

Chapter1 Product Introduction

1.1 Product Introduction

Thank you for purchasing A720 Current Torque Vector Control General Purpose Inverters developed by Qma Technical Company, featuring high performance and low noise. Please read this manual thoroughly and carefully to make good use of the performance and functions of this inverter and to keep your safety in operation. Please contact our agent in your regions or technical personnel of engineering department in our company if any problem you can not solve by referring to the manual occurs in operation. Our professionals are ready to help you. You are welcome to use our products.

[Notice]: A720 inverter is developed by Qma. In this manual, "Danger" and "Caution" paragraphs contain important safety precautions that shall be paid attention to during transportation, installation, operation and examination of the inverter.

[Danger]: Incorrect use of this inverter may result in personal injury and death. Do not dismount or install inverter or change its internal connection, wiring or component by yourself.

[Caution]: Incorrect use of this product may cause damages to the inverter or its mechanical systems.

[Danger]:

- After turning off the power, do not touch circuit board or components before CHARGE indicator goes off.
- Do not dismount or install inverter or change its internal connection, wiring or component by yourself.
- Make sure the power is off before wiring; do not check components, parts or signals on the circuit board while the inverter is running.
- Earthing terminals of the inverter must be grounded properly. Three grounding modes for 220V, special earthing for 440V.

[Caution]:

- Never perform withstanding voltage test for components or parts in the inverter, otherwise this may cause damages to these semi-conductor parts due to high voltage.
- Never wire output terminals U, V and W of the inverter to input terminals (R, S, T) of AC power supply.
- Component COM50C of inverter circuit board is susceptible to static electricity influence and damages. Do not touch the main circuit board.

[During operation]:

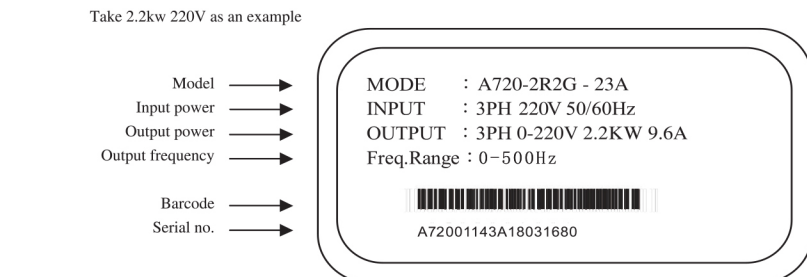
Danger

- Never remove front cover under power-on state to avoid personal injury due to electric shock;
- Never get close to the machine to avoid danger after motor stops working as it will automatically restart again if automatic restart function is enabled.
- Stop switch will be effected only after setting. Please note that it is different from emergency stop switch in usage.

Caution

- Never touch heating elements like heat sink and braking resistance to avoid electric shock; otherwise, it may cause personal injury.
- The inverter can be easily changed from low speed to high speed. Please input the allowable range of motor and machinery.
- When using brake, etc., please pay attention to relevant setting.
- Never check signals of circuit board when the inverter is running.
- Inverter has been set in the factory, so do not adjust it arbitrarily.

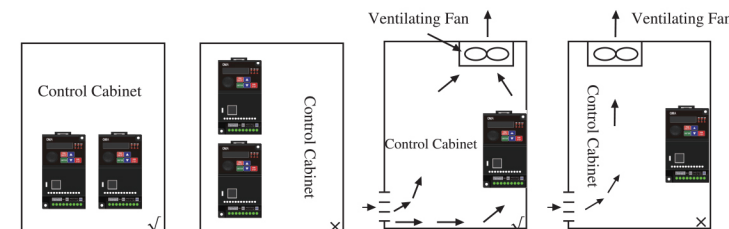
1.2 Nameplate



1.3 Application Environment

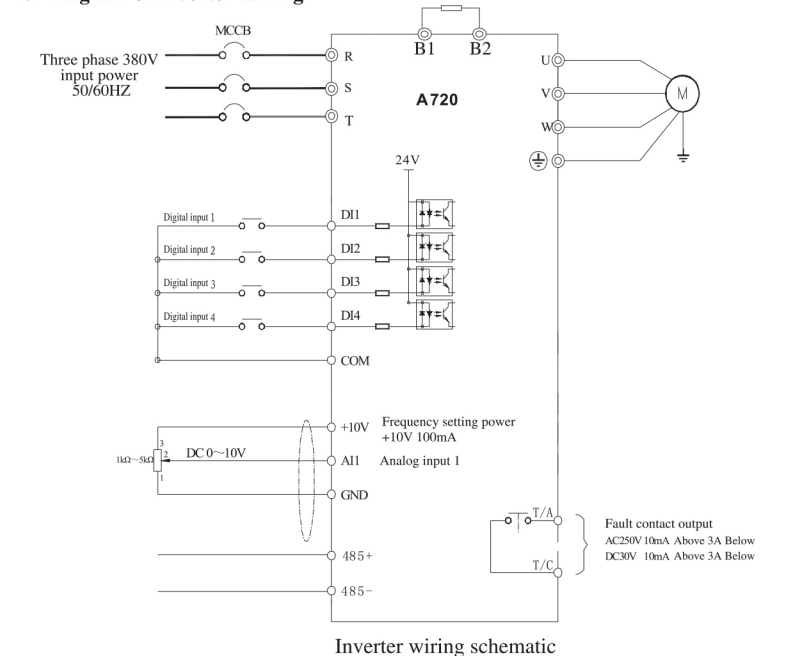
As the installation environment has direct influence on the performance and service life of the inverter, following conditions must be met.

- Ambient environment: Open installation in switchboard (-10~45)/+14~113°F)
 Closed wall-mounted type (-10~40)/+14~104°F)
- Avoid rain or humid environment. Avoid direct sunlight.
- Prevent erosion of oil mist and salt. Avoid corrosive liquid and gas.
- Prevent dust, battering and metal powder from entering the inverter.
- Away from radioactive substance and combustible material.
- Prevent electromagnetic interference (welding machine, power machine).
- Prevent vibration (punch press). If it is unavoidable, please install a shockproof gasket to reduce vibration.
- When multiple inverters are installed in a control cabinet, install them at proper positions for heat dissipation. In addition, please install a heat radiation fan to make the ambient temperature around the inverter lower than 45℃.



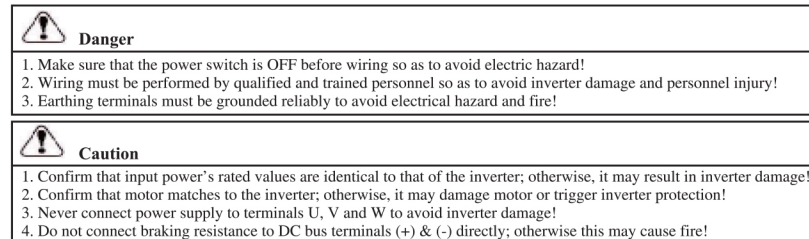
- Installing the inverter with its front surface forward and top part upward for heat radiation.
- Installation space must be in accordance with following regulations: When the inverter is installed inside the switchboard or if conditions permit, remove upper dustproof cover of the inverter for cooling and heat radiation.

1.4 Diagram of Inverter Wiring

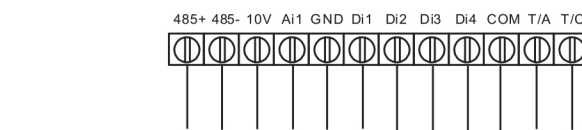


Inverter wiring schematic

1.5 Terminal & Wiring of Main Circuit



1.6 Control Terminal function instructions:



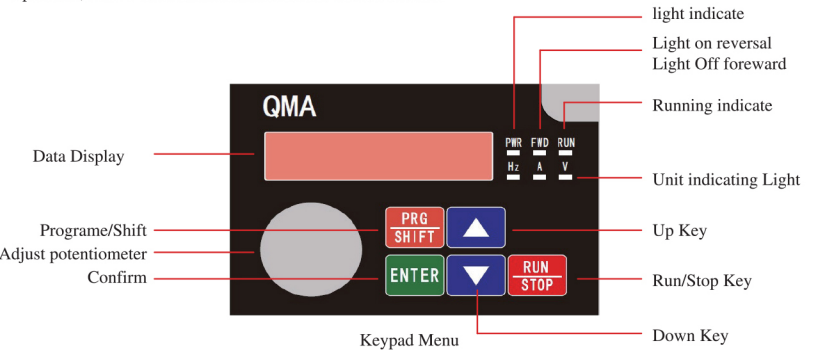
Control Terminal Marking instruction:

Terminal Symbol	Terminal Name	Terminal Function
D11	Digital input 1	1. optical coupling isolation 2. Impedance:2.4KΩ
D12	Digital input 2	
D13	Digital input 3	
D14	Digital input 4	
COM	Digital input com	Digital input D11-D14 common terminal
+10V-GND	External power supply+10V	External Power +10V, maximum output current 10mA, normally it is used for potentiometer power supply, potentiometer resistance value: 1KΩ-5KΩ
A11-GND	Analog input terminal 1	1. Input voltage range: DC 0V-10V 2. Input impedance: 22KΩ
485+	485 communication (+)	Standard RS Communication Connector
485-	485 communication (-)	
T/A-T/C	Normally Open terminal	Contact driving capacity: AC250V, 3A, COSΦ=0.4 DC 30V, 1A

Chapter 2. Operation and Display

2.1 Introduction to Operation and Display Interface

A user may operate A720 inverter by the operation panel through parameter setting, status monitoring, start/stop operation, etc. Its outlook and function zones area as follows:



Keypad button description

Button	Name	Function
PRG/SHIFT	Programmable	Loop Show parameters during running, can choose shift key if want to change the parameter
ENTER	Enter	Enter the menu step by step, set and enter parameters.
▲	Up	Increase figure or function code progressively.
▼	Down	Reduce figure or function code progressively.
RUN/STOP	Run/Stop	Press this button to start and stop the inverter with the keypad control.

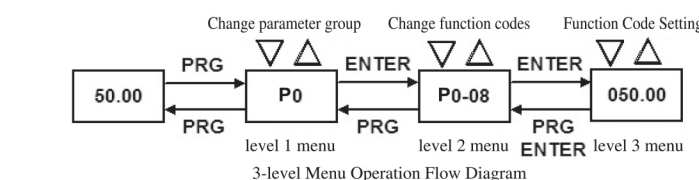
Description of function indicator lamp:

Indicator lamp	Description
RUN	Running status indicator lamp: Off: It means the inverter is in stop status; On: It means the inverter is in running status;
FWD/REV	Forward/reverse indicator lamp: On: it means reverse status; off: it means forward status.
Hz	Frequency indicator lamp, Unit: Hz
A	Current indicator lamp, unit: A
V	Voltage indicator lamp, unit: V

2.2 Description of Digital Manipulator

A720 inverter adopts three-level menu to set parameters.

3-level menu: Function parameter group (level 1) → function codes (level 2) → function code setting (level 3). See the figure below for operation procedure.



Description: Under the level 3 menu, user can press PRG or ENTER to back to the level 2 menu. The difference is that by pressing ENTER, it saves the setting parameter before getting back to the level 2 menu and then it enters the next function code automatically; by pressing PRG, it will directly return to the level 2 menu without saving parameters.

2.3 Methods to View Status Parameter

Under stop or running status, through the shift key ">", multiple status parameters can be displayed, P7-03 (running parameter 1), P7-04 (running parameter 2)

Under stopping status, 16 stopping parameters can be displayed in sequence according to selection, which respectively are: Setting frequency, bus voltage, DI input status, DO output status, analog input A11 voltage, actual count value, actual length, PLC running steps, load speed display, PID setting, PULSE input pulse frequency and 3 not used parameters.

Under running status, there are five default parameters of running status to be displayed: Running frequency, setting frequency, bus voltage, output voltage and output current. Besides, users can select to display other parameters, including output power, output torque, DI input status, DO output status, analog input A11 voltage, actual count value, actual length, linear speed, PID setting and PID feedback by bit of function code P7-03 and P7-04 (changed into binary bit). These parameters can be displayed in sequence.

When the inverter is powered on again after power failure, the default parameters displayed are parameters selected before power failure.

2.4 Password Setting

The inverter provides password protection for parameters. When 16-00 is set as non-zero, the password protection is enabled after exiting the function code editing status. By pressing PRG again, "-----" is displayed. At this time, users are required to enter correct user password to enter into the general menu.

To display the password protection function, user can enter the menu by inputting password and set 16-00 as 0.

Chapter 3. Autotuning

Motor parameter autotuning
 When the inverter is in vector control mode, motor nameplate parameters shall be entered correctly before inverter operation so that the inverter can select standard motor parameter according to the nameplate parameter; vector control mode is highly dependent on motor parameters. Therefore, to acquire good control performance, correct motor parameters are required.

- Perform the following steps to enable motor parameters autotuning:
- Firstly, select the command source (P0-02) as the operation panel command channel.
 - Then, input the following six parameters according to actual motor parameters:
 P1-00: Motor type options P1-01: Motor rated power
 P1-02: Motor rated voltage P1-03: Motor rated current
 P1-04: Motor rated frequency P1-05: Motor rated rotation speed

(3)According to the motor load condition:
 The best tuning mode is idling dynamic tuning; If conditions do not permit, on-load stationary tuning mode can be adopted;

1) Dynamic autotuning:
 When the motor is disconnected to load completely, set P1-37 as 2 and press ENTER to confirm. At this time, the keypad displays:

TUNE

Then, by pressing RUN on the keypad panel, the inverter will drive the motor to conduct acceleration/deceleration and forward/reverse running; moreover, the running indicator lamp is on. It takes about 2min to finish autotuning motor parameters. When above information disappears and returns to normal parameter display, it means autotuning is completed.

After autotuning, the inverter can calculate following motor parameters automatically:
 P1-06: Stator resistance of induction motor P1-07: Rotor resistance of induction motor
 P1-08: Leakage inductance of induction motor P1-09: Mutual inductance of induction motor
 P1-10: Idling current of induction motor

2) Static autotuning:
 If the motor can't be disconnected to load completely, select P1-37 then press ENTER to confirm. At this time, the keypad displays:

TUNE

Then, press RUN. After the inverter executes motor parameter tuning, motor parameter autotuning can be completed.

After autotuning, the inverter can calculate the following motor parameters automatically:
 P1-06: Stator resistance of induction motor P1-07: Rotor resistance of induction motor
 P1-08: Leakage inductance of induction motor

Chapter 4. Function Parameter Table

Function Code	Name	Setting Range	Minimum Unit	Default
P0-00	Motor Type Display	1: G type (constant torque load)	1	1
P0-01	Control Mode Options	0: Numerical vector control (SVC) 2: V/F control	1	0
P0-02	Start/Stop Control Options	0: Operation panel (LED on) 1: Terminal (LED on) 2: Serial port communication (LED flashing)	1	0
P0-03	Main Frequency Command Source A	0: Numeric setting (pre-setting frequency P108, which can be modified by pressing UP/DOWN and won't be memorized after power failure) 1: Numeric setting (pre-setting frequency P108, which can be modified by pressing UP/DOWN and memorized after power failure) 2: AI1 3: AI2 4: Reserve 5: PULSE setting (D15) 6: Preset speed command 7: Simple PLC 8: PID 9: Communication setting 10: Positioning mode	1	10
P0-04	Auxiliary Frequency Command Source B	Same with P0-03 (Main frequency command source A)	1	0
P0-05	Superposing Auxiliary Frequency Source B Range A	0: With respect to the maximum frequency 1: With respect to main frequency command source A	1	0
P0-06	Superposing Auxiliary Frequency Command B Range Selection	0%~150%	1%	100%
P0-07	Frequency Source Superposing Options	Ones place: Frequency source options 0: Main frequency source A 1: Main & auxiliary arithmetic results (arithmetic relation is determined by tens place) 2: Switching between main frequency source A and auxiliary frequency source B 3: Switching between main frequency source A and main & auxiliary arithmetic results. Tens place: Main & auxiliary arithmetic results. 0: Main frequency source's auxiliary frequency source 1: Main frequency source - auxiliary frequency source 2: The bigger of main frequency source A and auxiliary frequency source 3: The smaller of main frequency source A and auxiliary frequency source	11	00
P0-08	Main Frequency Setting of Digital Manipulator	0.00Hz~maximum frequency P0-10	0.01Hz	50.00Hz
P0-09	Running Direction	0: Same 1: Reverse	1	0
P0-10	Maximum Frequency	50.00Hz~200.00Hz	0.01Hz	50.00Hz
P0-11	Upper Limit Frequency Source Options	0: P0-12 setting 1: AI1 2: AI2 3: Not used 4: PULSE pulse setting 5: Communication setting 6: Simple PLC 7: PID	1	0
P0-12	Upper Limit Frequency	Lower limit frequency P0-14 - maximum frequency P0-10	0.01Hz	50.00Hz
P0-13	Upper Limit Frequency Offset	0.00Hz~maximum frequency P0-10	0.01Hz	0.00Hz
P0-14	Lower Limit Frequency	0.00Hz~Upper Limit Frequency P0-12	0.01Hz	0.00Hz
P0-15	Carrier Frequency	0.8kHz~16.0kHz	0.01kHz	Up to specific model
P0-16	Carrier Frequency Adjustment Along With Temperature	0: Disabled 1: Enabled	1	1
P0-17	Acceleration Time 1	0.00s~6500s	0.01s	Up to specific model
P0-18	Deceleration Time 1	0.00s~6500s	0.01s	Up to specific model
P0-19	Acceleration/Deceleration Time Unit	0: 1s 1: 0.1s 2: 0.01s	1	1
P0-20	Not Used	-	-	-
P0-21	Offset Frequency of Auxiliary Frequency at Superposing	0.00Hz~ maximum frequency P0-10	0.01Hz	0.00Hz
P0-22	Frequency Command Decimal Point	1: 0.1Hz 2: 0.01Hz	1	2
P0-23	Stop Memory Options of Digital Setting Frequency	0: Disabled 1: Enabled	1	0
P0-25	Acceleration/Deceleration Time Reference Frequency	0: Maximum frequency (P0-10) 1: Setting frequency 2: 100Hz	1	0

P0-26	Frequency Command UP/DOWN Quantity during Operation	0: Running frequency 1: Setting frequency	1	0
P0-27	Command Source Binding Frequency Source	Ones place: Binding frequency source options of operation panel command 0: No binding 1: Digital setting frequency 2: AI1 3: Reserve 4: Reserve 5: PULSE setting (D15) 6: Preset speed 7: Simple PLC 8: PID 9: Communication setting Tens place: Binding frequency source options of terminal command Hundreds place: Binding frequency source options of communication command	1	0000
P1-00	Motor Type Options	0: Common induction motor 1: Inverter induction motor	1	0
P1-01	Motor Rated Power	0.1kW~1000.0kW	0.1kW	Up to specific model
P1-02	Motor Rated Voltage	0V~2000V	1V	Up to specific model
P1-03	Motor Rated Current	0.01A~655.35A (inverter power <=55kW) 0.1A~65.535A (inverter power >=55kW)	0.01A	Up to specific model
P1-04	Motor Rated Frequency	0.00Hz~maximum frequency	0.01Hz	Up to specific model
P1-05	Motor Rated Rotation Speed	0rpm~65535rpm	1rpm	Up to specific model
P1-06	Stator Resistance of Induction Motor	0.0001~65.535m(inverter power <=55kW) 0.0001~6.5535m(inverter power >=55kW)	0.0001	Up to specific model
P1-07	Rotor Resistance of Induction Motor	0.001~65.535m(inverter power <=55kW) 0.0001~6.5535m(inverter power >=55kW)	0.001	Up to specific model
P1-08	Leakage Inductance of Induction Motor	0.01mH~655.35mH(inverter power <=55kW) 0.01mH~65.535mH(inverter power >=55kW)	0.01mH	Up to specific model
P1-09	Mutual Inductance of Induction Motor	0.1mH~6553.5mH(inverter power <=55kW) 0.01mH~655.35mH(inverter power >=55kW)	0.01mH	Up to specific model
P1-10	Idling Current of Induction Motor	0.01A~P1-03 (inverter power <=55kW) 0.1A~P1-03 (inverter power >=55kW)	0.01	Up to specific model
P1-37	Autotuning Options	0: No autotuning 1: Stationary tuning of induction motor 2: Full tuning of induction motor	1	0
P2-00	Speed Loop Proportional Gain 1	1~100	1	30
P2-01	Speed Loop Integral Time 1	0.01s~10.00s	0.01s	5.00s
P2-02	Switching Frequency 1	0.00~P2-05	0.01Hz	5.00Hz
P2-03	Speed Loop Proportional Gain 2	1~100	1	20
P2-04	Speed Loop Integral Time 2	0.01s~10.00s	0.01s	1.00s
P2-05	Switching Frequency 2	P2-02-Maximum frequency	0.01Hz	10.00Hz
P2-06	Slip Compensation Factor	50%~200%	1%	100%
P2-07	Filter Time Constant of SVC Speed Feedback	0.000s~0.100s	0.0001	0.01s
P2-08	Vector overcurrent gain	0~200	1	64
P2-09	Upper Limit Source of Speed Control (Drive) Torque	0: set through function code P2-10 1: Reserve 2: Reserve 3: Reserve 4: PULSE setting 5: Communication setting 6: Preset speed command 7: Reserve Full ranges of options 1 to 7 correspond to P2-10	1	0
P2-10	Upper Limit Numerical Setting of Speed Control Torque	0.0%~200.0%	0.1%	150.0%
P2-13	Excitation Adjustment Proportional Gain	0~60000	1	2000
P2-14	Excitation Adjustment Integral Gain	0~60000	1	1300
P2-15	Torque Adjustment Proportional Gain	0~60000	1	2000
P2-16	Torque Adjustment Integral Gain	0~60000	1	1300
P2-17	Speed Loop Integral Property	Ones place: Integral separation; 0: disabled; 1: enabled	1	0
P3-00	V/F Curve Setting	P3-Group: V/F Control Parameters 0: Straight V/F curve 1: Multi-point V/F curve 2: Multi-point V/F curve 3: 1.2th V/F curve 4: 1.4th V/F curve 5: 1.6th V/F curve 6: 1.8th V/F curve 7: 2.0th V/F curve 8: 2.2th V/F curve 9: Not used 10: V/F complete split mode 11: V/F half-split mode	1	0
P3-01	Torque Boost	0.0%: (no torque boost) 0.1%~30.0%	0.1%	Up to specific model
P3-02	Torque Boost End Frequency	0.00Hz~maximum frequency	0.01	50Hz
P3-03	Multi-point V/F Frequency Point 1	0.0Hz~P3-05	0.01Hz	0.00Hz
P3-04	Multi-point V/F Voltage Point 1	0.0%~100.0%	0.1%	0.0%
P3-05	Multi-point V/F Frequency Point 2	P3-03~P3-07	0.01Hz	0.00Hz
P3-06	Multi-point V/F Voltage Point 2	0.0%~100.0%	0.1%	0.0%
P3-07	Multi-point V/F Frequency Point 3	P3-05- motor rated frequency (P1-04)	0.01Hz	0.00Hz
P3-08	Multi-point V/F Voltage Point 3	0.0%~100.0%	0.1%	0.0%
P3-09	V/F Slip compensation gain	0.0%~200.0%	0.0%	0
P3-10	V/F Overexcitation Gain	0~200	1	64
P3-11	Oscillation Suppression Gain	0~100	1	Up to specific model
P3-13	V/F Separation Voltage	0: Numeric setting (P3-14) 1: AI1 2: AI2 3: Reserve 4: PULSE setting (D15) 5: Multipreset command 6: Simple PLC 7: PID 8: Communication setting 100.0% corresponds to motor rated voltage	1	0
P3-15	Voltage Rise Time of V/F Separation	0.0s~1000.0s Refers to the time from 0V to motor rated voltage	0.01s	Up to specific model
P4-00	D11 Terminal Function Options	0: No function 1: Forward running 2: Reverse running 3: 3-wire running control 4: Forward JOG (FJOG) 5: Reverse JOG (RJOG) 6: Terminal UP 7: Terminal DOWN 8: Stop	1	1
P4-01	D12 Terminal Function Options	0: No function 1: Forward running 2: Reverse running 3: 3-wire running control 4: Forward JOG (FJOG) 5: Reverse JOG (RJOG) 6: Terminal UP 7: Terminal DOWN 8: Stop	1	2
P4-02	D13 Terminal Function Options	0: No function 1: Forward running 2: Reverse running 3: 3-wire running control 4: Forward JOG (FJOG) 5: Reverse JOG (RJOG) 6: Terminal UP 7: Terminal DOWN 8: Stop	1	9
P4-03	D14 Terminal Function Options	0: No function 1: Forward running 2: Reverse running 3: 3-wire running control 4: Forward JOG (FJOG) 5: Reverse JOG (RJOG) 6: Terminal UP 7: Terminal DOWN 8: Stop	1	12
P5-02	T/A, T/C output terminal option	0: positive logic; 1- negative logic Ones place: RELAY Hundreds place: RELAY 2 Thousands place: DO1 Tens thousands place: DO2	11111	00000
P6-00	Start Mode	0: Direct start 1: Speed tracking start 2: Pre-excitation start of induction motor 3: SVC quick start 4: Start from stopping frequency 5: Start from industrial frequency 6: Start from maximum frequency	1	0
P6-01	Rotation Speed Tracking Mode	0: Start from stopping frequency 1: Start from industrial frequency 2: Start from maximum frequency	1	20
P6-02	Rotation Speed Tracking Fast/Slow	1~100	1	20
P6-03	Start Frequency	0.00Hz~10.00Hz	0.00	0.00
P6-04	Start Frequency Holding Time	0.0s~100.0s	0.1s	0.0s

