ETETA
ELECTRIC

INSTRUCTION MANUAL

MA510 SERIES

200V Class
0.75~55 KW
1~75 HP

380V Class
0.75~185 KW
1~250 HP

Preface

The MA510 product is an inverter designed to control a three-phase induction motor. Please read this manual carefully to ensure correct operation, safety and to become familiar with the inverter functions.

The MA510 inverter is an electrical / electronic product and must be installed and handled by qualified service personnel.

Improper handling may result in incorrect operation, shorter life cycle, or failure of this product as well as the motor.

All MA510 documentation is subject to change without notice.

Available Documentation:

1. MA510 Start-up and Installation Manual
2. MA10 Instruction Manual

Read this instruction manual thoroughly before proceeding with installation, connections(wiring), operation, or maintenance and inspection.

Ensure you have sound knowledge of the inverter and familiarize yourself with all safety information and precautions before proceeding to operate the inverter.

Please pay close attention to the safety precautions indicated by the warning  and caution  symbol.

 **Warning**	Failure to ignore the information indicated by the warning symbol may result in death or serious injury.
 **Caution**	Failure to ignore the information indicated by the caution symbol may result in minor or moderate injury and/or substantial property damage.

Chapter 1 Safety Precautions

1.1 Before Supplying Power to the Inverter

Warning

The main circuit must be correctly wired. For single phase supply use input terminals (R/L1, T/L3) and for three phase supply use input terminals (R/L1, S/L2, T/L3). Terminals U/T1, V/T2, W/T3 must only be used to connect the motor. Connecting the input supply to any of the U/T1, V/T2 or W/T3 terminals will cause damage to the inverter.

Caution

To avoid the front cover from disengaging or other physical damage, do not carry the inverter by its cover. Support the unit by its heat sink when transporting. Improper handling can damage the inverter or injure personnel, and should be avoided.

To avoid the risk of fire, do not install the inverter on or near flammable objects. Install on nonflammable objects such as metal surfaces.

If several inverters are placed inside the same control panel, provide adequate ventilation to maintain the temperature below 40°C/104°F (50°C/122°F without a dust cover) to avoid overheating or fire.

When removing or installing the digital operator, turn off the power first, and then follow the instructions in this manual to avoid operator error or loss of display caused by faulty connections.

Warning

This product is sold subject to IEC 61800-3. In a domestic environment this product may cause radio interference in which case the user may need to apply corrective measures .

Over temperature protection function on motor is disabled.

1.2 Wiring

Warning

Always turn OFF the power supply before attempting inverter installation and wiring of the user terminals.

Wiring must be performed by a qualified personnel / certified electrician.

Make sure the inverter is properly grounded. (200V Class: Grounding impedance shall be less than 100Ω. 400V Class: Grounding impedance shall be less than 10Ω.) It is required to disconnect the ground wire in the control board to avoid the sudden surge causing damage on electronic parts if it is improperly grounded.

Please check and test emergency stop circuits after wiring. (Installer is responsible for the correct wiring.)

Never touch any of the input or output power lines directly or allow any input or output power lines to come in contact with the inverter case.

Do not perform a dielectric voltage withstand test (megger) on the inverter or this will result in inverter damage to the semiconductor components.

Caution

The line voltage applied must comply with the inverter's specified input voltage.

Connect braking resistor and braking unit to the designated terminals.

Do not connect a braking resistor directly to the DC terminals P(+) and N(-), otherwise fire may result.

Use wire gauge recommendations and torque specifications.

Never connect input power to the inverter output terminals U/T1, V/T2, W/T3.

Do not connect a contactor or switch in series with the inverter and the motor.

Do not connect a power factor correction capacitor or surge suppressor to the inverter output。

Ensure the interference generated by the inverter and motor does not affect peripheral devices.

1.3 Before Operation

Warning

Reduce the carrier frequency (parameter P0-14) If the cable from the inverter to the motor is over 80 ft (25m). A high-frequency current can be generated by stray capacitance between the cables and result in an overcurrent trip of the inverter, an increase in leakage current, or an inaccurate current readout.

Be sure to install all covers before turning on power. Do not remove any of the covers while power to the inverter is on, otherwise electric shock may occur.

Do not operate switches with wet hands, otherwise electric shock may result.

Do not touch inverter terminals when energized even if inverter has stopped, otherwise electric shock may result.

1.4 Parameter Setting

Caution

Do not connect a load to the motor while performing an auto-tune.

Make sure the motor can freely run and there is sufficient space around the motor when performing a rotational auto-tune.

1.5 Operation

Warning

□ Do not connect or disconnect the motor during operation. This will cause the inverter to trip and may cause damage to the inverter.

□ Operations may start suddenly if an alarm or fault is reset with a run command active. Confirm that no run command is active upon resetting the alarm or fault, otherwise accidents may occur.

□ If automatic restart after power recovery (parameter P1-14) is enabled, the inverter will start automatically after power is restored.

□ Make sure it is safe to operate the inverter and motor before performing a rotational auto-tune.

□ Do not check signals on circuit boards while the inverter is running.

□ After the power is turned off, the cooling fan may continue to run for some time.

Caution

Do not touch heat-generating components such as heat sinks and braking resistors.

Carefully check the performance of motor or machine before operating at high speed, otherwise Injury may result.

Note the parameter settings related to the braking unit when applicable.

Do not use the inverter braking function for mechanical holding, otherwise injury may result.

Do not check signals on circuit boards while the inverter is running.

1.6 Maintenance, Inspection and Replacement

Warning

Wait a minimum of 5 minutes after power has been turned OFF before starting an inspection. Also confirm that the charge light is OFF and that the DC bus voltage has dropped below 25Vdc. Wait a minimum of 15 minutes while inverter is over 20HP.

Never touch high voltage terminals in the inverter.

Make sure power to the inverter is disconnected before disassembling the inverter.

Only authorized personnel should perform maintenance, inspection, and replacement operations. (Take off metal jewelry such as watches and rings and use insulated tools.)

Caution

The Inverter can be used in an environment with a temperature range from 14° - 104°F (-10 ~ 40°C) and relative humidity of 95% non-condensing.

The inverter must be operated in a dust, gas, mist and moisture free environment.

1.7 Disposal of the Inverter

Caution

Please dispose of this unit with care as an industrial waste and according to your required local regulations.

The capacitors of inverter main circuit and printed circuit board are considered as hazardous waste and must not be burned.

The Plastic enclosure and parts of the inverter such as the top cover board will release harmful gases if burned.

Chapter 2 Model Description

2.1 Nameplate Data

It is essential to verify the MA510 inverter nameplate and make sure that the MA510 inverter has the correct rating so it can be used in your application with the proper sized AC motor.

Unpack the MA510 inverter and check the following:

(1) The MA510 inverter and quick setting guide are contained in the package.

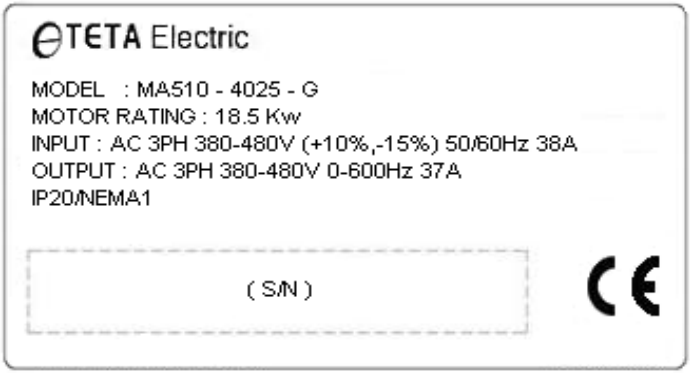
(2) The MA510 inverter has not been damaged during transportation there should be no dents or parts missing.

(3) The MA510 inverter is the type you ordered. You can check the type and specifications on the main nameplate.

(4) Check that the input voltage range meets the input power requirements.

(5) Ensure that the motor HP matches the motor rating of the inverter.

Model Identification



MA510 - 4 025

MA510 series

Voltage Rating:

2 : 220 v

4 : 380 v

Motor Rating:

001 : 1HP

025 : 25HP

050 : 50HP

2.2 Inverter Models-Motor Power Rating

Model Number	Input Voltage	Rated Power (kw)	Rated input current (A)	Rated output current (A)	Compatible Motor (HP)
MA510-2001	3-phase 220V -+ 15%	0.75	5	4.5	1
MA510-2002		1.5	7.7	7	2
MA510-2003		2.2	11	10	3
MA510-2005		4	17	16	5
MA510-2008		5.5	21	20	7.5
MA510-2010		7.5	31	30	10
MA510-2015		11	43	42	15
MA510-2020		15	56	55	20
MA510-2025		18.5	71	70	25
MA510-2030		22	81	80	30
MA510-2040		30	112	110	40
MA510-2050		37	132	130	50
MA510-2060		45	163	160	60
MA510-2075		55	181	190	75
MA510-4001	3-phase 380V -+ 15%	0.75	3.4	2.5	1
MA510-4002		1.5	5	3.7	2
MA510-4003		2.2	5.8	5	3
MA510-4005		4	10	9	5
MA510-4008		5.5	15	13	7.5
MA510-4010		7.5	20	17	10
MA510-4015		11	26	25	15
MA510-4020		15	35	32	20
MA510-4025		18.5	38	37	25
MA510-4030		22	46	45	30

Model Number	Input Voltage	Rated Power	Rated input current	Rated output current	Compatible Motor
MA510-4040	3-phase 380V -+ 15%	30	62	60	40
MA510-4050		37	76	75	50
MA510-4060		45	90	90	60
MA510-4075		55	105	110	75
MA510-4100		75	140	150	100
MA510-4125		90	160	176	125
MA510-4150		110	210	210	150
MA510-4175		132	240	250	175
MA510-4215		160	290	300	215
MA510-4250		185	330	340	250

Chapter 3 Environment and Installation

3.1 Environment

The installing environment of the inverter directly affects its functions and the service life. Therefore, the installation environment must meet the following conditions:

Applicable environment	
Operating Temperature	(-10~40° C) (With the dust-protection cover open, the applicable operation temperature (-10~50° C) (full load) can reach maximum of 60° C) . But it is required to de-rating 2% of the rated current for increasing one degree. For multiple inverters installed side by side in the plate, please pay attention to the placement to facilitate heat
Storage Temperature	(-20~70C)
Humidity	RH should be 5% to 95%, free of condensation or water droplets.
Shock	Maximum acceleration:1.2G (12m/s2), from 49.84 to 150 Hz Displacement amplitude : 0.3mm (peak value), from 10 to 49.84 Hz

3.2 Installation

Installation site

The product shall be installed in the environment for easy operation, avoiding to be exposed to the following environments:

□ Avoid direct sunlight

□ Avoid rain drops or wet environment

□ Avoid oil mist and salt erosion

□ Avoid corrosive liquid and gas

□ Avoid dust, lint fibers, and small metal filings.

□ Avoid electromagnetic interference (soldering machine, power machine)

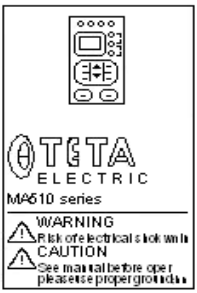
□ Keep away from radioactive and flammable materials

□ Avoid vibration (punch). Please add a vibration-proof pad to reduce vibration if it can not be avoided

3.2.1 Installation Spaces

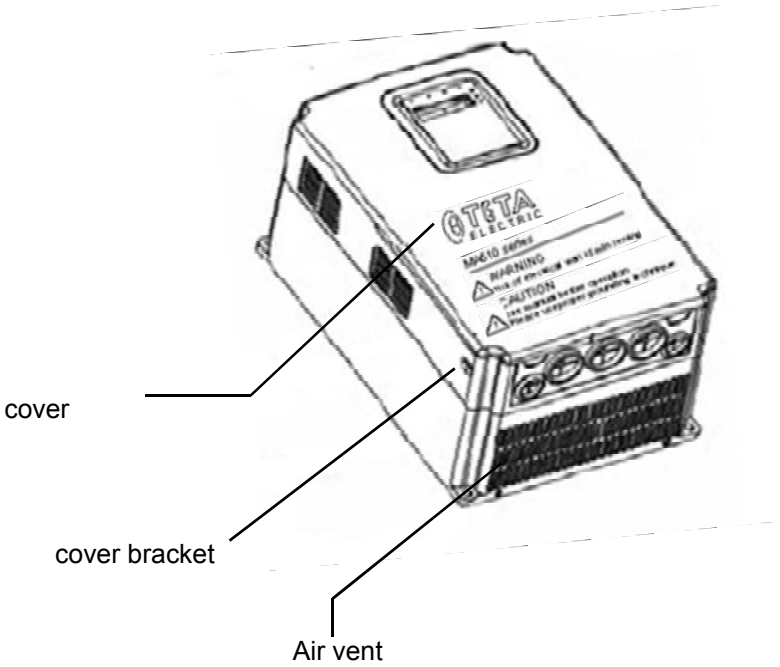
Please install the MA510 inverter in vertical direction, leaving enough space to ensure the cooling effect, shown in below Figure. Avoid the upside-down or horizontal installation.

The temperature of inverter's radiator cooling may reach 90 ° C in operation. Therefore, the contact surface for the inverter installation shall be made by the hightemperature-resistant material.
When the inverter is operating in the power distribution box, the environment must be ventilated and the environmental temperature must be less than +40 ° C.

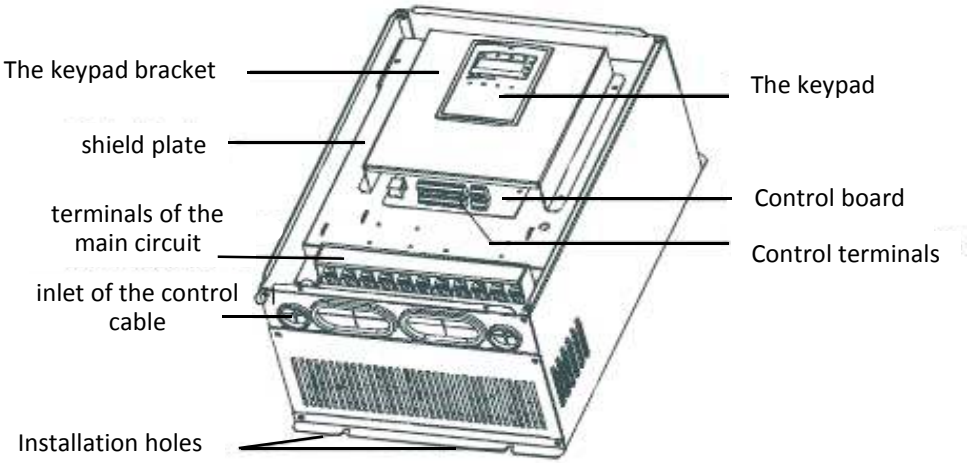


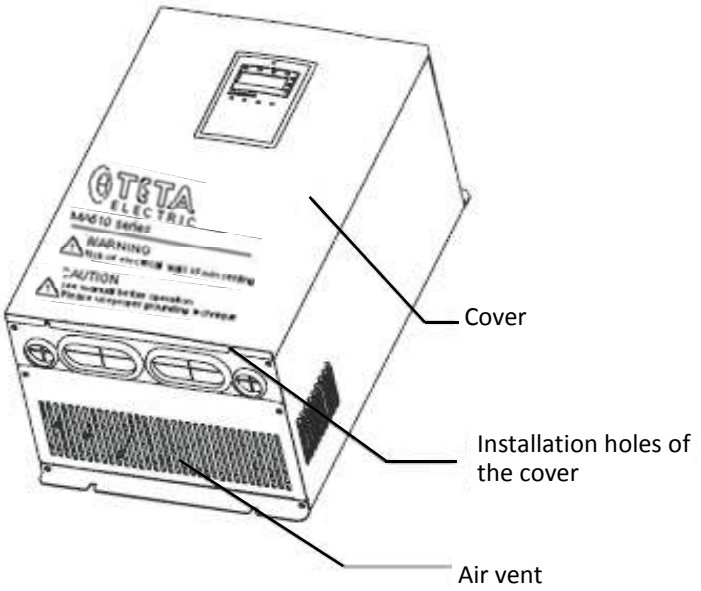
Up / Down	please leave 150mm
Left Right side	for the inverter capacity of 18.5kW (including the smaller Kw),the minimum width recommended is 100mm. for the inverter capacity of 22 kW (including the higher Kw), the minimum width recommended is 200mm.

3.2.2 External View and part description



for capacities below 25 HP





for capacities above(and include) 25 HP

3.2.3 Unpacking inspection

Caution

Don't install or use any inverter that is damaged or has fault parts, otherwise physical injury may occur.

check the following items after unpacking the inverter

1. Inspect the entire exterior of the inverter and motor to ensure there are no scratches or other damage caused by the transportation
2. Ensure there is operation manual in the packing box
3. Inspect the name plate and ensure it is what you ordered.
4. Ensure the optional parts are what you need if you have ordered ones.

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

3.2.4 Disassemble and installation

Caution

The dropping of the main part may cause physical injury .

The inverter is fixed on a non-flammable wall such as metal and away from heat and flammable materials to avoid the fire.

If more than two drives are installed in a cabinet , the temperature should be lower than 40 by means of cooling fan. Overheat may cause fire or damage to the drive.

Warning

Only qualified people are allowed to operate on the drive device/system. Ignoring the instructions in "warning" may cause serious physical injury or death or property loss.

1. After the power is cut off, while the “CHARGE” indicator of the inverter is still on, it means the discharge of the capacitor has not been completed. Don’t touch the circuit or replace components at this time.
2. Never wire or disassemble/assemble internal connectors of inverter when the power is supplied.
3. Prohibit connecting U,V and W of inverter output terminals to AC power.
4. Terminal E of the inverter must be well grounded.
5. Since semiconductor components are easily damaged by high voltage, do not carry out the high voltage withstand test on internal components of MA510 inverter.
6. CMOS IC of the inverter control board is easily affected and damaged by static electricity, thus, do not touch the control board.
7. connect the input power lines tightly and permanently.

3.3 Inverter Wiring

3.3.1 Wiring Peripheral Power Devices

Examples for wiring the periphery devices of MA510 are shown in the following:

Power supply

Circuit breaker

Electromagnetic contactor

AC reactor

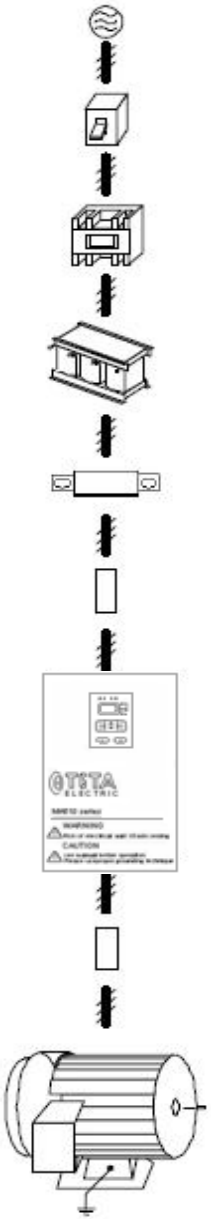
Fast acting fuse

Input noise filter

Inverter

Zero-phase noise filter

3-phase induction motor



Electromagnetic contactor : It can not add for general use. However for the application requiring external sequence control or automatic restart function power cut, is required. Please avoid using it for the start/stop control of the inverter as possible.

AC reactor : In case of further improving the power factor or suppress the external surge , an AC reactor can be additionally equipped.

Fast acting fuse: To protect interface devices.

Input noise filter: The surrounding device may be disturbed when inverter is working.EMC filter can minimize the interface

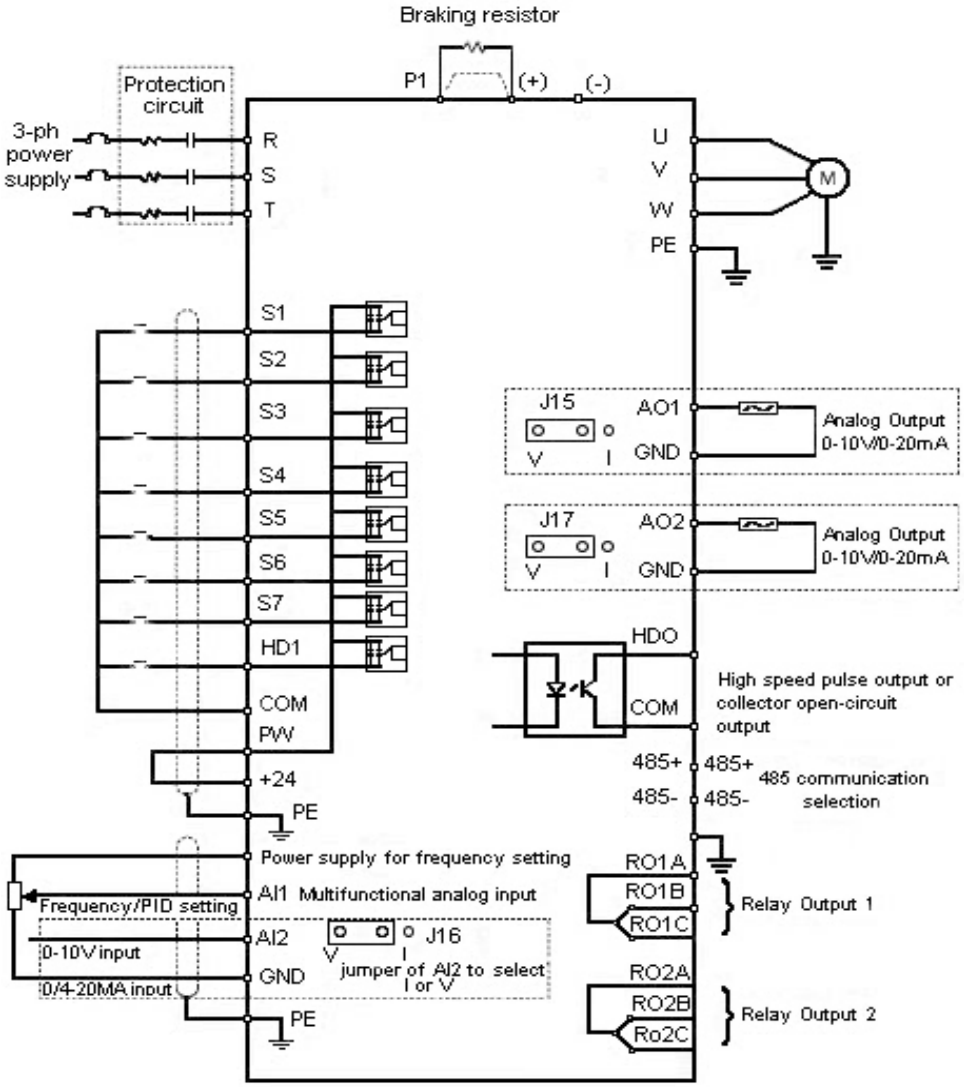
Inverter : Terminal R,S,T at input side have no phase requirement, thus they can be arbitrarily exchanged. Terminal E must be well grounded

Zero-phase noise filter : Adding this at the output side of the inverter can be decrease the radiated interface and induced noise.

Motor : If an inverter drives multiple motors, the rated current of the inverter must be greater than the total current that all motors operate at the same time. Motor and inverter must be grounded respectively.

3.3.2 General Wiring Diagram

The following is the standard wiring diagram for the MA510 inverter.Locations and symbols of the wiring terminal block might be different due to different models.



For Inverters≥ 18.5 Kw

Only the master circuit of 380 V 1~20HP (included) or models of lower capacity with built-in braking resistor provide terminal PB.The braking resistor can be connected directly between (+) and PB.

The wire length of the braking resistor should be less than 5m.

Please pay attention to safty prevention and smooth ventilation when installing braking resistors because the temperature will rise for the heat releasing.

The (+) and (-) terminals of the braking units corresponds to the (+) and (-) terminals of the inverter when the external braking unit is connected.

The wiring length between the (+) and (-) terminals of the inerter and the (+), (-) of the braking units should not be more than 5m and the distributing length among BR1 and BR2 and the braking resistor terminals should not be more than 10m.

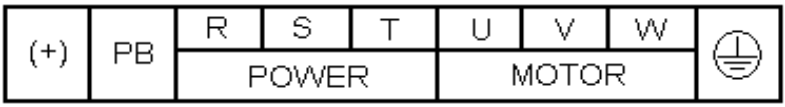
Caution
Be sure that the electric polarity of (+) (-) terminals is right; it is not allowed to connect (+) with (-) terminals directly , otherwise damage or fire may occur.

3.3.3 Terminal description

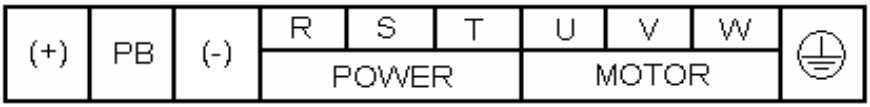
Major Circuit Terminals

Terminal	function discription
R S T	Terminals of 3phase AC input
(+) (-)	spare terminals of external braking unit
(+) PB	spare terminals of external braking resistor
P1 (+)	spare terminals of external DC reactor
(-)	terminal of negative DC bus
(+)	terminal of positive DC bus
U V W	Terminals of 3phase AC output
	terminal of ground

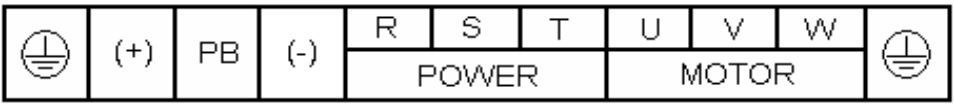
2 ~ 3 HP , 380 V



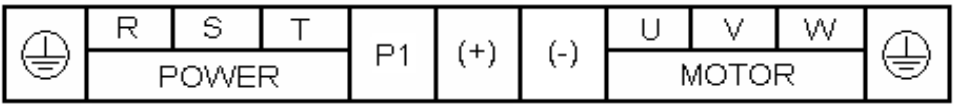
5 ~ 7.5 HP , 220 / 380 V



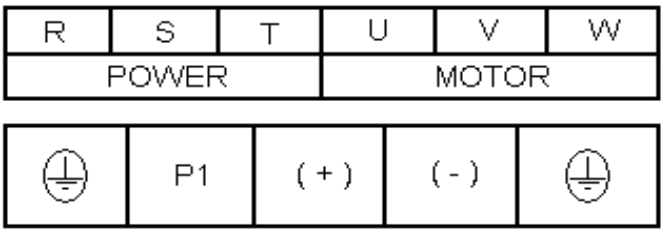
10 ~ 20 HP , 380 V / 10HP 220 V



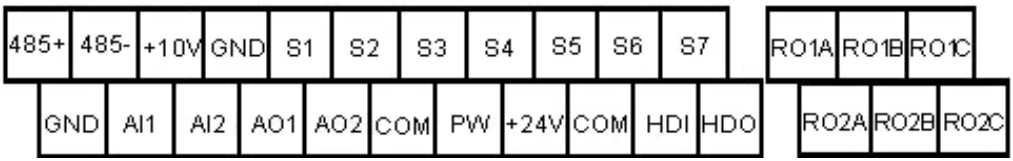
25 ~ 150 HP , 380 V / 15 ~ 20 HP 220V



175 ~ 250 HP , 380 V



Control Circuit Terminals

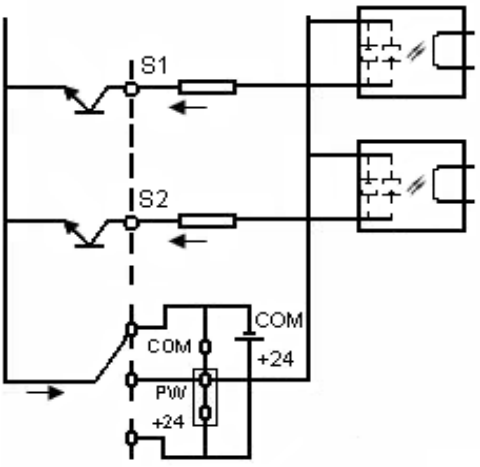


Type	Terminal	Terminal function	Signal level
Digital Input	S1~S7	ON-OFF signal input, optical coupling with PW and COM	24VDC,8mAoptocoupler isolation (maximum voltage of 30Vdc, input impedance of 3.3kΩ)
24V Power supply	(+24v)	Digital signal SOURCE sharing point (PW switched to SOURCE)	±15%, Maximum output current: 150mA (the sum of all load)
	COM	Common terminal of Digital signals (PW switched to SINK)	
External power supply	PW**	(+24v) terminal is connected to PW terminal as default*	default (+24v)
Pulse input signal	HDI	Pulse or ON-OFFinput ,optical coupling with PW and COM	frequency range:0~50kHz Input voltage:9~30V Input impedence:1.1KΩ
Analog input signal	AI1	Voltage speed command	(-10v~+10v)Input impedance:20KΩ
	AI2	Multi-function analog input terminal switched by J16	From 0V ~ +10V / 0 ~ 20mA Input impedance: 10KΩ(voltage) / 250Ω(current)
	(+10v)	Power for speed setting	
	GND	Analog signals sharing terminal	
Pulse output signal	HDO	high speed pulse or open collector output. The corresponding common terminal is COM	Output frequency range: 0 ~ 50kHz
Analog output signal	AO1	analog output terminals above 5HP: AO1 by J15 and AO2 by J17 2~3HP: AO1 by J15 and AO2 by J14 can be selected	Output range : Voltage (0 ~ 10v) current (0 ~ 20mA)
	AO2		
RS-485 port	+485	RS-485 / MODBUS***	Opto-coupler isolation, differential input and output
	-485		

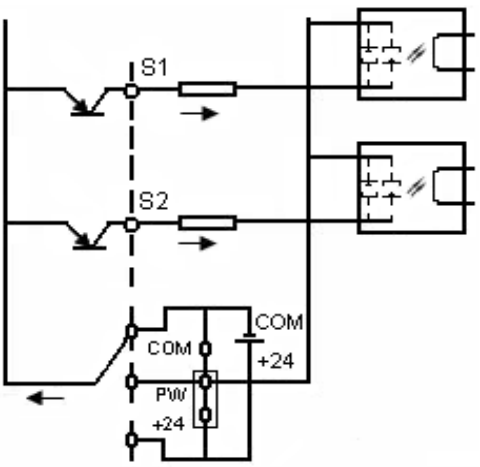
Type	Terminal	Terminal function	Signal level
Relay Output	RO1A	RO1 common	Contact capacity : AC 250V / 3A DC 30V / 1A
	RO1B	RO1 normally close(NC)	
	RO1C	RO1 normally open(NO)	
	RO2A	RO2 common	
	RO2B	RO2 normally close(NC)	
	RO2C	RO2 normally open(NO)	

*If the external power supply is needed , disconnect (+24v) with PW terminal and connect external power supply

**Using of PW to set sink or source mode



sink mode



source mode

***Please use twisted pairs and shield cables on the standard communication port

Jumper	Description
J2 , J4	It is porhibited to be connected together , otherwise it will cause inverter malufanction.
J16	switch between 0~10v and 0~20mA Input V connect to GND means voltage input I connect to GND means current input
J15 and J17 above 5HP	switch between 0~10v and 0~20mA Output V connect to GND means voltage output I connect to GND means current output
J14 and J15 2HP~3HP	switch between 0~10v and 0~20mA Output V connect to GND means voltage output I connect to GND means current output
SW1	Switch of terminal resistor for RS-485 communication , dialing to ON means connecting to terminal resistor while dialing to OFF means disconnecting to terminal resistor.(only valid for 5HP and above)
J7	RS-485 communication jumper
J17 and J18 2HP~3HP	Switch of terminal resistor for RS-485 communication. Jumper enable: connect terminal resistor Jumper disable: Disconnect terminal resistor

3.3.4 Wiring Precautions

For the external wiring of the control terminal, please attention to the followings:

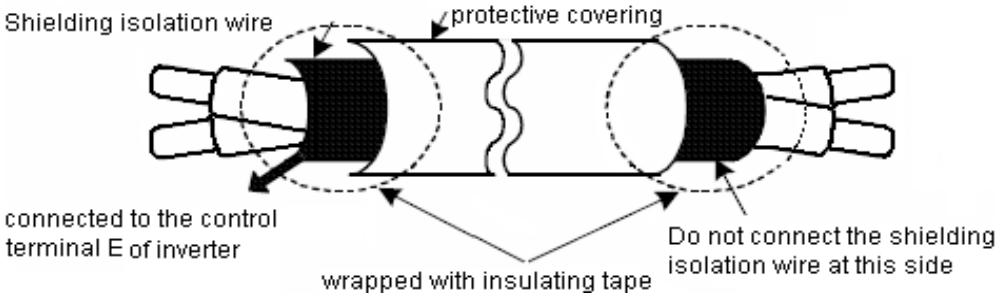
Use shield or twisted-pair cables to connect control terminals.

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

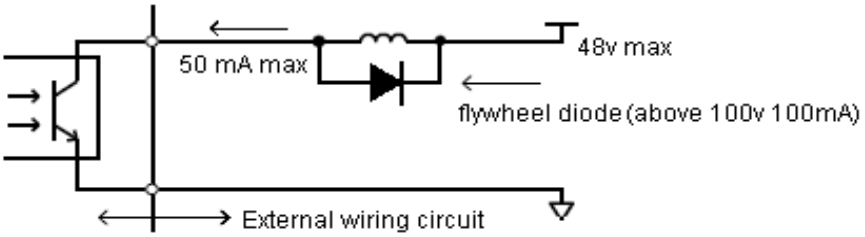
Contact output terminal R1A, R1B, R1C (or R2A,R2B, R2C) must be isolated from terminal 1～7, A01, A02, GND, HDO, COM, +10V, AI1, AI2, HD1 when wiring.

In order to avoid the electrical noise interference, the control circuit wiring must adopt shielding isolation twisted wire, please refer to the following diagram; the wiring distance should not exceed 50m.

Connect the ground terminal(PE) with shield wire.



When connecting the output contact of the multi-function optocoupler to the relay, it is necessary to add flywheel diode in parallel to both sides of the relay coil, as shown in the following diagram.



For the wiring of the main circuit terminal, please attention to the followings:

It doesn't need to consider the phase sequence for input power R, S, T.

Prohibit connecting U,V and W of inverter output terminals to AC power.

Inverter output terminal U, V and W are connected to the motor terminal U, V, W. If the inverter executes forward rotation instruction while the motor rotates in reversal direction, simply exchange any two wires of U, V, W is enough.

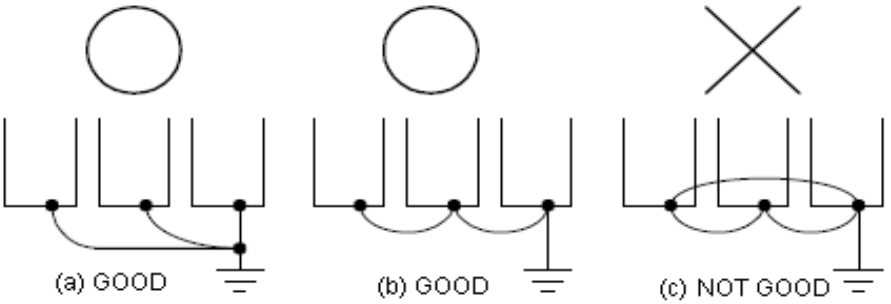
Never connect the inverter output terminal to the capacitor or LC,RC noise filter of improving the power factor.

Grounding terminal (E) is grounded to the earth by the third type grounding way. (grounding resistance of 100Ω or less)

Inverter grounding wire can not be grounded together with high - current loads such as welding machines and high-powered motors and so on. They must be grounded respectively.

Grounding wire size follows the specification of electrical equipment technical basisThe shorter grounding wire is, the better it is.

If several inverters are grounded jointly ， please refer to the following diagrams for grounding. Do not form a circuit in grounding.



Determine wire size:

When choosing wire, a consideration of the voltage drop caused by the wire is a must.

Voltage drop is calculated as shown below. In general, the voltage drop shall be controlled below 2% of the rated voltage. Voltage drop between wires (V) = × wire resistance (Ω / km) × wiring length (m) × current (A) × 10-3

AC reactor for parallel power coordination:

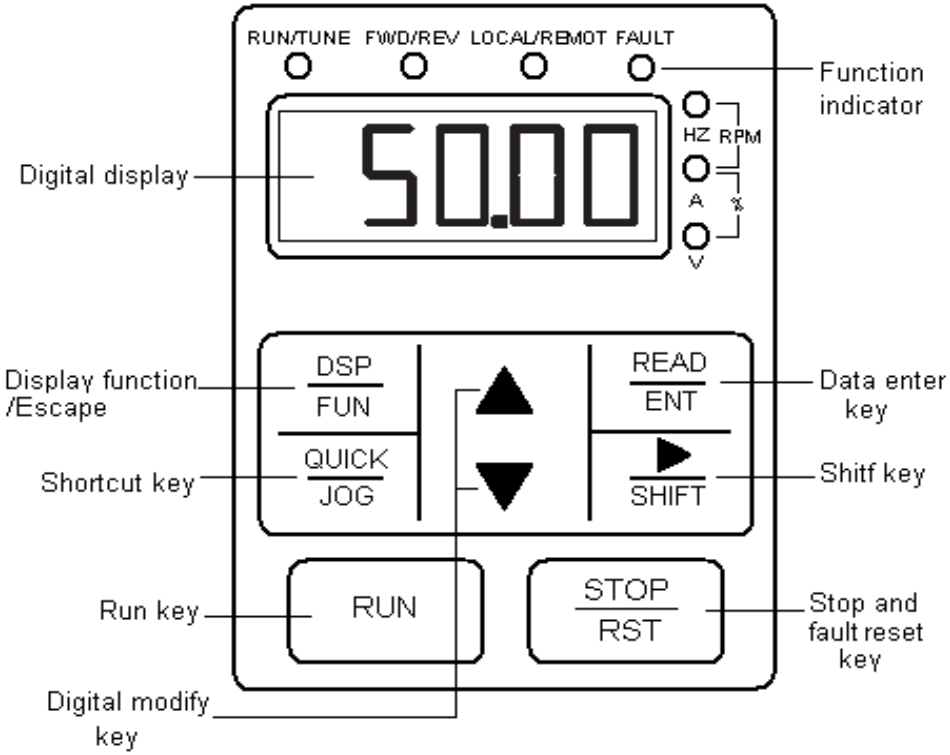
If the capacity exceeds 600kVA, please add AC reactor to the input side of the inverter in series. AC power can be used for power coordination and power factor improvement.

Wiring length between the inverter and the motor:

If the total length between the inverter and the motor, the inverter itself and other peripheral devices will be affected because the high-frequency carrier frequency(the IGBT ON / OFF switching frequency) of the inverter will increase the leakage current between wiring and the ground. As a result, if the wiring length between the inverter and the motor is very long, please modestly reduce the carrier frequency, as shown below.

Wiring distance between the inverter and the motor	＜30m	30m ~ 50m	50m~100m	≥ 100m
Allowable carrier frequency (set values of P0-14)	15kHz(max)	10kHz(max)	5kHz(max)	2kHz(max)

Chapter 4 Keypad and Programming Functions



Key	Name	Function Description
DSP / FUN	Display function/Escape	Enter or escape from the first level menu
READ / ENT	Read enter key	Progressively enter menu and confirm parameter
▲	Digital modify key	Progressively increase data or function codes
▼	Digital modify key	Progressively decrease data or function codes
▶ / SHIFT	shift key	In parameter setting mode , press this button to select the bit to be modified in in other modes cyclically displays parameters by right shift

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

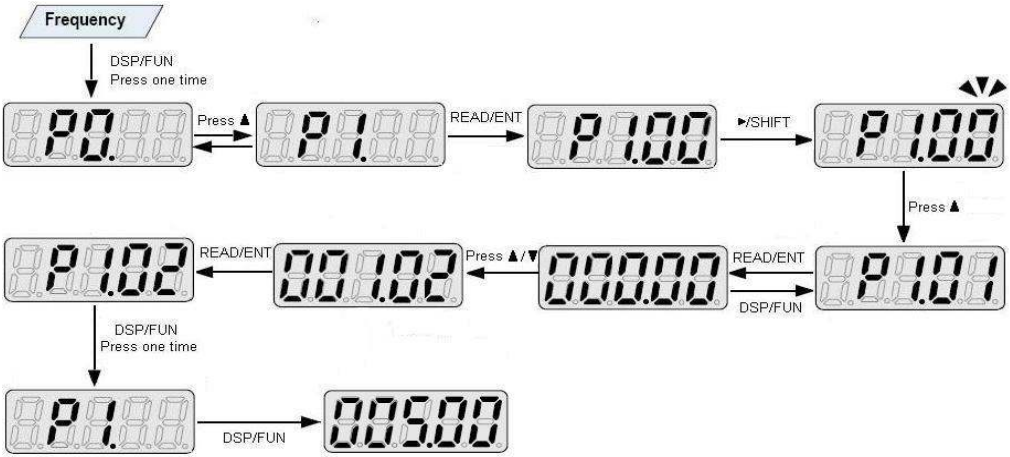
Function indicator	Description
RUN/TUNE	Extinguished : Stop status Flickering : Parameter auto tuning status Light on : Operating status
FWD/REV	Extinguished : Forward operation Light on : Reverse operation
LOCAL/REMOT	Extinguished : Keypad control Flickering : Terminal control Light on : Communication control

Function indicator	Description
FAULT ○	Extinguished : Normal operation status Flickering : Over load pre-warning status Light on : Fault of the inverter
HZ	Frequency unit
A	Current Unit
V	Voltage unit
RPM	Rotating speed unit
%	Percentage

4.4.1 Keypad Operation Description

4.4.1.1 Parameter setting

Press either the PRG/ESC or the DATA/ENT can return to the second - level menu from the third-level menu. The difference is: pressing DATA/ENT will save the set parameters in to the control panel,and then return to the second-level menu with shifting to the next function code automatically.While pressing PRG/ESC will return to the second-level menu without saving parameters,and keep staying at the current function code.



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

this function is not modifiable parameter, such as actual detected parameter operation records and so on.

this function is not modifiable in running mode.

Short cut menu QUICK/JOG

Short cut menu provides a quick way to view and modify function parameters. set the P7.03 to 4,then press QUICK/JOG , the inverter will search the which is different from the factory setting , save these data beyond 32,parameter it can not display the overlength part . Press QUICK/JOG will be shortcut debugging mode. If the QUICK/JOG displays "NULLP",it means the parameters are the same with the factory setting.

If want to return to last display , press QUICK/JOG

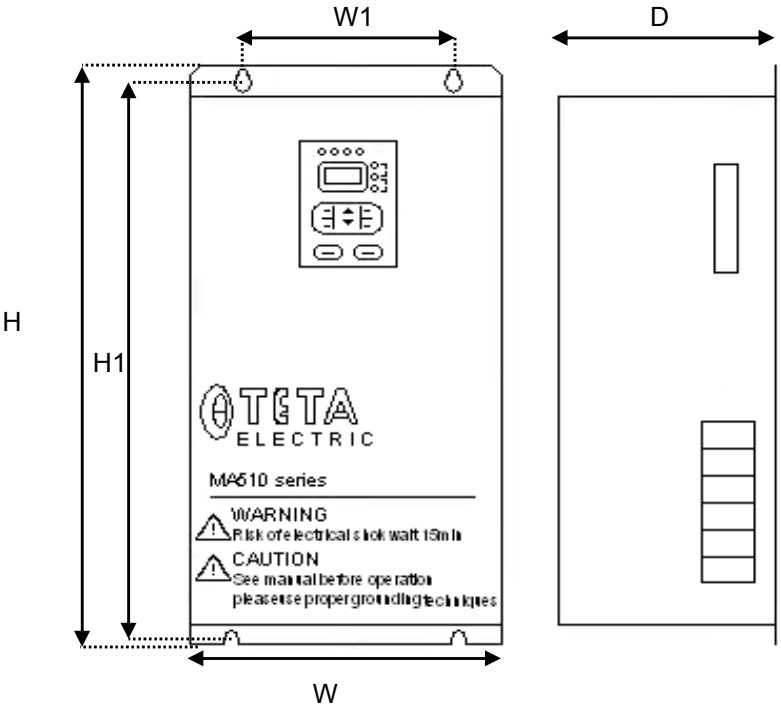
Fault reset

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

Chapter 5 Overall Dimension drawing

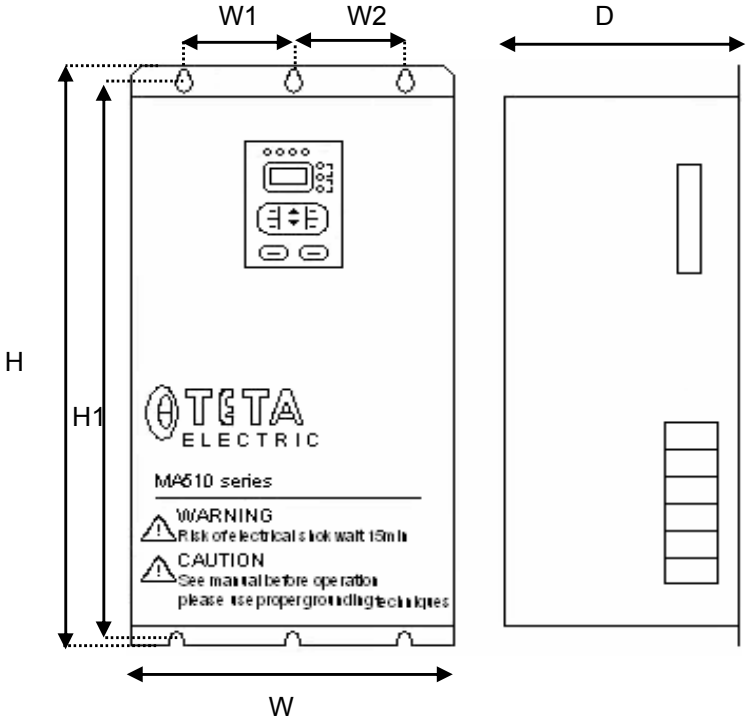
Standard model

(a) 380V : 20HP ~ 40HP



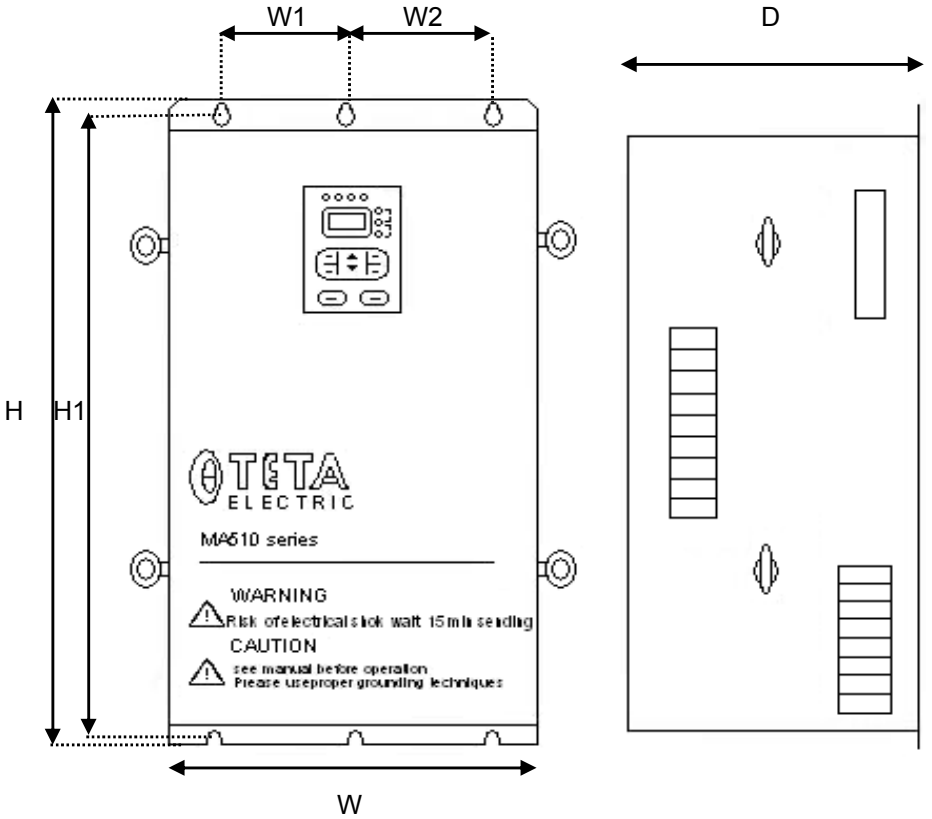
Inverter Model	Dimension (mm)					
	W	H	D	W1	H1	GW(kg)
MA510 4025	290	475	215	173	460	12
MA510 4030	290	475	215	173	460	12
MA510 4040	290	475	215	173	460	12

(b) 380V : 50HP ~ 75HP



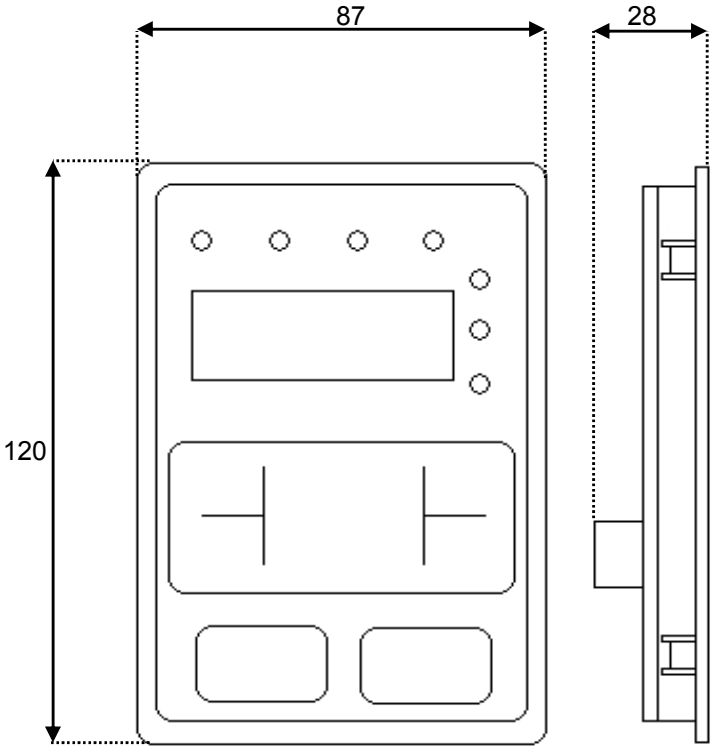
Inverter Model	Dimension (mm)					
	W	H	D	W1/W2	H1	GW(kg)
MA510 4050	375	585	270	115	555	36
MA510 4060	375	585	270	115	555	36
MA510 4075	375	585	270	115	555	36

(c) 380V : 100HP ~ 150HP



Inverter Model	Dimension (mm)					
	W	H	D	W1/W2	H1	GW(kg)
MA510 4100	460	755	330	160	735	48
MA510 4125	460	755	330	160	735	48
MA510 4150	460	755	330	160	735	50

Keypad Dimension



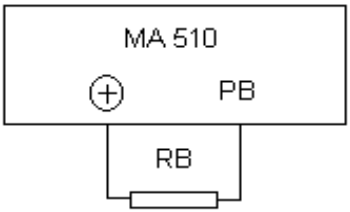
Chapter 6 Braking resistor

Model Number	Input Voltage	Braking Resistor	used number	Braking Unit	used number
MA510-2002	3-phase 220V -+ 15%	260W/130Ω	1	----	0
MA510-2003		260W/80Ω	1	----	0
MA510-2005		400W/48Ω	1	----	0
MA510-2008		550W/35Ω	1	----	0
MA510-2010		780W/26Ω	1	----	0
MA510-2015		1100W/17Ω	1	----	0
MA510-2020		1800W/13Ω	1	----	0
MA510-2025		2000W/10Ω	1	055-2	1
MA510-2030		2500W/8Ω	1		1
MA510-2040		1800W/13Ω	2		2
MA510-2050		2000W/10Ω	2		2
MA510-2060		2500W/8Ω	2		2
MA510-2075		3000W/6.5Ω	2		2
MA510-4002	3-phase 380V -+ 15%	260W/400Ω	1	----	0
MA510-4003		390W/150Ω	1	----	0
MA510-4005		390W/150Ω	1	----	0
MA510-4008		520W/100Ω	1	----	0
MA510-4010		1040W/50Ω	1	----	0
MA510-4015		1040W/50Ω	1	----	0
MA510-4020		1560W/40Ω	1	----	0
MA510-4025		6000W/20Ω	1	055-4	1
MA510-4030		6000W/20Ω	1		1
MA510-4040		6000W/20Ω	1		1
MA510-4050		9600W/13.6Ω	1		1
MA510-4060		9600W/13.6Ω	1		1
MA510-4075		9600W/13.6Ω	1		1

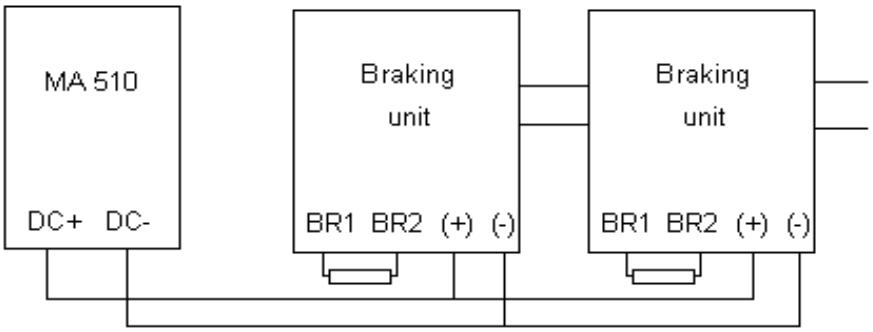
Model Number	Input Voltage	Rated Power	Rated input current	Rated output current	Compatible Motor
MA510-4100		9600W/13.6Ω	2	055-4	2
MA510-4125		9600W/13.6Ω	2		2
MA510-4150		9600W/13.6Ω	2		2
MA510-4175		3000W/4Ω	1	160-4	1
MA510-4215		3000W/4Ω	1		1
MA510-4250		4000W/3Ω	1	220-4	1

In the installation of braking module and braking resistor, you needs to keep an appropriate distance from the inverter, and maintain a good ventilation of the installation environment.

select the resistor and power of the braking unit according to the data our company provided.



External braking resistor



External braking unit
Parallel

Chapter 7 Parameters List

Parameter group	Name
P0 Group	Basic function
P1 Group	Start and Stop Control
P2 Group	Motor Parameters
P3 Group	Vector Control
P4 Group	V/F Control
P5 Group	Input Terminals
P6 Group	Output Terminals
P7 Group	Human and Machine Interface
P8 Group	Enhanced Function
P9 Group	PID Control
PA Group	Simple PLC and Multi-step Speed Control
PB Group	Protection Function
PC Group	serial communication
PD Group	Supplementary Function
PE Group	Factory Setting

P0 Group：Basic function				
Function	Name	Description	Setting	Default
P0.00	Control	0: V/F control 1: Sensorless vector control 2:Torque control (sensorless vector control)	0~2	0
P0.01	Run command source	0: Keypad (LED extinguished) 1: Terminal (LED flickering) 2: Communication(LED lights on)	0~2	0
P0.02	Keypad and Terminal UP/DOWN setting	0:Valid, save UP/DOWN value when Power off 1: Valid, do not save UP/DOWN value when power off 2: Invalid 3: valid during running, clear when stop.	0~3	0
P0.03	Maximum frequency	10.00~400.00Hz	10.00 ~ 400.00Hz	50.00Hz
P0.04	Upper frequency Limit	P0.05~P0.03 (the Maximum frequency)	P0.05 ~ P0.03	50.00Hz
P0.05	Lower frequency Limit	0.00~P0.04 (Lower frequency Limit)	P0.05 ~ P0.04	0.00Hz
P0.06	Keypad Reference Frequency	0.00~P0.03 (the Maximum frequency)	0.00 ~ P0.03	50.00Hz

Function	Name	Description	Setting	Default
P0.07	Frequency A command source	0: keypad 1: AI1 2: AI2 3: HDI 4: simple PLC 5: Multi-stage speed 6: PID 7: Remote communication	0~7	0
P0.08	Frequency B command Source	0: AI1 1: AI2 2: HDI	0~2	0
P0.09	Scale of frequency B command	0: maximum frequency 1: Frequency A command	0~1	0
P0.10	Frequency command selection	0: A 1: B 2: A+B 3: Max(A and B)	0~3	0
P0.11	Acceleration time 0	0.1~3600.0s	0.1 ~ 3600.0s	Depend 0n model
P0.12	Deceleration time 0	0.1~3600.0s	0.1 ~ 3600.0s	Depend 0n model
P0.13	Running direction selection	0: forward 1: reverse 2: forbid reverse	0~2	0
P0.14	Carrier frequency	1.0~15.0kHz	1.0 ~ 15.0kHz	Depend 0n model

Function	Name	Description	Setting	Default
P0.15	AVR function	0: Invalid 1: valid all the time 2: only valid in deceleration	0~2	1
P0.16	Motor parameters autotuning	0: No action 1: Rotation autotuning 2: static autotuning	0~3	2
P0.17	Restore parameters	0: No action 1: Restore factory setting 2: Clear fault records	P0.17	P0.17
P1 Group: Start and Stop Control				
P1.00	Start Mode	0: Start directly 1:DC braking and start 2:Speed tracking and start	0.2	0
P1.01	Starting frequency	0.00~10.00Hz	0.00 ~ 10.00	0.00Hz
P1.02	Hold time of starting frequency	0.0~50.0s	0.0~50.0	0.0s
P1.03	DC Braking Current Before start	0.0~150.0%	0.0~150.0	0
P1.04	DC Braking time before start	0.0~50.0s	0.0~50.0	0.0s
P1.05	Acceleration	0: Linear	0~1	0

Function	Name	Description	Setting	Default
	Deceleration mode	1: reserved		
P1.06	Stop mode	0: Decelerate to stop 1: Coast to stop	0~1	0
P1.07	Starting frequency of DC braking	0.00~P0.03	0.00 ~ P0.03	0.00Hz
P1.08	Waiting time before DC braking	0.0~50.0s	0.0~50.0	0.0s
P1.09	DC braking current	0.0~150.0s	0.0~150.0	0
P1.10	DC braking time	0.0~50.0s	0.0~50.0	0.0s
P1.11	Dead time of FWD/REV	0.0~3600.0s	0.0 ~ 3600.0	0.0s
P1.12	Action when running frequency is less than lower frequency limit (valid when lower frequency limit is above 0)	0: Running at the lower frequency limit 1: stop 2: stand-by	0~2	0

Function	Name	Description	Setting	Default
P1.13	Delay time for restart	0.0~3600.0s (valid when P1.12=2)	0.0 ~ 3600.0	0
P1.14	Restart after power off	0: Disabled 1: Enabled	0~1	0
P1.15	Waiting time of restart	0.0~3600.0s (valid when P1.14=1)	0.0 ~ 3600.0	0.0s
P1.16	Terminal detection selection when power is on	0: Disabled 1: Enabled	0~1	0
P1.17	Reserved			
P1.18	Reserved			
P1.19	Reserved			
P2 Group: Motor Parameters				
P2.00	Inverter model	0: G model 1: P model	0~1	Depend on model
P2.01	Motor rated power	0.4~900.0kW	0.4 ~ 3000.0	Depend on model
P2.02	Motor rated frequency	0.01Hz~P0.03	10.00 ~ P0.0	50.00Hz
P2.03	Motor rated speed	0~36000pm	0.0 ~ 3600.0	Depend on model
P2.04	Motor rated voltage	0~800V	0~800	Depend on model
P2.05	Motor rated current	0.8~6000.0A	0.8 ~ 6000.0	Depend on model

Function	Name	Description	Setting	Default
P2.06	Motor stator resistance	0.001~65.535Ω	0.001 ~ 65.535	Depend on model
P2.07	Motor rotor resistance	0.001~65.535Ω	0.001 ~ 65.535	Depend on model
P2.08	Motor leakage inductance	0.1~6553.5mH	0.1 ~ 6553.5	Depend on model
P2.09	Motor leakage inductance	0.1~6553.5mH	0.1 ~ 6553.5	Depend on model
P2.10	Current without load	0.1~6553.5A	0.1 ~ 6553.5	Depend on model
P3 Group: Vector Control				
P3.00	ASR proportional gain Kp1	0~100	0~100	20
P3.01	ASR integral time Kp1	0.01~10.00s	0.01 ~ 10.00	0.50S
P3.02	ASR switching point 1	0.00Hz~P3.05	0.00 ~ P3.05	5.00Hz
P3.03	ASR proportional gain Kp2	0~100	0~100	25
P3.04	ASR integral time Kp2	0.01~10.00s	0.01 ~ 10.00	1.00s

Function	Name	Description	Setting	Default
P3.05	ASR switching point 2	P3.02~P0.03 (the Maximum frequency)	P3.02 ~ P0.03	10.00Hz
P3.06	Slip compensation rate of VC	50.0%~200.0%	50~200	100%
P3.07	Torque upper limit	0.0~200% (the rated current of the inveter)	0.0~200.0	G model: 150.00% P model: 120.00%
P3.08	Torque setting source	0: Keypad (corresponds to P3.09) 1: AI1 2: AI2 3: HDI 4: Multi-step speed 5:Remote communication (1~5: 100% corresponds to 2 times of the rated current of the inverter)	0~5	0
P3.09	Keypad torque setting	(-200.0%~200.0%) (the rated current of the inverter)	(-200.0% ~200.0%)	50.00%
P3.10	Upper frequency setting source	0: Keypad (P0.04) 1: AI1 2: AI2 3: HDI 4: Multi-step 5:Remote communication (1~4: 100% corresponds to the max. Frequency)	0~5	0

P4 Group: V/F Control				
Function	Name	Description	Setting	Default
P4.00	V/F curve selection	0: Linear curve 1: Multidots curve 2: torque_stepdown curve (1.3 order) 3: Torque_stepdown curve (1.77 order) 4: Torque_stepdown curve (2.0 order)	0~4	0
P4.01	Torque boost	0.0%: (auto) 0.1%~10.0%	0.0 ~ 10.0	0.00%
P4.02	Torque boost cut-off	0.0%~50.0% (motor rated frequency)	0.0 ~ 50.0	20.00%
P4.03	V/F frequency 1	0.00Hz~P4.05	0.00 ~ P4.05	0.00Hz
P4.04	V/F voltage 1	0.0%~100.0% (the rated voltage of the motor)	0.0 ~ 100.0	0.00%
P4.05	V/F frequency 2	P4.03~P4.07	P4.03 ~ P4.7	0.00Hz
P4.06	V/F voltage 2	0.0%~100.0% (the rated voltage of the motor)	0.0 ~ 100.0	0.00%
P4.07	V/F frequency 3	P4.05~ P2.02 (the rated frequency of the motor)	P4.05 ~ P2.02	00.00Hz
P4.08	V/F voltage 3	0.0%~100.0% (the rated voltage of the motor)	0.0 ~ 100.0	0.00%
P4.09	Slip compensation limit	0.00~200.0%	0.0~200	0.00%

Function	Name	Description	Setting	Default
P4.10	Auto energy saving selection	0: Disabled 1: Enabled	0~1	0
P4.11	Low-frequency threshold of restraining oscillation	0~10	0~10	2
P4.12	High-frequen cy threshold of restraining oscillation	0~10	0~10	0
P4.13	Boundary of restraining oscillation	0.0~P3.03	0.00 ~ P0.03	30.00Hz
P5 Group: Input Terminals				
P5.00	HDI selection	0: High speed pulse input 1: ON-OFF input	0~1	0
P5.01	S1 Terminal function	0: Invalid 1:Forward 2: Reverse 3: 3-wire control 4: Jog forward 5: Jog reverse 6: Coast to stop 7: Reset fault 8: Pause running 9: External fault input	0~39	1
P5.02	S2 Terminal function		0~39	4
P5.03	S3 Terminal function		0~39	7
P5.04	S4 Terminal function		0~39	0
P5.05	S5 Terminal function		0~39	0

Function	Name	Description	Setting	Default
P5.06	S6 Terminal function	10: UP command 11: DOWN command	0~39	0
P5.07	S7 Terminal function	12: Clear UP/DOWN 13: Switch between A and B	0~39	0
P5.08	HDI Terminal function	14: Switch between A and A+B 15: Switch between B and A+B 16: Multi-step speed reference1 17: Multi-step speed reference2 18: Multi-step speed reference3 19: Multi-step speed reference4 20: Multi-step speed pause 21: ACC/DEC time selection 1 22: ACC/DEC time selection 2 23: Reset simple PLC when stop 24: Pause simple PLC 25: Pause PID 26: Pause traverse operation 27: Pause traverse operation 28: Reset counter 29: reset length 30: ACC/DEC ramp hold 31: Counter input 32: UP/DOWN invalid temporarily 33-39: Reserved	0~39	0
P5.09	ON-OFF filter times	1~10	1~10	5

Function	Name	Description	Setting	Default
P5.10	Terminal control mode	0: 2-wire control mode 1 1: 2-wire control mode 2 2: 3-wire control mode 1 3: 3-wire control mode 2	0~3	0
P5.11	UP/DOWN setting change rate	0.01~50.00Hz/s	0.01~50.00	0.50Hz/s
P5.12	AI1 lower limit	0.00V~10.00V	-10.00~10.	0.00V
P5.13	AI1 lower limit correspondi n g setting	-100.0%~100.0%	-100.0~100	0.00%
P5.14	AI1 upper limit	0.00V~10.00V	-10.00~10.	10.00V
P5.15	AI1 lower limit correspondi ng setting	-100.0%~100.0%	-100.0~100	100.00%
P5.16	AI1 filter time constant	0.00s~10.00s	0.00~10.00	0.10s
P5.17	AI2 lower limit	0.00V~10.00V	0.00~10.00	0.00V
P5.18	AI2 lower limit correspondi ng setting	-100.0%~100.0%	-100.0~100	0.00%

Function	Name	Description	Setting	Default
P5.19	AI2 upper limit	0.00V~10.00	0.000~10.0	10
P5.20	AI2 upper limit corresponding setting	-100.0%~100.0%	-100.0~100	100.00%
P5.21	AI2 filter time constant	0.00s~10.00s	0.00~10.00	0.10s
P5.22	HDI lower limit	0.0kHz	0.00~50.00	0.00kHz
P5.23	HDI lower limit corresponding setting	-100.0%~100.0%	-100.0~100	0.00%
P5.24	HDI upper limit	0.0kHz~50.0kHz	0.00~50.00	50.00kHz
P5.25	HDI lower limit setting	-100.0%~100.0%	-100.0~100	100%
P5.26	HDI filter time constant	0.00s~10.00s	0.00~10.00	0.10s
P6 Group: Output Terminals				
P6.00	HDO selection	0: No output 1: Running	0~1	0
P6.01	HDO ON-OFF Output selection	2: Run forward 3: Run reverse 4: Fault output	0~20	1

Function	Name	Description	Setting	Default
		5: FDT reached 6: Frequency reached 7: Zero speed running 8: Preset count value reached 9: Specified count value reached 10: Length reached 11: Simple PLC step completed 12: PLCcycle completed 13: Running time reached 14: Upper frequency limit reached 15: Lower frequency limit reached 16: Read 17: Auxiliary motor 1 started 18: Auxiliary motor 2 started 19~20: Reserved		
P6.02	Relay 1 output selection		0~20	4
P6.03	Relay 2 output selection		0~20	0
P6.04	AO1 function selection	0: Running frequency 1: Reference frequency 2: Rotation speed	0-10	0
P6.05	AO2 function selection	3: Output current 4: Output voltage	0-10	0
P6.06	HDO function selection	5: Output power 6: Output torque 7: AI1 voltage 8: AI2 voltage/current 9: HDI frequency	0-10	0
P6.07	AO1 lower limit	0.0%~100%	0.0~100.0	0.00%

Function	Name	Description	Setting	Default
P6.08	AO1 lower limit corresponding output	0.00V~10.00V	0.00~10.00	0.00V
P6.09	AO1 upper limit	0.00V~10.00V	0.0~100.0	100.00%
P6.10	AO1 upper limit corresponding output	0.00V~10.00V	0.00~10.00	10.00V
P6.11	AO2 lower limit	0.0~100.0%	0.0~100.0	0.00%
P6.12	AO2 lower limit corresponding output	1~10.00V	0.00~10.00	0.00V
P6.13	AO2 upper limit	0.0~100.0%	0.0~100.0	100.00%
P6.14	AO2 upper limit corresponding output	0.00~10.00V	0.00~10.00	10.00V
P6.15	HDO lower limit	0.00%~100.00%	0.00~100.0	0.00%
P6.16	HDO lower limit corresponding output	0.000~50.000KHz	0.000~50.0	0.00KHz

Function	Name	Description	Setting	Default
P6.17	HDO upper limit	0.00%~100.00%	0.000~100.	100.00%
P6.18	HDO upper limit corresponding output	0.0~50.0KHz	0.000~50.0	50.00KHz
P7 Group: Human and Machine Interfaces				
P7.00	User password	0~65535	0~65535	0
P7.01	Reserve		Reserved	Reserved
P7.02	Reserve		Reserved	Reserved
P7.03	QUICK/JOG function selection	0: Display status switching 1: Jog 2: FWD/REV switching 3: Clear UP/DOWN setting 4: QUICK set mode	0~4	0
P7.04	STOP/RST function selection	0: Valid when keypad control (P0.03=0) 1: Valid when keypad or terminal control (P0.03=0 or1) 2: Valid when keypad or communication control (P0.03=0 or 2) 3: Always valid	0~3	0
P7.05	Keypad display selection	0: Preferential to external keypad 1: Both display, only external key valid. 2: Both display, only local key valid.	0~3	0

Function	Name	Description	Setting	Default
		3: Both display and key valid.		
P7.06	Running status display selection 1	0~0XFFFF BIT0: running frequency BIT1: reference frequency BIT2: DC bus voltage BIT3: Output voltage BIT4: Output current BIT5: Rotation speed BIT6: Line speed BIT7: Output power BIT8: Output torque BIT9: PID preset BIT10: PID feedback BIT11: Input terminal status BIT12: Output terminal status BIT13: Torque setting value BIT14: Count value	0~0XFFFF	0X07FF
P7.07	Running status display selection 2	0~0XFFFF BIT0: AI1 BIT1: AI2 BIT2: HDI frequency BIT3: Load percentage of motor BIT4: Load percentage of inverter BIT5~15: Reserved	0~0XFFFF	0

Function	Name	Description	Setting	Default
P7.08	Stop status display selection	0~0XFFFFF BIT0: Reference frequency BIT1: DC bus voltage BIT2: Input terminal status BIT3: Output terminal status BIT4: PID preset BIT5: PID feedback BIT6: AI1 BIT7: AI2 BIT8: HDI frequency BIT9: Step No.of PLC or multi-step BIT10: Torque setting value BIT11~ BIT15: Reserved	0~0XFFFF	0x00ff
P7.09	Coefficient of rotation speed	0.0~999.9% Actual mechanical speed = 120 * output frequency * P7.09 / Number of poles of motor	0.1~999.9	100.00%
P7.10	Coefficient of line speed	0.0~999.9% Line speed = actual mechanical speed * P7.10	0.1~999.9	1.00%
P7.11	Rectify module temperature	0~100.0		
P7.12	IGBT module temperature	0~100.0		

Function	Name	Description	Setting	Default
P7.13	Software version			
P7.14	Inverter rated power	0.4~3000.0KW	0.4~3000.0	Depend on model
P7.15	Inverter rated current	0.0~6000.0A	0.0~6000.0	Depend on model
P7.16	Accumulated running time	0~65535h		
P7.17	Third latest fault type	0: Not fault 1: IGBT Ph-U fault(OUT1) 2: IGBT Ph-V fault(OUT1) 3: IGBT Ph-W fault(OUT1) 4: Over-current when acceleration(OC1) 5: Over-current when deceleration(OC2) 6: Over-current when constant speed running(OC3) 7: Over-voltage when acceleration (OV1) 8: Over-voltage when deceleration (OV2) 9: Over-voltage when constant speed running(OV3) 10: DC bus under-voltage(UV) 11: Motor overload (OL1) 12: Inverter overload (OL2)		
P7.18	Second latest fault type			
P7.19	Latest fault type			

Function	Name	Description	Setting	Default
		13: Input phase failure failure(SPO) 14: Output phase failure(SPO) 15: Rectify overheat (OH1) 16: IGBT overheat (OH2) 17: External fault (EF) 18: Communication fault(CE) 19: Current detection fault(ITE) 20: Autotuning fault (TE) 21: EEPROM fault (EEP) 22: PID feedback fault (PIDE) 23: Braking unit fault (BCE) 24: Running time arrival (END) 25: Overtorque fault（OL3)		
P7.20	Output frequency at current fault			
P7.21	Output current at current fault			
P7.22	DC bus voltage at current fault			
P7.23	Input terminal status at current fault			
P7.24	Output terminal status at current fault			

P8 Group: Enhanced Function				
Function	Name	Description	Setting	Default
P8.00	Acceleration time 1	0.1~3600.0s	0.1~3600.0	Depend on model
P8.01	Deceleration time 1	0.1~3600.0s	0.1~3600.0	Depend on model
P8.02	Acceleration time 2	0.1~3600.0s	0.1~3600.0	Depend on model
P8.03	Deceleration time 2	0.1~3600.0s	0.1~3600.0	Depend on model
P8.04	Acceleration time 3	0.1~3600.0s	0.1~3600.0	Depend on model
P8.05	Deceleration time 3	0.1~3600.0s	0.1~3600.0	Depend on model
P8.06	Jog reference	0.0~P0.03	0.00~P0.03	5.00Hz
P8.07	Jog acceleration time	0.1~3600.0s	0.1~3600.0	Depend on model
P8.08	Jog deceleration time	0.1~3600.0s	0.00~P0.03	Depend on model
P8.09	Skip Frequency1	0.00~P0.03	0.00~P0.03	0.00Hz
P8.10	Skip Frequency2	0.00~P0.03	0.00~P0.03	0.00Hz
P8.11	Skip Frequency bandwidth	0.00~P0.03	0.00~P0.03	0.00Hz
P8.12	Traverse amplitude	0.0~100.0%	0.0~100.0	0.00%

Function	Name	Description	Setting	Default
P8.13	Jitter frequency	0.0~50.0%	0.0~50.0	1.00%
P8.14	Rise time of traverse	0.1~3600.0s	0.1~3600.0	5.0s
P8.15	Fall time of traverse	0.1~3600.0s	0.1~3600.0	5.0s
P8.16	Auto reset times	0~3	0~3	0
P8.17	Reset interval	0.1~100.0s	0.1~100.0	1.0s
P8.18	Preset count value	P8.19~65535	P8.19~655	0
P8.19	Specified count value	0~P8.18	0~P8.18	0
P8.20	Preset running time	0~65535	0~65535	65535h
P8.21	FDT level	0.00~P0.03	0.00~P0.03	50.00Hz
P8.22	FDT lag	0.0~100.0%	0.0~100.0	5.00%
P8.23	Frequency arrive detecting range	0.0~100.0% (maximum frequency)	0.0~100.0	0.00%
P8.24	Droop control	0.00~10.00Hz	0.00~10.00	0.00Hz
P8.25	Brake threshold voltage	115.0~140.0%	115.0~140	130.00%
P8.26	Cooling fan control	0: Auto stop mode 1: Always working	115.0~140	120.00%

Function	Name	Description	Setting	Default
P8.27	Overmodulation	0: Enabled 1: Disabled	0~1	0
P8.28	PWM mode	0: PWM mode 1 1: PWM mode 2 2: PWM mode 3	0~1	0
P9 Group: PID Control				
P9.00	PID preset source selection	0: Keypad 1: AI1 2: AI2 3: HDI 4: Multi-step 5: Remote communication	0~5	0
P9.01	Keypad PID preset	0.0%~100.0%	0.0~100.0	0.00%
P9.02	PID feedback source selection	0: AI1 1: AI2 2: AI1+AI2 3: HDI 4: Communication	0~3	0
P9.03	PID output characteristic	0: Positive 1: Negative	0~1	0
P9.04	Proportional gain (KP)	0.00~100.00	0.00~100.0	0.10s
P9.05	Integral time (Ti)	0.00~10.00s	0.01~10.00	0.10s
P9.06	Differential time (Td)	0.00~10.00s	0.00~100.0	0.01s

Function	Name	Description	Setting	Default
P9.07	Sampling cycle (T)	0.01~100.00s	0.00~100.0	0.00%
P9.08	Bias limit	0.0~100.0%	0.0~100.0	0.00%
P9.09	Feedback lost detecting value	0.0~100.0%	0.0~100.0 %	0.00%
P9.10	Feedback lost detecting time	0.0~3600.0s	0.0~3600.0	1.0s
PA Group: Simple PLC and Multi-step Speed Control				
PA.00	Simple PLC	0: Stop after one cycle 1: Hold last frequency after one cycle 2: Circular run	0~2	0
PA.01	Simple PLC status saving after power off	0: Disabled 1: Enabled	0~1	0
PA.02	Multi-step speed 0	-100.0~100.0%	-100.0~100	0.00%
PA.03	0^{th} Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.04	Multi-step speed 1	-100.0~100.0%	-100.0~100	0.00%
PA.05	1st Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s

Function	Name	Description	Setting	Default
PA.06	Multi-step speed2	-100.0~100.0%	-100.0~100	0.00%
PA.07	2nd step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.08	Multi-step speed 3	-100.0~100.0%	-100.0~100	0.00%
PA.09	3rd step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.10	Multi-step speed 4	-100.0~100.0%	-100.0~100	0.00%
PA.11	4th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.12	Multi-step speed 5	-100.0~100.0%	-100.0~100	0.00%
PA.13	5th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.14	Multi-step speed 7	-100.0~100.0%	-100.0~100	0.00%
PA.15	6th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.16	Multi-step speed 7	-100.0~100.0%	-100.0~100	0.00%
PA.17	7th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.18	Multi-step speed 8	-100.0~100.0%	-100.0~100	0.00%
PA.19	8th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s

Function	Name	Description	Setting	Default
PA.20	Multi-step speed 9	-100.0~100.0%	-100.0~100	0.00%
PA.21	9th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.22	Multi-step speed 10	-100.0~100.0%	-100.0~100	0.00%
PA.23	10th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.24	Multi-step speed 11	-100.0~100.0%	-100.0~100	0.00%
PA.25	11th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.26	Multi-step speed 12	-100.0~100.0%	-100.0~100	0.00%
PA.27	12th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.28	Multi-step speed 13	-100.0~100.0%	-100.0~100	0.00%
PA.29	13th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.30	Multi-step speed 14	-100.0~100.0%	-100.0~100	0.00%
PA.31	14th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.32	Multi-step speed 15	-100.0~100.0%	-100.0~100	0.00%

Function	Name	Description	Setting	Default
PA.33	15th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s
PA.34	ACC/DEC time selection for step 0~7	0~0XFFFF	0~0XFFFF	0
PA.35	ACC/DEC time selection for step 8~15	0~0XFFFF	0~0XFFFF	0
PA.36	Simple PLC restart selection	0: restart from step 0 1: Continue from paused step	0~1	0
PA.37	Time unit	0: Second 1: Minute	0~1	0
PB Group: Protection Function				
Pb.00	Input phase-failure protection	0: Disabled 1: Enabled	0~1	1
Pb.01	Output phase-failure protection	0: Disabled 1: Enabled	0~1	1
Pb.02	Motor overload protection	0: Disabled 1: Normal motor(with low speed compensation) 2: Variable frequency motor (without low speed compensation)	0~2	2

Function	Name	Description	Setting	Default
Pb.03	Motor overload protection current	20.0%~120.0% (rated current of the motor)	20.0~120.0	100.00%
Pb.04	Threshold of trip-free	70.0.0~110.0% (standard bus voltage)	70.0~110.0	80.00%
Pb.05	Decrease rate of trip-free	0.00~P0.03 (the Max. frequency)	0.00~P0.03	0.00Hz/s
Pb.06	Over-voltage stall	0: Disabled 1: Enabled	0~1	1
Pb.07	Over-voltage stall protection point	110~150%	110~150	120%
Pb.08	Auto current limiting threshold	50~200%	50~200	G model : 150.00% P model : 160.00%
Pb.09	Frequency decrease rate when current limiting	0.00~100.00Hz/s	0.00~100.0	10.00Hz/s
Pb.10	Auto current limiting selection	0: Enabled 1: Disabled when constant speed	0~1	0

Function	Name	Description	Setting	Default
Pb.11	Selection of overtorque (OL3)	0: No detection 1: Valid detection of overtorque during running,then continue running 2: Valid detection of overtorque during running,then warning and stop 3: Valid detection of overtorque during constant speed running , then continue running 4: Valid detection of overtorque during constant speed running, then warning and stop.	0~4	1
Pb.12	Detection level of overtorque	10.0%~200.0%(relative to the rated curent of the motor)	1.0~200.0	G model :150.0% P model :120%
Pb.13	Detection time of overtorque	0.1~60.0s	0.0~60.0	0.1s
Pb.14	reserved			
Pb.15	reserved			
PC Group: serial communication				
PC.00	Local address	0~247, 0 stands for the broadcast address	0~247	1

Function	Name	Description	Setting	Default
PC.01	Baud rate selection	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0~5	4
PC.02	Data format	0: RTU, 1 start bit, 8 data bits, no parity check, 1 stop bit. 1: RTU, 1 start bit, 8 data bits, even parity check, 1 stop bit. 2: RTU, 1 start bit, 8 data bits, odd parity check, 1 stop bit. 3: RTU, 1 start bit, 8 data bits, no parity check, 2 stop bit. 4: RTU, 1 start bit, 8 data bits, even parity check, 2 stop bit. 5: RTU, 1 start bit, 8 data bits, odd parity check, 2 stop bit.	0~5	1
PC.03	Communica ti no delay time	0~200ms	0~200	5ms
PC.04	Communica tino timeout delay	0.0: Disabled 0.0~100.0s	0.0~100.0	0.0s
PC.05	Communica ti no error action	0: Alarm and coast to stop 1: No alarm and continue to run 2: No alarm but stop	0~3	1

Function	Name	Description	Setting	Default
		according to P1.06(if P0.03=2) 3: No alarm but stop according to P1.06		
PC.06	Response action	Unit`s place of LED 0: Response to writing 1: No response to writing Ten`s place of LED 0: Reference not saved when power off 1: Reference saved when power off	00~11	0
Pd Group: Supplementary Function				
PE Group: Factory Setting				

DETAILED FUNCTION DESCRIPTION

Function Code	Name	Setting Range
P0.00	Speed Control Model	0~2[0]

This parameter is used to select the speed control mode of the inverter.
0: V/F control: It is only suitable for motor commissioning cases where needs not high accuracy or the cases where one inverter drives multiple motors.

1: Sensorless vector control:It is only suitable for motor commissioning cases or the cases where needs not high accuracy. This mode is applied in the universal high performance cases where the pulse encoder is not installed or the cases where requires high torque at low speed,high speed accuracy,and quicker dynamic response,such as machine tool,injection molding machine,centrifugal machine and wire-drawing machine,etc. One inverter only drives one motor.

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

Note:
Set right nameplate parameters of the motor and when selecting vector control mode and complete the parameters autotune before running to get the right motor parameters.Only proper motor parameter can improve the high performance of vector control.

Function Code	Name	Setting Range
P0.01	Run command source	0~2[0]

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

0: Keypad (LED extinguished);
Both RUN and STOP/RST key are used for running command control. If Multifunction key QUICK/JOG is set as FWD/REV switching function (P7.03 is set to 2),it will be used to change the rotating orientation. **In running status,pressing RUN and STOP/RST in the same time will cause the inverter coast to stop.**

1: Terminal(LED flickering)
The operation, including forward run,reverse run, forward jog, reverse jog etc. can be controlled by multifunctional input terminals.

2:Communication (LED lights on)
The operation of inverter can be controlled by host through communication.

Function Code	Name	Setting Range
P0.02	Keypad and terminal UP/DOWN setting	0~3[0]

The frequency can be set by "∧" ,"∨" and terminal UP/DOWN. This setting method have the highest and it can be combined with setting channel. It is used to adjust the output frequency during the commissioning of controlling system.

0: valid, and the value can be saved when the inverter is powered off.The frequency command can be set and the value can be saved after the inverter is powered off and it will combinate with the current frequency when it is repowered on.

1: valid, and the value can not be saved when the inverter is powered off. The frequency command can be set but the value can not be saved after the inverter is powered off

2: invalid,the function of "∧", "∨" and terminal UP/DOWN is invalid, and the setting will be cleared automatically.

3: Valid during running.The function of "∨","∧" and terminal UP/DOWN is invalid during running and the setting will be cleared automatically when the inverter stops.

Note: When the factory setting is restored,the value of keypad and UP/DOWN will be cleared.

Function Code	Name	Setting Range
P0.03	Maximum frequency	10.00~400.00

This parameter is used to set the Max.Output frequency of the inverter.It is the basic of frequency setting and the speed of ACC/DEC.Please pay attention to it.

Function Code	Name	Setting Range
P0.04	Upper frequency limit	P0.05~P0.03

This is the upper limit of the output frequency and it will be less than or equal to the Max Output frequency.

Function Code	Name	Setting Range
P0.05	Lower frequency limit	0.00~P0.04 [0.00HZ]

This is the lower limit of the output frequency of the inverter.

This parameter can be selected by function code P1.12. If the setting frequency is lower than the upper limit,the inverter will run,stop or hibernate at the lower limit frequency the Max. Output frequency≥Upper limit of the frequency≥Lower limit of the frequency.

Function Code	Name	Setting Range
P0.06	keypad reference frequency	0.00~P0.03 [50.0HZ]

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

Function Code	Name	Setting Range
P0.07	Frequency A command source	0~7[0]

Select Frequency A command input channel and there are 8 main given frequency channels.

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

Set the frequency by the keypad through modifying P0.06.

1:AI1

2:AI2

Set the frequency through analog input terminals.MA510 series inverters provide 2 ways analog input terminal in its standard configuration,of which AI1 is -10V~10V voltage input; AI2 is 0~10V/0(4)~20mA input. The current/voltage can be shifted by J16.

Note:when AI2 selects 0~20mA input,20mA corresponds to 5V.

100.0% of analog input corresponds to the Max.Frequency (function code P0.03)
-100.0% corresponds to the Max.Frequency in reverse (function code P0.03).

3:HDI

The reference frequency is set by high speed pulse input.MA510 series inverters provide 1 way HDI input in its standard configuration.

Pulse specification: pulse voltage range 15~30V,and pulse frequency range 0.0~50.0KHZ. 100% of the setting impulse corresponds to maximal frequency,while -100% corresponds with minuse maximal frequency.

Note:pulse can only be input through multi-function terminal HDI. And set P5.00=0 to select the function of HDI as "setting input".

The inverter will run at simple PLC when selecting this frequency setting method. It is necessary to set the parameter of PA group to determine the given frequency, running direction and each ACC/DEC time. Please refer to the instruction of PA group carefully.

5. Multi-stage speed

The inverter will run at multi-stage speed when selecting this frequency setting method.

The reference frequency is determined by P5 and PA group. If P0.07 is not multi-stage speed setting,then the multi-stage setting has the priority which is lower than the priority of jogging.only stage 1~15 can be set when multi-stage setting has the priority. So stage 1~15 can be set when P0.07 is multi stage speed setting.

6. PID control

The running mode is procedure PID control when selecting this parameter. It is necessary to set P9 group.The reference frequency is the result of PID adjustment. For details, please refer to description pf P9 group.

7.Remote Communication

The frequency command is given by the upper monitor through communication given Please refer to MODBUS communication Protocol in chapter 9.

The reference frequency is set through RS485. For details, Please refer to Modbus Protocol in chapter 9.

Function Code	Name	Setting Range
P0.08	Frequency B command source	0~2[0]

0: AI1
1: AI2
2: HDI

When B frequency command is the only frequency reference channel, its application is the same with A frequency command. For details , Please refer to P0.07.

Function Code	Name	Setting Range
P0.09	Scale of frequency B command	0~1[0]

0: Maximum output frequency,100% of B frequency setting corresponds to the maximum output frequency.

1: A frequency command,100% of B frequency setting corresponds to the maximum output frequency.Select this setting if it needs to adjust on the base of A frequency command.

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

Function Code	Name	Setting Range
P0.10	Frequency command selection	0~3[0]

0:Only frequency command source A is active.

1:Only frequency command source B is active.

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

Reference frequency=reference frequency A+reference frequency B.

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

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

Note:Combination(0,1 and 2) can be switched by P5 group.

Function Code	Name	Setting Range
P0.11	Acceleration time 0	0.1~3600.0S [Depend on model]
P0.12	Deceleration time 0	0.1~3600.0S [Depend on model]

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

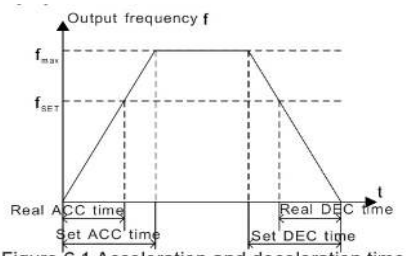


Figure 6.1 Acceleration and deceleration time

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

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

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

1st group: P0.11,P0.12

2nd group: P8.00,P8.01

3rd group: P8.02,P8.03

4th group: P8.04,P8.05

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

Function Code	Name	Setting Range
P0.13	Running direction selection	0~3[0]

0:Runs at the default direction,the inverter runs in the forward direction.

1: Runs at the opposite direction,the inverter runs in the reverse direction.This effect

equals to the shifting the rotation direction by adjusting either two of the motor wires.

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

2: Forbid to run in reverse direction:It can be used in some special cases if the reverse running is disabled.

Function Code	Name	Setting Range
P0.14	Carrier frequency	1.0~15.0KHZ [Depend on model]

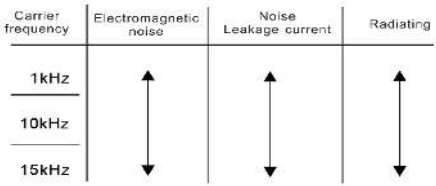


Figure 6.2 Effect of carrier frequency

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

Carrier F / Model	Highest carrier F (kHZ)	lowest carrier F (kHZ)	Factory setting (kHZ)
0.75kW~11kW	15	1.0	8
15kW~55kW	8	1.0	4
75~500kW	6	1.0	2

The advantage of high carrier frequency: ideal current waveform,little current harmonic wave and motor noise.

The disadvantage of high carrier frequency: increasing the switch loss, increasing inverter temperature and the impact to the output capacity. The inverter needs to derate on high carrier frequency. At the same time, the leakage and electrical magnetic interference will increase.

Applying low carrier frequency is contrary to the above,too low carrier frequency will cause unstable running,torque decreasing and surge.

The manufacturer has set a reasonal carrier frequency when the inverter is in factory. In general, users do not need to change the parameter.

when the frequency used exceeds the default carrier frequency,the inverter needs to derate 20% for each additional 1K carrier frequency.

Function Code	Name	Setting Range
P0.15	AVR function	0~2[1]

AVR function is the output voltage automatic adjustment function.When AVR is invalid,the output voltage will change with the input voltage (or DC bus voltage) ; when AVR is valid, the output voltage won't change with the input voltage (or DC bus voltage). The range of output voltage will keep constant. If the site requirement is not met, AVR function can be canceled to shorten the DEC time.

Function Code	Name	Setting Range
P0.16	Motor parameters autotuning	0~2[0]

0: No action : Forbidding autotuning.

1:Rotation autotuning:

Input right parameters of the motor nameplate (P2.01-P2.05) and do not connect any load to the motor before performing autotuning and ensure the motor is in static and empty status.Otherwise the parameters detected by autotuning will be incorrect.

Set the proper acceleration and deceleration time (P0.11 and P0.12) according to the motor inertia before performing autotuning. Otherwise it may cause over-current and over-voltage fault during autotuning.

Set P0.16 to be 1 then press the DATA/ENT , LED will display "-TUN-" and flickers.

During "-TUN-" is flickering,press the PRG/ESC to exit autotuning. Press RUN to start the autotuning, and the LED will display "TUN-0" and "TUN-1" "RUN/TUNE" light will flicker.After a few minutes ,LED will display "-END-" . That means the autotuning is finished and return to the stop status. When "-TUN-" flickers, pressing PRG/ESC can escape from the parameter autotune. During the autotuning, press the STOP/RST will stop the autotune.

Note:Only keypad can control the autotuning. P0.16 will restore to 0 automatically when the autotuning is finished.

2:Static autotuning:
• If it difficult to disconnect the load,static autotuning is recommended.
• The Operation process is the same as rotation autotuning.

But the mutual inductance and the non-load current can not be measured.

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

Function Code	Name	Setting Range
P0.17	Restore parameters	0~2[0]

0:No action
1:Inverter restores all parameters to factory setting.
2:Inverter clear all fault records.
This function code will restore to 0 automatically when complete the function operation.

P1 Group start and stop control

Function Code	Name	Setting Range
P1.00	Start Mode	0~2[0]

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

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

Note:It only applies on the inverter of 7.5KW and above.

Function Code	Name	Setting Range
P1.01	Starting frequency	0.00~10.00HZ [1.50HZ]
P1.02	Hold time of starting frequency	0.0~50.0 s[0.0s]

Set proper starting frequency can increase the starting torque. The inverter runs from the starting frequency and after the keeping time of the starting frequency, the inverter will accelerate to the aimed frequency during the ACC time. If the reference frequency is less than starting frequency, the inverter will be at stand-by status. The indicator of RUN/TUNE lights on, inverter has no output. The starting frequency could be less than the lower frequency limits. The starting frequency takes no effect during FWD/REV switching.

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

During the DC braking befor P1.03,the increased current is the percentage to the rated current of the inverter.

DC braking is invalid when P1.04 is set to be 0.
The bigger the DC braking current , the greater the braking torques.

Function Code	Name	Setting Range
P1.05	Acceleration/Deceleration mode	0~1[0]

The frequency changing method during the running and starting of the inverter
0:Linear
Output frequency will increase or decrease with fixed acceleration or deceleration time.
1:Reserved

Function Code	Name	Setting Range
P1.06	Stop mode	0~1[0]

0:Deceleration to stop
When the stop command takes effect,the inverter decreases the output frequency according to P1.05 and the defined deceleration time till stop.
1: Coast to stop
When the stop command takes effect, the inverter blocks the output immediately.The motor coasts to stop by its mechanical inertia.

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

Starting frequency of DC braking:Start the DC braking when running frequency reaches starting frequency determined.Starting frequency of DC braking is 0 and the DC braking is invalid. The inverter will stop in the defined DEC time.

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

DC braking current:The value is the percentage of rated current of inverter.The bigger DC braking current is, the greater the braking torque is.
DC braking time:The time used to perform DC braking.If the time is 0,the DC braking will be invalid.

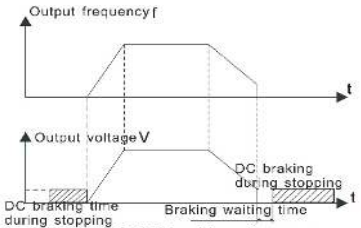


Figure 6.3 DC braking diagram.

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

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

It is shown as following figure:

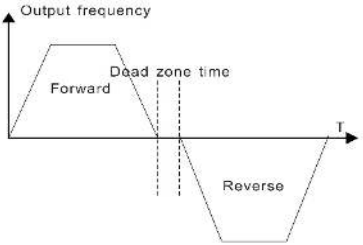


Figure 6.4 FWD/REV dead time diagram.

Function Code	Name	Setting Range
P1.12	Action when running frequency is less than lower frequency limit	0~2[0]

This function code is used to define the running state when the setting frequency is lower than the lower frequency limit.

0:Running at the lower frequency limit: The inverter runs at a frequency which is lower than the lower frequency limit

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

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

Note:the function is only valid when the lower frequency limit is above 0.

Function Code	Name	Setting Range
P1.13	Delay time for restart	0.0~3600.0s[0]
P1.14	Restart after power off	0~1[0]

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

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

Note:

• If P1.14 is set to be 1,it is recommended that start mode should be set as speed tracing mode(P1.00=2).

This function may cause the inverter restart automatically,please be cautious.

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

Note:Valid when P1.14=1

Function Code	Name	Setting Range
P1.16	Terminal function exmined when power is on	0~1[0]

This function only takes effect if run command source is terminal control.

If P1.15 is set to be 0,when power on,inverter will not start even if FWD/REV terminal is active , until FWD/REV terminal disabled and enabled again.

Note: This function may cause the inverter restart automatically , please use it with cautious.

Function Code	Name	Setting Range
P1.17~P1.19	Reserved	

P2 Group Motor Parameters

Function Code	Name	Setting Range
P2.00	Inverter model	0~1 [Depend on model]

0: G model: Applicable to constant torque load.

1: P model: Applicable to constant power load.

MA510 series inverters apply the manner of G/P unification,which means the power of the motor used in G type is lower than the power of the motor used in P type for one gear.

The factory setting of the inverter is G model.If P model is selected,it is necessary to set the function code to 1 and reset the motor parameters of P2.

For example,the factory setting of MA510 is 22KW G. If it is necessary to change it to 30KW P, set P2.00 to 1 and reset the motor parameters of P2.

Function Code	Name	Setting Range
P2.01	Motor rated power	0.4~3000.0kw [Depend on model]
P2.02	Motor rated frequency	0.01HZ~P0.03 [50.00HZ]
P2.03	Motor rated speed	0~36000rpm [1460rpm]
P2.04	Motor rated voltage	0~800v [depend on model]
P2.05	Motor rated current	0.8~6000A [Depend on model]

Note: In order to achieve superior performance,please set these parameters according to motor nameplate,and then perform autotuning.

The inverter provides parameters autotune.correct parameters autotune is from the right setting of parameter of motor.

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

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

Function Code	Name	Setting Range
P2.06	Motor stator resistance	0.001~65.535Ω [Depend on model]
P2.07	Motor rotor resistance	0.001~65.535Ω [Depend on model]
P2.08	Motor leakage inductance	0.1~6553.5 mh [Depend on model]
P2.09	Motor mutual inductance	0.1~6553.5 mh [Depend on model]
P2.10	Current without load	0.1~6553.5 A [Depend on model]

After autotuning,the value of P2.06-P2.10 will be automatically updated.These parameters are the basic parameters for high performance V/F control which have direct impact to the control performance.

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

P3 Group Vector Control

Function Code	Name	Setting Range
P3.00	ASR proportional gain kp1	0~100 [20]
P3.01	ASR integral time ki1	0.01~10.00s [0.05]
P3.02	ASR switching point 1	0.00~P3.05 [5.00HZ]
P3.03	ASR proportional gain kp2	0~100 [25]
P3.04	ASR integral time ki2	0.01~10.00 [1.00s]
P3.05	ASR switching point 2	P3.02~P0.03 [10.00HZ]

The above parameters are only valid for vector control and torque control and invalid for V/F control. Through P3.00~P3.05 , user can set the proportional gain kp and integral time ki of speed regulator (ASR),so as to change the speed response characteristic.

P3.00 and P3.01 only take effect when output frequency is less than P3.02.P3.03 and P3.04 only take effect when output frequency is greater than P3.05.When output frequency is betweenP3.02 and P3.05, Kp and Ki are proportional to the bias between P3.02 and P3.05. For details, please refer to following figure.

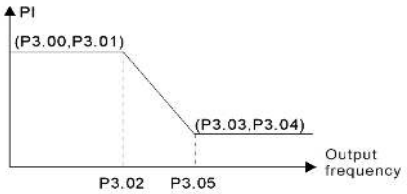


Figure 6.5 PI parameter diagram.

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

The system dynamic response can be faster if the integral time Ki is decreased;
However,if Ki is too small,the system becomes overshoot and tends to oscillate.
P3.00 and P3.01 are corresponding to Kp and Ki at low frequency,while P3.03 and P3.04 are corresponding to Kp and Ki at high frequency. Please adjust these parameters according to actual situation. The adjustment procedure is as follow:

• Increase the proportional gain (Kp) as far as possible without creating oscillation.

• Reduce the integral time (Ki) as far as possible without creating oscillation.

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

Function Code	Name	Setting Range
P3.06	Slip compensation rate of VC	50%~200% [100%]

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

Function Code	Name	Setting Range
P3.07	Torque upper limit	0.0~200.0% [Depend on model]

Note:

• 100% setting corresponding to rated current.G model : 150.0% ; P model: 120.0%

• Under torque control,P3.07 and P3.09 are all related with torque setting.

Function Code	Name	Setting Range
P3.08	Torque setting source	0~5 [0]

0:Keypad (P3.09)
1:AI1
2:AI2
3:HDI
4:Multi-step speed
5:Communication

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

Under speed control mode, output torque matches load torque automatically,but limited by P3.07. If the load is above the set upper limit of the torque,the output torque of the inverter will be limited,and the rotation speed of the motor will change automatically.

Under the torque control mode,the inverter will output torque at the set command,but the output frequency is limited by the upper or lower limit. when the set torque is above the load torque,the output frequency of the inverter will raise to the upper limit frequency;

if the set torque is below the load torque,the output frequency of the inverter will decrease to the lower limit frequency. If the output frequency of the inverter is limited, the output torque will be different from the set torque.

Note:

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

Function Code	Name	Setting Range
P3.09	Keypad torque setting	-200.0~200.0% [50.0%]
P3.10	Upper frequency setting source	0~5 [0]

0:Keypad (P3.09)
1:AI1
2:AI2
3:HDI
4:Multi-step speed
5:communication

Note: 1~4 100% corresponds to maximum frequency.

P4 Group V/F control

Function Code	Name	Setting Range
P4.00	V/F curve selection	0~4 [0]

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

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

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

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

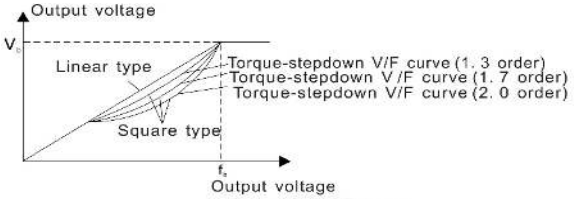


Figure 6. 6V/F curve.

Function Code	Name	Setting Range
P4.01	Torque boost	0.0~10.0% [0.0%]
P4.02	Torque boost cut-off	0.0~50.0% [20.0%]

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

The value of torque boost should be determined by the load. The heavier the load, the larger the value is. If the boost is too large, the motor will run in exciting. The efficiency of the motor decreases as the current of the inverter increases and the motor increases the heat-releasing.

when the torque boost is set to 0.0%, the inverter is in the automatic torque boost state.

Cut-off point of torque boost : The torque boost is valid under this point, and the torque boost is invalid when exceeding this set frequency.

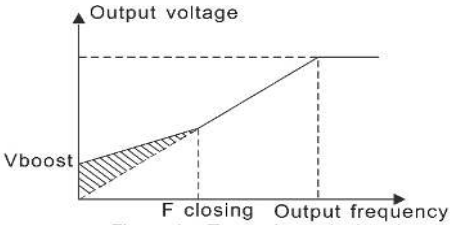


Figure 6. 7Torque boost by hand.

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

P4.03~P4.08 are used to set the user-defined V/F curve. The value should be set according to the load characteristic of motor.

Note :

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

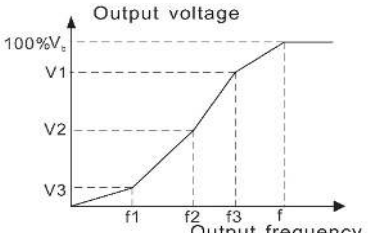


Figure 6.8 V/F curve setting diagram.

Function Code	Name	Setting Range
P4.09	Slip compensation limit	0.0~200% [0.0%]

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

P4.09=fb-n*p/60

Fb=Motor rated frequency (P2.02)

N=Motor reted speed (P2.03)

P=Motor poles

Function Code	Name	Setting Range
P4.10	Auto energy saving selection	0~1 [0]

0: Disabled
1: Enabled

While there is a light or empty load such as pumps or fans. It will reduce the inverter output voltage and save energy through detecting the load current.

Function Code	Name	Setting Range
P4.11	Low-frequency threshold of restraining oscillatioon	0~10[2]

Function Code	Name	Setting Range
P4.12	High-frequency threshold of restraining oscillatioon	0~10[0]
P4.13	Boundary of restraining oscillatioon	0.00Hz~P3.03 [30.00HZ]

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

P5 Group Input Terminals

There are 8 multi-function digital input terminals and 2 analog input terminals in MA510 series inverters.

Function Code	Name	Setting Range
P5.00	HDI selection	0~1[0]
P5.01	S1 terminal function	0~39[1]
P5.02	S2 terminal function	0~39[4]
P5.03	S3 terminal function	0~39[7]
P5.04	S4 terminal function	0~39[0]
P5.05	S5 terminal function	0~39[0]
P5.06	S6 terminal function	0~39[0]
P5.07	S7 terminal function	0~39[0]
P5.08	HDI terminal function	0~39[0]

0:High speed pulse input
1:ON-OFF input
Note:P5.08 is only used when P5.00 is set to be 1.
The meaning of each setting is shown in following table.

setting value	Function	Description
0	Invalid	Please set unused terminals to be invalid to avoid malfunction
1	Forward	Please refer to description of P5.10.
2	Reverse	
3	3-wire control	Please refer to description of P5.10.
4	Jog forward	Please refer to description of P8.06~P8.08.
5	Jog reverse	

<table>
<tr><th>setting value</th><th>Function</th><th>Description</th></tr>
<tr><td>6</td><td>Coast to stop</td><td>The inverter blocks the output immediately. The motor coasts to stop by its mechanical inertia.</td></tr>
<tr><td>7</td><td>Reset fault</td><td>Reset faults that have occurred.It has the same function as STOP/RST.</td></tr>
<tr><td>8</td><td>Pause running</td><td>When this terminal takes effect,inverter decelerates to stop and save current status, such as PLC,traverse frequency and PID. When this terminal takes no effect, inverter restores the status.</td></tr>
<tr><td>9</td><td>External fault input</td><td>Stop the inverter and output an alarm when a fault occurs in a peripheral device.</td></tr>
<tr><td>10</td><td>Up command</td><td rowspan="3">The reference frequency of inverter can be adjusted by UP command and DOWN command. These three functions are used to modify the reference frequency through external terminals. UP is the increasing command, DOWN is the decreasing command, and the Clear UP/DOWN is used to restore to the reference frequency given by the frequency command channel.</td></tr>
<tr><td>11</td><td>DOWN command</td></tr>
<tr><td>12</td><td>Clear UP/DOWN</td></tr>
<tr><td>13</td><td>Switch between A and B</td><td rowspan="3"><table><tr><th>P0.10
Terminal action</th><th>A</th><th>B</th><th>A+B</th></tr><tr><td>13 valid</td><td>B</td><td>A</td><td></td></tr><tr><td>14 valid</td><td>A+B</td><td></td><td>A</td></tr><tr><td>15 valid</td><td></td><td>A+B</td><td>B</td></tr></table></td></tr>
<tr><td>14</td><td>Switch between A and A+B</td></tr>
<tr><td>15</td><td>Switch between B and A+B</td></tr>
<tr><td>16</td><td>Multi-step speed reference 1</td><td rowspan="4">16 steps speed control can be realized by the combination of these four terminals. For details, please refer to : Multi-step speed reference terminal status and according step value table:</td></tr>
<tr><td>17</td><td>Multi-step speed reference 2</td></tr>
<tr><td>18</td><td>Multi-step speed reference 3</td></tr>
<tr><td>19</td><td>Multi-step speed reference 4</td></tr>
<tr><td>20</td><td>Multi-step speed pause</td><td>Keep current step unchanged no matter what the input status of four multi-step speed terminals is.</td></tr>
</table>

setting value	Function	Description
21	ACC/DEC time selection 1	4 groups of ACC/DEC time can be selected by the combination of these two terminals. 
22	ACC/DEC time selection 2	
23	Reset simple PLC when stop	When simple PLC stops,the status of PLC such as running step,running time and running frequency will be cleared when this terminal is enabled.
24	Pause simple PLC	Inverter runs at zero frequency and PLC pauses the timing when this terminal is enabled. If this terminal is disabled,inverter will start and continue the PLC operation from the status before pause.
25	Pause PID	PID adjustment will be paused and inverter keeps output frequency unchanged.
26	Pause traverse operation	Inverter keeps output frequency unchanged. If this terminal is disabled, inverter will continue traverse operation with current frequency.
27	Reset traverse operation	Reference frequency of inverter will be forced as center frequency of traverse operation.
28	Reset counter	Clear the value of counter.
29	Forbid torque control mode	Torque control is forbidden and switch inverter to run in speed control mode.
30	Forbid the function of ACC/DEC	ACC/DEC is invalid and maintains output frequency if it is enabled.
31	Counter input	The pulse input terminal of internal counter.Maximum pulse frequency:200HZ.
32	UP/DOWN invalid temporarily	UP/DOWN setting is invalid but will not be cleared.When this terminal is disabled, UP/DOWN value before will be valid again.

33~39	Reserved	Reserved

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

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

Function Code	Name	Setting Range
P5.10	Terminal control mode	0~3[0]

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

0:2-wire control mode1: integrate enabling with run direction. The defined FWD and REV terminal command determines the direction.

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

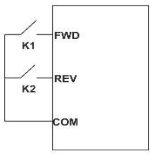


Figure 6.9 2-wire control mode 1.

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

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

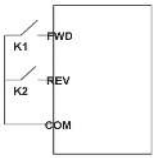


Figure 6.10 2-wire control mode 2.

2 : 3-wire control mode 1 :

SB1: Start button

SB2: Stop button (NC)

K: Run direction button

Terminal SIn is the multifunctional input terminal of S1~S7 and HDI. The terminal function should be set to be 3(3-wire control).

K	Run command
OFF	FWD
ON	REV

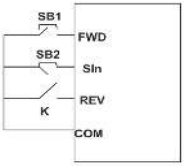


Figure 6.11 3-wire control mode 1.

3: 3-wire control mode 2:
SB1: Forward run button
SB2: Stop button (NC)
SB3: Reverse run button
Terminal SIn is the multifunctional input terminal of S1~S7 and HDI. The terminal function should be set to be 3(3-wire control).

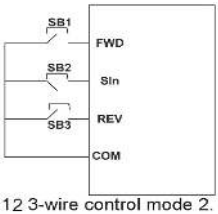


Figure 6.12 3-wire control mode 2.

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

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

Function Code	Name	Setting Range
P5.11	UP/DOWN setting change rate	0.01~50.0HZ/s [0.5HZ/s]

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

Function Code	Name	Setting Range
P5.12	AI1 lower limit	-10.0~10.0V[0.0V]
P5.13	AI1 lower limit corresponding setting	-100.0~100.0% [0.0%]
P5.14	AI1 upper limit	-10.0~10.0V[10.0V]
P5.15	AI1 upper limit corresponding setting	-100.0~100.0% [100.0%]
P5.16	AI1 filter time constant	0.0~10.0s [0.10s]

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

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

For different applications, the corresponding value of 100.0% analog setting is different.

For details, Please refer to description of each application.

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

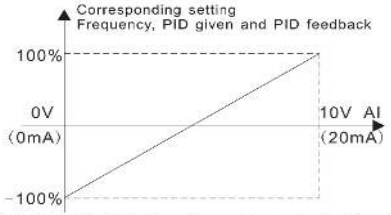


Figure 6.13 Relationship between AI and corresponding setting.

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

Function Code	Name	Setting Range
P5.17	AI2 lower limit	0.0~10.0V[0.0v]
P5.18	AI2 lower limit corresponding setting	-100.0~100.0 [0.0%]
P5.19	AI2 upper limit	0.0~10.0V[10.0v]
P5.20	AI2 upper limit corresponding setting	-100.0~100.0 [100.0%]
P5.21	AI2 filter time constant	0.0~10.0s[0.10s]

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

Function Code	Name	Setting Range
P5.22	HDI lower limit	0.0~50.0kHZ [0.0kHZ]
P5.23	HDI lower limit corresponding setting	-100.0~100.0 [0.0%]

Function Code	Name	Setting Range
P5.24	HDI upper limit	0.0~50.0kHZ [50.0kHZ]
P5.25	HDI upper limit corresponding setting	-100.0~100.0 [100.0%]
P5.26	HDI filter time constant	0.0~10.0s [0.10s]

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

P6 Group Output Terminals

There are 2 multi-function relay output terminals, 1 HDO terminal and 2 multi-function analog output terminals in MA510 series inverters.

Function Code	Name	Setting Range
P6.00	HDO selection	0~1 [0]

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

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

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

Function Code	Name	Setting Range
P6.01	HDO ON-OFF output selection	0~20 [1]
P6.02	Relay 1 output selection	0~20 [4]
P6.03	Relay 2 output selection	0~20 [0]

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

setting value	Function	Description
0	No output	Output terminal has no function.
1	Running	ON: Run command is ON or voltage is being output.
2	Run forward	ON: During forward run.
3	Run reverse	ON: During reverse run.
4	Fault output	ON: Inverter is in fault status.

setting value	Function	Description
5	FDT reached	Please refer to description of P8.21,P8.22.
6	Frequnecy reached	Please refer to description of P8.23.
7	Zero speed running	ON: The running frequency of inverter and setting frequency are zero.
8	Preset count value reached	Please refer to description of P8.18.
9	Specified count value reached	Please refer to description of P8.19.
10	Overload pre-warming of inverter	According to the "pre-alarm point of the inverter",it will output ON signal when exceeding the pre-alarm time.
11	Simple PLC step completed	After simple PLC completes one step, inverter will output ON signal for 500ms.
12	PLC cycle completed	After simple PLC completes one cycle, inverter will output ON signal for 500ms.
13	Running time reached	ON: The accumulated running time of inverter reaches the value of P8.20.
14	Upper frequency limit reached	ON: Running frequency reaches the value of P0.04.
15	Lower frequency limit reached	ON: Running frequency reaches the value of P0.05.
16	Ready	ON: Inverter is ready(no fault,power is ON).
17~20	Reserved	Reserved

Function Code	Name	Setting Range
P6.04	AO1 function selection	0~10 [0]
P6.05	AO2 function selection	0~10 [0]
P6.06	HDO function selection	0~10 [0]

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

setting value	Function	Description
0	Running frequency	0~Maximum frequency
1	Reference frequency	0~Maximum frequency
2	Running speed	0~2* rated synchronous speed of motor
3	Output current	0~2* inverter rated current

setting value	Function	Description
4	Output voltage	0~1.5* inverter rated voltage
5	Output power	0~2 * rated power
6	Setting torque	0~2* rated current of motor
7	Output torque	0~2* rated current of motor
8	AI1 voltage	-10~10V
9	AI2 voltage/current	0~10V/0~20mA
10	HDI frequency	0.1~50.0kHZ

Function Code	Name	Setting Range
P6.07	AO1 lower limit	0.0~100.0%[0.0%]
P6.08	AO1 lower limit corresponding output	0.0~10.0V [0.0v]
P6.09	AO1 upper limit	0.0~100.0% [100.0%]
P6.10	AO1 upper limit corresponding output	0.0~10.0V [10.0v]

These parameters determine the relationship between analog output voltage/current and the corresponding output value. When the analog output value exceeds the range between lower limit and upper limit, it will output the upper limit or lower limit. When AO1 is current output, 1 mA is corresponding to 0.5V.

For different applications, the corresponding value of 100% analog output is different. For details, please refer to description of each application.

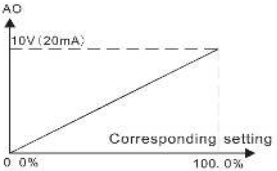


Figure 6.14 Relationship between AO and corresponding setting.

Function Code	Name	Setting Range
P6.11	AO2 lower limit	0.0~100.0% [0.0%]
P6.12	AO2 lower limit corresponding output	0~10.0V [0.0V]
P6.13	AO2 upper limit	0.0~100.0% [100.0%]
P6.14	AO2 upper limit corresponding output	0.0~10.0v [10.0v]

Function Code	Name	Setting Range
P6.15	HDO lower limit	0.0~100.0% [0.0%]
P6.16	HDO lower limit corresponding output	0.0~50.0KHZ [0.0KHZ]
P6.17	HDO upper limit	0.0~100.0% [100.0%]
P6.18	HDO upper limit corresponding output	0.0~50.0KHZ [50.0KHZ]

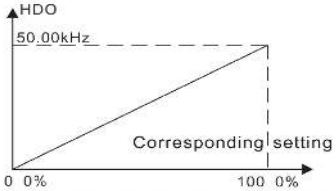


Figure 6.15 Relationship between HDO and corresponding setting.

P7 Group Display Interface

Function Code	Name	Setting Range
P7.00	User password	0~65535 [0]

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

After the password has been set and becomes valid, the user can not access menu if the user's password is not correct. Only when a correct user's password is input, the user can see and modify the parameters. Please keep user's password in mind.
The password protection becomes valid in 1 minute after quitting from the function code editing state.Press PRG/ESC again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the correct password, the operators cannot enter it.

Function Code	Name	Setting Range
P7.01	Reserved	0~1 [0]
P7.02	Reserved	0~2 [0]
P7.03	QUICK/JOG function selection	0~4 [0]

QUICK/JOG is a multifunctional key, whose function can be defined by the value
0: Display status switching
1: Jog : Press QUICK/JOG , the inverter will jog.
2: FWD/REV switching: Press QUICK/JOG , the running direction of inverter will reverse. It is only valid if P0.03 is set to be 0.
3: Clear UP/DOWN setting: Press QUICK/JOG, the UP/DOWN setting will be cleared.
4: Quick debugging mode

Function Code	Name	Setting Range
P7.04	STOP/RST function	0~3 [0]

0: Valid when keypad control (P0.02=0)
1: Valid when keypad or terminal control (P0.02=0 or 1)
2: Valid when keypad or communication control (P0.02=0 or 2)
3: Always valid

Note:

- **The value of P7.04 only determines the STOP function of STOP/RST.**

- **The RESET function of STOP/RST is always valid.**

Function Code	Name	Setting Range
P7.05	Keypad display selection	0~3 [0]

0: When external keypad exists, local keypad will be invalid.
1: Local and external keypad display simultaneously, only the key of external keypad is valid.
2: Local and external keypad display simultaneously, only the key of local keypad is valid.
3: Local and external keypad display simultaneously, both keys of local and external keypad are valid.

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

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

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

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

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

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Output power	Line speed	Rotation speed	Output current	Output voltage	DC bus voltage	Reference frequency	Running frequenc

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Step No. of PLC or multi-step	Count value	Torque setting value	Output terminal status	Input terminal status	PID feedback	PID preset	Output torque

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

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

The value of P7.06 is 100Fh.

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

For details, please refer to description of P7.23 and P7.24.

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

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

Function Code	Name	Setting Range
P7.08	Stop status display selection	0~0xFFFF [0x07FF]

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

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

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
AI2	AI1	PID feedback	PID preset	Output terminal status	Input terminal status	DC bus voltage	Reference frequency

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Reserved	Reserved	Reserved	Reserved	Torque setting value	Step No. of PLC or multi-step	HDI frequency

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

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

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

Function Code	Name	Setting Range
P7.10	Coefficient of line speed	0.1~999.9% [100.0%]

This parameter is used to calculate the line speed based on actual mechanical speed. The formula is as below:
Line speed=actual mechanical speed *P7.10

Function Code	Name	Setting Range
P7.11	Rectify module temperature	0~100.0°C
P7.12	IGBT module temperature	0~100.0°C
P7.13	Software version	

P7.14	Inverter rated power	0~3000KW [Depend on model]
Function Code	Name	Setting Range
P7.15	Inverter rated current	0.0~6000A [Depend on model]
P7.16	Accumulated running time	0~65535h

Rectify module temperature: Indicates the temperature of rectify module. Overheat protection point of different model may be different.
IGBT module temperature: Indicates the temperature of IGBT module. Overheat protection point of different model may be different.
Software version: Indicates current software version of DSP.
Accumulated running time: Displays accumulated running time of inverter.

Note:Above parameters are read only.

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

These parameters record three recent fault type. 0 means there is no fault and 0~25 means there are 25 faults. For details, please refer to fault analysis.

Function Code	Name	Setting Range
P7.20	Output frequency at current fault	
P7.21	Output current at current fault	
P7.22	DC bus voltage at current fault	
P7.23	Input terminal status at current fault	
P7.24	Output terminal status at current fault	

This value is displayed as decimal.This value records ON-OFF input terminal status at current fault. The meaning of each bit is as below:

BIT7	BIT6	BIT5	BIT4
HDI	S7	S6	S5
BIT3	BIT2	BIT1	BIT0
S4	S3	S2	S1

1 indicates corresponding input terminal is ON, while 0 indicates OFF. This value records output terminal status at current fault.

This value is displayed as decimal. The meaning of each bit is as below:

BIT3	BIT2	BIT1	BIT0
Reserved	RO2	RO1	HDO

1 indicates corresponding output terminal is ON,while 0 indicates OFF. Notice: This value is displayed as decimal.

P8 Group Enhanced Function

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

ACC/DEC time can be selected among P0.11, P0.12 and the above three groups.Their meaning are the same.Please refer to the relative instructions of P0.11 and P0.12.

Select the ACC/DEC time 0~3 through the different combination of the multi-function digital terminals when the inverter runs.

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

Function Code	Name	Setting Range
P8.06	Jog reference	0.0~P0.03 [Depend on model]
P8.07	Jog acceleration time	0.1~3600.0s [Depend on model]
P8.08	Jog deceleration time	0.1~3600.0s [Depend on model]
P8.09	Skip frequency 1	0.0~P0.03 [0.0HZ]
P8.10	Skip frequency 2	0.0~P0.03 [0.0HZ]
P8.11	Skip frequency bandwidth	0.0~P0.03 [0.0HZ]

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

Notice:

If P8.11 is 0, the skip function is invalid.

If both P8.09 and P8.10 are 0,the skip function is invalid no matter what P8.11 is.

Operation is prohibited within the skip frequency bandwidth,but changes during acceleration and deceleration are smooth without skip.

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

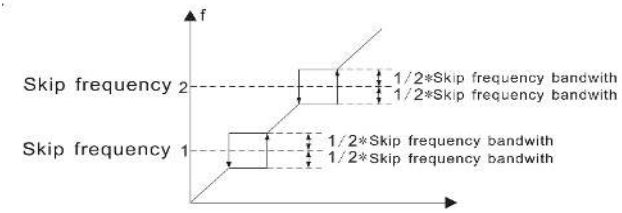


Figure 6.16 Skip frequency diagram.

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

Traverse function applies to the industries where need the traverse and convolution function such as textile and chemical fiber industries.

The traverse function means that the output frequency of the inverter is fluctuated with the set frequency as its center. The route of the running frequency is illustrated as below of which the traverse is set by P08.12 and when P08.12 is set as 0,the traverse is 0 with no function.

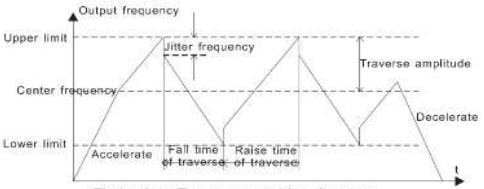


Figure 6.17 Traverse operation diagram.

Traverse range: The traverse running is limited by upper and low frequency.

The traverse range relative to the center frequency:traverse range AW= center frequency×traverse range P08.12.

Sudden jumping frequency=traverse range AW×sudden jumping frequency range P08.13. When run at the traverse frequency,the value which is relative to the sudden jumping frequency.

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

The times of the fault reset: the inverter set the fault reset times by selecting this function. If the reset times exceed s this set value, the inverter will stop for the fault and wait to be repaired.

The interval time of the fault reset: The interval between the time when the fault occurs and the time when the reset action occurs.

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

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

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

If function of output terminal is set as specified count reached,when the count value reaches specified count value (P8.18). Inverter will clear the counter and restart counting.

Note:

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

This function is shown as following figure.

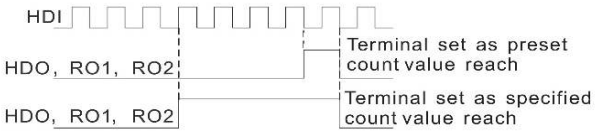


Figure 6.18 Timing chart for preset and specified count reached.

Function Code	Name	Setting Range
P8.20	Preset running time	0~65535h [65535h]

Pre-set running time of the inverter.
When the accumulative running time achieves the set time,the multi-function digital output terminals will output the signal of "running time arrival".

Function Code	Name	Setting Range
P8.21	FDT level	0.0~P0.03 [50.0HZ
P8.22	FDT lag	0.0~100.0 [5.0%]

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

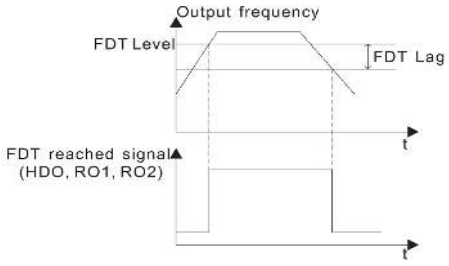


Figure 6.19 FDT level and lag diagram.

Function Code	Name	Setting Range
P8.23	Frequency arrive detecting range	0.0~100.0% [0.0%]

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

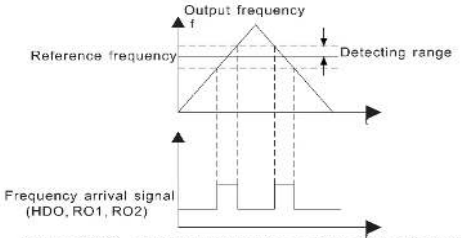


Figure 6.20 Frequency arriving detection diagram.

Function Code	Name	Setting Range
P8.24	Droop control	0.0~10.0HZ [0.0HZ]

When several motors drive the same load,each motor's load is different because of the difference of motor's rated speed. The load of different motors can be balanced through droop control function which makes the speed droop along with load increase.
When the motor outputs rated torque,actual frequency drop is equal to P8.24. User can adjust this parameter from small to big gradually during commissioning. The relation between load and output frequency is in the following figure.

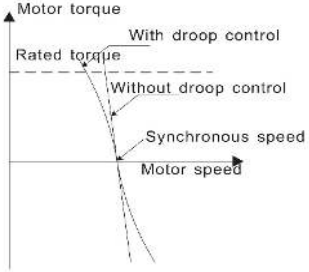


Figure 6.21 Droop control diagram.

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

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

Note:
- **Factory setting is 120% if rated voltage of inverter is 230V.**
- **Factory setting is 130% if rated voltage of inverter is 400V.**
- **The value of P8.25 is corresponding to the DC bus voltage at rated input voltage.**

Function Code	Name	Setting Range
P8.26	Cooling fan control	0~1 [0]

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

Function Code	Name	Setting Range
P8.27	Overmodulation	0~1 [0]

0: the function is invalid
1: the function is valid
The function is applicable in the instance of low network voltage or heavy load for a long time, inverter raises the output voltage with rising utilization rate of bus voltage.

Function Code	Name	Setting Range
P8.28	PWM mode	0~2 [0]

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

Mode	Noise in lower frequency	Noise in higher frequency	Others
PWM mode 1	Low	high	
PWM mode 2	low		Need to be derated, because of higher temperature rise.
PWM mode 3	high		Be more effective to restrain the oscillation

P9 Group PID Control

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

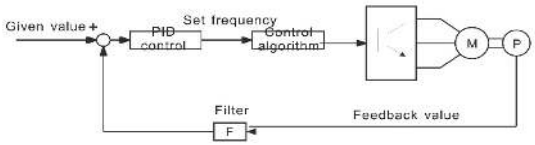


Figure 6.22 PID control diagram.

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

Function Code	Name	Setting Range
P9.00	PID preset source selection	0~5 [0]

0: Keypad
1: AI1
2: AI2
3: HDI
4: Multi-step
5: Communication

When P0.07=6, this function is valid. The parameter determines the target given channel during the PID procures.
These parameters are used to select PID preset and feedback source.
Note:
- **Preset value and feedback value of PID are percentage value.**
- **100% of preset value is corresponding to 100% of feedback value.**
- **Preset source and feedback source must not be same, otherwise PID will be malfunction.**

Function Code	Name	Setting Range
P9.01	Keypad PID preset	0.0~100.0% [0.0%]

Set the parameter when P9.00=0.
The basic value of this parameter is the feedback value.

Function Code	Name	Setting Range
P9.02	PID feedback source selection	0~4 [0]

0: AI1
1: AI2
3: AI1+AI2
3: HDI
4: Communication
This parameter is used to select PID feedback source.
The given channel and the feedback channel can not coincide, otherwise, PID can not control effectively.

Function Code	Name	Setting Range
P9.03	PID output characteristic	0~1 [0]

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

Function Code	Name	Setting Range
P9.04	Proportional gain (Kp)	0.0~100.0 [0.10]
P9.05	Integral time (Ti)	0.0~100.0 s [0.10s]
P9.06	Differential (Td)	0.0~100.0 s [0.10s]

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

Adjusting PID control:

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

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

Making fine adjustments:

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

• Reducing overshooting

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

• Rapidly stabilizing control status

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

• Reducing long-cycle oscillation

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

• Reducing short-cycle oscillation

If the oscillation cycle is short and oscillation occurs with a cycle approximately the same as the differential time setting, it means that the differential operation is strong. The oscillation will be reduced as the differential time is shortened.
If oscillation cannot be reduced even by setting the differential time to 0, then either lower the proportional gain or raise the PID primary delay time constant.

Function Code	Name	Setting Range
P9.07	Sampling cycle (T)	0.01~100.0s[0.10s]
P9.08	Bias limit	0.00~100.0%[0.0%]

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

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

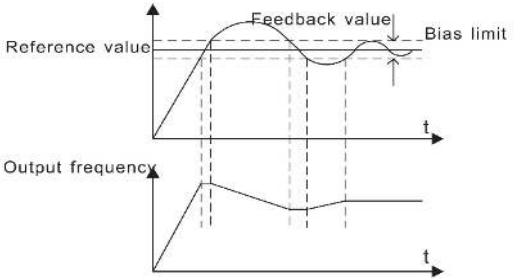


Figure 6.2 3 Relationship between bias limit and output frequency.

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

When feedback value is less than P9.09 continuously for the period determined by P9.10, the inverter will alarm feedback lost failure (PIDE).

Note: 100% of P9.09 is the same as 100% of P9.01.

PA Group Simple PLC and Multi-step Speed Control

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

Note:

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

Function Code	Name	Setting Range
PA.00	Simple PLC mode	0~2 [0]

0: Stop after one cycle: Inverter stops automatically as soon as it completes on cycle, and it needs run command to start again.
1: Hold last frequency after one cycle: Inverter holds frequency and direction of last step after one cycle.
2: Circular run: Inverter continues to run cycle by cycle until receive a stop command.

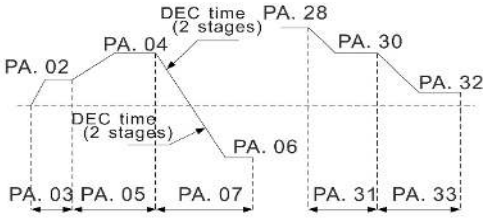


Figure 6.24 Simple PLC operation diagram.

Function Code	Name	Setting Range
PA.01	Simple PLC status saving after power off	0~1 [0]

0: Power loss without memory

1: Power loss memory

PLC record the running stage and frequency when power loss.

Function Code	Name	Setting Range
PA.02	Multi-step speed 0	-100.0~100.0% [0.0%]
PA.03	0th step running time	0.0~6553.5s [0.0s]
PA.04	Multi-step speed 1	-100.0~100.0% [0.0%]
PA.05	1st step running time	0.0~6553.5s [0.0s]
PA.06	Multi-step speed 2	-100.0~100.0% [0.0%]
PA.07	2nd step running time	0.0~6553.5s [0.0s]
PA.08	Multi-step speed 3	-100.0~100.0% [0.0%]
PA.09	3rd step running time	0.0~6553.5s [0.0s]

Function Code	Name	Setting Range
PA.10	Multi-step speed 4	-100.0~100.0% [0.0%]
PA.11	4th step running time	0.0~6553.5s [0.0s]
PA.12	Multi-step speed 5	-100.0~100.0% [0.0%]
PA.13	5th step running time	0.0~6553.5s [0.0s]
PA.14	Multi-step speed 6	-100.0~100.0% [0.0%]
PA.15	6th step running time	0.0~6553.5s [0.0s]
PA.16	Multi-step speed 7	-100.0~100.0% [0.0%]
PA.17	7th step running time	0.0~6553.5s [0.0s]
PA.18	Multi-step speed 8	-100.0~100.0% [0.0%]
PA.19	8th step running time	0.0~6553.5s [0.0s]
PA.20	Multi-step speed 9	-100.0~100.0% [0.0%]
PA.21	9th step running time	0.0~6553.5s [0.0s]
PA.22	Multi-step speed 10	-100.0~100.0% [0.0%]
PA.23	10th step running time	0.0~6553.5s [0.0s]
PA.24	Multi-step speed 11	-100.0~100.0% [0.0%]
PA.25	11th step running time	0.0~6553.5s [0.0s]
PA.26	Multi-step speed 12	-100.0~100.0% [0.0%]
PA.27	12th step running time	0.0~6553.5s [0.0s]

Function Code	Name	Setting Range
PA.28	Multi-step speed 13	-100.0~100.0% [0.0%]
PA.29	13th step running time	0.0~6553.5s [0.0s]
PA.30	Multi-step speed 14	-100.0~100.0% [0.0%]
PA.31	14th step running time	0.0~6553.5s [0.0s]
PA.32	Multi-step speed 15	-100.0~100.0% [0.0%]
PA.33	15th step running time	0.0~6553.5s [0.0s]

100.0% of the frequency setting corresponds to the Max.Frequency.

When selecting simple PLC running, set PA.02~PA.33 to define the running and direction of all stages.

Note: The symbol of multi-stage determines the running direction of simple PLC.

The negative value means reverse rotation.

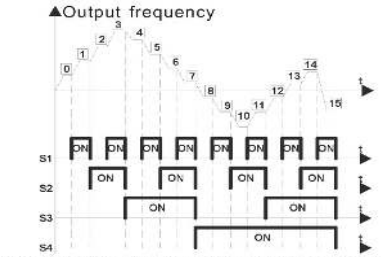


Figure 6.25 Multi-steps speed operation diagram.

Multi-stage speeds are in the range of -Fmax~Fmax and it can be set continuously. MA510 series inverter can set 16 stages speed, selected by the combination of multi-stage terminals S1,S2,S3,S4 corresponding to the speed 0 to speed 15.
When S1=S2=S3=S4=OFF, the frequency input manner is selected via code P0.06 or P0.07. When all S1=S2=S3=S4 terminals aren't off, it runs at multi-stage which takes precedence of keypad, analog value, high-speed pulse,PLC,communication frequency input. Select at most 16 stages speed via the combination code of,S2,S3,and,S4.
The start-up and stopping of multi-stage running is determined by function code P0.01,the relationship between S1,S2,S3,S4 terminals and multi-stage speed is as following.

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

Function Code	Name	Setting Range
PA.34	ACC/DEC time selection for step 0~7	0~0XFFFF [0]
PA.35	ACC/DEC time selection for step 8~15	0~0XFFFF [0]

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

Function Code	Binary Digit		Step No.	ACC/DEC Time 0	ACC/DEC Time 1	ACC/DEC Time 2	ACC/DEC Time 3
	BIT1	BIT0	0	00	01	10	11
	BIT3	BIT2	1	00	01	10	11
	BIT5	BIT4	2	00	01	10	11
	BIT7	BIT6	3	00	01	10	11

PA.34	BIT9	BIT8	4	00	01	10	11
	BIT11	BIT10	5	00	01	10	11
	BIT13	BIT12	6	00	01	10	11
	BIT15	BIT14	7	00	01	10	11
PA.35	BIT1	BIT0	8	00	01	10	11
	BIT3	BIT2	9	00	01	10	11
	BIT5	BIT4	10	00	01	10	11
	BIT7	BIT6	11	00	01	10	11
	BIT9	BIT8	12	00	01	10	11
	BIT11	BIT10	13	00	01	10	11
	BIT13	BIT12	14	00	01	10	11
	BIT15	BIT14	15	00	01	10	11

After the users select the ccorresponding ACC/DEC time, the combining 16 binary bit will change into decimal bit,and then set the corresponding function codes.

Function Code	Name	Setting Range
PA.36	Simple PLC restart selection	0~2 [0]

0: Restart from step 0: If the inverter stops during running (due to stop command or fault), it will run from step 0 when it restarts.
1: continue from interrupted step: If the inverter stops during running (due to stop command or fault), it will record the running time of current step. When inverter restarts, it will resume from interrupted time automatically. For details please refer to following figure.

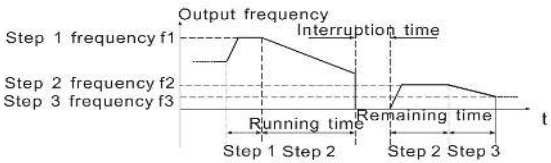


Figure 6.26 Simple PLC continues from interrupted step.

Function Code	Name	Setting Range
PA.37	Time unit	0~1 [0]

0: Seconds

1: Minutes

This parameter determines the unit of x step running time.

Pb Group Protection Function

Function Code	Name	Setting Range

Pb.00	Input phase-failure protection	0~1 [1]
Pb.01	Output phase-failure protection	0~1 [1]

0: Disable

1: Enable

Input phase loss protection: select whether to protect the input phase loss.

Function Code	Name	Setting Range
Pb.02	Motor overload protection	0~2 [2]

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

1: Common motor (with low speed compensation). As the cooling effect of the common motor is weakened at low speed, the corresponding electronic heating protection is adjusted. The low speed compensation means decrease the motor overload protection threshold whose frequency is below 30HZ.

2: Variable frequency motor (without low speed compensation). As the cooling effect of variable frequency motor has nothing to do with running speed,it is not required to adjust the motor overload protection threshold.

Function Code	Name	Setting Range
Pb.03	Motor overload protection coefficient	20.0~120.0% [100.0%]

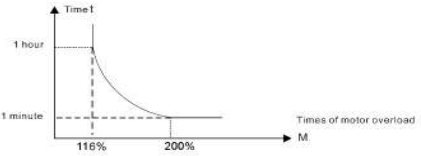


Figure 6.27 Motor overload protection curve.

Times of the motor overload M=Iout/(In*K)

In= the rated current of the motor

Iout= the output current of the inverter

K= motor overload protection coefficient

So, the bigger the value of K is, the smaller the value of M is.

When M=116%, protect after the motor overloads 1 hour; when M=200%, protect after the motor overloads 60 seconds; when M≥400%, protect immediately.

Function Code	Name	Setting Range
Pb.04	Threshold of trip-free	70.0~110.0% [80.0%]
Pb.05	Decrease rate of trip-free	0.0HZ~P0.03 [0.0HZ]

100% of Pb.04 corresponds to the standard bus voltage.
If Pb.05 is set to be 0, the trip-free function is invalid.
Trip-free function enables the inverter to perform low-voltage compensation when DC bus voltage drops below Pb.04.The inverter can continue to run without tripping by reducing its output frequency and feedback energy via motor.

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

Function Code	Name	Setting Range
Pb.06	Over-voltage stall protection	0~1 [4]
Pb.07	Over-voltage stall protection point	110~150% [130%]

0: Disabled
1: Enabled
During deceleration,the motor's decelerating rate may be lower than that of inverter's outbut frequency due to the load inertia. At this time, the motor will feed the energy back to the inverter, resulting in rise of DC bus voltage rise. If no measures taken,the inverter will trip due to over voltage.
During deceleration,the inverter detects DC bus voltage and compares it with over-voltage stall protection point. If DC bus voltage exceeds Pb.07, the inverter will stop reducing its output frequency. When DC bus voltage become lower than Pb.07, the deceleration continues, as shown in following figure.

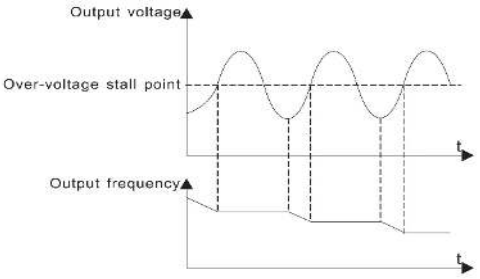


Figure 6.28 Over-voltage stall function.

Function Code	Name	Setting Range
Pb.08	Auto current limiting threshold	50~200% [G model: 160% P Model: 120%]
Pb.09	Frequency decrease rate when current limiting	0.0~50.0 HZ/S [10.0 HZ/S]
Pb.10	Action selection when current limiting	0~1 [0]

0: Enabled

1: Disabled when constant speed

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

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

Pb.09 defines the decrease rate of output frequency when this function is active. If Pb.08 is too small, overload fault may occur. If it is too big, the frequency will change too sharply and therefore, the feedback energy of motor will be too large and may cause over-voltage fault. This function is always enabled during acceleration or deceleration whether the function is enabled in constant speed running is determined by Pb.10.

Note:

• During auto current limiting process,the inverter's output frequency may change;therefore,it is recommended not to enable the function when inverter needs to output stable frequency

• During auto current limiting process,if Pb.08 is too low,the overload capacity will be impacted.

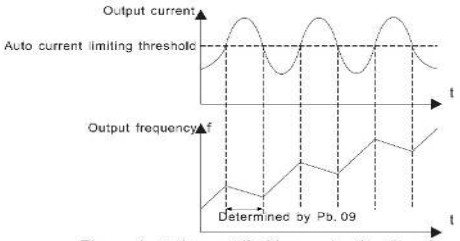


Figure 6. 29Current limiting protection function.

Function Code	Name	Setting Range
Pb.11	Selection of overtorque (OL3)	0~4 [1]
Pb.12	Detection level of overtorque	10.0~200.0% [Depend on model]

0: No detection

1: Valid detection of overtorque during running,then continue running.

2: Valid detection of overtorque during running,then warning and stop.

3: Valid detection of overtorque during constant speed running,then continue running.

4: Valid detection of overtorque during constant speed running,then warning (OL3) and stop.

G model: 150%

P model: 120%

This value is depending on model.

Function Code	Name	Setting Range
Pb.13	Detection time of overtorque	0.0~60.0s [0.1s]

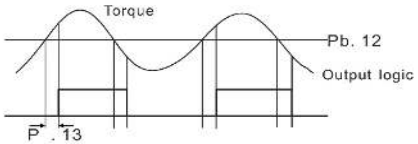


Figure 6.30 Overtorque control function.

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

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

PC Group Serial Communication

Function Code	Name	Setting Range
PC.00	Local address	0~247 [1]

When the master is writing the frame,the communication address of the slave is set to 0, the address is the communication adress. All slaves on the MODBUS fieldbus can receive the frame, but the salve doesn't answer.
The communication of the drive is unique in the communication net. This is the fundamental for the point to point communication between the upper monitor and the drive.

Note: The address of the slave cannot set to 0.

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

Function Code	Name	Setting Range
PC.01	Baud rate selection	0~5 [4]

0: 1200BPS

1: 2400BPS

2: 4800BPS

3: 9600BPS

4: 19200BPS

5: 38400BPS

This parameter can set the data transmission rate during serial communication.
The baud rate between the upper monitor and the inverter must be the same. Otherwise,the communication is not applied. The bigger the baud rate,the quicker the communication speed.

Function Code	Name	Setting Range
PC.02	Data format	0~5 [0]

0: RTU, 1 start bit, 8 data bits, no parity check, 1 stop bit.

1: RTU, 1 start bit, 8 data bits, even parity check, 1 stop bit.

2: RTU, 1 start bit, 8 data bits, odd parity check, 1 stop bit.

3: RTU, 1 start bit, 8 data bits, no parity check, 2 stop bits.

4: RTU, 1 start bit, 8 data bits, even parity check, 2 stop bits.

5: RTU, 1 start bit, 8 data bits, odd parity check, 2 stop bits.

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

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

This parameter means the interval time when the drive receive the data and sent it to the upper monitor. If the answer delay is shorter than the system processing time, then the answer delay time is the system processing time, if the answer delay is longer than the system processing time, then after the system deal with the data, waits until achieving the answer delay time to send the data to the upper monitor.

Function Code	Name	Setting Range
PC.04	Communication timeout delay	0.0~100.0s [0.0s]

When the function code is set as 0.0, the communication overtime parameter is invalid. When the function code is set to a valid value, if the interval time between two communications exceeds the communication overtime, the system will report 'communication faults" (CE).
Generally, set it as invalid; set the parameter in the continuous communication to monitor the communication state.

Function Code	Name	Setting Range
PC.05	Communication error action	0~3 [1]

0: When communication error occurs,inverter will alarm (CE) and coast to stop.
1: When communication error occurs, inverter will omit the error and continue to run.
2: When communication error occurs, if P0.01=2, inverter will not alarm but stop according to stop mode determined by P1.06. Otherwise it will omit the error.
3: When communication error occurs, inverter will not alarm but stop according to stop mode determined by P1.06.

Function Code	Name	Setting Range
PC.06	Response action	00~11 [0000]

Unit's place of LED
0: Response to writing
1: No response to writing
Ten's place of LED
0: Reference not saved when power off.
1: Reference saved when power off

Pd Group Supplementary Function

Function Code	Name	Setting Range

Pd.00~Pd.09	Reserved	

PE Group Factory Setting

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

COMMUNICATION PRTOTOCOL

Interfaces

RS485: asynchronous, half-duplex.

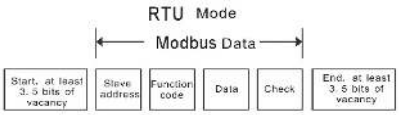
Default: 8-E-1, 19200bps. See Group PC parameter settings.

Communication Modes

The protocol is Modbus protocol. Besides the common register read/write operation, it is supplemented with commands of parameters management.
The drive is a slave in the network. It communicates in 'point to point' master-slave mode. It will not respond to the command sent by the master via broadcast address.
In the case of multi-drive communication or long-distance transmission, connecting a 100~120Ω resistor in parallel with the master signal line will help to enhance the immunity to interference.

Protocol Format

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



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

RTU mode

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

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

Node addr.	Command	Data addr.		Read No.		CRC	
0X01	0X03	0X00	0X02	0X00	0X01	0X25	0XCA

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

Node addr.	Command	Bytes No.	Data		CRC	
0X01	0X03	0X02	0X00	0X00	0XB8	0X44

Protocol function

Different respond delay can be set through drive's parameters to adapt to different needs.

For RTU mode, the respond delay should be no less than 3.5 bytes interval.

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

0X03	Read inverter's function parameter and status parameters
0X06	Write single function parameter or command parameter to inverter

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

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

Parameter Description	Address	Meaning of value	R/W Feature
		0001H: Forward	
		0002H: Reverse	
		0003H: JOG forward	

Control Command	1000H	0004H: JOG reverse	W/R
		0005H: Stop	
		0006H: Coast to stop	
		0007H: Reset fault	
		0008H: JOG stop	
Inverter status	1001H	0001H: Forward running	R
		0002H: Reverse running	
		0003H: Standby	
		0004H: Fault	
		0005H: Status of inverter POFF	
Parameter Description	**Address**	**Meaning of value**	**R/W Feature**
Communication setting	2000H	Communication setting range (-10000~10000) Note: the communication setting is the percentage of the relative value(-100.0%~100.0%) . If it is set as frequency source, the value is the percentage of the maximum frequency. If it is set PID (preset value or feedback value), the value is the percentage of the PID.	W/R
	2001H	PID setting, Range: 0~1000,1000 means 100.0%	W/R
	2002H	PID feedback Range: 0~1000,1000 means 100.0%	W/R
	2003H	Setting value of torque Range: -1000~1000 1000 means 100.0%	W/R

	2004H	Setting value of upper limit frequency (0~Fmax)	W/R
Status parameters	3000H	Output frequency	R
	3001H	Reference frequency	R
	3002H	DC Bus voltage	R
	3003H	Output voltage	R
	3004H	Output current	R
	3005H	Rotation speed	R
	3006H	Output power	R
	3007H	Output torque	R
	3008H	PID preset value	R
	3009H	PID feedback value	R
	300AH	Input terminal status	R
Parameter Description	**Address**	**Meaning of value**	**R/W Feature**
Status parameters	300BH	Output terminal status	
	300CH	Input of AI1	
	300DH	Input of AI2	
	300EH	Reserved	
	300FH	Reserved	
	3010H	HDI frequency	
	3011H	Reserved	
	3012H	Step No. of PLC or multi-step	
	3013H	Reserved	
	3014H	External counter input	
	3015H	Torque setting	
	3016H	Device code	
		0X00H:No fault	
		0X01H: OUT1	
		0X02H: OUT2	R

Inverter fault info address	5000H	0X03H: OUT3	R
		0X04H: OC1	
		0X05H: OC2	
		0X06H: OC3	
		0X07H: OV1	
		0X08H: OV2	
		0X09H: OV3	
		0X0A: UV	
		0X0B: OL1	
		0X0C: OL2	
		0X0D: SPI	
		0X0E:SPO	
Inverter fault info address	5000H	0X0F: OH1	
		0X10: OH2	
		0X11: EF	
Parameter Description	**Address**	**Meaning of value**	**R/W Feature**
Inverter fault info address	5000H	0X12: CE	R
		0X13: ItE	
		0X14: tE	
		0X15: EEP	
		0X16: PIDE	
		0X17: bCE	
		0X18: END	
		0X19: OL3	

and data structure in details, which is called protocol data unit for simplicity. Also MSB stands for the most significant byte and LSB stands for the least significant byte for the same reason. The description below is data format in RTU mode.
Protocol data unit format of reading parameters:
Request format:

Protocol data unit	Data length (bytes)	Range
Command	1	0X03

Data Address	2	0~0XFFFF
Read number	2	0X0001~0X0010

Reply format (success):

Protocol data unit	Data length	Range
Command	1	0X03
Returned byte number	2	2*Read number
content	2*Read number	

If the command is reading the type of inverter (data address OX3016),the content value in reply message is the device code:

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

For details,please refer to the following table:

High byte	Meaning	Low byte	Meaning
02	MA510	01	Universal type
		02	Vector type MA510

If the operation fails,the inverter will reply a message formed by failure command and error code. The failure command is (Command+0X80). The error code indicates the reason of the error; see the table below.

Value	Name	Mean
01H	IIlegal command	The command from master can not be executed. The reason maybe: 1 This command is only for new version and this version can not realize. 2 slave is in fault status and can not execute it.
02H	IIlegal data address.	Some of the operation addresses are invalid or not allowed to access.
03H	IIlegal value	When there are invalid data in the message framed received by slave. Note: This error code does not indicate the data value to write exceed the range,but indicate the message frame is a illegal frame.
06H	Slave busy	Inverter is busy (EEPROM is storing)

10H	Password error	The password written to the password check address is not same as the password set by P7.00.
11H	Check error	The CRC (RTU mode) check not passed.
12H	Written not allowed	It only happen in write command,the reason maybe: 1 The data to write exceed the range of according parameter
13H	System locked	When password protection take effect and user does not unlock it, write/read the function parameter will return this error.

Protocol data unit format of writing single parameter:
Request format:

Protocol data unit	Data length (bytes)	Range
Command	1	0X06
Data Address	2	0~0XFFFF
Write Content	2	0~0XFFFF

Reply format (success):

Protocol data unit	Data length (bytes)	Range
Command	1	0X06
Data Address	2	0~0XFFFF
Write Content	2	0~0XFFFF

If the operation fails,the inverter will reply a message formed by failure command and error code. The failure command is (Command+ 0X80). The error code indicates the reason of the error; see table 1.

Note
Between frames,the span should not less than 3.5 bytes interval,otherwise,the message will be discarded.
Be cautious to modify the parameters of PC group through communication, otherwise may cause the communication interrupted.

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

CRC Check

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

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

Example

Command code: 03H(0000 0011), read N words (Word) (the continuous Max. reading is 16 words)

For example, read continuous 2 words from the inverter with the address of 01H. The frame structure is as below:

RTU master command message (from the master to the inverter)

START	T1-T2-T3-T4
ADDR	01H
CMD	03H
High bit of the start bit	00H
Low bit of the start bit	03H
High bit of data number	00H
Low bit of data number	02H
CRC low bit	34H
CRC high bit	0BH

END	T1-T2-T3-T4

RTU slave response message

START	T1-T2-T3-T4
ADDR	01H
CMD	03H
Byte number	04H
Data high bit of address 0004H	13H
Data low bit of address 0004H	88H
Data high bit of address 0005H	13H
Data low bit of address 0005H	88H
END	T1-T2-T3-T4

Command code: 06H
06H (0000 0110), write one word (Word)

For example,write 5000 (1388H) to 0006H from the inverter with the address of 02H,the frame structure is as below:
RTU master command message

START	T1-T2-T3-T4
ADDR	02H
CMD	06H
High bit of writing data address	00H
Low bit of writing data address	06H
Data content	13H
Data content	88H
END	T1-T2-T3-T4

RTU slave response message

START	T1-T2-T3-T4
ADDR	02H
CMD	06H
High bit of writing data address	00H
Low bit of writing data address	06H
High bit of data content	13H

Low bit of data content	88H
END	T1-T2-T3-T4

Command code: 08H (0000 1000) for diagnosis

Meaning of sub-function codes:

Sub-function code	Description
0000	Return to inquire information data

For example: The inquiry information string is same as the response information string when the loop detection to address 01H of drive is carried out.

The RTU request command is:

START	T1-T2-T3-T4
ADDR	01H
CMD	08H
High byte of sub-function code	00H
Low byte of sub-function code	00H
High byte of data content	12H
Low byte of data content	ABH
Low byte of CRC	ADH
High byte of CRC	14H
END	T1-T2-T3-T4

The RTU response command is:

START	T1-T2-T3-T4
ADDR	01H
CMD	08H
High byte of sub-function code	00H
Low byte of sub-function code	00H
High byte of data content	12H
Low byte of data content	ABH
Low byte of CRC	ADH
High byte of CRC	14H
END	T1-T2-T3-T4

8-TROUBLE SHOOTING

fault messages including the possible cause and corrective actions.This

chapter tells how to reset faults and view fault history.It also lists all alarm and

8.1 Fault and Trouble shooting

Fault Code	Fault Type	Reason	Solution
Out1	IGBT fault	1. Acc time is too short. 2. IGBT module fault. 3.Malfunction caused by interference. 4.Grounding is not properly	1. Increase Acc time. 2. Ask for support. 3. Inspect external equipment and eliminate interference.
OC1	Over-current when acceleration	1. Acc time is too short. 2.The voltage of the grid is too low. 3.The power of the inverter is too low.	1. Increase Acc time. 2. Check the input power 3. Select bigger capacity inverter.
OC2	Over-current when deceleration	1. Dec time is too short. 2. The torque of the load inertia is big 3. The power of the inverter is too low.	1. Increase Dec time. 2.Install a proper energy consumption braking components 3. Select bigger capacity inverter.
OC3	Over-current when constant speed running	1 The load transients or is abnormal. 2.The voltage of the grid is too low. 3.The power of the inverter is	1. Check the load or reduce the transient of the load 2. Check the input power supply 3. Select bigger capacity inverter.
OV1	Over-voltage when	1. The input voltage is Abnormal	1. Check the input power

Fault Code	Fault Type	Reason	Solution
	acceleration	2. Restart the running motor after sudden power loss.	2.Avoid restart-up after stopping
OV2	Over-voltage when deceleration	1. Dec time is too short. 2.The inertia of the load is big. 3.The input voltage is abnormal	1.Increase the Dec time 2.Increase the energy-consuming components 3. Check the input power
OV3	Over-voltage when constant speed running	1. The input voltage changes Abnormally. 2. The inertia of the load is big.	1. Install the input reactor 2.Add proper energy-consuming components
UV	DC bus Under-voltage	1. The voltage of the grid is low	1.Check the input power supply of the grid
OL1	Motor overload	1. The voltage of the power supply is 2. The motor setting rated current is incorrect. 3. The motor stall or load transients is too strong. 4.The power of the motor is too big.	1. Check the power of the supply Line 2. Reset the rated current of the motor 3. Check the load and adjust the torque lift 4. Select a proper motor.
OL2	Inverter overload	1. The acceleration is too fast 2. Reset the rotating motor 3. The voltage of the power supply is too low. 4. The load is too heavy.	1. Increase the ACC time 2. Avoid the restarting after stopping. 3. Check the power of the supply line 4. Select an inverter with bigger power

Fault Code	Fault Type	Reason	Solution
SPI	Input phase loss	Phase loss or fluctuation of input R,S,T	1. Check input power 2. Check installation distribution
SPO	Output phase loss	U, V, W phase loss input(or serious asymmetrical three phase of the load)	1. Check the output distribution 2. Check the motor and cable
OH1	Rectify IGBT overheat	1.Sudden overcurrent of the inverter	1. Refer to the overcurrent solution
		2.There is direct or indirect short circuit between output 3 phase	2. Redistribute
		3.Air duct jam or fan damage	3. Dredge the wind channel or
		4.Ambient temperature is too high.	4. Low the ambient temperature
OH2	Inverter IGBT overheat	5.The wiring of the control panel or plug-ins are loose	5. Check and reconnect
		6.The assistant power supply is damaged and the drive voltage is undervoltage	6. Ask for service
		7.The bridge arm of the power module is switched on	7. Ask for service
		8.The control panel is abnormal1. Refer to the overcurrent solution	8. Ask for service
EF	External fault	S1: External fault input terminal take effect	1. Check the external device input

Fault Code	Fault Type	Reason	Solution
CE	Communi cation	1. The baud rate setting is incorrect. 2.Communication fault 3.The communication is off for a long time.	1. Set proper baud rate 2. Press STOP/RST to reset and ask for help 3. Check the communication connection distribution
ItE	Current detection fault	1. The connection of the control board is not good Assistant power is bad 2. Assistant power is damaged 3. Hoare components is broken 4. The modifying circuit is abnormal.	1. Check and reconnect 2. Ask for service 3. Ask for service 4. Ask for service
tE	Autotuning fault	1. The motor capacity does not comply with the inverter capability 2. The rated parameter of the motor	1.Change the inverter model 2.Set the rating parameters according to the nameplate of the motor
EEP	EEPROM fault	1. Error of controlling the write and read of the parameters 2. Damage to EEPROM	1.Press STOP/RST to reset 2. Ask for service
PIDE	PID feedback fault	1. PID feedback offline 2. PID feedback source disappear	1.Check the PID feedback signal wires 2.Check PID feedback source

Fault Code	Fault Type	Reason	Solution
bE	Braking unit fault	1. Braking circuit fault or damage to the braking pipes 2.The external braking resisitor is a little low	1.Check the braking unit and change new braking pipes 2.Increase the braking resistor
END	Time reach of factory setting	1.Trial time arrival	1. Ask for service
OL3	Overtorque	1. The acceleration is too fast 2. Reset the rotating motor 3. The voltage of the power supply is too low. 4. The load is too heavy.	1. Increase the ACC time 2. Avoid the restarting after stopping. 3.Check the power of the supply line 4. Select an inverter with bigger power 5. Adjust PB.11 to a proper value

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