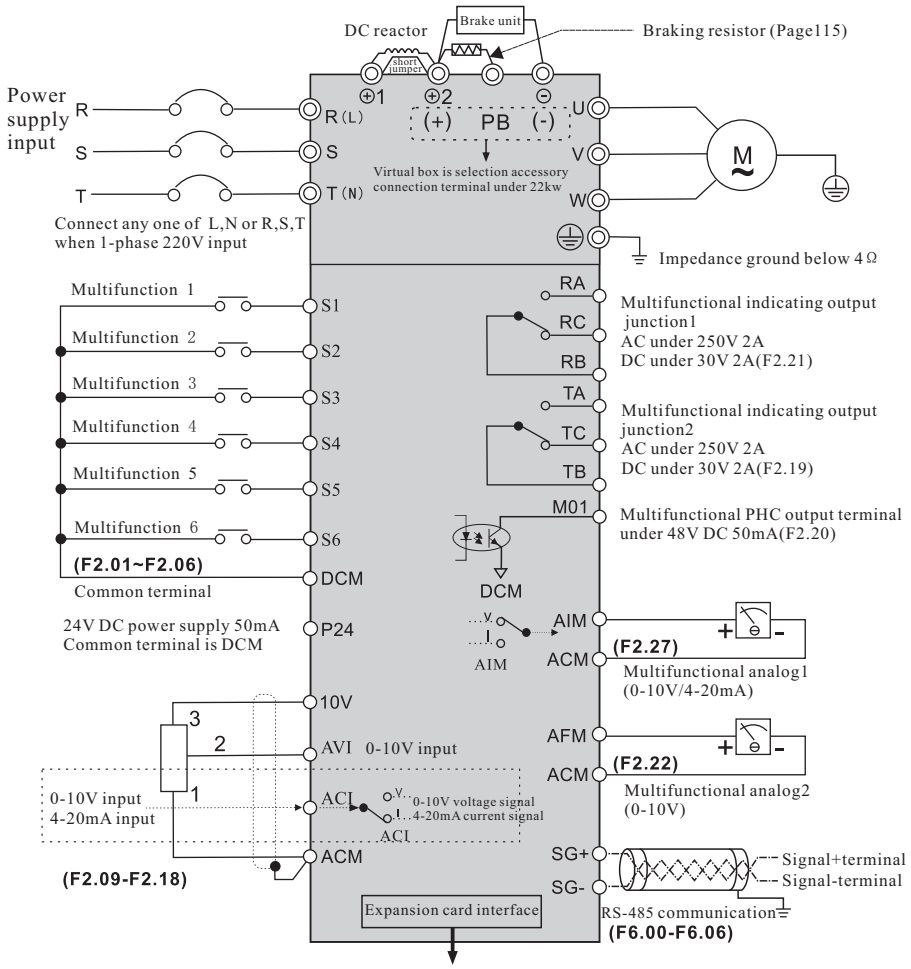
❾ Noise filter of output terminal:
When inverter has interference phenomenon over other electrical equipments,you can install ferrite bead into output cable to solve this problem.Generally three-turns reeling will have a best effect.If condition permission,it will be better to install noise filter.

❿ AC electric reactor of output end:
Smooth electric wave form can help to decrease motor vibration caused by switch waveform of inverter.When the connection line between inverter and motor is more than 10m, it also can restrain harmonic wave.

3.Basic wiring diagram

◎ Main circuit terminal

○ Cotrol circuit terminal



Expansion card:V/I expansion card,I/O expansion card,relay expansion card

Figure 3-3 Basic wiring diagram

Notes: The general type inverters of 22KW and below have built-in brake unit,brake resistance (+) and PB terminal; (+) and (-) terminals are the plus or minus terminals of inverter's DC bus. Reserved direct current reactor connection terminals above 22KW, ⊕1 ⊕2, ⊕2 and ⊖ terminals are used to connect energy feedback unit or brake unit.

When brake unit is used in high-power inverters, you shall connect positive pole of brake unit to output terminal ⊕2 of direct current reactor. If it is connected to ⊕1 terminal, it will damage brake unit.

4. Jumper function declaration of main board:

ACI: Analogue input interface 2 voltage/current signal conversion

V: 0-10VDC voltage signal input

I: 4-20mA analogue current signal input

AIM: Analogue output interface 2 voltage/current signal conversion

V: 0-10VDC voltage signal output

I: 4-20mA analogue current signal output

5.Main circuit terminals and connection

Danger

★ Confirm power switch stays in the state of OFF,and then start wiring operation,or it will give rise to electric shock hazard!
★ Wiring personnel must be those professional trainees,or it will cause equipment damages and
★ personal injuries!
Reliable ground connection is necessary,or it will give rise to electric shock or fire alarm!

Danger

★ Confirm the input power is in accordance with the rated value of inverter,or it will cause damages to inverter!
★ Confirm motor is adaptive with inverter,or it will cause damages to motor or cause inverter protection!
★ Power supply shall not be connected to the terminals of U, V and W, or it will cause damages to inverter!
★ Brake resistance shall not be connected directly to DC bus, ⊕ and ⊖ terminals, or it will cause damages to inverter!

1) Main circuit terminal description:

Main circuit wiring terminal ≤22kw

Terminal identification	Name	Function description
R、S、T(L、N)	Main circuit power input terminal	Connect three-phase (one-phase) power supply
U、V、W	Output terminal of inverter	Connect three phase motor
(+) 、PB	Braking terminal	Connect external brake resistance
(+)、(-)	DC bus terminal	2 sets or more inverters use a common DC bus
⏚	Grounding terminal	Safty grounding

Main circuit wiring terminal >22kw

Terminal identification	Name	Function description
R、S、T(L、N)	Main circuit power input terminal	Connect three-phase (one-phase) power supply
U、V、W	Output terminal of inverter	Connect three phase motor
⊕2 ⊖	DC bus terminal	Use for connect brake unit,energy feedback, 2 sets or more inverters use a common DC bus
⊕1 ⊕2	External reactor terminal	Connect external DC reactor
⏚	Grounding terminal	Inverter safety grounding

2) Attentions of wiring:

A. Input power L, N or R, S and T:

The connection of inverter input side has no phase sequence requirements.

B. DC bus ⊕ , ⊖ terminals:

At the moment of power failure, DC bus ⊕ , ⊖ terminals still have residual voltage, you just can touch it after internal "charge" power light is off confirming the voltage is less than 36V, it may cause electric shock.

When you select external brake unit for the inverter ＞22KW, the polarity of ⊕2 and ⊖ cannot be connected inversely, or it will cause damages to inverter, or even fire hazard.

The wiring length of brake unit shall not be more than 10m, and only twisted pair or tight double-line is available in parallel.

Brake resistance cannot be connected onto DC bus directly, or it may cause damages to inverter, or even fire hazard.

C. Brake resistance connection terminal (+) and PB:

Inverter ＜30KW and built-in brake unit.

The recommended value of brake resistance model selection reference and wiring distance shall be less than 5m, or it may cause damages to inverter.

D. Inverter output side U, V and W:

Inverter output side shall not be connected to capacitor or surge absorber, or it will frequent protection of inverter, or even damages.

When the cable of motor is overlong, the effects of distributed capacitance will generate electric resonance easily, and give rise to dielectric breakdown of motor. The generated large leakage current makes inverter suffer overcurrent protection. If cable length is more than 100m, alternating current output reactor shall be installed.

E. Grounding terminal ⏚:

Terminals must have been reliable ground connection, and resistance value of ground wire shall be less than 4Ω, or it will cause abnormal work of equipment, and even damages.

Grounding terminal ⏚ and null line N terminal of power supply cannot be shared.

6. Control circuit terminal and wiring

1) Schematic diagram of control circuit wiring terminal (Figure 3-4)

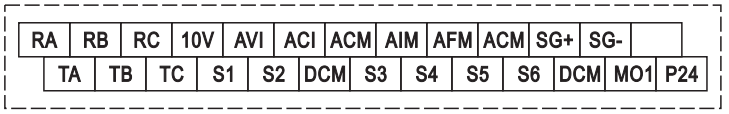


Figure 3-4: Schematic diagram of main control board wiring terminal

2) Control circuit terminal description:

Terminal identification	Terminal function description	
S1-DCM	Multifunctional input terminal 1	Function setting: F2. 01～F2. 06
S2-DCM	Multifunctional input terminal 2	
S3-DCM	Multifunctional input terminal 3	
S4-DCM	Multifunctional input terminal 4	
S5-DCM	Multifunctional input terminal 5	
S6-DCM	Multifunctional input terminal 6	
10V-ACM	Input auxiliary power supply 10VDC 20mA	
P24-DCM	Auxiliary power supply 24VDC 50mA	
AVI-ACM	Analog voltage input port 1: 0-10VDC	Function setting: F2. 09～F2. 18
ACI-ACM	Analog current input port 2: output 0-10VDC or 4-20mA	
AFM-ACM	Analogue output port 1: output 0-10VDC	Function setting: F2. 22～F2. 31
AIM-ACM	Analog out put port2: output 0-10VDC or 4-20mA	
SG+ SG-	Rs485 communication port	F6. 00～F6. 06
RA-RB-RC	Multifunctional connection point output, factory default is failure output	Function setting: F2. 19～F2. 21
TA-TB-TC	Multifunctional connection point output, factory default is output when running	
MO1-DCM	Multifunctional collector output port of open circuit	

3) Control circuit terminal wiring explanation:

A. Analog input terminal:

As the weak analogue voltage signal will suffer external disturbance easily, generally shield cable is required, and the wiring distance shall be kept as short as possible, and no more than 20m will be better, as follows:

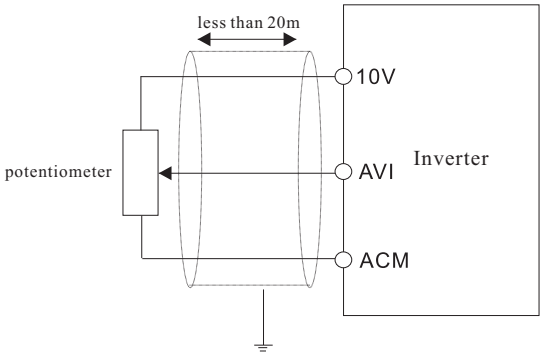


Figure 3-5 Schematic diagram of analog input terminal wiring

At some occasion where analog signal suffers severe interference, filter conden -ser or ferrite core shall be installed at the side of analog signal source, as Figure 3-6shows:

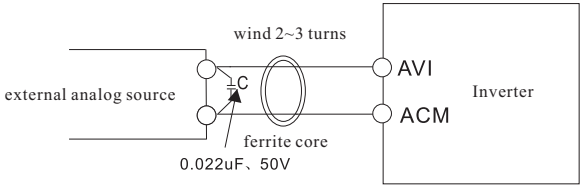


Figure 3-6 Analog input terminal with filter devices

B. Digital input terminal:

Inverter receives figure signal upon its judging of these terminals' states. So the external contactors shall be those connection points with high reliability over weak signals. If the applied open collector output to digital input terminal of inver -ter provides 0N/0FF signal, you shall consider the false operation caused from the power crosstalk. We advise to adopt contactor control mode.

C. Digital output terminal:

When driving relay is required for digital output terminals, absorber diode shall be installed at both sides of relay coil, or it will cause damages to DC 24V power supply.

Attention: The polarity of absorber diode must be installed correctly, as follow -ing picture shows. Or when digital output terminals are outputted, it will cause DC 24Vpower supply damaged.

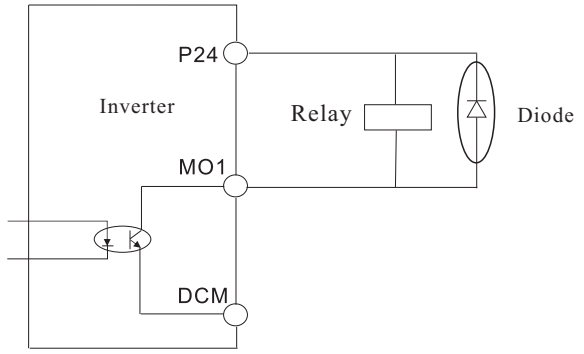


Figure 3-7 Wiring diagram of digital output terminal

7. Treatment of EMC problem:

Ⅰ. Effects of harmonic wave

1) Higher harmonic wave of power supply will cause damages to inverter. So in some places with bad power grid quality, we advise to install AC input reactor.

2) As higher harmonic wave exists at the output side of inverter, the application of capacitor to improve power factor and surge suppressor at output side may lead to elec -tric shock, or even damages to equipment, so capacitor or surge suppression device cannot be installed at output side.

Ⅱ. Electromagnetic interference and treatment

1) Electromagnetic interference has two categories: One is peripheral electromagnetic noise's interference on inverter, which will give rise to false operations of inverter itself. But the effects of such interference usually are small, because inverter has been process ed internally in design about this interference, and it has a strong anti-interference capability. The other one is inverter's effects on peripheral equipments.

Common handling methods:

A. inverter and other electrical products should ground well, and the ground resistance shall not more than 5Ω.

B. It will be better if power line of inverter won't be placed in parallel with circuit of control line. If condition permission, please arrange power lines vertically.

C. At those occasions with a high anti-interference requirement, shield cable shall be used between inverter and power line of motor, and reliable ground connection also is necessary for shielding layer.

D. For the leading wire of interrupted equipment, we advise to adopt twisted pair shielding control line, and reliable ground connection also is necessary for shielding layer.

2) Handling methods of interference from peripheral electromagnetic equipment on inverter.Electromagnetic effects on inverter generally result from the installation of many relays, contactors or electromagnetic contactors near inverter. When inverter has false operation from the interference, please try to solve it with following methods:

A. Install surge suppressor on the devices that make interference.

B. Install filter at signal input terminal of inverter.

C. The leading wire of inverter's control signal line and detection circuit shall be shield cable, and reliable ground connection also is necessary for shielding layer.

3) The handling methods of interference on peripheral equipments from the noises of inverter:

This part of noise can be divided into two categories: One is the radiation of inverter itself, and the other one is the radiation of the leading wire from inverterto motor. These two kinds of radiations make the leading wires surface of peripheral electrical equipments suffer electromagnetic and electrostatic induction, which will lead to false operations of equipments. About these several different disturbed conditions, please refer to following methods to resolve them:

A. Instrument, receiver, sensor and other equipment for measurement, generally have a weaker signal. If they are placed near inverter or in a same control cabinet, they will suffer interference and operate falsely. So we advise to take following methods: Keep away from interference source; Signal line shall not be placed with power line in parallel, especially shall not be tied up together in parallel, and please adopt shield cable signal line and power line; Install linear filter or radio noise filter at the input and output sides of inverter.

B. When interrupted equipments and inverter share a same power supply, if above me -thods still cannot help to eliminate interference, you shall install linear filter or radio noise filter between inverter and power supply.

C. Separated ground connection for peripheral equipments can help to eliminate the interference from ground wires' leakage current of inverter while common-grounding.

Ⅲ. Leakage current and treatment

Leakage current has two categories when inverter is in service: One is leakage current over the ground: and the other is leakage current between lines.

1) The factors of influencing leakage current over the ground and solutions:

Distributed capacitances exist between wire and ground. The larger distributed capaci -tances are, the larger the leakage current will be: Effectively decreasing the distance between inverter and motor can reduce distributed capacitances. The larger carrier frequen -cy is, the larger the leakage current will be. Reducing carrier frequency can decrease leakage current effectively. But reducing carrier frequency will result in the increase of motor noise, so please note this. Installing electric reactor also is an effective method to solve leakage current.

Leakage current will increase with enlargement of loop current, so when the power of motor is large, the relevant leakage current also will be large.

2) The factors of influencing electric current between lines and solutions:

Distributed capacitances exit between output wires of inverter. If the electric current passing the circuit contains higher harmonic, it may give rise to resonance and leakage current. If you use thermal relay, it may cause false operation at this time.

The solution is to decrease carrier frequency or install output reactor. We advise not to install thermal relay before you use the motor of inverter, but apply the electronic overcurrent protection function of inverter.

Chapter 4 Operation and Display

4.1 Keyboard description

● Keyboard explanation and function

Keyboard locates above inverter, and can be divided into two parts: display area and control area. Display area shows parameter setting mode and different run state. Control area is communication interface for users and inverter.

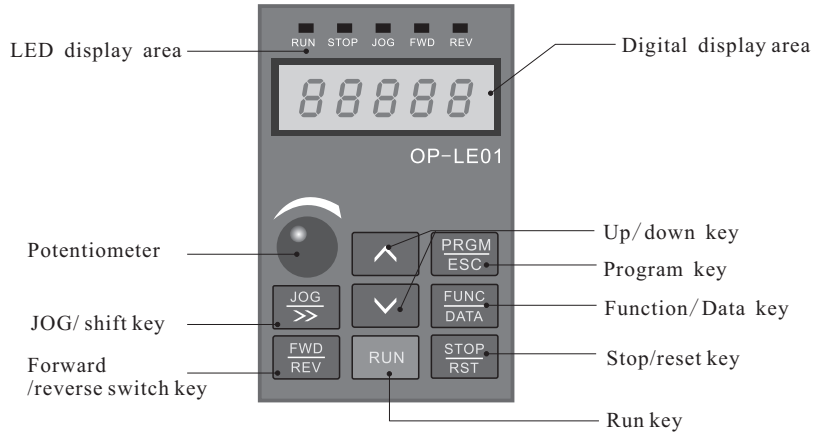


Figure 4-1 Schematic diagram of operation panel

PRGM/ESC	PRGM/ESC Program key:Enter first level menu or exit parameter group
FUNC/DATA	FUNCTION/DATA In the mode of normal operation, press this key to display all items of status and information of inverter, such as frequency command, output frequency and output current; In the mode of program, press this key to display parameters, and press again to write modified data into the internal storage.
FWD/REV	FORWARD/REVERSE Press the key of forward/reverse turning to slow down the motor to 0Hz, and acceleration in negative direction to the setting frequency command.
JOG/»	JOG/» Press this key to execute jog frequency command; In the mode of parameter operation, work as the left shift key.

RUN	RUN Used to start AC drive operation.(This key has no effect when the drive is set to terminal run.)
STOP/RST	STOP/RST Used to stop the AC drive operation.If the AC drive has stopped due to a fault, press this key to reset the drive.
∧ ∨	UP/DOWN Used to select parameter item and modify parameter

● Digital display item and description

1.operating state (display item selection refer to parameter F3.05)

display code	item description	operation
H	setting frequency	Press FUNC DATA key
P	operation frequency	Press FUNC DATA key
C	output current	Press FUNC DATA key
d	output voltage	Press FUNC DATA key
n	operation speed	Press FUNC DATA key
t	actual delay value	Press FUNC DATA key
r	delay setting value	Press FUNC DATA key
U	bus voltage	Press FUNC DATA key
A	PID setting value	Press FUNC DATA key
b	PID feedback value	Press FUNC DATA key
I	input terminal state	Press FUNC DATA key
o	output terminal state	Press FUNC DATA key
u	analog AVI value	Press FUNC DATA key
c	analog ACI value	Press FUNC DATA key
8	current speed of multi-spped	Press FUNC DATA key

2. In halted state（Refer to more details of display items selection in F3. 06）:

Display code	Display items explanation	Operating instructions
H	Setting frequency	Press FUNC DATA key
U	bus voltage	Press FUNC DATA key
I	Input terminal state	Press FUNC DATA key
o	Output terminal state	Press FUNC DATA key
A	PID setting value	Press FUNC DATA key
b	PID feedback value	Press FUNC DATA key
u	Analog AVI value	Press FUNC DATA key
c	Analog ACI value	Press FUNC DATA key
8	Current speed of multi-speed	Press FUNC DATA key

4. 2 Function code examining and modifying methods explanation:

The operation panel for BD330 series of inverters adopts three-level menu struc-ture for parameter setting and other operations. The three-level menus respectively are: functional parameter group（first-level menu）→function code（second-level menu）→ function code setting value（third-level menu）. Operational process is shown in Figure 4-2:

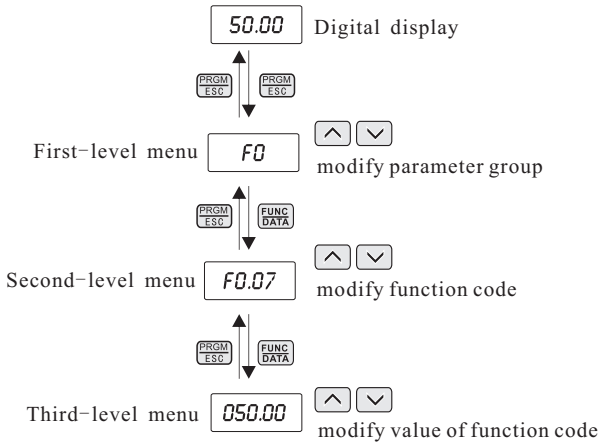
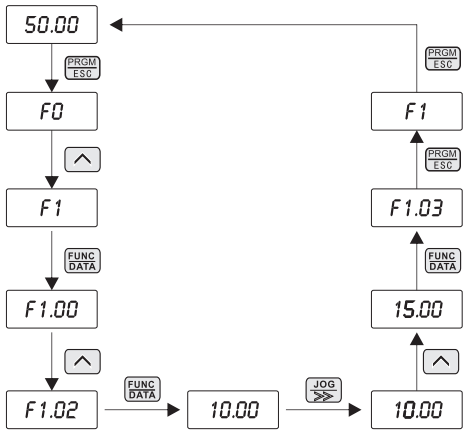


Figure 4-2 Operation flow chart of three-level menu

Explanation: In third-level menu operation, press PRGM or DATA to return to second-level menu. The difference between them: Press DATA to store the setting parameters into control panel, return to second-level menu, and automatically shift to next function code; Press PRGM to return to second-level menu directly without saving parameters,and then return to function code.

For example:Change the function code F1. 02 from 10. 00Hz to 15. 00Hz.
(Bold means flash bit):



Picture 4-3 Example for parameter changing

In third-menu state, if parameter has no flash bit, it means this code cannot be changed, and the reason may be:

1) This parameter of function code cannot be changed, such as actually detected parameter,and running record parameter.

2) In running status, this function code cannot be changed. And it can be changed only when inverter is stoped.

4. 3 How to view status parameters:

In stop or running status, LED nixie tube can be used to display the multiple state parameters of inverter. The function code F3. 05 (operating parameter) and F3. 06 (halting parameter) can be used to select whether this state parameter shall be displayed. Please refer to the function code F3. 05 and F3. 06 for more explanations. DATA is available for circular switchover to display the state parameter of halting state or running state.

In stop status, total 9 stop status parameters are available for selection to be display-ed or not, and respectively are: setting frequency, bus voltage, input terminal status, output terminal status, PID setting, PID feedback, analog AVI value, analog ACI value, multi-speed segments. Positionally select whether display function F3. 06, and switch to display the selected parameters upon the sequence of FUNC/DATA.

In running status, total 15 status parameters are available for selection to be displayed or not, and respectively are: setting frequency, running frequency, output current, output voltage, running speed, practical delayed value, delayed setting value, bus voltage, PID setting value, PID feedback value, input terminal status, output terminal status, analog AVI value, analog ACI value, current step of multi-speed. Positionally select whether display function F3. 05, and switch to display the selected parameters upon the sequence of FUNC/DATA.

Inverter is power off, and then power on again, the displayed parameters are defaulted as the selected parameter before power off.

4. 4 Password setting:

BD330 series of inverters provide user password defensive function. When F3. 00 is set at nonzero state, it is user password. While quiting function code editing state, password protection will take effect. Press PRGM/ESC again to enter into function code editing state, it will display "0. 0. 0. 0. 0. ". Manipulator must enter password correctly, or he cannot get access.

If you would like to cancel password protection function, set F3. 00 at 0.

4. 5 Self-learning of motor parameters (while selecting vector control function):

When you select vector control mode without PG, before inverter is running, you must input nameplate parameters of motors correctly. BD330 series of inverters will match standard motor parameters upon the nameplate parameters. Vector control mode has a strong dependency on motor parameters. To obtain a good control performance, you shall get the exact parameters of controlled motors.

The operating steps of motor parameters self-learning as below:

First select operation instruction channel (F0. 01) as keyboard instruction channel.

Then input following parameters upon motor's actual parameters:

F1. 01: Motor rated power;

F1. 02: Motor rated frequency;

F1. 03: Motor rated speed;

F1. 04: Motor rated voltage;

F1. 05: Motor rated current.

If motors can be separated with loads totally, please select 1 in Fl. ll (dynamic self-learning), and then press "RUN"on control panel, inverter will calculate parameter automatically:

F1. 06: Motor stator resistance;

F1. 07: Motor rotor resistance;

F1. 08: Motor stator and rotor leakage inductance;

F1. 09: Motor stator and rotor mutual inductance;

F1. 10: Motor no-load current;

If motors cannot be separated with loads totally, please select 2 in Fl. ll (static self-learning), and then press "RUN" on control panel.

Inverter will measure stator resistance, rotor resistance and leakage inductance in sequence, these three parameters, excluding mutual inductance and no-load current of motors. Users can calculate these two parameters by themselves upon motor nameplate, and the used motor nameplate parameters in the calculation include rated voltage U, rated current I, rated frequency f and power factor η.

The computing methods of motor no-load current and motor mutual inductance are described as below, thereinto, L_δ is motor leakage inductive reactance.

No-load current: $I_0 = I \cdot \sqrt{1-\eta^2}$

Mutual inductance calculation: $L_m = \frac{U}{2\sqrt{3}\pi f \cdot I_0} - L_\delta$

Where I_0 is no-load current, L_m is mutual inductance, and L_δ is leakage inductance.

Chapter 5 Function & Parameter Table

The functional parameters of BD330 series of inverters are grouping by function, total 8 groups from F0 to F7. Each functional group includes several function codes. Function codes adopt three-level menu, for example, "F4. 08" means 8th function code of the functions in group F4.

For convenience of setting function codes, while operating with operation panel, functio-nal group number accords with first-level menu, function code number accords with second-level menu, and function cade parameters accord with third-level menu.

1. Contents note of function table is described as below:

First column "function code": Functional parameter set and parametric number;

Second column "name": Full name of functional parameters;

Third column "setting range": Valid set value range of functional parameters;

Fourth column "factory default": Original factory default of functional parameters;

Fifth column "modify": Alteration property of functional parameters (whether or not it is permitted to modify and modification conditions) and the explanations are described as below:

"※": it means the setting value of this parameter can be modified when inverter is in stop or running state;

"●": it means the setting value of this parameter cannot be modified when inverter is in running state;

"**": it means the numerical value of this parameter is practical detection record value, and cannot be modified;

"##": it means the numerical value of this parameter is "factory parameter", and is limited to be set by manufacturers. Users are prohibited about such operation.

Sixth column "No.": Serial number of this function code in the whole function codes, as well as the store address in communication.

(Inverters have already made automatic inspection constraint about the modification property of all parameters, which can help users to avoid faults in modification.)

2. "Factory default" refers to the numerical value after function code parameters are renovated when you take factory reset operation; but the actually detective parameter values or recorded values won't be renovated.

3. To make more effective parameter protection, inverters provide password protection for function codes. After users set password (the parameter of user password, F3. 00 is not 0 any more), and press PRGM/ESC to enter into user parameter editing state, the system will enter into user password authorization state, and display "0. 0. 0. 0. 0.". The manipulator must input user password correctly, or he cannot get access to it. In the unlocked state of password protection, user assword can be altered at any time, and user password will be confirmed as the last input numerical value. When F3. 00 is set at 0, user password can be canceled; while power on, F3. 00 is not at 0, then parameters are protected by password.

4. While function code parameters are altered with serial communications, any functions of user password still keep to above regulations.

Function & Parameter Table

function code	Name	Description(setting range)	factory setting	Change	No.
F0 group basic function group					
F0.00	Speed control mode	0:vector control without PG 1:V/F control	1	●	0.
F0.01	Run command source	0:keyboard control 1:terminal control 2:RS 485 communication control	0	●	1.
F0.02	keyboard and UP/DOWN setting	0: Valid, save UP/DOWN value when power off 1: Valid, do not save UP/DOWN value when power off 2:standby frequency function 3: initial frequency function when power on 4: invalid	0	※	2.
F0.03	frequency command selection	0:keyboard setting 1:AVI 2:ACI 3:AVI+ACI 4:Multi-step speed 5:PID 6:RS485 Communication 7.Panel potentiometer	0	※	3.
F0.04	Maximum output frequency	0.00~200.00Hz	50.00Hz	●	4.
F0.05	Upper run frequency limit	F0.06~F0.04(max.frequency)	50.00Hz	※	5.
F0.06	Lower run frequency limit	0.5Hz~F0.05(upper run frequency limit)	0.50Hz	※	6.
F0.07	Keyboard reference frequency	0.5Hz~F0.04(max.frequency)	50.00Hz	※	7.
F0.08	Acceleration time 1	0.1~3600.0s	10.0s	※	8.
F0.09	Deceleration time 1	0.1~3600.0s	10.0s	※	9.
F0.10	Running direction selection	0:default direction 1:reverse 2:forbid reverse 3:panel forward/reverse key switch no 1s delay	0	●	10.
F0.11	Carrier frequency	1. 0～15. 0kHz	Depend on model	●	11.

function code	Name	Description(setting range)	factory setting	Change	No.
F0.12	function parameter restore	0: no operate 1:restore factory default 2:clear fault history	0	●	12.
F0.13	AVR function selection	0: invalid 1:valid 2:valid when deceleration 3:constant torque	1	※	13.
F0.14	start run mode	0:start directly 1:DC brake and start 2:speed tracking and start(>7.5kw)	0	●	14.
F0.15	starting frequency	0.50~10.00Hz	0.50Hz	※	15.
F0.16	hold time of starting frequency	0.0~50.0s	0.1s	※	16.
F0.17	braking voltage before start	0.0~100.0	0.0	※	17.
F0.18	braking time before start	0.0~50.0s	0.0s	※	18.
F0.19	stop mode	0: deceleration to stop 1:stop freely	0	※	19.
F0.20	starting frequency of braking	0.00~F0.04 (max.frequency)	0.00Hz	※	20.
F0.21	waiting time before braking	0.0~50.0s	0.0s	※	21.
F0.22	DC braking voltage when stop	0.0~100.0	0.0	※	22.
F0.23	DC braking time when stop	0.0~50.0s	0.0s	※	23.
F0.24	Dead time of FWD/REV	0.0~3600.0s	0.0s	※	24.
F0.25	terminal run protect selection when power on	0:run command is invalid when power on 1:run command is valid when power on	0	※	25.
F0.26	auxiliary frequency source selection	same with F0.03 parameter	0	※	26.
F1 Group motor parameter group					
F1.00	motor model selection	0:G model 1:P model	0	●	27.
F1.01	motor rated power	0.4~900.0kw	model setting	●	28.
F1.02	motor rated frequency	0.01Hz~F0.04(max.frequency)	50.00Hz	●	29.

function code	Name	Description(setting range)	factory setting	Change	No.
F1.03	motor rated speed	0~36000rpm	model setting	●	30.
F1.04	motor rated voltage	0~460V	model setting	●	31.
F1.05	motor rated current	0.1~1000.0A	model setting	●	32.
F1.06	motor stator resistance	0.001~65.535Ω	model setting	※	33.
F1.07	motor rotor resistance	0.001~65.535Ω	model setting	※	34.
F1.08	motor leakage inductance	0.1~6553.5mH	model setting	※	35.
F1.09	motor mutual inductance	0.1~6553.5mH	model setting	※	36.
F1.10	no-load current	0.01~655.35A	model setting	※	37.
F1.11	motor paratemeter self-learning	0:no operate 1:dynamic self-learning 2:static self-learning	0	●	38.
F1.12	ASR proportional gain Kp1	0~100	30	※	39.
F1.13	ASR integral time Ki1	0.01~10.00s	1.5s	※	40.
F1.14	ASR switching point 1	0.00Hz~F1.17	5.00Hz	※	41.
F1.15	ASR proportional gain Kp2	0~100	10	※	42.
F1.16	ASR integral time Ki2	0.01~10.00s	1.00s	※	43.
F1.17	ASR switching point 2	F1.14~F0.04 (max.frequency)	10.00Hz	※	44.
F1.18	slip compensation rate of VC	50%~200%	100%	※	45.
F1.19	torque upper limit	0.0~200.0%(inverter rated current)	150.0%	※	46.
F1.20	V/F curve selection	0:linear V/F curve 1:square torque V/F curve 2:user-defined curve	0	●	47.
F1.21	torque boost	0.0%:(auto) 0.1%~30. 0%	2.0%	※	48.
F1.22	torque boost cut-off	0.0~80.0% (motor rated frequency)	60.0%	●	49.
F1.23	V/F slip compensation limit	0.0~200.0%	0	※	50.
F1.24	auto energy saving selection	0: disabled 1: enabled	0	●	51.
F1.25	middle frequency point 1	0~F1.27	1. 30Hz	●	52.
F1.26	middle frequency point 1 corresponding voltage	0~F1.28	18V	●	53.
F1.27	middle frequency point 2	0~200.00Hz	2. 50Hz	●	54.
F1.28	middle frequency point 2 corresponding voltage	0~F1.04	30V	●	55.

function code	Name	Description(setting range)	factory setting	Change	No.
F2 group input/output group					
F2.00	number of switching vaule filter	1~10	5	※	56.
F2.01	S1 terminal function	0:invalid 1:forward 2:reverse 3:3-wire control 4:jog forward 5:jog reverse 6:coast to stop 7:fault/timing/reset 8:external fault input 9:UP command 10:DOWN command 11:clear UP/DOWN 12:multi-step speed reference1 13:multi-step speed reference2 14:multi-step speed reference3 15:ACC/DEC time selection 16:pause PID 17:pause traverse operation (traverse operation with current frequency) 18:reset traverse operation (back to center frequency) 19:forbid the function of ACC/DEC 20:external sleep signal 21:external ACC terminal 22:external DEC terminal 23:delay value increase terminal 24:delay value decrease terminal 25:program run reset 26:program run invalid 27:terminal count 28:jog function 29:retain 30:energy saving running 31:retain	1	●	57.
F2.02	S2 terminal function		2	●	58.
F2.03	S3 terminal function		0	●	59.
F2.04	S4 terminal function		0	●	60.
F2.05	S5 terminal function		0	●	61.
F2.06	S6 terminal function		0	●	62.

function code	Name	Description(setting range)	factory setting	Change	No.
		32:multi-step speed 4 33:auxiliary frequency source selection 34:local/remote control 35:force of run command enabled by terminal 36:force of run command enabled by communication			

function code	Name	Description(setting range)	factory setting	Change	No.
F2.07	terminal control running mode	0:2-wire control mode 1 1:2-wire control mode 2 2:3-wire control mode 1 3:3-wire control mode 2	0	●	63.
F2.08	UP/DOWN setting change rate	0.01~50.00Hz/s	0.50Hz/s	※	64.
F2.09	VI lower limit	0.00V~10.00V	0.00V	※	65.
F2.10	VI lower limit corresponding setting	-100.0%~100.0%	0.0%	※	66.
F2.11	VI upper limit	0.00V~10.00V	10.00V	※	67.
F2.12	VI upper limit corresponding setting	-100.0%~100.0%	100.0%	※	68.
F2.13	VI input filter time	0.00s~10.00s	0.10s	※	69.
F2.14	CI lower limit	0.00V~10.00V	2.00V	※	70.
F2.15	CI lower limit corresponding setting	-100.0%~100.0%	0.0%	※	71.
F2.16	CI upper limit	0.00V~10.00V	10.00V	※	72.
F2.17	CI upper limit corresponding setting	-100.0%~100.0%	100.0%	※	73.
F2.18	CI input filter time	0.00s~10.00s	0.10s	※	74.
F2.19	multi-functional realy junction output TA*TB*TC	0:no output 1:frequency reached 2:FDT reached 3:fault open output 4:run forward 5:run reverse 6:zero speed running 7:upper frequency limit reached 8:lower frequency limit reached 9~12:retain 13:high-pressure reached checkout(NO) 14:low-pressure reached checkout(NO) 15:sleep state indication 16:water shortage alarm indication 17:non-zero speed running 18:running	18	※	75.
F2.20	MO1(collector open circuit) output selection		2	※	76.
F2.21	multi-functional realy junction output RA*RB*RC		3	※	77.

function code	Name	Description(setting range)	factory setting	Change	No.
		19:lack of torque output 20:over torque output 21:program run one cycle to signal output 22:fault close output 23:pump 1 output signal 24:pump 2 output signal 28:brand brake signal output			

function code	Name	Description(setting range)	factory setting	Change	No.
F2.22	AFM multi-functional analog output terminal function selection	0:frequency setting 1:run frequency 2:output current 3.output voltage 4:run speed 5:PID setting 6:PID feedback 7:AVI input 8:ACI input 9~10:retain	1	※	78.
F2.23	lower limit of AFM analog output	0.0%~100.0%	0.0%	※	79.
F2.24	lower limit of AFM corresponding analog	0.00V~10.00V	0.00V	※	80.
F2.25	upper limit of AFM analog output	0.0%~100.0%	100.0%	※	81.
F2.26	lower limit of AFM corresponding analog	0.00V~10.00V	10.00V	※	82.
F2.27	AIM multi-function analog output terminal function selection	same with F2.22	2	※	83.
F2.28	lower limit of AIM analog output	0.0%~100.0%	0.0%	※	84.
F2.29	lower limit of AIM corresponding analog	0.00V~10.00V	0.00V	※	85.
F2.30	upper limit of AIM analog output	0.0%~100.0%	100.0%	※	86.
F2.31	upper limit of AIM corresponding analog	0.00V~10.00V	10.00V	※	87.
F3 group human-computer interface					
F3.00	user password	0~65535	0	※	88.
F3.01	retain				89.
F3.02	retain				90.

function code	Name	Description(setting range)	factory setting	Change	No.
F3.03	STOP key function selection	0: valid when keypad control 1: valid when keypad or terminal control 2: valid when keypad or communication control 3: always valid	0	※	91.
F3.04	retain		0	※	92.

function code	Name	Description(setting range)		factory setting	Change	No.
F3.05	running status display selection (display code)	display details	code	1183	※	93.
		0:frequency setting	1			
		1:run frequency	2			
		2:output current	4			
		3:output voltage	8			
		4:running speed	16			
		5:actual delay value	32			
		6:delay setting value	64			
		7:bus voltage	128			
		8:PID setting	256			
		9:PID feedback	512			
		10:input terminal state	1024			
		11:output terminal state	2048			
		12:analog AVI value	4096			
		13:analog ACI value	8192			
		14:current step of multi-step speed	16384			
note:setting value=sum of code,for example it need display output current,run speed,bus voltage,so setting value=4+16+128=148,it can check parameter after saved.						
F3.06	stop state parameter display selection	frequency setting	1	15	※	94.
		bus voltage	2			
		input terminal state	4			
		output terminal state	8			
		PID setting	16			
		PID feedback	32			
		analog AVI value	64			
		analog ACI value	128			
		current step of multi-step speed	256			
		actual delay value	512			
		delay setting value	1024			
F3.07	priority selection of run state display	0~14(0:priority selection invalid)		1	※	95.

function code	Name	Description(setting range)	factory setting	Change	No.
F3.08	contravariant module temperature	0~100.0℃		**	96.
F3.09	software version			**	97.
F3.10	accumulated running time	0~65535h	0	**	98.
F3.11	second latest fault type	0:no fault 1:contravariant unit U phase protection (E009) 2:contravariant unit V phase protection (E019) 3:contravariant unit W phase protection(E029) 4:ACC over-current(E004) 5:DEC over-current(E005) 6:constant speed over-current(E006) 7:ACC over-voltage(E002) 8:DEC over-voltage(E00A) 9:constant over-voltage(E003) 10:bus undervoltage fault(E001) 11:motor overload(E007) 12:inverter overload(E008) 13:input side default phase(E012) 14:output side default phase(E013) 15:rectifier module is overheating (E00E) 16:contravariant module is overheating(E01E) 17:external fault(E00d) 18:communication fault(E018) 19:current test fault(E015) 20:motor self-learning fault(E016) 21:EEPROM operate fault(E00F) 22:PID feedback lost fault(E02E) 23:brake unit fault(E01A) 25:over-torque protection(E022) 26:underload protection(E027)		**	99.
F3.12	latest fault type			**	100.
F3.13	current fault type			**	101.

function code	Name	Description(setting range)	factory setting	Change	No.
F3.14	run frequency at current fault		0.00Hz	**	102.
F3.15	output current at current fault		0.0A	**	103.
F3.16	DC bus voltage at current fault		0.0V	**	104.
F3.17	delay value or count value	0～65000	0	※	105.
F3.18	delay unit or count number setting	0~15(0:delay and count function is invalid)	0	※	106.
F4 gruop application function group					
F4.00	acceleration time 2	0.1~3600.0s	10.0s	※	107.
F4.01	deceleration time 2	0.1~3600.0s	10.0s	※	108.
F4.02	jog running frequency	0.00~F0.04 (max.frequency)	5.00Hz	※	109.
F4.03	jog acceletation time	0.1~3600.0s	10.0s	※	110.
F4.04	jog deceletation time	0.1~3600.0s	10.0s	※	111.
F4.05	skip frequency	0.00~F0.04 (max.frequency)	0.00Hz	※	112.
F4.06	skip frequency range	0.00~F0.04 (max.frequency)	0.00Hz	※	113.
F4.07	traverse amplitude	0.0~100.0%(setting frequency)	0.0%	※	114.
F4.08	jitter frequency	0.0~50.0%(traverse amplitude)	0.0%	※	115.
F4.09	rise time of traverse	0.1~3600.0s	5.0s	※	116.
F4.10	fall time of traverse	0.1~3600.0s	5.0s	※	117.
F4.11	auto reset times	0~3	0	※	118.
F4.12	reset interval	0.1~100.0s	1.0s	※	119.
F4.13	FDT level	0.00~F0.04 (max.frequency)	50.00Hz	※	120.
F4.14	FDT lag	0.0~100.0%(FDT level)	5.0%	※	121.
F4.15	frequency arrive detecting range	0.0~100.0%(max.frequency)	0.0%	※	122.
F4.16	brake threshold voltage	115.0~140.0%(standard bus voltage)(380V series)	130.0%	※	123.
		115.0~140.0%(standard bus voltage)(220V series)	120.0%		
F4.17	speed display factor	0. 1~999. 9% mechanical speed=120*run frequency*F4. 17/pole of motor	100.0%	※	124.

function code	Name	Description(setting range)	factory setting	Change	No.
F4.18	PID preset source selection	0:keyboard (F4.19)	0	●	125.
		1:analog AVI			
		2:analog ACI			
		3:remote communication			
		4:multi-step			
F4.19	keyboard PID preset	0.0%~100.0%	0.0%	※	126.
F4.20	PID feedback source selection	0:AVI	0	●	127.
		1:ACI			
		2:AVI+ACI feedback			
		3:communication			
		4:AVI-ACI feedback			
F4.21	PID output characteristic	0: positive	0	●	128.
		1:negative			
F4.22	proportional gain (Kp)	0.00~100.00	1.00	※	129.
F4.23	integral time (Ti)	0.01~10.00s	0.10s	※	130.
F4.24	differential time (Td)	0.00~10.00s	0.00s	※	131.
F4.25	sampling cycle (T)	0.01~100.00s	0.10s	※	132.
F4.26	PID control bias limit	0.0~100.0%	5.0%	※	133.
F4.27	feedback lost detecting value	0.0~100.0%	0.0%	※	134.
F4.28	feedback lost detecting time	0.0~3600.0s	1.0s	※	135.
F4.29	multi-step speed 0	-100.0~100.0%	0.0%	※	136.
F4.30	multi-step speed 1	-100.0~100.0%	0.0%	※	137.
F4.31	multi-step speed 2	-100.0~100.0%	0.0%	※	138.
F4.32	multi-step speed 3	-100.0~100.0%	0.0%	※	139.
F4.33	multi-step speed 4	-100.0~100.0%	0.0%	※	140.
F4.34	multi-step speed 5	-100.0~100.0%	0.0%	※	141.
F4.35	multi-step speed 6	-100.0~100.0%	0.0%	※	142.
F4.36	multi-step speed 7	-100.0~100.0%	0.0%	※	143.
F4.37 ~ F4.44	multi-step speed 8 ~multi-step speed 15	-100.0~100.0%	0.0%	※	144. ~ 151.

function code	Name	Description(setting range)	factory setting	Change	No.
F5 group protect function group					
F5.00	motor overload protection	0:disabled 1:normal motor(low speed compensation) 2:variable frequency motor (no low speed compensation)	1	●	152.
F5.01	motor overload protection current	20.0~120.0%(motor rated current)	100.0%	※	153.
F5.02	threshold of trip-free	70.0~110.0%(standard bus voltage)	80.0%	※	154.
F5.03	decrease rate of trip-free	0.00Hz~F0.04(max frequency)	0.00Hz	※	155.
F5.04	over-voltage stall protection	0: disabled 1: enabled	0	※	156.
F5.05	over-voltage stall protection point	110~150%(380V series) 110~150%(220V series)	120% 115%	※	157.
F5.06	over current stall selection	80～200%	160%	※	158.
F5.07	over current stall prevention gain	0~100	5	※	159.
F6 group communication group					
F6.00	local address	1~247,0 is broadcast address	1	※	160.
F6.01	baud rate selection	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	3	※	161.
F6.02	data format	0:no parity check(N,8,1)for RTU 1:even parity check(E,8,1)for RTU 2:odd parity check(O,8,1)for RTU 3:no parity check(N,8,2)for RTU 4:even parity check(E,8,2)for RTU 5:odd parity check(O,8,2)for RTU 6:no parity check(N,7,1)for ASCII 7:even parity check(E,7,1)for ASCII 8:odd parity check(O,7,1)for ASCII 9:no parity check(N,7,2)for ASCII 10:even parity check(E,7,2)for ASCII 11:odd parity check(O,7,2)for ASCII	0	※	162.

function code	Name	Description(setting range)	factory setting	Change	No.
		12:no parity check(N,8,1)for ASCII 13:even parity check(E,8,1)for ASCII 14:odd parity check(O,8,1)for ASCII 15:no parity check(N,8,2)for ASCII 16:even parity check(E,8,2)for ASCII 17:odd parity check(O,8,2)for ASCII			
F6.03	communication delay time	0~200ms	5ms	※	163.
F6.04	communication timeout delay	0.0(disabled),0.1~100.0s	0.0s	※	164.
F6.05	communication error action	0: alarm and coast to stop 1: no alarm and continue torun 2: no alarm but stop (communication control mode only) 3: no alarm but stop according to stop mode (all control mode)	1	※	165.
F6.06	communication response action	0:have response to writing 1:have no response to writing	0	※	166.
F7 group high-level function group					
F7.00 ~ F7.05	facoty setting		****	##	167. ~ 172.
F7.06	underload detection	0~100.0%(motor rated current)	0	※	173.
F7.07	underload detection time	0~999.9s	0	※	174.
F7.08	underload function selection	0:disabled 1:stop output,no alarm 2:stop output,alarm	0	※	175.
F7.09	over-torque detection	0~150.0%(motor rated current)	0	※	176.
F7.10	over-torque detection time	0~999.9s	0	※	177.
F7.11	over-torque function selection	0:disabled 1:stop output,no alarm 2:stop output,alarm	0	※	178.
F7.12	high pressure reached test	0~100.0	0	※	179.
F7.13	low pressure reached test	0~100.0	0	※	180.

function code	Name	Description(setting range)	factory setting	Change	No.
F7.14	pressure reached test range	0~100.0	0	※	181.
F7.15	relay 1 close delay (RA*RB*RC)	0~25.0s	0.0	※	182.
F7.16	relay 1 break delay (RA*RB*RC)	0~25.0s	0.0	※	183.
F7.17	relay 2 close delay (TA*TB*TC)	0~25.0s	0.0	※	184.
F7.18	relay 2 break delay (TA*TB*TC)	0~25.0s	0.0	※	185.
F7.19	start delay setting	0~60.0s	0.0	※	186.
F7.20	allowed start pressure	0~100.0	0	※	187.
F7.21	sleep test frequency	0~max.frequency	0	※	188.
F7.22	sleep test delay	0~999.9s	0	※	189.
F7.23	wake pressure	0~100	0	※	190.
F7.24	wake test delay	0~999.9s	0	※	191.
F7.25	water shortage test delay	0~999.9s	0	※	192.
F7.26	PID adjust range	0~50.0	10.0	※	193.
F7.27	enabled when setting frequency is lower than lower limit frequency	0:run according to lower limit frequency 1:stop 2:emergency stop	1	※	194.
F7.28	sleep signal selection	0:select internal sleep signal 1:select external sleep signal 2:internal and external are valid	0	※	195.
F7.29	program run mode	0:program run invalid 1:cycle run 2:program cycle once,then stop 3: program cycle once,then run on select speed(F7.48)	0	※	196.
F7.30	first running time	0~999.9	0	※	197.
F7.31	first-step running time	0~999.9	0	※	198.
F7.32	second-step running time	0~999.9	0	※	199.
F7.33	third-step running time	0~999.9	0	※	200.
F7.34	fourth-step running time	0~999.9	0	※	201.
F7.35	fifth-step running time	0~999.9	0	※	202.
F7.36	sixth-step running time	0~999.9	0	※	203.

function code	Name	Description(setting range)	factory setting	Change	No.
F7.37	seventh-step running time	0~999.9	0	※	204.
F7.38	program lost memory selection	0:memory when power lost 1:no momory when power lost	0	※	205.
F7.39	program run time unit	0:s (display timing by add mode) 1:min (display timing by add mode) 2:s (display timing by minus mode) 3:min (display timing by minus mode)	2	※	206.
F7.40	input default phase protection and output terminal polarity selection	0:input default protection is valid when close 1:input default protection is valid when open 2:input default protection is invalid when close 3:input default protection is invalid when open	0	●	207.
F7.41	output default phase protection function	0:close 1:open	1	●	208.
F7.42	output power monitor gain adjustment	0.0-150.0	9.2	※	209.
F7.43	oscillation suppression function	0:close 1:open	1	●	210.
F7.44	oscillation suppression gain	0-500	200	●	211.
F7.45	lifting early function	0:close 1:open	0	●	212
F7.46	lifting early frequency	0-10.00Hz	3.00	●	213.
F7.47	lifting early excitation current	0-100.0%	50.0%	●	214.
F7.48	selection speed after program run cycle once	0~7 note:If not use F4.36 (seventh-step speed) when this function,it must setting any one value	0	●	215.

Chapter 6 Function·Particular Parameters

F0 Basic function

Function Code	Name	Setting range	Factory setting
F0.00	Speed control mode	0:vector control without PG	1
		1:V/F control	

Choose inverters' operation mode:

0: No PG Vector Control

Refer to the open-loop vector, which is applied to no encoder PG high performance of common occasions. An inverter can drive only one motor, such as machine tools, centrifuges, wire drawing machine, injection molding machines and other loads.

1: V/F Control

It is applied to occasions which have few requirements on the control accuracy, such as fans, pumps load. It can be used for an inverter driving multiple motors.

Tips: When selecting the vector control mode, you must have a self-learning on the motor parameters. Only to get accurate motor parameters so that advantages of vector control mode can be developed. Better performance will be obtained through adjusting speed parameters (Group F1).

Function Code	Name	Setting range	Factory setting
F0.01	Run command source	0:keyboard control	0
		1:terminal control	
		2:RS485 communication	

Choose the channel of inverters' command code:

0 : Keyboard Instruction ;

Command control by keys like RUN, STOP on the keyboard.

1 : Terminal Instruction ;

Command control by multi-functional input terminals forward, reverse, forward JOG, reverse JOG and so on.

2 : RS485 Communication Instruction ;

Run command is controlled by upper computers through communication.

Function Code	Name	Setting range	Factory setting
F0.02	keypad and UP/DOWN setting	0: Valid, save UP/DOWN value when power off 1: Valid, do not save UP/DOWN value when power off 2: standby frequency function 3: initial frequency function when power on 4: invalid	0

BD 330 inverters can be set by the operation "∧" and "∨" on the keyboard and terminal UP / DOWN (frequency increment / decrement frequency) function. With the highest authority, they can combine any other frequency setting channels, mainly to have a fine-tuning on the inverter output frequency during the operation.

0: Effective and inverter power down with storage. Frequency instruction can be set and when the inverter loses its power, store its set frequency values. Till the next time the power is on, itcan be automatically combined with the present set frequency.

1: Effective and inverter power down without storage. Frequency instruction can be set. Only if when the power of the inverter is down, the set frequency value is no longer stored.

2: In standby mode, the initial set frequency is F7.21. In the operating state it can be adjusted by the panel or terminal adding or subtracting frequency.

3: Each time the power is on, the initial set frequency is F7.21. In the operating state, it can be adjusted by the panel or terminal adding or subtracting frequency.

4: Ineffective. Frequency value of keyboard and terminal UP / DOWN feature set is automatically cleared, and the keyboard and terminal UP / DOWN setting is invalid.

Notes: When the user operates the factory reset of the inverter function parameters, the frequency value of keyboard and terminal UP / DOWN function setting is automatically cleared.

Function Code	Name	Setting range	Factory setting
F0.03	frequency command selection	0:keyboard setting 1:AVI 2:ACI 3:AVI+ACI 4:Multi-step speed 5:PID 6:RS485 communication 7.Panel potentiometer	0

Choose the input channel of inverters' frequency instruction. There are 8 main given frequency channels in total.

0: Keypad setting

Change the value of function mode F0. 07 keyboard setting frequency to achieve the purpose of keyboard setting frequency.

1: Analog AVI Setting

2: Analog ACI Setting

3: Analog AVI+ACI Setting

Specified frequency is set by the analog input terminal. BD330 inverter standard layout provides 2 analog input terminals, while AVI is 0 ~ 10V voltage input and ACI 0 ~ 10V input voltage. It can also be input by the 4 ~ 20mA current (switched by ACI jumper on the motherboard). While inputting 4 ~ 20mA signal, F2. 14 value is set to 2. 00V.

100. 0% of analog input setting corresponds to the maximum frequency (function code F0. 04), while - 100. 0% corresponds to the maximum reverse frequency (Function Code F0. 04).

4： Multistage speed operation settings

While selecting this frequency setting mode, the inverter operates in multi-speed mode. You need to set the group F2 and F4 "multi-speed control group" parameter to determine the correspondence between a given percentage and given frequency.

5： PID control setting

If selecting this parameter, the inverter operation mode will be the process PID control. At this point, you need to set group F4 "PID control group". Running frequency of the inverter is the value after PID functions. Please refer to the introduction of group F4 "PID function" to learn about the meaning of PID given source, given quantity, feedback source, etc. .

6： RS485 communication setting

Frequency command is given by the upper computer via communication.

Refer to "BD330 inverter ModBus protocol" for more details.

7： Panel potentiometer setting: the operating frequency is given by the operation panel potentiometer.

Function Code	Name	Setting range	Factory setting
F0.04	Maximum output frequency	0.00～200. 0	50.00Hz

It is used to set the maximum output frequency of the inverter. It is the basis of the frequency setting, as well as the foundation of acceleration and deceleration speed. Please pay attention.

Function Code	Name	Setting range	Factory setting
F0.05	Upper run frequency limit	F0.06～F0.04(max.frequency)	50.00Hz

Upper limit of the inverter's output frequency. The value should be less than or equal to the maximum output frequency.

Function Code	Name	Setting range	Factory setting
F0.06	Lower run frequency limit	0.50Hz～F0.05(upper run frequency limit)	0.50Hz

Lower limit of the inverter's output frequency.

When the set frequency is lower than the lower limit frequency: When the starting set frequency is lower than the lower limit of frequency, it can not be started. When the set frequency entering the running frequency is lower than the lower limit frequency, the following is limited in the frequency operation.

Function Code	Name	Setting range	Factory setting
F0.07	Keypad reference frequency	0.50Hz～F0.04(max.frequency)	50.00Hz

When the frequency instruction is chosen as "keyboard setting", this function mode value turns into the initial frequency setting value of the inverters.

Function Code	Name	Setting range	Factory setting
F0.08	Acceleration time 1	0.1～3600.0s	10.0s
F0.09	Deceleration time 1	0.1～3600.0s	10.0s

Acceleration time refers to the needed time t1 for the inverter accelerating from 0 hz to the maximum output frequency (F0. 04).

Deceleration time refers to the needed time t2 for the inverter decelerating from the maximum output frequency (F0. 04) to 0 hz. See the following chart:

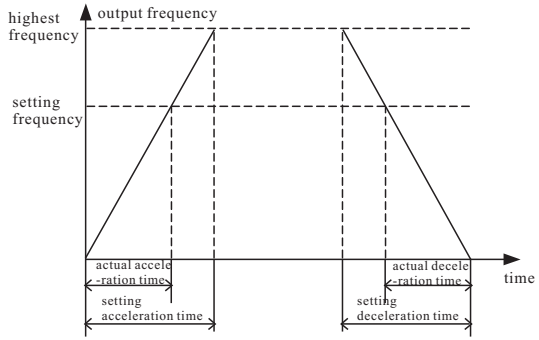


Figure 6-1 Sketch diagram of acceleration and deceleration time

When the setting frequency is equal to the maximum frequency, the actual accelera -tion and deceleration time is consistent with the setting ones.

When the setting frequency is less than the maximum frequency, the actual acceleration and deceleration time is less than the setting ones.

Actual acceleration and deceleration time = setting acceleration and deceleration time ×(setting frequency/ maximum frequency)

BD330 inverters have 2 groups of acceleration and deceleration time.

Group one : F0. 08、F0. 09 ;

Group two : F4. 00、F4. 01。

You can choose acceleration and deceleration time by multi-function digital input terminals (Group F2).

Factory default of acceleration and deceleration time of 5. 5KW and below models is 10. 0S, while 7. 5KW to 55KW models 20. 0S, 75KW and above models 40. 0S.

Function Code	Name	Setting range	Factory setting
F0.10	Running direction selection	0:default direction 1:reverse 2:forbid reverse 3:panel forward/reverse key switch no 1s delay	0

0： Operate towards the default direction. When the inverter is powered on, operate towards the actual direction.

1 : Move on the opposite direction. Motor rotation direction can be changed without changing any other parameters by changing the function code. Its effect is equivalent to realize the transformation of motor rotation direction through adjusting any two lines of motor lines (U, V, W).

Tip: After parameters initialization, motor running direction will restore the original state. For the occasion that motor rotation direction is forbidden to change after system debugging, it should be used with caution.

2: Forbid reverse movement. Forbid inverter reverse movement, which is suitable for the occasion with certain ban on reversal operation.

Function Code	Name	Setting range	Factory setting
F0.11	Carrier frequency	1.0～15.0kHz	Depend on model

Carrier frequency	Electromagnetic Noise	Noise and Leakage Current	heat dissipation
1KHz	↑ high	↑ low	↑ low
10KHz			
15KHz	↓ low	↓ high	↓ high

Figure 6-2 Effect Relationship between Carrier Frequency on Environment Diagram

Model \ Carrier Frequency	Highest Carrier Frequency (KHz)	Lowest Carrier Frequency (KHz)	Factory Default (kHz)
Model G: 0.75kW～11Kw Model P: 0.75kW～15kW	15	1	6
Model G:15kW～55Kw Model P: 18. 5kW～75kW	8	1	4
Model G: 75kW～300Kw Model P:90kW～315kW	6	1	2

This function is mainly used for improving the noise problem of the motor running and the interference problem of inverter to outside, etc.

Advantages of using high carrier frequency: ideal current waveform, less current harmonic, and low motor noise;

Disadvantages of using high carrier frequency: increase switching loss, increase the temperature inverter, and affect inverter output capacity. Under high carrier frequency, the inve -rter needs derating use;Meanwhile, the leakage current of inverter increases at the same time, which increases electromagnetic interference for outside.

Using low carrier frequency is contrary to the above situation. Too Low carrier frequency will cause instability of low-frequency running, reduction of torque and even oscillation phenomenon.

When the inverter is out of the factory, reasonable setting on carrier frequency has been done. In general, users do not need to change parameters.

Function Code	Name	Setting range	Factory setting
F0.12	function parameter restore	0: no operate 1:restore factory default 2:clear fault history	0

1 : Inverter resets all parameters to factory defaults

2 ; Inverter removes recent fault records.

After the operation of selected function is completed, the function code will be automatically back to 0.

Function Code	Name	Setting range	Factory setting
F0.13	AVR function selection	0: invalid 1:valid 2:valid when deceleration 3:constant torque	1

AVR function is the function of output voltage automatic adjustment. When AVR function is invalid, the output voltage will change along with the change of the input voltage (or DC bus voltage); when AVR function is valid, the output voltage will not change along with the change of the input voltage (or DC bus voltage). Output voltage will keep basic constant within the output capacity.

Constant torque running function, when the bus voltage is lower than the standard voltage, calculate the optimal value of output frequency according to the standard of V/F to ensure the constant torque running of effective frequency and prevent burning out motor and inverter due to excessive slip.

Note: when the motor slows down to standstill, turning off the automatic voltage regulation AVR function will make it close down in a shorter stop time without overpressure.

Function Code	Name	Setting range	Factory setting
F0.14	start run mode	0: start directly 1: DC brake and start 2: speed tracking and start	0

0 : start directly: starting from the starting frequency.

1 : DC brake first, then start: DC brake first (pay attention to set parameters of F0. 17 and F0. 18), then start the motor from the starting frequency.

2 : speed tracking and start function: this function is suitable for machines with large inertia load such as centrifugal fan, load cyclone cluster and other inverters in high speed condition before they start. No impact rapid start with current speed of multi motors can be realized through this function, which is limited to inverters >7. 5kW.

Function Code	Name	Setting range	Factory setting
F0.15	starting frequency	0.50～10.00Hz	0.50Hz
F0.16	hold time of starting frequency	0.0～50.0s	0.1s

Setting appropriate start frequency can increase the starting torque. Within the start frequency holding time (F0. 16), inverter output frequency is the start frequency, then run to target frequency from start frequency. If the target frequency (frequency order) is less than start frequency, the inverter will not run but be in the standby state. Start frequency values will not restricted by the lower frequency.

Start frequency doesn't work in forward and reverse switching process.

Function Code	Name	Setting range	Factory setting
F0.17	braking current before start	0.0～100.0	0.0
F0.18	braking time before start	0.0～50.0s	0.0s

DC braking according to the setting DC braking current before starting when the inverter starts for the setting DC braking time before starting, then begin to accelerate the running. If set the DC braking time as 0, the DC braking is invalid.

The greater the DC braking voltage is, the greater the braking force is.

Function Code	Name	Setting range	Factory setting
F0.19	stop mode	0: deceleration to stop	0
		1:stop freely	

0：deceleration to stop

After the stop command works, inverter reduces the output frequency according to the deceleration mode and the defined deceleration time. When the frequency drops to 0, it stops.

1：stop freely：

After the stop command works, inverter immediately terminates the output, loads and stops freely according to the mechanical inertia.

Function Code	Name	Setting range	Factory setting
F0.20	starting frequency of braking	0.00～F0. 04(max.frequency)	0.00Hz
F0.21	waiting time before braking	0.0～50.0s	0.0s
F0.22	DC braking voltage when stop	0.0～100.0	0.0
F0.23	DC braking time when stop	0.0～50.0s	0.0s

Stop brake starting frequency: when it gets to this frequency, it starts the stop DC brake in the process of slowing down to stop.

Stop brake waiting time: inverter blockades output before the stop DC brake starts, then starts DC brake after the delay. It is used to prevent the overcurrent fault caused by the DC brake that starts at high speed.

Stop DC brake voltage： refers to the added DC brake amount. The greater the voltage is, the stronger the DC braking effect is.

Stop DC brake time: the persistent time of DC brake amount. When the time is 0, the DC brake is invalid, and the inverter stops working according to the setting deceleration time.

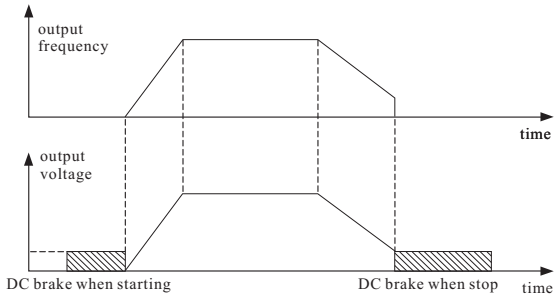


Figure 6-3 DC brake schematic diagram

Function Code	Name	Setting range	Factory setting
F0.24	Dead time of FWD/REV	0.0～3600.0s	0.0s

In the setting forward and reverse transition process of the inverter, output frequency seeks within the transition time when it outputs at zero frequency:

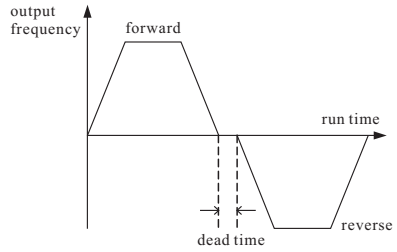


Figure 6-4 Dead time of FWD/REW schematic diagram

Function Code	Name	Setting range	Factory setting
F0.25	terminal run protect selection when power on	0:run command is invalid when power on 1:run command is valid when power on	0

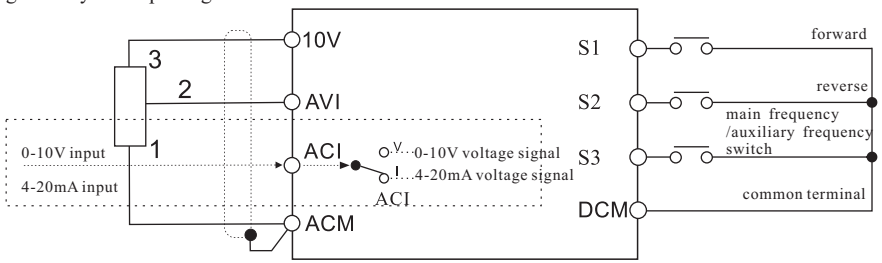
When running command channels are controlled by terminals, the system will automa -tically detect the condition of running terminal in the power-on process of the inverter.

0 : Power-on terminals running command is invalid. If it is detected that the running command terminal is valid even in the power-on process, the inverter will not run and the system will be in the state of running protection until this running command terminal is withdrawn.

1 : Power-on terminal running command is valid. If it is detected that the running command terminal is valid in the power-on process, the system will automatically start the inverter after the completion of the initialization. It should be noted that users must choose this function carefully, otherwise it may cause serious consequences.

Function Code	Name	Setting range	Factory setting
F0.26	auxiliary frequency source selection	0:keyboard setting	0
		1:analog AVI	
		2:analog ACI	
		3：AVI+ ACI	
		4:Multi-step speed	
		5:PID	
		6:RS485 communication	
		7.Panel potentiometer	

The main frequency and auxiliary frequency can switch by multi-function input termi -nal, and the parameter is F2. 01-F2. 06, function code: 33; for example, set F2. 03 to 33, the terminal is S3, and set F0. 03 to 1, set F0. 26 to 2, when S3 port closes, frequency is given by ACI passage, and when disconnects, frequency is given by AVI passage.



F1 Motor function

Function Code	Name	Setting range	Factory setting
F1.00	motor model selection	0: G model	model setting
		1: P model	
F1.01	motor rated power	0.4～900.0kW	model setting
F1.02	motor rated frequency	0.01Hz～F0. 04(max.frequency)	50.00Hz
F1.03	motor rated speed	0～36000rpm	model setting
F1.04	motor rated voltage	0～460V	model setting
F1.05	motor rated current	0.1～1000.0A	model setting

Note: please set in accordance with the nameplate parameters of motor. Only when accurately set motor parameters can the vector control achieve the best effect.

In order to guarantee the control performance, please make motor configuration according to the standard adaptive motor of inverter. If the gap between motor power and the standard adapter is too large, the control performance of inverter will markedly reduce.

Note: reset the motor rated power (F1.01), and can initialize motor parameters of F1.02～F1.10.

Note: the model selection explanation

Users can choose their required model by changing F1.00 parameter, and after setting initialization parameters of F0.12=1, it can be normally used.

Function Code	Name	Setting range	Factory setting
F1.06	motor stator resistance	0.001～65.535Ω	model setting
F1.07	motor rotor resistance	0.001～65.535Ω	model setting
F1.08	motor leakage inductance	0.1～6553.5mH	model setting
F1.09	motor mutual inductance	0.1～6553.5mH	model setting
F1.10	no-load current	0.01～655.35A	model setting

After the motor parameter self-learning, P1.06～F1.10 settings automatically update. These parameters are the basic parameter of high-performance vector control, and have a direct influence on the performance of the control.

Function Code	Name	Setting range	Factory setting
F1.11	motor paratemeter self-learning	0:no operate	0
		1:dynamic self-learning	
		2:static self-learning	

0: no operation: forbid self-learning.

1: parameter dynamic self-learning

Before motor parameter self-learning, motor and load must be separated, let the motor in no-load condition, and confirm the motor in stationary state.

Before the motor parameter self-learning, it is necessary to correctly input parameters of motor nameplates (F1. 01～F1. 05), otherwise the motor parameter self-learning results may be incorrect.

Before motor parameter self-learning, it is necessary to appropriately set the accelera-tion and deceleration time (F0. 08、F0. 09) according to the motor inertia, otherwise the motor parameters self-learning process may exist over-current fault.

Set F1. 11 to 1 and then press FUNC/DATA button, the motor parameter self-learning starts. At this time, the LED displays "-TUN-" and flashing, and then press the RUN button, at this time shows "TUNE". Motor starts self-learning, and "RUN" indicator light is flashing. At the end of parameter self-learning, it displays "-END-", and finally shows back to stop status interface.

When "-TUN-" flashing, press PRGM/RESET button to exit the parameter self-learning state.

In the process of parameter self-learning, press the STOP button to suspend the parameter self-learning.

Note: the start and stop of parameters self-learning can only be controlled by the keyboard; after parameter self-learning completion, the function code automatically return to 0.

2: parameter static self-learning

Motor parameter static self-learning is used in the condition that motor and load cannot be separated. Before the motor parameter self-learning, it is necessary to correc-tly input parameters of motor nameplates (F1. 00—F1. 05), and after self-learning, the motor stator and rotor resistance as well as the leakage inductance of motor will be detected. But the mutual inductance of motor and no-load current cannot be measured, and users can input the corresponding function code based on experience.

Function Code	Name	Setting range	Factory setting
F1.12	ASR proportional gain Kp1	0～100	30
F1.13	ASR integral time Ki1	0.01～10.00s	1.5s
F1.14	ASR switching point 1	0.00Hz ~ F1.1 7	5.00Hz
F1.15	ASR proportional gain Kp2	0～100	10
F1.16	ASR integral time Ki2	0.01～10.00s	1.00s
F1.17	ASR switching point 2	F1. 14～F0. 04 (max. frequency)	10.00Hz

Note: F1. 06～F1. 19 parameter is valid only at the time of vector control, and invalid in V/F control.

Below switching frequency 1 (F1. 14), speed loop PI parameters are: F1.12 and F1.13.

Above switching frequency 2 (F1. 17), speed loop PI parameters are: F1.15 and F1.16.

Between the switching point, PI parameters are obtained by the linear change of the two groups of parameters, as shown in the diagram below:

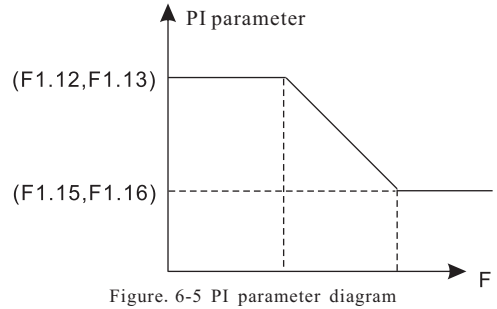


Figure. 6-5 PI parameter diagram

By setting the proportional coefficient and integral time of speed regulator, it can adjust the speed dynamic response characteristics of vector control. Increasing the propor-tional gain and decreasing the integration time can speed up the dynamic response of speed loop, but bigger proportional gain or less integration time are easy to cause the system oscillation and higher overshoot. Less proportional gain is also easy to cause the system steady-state oscillation, and likely to exist the speed offset.

Speed loop PI parameters have close relations with the inertia of motor system. Users can make adjustment in accordance with different load characteristics requirements and on the basis of default PI parameters, so as to meet the requirements of various occasions.

Function Code	Name	Setting range	Factory setting
F1.18	slip compensation rate of VC	50%～200%	100%

Slip compensation coefficient is used to adjust the slip frequency of vector control, and improve the speed control precision of the system. Properly adjusting the parameters can effectively inhibit speed static error.

Function Code	Name	Setting range	Factory setting
F1.19	torque upper limit	0.0~200.0%(inverter rated current)	150.0%

Set 100. 0% corresponding rated output current of the inverter.

The following function code (F1. 20-F1. 24) is valid for V/F control (F0. 00=1), and invalid for vector control.

Function Code	Name	Setting range	Factory setting
F1.20	V/F curve selection	0:linear V/F curve	0
		1:square torque V/F curve	
		2:user-defined V/F curve	

Fan and pump load can choose square V/F control.

0: linear V/F curve is suitable for ordinary constant torque load.

1: square V/F curve is suitable for centrifugal load of fans and pumps, etc.

2: user-defined V/F curve is suitable for high starting torque or low starting torque of centrifugal fan, etc. (F1. 25~F1. 28)

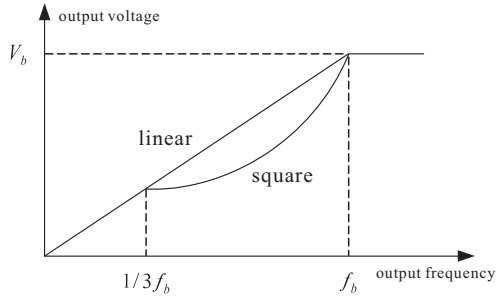


Figure. 6-6 V/F curve diagram

Function Code	Name	Setting range	Factory setting
F1.21	torque boost	0.0%: (auto) 0.1%~30.0%	2.0%
F1.22	torque boost cut-off	0.0%~80.0% (motor rated current)	60.0%

Torque ascension is mainly used below cutoff frequency (F1. 22). The V/F curve after ascending is as shown in diagram below. Torque ascension can improve the V/F low frequency torque characteristics.

It is necessary to appropriately choose torque amount according to load size. Large load can increase ascension, but the torque ascension should not be too large. Too large torque ascension, and motor over-excitation operation are easy to overheat, and inverter output current is big, and efficiency is lower.

When the torque ascension is set to 0. 0%, inverter is automatic torque ascension.

Torque ascension cut-off frequency: under this frequency, torque ascension is valid; above the setting frequency, torque ascension is invalid.

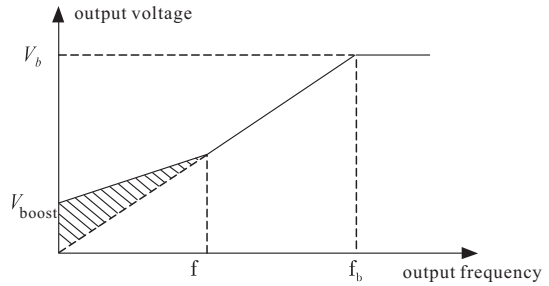


Figure. 6-7 torque boost manually diagram

Function Code	Name	Setting range	Factory setting
F1.23	V/F slip compensation limit	0.0~200.0%	0

Setting this parameter can compensate for motor speed change caused by load during V/F control, in order to improve the hardness of motor mechanical properties, this value should correspond to the rated slip frequency of the motor.

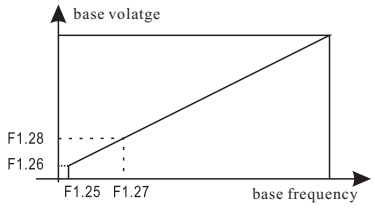
Function Code	Name	Setting range	Factory setting
F1.24	auto energy saving selection	0: disabled	0
		1: enabled	

When motor conducts constant speed operation in no-loading or under-loading process, inverter will adjust output voltage to achieve automatic energy saving by detecting loading current.

Attention: This function is especially effective for draught fan and pump loading.

Function Code	Name	Setting range	Factory setting
F1.25	middle frequency point 1	0~F1.27	1. 30Hz
F1.26	middle frequency point 1 corresponding voltage	0~F1.28	18V
F1.27	middle frequency point 2	0~200.00	2. 50Hz
F1.28	middle frequency point 2 corresponding voltage	0~F1.04	30V

While adjusting, it must be the lowest frequency, and voltage must be lower than or equal to intermediate voltage/frequency, and it shall be time. The over adjustment will lead to over-current of inverter, and the adjustment of voltage and frequency must be kept in proportional control. If only one item is adjusted, it will give rise to over-current or low frequency.



F2 Input output terminal group

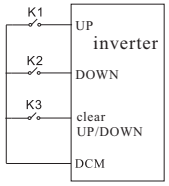
Function Code	Name	Setting range	Factory setting
F2.00	number of switching vaule filter	1～10	5

Setting filtering time of S1~S6 terminals sampling. Under the circumstance of great interference, this parameter shall be enlarged to prevent false operation.

Function Code	Name	Setting range	Factory setting
F2.01	S1 terminal function	0~28	1
F2.02	S2 terminal function	0~28	2
F2.03	S3 terminal function	0~28	0
F2.04	S4 terminal function	0~28	0
F2.05	S5 terminal function	0~28	0
F2.06	S6 terminal function	0~28	0

This parameter is used to set the corresponding functions of digital multifunction input terminals（All terminal functions cannot repetitive, or they will be invalid）.

setting value	function	Introduction
0	invalid	If there are signals are input, inverter still invalid. Those unused terminals can be set as invalid to prevent false operations.
1	forward	control forward and reverse of inverter by external terminal
2	reverse	
3	3-wire control	This terminal can be used to confirm the running mode of inverter is 3-wire control mode. Please refer to three-wire operation control mode function code introduction in F2. 07 for details.
4	jog forward	Please refer to function code explanations in F4. 02, F4. 03 and F4. 04 for more details about frequency and acceleration /deceleration time when jog operation.
5	jog reverse	
6	coast to stop	Inverter block output, motor halting process is not controlled by inverter.For large inertia loads, and no requirements in halting time, this method is often adopted. This mode is same as the implication of freely halting described in F0. 19.
7	fault/timing/reset	External fault/timing/reset function. As fault reset function, it can achieve remote fault resetting.

8	external fault input	Inverter will report fault code after received external fault signal
9	frequency UP command	When external terminals give frequency, the UP and DOWN commands of frequency shall be altered. When frequency source setting is digital setting, you can adjust up and down to set frequency.  Terminals can be used to eliminate the frequency values set with UP/D0WN, to recover the given frequency to the frequency given by frequency instruction tunnel.
10	frequency DOWN command	
11	clear UP/DOWN	
12	multi-step speed reference1	The digital combination of these three terminals can help to achieve the setting of 8 segment speed. Attention: Multi-step speed 1 is lower, while multi-step speed 3 is higher.
13	multi-step speed reference2	
14	multi-step speed reference3	
15	ACC/DEC time selection	The digital state combination of these two terminals can be used to select two kinds of acceleration and deceleration time.
16	pause PID	PID is invalid momentarily, inverter will output current frequency
17	pause traverse(traverse operation with current frequency)	Inverter stops in current output frequency. After the function is repealed, the traverse frequency operation will restart in current frequency.
18	reset traverse	Inverter returns to center frequency output.
19	forbid the function of ACC/DEC	Inverter shall be kept out of the effects from external signals（except halting command）, and maintained at current output frequency.
20	retain	retain
21	external ACC terminal	In the effective state, it will automatically switch to revolving speed display state; in the halting state, the accelerating and decelerating adjustment is invalid.
22	external DEC terminal	
23	delay value increase terminal	In the effective state, it will automatically switch to time setting display state. When F3. 18 is set at 0, terminal adjustment is invalid.
24	delay value decrease terminal	

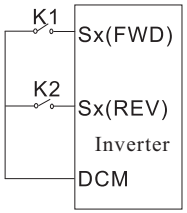
Terminal	ACC/DEC time selection	corresponding parameter
OFF	acceleration time 0	F0. 08、F0. 09
ON	acceleration time 1	F4. 00、F4. 01

25	program run reset	setting program run mode in effective state
26	program run invalid	
27	terminal count	when count is valid,terminal close once,count for once
28	jog function	jog running according to current state(ACC/DEC)
29	retain	
30	energy-saving operation	ON:energy-saving operation is valid, OFF: energy-saving operation is invalid
31	retain	
32	multi-step speed reference 4	multi-step speed 8~15 selection
33	auxiliary frequency source selection	auxiliary frequency source selection, ON:F0.26, OFF:F0.03
34	local / remote switch	ON:remote OFF:local
35	run command force setting by terminal	ON:run command force setting by terminal
36	run command force setting by communication	ON:run command force setting by RS485 communication

Function Code	Name	Setting range	Factory setting
F2.07	terminal control running mode	0:2-wire control mode 1	0
		1:2-wire control mode 2	
		2:3-wire control mode 1	
		3:3-wire control mode 2	

This parameter defines the four different modes of controlling inverter operation by external terminals.

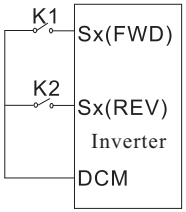
0:2-wire control mode 1
2-wire is commonly used mode.Forward/ reverse is decide by K1,K2 signal.



K1	K2	run command
OFF	OFF	stop
ON	OFF	forward
OFF	ON	reverse
ON	ON	stop

Figure. 6-8 2-wire mode 1 diagram

1:2-wire control mode 2
K1 is close inverter run,direction is decide by K2

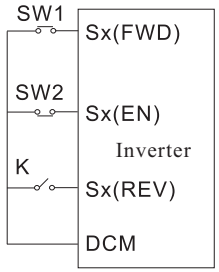


K1	K2	run command
OFF	OFF	stop
ON	OFF	forward
OFF	ON	stop
ON	ON	reverse

Figure. 6-9 2-wire mode 2 diagram

Reminder: For two-wire operation mode, when S1/S2 terminal is valid, if other sources generate halting command and make inverter stop, even if the control terminal S1/S2 still keeps valid, the inverter still won't restart after the halting command disap -pears. If to get inverter runs again, S1/S2 shall be triggered again.

2:3-wire control mode 1
EN is enabling terminal ,run command is setting by SW1,direction command is setting by K.EN is close input



K	run direction
OFF	forward
ON	reverse

Figure. 6-10 3-wire mode 1 diagram

K:forward/reverse switch
SW1: run button
SW2:stop button
EN is 3-wire run function enabling terminal

2:3-wire control mode 2
EN is enabling terminal ,run command and direction command are setting by Sw1 or Sw3, stop command is setting by SW2

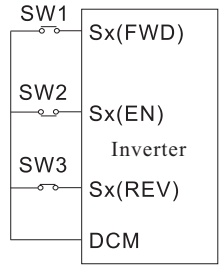


Figure. 6-11 3-wire mode 2 diagram

SW1:forward button
SW2:stop button
SW3:reverse button
EN is 3-wire run function enabling terminal

Function Code	Name	Setting range	Factory setting
F2.08	UP/DOWN setting change rate	0.01～50.00Hz/s	0.50Hz/s

UP/DOWN setting rate when frequency change.

Function Code	Name	Setting range	Factory setting
F2.09	AVI lower limit	0.00V～10.00V	0.00V
F2.10	AVI lower limit corresponding setting	-100.0%～100.0%	0.0%
F2.11	AVI upper limit	0.00V～10.00V	10.00V
F2.12	AVI upper limit corresponding setting	-100.0%～100.0%	100.0%
F2.13	VI input filter time	0.00s～10.00s	0.10s
F2.14	ACI lower limit	0.00V～10.00V	0.00V
F2.15	ACI lower limit corresponding setting	-100.0%～100.0%	0.0%
F2.16	ACI upper limit	0.00V～10.00V	10.00V
F2.17	ACI upper limit corresponding setting	-100.0%～100.0%	100.0%
F2.18	ACI input filter time	0.00s～10.00s	0.10s

Above function codes define the relations between analog input voltage and the setting value of analog input. When the analog input voltage exceeds the setting range of maximum input or minimum input, the additional parts will be counted as maximum input or minimum input.

When analog input is current input, 0mA~20mA current accords with 0V~5V voltage.

At different application occasions, the corresponding nominal values of analog setting 100. 0% also are different, please refer to the explanations of all applications.

Attention: The lower limiting value must be less than its upper limiting value.

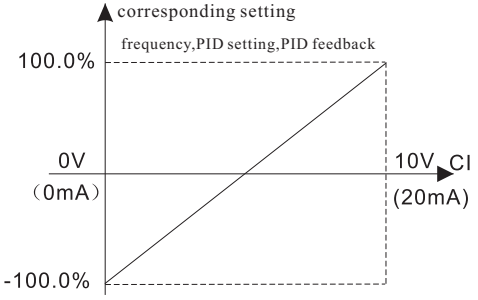


Figure. 6-12 corresponding relationship of analog setting and setting value

AVI input filtering time: Confirm sensitivity of analog quantity input. If to prevent the false operations from interference of analog quantity, you can increase this parameter to enhance anti-interference ability, but it will decrease the sensitivity of analog quantity input.

The functions of ACI are similar to the setting methods of AVI. Analog quantity CI can support 0~10V or 0~20mA input. When CI selects 0~20mA input, the corresponding voltage is 5V.

Function Code	Name	Setting range	Factory setting
F2.19	multi-functional realy junction output TA*TB*TC	0~28	18
F2.20	MO1(collector open circuit) output selection	0~28	2
F2.21	multi-functional realy junction output RA*RB*RC	0~28	3

Folowing is multi-function output terminal function:(ON means connection,OFF means break)

Setting value	Function	Introduction
0	no output	output terminal have no function
1	frequency reached	please refer to F4.15
2	FDT reached	please refer to F4.13,F4.14
3	fault open output	output ON signal when fault
4	run forward	output ON signal when forward run and output frequency
5	run reverse	output ON signal when reverse run and output frequency
6	zero speed running	output ON signal when output frequency is lower than start frequency
7	upper frequency limit reached	output ON signal when run frequency is reach to upper limit frequency
8	lower frequency limit reached	output ON signal when run frequency is reach to lower limit frequency
9～12	retain	
13	high-pressure reached checkout(NO)	output ON signal when pressure is reach to F7.12 high pressure
14	low-pressure reached checkout(NO)	output ON signal when pressure is reach to F7.13 low pressure
15	sleep state indication	in sleep state,output ON signal and display EOPP
16	water shortage alarm indication	when water shortage alarm,output ON signal and display EOP2
17	non-zero speed running	output ON signal when output frequency is higher than lowest output frequency
18	running	output ON signal when output or input run command
19	underload output	output ON signal when output current is lower than F7.06 setting value
20	over torque output	output ON signal when output current is higher than F7.09 setting value
21	program run one cycle to signal output	output ON signal when program run one cycle
22	fault close output	output ON signal when inverter running,output OFF signal when fault
23	pump 1 output signal	valid on constant pressure and one inverter drive two motor(one motor is run by variable frequency,another one is run by power frequency)
24	pump 2 output signal	
28	brand brake signal output	it need setting parameter if lifting machine

Function Code	Name	Setting range	Factory setting
F2.22	AFM analog output selection	0 ~10	0

Standard output of analog is 0~10V,fllowing is range:

Setting value	Function	Range
0	frequency setting	0~max output frequency
1	run frequency	0~max output frequency
2	output current	0~2 times inverter rated current
3	output voltage	0~2 times inverter rated voltage
4	run speed	0~2 times inverter rated speed
5	PID setting	0～10V
6	PID feedback	0～10V
7	analog AVI input	0～10V
8	analog ACI input	0～10V/0～20mA
9~10	retain	retain

Function Code	Name	Setting range	Factory setting
F2.23	lower limit of AFM analog output	0.0%～100.0%	0.0%
F2.24	lower limit of AFM corresponding analog	0.00V～10.00V	0.00V
F2.25	upper limit of AFM analog output	0.0%～100.0%	100.0%
F2.26	lower limit of AFM corresponding analog	0.00V～10.00V	10.00V

Above function codes define the relationship between output value and corresponding output values of analog output as the chart shows, when output value exceeds the range of maximum output or minimal output, the beyond part should be calculated as maximum output or minimal output.

When the analog output is current output, 1mA of electric current equals to 0. 5V of voltage.

Under different applications, 100% output value corresponding to different analog output, please see the details referring to instruction of each part.

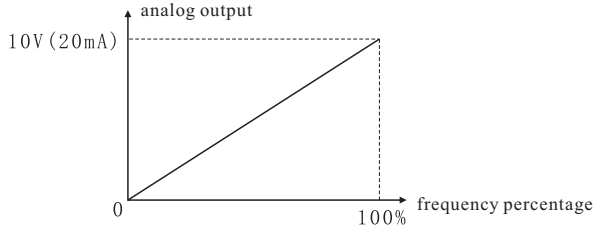


Figure 6-13 Corresponding relationship between setting value and analog output

Function Code	Name	Setting range	Factory setting
F2.27	AIM multi-function analog output terminal function selection	0~10 (same with F2.22)	2

Standard output of analog output is 0～20mA（or 0～10V), you can choose current or voltage output through mainboard jumper AIM.

Function Code	Name	Setting range	Factory setting
F2.28	lower limit of AIM analog output	0.0%～100.0%	0.0%
F2.29	lower limit of AIM corresponding analog	0.00V～10.00V	0.00V
F2.30	upper limit of AIM analog output	0.0%～100.0%	100.0%
F2.31	upper limit of AIM corresponding analog	0.00V～10.00V	10.00V

F3 human-computer interface group

Function Code	Name	Setting range	Factory setting
F3.00	user password	0～65535	0

The function of user password setting if used for forbidding unauthorized personnel to read or change functional parameter, a non-zero five-digit number should be set when this function opened, press FUNC/DATA to confirm codes and it will take effect automatically without any operation in one minute.

When the codes are set and taken effect, uses cannot enter into parameter menu if the codes are wrong, only with the correct codes, users can read and change the parameters. Please remember user's codes set.

If you don't need this function, set the function value as 00000.

Function Code	Name	Setting range	Factory setting
F3.01	retain		
F3.02	retain		

Function Code	Name	Setting range	Factory setting
F3.03	STOP key function selection	0: valid when keypad control 1: valid when keypad or terminal control 2: valid when keypad or communication control 3: always valid	0

Function code defined the effective choice of STOP function.

Function Code	Name	Setting range	Factory setting
F3.05	running status display selection (display code)	0-32767	1183
F3.06	stop state parameter display selection (display code)	0-2048	15
F3.07	priority selection of run state display	0~14(0:priority selection invalid)	1

Running status display selection:

Description	Code	F3.07 code
0:frequency setting	1	0
1:run frequency	2	1
2:output current	4	2
3:output voltage	8	3
4:running speed	16	4
5:actual delay value	32	5
6:delay setting value	64	6
7:bus voltage	128	7
8:PID setting	256	8
9:PID feedback	512	9
10:input terminal state	1024	10
11:output terminal state	2048	11
12:analog AVI value	4096	12
13:analog ACI value	8192	13
14:current step of multi-step speed	16384	14

Stop state parameter display selection:

Description	Code
frequency setting	1
bus voltage	2
input terminal state	4
output terminal state	8
PID setting	16
PID feedback	32
analog AVI value	64
analog ACI value	128
current step of multi-step speed	256
actual delay value	512
delay setting value	1024

Display setting method of F3. 05 , F3. 06: Set up parameters= add together all the display code.If you need to display output current, running speed and bus voltage during operation : set the parameter value as : 4+16+128=148, namely F3. 05 is 148, exit after save to view the required parameters.

F3. 07 running state shows priority selection:

0 : Display content under running state could be chosen by DATA button on panel randomly.

1-14 : Choose corresponding display content of F3. 05.

Under running state, it will switch into parameter selection display content without DATA action last for 10 seconds.

It will switch into parameter selection display content from stop state to running state automatically.

Function Code	Name	Setting range	Factory setting
F3.08	contravariant module temperature	0～100.0℃	
F3.09	software version		
F3.10	accumulated running time	0～65535h	0

All these function codes can only be read but cannot be changed.

Contravariant module temperature: shows the temperature of inverter module IGBT, different types of inverter module IGBT have different over temperature protection value.

Software version: number of software version

Accumulated running time : It shows the frequency converter's cumulative running duration till now.

Function Code	Name	Setting range	Factory setting
F3.11	second latest fault type		
F3.12	latest fault type		
F3.13	current fault type		

It records the third last fault types: 0 is fault-free, 1~26 means 26 kinds of fault types. Please see fault analysis in detail.

Function Code	Name	Setting range	Factory setting
F3.14	run frequency at current fault	run frequency at current fault	0.00Hz
F3.15	output current at current fault	output current at current fault	0.0A
F3.16	DC bus voltage at current fault	DC bus voltage at current fault	0.0V

Function Code	Name	Setting range	Factory setting
F3.17	delay value or count value	0～65000	0
F3.18	delay unit or count number setting	0~15(0:delay and count function is invalid)	0

F3. 17 can be set to show delay value or counting times, it's determined by F3. 18 parameters or also can be set through external terminal function (23, 24).

F3. 18 Delay unit setting :

0 : Delay function or count function is invalid

1 : Delay unit is 0. 1 second, displayed as minus mode.

2 : Delay unit is 1 second, displayed as minus mode.

3 : Delay unit is 1 minute, displayed as minus mode.

11 : Delay unit is 0. 1 second, displayed as plus mode.

12 : Delay unit is 1 second, displayed as plus mode.

13 : Delay unit is 1 minute, displayed as plus mode.

F3. 18 Counting mode setting :

4 : Program counter, displayed as minus mode.

5 : Terminal counter, displayed as minus mode. (External input terminal function code = 27).

14 : Program counter, displayed as plus mode.

15 : Terminal counter, displayed as minus mode. (External input terminal function code = 27).

F4 Application function group

Function Code	Name	Setting range	Factory setting
F4.00	acceleration time 2	0.1～3600.0s	10.0s
F4.01	deceleration time 2	0.1～3600.0s	10.0s

Meaning of deceleration time 2 is same with deceleration time 1, please refer to related instructions of F0. 08 and F0. 09.

Leaving factory value of acceleration and deceleration time on 5. 5 KW and below models is 10. 0S, 7. 5 KW to 55 KW models is 20. 0S, above 75 KW is 40. 0 S.

Function Code	Name	Setting range	Factory setting
F4.02	jog running frequency	0.00~F0.04 (max.frequency)	5.00Hz
F4.03	jog acceletation time	0.1～3600.0s	10.0s
F4.04	jog deceletation time	0.1～3600.0s	10.0s

Define inverter's frequency setting and acceleration/deceleration time during jog running. Jog running process will do start-stop operation according to direct starting and slow down and stop way.

Jog acceleration time refers to the duration required from 0 hz (F0. 04) to maximum output frequency.

Jog deceleration time refers to the duration required from maximum output frequency to 0 hz.

Leaving factory value of acceleration and deceleration time on 5. 5 KW and below models is 10. 0S, 7. 5 KW to 55 KW models is 20. 0S, above 75 KW is 40. 0 S.

Function Code	Name	Setting range	Factory setting
F4.05	skip frequency	0.00~F0.04 (max.frequency)	0.00Hz
F4.06	skip frequency amplitude	0.00~F0.04 (max.frequency)	0.00Hz

The actual running frequency will run in the edge of skip frequency which closes to the setting frequency when the setting frequency is within the skip frequency range. Prevent the inverter from loaded mechanical resonance point through setting skip frequency.

This inverter could set a skip frequency point, but this function will lose the effect if sets skip frequency to 0.

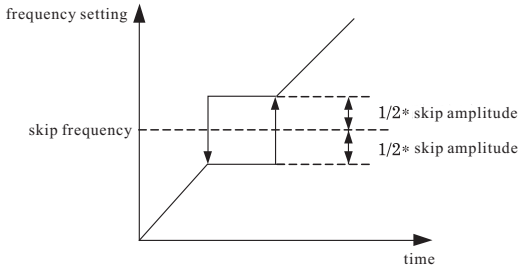


Figure 6-14 skip frequency

Function Code	Name	Setting range	Factory setting
F4.07	traverse amplitude	0.0~100.0%(setting frequency)	0.0%
F4.08	jitter frequency	0.0~50.0%(traverse amplitude)	0.0%
F4.09	rise time of traverse	0.1～3600.0s	5.0s
F4.10	fall time of traverse	0.1～3600.0s	5.0s

The function of traverse frequency suits to textile, chemical fiber industries and occas -ions when need traversing and winding functions.

The function of traverse frequency refers to: the output frequency of the inverter traverse around the center of the setting frequency, the track of running frequency in the timeline as belows, F4. 07decides traverse amplitude, when F4. 07 is 0, traverse amplitude is 0, consequently, traverse frequency is invalid.

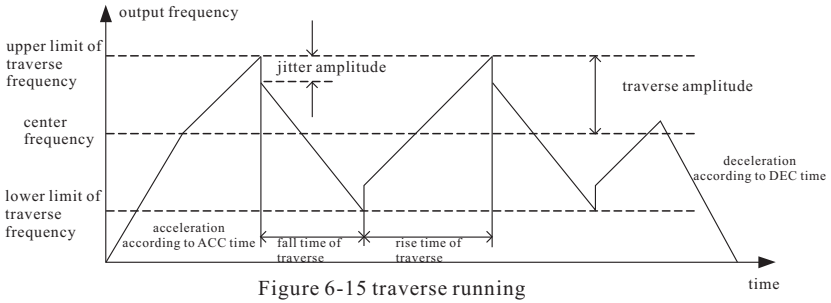


Figure 6-15 traverse running

Traverse amplitude:traverse running frequency is limit by upper and lower frequency.

Traverse amplitude=center frequency × traverse amplitude F4. 07.

Jitter frequency = traverse amplitude × jitter frequency amplitude F4.08.It means relative value of jitter frequency and traverse amplitude when traverse operation

Rise time of traverse:time from lowest frequency to highest frequency.

Fall time of traverse:time form highest frequency to lowest frequency.

Function Code	Name	Setting range	Factory setting
F4.11	auto reset times	0～3	0
F4.12	reset interval	0.1～100.0s	1.0s

Fault reset time: the times which we set to permit automatic fault reset when the inverter chooses this function. If the times exceed the setting value, the inverter will wait to be repaired.

Setting of fault reset interval: select the interval time from breakdown to automatic fault reset.

Function Code	Name	Setting range	Factory setting
F4.13	FDT level	0.00~F0.04 (max.frequency)	50.00Hz
F4.14	FDT lag	0.00~100% (FDT level)	5.0%

Setting value of output frequency and FDT lag:

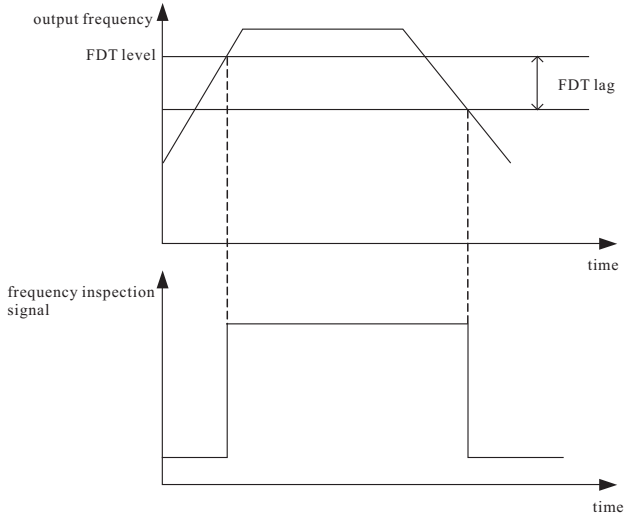


Figure 6-16 FDT level

Function Code	Name	Setting range	Factory setting
F4.15	frequency arrive detecting range	0.00~100% (max.frequency)	0.0%

The output frequency arrive to setting frequency,this function can adjust amplitude:

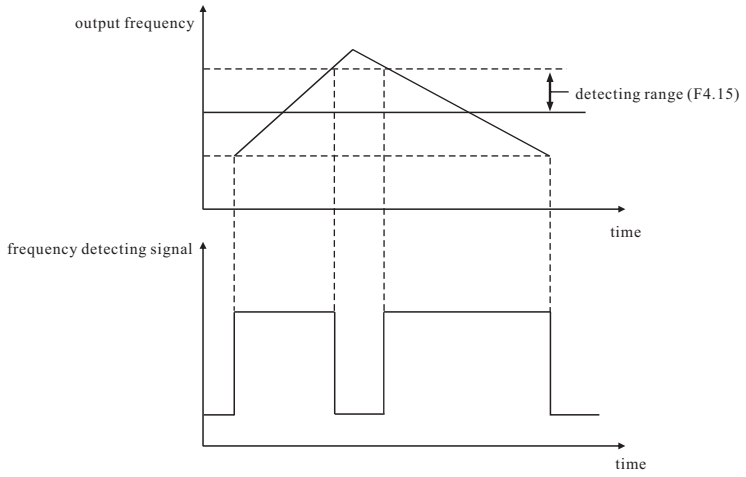


Figure 6-17 frequency reach to inspection amplitude

Function Code	Name	Setting range	Factory setting
F4.16	brake threshold voltage	115.0~140.0%(standard bus voltage)(380V series)	130.0%
		115.0~140.0%(standard bus voltage)(220V series)	120.0%

This code is to setting brake start bus voltage,so that can brake load effectively.

Function Code	Name	Setting range	Factory setting
F4.17	speed display factor	0.1~999.9% mechanical speed= 120* run frequency* F4.17/ pole of motor	100.0%

Mechanical rotation speed = 120× running frequency× F4.17/pole of motor, this function code is to correct the display error of rotation speed, there is no influence to the actual rotation speed.

PID control is a commonly used method in process control, through ratio, integration and differential calculation in deviations between the feedback signal of controlled quantity and quantity of target signal, in order to adjust the output frequency of the inverter, constitute the negative feedback system and make sure the controlled quantity is stabilized on the target. This is suitable for flow control, pressure control, temperature control and other process controls. The basic theory of control is following:

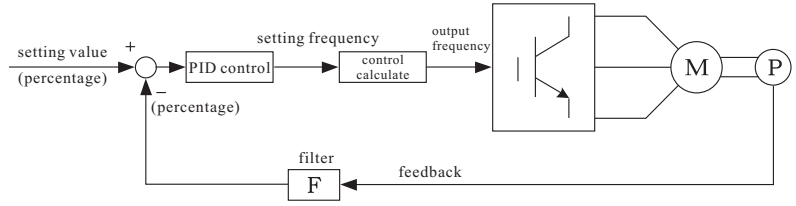


Figure 6-18 PID process

Function Code	Name	Setting range	Factory setting
F4.18	PID preset source selection	0:keypad (F4.19)	0
		1:AVI	
		2:ACI	
		3:communication	
		4:multi-step	

When the frequency source chooses PID, as the same as F0.03 chooses 5, then this group of functions will work. This parameter will decide the given channel of target quantity in PID process.

The setting target quantity of PID process is a relative value, the setting value 100% shall be accordance with 100% feedback signal of controlled system; The system will calculate by the relative value (0~100.0%) all the time.

Attention: we can realize given multi stages through setting the parameter of group F4.

Function Code	Name	Setting range	Factory setting
F4.19	keypad PID preset	0.0%～100.0%	0.0%

If we choose F4. 18=0, means the target source is given keypad, we need to set this parameter.

The reference value of this parameter is the feedback quantity of system.

Function Code	Name	Setting range	Factory setting
F4.20	PID feedback source selection	0:AVI	0
		1:ACI	
		2:AVI+ACI feedback	
		3:communication	

Choose PID feedback channel through this parameter.

Attention: the given channel can't be coincided with the feedback channel, or PID will fail to control effectively.

Function Code	Name	Setting range	Factory setting
F4.21	PID output characteristic	0: positive	0
		1:negative	

Positive characteristics of PID output: if the feedback signal is larger than PID's given, which also requires to decline the output frequency of the inverter could balance the PID. For example: PID control of winding tension.

Negative characteristics of PID output: if the feedback signal is larger than PID's given, which also requires to rise the output frequency of the inverter could balance the PID. For example: PID control of unwinding tension.

Function Code	Name	Setting range	Factory setting
F4.22	proportional gain (Kp)	0.00～100.00	1.00
F4.23	integral time (Ti)	0.01～10.00s	0.10s
F4.24	differential time (Td)	0.00～10.00s	0.00s

Proportional gain (Kp): decides the adjustment intensity of the whole PID adjuster, larger the P is, more intensity of adjustment. If this parameter is 100, which means when the deviation value between PID feedback quantity and given quantity is 100%, the adjustment range to the order of output frequency is the maximum frequency by PID adjuster (ignore the integration and differential effects).

Integral time (Ti): decides the integration adjustment speed to the deviation between PID feedback quantity and given quantity by PID adjuster. Integral time refers to when the deviation between PID feedback quantity and given quantity is 100%, the quantity of adjustment reaches to the maximum frequency (F0. 04) through consecutive adjustment of integration adjuster (ignore proportional and differential effects). Less time of integration, more intensity of adjustment.

Differential time (Td): decides the intensity of adjustment to the deviation changing rate between PID feedback quantity and given quantity by PID adjuster. Time of differential refers to if the feed-back quantity varies 100% within this time, the adjustment of the integration adjuster will be the maximum frequency (F0. 04) (ignore proportional and integration effects). Longer time of differential, more intensity of adjustment.

PID is the most common controlling method in process control, each part plays different role, in the bellowing, we will give a brief introduction to the theory and adjustment method:

Proportional adjustment (P): when the deviation rises in feedback and given, the adjustment quantity of output and deviation is in proportion, if the deviation is constant, so do quantity of adjust-ment. Proportional adjustment could response the changes of feedback promptly, but use proportional adjustment only can't guarantee the control without deviation. More proportional gains, faster of adjustment speed by the system, but vibration will also occure if too much. The adjustment method is: first to set a long enough time of integration, time of differential is 0, start the system by propor-tional adjustment only, then change the given quantity, and observe the stable deviation (static error) of feedback signal and given quantity. If the static error is accordance with the change of given quan-tity (eg. increase given quantity, the total feedback quantity will less than given quantity after the system becoming stable), more proportional gain will be increased continuely, in the contrast, to decrease the proportional gain, and repeat the above process, till to smaller static error (hard to eliminate the static error).

Integral time (I): when the deviation occurs between the feedback and given, the output adjustement accumualates consecutively, if the deviation lasts, the quantity of adjustment should be increased continuely till the deviation disappears, integration adjuster could eliminate the static error effectively. But if the integration adjuster is over strong, which will make an unstable system till to viberations. The characteristics of vibration which made by over strong integration effect is that the feedback signal swings up and down around the given quantity, the swing range increases gradually and result in vibration. Generally, the adjustment of integration time parameter is from big to small, adjust the time of integration gradually, and observe the effectiveness of adjustment, till to meet the speed requirement of a stable system.

Differential time (D): when the deviation occurs in the feedback and given, the adjustment quantity of output and deviation changing rate is in proportion, this adjustment quantity only relates to the direction and scale of changing deviation, nor deviation's direction and scale themselves. Differential adjustment works to prevent the change of feedback signal according to the changing tendency when the the feedback signal changes. Please be careful enough to use the differential adjuster, since the differential adjustment is easy to enlarge the disturbance of the system, especially the disturbance of highly changed frequency.

Function Code	Name	Setting range	Factory setting
F4.25	sampling cycle (T)	0.01～100.00s	0.10s
F4.26	PID control bias limit	0.0～100.0%	5.0%

Sampling cycle (T): refers to the sampling period of feedback quantity, the adjuster would run once in each sampling period. Longer sampling period, slower the response is.

PID control bias limit: the permitted maximum deviation quantity based on the output of PID system relatives to closed-loop given quantity, as the bellowing chart shows, within the deviation limit, PID adjuster will stop adjusting. Set this function reasonably could adjust the accuracy and stability of PID system.

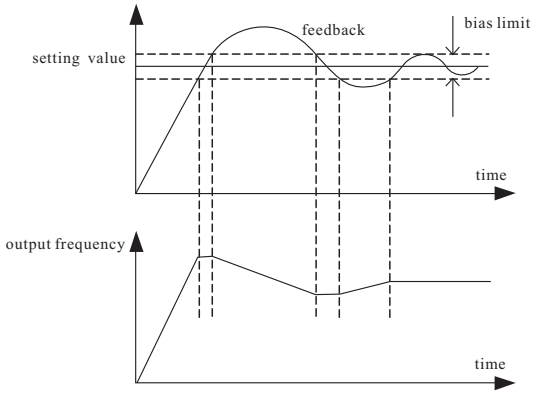


Figure 6-19 corresponding relationship between bias limit and output frequency

Function Code	Name	Setting range	Factory setting
F4.27	feedback lost detecting value	0.0～100.0%	0.0%
F4.28	feedback lost detecting time	0.0～3600.0s	1.0s

Feedback lost detecting value: this value is based on full scale (100%), the system keeps detecting the feedback quantity of PID, when the feedback value is smaller or equal to feedback lost detecting value, the system will start to timing the inspection. When the detecting time exceeds the time of feedback lost detecting, the system will reflect the fault of PID feedback lost detecting (E02E).

Function Code	Name	Setting range	Factory setting
F4.29	multi-step speed 0	-100.0～100.0%	0.0%
F4.30	multi-step speed 1	-100.0～100.0%	0.0%
F4.31	multi-step speed 2	-100.0～100.0%	0.0%
F4.32	multi-step speed 3	-100.0～100.0%	0.0%
F4.33	multi-step speed 4	-100.0～100.0%	0.0%
F4.34	multi-step speed 5	-100.0～100.0%	0.0%
F4.35	multi-step speed 6	-100.0～100.0%	0.0%
F4.36	multi-step speed 7	-100.0～100.0%	0.0%
F4.37	multi-step speed 8	-100.0～100.0%	0.0%
F4.38	multi-step speed 9	-100.0～100.0%	0.0%
F4.39	multi-step speed 10	-100.0～100.0%	0.0%
F4.40	multi-step speed 11	-100.0～100.0%	0.0%
F4.41	multi-step speed 12	-100.0～100.0%	0.0%
F4.42	multi-step speed 13	-100.0～100.0%	0.0%
F4.43	multi-step speed 14	-100.0～100.0%	0.0%
F4.44	multi-step speed 15	-100.0～100.0%	0.0%

Note: the symbol of multi-stage speed decides the running direction. If the symbol is a negative value, means contrast direction. 100% frequency corresponds to the the maximum frequency (F0. 04).

If S1=S2=S3=S4=0FF, select the ways of frequency's input by code F0. 03. If we run in multi-stage speed mode when not all the terminals S1, S2, S3 and S4 are in OFF, multi-stage speed is prior to frequency input by keyboard, analog and communication. We can choose 16 stages of speed at most if code by combination of S1, S2, S3 and S4.

Function code F0. 01 also decides the selection of starting the parking channel when in multi-stage speed mode, the control process of multi-stage speed is shown in chart 6-20. The relationship between terminal S1, S2, S3 and multi-stage speed as show bellow.

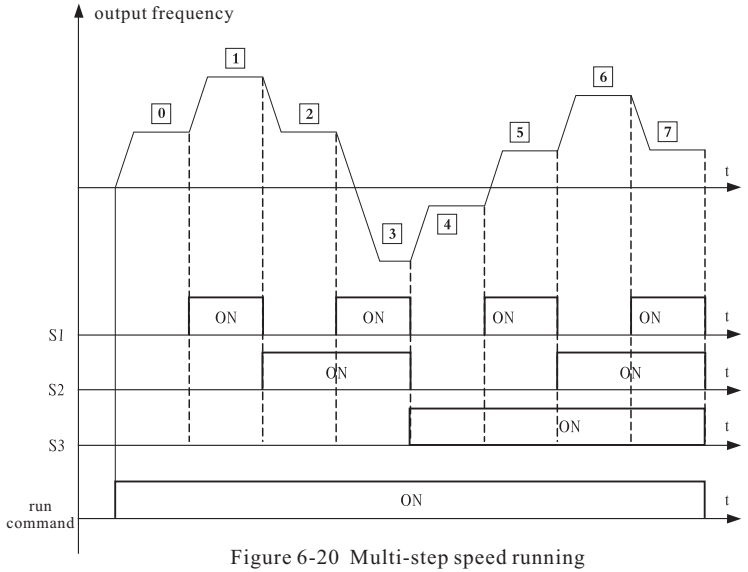


Figure 6-20 Multi-step speed running

Logic constitution diagram of 16-step speed:

S1	S2	S3	S4	Current step speed
OFF	OFF	OFF	OFF	0-step speed
ON	OFF	OFF	OFF	1-step speed
OFF	ON	OFF	OFF	2-step speed
ON	ON	OFF	OFF	3-step speed
OFF	OFF	ON	OFF	4-step speed
ON	OFF	ON	OFF	5-step speed
OFF	ON	ON	OFF	6-step speed
ON	ON	ON	OFF	7-step speed
OFF	OFF	OFF	ON	8-step speed
ON	OFF	OFF	ON	9-step speed
OFF	ON	OFF	ON	10-step speed
ON	ON	OFF	ON	11-step speed
OFF	OFF	ON	ON	12-step speed
ON	OFF	ON	ON	13-step speed
OFF	ON	ON	ON	14-step speed
ON	ON	ON	ON	15-step speed

F5 Protect function group

Function Code	Name	Setting range	Factory setting
F5.00	motor overload protection	0:disabled	1
		1:normal motor	
		2:variable frequency motor	

0: disabled. Without characteristics of motor overload protection (be cautious), at the time, the inverter is not able to protect the overload motor.

1: normal motor (with low-speed compensation). In view of the bad cooling while the general motor is in low-speed, the electronic thermal protection value needs to be adjusted accordingly, the characteristics of low-speed compensation here, means to lower the overload protection valve of the motor when under the running frequency of 30Hz.

2: variable frequency motor (without low-speed compensation). The cooling of variable frequency motor is not influenced by rotation speed, so there need not adjustment to the protection value when under low-speed running.

Function Code	Name	Setting range	Factory setting
F5.01	motor overload protection current	20.0~120.0%(motor rated current)	100.0%

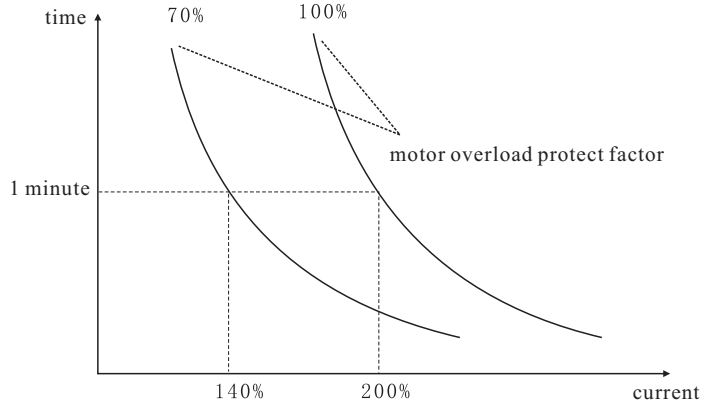


Figure 6-21 motor overload protect factor setting

This value will be acquired through the following formula:

Motor overload protection current= (permitted the maximum load current / rated current of motor)*100%

Generally, the permitted maximum load current is the rated current of the load motor.

If the rated current of the load motor is not compatible to the rated current of the inverter, the overload protection to the motor can be realized through setting the value of F5. 00~F5. 01.

Function Code	Name	Setting range	Factory setting
F5.02	threshold of trip-free	70.0~110.0%(standard bus voltage)	80.0%
F5.03	decrease rate of trip-free	0.00~F0.04 (max.frequency)	0.00Hz

If we set decrease rate of trip-free as 0, the function of recovery after instant power -off will be invalid.

Threshold of trip-free: refers to when we cut the power network, the busbar voltage declines to threshold of trip-free, the inverter starts to lower the running frequency according to decrease rate of trip-free (F5. 03) which keeps the motor in generating the power, enables the returned power to sustain the busbar voltage, make sure the inverter under normal running till it is re-charged.

Attention: adjust these two parameters properly could realize switching the power network, and won't trigger breakdown by inverter protection.

Function Code	Name	Setting range	Factory setting
F5.04	over-voltage stall protection	0: disabled	0
		1: enabled	
F5.05	over-voltage stall point	110~150%(380V series)	120%
		110~150%(220V series)	115%

During the running of inverter deceleration running, in view of inertia load, the actual decline rate of motor's rotation speed may lower than the decline rate of output frequency, at that time, the motor will return the power to the inverter, and result rise of the inverter's bus voltage. If we don't take any actions, the bus will be over-voltage and result in i nverter's trip consequently.

Over-voltage stall protection could inspect the bus voltage during the running of inverter, and compare with over-voltage stall protection point which defined in F5. 05 (relative to standard busbar voltage), if exceeds the point, the inverter's output frequency will stop declining. It will continue to run by declining speed when the inspection shows the bus voltage is lower than the point again.

See the bellowing chart:

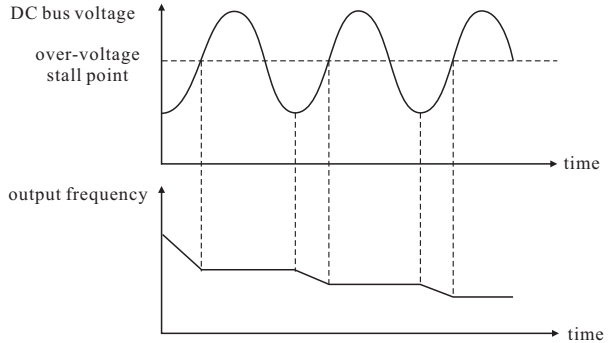


Figure 6-22 Over-voltage stall protection

Function Code	Name	Setting range	Factory setting
F5.06	over current stall selection	100～200%	160%
F5.07	over current stall prevention gain	0～100	5

During the running of the inverter, the actual rise rate of the motor's rotation speed is lower than output frequency in view of too much overload, if we fail to take any actions, acceleration crosscurrent fault will arise and result in inverter's trip.

Function of overcurrent stall protection will inspect the output current during the running of the inverter, and compare with the overcurrent stall point which defined in F5. 06, if exceeds the point, the output frequency of inverter will be declined according to overcurrent prevent stall gain (F5. 07), it will recover normal running after inspecting the output current lower than the point again. See the bellowing chart:

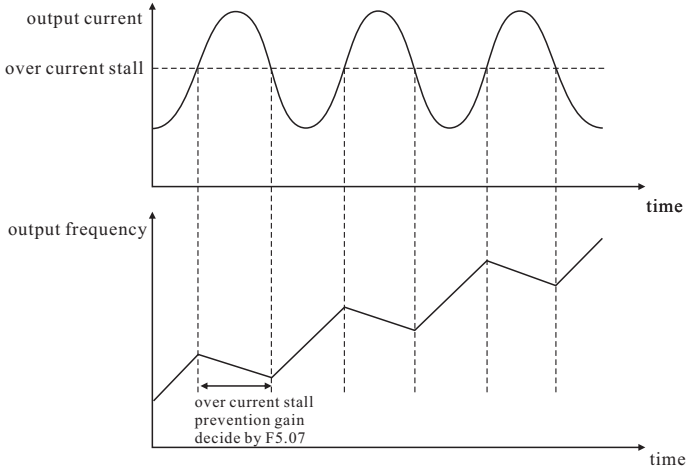


Figure 6-23 Over current stall protection

F6 Communication group

Function Code	Name	Setting range	Factory setting
F6.00	local address	1~247,0 is broadcast address	1

Set the local communication address as 0, means broadcast communication address when the mainframe is editing the frame. All other subsidiary machines on MODBUS mainline will accept the frame, but they won't response. Attention, the address of subsidiary machines can't be set as 0.

Local communication address is unique in the communication network, this is the basic to realize point-to-point communication between upper computer and inverter.

Function Code	Name	Setting range	Factory setting
F6.01	baud rate selection	0：1200BPS	3
		1：2400BPS	
		2：4800BPS	
		3：9600BPS	
		4：19200BPS	
		5：38400BPS	

This parameter is used to set the transmission speed rate between upper computer and inverter.

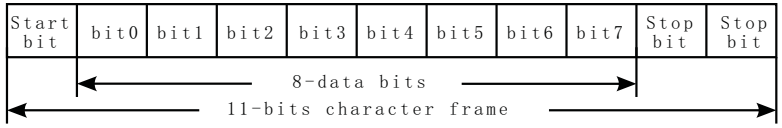
Function Code	Name	Setting range	Factory setting
F6.02	data format	0:no parity check(N,8,1)for RTU	0
		1:even parity check(E,8,1)for RTU	
		2:odd parity check(O,8,1)for RTU	
		3:no parity check(N,8,2)for RTU	
		4:even parity check(E,8,2)for RTU	
		5:odd parity check(O,8,2)for RTU	
		6:no parity check(N,7,1)for ASCII	
		7:even parity check(E,7,1)for ASCII	
		8:odd parity check(O,7,1)for ASCII	
		9:no parity check(N,7,2)for ASCII	
		10:even parity check(E,7,2)for ASCII	
		11:odd parity check(O,7,2)for ASCII	
		12:no parity check(N,8,1)for ASCII	
		13:even parity check(E,8,1)for ASCII	

Function Code	Name	Setting range	Factory setting
F6.02	data format	14:odd parity check(O,8,1)for ASCII	0
		15:no parity check(N,8,2)for ASCII	
		16:even parity check(E,8,2)for ASCII	
		17:odd parity check(O,8,2)for ASCII	

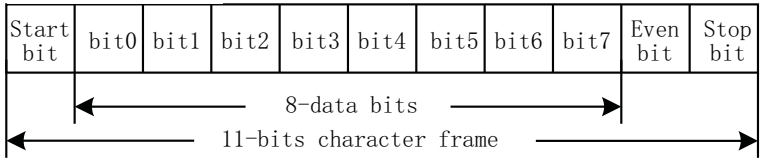
The data's format of upper computer and inverter should keep same, otherwise communica -tion is invalid.

11-bits(for RTU)

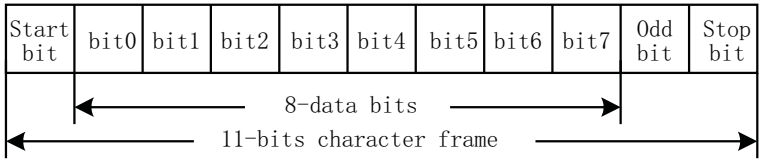
Data's format:8-N-2



Data's format:8-E-1

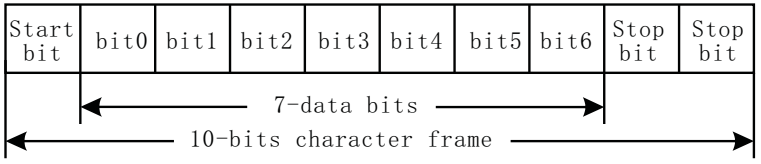


Data's format:8-0-1

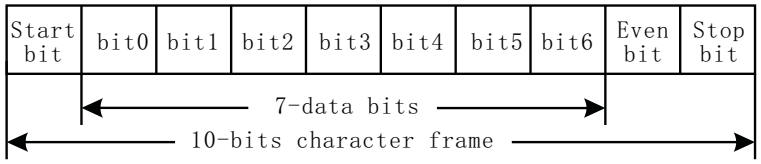


10-bits(for ASCII)

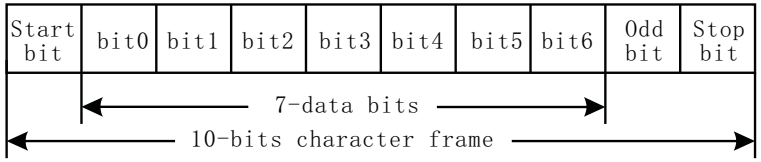
Data's format:7-N-2



Data's format:7-E-1



Data's format:7-0-1



Function Code	Name	Setting range	Factory setting
F6.03	communication delay time	0～200ms	5ms

Communication delay : refers to the interval time from accepting the data by inverter to sending the response data to upper computer. If the response delay is shorter than the handling time by system, the response delay will submit to the handling time by system, in the contrast, if the response delay is longer, the system needs to wait after processing the data till the response delay time is up, then to send the data to upper computer.

Function Code	Name	Setting range	Factory setting
F6.04	communication timeout delay	0.0(disabled),0.1~100.0s	0.0s

The parameter of communication timeout time will be invalid if set this function code as 0. 0s.

If this function code is a valid value, the interval time between two communications exceeds the time of communication timeout, the system will show communication fault error (E018).

In general circumstances, we will set to invalid. If we set this parameter in a consecutive communication system, it will supervise the communication status.

Function Code	Name	Setting range	Factory setting
F6.05	communication error action	0: alarm and coast to stop	1
		1: no alarm and continue to run	
		2: no alarm but stop according to stop mode(communication mode only)	
		3: no alarm but stop according to stop mode(all control mode)	

The inverter could continue running through setting protection actions in order to shield fault alarm and stop in abnormal communication situations.

Function Code	Name	Setting range	Factory setting
F6.06	communication response action	0:have response when write	0
		1:no response when write	

The inverter will respond both writing and reading orders from upper computer when this function code is 0.

The inverter will only respond the reading order from upper computer, no reaction to the reading order when the function code is 1, it'll improve communication efficiency through this method.

F7 high-level function group

F7. 00~F7. 05 are factory default which set by the factory only, the users are not authorized to operate.

Function Code	Name	Setting range	Factory setting
F7.06	underload detection	0~100.0%(corresponding motor rated current)	0
F7.07	underload detection time	0～999.9s	0
F7.08	underload function selection	0:disabled	0
		1:stop output,no alarm	
		2:stop output,alarm	

The torque of the motor will decline when lower or transfer the load.

The inverter will start underload protection when the load is lower than the value of F7. 06, and after keeping the time of F7. 07.

Function Code	Name	Setting range	Factory setting
F7.09	over- torque detection	0~150.0%(corresponding motor rated current)	0
F7.10	over- torque detection time	0～999.9s	0
F7.11	over-torque function selection	0:disabled	0
		1:stop output,no alarm	
		2:stop output,alarm	

The inverter will start over torque protection if the torque is higher than the value of F7. 09 and after keeping the time of F7. 10.

Function Code	Name	Setting range	Factory setting
F7.12	high pressure reached test	0～100.0	0
F7.13	low pressure reached test	0～100.0	0
F7.14	pressure reached test range	0～100.0	0
F7.15	relay 1 close delay (RA*RB*RC)	0～25.0s	0.0
F7.16	relay 1 break delay (RA*RB*RC)	0～25.0s	0.0
F7.17	relay 2 close delay (TA*TB*TC)	0～25.0s	0.0
F7.18	relay 2 break delay (TA*TB*TC)	0～25.0s	0.0
F7.19	start delay setting	0～60.0s	0.0
F7.20	allowed start pressure	0～100.0	0
F7.21	sleep test frequency	0~max.frequency	0
F7.22	sleep test delay	0～999.9s	0

The inverter will stop output and show "EOPP", then turn to sleeping status when the output frequency is lower than the frequency setted in F7. 21, and after keeping F7. 22 delay.

Note: either F7. 21 or 7. 22 is 0, the sleeping function won't work.

Function Code	Name	Setting range	Factory setting
F7.23	wake pressure	0～100	0
F7.24	wake test delay	0～999.9s	0

If we choose mode of positive characteristics, the inverter will remove sleeping status, and re-start to output when the feedback value is lower than the value of F7. 23, and after keeping F7. 24 time-delay;

If we choose mode of negative characteristics, the inverter will remove sleeping status, and re-start to output when the feedback value is larger than the value of F7. 23, and after keeping F7. 24 time-delay.

Note: either F7. 23 or F7. 24 is 0, the wake function won't work.

Function Code	Name	Setting range	Factory setting
F7.25	water shortage test delay	0～999.9s	0

When the output frequency runs on upper limit of frequency, the inverter will stop output, and show alarm of "EOP2" if the feedback pressure still has not reached the given value, and after keeping F7. 25 time-delay.

Function Code	Name	Setting range	Factory setting
F7.26	PID adjust range	0～50.0	10.0

Set the effective PID adjust range in order to improve the controllability of speed acceleration and decline out of the range, the time of speed acceleration and decline which out of the range will submit to F4. 00/F4. 01, time of speed acceleration and decline within the range could be realized through setting the parameter of F4. 22~FF4. 24.

Function Code	Name	Setting range	Factory setting
F7.27	enabled when setting frequency is lower than lower limit frequency	0:run according to lower limit frequency	1
		1:stop	
		2:emergency stop	

Choose the running status of the inverter when the setting frequency is lower than the bottom limit.

We could choose this function to stop the machine in order to prevent the motor running in low speed for a long time.

Function Code	Name	Setting range	Factory setting
F7.28	sleep signal selection	0:select internal sleep signal	0
		1:select external sleep signal	
		2:internal and external are valid	
F7.29	program run mode	0:program run invalid	0
		1:cycle run	
		2:program cycle once,then stop	
		3: program cycle once,then run on select speed	

This parameter is used to choose the running mode of the programme.

The programme will run in multi-stage speed which setted by F7. 48 parameter after one cycle running.

The setting range of F7. 48 parameter is 0~7, corresponds to 8 stages of speed which listed in F4. 29~F4. 36. Parameter F4. 36 should be non 0, could the function work according to selected stage of speed after one cycle running.

Function Code	Name	Setting range	Factory setting
F7.30	first running time	0～999.9	0
F7.31	first-step running time	0～999.9	0
F7.32	second-step running time	0～999.9	0
F7.33	third-step running time	0～999.9	0
F7.34	fourth-step running time	0～999.9	0
F7.35	fifth-step running time	0～999.9	0
F7.36	sixth-step running time	0～999.9	0
F7.37	seventh-step running time	0～999.9	0

Under the Running of Programme:

Skip the step when the running time is set to 0, if all are 0, the programme won't work. The parameter which corresponds to frequency from the initial step to the 7th step in the programme is F4. 29 to F4. 36.

Function Code	Name	Setting range	Factory setting
F7.38	program lost memory selection	0:memory when power lost	0
		1:no momory when power lost	

Programme of power-off memory refers to whether to memorize the programme's operation status before power-off.

Function Code	Name	Setting range	Factory setting
F7.39	program run time unit	0:s (display timing by add)	2
		1: min (display timing by add)	
		2:s (display timing by minus)	
		3: min (display timing by minus)	
F7.40	input phase-failure protection and output terminal polarity selection	0:input default protection is valid when close	0
		1:input default protection is valid when open	
		2:input default protection is invalid when close	
		3:input default protection is invalid when open	

Note: close the over modulation could lower the harmonic wave from the inverter, as well as the induced electricity generated by inverter. Open the over modulation could improve the output voltage of the inverter, the equipment shall open the over modulation function if grounded, which could enable the maximum output voltage of the inverter, as well as the maximum output torque.

Function Code	Name	Setting range	Factory setting
F7.41	output phase-failure protection function	0:close 1: open	1
F7.42	output power monitor gain adjustment	0.0-150.0	9.2
F7.43	oscillation suppression function	0:close 1: open	1
F7.44	oscillation suppression gain	0-500	200

Function F7. 42 is used to supervise the output frequency of the inverter, make sure the actual output function is accordance with the data displays through adjusting this parameter. Display function ≈Uo*Io*l. 732*F7. 41*0. 1

Function Code	Name	Setting range	Factory setting
F7.45	lifting early function	0:close 1: open	0
F7.46	lifting early frequency	0-10.00Hz	3.00
F7.47	lifting early excitation current	0-100.0%	50.0%
F7.48	selection speed after program run cycle once	0～7	0

In crane industry, in order to guarantee enough torque of the motor to prevent "slide hook" when opens the lifting arms, we need to do early excitation to the motor before outputting the signal to lifting arms, the function code of output signal of lifting arms is F2. 19=28.

In crane industry, in order to guarantee the output torque of the motor, we need to choose to use vector control mode, and learn the parameters of the motor by ourselves.

Chapter 7 Fault Diagnosis and Trouble Shooting

BD330 series of inverter have a total of 26 fault information and protection function. Once the abnormal fault happens, protection function works, and the inverter stops output, inverter fault and shows the fault code on the display panel of inverter. You could first of all inspect by yourself according to the tips in this section, analyze the cause of the fault, and then find out the solution. If it belongs to the stated reason in dotted box, please seek service, and contact with the agent of your purchased inverter or directly with our company.

7.1 Fault code:

DC bus under-voltage (E001)	external fault (E00D)	brake unit fault(E01A)
over-voltage when ACC(E002)	EEPROM fault(E00F)	over torque protection(E022)
over-current when ACC(E004)	input side default phase(E012)	underload protection(E027)
over-current when DEC(E005)	output side default phase(E013)	PID feedback fault(E02E)
motor overload(E007)	current detection fault(E015)	PID control sleeping(EOPP)
inverter overload(E008)	motor self-learning fault(E016)	water shortage protection (EOP2)
over-voltage when constant speed running (E003)	over-current when constant speed running (E006)	contravariant module over heating (E01E)
over-voltage when DEC(E00A)	rectify module over heating (E00E)	contravariant unit ph-W protection(E029)
communication fault(E018)		

7. 2 Common faults and processing methods

Inverter may encounter the following fault conditions in the process of using, please make simple fault analysis refer to the following methods:

1. No display when power on:

1) Check with a multimeter whether the inverter input power is consistent with rated voltage of inverter. If the power supply has any problems, please check and rule out.

2) Check whether the three-phase rectifier bridge is in good condition. If the rectifier bridge has blasted, please seek service.

3) Check whether the charge lamp is lit. if the light is not bright, fault generally focus on the rectifier bridge or buffer resistance. If the light is bright, the fault may be in switch power supply, please seek service.

2. The air switch of power supply trips after power on:

1) Check whether the input power supply has grounding or short circuit problem, and eliminate the problems.

2) Check whether the rectifier bridge is breakdown, if damaged, please seek service.

3. The motor does not turn after inverter running:

1) Check whether there is a balanced three-phase output between U, V, W. if yes, the motor line or itself is damaged, or motor is blocked due to mechanical trouble. If yes, please rule out.

2) If there is output but imbalanced three-phase, the inverter drive board or output module is damaged, please seek service.

3) If there is no output voltage, the drive board or output module may be damaged, please seek service.

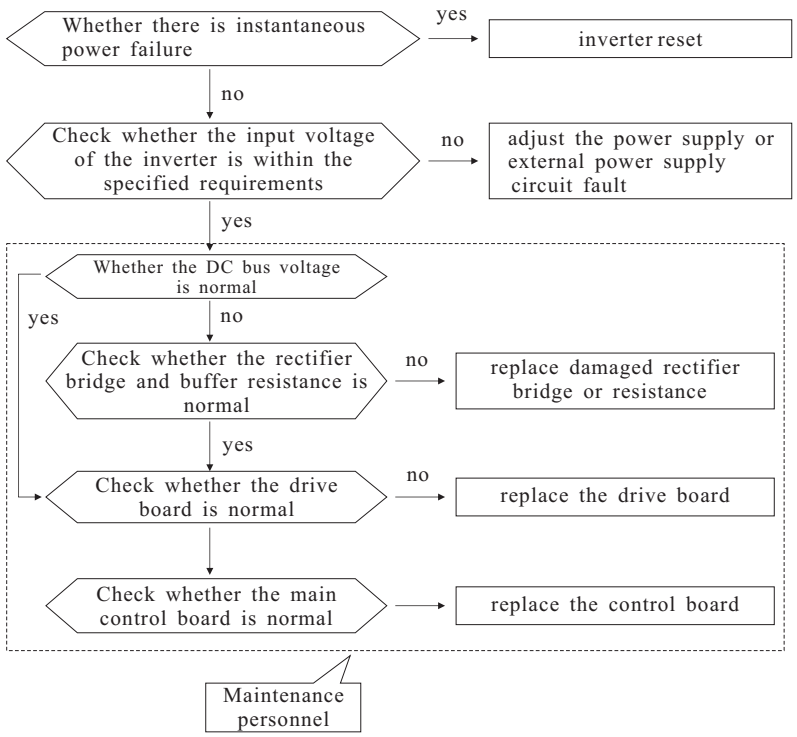
4. Inverter shows abnormal when power on, the air switch of power supply trips after running:

1) Check whether there is a short circuit between the output module. If yes, please seek service.

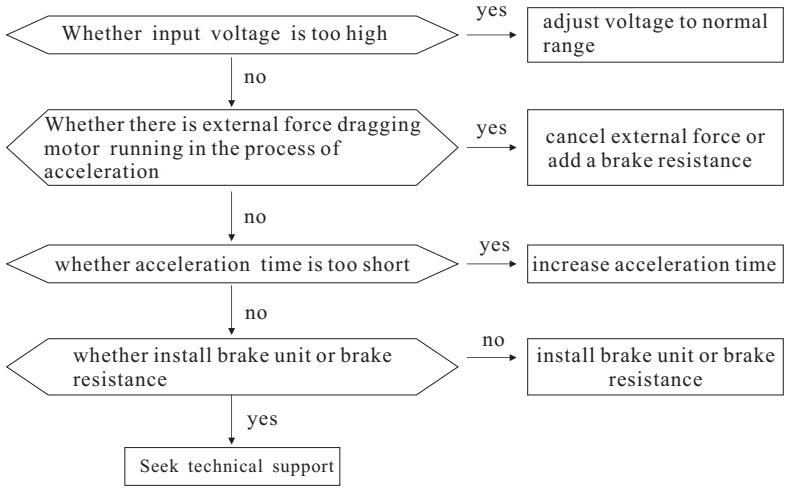
2) Check whether there is a short circuit or grounding between motor lead. If yes, please rule out.

3) If the trip is occasionally happened and it is relatively far distance between the motor and inverter, consider adding an output AC reactor.

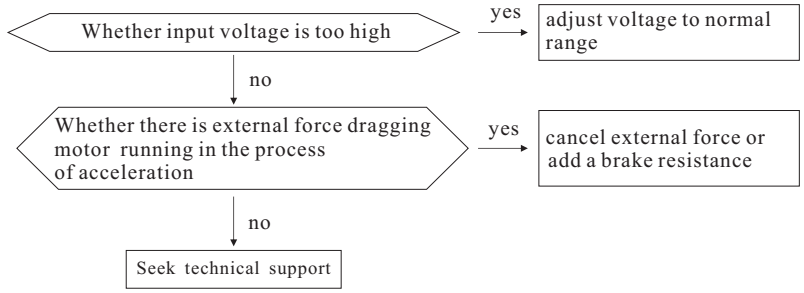
1.DC bus under-voltage (E001)



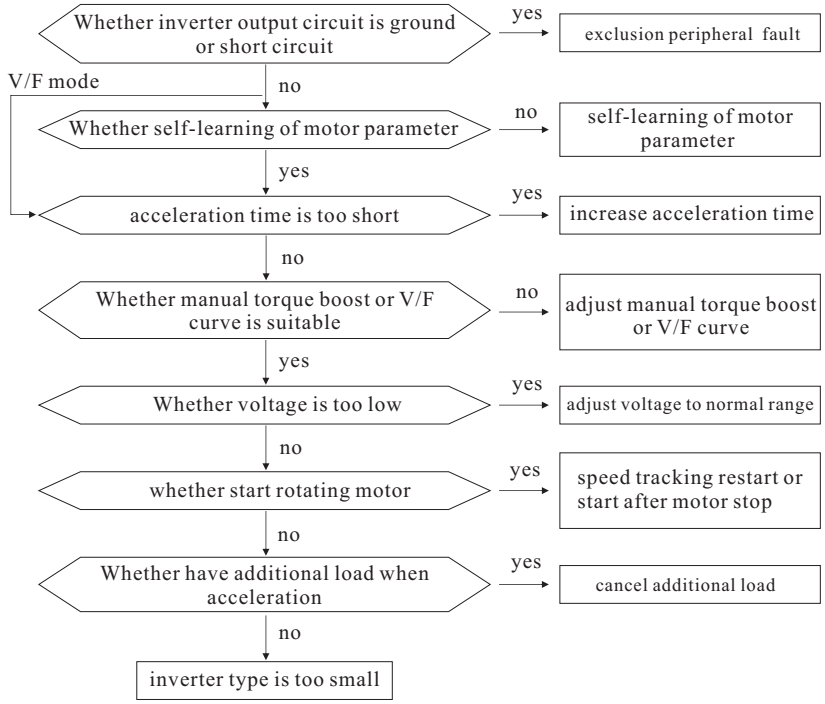
2.Over-voltage when ACC(E002)



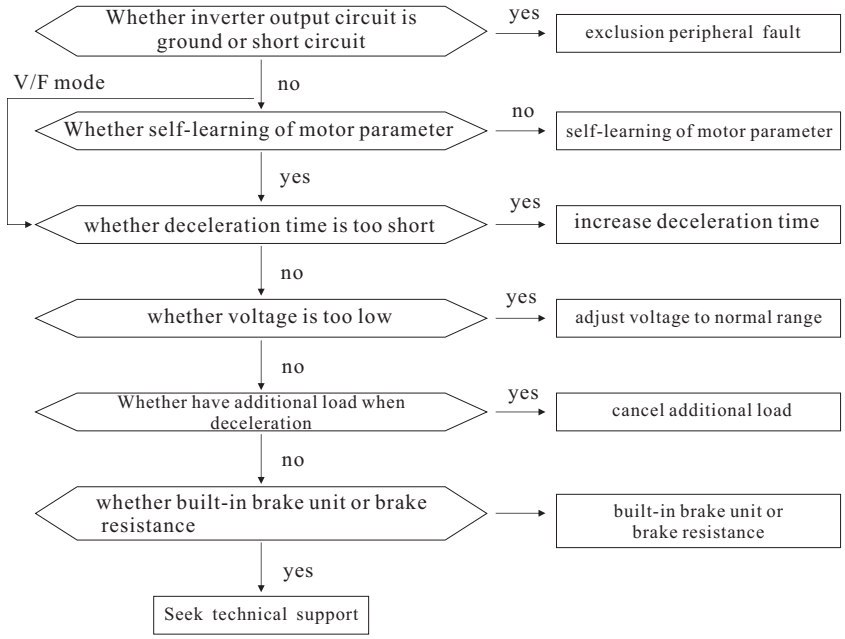
3.Over-voltage when constant speed running (E003)



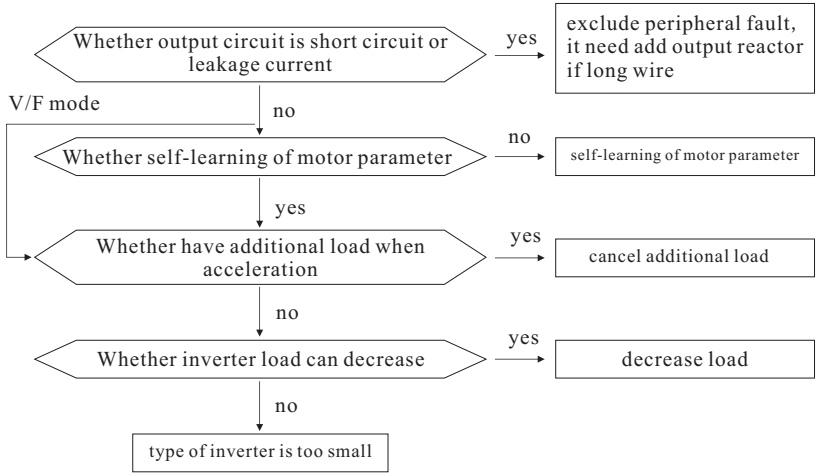
4.Over-current when ACC(E004)



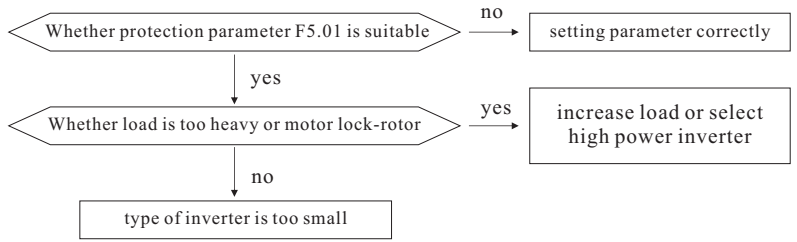
5.Over-current when DEC(E005)



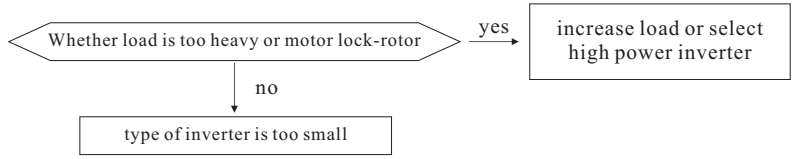
6.Over-current when constant speed running (E006)



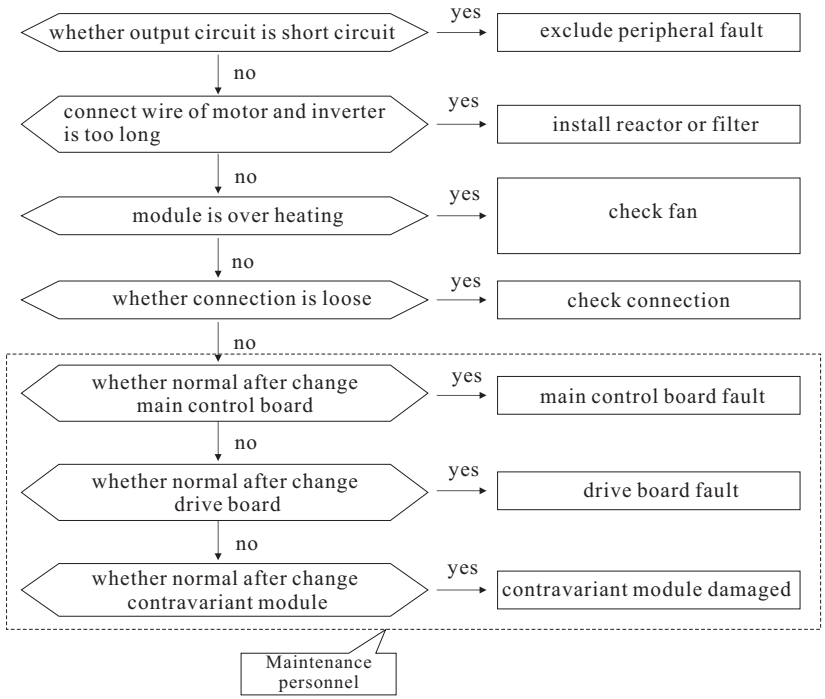
7.Motor overload(E007)



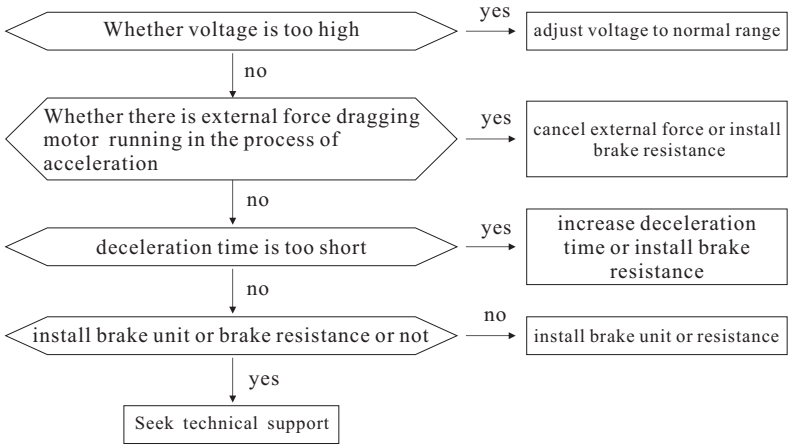
8.Inverter overload(E008)



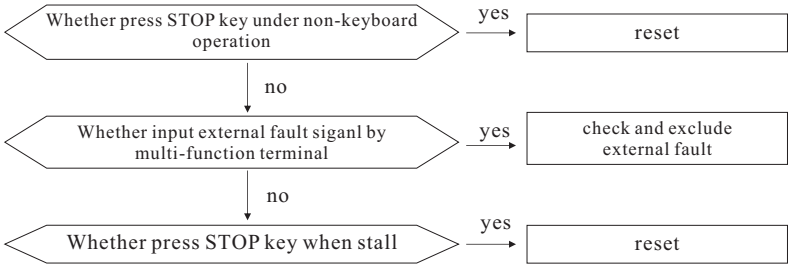
9.Contravariant unit protection(E009,E019,E029)



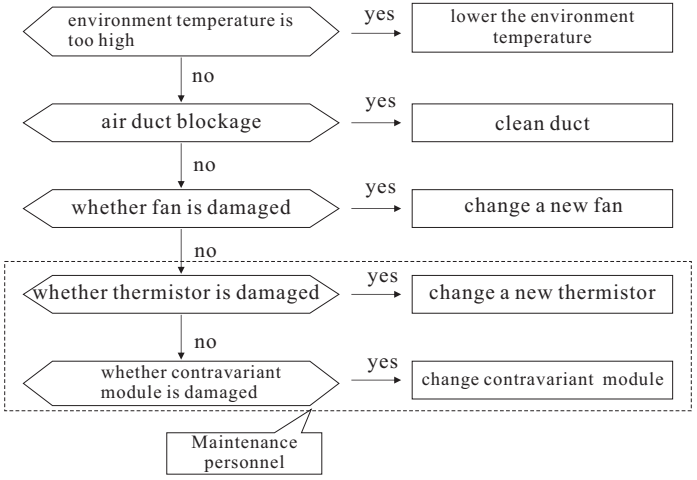
10.Over-voltage when DEC(E00A)



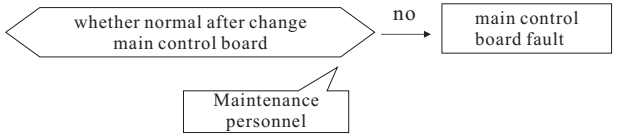
11.External fault (E00D)



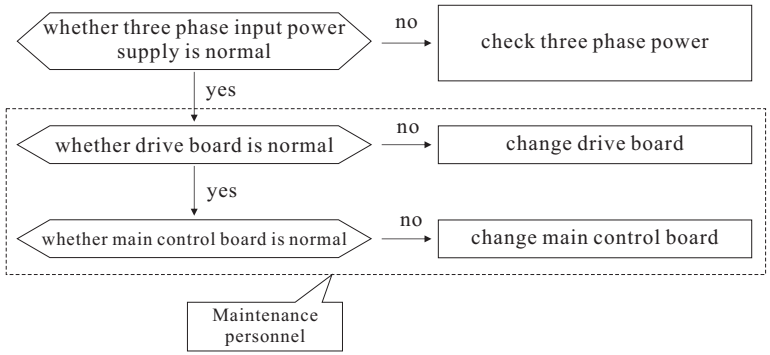
12.Rectify module over heating(E00E)



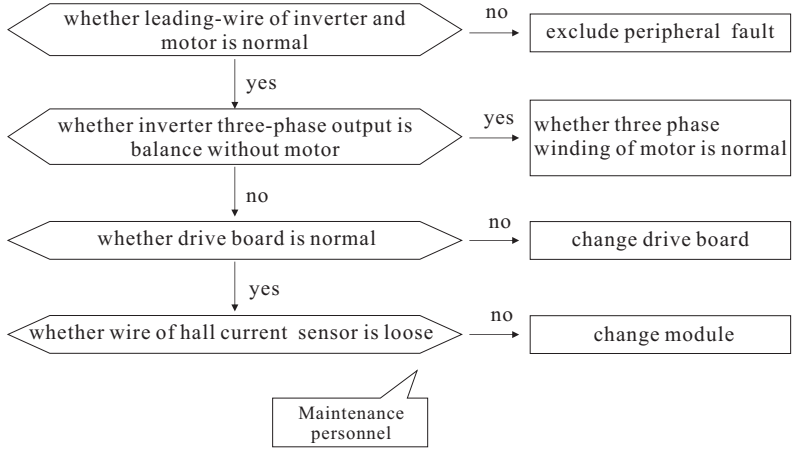
13.EEPROM fault(E00F)



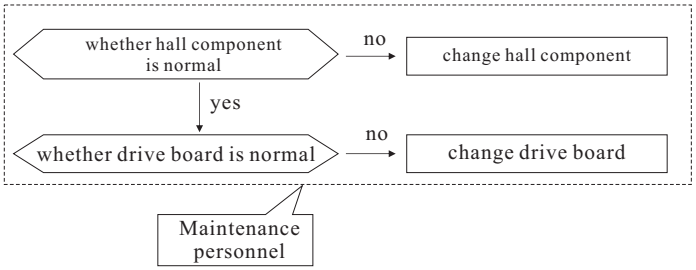
14.Input side default phase(E012)



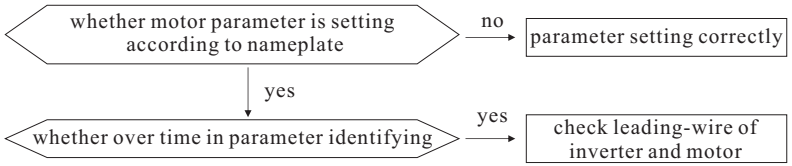
15.Output side default phase(E013)



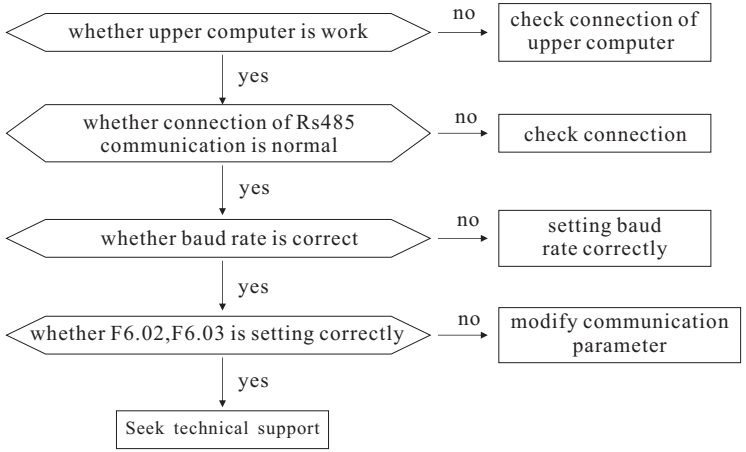
16.Current detection fault (E015)



17.Motor self-learning fault(E016)



18.Communication fault (E018)



Appendix A Serial Communications

BD330 series inverter, provide the RS485 communication interface, and adopt the ModBus communication protocol of international standard to make master-slave communi-cation. Users can realize centralized control by PC/PLC, upper computer controlling and so on(set the controlling command, operation frequency, correlation function code parame-ters change, inverter working state and fault information monitoring, etc.), so as to adapt to specific application requirements.

1. Protocol content

The Modbus serial communication protocol defines the frame content and using form of asynchronous transmission in serial communication, including: host polling and broadcast frame, slave response frame format; frame content of host organization includes: slave address (or the broadcast address), performing commands, data and error checking, etc.; slave response is also using the same structure, content including: action confirmation, data returning and error checking, etc. if error happens when slave is receiving frame, or cannot achieve the requirements of the host, it will organize a fault frame as a response feedback to the host.

2. Application way

BD330 series inverter access the controlling network of "single master multiple slave" with RS232/RS485 bus.

3. Bus structure

(1) The interface way

RS485 hardware interface

(2) Transmission mode

Asynchronous serial and half-duplex transmission mode. At the same time only one between the host and the slave can send data and the other receives data. In the process of serial asynchronous communication, data is sending in the form of message, and frame by frame.

(3) Topological structure

Single master multiple slave system. Slave address set range from 1～247, 0 as the broadcast address, and each slave address in the network has uniqueness. This is the foundation of guaranteeing Modbus serial communication.

4. Protocol specification

The communication protocol of BD330 series of inverter is a kind of master-slave Modbus communication protocol with asynchronous serial, and in the network only one device (host) can establish protocol (called "query/command"). Other device (slave) can only respond to "query/command" of the host with the provided data, or make corresponding action according to the "query/command" of the host. Host here refers to the personal computer (PC), industrial control equipment or programmable logic controller (PLC), etc., and slave refers to BD330 series inverter or other controlling equipment of the same communication protocol. Host can not only separately communi-cate with a certain slave, but also can release broadcast information to all slaves. For the separately "query/command" of the host, slave should return a information (called response), and for broadcast information of the host, the slave does not have to feedback information to the host.

5. Communication frame structure

The Modbus protocol communication data format of BD330 series inverter is divided

into two communication mode, one is RTU mode (remote terminal units) and the other is ASCII mode (American Standard Code for Information International Interchange). In the RTU mode, the format of each byte is as follows:

Coding system: 8 bit binary,

Hexadecimal 0～9, A～F

Each of the 8 bit frame includes two hexadecimal characters.

In the ASCII mode, the format of each byte is as follows:

Coding system: communication protocol belongs to the hexadecimal, characters implication of ASCII information:

"0"…"9", "A"…"F"each hexadecimal represents each ASCII information, For example:

Character	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'	'8'	'9'
ASCII CODE	0x30	0x31	0x32	0x33	0x34	0x35	0x36	0x37	0x38	0x39
Character	'A'	'B'	'C'	'D'	'E'	'F'				
ASCII CODE	0x41	0x42	0x43	0x44	0x45	0x46				

The byte bit:

Including the start bit, seven or eight data bits, check bit and stop bits.

Deduction of bytes bit is as follows:

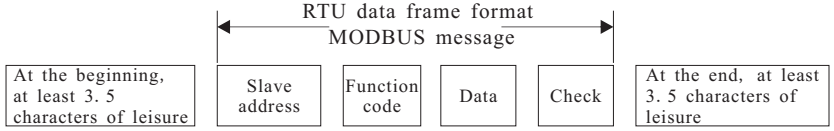
11-bit character frame:

Start bit	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	No check bit Even check bit Odd check bit	Stop bit

10-bit character frame

Start bit	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	No check bit Even check bit Odd check bit	Stop bit

In RTU mode, new information always becomes silent for at least 3.5 bytes of transmis-sion time as a start. In the network that calculates transmission rate by baud rate, transmission time of 3.5 bytes can be easily grasped. And then the transmitted data fields are, in order: slave address, operation command code, data and CRC check words, transmitted bytes of each domain are hexadecimal 0...9, A...F. network device always monitors the activities of the communication bus, even in the silent intervals. When receiving the first field (address information), each network device will conform the byte. With the last byte transmission completion, a similar 3.5 bytes of transmission time interval is used to show the end of the frame. After this, the transmission of a new frame will start.

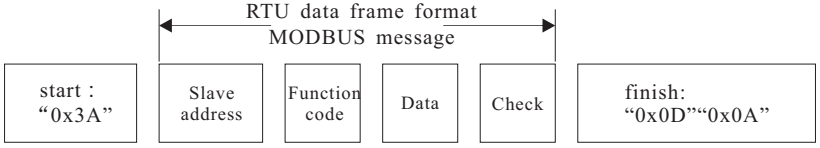


Information of a frame must be transmitted in a continuous flow of data. If the interval is more than 1. 5 bytes before the end of the whole frame transmission, the receiving device will remove the incomplete information, and mistakenly consider the following byte to be part of a new frame address. In the same way, if the interval between the start of a new frame and previous frame is less than 3. 5 bytes, receiving device will consider it to be a continuation of the previous frame. Because of the frame disorder, the final CRC check value is not correct, which will lead to communication fault.

The standard structure of RTU frame

START	T1-T2-T3-T4(3. 5 bytes of transmission time)
SLAVE ADDR	Communication address : 0～247(decimal) (0 is the broadcast)
CMD	03H : read slave parameters : 06H : write slave parameters
DATA(N-1) … DATA(0)	2*N bytes of data, This part is the main content of communication, And also the core of data exchange.
CRC CHK low-order	Check value: CRC check value (16BIT)
CRC CHK high-order	
END	T1-T2-T3-T4(3. 5 bytes of transmission time)

In ASCII mode, the start is “:” (“0X3A”), and the end default is “CRLF” (“0x0D”“0X0A”). In ASCII mode, except the start and end, all the rest of the data bytes send in ASCII way, firstly send higher tuple, and then send the low 4 tuple. In ASCII mode, data is 7 or 8 bit length. ‘A’～ ‘F’adopts its uppercase ASCII. At the same time, data adopts LRC check, covering from slave address to information of data. The checksum is equal to complement of characters of all participated check data (abandon carry bit).



The standard structure of ASCII frame:

START	’:’ (0x3A)
Address Hi	Communication address: 8-bit address is combined by two ASCII code
Address Lo	
Function Hi	Function code: 8-bit address is combined by two ASCII code
Function Lo	
DATA (0) … DATA (N-1)	The data content : nx8-bit data content is combined by 2n ASCII code n<=16 , maximum 32 ASCII code
LRC CHK Hi	LRC check code : 8-bit check code is combined by 2 ASCII code
LRC CHK Lo	
END Hi	END Hi=CR(0x0D), END Lo=LF(OxOA)
END Lo	

6. The command code and communication data description

6. 1 command code: 03H(0000 0011), read N words (at most continuously read 16 words). For example, the inverter of which slave address is 01H, memory starting address is 0004, when continuously reading two words, and then the structure of this frame is described as below:

RTU host command information

START	T1-T2-T3-T4(3. 5 bytes of transmission time)
ADDR	01H
CMD	03H
Starting address high-order	00H
Starting address low-order	04H
Number of data high-order	00H
Number of data low-order	02H
CRC CHK low-order	85H
CRC CHK high-order	CAH
END	T1-T2-T3-T4(3. 5 bytes of transmission time)

RTU slave response information

START	T1-T2-T3-T4(3.5 bytes of transmission time)
ADDR	01H
CMD	03H
Number of bytes	04H
Data address 0004H high-order	00H
Data address 0004H low-order	00H
Data address 0005H high-order	00H
Data address 0004H low-order	00H
CRC CHK low-order	FAH
CRC CHK high-order	33H
END	T1-T2-T3-T4(3.5 bytes of transmission time)

The ASCII host command information

START	':'
ADDR	'0'
	'1'
CMD	'0'
	'3'
Starting address high-order	'0'
	'0'
Starting address low-order	'0'
	'4'
Number of data high-order	'0'
	'0'
Number of data low-order	'0'
	'2'
LRC CHK Hi	'F'
LRC CHK Lo	'6'
END Lo	CR
END Hi	LF

ASCII slave response information

START	':'
ADDR	'0'
	'1'
CMD	'0'
	'3'
Number of bytes	'0'
	'4'
Data address 0004H high-order	'0'
	'0'
Data address 0004H low-order	'0'
	'0'
Data address 0005H high-order	'0'
	'0'
Data address 0004H low-order	'0'
	'0'
LRC CHK Hi	'46'
LRC CHK Lo	'8'
END Lo	CR
END Hi	LF

6.2 command code: 06H(0000 0110), write a word

For example, write 5000(1388H) in 0007H address of inverter that the slave address is 02H

Then the frame structure is described as below:

RTU host command information

START	T1-T2-T3-T4(3.5 bytes of transmission time)
ADDR	02H
CMD	06H
Write data address high-order	00H
Write data address low-order	07H
Data content high-order	13H
Data content low-order	88H

CRC CHK low-order	35H
CRC CHK high-order	6EH
END	T1-T2-T3-T4(3.5 bytes of transmission time)

RTU slave response information

START	T1-T2-T3-T4(3.5 bytes of transmission time)
ADDR	02H
CMD	06H
Write data address high-order	00H
Write data address low-order	07H
Data content high-order	13H
Data content low-order	88H
CRC CHK low-order	35H
CRC CHK high-order	6EH
END	T1-T2-T3-T4(3.5 bytes of transmission time)

ASCII host command information

START	':'
ADDR	'0'
	'2'
CMD	'0'
	'6'
Write data address high-order	'0'
	'0'
Write data address low-order	'0'
	'7'
Data content high-order	'1'
	'3'
Data content low-order	'8'
	'8'
LRC CHK Hi	'5'
LRC CHK Lo	'6'
END Lo	CR
END Hi	LF

ASCII slave response information

START	':'
ADDR	'0'
	'2'
CMD	'0'
	'6'
Write data address high-order	'0'
	'0'
Write data address low-order	'0'
	'7'
Data content high-order	'1'
	'3'
Data content low-order	'8'
	'8'
LRC CHK Hi	'5'
LRC CHK Lo	'6'
END Lo	CR
END Hi	LF

6.3 communication frame error checking methods

Frame error checking way mainly includes two parts, namely the byte bit checking (odd/even check) and the whole data of frame checking (CRC check or LRC check).

6.3.1 byte bit check

Users can choose different checking ways according to their requirements, and also can choose no check, which will affect check setting of every byte.

The meaning of even check: add an even check bit before data transmission, which is used to represent whether the number of "1" is odd or even in data transmission. For even number, the check position sets "0", otherwise sets "1", so as to keep the data parity the same.

The meaning of odd check: add an odd check bit before data transmission, which is used to represent whether the number of "1" is odd or even in data transmission. For odd number, the check position sets"0", otherwise sets"1", so as to keep the data parity the same.

For example, when transmitting "11001110", data contains five "1", if using even check, its even check bit is "1", if using odd check, its odd check bit is "0". During data transmission, odd-even check bit is located in the check position of frame after calculation, and receiving device also must carry in the parity, if the data parity received is inconsistent with presetting, an error has occurred in communication.

6. 3. 2 CRC checking methods---CRC(Cyclical Redundancy Check):

Use the RTU frame format, and frame contains frame error detection domain based on CRC calculation. CRC domain detects the content of the entire frame. CRC domain is two bytes, containing 16 bit binary value. It joins the frame after calculated by the transmission equipment, and the receiving device recalculates CRC of the received frame, and compared with the received value of CRC domain, if the two CRC value is not equal, then there is an error in transmission.

CRC is deposited in the OxFFFF first, and then process more than six consecutive bytes of the frame with the value of current register. Only 8 bit data of each character is valid for CRC, and the start bit and stop bit and parity bit are all invalid.

In the process of CRC, each 8-bit character is separately XOR with register content, and as a result, moves to the lowest effective direction, and the highest effective bit fills with 0. LSB is extracted to detect, if the LSB is 1, register is separately XOR with preset value, if the LSB is 0, then give up. The whole process will repeat 8 times. After the completion of the final bit (eighth bit), next 8-bit bytes will separately XOR with the current value of register. The value in the register finally is the CRC value after all bytes in the frame perform.

This calculation method of CRC adopts the CRC check rule of international standards. When users edit CRC algorithm, they can refer to relevant standard of the CRC algorithm, and write CRC calculation program that really meets the requirements.

Now offer a simple function of CRC calculation for user reference (programming with C language):

```
unsigned int crc_cal_value(unsigned char*data_value , unsigned char data_length)
{
   inti ;
   unsigned int crc_value=Oxffff ;
   while(data_length--)
     {
       crc_value^=*data_value++;
       for(i=0 ; i<8 ; i++)
         {
            if(crc_value&0x0001) crc_value=(crc_value>>1)^0xa00l
           else crc_value=crc_value>>1 ;
         }
     }
  return(crc_value);
}
```

In the ladder logic, CKSM calculates CRC value according to the frame content with look-up table method. This method is easy to program, and its computing speed is fast, but the program occupies larger ROM space. Please use with caution on the occasion that has requirements for program space.

6. 3. 3 ASCII check (LRC Check)

Check code (LRC Check) is combined value from the Address to the Data Content results, for example, the check code of communication information in above 6. 2: 0x02+0x06+0x00+0x08+0xl3+0x88=0xAB , and then take the complement of 2=0x55.

6. 4 The definition of communication data address

This part is the address definition of communication data, and used to control the operation of the inverter, obtain inverter state information and related function parameters settings, etc.

(1) Function code parameter address rules

Function code number as parameters correspond to the register address, but convert to hexadecimal, for example, serial number of F4. 32 is 139, so the function code address is 008BH expressed in hexadecimal.

High and low byte range respectively: high byte 00~01; low byte 00~FF.

Note: F8 group: manufactures setting parameters, neither can read this group of parameter, nor change this group of parameters; when inverter is in operation, some parameters cannot be changed; some parameters cannot be changed no matter what state the inverter is; when changing the function code parameters, you also should note the parameter setting range, units, and related instructions.

In addition, because the EEPROM is frequently stored, it will reduce the service life of EEPROM. As for users, some function code does not need to be stored under the mode of communication, and only need to change the value of RAM to satisfy the usage requirements. This function can be achieved only by changing the highest position of the corresponding code address from 0 to 1. For example, function code F0. 07 is not stored in the EEPROM, only modify the values in the RAM, and set the address to 8007h. This address can only be used for chip RAM, and cannot used as a function of reading, if doing so, then invalid address.

(2) Address explanation of other features:

Function explanation	Address definition	Data meaning explanation	R/W feature
Communication control command	1000H	0001H : forward running	W/R
		0002H : reverse running	
		0003H : forward jog	
		0004H : reverse jog	
		0005H : stop	
		0006H : free stop(emergency stop)	
		0007H : fault resetting	
		0008H : jog stop	
Inverter status	1001H	0001H : forward running	R
		0002H : reverse running	
		0003H : inverter standby	
		0004H : fault	
Frequency setting	8007H	0-upper limiting frequency	

Note: when frequency setting F0. 03=0, you can modify the current running frequency of inverter by modifying the data of 8007 address. When F0. 03=6, the address of frequency setting is 2000H, and the data is −100. 0～+100. 0, 100 corresponds to the highest output frequency.

Function explanation	Address definition	Data meaning explanation	R/W feature
Communication setting address	2000H	Communication setting value range (−10000～10000) note: communication setting value is relative percentage (−100. 00%～100. 00%), and can make communication write operations. When setting as frequency source, relative is the largest frequency(F0. 04) percentage; When setting or feedback as PID, relative is the percentage of PID. The given value of PID and the PID feedback value are both the PID calculation in the form of percentage.	W/R
Run/stop parameter address explanation	3000H	frequency setting	R
	3001H	frequency running	R
	3002H	output current	R
	3003H	output voltage	R
	3004H	run speed	R
	3005H	output power	R
	3006H	output torque	R
	3007H	bus voltage	R
	3008H	PID setting	R
	3009H	PID feedback	R
	300AH	terminal input symbol state	R
	300BH	terminal output symbol state	R
	300CH	analog VI value	R
	300DH	analog CI value	R
	300EH	multi-step speed current step	R
	300FH	retain	R
	3010H	retain	R
	3012H	retain	R
	3012H	retain	R
Inverter fault address	5000H	Fault information code is consistent with fault serial number in function code menu, but it returns hexadeci -mal data to the upper computer rather than fault characters. R	R

Function explanation	Address definition	Data meaning explanation	R/W feature
ModBus communication fault address	5001H	0000H : no fault	R
		0001H : wrong password	
		0002H : wrong command code	
		0003H : wrong CRC check	
		0004H : invalid address	
		0005H : invalid data	
		0006H : invalid parameter change	
		0007H : system is locked	
		0008H : inverter busy (EEPR0M in storage)	

6. 5 extra response of error communication

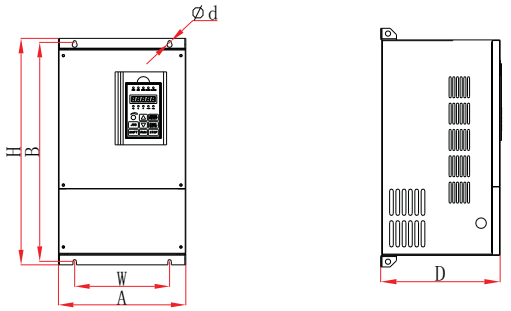
When inverter communication is in connection, if an error, the inverter will respond error code and feedback to the master control system according to the fixed format, so as to let the master control system know that there is an error. The command code of inverter communication is either "03" or "06", fault response of inverter will all reply with 06, and data address is fixed to 0x5001. For example,

RTU slave fault response information

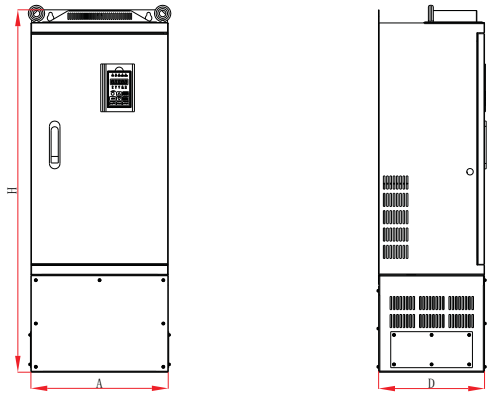
START	T1-T2-T3-T4(3. 5 bytes of transmission time)
ADDR	01H
CMD	06H
Fault return to address high-order	50H
Fault return to address low-order	01H
Error code high-order	00H
Error code low-order	05H
CRC CHK low-order	09H
CRC CHK high-order	09H
END	T1-T2-T3-T4(3. 5 bytes of transmission time)

Appendix B : External Dimension

1.External dimension 1:wall-mounted housing



2.External dimension 2:wall-mounted/ floor combination housing



Base No.	Model	Power (kw)	Dimensions (mm)						Housing
			A-width	H-height	D-depth	W	B	d	
B10	BD330-0R5G-2	0.5KW	116	175	146	103	165	6	Wall -mounted plastic housing
	BD330-0R7G-2	0.75kW							
B01	BD330-1R5G-2	1.5KW	134	251	173	121	238	5	
	BD330-2R2G-2	2.2KW							
B02	BD330-3R7G-2	3.7KW	161	274	198	148	261	6	
	BD330-5R5G-2	5.5KW							
B03	BD330-7R5G-2	7.5KW	210	343	215	195	327	6	
B10	BD330-0R7G/1R5P-4	0.75kW	116	175	146	103	165	6	
	BD330-1R5G/2R2P-4	1.5KW							

Base No.	Model	Power (kw)	Dimensions (mm)						Housing
			A-width	H-height	D-depth	W	B	d	
B01	BD330-2R2G/3R7P-4	2.2KW	134	251	173	121	238	5	Wall -mounted plastic housing
	BD330-3R7G/5R5P-4	3.7KW							
B02	BD330-5R5G/7R5P-4	5.5KW	161	274	198	148	261	6	
	BD330-7R5G/011P-4	7.5KW							
B03	BD330-011G/015P-4	11KW	210	343	215	195	327	6	
	BD330-015G/018P-4	15KW							
B11	BD330-018G/022P-4	18.5KW	220	395	215	160	378	7	Wall -mounted steel casing housing
	BD330-022G/030P-4	22KW							
B04	BD330-030G/037P-4	30KW	255	453	225	190	440	7	
	BD330-037G/045P-4	37KW							
B05	BD330-045G/055P-4	45KW	280	582	285	200	563	9	
	BD330-055G/075P-4	55KW							
B06	BD330-075G/093P-4	75KW	300	685	320	200	667	11	
	BD330-093G/110P-4	93KW							
B07	BD330-110G/132P-4	110KW	420	840	325	150*150	815	11	
	BD330-132G/160P-4	132KW							
	BD330-160G/187P-4	160KW							
	BD330-187G/200P-4	187KW							
B09	BD330-200G/220P-4	200KW	640	1035	380	250*250	1003	13	
	BD330-220G/250P-4	220KW							
	BD330-250G/280P-4	250KW							
	BD330-280G/315P-4	280KW							
	BD330-315G/350P-4	315KW							
B07-G	BD330-110G/132P-4-01	110KW	420	1108	325				Floor type steel casing housing
	BD330-132G/160P-4-01	132KW							
	BD330-160G/187P-4-01	160KW							
	BD330-187G/200P-4-01	187KW							
B09-G	BD330-200G/220P-4-01	200KW	640	1400	380				
	BD330-220G/250P-4-01	220KW							
	BD330-250G/280P-4-01	250KW							
	BD330-280G/315P-4-01	280KW							
	BD330-315G/350P-4-01	315KW							

Appendix C Accessories Selection

1:Beake unit and brake resistance

Voltage	Inverter Power	brake unit		brake resistance			brake torque (10%UD)
		model	quantity (piece)	power(W) /resistance value(Ω)		quantity (piece)	
220V	0.5KW	built-in		80	120	1	100%
	0.7KW			80	120	1	
	1.5KW			150	100	1	
	2.2KW			300	68	1	
	3.7KW			300	68	1	
	5.5KW			400	30	1	
	7.5KW			400	30	1	
380V	0.7KW			150	300	1	
	1.5KW			200	300	1	
	2.2KW			200	200	1	
	3.7KW			400	150	1	
	5.5KW			400	100	1	
	7.5KW			750	75	1	
	11KW			1000	60	1	
	15KW			1500	40	1	
	18.5KW			2500	30	1	
	22KW			3000	30	1	
	30KW	DBU-4030	1	5000	25	1	
	37KW	DBU-4045	1	7500	20	1	
	45KW		1	10000	13.6	1	
	55KW	DBU-4030	2	5000*2	25	1	
	75KW	DBU-4045	2	7500*2	15	1	
	93KW		2	10000*2	13.6	1	
	110KW	DBU-4160	1	20000	8	1	
	132KW		1	25000	6	1	
	160KW		1	30000	6	1	
	187KW		1	35000	5	1	
	200KW		1	40000	4.5	1	
	220KW	DBU-4280	1	40000	4.5	1	
	250KW		1	45000	4	1	
	280KW		1	50000	3.5	1	
	315KW		1	55000	3	1	
	400KW		1	60000	2.5	1	
	500KW		1	80000	2	1	

Notes :

1:Please select the power and the resistance value recommended by our company.

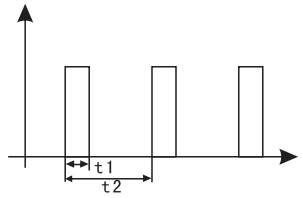
2: The power and the resistance value that recommended above can be calculated by 100% braking torque and 10% frequency of utilization. The power and the resistance value can be appropriately reduced as long as it meets the load demand and the system is reliable: The power and the resistance value of the braking resistor should be appropriately changed if the braking torque and frequency of utilization need to be increased, or users can contact the company.

3: When installing a braking resistor , please consider the safety and the inflammability of the surrounding environment.

4: The frequency of use of Braking UD=t1/t2*100%

tl : the braking time in a working period

t2 : a working period



If the braking efficiency is double, the power of the corresponding braking unit and braking resistor also need to be double.

5. The resistance of the resistor that over 2500W and the power are the total amount of resistance and power. The power of the resistor is get from parallel connection based on 2500W. For example, to get a 25000W 6Ω IS, ten 2500W 60Ω resistors are needed to be connected in parallel.

The calculation of braking resistor: Statistics show that

IB=IMN/2 → TB≈TMN or IB=2UB/IMN

Notes : IB—braking current , A ; IMN—the motor rated current , A ;

TB—braking torque , N▪m ; TMN—rated load torque of motor , N▪m。

As a general rule, the range of choice of braking torque is :

TMN＜TB＜2TMN IMN＜IB＜21MN

According to specific situation , users can decide the braking current according to the formula(3-12) and (3-13).

After that , it is easy to calculate the braking resistance :

RB=UB/IB RBmin=UB/IMN

Notes : UB is the braking threshold voltage ; RB is braking resistor value . UB is 1.1 times as that of the rated voltage of bus. RBmin is the minimum braking resistance the common braking threshold voltage :

AC220V : DC380V AC380V : DC680V AC660V : DC1140V

When get IB and RB, the power of resistance will be known.

λ: Actual resistance value/calculated value ED%: Braking efficiency e. g:

Suppose that there is a 7.5KW motor , rated current is 18A and rated input voltage is 380V

and : RB=680V/9A=75Ω

RBmin=680/18=38Ω

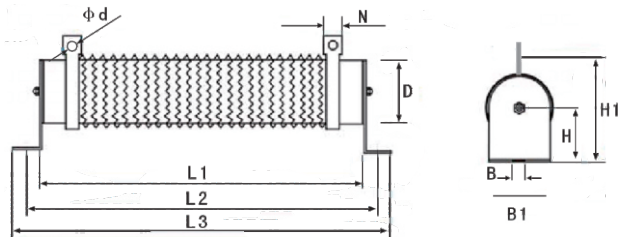
Empirically, the value is 75Ω

The power of braking resistor=1*680^2/75*0.1=616W

The power can be appropriately enlarged in actual use.

2.Mounting dimension of brake resistance

rated power	dimension (mm)									
(w)	L1 (±2)	L2 (±5)	L3 (±3)	D (±2)	B	B1	H	H1 (±3)	N	¢d
80	152	174	196	28	6.5	28	28	61	10	4.5
150	195	217	239	40	8	40	41	81	12	5.5
200	195	217	239	40	8	40	41	81	12	5.5
300	282	304	326	40	8	40	41	81	12	5.5
400	282	304	326	40	8	40	41	81	12	5.5
750	316	338	360	50	8	50	45	101	16	6
1000	300	325	350	60	8.5	60	60	119	16	6
1500	415	440	465	60	8.5	60	60	119	16	6
2000	510	535	560	60	8.5	60	60	119	16	6
2500	600	625	650	60	8.5	60	60	119	16	6



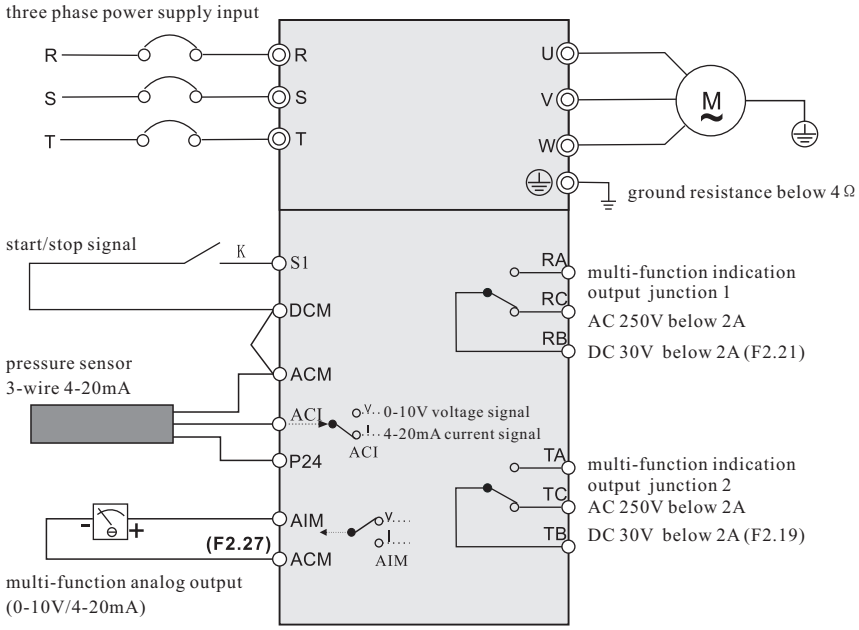
3. Display panel

Hole diameter of the panel installation box (height*width) : 142*98mm
size of outline box : 147*103

Appendix D Dedicated Parameter Specification Constant Pressure Water Supply

1.For example: one inverter drive one motor

1) Basic wiring diagram of current type (4-20mA) pressure feedback signal



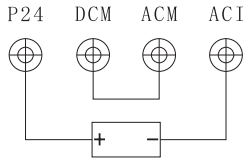


Figure 1: Wiring diagram of 2-wire pressure sensor

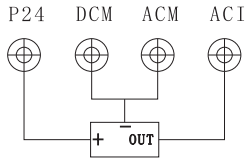
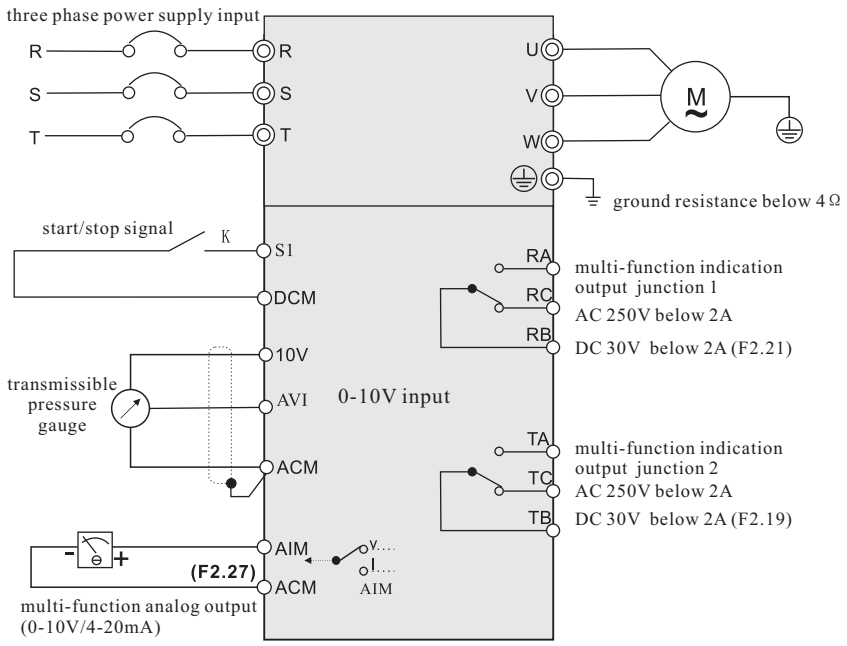
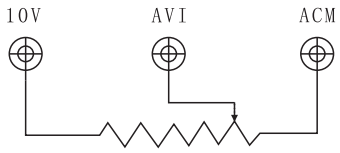


Figure 2: Wiring diagram of 3-wire pressure sensor

Note : Pressure reflected signals of the water pump are divided into analog voltage signal and analog current signal. Wire connecting methods of analog 4-20mA current-mode feedback signals are three-wire type and two-wire type. The wire connecting method of pressure sensor using two-wire type is shown in Figure 1. The wire connecting method of pressure sensor using three-wire type is shown in Figure 2. Pay attention to the corresponding jumper on the main-board when the signal is current signal.

2) Basic wiring diagram of voltage type (0-10V) pressure feedback signal





Transmissible pressure gauge

Note:Total value of resistance should higher than 400Ω

3) Running mode parameter table

Function code	Name	Setting range	Factory setting	Modify	Serial No.
Basic parameter introduction					
F0.01	run command channel	0~2	0	●	1.
F0.03	frequency command selection	0~6	0	※	3.
F3.05	run state parameter display selection	1~33767	1183	※	93.
F3.06	stop state parameter display selection	1~2047	15	※	94.
F4.00	acceleration time 2	0.1~3600.0	10.0	※	107.
F4.01	deceleration time 2	0.1~3600.0	10.0	※	108.
F4.18	PID setting source selection	0~4	0	●	125.
F4.19	keypad preinstall PID setting	0.0%~100.0%	0.0%	※	126.
F4.20	PID feedback source selection	0~4	0	●	127.
F4.21	PID output character selection	0~1	0	●	128.
F4.22	proportional gain（Kp）	0.00~100.00	1.00	※	129.
F4.23	integral time (Ti)	0.01~10.00s	0.10s	※	130.
F4.24	derivative time(Td)	0.00~10.00s	0.00s	※	131.
F4.25	sampling period(T)	0.01~100.00s	0.10s	※	132.
F4.26	PID control bias limit	0.0~100.0%	5.0%	※	133.
F4.27	feedback lost detecting value	0.0~100.0%	0.0%	※	134.
F4.28	feedback lost detecting time	0.0~3600.0s	1.0s	※	135.
Parameter introduction of sleep function					
F7.21	sleep test frequency	0~max.frequency	0	※	188.
F7.22	sleep test delay	0~999.9s	0	※	189.
F7.23	wake pressure	0~100	0	※	190.
F7.24	wake test delay	0~999.9s	0	※	191.
F7.25	water shortage test delay	0~999.9s	0	※	192.
F7.26	PID adjust range	0~50.0	10.0	※	193.
F7.28	sleep signal selection	0~2	0	※	195.

Detailed Descriptions of Parameters and Functions

F3.05/F3.06

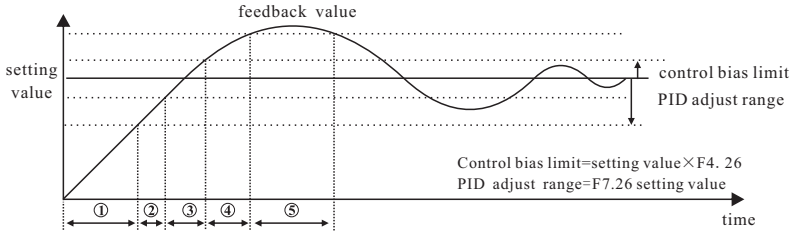
Name	Display Selection of Running/Stop Status Parameters
Factory default	1183/15
Setting range	1---33767/1---2047

☞ PID control system is common set as F3. 05=1023 , F3. 06=63 Users can set it according to needs , A detailed explanation see the corresponding parameter in function parameters in the sixth chapter. F4. 00/F4. 01

F4.00/F4.01

Name	Acceleration Time 2 / Deceleration Time 2
Factory default	10. 0
Setting range	0. 0---3600. 0s

☞ The time table of acceleration and deceleration in PID control system has something related to the parameters set in F4. 26 and F7. 26. See following instructions.



① feedback value＜setting value-F7. 26: acceleration time and deceleration time of output frequency are set by F4. 00/F4. 01.

② given amount-F7. 26＜feedback quantity＜given amount-given amountXF4. 26 : acceleration time and deceleration time of output frequency are automatically adjusted by PID, F0. 08/F0. 09 is the real-time monitoring acceleration time and deceleration time, which cannot be manually set.

③ given amount-given amount×F4. 26＜feedback quantity＜given amount+given amount×F4. 26 : output frequency basically maintains invariable.

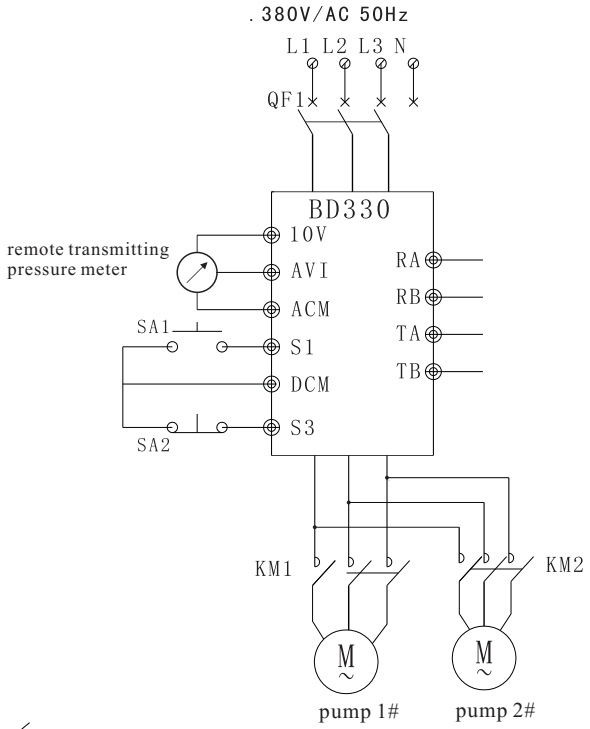
④ given amount+given amount×F4. 26＜feedback quantity＜given amount+F7. 26 : acceleration time and deceleration time of output frequency are automatically adjusted by PID, F0. 08/F0. 09is the real-time monitoring acceleration time and deceleration time, which cannot be manually set.

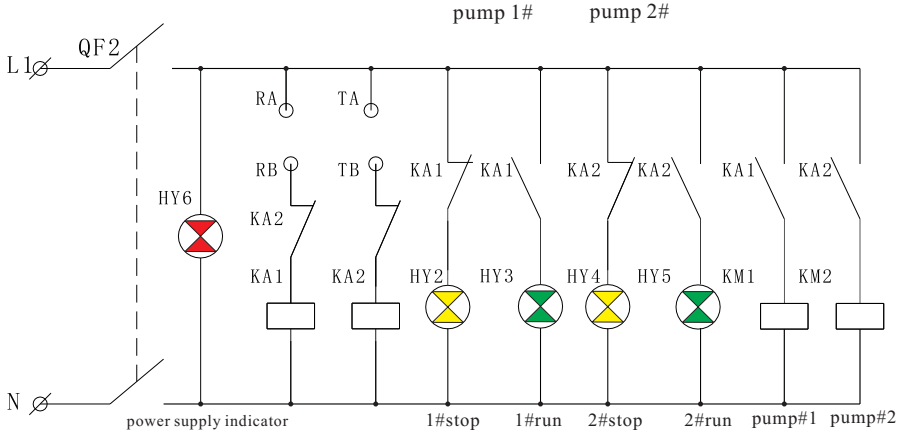
⑤ given amount+F7. 26＜feedback quantity : acceleration time and deceleration time of output frequency are set by F4. 00/F4. 01.

☞ For detailed descriptions of all other parameters, refer to the corresponding parameter in **"the Sixth Chapter Function Parameters"**

2.One inverter drive two pumps

1) The wiring diagram of tows two(Timing cycle of two water pumps)





2) Parameter table of one inverter drive two pumps

Function code	Name	Setting range	Factory setting	Modify	Serial No.
Additional parameter table of one inverter drive two motors					
F7.19	inverter start delay	0.0---60.0	0.0	※	186.
F7.29	auto switch mode	7---8	0	●	196.
F7.31	auxiliary machine start frequency	F7.32 auxiliary machine stop frequency-- upper frequency limit	0.00	※	198.
F7.32	auxiliary machine stop frequency	low frequency limit-- F7.31 auxiliary machine start frequency	0.00	※	199.
F7.33	auxiliary machine start frequency	0---999.9	0.0	※	200.
F7.34	auxiliary machine stop frequency	0---999.9	0.0	※	201.
F7.35	auxiliary machine pressure compensation	0---25.0%	0	※	202.
F7.36	auto cycle switch time	0---6000.0	0.0	※	203.
F7.37	ACC/DEC time of ACC/DEC pump	0---999.9	0.0	※	204.
F7.39	delay unit	0---3	0	※	206.
F2.19	relay 1 output (TA*TB*TC)	0---24	18	※	75.
F2.20	Mo1 open collector output		2	※	76.
F2.21	relay 1 output (TA*TB*TC)		3	※	77.
Patrol function parameter table of one inverter drive two motors					
F7.30	patrol frequency	0--frequency upper limit	0.00	※	197.
F4.03	patrol frequency acceleration time	0.1---3600.0	10.0	※	110.
F4.04	patrol frequency deceleration time	0.1---3600.0	10.0	※	111.
F2.06	multi-function input terminal	0---28	13	●	62.

Detailed Descriptions of Parameters and Functions

F7.19

Name Inverter Startup Delay
Factory default 0. 0
Setting range 0. 0—60. 0seconds

☞ Set the inverter startup delay of electric motor in the system. The time delay counting is as followed:

1 : pull in and govern speed of motor control contactor, Motor is connected with inverter

2 : turn stand-by state to the delay time set by the F7. 19 parameter

3 : inverter starts, motor runs

F7.29

Name Automatic Mode Switch
Factory default 0
Setting range 7 : Fixed model with one inverter and one power frequency
8 : Auto-cycle mode with one inverter and one power frequency

☞ Set the switch mode between inverter and power frequency

F7.31

Name Auxiliary Machine Startup Frequency
Factory default 0. 00
Setting range F7. 32---the Upper Frequency

☞ When the output frequency of the inverter is beyond (F7. 31+1) Hz without auxiliary machine running, the auxiliary delay star. When it is up to the time set by F7. 33 and the output frequency of the inverter is still beyond (F7. 31-1) Hz, start the auxiliary according to automatic switching mode F7. 29. After that, the output frequency of the inverter will drop (F7. 31-F7. 32) Hz.

F7.32

Name Auxiliary Machine Stop Frequency
Factory default 0. 00
Setting range The Lower Frequency ---F7. 32

☞ When the output frequency of the inverter is below (F7. 32-1) HZ and the auxiliary machine has been operating, the stop delay time of the auxiliary machine starts. When the time is up to the time set by F7. 34 and the output frequency is still below (F7. 32+1) HZ, stop the auxiliary machine according to automatic switching mode F7. 29. When the auxiliary machine stops, the output frequency of the inverter will increase (F7. 31-1) Hz.

F7.33

Name Auxiliary Machine Startup Delay
Factory default 0. 0
Setting range 0---999. 9seconds

☞ The details of setting startup delay time of Auxiliary Machine were specified on F7. 31.

F7.34

Name Auxiliary Machine Stop Delay
Factory default 0. 0
Setting range 0---999. 9seconds

☞ The details of setting stop delay time of auxiliary machine were specified on F7. 32.

F7.35

Name	Pressure Compensation of Auxiliary Machine
Factory default	0
Setting range	0---25. 0%

☞ Set an increment in the form of percentage to overlay the original given value when there is an auxiliary machine is operating. When the water consumption increases, the auxiliary machine operates. With the increase of the water flow, the auxiliary machine is operated. With the increase of the water flow, the pressure difference between the head(measuring point) and the end of the pipeline is also increase. If the increment is appropriate, the given value will increase as the increase of the water supply to compensate for the pressure difference that increased, which prevent the decrease of the pressure of the pipe ends.
This feature is in development.

F7.36

Name	Time Cycles of Automatic Switch
Factory default	0. 0
Setting range	0---6000. 0

☞ Set the automatic switching time interval between the variable-frequency pump and pump frequency. Start timing after the operation of the inverter.

F7.37

Name	Acceleration and Deceleration Time of ACC/DEC Pump
Factory default	0. 0
Setting range	0～999. 9

☞ When the auxiliary machine starts(increase pump), the speed of the output of the inverter will decrease to the deceleration time of F7. 31-F7. 32 frequency. When the auxiliary machine stops(decrease pump), the speed of the output of the inverter will increase to the acceleration time of F7. 31-1Hz frequency

F7.39

Name	Delay Unit
Factory default	0
Setting range	0 : Delay is invalid
	1 : Unit Duration : 0. 1second
	2 : Unit Duration : 10. 0seconds
	3 : Unit Duration : 10. 0minutes

F2.19~F2.21

Name	Multi-function Output Terminal
Factory default	F2. 19=18、F2. 20=2、F2. 21=3
Setting range	0～24

☞ Functional Code of Output Terminal

23 : Output Signal of Pump1:

24 : Output Signal of Pump2:

F7.30

Name	Inspection Frequency
Factory default	0
Setting range	0---the Upper Frequency

☞ The function is mainly on the occasion of load and is not often used, which is used to regularly maintain and inspect the motor and the whole running system.

F4.03

Name	Acceleration Time of Inspection Frequency
Factory default	10. 0
Setting range	0. 1～3600. 0

☞ Accelerate the inspection frequency to that set by F7. 30 with the acceleration time set by F4. 03 When the inspection function is valid.

F4.04

Name	Deceleration Time of Inspection Frequency
Factory default	10. 0
Setting range	0. 1～3600. 0

☞ When the inspection is valid, the inspection frequency set by F7. 30 stops its operation with the deceleration time set by F4. 04.

F2.01~F2.06

Name	Multi-function Input Terminals
Factory default	F2. 01=1、F2. 02=2、F2. 03=4、F2. 04=7、F2. 05=12、F2. 06=13
Setting range	0～28

☞ Functional Code of Input Terminals

28 : Start the inspection. When the input terminals are valid, the inverter accelerates the inspection frequency to that set by F7. 30 with the acceleration time set by F4. 03.