Operation manual

CHF100A Series
High Performance Universal Inverter

SHENZHEN INVT ELECTRIC CO., LTD.

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SAFETY PRECAUTIONS

Please read this operation manual carefully before installation, operation, maintenance or inspection.

In this manual, the safety precautions were sorted to “WARNING” or “CAUTION”.

WARNING	Indicates a potentially hazardous situation which, if not, will result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury and physical damage. This sign is also used for alert of any unsafety operation.

In some cases, the contents of “CAUTION” could cause serious accident. Please follow these important precautions in any situation.

★ **NOTE** is the necessary step to ensure the proper operation.

Warning marks were shown on the front keypad of inverters.
Please follow these indications when using the inverter.

WARNING
•May cause injury or electric shock. **•Please follow the instructions in the manual before installation or operation.** **•Disconnect all power line before opening front cover of unit. Wait at least 10 minute until DC Bus capacitors discharge.** **•Use proper grounding techniques.** **•Never connect AC power to output UVW terminals**

1. INTRODUCTION

1.1 Technology Features

● **Input & Output**

- Input Voltage Range: 380/220V±15%
- Input Frequency Range: 47~63Hz
- Output Voltage Range: 0~rated input voltage
- Output Frequency Range: 0~400Hz

● **I/O Features**

- Programmable Digital Input: Provide 7 terminals which can support ON-OFF inputs, 1 terminal which can support high speed pulse input and support PNP, NPN
- Programmable Analog Input: AI1 can accept input of -10V ~10V, AI2 can accept input of 0~10V or 0~20mA.
- Programmable Open Collector Output: Provide 1 output terminal (open collector output or high speed pulse output)
- Relay Output: Provide 2 output terminals
- Analog Output: Provide 2 output terminal, whose output scope can be 0/4~20 mA or 0~10 V, as chosen.

● **Main Control Function**

- Control Mode: V/F control, Sensorless Vector Control (SVC)
- Overload Capacity: 60s with 150% of rated current, 10s with 180% of rated current.
- Speed Adjusting Range: 1:100 (SVC)
- Carrier Frequency: 1 kHz ~15.0 kHz.
- Frequency reference source: keypad, analog input, HDI, serial communication, multi-step speed, simple PLC and PID. The combination of multi- modes and the switch between different modes can be realized.
- PID Control Function
- Simple PLC, Multi-Steps Speed Control Function: 16 steps speed can be set.
- Traverse Control Function
- None-Stop when instantaneous power off.
- Speed Trace Function: Smoothly start the running motor.
- QUICK/JOG Key: User defined shortcut key can be realized.
- Automatic Voltage Regulation Function (AVR):

- Automatically keep the output voltage stable when input voltage fluctuating
- Up to 25 fault protections:
- Protect from over current, over voltage, under voltage, over temperature, phase failure, over load etc.

1.2 Description of Name Plate

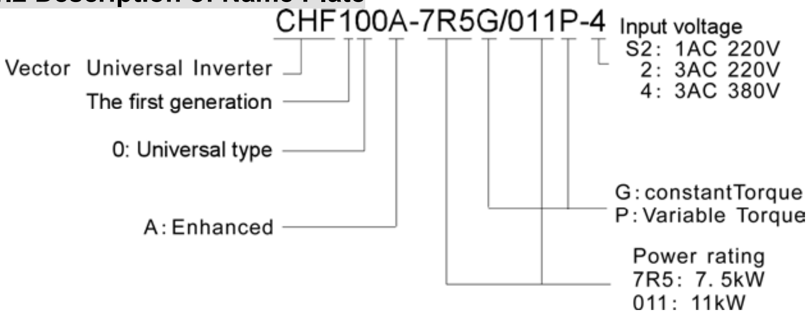


Figure 1.1 Nameplate of inverter.

1.3 Selection Guide

Model No.	Rated output Power (kW)	Rated input current (A)	Rated output current (A)	Size
1AC 220V ±15%				
CHF100A-1R5G-S2	1.5	14.2	7.0	B
CHF100A-2R2G-S2	2.2	23.0	10	B
3AC 220V ±15%				
CHF100A-0R7G-2	0.75	5.0	4.5	B
CHF100A-1R5G-2	1.5	7.7	7	B
CHF100A-2R2G-2	2.2	11.0	10	B
CHF100A-004G-2	4.0	17.0	16	C
CHF100A-5R5G-2	5.5	21.0	20	C
CHF100A-7R5G-2	7.5	31.0	30	D
CHF100A-011G-2	11.0	43.0	42	E
CHF100A-015G-2	15.0	56.0	55	E
CHF100A-018G-2	18.5	71.0	70	E
CHF100A-022G-2	22.0	81.0	80	F
CHF100A-030G-2	30.0	112.0	110	F

Model No.	Rated output Power (kW)	Rated input current (A)	Rated output current (A)	Size
CHF100A-037G-2	37.0	132.0	130	F
CHF100A-045G-2	45.0	163.0	160	G
CHF100A-055G-2	55.0	181.0	190.0	G
3AC 380V ±15%				
CHF100A-1R5G/2R2P-4	1.5	5.0	3.7	B
CHF100A-2R2G/004P-4	2.2	5.8	5	B
CHF100A-004G/5R5P-4	4.0/5.5	10/15	9/13	C
CHF100A-5R5G/7R5P-4	5.5/7.5	15/20	13/17	C
CHF100A-7R5G/011P-4	7.5/11	20/26	17/25	D
CHF100A-011G/015P-4	11/15	26/35	25/32	D
CHF100A-015G/018P-4	15/ 18.5	35/38	32/37	D
CHF100A-018G/022P-4	18.5/ 22	38/46	37/45	E
CHF100A-022G/030P-4	22/30	46/62	45/60	E
CHF100A-030G/037P-4	30/37	62/76	60/75	E
CHF100A-037G/045P-4	37/45	76/90	75/90	F
CHF100A-045G/055P-4	45/55	90/105	90/110	F
CHF100A-055G/075P-4	55/75	105/ 140	110/ 150	F
CHF100A-075G/090P-4	75/90	140/ 160	150/ 176	G
CHF100A-090G/110P-4	90/110	160/ 210	176/ 210	G
CHF100A-110G/132P-4	110/132	210/ 240	210/ 250	G
CHF100A-132G/160P-4	132/160	240/ 290	250/ 300	H
CHF100A-160G/185P-4	160/185	290/ 330	300/ 340	H
CHF100A-185G/200P-4	185/200	330/ 370	340/ 380	H
CHF100A-200G/220P-4	200/220	370/ 410	380/ 415	I
CHF100A-220G/250P-4	220/250	410/ 460	415/ 470	I
CHF100A-250G/280P-4	250/280	460/ 500	470/ 520	I
CHF100A-280G/315P-4	280/315	500/ 580	520/ 600	I
CHF100A-315G/350P-4	315/350	580/ 620	600/ 640	I
CHF100A-350G-4	350	620	640	2*H
CHF100A-400G-4	400	670	690	2*I
CHF100A-500G-4	500	835	860	2*I
CHF100A-560G-4	560	920	950	2*I

1.4 Parts Description

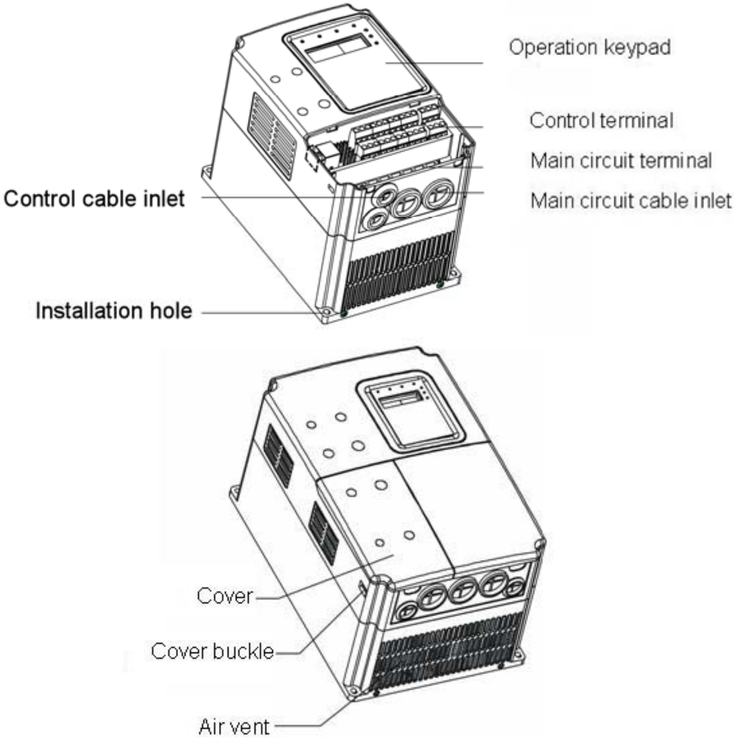
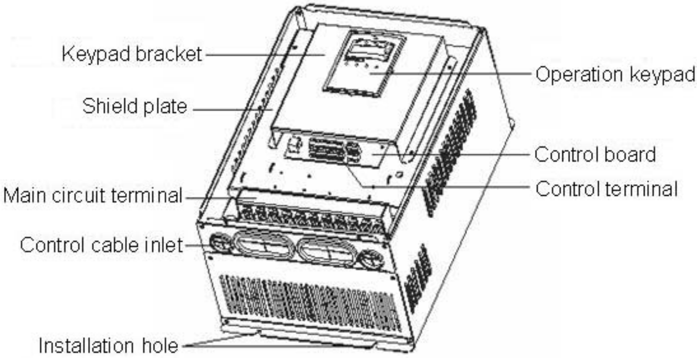


Figure 1.2 Parts of inverter (15kw and below).



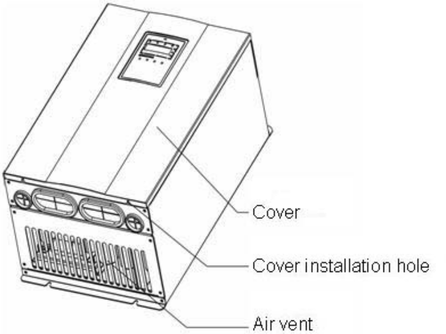


Figure 1.3 Parts of inverter (18.5kw and above).

2. UNPACKING INSPECTION

CAUTION
● Don’t install or use any inverter that is damaged or have fault part, otherwise may cause injury.

Check the following items when unpacking the inverter,

1. Inspect the entire exterior of the Inverter to ensure there are no scratches or other damage caused by the transportation.
2. Ensure there is operation manual and warranty card in the packing box.
3. Inspect the nameplate and ensure it is what you ordered.
4. Ensure the optional parts are what you need if have ordered any optional parts.

Please contact the local agent if there is any damage in the inverter or optional parts.

3. INSTALLATION

WARNING

● The person without passing the training manipulate the device or any rule in the "Warning" being violated, will cause severe injury or property loss. Only the person, who has passed the training on the design, installation, commissioning, debugging, and operation of the device and gotten the certification, is permitted to operate this equipment.

● Input power cable must be connected tightly, and the equipment must be grounded securely.

● Even if the inverter is not running, the following terminals still have dangerous voltage:

- Power Terminals: R, S, T
- Motor Connection Terminals: U, V, W.

● When power off, should not operate the inverter until 10 minutes after, which will ensure the device discharge completely.

● The section area of grounding conductor must be no less than that of power supply cable.

Section area of power line (mm^2)	Section area of grouding conductor
S≤16	S
16<S≤35	16
35<S	S/2

CAUTION

●When moving the inverter please lift its base and don't lift the panel. Otherwise may cause the main unit fall off which may result in personal injury.

● Install the inverter on the fireproofing material (such as metal) to prevent fire.

● When need install two or more inverters in one cabinet, cooling fan should be provided to make sure that the air temperature is lower than 45°C. Otherwise it could cause fire or damage to the device.

3.1 Environmental Requirement

3.1.1 Temperature

Environment temperature range: -10°C ~ +40°C. Inverter will be derated at 4%/1°C if ambient temperature exceeds 40°C up to 50°C. The utmost permited ambient temperature shoud not exceed 50°C.

3.1.2 Humidity

Less than 90% RH, without dewfall.

3.1.3 Altitude

Inverter can output the rated power when installed with altitude of lower than 1000m. It will be derated when the altitude is higher than 1000m. For details, please refer to the following figure:

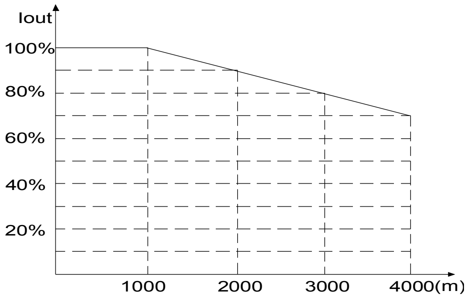


Figure 3.1 Relationship between output current and altitude.

3.1.4 Impact and Oscillation

It is not allowed that the inverter falls down or suffers from fierce impact or the inverter is installed at the place that oscillation frequently.

3.1.5 Electromagnetic Radiation

Keep away from the electromagnetic radiation source.

3.1.6 Water

Do not install the inverter at the wringing or dewfall place.

3.1.7 Air Pollution

Keep away from air pollution such as dusty, corrosive gas.

3.1.8 Storage

Do not store the inverter in the environment with direct sunlight, vapor, oil fog and vibration.

4. WIRING

WARNING

● Wiring must be performed by the person certified in electrical work.

● Forbid testing the insulation of cable that connects the inverter with high-voltage insulation testing devices.

● Cannot install the inverter until discharging completely after the power supply is switched off for 5 minutes.

● Be sure to ground the ground terminal.

(200V class: Ground resistance should be 100Ω or less, 400V class: Ground resistance should be 10Ω or less, 660V class: Ground resistance should be 5Ω or less). Otherwise, it might cause electric shock or fire.

● Connect input terminals (R, S, T) and output terminals (U, V, W) correctly.

Otherwise it will damage the inside part of inverter.

● Do not wire or operate the inverter with wet hands, otherwise there is a risk of electric shock.

CAUTION

● Check to be sure that the voltage of the main AC power supply satisfies the rated voltage of the Inverter.

● Injury or fire can occur if the voltage is not correct.

● Connect power supply cables and motor cables tightly.

4.1 Connection of Peripheral Devices

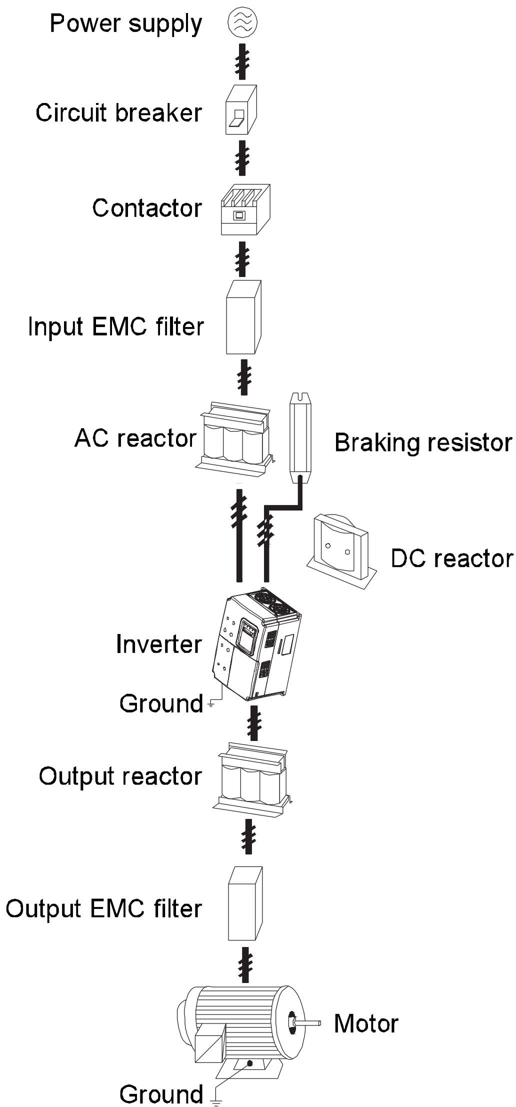


Figure 4.1 Connection of peripheral devices.

4.2 Terminal Configuration

4.2.1 Main Circuit Terminals (380VAC)

(+)	PB	R	S	T	U	V	W	⏚
		POWER			MOTOR			

Figure 4.2 Main circuit terminals (1.5~2.2kW).

(+)	PB	(-)	R	S	T	U	V	W	⏚
			POWER			MOTOR			

Figure 4.3 Main circuit terminals (4~5.5kW).

⏚	(+)	PB	(-)	R	S	T	U	V	W	⏚
				POWER			MOTOR			

Figure 4.4 Main circuit terminals (7.5~15kW).

⏚	R	S	T	P1	(+)	(-)	U	V	W	⏚
	POWER						MOTOR			

Figure 4.5 Main circuit terminals (18.5~110kW).

R	S	T	U	V	W
POWER			MOTOR		

⏚	P1	(+)	(-)	⏚

Figure 4.6 Main circuit terminals (132~315kW).

⏚	R	S	T	U	V	W
POWER				MOTOR		

⏚	P1	(+)	(-)	⏚

Figure 4.7 Main circuit terminals (350~500kW).

4.2.2 Main Circuit Terminals (220VAC)

(+)	PB	(–)	R	S	T	U	V	W	⏚
			POWER			MOTOR			

Figure 4.8 Main circuit terminals (4~5.5kW).

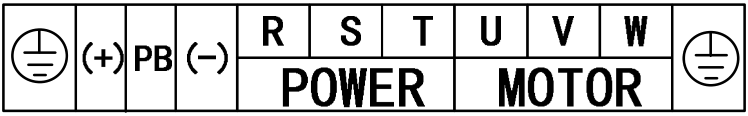


Figure 4.9 Main circuit terminals (7.5kW).

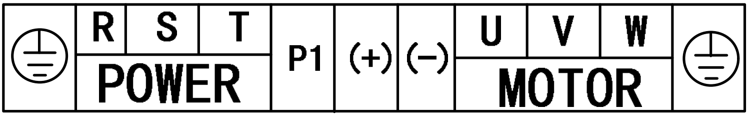


Figure 4.10 Main circuit terminals (11~18.5kW).

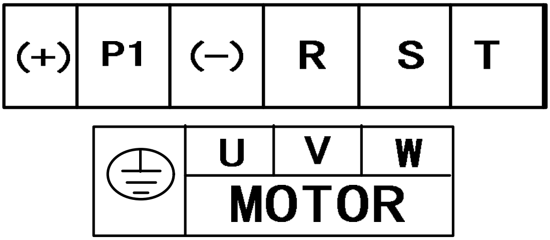


Figure 4.11 Main circuit terminals (22kW and bigger).

the main circuit terminals's description are as following. Wire the terminal correctly for the desired purposes.

Terminal Symbol	Function Description
R、S、T	Terminals of 3 phase AC input
(+)、(-)	Spare terminals of external braking unit
(+)、PB	Spare terminals of external braking resistor
P1、(+)	Spare terminals of external DC reactor
(-)	Terminal of negative DC bus
U、V、W	Terminals of 3 phase AC output
	Terminal of ground
(+)	Terminal of positive DC bus

4.2.3 Control Circuit Terminals

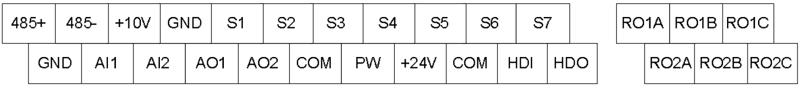


Figure 4.12 Control circuit terminals.

4.3 Wiring Diagram

4.3.1 Typical Wiring Diagram

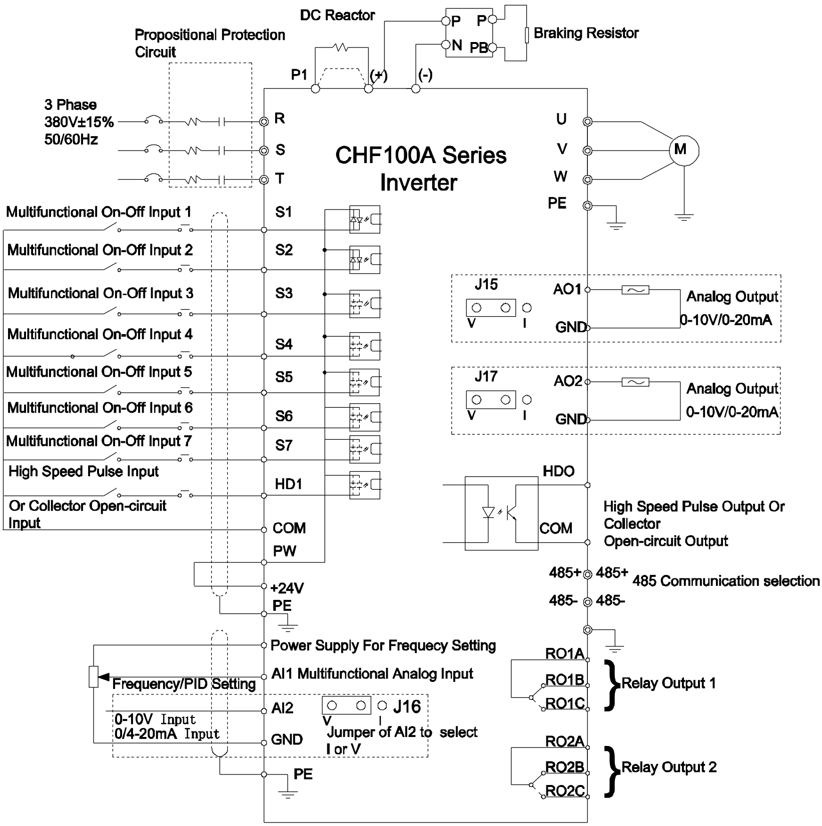


Figure4.13 Typical Wiring diagram.

Notice:

- **Inverters between 18.5kW and 90kW have built-in DC reactor which is used to improve power factor. For inverters above 110kW, it is recommended to install DC reactor between P1 and (+).**
- **The inverters below 18.5kW have build-in braking unit. If need braking, only need to install braking resistor between PB and (+).**
- **For inverters above (including) 18.5kW, if need braking, should install external braking unit between (+) and (-).**
- **Only the inverters above 4 kW provide Relay output 2.**
- **+24V connect with PW as default setting. If user need external power supply,**

disconnect +24V with PW and connect PW with external power supply.

- **485+ and 485- are optional for 485 communications.**

4.3.2 Outpu and input signal connection

Set the common emitter/common collector mode and out/input power supply by U-short splicing. The factory setting is the common emitter.

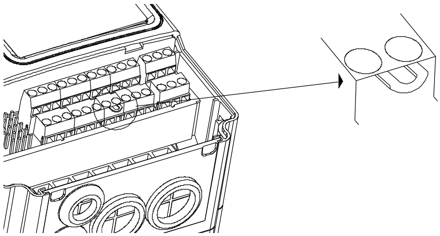


Figure 4.14 U-short splicing.

Common emitter mode:

Please set the U-short splicing according to the type of power supply, when the input signal is from the NPN transistor.

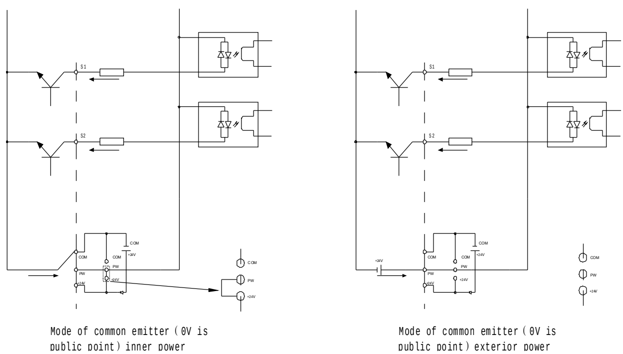
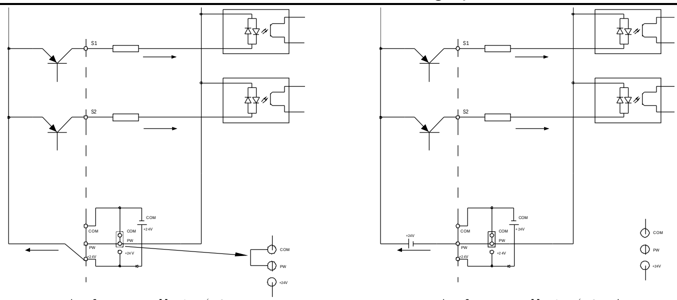


Figure 4.15 Common emitter mode.

Common Collector mode:

Please set the U-short splicing according to the type of power supply, when the input signal is from the PNP transistor.



Mode of common collector (+24V is public point) inner power

Mode of common collector (+24V is public point) exterior power

Figure 4.16 Common collector mode.

4.4 Wiring Main Circuits

4.4.1 Wiring at input side of main circuit

4.4.1.1 Circuit breaker

It is necessary to connect a circuit breaker which is compatible with the capacity of inverter between 3ph AC power supply and power input terminals (R, S, T). The capacity of breaker is 1.5~2 times to the rated current of inverter. For details, see <Specifications of Breaker, Cable, and Contactor>.

4.4.1.2 Contactor

In order to cut off the input power effectively when something is wrong in the system, contactor should be installed at the input side to control the ON-OFF of the main circuit power supply.

4.4.1.3 AC reactor

In order to prevent the rectifier damage result from the large current, AC reactor should be installed at the input side. It can also prevent rectifier from sudden variation of power voltage or harmonic generated by phase-control load.

4.4.1.4 Input EMC filter

The surrounding device may be disturbed by the cables when the inverter is working. EMC filter can minimize the interference. Just like the following figure.

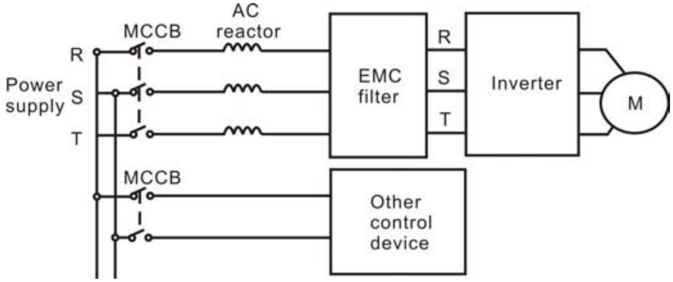


Figure4.17 Wiring at input side.

4.4.2 Wiring at inverter side of main circuit

4.4.2.1 DC reactor

Inverters from 18.5kW to 90kW have built-in DC reactor which can improve the power factor,

4.4.2.2 Braking unit and braking resistor

• Inverter of 15KW and below have built-in braking unit. In order to dissipate the regenerative energy generated by dynamic braking, the braking resistor should be installed at (+) and PB terminals. The wire length of the braking resistor should be less than 5m.

• Inverter of 18.5KW and above need connect external braking unit which should be installed at (+) and (-) terminals. The cable between inverter and braking unit should be less than 5m. The cable between braking unit and braking resistor should be less than 10m.

• The temperature of braking resistor will increase because the regenerative energy will be transformed to heat. Safety protection and good ventilation is recommended.

Notice: Be sure that the electric polarity of (+) (-) terminals is right; it is not allowed to connect (+) with (-) terminals directly, Otherwise damage or fire may occur.

4.4.3 Wiring at motor side of main circuit

4.4.3.1 Output Reactor

Output reator must be installed in the following condition. When the distance between inverter and motor is more than 50m, inverter may be tripped by over-current protection frequently because of the large leakage current resulted from the parasitic capacitance with ground. And the same time to avoid the damage of motor insulation, the output reactor should be installed.

4.4.3.2 Output EMC filter

EMC filter should be installed to minimize the leakage current caused by the cable and minimize the radio noise caused by the cables between the inverter and cable. Just see the following figure.

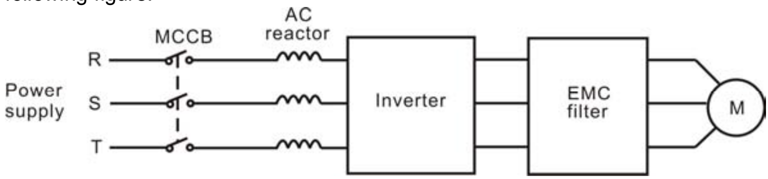


Figure 4.18 Wiring at motor side.

4.4.4 Wiring of regenerative unit

Regenerative unit is used for putting the electricity generated by braking of motor to the grid. Compared with traditional 3 phase inverse parallel bridge type rectifier unit, regenerative unit uses IGBT so that the total harmonic distortion (THD) is less than 4%. Regenerative unit is widely used for centrifugal and hoisting equipment.

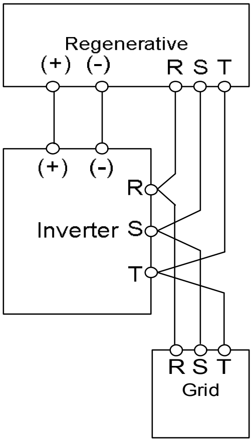


Figure 4.19 Wiring of regenerative unit.

4.4.5 Wiring of Common DC bus

Common DC bus method is widely used in the paper industry and chemical fiber industry which need multi-motor to coordinate. In these applications, some motors are in driving status while some others are in regenerative braking (generating electricity) status. The regenerated energy is automatically balanced through the common DC bus, which means it can supply to motors in driving status. Therefore the power consumption of whole system will be less compared with the traditional method (one inverter drives one motor).

When two motors are running at the same time (i.e. winding application), one is in driving status and the other is in regenerative status. In this case the DC buses of these two inverters can be connected in parallel so that the regenerated energy can be supplied to motors in driving status whenever it needs. Its detailed wiring is shown in the following figure:

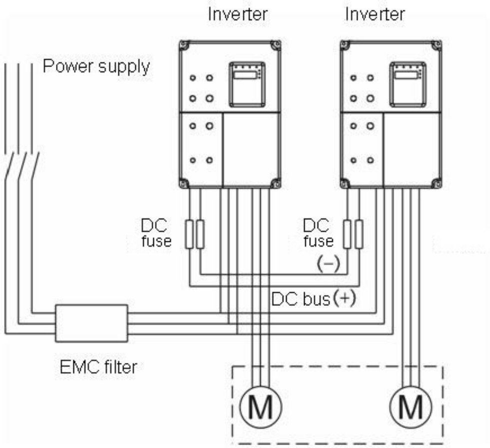


Figure 4.20 Wiring of common DC bus.

Notice: Two inverters must be the same model when connected with Common DC bus method. Be sure they are powered on at the same time.

4.4.6 Ground Wiring (PE)

In order to ensure safety and prevent electrical shock and fire, terminal PE must be grounded with ground resistance. The ground wire should be big and short, and it is better to use copper wire (>3.5mm^2). When multiple inverters need to be grounded, do not loop the ground wire.

4.5 Wiring Control Circuit

4.5.1 Precautions

4.5.1.1 Use shielded or twisted-pair cables to connect control terminals.

4.5.1.2 Connect the ground terminal (PE) with shield wire.

4.5.1.3 The cable connected to the control terminal should leave away from the main circuit and heavy current circuits (including power supply cable, motor cable, relay and contactor connecting cable) at least 20cm and parallel wiring should be avoided. It is suggested to apply perpendicular wiring to prevent inverter malfunction caused by external interference.

4.5.2 Control circuit terminals

Terminal	Description
S1~S7	ON-OFF signal input, optical coupling with PW and COM. Input voltage range: 9~30V Input impedance: 3.3kΩ
HDI	High speed pulse or ON-OFF signal input, optical coupling with PW and COM. Pulse input frequency range: 0~50kHz Input voltage range: 9~30V Input impedance: 1.1kΩ
PW	External power supply. +24V terminal is connected to PW terminal as default setting. If user need external power supply, disconnect +24V terminal with PW terminal and connect PW terminal with external power supply.
+24V	Provide output power supply of +24V. Maximum output current: 150mA
AI1	Analog input, -10V~10V Input impedance: 20kΩ
AI2	Analog input, 0~10V/ 0~20mA, switched by J16. Input impedance: 10kΩ (voltage input) / 250Ω (current input)
GND	Common ground terminal of analog signal and +10V. GND must isolated from COM.
+10V	Supply +10V for inverter.
HDO	High speed pulse output terminal. The corresponding common ground terminal is COM. Output frequency range: 0~50 kHz
COM	Common ground terminal for digital signal and +24V (or external power supply).
AO1、AO2	Provide voltage or current output which can be switched by J15 and J17. Output range: 0~10V/ 0~20mA
RO1A、RO1B、RO1C	RO1 relay output: RO1A—common; RO1B—NC; RO1C—NO. Contact capacity: AC 250V/3A, DC 30V/1A.
RO2A、RO2B、RO2C	RO2 relay output: RO2A—common; RO2B—NC; RO2C—NO. Contact capacity: AC 250V/3A, DC 30V/1A.
485+、485-	485 communication port. 485 differenticial signal, +,-.

4.5.3 Jumper on control board

<table>
<tr><th>Jumper</th><th>Description</th></tr>
<tr><td>J2, J4</td><td>It is prohibited to be connected together, otherwise it will cause inverter malfunction.</td></tr>
<tr><td>J16</td><td>Switch between (0~10V) voltage input and (0~20mA) current input.
V connect to GND means voltage input;
I connect to GND means current input.</td></tr>
<tr><td>J15、J17
（4.0kW 以上）</td><td rowspan="2">Switch between (0~10V) voltage output and (0~20mA) current output.
V connect to GND means voltage output;
I connect to GND means current output.</td></tr>
<tr><td>J14、J15
（1.5~2.2kW）</td></tr>
<tr><td>SW1</td><td>Switch of terminal resistor for RS485 communication. ON: Connect to terminal resistor. OFF: Disconnect to terminal resistor. (Valid for inverter of 4.0KW or above)</td></tr>
<tr><td>J17</td><td>RS485 communication jumper</td></tr>
<tr><td>J17, J18</td><td>Switch of terminal resistor for RS485 communication. Jumper enable: Connect terminal resistor.
Jumper disable: Disconnect terminal resistor. (Valid for inverter of 1.5~2.2kW).</td></tr>
</table>

4.6 Installation Guidline to EMC Compliance

4.6.1 General knowledge of EMC

EMC is the abbreviation of electromagnetic compatibility, which means the device or system has the ability to work normally in the electromagnetic environment and will not generate any electromagnetic interference to other equipments.

EMC includes two subjects: electromagnetic interference and electromagnetic anti-jamming.

According to the transmission mode, Electromagnetic interference can be divided into two categories: conducted interference and radiated interference.

Conducted interference is the interference transmitted by conductor. Therefore, any conductors (such as wire, transmission line, inductor, capacitor and so on) are the transmission channels of the interference.

Radiated interference is the interference transmitted in electromagnetic wave, and the energy is inverse proportional to the square of distance.

Three necessary conditions or essentials of electromagnetic interference are: interference source, transmission channel and sensitive receiver. For customers, the solution of EMC problem is mainly in transmission channel because of the device attribute of disturbance source and receiver can not be changed.

4.6.2 EMC features of inverter

Like other electric or electronic devices, inverter is not only an electromagnetic interference source but also an electromagnetic receiver. The operating principle of inverter determines that it can produce certain electromagnetic interference noise. At the same time inverter should be designed with certain anti-jamming ability to ensure the smooth working in certain electromagnetic environment. Following is its EMC features:

4.6.2.1 Input current is non-sine wave. The input current includes large amount of high-harmonic waves that can cause electromagnetic interference, decrease the grid power factor and increase the line loss.

4.6.2.2 Output voltage is high frequency PMW wave, which can increase the temperature rise and shorten the life of motor. And the leakage current will also increase, which can lead to the leakage protection device malfunction and generate strong electromagnetic interference to influence the reliability of other electric devices.

4.6.2.3 As the electromagnetic receiver, too strong interference will damage the inverter and influence the normal using of customers.

4.6.2.4 In the system, EMS and EMI of inverter coexist. Decrease the EMI of inverter can increase its EMS ability.

4.6.3 EMC Installation Guideline

In order to ensure all electric devices in the same system to work smoothly, this section, based on EMC features of inverter, introduces EMC installation process in several aspects of application (noise control, site wiring, grounding, leakage current and power supply filter). The good effective of EMC will depend on the good effective of all of these five aspects.

4.6.3.1 Noise control

All the connections to the control terminals must use shielded wire. And the shield layer of the wire must ground near the wire entrance of inverter. The ground mode is 360 degree annular connection formed by cable clips. It is strictly prohibitive to connect the twisted shielding layer to the ground of inverter, which greatly decreases or loses the shielding effect.

Connect inverter and motor with the shielded wire or the separated cable tray. One side of shield layer of shielded wire or metal cover of separated cable tray should connect to ground, and the other side should connect to the motor cover. Installing an EMC filter can reduce the electromagnetic noise greatly.

4.6.3.2 Site wiring

Power supply wiring: the power should be separated supplied from electrical transformer. Normally it is 5 core wires, three of which are fire wires, one of which is the neutral wire, and one of which is the ground wire. It is strictly prohibitive to use the same line to be both the neutral wire and the ground wire

Device categorization: there are different electric devices contained in one control cabinet, such as inverter, filter, PLC and instrument etc, which have different ability of emitting and withstanding electromagnetic noise. Therefore, it needs to categorize these devices into strong noise device and noise sensitive device. The same kinds of device should be placed in the same area, and the distance between devices of different category should be more than 20cm.

Wire Arrangement inside the control cabinet: there are signal wire (light current) and power cable (strong current) in one cabinet. For the inverter, the power cables are categorized into input cable and output cable. Signal wires can be easily disturbed by power cables to make the equipment malfunction. Therefore when wiring, signal cables and power cables should be arranged in different area. It is strictly prohibitive to arrange them in parallel or interlacement at a close distance (less than 20cm) or tie them together. If the signal wires have to cross the power cables, they should be arranged in 90 angles. Power input and output cables should not either be arranged in interlacement or tied together, especially when installed the EMC filter. Otherwise the distributed capacitances of its input and output power cable can be coupling each other to make the EMC filter out of function.

4.6.3.3 Ground

Inverter must be ground safely when in operation. Grounding enjoys priority in all EMC methods because it does not only ensure the safety of equipment and persons, but also is the simplest, most effective and lowest cost solution for EMC problems.

Grounding has three categories: special pole grounding, common pole grounding and series-wound grounding. Different control system should use special pole grounding, and different devices in the same control system should use common pole grounding, and different devices connected by same power cable should use series-wound grounding.

4.6.3.4 Leakage Current

Leakage current includes line-to-line leakage current and over-ground leakage current.

Its value depends on distributed capacitances and carrier frequency of inverter. The over-ground leakage current, which is the current passing through the common ground wire, can not only flow into inverter system but also other devices. It also can make leakage current circuit breaker, relay or other devices malfunction. The value of line-to-line leakage current, which means the leakage current passing through distributed capacitors of input output wire, depends on the carrier frequency of inverter, the length and section areas of motor cables. The higher carrier frequency of inverter, the longer of the motor cable and/or the bigger cable section area, the larger leakage current will occur.

Countermeasure:

Decreasing the carrier frequency can effectively decrease the leakage current. In the case of motor cable is relatively long (longer than 50m), it is necessary to install AC reactor or sinusoidal wave filter at the output side, and when it is even longer, it is necessary to install one reactor at every certain distance.

4.6.3.5 EMC Filter

EMC filter has a great effect of electromagnetic decoupling, so it is preferred for customer to install it.

For inverter, noise filter has following categories:

- Noise filter installed at the input side of inverter;
- Install noise isolation for other equipment by means of isolation transformer or power filter.

4.6.4 The installation complies with the following standard:

- EN61000-6-4: Electromagnetic Interference Detection on the industrial condition.
- EN61800-3: Comply with the electromagnetic radiation standard of EN61800-3 (The second environment). Can comply with the electromagnetic radiation standard of EN61000-6-3(residence) and standard of EN61000-6-4.

4.6.5 Notice

- **This type of PDS is not intended to be used on a low-voltage public network which supplies domestic premise;**
- **Radio frequency interference is expected if used on such a network.**

5. OPERATION

5.1 Keypad Description

5.1.1 Keypad schematic diagram

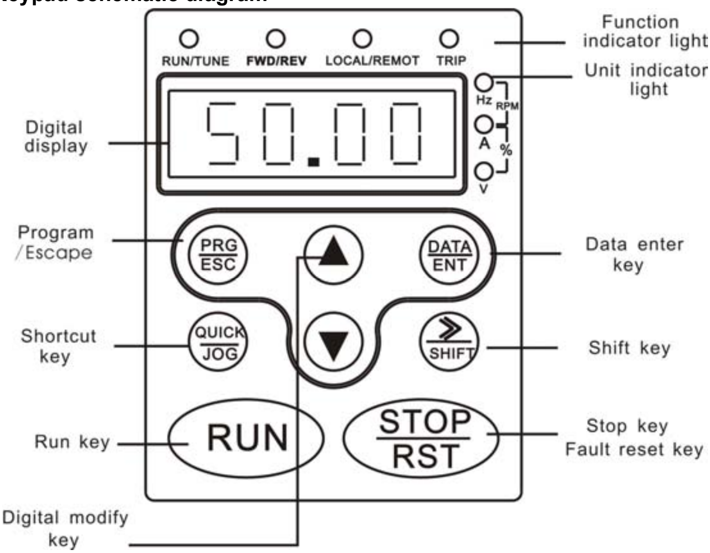


Figure 5.1 Keypad schematic diagram.

5.1.2 Function key description

Key	Name	Function Description
PRG/ESC	Programming Key	Entry or escape of first-level menu.
DATA/ENT	Enter Key	Progressively enter menu and confirm parameters.
▲	UP Increment Key	Progressively increase data or function codes.
▼	DOWN Decrement Key	Progressive decrease data or function codes.
>>/SHIFT	Right shift Key	In parameter setting mode, press this button to select the bit to be modified. In other modes, cyclically displays parameters by right shift
RUN	Run Key	Start to run the inverter in keypad control mode.

Key	Name	Function Description
STOP/RST	STOP/RESET Key	In running status, restricted by P7.04, can be used to stop the inverter. When fault alarm, can be used to reset the inverter without any restriction.
QUICK/JOG	Shortcut Key	Determined by Function Code P7.03: 0: Display status switching 1: Jog operation 2: Switch between forward and reverse 3: Clear the UP/DOWN settings. 4: Quick debugging mode
RUN + STOP/RST	Combination Key	Pressing the RUN and STOP/RST at the same time can achieve inverter coast to stop.

5.1.3 Indicator light description

5.1.3.1 Function Indicator Light Description

Function indicator	Description
RUN/TUNE	Extinguished: stop status Flickering: parameter autotuning status Light on: operating status
FWD/REV	Extinguished: forward operation Light on: reverse operation.
LOCAL/REMOT	Extinguished: keypad control Flickering: terminal control Light on: communication control
TRIP	Extinguished: normal operation status Flickering: overload pre-warning status

5.1.3.2 Unit Indicator Light Description

Unit indicator	Description
Hz	Frequency unit
A	Current unit
V	Voltage unit
RPM	Rotating speed unit
%	Percentage

5.1.3.3 Digital Display

Have 5 digit LED , which can display all kinds of monitoring data and alarm codes such as reference frequency, output frequency and so on.

5.2 Operation Process

5.2.1 Parameter setting

Three levels of menu are:

- Function code group (first-level);
- Function code (second-level);
- Function code value (third-level).

Remarks:

Press both the PRG/ESC and the DATA/ENT can return to the second-class menu from the third-class menu. The difference is: pressing DATA/ENT will save the set parameters into the control panel, and then return to the second-class menu with shifting to the next function code automatically; while pressing PRG/ESC will directly return to the second-class menu without saving the parameters, and keep staying at the current function code.

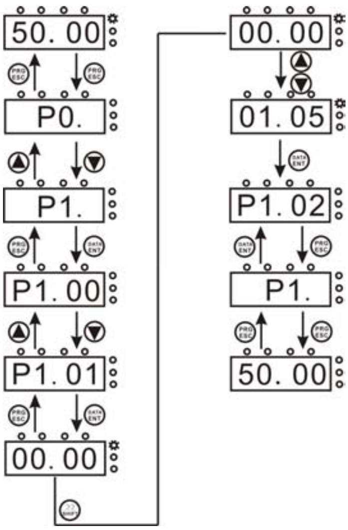


Figure 5.2 Flow chart of parameter setting.

Under the third-class menu, if the parameter has no flickering bit, it means the function code cannot be modified. The possible reasons could be:

- This function code is not modifiable parameter, such as actual detected parameter, operation records and so on;

l This function code is not modifiable in running status, but modifiable in stop status.

5.2.2 Fault reset

If the inverter has fault, it will prompt the related fault information. User can use STOP/RST or according terminals determined by P5 Group to reset the fault. After fault reset, the inverter is at stand-by state. If user does not reset the inverter when it is at fault state, the inverter will be at operation protection state, and can not run.

5.2.3 Motor parameters autotuning

The procedure of motor parameter autotuning is as follows:

Firstly, choose the keypad command channel as the operation command channel (P0.01).

And then input following parameters according to the actual motor parameters:

P2.01: motor rated power.

P2.02: motor rated frequency;

P2.03: motor rated speed;

P2.04: motor rated voltage;

P2.05: motor rated current;

Notice: the motor should be uncoupled with its load; otherwise, the motor parameters obtained by autotuning may be not correct.

Set P0.16 to be 1, and for the detail process of motor parameter autotuning, please refer to the description of Function Code P0.16. And then press RUN on the keypad panel, the inverter will automatically calculate following parameter of the motor:

P2.06: motor stator resistance;

P2.07: motor rotor resistance;

P2.08: motor stator and rotor inductance;

P2.09: motor stator and rotor mutual inductance;

P2.10: motor current without load;

Then motor autotuning is finished.

5.2.4 Password setting

CHF100A series inverter offers user's password protection function. When P7.00 is set to be nonzero, it will be the user's password, and after exiting function code edit mode, it will become effective after 1 minute. If pressing the PRG/ESC again to try to access the function code edit mode, "------" will be displayed, and the operator must input correct user's password, otherwise will be unable to access it.

If it is necessary to cancel the password protection function, just set P7.00 to be zero.

5.2.5 Shortcut menu setting

Shortcut menu, in which parameters in common use can be programmed, provides a quick way to view and modify function parameters. In the shortcut menu, a parameter being displayed as “hP0.11” means the function parameter P0.11. Modifying parameters in the shortcut menu has the same effect as doing at normal programming status.

Maximum 16 function parameters can be saved into the shortcut menu, and these parameters can be added or deleted when P7.03 is set to be 0.

5.3 Running State

5.3.1 Power-on initialization

Firstly the system initializes during the inverter power-on, and LED displays “8.8.8.8.8.8”. After the initialization is completed, the inverter is in stand-by status

5.3.2 Stand-by

At stop or running status, parameters of multi-status can be displayed. Whether or not to display this parameter can be chosen through Function Code P7.06, P7.07 (Running status display selection) and P7.08 (Stop status display selection) according to binary bits, the detailed description of each bit please refer the function code description of P7.06, P7.07 and P7.08.

In stop status, there are ten parameters which can be chosen to display or not. They are: reference frequency, DC bus voltage, ON-OFF input status, open collector output status, PID setting, PID feedback, analog input AI1 voltage, analog input AI2 voltage, HDI frequency, step number of simple PLC and multi-step speed. Whether or not to display can be determined by setting the corresponding binary bit of P7.08. Press the 》/SHIFT to scroll through the parameters in right order. Press DATA/ENT + QUICK/JOG to scroll through the parameters in left order.

5.3.3 Operation

In running status, there are nineteen running parameters which can be chosen to display or not. They are: running frequency, reference frequency, DC bus voltage, output voltage, output current, rotating speed, line speed, output power, output torque, PID setting, PID feedback, ON-OFF input status, open collector output status, length value, count value, step number of PLC and multi-step speed, voltage of AI1, voltage of AI2, high speed pulse input HDI frequency. Whether or not to display can be determined by setting the corresponding bit of P7.06, P7.07. Press the 》/SHIFT to scroll through the parameters in right order. Press DATA/ENT + QUICK/JOG to scroll through the parameters in left order.

5.3.4 Fault

In fault status, inverter will display parameters of STOP status besides parameters of fault status. Press the 》/SHIFT to scroll through the parameters in right order . Press DATA/ENT + QUICK/JOG to to scroll through the parameters in left order.

CHF series inverter offers a variety of fault information. For details, see inverter faults and their troubleshooting.

5.4 Shortcut Menu

Shortcut menu provides a quick way to view and modify function parameters.

Seting the P7.03 to be 4, the press QUICK/JOG, the inverter will search the parameter which is different from the factory seting, save these parameters to be ready for checking. The buffer length of shortcut menu is 32. So when the record data beyonds to 32, can not display the overlength part. Press QUICK/JOGwill be the shortcut debugging mode. If the UICK/JOG display “NULLP”, It means the parameters is the same with the factory setting. If want to return to last display, press QUICK/JOG.

6. DETAILED FUNCTION DESCRIPTION

6.1 P0 Group--Basic Function

Function Code	Name	Description	Setting Range	Factory Setting
P0.00	Control model	0: V/F control 1: Sensorless vector control 2: Torque control	0~2	0

0: V/F control: It is suitable for general purpose application such as pumps, fans etc.

1: Sensorless vector control: It is widely used for the application which requires high torque at low speed, high speed accuracy, and quicker dynamic response, such as machine tool, injection molding machine, centrifugal machine and wire-drawing machine, etc.

2. Torque control: It is suitable for the application with low accuracy torque control, such as wired-drawing.

Notice:

- **The autotuning of motor parameters must be accomplished properly** If you use the **sensorless vector control mode or Torque control mode. How to autotuning of motor parameters please refer to page 36**
- **In order to achieve better control characteristic, the parameters of vector control (P3 Group) should be adjusted.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.01	Run command source	0: Keypad (LED extinguished) 1: Terminal (LED flickering) 2: Communication (LED lights on)	0~2	0

The control commands of inverter include: start, stop, forward run, reverse run, jog, fault reset and so on.

0: Keypad (LED extinguished);

Both RUN and STOP/RST key are used for running command control. If Multifunction key QUICK/JOG is set as FWD/REV switching function (P7.03 is set to be 1), it will be used to change the rotating orientation. **In running status, pressing RUN and STOP/RST in the same time will cause the inverter coast to stop.**

1: Terminal (LED flickering)

The operation, including forward run, reverse run, forward jog, reverse jog etc. can be controlled by multifunctional input terminals.

2: Communication (LED lights on)

The operation of inverter can be controlled by host through communication.

Function Code	Name	Description	Setting Range	Factory Setting
P0.02	UP/DOWN setting	0: Valid, save UP/DOWN value when power off 1: Valid, do not save UP/DOWN value when power off 2: Invalid 3: Valid during running, clear when stop.	0~3	0

0: User can adjust the reference frequency by UP/DOWN. The value of UP/DOWN can be saved when power off.

1: User can adjust the reference frequency by UP/DOWN, but the value of UP/DOWN will not be saved when power off.

2: User can not adjust the reference frequency by UP/DOWN. The value of UP/DOWN will be cleared.

3: User can only adjust the reference frequency by UP/DOWN during the inverter is running. The value of UP/DOWN will be cleared when the inverter stops.

Notice:

- **UP/DOWN function can be achieved by keypad (∧ and ∨) and multifunctional terminals.**
- **Reference frequency can be adjusted by UP/DOWN.**
- **UP/DOWN has highest priority which means UP/DOWN is always active no matter which frequency command source is.**
- **When the factory setting is restored (P0.17 is set to be 1), the value of UP/DOWN will be cleared.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.03	Maximum frequency	10.00~400.00Hz	10.00~400.00	50.00Hz

Notice: The frequency reference should not exceed maximum frequency, and it is the basis of ramping time of ACC/DEC.

Function Code	Name	Description	Setting Range	Factory Setting
P0.04	Upper frequency limit	P0.05~P0.03	P0.05~P0.03	50.00Hz

Notice:

- **Upper frequency limit should exceed than the maximum frequency**
- **Output frequency should not exceed upper frequency limit.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.05	Lower frequency limit	0.00~P0.04	0.00~P0.04	0.00Hz

Notice:

- **Lower frequency limit should exceed than upper frequency limit (P0.04).**
- **If frequency reference is lower than P0.05, the action of inverter is determined by P1.12. Please refer to description of P1.12.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.06	Keypad reference frequency	0.00~P0.03	0.00~P0.03	50.00Hz

When Frequency A command source is set to be Keypad, this parameter is the initial value of inverter reference frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P0.07	Frequency A command source	0: Keypad 1: AI1 2. AI2 3: HDI 4. Simple PLC 5: Multi-step speed 6: PID 7: Communication	0~7	0

0: Keypad: Please refer to description of P0.06

1: AI1

2: AI2

The reference frequency is set by analog input. AI1 is -10V~10V voltage input terminal, while AI2 is 0~10V/0（4）~20mA, which can be selected by J16. When AI2 is selected to be 0~20mA, which corresponds with 5V.

3: HDI

The reference frequency is set by high speed pulse input.

Pulse specification: pulse voltage range 15~30V, and pulse frequency range 0.0~50.0 kHz. 100% of the setting inpluse corresponds with maximal frequency, while -100% corresponds with minus maximal frequency.

4. Simple PLC

User can set reference frequency, hold time, running direction of each step and acceleration/deceleration time between steps. For details, please refer to description of PA group.

5. Multi-step speed

The reference frequency is determined by P5 and PA group. The selection of steps is determined by combination of multi-step speed terminals.

Notice:

- **Multi-step speed mode will enjoy priority in setting reference frequency if P0.03 is not set to be 4 or 5. In this case, only step 1 to step 15 are available.**
- **If P0.03 is set to be 5, step 0 to step 15 can be realized.**
- **Jog has highest priority.**

6. PID

The reference frequency is the result of PID adjustment. For details, please refer to description of P9 group.

7. Communication

The reference frequency is set through RS485. For details, please refer to Modbus protocol in Chapter 9.

Function Code	Name	Description	Setting Range	Factory Setting
P0.08	Frequency B command source	0:AI1 1:AI2 2:HDI	0~2	0

For details, please refer to P0.07.

Function Code	Name	Description	Setting Range	Factory Setting
P0.09	Scale of frequency B command	0: Maximum frequency 1: Frequency A command	0~1	0

Notice: If set AI2 to be 0~20mA input, the relative voltage of 20mA is 5V. P0.09 is used when the frequeny B is superimposed.

Function Code	Name	Description	Setting Range	Factory Setting
P0.10	Frequency command selection	0: A 1: B 2: A+B 3: Max（A, B）	0~3	0

This parameter can be used to select the reference frequency command.

0: Only frequency command source A is active.

1: Only Frequency command source B is active.

2: Both Frequency command source A and B are active.

Reference frequency = reference frequency A + reference frequency B.

3: Both Frequency command source A and B are active.

Reference frequency = Max (reference frequency A, reference frequency B).

Notice: Combination （0、1、2）can be switched by Multifunctional terminal S1~S7

Function Code	Name	Description	Setting Range	Factory Setting
P0.11	Acceleration time 0	0.1~3600.0s	0.1~3600.0	Depend on model
P0.12	Deceleration time 0	0.1~3600.0s	0.1~3600.0	Depend on model

Acceleration time is the time of accelerating from 0Hz to maximum frequency (P0.03). Deceleration time is the time of decelerating from maximum frequency (P0.03) to 0Hz. Please refer to following figure.

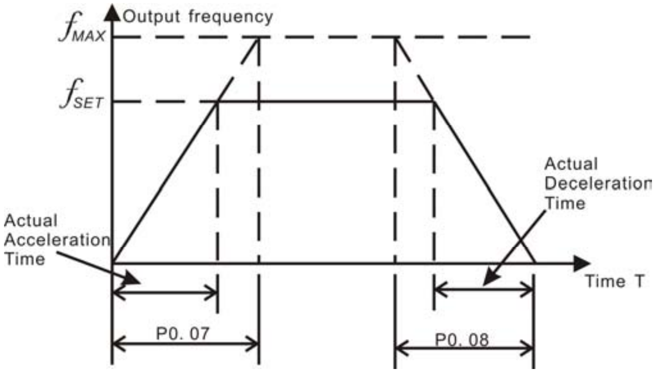


Figure 6.1 Acceleration and deceleration time.

When the reference frequency is equal to the maximum frequency, the actual acceleration and deceleration time will be equal to actual setting.

When the reference frequency is less than the maximum frequency, the actual acceleration and deceleration time will be less than actual setting.

The actual acceleration (deceleration) time = setting ACC/DEC time* referrence frequency/ maximum frequency.

1st group: P0.11, P0.12

2nd group: P8.00, P8.01

3rd group: P8.02, P8.03

4th group: P8.04, P8.05.

The acceleration and deceleration time can be selected by combination of multifunctional ON-OFF input terminals.

Function Code	Name	Description	Setting Range	Factory Setting
P0.13	Running direction selection	0: Forward 1: Reverse 2: Forbid reverse	0~2	0

Notice: If the parameters are restored, the running direction will be back to its original status.

Function Code	Name	Description	Setting Range	Factory Setting
P0.14	Carrier frequency	1.0~15.0kHz	1.0~15.0	Depend on model

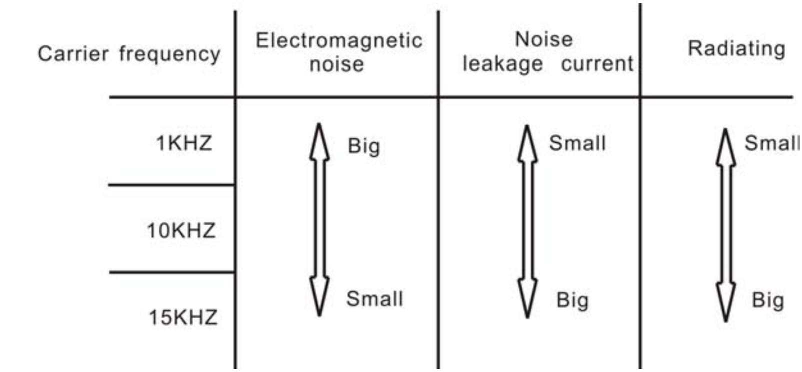


Figure 6.2 Effect of carrier frequency.

The following table is the relationship between power rating and carrier frequency.

Carrier f / Model	Highest Carrier f (kHz)	Lowest Carrier f (kHz)	Factory setting (kHz)
0.4kW~11kW	15	1.0	8
15kW~55kW	8	1.0	4
75kW~630kW	6	1.0	2

Carrier frequency will affect the noise of motor and the EMI of inverter.

If the carrier frequency is increased, it will cause better current wave, less harmonic current and lower noise of motor.

Notice:

l The factory setting is optimal in most cases. Modification of this parameter is not recommended.

l If the carrier frequency exceeds the factory setting, the inverter must be derated because the higher carrier frequency will cause more switching loss, higher temperature rise of inverter and stronger electromagnetic interference.

l If the carrier frequency is lower than the factory setting, it is possible to cause less output torque of motor and more harmonic current.

Function Code	Name	Description	Setting Range	Factory Setting
P0.15	AVR function	0~2	0~2	1

Notice: AVR function is automatical debugging of output voltage

Function Code	Name	Description	Setting Range	Factory Setting
P0.16	Motor parameters autotuning	0: No action 1: Rotation autotuning 2: Static autotuning	0~2	0

0: No action: Forbidding autotuning.

1: Rotation autotuning:

- Do not connect any load to the motor when performing autotuning and ensure the motor is in static status.
- Input the nameplate parameters of motor (P2.01－P2.05) correctly before performing autotuning. Otherwise the parameters detected by autotuning will be incorrect; it may influence the performance of inverter.
- Set the proper acceleration and deceleration time (P0.11 and P0.12) according to the motor inertia before performing autotuning. Otherwise it may cause over-current and over-voltage fault during autotuning.
- The operation process is as follow:

  a. Set P0.16 to be 1 then press the DATA/ENT, LED will display “-TUN-” and flickers. During “-TUN-” is flickering, press the PRG/ESC to exit autotuning.

  b. Press the RUN to start the autotuning, LED will display “TUN-0”.

  c. After a few seconds the motor will start to run. LED will display “TUN-1” and “RUN/TUNE” light will flicker.

  d. After a few minutes, LED will display “-END-”. That means the autotuning is finished and return to the stop status.

  e. During the autotuning, press the STOP/RST will stop the autotuning.

Notice: Only keypad can control the autotuning. P0.12 will restore to 0 automatically when the autotuning is finished or cancelled.

2: Static autotuning:

- If it is difficult to disconnect the load, static autotuning is recommended.
- The operation process is the same as rotation autotuning except step c.

Notice: The Mutual inductance and current without load will not be detected by static autotuning, if needed user should input suitable value according to experience.

Function Code	Name	Description	Setting Range	Factory Setting
P0.17	Restore parameters	0: No action 1: Restore factory setting 2: Clear fault records	0~2	0

0: No action

1: Inverter restores all parameters to factory setting except P2 group.

2: Inverter clear all fault records.

This function code will restore to 0 automatically when complete the function operation.

6.2 P1 Group --Start and Stop Control

Function Code	Name	Description	Setting Range	Factory Setting
P1.00	Start Mode	0: Start directly 1: DC braking and start 2: Speed tracking and start	0~2	0

0: Start directly: Start the motor at the starting frequency determined by P1.01.

1: DC braking and start: Inverter will output DC current firstly and then start the motor at the starting frequency. Please refer to description of P1.03 and P1.04. It is suitable for the motor which have small inertia load and may reverse rotation when start.

2: Speed tracking and start: Inverter detects the rotation speed and direction of motor, then start running to its reference frequency based on current speed. This can realize smooth start of rotating motor with big inertia load when instantaneous power off.

Notice: It only applies on the inverter of 7.5kW and above.

Function Code	Name	Description	Setting Range	Factory Setting
P1.01	Starting frequency	0.00~10.00Hz	0.00~10.00	0.00Hz
P1.02	Hold time of starting frequency	0.0~50.0s	0.0~50.0	0.0s

Notice:

- **Set proper starting frequency can increase the starting torque.**
- **If the reference frequency is less than starting frequency, inverter will be at stand-by status. The indicator of RUN/TUNE lights on, inverter has no output.**

- **The starting frequency could be less than the lower frequency limit (P0.05).**
- **P1.01 and P1.02 take no effect during FWD/REV switching.**

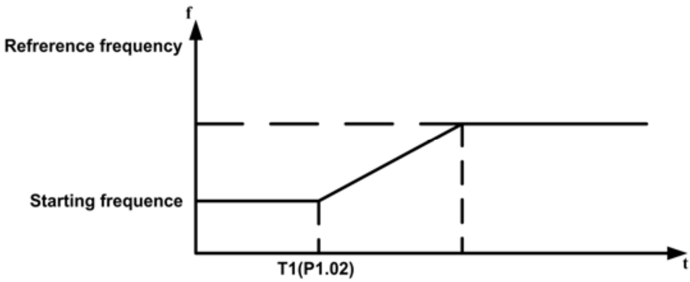


Figure 6.3 Starting diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P1.03	DC Braking current before start	0.0~150.0%	0.0~150.0	0.0%
P1.04	DC Braking time before start	0.0~50.0s	0.0~50.0	0.0s

When inverter starts, it performs DC braking according to P1.03 firstly, then start to accelerate after P1.04.

Notice:

- **DC braking will take effect only when P1.00 is set to be 1.**
- **DC braking is invalid when P1.04 is set to be 0.**
- **The value of P1.03 is the percentage of rated current of inverter. The bigger the DC braking current, the greater the braking torque.**

Function Code	Name	Description	Setting Range	Factory Setting
P1.05	Acceleration / Deceleration mode	0: Linear 1: reserved	0~1	0

0: Linear: Output frequency will increase or decrease with fixed acceleration or deceleration time.

1: Reserved

Notice: CHF100A inverter offers 4 groups of specific acceleration and deceleration

time, which can be determined by the multifunctional ON-OFF input terminals (P5 Group).

Function Code	Name	Description	Setting Range	Factory Setting
P1.06	Stop mode	0: Deceleration to stop 1: Coast to stop	0~1	0

0: Deceleration to stop

When the stop command takes effect, the inverter decreases the output frequency according to P1.05 and the defined deceleration time till stop.

1: Coast to stop

When the stop command takes effect, the inverter blocks the output immediately. The motor coasts to stop by its mechanical inertia.

Function Code	Name	Description	Setting Range	Factory Setting
P1.07	Starting frequency of DC braking	0.00~P0.03	0.00~P0.03	0.00Hz
P1.08	Waiting time before DC braking	0.0~50.0s	0.0~50.0	0.0s
P1.09	DC braking current	0.0~150.0%	0.0~150.0	0.0%
P1.10	DC braking time	0.0~50.0s	0.0~50.0	0.0s

Starting frequency of DC braking: Start the DC braking when running frequency reaches starting frequency determined by P1.07.

Waiting time before DC braking: Inverter blocks the output before starting the DC braking. After this waiting time, the DC braking will be started so as to prevent over-current fault caused by DC braking at high speed.

DC braking current: The value of P1.09 is the percentage of rated current of inverter. The bigger the DC braking current is, the greater the braking torque is.

DC braking time: The time used to perform DC braking. If the time is 0, the DC braking will be invalid.

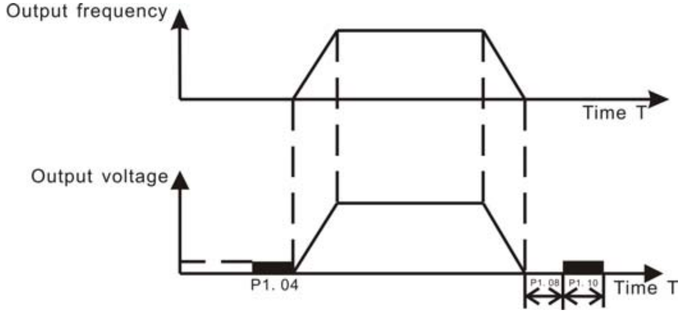


Figure 6.4 DC braking diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P1.11	Dead time of FWD/REV	0.0~3600.0s	0.0~3600.0	0.0s

Set the hold time at zero frequency in the transition between forward and reverse running.

It is shown as following figure:

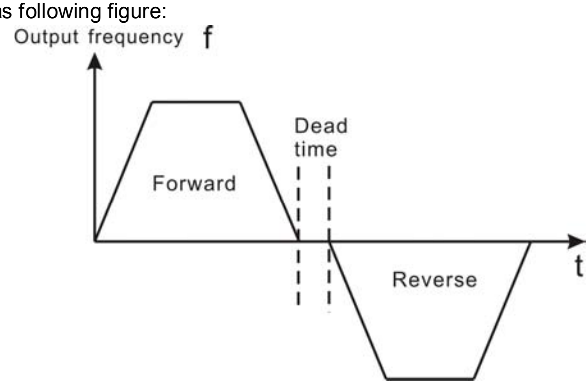


Figure 6.5 FWD/REV dead time diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P1.12	Action when running frequency is less than lower frequency limit	0: Running at the lower frequency limit 1: Stop 2: Stand-by	0~2	0

0: Running at the lower frequency limit (P0.05): The inverter runs at P0.05 when the running frequency is less than P0.05.

1: Stop: This parameter is used to prevent motor running at low speed for a long time.

2: Stand-by: Inverter will Coast to stop when the running frequency is less than P0.05. When the reference frequency is higher than or equal to P0.05 again, the inverter will start to run automatically.

Function Code	Name	Description	Setting Range	Factory Setting
P1.13	Delay time for restart	0.0~3600.0s	0.0~3600.0	0.0s
P1.14	Restart after power off	0: Disabled 1: Enabled	0~1	0

0: Disabled: Inverter will not automatically restart when power on again until run command takes effect.

1: Enabled: When inverter is running, after power off and power on again, if run command source is key control (P0.01=0) or communication control (P0.01=2), inverter will automatically restart after delay time determined by P1.14; if run command source is terminal control (P0.01=1), inverter will automatically restart after delay time determined by P1.14 only if FWD or REV is active.

Notice:

- **If P1.14 is set to be 1, it is recommended that start mode should be set as speed tracing mode (P1.00=2).**
- **This function may cause the inverter restart automatically, please be cautious.**

Function Code	Name	Description	Setting Range	Factory Setting
P1.15	Waiting time of restart	0.0~3600.0s	0.0~3600.0s	0.0

Notice: Valid when P1.14=1

Function Code	Name	Description	Setting Range	Factory Setting
P1.16	Terminal function examined when power is	0: Disabled 1: Enabled	0~1	0

	on			

Notice:

- **This function only takes effect if run command source is terminal control.**
- **If P1.15 is set to be 0, when power on, inverter will not start even if FWD/REV terminal is active, until FWD/REV terminal disabled and enabled again.**
- **If P1.15 is set to be 1, when power on and FWD/REV terminal is active, inverter will start automatically.**
- **This function may cause the inverter restart automatically, please be cautious.**

Function Code	Name	Description	Setting Range	Factory Setting
P1.17~P1.19	Reversed			

6.3 P2 Group--Motor Parameters

Function Code	Name	Description	Setting Range	Factory Setting
P2.00	Inverter model	0: G model 1: P model	0~1	0

0: G model: Applicable to constant torque load.

1: P model: Applicalbe to constant power load.

Function Code	Name	Description	Setting Range	Factory Setting
P2.01	Motor rated power	0.4~3000.0kW	0.4~3000.0	Depend on model
P2.02	Motor rated frequency	10Hz~P0.03	10~P0.03	50.00Hz
P2.03	Motor rated speed	0~36000rpm	0~36000	Depend on model
P2.04	Motor rated voltage	0~800V	0~800V	Depend on model
P2.05	Motor rated current	0.8~6000.0A	0.8~6000.0	Depend on model

Notice:

- **In order to achieve superior performance, please set these parameters**

according to motor nameplate, and then perform autotuning.

l The power rating of inverter should match the motor. If the bias is too big, the control performances of inverter will be deteriorated distinctly.

l Reset P2.01 can initialize P2.06~P2.10 automatically.

Function Code	Name	Description	Setting Range	Factory Setting
P2.06	Motor stator resistance	0.001~65.535Ω	0.001~65.535	Depend on model
P2.07	Motor rotor resistance	0.001~65.535Ω	0.001~65.535	Depend on model
P2.08	Motor leakage inductance	0.1~6553.5mH	0.1~6553.5	Depend on model l
P2.09	Motor mutual inductance	0.1~6553.5mH	0.1~6553.5	Depend on model
P2.10	Current without load	0.01~655.35A	0.01~655.35	Depend on model

After autotuning, the value of P2.06~P2.09 will be automatically updated.

Notice: Do not change these parameters, otherwise it may deteriorate the control performance of inverter.

6.4 P3 Group—Vector Control

Function Code	Name	Description	Setting Range	Factory Setting
P3.00	ASR proportional gain K_p1	0~100	0~100	20
P3.01	ASR integral time K_i1	0.01~10.00s	0.01~10.00	0.50s
P3.02	ASR switching point 1	0.00Hz~P3.05	0.00~P3.05	5.00Hz
P3.03	ASR proportional gain K_p2	0~100	0~100	25

Function Code	Name	Description	Setting Range	Factory Setting
P3.04	ASR integral time K_i2	0.01~10.00s	0.01~10.00	1.00s
P3.05	ASR switching point 2	P3.02~P0.03	P3.02~P0.03	10.00Hz

P3.00～P3.05 are only valid for vector control and torque control and invalid for V/F control. Through P3.00～P3.05, user can set the proportional gain K_p and integral time K_i of speed regulator (ASR), so as to change the speed response characteristic. ASR's structure is shown in following figure.

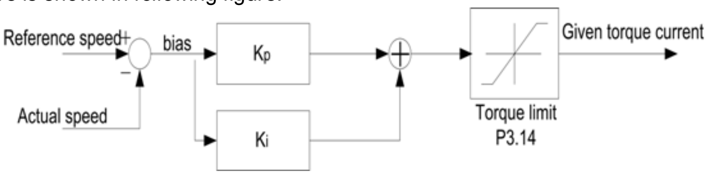


Figure 6.6 ASR diagram.

P3.00 and P3.01 only take effect when output frequency is less than P3.02. P3.03 and P3.04 only take effect when output frequency is greater than P3.05. When output frequency is between P3.02 and P3.05, K_p and K_I are proportional to the bias between P3.02 and P3.05. For details, please refer to following figure.

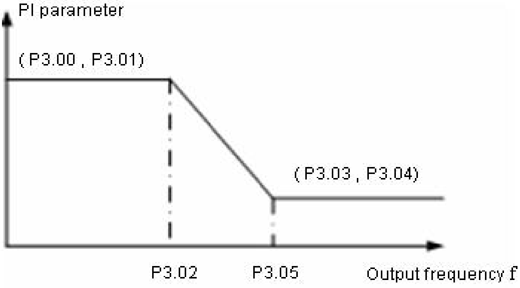


Figure 6.7 PI parameter diagram.

The system's dynamic response can be faster if the proportion gain K_p is increased; However, if K_p is too large, the system tends to oscillate.

The system dynamic response can be faster if the integral time K_i is decreased; However, if K_i is too small, the system becomes overshoot and tends to oscillate.

P3.00 and P3.01 are corresponding to K_p and K_i at low frequency, while P3.03 and P3.04 are corresponding to K_p and K_i at high frequency. Please adjust these parameters according to actual situation. The adjustment procedure is as follow:

- Increase the proportional gain (Kp) as far as possible without creating oscillation.
- Reduce the integral time (Ki) as far as possible without creating oscillation.

For more details about fine adjustment, please refer to description of P9 group.

Function Code	Name	Description	Setting Range	Factory Setting
P3.06	Slip compensation rate of VC	50.0%~200.0%	50~200	100%

The parameter is used to adjust the slip frequency of vector control and improve the precision of speed control. Properly adjust this parameter can effectively restrain the static speed bias.

Function Code	Name	Description	Setting Range	Factory Setting
P3.07	Torque upper limit	0.0~200.0%	0~200	Depend on model

Notice:

- **100% setting corresponding to rated current. G model : 150.0%；P model：120.0%.**
- **Under torque control, P3.07 and P3.09 are all related with torque setting.**

Function Code	Name	Description	Setting Range	Factory Setting
P3.08	Torque setting source	0: Keypad （P3.09） 1:AI1 2:AI2 3:HDI 4:Multi-step speed 5:Communication	0~5	0

0: Keypad （P3.09）

1:AI1

2:AI2

3:HDI

4:Multi-step speed

5:Communication

1~5: Torque control is valid, which defines the torque setting source. When the torque setting is minus, the motor will reverse.

Under speed control model, output torque matches load torque automatically, but limited by P3.07.

Under torque control model, output torque is limited by upper and lower frequency limit.

Notice:

- **speed control and torque control can be switched by using multi-function input terminals.**
- **1~5：100% corresponding to twice of rated current of inverter.**
- **When inverter decelerate to stop, Torque control model is switched to speed control mode automatically**

Function Code	Name	Description	Setting Range	Factory Setting
P3.09	Keypad torque setting	-200.0%~200.0%	-200.0%~200.0%	50.0%
P3.10	Upper frequency setting source	0: Keypad （P0.04） 1: AI1 2: AI2 3: HDI 4: Multi-step 5: Communication	0~5	0

Notice: 1~4 100% Corresponding to maximum frequency.

6.5 P4 Group—V/F Control

Function Code	Name	Description	Setting Range	Factory Setting
P4.00	V/F curve selection	0:Linear V/F curve 1: User-defined curve 2: Torque_stepdown curve (1.3 order) 3: Torque_stepdown curve (1.7 order) 4: Torque_stepdown curve (2.0 order)	0~4	0

0: Linear V/F curve. It is applicable for normal constant torque load.

1: User-defined curve. It can be defined through setting (P4.03~P4.08).

2~4: Torque_stepdown curve. It is applicable for variable torque load, such as blower, pump and so on. Please refer to following figure.

Notice：Vb= Motor rated voltage Fb= Motor rated frequency.

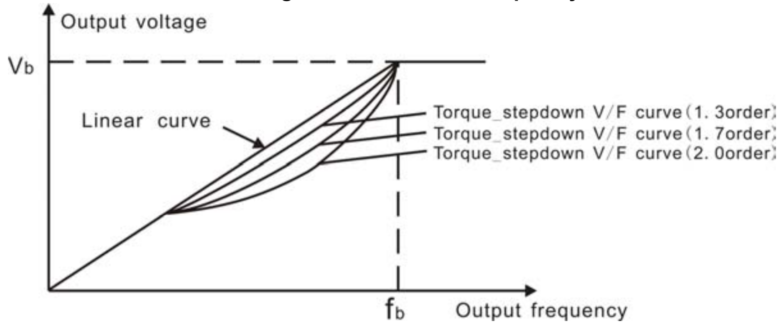


Figure 6.8 V/F curve.

Function Code	Name	Description	Setting Range	Factory Setting
P4.01	Torque boost	0.0%: (auto) 0.1%~10.0%	0.0~10.0	0.0%
P4.02	Torque boost cut-off	0.0%~50.0% (motor rated frequency)	0.0~50.0	20.0%

Torque boost will take effect when output frequency is less than cut-off frequency of torque boost (P4.02). Torque boost can improve the torque performance of V/F control at low speed.

The value of torque boost should be determined by the load. The heavier the load, the larger the value.

Notice: This value should not be too large, otherwise the motor would be over-heat or the inverter would be tripped by over-current or over-load.

If P4.01 is set to be 0, the inverter will boost the output torque according to the load automatically. Please refer to following diagram.

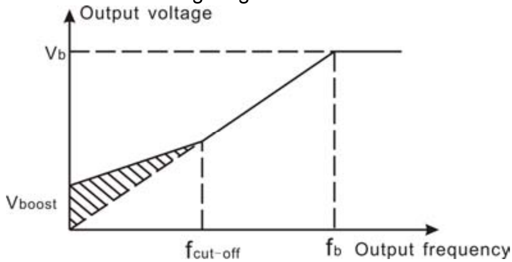


Figure 6.9 Torque boost by hand.

Function Code	Name	Description	Setting Range	Factory Setting
P4.03	V/F frequency 1	0.00Hz~P4.05	0.00~P4.05	0.00Hz
P4.04	V/F voltage 1	0.0%~100.0%	0.0~100.0	0.0%
P4.05	V/F frequency 2	P4.03~P4.07	P4.03~ P4.07	0.00Hz
P4.06	V/F voltage 2	0.0%~100.0%	0.0~100.0	0.0%
P4.07	V/F frequency 3	P4.05~P2.02	P4.05~ P2.02	0.00Hz
P4.08	V/F voltage 3	0.0%~100.0%	0.0~100.0	0.0%

This function is only active when P4.00 is set to be 1. P4.03~P4.08 are used to set the user-defined V/F curve. The value should be set according to the load characteristic of motor.

Notice:

- **0＜V1＜V2＜V3＜rated voltage.**
- **0＜f1＜f2＜f3＜rated frequency.**
- **The voltage corresponding to low frequency should not be set too high, otherwise it may cause motor overheat or inverter fault.**

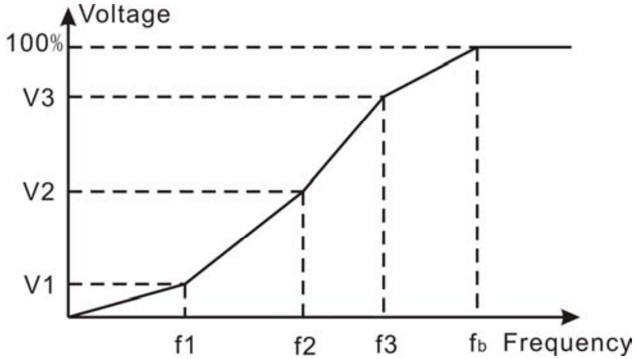


Figure 6.10 V/F curve setting diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P4.09	Slip compensation limit	0.00~200.0%	0.00~200.00	0.0%

The slip compensation function calculates the torque of motor according to the output current and compensates for output frequency. This function is used to improve speed accuracy when operating with a load. P4.09 sets the slip compensation limit as a percentage of motor rated slip, the slip compensation limit is calculated as the formula:

P4.09=fb-n*p/60

Fb= Motor rated frequency (P2.02)

N= Motor rated speed (P2.03)

P= Motor poles

Function Code	Name	Description	Setting Range	Factory Setting
P4.10	Auto energy saving selection	0: Disabled 1: Enabled	0~1	0

When P4.10 is set to be 1, while there is a light load such as pumps or fans, it will reduce the inverter output voltage and save energy.

Function Code	Name	Description	Setting Range	Factory Setting
P4.11	Low-frequency threshold of restraining oscillation	0~10	0~10	2
P4.12	High-frequency threshold of restraining oscillation	0~10	0~10	0
P4.13	Boundary of restraining oscillation	0.0~P3.03	0.0~P3.03	30Hz

P4.11~P4.12 are only valid in the V/F control mode, When set P4.11 and P4.12 to be 0, the restraining oscillation is invalid. While set the values to be 1~3 will have the effect of restraining oscillation.When the running frequency is lower than P4.13, P4.11 is valid, when the running frequency higher than P4.13, P4.12 is valid.

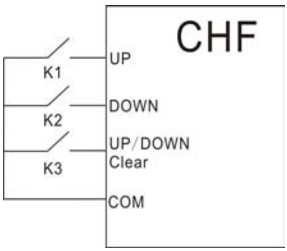
6.6 P5 Group--Input Terminals

Function Code	Name	Description	Setting Range	Factory Setting
P5.00	HDI selection	0: High speed pulse input 1: ON-OFF input	0~1	0
P5.01	S1 terminal function	Programmable multifunctional terminal	0~39	1
P5.02	S2 terminal function	Programmable multifunctional terminal	0~39	4
P5.03	S3 terminal function	Programmable multifunctional terminal	0~39	7
P5.04	S4 terminal function	Programmable multifunctional terminal	0~39	0
P5.05	S5 terminal function	Programmable multifunctional terminal	0~39	0
P5.06	S6 terminal function	Programmable multifunctional terminal	0~39	0
P5.07	S7 terminal function	Programmable multifunctional terminal	0~39	0
P5.08	HDI terminal function	Programmable multifunctional terminal	0-39	0

Notice: P5.08 is only used when P5.00 is set to be 1.

The meaning of each setting is shown in following table.

Setting value	Function	Description
0	Invalid	Please set unused terminals to be invalid to avoid malfunction
1	Forward	Please refer to description of P5.10.
2	Reverse	
3	3-wire control	Please refer to description of P5.10.
4	Jog forward	Please refer to description of P8.06~P8.08.
5	Jog reverse	
6	Coast to stop	The inverter blocks the output immediately. The motor

<table>
<tr><th>Setting value</th><th>Function</th><th>Description</th></tr>
<tr><td></td><td></td><td>coasts to stop by its mechanical inertia.</td></tr>
<tr><td>7</td><td>Reset fault</td><td>Resets faults that have occurred. It has the same function as STOP/RST.</td></tr>
<tr><td>8</td><td>Pause running</td><td>When this terminal takes effect, inverter decelerates to stop and save current status, such as PLC, traverse frequency and PID. When this terminal takes no effect, inverter restores the status</td></tr>
<tr><td>9</td><td>External fault input</td><td>Stop the inverter and output an alarm when a fault occurs in a peripheral device.</td></tr>
<tr><td>10</td><td>Up command</td><td rowspan="3">The reference frequency of inverter can be adjusted by UP command and DOWN command.


Use this terminal to clear UP/DOWN setting. Please refer to description of P0.02.</td></tr>
<tr><td>11</td><td>DOWN command</td></tr>
<tr><td>12</td><td>Clear UP/DOWN</td></tr>
<tr><td>13</td><td>Switch between A and B</td><td rowspan="3"><table><tr><th>P3.04 / Terminal action</th><th>A</th><th>B</th><th>A+B</th></tr><tr><td>13 valid</td><td>B</td><td>A</td><td></td></tr><tr><td>14 valid</td><td>A+B</td><td></td><td>A</td></tr><tr><td>15 valid</td><td></td><td>A+B</td><td>B</td></tr></table></td></tr>
<tr><td>14</td><td>Switch between A and A+B</td></tr>
<tr><td>15</td><td>Switch between B and A+B</td></tr>
<tr><td>16</td><td>Multi-step speed reference1</td><td rowspan="4">16 steps speed control can be realized by the combination of these four terminals. For details, please refer to: Multi-step speed reference terminal status and according step value table:</td></tr>
<tr><td>17</td><td>Multi-step speed reference 2</td></tr>
<tr><td>18</td><td>Multi-step speed reference 3</td></tr>
<tr><td>19</td><td>Multi-step speed</td></tr>
</table>

<table>
<tr><th>Setting value</th><th>Function</th><th>Description</th></tr>
<tr><td></td><td>reference 4</td><td></td></tr>
<tr><td>20</td><td>Multi-step speed pause</td><td>Keep current step unchanged no matter what the input status of four multi-step speed terminals is.</td></tr>
<tr><td>21</td><td>ACC/DEC time selection1</td><td rowspan="2">4 groups of ACC/DEC time can be selected by the combination of these two terminals.
<table>
<tr><th>ACC/DEC time selection 2</th><th>ACC/DEC time selection 1</th><th>ACC/DEC time</th></tr>
<tr><td>OFF</td><td>OFF</td><td>ACC/DEC time 0 (P0.11、P0.12)</td></tr>
<tr><td>OFF</td><td>ON</td><td>ACC/DEC time 1 (P8.00、P8.01)</td></tr>
<tr><td>ON</td><td>OFF</td><td>ACC/DEC time 2 (P8.02、P8.03)</td></tr>
<tr><td>ON</td><td>ON</td><td>ACC/DEC time 3 (P8.04、P8.05)</td></tr>
</table></td></tr>
<tr><td>22</td><td>ACC/DEC time selection 2</td></tr>
<tr><td>23</td><td>Reset simple PLC when stop</td><td>When simple PLC stops, the status of PLC such as running step, running time and running frequency will be cleared when this terminal is enabled.</td></tr>
<tr><td>24</td><td>Pause simple PLC</td><td>Inverter runs at zero frequency and PLC pauses the timing when this terminal is enabled. If this terminal is disabled, inverter will start and continue the PLC operation from the status before pause.</td></tr>
<tr><td>25</td><td>Pause PID</td><td>PID adjustment will be paused and inverter keeps output frequency unchanged.</td></tr>
<tr><td>26</td><td>Pause traverse operation</td><td>Inverter keeps output frequency unchanged. If this terminal is disabled, inverter will continue traverse operation with current frequency.</td></tr>
<tr><td>27</td><td>Reset traverse operation</td><td>Reference frequency of inverter will be forced as center frequency of traverse operation.</td></tr>
<tr><td>28</td><td>Reset counter</td><td>Clear the value of counter.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>29</td><td>Forbid torque</td><td>Torque control is forbided and switch inverter to run in</td></tr>
</table>

Setting value	Function	Description
	control mode	speed control mode.
30	Forbid the function of ACC/DEC	ACC/DEC is invalid and maintains output frequency if it is enabled.
31	Counter input	The pulse input terminal of internal counter. Maximum pulse frequency: 200Hz.
32	UP/DOWN invalid temporarily	UP/DOWN setting is invalid but will not be cleared. When this terminal is disabled, UP/DOWN value before will be valid again.
33~39	Reserved	Reserved

Multi-step speed reference terminal status and according step value table:

Terminal / Step	Multi-step speed reference1	Multi-step speed reference2	Multi-step speed reference3	Multi-step speed reference4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

Function Code	Name	Description	Setting Range	Factory Setting
P5.09	ON-OFF filter times	0~10	0~10	5

This parameter is used to set filter strength of terminals (S1~S4, HDI). When interference is heavy, user should increase this value to prevent malfunction.

Function Code	Name	Description	Setting Range	Factory Setting
P5.10	FWD/REV control 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	0~3	0

This parameter defines four different control modes that control the inverter operation through external terminals.

0: 2-wire control mode 1: Integrate START/STOP command with run direction.

K1	K2	Run command
OFF	OFF	Stop
ON	OFF	FWD
OFF	ON	REV
ON	ON	Maintenance

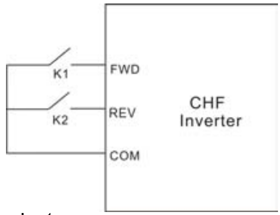


Figure 6.11 2-wire control mode 1.

1: 2-wire control mode 2: START/STOP command is determined by FWD terminal. Run direction is determined by REV terminal.

K1	K2	Run command
OFF	OFF	Stop
ON	OFF	FWD
OFF	ON	Stop
ON	ON	REV

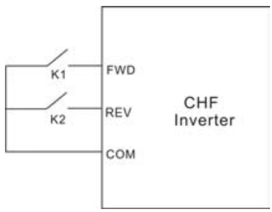


Figure 6.12 2-wire control mode 2.

2: 3-wire control mode 1:

SB1: Start button

SB2: Stop button (NC)

K: Run direction button

Terminal SIn is the multifunctional input terminal of S1~S4 and HDI. The terminal function should be set to be 3 (3-wire control).

K	Run command
OFF	FWD
ON	REV

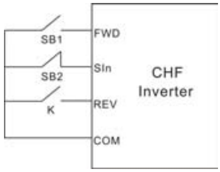


Figure 6.13　3-wire control mode 1.

3: 3-wire control mode 2:

SB1: Forward run button

SB2: Stop button (NC)

SB3: Reverse run button

Terminal SIn is the multifunctional input terminal of S1~S4 and HDI. The terminal function should be set to be 3 (3-wire control).

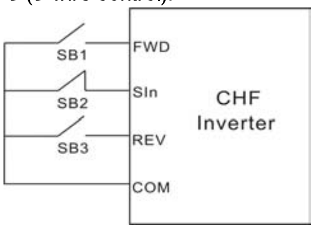


Figure 6.14 3-wire control mode 2.

Notice: When 2-wire control mode is active, the inverter will not run in following situation even if FWD/REV terminal is enabled:

- **Coast to stop (press RUN and STOP/RST at the same time).**
- **Stop command from serial communication.**
- **FWD/REV terminal is enabled before power on.**

Function Code	Name	Description	Setting Range	Factory Setting
P5.11	UP/DOWN setting change rate	0.01~50.00Hz/s	0.01~50.00	0.50Hz/s

This parameter is used to determine how fast UP/DOWN setting changes.

Function Code	Name	Description	Setting Range	Factory Setting
P5.12	AI1 lower limit	-10.00V~10.00V	-10.00~10.00	0.00V

Function Code	Name	Description	Setting Range	Factory Setting
P5.13	AI1 lower limit corresponding setting	-100.0%~100.0%	-100.0~100.0	0.0%
P5.14	AI1 upper limit	-10.00V~10.00V	-10.00~10.00	10.00V
P5.15	AI1 upper limit corresponding setting	-100.0%~100.0%	-100.0~100.0	100.0%
P5.16	AI1 filter time constant	0.00s~10.00s	0.00~10.00	0.10s

These parameters determine the relationship between analog input voltage and the corresponding setting value. When the analog input voltage exceeds the range between lower limit and upper limit, it will be regarded as the upper limit or lower limit.

The analog input AI1 can only provide voltage input, and the range is -10V~10V.

For different applications, the corresponding value of 100.0% analog setting is different. For details, please refer to description of each application.

Notice: AI1 lower limit must be less or equal to AI1 upper limit.

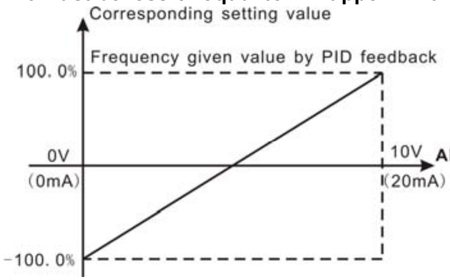


Figure 6.15 Relationship between AI and corresponding setting.

AI1 filter time constant is effective when there are sudden changes or noise in the analog input signal. Responsiveness decreases as the setting increases.

Function Code	Name	Description	Setting Range	Factory Setting
P5.17	AI2 lower limit	0.00V~10.00V	0.00~10.00	0.00V
P5.18	AI2 lower limit corresponding setting	-100.0%~100.0%	-100.0~100.0	0.0%

Function Code	Name	Description	Setting Range	Factory Setting
P5.19	AI2 upper limit	0.00V~10.00V	0.00~10.00	10.00V
P5.20	AI2 upper limit corresponding setting	-100.0%~100.0%	-100.0~100.0	100.0%
P5.21	AI2 filter time constant	0.00s~10.00s	0.00~10.00	0.10s

Please refer to description of AI1. When AI2 is set as 0~20mA current input, the corresponding voltage range is 0~5V.

Function Code	Name	Description	Setting Range	Factory Setting
P5.22	HDI lower limit	0.0 kHz ~50.0kHz	0.0~50.0	0.0kHz
P5.23	HDI lower limit corresponding setting	-100.0%~100.0%	-100.0~100.0	0.0%
P5.24	HDI upper limit	0.0 kHz ~50.0kHz	0.0~50.0	50.0kHz
P5.25	HDI upper limit corresponding setting	-100.0%~100.0%	-100.0~100.0	100.0%
P5.26	HDI filter time constant	0.00s~10.00s	0.00~10.00	0.10s

The description of P5.22~P5.26 is similar to AI1.

6.7 P6 Group--Output Terminals

Function Code	Name	Description	Setting Range	Factory Setting
P6.00	HDO selection	0: High-speed pulse output 1: ON-OFF output	0~1	0

0: High-speed pulse output: The maximum pulse frequency is 50.0 kHz. Please refer to description of P6.06.

1: ON-OFF output: Please refer to description of P6.01.

Notice: The output of HDO terminal is OC (open collector) output.

Function Code	Name	Description	Setting Range	Factory Setting
P6.01	HDO ON-OFF output selection	Open-collector output	0~20	1
P6.02	Relay 1 output selection	Relay output	0~20	4
P6.03	Relay 2 output selection (4.0kW and above)	Relay output	0~20	0

OC/Relay output functions are indicated in the following table:

Setting Value	Function	Description
0	No output	Output terminal has no function.
1	Running	ON: Run command is ON or voltage is being output.
2	Run forward	ON: During forward run.
3	Run reverse	ON: During reverse run.
4	Fault output	ON: Inverter is in fault status.
5	FDT reached	Please refer to description of P8.21, P8.22.
6	Frequency reached	Please refer to description of P8.23.
7	Zero speed running	ON: The running frequency of inverter and setting frequency are zero.
8	Preset count value reached	Please refer to description of P8.18.
9	Specified count value reached	Please refer to description of P8.19.
10	overload pre-warming of inverter	Please refer to description of Pb.04~Pb.06
11	Simple PLC step	After simple PLC completes one step, inverter will

Setting Value	Function	Description
	completed	output ON signal for 500ms.
12	PLC cycle completed	After simple PLC completes one cycle, inverter will output ON signal for 500ms.
13	Running time reached	ON: The accumulated running time of inverter reaches the value of P8.20.
14	Upper frequency limit reached	ON: Running frequency reaches the value of P0.04.
15	Lower frequency limit reached	ON: Running frequency reaches the value of P0.05.
16	Ready	ON: Inverter is ready (no fault, power is ON).
17~20	Reserved	Reserved

Function Code	Name	Description	Setting Range	Factory Setting
P6.04	AO1 function selection	Multifunctional analog output	0~10	0
P6.05	AO2 function selection	Multifunctional analog output	0~10	0
P6.06	HDO function selection	Multifunctional high-speed pulse output	0~10	0

AO/HDO output functions are indicated in the following table:

Setting Value	Function	Range
0	Running frequency	0~maximum frequency (P0.03)
1	Reference frequency	0~ maximum frequency (P0.03)
2	Running speed	0~2* rated synchronous speed of motor
3	Output current	0~2* inverter rated current
4	Output voltage	0~1.5* inverter rated voltage
5	Output power	0~2* rated power
6	Setting torque	0~2*rated current of motor
7	Output torque	0~2*rated current of motor
8	AI1 voltage	-10~10V

Setting Value	Function	Range
9	AI2 voltage/current	0~10V/0~20mA
10	HDI frequency	0.1~50.0kHz

Function Code	Name	Description	Setting Range	Factory Setting
P6.07	AO1 lower limit	0.0%~100.0%	0.0~100.0	0.0%
P6.08	AO1 lower limit corresponding output	0.00V ~10.00V	0.00~10.00	0.00V
P6.09	AO1 upper limit	0.0%~100.0%	0.0~100.0	100.0%
P6.10	AO1 upper limit corresponding output	0.00V ~10.00V	0.00~10.00	10.00V

These parameters determine the relationship between analog output voltage/current and the corresponding output value. When the analog output value exceeds the range between lower limit and upper limit, it will output the upper limit or lower limit.

When AO1 is current output, 1mA is corresponding to 0.5V.

For different applications, the corresponding value of 100.0% analog output is different. For details, please refer to description of each application.

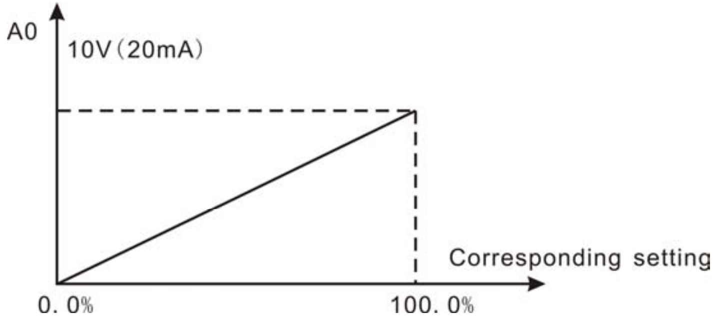


Figure 6.16 Relationship between AO and corresponding setting.

Function Code	Name	Description	Setting Range	Factory Setting
P6.11	AO2 lower limit	0.0~100.0%	0.0~100.0	0.0%
P6.12	AO2 lower limit corresponding output	0~10.00V	0~10.00	0.00V
P6.13	AO2 upper limit	0.0~100.0%	0.0~100.0	100.0%
P6.14	AO2 upper limit corresponding output	0.00~10.00V	0.00~10.00	10.00V
P6.15	HDO lower limit	0.0%~100.0%	0.0~100.0	0.0%
P6.16	HDO lower limit corresponding output	0.0 ~ 50.0kHz	0.0~50.0	0.0kHz
P6.17	HDO upper limit	0.0%~100.0%	0.0~100.0	100.0%
P6.18	HDO upper limit corresponding output	0.0 ~ 50.0kHz	0.0~50.0	50.0kHz

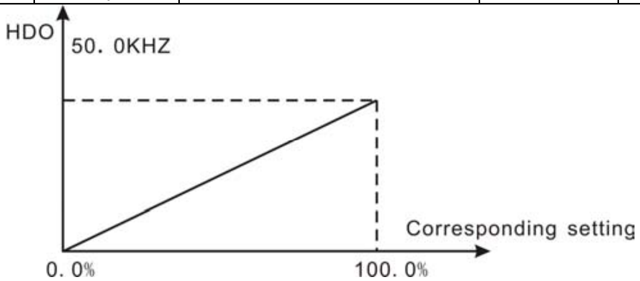


Figure 6.17 Relationship between HDO and corresponding setting.

6.8 P7 Group—Display Interface

Function Code	Name	Description	Setting Range	Factory Setting
P7.00	User password	0~65535	0~65535	0

The password protection function will be valid when P7.00 is set to be any nonzero data. When P7.00 is set to be 00000, user's password set before will be cleared and the password protection function will be disabled.

After the password has been set and becomes valid, the user can not access menu if the user's password is not correct. Only when a correct user's password is input, the user can see and modify the parameters. Please keep user's password in mind.

Function Code	Name	Description	Setting Range	Factory Setting
P7.01	Reserved		0~1	0
P7.02	Reserved		0~1	0
P7.03	QUICK/JOG function selection	0: Display status switching 1: Jog 2: FWD/REV switching 3: Clear UP/DOWN setting 4. Quick debugging mode	0~4	0

QUICK/JOG is a multifunctional key, whose function can be defined by the value

0. Display status switching

1: Jog: Press QUICK/JOG, the inverter will jog.

2: FWD/REV switching: Press QUICK/JOG, the running direction of inverter will reverse. It is only valid if P0.02 is set to be 0.

3: Clear UP/DOWN setting: Press QUICK/JOG, the UP/DOWN setting will be cleared.

4. Quick debugging mode

Function Code	Name	Description	Setting Range	Factory Setting
P7.04	STOP/RST function selection	0: Valid when keypad control (P0.02=0) 1: Valid when keypad or terminal control (P0.02=0 or 1) 2: Valid when keypad or	0~3	0

Function Code	Name	Description	Setting Range	Factory Setting
		communication control (P0.02=0 or 2) 3: Always valid		

Notice:

- **The value of P7.04 only determines the STOP function of STOP/RST.**
- **The RESET function of STOP/RST is always valid.**

Function Code	Name	Description	Setting Range	Factory Setting
P7.05	Keypad display selection	0: Preferential to external keypad 1: Both display, only external key valid. 2: Both display, only local key valid. 3: Both display and key valid.	0~3	0

0: When external keypad exists, local keypad will be invalid.

1: Local and external keypad display simultaneously, only the key of external keypad is valid.

2: Local and external keypad display simultaneously, only the key of local keypad is valid.

3: Local and external keypad display simultaneously, both keys of local and external keypad are valid.

Notice: This function should be used cautiously, otherwise it may cause malfunction.

Function Code	Name	Description	Setting Range	Factory Setting
P7.06	Running status display selection 1	0~0xFFFF	0~0xFFFF	0x07FF
P7.07	Running status display selection 2	0~0xFFFF	0~0xFFFF	0x0000

P7.06 and P7.07 define the parameters that can be displayed by LED in running status.

If Bit is 0, the parameter will not be displayed; If Bit is 1, the parameter will be displayed. Press 》/SHIFT to scroll through these parameters in right order . Press DATA/ENT + QUICK/JOG to scroll through these parameters in left order.

The display content corresponding to each bit of P7.06 is described in the following table:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Output power	Line speed	Rotation speed	Output current	Output voltage	DC bus voltage	Reference frequency	Running frequency
BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Step No. of PLC or multi-step	Count value	Torque setting value	Output terminal status	Input terminal status	PID feedback	PID preset	Output torque

For example, if user wants to display output voltage, DC bus voltage, Reference frequency, Output frequency, Output terminal status, the value of each bit is as the following table:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
0	0	0	0	1	1	1	1
BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
0	0	0	1	0	0	0	0

The value of P7.06 is 100Fh.

Notice: I/O terminal status is displayed in decimal.

For details, please refer to description of P7.21 and P7.22.

The display content corresponding to each bit of P7.07 is described in the following table:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Reserved	Reserved	Reserved	Load percentage of inverter	Load percentage of motor	HDI frequency	AI2	AI1
BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

Function Code	Name	Description	Setting Range	Factory Setting
P7.08	Stop status display selection	0~0xFFFF	0~0xFFFF	0x00FF

P7.08 determines the display parameters in stop status. The setting method is similar with P7.06.

The display content corresponding to each bit of P7.08 is described in the following table:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
AI2	AI1	PID feedback	PID preset	Output terminal status	Input terminal status	DC bus voltage	Reference frequency
BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Reserved	Reserved	Reserved	Reserved	Torque setting value	Step No. of PLC or multi-step	HDI frequency

Function Code	Name	Description	Setting Range	Factory Setting
P7.09	Coefficient of rotation speed	0.1~999.9%	0.1~999.9	100.0%

This parameter is used to calibrate the bias between actual mechanical speed and rotation speed. The formula is as below:

Actual mechanical speed = 120 * output frequency *P7.09 / Number of poles of motor.

Function Code	Name	Description	Setting Range	Factory Setting
P7.10	Coefficient of line speed	0.1~999.9%	0.1~999.9	1.0%

This parameter is used to calculate the line speed based on actual mechanical speed. The formula is as below:

Line speed = actual mechanical speed * P7.10

Function Code	Name	Description	Setting Range	Factory Setting
P7.11	Rectify module temperature	0~100.0℃		
P7.12	IGBT module temperature	0~100.0℃		
P7.13	Software version			
P7.14	Inverter rated power	0-3000KW		Depends on model
P7.15	Inverter rated current	0.0-6000A		Depends on model
P7.16	Accumulated running time	0~65535h		

Rectify module temperature: Indicates the temperature of rectify module. Overheat protection point of different model may be different.

IGBT module temperature: Indicates the temperature of IGBT module. Overheat protection point of different model may be different.

Software version: Indicates current software version of DSP.

Accumulated running time: Displays accumulated running time of inverter.

Notice: Above parameters are read only.

Function Code	Name	Description	Setting Range	Factory Setting
P7.17	Third latest fault type	0~25		
P7.18	Second latest fault type	0~25		
P7.19	Latest fault type	0~25		

These parameters record three recent fault types. For details, please refer to description of chapter 7.

<table>
<tr><th>Function Code</th><th>Name</th><th>Description</th><th>Setting Range</th><th>Factory Setting</th></tr>
<tr><td>P7.20</td><td>Output frequency at current fault</td><td>Output frequency at current fault.</td><td></td><td></td></tr>
<tr><td>P7.21</td><td>Output current at current fault</td><td>Output current at current fault.</td><td></td><td></td></tr>
<tr><td>P7.22</td><td>DC bus voltage at current fault</td><td>DC bus voltage at current fault.</td><td></td><td></td></tr>
<tr><td>P7.23</td><td>Input terminal status at current fault</td><td>This value records ON-OFF input terminal status at current fault. The meaning of each bit is as below:
<table><tr><td>BIT7</td><td>BIT6</td><td>BIT5</td><td>BIT4</td></tr><tr><td>HDI</td><td>S7</td><td>S6</td><td>S5</td></tr><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>S4</td><td>S3</td><td>S2</td><td>S1</td></tr></table>1 indicates corresponding input terminal is ON, while 0 indicates OFF. Notice: This value is displayed as decimal.</td><td></td><td></td></tr>
<tr><td>P7.24</td><td>Output terminal status at current fault</td><td>This value records output terminal status at current fault. The meaning of each bit is as below:
<table><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>Reserved</td><td>RO2</td><td>RO1</td><td>HDO</td></tr></table>1 indicates corresponding output terminal is ON, while 0 indicates OFF. Notice: This value is displayed as decimal.</td><td></td><td></td></tr>
</table>

6.9 P8 Group--Enhanced Function

Function Code	Name	Description	Setting Range	Factory Setting
P8.00	Acceleration time 1	0.1~3600.0s	0.1~3600.0	Depend on model
P8.01	Deceleration time 1	0.1~3600.0s	0.1~3600.0	Depend on model
P8.02	Acceleration time 2	0.1~3600.0s	0.1~3600.0	Depend on model
P8.03	Deceleration time 2	0.1~3600.0s	0.1~3600.0	Depend on model
P8.04	Acceleration time 3	0.1~3600.0s	0.1~3600.0	Depend on model
P8.05	Deceleration time 3	0.1~3600.0s	0.1~3600.0	Depend on model

For details, please refer to description of P0.11 and P0.12.

Function Code	Name	Description	Setting Range	Factory Setting
P8.06	Jog reference	0.00~P0.03	0.00~P0.03	5.00hz
P8.07	Jog acceletation time	0.1-3600.0s	0.1~3600.0	Depand on Model
P8.08	Jog deceleration time	0.1~3600.0s	0.1~3600.0	Depand on Model
P8.09	Skip Frequency 1	0.00~P0.03	0.00~P0.03	0.00hz
P8.10	Skip Frequency 2	0.00~P0.03	0.00~P0.03	0.00hz
P8.11	Skip frequency bandwidth	0.00~P0.03	0.00~P0.03	0.00hz

By means of setting skip frequency, the inverter can keep away from the mechanical resonance with the load. P8.09 and P8.10 are centre value of frequency to be skipped.

Notice:

- **If P8.11 is 0, the skip function is invalid.**
- **If both P8.09 and P8.10 are 0, the skip function is invalid no matter what P8.11 is.**
- **Operation is prohibited within the skip frequency bandwidth, but changes during acceleration and deceleration are smooth without skip.**

The relation between output frequency and reference frequency is shown in following figure.

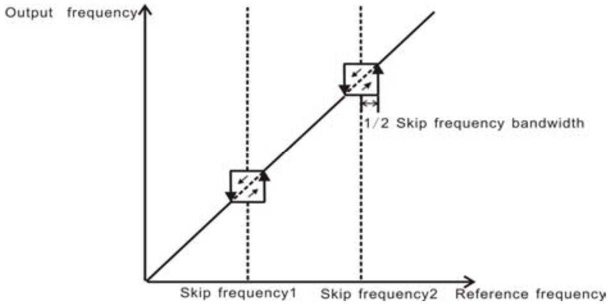


Figure 6.18 Skip frequency diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P8.12	Traverse amplitude	0.0~100.0%	0.0~100.0	0.0%
P8.13	Jitter frequency	0.0-50.0%	0.0-50.0	0.0%
P8.14	Rise time of traverse	0.1-3600.0s	0.1-3600.0	5.0s
P8.15	Fall time of traverse	0.1-3600.0s	0.1-3600.0	5.0s

Traverse operation is widely used in textile and chemical fiber industry. The typical application is shown in following figure.

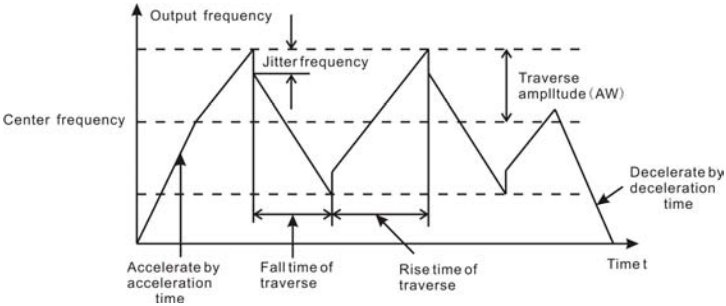


Figure 6.19 Traverse operation diagram.

Center frequency (CF) is reference frequency.

Traverse amplitude (AW) =center frequency (CF) * P8.12%

Jitter frequency = traverse amplitude (AW) * P8.13%

Rise time of traverse: Indicates the time rising from the lowest traverse frequency to the highest traverse frequency.

Fall time of traverse: Indicates the time falling from the highest traverse frequency to the lowest traverse frequency.

Notice: P8.12 determines the output frequency range which is as below: (1-P8.12%) * reference frequency ≤ output frequency ≤ (1+P8.12%) * reference frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P8.16	Auto reset times	0~3	0~3	0
P8.17	Reset interval	0.1~100.0s	0.1~100.0	1.0s

Auto reset function can reset the fault in preset times and interval. When P8.16 is set to be 0, it means “auto reset” is disabled and the protective device will be activated in case of fault.

Notice: The fault such as OUT 1, OUT 2, OUT 3, OH1 and OH2 cannot be reset automatically.

Function Code	Name	Description	Setting Range	Factory Setting
P8.18	Preset count value	P8.19~65535	P8.19~65535	0
P8.19	Specified count value	0~P8.18	0~ P8.18	0

The count pulse input channel can be S1~S4 (≤200Hz) and HDI.

If function of output terminal is set as preset count reached, when the count value reaches preset count value (P8.18), it will output an ON-OFF signal. Inverter will clear the counter and restart counting.

If function of output terminal is set as specified count reached, when the count value reaches specified count value (P8.19), it will output an ON-OFF signal until the count value reaches preset count value (P8.18). Inverter will clear the counter and restart counting.

Notice:

- **Specified count value (P8.19) should not be greater than preset count value (P8.18).**
- **Output terminal can be RO1, RO2 or HDO.**

This function is shown as following figure.

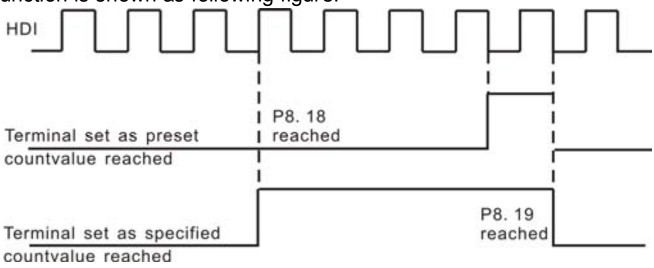


Figure 6.20 Timing chart for preset and specified count reached.

Function Code	Name	Description	Setting Range	Factory Setting
P8.20	Preset running time	0~65535h	0~65535	65535 h

If function of output terminal is set as running time reached, when the accumulated running time reaches the preset running time, it will output an ON-OFF signal.

Function Code	Name	Description	Setting Range	Factory Setting
P8.21	FDT level	0.00~ P0.03	0.00~ P0.03	50.00Hz
P8.22	FDT lag	0.0~100.0%	0.0~100.0	5.0%

When the output frequency reaches a certain preset frequency (FDT level), output terminal will output an ON-OFF signal until output frequency drops below a certain frequency of FDT level (FDT level - FDT lag), as shown in following figure.

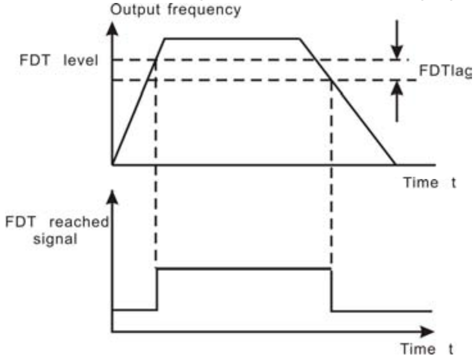


Figure 6.21 FDT level and lag diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P8.23	Frequency arrive detecting range	0.0~100.0% （maximum frequency）	0.0~100.0	0.0%

When output frequency is within the detecting range of reference frequency, an ON-OFF signal will be output. The function can adjust the detecting range.

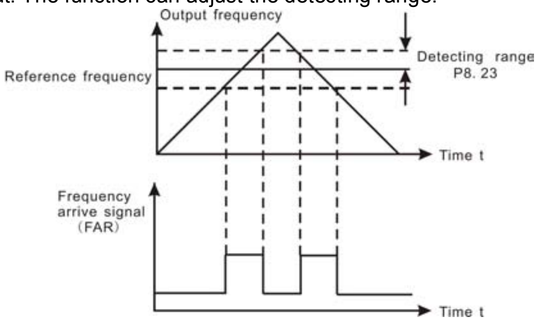


Figure 6.22 Frequency arriving detection diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P8.24	Droop control	0.00~10.00Hz	0.00~10.00	0.00Hz

When several motors drive the same load, each motor's load is different because of the difference of motor's rated speed. The load of different motors can be balanced through droop control function which makes the speed droop along with load increase.

When the motor outputs rated torque, actual frequency drop is equal to P8.24. User can adjust this parameter from small to big gradually during commissioning. The relation between load and output frequency is in the following figure.

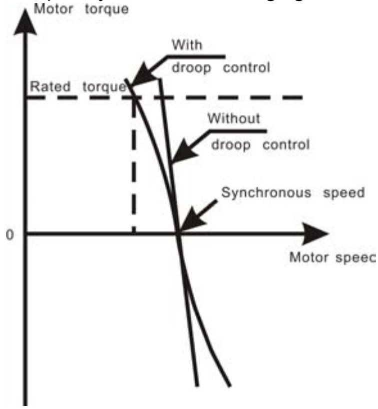


Figure 6.23 Droop control diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P8.25	Brake threshold voltage	115.0~140.0%	115.0~140.0	Depend on model

When the DC bus voltage is greater than the value of P8.25, the inverter will start dynamic braking.

Notice:

- **Factory setting is 120% if rated voltage of inverter is 220V.**
- **Factory setting is 130% if rated voltage of inverter is 380V.**
- **The value of P8.25 is corresponding to the DC bus voltage at rated input voltage.**

Function Code	Name	Description	Setting Range	Factory Setting
P8.26	Cooling fan control	0: Auto stop mode 1: Always working	0~1	0

0: Auto stop mode: The fan keeps working when the inverter is running. When the inverter stops, whether the fan works or not depends on the module temperature of inverter.

Function Code	Name	Description	Setting Range	Factory Setting
P8.27	Overmodulation	0: Invalid 1: Valid	0~1	0

The function is applicable in the instance of low network voltage or heavy load for a long time, inveter rises the output voltage with rising utilization rate of itself bus voltage.

Function Code	Name	Description	Setting Range	Factory Setting
P8.28	PWM mode	0: PWM mode 1 1: PWM mode 2 2: PWM mode 3	0~2	0

The features of each mode, please refer the following table:

<table>
<tr><th>Mode</th><th>Noise in lower frequency</th><th>Noise in higher frequency</th><th>Others</th></tr>
<tr><td>PWM mode 1</td><td>Low</td><td>high</td><td></td></tr>
<tr><td>PWM mode 2</td><td colspan="2">low</td><td>Need to be derated, because of higher temperature rise.</td></tr>
<tr><td>PWM mode 3</td><td colspan="2">high</td><td>Be more effective to restrain the oscillation</td></tr>
</table>

6.10 P9 Group--PID Control

PID control is a common used method in process control, such as flow, pressure and temperature control. The principle is firstly to detect the bias between preset value and feedback value, then calculate output frequency of inverter according to proportional gain, integral and differential time. Please refer to following figure.

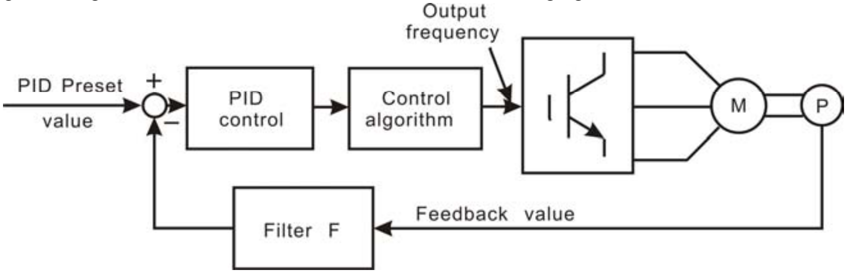


Figure 6.24 PID control diagram.

Notice: To make PID take effect, P0.07 must be set to be 6.

Function Code	Name	Description	Setting Range	Factory Setting
P9.00	PID preset source selection	0: Keypad 1: AI1 2: AI2 3: HDI 4: Multi-step 5: Communication	0~5	0
P9.01	Keypad PID preset	0.0%~100.0%	0.0~100.0	0.0%
P9.02	PID feedback source selection	0: AI1 1: AI2 2: AI1+AI2 3: HDI 4: Communication	0~4	0

These parameters are used to select PID preset and feedback source.

Notice:

- **Preset value and feedback value of PID are percentage value.**
- **100% of preset value is corresponding to 100% of feedback value.**
- **Preset source and feedback source must not be same, otherwise PID will be malfunction.**

Function Code	Name	Description	Setting Range	Factory Setting
P9.03	PID output characteristic	0: Positive 1: Negative	0~1	0

0：Positive. When the feedback value is greater than the preset value, output frequency will be decreased, such as tension control in winding application.

1: Negative. When the feedback value is greater than the preset value, output frequency will be increased, such as tension control in unwinding application.

Function Code	Name	Description	Setting Range	Factory Setting
P9.04	Proportional gain (Kp)	0.00~100.00	0.00~100.00	0.10
P9.05	Integral time (Ti)	0.01~10.00s	0.01~10.00	0.10s

Function Code	Name	Description	Setting Range	Factory Setting
P9.06	Differential time (Td)	0.00~10.00s	0.00~10.00	0.00s

Optimize the responsiveness by adjusting these parameters while driving an actual load.

Adjusting PID control:

Use the following procedure to activate PID control and then adjust it while monitoring the response.

1. Enabled PID control (P0.07=6)
2. Increase the proportional gain (Kp) as far as possible without creating oscillation.
3. Reduce the integral time (Ti) as far as possible without creating oscillation.
4. Increase the differential time (Td) as far as possible without creating oscillation.

Making fine adjustments:

First set the individual PID control constants, and then make fine adjustments.

l Reducing overshooting

If overshooting occurs, shorten the differential time and lengthen the integral time.

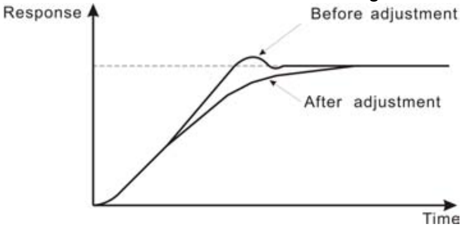


Figure 6.25 Reducing overshooting diagram.

l Rapidly stabilizing control status

To rapidly stabilize the control conditions even when overshooting occurs, shorten the integral time and lengthen the differential time.

l Reducing long-cycle oscillation

If oscillation occurs with a longer cycle than the integral time setting, it means that integral operation is strong. The oscillation will be reduced as the integral time is lengthened.

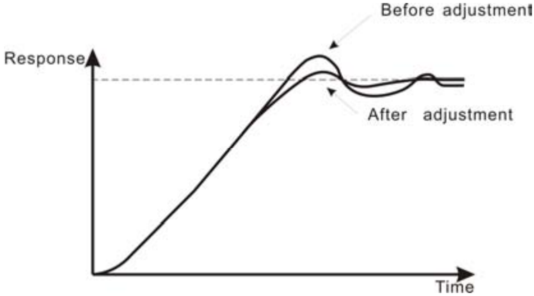


Figure 6.26 Reducing long-cycle oscillation diagram.

l Reducing short-cycle oscillation

If the oscillation cycle is short and oscillation occurs with a cycle approximately the same as the differential time setting, it means that the differential operation is strong. The oscillation will be reduced as the differential time is shortened.

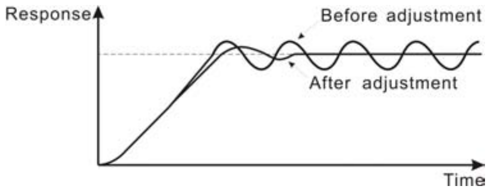


Figure 6.27 Reducing short-cycle oscillation diagram.

If oscillation cannot be reduced even by setting the differential time to 0, then either lower the proportional gain or raise the PID primary delay time constant.

Function Code	Name	Description	Setting Range	Factory Setting
P9.07	Sampling cycle (T)	0.01~100.00s	0.01~100.00	0.10s
P9.08	Bias limit	0.0~100.0%	0.0~100.0	0.0%

Sampling cycle T refers to the sampling cycle of feedback value. The PI regulator calculates once in each sampling cycle. The bigger the sampling cycle is, the slower the response is.

Bias limit defines the maximum bias between the feedback and the preset. PID stops operation when the bias is within this range. Setting this parameter correctly is helpful to improve the system output accuracy and stability.

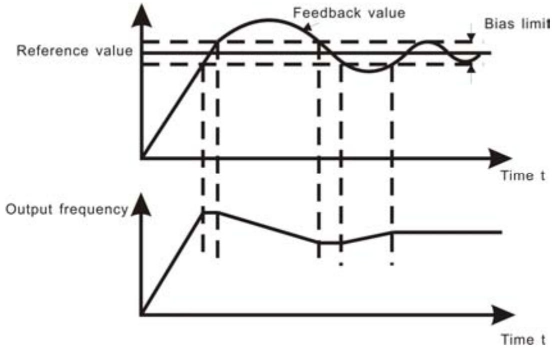


Figure 6.28 Relationship between bias limit and output frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P9.09	Feedback lost detecting value	0.0~100.0%	0.0~100.0	0.0%
P9.10	Feedback lost detecting time	0.0~3600.0s	0.0~3600.0	1.0s

When feedback value is less than P9.09 continuously for the period determined by P9.10, the inverter will alarm feedback lost failure (PIDE). **Notice: 100% of P9.09 is the same as 100% of P9.01.**

6.11 PA Group--Simple PLC and Multi-step Speed Control

Simple PLC function can enable the inverter to change its output frequency and directions automatically according to programmable controller PLC. For multi-step speed function, the output frequency can be changed only by multi-step terminals.

Notice:

- **Simple PLC has 16 steps which can be selected.**
- **If P0.07 is set to be 5, 16 steps are available for multi-step speed. Otherwise only 15 steps are available (step 1~15).**

Function Code	Name	Description	Setting Range	Factory Setting
PA.00	Simple PLC mode	0: Stop after one cycle 1: Hold last frequency after one cycle 2: Circular run	0~2	0

0: Stop after one cycle: Inverter stops automatically as soon as it completes one cycle, and It needs run command to start again.

1: Hold last frequency after one cycle: Inverter holds frequency and direction of last step after one cycle.

2: Circular run: Inverter continues to run cycle by cycle until receive a stop command.

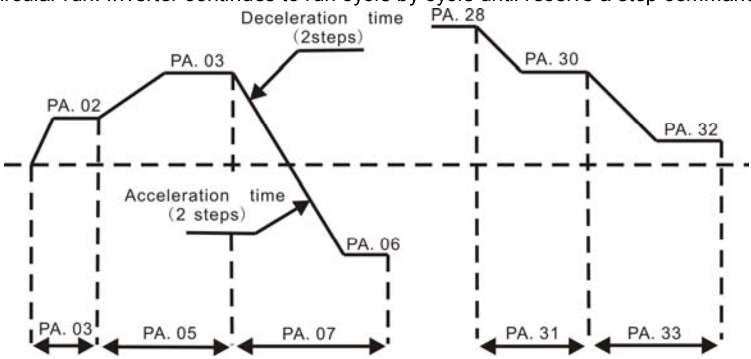


Figure 6.29 Simple PLC operation diagram.

Function Code	Name	Description	Setting Range	Factory Setting
PA.01	Simple PLC status saving after power off	0: Disabled 1: Enabled	0~1	0

This parameter determines whether the running step and output frequency should be saved when power off or not.

Function Code	Name	Description	Setting Range	Factory Setting
PA.02	Multi-step speed 0	-100.0~100.0%	-100.0~100.0	0.0%
PA.03	0^{th} Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.04	Multi-step speed 1	-100.0~100.0%	-100.0~100.0	0.0%
PA.05	1^{st} Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.06	Multi-step speed 2	-100.0~100.0%	-100.0~100.0	0.0%

Function Code	Name	Description	Setting Range	Factory Setting
PA.07	2nd Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.08	Multi-step speed 3	-100.0~100.0%	-100.0~100.0	0.0%
PA.09	3rd Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.10	Multi-step speed 4	-100.0~100.0%	-100.0~100.0	0.0%
PA.11	4th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.12	Multi-step speed 5	-100.0~100.0%	-100.0~100.0	0.0%
PA.13	5th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.14	Multi-step speed 6	-100.0~100.0%	-100.0~100.0	0.0%
PA.15	6th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.16	Multi-step speed 7	-100.0~100.0%	-100.0~100.0	0.0%
PA.17	7th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.18	Multi-step speed 8	-100.0~100.0%	-100.0~100.0	0.0%
PA.19	8th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.20	Multi-step speed 9	-100.0~100.0%	-100.0~100.0	0.0%
PA.21	9th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.22	Multi-step speed 10	-100.0~100.0%	-100.0~100.0	0.0%

Function Code	Name	Description	Setting Range	Factory Setting
PA.23	10th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.24	Multi-step speed 11	-100.0~100.0%	-100.0~100.0	0.0%
PA.25	11th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.26	Multi-step speed 12	-100.0~100.0%	-100.0~100.0	0.0%
PA.27	12th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.28	Multi-step speed 13	-100.0~100.0%	-100.0~100.0	0.0%
PA.29	13th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.30	Multi-step speed 14	-100.0~100.0%	-100.0~100.0	0.0%
PA.31	14th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s
PA.32	Multi-step speed 15	-100.0~100.0%	-100.0~100.0	0.0%
PA.33	15th Step running time	0.0~6553.5 s(m)	0.0~6553.5	0.0s

Notice:

- **100% of multi-step speed x corresponds to the maximum frequency (P0.04).**
- **If the value of multi-step speed x is negative, the direction of this step will be reverse, otherwise it will be forward.**
- **The unit of x step running time is determined by PA.37.**

Selection of step is determined by combination of multi-step terminals. Please refer to following figure and table.

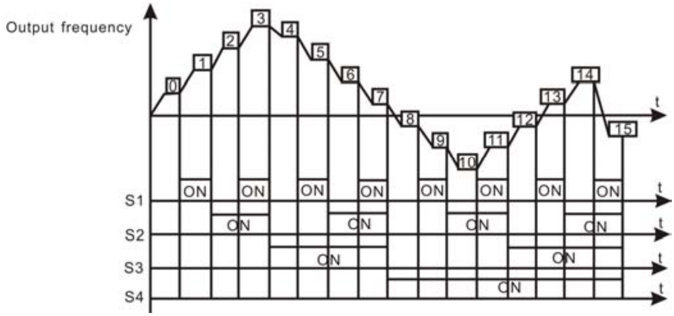


Figure 6.30 Multi-steps speed operation diagram.

Terminal Step	Multi-step speed reference1	Multi-step speed reference2	Multi-step speed reference3	Multi-step speed reference4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

Function Code	Name	Description	Setting Range	Factory Setting
PA.34	ACC/DEC time selection for step 0~7	0~0XFFFF	0~0XFFFF	0

Function Code	Name	Description	Setting Range	Factory Setting
PA.35	ACC/DEC time selection for step 8~15	0~0XFFFF	0~0XFFFF	0

These parameters are used to determine the ACC/DEC time from one step to next step. There are four ACC/DEC time groups.

Function Code	Binary Digit		Step No.	ACC/DEC Time 0	ACC/DEC Time 1	ACC/DEC Time 2	ACC/DEC Time 3
PA.34	BIT1	BIT0	0	00	01	10	11
	BIT3	BIT2	1	00	01	10	11
	BIT5	BIT4	2	00	01	10	11
	BIT7	BIT6	3	00	01	10	11
	BIT9	BIT8	4	00	01	10	11
	BIT11	BIT10	5	00	01	10	11
	BIT3	BIT12	6	00	01	10	11
	BIT15	BIT14	7	00	01	10	11
PA.35	BIT1	BIT0	8	00	01	10	11
	BIT3	BIT2	9	00	01	10	11
	BIT5	BIT4	10	00	01	10	11
	BIT7	BIT6	11	00	01	10	11
	BIT9	BIT8	12	00	01	10	11
	BIT11	BIT10	13	00	01	10	11
	BIT3	BIT12	14	00	01	10	11
	BIT15	BIT14	15	00	01	10	11

For example: To set the acceleration time of following table:

Step No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ACC/DEC time group	0	1	2	3	2	1	3	0	3	3	2	0	0	0	2	2

The value of every bit of PA.34 and PA.35 is:

Low byte	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7
PA.34	0	0	1	0	0	1	1	1
PA.35	1	1	1	1	0	1	0	0

High byte	BIT 8	BIT 9	BIT 10	BIT 11	BIT 12	BIT 13	BIT 14	BIT 15
PA.34	0	1	1	0	1	1	0	0
PA.35	0	0	0	0	0	1	0	1

So the value of PA.34 should be: 0X36E4, the value of PA.35 should be: 0XA02F

Function Code	Name	Description	Setting Range	Factory Setting
PA.36	Simple PLC restart selection	0: Restart from step 0 1: Continue from interrupted step	0~1	0

0: Restart from step 0: If the inverter stops during running (due to stop command or fault), it will run from step 0 when it restarts.

1: Continue from interrupted step: If the inverter stops during running (due to stop command or fault), it will record the running time of current step. When inverter restarts, it will resume from interrupted time automatically. For details, please refer to following figure.

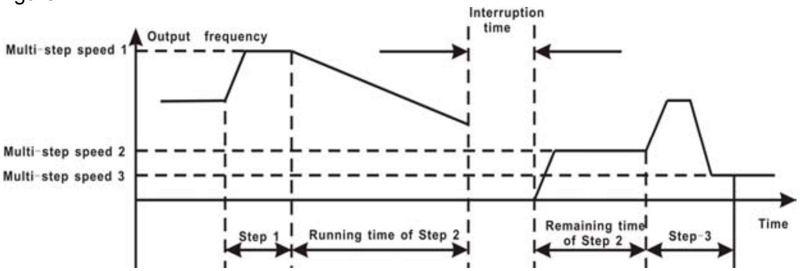


Figure 6.31 Simple PLC continues from interrupted step.

Function Code	Name	Description	Setting Range	Factory Setting
PA.37	Time unit	0: Second 1: Minute	0~1	0

This parameter determines the unit of x step running time.

6.12 PB Group-- Protection Function

Function Code	Name	Description	Setting Range	Factory Setting
PB.00	Input phase-failure protection	0: Disable 1: Enable	0~1	1

Function Code	Name	Description	Setting Range	Factory Setting
PB.01	Output phase-failure protection	0: Disable 1: Enable	0~1	1

Notice: Please be cautious to set these parameters as disabled. Otherwise it may cause inverter and motor overheat even damaged.

Function Code	Name	Description	Setting Range	Factory Setting
PB.02	Motor overload protection	0: Disabled 1: Normal motor 2: Variable frequency motor	0~2	2

1: For normal motor, the lower the speed is, the poorer the cooling effect is. Based on this reason, if output frequency is lower than 30Hz, inverter will reduce the motor overload protection threshold to prevent normal motor from overheat.

2: As the cooling effect of variable frequency motor has nothing to do with running speed, it is not required to adjust the motor overload protection threshold.

Function Code	Name	Description	Setting Range	Factory Setting
PB.03	Motor overload protection current	20.0%~120.0%	20.0~120.0	100.0%

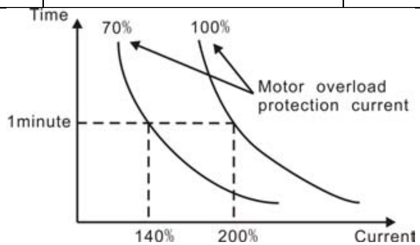


Figure 6.32 Motor overload protection curve.

The value can be determined by the following formula:

Motor overload protection current = (Maximum load current / inverter rated current) * 100%

Notice:

- **This parameter is normally used when rated power of inverter is greater than**

rated power of motor.

- **Motor overload protection time: 60s with 200% of rated current. For details, please refer to above figure.**

Function Code	**Name**	**Description**	**Setting Range**	**Factory Setting**
PB.04	Threshold of trip-free	70.0~110.0%	70.0~110.0	80.0%
PB.05	Decrease rate of trip-free	0.00Hz~P0.03	0.00Hz~P0.03	0.00Hz

If PB.05 is set to be 0, the trip-free function is invalid.

Trip-free function enables the inverter to perform low-voltage compensation when DC bus voltage drops below PB.04. The inverter can continue to run without tripping by reducing its output frequency and feedback energy via motor.

Notice: If PB.05 is too big, the feedback energy of motor will be too large and may cause over-voltage fault. If PB.05 is too small, the feedback energy of motor will be too small to achieve voltage compensation effect. So please set PB.05 according to load inertia and the actual load.

Function Code	**Name**	**Description**	**Setting Range**	**Factory Setting**
PB.06	Over-voltage stall protection	0: Disabled 1: Enabled	0~1	1
PB.07	Over-voltage stall protection point	110~150%	110~150	120%

During deceleration, the motor’s decelerating rate may be lower than that of inverter’s output frequency due to the load inertia. At this time, the motor will feed the energy back to the inverter, resulting in rise of DC bus voltage rise. If no measures taken, the inverter will trip due to over voltage.

During deceleration, the inverter detects DC bus voltage and compares it with over-voltage stall protection point. If DC bus voltage exceeds PB.07, the inverter will stop reducing its output frequency. When DC bus voltage become lower than PB.07, the deceleration continues, as shown in following figure.

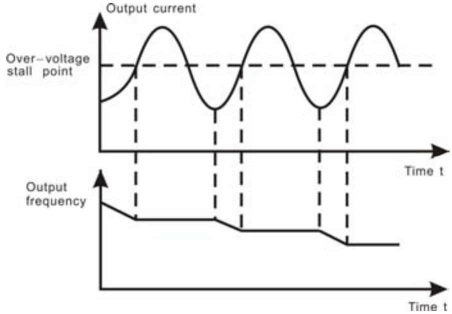


Figure 6.33 Over-voltage stall function.

Function Code	Name	Description	Setting Range	Factory Setting
PB.08	Auto current limiting threshold	50~200%	50~200	G Model: 160% P Model: 120%
PB.09	Frequency decrease rate when current limiting	0.00~100.00Hz/s	0.00~100.00	10.00Hz/s
PB.10	Auto current limiting selection	0: Enabled 1: Disabled when constant speed	0~1	0

Auto current limiting is used to limit the current of inverter smaller than the value determined by PB.08 in real time. Therefore the inverter will not trip due to surge over-current. This function is especially useful for the applications with big load inertia or step change of load.

PB.08 is a percentage of the inverter's rated current.

PB.09 defines the decrease rate of output frequency when this function is active. If PB.08 is too small, overload fault may occur. If it is too big, the frequency will change too sharply and therefore, the feedback energy of motor will be too large and may cause over-voltage fault. This function is always enabled during acceleration or deceleration. Whether the function is enabled in constant

Speed running is determined by PB.10.

Notice:

- **During auto current limiting process, the inverter's output frequency may**

change; therefore, it is recommended not to enable the function when inverter needs to output stable frequency

- **During auto current limiting process, if PB.08 is too low, the overload capacity will be impacted.**

Please refer to following figure.

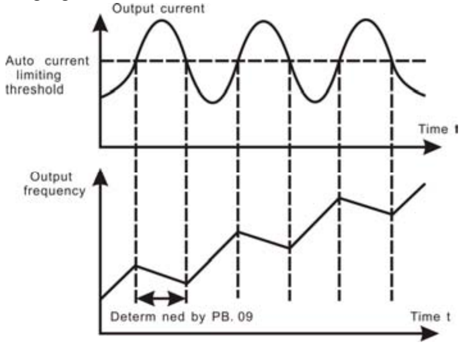


Figure 6.34 Current limiting protection function.

Function Code	Name	Description	Setting Range	Factory Setting
PB.11	Selection of overtorque (OL3)	0：No detection 1：Valid detection of overtorque during running, then continue running 2：Valid detection of overtorque during running, then warning and stop 3：Valid detection of overtorque during constant speed running, then continue running 4：Valid detection of overtorque during constant speed running, then warning and stop.	0~4	1
PB.12	Detection level of overtorque	10.0%~200.0%	10.0~200.0	G model: 150% P model: 120%

This value is depending on model.

Function Code	Name	Description	Setting Range	Factory Setting
PB.13	Detection time cof overtorque	0.0~60.0s	0~60	0.1s

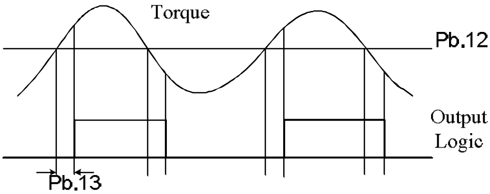


Figure 6.35 Overtorque control function.

If PB.11 is set to be 1or 3, and if the output torque of inverter reaches to PB.12, and with delay of PB.13, this will output the overtorque. And the TRIP light will reflash. If P6.01 ~P6.03 are set to be10, the output will be valid.

If PB.11 is set to be 2 or 4, when overtorque signal meets the output conditions, inverter proforms warming signal OL3,and meanwhile stops the output.

6.13 PC Group–Serial Communication

Function Code	Name	Description	Setting Range	Factory Setting
PC.00	Local address	0~247	0~247	1

This parameter determines the slave address used for communication with master. The value “0” is the broadcast address.

Function Code	Name	Description	Setting Range	Factory Setting
PC.01	Baud rate selection	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0~5	4

This parameter can set the data transmission rate during serial communication.

Notice: The baud rate of master and slave must be the same.

Function Code	Name	Description	Setting Range	Factory Setting
PC.02	Data format	0: RTU, 1 start bit, 8 data bits, no parity check, 1 stop bit. 1: RTU, 1 start bit, 8 data bits, even parity check, 1 stop bit. 2: RTU, 1 start bit, 8 data bits, odd parity check, 1 stop bit. 3: RTU, 1 start bit, 8 data bits, no parity check, 2 stop bits. 4: RTU, 1 start bit, 8 data bits, even parity check, 2 stop bits. 5: RTU, 1 start bit, 8 data bits, odd parity check, 2 stop bits.	0~5	1

This parameter defines the data format used in serial communication protocol.

Function Code	Name	Description	Setting Range	Factory Setting
PC.03	Communication delay time	0~200ms	0~200	5ms

This parameter can be used to set the response delay in communication in order to adapt to the MODBUS master. In RTU mode, the actual communication delay should be no less than 3.5 characters' interval.

Function Code	Name	Description	Setting Range	Factory Setting
PC.04	Communication timeout delay	0.0: Disabled 0.1~100.0s	0.0~100.0	0.0s

When the value is zero, this function will be disabled. When communication interruption is longer than the non-zero value of PC.04, the inverter will alarm communication error (CE).

Function Code	Name	Description	Setting Range	Factory Setting
PC.05	Communication error action	0: Alarm and coast to stop 1: No alarm and continue to run 2: No alarm but stop	0~3	1

Function Code	Name	Description	Setting Range	Factory Setting
		according to P1.06 (if P0.01=2) 3: No alarm but stop according to P1.06		

0: When communication error occurs, inverter will alarm (CE) and coast to stop.

1: When communication error occurs, inverter will omit the error and continue to run.

2: When communication error occurs, if P0.01=2, inverter will not alarm but stop according to stop mode determined by P1.06. Otherwise it will omit the error.

3: When communication error occurs, inverter will not alarm but stop according to stop mode determined by P1.06.

Function Code	Name	Description	Setting Range	Factory Setting
PC.06	Response action	Unit's place of LED 0: Response to writing 1: No response to writing Ten's place of LED 0: Reference not saved when power off 1: Reference saved when power off	00~11	00

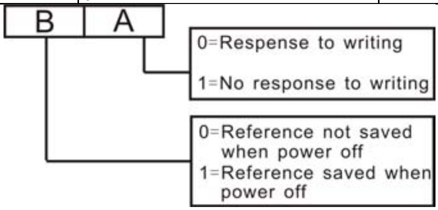


Figure 6.36 Meaning of PC.06.

A stands for: Unit's place of LED.

B stands for: Ten's place of LED

6.14 PD Group--Supplementary Function

Function Code	Name	Description	Setting Range	Factory Setting
PD.00-PD.09	Reserved			

6.15 PE Group—Factory Setting

This group is the factory-set parameter group. It is prohibited for user to access.

7. TROUBLE SHOOTING

7.1 Fault and Trouble shooting

Fault Code	Fault Type	Reason	Solution
OUT1	IGBT Ph-U fault	1. Acc/Dec time is too short. 2. IGBT module fault. 3. Malfunction caused by interference. 4. Grounding is not properly.	1. Increase Acc/Dec time. 2. Ask for support. 3. Inspect external equipment and eliminate interference.
OUT2	IGBT Ph-V fault		
OUT3	IGBT Ph-W fault		
OC1	Over-current when acceleration	1. Short-circuit or ground fault occurred at inverter output. 2. Load is too heavy or Acc/Dec time is too short. 3. V/F curve is not suitable. 4. Sudden change of load.	1. Inspect whether motor damaged, insulation worn or cable damaged. 2. Increase Acc/Dec time or select bigger capacity inverter. 3. Check and adjust V/F curve. 4. Check the load.
OC2	Over-current when deceleration		
OC3	Over-current when constant speed running		
OV1	Over-voltage when acceleration	1. Dec time is too short and regenerative energy from the motor is too large. 2. Input voltage is too high.	1. Increase Dec time or connect braking resistor 2. Decrease input voltage within specification.
OV2	Over-voltage when deceleration		
OV3	Over-voltage when constant speed running		

Fault Code	Fault Type	Reason	Solution
UV	DC bus Under-voltage	1. Open phase occurred with power supply. 2. Momentary power loss occurred 3. Wiring terminals for input power supply are loose. 4. Voltage fluctuations in power supply are too large.	Inspect the input power supply or wiring.
OL1	Motor overload	1. Motor drive heavy load at low speed for a long time. 2. Improper V/F curve 3. Improper motor's overload protection threshold (PB.03) 4. Sudden change of load.	1. Select variable frequency motor. 2. Check and adjust V/F curve. 3. Check and adjust PB.03 4. Check the load.
OL2	Inverter overload	1. Load is too heavy or Acc/Dec time is too short. 2. Improper V/F curve 3. Capacity of inverter is too small.	1. Increase Acc/Dec time or select bigger capacity inverter. 2. Check and adjust V/F curve. 3. Select bigger capacity inverter.
SPI	Input phase failure	1. Open-phase occurred in power supply. 2. Momentary power loss occurred. 3. Wiring terminals for input power supply are loose. 4. Voltage fluctuations in power supply are too large. 5. Voltage balance between phase is bad.	Check the wiring, installation and power supply.

Fault Code	Fault Type	Reason	Solution
SPO	Output phase failure	1. There is a broken wire in the output cable 2. There is a broken wire in the motor winding. 3. Output terminals are loose.	Check the wiring and installation.
EF	External fault	Sx: External fault input terminal take effect.	Inspect external equipment.
OH1	Rectify overheat	1. Ambient temperature is too high. 2. Near heat source. 3. Cooling fans of inverter stop or damaged. 4. Obstruction of ventilation channel 5. Carrier frequency is too high.	1. Install cooling unit. 2. Remove heat source. 3. Replace cooling fan 4. Clear the ventilation channel. 5. Decrease carrier frequency.
OH2	IGBT overheat		
CE	Communication fault	1. Improper baud rate setting. 2. Receive wrong data. 3. Communication is interrupted for Long time	1. Set proper baud rate. 2. Check communication devices and signals.
ITE	Current detection fault	1. Wires or connectors of control board are loose 2. Hall sensor is damaged. 3. Amplifying circuit is abnormal.	1. Check the wiring. 2. Ask for support.
TE	Autotuning fault	1. Improper setting of motor rated parameters. 2. Overtime of autotuning.	1. Set rated parameters according to motor nameplate. 2. Check motor's wiring.

Fault Code	Fault Type	Reason	Solution
EEP	EEPROM fault	Read/Write fault of control parameters	Press STOP/RESET to reset Ask for support
PIDE	PID feedback fault	1. PID feedback disconnected. 2. PID feedback source disappears.	1. Inspect PID feedback signal wire. 2. Inspect PID feedback source.
BCE	Brake unit fault	1. Braking circuit failure or brake tube damaged. 2. Too low resistance of externally connected braking resistor.	1. Inspect braking unit, replace braking tube. 2. Increase braking resistance.
END	Time reach of factory setting	1. Reach the working time	1.As for service
OL3	Overtorque	1. More fast acceleration 2.Restart the running motor 3. Lower DC bus voltage 4.Bigger load	1.Increase the acceleration time 2.Avoid to restart after stop 3.Check the DC bus voltage 4. Use the bigger power rating inverter 5.Set PB.11 to be the correct value

7.2 Common Faults and Solutions

Inverter may have following faults or malfunctions during operation, please refer to the following solutions.

No display after power on:

- Inspect whether the voltage of power supply is the same as the inverter rated voltage or not with multi-meter. If the power supply has problem, inspect and solve it.
- Inspect whether the three-phase rectify bridge is in good condition or not. If the

rectification bridge is burst out, ask for support.

- Check the CHARGE light. If the light is off, the fault is mainly in the rectify bridge or the buffer resistor. If the light is on, the fault may be lies in the switching power supply. Please ask for support.

Power supply air switch trips off when power on:

- Inspect whether the input power supply is grounded or short circuit. Please solve the problem.
- Inspect whether the rectify bridge has been burnt or not. If it is damaged, ask for support.

Motor doesn't move after inverter running:

- Inspect if there is balanced three-phase output among U, V, W. If yes, then motor could be damaged, or mechanically locked. Please solve it.
- If the output is unbalanced or lost, the inverter drive board or the output module may be damaged, ask for support..

Inverter displays normally when power on, but switch at the input side trips when running:

- Inspect whether the output side of inverter is short circuit. If yes, ask for support.
- Inspect whether ground fault exists. If yes, solve it.
- If trip happens occasionally and the distance between motor and inverter is too far, it is recommended to install output AC reactor.

8. MAINTENANCE

WARNING

- **Maintenance must be performed according to designated maintenance methods.**
- **Maintenance, inspection and replacement of parts must be performed only by certified person.**
- **After turning off the main circuit power supply, wait for 10 minutes before maintenance or inspection.**
- **DO NOT directly touch components or devices of PCB board. Otherwise inverter can be damaged by electrostatic.**
- **After maintenance, all screws must be tightened.**

8.1 Daily Maintenance

In order to prevent the fault of inverter to make it operate smoothly in high-performance for a long time, user must inspect the inverter periodically (within half year). The following table indicates the inspection content.

Items to be checked	Main inspections		Criteria
	Inspection content	Frequency	Means/methods
Operation environment	1. temperature 2. humidity 3. dust 4. vapor 5. gases	1. point thermometer, hygrometer 2. observation 3. visual examination and smelling	1. ambient temperature shall be lower than 40℃ , otherwise, the rated values should be decreased. Humidity shall meet the requirement 2. no dust accumulation, no traces of water leakage and no condensate. 3. no abnormal color and smell.
Inverter	1. vibration 2. cooling and	1. point thermometer	1. smooth operation without vibration.

Items to be checked	Main inspections		Criteria
	Inspection content	Frequency	Means/methods
	heating 3. noise	2. comprehensive observation 3. listening	2. fan is working in good condition. Speed and air flow are normal. No abnormal heat. 3. No abnormal noise
Motor	1. vibration 2. heat 3. noise	1. comprehensive observation 2. point thermometer 3. listening	1. No abnormal vibration and no abnormal noise. 2. No abnormal heat. 3. No abnormal noise.
Operation status parameters	1. power input voltage 2. inverter output voltage 3. inverter output current 4. internal temperature	1. voltmeter 2. rectifying voltmeter 3. ammeter 4. point thermometer	1. satisfying the specification 2. satisfying the specification 3. satisfying the specification 4. temperature rise is lower than 40℃

8.2 Periodic Maintenance

Customer should check the drive every 3 months or 6 months according to the actual environment

8.2.1 Check whether the screws of control terminals are loose. If so, tighten them with a screwdriver;

8.2.2 Check whether the main circuit terminals are properly connected; whether the mains cables are over heated;

8.2.3 Check whether the power cables and control cables are damaged, check especially for any wear on the cable tube;

8.2.4 Check whether the insulating tapes around the cable lugs are stripped;

8.2.5 Clean the dust on PCBs and air ducts with a vacuum cleaner;

8.2.6 For drives that have been stored for a long time, it must be powered on every 2 years. When supplying AC power to the drive, use a voltage regulator to raise the input voltage to rated input voltage gradually. The drive should be powered for 5 hours without load.

8.2.7 Before performing insulation tests, all main circuit input/output terminals should be short-circuited with conductors. Then proceed insulation test to the ground. Insulation test of single main circuit terminal to ground is forbidden; otherwise the drive might be damaged. Please use a 500V Mega-Ohm-Meter.

8.2.8 Before the insulation test of the motor, disconnect the motor from the drive to avoid damaging it.

8.3 Replacement of wearing parts

Fans and electrolytic capacitors are wearing part, please make periodic replacement to ensure long term, safety and failure-free operation. The replacement periods are as follows:

◆Fan: Must be replaced when using up to 20,000 hours;

◆Electrolytic Capacitor: Must be replaced when using up to 30,000~40, 000 hours.

9. COMMUNICATION PROTOCOL

9.1 Interfaces

RS485: asynchronous, half-duplex.

Default: 8-E-1, 19200bps. See Group PC parameter settings.

9.2 Communication Modes

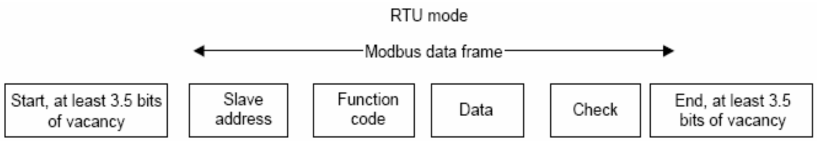
9.2.1 The protocol is Modbus protocol. Besides the common register Read/Write operation, it is supplemented with commands of parameters management.

9.2.2 The drive is a slave in the network. It communicates in 'point to point' master-slave mode. It will not respond to the command sent by the master via broadcast address.

9.2.3 In the case of multi-drive communication or long-distance transmission, connecting a 100~120Ω resistor in parallel with the master signal line will help to enhance the immunity to interference.

9.3 Protocol Format

Modbus protocol supports both RTU. The frame format is illustrated as follows:



Modbus adopts "Big Endian" representation for data frame. This means that when a numerical quantity larger than a byte is transmitted, the most significant byte is sent first.

RTU mode

In RTU mode, the Modbus minimum idle time between frames should be no less than 3.5 bytes. The checksum adopts CRC-16 method. All data except checksum itself sent will be counted into the calculation. Please refer to section: CRC Check for more information. Note that at least 3.5 bytes of Modbus idle time should be kept and the start and end idle time need not be summed up to it.

The table below shows the data frame of reading parameter 002 from slave node address 1.

Node addr.	Command	Data addr.		Read No.		CRC	
0x01	0x03	0x00	0x02	0x00	0x01	0x25	0xCA

The table below shows the reply frame from slave node address 1

Node addr.	Command	Bytes No.	Data		CRC	
0x01	0x03	0x02	0x00	0x00	0xB8	0x44

9.4 Protocol function

Different respond delay can be set through drive's parameters to adapt to different needs. For RTU mode, the respond delay should be no less than 3.5 bytes interval, and for ASCII mode, no less than 1ms.

The main function of Modbus is to read and write parameters. The Modbus protocol supports the following commands:

0x03	Read inverter's function parameter and status parameters
0x06	Write single function parameter or command parameter to inverter

All drive's function parameters, control and status parameters are mapped to Modbus R/W data address.

The data address of control and status parameters please refer to the following table.

Parameter Description	Address	Meaning of value	R/W Feature
Control command	1000H	0001H: Forward	W/R
		0002H: Reverse	
		0003H: JOG forward	
		0004H: JOG reverse	
		0005H: Stop	
		0006H: Coast to stop	
		0007H: Reset fault	
		0008H: JOG stop	
Inverter status	1001H	0001H: Forward running	R
		0002H: Reverse running	
		0003H: Standby	
		0004H: Fault	
		0005H: Status of inverter POFF	
Communication setting	2000H	Communication Setting Range (-10000~10000) Note: the communication setting is the percentage of the relative value (-100.00%~100.00%). If it is set as frequency source, the value is the	W/R

Parameter Description	Address	Meaning of value	R/W Feature
		percentage of the maximum frequency (P0.04). If it is set as PID (preset value or feedback value), the value is the percentage of the PID.	
	2001H	PID setting， Range: 0~1000，1000 means100.0%	W/R
	2002H	PID fedback， Range: 0~1000，1000 means100.0%	W/R
	2003H	Setting value of torque Range: -1000~1000，1000 means100.0%	W/R
	2004H	Setting value of upper limit frequency （0~Fmax）	W/R
Status parameters	3000H	Output frequency	R
	3001H	Reference frequency	R
	3002H	DC Bus voltage	R
	3003H	Output voltage	R
	3004H	Output current	R
	3005H	Rotation speed	R
	3006H	Output power	R
	3007H	Output torque	R
	3008H	PID preset value	R
	3009H	PID feedback value	R
	300AH	Input terminal status	R
	300BH	Output terminal status.	R
	300CH	Input of AI1	R
	300DH	Input of AI2	R
	300EH	Reserved	R
	300FH	Reserved	R
	3010H	HDI frequency	R
	3011H	Reserved	R
	3012H	Step No. of PLC or multi-step	R

Parameter Description	Address	Meaning of value	R/W Feature
	3013H	Reserved	R
	3014H	External counter input	R
	3015H	Torque setting	R
	3016H	Device code	R
Inveter fault info address	5000H	0X00H: No fault 0X01H: OUT1 0X02H: OUT2 0X03H: OUT3 0X04H: OC1 0X05H: OC2 0X06H: OC3 0X07H: OV1 0X08H: OV2 0X09H: OV3 0x0A: UV 0x0B: OL1 0x0C:OL2 0x0D: SPI 0x0E: SPO 0x0F: OH1 0x10: OH2 0x11: EF 0x12: CE 0x13: ItE 0x14: tE 0x15: EEP 0x16:PIDE 0x17: bCE 0x18: END 0x19: OL3	R

The above shows the format of the frame. Now we will introduce the Modbus command and data structure in details, which is called protocol data unit for simplicity. Also MSB stands for the most significant byte and LSB stands for the least significant byte for the same reason. The description below is data format in RTU mode.

Protocol data unit format of reading parameters:

Request format:

Protocol data unit	Data length(bytes)	Range
Command	1	0x03
Data Address	2	0~0xFFFF
Read number	2	0x0001~0x0010

Reply format (success):

Protocol data unit	Data length(bytes)	Range
Command	1	0x03
Returned byte number	2	2* Read number
Content	2* Read number	

If the command is reading the type of inverter (data address 0x3016), the content value in reply message is the device code:

The high 8 bit of device code is the type of the inverter, and the low 8 bit of device code is the sub type of inverter.

For details, please refer to the following table:

High byte	Meaning	Low byte	Meaning
00	CHV	01	Vector control type
		02	For water supply
		03	Middle frequency 1500Hz
		04	Middle frequency 3000Hz
01	CHE	01	Vector control type
		02	Middle frequency 1500Hz
02	CHF	01	Universal type
		02	Vector type CHF100A

If the operation fails, the inverter will reply a message formed by failure command and error code. The failure command is (Command＋0x80). The error code indicates the reason of the error; see the table below.

Value	Name	Mean
01H	Illegal command	The command from master can not be executed. The reason maybe: 1 This command is only for new version and this version can not realize.

Value	Name	Mean
		2 Slave is in fault status and can not execute it.
02H	Illegal data address.	Some of the operation addresses are invalid or not allowed to access.
03H	Illegal value	When there are invalid data in the message framed received by slave. Note: This error code does not indicate the data value to write exceed the range, but indicate the message frame is a illegal frame.
06H	Slave busy	Inverter is busy(EEPROM is storing)
10H	Password error	The password written to the password check address is not same as the password set by P7.00.
11H	Check error	The CRC (RTU mode) check not passed.
12H	Written not allowed.	It only happen in write command, the reason maybe: 1 The data to write exceed the range of according parameter 2 The parameter should not be modified now. 3 The terminal has already been used.
13H	System locked	When password protection take effect and user does not unlock it, write/read the function parameter will return this error.

Protocol data unit format of writing single parameter:

Request format:

Protocol data unit	Data length(bytes)	Range
Command	1	0x06
Data Address	2	0~0xFFFF
Write Content	2	0~0xFFFF

Reply format (success):

Protocol data unit	Data length(bytes)	Range
Command	1	0x06
Data Address	2	0~0xFFFF
Write Content	2	0~0xFFFF

If the operation fails, the inverter will reply a message formed by failure command and error code. The failure command is (Command＋0x80). The error code indicates the reason of the error; see table 1.

9.5 Note:

9.5.1 Between frames, the span should not less than 3.5 bytes interval, otherwise, the message will be discarded.

9.5.2 Be cautious to modify the parameters of PC group through communication, otherwise may cause the communication interrupted.

9.5.3 In the same frame, if the span between two .near bytes more than 1.5 bytes interval, the behind bytes will be assumed as the start of next message so that communication will failure.

9.6 CRC Check

For higher speed, CRC-16 uses tables. The following are C language source code for CRC-16.

```
unsigned int crc_cal_value(unsigned char *data_value,unsigned char data_length)
{
int i;
unsigned int crc_value=0xffff;
while(data_length--)
{
crc_value^=*data_value++;
        for(i=0;i<8;i++)
        {
if(crc_value&0x0001)crc_value=(crc_value>>1)^0xa001;
        else crc_value=crc_value>>1;
        }
 }
return(crc_value);
}
```

9.7 Example

RTU mode, read 2 data from 0004H

The request command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Node address	01H
Command	03H

High byte of start address	00H
Low byte of start address	04H
High byte of data number	00H
Low byte of data number	02H
Low byte of CRC	85H
High byte of CRC	CAH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The reply is :

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Node address	01H
Command	03H
Returned byte number	04H
Higher byte of 0004H	00H
Low byte of 0004H	00H
High byte of 0005H	00H
Low byte of 0005H	00H
Low byte of CRC	43H
High byte of CRC	07H
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

Appendix A: External Dimension

A.1 380V

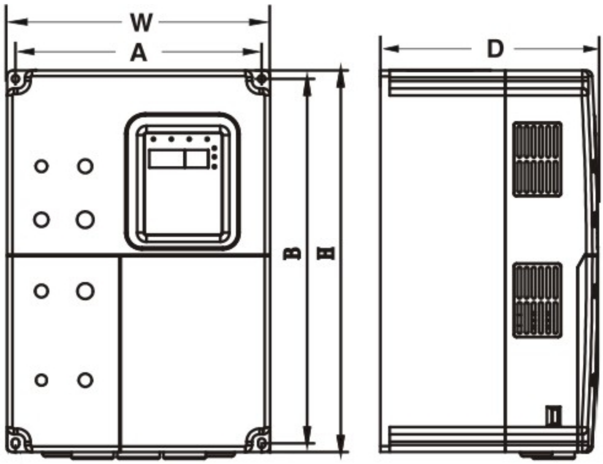


Figure A-1 Dimensions (15kW and below).

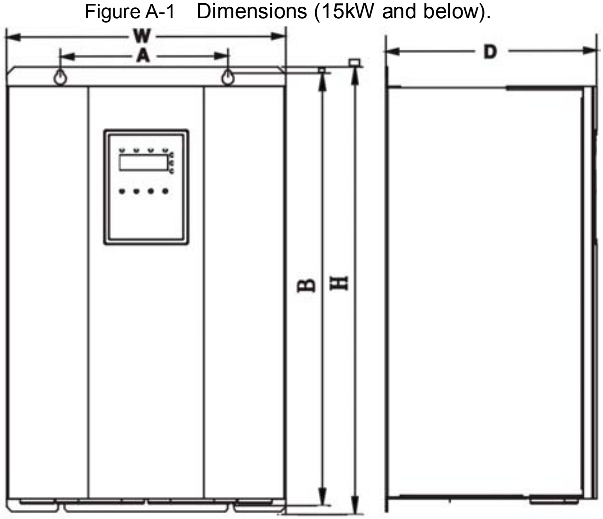


Figure A-2 Dimensions (18.5 ~110kW).

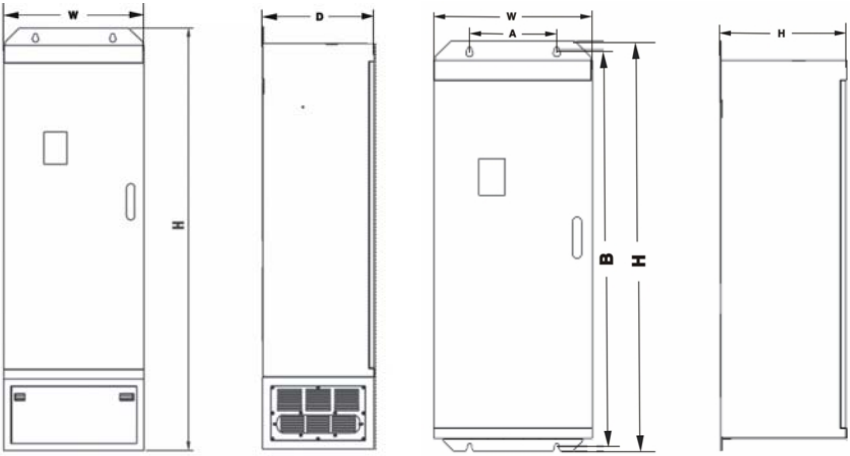


Figure A-3 Dimensions (132~315kW with base or without base).

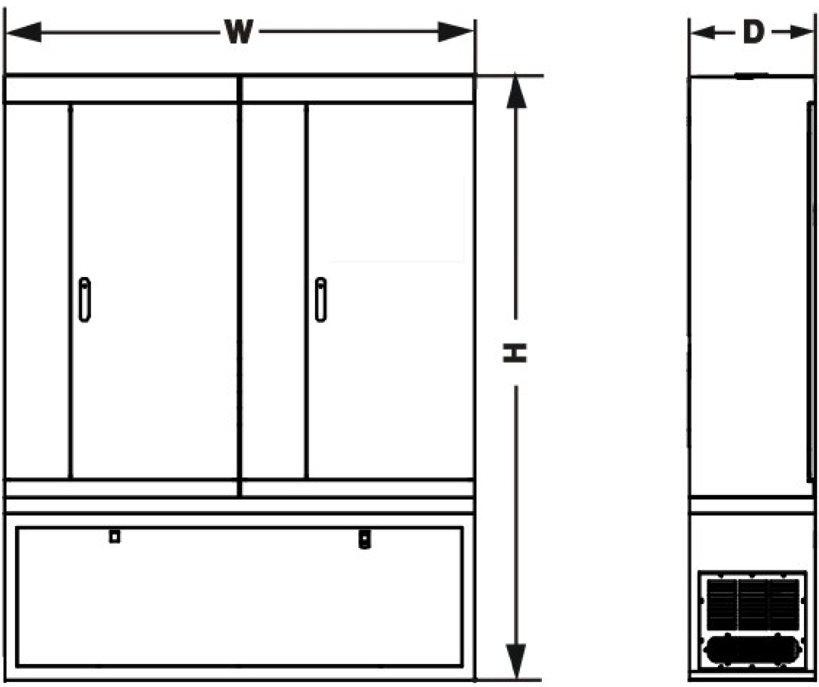


Figure A-4 Dimensions (350~500kW).

Power (kW)	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Installation Hole (mm)	Notice
	Installation Dimension		External Dimension				
1.5~5.5	147.5	237.5	250	160	175	5	——
7.5~15	206	305.5	320	220	180	6	——
18.5~30	176	454.5	467	290	215	6.5	——
37~55	230.0	564.5	577.0	375.0	270.0	7.0	——
75~110	320.0	738.5	755.0	460.0	330.0	9.0	——
132~185	270	1233	1275	490	391	13	Without base
	——	——	1490	490	391	——	With base
200~315	500	1324	1358	750	402	12.5	Without base
	——	——	1670	750	402	——	With base
350~500	——	——	1900	1505	502	——	——

A.2 220V

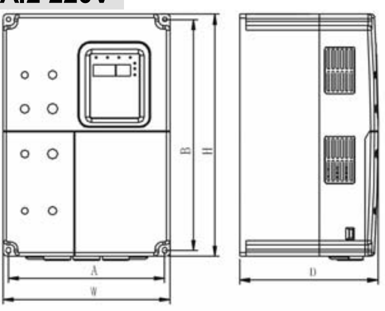


Figure A-5 7.5kW and lower

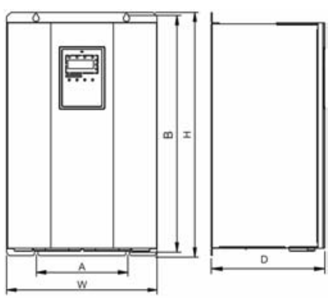


Figure A-6 11kW~18.5kW

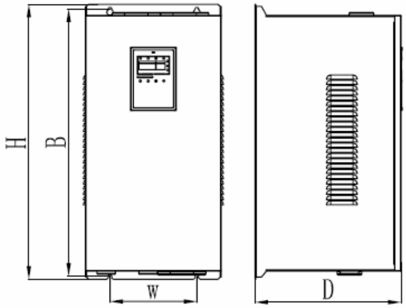
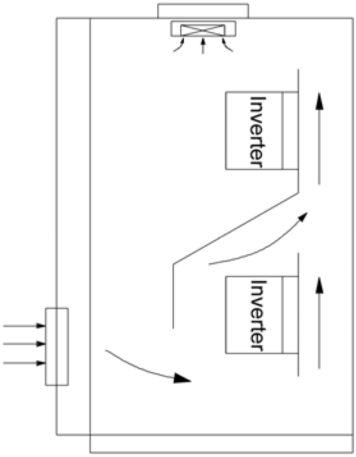


Figure A-7 22~55kW

Model	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Installation Hole (mm)
	Installation Dimension		External Dimension			
CHF100A-1R5G-2 CHF100A-2R2G-2 CHF100A-004G-2 CHF100A-5R5G-2	147.5	237.5	250	160	175	5
CHF100A-7R5G-2	206	305.5	320	220	180	6
CHF100A-011G-2 CHF100A-015G-2 CHF100A-018G-2	176	454.5	467	290	215	6.5
CHF100A-022G-2 CHF100A-030G-2 CHF100A-037G-2	166	510	525	260	280	5
CHF100A-045G-2 CHF100A-055G-2	178	663	680	300	280	6

A.3 Installation Space



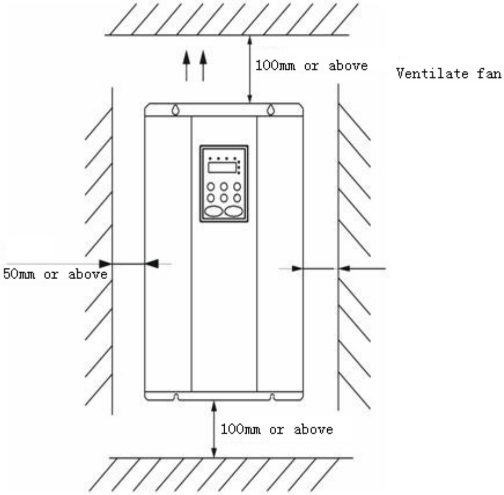
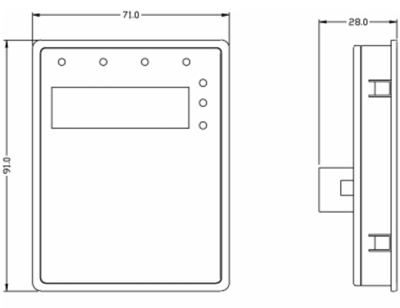


Figure A-8 Installation of multiple inverters. Figure A-9 Safety space.

Notice: Add the air deflector when apply the up-down installation.

A.4 Dimensions of External small Keypad



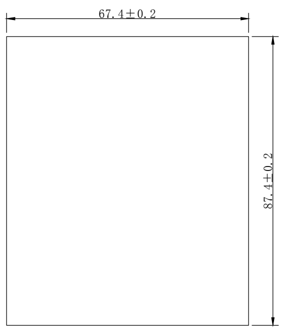


Figure A-10 Dimension of small keypad. Figure A-11 installation of small keypad

A.5 Dimensions of External big Keypad

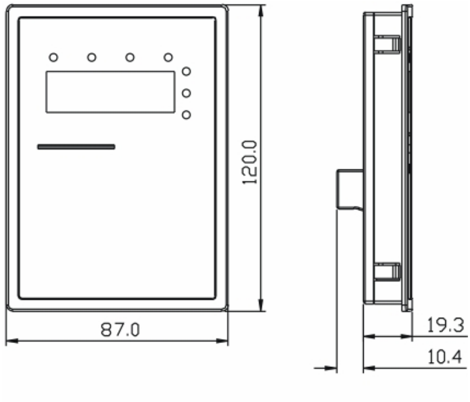


Figure A-12 Dimension of big keypad.

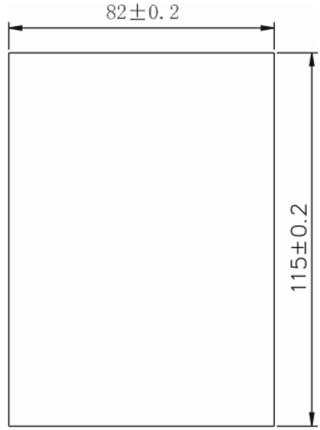


Figure A-13 installation of big keypad

A.6 Disassembly

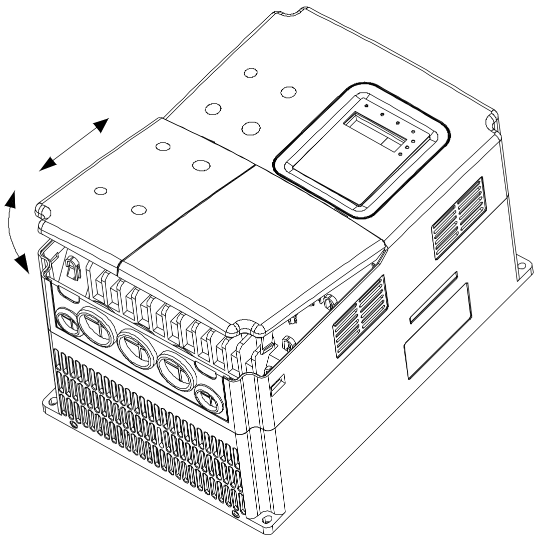
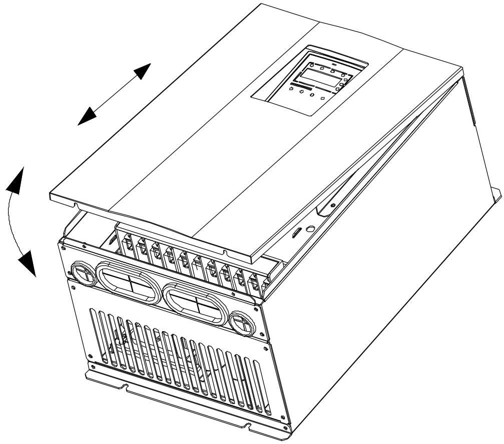


Figure A-14 Disassembly of plastic cover.



FigureA-15 Disassembly of metal plate cover.

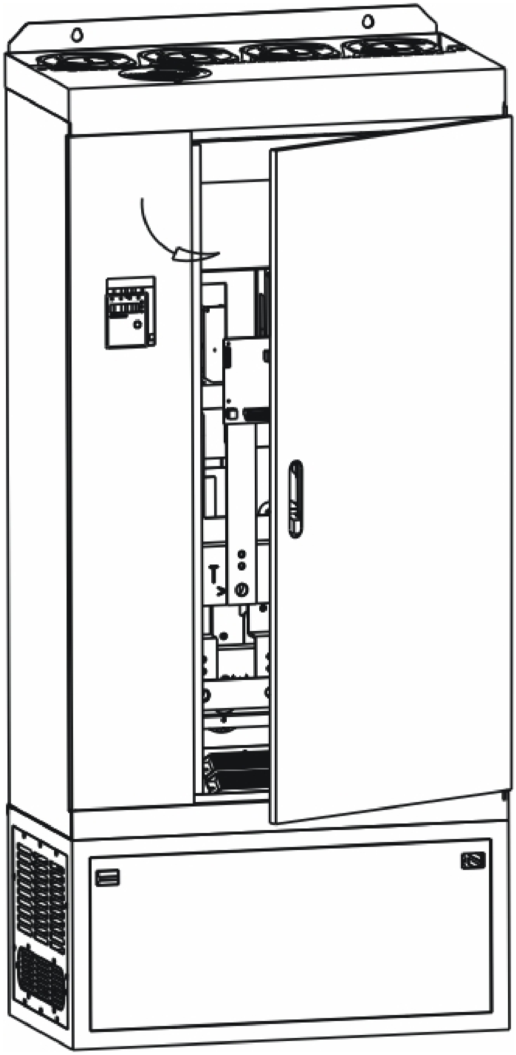


Figure A-16 Open inverter cabinet.

Appendix B Specifications of Breaker, Cable, Contactor and Reactor

B.1 Specifications of breaker, cable and contactor

Model No.	Circuit Breaker (A)	Input/Output Cable (mm^2)	AC Contactor (A)
3AC 220V ±15%			
CHF100A -1R5G-2	20	4	16
CHF100A -2R2G-2	32	6	20
CHF100A -004G-2	40	6	25
CHF100A-5R5G-2	63	6	32
CHF100A-7R5G-2	100	10	63
CHF100A -011G-2	125	25	95
CHF100A -015G-2	160	25	120
CHF100A -018G-2	160	25	120
CHF100A -022G-2	200	35	170
CHF100A -030G-2	200	35	170
CHF100A -037G-2	200	35	170
CHF100A -045G-2	250	70	230
CHF100A-055G-2	315	70	280
3AC 380V ±15%			
CHF100A-1R5G-4	16	2.5	10
CHF100A-2R2G-4	16	2.5	10
CHF100A -004G/5R5P-4	25	4	16
CHF100A -5R5G/7R5P-4	25	4	16
CHF100A-7R5G/011P-4	40	6	25
CHF100A-011G/015P-4	63	6	32
CHF100A-015G/018P-4	63	6	50
CHF100A-018G/022P-4	100	10	63
CHF100A-022G/030P-4	100	16	80
CHF100A-030G/037P-4	125	25	95
CHF100A-037G/045P-4	160	25	120
CHF100A-045G/055P-4	200	35	135

Model No.	Circuit Breaker (A)	Input/Output Cable (mm^2)	AC Contactor (A)
CHF100A-055G/075P-4	200	35	170
CHF100A-075G/090P-4	250	70	230
CHF100A-090G/110P-4	315	70	280
CHF100A-110G/132P-4	400	95	315
CHF100A-132G/160P-4	400	150	380
CHF100A-160G/185P-4	630	185	450
CHF100A-185G/200P-4	630	185	500
CHF100A-200G/220P-4	630	240	580
CHF100A-220G/250P-4	800	150x2	630
CHF100A-250G/280P-4	800	150x2	700
CHF100A-280G/315P-4	1000	185x2	780
CHF100A-315G/350P-4	1200	240x2	900
CHF100A-350G-4	1280	240x2	960
CHF100A-400G-4	1380	185x3	1035
CHF100A-500G-4	1720	185x3	1290

B.2 Specifications of AC input/output reactor and DC reactor

Model No.	AC Input reactor		AC Output reactor		DC reactor	
	Current (A)	Inductance (mH)	Current (A)	Inductance (mH)	Current (A)	Inductance (mH)
CHF100A-1R5G-4	5	3.8	5	1.5	—	—
CHF100A-2R2G-4	7	2.5	7	1	—	—
CHF100A-004G/5R5P-4	10	1.5	10	0.6	—	—
CHF100A-5R5G/7R5P-4	15	1.4	15	0.25	—	—
CHF100A-7R5G/011P-4	20	1	20	0.13	—	—
CHF100A-011G/015P-4	30	0.6	30	0.087	—	—
CHF100A-015G/018P-4	40	0.6	40	0.066	—	—
CHF100A-018G/022P-4	50	0.35	50	0.052	80	0.4
CHF100A-022G/030P-4	60	0.28	60	0.045	80	0.4
CHF100A-030G/037P-4	80	0.19	80	0.032	80	0.4
CHF100A-037G/045P-4	90	0.19	90	0.03	110	0.25

Model No.	AC Input reactor		AC Output reactor		DC reactor	
	Current（A）	Inductance（mH）	Current（A）	Inductance（mH）	Current（A）	Inductance（mH）
CHF100A-045G/055P-4	120	0.13	120	0.023	110	0.25
CHF100A-055G/075P-4	150	0.11	150	0.019	110	0.25
CHF100A-075G/090P-4	200	0.08	200	0.014	180	0.18
CHF100A-090G/110P-4	200	0.08	200	0.014	180	0.18
CHF100A-110G/132P-4	250	0.065	250	0.011	250	0.2
CHF100A-132G/160P-4	290	0.065	290	0.011	326	0.215
CHF100A-160G/185P-4	330	0.05	330	0.01	494	0.142
CHF100A-185G/200P-4	400	0.044	400	0.008	494	0.142
CHF100A-200G/220P-4	400	0.044	400	0.008	494	0.142
CHF100A-220G/250P-4	490	0.035	490	0.005	494	0.126
CHF100A-250G/280P-4	530	0.04	530	0.005	700	0.1
CHF100A-280G/315P-4	600	0.04	600	0.005	700	0.1
CHF100A-315G/350P-4	660	0.025	660	0.004	800	0.08
CHF100A-350G-4	400*2	0.04	400*2	0.005	460*2	0.12
CHF100A-400G-4	490*2	0.03	490*2	0.004	460*2	0.12
CHF100A-500G-4	530*2	0.03	530*2	0.003	650*2	0.11

B.3 Specifications of AC input/output filter

Model No.	Input filter	Output filter
CHF100A -1R5G-2	NF241B10/01	
CHF100A -2R2G-2	NF241B20/01	
CHF100A-1R5G-4	NFI-005	NFO-005
CHF100A-2R2G-4	NFI-010	NFO-010
CHF100A -004G/5R5P-4	NFI-010	NFO-010
CHF100A -5R5G/7R5P-4	NFI-020	NFO-020
CHF100A-7R5G/011P-4	NFI-020	NFO-020
CHF100A-011G/015P-4	NFI-036	NFO-036
CHF100A-015G/018P-4	NFI-036	NFO-036
CHF100A-018G/022P-4	NFI-050	NFO-050
CHF100A-022G/030P-4	NFI-050	NFO-050

Model No.	Input filter	Output filter
CHF100A-030G/037P-4	NFI-065	NFO-065
CHF100A-037G/045P-4	NFI-080	NFO-080
CHF100A-045G/055P-4	NFI-100	NFO-100
CHF100A-055G/075P-4	NFI-150	NFO-150
CHF100A-075G/090P-4	NFI-150	NFO-150
CHF100A-090G/110P-4	NFI-200	NFO-200
CHF100A-110G/132P-4	NFI-250	NFO-250
CHF100A-132G/160P-4	NFI-250	NFO-250
CHF100A-160G/185P-4	NFI-300	NFO-300
CHF100A-185G/200P-4	NFI-400	NFO-400
CHF100A-200G/220P-4	NFI-400	NFO-400
CHF100A-220G/250P-4	NFI-600	NFO-600
CHF100A-250G/280P-4	NFI-600	NFO-600
CHF100A-280G/315P-4	NFI-900	NFO-900
CHF100A-315G/350P-4	NF241B10/01	
CHF100A-350G-4	NF241B20/01	
CHF100A-400G-4	NFI-005	NFO-005
CHF100A-500G-4	NFI-010	NFO-010

B.4 Specifications of braking unit and braking resistor

B.4.1 Specifications of braking unit

Model No.	Braking unit		Braking resistor (100% braking torque)	
	Order No.	Quantity	Specification	Quantity
3AC 220V ±15%				
CHF100-1R5G-2	Built-in	1	130Ω/260W	1
CHF100-2R2G-2		1	80Ω/260W	1
CHF100-004G-2		1	48Ω/400W	1
CHF100-5R5G-2		1	35Ω/550W	1
CHF100-7R5G-2	DBU-055-2	1	26Ω/780W	1
CHF100-011G-2		1	17Ω/1100W	1
CHF100-015G-2		1	13Ω/1800W	1
CHF100-018G-2		1	10Ω/2000W	1

Model No.	Braking unit		Braking resistor (100% braking torque)	
	Order No.	Quantity	Specification	Quantity
CHF100-022G-2		1	8Ω/2500W	1
CHF100-030G-2	DBU-055-2	2	13Ω/1800W	2
CHF100-037G-2		2	10Ω/2000W	2
CHF100-045G-2		2	8Ω/2500W	2
CHF100-055G-2		2	6.5Ω/3000W	2

Model: 380V

Model No.	Braking unit		Braking resistor (100% braking torque)		
	Order No.	Quantity	Resistor	Power	Quantity
1.5（2）	Built-in	1	400Ω	260W	1
2.2（3）		1	150Ω	390W	1
4（5）		1	150Ω	390W	1
5.5（7.5）		1	100Ω	520W	1
7.5（11）		1	50Ω	1040W	1
11（15）		1	50Ω	1040W	1
15（20）		1	40Ω	1560W	1
18.5（25）	DBU-055-4	1	20Ω	6000W	1
22（30）		1	20Ω	6000W	1
30（40）		1	20Ω	6000W	1
37（50）		1	13.6Ω	9600W	1
45（60）		1	13.6Ω	9600W	1
55（75）		1	13.6Ω	9600W	1
75（100）		2	13.6Ω	9600W	2
90（120）		2	13.6Ω	9600W	2
110（150）		2	13.6Ω	9600W	2
132（180）	DBU-160-4	1	4Ω	30000W	1
160（215）		1	4Ω	30000W	1
185（250）	DBU-220-4	1	3Ω	40000W	1
200（270）		1	3Ω	40000W	1
220（300）		1	3Ω	40000W	1

Model No.	Braking unit		Braking resistor (100% braking torque)		
	Order No.	Quantity	Resistor	Power	Quantity
250（340）	DBU-315-4	1	2Ω	60000W	1
280（380）		1	2Ω	60000W	1
315（430）		1	2Ω	60000W	1
350（470）	DBU-220-4	2	3Ω	40000W	2
400（540）		2	3Ω	40000W	2
500（680）	DBU-315-4	2	2Ω	60000W	2
560（760）		2	2Ω	60000W	2
630（860）		2	2Ω	60000W	2

B.4.2 Connection

1. Connection of brake resistor

For D size and lower inverter, please refer to the figure B-1.

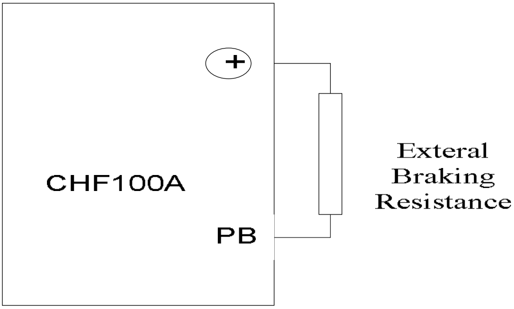


Figure B-1 Connection of brake resistor

2. Connection of brake unit, please refer to figure B-2.

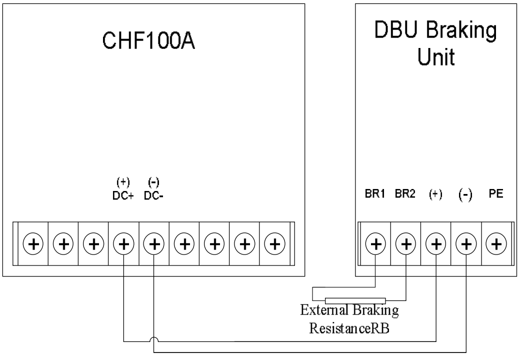


Figure B-2 Connection of braking unit

3. Parallel connection of braking unit

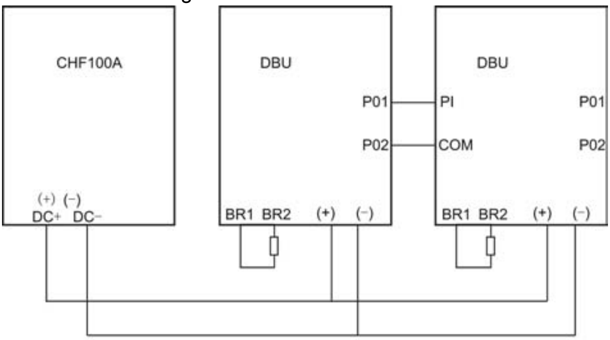


Figure B-3 Parallel connection of brake unit and inverter

Appredix C: LIST OF FUNCTION PARAMETERS

Notice:

- **PE group is factory reserved, users are forbidden to access these parameters.**
- **The column "Modify" determines the parameter can be modified or not.**
  "○" indicates that this parameter can be modified all the time.
  "◎"indicates that this parameter cannot be modified during the inverter is running.
  "●" indicates that this parameter is read only.
- **"Factory Setting" indicates the value of each parameter while restoring the factory parameters, but those detected parameters or record values cannot be restored.**

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P0 Group: Basic Function					
P0.00	Control model	0: V/F control 1: Sensorless vector control 2: Torque control (sensorless vector control)	0	¥	0
P0.01	Run command source	0: Keypad (LED extinguished) 1: Terminal (LED flickering) 2: Communication (LED lights on)	0	●	1

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P0.02	UP/DOWN setting	0: Valid, save UP/DOWN value when power off 1: Valid, do not save UP/DOWN value when power off 2: Invalid 3: Valid during running, clear when stop.	0	●	2
P0.03	Maximum frequency	10.00~400.00Hz	50.00Hz	¥	3
P0.04	Upper frequency limit	P0.05~P0.03	50.00Hz	¥	4
P0.05	Lower frequency limit	0.00~P0.04	0.00Hz	0	5
P0.06	Keypad reference frequency	0.00~P0.03	50.00Hz	0	6
P0.07	Frequency A command source	0: Keypad 1: AI1 2. AI2 3: HDI 4. Simple PLC 5: Multi-step speed 6: PID 7: Communication	0	0	7
P0.08	Frequency B command source	0:AI1 1:AI2 2:HDI	0	0	8
P0.09	Scale of frequency B command	0: Maximum frequency 1: Frequency A command	0	¥	9

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P0.10	Frequency command selection	0: A 1: B 2: A+B 3: Max（A, B）	0	0	10
P0.11	Acceleration time 0	0.1~3600.0s	Depend on model	0	11
P0.12	Deceleration time 0	0.1~3600.0s	0	¥	12
P0.13	Running direction selection	0: Forward 1: Reverse 2: Forbid reverse	0	¥	13
P0.14	Carrier frequency	1.0~15.0kHz	Depend on model		14
P0.15	AVR function	0~2	1		15
P0.16	Motor parameters autotuning	0: No action 1: Rotation autotuning 2: Static autotuning	0		16
P0.17	Restore parameters	0: No action 1: Restore factory setting 2: Clear fault records	0		17
P1 Group: Start and Stop Control					
P1.00	Start Mode	0: Start directly 1: DC braking and start 2: Speed tracking and start	0	¥	18
P1.01	Starting frequency	0.00~10.00Hz	0.00Hz	¥	19
P1.02	Hold time of starting frequency	0.0~50.0s	0.0s	¥	20
P1.03	DC Braking current before start	0.0~150.0%	0.0%	¥	21
P1.04	DC Braking time before start	0.0~50.0s	0.0s	¥	22

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P1.05	Acceleration / Deceleration mode	0: Linear 1: reserved	0	¥	23
P1.06	Stop mode	0: Deceleration to stop 1: Coast to stop	0	0	24
P1.07	Starting frequency of DC braking	0.00~P0.03	0.00Hz	0	25
P1.08	Waiting time before DC braking	0.0~50.0s	0.0s	0	26
P1.09	DC braking current	0.0~150.0%	0.0%	0	27
P1.10	DC braking time	0.0~50.0s	0.0s	0	28
P1.11	Dead time of FWD/REV	0.0~3600.0s	0.0s	0	29
P1.12	Action when running requency is less than lower frequency limit	0: Running at the lower frequency limit 1: Stop 2: Stand-by	0	¥	30
P1.13	Delay time for restart	0.0~3600.0s	0.0s	0	31
P1.14	Restart after power off	0: Disabled 1: Enabled	0	0	32
P1.15	Waiting time of restart	0.0~3600.0s	0	0	33
P1.16	Terminal function examined when power is on	0: Disabled 1: Enabled	0	¥	33
P1.17~P1.19	Reserved		0	¥	34
P2 Group: Motor Parameters					
P2.00	Inverter model	0: G model 1: P model	0	¥	36
P2.01	Motor rated power	0.4~3000.0kW	Depend on model		37

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P2.02	Motor rated frequency	10.00Hz~P0.03	50.00Hz	¥	38
P2.03	Motor rated speed	0~36000rpm	Depend on model	¥	39
P2.04	Motor rated voltage	0~800V	Depend on model	¥	40
P2.05	Motor rated current	0.8~6000.0A	Depend on model	¥	41
P2.06	Motor stator resistance	0.001~65.535Ω	Depend on model	0	42
P2.07	Motor rotor resistance	0.001~65.535Ω	Depend on model	0	43
P2.08	Motor leakage inductance	0.1~6553.5mH	Depend on model	0	44
P2.09	Motor mutual inductance;	0.1~6553.5mH	Depend on model	0	45
P2.10	Current without load	0.01~6553.5A	Depend on model	0	46
P3 Group: Vector Control					
P3.00	ASR proportional gain K_p1	0~100	20	0	47
P3.01	ASR integral time K_i1	0.01~10.00s	0.50s		48
P3.02	ASR switching point 1	0.00Hz~P3.05	5.00Hz		49
P3.03	ASR proportional gain K_p2	0~100	25		50
P3.04	ASR integral time K_i2	0.01~10.00s	1.00s		51
P3.05	ASR switching point 2	P3.02~P0.03	10.00Hz		52
P3.06	Slip compensation rate of VC	50.0%~200.0%	100%		53

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P3.07	Torque upper limit	0.0~200.0%	Depend on model		54
P3.08	Torque setting source	0: Keypad （P3.09） 1:AI1 2:AI2 3:HDI 4:Multi-step speed 5:Communication	0		55
P3.09	Keypad torque setting	-200.0%~200.0%	50.0%		56
P3.10	Upper frequency setting source	0: Keypad （P0.04） 1: AI1 2: AI2 3: HDI 4: Multi-step 5: Communication	0		57
P4 Group: V/F Control					
P4.00	V/F curve selection	0:Linear curve 1: User-defined curve 2: Torque_stepdown curve (1.3 order) 3: Torque_stepdown curve (1.7 order) 4: Torque_stepdown curve (2.0 order)	0	¥	58
P4.01	Torque boost	0.0%: (auto) 0.1％~10.0％	0.0％	0	59
P4.02	Torque boost cut-off	0.0%~50.0% (motor rated frequency)	20.0%	¥	60
P4.03	V/F frequency 1	0.00Hz~ P4.05	0.00Hz	0	61
P4.04	V/F voltage 1	0.0%~100.0%	0.00%	0	62
P4.05	V/F frequency 2	P4.03~ P4.07	30.00Hz	¥	63
P4.06	V/F voltage 2	0.0%~100.0%	00.0%	¥	64

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P4.07	V/F frequency 3	P4.05~ P2.02	00.00Hz	0	65
P4.08	V/F voltage 3	0.0%~100.0%	0.0%	¥	66
P4.09	Slip compensation limit	0.00~200.0%	0.0%	0	67
P4.10	Auto energy saving selection	0: Disabled 1: Enabled	0	¥	68
P4.11	Low-frequency threshold of restraining oscillation	0~10	2		69
P4.12	High-frequency threshold of restraining oscillation	0~10	0		70
P4.13	Boundary of restraining oscillation	0.0~P3.03	30Hz		71
P5 Group: Input Terminals					
P5.00	HDI selection	0: High speed pulse input 1: ON-OFF input	0	¥	72
P5.01	S1 Terminal function	0: Invalid 1: Forward 2: Reverse 3: 3-wire control	1	¥	73
P5.02	S2 Terminal function		4	¥	74

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P5.03	S3 Terminal function	4: Jog forward 5: Jog reverse 6: Coast to stop 7: Reset fault 8: Pause running 9: External fault input 10: Up command 11: DOWN command 12: Clear UP/DOWN 13: Switch between A and B 14: Switch between A and A+B 15: Switch between B and A+B 16: Multi-step speed reference1 17: Multi-step speed reference 2 18: Multi-step speed reference 3 19: Multi-step speed reference 4 20: Multi-step speed	7	¥	75
P5.04	S4 Terminal function		0	¥	76

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P5.05	S5 terminal function	pause 21: ACC/DEC time selection1n time 22: ACC/DEC time selection 2 23: Reset simple PLC when stop 24: Pause simple PLC 25: Pause PID 26: Pause traverse operation 27: Reset traverse operation 28: Reset counter 29: Reset length 30: ACC/DEC ramp hold 31: Counter input 32: UP/DOWN invalid temporarily 33-39: Reserved	0		77
P5.06	S6 terminal function		0		78

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P5.07	S7 terminal function		0		79
P5.08	HDI terminal function		0	¥	80
P5.09	ON-OFF filter times	1~10	5	0	81
P5.10	FWD/REV control 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	¥	82
P5.11	UP/DOWN setting change rate	0.01~50.00Hz/s	0.50Hz/s	0	83
P5.12	AI1 lower limit	-10.00V~10.00V	0.00V	0	84
P5.13	AI1 lower limit corresponding setting	-100.0%~100.0%	0.0%	0	85
P5.14	AI1 upper limit	-10.00V~10.00V	10.00V	0	86
P5.15	AI1 upper limit corresponding setting	-100.0%~100.0%	100.0%	0	87
P5.16	AI1 filter time constant	0.00s~10.00s	0.10s	0	88
P5.17	AI2 lower limit	0.00V~10.00V	0.00V	0	89

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P5.18	AI2 lower limit corresponding setting	-100.0%~100.0%	0.0%	0	90
P5.19	AI2 upper limit	0.00V~10.00V	10.00V	0	91
P5.20	AI2 upper limit corresponding setting	-100.0%~100.0%	100.0%	0	92
P5.21	AI2 filter time constant	0.00s~10.00s	0.10s	0	93
P5.22	HDI lower limit	0.0 kHz ~50.0kHz	0.0KHz	0	94
P5.23	HDI lower limit corresponding setting	-100.0%~100.0%	0.0%	0	95
P5.24	HDI upper limit	0.0 KHz~50.0KHz	50.0KHz	0	96
P5.25	HDI upper limit corresponding setting	-100.0%~100.0%	100.0%	0	97
P5.26	HDI filter time constant	0.00s~10.00s	0.10s	0	98
P6 Group: Output Terminals					
P6.00	HDO selection	0: High-speed pulse output 1: ON-OFF output	0	0	99
P6.01	HDO ON-OFF output selection	0: No output 1: Running 2: Run forward 3: Run reverse 4: Fault output 5: FDT reached 6: Frequency reached 7: Zero speed running 8: Preset count value	1	0	100
P6.02	Relay 1 output selection		4	0	101

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P6.03	Relay 2 output selection (4.0kW and above)	reached 9: Specified count value reached 10: Length reached 11: Simple PLC step completed 12: PLC cycle completed 13: Running time reached 14: Upper frequency limit reached 15: Lower frequency limit reached 16: Ready 17: Auxiliary motor 1 started 18: Auxiliary motor 2 started 19-20: reserved	0	0	102
P6.04	AO1 function selection	0: Running frequency 1: Reference frequency 2: Motor speed 3: Output current 4: Output voltage 5: Output power 6: Output torque 7: AI1 voltage 8: AI2 voltage/current 9: HDI frequency	0	0	103
P6.05	AO2 function selection		0		104

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P6.06	HDO function selection		0	○	105
P6.07	AO1 lower limit	0.0%~100.0%	0.0%	○	106
P6.08	AO1 lower limit corresponding output	0.00V ~10.00V	0.00V	○	107
P6.09	AO1 upper limit	0.0%~100.0%	100.0%	○	108
P6.10	AO1 upper limit corresponding output	0.00V ~10.00V	10.00V	○	109
P6.11	AO2 lower limit	0.0~100.0%	0.0%		110
P6.12	AO2 lower limit corresponding output	0~10.00V	0.00V		111
P6.13	AO2 upper limit	0.0~100.0%	100.0%		112
P6.14	AO2 upper limit corresponding output	0.00~10.00V	10.00V		113
P6.15	HDO lower limit	0.00%~100.00%	0.00%	○	114
P6.16	HDO lower limit corresponding output	0.00~ 50.00kHz	0.00kHz	○	115
P6.17	HDO upper limit	0.00%~100.00%	100.0%	○	116
P6.18	HDO upper limit corresponding output	0.00~ 50.0kHz	50.0kHz	○	117
P7 Group: Display Interface					
P7.00	User password	0~65535	0	○	118
P7.01	Reserve		0	○	119
P7.02	Reserve		0	¥	120
P7.03	QUICK/JOG function selection	0: Display status switching 1: Jog 2: FWD/REV switching 3: Clear UP/DOWN setting 4.QUICK set mode	0	○	121

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P7.04	$\boxed{\text{STOP/RST}}$ function selection	0: Valid when keypad control (P0.03=0) 1: Valid when keypad or terminal control (P0.03=0 or 1) 2: Valid when keypad or communication control (P0.03=0 or 2) 3: Always valid	0	○	122
P7.05	Keypad display selection	0: Preferential to external keypad 1: Both display, only external key valid. 2: Both display, only local key valid. 3: Both display and key valid.	0	○	123

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P7.06	Running status display selection 1	0~0XFFFF BIT0: running frequency BIT1: Reference frequency BIT2: DC bus voltage BIT3: Output voltage BIT4: Output current BIT5: Rotation speed BIT6: Line speed BIT7: Output power BIT8: Output torque BIT9: PID preset BIT10: PID feedback BIT11: Input terminal status BIT12: Output terminal status BIT13: Torque setting value BIT14: Count value BIT15: Step No. of PLC or multi-step	0X07FF	○	124
P7.07	Running status display selection 2	0~0XFFFF BIT0: AI1 BIT1: AI2 BIT2: HDI frequency BIT3: Load percentage of motor BIT4: Load percentage of inverter BIT 5: Accumulated running time BIT6~15: Reserved	0X0000	○	125

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P7.08	Stop status display selection	0~0XFFFFF BIT0: Reference frequency BIT1: DC bus voltage BIT2: Input terminal status BIT3: Output terminal status BIT4: PID preset BIT5: PID feedback BIT6: AI1 BIT7: AI2 BIT8: HDI frequency BIT9: Step No. of PLC or multi-step BIT10: Torque setting value BIT11~15: Reserved	0x00FF	○	126
P7.09	Coefficient of rotation speed	0.1~999.9% Actual mechanical speed = 120 * output frequency *P7.09 / Number of poles of motor	100.0%	○	127
P7.10	Coefficient of line speed	0.1~999.9% Line speed = actual mechanical speed * P7.10	1.0%	○	128
P7.11	Rectify module temperature	0~100.0°C		●	129
P7.12	IGBT module temperature	0~100.0°C		●	130
P7.13	Software version			●	131
P7.14	Inverter rated power	0-3000KW		Depends on model	132

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P7.15	Inverter rated current	0.0-6000A		Depends on model	133
P7.16	Accumulated running time	0~65535h		●	134
P7.17	Third latest fault type	0: Not fault 1: IGBT Ph-U fault(OUT1) 2: IGBT Ph-V fault(OUT2) 3: IGBT Ph-W fault(OUT3) 4: Over-current when acceleration(OC1) 5: Over-current when deceleration(OC2) 6: Over-current when constant speed running		●	135
P7.18	Second latest fault type			●	136

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P7.19	Latest fault type	(OC3) 7: Over-voltage when acceleration(OV1) 8: Over-voltage when deceleration(OV2) 9: Over-voltage when constant speed running(OV3) 10: DC bus Under-voltage(UV) 11: Motor overload (OL1) 12: Inverter overload (OL2) 13: Input phase failure (SPI) 14: Output phase failure (SPO) 15: Rectify overheat (OH1) 16: IGBT overheat (OH2) 17: External fault (EF) 18: Communication fault (CE) 19: Current detection fault (ITE) 20: Autotuning fault (TE) 21: EEPROM fault (EEP) 22: PID feedback fault (PIDE) 23: Brake unit fault (BCE) 24: Reserved		●	137
P7.20	Output frequency at current fault			●	138

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P7.21	Output current at current fault			●	139
P7.22	DC bus voltage at current fault			●	140
P7.23	Input terminal status at current fault			●	141
P7.24	Output terminal status at current fault			●	142
P8 Group: Enhanced Function					
P8.00	Acceleration time 1	0.1~3600.0s	Depend on model	○	143
P8.01	Deceleration time 1	0.1~3600.0s	Depend on model	○	144
P8.02	Acceleration time 2	0.1~3600.0s	Depend on model	○	145
P8.03	Deceleration time 2	0.1~3600.0s	Depend on model	○	146
P8.04	Acceleration time 3	0.1~3600.0s	Depend on model	○	147
P8.05	Deceleration time 3	0.1~3600.0s	Depend on model	○	148
P8.06	Jog reference	0.00~P0.03	5.00hz		149
P8.07	Jog acceletation time	0.1-3600.0s	Depand on Model		150
P8.08	Jog deceleration time	0.1~3600.0s	Depand on Model		151
P8.09	Skip Frequency 1	0.00~P0.03	0.00Hz		152
P8.10	Skip Frequency 2	0.00~P0.03	0.00Hz		153
P8.11	Skip frequency bandwidth	0.00~P0.03	0.00hz		154
1P8.12	Traverse amplitude	0.0~100.0%	0.0%	○	155
P8.13	Jitter frequency	0.0~50.0%	0.0%	○	156

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P8.14	Rise time of traverse	0.1~3600.0s	5.0s	0	157
P8.15	Fall time of traverse	0.1~3600.0s	5.0s	0	158
P8.16	Auto reset times	0~3	0	0	159
P8.17	Reset interval	0.1~100.0s	1.0s	0	160
P8.18	Preset count value	P8.19~65535	0	0	161
P8.19	Specified count value	0~P8.18	0	0	162
P8.20	Preset running time	0~65535h	65535h	0	163
P8.21	FDT level	0.00~ P0.03	50.00Hz	0	164
P8.22	FDT lag	0.0~100.0%	5.0%	0	165
P8.23	Frequency arrive detecting range	0.0~100.0%(maximum frequency)	0.0%	0	166
P8.24	Droop control	0.00~10.00Hz	0.00Hz	0	167
P8.25	Brake threshold voltage	115.0~140.0%	Depend on model	0	168
P8.26	Cooling fan control	0: Auto stop mode 1: Always working	0	0	169
P8.27	Restrain oscillation	0: Enabled 1: Disabled	1	0	170
P8.28	PWM mode	0: PWM mode 1 1: PWM mode 2 2: PWM mode 3	0	¥	171
P9 Group: PID Control					
P9.00	PID preset source selection	0: Keypad 1: AI1 2: AI2 3: HDI 4: Multi-step 5: Communication	0	0	172

Function Code	Name	Description	Factory Setting	Modify	Serial No.
P9.01	Keypad PID preset	0.0%~100.0%	0.0%	○	173
P9.02	PID feedback source selection	0: AI1 1: AI2 2: AI1+AI2 3: HDI 4: Communication	0	○	174
P9.03	PID output characteristic	0: Positive 1: Negative	0	○	175
P9.04	Proportional gain (Kp)	0.00~100.00	0.10	○	176
P9.05	Integral time (Ti)	0.01~10.00s	0.10s	○	177
P9.06	Differential time (Td)	0.00~10.00s	0.00s	○	178
P9.07	Sampling cycle (T)	0.00~100.00s	0.10s	○	179
P9.08	Bias limit	0.0~100.0%	0.0%	○	180
P9.09	Feedback lost detecting value	0.0~100.0%	0.0%	○	181
P9.10	Feedback lost detecting time	0.0~3600.0s	1.0s	○	182
PA Group: Simple PLC and Multi-step Speed Control					
PA.00	Simple PLC mode	0: Stop after one cycle 1: Hold last frequency after one cycle 2: Circular run	0	○	183
PA.01	Simple PLC status saving after power off	0: Disabled 1: Enabled	0	○	184
PA.02	Multi-step speed 0	-100.0~100.0%	0.0%	○	185
PA.03	0th Step running time	0.0~6553.5s(h)	0.0s	○	186
PA.04	Multi-step speed 1	-100.0~100.0%	0.0%	○	187

Function Code	Name	Description	Factory Setting	Modify	Serial No.
PA.05	1st Step running time	0.0~6553.5s(h)	0.0s	○	188
PA.06	Multi-step speed 2	-100.0~100.0%	0.0%	○	189
PA.07	2nd Step running time	0.0~6553.5s(h)	0.0s	○	190
PA.08	Multi-step speed 3	-100.0~100.0%	0.0%	○	191
PA.09	3rd Step running time	0.0~6553.5s(h)	0.0s	○	192
PA.10	Multi-step speed 4	-100.0~100.0%	0.0%	○	193
PA.11	4th Step running time	0.0~6553.5s(h)	0.0s	○	194
PA.12	Multi-step speed 5	-100.0~100.0%	0.0%	○	195
PA.13	5th Step running time	0.0~6553.5s(h)	0.0s	○	196
PA.14	Multi-step speed 6	-100.0~100.0%	0.0%	○	197
PA.15	6th Step running time	0.0~6553.5s(h)	0.0s	○	198
PA.16	Multi-step speed 7	-100.0~100.0%	0.0%	○	199
PA.17	7th Step running time	0.0~6553.5s(h)	0.0s	○	200
PA.18	Multi-step speed 8	-100.0~100.0%	0.0%	○	201
PA.19	8th Step running time	0.0~6553.5s(h)	0.0s	○	202
PA.20	Multi-step speed 9	-100.0~100.0%	0.0%	○	203
PA.21	9th Step running time	0.0~6553.5s(h)	0.0s	○	204
PA.22	Multi-step speed 10	-100.0~100.0%	0.0%	○	205
PA.23	10th Step running time	0.0~6553.5s(h)	0.0s	○	206
PA.24	Multi-step speed 11	-100.0~100.0%	0.0%	○	207

Function Code	Name	Description	Factory Setting	Modify	Serial No.
PA.25	11th Step running time	0.0~6553.5s(h)	0.0s	○	208
PA.26	Multi-step speed 12	-100.0~100.0%	0.0%	○	209
PA.27	12th Step running time	0.0~6553.5s(h)	0.0s	○	210
PA.28	Multi-step speed 13	-100.0~100.0%	0.0%	○	211
PA.29	13th Step running time	0.0~6553.5s(h)	0.0s	○	212
PA.30	Multi-step speed 14	-100.0~100.0%	0.0%	○	213
PA.31	14th Step running time	0.0~6553.5s(h)	0.0s	○	214
PA.32	Multi-step speed 15	-100.0~100.0%	0.0%	○	215
PA.33	15th Step running time	0.0~6553.5s(h)	0.0s	○	216
PA.34	ACC/DEC time selection for step 0~7	0~0XFFFF	0	○	217
PA.35	ACC/DEC time selection for step 8~15	0~0XFFFF	0	○	218
PA.36	Simple PLC restart selection	0: Restart from step 0 1: Continue from paused step	0	¥	219
PA.37	Time unit	0: Second 1: Minute	0	¥	220
PB Group: Protection Function					
PB.00	Input phase-failure protection	0: Disable 1: Enable	1	○	221

Function Code	Name	Description	Factory Setting	Modify	Serial No.
PB.01	Output phase-failure protection	0: Disabled 1: Enabled	1	○	222
PB.02	Motor overload protection	0: Disabled 1: Normal motor 2: Variable frequency motor	2	¥	223
PB.03	Motor overload protection current	20.0% ~ 120.0% (rated current of the motor)	100.0%	○	224
PB.04	Threshold of trip-free	70.0.0~110.0% (standard bus voltage)	80.0%	○	225
PB.05	Decrease rate of trip-free	0.00Hz~P0.03	0.00Hz	○	226
PB.06	Over-voltage stall protection	0: Disabled 1: Enabled	1	○	227
PB.07	Over-voltage stall protection point	110~150%	380V: 130% 220V: 120%	○	228
PB.08	Auto current limiting threshold	50~200%	G Model: 160% P Model: 120%	○	229
PB.09	Frequency decrease rate when current limiting	0.00~50.00Hz/s	10.00Hz/s	○	230
PB.10	Auto current limiting selection	0: Enabled 1: Disabled when constant speed	0	○	231

Function Code	Name	Description	Factory Setting	Modify	Serial No.
PB.11	Selection of overtorque (OL3)	0：No detection 1：Valid detection of overtorque during running, then continue running 2：Valid detection of overtorque during running, then waring and stop 3：Valid detection of overtorque during constant speed running, then continue running 4：Valid detection of overtorque during constant speed running, then waring and stop.	1		232
PB.12	Detection level of overtorque	1.0%~200.0%	Depends on model		233
PB.13	Detection time cof overtorque	0.0~60.0s	0.1s		234
PC Group: Serial Communication					
PC.00	Local address	0~247, 0 stands for the broadcast address	1	0	235
PC.01	Baud rate selection	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	4	0	236

Function Code	Name	Description	Factory Setting	Modify	Serial No.
PC.02	Data format	0: RTU, 1 start bit, 8 data bits, no parity check, 1 stop bit. 1: RTU, 1 start bit, 8 data bits, even parity check, 1 stop bit. 2: RTU, 1 start bit, 8 data bits, odd parity check, 1 stop bit. 3: RTU, 1 start bit, 8 data bits, no parity check, 2 stop bits. 4: RTU, 1 start bit, 8 data bits, even parity check, 2 stop bits. 5: RTU, 1 start bit, 8 data bits, odd parity check, 2 stop bits.	1	○	237
PC.03	Communication delay time	0~200ms	5ms	○	238
PC.04	Communication timeout delay	0.0: Disabled 0.1~100.0s	0.0s	○	239
PC.05	Communication error action	0: Alarm and coast to stop 1: No alarm and continue to run 2: No alarm but stop according to P1.06 (if P0.03=2) 3: No alarm but stop according to P1.06	1	○	240

Function Code	Name	Description	Factory Setting	Modify	Serial No.
PC.06	Response action	Unit's place of LED 0: Response to writing 1: No response to writing Ten's place of LED 0: Reference not saved when power off 1: Reference saved when power off	0	0	241
PD Group: Supplementary Function					
PD.00-PD.09	Reserved			●	242
PE Group: Factory Setting					
PE.00	Factory password	0~65535	*****	0	243

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