CV20 Series Crane Inverter Manual

2025-04 Version

Thank you very much for choosing CV20 series high-performance vector control special for crane inverter. please read the 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 dangerous situation which, if can not avoid will result in death or serious injury.

" CAUTION" Indicates a potentially dangerous situation which, if can not avoid will cause minor or moderate injury and damage the device. This symbol is also used for warning any un-safety operation. In some cases, even the contents of "CAUTION" still can cause series accident. Please follow these important precautions in any situation.

The figures in this instruction manual are for convenience with description, they may have slight differences compared to the product, and the product update can also cause slight differences between the figure and product, the actual sizes are subject to actual products.

Please keep the operation manual handy for future reference, maintenance, inspection and repair.

If you have any questions, please contact us or our agents in time, you will always receive our best attention.

Chapter 1 Introduction

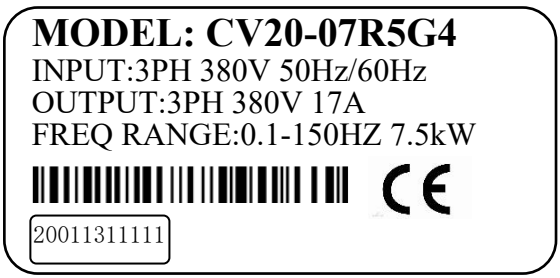
1.1 Technology Features

Item		CV20	
Basic Control Function	Control Mode	V/F control Open-loop vector control (SVC) Closed-loop vector control (FVC)	
	Maximum frequency	0～150Hz	
	Carrier frequency	1kHz～12kHz The carrier frequency is automatically adjusted based on the load features.	
	Input frequency resolution	Digital setting:0.01Hz Analog setting: Maximum frequency x 0.025%	
	Start torque	G type:0.25Hz/150%(SVC); 0Hz/180% (FVC)	
	Speed range	1：200 (SVC)	1:1000 (FVC)
	Speed stability accuracy	±0.5% (SVC)	±0.02% (FVC)
	Torque control accuracy	±5% (SVC)，±3% (FVC)	
	Overload capacity	G Type:60s for 150% of the rated current, 3s for 180% of the rated current.	
	Torque boost	Auto-boost; Manual torque boost: 0.1%~30.0%	
	Acceleration and deceleration curve	Straight-line or "s"curve ramp. Three groups of acceleration/deceleration time with the range of 0.00~600.0s	
	Multi-speed operation	A maximum of 8 frequency settings can be achieved through the control terminals.	
	Auto voltage regulation (AVR)	It can keep constant output voltage automatically when the grid voltage changes	
	Over-voltage/over-current stall control	The current and voltage are limited automatically during the running process so as to avoid frequent tripping due to over voltage/over current	
	Rapid current limit	It helps to avoid frequent over current faults of the inverter.	
	Torque limit and control	It can limit the torque automatically and prevent frequent over current tripping during the running	

		process. Torque control can be implemented in the closed loop vector mode.
Special Function	Support for kinds of PG cards	Support for PG cards of resolver, differential, open collector
	Instantaneous stop doesn't stop	The load feedback energy compensates the voltage reduction so that the inverter can continue to run for a short time.
	Communication	RS-485
	Protection mode	Motor short-circuit detection at power-on, input/output phase loss protection, over current protection, over voltage protection, under voltage protection, overheat protection and overload protection
	Lifting process control	Inverter built in anti-sway, grab and other complex lifting process control, used for lifting, translation, slewing and other driving in lifting equipment.
Input/Output terminal	Input terminal	Maximum 10 digital input terminals 2 analog input terminals 1 voltage input (only support for 0~10V,), 1 voltage input(0~10V) or current input (4～20mA) (Different power are with different terminals, see details at circuit description)
	Frequency source	Digital setting, analog voltage setting, analog current setting, communication setting. You can perform switchover in various ways.
	Command source	Operation panel/Control terminals/Serial communication port You can perform switchover between these sources in various ways.
	Output terminal	2 digital output terminals 2 relay output terminals
Display &operation panel	LED display	It display the parameter
	Key locking and function selection	It can lock the keys partially or completely and define the function range of some keys so as to To prevent misoperation.
Environment	Installation location	Indoor, free from direct sunlight, dust, corrosive gas, combustible gas, oil smoke, vapor, drip or salt.

	Altitude	Lower than 1000m
	Ambient temperature	－10℃~＋40℃（de-rated use if the ambient temperature is between 40℃~50℃）
	Humidity	Less than 95%RH，without condensing
	Vibration	Less than 5.9m/s2（0.6g）
	Storage temperature	－20℃~＋60℃

1.2 Description of nameplate



CV20-07R5G4

Voltage: 2: 1PH AC 220V; 4: 3 PH AC 380V.

G: constant torque

Power: 07R5: 7.5KW

CV20 crane inverter

1.3 Selection guide

Voltage：3PH AC380V±15%

Model No.	Input voltage	Rated output power(KW)	Rated input current（A）	Rated output current（A）	Motor Power (KW)
CV20-03R57G4	3PH AC380V±15%	3.7	10.0	9.0	3.7
CV20-05R5G4		5.5	15.0	13.0	5.5
CV20-07R5G4		7.5	20.0	17.0	7.5
CV20-11G4		11	26.0	25.0	11
CV20-15G4		15	35.0	32.0	15
CV20-18.5G4		18.5	38.0	37.0	18.5
CV20-22G4		22	46.0	45.0	22
CV20-30G4		30	62.0	60.0	30
CV20-37G4		37	76.0	75.0	37
CV20-45G4		45	92.0	90.0	45
CV20-55G4		55	113.0	110.0	55
CV20-75G4		75	157.0	150.0	75
CV20-90G4		90	180.0	176.0	90
CV20-110G4		110	214.0	210.0	110
CV20-132G4		132	256.0	253.0	132
CV20-160G4		160	307.0	300.0	160
CV20-200G4		200	385.0	380.0	200
CV20-220G4		220	430.0	420.0	220
CV20-250G4		250	475.0	470.0	250
CV20-280G4		280	525.0	520.0	280
CV20-315G4		315	595.0	585.0	315
CV20-350G4		350	665.0	650.0	350
CV20-400G4		400	740.0	725.0	400

CV20-450G4		450	835.0	820.0	450

1.4 Installation

1.4.1Environment Requirement

Inverter's installation environment on the service life of inverter, and has direct influence on the normal function, Inverter can't satisfy the specification of environment, protection or fault could lead to the Inverter

CV20 series inverter of wall hung inverter, please use the vertical installation so that the air convection and the heat dissipation effect can be better.

Inverter's installation environment, please make sure it must comply with

(01) - 10 ℃ to + 40 ℃ ambient temperature

(02) Environment humidity 0 ~ 95% and no condensation

(03) Avoid direct sunlight

(04) Environment does not contain corrosive gas and liquid

(05) Environment without dust, floating fiber, cotton and metal particles

(06) Away from the radioactive material and fuel

(07) Away from electromagnetic interference source (such as electric welding machine, big power machine)

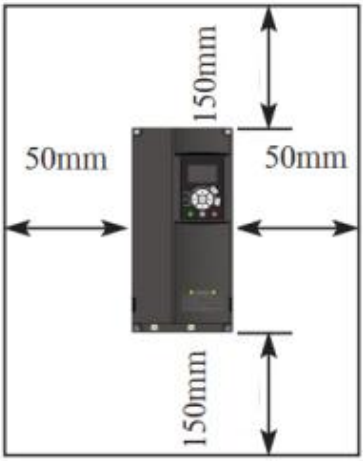
(08) Installed planar solid, no vibration, if it cannot avoid vibration, please add antivibration pads to reduce the vibration

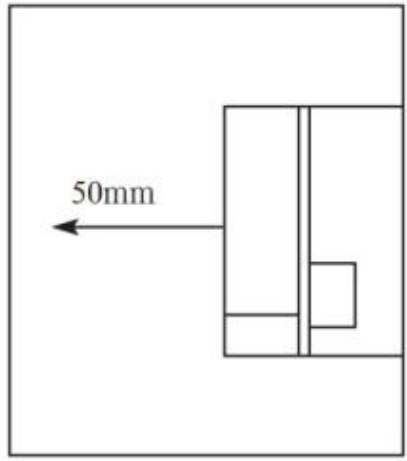
(09) Please install the inverter in the well ventilated place, easy to check and maintain, and install on the solid non-combustible material, away from the heating element (such as braking resistance, etc.)

(10)Inverter can output the rated power when installed in the altitude of lower than 1000m. It will be derated when the altitude is higher than 1000m.

(11)Inverter's installation ,please reserve enough space, especially many inverters' installation, please pay attention to the placement of the Inverter, and configure cooling fans, make the environment temperature lower than 45 ℃.

(1)Single Inverter Installation:

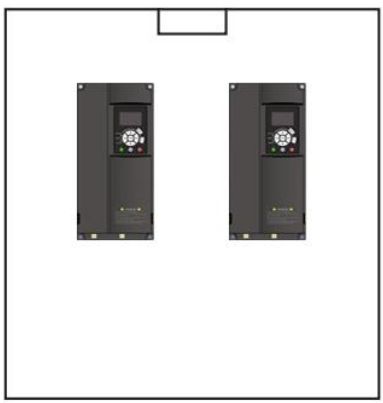




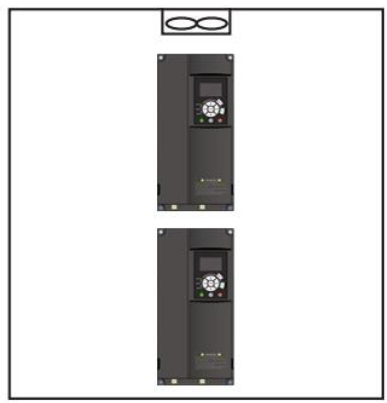
(2) Multiple inverters installed in one control cabinet

please note：

① During installation, the inverters should be placed in parallel configuration as much as possible.

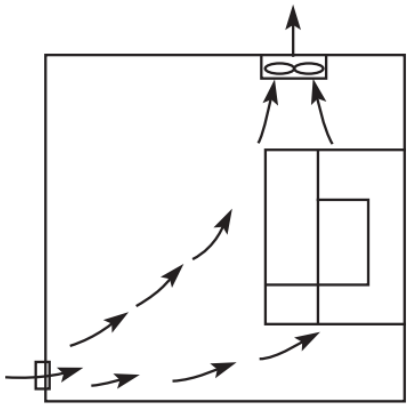


Favorable placing

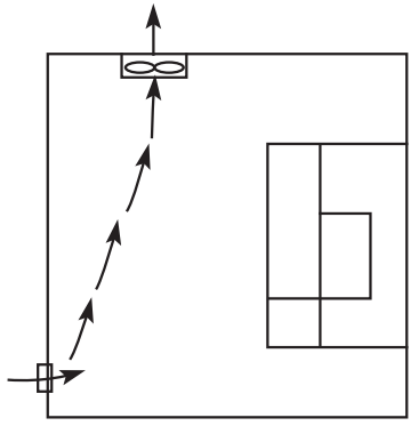


Unfavorable placing

② If multiple inverter are installed in one control cabinet, please leave enough clearances and take cooling measure

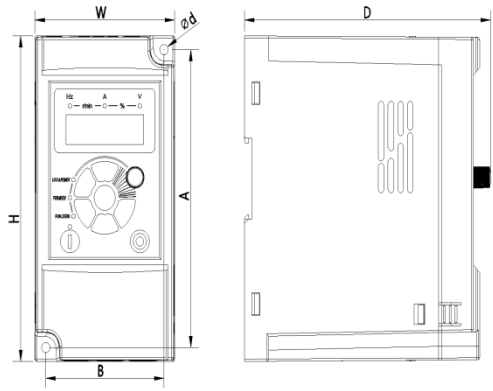


Correct installation position of the fan



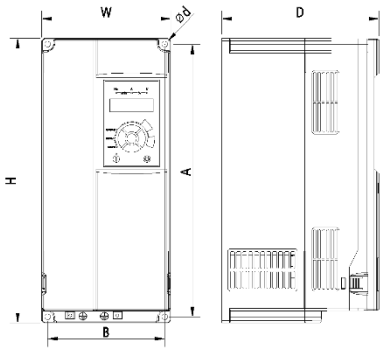
Incorrect installation position of the fan

1.4.2 The inverter's outside shape and installation dimensions



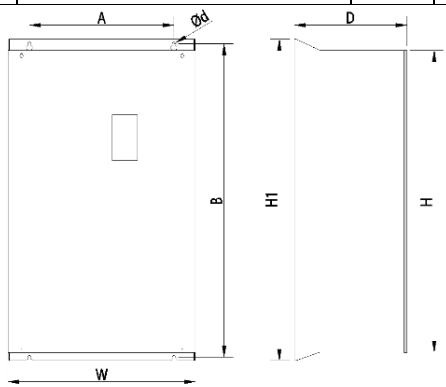
TYPE
A

TYPE	Inverter model	W	H	D	A	B	Ød
A	CV20-03R57G4	85	180	131	167	72	5.5
	CV20-05R5G4						



TYPE
B

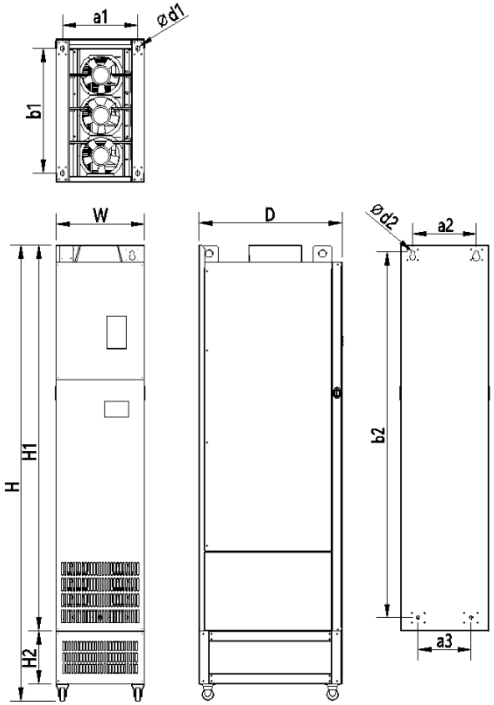
TYPE	Inverter model	W	H	D	A	B	Ød
B	CV20-07R5G4 CV20-11G4	106	240	168	230	96	4.5
B	CV20-15G4 CV20-18.5G4 CV20-22G4	151	332	183	318	137	7
B	CV20-30G4 CV20-37G4	217	400	216	385	202	7



TYPE
C

TYPE	Inverter model	W	H	H1	D	A	B	Ød
C	CV20-45G4 CV20-55G4	300	440	470	240	200	455	9

C	CV20-75G4 CV20-90G4 CV20-110G4	275	590	630	310	200	612	9
C	CV20-132G4 CV20-160G4	400	675	715	310	320	695	11



TYPE D

TYPE	Inverter model	Outline dimension(mm)					Installation Size (mm)			Wall mount Installation Size (mm)			
		W	H	H1	H2	D	a1	b1	d1	a2	a3	b2	d2
D	CV20-200G4 CV20-220G4	300	1445	1180	200	500	250	430	14	220	150	1135	13
D	CV20-250G4	330	1595	1330	200	545	280	475	14	220	185	1275	13

D	CV20-280G4 CV20-315G4	325	1495	1230	200	545	275	470	14	225	185	1175	14
D	CV20-350G4 CV20-400G4 CV20-450G4	335	1720	1455	200	545	285	470	14	240	200	1380	14

WARNING

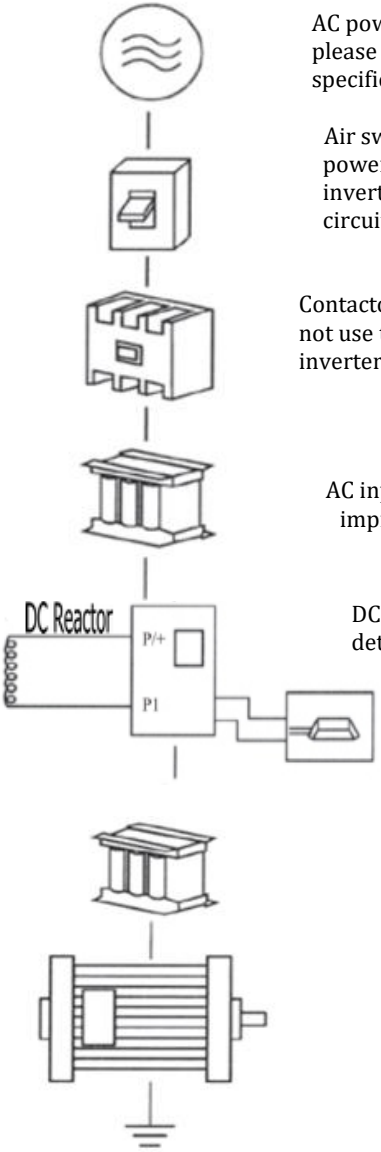
• To ensure safe operation of the frequency converter, all work must be performed by certified professional electrical personnel.
• Never use high-voltage insulation test equipment to test cables connected to the converter.
• Dangerous voltages may persist at power input terminals, DC circuit terminals, and motor terminals even when the converter is inactive. Allow at least 10 minutes after power disconnection for complete discharge before installation.
• The grounding terminal must be reliably earthed with resistance <10Ω. Failure to comply may cause electric shock or fire hazards.
• Never connect three-phase power supply to output terminals (UVW), as this will damage the converter.
• Before energizing, verify power cables are connected to R/S/T terminals and motor cables to UVW terminals.
• Avoid touching the converter with wet hands to prevent electric shock risks.

CAUTION

•Make sure the rated voltage of the inverter is corresponding to the AC power voltage.
•Make sure the power supply cable and motor cable Permanently fastened connection.

Chapter 2 Wiring

2.1 Connection of Peripheral Devices



AC power supply: 3-phase or 2-phase AC power supply, please use the power supply within the allowable specifications of the inverter.

Air switch: MCCB or leakage circuit breaker. When the power is turned on, a large impact current flows into the inverter, please pay attention to the selection of the circuit breaker.

Contactor: electromagnetic contactor (MC), note: please do not use the electromagnetic contactor to start or stop the inverter, otherwise it will reduce the life of the inverter.

AC input reactor: optional, suppress high harmonics, improve power factor, select a suitable reactor.

DC reactor: only some models have, please see the detailed description below.

Braking resistor: can improve the braking capacity of the built-in brake of the inverter.

AC output reactor: optional, suppress high harmonics, improve power factor, please select a suitable reactor.

Motor

ground

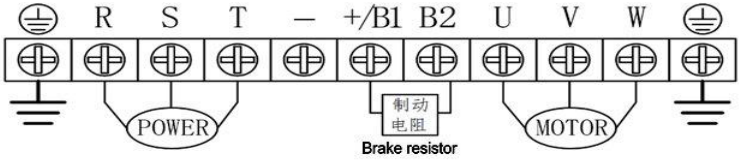
2.2 Terminal diagram

2.2.1 Main circuit terminal description

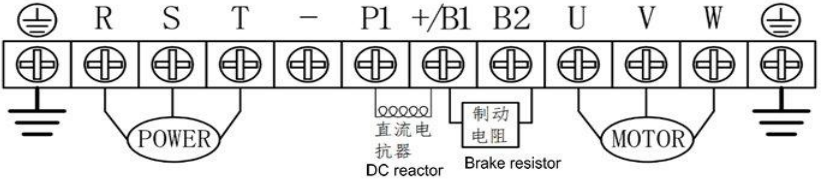
Name	Function description
E ⏚	Terminal of ground
R、S、T	Power input: Note: 3.7-5.5kW are marked as L1, L2, L3; 7.5-450kW are marked as R, S, T
B1/+、(+)	DC voltage +
P1	Remove the shorting link between the B1/+ and P1 terminals.
B2	Braking resistor can be connect between B1 and B2 or (+) and B2
(-)	Braking unit can be connected DC voltage - :P1、(-) or （+）、（-）
U、V、W	Connect to 3 phase motor

2.3 Main circuit wiring example

Main circuit terminal wiring diagram (Without reactor)



With Reactor



Note: Please pay attention to the position of the terminal, otherwise the inverter will be damaged

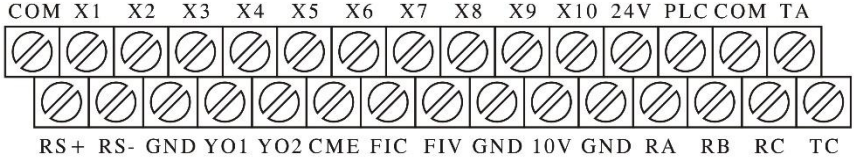
2.4 Control circuit terminal

2.4.1 Mainboard terminal arrangement

1) 3.7kw – 5.5kw

Terminal code	Destription
X1-X6	Switch input terminals forms a bipolar optocoupler isolated input. Input voltage 9-30V, input resistance 3.3kΩ
+24V	+ 24V power supply（Current：150mA）
GND	+24V Common terminal
RA、 RC	Relay 2 output, RC common terminal, RA normally open, contact capacity: AC250V/3A, DC30V/1A
TA、TC	Relay 1 output, TC common terminal, TA normally open, contact capacity: AC250V/3A, DC30V/1A
RS+ 、 RS- 、 COM	485 communication interface，485 differential signal positive、Negative terminal， standard 485 Please use twisted pair or shielded wire for communication interface

2) 7.5kw – 450 kw



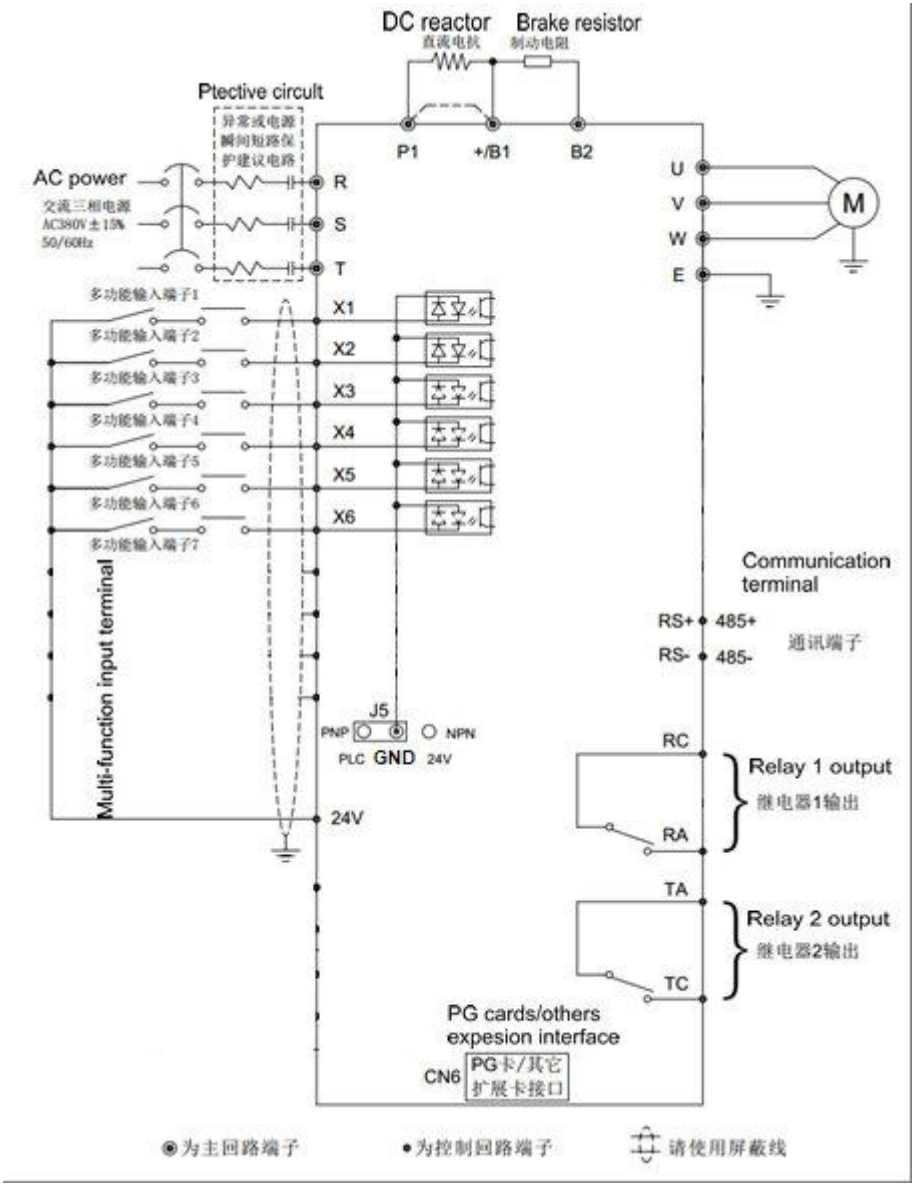
Terminal Name	Terminal function and description
X1-X10	Switch input terminals forms a bipolar optocoupler isolated input. Input voltage 9-30V, input resistance 3.3kΩ
PLC	For external power supply, users can directly connect it to the power supply (between COM) or use the +24V power supply of this machine. When the CV20 series inverter leaves the factory, the +24V is short-circuited with the PLC by default. Please disconnect it from the +24V when using the external power supply.
+24V	Provide output power supply of +24V. output current: 150mA
COM	Common terminal for +24V
FIV	Analog input, voltage range: 0~10V, Input impedance: 20kΩ
FIC	Analog input, 0~10V/0~20mA, switched by J8. Input impedance: 10kΩ(voltage input)/250kΩ(current input)

+10V	Supply +10V for inverter
GND	The reference ground is at +10V (Note: GND and COM are electrically isolated).
YO1/YO2	The open-collector output terminals correspond to the common terminal CME.
CME	Collector Common Terminal
RA 、 RB 、 RC	Relay 2 output, RC common terminal, RB normally closed, RA normally open. Contact capacity: AC250V/3A, DC30V/1A.
TA、TC	Relay 1 output, TC common terminal, TA normally open. Contact capacity: AC250V/3A, DC30V/1A
RS+、RS-	RS-485 communication port. The differential signal terminals (+/-) of the RS-485 interface must use twisted-pair or shielded cables for standard communication.

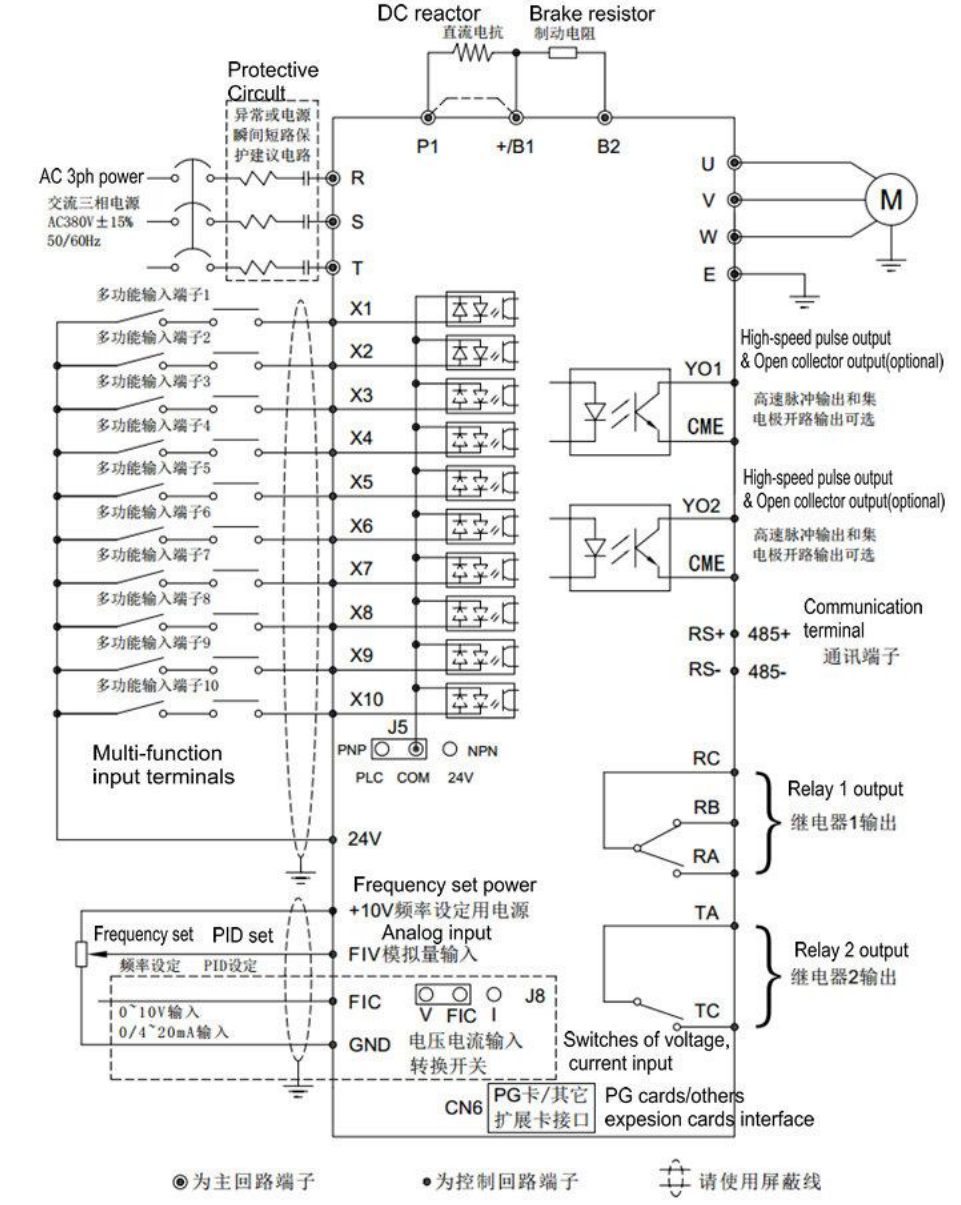
Please request NIETZ to learning other PG cards interfact destription

2.5 Basic wiring diagram

1) 3.7kw - 5.5kw



2) 7.5kw – 450 kw


DC reactor
直流电抗
Brake resistor
制动电阻
Protective Circuit
异常或电源瞬间短路保护建议电路
P1
+/B1
B2
AC 3ph power
交流三相电源
AC380V±15%
50/60Hz
R
S
T
U
V
W
E
M
多功能输入端子1
多功能输入端子2
多功能输入端子3
多功能输入端子4
多功能输入端子5
多功能输入端子6
多功能输入端子7
多功能输入端子8
多功能输入端子9
多功能输入端子10
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
Multi-function input terminals
J5
PNP
NPC
PLC
COM
24V
High-speed pulse output & Open collector output(optional)
高速脉冲输出和集电极开路输出可选
YO1
YO2
CME
Communication terminal
通讯端子
RS+
485+
RS-
485-
RC
RB
RA
Relay 1 output
继电器1输出
TA
TC
Relay 2 output
继电器2输出
Frequency set power
+10V频率设定用电源
Frequency set
PID set
Analog input
FIV模拟量输入
频率设定
PID设定
FIC
GND
0~10V输入
0/4~20mA输入
J8
V
FIC
I
电压电流输入转换开关
Switches of voltage, current input
CN6
PG卡/其它扩展卡接口
PG cards/others expesion cards interface
◉为主回路端子
•为控制回路端子
请使用屏蔽线

2.6 Recommended specifications for the device

Inverter models	Input voltage	Motor output (KW)	Main Circuit Cable Type ($mm^{2)}$	Breaker selection (A)	Input side Magnetic Contractor (A)
CV20-03R7G4	380V	3.7	1.5	16	12
CV20-5R5G4		5.5	2.5	20	18
CV20-07R5G4		7.5	4	32	25
CV20-11G4		11	4	40	32
CV20-15G4		15	6	50	38
CV20-18.5G4		18.5	10	50	40
CV20-22G4		22	10	63	50
CV20-30G4		30	16	100	65
CV20-37G4		37	25	100	80
CV20-45G4		45	35	125	95
CV20-55G4		55	50	160	115
CV20-75G4		75	70	225	170
CV20-90G4		90	95	250	205
CV20-110G4		110	120	315	245
CV20-132G4		132	120	350	300
CV20-160G4		160	150	400	300
CV20-200G4		200	185	500	410
CV20-220G4		220	240	630	475
CV20-250G4		250	240	630	475
CV20-280G4		280	240	800	620
CV20-315G4		315	150*2	800	620
CV20-350G4		350	185*2	1000	800
CV20-400G4		400	240*2	1250	800
CV20-450G4		450	240*2	1250	1000

2.7 Main Circuit Wiring

2.7.1 Wiring of the main circuit power supply side

2.7.1.1 Circuit breaker

It is nessary to connect a circuit breaker (MLCB) which is compatible with the power 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>.

2.7.1.2 Electromagnetic contactor

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

2.7.1.3 Input AC reactor

To prevent damage to the rectifier components caused by high-current surges from grid voltage spikes, an AC line reactor must be installed at the input side. This reactor also improves the input power factor. For effective protection of the inverter, it is recommended that 380V-rated inverters with a capacity of 110kW or higher be equipped with an input reactor.

2.7.2 Connection at inverter side of main circuit.

2.7.2.1 DC reactor

DC reactor can improve power factor, it can prevent the rectifier bridge destroy when overload due to connect a big capacity transformer, it can prevent the destroy of the rectifier circuit while power grid suddenly change or phase control overload.

2.7.2.2 Braking unit and braking resistor

Inverter of 380V below 315kW have built-in braking unit. In order to dissipate the regenerative energy generated by dynamic braking, the braking resistor should be installed at P/+,PR terminals. The wiring length of the braking resistor should be less than 5m. The temperature of braking resistor will increase because the regenerative energy will be transformed to heat. Safety protection and good ventilation is recommended.

When an external braking unit is required, connect the braking unit's P/+ and (-) terminals to the inverter's P/+ and (-) terminals in a one-to-one correspondence. Connect the braking resistor to the BR1 and BR2 terminals of the braking unit. 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.

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

2.7.3 Wiring at motor side of main circuit.

Output reactor 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.

2.7.4 Grounding wiring (E)

To ensure safety and prevent electric shock and fire accidents, the inverter grounding terminal E must be well grounded with a grounding resistance less than 10Ω. The grounding wire should be thick and short, and a multi-strand copper wire with a diameter of more than 3.5mm2 should be used. When multiple inverters are grounded, it is recommended not to use a common ground wire to avoid a grounding loop.

2.8 Control loop wiring

2.8.1 Note

Please use multi-core shielded cable or twisted pair to connect terminals, the shielded cable that next to inverter should be connected to the ground terminal E . When wiring, control cable should be more than 20cm away from power cable, motor cable, relay cable, contactor cable. Do not make it parallel wiring, but vertical wiring, in case of malfunction due to external interfere.

2.9 Installation Guidline to EMC compliance

2.9.1 EMC introduce

EMC is the abbreviation of electromagnetic compatible, 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 equipment. 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 sentitive 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.

2.9.2 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 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:

2.9.2.1 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.

2.9.2.2 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.

2.9.2.3 As the electromagnetic receiver, too strong interference will damage the inverter and influence the reliability of other electric devices.

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

2.9.3 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.

2.9.3.1 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 decrease or loses the shielding effect.The connection line between the inverter and the motor (motor line)

uses a shielded line or an independent wiring trough. The shielding layer of the motor line or the metal shell of the wiring trough is connected to the inverter ground at one end, and the other end is connected to the motor housing. If a noise filter is installed at the same time, electromagnetic noise can be greatly suppressed.

2.9.3.2 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, three of which is the ground wire. It is strictly prohibitive to use the same line to be both 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 aream and the distance between devices of different category should be more than 20cm. Wire arrangement inside the control cabinet: thre are signal wire(light current) to make the 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.

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.

2.9.3.3 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.

2.9.3.4 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 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.

2.9.3.5 Noise 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 two categories: a. Install a noise filter at the input end of the inverter to isolate it from other devices.
b. Install a noise filter or isolation transformer at the input end of other devices to isolate them from the inverter.

2.9.4 When install inverter and EMI filter according to the operate manual and wiring, it can meet below requiremen:

EN61000-6-4: Pass electromagnetic interference test in industrial environment.

EN61800-3: Meet the require of the EN61800-3 electromagnetic radiation standard (II environment)， If add EMC filter, it can meet the require of EN61000-6-3 electromagnetic radiation standard(Home environment) and EN61000-6-4 electromagnetic radiation standard (Industrial environment)

Chapter 3 Operation

3.1 Keypad description

3.1.1 Keypad

1) 3.7kw-5.5kw (Can be connected externally, open hole 79x59mm)

Figure 3-1-1

2) 7.5kw-450kw (cannot be removed, user can use small power keypad like pic Figure3-1-1 to remove)

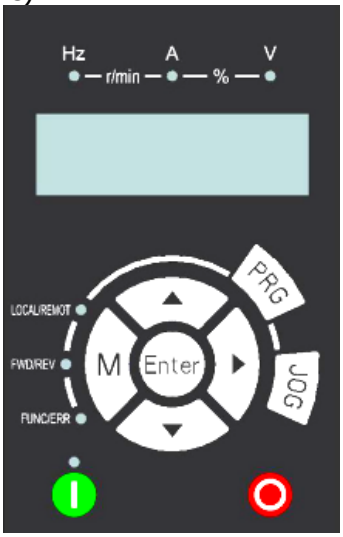
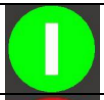


Figure 3-1-2

3.1.2 Function Key description

Button name	Name	Function Description
PRG	Programming key	Entry or escape of first-level menu
ENTER	Confirm key	Progressively enter menu and confirm parameters
▲	UP Increment Key	Increase data or function codes
▼	Down Decrement Key	Decrease data or function codes
▶	Shift Key	In parameter setting mode, press this button to select the bit to be modified. In the other modes, cyclically displays parameters by right shift
	Run Key	Start to run the inverter in keypad control mode
	Stop/Fault reset Key	In keyboard operation mode, in the running state, press this key to stop the operation. In the fault alarm state, this key can be used to reset the fault.
JOG and M	No function	

3.1.3 Indicator light description

Symbol	Description
Hz	Frequency Unit
A	Current Unit
V	Voltage Unit
FWD/REV	Forward/Reverse indicator light: Light off indicate Forward status; Light on indicate Reverse status
LOCAL/REMOT	Indicator light in control mode The light off indicates the keyboard control status, the light on indicates the terminal control status, and the light flashing indicates the communication control status.
FUNC/ERR	Warning indicator When the light is off, it indicates the inverter is in normal state; when the light flashes, it indicates the inverter is in pre-alarm state or self-learning state; when the light is on, it indicates the inverter is in fault state.

	Running state indicator When the light is off, it means the inverter is in shutdown state; when the light flashes, it means the inverter is in parameter self-learning state; when the light is on, it means the inverter is in running state.

3.2 Operation Process

3.2.1 Three levels of menu are:

a. Function code group No. (First-level)

b. Function code No. (Second-level)

c. Function code setting value (Third-level)

Explanation: the three-level menu operation can press PRG or ENTTER to return to the secondary menu. The difference between the two menus are: press ENTER to set parameters in control panel, and then return to the secondary menu, and automatically move to the next function code; Press PRG directly to return to the secondary menu, don't store parameters, and keep staying in the current function code. Example: change the function code P2.04 from 50.00 Hz to 10.00 Hz.

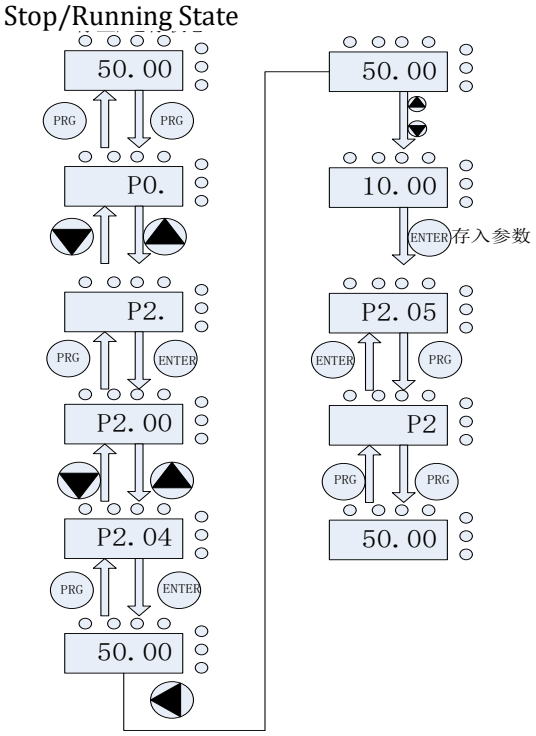


Figure 3-2 Third level operation process

In three-level state, if the parameter is not flashing, means the function code cannot be modified, possible reasons are:
1) The function code parameters cannot be modified .Such as the actual testing parameters, operation records, etc.
2) The function code in the running state cannot be modified, need to stop to modify;

3.2.2 After the failure of the inverter, the inverter will prompt the related fault information. Users can press STOP key on the keyboard or terminal function to conduct the fault reset (P5), after fault reset, the inverter is in the standby state. If the inverter is in fault state, the user does not carry on the fault reset, the inverter is in the running to protect state, inverter can't run.

3.2.3 Motor parameter auto-tuning

Choosing no PG vector control operation mode, input motor nameplate parameters must be accurate, inverter will base on nameplate parameters matching standard motor; In order to get better control performance, motor parameter auto-tuning is suggested and auto-tuning steps are as follows:

First will run command channel choice (P0.02) choice for keyboard commands. Then the actual parameters according to the motor, please input the following parameters.

P2.01: the motor rated power;
P2.02: the motor rated voltage;
P2.03: the motor rated current;
P2.04: the motor rated frequency;
P2.05: the motor rated speed.
With PG vector control, need to set below parameters:
P2.27- Number of Encoder lines
P2.28- Encoder type

In the process of auto-tuning, the keypad display STUDY, when it display frequency, motor parameter self-learning is finished.

Note: in the process of auto-tuning , motor and load should be released, otherwise, the motor parameters obtained from the auto-tuning may not be correct.

The detail operate please refer to P2.37 description.

3.3 Running state

3.3.1 Power-on initialization

In the process of the Inverter's power-on, the system first initializes, LED display for "9000", and 7 lights are all bright. After the initialization is complete, the drive is in the standby mode.

3.3.2Standby Status

In the stop or running status, can display a variety of state parameters. Press left button to select

3.3.3 Motor parameters self-learning please refer to the detailed descriptions of P2.37 function code.

3.3.4 n the running state, kinds of status parameters can choose whether to display the status parameters : operating frequency, set frequency, bus voltage, output voltage, output current, running rotating speed, output frequency, output torque, ON-OFF input state, open collector output state, analog input FIV voltage, analog input FIC voltage, torque setting value.

3.3.5 Failure : inverter offers a variety of fault information, please refer CV20 series inverter faults and their countermeasures.

3.4 Quick commissioning

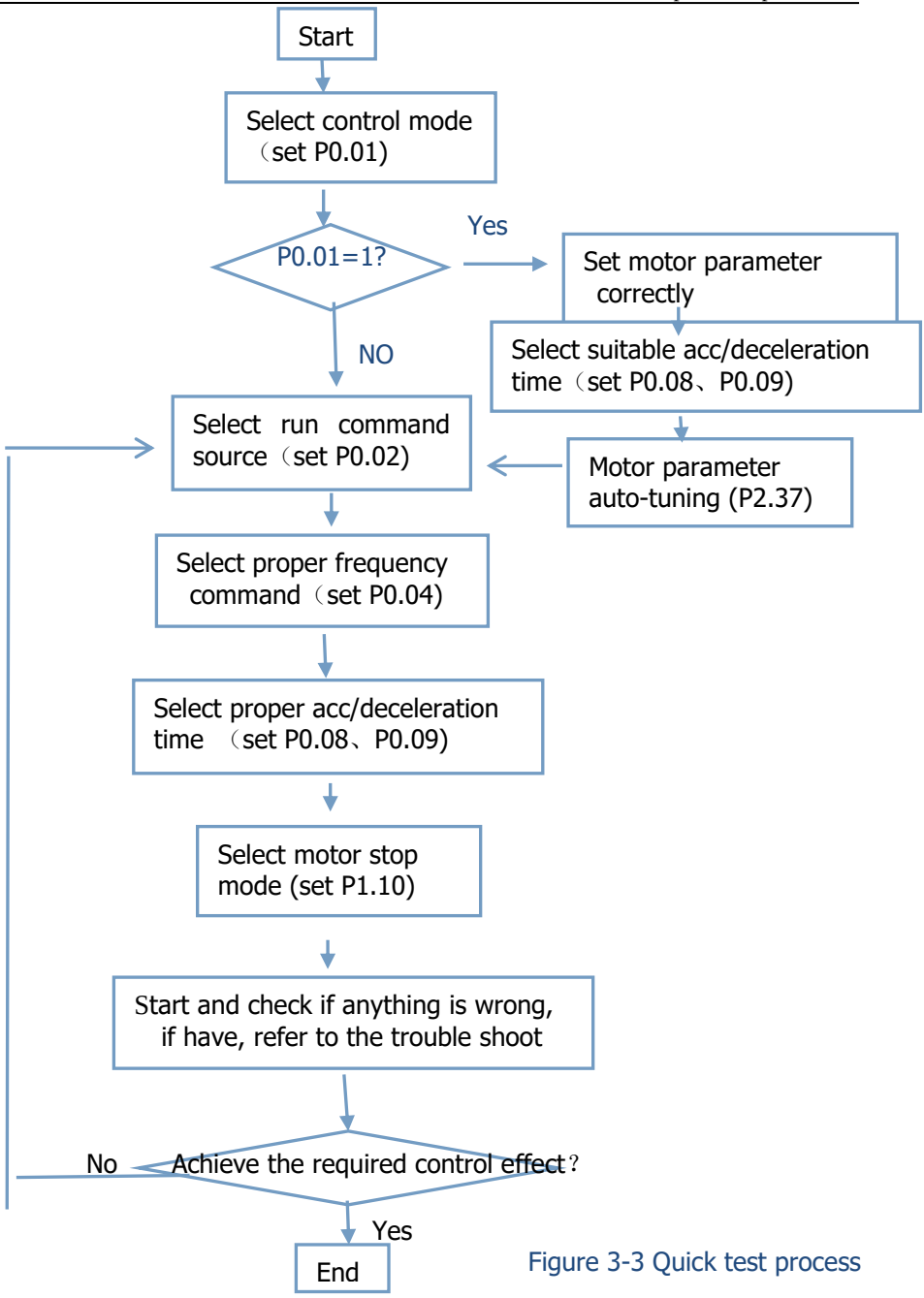


Figure 3-3 Quick test process

Chapter 4 Detailed Function parameter Descriptions

Group P0 Basic function group

P0.01	Control Mode selection		Default	0
	Setting range	2	V/F control	
		0	Speed sensorless vector control (SVC)	
		1	Vector control with speed sensor (FVC)	

2：V/F control

It is applicable to applications with lower require for speed accuracy. This series improved the low speed start up torque, can be use in lifting mode.

0：Speed sensorless vector control(SVC)

It indicates open-loop vector control, and is applicable to high-performance control applications. One inverter can only drive one motor.

1：Vector control with speed sensor (FVC)

It indicates close-loop vector control, motor should install encoder, the PG card of inverter should be the same type accordingly.It applicable to high-accuracy speed control or torque control application. One inverter can only drive one motor.

P0.02	Command source selection		Default	0
	Setting range	0	Operation panel control (LED off)	
		1	Terminal control (LED on)	
		2	Communication control (LED blinking)	

It is used to determine the input channel of the inverter control commands, such as run, stop, forward rotation, reverse rotation .

0: Operation panel control("LOCAL/REMOT"indicator off)

Commands are given by pressing keys RUN and STOP/RESET on the operation panel.

1: Terminal control("LOCAL/REMOT"indicator on)

Commands are given by means of multifunctional input terminals with functions such as FWD, REV, JOGF, and JOGR.

2: Communication control("LOCAL/REMOT"indicator blinking)

Commands are given from host computer via communication. Communication command please see " Appendix 2 protocol"

P0.04	Main frequency source selection A		Default	0
	Setting range	0	Multi-speed setting	
		1	FIV	
		2	FIC	
		3	Reserved	
		4	Acceleration/Deceleration setting	
		5	Reserved	
		9	Communication setting	

Choose inverter main input channel of a given frequency.

A total of 10 given frequency channels:

0: Multistage setting

select speed through the digital input X terminal state of different combinations, CV20 can set up 3 multispeed instruction terminals and select 8 state of those terminals. Through the function of the PC group code corresponding to any 8 Multistage instruction.

Digital input terminal function X terminal as multispeed selection terminal need to be done in group P5 corresponding settings, please refer to the specific content P5 group of related function parameters.

1：FIV

2：FIC

Frequency given by analog input terminal. CV20 provides two analog input terminal (FIV, FIC), Among them, the FIV is from 0V to 10V voltage input, FIC is from 0V to 10V voltage input, can also be used for 4 ~ 20 mA current input, jump line selection by the panel.

FIV, FIC of the input voltage value, the corresponding relationship with the target frequency, users are free to choose.

CV20 provide 2 set of corresponding relation curve, the 2 groups of curve is linear relationship (2 point correspondence), user can set through group P5.

9: Communication refers to the main frequency given source by the upper machine is given by way of communication RS485.

CV20 support communication method: RS-485。

P0.08	Acceleration time 1	Default	Model dependent
	Setting range	0.00s～65000s	
P0.09	Deceleration time 1	Default	Model dependent
	Setting range	0.00s～65000s	

The acceleration time refers to the time required for the inverter to accelerate from zero frequency to maximum frequency. The deceleration time refers to the time required for the inverter to decelerate from maximum frequency to zero frequency.

P0.10	Frequency preset	Default	50.00Hz
	Setting range	0.00～Maximum frequency	

When the command source is selected as keyboard control, the function code value is the target frequency of the inverter.

P0.11	Rotation direction		Default	0
	Setting range	0	Same direction	
		1	Reverse direction	

By changing the function code, no need to change the motor wiring for the purpose of the motor's direction , its effect is equivalent to adjust electric machine (U, V, W) any two lines for motor direction of rotation transformation.

Note: After the parameters are initialized, the motor direction will return to its original state. Use with caution in situations where it is strictly forbidden to change the motor direction after the system is debugged. Try to adjust the motor direction by changing the line.

P0.12	Maximum frequency	Default	50.00Hz
	Setting range	50.00Hz～150.00Hz	

All given frequency will be limited by the Maximum frequency.

P0.16	Minimum frequency	Default	0.00Hz
	Setting range	0.00Hz～upper limit frequency P0.12	

Frequency instruction lower than the minimum frequency setting(P0.16), inverter running as lower limit frequency.

P0.17	Carrier frequency	Default	Model dependent
	Setting range	1.0kHz～12.0kHz	

This function adjusting carrier frequency inverter. By adjusting the carrier frequency can reduce electrical noise, to avoid the resonance point of mechanical system, reduce the line of floor drain current and reducing interference caused by inverter .

When the carrier frequency is low, the output current of higher harmonic component increases, motor loss increases, the motor temperature increases. When the carrier frequency is higher, the motor loss reduces, the motor temperature rise reduces, but the loss of the inverter increases, the temperature rise of the inverter increases, increased interference.

Adjusting the carrier frequency will affect the performance of the following:

Carrier frequency	low → high
The motor noise	large → small
The output current waveform	Bad → good
Temperature Rise in Electric Motors	High → low
The temperature rise of the inverter	Low → high
leak current	Small → large
External radiation interference	Small → large

Different power inverter, the carrier frequency of the factory settings is different. Although the user can modify according to need, but pay attention: if the carrier frequency set to a higher value than the factory, will lead to inverter radiator temperature increasing, the user needs to derate to use inverter, otherwise the inverter is in danger of overheating alarm.

P0.25	UP/DOWN basic frequency	Default	50.00HZ
	Setting range	Opening frequency to maximum frequency	

This parameter only valid frequency source as acc/dec given. When terminal UP/DOWN action, target frequency is base on P0.25 increasing or decreasing.

Group P1 Start stop control

P1.04	Stop excitation holding time	Default	30s
	Setting range	0-65535	

Used to set the time to maintain excitation after the inverter stops. During the excitation holding phase, the inverter outputs zero speed and maintains the excitation current. When a run command is received during this period, pre-excitation can be skipped and the brake can be quickly opened.

P1.06	Pre-excitation time	Default	0.30s
	Setting range	0.0-5.0s	

Used to set the duration of the pre-excitation phase when the inverter starts. (This function is only valid in closed-loop control mode)

P1.07	Acceleration/ Deceleration mode		Default 0
	Setting range	0	Linear acceleration/deceleration
		1	S-curve acceleration/deceleration 1
		2	S-curve acceleration/deceleration 2

It is used to set the frequency change mode during the inverter start and stop process.

0: Linear acceleration and deceleration output frequency increases or decreases in a straight line

1: S-curve acceleration/deceleration 1

The output frequency is increasing or decreasing as S-curve. S-curve is required to use in the occasion where smoothly start or stop, such as the elevator, conveyer belt，etc. Function code P1.08 and P1.09 respectively defines S-curve the start and end of the acceleration/deceleration time rate.

2: S-curve acceleration/deceleration 2

In this curve, the rated motor frequency is always the inflexion point. This mode is fb usually used in applications where acceleration/deceleration is required at the speed higher than the rated frequency.

When the set frequency is higher than the rated frequency, the acceleration/deceleration time is:

$$t = (\frac{4}{9} * (\frac{f}{f_b}) + \frac{5}{9}) * T$$

In the formula,"f "is the set frequency,"fb "is the rated motor frequency and T is the acceleration time from 0 Hz to the rated frequency fb.

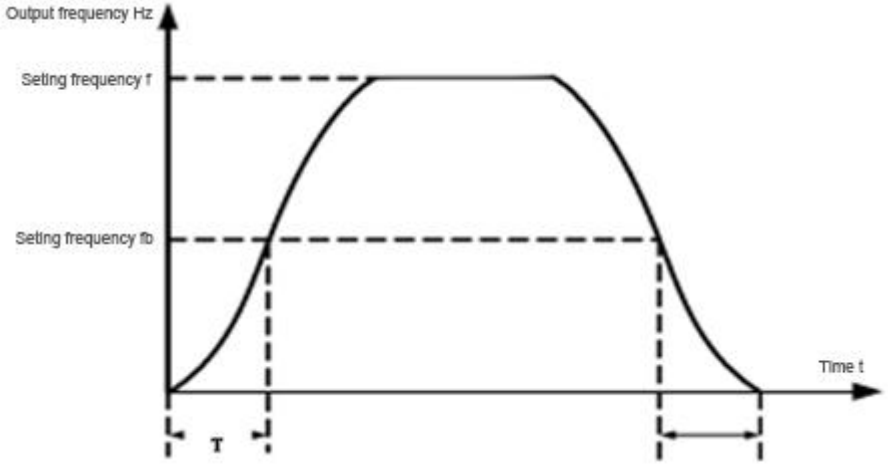


Figure 4-1

P1.08	Time proportion of S-curve start segment	Default	30.0%
	Setting range	0.0%～（100.0%-P1.09）	
P1.09	Time proportion of S-curve end segment	Default	30.0%
	Setting range	0.0%～（100.0%-P1.08）	

These two parameters respectively define the time proportions of the start segment and the end segment of S-curve acceleration/deceleration A. They must satisfy the requirement:

P1.08 + P1.09 ≤ 100.0%.

In Figure 4-2, t1 is the time defined in P1.08, within which the slope of the output frequency change increases gradually. t2 is the time defined in P1.09, within which the slope of the output frequency change gradually decreases to 0. Within the time between t1 and t2, the slope of the output frequency change remains unchanged, that is, linear acceleration/deceleration.

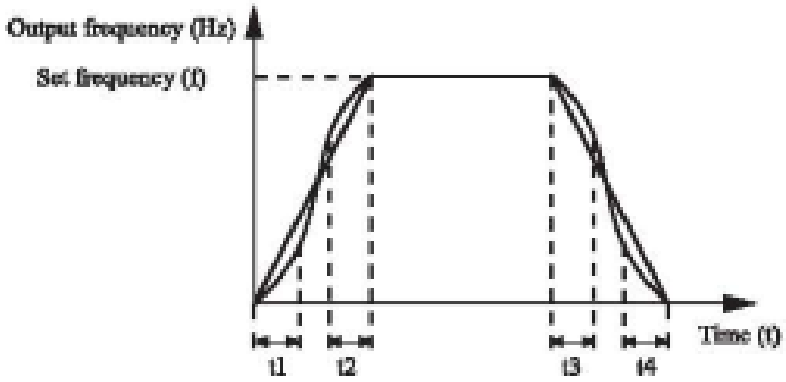


Figure 4-2 S-curve acceleration/deceleration 1

P1.10	Stop mode		Default	0
	Setting range	0	Decelerate to stop	
		1	Coast to stop	

0: Decelerate to stop

After the stop command is enabled, the inverter decreases the output frequency according to the deceleration time and stops when the frequency decreases to zero.

1: Coast to stop

After the stop command is enabled, the inverter immediately stops the output. The motor will coast to stop based on the mechanical inertia.

P1.11	Initial frequency of stop DC braking	Default	0.00Hz
	Setting range	P0.16～P2.04	
P1.13	Stop DC braking current Setting Range	Default	30%
	Setting range	0%～120%	

During the process of decelerating to stop, the AC drive starts DC braking when the running frequency is lower than the value set in P1.11.

This parameter specifies the output current at DC braking and is a percentage relative to the base value. If the rated motor current is less than or equal to 80% of the rated AC drive current, the base value is the

rated motor current. If the rated motor current is greater than 80% of the rated AC drive current, the base value is 80% of the rated inverter current.

Stop DC braking time

This parameter specifies the holding time of DC braking. If it is set to 0, DC braking is canceled.

P1.16	Brake open frequency		Default	2.00Hz
	Setting range		P0.16～15.00Hz	
P1.17	Brake open current		Default	30.0%
	Setting range		0.0～150.0%	
P1.18	Brake open mechanical time		Default	0.50s
	Setting range		0.00～5.00s	
P1.19	Brake open rotating direction		Default	0
	Setting range	0	When brake opened, torque and operation direction is same	
		1	When brake opened, torque always forward turning direction	

Brake open frequency is the output frequency of the inverter before the brake is fully open, that is motor output full torque at the lowest frequency. Brake open current is relative to rated motor current percentage. When inverter's output current reach this value, it will output brake open instruction immediately. Brake open mechanical time is mechanical brake open time from start to fully open, during the time, inverter maintain brake open frequency (P1.16) output.

Brake open running direction is the motor rotating direction when brake open, set as 1 and brake will open at forward always, set as 0, it will be the same direction as actual given.

P1.20	Brake frequency	Default	2.00Hz
	Setting range	P0.16～15.00Hz	
P1.21	Brake mechanical time	Default	0.50s
	Setting range	0.00～5.00s	

P1.22	Brake delay time	Default	0.0s
	Setting range	0.0～30.0s	

P1.20 parameter indicate the inverter output lower than the setting value when deceleration process, it will output brake close instruction immediately.

Brake mechanical time is the mechanical brake time from start close to fully close, during the time, the inverter maintain brake frequency output.

Brake delay parameter is the brake don't output brake close instruction immediately, but output the instruction after the parameter delay time set. It is invalid when quick stop and coast to stop.

P1.23	Brake action curve		Default	1
	Setting range	0	No brake control	
		1	Auto-brake control 1	
		2	Auto-brake control 2	

When this parameter is set to 0, the brake command (1) is the same as the command during inverter operation.

When this parameter set as 1, during the brake open time, inverter output maximum torque, brake open after current reached. The maximum torque is determined by P3.10 and P3.12

When this parameter set as 2, during the brake open time, inverter output the specific torque, brake open after current reached.The default gate opening forward torque is 150%, and the gate opening reverse torque defaults to 130%.

P1.24	Restart selection in the process of brake process		Default	0
	Setting range	0	No allow to restart in the process of brake	
		1	Allow to restart in the process of brake	

If you select 0, if the brake has begun to close during the stop process, the start instruction will not be accepted. You must wait until the brake is completely turned off and the inverter stop output to continue running.

If you select 1, In the process of stop, even if the brake has started to close, the inverter also accept new instruction.

P1.25	Restart waiting time	Default	0.0s
	Setting range	0.0～30.0s	

This parameter means that after the inverter is stopped, to start the next startup operation need to wait the restart waiting time delay.

P1.26	Brake feedback		Default 0
	Setting range	0	Do not use brake feedback
		1	For action detection
		2	For full monitor

0：No brake feedback connector input to inverter, or no need brake feedback function.

1：Detect brake feedback when action, it will alarm if no feedback signal.

2：Detect feedback signal when power on, it need to connect two signal, one is brake open feedback signal and the other one is brake feedback signal.

P1.27	Running command reverse timing control	Default	0
	Setting range 0	No allow to direct reverse during operation	
	Setting range 1	Allow to direct reverse during operation	
P1.28	Zero-crossing jump frequency during running	Default	2.00 Hz
	Setting range	0～20.00Hz	

If the parameter is set to 0, it means that if the reverse running command is given during running, the inverter will stop normally and restart the reverse running after inverter stop output.

If the parameter is set to 1, it means that if the reverse running command is given during running, the inverter will decelerate to the zero-crossing jump frequency, and then start directly from the reverse frequency given by the zero-crossing jump frequency (P1.28), no brake on-off control in this process.

Group P2 Motor parameter

P2.01	Rated power	Default	Model dependent
	Setting range	0.1kW～1000.0kW	
P2.02	Rated voltage	Default	Model dependent
	Setting range	1V～2000V	
P2.03	Rated current	Default	Model dependent
	Setting range	0.01A～655.35A（inverter power<=55kW） 0.1A～6553.5A（inverter power>55kW）	
P2.04	Rated frequency	Default	Model dependent
	Setting range	0.01Hz～Maximum frequency	
P2.05	Rated rotating speed	Default	Model dependent
	Setting range	1rpm～65535rpm	

Above function code is motor nameplate parameters, and all relative parameters need to be set accurately according to motor nameplate. For the asynchronous motor auto-tuning, it need set motor nameplate correctly.

P2.06	Stator resistance (asynchronous motor)	Default	Model dependent
	Setting range	0.001Ω～30.000Ω	
P2.07	Rotor resistance (asynchronous motor)	Default	Model dependent
	Setting range	0.001Ω ～ 65.535Ω （ Inverter Power<=55kW） 0.0001Ω ～ 6.5535Ω （ Inverter Power>55kW）	
P2.08	Leakage inductive reactance (asynchronous motor)	Default	Model dependent
	Setting range	0.01mH ～ 655.35mH(Inverter Power<=55kW) 0.001mH ～ 65.535mH(Inverter	

		Power>55kW)	
P2.09	Mutual inductive reactance (asynchronous motor)	Default	Model dependent
	Setting range	0.1mH ～ 6553.5mH （ Inverter Power<=55kW） 0.01mH ～ 655.35mH （ Inverter Power>55kW）	
P2.10	No-load current (asynchronous motor)	Default	Model dependent
	Setting range	0.01A～P2.03（Inverter Power<=55kW） 0.1A～P2.03（Inverter Power>55kW）	

The parameters in P2.06 to P2.10 are asynchronous motor parameters. P2.06-~ P2.10 parameters are ordinary unavailable on the motor's nameplate and are obtained by means of inverter's auto-tuning. Asynchronous motor's stationary auto-tuning can obtain only P2.06 to P2.08 three parameters. Asynchronous motor's dynamic auto-tuning can obtain besides all the parameters in P2.06 to P2.10,and can also obtain encoder phase sequence and current loop PI.

Each time "Rated motor power" (P2.01) or "Rated motor voltage" (P2.02) is changed, the inverter automatically restores values of P2.06 to P2.10 to the parameter setting for the common standard Y series asynchronous motor.

If it is impossible to perform asynchronous motor's stationary auto-tuning manually input the values of these parameters according to data provided by the motor manufacturer.

P2.27	Encoder pulses per revolution	Default	1024
	Setting range	1～65535	

This parameter is used to set the pulses per revolution(PPR) of ABZ incremental encoder. In CLVC mode, the motor can not run properly if this parameter is set incorrectly.

P2.28	Encoder type		Default	0
	Setting range	0	ABZ incremental encoder	
		1	Reserved	
		2	Resolver	

CV20 support a variety of encoder type, different encoder needs matching PG card,please correct choose and buy when using the PG card. After installed the PG card, set P2.28 according to the actual situation correctly, otherwise inverter may not run properly.

P2.30	ABZ incremental encoder AB phase sequence		Default	0
	Setting range	0	Forward	
		1	Reverse	

The function code is only valid for ABZ incremental encoder, set P1.28=0. It is use to set AB phase sequence of ABZ incremental encoder. When the motor complete tuning, can get ABZ encoder AB phase sequence.

P2.35	Encoder wire-break detection function selection		Default	0
	Setting range	0	Close	
		1	Open	
P2.36	Encoder wire-break fault detection time		Default	0.000s
	Setting range		0.0s：No action,0.000s～1.000s	

These two parameter is used to encoder detection, set P2.35=1, encoder fault will warning. P2.36 is use to set the time that a wire-break fault lasts. If it is set to 0.000s, the inverter does not detect the encoder wire-break fault. If the duration of the encoder wire-break fault detected by the inverter exceeds P2.36 the time set in this parameter, the inverter reports "PG".

P2.37	Auto-tuning selection	Default	0

	Setting range	0	No auto-tuning
		1	Asynchronous motor static auto-tuning
		2	Asynchronous motor complete auto-tuning
		3	Asynchronous motor static complete auto-tuning

0：No auto-tuning

Auto-tuning is prohibited.

1：Asynchronous motor static auto-tuning

It is applicable to scenarios where complete auto-tuning cannot be performed because the asynchronous motor can't be easily disconnected to the load.

Before performing static auto-tuning, properly set the motor type and motor nameplate parameters of P2.01 to P2.05 first. The inverter will obtain three parameters of P2.06 to P2.08 by static auto-tuning .

Action description: Set this parameter to 1, and press RUN. Then, the inverter starts static auto-tuning.

2：Asynchronous motor complete auto-tuning

To perform this type of auto-tuning , ensure that the motor is disconnected to the load. During the process of complete auto-tuning , the inverter performs static auto-tuning first and then accelerates to 80% of the rated motor frequency within the acceleration time set in P0.08. The inverter keeps running for a certain period and then decelerates to stop within deceleration time set in P0.09. Before performing complete auto-tuning, properly set the motor type, motor nameplate of P2.01~P2.05, "Encoder type" (P2.28) and "Encoder pulses per revolution"(P2.27) first.

The inverter will obtain motor parameters of P2.06 to P2.10, AB phase sequence of ABZ incremental encoder(P2.30) and vector control current loop PI parameters of P3.13 to P3.16 by complete auto-tuning.

Action description: Set this parameter to 2. and press RUN. Then the inverter starts complete auto-tuning.

3：Asynchronous motor static complete auto-tuning

It is applicable to asynchronous motor can't disconnected to the load, it will obtain motor parameters of P2.06 to P2.10.

Action description: Set this parameter to 3 and press RUN, inverter starts static complete auto-tuning.

Group P3 Vector Control Parameters

P3.00	Speed loop proportional gain1	Default	20
	Setting range	1～100	
P3.01	Speed loop integral time 1	Default	0.50s
	Setting range	0.01s～10.00s	
P3.02	Switchover frequency 1	Default	5.00Hz
	Setting range	0.00～P3.05	
P3.03	Speed loop proportional gain 2	Default	15
	Setting range	0～100	
P3.04	Speed loop integral time 2	Default	1.00s
	Setting range	0.01s～10.00s	
P3.05	Switchover frequency 2	Default	10.00Hz
	Setting range	P3.02 ～ Maximum output frequency	

Speed loop PI parameters vary with running frequencies of the inverter.

If the running frequency is less than or equal to "Switchover frequency 1" (P3.02), the speed loop PI parameters are P3.00 and P3.01.

If the running frequency is equal to or greater than "Switchover frequency 2" (P3.05), the speed loop PI parameters are P3.03 and P3.04.

If the running frequency is between P3.02 and P3.05, the speed loop PI parameters are obtained from the linear switchover between the two groups of PI parameters, as shown in Figure 4-3.

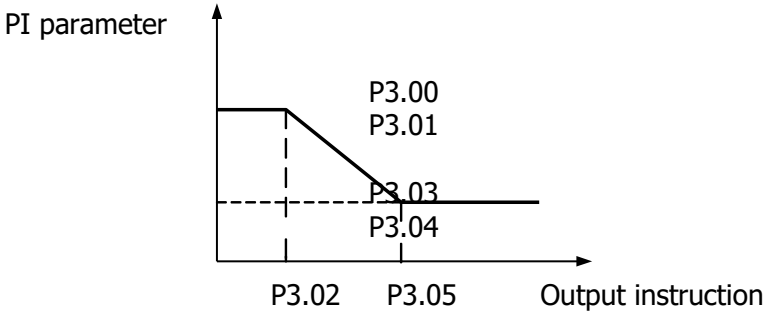


Figure 4-3
Relationship between running frequency and PI parameters

The speed dynamic response characteristics in vector control can be adjusted by setting the proportional gain and integral time of the speed regulator.

To achieve a faster system response, increase the proportional gain and reduce the integral time. Be aware that this may lead to system oscillation.

The recommended adjustment method is as follows:

If the factory setting cannot meet the requirements, make proper adjustment. Increase the proportional gain first to ensure that the system does not oscillate, and then reduce the integral time to ensure that the system has quick response and small overshoot.

Note:Improper PI parameter setting may cause too large speed overshoot, and over-voltage fault may even occur when the overshoot drops.

P3.06	Vector control slip gain	Default	100%
	Setting range	50%～200%	

For SFVC, it is used to adjust speed stability accuracy of the motor. When the motor with load runs at a very low speed, increase the value of this parameter; when the motor with load runs at a very large speed, decrease the value of this parameter.

P3.07	Speed loop filter time constant	Default	0.080s
	Setting range	0.000s～1.000s	

In the vector control mode, the output of the speed loop regulator is torque current reference. This parameter is used to filter the torque references. It is no need to adjust generally and it can be increased in the case of large speed fluctuation. In the case of motor oscillation, decrease the value of this parameter properly. If the value of this parameter is small, the output torque of the inverter may fluctuate greatly, but the response is quick.

P3.10	Digital setting of torque upper limit in speed control mode	Default	180.0%

	(electric)		
	Setting range	0.0%～200.0%	
P3.12	digital setting of torque upper limit in speed control mode (power generation)	Default	180.0%
	Setting range	0.0%～200.0%	

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

P3.13	Excitation adjustment proportional gain	Default	10
	Setting range	0～100	
P3.14	Excitation adjustment integral gain	Default	10
	Setting range	0～100	
P3.15	Torque adjustment proportional gain	Default	10
	Setting range	0～100	
P3.16	Torque adjustment integral gain	Default	10
	Setting range	0～100	

These are current loop PI parameters for vector control. These parameters are automatically obtained through "Asynchronous motor complete auto-tuning ", and commonly no need to modify.

The dimension of the current loop integral regulator is integral gain rather than integral time.

Note that too large current loop PI gain may lead to oscillation of the entire control loop. Therefore, when current oscillation or torque fluctuation is great, manually decrease the proportional gain or integral gain here.

P3.22	Field weakening multiple	Default	100.0%
	Setting range	100.0%～300.0%	
P3.23	Slack rope torque	Default	5.0%
	Setting range	0.0%～P3.25	

P3.24	Load allow	Default	80.0%
	Setting range	P3.25～100.0%	
P3.25	Light load coefficient	Default	35.0%
	Setting range	P3.23～P3.24	
P3.26	Light load detection frequency	Default	40.00 Hz
	Setting range	P1.16～P0.12	
P3.27	Light load detection time	Default	0.5s
	Setting range	0.0～5.0s	
P3.28	Forward frequency correction	Default	100.0%
	Setting range	0～100%	
P3.29	Reverse frequency correction	Default	100.0%
	Setting range	0～100%	

The light-load high-speed function indicate that the target frequency is greater than the rated frequency, the inverter automatically calculates the maximum output frequency according to the load condition to avoid faults such as overload and over current caused by the load. When the output frequency of the inverter reaches the set value of P3.26, the inverter maintains the frequency output with a maintenance time of P3.27. After the maintenance time is reached, detect the output torque T, and T is used to calculate the current maximum frequency F. If the target frequency of current is greater than the rated frequency and P3.22 > 100.0%, the light-load high-speed function is enabled. When T ≤ slack rope torque or T ≥ allowable load, the highest value of F is the rated frequency; when slack rope torque <T ≤ light load coefficient, the highest value of F is P3.22 × rated frequency; when light load coefficient <T <the load allow, F is linearly adjusted between the rated frequency and the maximum frequency.

P3.28 and P3.29 indicate that when the light load coefficient ≤ T ≤ load allow, Finally the target frequency of the inverter is F × P3.28 (Forward running) or F × P3.29 (Reverse running). The actual operating frequency is also limited by the maximum torque that the inverter or motor can reach.

P3.30	Overload protection	Default	0.0

	torque threshold		
	Setting range	0.0～150.0%	

If the value is set to 0, this function will not be activated. If this value is not 0, this function will take effect. If the output torque is greater than the set value of P3.30, it will automatically stop and limit continue forward operation. Limit are relieved immediately after reverse operation.

P3.31	Constant power control		Default	0
	Setting range	0	Disabled	
		1	Enabled	

If select 1, when the power exceeds the rated power during operation, the frequency will be automatically reduced to maintain constant power operation. If it is set to 0, this function will be disabled.

Group P4 V/F Control parameter

This group of function codes is only valid for V / F control, but not for vector control.

P4.01	Torque boost	Default	Model dependent
	Setting range	0.0%～30%	
P4.02	Cut-off frequency of torque boost	Default	50.00Hz
	Setting range	0.00Hz～maximum output frequency	

To compensate the low frequency torque characteristics of V/F control, you can boost the output voltage of the inverter at low frequency by modifying P4.01. If the torque boost is set to too large, the motor may overheat, and the inverter may suffer over-current. If the load is large and the motor startup torque is insufficient, increase the value of P4.01. If the load is small, decrease the value of P4.01. If it is set to 0.0, the inverter performs automatic torque boost. In this case, the inverter automatically calculates the torque boost value based on motor parameters including the stator resistance.

P4.02 specifies the frequency under which torque boost is valid. Torque boost becomes invalid when this frequency is exceeded, as shown in the following figure.

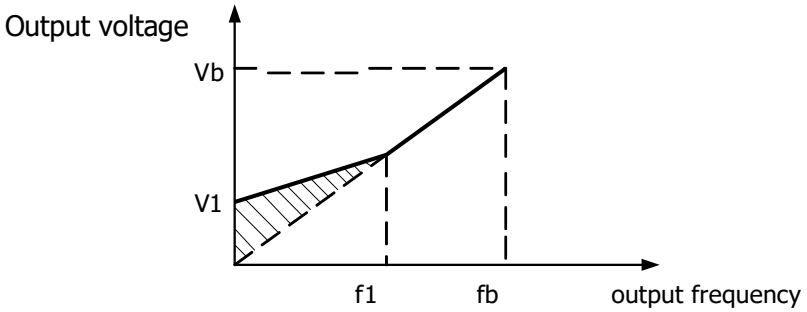


Figure 4-4 Manual torque boost

V1：Voltage of manual torque boost Vb Maximum output voltage
f1：Cut-off frequency of manual torque boost
fb：Rated running frequency

P4.09	V/F slip compensation gain	Default	0.0%
	Setting range	0.0%～100.0%	

V/F slip compensation parameter is valid only for the asynchronous motor.

It can compensate the rotational speed slip of the asynchronous motor when the load of the motor increases, stabilizing the motor speed in case load changes.

If this parameter is set to 0.0%, it indicates that the compensation when the motor bears rated load is the rated motor slip. The rated motor slip is automatically obtained by the inverter through calculation based on the rated motor frequency and rated motor rotational speed in group P2.

When adjust the V/F slip compensation gain,Generally, At rated load,if the motor rotational speed is different from the target speed, slightly adjust this Parameter.

P4.10	V/F over-excitation gain	Default	0
	Setting range	0～200	

During deceleration of the inverter, over-excitation can restrain rise of the bus voltage,to prevent the over-voltage fault. The larger the over-excitation is, the better the restraining result is.

Increase the over-excitation gain if the inverter is liable to over-voltage error during deceleration. However, too large over-excitation gain may

lead to an increase in the output current. Set P4.09 to a proper value in actual applications.

Set the over-excitation gain to 0 in the applications where the inertia is small and the bus voltage will not rise during motor deceleration or where there is a braking resistor.

P4.11	V/F oscillation suppression gain	Default	Model dependent
	Setting range	0～100	

Set this parameter to a value as small as possible in the prerequisite of efficient oscillation suppression to avoid influence on V/F control. Set this parameter to 0 if the motor has no oscillation. Increase the value properly only when the motor has obvious oscillation. The larger the value is, the more obvious the oscillation suppression result will be.

When the oscillation suppression function is enabled, the rated motor current and no- load current must be correct. Otherwise, the V/F oscillation suppression effect will not be satisfactory.

Group P5 Input terminals

CV20 series inverter with 10 multi-function digital inputs , two analog input terminals. (Analog terminal can be used as X terminal)

P5.00	X1 function selection	Default	1
P5.01	X2 function selection	Default	2
P5.02	X3 function selection	Default	8
P5.03	X4 function selection	Default	9
P5.04	X5 function selection	Default	10
P5.05	X6 function selection	Default	5
P5.06	X7 function selection	Default	0
P5.07	X8 function selection	Default	0
P5.08	X9 function selection	Default	0
P5.09	X10 function selection	Default	0

The following table lists the functions available for the multi-function input terminals.

Can choose the functions in the table as follows:

Value	Function	Description
0	No function	Unused terminals can be set to "No Function" to prevent malfunctions.
1	Forward RUN （FWD）	The terminal is used to control forward or reverse RUN of the inverter.
2	Reverse RUN （REV）	
3	Fault reset （RESET）	The terminal is used for fault reset function, the same as the function of RESET key on the operation panel. Remote fault reset can be implemented by this function.
4	Fast stop	The inverter blocks its output, the motor coasts to rest and is not controlled by the inverter. The decelerate to stop is consistent with the cancel of the running command, and the brake logic is valid. If the fast stop is valid, the brake frequency will be given immediately, and the brake will stop according to the normal brake logic.
5	Coast to stop	
6	Decelerate to stop	
7	Normally open (NO) input of external fault	If this terminal becomes ON, the inverter reports EF and performs the fault protection action.
8	Multi-speed terminal 1	The setting of 8 speeds can be implemented through combinations of 8 states of these three terminals. Refer to table 2 for more details.
9	Multi-speed terminal 2	
10	Multi-speed terminal 3	
11	Brake open feedback	When the brake feedback(P1.26) is set to 1, only connect to instruction 11, when the brake feedback is set to 2, it will need to connect to instruction 11 and instruction 12.
12	Brake close feedback	
13	2 segment accelerate ramp switchover	It is used to switch different accelerate/decelerate time, for detail, refer to P8.00~P8.10
14	2 segment decelerate ramp switchover	

15	3 segment accelerate ramp switchover	
16	3 segment decelerate ramp switchover	
19	Accelerate to run （UP）	Modify the frequency increasing instruction and decreasing instruction when the frequency is given by the external terminal.When the frequency source is set to the acceleration / deceleration setting, set frequency through up and down.
20	Decelerate to run （DOWN）	
21	Torque control/Speed control switchover	Make the inverter switchover between torque control and speed control mode. If this terminal is valid, it will switch to torque mode. Otherwise it will be speed mode

Table 2：Multi-reference instruction function description
The 3 multi-reference terminals have 8 state combinations, corresponding to 8 reference values, as listed in the following table:

K3	K2	K1	Reference setting	Corresponding Parameter
OFF	OFF	OFF	Reference 0	PC.00
OFF	OFF	ON	Reference 1	PC.01
OFF	ON	OFF	Reference 2	PC.02
OFF	ON	ON	Reference 3	PC.03
ON	OFF	OFF	Reference 4	PC.04
ON	OFF	ON	Reference 5	PC.05
ON	ON	OFF	Reference 6	PC.06
ON	ON	ON	Reference 7	PC.07

P5.10	Terminal filter time	Default	0.010s
	Setting range	0.000s～1.000s	

It is used to set the software filter time of terminal status. If terminals are liable to interference and may cause malfunction, increase the value of this parameter to enhance the anti-interference capability. However, increase of filter time will reduce the response of input terminal.

P5.12	Terminal UP/DOWN change rate	Default	5.00Hz/s
	Setting range	0.01Hz/s～50.00Hz/s	

It is used to adjust the rate of change of frequency when the frequency is adjusted by means of terminal UP/DOWN.

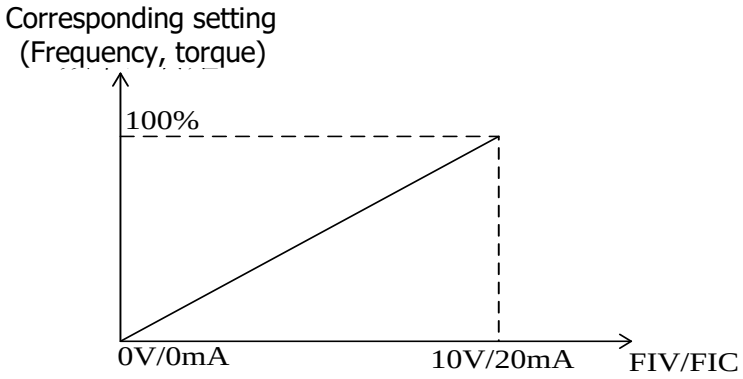
P5.13	FI curve 1 minimum input	Default	0.00V
	Setting range	0.00V～P5.15	
P5.14	Corresponding setting of FI curve 1 minimum input	Default	0.0%
	Setting range	-100.00%～100.0%	
P5.15	FI curve 1 maximum input	Default	10.00V
	Setting range	P5.13～10.00V	
P5.16	Corresponding of FI curve 1 maximum input	Default	100.0%
	Setting range	-100.00%～100.0%	
P5.17	FI curve 1 filter time	Default	0.10s
	Setting range	0.00s～10.00s	

These parameters are used to define the relationship between the analog input voltage and the corresponding setting. When the analog input voltage exceeds the maximum value (P5.15), the analog voltage maximum value is calculated by "maximum input".When the analog input voltage is less than the setting minimum input (P5.13), the value is calculated by the minimum input.

When the analog input is current input,1mA current corresponds to 0.5V voltage.

FI input filter time is used to set the software filter time of FI. If the analog input is liable to interference, increase the filter time value of this parameter to stabilize the detected analog input. However, increase of the FI filter time will slow down the response of analog detection. Set this parameter properly based on actual conditions.

In different applications, 100% of analog input corresponds to different nominal values. For details, refer to the description of different applications. Two typical setting examples are shown in the following figure.



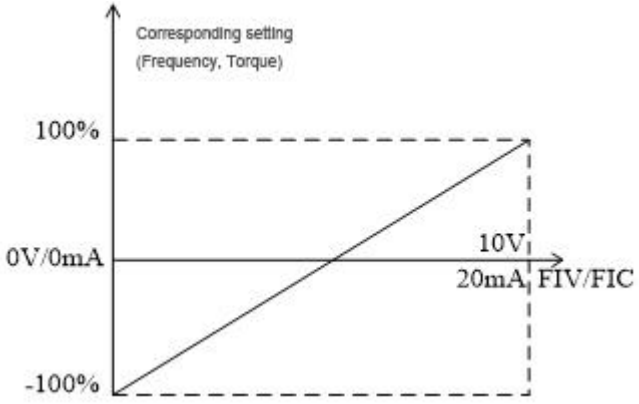


Figure 4-5 Corresponding relationship between analog input and set values

P5.18	FI curve 2 minimum input	Default	0.00V
	Setting range	0.00V～P5.20	
P5.19	Corresponding setting of FI	Default	0.0%

	curve 2 minimum input		
	Setting range	-100.00%～100.0%	
P5.20	FI curve 2 maximum input	Default	10.00V
	Setting range	P5.18～10.00V	
P5.21	Corresponding setting of FI curve 2 maximum input	Default	100.0%
	Setting range	-100.00%～100.0%	
P5.22	FI curve 2 filter time	Default	0.10s
	Setting range	0.00s～10.00s	

The method of setting and function of FI curve 2, please refer to FI curve 1.

P5.28	FIV function selection	Default	0
	Setting range	0-133	
P5.29	FIC function selection	Default	0
	Setting range	0-133	

The FIV and FIC can be used as X terminal when the terminals are not enough. The functions are the same as X terminals, below 2 V is low level, above 8V is high level, and other voltages are uncertain.

P5.30	Up/Down lowest frequency	Default	0
	Setting range	0.00-15.00	
P5.31	Up/Down memory	Default	0
	Setting range	0-1	
P5.32	Up/Down Optimization function selection	Default	0
	Setting range	0-1	
P5.33	Up/Down limit frequency	Default	5.00Hz
	Setting range	0.00Hz-50.00Hz	

Up / Down minimum frequency is used to limit the minimum frequency

in Up / Down mode. Up / Down memory indicate whether to memory when power off in the UP/DOWN mode, 0 means don't memory, 1 means memory.

When the Up / Down optimization function is 1, the optimization function is turned on. When the optimization function is turned on, the acceleration / deceleration function will be affected. The inverter will automatically calculate the time from deceleration of the current frequency to the Up / Down limit frequency (P5.33).

Group P6 Output terminals

The CV20 provides 2 multi-function output terminal (YO1/YO2), 2 multi-function relay output terminals.

P6.02	Relay output function selection（TA-TC）	Default	1
P6.03	Relay output function selection（RA-RB-RC）	Default	13
P6.05	YO1 function selection (open collector output terminal）	Default	0
P6.06	YO2 function selection （open collector output terminal）	Default	0

The functions of the multi-function terminals are described in the following table.

Value	Function	Description
0	No output	The terminal has no function.
1	Brake control output	It indicate that the inverter is in the running state and has an output frequency (can be zero), output ON signal.
2	Fault output （ Fault stop）	When inverter fault and stop, output ON signal
3	Fault alarm	Please refer to description of function code P9.47
4	Fault notice	Please refer to description of function code P9.47
8	Inverter overload pre-warning	The terminal outputs ON 10s before the inverter overload protection action is

		performed.
9	Motor overload pre-warning	The inverter judges whether the motor load exceeds the overload pre-warning threshold before performing the protection action. If the pre-warning threshold is exceeded, the terminal outputs ON. For motor overload parameters, see the descriptions of P9.00 to P9.02.
10	Low voltage startup protection	Voltage lower than under voltage value when startup,output the signal
11	Over load protection start	The inverter output power exceeds the ratio set by P3.30, outputs ON signal.
12	Over torque output	The inverter output torque exceeds the torque set in P8.36, and output the ON signal
13	Motor fan control	It is used for motor fan control. The inverter will start when the inverter is running, and the fan will be turned off after shutdown.
14	Frequency reached output	When running frequency reached the set frequency, output ON signal
15	Inverter running	When the inverter is running, it outputs ON signal. This signal is OFF in the stop state.
19	Self-start function output	When the self-start function effective, the inverter will start outputting this signal.

Groupt P7 Operation Panel and Display

Set display and monitoring parameters

P7.06	Load speed display coefficient	Default	1.0000
	Setting range	0.0001～6.5000	

This parameter is used to adjust the corresponding relationship between the inverter output frequency and the load speed when it need to display the load speed.

P7.09	Accumulative running time	Default	-

	Setting range	0h～65535h

It is used to display the accumulative running time of the inverter.

P7.13	Accumulative power-on time	Default	-
	Setting range	0h～65535h	

It is used to display the accumulative power-on time of the inverter since the delivery.

P7.14	Accumulative power consumption	Default	-
	Setting range	0～65535 degree	

t is used to display the accumulative power consumption of the inverter until now.

Group P8 Auxiliary Functions

P8.00	Acceleration mode selection		Default	0
	Setting range	0	Do not use special Acceleration/Deceleration	
		2	3 segment of acceleration and deceleration automatically switch according to frequency	
		4	3 segment of acceleration and deceleration are switched by terminals	
P8.01	Deceleration mode selection		Default	0
	Setting range	0	Do not use special Acceleration/Deceleration	
		2	3 segment of acceleration and deceleration automatically switch according to frequency	
		4	3 segment of acceleration and deceleration are switched by terminals	
P8.02	Hold time of each segment		Default	0.0s
	Setting range		0.0～600.0s	
P8.03	Acceleration time 2		Default	3.0s

	Setting range	0.0s～600.0s	
P8.04	Deceleration time 2	Default	3.0s
	Setting range	0.0s～600.0s	
P8.05	Acceleration frequency 2	Default	0%
	Setting range	0.00Hz～P8.09(% of rated frequency)	
P8.06	Deceleration frequency 2	Default	99%
	Setting range	P8.10-99% (% of rated frequency)	
P8.07	Acceleration time 3	Default	3.0s
	Setting range	0.0s～600.0s	
P8.08	Deceleration time 3	Default	3.0s
	Setting range	0.0s～600.0s	
P8.09	Acceleration frequency 3	Default	99%
	Setting range	P8.05-99% (% of rated frequency)	
P8.10	Deceleration frequency 3	Default	0%
	Setting range	0%-P8.06 (% of rated frequency)	

QZ9000 provides 3 sets of acceleration and deceleration times, respectively P0.08, P0.09 and the above 2 sets of acceleration and deceleration times. These 3 sets of acceleration and deceleration times are switched with the settings of P8.00 and P8.01. If set to 0, the acceleration and deceleration times are according to the times of P0.08 and P0.09; if set to 2, the different acceleration and deceleration times are automatically switched according to the frequencies set in P8.05, P8.06, P8.07 and P8.08. If set to 4, different acceleration and deceleration times are switched by the terminals.

P8.15	Droop control	Default	0.00Hz
	Setting range	0.00Hz～10.00Hz	

This function is generally used for load distribution when multiple motors drag the same load.

Droop control indicate when the load increases, the output frequency of the inverter decreases. In this way, when multiple motors drag the same load, the output frequency of the motor with a heavy load decreases more, it will reduce the motor load and makes the Load even. This parameter refers to the frequency drop value of the output when the inverter outputs

the rated load.

P8.19	Frequency detection value（FDT1）	Default	50.00Hz
	Setting range	0.00Hz～Maximum frequency	
P8.20	Frequency detection hysteresis（FDT1）	Default	5.0%
	Setting range	0.0%～100.0%（FDT1 level）	

When the running frequency is higher than the frequency detection value, the inverter multifunction outputs YO output ON signal, and after the frequency is lower than a certain frequency value of the detection value, the YO output ON signal is canceled.

The above parameters are used to set the detection value of the output frequency, and the hysteresis value of the output action release. Where P8.20 is the percentage of the hysteresis frequency relative to the frequency detection value P8.19. Figure 4-6 shows the schematic diagram of the FDT function.

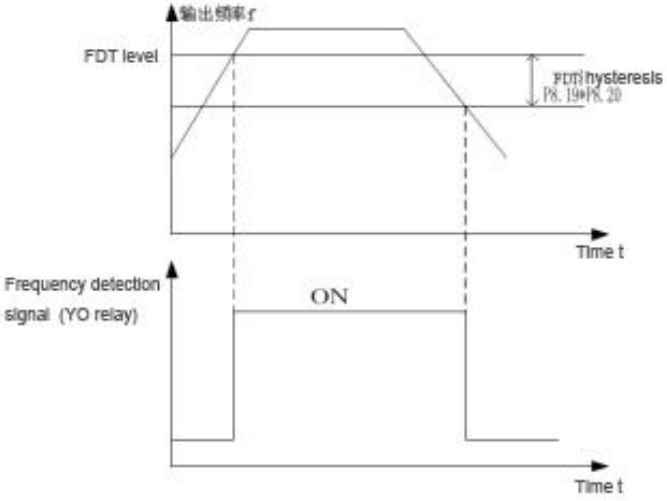


Figure 4-6 FDT level

P8.28	Low speed running protection frequency	Default	5.00Hz
	Setting range	0.01Hz～20.00Hz	
P8.29	Low speed running protection time	Default	0s
	Setting range	0s～1000s	

This function is used to protect non-inverter motors. When the non-inverter motor is running at low speed, the air flow of the fan at the shaft end is too small. Long-time operation will cause the motor overheat and burn. When the time set ＞0, this function takes effect.

P8.36	Over-torque output threshold	Default	0.0%
	Setting range	0.0%（No detection） 0.1%～200.0%（rated motor current）	

When the inverter output torque is greater than the over-torque output threshold, the inverter multi-function YO output ON signal

P8.48	Inverter fan control		Default	0
	Setting range	0	Fan runs during operation	
		1	Fan runs always	

It is used to select the operation mode of the inverter cooling fan. When the it is set to 0, the fan runs in the operation state. If the radiator temperature is higher than 40 degrees in stop state, the fan will run. If the radiator temperature is lower than 40 degrees in stop state, the fan will not run.

If it is set to 1, the fan keeps running after power on.

P8.49	Motor fan control delay	Default	30s
	Setting range	0s～3000s	

Cooperate with terminal output command No. 13, when the inverter stops, the motor fan will delay P8.49 time before turning off the output.

Group P9 Fault and protection

P9.00	Motor overload protection selection		Default	1
	Setting range	0	Disabled	
		1	Enabled	
P9.01	Motor overload protection gain		Default	1.00
	Setting range		0.20～10.00	

P9.00 = 0

The motor overload protective function is disabled. The motor is exposed to potential damage due to overheating. A thermal relay is suggested to be installed between the inverter and the motor.

P9.00 = 1

The Inverter judges whether the motor is overloaded according to the inverse time-lag curve of the motor overload protection.

The inverse time-lag curve of the motor overload protection is:

220% *P9.01 * rated motor current (if the load remains at this value for one minute, the inverter reports motor overload fault), or 150% *P9.01 * rated motor current (if the load remains at this value for 60 minutes, the inverter reports motor overload fault).

Set P9.01 properly based on the actual overload capacity. If the value of P9.01 is set too large, the damage to the motor may result when the motor overheats but the inverter does not report the alarm.

P9.02	Motor overload warning coefficient	Default	80%
	Setting range	50%～100%	

This function is used to give a warning signal to the control system via YO before motor overload protection. This parameter is used to determine the percentage, at which pre-warning is performed before motor overload. The larger the value is, the less advanced the pre-warning will be.

When the accumulative output current of the inverter is greater than the value of the overload inverse time-lag curve multiplied by P9.02, the multifunctional digital YO terminal on the inverter (Motor overload pre-warning) outputs ON.

P9.03	Over-voltage stall gain	Default	0
	Setting range	0（no over voltage stall）～100	
P9.04	Over-voltage stall protective voltage	Default	640V
	Setting range	620V-P9.08	

During deceleration of the frequency converter, when the DC bus voltage exceeds the over-voltage stall protection voltage, the frequency converter stops decelerating to keep at the current operating frequency, and continues to decelerate when the bus voltage drops.

Overvoltage stall gain is used to adjust the inverter’s ability to

suppress overvoltage during deceleration. A larger value indicates stronger overvoltage suppression capability. On the premise of avoiding overvoltage, this gain should be set as small as possible.

For small inertia loads, the overvoltage stall gain should be small, otherwise it causes the system dynamic response to become slower. For large inertia loads, this value should be large, otherwise the suppression effect is not good and overvoltage failure may occur.

When the overpressure stall gain is set to 0, the overpressure stall function is canceled

P9.05	Over-current stall gain	Default	20
	Setting range	0～100	
P9.06	Over-current stall protective current	Default	150%
	Setting range	100%～200%	

When the output current exceeds the over-current stall protective current during acceleration/deceleration of the inverter, the inverter stops acceleration/deceleration and keeps the present running frequency. After the output current declines, the inverter continues to accelerate/decelerate.

P9.05 (Over-current stall gain) is used to adjust the over-current suppression capacity of the inverter. The larger the value is, the greater the over-current suppression capacity will be. In the prerequisite of no over-current occurrence, set P9.05 to a small value.

For small-inertia load, the value should be small. Otherwise, the system dynamic response will be slow. For large-inertia load, the value should be large. Otherwise, the suppression result will be poor and over-current fault may occur. If the over-current stall gain is set to 0, the over-current stall function is disabled.

P9.07	Short-circuit to ground upon power-on	Default	0
	Setting range	0	Disabled
		1	Enabled

It is used to determine whether to check the motor is short-circuited to ground at power-on of the inverter. If this function is enabled, the inverter's UVW will have voltage output a while after power-on.

P9.08	Built-in brake unit action voltage	Default	660V
	Setting range	620V-800V	

Built-in brake unit action voltage: when using built-in brake unit, the brake start to work when exceed this voltage.

P9.12	Input phase loss protection selection	Default	1
	Setting range	0	Disabled
		1	Enabled

It is used to determine whether to perform input phase loss protection.

P9.13	Output phase loss protection selection	Default	1
	Setting range	0	Disabled
		1	Enabled

It is used to determine whether to perform output phase loss protection.

P9.14	1st fault type	0～99
P9.15	2nd fault type	
P9.16	3rd (latest) fault type	

It is used to record the types of the recent three faults of the inverter. 0 indicates no fault. For possible causes and solution of each fault, refer to Chapter 5.

P9.47	Fault protection action selection 1	Set the fault level, each representing a fault, numbered from 41, the fault level is divided into 4 types, and each performs the corresponding fault measures. 5 means that the fault is ignored.	11115
P9.48	Fault protection action selection 2		11111
P9.49	Fault protection action selection 3		11411
P9.50	Fault protection action selection 4		11111
P9.51	Fault protection action selection 5		11111

Set the fault level, each bit represents a fault. There are 4 types of

fault levels, and each type implements corresponding fault measures.

First-level fault, operation panel displays fault code, output function 1 (brake control) is invalid, output function 2 (fault stop) is valid, and the inverter performs coast to stop.

Second-level fault, operation panel displays fault code, output function 3 (fault alarm) isvalid, the inverter performs fast stop.

Third-level fault, operation panel displays fault code, output function 3 (fault alarm) is valid, the inverter performs deceleration to stop.

Fourth-level fault, operation panel displays fault code, output function 4 (fault notice) is valid, inverter working does not effect.

If set as 5, inverter is running normally.

Group Pb Lifting auxiliary parameters

Group Pb is the lifting auxiliary parameter, do not need to modify generally.

Pb.00	Position display proportion	Default	1
	Setting range	1-65535	
Pb.01	Initial position	Default	0
	Setting range	0-65535	

This parameter is use to set pulse display coefficient, Pulse no. Of D0.37 and D0.38 = Input pulse / Pb.00. When the position check terminal is valid, the value of D0. 37 and D0.38 is the value of Pb.01.

Pb.02	Number of self-starting pulses	Default	0
	Setting range	0-65535	

This function is only effective in closed-loop, when the stopping brake is effective, if it is found that the hook is slipping, the frequency converter will automatically start and give a prompt. This function can detect the early failure of the holding brake, to prevent the slippery hook, and remind the user to repair in time.

Pb.03	Frequency abnormal detection period	Default	0.50
	Setting range	0.00-1.00	

This parameter is use to set detection time of frequency abnormal, if the rotate speed of motor feedback is opposite to the given rotate speed, and the time is ＞ Pb.03, it report oSP. If set to 0, the warning is disabled.

Pb.04	Frequency following deviation detection reference	Default	20
	Setting range	0-30	
Pb.05	Frequency following deviation detection period	Default	0.50
	Setting range	0.00-1.00	

These two parameters is to set the threshold of the ESP alarm. To turn off this alarm, set Pb.05 to 0.

Pb.08	Speed reduction with pressure function selection		Default	0
	Setting range	0	Close	
		1	Open	
Pb.09	Action voltage of speed reduction with pressure function selection		Default	85%
	Setting range		70%-100%	

These two parameters are used to set the function of speed reduction with pressure. The function indicates that the inverter can automatically reduce the output frequency to maintain full torque output when the bus voltage is continuously low. When Pb.08 is set to 1, the speed reduction with pressure function is enabled, and when it is set to 0, the function is invalid.

Group PC Multi-Reference

QZ9000 provide 8 speed instruction, can select different speed through 3 X terminals

PC.00	multi-reference 0	Default	5.00
	Setting range	0-Maximum frequency(P0.12)	
PC.01	multi-reference 1	Default	20.00
	Setting range	0-Maximum frequency(P0.12)	
PC.02	multi-reference 2	Default	35.00
	Setting range	0-Maximum frequency(P0.12)	
PC.03	multi-reference 3	Default	0.00

	Setting range	0-Maximum frequency(P0.12)	
PC.04	multi-reference 4	Default	50.00
	Setting range	0-Maximum frequency(P0.12)	
PC.05	multi-reference 5	Default	0.00
	Setting range	0-Maximum frequency(P0.12)	
PC.06	multi-reference 6	Default	0.00
	Setting range	0-Maximum frequency(P0.12)	
PC.07	multi-reference 7	Default	0.00
	Setting range	0-Maximum frequency(P0.12)	

The corresponding relationship between the multi-reference and the X terminal refer to table 2, group P5.

Group Pd Communication parameters

Refer to QZ9000 Communication Protocol

Group PP User-Defined Function Codes

PP.00	User password	Default	0
	Setting range	0～65535	

PP.00 Set any non-zero number, then the password protection function takes effect. The next time you enter the menu, you must enter the password correctly, otherwise you can not view and modify the function parameters, please keep in mind the user password set.

Setting PP.00 to 00000 clears the set user password and invalidates the password protection function

PP.01	Restore default settings	Default	0
	Setting range	0	No operation
		1	Restore factory settings except motor parameters
		2	Clear records

1、Restore factory set values, excluding motor parameters

After setting PP.01 to 1, most of the inverter function parameters are restored to the manufacturer's factory parameters, but the motor parameters, fault record information, cumulative running time (P7.09),

cumulative power-on time (P7.13), and cumulative power consumption (P7.14) are not restored.

2: Clear records

Clears the inverter fault record information, accumulated running time (P7.09), accumulated power-on time (P7.13), and accumulated power consumption (P7.14).

Group C0 Torque Control and Restricting Parameters

C0.00	Speed/Torque control selection		Default	0
	Setting range	0	Speed control	
		1	Torque control	
		2	Auto switch to torque according to C0.09	
		3	Auto switch to torque according to C0.10	
		5	Switch torque through terminal	

It is used to select the inverter's control mode: speed control or torque control.

The QZ9000's multifunctional digital X-terminal with torque control switching function allows switching between speed and torque control. It can also switch automatically according to the values of C0.09 and C0.10. Frequency greater than C0.09 or torque greater than C0.10 will automatically switch to torque mode.

C0.01	Torque setting source selection in torque control		Default	0
	Setting range	0	Digital setting （C0.03）	
		1	FIV	
		2	FIC	
		5	Communication setting	
C0.03	Torque digital setting in torque control		Default	50%
	Setting range		0.0%～500.0%	

C0.01 is used to set the torque setting source. There are a total of four

torque setting sources. The torque setting is a relative value. 100.0% corresponds to the inverter's rated torque. 100% of communication, analog input corresponds to C0.03.

C0.05	Forward maximum frequency in torque control	Default	50.00Hz
	Setting range	0.00Hz～Maximum frequency（P0.12）	
C0.06	Reverse maximum frequency in torque control	Default	50.00Hz
	Setting range	0.00Hz～Maximum frequency（P0.12）	

This two parameters are used to set the maximum frequency in forward or reverse rotation in torque control mode.

In torque control, if the load torque is smaller than the motor output torque, the motor's rotational speed will rise continuously. To avoid runaway of the mechanical system, the motor maximum rotating speed must be limited in torque control.

C0.07	Acceleration time in torque control	Default	0.00s
	Setting range	0.00s～65000s	
C0.08	Deceleration time in torque control	Default	0.00s
	Setting range	0.00s～65000s	

In torque control, the difference between the motor output torque and the load torque determines the speed change rate of the motor and load. The motor rotational speed may change quickly and this will result in noise or too large mechanical stress. The setting of acceleration/deceleration time in torque control makes the motor rotational speed change smoothly.

However, for the occasions which need fast response of torque, it is necessary to set the acceleration and deceleration time of torque control as 0.00s. For example: two motors are hard connected to drag the same load, in order to ensure the even distribution of the load, one inverter is set as the host and adopts the speed control mode, the other inverter is the slave and adopts the torque control, and the actual output torque of the host is taken as the torque command of the slave, and at this time, the torque of the slave needs to follow the host quickly, so the torque control acceleration and deceleration time of the slave is 0.00s.

C0.09	Torque switchover frequency clamp	Default	25.00Hz
	Setting range	0.00Hz～Maximum frequency(P0.12)	
C0.10	Torque switchover torque clamp	Default	50.0 %
	Setting range	0.0%～150.0%	

This parameter is used to switchover between speed and torque. If the control mode is set to 2 and the frequency is greater than C0.09, it will automatically switch to the torque control mode. If the control mode is set to 3 and the torque is greater than C0.10, it will automatically switch to the torque control mode.

Group C5: Control Optimization Parameters

C5.00	DPWM switchover frequency upper limit	Default	12.00Hz
	Setting range	5.00Hz～Maximum frequency(P0.12)	
C5.01	PWM modulation mode	Default	0
	Setting range 0	Asynchronous modulation	
	Setting range 1	Synchronous modulation	

The DPWM switchover frequency upper limit is mainly use to switch 7-segment and 5-segment. The 7-segment continuous modulation causes more loss to switches of the inverter and heat sink temperature is high but smaller current ripple. Generally, asynchronous modulation is selected below 100Hz. During synchronous modulation, the carrier changes linearly with the output frequency. The above two parameters generally do not need to be adjusted.

C5.02	Dead compensation mode selection	Default	1
	Setting range 0	No compensation	
	Setting range 1	Compensation mode 1	
	Setting range 2	Compensation mode 2	

It doesn't have to modify generally. If motor oscillate, try to adjust the parameter.

C5.03	Random PWM depth		Default	0
	Setting range	0	Random PWM depth Disabled	
		1	1-10	

Random PWM depth is set to improve the motor's noise, reduce electromagnetic interference.

C5.04	Fast current limiting open		Default	1
	Setting range	0	Disabled	
		1	Enabled	

Opening fast current limiting can reduce over current fault,make the inverter work continuously. Opening fast current limiting for a long time ,can make the inverter overheat,Report a fault CBC.CBC represents fast current limiting fault and need to stop.

C5.05	Current detection compensation	Default	5
	Setting range	0～100	

It is used to set current detection compensation of inverter, don't recommend to modify.

C5.06	Lack voltage setting	Default	350.0V
	Setting range	210.0V-630.0V	

Used to set the voltage of inverter's lack voltage fault LU,Different voltage levels of inverter's corresponding to different voltages, Respectively: three-phase 380V:350V.

Chapter 5 Fault checking and ruled out

5.1 Fault alarm and countermeasures

QZ9000 with kinds of warning information and the protection function, once the failure, protection function, inverter to stop output, inverter fault relay contact action, and in the inverter fault code shown on the display panel. the user can check himself according to the tips before seeking service, analyze the cause of the problem, find out the solution. If it is belong to the dotted line frame stated reason, please seek service ,with your purchased inverter agents or direct contact with our company.

Table 5-1 Fault display and countermeasures

Fault name	Fault code	Display	Possible causes	Solutions
Inverter unit protection	1	oC	1: The output circuit is grounded or short circuited. 2: The connecting cable of the motor is too long. 3: The module overheats. 4: The internal connections become loose. 5: The main control board is faulty. 6: The drive board is faulty. 7: The inverter module is faulty	1: Eliminate external faults. 2: Install a reactor or an output filter. 3: Check the air filter and the cooling fan. 4:Connect all cables Properly. 5:Looking for technical support 6:Looking for technical support 7:Looking for technical support

Over-current during acceleration	2	oC1	1:The output circuit is grounded or short circuited. 2: Inverter is under vector control and do not auto-tuning 3: Acceleration time is too short 4: Manual torque boost or V/F curve is not appropriate. 5: Voltage too low 6: Operate start on rotating motor 7: A sudden load is added during acceleration 8: The inverter model is too small power class.	1: Eliminate external faults. 2: Motor auto-tuning 3: Add the Acceleration time 4: Adjust the torque boost or change the V/F curve manual 5: Adjust the power voltage to normal range 6: Select speed tracking start or wait until the motor stops 7: Cancel sudden load 8: Select an inverter of higher power class.
Over-current during deceleration	3	oC2	1:The output circuit is grounded or short circuited. 2: Inverter is under vector control and do not auto-tuning 3:Deceleration time is too short 4: Voltage too low 5: A sudden load is added during acceleration 6: Do not install braking unit or braking resistor	1: Eliminate external faults. 2: Motor auto-tuning 3: Add the deceleration time 4: Adjust the power voltage to normal range 5: Cancel sudden load 6: Install braking unit and braking resistor
Over-current at constant speed	4	oC3	1:The output circuit is grounded or short circuited.	1: Eliminate external faults. 2: Motor auto-

			2: Inverter is under vector control and do not auto-tuning 3: Voltage too low 4: A sudden load is added during acceleration 5: The inverter model is too small power class.	tuning 3: Adjust the power voltage to normal range 4: Cancel sudden load 5: Select an inverter of higher power class.
Over-voltage during acceleration	5	oU1	1: The input voltage is too high. 2: An external force drives the motor during acceleration. 3: The acceleration time is too Short. 4: The braking unit and braking resistor are not installed.	1: Adjust the voltage to normal range. 2: Cancel the external force or install a braking resistor. 3: Increase the acceleration time. 4: Install the braking unit and braking resistor.
Over-voltage during deceleration	6	oU2	1: The input voltage is too high. 2: An external force drives the motor during deceleration. 3: The deceleration time is too Short. 4: The braking unit and braking resistor are not installed.	1: Adjust the voltage to normal range. 2: Cancel the external force or install the braking resistor. 4: Install the braking unit and braking resistor.
Over-voltage at constant speed	7	oU3	1: The input voltage is too high. 2: An external force drives the motor during	1: Adjust the voltage to normal range. 2: Elimination of additional power

			deceleration.	or addition of braking resistors
Control power fault	8	PoFF	1: Input voltage is not within the range of the specification	1: Adjust the voltage to normal range.
Lack of voltage	9	LU	1:Instantaneous power failure 2: Input voltage is not within the range of the specification 3: Bus voltage is abnormal 4: Rectifier bridge and buffer resistance are faulty 5: Drive board is faulty 6: Power board is faulty	1: Fault reset 2: Adjust the voltage to normal range. 3: Looking for technical support 4: Looking for technical support 5:Looking for technical support 6: Looking for technical support
Inverter overload	10	oL2	1: Load is too large or blocking 2: The inverter model is of too small power class.	1: Check the load and motor, machine 2:Select an inverter of higher power class.
Motor overload	11	oL1	1: P9.01 is set improperly. 2: Load is too large or blocking 3: The inverter model is of too small power class.	1: Set the parameter correctly 2: Check the load and motor, machine 3: Select an inverter of higher power class
Input phase loss	12	LI	1: The three-phase power input is abnormal	1: Eliminate external faults. 2: Looking for

			2: The drive board is faulty 3: The lightening board is faulty 4: The main control board is faulty	technical support 3: Looking for technical support 4: Looking for technical support
Output phase loss	25	Lo	1: The cable connecting the AC drive and the motor is faulty. 2: The inverter's three-phase output is unbalanced when the motor is running. 3: The drive board is faulty. 4: The module is faulty.	1:Eliminate external faults. 2:Check whether the motor three-phase winding is normal. 3:Looking for technical support .
Module overheat	14	oH	1: The ambient temperature is too high.. 2: The air filter is blocked. 3: The fan is damaged. 4:The thermally sensitive resistor of the module is damaged. 5:The inverter module is damaged.	1:Lower the ambient temperature. 2:Clean the air filter. 3:Replace the damaged fan. 4:Replace the damaged thermally sensitive resistor. 5:Replace the inverter module.
External equipment fault	50	EF	1: External fault signal is input via X. 2: External fault signal is input via virtual I/O.	Reset the operation

Communication fault	48	CE	1: The host computer is in abnormal state. 2: The communication cable is faulty. 3: The communication parameters in group PD are set improperly.	1: Check the cabling of host computer. 2: Check the communication cabling. 3: Set the communication parameters properly
Contactor fault	17	rAy	1: The drive board and power supply are faulty. 2: The contactor is faulty.	1: Replace the faulty drive board or power supply board. 2: Replace the faulty Contactor.
Current detection fault	18	IE	1: The HALL device is faulty. 2: The drive board is faulty.	1: Replace the faulty HALL device. 2: Replace the faulty drive board.
Motor auto-tuning fault	19	TE	1: The motor parameters are not set according to the nameplate. 2: The motor auto-tuning times out.	1: Set the motor parameters according to the nameplate properly. 2: Check the cable connecting the inverter and the motor.
Encoder/PG cards fault	20	PG	1: The encoder type is incorrect 2: The cable connection of the encoder is incorrect 3: The encoder is damaged 4: The PG card is faulty	1: Set the encoder type correctly based on the actual situation 2: Eliminate external faults. 3: Replace the damaged Encoder 4: Replace the

				faulty PG card
Harware fault	22	INU	1. The driver board and power supply are abnormal 2. The motherboard is abnormal	1. Change the drive board 2. Change the main board 3. Looking for technical support
EEPROM read-write fault	49	EEP	1、EEPROM chip is damaged.	Replace the main control board.
Short circuit to ground fault	23	GND	The motor is short circuited to the ground.	Replace the cable or motor.
Pulse-by-pulse current limit fault	40	CBC	1: The load is too heavy or locked-rotor occurs on the motor. 2: The inverter model is of too small power class.	1: Reduce the load and check the motor and mechanical condition. 2: Select an inverter of higher power class.
Too large speed deviation fault	38	ESP	1: The encoder parameters are set incorrectly. 2: The motor auto-tuning is not performed.	1: Set the encoder parameters properly. 2:Perform the motor auto-tuning.
Speed and running direction are opposite	37	oSP	1: The encoder parameters are set incorrectly. 2: The motor auto-tuning is not performed. 3: Load is too large, exceed the motor torque	1: Set the encoder parameters properly. 2: Perform the motor auto-tuning. 3: Select inverter according to actual situation
Brake fault	42	bcE	1: Check brake	1: Set brake

			feedback parameter setting 2: Check brake open feedback connect wiring and brake sensor	feedback parameter correctly 2: Re-install the brake sensor
Brake open fault	41	boE	1: Check brake open feedback parameter setting 2: Check brake open feedback connect wiring and brake sensor	1: Set brake feedback parameter correctly 2: Re-install the brake sensor
Long time low speed alarm	43	LSP	1: Check low speed running alarm parameter setting 2: Check running speed setting	1: Set low speed running alarm parameter correctly 2: Modify running speed
Both forward and reverse are valid	44	FrAc	Check lifting joystick	Re-wiring or change the lifting joystick
Joystick is not becoming 0 fault	45	FrPo	Check lifting joystick	Re-wiring or change the lifting joystick

5.2 Common Faults and Solutions

You may come across the following faults during the use of the inverter. Refer to the following table for simple fault analysis.

Table 5-2 Troubleshooting to common faults of the inverter

SN	Fault	Possible Causes	Solutions

1	There is no display when the power is on	1: There is no power supply to the inverter or the power input to the inverter is too low. 2: The power supply of the switch on the drive board of the inverter is Faulty. 3: The rectifier bridge is damaged. 4: The control board or the operation panel is faulty. 5: The cable connecting the control board and the drive board and the operation panel breaks.	1: Check the power supply. 2: Check the bus voltage. 3:Looking for technical support
2	"9000" is displayed when the power is on	1: The cable between the drive board and the control board is in poor contact. 2: Related components on the control board are damaged. 3: The motor or the motor cable is short circuited to the ground. 4: The HALL device is faulty. 5: The power input to the inverter is too low.	Looking for technical support
3	"GND" is displayed when the power is on	1: The motor or the motor output cable is short-circuited to the ground. 2: The inverter is damaged.	1: Measure the insulation of the motor and the output cable with a megger. 2: Looking for technical support

4	The inverter display is normal when the power is on. But "9000" is displayed after running and stops immediately.	1:The cooling fan is damaged or locked-rotor occurs. 2: The external control terminalcable is short circuited.	1: Replace the damaged fan. 2: Eliminate external faults.
5	OH (module overheat) fault is reported frequently.	1: The setting of carrier frequency is too high. 2: The cooling fan is damaged, or the air filter is blocked. 3: Components inside the inverter are damaged (thermal coupler or others).	1: Reduce the carrier frequency (P0.15). 2: Replace the fan and clean the air filter. 3: Looking for technical support
6	The motor does not rotate after the inverter runs.	1: Check the motor and the motor Cables. 2: The inverter parameters are set improperly (motor parameters). 3: The cable between the drive board and the control board is in poor contact. 4: The drive board is faulty.	1: Ensure the cable between the inverter and the motor is normal. 2: Replace the motor or clear mechanical faults. 3: Check and reset motor parameters.
7	The X terminals are disabled.	1: The parameters are set incorrectly. 2: The external signal is incorrect 3: The jumper bar across OP and +24 V becomes loose. 4: The control board is faulty.	1: Check and reset the parameters in group P5. 2: Re-connect the external signal cables. 3: Re-confirm the jumper bar across OP and +24 V. 4:Looking for technical support

8	In closed-loop vector control, the motor speed cannot be increased.	1:Encoder failure. 2: encoder wire connection. error or poor contact. 3: PG card failure. 4:Driver board failure.	1:Replace the encoder and reconfirm the wiring. 2: replace the PG card. 3:Looking for technical support
9	The inverter reports Over-current and over-voltage frequently.	1: The motor parameters are set improperly. 2: The acceleration/deceleration time is improper. 3: The load fluctuates.	1:Reset motor parameters or re-perform the motor auto-tuning . 2: Set proper acceleration/ deceleration time. 3: Looking for technical support
10	RAY is reported when the power is or the inverter is running.	The soft startup contactor is not picked up.	1: Check whether the contactor cable is loose. 2: Check whether the contactor is faulty. 3: Check whether 24 V power supply of the contactor is faulty. 4: Looking for technical support

Chapter 6 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.

6.1 Inspection

In order to prevent inverter failure, ensure normal operation of the equipment and extend the service life of the inverter, daily maintenance of the inverter is required. The contents of daily maintenance are as follows.

Items to be checked	Items to be checked
Temperature/humidity	Ambient temperature shall be lower than 40°C Humidity shall meet the requirement of 20～90% and has no Gel
Smoke and dust	No dust accumulation,no traces of water leakage and no condensate.
Inverter	Check the inverter to ensure it has no abnormal heat abnormal vibration
Fan	Ensure the fan operation is normal,no debris stuck,etc.
Power input	Power input voltage and frequency are at the permissible range
Motor	To check the motor whether the motor has abnormal vibration ; abnormal heat; abnormal noise and phase loss,etc

6.2 Periodic Maintenance

In order to prevent the inverter from malfunctioning and ensure its long-term high-performance and stable operation, the user must regularly (within half a year) inspect the inverter. The inspection contents are as follows::

Items to be checked	checking contents	Solutions
the screws of control terminals	whether the screws of control terminals are loose	tighten them
PCB	Duct and dirt	Clean the dust on PCBs and air ducts with a vacuum cleaner
Fan	abnormal noise,abnormal vibration, whether it has used up 20,000 hours	Clear debris and replace the fan
Electrolytic capacitor	Whether the clour is changed and the smell is abnormal	Change the electrolytic capacitor
Heatsink	Duct and dirt	Clean the dust and air ducts with a vacuum cleaner
Power Components	Duct and dirt	Clean the dust and air ducts with a vacuum cleaner

6.3 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.

6.4 Inverter Warranty

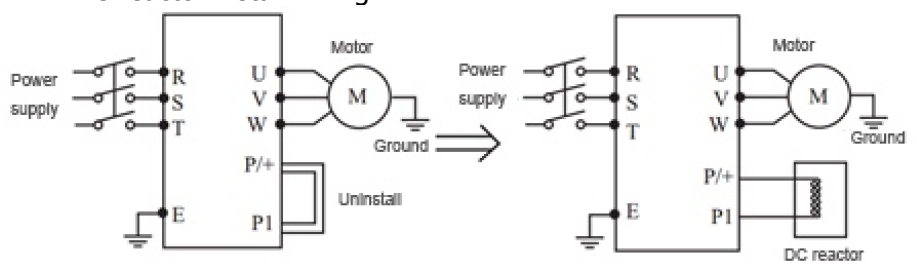
The company provides 12 months of warranty for QZ9000 Inverter since it go out from the factory

Chapter 7 Peripheral Devices Selection

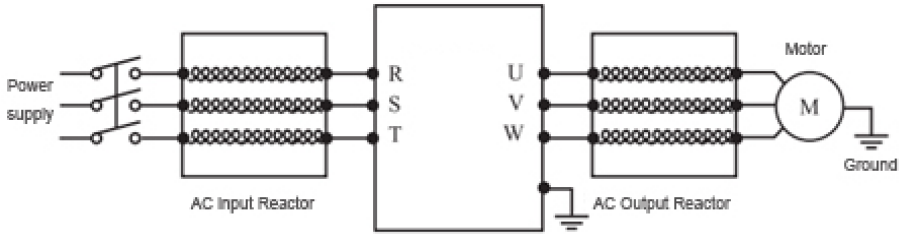
devices name	Descriptions
Circuit breaker and leakage breaker.	Protect inverter wiring,convenient to the installation and maintenance.
Electromagnetic contactor	Inverter is convenient to the power supply's power-on and power-off ,ensure the safety
Surge absorber	Absorb surge current of electromagnetic contactor and control relay switch
Isolation Transformers	Isolation to the Inverter's input and output,Reduce interference
DC Reactor	Protect the Inverter and suppress higher harmonics.
AC Reactor	Protect the Inverter and suppress higher harmonics.Prevent the impact of surge voltage
Brake resistor and brake unit	Absort the renewable Energy
Noise filter	To reduce the electromagnetic disturbance which is generated by inverter.
Ferrite ring	To reduce the electromagnetic disturbance which is generated by inverter.

7.1 Wiring

7.1.1 DC reactor install wiring



7.1.2 AC input/output reactor install wiring



7.2 DC reactor

Inverter model	Power (KW)	DC reactor selection		Remark
		Rated current （A）	Inductance （mH）	
CV20-30G	30	65	0.8	Built in optional
CV20-37G	37	78	0.7	
CV20-45G	45	95	0.54	Can be connected external
CV20-55G	55	115	0.45	
CV20-75G	75	160	0.36	
CV20-90G	90	180	0.33	
CV20-110G	110	250	0.26	
CV20-132G	132	250	0.26	
CV20-160G	160	340	0.18	
CV20-185G	185	460	0.12	
CV20-200G	200	460	0.12	
CV20-220G	220	460	0.12	
CV20-250G	250	500	0.12	
CV20-280G	280	650	0.11	
CV20-315G	315	650	0.11	

CV20-350G	350	800	0.06	Built in
CV20-400G	400	800	0.06	
CV20-450G	450	1000	0.05	

7.3 AC input reactor

Inverter Model	Power (KW)	AC reactor selection		Remark
		Rated current（A）	Inductance（mH）	
CV20-3R7G	3.7	10	1.5	
CV20-5R5G	5.5	15	1	
CV20-7R5G	7.5	20	0.75	
CV20-11G	11	30	0.6	
CV20-15G	15	40	0.42	
CV20-18R5G	18.5	50	0.35	
CV20-22G	22	60	0.28	
CV20-30G	30	80	0.19	
CV20-37G	37	90	0.16	
CV20-45G	45	120	0.13	
CV20-55G	55	150	0.1	
CV20-75G	75	200	0.12	
CV20-90G	90	250	0.06	
CV20-110G	110	250	0.06	
CV20-132G	132	290	0.04	
CV20-160G	160	330	0.04	
CV20-200G	200	490	0.03	
CV20-220G	220	490	0.03	
CV20-250G	250	530	0.03	
CV20-280G	280	600	0.02	

CV20-315G	315	660	0.02	
CV20-350G	350	800	0.0175	
CV20-400G	400	800	0.0175	
CV20-450G	450	1000	0.014	

7.4 AC output reactor

Inverter model	Power (KW)	AC reactor selection		Remark
		Rated current（A）	Inductance（mH）	
CV20-3R7G	3.7	10	0.6	
CV20-5R5G	5.5	15	0.25	
CV20-7R5G	7.5	20	0.13	
CV20-11G	11	30	0.087	
CV20-15G	15	40	0.066	
CV20-18R5G	18.5	50	0.052	
CV20-22G	22	60	0.045	
CV20-30G	30	80	0.032	
CV20-37G	37	90	0.03	
CV20-45G	45	120	0.023	
CV20-55G	55	150	0.019	
CV20-75G	75	200	0.014	
CV20-90G	90	250	0.011	
CV20-110G	110	250	0.011	
CV20-132G	132	290	0.008	
CV20-160G	160	330	0.008	
CV20-200G	200	490	0.004	
CV20-220G	220	490	0.004	

CV20-250G	250	530	0.003	
CV20-280G	280	600	0.003	
CV20-315G	315	660	0.002	
CV20-350G	350	800	0.002	
CV20-400G	400	800	0.002	
CV20-450G	450	1000	0.0012	
CV20-450G	450	1000	0.0012	

7.5 Brake resistor

Inverter Model	Brake resistor			Brake unit CDBR	Motor （KW）
	Lifting application (KW) Resistance power	Pan application Resistance power	Resistance Ω(≥)		
CV20-3R7G	2.6KW	0.9KW	32	Built in	3.7
CV20-5R5G	4KW	1.2KW	32		5.5
CV20-7R5G	6KW	1.8KW	32		7.5
CV20-11G	9KW	2.7KW	20		11
CV20-15G	12KW	3.7KW	20		15
CV20-18R5G	15KW	4KW	20		18.5
CV20-22G	18KW	5KW	20		22
CV20-30G	24KW	7KW	19.2		30
CV20-37G	30KW	9KW	14.8		37
CV20-45G	37KW	11KW	12.8	Built in	45
CV20-55G	45KW	13KW	9.6		55
CV20-75G	60KW	18KW	6.8		75
CV20-90G	37KW*2	11KW*2	11*2		90
CV20-110G	45KW*2	13KW*2	8*2		110

CV20-132G	50KW*2	16KW*2	8*2		132
CV20-160G	65KW*2	20KW*2	8*2		160
CV20-200G	160KW	50KW	2.5		200
CV20-220G	90KW*2	27KW*2	2.5*2		220
CV20-250G	100KW*2	31KW*2	2.5*2		250
CV20-280G	110KW*2	35KW*2	2.5*2		280
CV20-315G	125KW*2	40KW*2	2.5*2		315
CV20-350G	140KW*2	45KW*2	2.5*2		350
CV20-400G	160KW*2	50KW*2	2.5*2	External	400
CV20-450G	180KW*2	55KW*2	2.5*2		450

Appendix A List of Function Parameters

If PP.00 is set to a non-zero value, the parameter protection password is set. In the function parameter mode and the user parameter change mode, the parameter menu can only be entered after the password is correctly entered. To cancel the password, PP.00 must be set to 0.

The parameter menu in the user-defined parameter mode is not password protected. Groups P and C are basic function parameters, and Group D is monitoring function parameters. The symbols in the function table are explained as follows:

"☆": The parameter can be modified when the inverter is in either stop or running state.

"★": The parameter cannot be modified when the inverter is in the running state.

"●": The parameter is the actually measured value and cannot be modified.

"*": The parameter is factory parameter and can be set only by the manufacturer.

Standard Function Parameters：

Function Code	Name	Setting range	Default	Property
Group P0 Basic function				
P0.01	Control Mode selection	0: No PG (speed sensor) vector control 1: With PG (speed sensor) vector control 2: V/F control	0	★
P0.02	Command source selection	0: Keyboard command channel (LED off) 1: Terminal command channel (LED on) 2: Communication command channel (LED flashing)	0	☆
P0.04	Main frequency source selection A	0: Multi-speed setting 1: AI1 setting 2: AI2 setting	0	★

		3: Reserved 4:Acceleration/Deceleration setting 9: Communication setting		
P0.08	Acceleration time 1	0.0s～600.0s	3.0s	☆
P0.09	Deceleration time1	0.0s～600.0s	3.0s	☆
P0.10	Frequency preset	P0.16～P0.12	50.00Hz	☆
P0.11	Rotation direction	0: Same direction 1: Reverse direction	0	☆
P0.12	Maximum frequency	50.00Hz～150.00Hz	50.00Hz	★
P0.16	Minimum frequency	0.00Hz～15.00Hz	0.00Hz	☆
P0.17	Carrier frequency	1.0kHz～12.0kHz	Model dependent	☆
P0.25	UP/DOWN basic frequency	Opening frequency to maximum frequency	50.00HZ	☆
Group P1 Start stop parameters				
P1.04	Stop excitation holding time	0-65535s	30s	★
P1.04	Pre-excitation time	0-5s	0.30s	★
P1.07	Acceleration/ Deceleration mode	0: Linear acceleration/deceleration 1: S-curve acceleration/deceleration 1 2: S-curve acceleration/deceleration 2	0	★
P1.08	Time proportion of S-curve start segment	0.0%～40.0%	30.0%	★
P1.09	Time proportion of S-curve end segment	0.0%～40.0%	30.0%	★
P1.10	Stop mode	0: Decelerate to stop 1: Coast to stop	0	☆
P1.11	Initial frequency of stop DC braking	P0.16～P2.04	0.00Hz	☆
P1.13	Stop DC braking	0%～120%	50%	☆

	current Setting Range			
P1.16	Brake open frequency	P0.16～15.00Hz	2.00 Hz	☆
P1.17	Brake open current	0.0～150.0%	30.0%	☆
P1.18	Brake open mechanical time	0.00～5.00s	0.50s	☆
P1.19	Brake open rotating direction	0：Brake opening torque is the same as the running direction 1：Brake opening torque is always forward	0	☆
P1.20	Brake frequency	P0.16～20.00Hz	2.00 Hz	☆
P1.21	Brake mechanical time	0.00～5.00s	0.50s	☆
P1.22	Brake delay time	0.0～30.0s	0.0s	☆
P1.23	Brake action curve	0: No brake control 1: Auto-brake control 1 2: Auto-brake control 2	1	☆
P1.24	Restart selection in the process of brake process	0: No allow to restart in the process of brake 1: Allow to restart in the process of brake	0	☆
P1.25	Restart waiting time	00.0～15.0s	0.3s	☆
P1.26	Brake feedback	0: Do not use brake feedback 1: For action detection 2: For full monitor	0	☆
P1.27	Running command reverse timing control	0: No allow to direct reverse during operation 1: Allow to direct reverse during operation	0	☆
P1.28	Zero-crossing jump frequency during running	0～20.00Hz	2.00 Hz	☆
Group P2 Motor parameter				
P2.01	Rated motor power	0.4kW～1000.0kW	Model depende	★

			nt	
P2.02	Rated motor voltage	0V～2000V	380V	★
P2.03	Rated motor current	0.01A～655.35A（Inverter Power<=55kW） 0.1A～6553.5A（Inverter Power>55kW）	Model dependent	★
P2.04	Rated motor frequency	0.01Hz～P0.12	50.00Hz	★
P2.05	Rated motor rotating speed	0rpm～3000rpm	1400rpm	★
P2.06	Stator resistance （asynchronous motor)	0.001Ω～65.535Ω（Inverter Power<=55kW） 0.0001Ω～6.5535Ω（Inverter Power>55kW）	Tuning paramters	★
P2.07	Rotor resistance (asynchronous motor)	0.001Ω～65.535Ω（Inverter Power<=55kW） 0.0001Ω～6.5535Ω（Inverter Power>55kW）	Tuning paramters	★
P2.08	Leakage inductive reactance (asynchronous motor)	0.01mH～655.35mH（Inverter Power<=55kW） 0.001mH～65.535mH（Inverter Power>55kW）	Tuning paramters	★
P2.09	Mutual inductive reactance (asynchronous motor)	0.1mH～6553.5mH（Inverter Power<=55kW） 0.01mH～655.35mH（Inverter Power>55kW）	Tuning paramters	★
P2.10	No-load current (asynchronous motor)	0.01A～P2.03（Inverter Power<=55kW） 0.1A～P2.03（Inverter Power>55kW）	Tuning paramters	★
P2.27	Encoder pulses per revolution	0～8192	1024	★
P2.28	Encoder type	0: ABZ incremental encoder 1: Reserved 2: Resolver	0	★
P2.30	ABZ incremental encoder AB phase	0: Forward 1: Reverse	0	★

	sequence			
P2.35	Encoder wire-break detection function selection	0: Close 1: Open	1	★
P2.36	Speed feedback PG disconnection detection time	0.000s～1.000s	0.000s	★
P2.37	Auto-tuning selection	0: No auto-tuning 1: Asynchronous motor static auto-tuning 2: Asynchronous motor complete auto-tuning 3: Asynchronous motor static complete auto-tuning	0	★
Group P3 Vector Control Parameters				
P3.00	Speed loop proportional gain1	1～100	60	☆
P3.01	Speed loop integral time 1	0.01s～10.00s	0.50s	☆
P3.02	Switchover frequency 1	0.00～P3.05	5.00Hz	☆
P3.03	Speed loop proportional gain 2	1～100	20	☆
P3.04	Speed loop integral time 2	0.01s～10.00s	1.00s	☆
P3.05	Switchover frequency 2	P3.02～P0.12	10.00Hz	☆
P3.06	Vector control slip gain	50%～200%	100%	☆
P3.07	Time constant of speed loop filter	0.000s～1.000s	0.080s	☆
P3.10	Digital setting of torque upper limit in speed control mode (electric)	0.0%～500.0%	180.0%	☆
P3.12	Digital setting of torque upper limit in speed control mode (power generation)	0.0%～500.0%	180.0%	☆

P3.13	Excitation adjustment proportional gain	0～100	10	☆
P3.14	Excitation adjustment integral gain	0～100	10	☆
P3.15	Torque adjustment proportional gain	0～100	10	☆
P3.16	Torque adjustment integral gain	0～100	10	☆
P3.22	Field weakening multiple	100.0%～300.0%	100.0%	☆
P3.23	Slack rope torque	0.0%～P3.25	5.0%	
P3.24	Load allow	P3.25～100.0%	80.0%	
P3.25	Light load coefficient	P3.23～P3.24	35.0%	
P3.26	Light load detection frequency	P1.16～P0.12	40.00 Hz	
P3.27	Light load detection time	0.0～5.0s	0.5s	
P3.28	Forward frequency correction	0～100%	100%	
P3.29	Reverse frequency correction	0～100%	100%	
P3.30	Overload protection torque threshold	0.0～150.0%	0.0	
P3.31	Constant power control	0: Disabled 1: Enabled	1	
Group P4 V/F Control parameter				
P4.01	Torque boost	0.0%～30.0%	Model dependent	☆
P4.02	Cut-off frequency of torque boost	0.00Hz～P0.12	50.00Hz	★
P4.09	V/F slip compensation gain	0.0%～100.0%	0.0%	☆

P4.10	V/F over-excitation gain	0～200	0	☆
P4.11	V/F oscillation suppression gain	0～100	Model dependent	☆
Group P5 Input terminals				
P5.00	X1	1: Forward RUN（FWD） 2: Reverse RUN（REV） 3: Fault reset（RESET） 4: Fast stop 5: Coast to stop 6: Decelerate to stop 7: Normally open (NO) input of external fault 8: Multi-reference terminal 1 9: Multi-reference terminal 2 10: Multi-reference terminal 3 11: Brake open feedback 12: Brake close feedback 13: 2 segment accelerate ramp switchover 14: 2 segment decelerate ramp switchover 15: 3 segment accelerate ramp switchover 16: 3 segment decelerate ramp switchover 19: Accelerate to run（UP） 20: Decelerate to run（DOWN） 21: Torque control/Speed control switchover	1	★
P5.01	X2		2	★
P5.02	X3		8	★
P5.03	X4		9	★
P5.04	X5		10	★
P5.05	X6		5	★
P5.06	X7		0	★
P5.07	X8(reserved)		0	★
P5.08	X9(reserved)		0	★
P5.09	X10(reserved)		0	★
P5.10	Terminal filter time	0.000s～1.000s	0.010s	☆
P5.12	Terminal UP/DOWN rate	0.01Hz/s～50.00Hz/s	5.00Hz/s	☆
P5.13	FI minimum input	0.00V～P5.15	0.00V	☆

P5.14	Corresponding setting of FIV minimum input	0.0%～+100.0%	0.0%	☆
P5.15	FI maximum input	P5.13～+10.00V	10.00V	☆
P5.16	Corresponding of FI maximum input	0.0%～+100.0%	100.0%	☆
P5.17	FI filter time	0.00s～10.00s	0.10s	☆
P5.18	FI minimum input	0.00V～P5.20	0.00V	☆
P5.19	Corresponding setting of FI minimum input	0.0%～+100.0%	0.0%	☆
P5.20	FI maximum input	P5.18～+10.00V	10.00V	☆
P5.21	Corresponding setting of FI maximum input	0.0%～+100.0%	100.0%	☆
P5.22	FI filter time	0.00s～10.00s	0.10s	☆
P5.28	FIV function selection	0-133	0	☆
P5.29	FIC function selection	0-133	0	☆
P5.30	Up/Down lowest frequency	0.00-15.00	0	☆
P5.31	Up/Down memory	0-1	0	☆
P5.32	Up/Down Optimization function selection	0-1	0	☆
P5.33	Up/Down limit frequency	0.00-50.00	5.00	☆
Group P6 Output terminals				
P6.01	Reserved	1: Brake control output 2: Fault output（Fault stop） 3: Fault alarm 4: Fault notice 8: Inverter overload pre-warning 9: Motor overload pre-warning	0	☆
P6.02	Relay output function selection（TA-TC）		1	☆
P6.03	Relay output function selection（RA-RB-RC）		13	☆
P6.04	Reserved		0	☆

P6.05	YO1 output function selection	10: Low voltage startup protection	0	☆
P6.06	YO2 output function selection	11: Over load protection start 12: Over torque output 13: Motor fan control 14: Frequency reached output 15: Inverter running 16: Self-start function output	0	☆
P6.10	Reserved	-100.0%～+100.0%	0.0%	☆
P6.11	Reserved	-10.00～+10.00	1.00	☆
P6.12	Reserved	-100.0%～+100.0%	0.0%	☆
P6.13	Reserved	-10.00～+10.00	1.00	☆
Group P7 Operation Panel and Display				
P7.06	Load speed display coefficient	0.0001～6.5000	1.0000	☆
P7.09	Accumulative running time	0h～65535h	-	●
P7.11	Software	-	-	●
P7.13	Accumulative power-on time	0h～65535h	-	●
P7.14	Accumulative power consumption	0kW～65535 degree	-	●
Group P8 Auxiliary Functions				
P8.00	Acceleration mode selection	0: Do not use special Acceleration/Deceleration	0	☆
P8.01	Deceleration mode selection	1: 2 segment of acceleration and deceleration automatically switches in according to frequency 2: 3 segment of acceleration and deceleration automatically switch according to frequency 4: 3 segment of acceleration and deceleration switch by terminals	0	☆

P8.03	Acceleration time 2	0.1s～600.0s	3.0s	☆
P8.04	Deceleration time 2	0.1s～600.0s	3.0s	☆
P8.05	Acceleration frequency 2	0 – P8.09	0%	☆
P8.06	Deceleration frequency 2	P8.10-99%	99%	☆
P8.07	Acceleration time 3	0.1s～600.0s	3.0s	☆
P8.08	Deceleration time 3	0.1s～600.0s	3.0s	☆
P8.09	Acceleration frequency 3	P8.05-99%	99%	☆
P8.10	Deceleration frequency 3	0-P8.06	0%	☆
P8.15	Droop control	0.00Hz～20.00Hz	0.00Hz	☆
P8.19	Frequency detection value（FDT1）	P1.16～P0.12	50.00Hz	☆
P8.20	Frequency detection hysteresis（FDT1）	0.0%～100.0%（FDT1 level）	5.0%	☆
P8.28	Low speed running protection frequency	0.01Hz～20.00Hz	5.00Hz	☆
P8.29	Low speed running protection time	0s～1000s	0s	☆
P8.36	Over-torque output threshold	0.0%（No detection） 0.1%～200.0%（rated motor current）	0.0%	☆
P8.48	Inverter fan control	0: Fan runs during operation 1: Fan runs always	0	☆
P8.49	Motor fan control delay	0～3000s	30s	☆
Group P9 Fault and protection				
P9.00	Motor overload protection selection	0：Disabled 1：Enabled	1	☆
P9.01	Motor overload protection gain	0.20～10.00	1.00	☆
P9.02	Motor overload warning coefficient	50%～100%	80%	☆

P9.03	Over-voltage stall gain	0～100	0	☆
P9.04	Over-voltage stall protective voltage	620.0～P9.08	640.0	☆
P9.05	Over-current stall gain	0～100	20	☆
P9.06	Over-current stall protective current	100%～200%	150%	☆
P9.07	Short-circuit to ground upon power-on	0：Disabled 1：Enabled	0	☆
P9.08	Built-in brake unit action	620.0-800.0	660	☆
P9.12	Input phase loss protection selection	0：Disabled 1：Enabled	1	☆
P9.13	Output phase loss protection selection	0：Disabled 1：Enabled	1	☆
P9.14	1st fault type	0: No fault 1: Inverter unit protection 2: Over-current during acceleration 3: Over-current during deceleration 4: Over-current at constant speed 5: Over-voltage during acceleration 6: Over-voltage during deceleration 7: Over-voltage at constant speed 8: Control power failure 9: Undervoltage 10: Inverter overload 11: Motor overload 12: Input phase loss	-	●
P9.15	2nd fault type	14: Module overheat 17: Contactor fault 18: Current detection fault 19: Motor auto-tuning fault	—	●

		20: Encoder/PG card faulty 22: Inverter hardware fault 23: Short circuit to ground 25: Output phase loss		
P9.16	3rd (latest) fault type	37: Speed is opposite to running direction 38: Speed deviation too large 40: Cycle-by-Cycle Current Limit Fault 41: Brake open fault 42: Brake fault 43: Long time low speed running fault 44: Both Forward and Reverse operate enabled 45: Joystick no becoming 0 fault 48 Communication abnormal 49: EEPROM read and write failure 50: External device failure	—	●
P9.47	Fault protection action selection 1	Set the fault level, each bit represents a fault.Starting from 41 ,There are 4 types of fault levels, and each type implements corresponding fault measures. If set as 5, inverter is running normally.	11115	☆
P9.48	Fault protection action selection 2		11111	☆
P9.49	Fault protection action selection 3		11411	☆
P9.50	Fault protection action selection 4		11111	☆
P9.51	Fault protection action selection 5		11111	☆
Group Pb Lifting auxiliary parameters				
PB.00	Position display proportion	1-65535	1	☆
PB.01	Initial position	0-65535	0	☆
PB.02	Number of self-starting pulses	0-65535	0	☆

PB.03	Frequency abnormal detection period	0.00-1.00	0.50	☆
PB.04	Frequency following deviation detection reference	0-30	20	☆
PB.05	Frequency following deviation detection period	0.00-1.00	0.50	☆
PB.08	Speed reduction with pressure function selection	0：Close，1：Open	0	☆
PB.09	Action voltage of speed reduction with pressure function selection	70%-100%	85%	☆
Group PC Multi-Reference				
PC.00	multi-reference 0	0-Maximum frequency(P0.12)	5.00	☆
PC.01	multi-reference 1	0-Maximum frequency(P0.12)	20.00	☆
PC.02	multi-reference 2	0-Maximum frequency(P0.12)	35.00	☆
PC.03	multi-reference 3	0-Maximum frequency(P0.12)	0.00	☆
PC.04	multi-reference 4	0-Maximum frequency(P0.12)	50.00	☆
PC.05	multi-reference 5	0-Maximum frequency(P0.12)	0.00	☆
PC.06	multi-reference 6	0-Maximum frequency(P0.12)	0.00	☆
PC.07	multi-reference 7	0-Maximum frequency(P0.12)	0.00	☆
Group Pd Communication parameters				
PD.00	Baud rate	5：9600BPS 6：19200BPS 7：38400BPS 8：57600BPS 9：115200BPS	9600	☆

PD.01	Data format	0：No check (8-N-2) 1：Even parity check (8-E-1) 2：Odd Parity check (8-O-1) 3：8-N-1	3	☆
PD.02	Local address	1～247，0 Broadcast address	1	☆
PD.03	Response delay	0ms～20ms	2	☆
PD.04	Communication timeout	0.0（Disabled），0.1s～60.0s	0.0	☆
Group PP User-Defined Function Codes				
PP.00	User password	0～65535	0	☆
PP.01	Restore default settings	0: No operation 1: Restore factory settings except motor parameters 2: Clear records	0	★
Group C0 Torque Control and Restricting Parameters				
C0.00	Speed/Torque control selection	0: Speed control 1: Torque control 2: Auto switch to torque according to C0.09 3: Auto switch to torque according to C0.10 4:Reserved 5: Switch torque through terminal	0	★
C0.01	Torque setting source	0：Digital setting（C0.03） 1：FIV 2：FIC 3：Reserved 4：Reserved 5：Communication setting	0	★
C0.03	Torque digital setting in torque control	0.0%～500.0%	50.0%	☆
C0.05	Forward maximum frequency in torque control	0.00Hz～Maximum frequency(P0.12)	50.00Hz	☆

C0.06	Reverse maximum frequency in torque control	0.00Hz～Maximum frequency(P0.12)	50.00Hz	☆
C0.07	Acceleration time in torque control	0.0s～600.0s	0.0s	☆
C0.08	Deceleration time in torque control	0.0s～600.0s	0.0s	☆
C0.09	Torque switchover frequency clamp	0.00Hz～Maximum frequency(P0.12)	25.00Hz	☆
C0.10	Torque switchover torque clamp	0.0%～150.0%	50.0%	☆
Group C5: Control Optimization Parameters				
C5.00	DPWM switchover frequency upper limit	5.00Hz～Maximum frequency(P0.12)	12.00Hz	☆
C5.01	PWM modulation mode	0: Asynchronous modulation 1: Synchronous modulation	0	☆
C5.02	Dead compensation mode selection	0: No compensation 1: Compensation mode 1 2: Compensation mode 2	1	☆
C5.03	Random PWM depth	0：Random PWM is invalid 1～10：PWM carrier frequency random depth	0	☆
C5.04	Fast current limiting open	0：Disabled 1：Enabled	1	☆
C5.05	Current detection compensation	0～100	5	☆
C5.06	Lack voltage setting	210.0～630.0	350	☆

Group D0: Monitoring Parameters

Function code	Parameter Name	Unit
Group D0: Basic monitoring parameters		
D0.00	Running frequency（Hz）	0.1Hz
D0.01	Setting frequency（Hz）	0.1Hz
D0.02	Bus voltage（V）	0.1V
D0.03	Output voltage（V）	1V

D0.04	Output current（A）	0.01A
D0.05	Output power（kW）	0.1kW
D0.06	Output torque（%）	0.1%
D0.07	X1-X7 input state	1
D0.08	DO output state	1
D0.09	FIV voltage（V）	0.01V
D0.10	FIC voltage（V）	0.01V
D0.14	Load speed display	1 rpm
D0.17	Brake use times high level	1
D0.18	Brake use times low level	1
D0.19	Feedback speed（unit: 0.1Hz）	0.1Hz
D0.25	X8-X10 state	1
D0.25	Current power on time	1Min
D0.26	Current running time	1Min
D0.27	Reserved	1Hz
D0.28	Communication setting value	0.01%
D0.29	Encoder feedback speed	0.01Hz
D0.35	Target torque（%）	0.1%
D0.36	Resolver position	1
D0.37	ABZ position high level	0.1°
D0.38	ABZ position low level	1
D0.39	Fault code	1
D0.61	Inverter state	1

The Group D0 is used to monitor the inverter's running state. You can view the parameter values by using operation panel, covenient for on-site commissioning or from the host computer by means of communication.

Appendix B
Communication Protocol

QZ9000 series inverter provides RS485 communication interface, and support the Modbus communication protocol. Users can be achieved by computing machine or PLC central control, through the communication protocol set frequency converter running commands, modify or read function code parameters, read the inverter working condition and fault information, etc.

1. **The agreement content**

The serial communication protocol defines the serial communication transmission of information content and format. Including: host polling or wide planting format;Host encoding method, the content includes: the function of the required action code, data transmission and error checking, etc.From the ring of machine should be used is the same structure, content including: action confirmation, return the data and error checking, etc.If there was an error in receiving information from a machine, or cannot achieve the requirements of the host, it will organize a fault feedback information in response to the host.

Application mode converter with RS485 bus access to the "from" single main PC/PLC control network.

（1）The interface way RS485 interface hardware

（2）Asynchronous serial transmission mode, half-duplex transmission mode.At the same time the host and the only one to send data from the machine and the other can only receive data.Data in the process of serial asynchronous communication, the form of a message, a frame of a frame to send

（3）Topological structure from single host machine system.From the machine address set in the range of 1 ~ 247, 0 for broadcast communication address.In the network from the machine address must be unique.

Protocol Description:

QZ9000 series inverter is a kind of asynchronous serial port communication protocol of master-slave Modbus communication protocol, the network has only one equipment (host) to establish agreement (called "query/command").Other equipment (machine) can only by providing data response of the main machine "query/command", or "query/command" according to the host to make the corresponding action.Host in this refers

to the personal computer (PC), industrial control equipment or programmable logic controller (PLC), etc., from machine refers to QZ9000 inverter.The host can communicate to a separate from the machine, also can to all under a broadcast information from machine release.For access to the host alone "query/command", from the machine to return to a information (called response), for radio host information, from the machine without feedback response to the host.

Communications data structure

Communication data structure QZ9000 series frequency converter of the Modbus protocol communication data format is as follows: using the RTU mode, messages are sent at least begin with 3.5 characters pause time interval.

In network wave rate under varied characters of the time, this is the most easy to implement (below T1, T2, T3, T4).Transmission equipment is the first domain address.

The transmission character of you can use is the hex 0...9, A...F.Continuously detect network bus network facilities, including pause interval of time.When the first domain (domain) to receive, every equipment decoding to determine whether to own.After the last transmission character, a pause at least 3.5 characters time calibration for the end of the message.A new message can be started after the pause.

The entire message frame must be as a continuous flow of transmission.If the time frame to complete more than 1.5 characters before pause time, receiving equipment will refresh incomplete message and assume that the next byte is a new message the address of the domain.Likewise, if a new message in less than 3.5 characters of time and then a message before, receiving equipment will think it is a continuation of the previous message.This will result in an error, because in the final CRC field value can't be right.

RTU frame format:

<table>
<tr><td>The frame header START</td><td>3.5 characters</td></tr>
<tr><td>Slave address ADR</td><td>Communication address：1~247</td></tr>
<tr><td>command code CMD</td><td>03：Read the machine parameters；06：write the machine parameters</td></tr>
<tr><td>Date content DATA（N-</td><td rowspan="4">Information content：Function code parameter address, function code number of parameters, function code parameter values, etc</td></tr>
<tr><td>Data content DATA（N-</td></tr>
<tr><td>……</td></tr>
</table>

Data contentDATA0	
high-order position of CRC CHK	estimated value： CRC value
low-order position of CRC CHK	
END	3.5 characters'time

CMD（Command instruction）and DATA（the description of data word）

command code：03H，read N word（Word）（Can read the most words of 12）For example,From the machine address of 01 inverter startup F105 continuous read for two consecutive values

The host command information

ADR	01H
CMD	03H
high-order position of the starting address	F1H
low-order position of the starting address	05H
high-order position of	00H
low-order position of register	02H
low-order position of CRC CHK	Wait to calculate the CRC CHK values
high-order position of CRC CHK	

In response to information from the slave machine

Set PD.05 to 0：

ADR	01H
CMD	03H
high-order position of bytes	00H
low-order position of bytes	04H
Data high-order position of F002H	00H

Data low-order position of F002H	00H
Data high-order position of F003H	00H
Data high-order position of F003H	01H
low-order position of CRC CHK	Wait to calculate the CRC CHK values
high-order position of CRC CHK	

Set PD.05 to 1:

ADR	01H
CMD	03H
The number of bytes	04H
Data high-order position of F002H	00H
Data low-order position of F002H	00H
Data high-order position of F003H	00H
Data low-order position of F003H	01H
low-order position of CRC CHK	Wait to calculate the CRC CHK values
high-order position of CRC CHK	

The command code：06H write a word（Word）For example,write 3000（BB8H）to slave machine.

Address 05H frequency converter's F00AH address.

The host command information

ADR	05H
CMD	06H

high-order position of data address	F0H
low-order position of data address	0AH
high-order position of information content	0BH
low-order position of information content	B8H
low-order position of CRC CHK	Wait to calculate the CRC CHK values
high-order position of CRC CHK	

In response to information from the slave machine

ADR	02H
CMD	06H
high-order position of data	F0H
low-order position of data	0AH
high-order position of information content	13H
low-order position of information content	88H
low-order position of CRC CHK	Wait to calculate the CRC CHK values
high-order position of CRC CHK	

Check way——CRC Check way：CRC（Cyclical Redundancy Check）use RTU frame format,The message includes error detection field based on the method of CRC .CRC domain test the whole content of a message。CRC domain is two bytes，contains a 16-bit binary values.it is calculated by the transmission equipment, added to the message.receive messages the device recalculate.And compared with receives the CRC in the domain of value, if the two CRC value is not equal, then there is an error in transmission.

CRC is saved in 0xFFFF,Then call a process to continuous 8-bit bytes of the

message and the values in the current register for processing.Only 8 bit data in each character of CRC is effective，Starting bit and stopping bit and parity bits are invalid.
In the process of CRC,Each of the eight characters are separate and dissimilar or register contents（XOR）,The results move to the least significant bit direction, set the most significant bit to 0. LSB is extracted to test，if set LSB to 1,Register and preset value dissimilarity or alone，if set LSB to 0, is not to.The whole process will repeat 8 times.when the last time (the eighth time) is completed，next 8-bit bytes and separate and register under the current value of the alien or.The values in the final register，Is all bytes in the message is executed after the CRC value.

When CRC added to the messages .The low byte to join first and then high byte.CRC Simple function is as follows:

```
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);
}
```

Address definition of communication parameters
This part is the content of the communication, used to control the operation of the inverter, inverter status and related parameters setting.Read and write functional code parameter (some function code which can not be changed, only for the use of manufacturers or monitoring) : function code parameter address label rules:
By function block number and the label for the parameter address

representation rules .

High byte: F0~FF（P group）、A0~AF（C group）、70~7F（D group）

low byte：00~FF

Such as：P3.12，The address is expressed as F30C； attention： PF group：Neither read the parameters, and do not change parameters; D group: only can read, do not change the parameters.

When some parameters in converter is in operation, can't not be changed; Some parameters of the frequency converter in any state, cannot be changed;Change function code parameters, but also pay attention to the range of parameters, units, and related instructions.

In addition, because the EEPROM is stored frequently, the service life of the block can reduce the the life of the block EPROM, so some function codes under the mode of communication, do not need to be stored, just change the value of RAM.If it is P group of parameters, in order to realize the function, as long as putting this function code address high F into 0 can be achieved.If it is C group of parameters, in order to realize the function, as long as putting the function code the address of high A into 4 can be achieved.Corresponding function codes are shown as the following address: the high byte: 00 ~ 0F (P group), 40 ~ 4F(group B) low byte: 00 to FF

Such as:

Function code P3.12 is not stored in the EEPROM,The address is expressed as 030C；Function code C0-05 is not stored in the EEPROM,The address is expressed as 4005； The address representation can only do writing RAM，can't do reading action,when reading,it is invalid address.

Stopping/starting parameters:

Parameter address	Parameter description
1000	Communication Setting value（-10000~10000）（decimal system）
1001	Operating frequency
1002	Bus voltage
1003	output voltage
1004	output current
1005	output power
1006	output torque
1007	running velocity

Attention：

Communication setting value is relative percentage, 10000 corresponds to 100.00% and - 10000-100.00%.The frequency of dimensional data, the percentage is relative to the percentage of maximum frequency (P0.12);For torque dimension data, the percentage is C0.03

Control command input to the converter:（write-only）

The command word	Command function
2000	0001：Running forward
	0002：Reverse running
	0003：Forward point move
	0004：Reversal point move
	0005：Free downtime
	0006：Slowdown stop
	0007：Fault reset

Read the inverter state: (read-only)

Status word address	Status word function
3000	0001：Running forward
	0002：Reverse running
	0003：closing down

Parameters lock password check: (if return for 8888H,it indicates that the password check through)

Password address	The content of the input password
1F00	*****

Frequency inverter fault description:

Inverter fault address	Inverter fault information
8000	0: No fault 1: Inverter unit protection 2: Over-current during acceleration 3: Over-current during deceleration 4: Over-current at constant speed 5: Over-voltage during acceleration 6: Over-voltage during deceleration 7: Over-voltage at constant speed 8: Control power failure 9: Undervoltage 10: Inverter overload

	11: Motor overload 12: Input phase loss 14: Module overheat 17: Contactor fault 18: Current detection fault 19: Motor auto-tuning fault 20: Encoder/PG card faulty 22: Inverter hardware fault 23: Short circuit to ground 25: Output phase loss 37: Speed is opposite to running direction 38: Speed deviation too large 40: Fast current limit overtime 41: Brake open fault 42: Brake fault 43: Long time low speed running fault 44: Both Forward and Reverse operate enabled 45: Joystick no becoming 0 fault 48 Communication abnormal 49: EEPROM read write abnormal 50: External input fault

Communication fault address	Fault functional description
8001	0000：No fault 0001：Password error 0002：The command code error 0003：CRC Checking error 0004：Disabled address 0005：Disabled parameter 0006：correcting parameter is invalid 0007：System is locked 0008：Block is EEPROM operation

PD group Communication parameters description

PD.00	Baud rate	Default	0005
	Setting range	Unit's digit：MODUBS Baud rate 5：9600BPS	

		6：19200BPS 7：38400BPS 8：57600BPS 9：115200BPS

This parameter is used to set data transfer rate between the PC and inverter. Notice that setting the baud rate of upper machine and converter must be consistent, otherwise, the communication can't carry on.The faster the baud rate, the greater the communication.

PD.01	The data format	The factory value	0
	setting range	0：No check：The data format<8,N,2> 1：Even-parity：The data format<8,E,1> 2：Odd parity check：The data format<8,O,1> 3：No check：The data format<8-N-1>	

PC and data format set by the frequency converter must be consistent, otherwise, the communication can't carry on.

PD.02	The machine address	The factory value	1
	setting range	1~247，0 is the broadcast address	

When the machine address is set to 0, namely for the broadcast address, realize PC broadcasting functions.

The machine address has uniqueness (except the broadcast address), which is to achieve the basis of upper machine and inverter peer-to-peer communications.。

PD.03	Response delay	The factory value	0
	setting range	0~20ms	

Response delay: refers to the frequency converter data to accept the end up to a upper machine to send data in the middle of the interval of time. If the response time delay is less than the system processing time, the response time delay will be subject to system processing time, processing time, such as response time delay is longer than system after processing the data, the system will delay waiting, until the response delay time to up to a upper machine to send data.

PD.04	Communication timeout	The factory value	0.0 s
	setting range	0.0 s（invalid）	

		0.1~60.0s

When the function code is set to 0.0 s, communication timeout parameter is invalid.

When the function code is set to valid values, if a communication and the interval time of the next communication beyond the communication timeout, system will be submitted to the communication failure error (CE).Usually, it is set into is invalid. If in the continuous communication system times parameter is set , you can monitor the communication status.