INOMAX

Medium and Low-Voltage drives Servo drives
New Energy Vehicle Drives solution provider

# MAX300 general purpose AC drive

0.75KW-3.7KW 200V-480V

## User manual

19111020

REV: V210
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**SHENZHEN INOMAX TECHNOLOGY CO.LTD**
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# 1. Inverter checking

Before leaving the factory, each inverter has undergone strict quality control and strengthened anti-collision packaging. After unpacking, please check the following items:

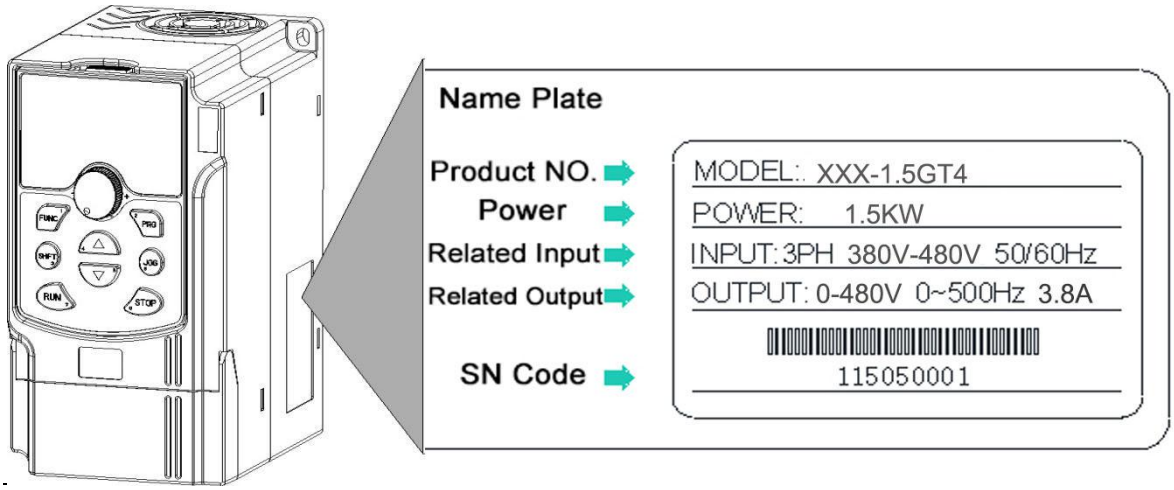
• Check whether the inverter has been damaged during transportation

• Check whether there are instructions in the packing box (with certificate of conformity attached)

• Check the nameplate of the inverter and confirm that it is the model of the product you ordered

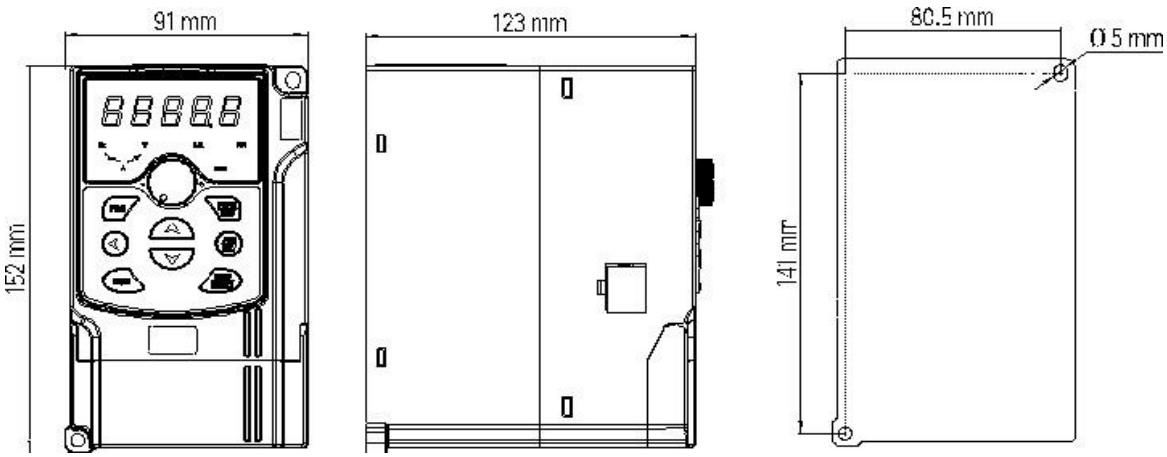
• If you have ordered the optional accessories of the inverter, please check to confirm

## 1-1 Inverter name plate




| Model | Power Capacity (KVA) | Input Current (A) | Output Current (A) | Adaptable Motor | |
|---|---|---|---|---|---|
| | | | | KW | HP |
| **Single-phase 200V-240V, 50/60Hz** | | | | | |
| MAX300-0R4GS2 | 1 | 5.4 | 2.3 | 0.4 | 0.5 |
| MAX300-R75GS2 | 1.5 | 8.2 | 4 | 0.75 | 1 |
| MAX300-1R5GS2 | 3 | 14 | 7 | 1.5 | 2 |
| MAX300-2R2GS2 | 4 | 23 | 9.6 | 2.2 | 3 |
| **Three-phase 380V-480V, 50/60Hz** | | | | | |
| MAX300-R75GT4 | 1.5 | 3.4 | 2.1 | 0.75 | 1 |
| MAX300-1R5GT4 | 3 | 5 | 3.8 | 1.5 | 2 |
| MAX300-2R2GT4 | 4 | 5.8 | 5.1 | 2.2 | 3 |
| MAX300-3R7GT4 | 5.9 | 10.5 | 9 | 3.7 | 5 |

## 2-2 product dimensions and installation dimensions

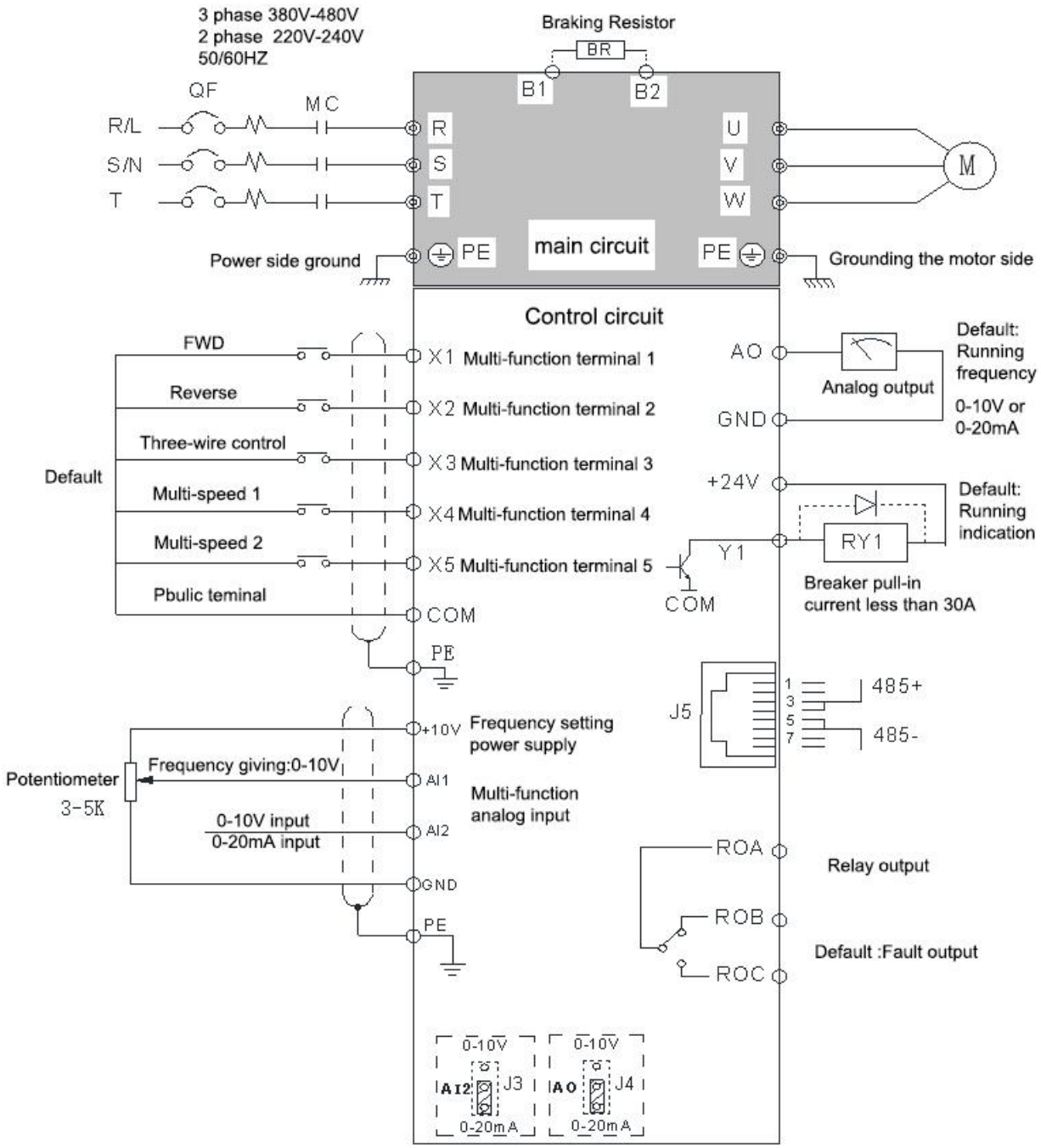



| model | Installation size | | Dimensions | | | Installation aperture (mm) |
|---|---|---|---|---|---|---|
| | A(mm) | B(mm) | H(mm) | W(mm) | D(mm) | |
| 0.75G~3.7G | 80.5 | 141 | 152 | 91 | 123 | 5 |

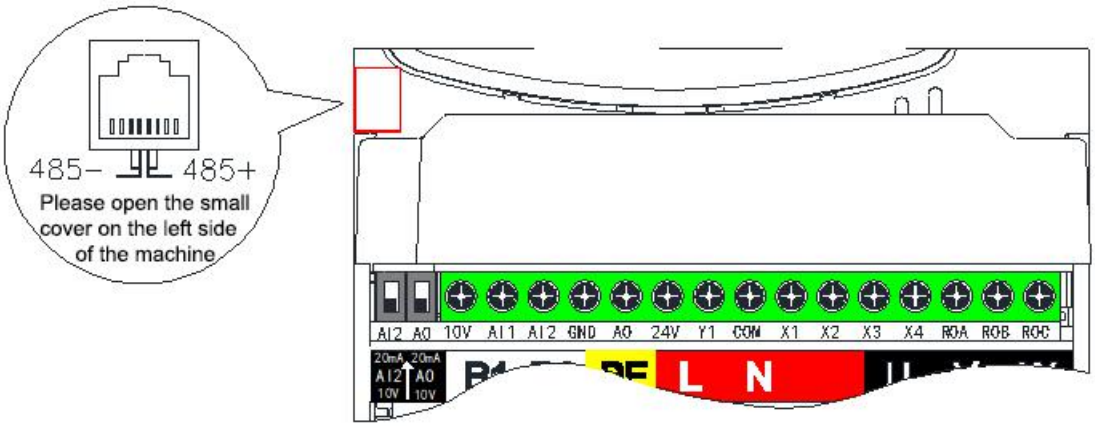
## 2-4 Specification model and brake resistor selection

| Inverter power | Recommended resistance value | Minimum resistance value | Inverter power | Recommended resistance value | Minimum resistance value |
|---|---|---|---|---|---|
| 0.75G-S2 | 80W 150Ω | 80Ω | 5.5G/7.5P-T4 | 500W 90Ω | 60Ω |
| 1.5G-S2 | 200W 100Ω | 55Ω | 7.5G/11P-T4 | 800W 60Ω | 47Ω |
| 2.2G-S2 | 200W 70Ω | 35Ω | 11G/15P-T4 | 1000W 47Ω | 36Ω |
| 0.75G-T4 | 150W 400Ω | 260Ω | 15G/18.5P-T4 | 1500W 36Ω | 27Ω |
| 1.5G-T4 | 200W 300Ω | 200Ω | 18.5G/22P-T4 | 2000W 30Ω | 25Ω |
| 2.2G-T4 | 250W 200Ω | 150Ω | 22G/30P-T4 | 2000W 25Ω | 22Ω |
| 3.7G/5.5P-T4 | 400W 150Ω | 90Ω | | | |

# 3-1 Standard wiring diagram of the inverter



# 4-1 Control circuit terminal description




| Classification | mark | Terminal name | Terminal description and factory settings |
|---|---|---|---|
| Multi-function input terminal | X1 | Multi-function input terminal 1 | Factory setting: 1 forward/stop |
| | X2 | Multi-function input terminal 2 | Factory setting: 2 reverse/stop |
| | X3 | Multi-function input terminal 3 | Factory setting: 3 three-wire control mode |
| | X4 | Multi-function input terminal 4 | Factory setting: 4 multi-stage speed one |
| | COM | Common terminal | Multi-function input common terminal, and corresponding +24V power reference ground |
| Analog input | AI1 | Analog input 1 | 0~10V input |
| | AI2 | Analog input 2 | 0~10V/0~20mA input (Dip switch or jumper switch) |
| | +10V | Power supply for analog quantity setting | +10V DC 10mA (potentiometer 3~5K) |
| | GND | Analog reference ground | Analog input and output reference ground corresponding to +10V |
| Multi-function output | Y1 | Multi-function output terminal 1 | Open collector output. Factory setting: 1 running output ON |
| | Y2 | Multi-function output terminal 2 | Open collector output. Factory setting: 2 positive direction running output ON<br>(100 series does not have this terminal) |
| | ROA | ROA-ROB normally closed<br>ROA-ROC normally open | Relay output Factory setting: inverter fault output |
| | ROB | | |
| | ROC | | |
| Analog output | AO | Analog output terminal | 0~10V/0~20mA output (Dip switch or jumper switch)<br>GND is the reference ground |
| power supply | +24V | +24V power supply | +24V DC 100mA The corresponding COM is the power ground. |
| communication | 485+ | 485 signal positive end | Standard MODBUS RS-485 serial communication interface<br>Please use twisted pair or shielded wire |
| | 485- | 485 signal negative terminal | |

# 6. Function parameter list

"○": Indicates that this parameter can be changed while the inverter is running or stopped when P0.00=0.
"●": Indicates that this parameter cannot be changed while the inverter is running.
"×": Indicates that this parameter is only the actual detected record value and cannot be changed.

P0 Basic function

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|
| P0-00 | Parameter setting mode | 0: Allow parameter setting (except with "×")<br>1: Prohibit parameter setting (except P0-00)<br>99: restore factory value | 0 | ● | 1000 |
| P0-01 | Frequency setting method | 0: Frequency digital setting (P0-03)<br>1: Panel potentiometer<br>2: External AI1<br>3: External AI2<br>4: PID adjustment setting<br>5: Digital setting, UP/DOWN rate press P5-20 to increase or decrease<br>6: Digital setting, UP/DOWN rate is added or subtracted according to P5-20, and the frequency returns to zero after stopping (not power-off)<br>7: Communication setting (corresponding to MODBUS communication address 1003)<br>※Digital setting is suitable for encoder keyboard or speed regulation via keyboard UP/DOWN keys, and the value of P0-03 can also be modified directly.<br>※AI2 input can be connected to voltage signal (0～10V) or current signal (0～20mA), which can be switched by dial switch or jumper on the control panel. | 1 | ● | 1001 |
| | ※When the simple PLC program (P8-00) is valid, the PLC program operation has priority. When the multi-stage speed (terminal setting) is valid, the multi-stage speed has priority over (P0-01).<br>The priority order of frequency reference is: simple PLC program>multi-step speed>(P0-01) | | | | |
| P0-02 | Start-stop control method | 0: keyboard control<br>1: External terminal control, keyboard STOP key is invalid<br>2: External terminal control, keyboard STOP key is valid<br>3: Controlled by communication command word (corresponding to MODBUS communication address 200) | 0 | ● | 1002 |
| P0-03 | Frequency digital setting | 0.0 Hz ～upper limit frequency (P0-09) | 50.0Hz | ○ | 1003 |
| P0-04 | Acceleration time 0 | 0.1s～3600.0s | Depending | ○ | 1004 |
| P0-05 | Deceleration time 0 | 0.1s～3600.0s | Depending | ○ | 1005 |
| P0-06 | Running direction setting | 0: Default direction 1: Opposite to the default direction | 0 | ● | 1006 |
| P0-07 | Anti-reverse setting | 0: Reverse is allowed 1: Reverse is forbidden | 0 | ● | 1007 |

| | | | | | |
|---|---|---|---|---|---|
| P0-08 | Highest frequency | Upper limit frequency (P0-09)～400.0Hz | 60.0 Hz | ● | 1008 |
| P0-09 | Upper limit frequency | Lower limit frequency (P0-10) ~ highest frequency (P0-08) | 50.0Hz | ● | 1009 |
| P0-10 | Lower limit frequency | 0.0Hz～upper limit frequency (P0-09) | 0.0Hz | ● | 1010 |
| P0-11 | Jog frequency | 0.0Hz～upper limit frequency (P0-09) | 5.0Hz | ○ | 1011 |
| P0-12 | Carrier frequency | 1～16KHz | Depending | ● | 1012 |
| P0-13 | Carrier frequency adjustment | 0: Fixed PWM mode 1: Random PWM mode | 0 | ● | 1013 |
| P0-14 | Digital setting frequency storage | 0: Inverter power-off storage 1: Inverter power-off does not save | 0 | ○ | 1014 |
| P0-15 | MODBUS local address | 1～127 | 1 | ○ | |

## P1 Keyboard and display parameters

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|
| P1-00 | Default display at boot | 0: Setting frequency (Hz)<br>1: Output frequency (Hz)<br>2: Output current (C)<br>3: Bus voltage (V)<br>4: Motor speed (r/min)<br>5: Output motor rated current percentage (%)<br>6: IGBT temperature (℃)<br>7: output voltage (V)<br>8: output power (KW)<br>9: count value (times)<br>10: PI given value<br>11: PID feedback value<br>12: Cumulative running time (hours)<br>13: Input terminal status<br>14: Output terminal status<br>15: Inverter capacity (KW)<br>※: The front of the display is the code, and the back is the specific content, which can be changed with the current status; it can be viewed through the "PRG" key cycle. | 0 | ○ | 1018 |
| P1-01 | Display information settings | 0: Display 0～3 information 1: Display 0～7 information<br>2: Display 0 ～ 11 information 3: Display 0 ～ 15 information | 1 | ○ | 1019 |
| P1-02 | Speed display coefficient | 0.1～60.0 | 29.0 | ○ | 1020 |
| P1-03 | JOG/REV function setting | 0: Jog running, disconnected to stop<br>1: Forward/reverse switch, the running direction changes after pressing | 0 | ● | 1021 |

## P2 Start-stop mode parameters

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| P2-00 | Start method | 0: Direct start 1: DC braking first and then start | 0 | ● | 1025 |
| P2-01 | Start frequency | 0.0～10.0Hz | 0.5 Hz | ● | 1026 |
| P2-02 | Start hold time | 0.0～50.0 s | 0.0s | ● | 1027 |
| P2-03 | Braking current before starting | 0～150.0% (valid when P2-00=1) | 50.0% | ● | 1028 |
| P2-04 | Braking time before starting | 0～50.0s | 0.0s | ● | 1029 |
| P2-05 | Stop mode | 0: Free stop 1: Decelerate to stop<br>2: Decelerate first and then stop by DC braking | 1 | ● | 1030 |
| P2-06 | Starting frequency of stop braking | 0.0～10.0Hz | 2.0Hz | ● | 1031 |
| P2-07 | Stop braking current | 0～150.0% | 50.0% | ● | 1032 |
| P2-08 | Stop braking time | 0～50.0s | 0.0s | ● | 1033 |
| P2-09 | Forward and reverse dead time | 0.0 ～ 50.0 s (forward and reverse direction commutation interval time) | 0.2s | ● | 1034 |
| P2-10 | Lower limit frequency operation mode | 0: Run at lower frequency limit 1: Stop (run signal failure)<br>2: Standby, the running frequency is 0 (the running signal is valid) | 0 | ● | 1035 |

## P3 Motor parameters

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|
| P3-00 | Motor rated frequency | P4-05～400.0Hz | 50.0Hz | ● | 1038 |
| P3-01 | Motor rated voltage | 200～440V | Depending | ● | 1039 |
| P3-02 | Motor rated current | 0.1～999.9A | Depending | ● | 1040 |
| P3-03 | Motor rated power | 0.1～630.0KW | Depending | ● | 1041 |
| P3-04 | Motor rated speed | 1～36000rpm | 1440rp | ● | 1042 |
| P3-05 | Motor no-load current | 0.1～999.9A | Depending | ● | 1043 |
| P3-06 | Motor stator resistance | 0.001～50.000Ω | Depending | ● | 1044 |
| P3-07 | Motor magnetizing inductance | 0.1～5000.0mH | Depending | ● | 1045 |

## P4 V/F control parameter

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|
| P4-00 | V/F curve setting | 0: Normal V/F 1: 2nd power down V/F<br>2: 3rd power drop V/F 3: High starting torque V/F | 0 | ● | 1051 |

| | | | | | |
|---|---|---|---|---|---|
| | | 4: Self-setting V/F | | | |
| P4-01 | V/F intermediate frequency 1 | 0.0Hz～P4-03 | 1.0Hz | ● | 1052 |
| P4-02 | V/F Intermediate voltage 1 | 0～Motor rated voltage (P3-01) | 5V | ● | 1053 |
| P4-03 | V/F intermediate frequency 2 | P4-01～P4-05 | 5Hz | ● | 1054 |
| P4-04 | V/F Intermediate voltage 2 | 0～Motor rated voltage (P3-01) | 25V | ● | 1055 |
| P4-05 | V/F intermediate frequency 3 | P4-03～rated frequency of motor (P3-00) | 25Hz | ● | 1056 |
| P4-06 | V/F Intermediate voltage 3 | 0～Motor rated voltage (P3-01) | 115V | ● | 1057 |
| P4-07 | Torque boost | 0.0～15.0% | Dependin g | ● | 1058 |
| P4-08 | Slip compensation | 0.0～10.0Hz | 0.0 Hz | ● | 1059 |
| P4-09 | (AVR) adjustment function | 0: Invalid 1: Valid for the whole process 2: Only valid for deceleration | 0 | ● | 1060 |
| P4-10 | Energy-saving operation | 0: Invalid 1: Energy-saving operation | 0 | ● | 1061 |

P5 External input function parameters

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|
| P5-00 | AI1 lower limit | 0～10.00V | 0.05V | ○ | 1070 |
| P5-01 | AI1 lower limit corresponding setting | 0～100.0% | 0.0% | ○ | 1071 |
| P5-02 | AI1 upper limit | AI1 lower limit ～10.00V | 10.00V | ○ | 1072 |
| P5-03 | AI1 upper limit corresponding setting | 0～100.0% | 100.0% | ○ | 1073 |
| P5-04 | AI1 input filter time | 0.0s～10.0s | 0.1s | ○ | 1074 |
| P5-05 | AI2 lower limit | 0.00V～10.00V<br>※When connecting 4 ～ 20mA externally, please set P5-05=2.0, corresponding to 4mA | 0.05V | ○ | 1075 |
| P5-06 | AI2 lower limit corresponding setting | 0～100.0% | 0.0% | ○ | 1076 |
| P5-07 | AI2 upper limit | AI2 lower limit ～10.00V | 10.00V | ○ | 1077 |
| P5-08 | AI2 upper limit corresponding setting | 0～100.0% | 100.0% | ○ | 1078 |
| P5-09 | AI2 input filter time | 0.0s～10.0s | 0.1s | ○ | 1079 |
| P5-10 | Multi-function input terminal X1 | 0: No function 1: Forward rotation 2: Reverse rotation 3: Three-wire control 4: Multi-stage speed one 5: Multi-stage speed two 6: Multi-stage speed three 7: Jog forward rotation 8: Jog reverse rotation 9: Frequency increase 10: Frequency decrease | 1 | ● | 1080 |
| P5-11 | Multi-function input terminal X2 | | 2 | ● | 1081 |
| P5-12 | Multi-function input | | 3 | ● | 1082 |

| | | | | | |
|---|---|---|---|---|---|
| | terminal X3 | 11: Acceleration and deceleration time selection one<br>12: Acceleration and deceleration time selection two<br>13: acceleration or deceleration pause<br>14: External fault input<br>16: Free stop 15: Fault reset<br>17: External counting input 18: Counter clear reset<br>19: Start program operation 20: Program operation pause | | | |
| P5-13 | Multi-function input terminal X4 | | 4 | ● | 1083 |
| P5-14 | Multi-function input terminal X5 | | 5 | ● | 1084 |
| P5-15 | Multi-function input terminal X6 | | 6 | ● | 1085 |
| P5-16 | Multi-function input terminal X7 | | Reserve | ● | 1086 |
| P5-17 | Multi-function input terminal X8 | | Reserve | ● | 1087 |

※The 8-speed setting can be achieved through the state combination of three multi-function input terminals.

| Multi-stage three | Multistage two | Multi-paragraph | Frequency setting | Corresponding parameters | Multi-stage three | Multistage two | Multi-paragraph | Frequency setting | Corresponding parameters |
|---|---|---|---|---|---|---|---|---|---|
| OFF | OFF | OFF | Multi-band frequency 0 | P0-01 decision | ON | OFF | OFF | Multi-band frequency 4 | P8-04 |
| OFF | OFF | ON | Multi-band frequency 1 | P8-01 | ON | OFF | ON | Multi-band frequency 5 | P8-05 |
| OFF | ON | OFF | Multi-band frequency 2 | P8-02 | ON | ON | OFF | Multi-band frequency 6 | P8-06 |
| OFF | ON | ON | Multi-band frequency 3 | P8-03 | ON | ON | ON | Multi-band frequency 7 | P8-07 |

| | | | | | |
|---|---|---|---|---|---|
| P5-18 | Terminal operation control mode | 0: Two-line control 1 1: Two-line control 2<br>2: Three-wire control 1 3: Three-wire control 2 | 0 | ● | 1088 |
| P5-19 | Input terminal filter time | 2ms～100 ms | 10 ms | ○ | 1089 |
| P5-20 | UP/DOWN range | 0.0 ～ 50.0Hz (the amplitude of keyboard or terminal increasing/decreasing) | 0.1 | ○ | 1090 |
| P5-25 | MODBUS communication baud rate | 2：1200BPS 3：2400BPS 4：4800BPS<br>5：9600BPS 6：19200BPS 7：38400BP | 5 | ○ | |
| P5-26 | MODBUS data format | 0: No parity (8-N-1) 1: No parity (8-N-2)<br>2: Even parity (8-E-1) 3: Odd parity (8-O-1) | 0 | ○ | |
| P5-27 | MODBUS response delay | 0 ～ 200ms | 20 | ○ | 1097 |
| P5-28 | Communication abnormal timeout | 0.0：No detection 0.1 ～ 60.0s | 0.0 | ○ | 1098 |
| P5-29 | Communication abnormal action selection | 0: Continue to run 1: Alarm and stop | 0 | ○ | 1099 |

## P6 Terminal output function parameters

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|
| P6-00 | Y1 output selection | 0: No function 1: Inverter running<br>2: The actual running direction is opposite to the given direction<br>3: Fault output 4: Ready to run<br>5: Frequency reach FAR (refer to PA-13)<br>※With the value of PA-11 as the center, the value of (PA-13) is the upper and lower amplitude, the operating frequency is within this range, and the signal output is ON<br>6: Frequency level detection FDT (refer to PA-11～PA-13)<br>※The value of PA-11 is centered, the value of PA-12 is the hysteresis value, the operating frequency acceleration is higher than the value of PA-11, and the deceleration is not lower than the hysteresis value of PA-12 relative to PA-11, the signal output is ON<br>7: Upper limit frequency reached (P0-09)<br>8: Lower limit frequency reached (P0-10)<br>9: Set count arrival (refer to PA-14)<br>10: The designated count arrives (refer to PA-15)<br>12: Stop delay output. The output signal is ON immediately after stopping, and the output time is determined by P6-05 | 1 | ○ | 1101 |
| P6-02 | Relay output selection | | 3 | ○ | 1103 |
| P6-03 | AO output selection | 0: Operating frequency (0～upper limit frequency)<br>1: Output current (0～2 times the rated output current of the inverter)<br>2: Bus voltage (0～2 times the rated bus voltage of the inverter)<br>3: Output voltage (0～2 times the rated output voltage of the inverter) | 0 | ○ | 1104 |
| ※The output can be a voltage signal (0～10V) or a current signal (0～20mA), which can be switched by the DIP switch of the control panel. | | | | | |
| P6-04 | AO correction factor | 0.0～250.0% | 100.0% | ○ | 1105 |
| P6-05 | Stop delay output time | 0～3000.0 s | 0 | ○ | 1106 |

## P7 PID function control parameters

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|
| P7-00 | PID reference source selection | 0: Digital setting (P7-01) 1: Panel potentiometer<br>2: Analog channel AI1 3: Analog channel AI2 | 0 | ○ | 1110 |
| P7-01 | PID digital given value | 0.00～10.00 V | 0.00V | ○ | 1111 |

| | | | | | |
|---|---|---|---|---|---|
| P7-02 | PID feedback source selection | 0: Analog channel AI1 1: Analog channel AI2 | 0 | ○ | 1112 |
| P7-03 | PID output characteristic selection | 0: PID output is positive characteristic 1: PID output is negative characteristic | 0 | ○ | 1113 |
| P7-04 | Proportional gain P | 0.0～10.0 | 1.0 | ○ | 1114 |
| P7-05 | Integration time I | 0.0～100.0s | 1.0s | ○ | 1115 |
| P7-06 | Set and feedback deviation tolerance | 0.00～2.00(Within tolerance, PID is not calculated) | 0.02 | ○ | 1116 |
| P7-07 | Feedback amount sampling period (T) | 0.1～100.0s | 0.02s | ○ | 1117 |
| P7-08 | Feedback source disconnection detection value | 0.00～5.00 | 0.0 | ○ | 1118 |
| P7-09 | Feedback source disconnection detection time | 0.0～100.0s | 10.0s | ○ | 1119 |
| P7-12 | Sleep time | 0～3000S | 600 | ○ | 1122 |
| P7-13 | Dormant pressure | 0～10.00 (Slightly less than the set pressure P7-01) | 0 | ○ | 1123 |
| P7-14 | Sleep frequency | 0～50.0Hz (2～3Hz greater than the frequency of maintaining pipeline pressure) | 0 | ○ | 1124 |
| P7-15 | Wake up stress | 0～10.00 (need to be less than sleep pressure P7-13) | 0 | ○ | 1125 |
| ※Inverter sleep conditions | The feedback pressure is greater than the set value of the sleep pressure (P7-13); when the running frequency is continuously lower than the set value of the sleep frequency (P7-14) and the duration reaches the set time (P7-12), the inverter starts to sleep. | | | | |

## P8 Simple PLC mode and multi-speed parameters

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|
| P8-00 | Simple PLC mode | 0: Simple PLC program operation is invalid<br>1: The program stops after running for one cycle<br>2: After running for a week, run at the last frequency<br>3: The program runs cyclically | 0 | ● | 1126 |
| P8-01 | First stage speed | Lower limit frequency ~ upper limit frequency | 11.0Hz | ○ | 1127 |
| P8-02 | Second speed | Lower limit frequency ~ upper limit frequency | 12.0Hz | ○ | 1128 |
| P8-03 | Third stage speed | Lower limit frequency ~ upper limit frequency | 13.0Hz | ○ | 1129 |
| P8-04 | Fourth stage speed | Lower limit frequency ~ upper limit frequency | 14.0Hz | ○ | 1130 |
| P8-05 | Fifth stage speed | Lower limit frequency ~ upper limit frequency | 15.0Hz | ○ | 1131 |
| P8-06 | Sixth speed | Lower limit frequency ~ upper limit frequency | 16.0Hz | ○ | 1132 |
| P8-07 | Seventh stage speed | Lower limit frequency ~ upper limit frequency | 17.0Hz | ○ | 1133 |
| P8-08 | Main frequency running time | 0～6400.0 (The corresponding frequency is determined by P0-01) | 0.0s | ○ | 1134 |
| P8-09 | The first period of time | 0～6400.0 (The corresponding frequency is P8-01) | 0.0s | ○ | 1135 |
| P8-10 | Second period | 0～6400.0 (Similar to the same as above, the same below) | 0.0s | ○ | 1136 |
| P8-11 | The third period | 0～6400.0 | 0.0s | ○ | 1137 |
| P8-12 | The fourth period | 0～6400.0 | 0.0s | ○ | 1138 |

| | | | | | |
|---|---|---|---|---|---|
| P8-13 | Fifth period | 0～6400.0 | 0.0s | ○ | 1139 |
| P8-14 | Sixth period | 0～6400.0 | 0.0s | ○ | 1140 |
| P8-15 | Seventh period | 0～6400.0 | 0.0s | ○ | 1141 |
| P8-16 | Multi-speed time unit | 0: second 1: minute 2: hour | 0 | ● | 1142 |
| P8-17 | The direction of each segment of the program | From 0 to 255, each bit of the binary system represents a block direction. 0 means forward rotation, 1 means reverse rotation; corresponding to binary and then converted to decimal<br>※Example: The first paragraph is reversed, and the third paragraph is reversed, expressed in binary as: (0000 1010)2=(10)10 ie P8-17=10 | 0 | ● | 1143 |
| P8-18 | Selection of acceleration and deceleration time for each section of the program | 0～65535 Use every two digits of the binary system to represent the acceleration and deceleration time corresponding to a block direction<br>BIT 15～0 represents the acceleration and deceleration time corresponding to the 7～0 segment, the algorithm is the same as above<br>※Binary 00: (P0-04, P0-05) 01: (PA-00, PA-01) 10: (PA-02, PA-03) 11: (PA-04, PA-05) | 0 | ○ | 1144 |

## P9 Protection function parameters

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|
| P9-00 | Motor overload protection selection | 0: No protection 1: Protection | 0 | ● | 1147 |
| P9-01 | Motor overload protection point | 50～120% (100% corresponds to the rated current of the motor P3-02) | 110% | ● | 1148 |
| P9-02 | Overvoltage stall protection | 0: Prohibit protection 1: Allow protection<br>※It can be set to 0 when there is a braking resistor connected to improve the braking effect | 1 | ● | 1149 |
| P9-03 | Stall overvoltage point | 110.0～150.0% (100% corresponds to the standard bus voltage of the inverter) | 135 | ● | 1150 |
| P9-04 | Over-current protection | 0: Prohibit protection 1: Allow protection | 1 | ● | 1151 |
| P9-05 | Stall overcurrent point | 100～180% (100% corresponds to the rated current of the inverter) | 180 | ● | 1152 |
| P9-06 | Input phase loss protection | 0: Prohibit protection 1: Allow protection | Reserve | ● | 1153 |
| P9-07 | Output phase loss protection | 0: Prohibit protection 1: Allow protection | Reserve | ● | 1154 |
| P9-08 | Recent failure information | 0 ～ 21 (Refer to fault information and corresponding countermeasures for details) | | × | 1155 |
| P9-09 | Last failure information | 0 ～ 21 (Refer to fault information and corresponding countermeasures for details) | | × | 1156 |
| P9-10 | The first two failure information | 0 ～ 21 (Refer to fault information and corresponding countermeasures for details) | | × | 1157 |
| P9-11 | Operating frequency of | | | × | 1158 |

| | | | | | |
|---|---|---|---|---|---|
| | recent failures | | | | |
| P9-12 | Output current of recent fault | | | × | 1159 |
| P9-13 | Bus voltage of the last fault | | | × | 1160 |
| P9-14 | Input status of recent fault | | | × | 1161 |
| P9-15 | Latest fault output status | | | × | 1162 |
| P9-16 | Fault self-reset function | 0: Invalid 1: Auto reset of undervoltage fault (unlimited number of times)<br>2～20: Number of automatic fault resets | 0 | ● | 1163 |

PA Enhanced function parameters

| Function Code | Name | Parameter description | Default | Change | MODBUS address (decimal) |
|---|---|---|---|---|---|
| PA-00 | Acceleration time 1 | 0.1～3600.0s | 20.0s | ○ | 1165 |
| PA-01 | Deceleration time 1 | 0.1～3600.0s | 20.0s | ○ | 1166 |
| PA-02 | Acceleration time 2 | 0.1～3600.0s | 20.0s | ○ | 1167 |
| PA-03 | Deceleration time 2 | 0.1～3600.0s | 20.0s | ○ | 1168 |
| PA-04 | Acceleration time 3 | 0.1～3600.0s | 20.0s | ○ | 1169 |
| PA-05 | Deceleration time 3 | 0.1～3600.0s | 20.0s | ○ | 1170 |
| PA-06 | Jog acceleration time | 0.1～3600.0s | 5.0s | ○ | 1171 |
| PA-07 | Jog deceleration time | 0.1～3600.0s | 5.0s | ○ | 1172 |
| PA-08 | Hop frequency 1 | 0.0～Upper limit frequency (P0-09) | 0.0Hz | ○ | 1173 |
| PA-09 | Hop frequency 2 | 0.0～Upper limit frequency (P0-09) | 0.0Hz | ○ | 1174 |
| PA-10 | Hop frequency range | 0.0～Upper limit frequency (P0-09) | 0.0Hz | ○ | 1175 |
| PA-11 | FDT level detection value | 0.0～Upper limit frequency (P0-09) | 0.0Hz | ○ | 1176 |
| PA-12 | FDT hysteresis detection value | 0.0～FDT level (PA-11) | 0.0Hz | ○ | 1177 |
| PA-13 | Frequency reach FAR | 0.0～Upper limit frequency (P0-09) | 0.0Hz | ○ | 1178 |
| PA-14 | Set the count value | 1～65535 | 10 | ○ | 1179 |
| PA-15 | Specify the number of counts | 1～65535 (The designated count value cannot be greater than the set count value) | 10 | ○ | 1180 |
| PA-16 | Overload frequency reduction function | 0: invalid 1: valid | 1 | ● | 1181 |
| PA-17 | DC braking coefficient | 110%～150% | 130 | ● | 1182 |
| PA-21 | Dead zone compensation time | Model determination | Depending | ● | 1186 |
| PA-22 | Down frequency current point | 100%～300% | 210 | ● | 1187 |

# 2. Failure information and corresponding countermeasures

| Fault display | Code | Fault type | Possible cause of failure | Corresponding countermeasures |
|---|---|---|---|---|
| LU | 3 | Undervoltage | Abnormal input power or loose wiring | Check the input power voltage and wiring |
| OU | 4 | Overpressure | 1. Check the input power supply voltage<br>2. Decelerate too fast<br>3. The load inertia is too large | 1. Check the input power supply voltage<br>2. Increase deceleration time<br>3. Use energy-consumption braking components |
| OC | 6/14 | Overcurrent | 1. The capacity of the inverter and the motor do not match<br>2. Low grid voltage<br>3. Acceleration and deceleration are too fast<br>4. Large load inertia torque<br>5. Sudden change or abnormality in load | 1. Choose a large-capacity inverter<br>2. Check the power supply and wiring tightness<br>3. Increase acceleration and deceleration time<br>4. Choose appropriate brake components<br>5. Check and reduce sudden changes in load |
| OL | 5 | Inverter overload | 1. See the cause of overcurrent OC failure<br>2. The motor load is too large<br>3. Improper setting of V/F curve | 1. Refer to overcurrent OC countermeasures<br>2. Reduce motor load<br>3. Reset the parameters |
| OL1 | 15 | Motor overload | 1. The grid voltage is too low<br>2. The motor is blocked or the load sudden change is too large<br>3. The setting of motor rated current, motor overload protection point or V/F curve is incorrect | 1. Check the grid voltage<br>2. Check the motor load<br>3. Reset the parameters |
| SC | 9 | Output short circuit | 1. See the cause of overcurrent OC failure<br>2. Output U-V-W interphase or ground short circuit<br>3. The control board connection or plug-in is loose<br>4. The power module or other parts are damaged | 1. Refer to overcurrent OC countermeasures<br>2. Good motor and cable insulation<br>3. Check that the connectors are well connected<br>4. Seek service |
| SPI | 7 | Input phase loss | Input power R, S, T has phase loss | 1. Check the input power and voltage<br>2. Check and tighten the input wiring |
| SPO | 8 | Output phase loss | 1. U, V, W phase loss output<br>2. The three-phase load is severely unsymmetrical | 1. Check and tighten the output wiring<br>2. Check the motor and cable |

| | | | | |
|---|---|---|---|---|
| OH | 13 | overheat | 1. The ambient temperature is too high<br>2. The air duct is blocked and the fan is damaged<br>3. The motor load is too large | 1. Reduce the ambient temperature<br>2. Clean the air duct and replace the fan<br>3. Reduce the load or carrier frequency |
| PIE | 12 | PID failure | PID feedback signal is lost for more than a certain time | Check PID feedback signal and connection |
| EF | 11 | External fault | External fault input terminal action | Check external device input |
| EEP | 1 | EEPROM Fault | 1. Parameter read and write error<br>2. EEPROM is damaged | 1. Restore factory value<br>2. Seek service |
| NCE | 16 | The contactor is not closed | 1. The grid voltage is too low<br>2. The contactor is damaged<br>3. Damage to other circuits | 1. Check the grid voltage<br>2. Replace the main circuit contactor<br>3. Seek service |
| OPSE | 10 | system error | Severe interference and noise | Add filters or seek service |
| CF | 20 | Current detection signal failure | 1. The current sensor is damaged<br>2. The signal line is in poor contact<br>3. Other line faults | 1. Replace the current sensor<br>2. Check the signal line<br>3. Seek service |
| CE | 21 | communication fail | Poor communication or broken communication line | 1. Check whether the communication settings are correct<br>2. Whether the communication line is broken or poorly connected |

# 7、MODBUS communication

- This inverter supports Modbus protocol communication data format as RTU (remote terminal unit) mode. Command code 03 is read data, 06 is write data.
- In the parameter table, all the parameters from P0-00 to PA-26 in sequence correspond to the RAM (not stored after power-off) communication address: 1000～1191 (decimal). For the specific address, please refer to the MODBUS communication address on the right side of the function parameter summary table. If you need to store data in EEPROM (power-down storage), subtract 1000. Example: The RAM address of function code P0-04 is represented as 1004, and in EEPROM, the address is 0004. There is no such difference in related addresses in other non-parameter tables.
- The 100 series inverter only supports reading/writing one data at a time. When communicating with the touch screen, please set the PLC interval address to 1.
- The 200 series inverter has no such restriction.

1. Monitoring parameter address (read only):

| MODBUS communication address (decimal) | Data meaning description | MODBUS communication address (decimal) | Data meaning description |
|---|---|---|---|
| 220 | Set frequency | 232 | Accumulated running time of inverter |
| 221 | Output frequency | 233 | Display input terminal |
| 222 | Output current | 234 | Display output terminal |

| | | | |
|---|---|---|---|
| 223 | bus voltage | 235 | Display inverter rated power |
| 224 | Motor speed | 236 | Display compensation frequency |
| 225 | Percentage of current | 237 | Display compensation voltage |
| 226 | IGBT temperature | 238 | Display phase angle |
| 227 | The output voltage | 239 | Display load factor |
| 228 | Output Power | 242 | Analog AI1 given value |
| 229 | Current count value | 243 | Analog AI2 given value |
| 230 | PID given value | 244 | Keyboard potentiometer set value |
| 231 | PID feedback value | | |

2. Communication control start-stop command address (read and write, valid when P0-02=3)

| MODBUS communication address (decimal) | Data meaning description |
|---|---|
| 200 | 1: Forward running 2: Forward jog 5: Reverse running<br>6: Reverse jog 8: Stop 16: Free stop 32: Fault reset |

3. Communication control operating frequency address (read and write, valid when P0-01=7)

| MODBUS communication address (decimal) | Data meaning description |
|---|---|
| 1003 | The given value is the given frequency of the inverter |

4. Inverter status address (read only)

| MODBUS communication address (decimal) | Data meaning description |
|---|---|
| 240 | 0: Inverter stops 1: Forward running<br>2: Reverse running 3: Failure |

5. Inverter fault address (read only)

| MODBUS communication address (decimal) | Data meaning description |
|---|---|
| 241 | 1: Memory failure 3: Under voltage 4: Over voltage<br>5: Overload 6: Over current 7: Input phase loss<br>8: Output phase loss 9: Output short circuit 10: System failure<br>11: External fault 12: PID fault 13: Overheating<br>14: Over current 15: Motor overload 16: Contactor is not closed<br>20: Current detection signal failure 21: Communication failure |

# 6-2 Detailed of function parameters (Explanations of Functional Parameters)

## P0 Basic functional parameters

| | | | |
|---|---|---|---|
| **P0-00** | Parameter setting mode | 0: Enabled (except those parameters marked with"×")<br>1: Disabled (except P0-00)<br>99: Factory reset | Default: 0 |

It's mainly applied to the setting of functional parameters;"factory reset" option should be used with caution, especially after all these parameters are set.

| | | | |
|---|---|---|---|
| **P0-01** | Frequency setting mode | 0：Frequency setting (UP/DOWN)<br>1：Panel potentiometer<br>2：External AI1<br>3：External AI2<br>4：PI regulation<br>5: UP/DOWN by the P5-20 add and subtract<br>6: UP/DOWN by the P5-20 add and subtract, frequency qing zero downtime | Default: 0 |

It's mainly used to select the source of operating frequency for converter.

0：Frequency setting

The frequency of converter can be preset by parameter P0-03; frequency can be preset or changed directly through these two keys ▲ ▼ on the panel when state information is displayed; it also can be changed directly by external terminals UP/DOWN whenthey are enabled.

1：Panel potentiometer

Operating frequency can be set by thepotentiometer on the panel.

2 / 3：Preset of externalanalog voltage AI1 /AI2

Operating frequencynot only can be set by the signal of external analog voltage(0.0~10.0V) sent out by AI1 or AI2 whose input voltage is formed by the synergy of internal +10V power source and potentiometer.

AI2 can be done through the signal of external analog current(0~20mA) via J4 jumper.

**4：PI regulation**

**Precaution: Corresponding multispeed frequency will be applied firstly when external multispeed terminals are enabled.** For detailed information, please refer to the standard wiring diagram on Chapter 3.

5, 6: frequency by external terminals given (note: each time the increase or decrease of a given frequency range be determined by the P5-20), when set to 6, the frequency converter after every stop, zero frequency

| | | | |
|---|---|---|---|
| **P0-02** | Control mode for running | 0：Controlled by keyboard<br>1：Controlled by terminals, STOP Key disabled<br>2：Controlled by terminals, STOP Key enabled<br>3：Controlled by communication | Default: 0 |

It's mainly applied tothe instruction sources of booting, stopping or jog for converter.

0: Converter can be controlled through the following three keys RUN STOP/RESET JOG/REV which stand for booting, stopping, jog or forward/reverse accordingly.

1: STOP/RESET key will be disabled when converter is controlled by external terminals, including its booting, stopping, jog or forward/reverse running.

2: STOP/RESET key will be enabled when converter is controlled by external terminals, including its booting, stopping, jog or forward/reverse running.

3:Communiaction command channel(LR flickering),it is controlled by communication via upper monitor

| | | | |
|---|---|---|---|
| **P0-03** | Frequency setting | 0.0 Hz ～Upper limiting frequency（P0-09） | Default: 50.0Hz |

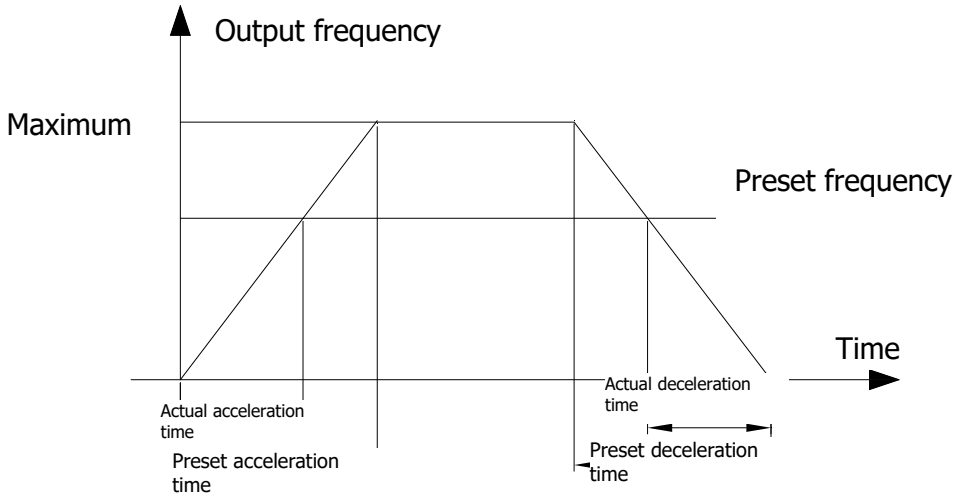
Frequency of output can be set by setting this parameter only when P0-01equals zero.

| | | | |
|---|---|---|---|
| **P0-04** | Acceleration time 0 | 0.1s~3600.0s | Default: 20.0s |
| **P0-05** | Deceleration time 0 | 0.1s~3600.0s | Default: 20.0s |

Acceleration time 0: Time for converter to increase its frequency from 0Hz to maximum frequency(P0-08).

Deceleration time 0: Time for converter to decrease its frequency from maximum frequency(P0-08) to 0Hz.

Please refer to following graph.：




| | | | |
|---|---|---|---|
| **P0-06** | Running direction | 0：Default direction<br>1：Reverse direction | Default: 0 |

Running direction can be preset through this parameter, which will also be taken as forward direction by default. It will also be chosen as a reference for reverse direction which is controlled by JOG REV key as well as external terminals.

0: Converter will be running in default direction

1: Running direction will be changed, which also means that it is changed by altering any two of motor wires(U, V, W).

| | | | |
|---|---|---|---|
| **P0-07** | Anti-reversion Setting | 0: Enabled<br>1: Disabled | Default: 0 |

Running direction will be controlled by parameter "P0-06" when reverse direction is disabled. Both JOG REV key and external terminals will be disabled.

| | | | |
|---|---|---|---|
| **P0-08** | Maximum frequency | Upper limit frequency（P0-09）~400.0Hz | Default: 60.0Hz |

The setting of Acc-Dec time is based on maximum output frequency of running.

| | | | |
|---|---|---|---|
| **P0-09** | Upper limitingfrequency | Lower limitingfrequency（P0-10）~Maximum frequency（P0-08） | Default: 50.0Hz |
| **P0-10** | Lower limitingfrequency | 0.0Hz~Upper limitingfrequency（P0-09） | Default: 0.0Hz |

It's mainly applied to the setting of the amplitude between upperlimiting frequency and lower limiting frequency, which are also the range values of frequency regulation displayed on the panel potentiometer.

These two parameters are also related to the amplitude of upper limiting voltage and lower limiting voltage set by AI1 or AI2. For detailed information, please refer to P5-00~08.

| | | | |
|---|---|---|---|
| **P0-11** | Jog frequency | 0.0Hz~Upper limitingfrequency（P0-09） | Default:5.0Hz |

It's mainly applied to the setting of running frequency for jog.

| | | | |
|---|---|---|---|
| **P0-12** | Carrier frequency | 1~16KHz | Default: Depending on model |

The switching frequency of interiorpower module is controlled by this parameter.

Audio noise and heat effect generated during the process of running are mainly affected by carrier frequency. Carrier frequency must be increased slightly in order to achieve a quieter running; however, the maximum load will be decreased somehow at the same time, which may increase the risk of electric leakage between motor lines or between wires and earth. When ambient temperature is too high or there is too much load for motor, carrier frequency should be decreased properly to improve converter's thermal characteristics.

Generally, carrier frequency will be preset right before delivery; therefore, it doesn't need to be reset or modified.

It should be used by derating if the carrier frequency which is being applied by operator exceeds the default value preset by factory.

| | | | |
|---|---|---|---|
| **P0-13** | Carrier frequency Regulation | 0：Regular PWM mode<br>1：Random PWM mode | Default: 0 |

Noise frequency of motor is fixed while running in regular PWM mode; frequency domain of noise is wider while the running of motor is set in random PWM mode.

| | | | |
|---|---|---|---|
| **P0-14** | Keyboard frequency（UP/DOWN） | 0：Automatic storage when it powers down<br>1：No storage when it powers down | Default: 0 |

It's mainly used to alter the operating frequency through ▲ ▼ keys or external terminals UP/DOWN. Whether a modified operating frequency would be saved in the parameter P0-03 after it powers down depends on the setting of this parameter.

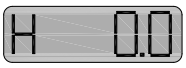
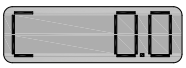
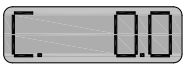
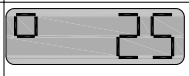
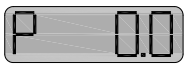
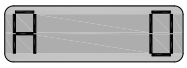
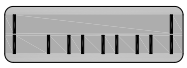
| | | | |
|---|---|---|---|
| **P0-15** | Drive address | 1-247. 0 is broadcast address | Default: 1 |

When drive address is set to 0,it means broadcast address ,so it achieve function of upper monitoring broadcasting.The local drive address is unique (except the broadcast address), which is the basis for the peer-to-peer communication between the host computer and the inverter.

**P1: Human Interface parameters**

| | | | |
|---|---|---|---|
| **P1-00** | Default display information for Starting | 0：Setting frequency<br>1：Output frequency<br>2：Output current<br>3：Bus voltage<br>4：Rotational Speed of motor<br>5：Percentage of output current<br>6：IGBT temperature<br>7：Output voltage<br>8：Output power<br>9：Count value<br>10：PI index value<br>11：PI feedback value<br>12：Accumulated running time（hour）<br>13：Input terminal status<br>14：Output terminal status<br>15：Power | Default: 0 |

**It's mainly applied to the setting of default display informationfor starting.**

| Setvalue | Statusinformation | Description | Unit |
|---|---|---|---|
| 0 |  | Preset frequency | Hz |
| 1 |  | Output | Hz |
| 2 |  | Output | A |
| 3 |  | Bus voltage | V |
| 4 |  | Rotational speed of | r/min |
| 5 |  | Percentage of output current | |
| 6 |  | IGBT Temperature | ℃ |
| 7 |  | Output voltage | V |
| 8 |  | Output power | KW |
| 9 |  | Count value | |
| 10 |  | PI preset value | |
| 11 |  | PI feedback value | |
| 12 |  | Total run time | H |
| 13 |  | Status of input | |
| 14 |  | Status of output terminal | |
| 15 |  | Converter power | KW |

| | | | |
|---|---|---|---|
| **P1-01** | Setting of display information | 0: 0~3 messages<br>1: 0~7 messages<br>2: 0~11 messages<br>3: 0~15 messages | Default: 1 |

It's mainly applied to the setting for how many messages are allowed to displayed on the panel. About the corresponding information for No. 0~15, please refer to P1-00.

| | | | |
|---|---|---|---|
| **1-02** | Display coefficient of mechanical speed | 0.1~60.0 | Default: 29.0 |

It's mainly applied to the adjustment of displayed value for the rotational speed of motor. Display coefficient of mechanical speed = rotational speed of motor/operating frequency

| | | | |
|---|---|---|---|
| **P1-03** | JOG/REV Function selection | 0：Jog 1：FDW/REV switching | Default: 0 |

It mainly applied to the features setup of JOG/REV key; and when running is under the control of keyboard:

0: Jogging will be enabled by pressing JOG/REV key;

1: Forward direction and reverse direction can be switched to each other by JOG/REV key.

**P2: Parameters of Start-Stop Mode**

| | | | |
|---|---|---|---|
| **P2-00** | Starting Mode | 0: Starting directly<br>1: DC braking-Starting | Default: 0 |

0: It starts directly with the original start frequency;

1: DC braking-Starting -- DC braking will be enabled first; then motor starts runningwith the original start frequency; this is applicable for the situation when reverse may be caused by small inertia load during the process of starting.

| | | | |
|---|---|---|---|
| **P2-01** | Starting frequency | 0.0~10.0Hz | Default: 0.5 Hz |
| **P2-02** | Retention time for starting | 0.0~50.0 s | Default: 0.0s |

Applicablestarting frequency can ensure that there is enough torque for starting.

Retention time for startingis needed for the formation of magnetic flow while motor is on standby, so that it can start accelerating after start frequency is stabilized for a certain time.

| | | | |
|---|---|---|---|
| **P2-03** | Brakingcurrent before starting | 0~150.0% | Default: 50.0% |
| **P2-04** | Braking timebefore starting | 0~50.0s | Default: 0.0s |

It's only when P2-00 equals 1 that DC braking can be enabled before starting. When converter is about to be started, DC braking should be proceeded according to the preset braking current (P2-03); after the preset braking time (P2-04) is over, it will start running.

Brakingcurrent means the percentage comparing with rated current. The higher braking DC

is, the stronger braking force will be.

| | | | |
|---|---|---|---|
| **P2-05** | Stop mode | 0：Regular stopping<br>1：Stop by decelerating<br>2：Decelerating-DC braking-Stopping | Default: 1 |

It's mainly applied to the setting of stop mode for converter.

0: Regular stopping -- the output of converter will be blocked immediately once stop instruction comes into effect.

1: Stopping by decelerating -- output frequency will be decreased slowly according to the preset deceleration time once stop instruction comes into effect; when it comes to zero, converter will be shut down.

2: Decelerating-DC braking-Stopping: output frequency will be reduced down to start frequency(P2-06) according to the preset deceleration time once stop instruction comes into effect; since then, DC braking will be enabled; after braking time(P2-08) is over, converter will be shut down.

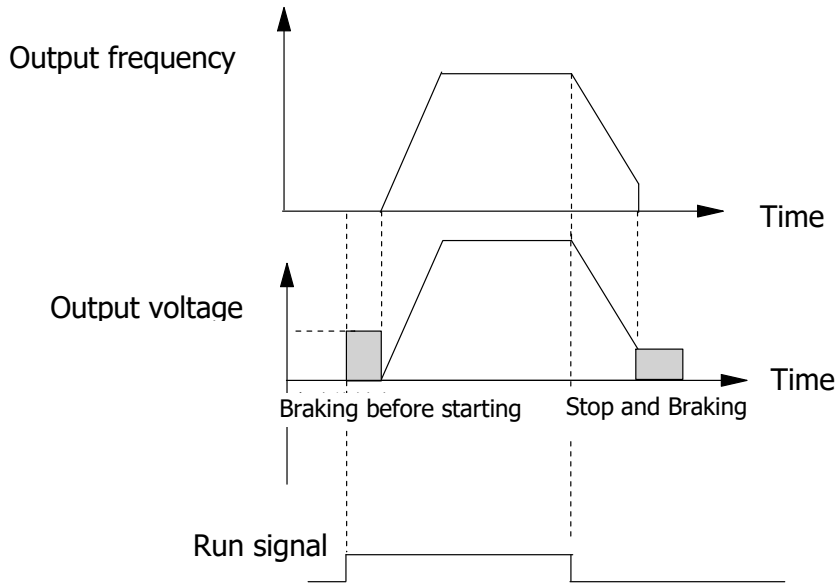
| | | | |
|---|---|---|---|
| **P2-06** | Start frequency of DC braking | 0.0~10.0Hz | Default: 0.0Hz |

If parameter P2-05 equals two， it will be stopped through DC braking when converter reaches up to the corresponding frequency.

| | | | |
|---|---|---|---|
| **P2-07** | Braking current for stopping | 0~150.0% | Default: 50.0% |
| **P2-08** | Braking time for stopping | 0~50.0s | Default: 0.0s |

Braking current for stopping means the amperage of direct current for braking; the higher the amperage is, the stronger the braking force will be.

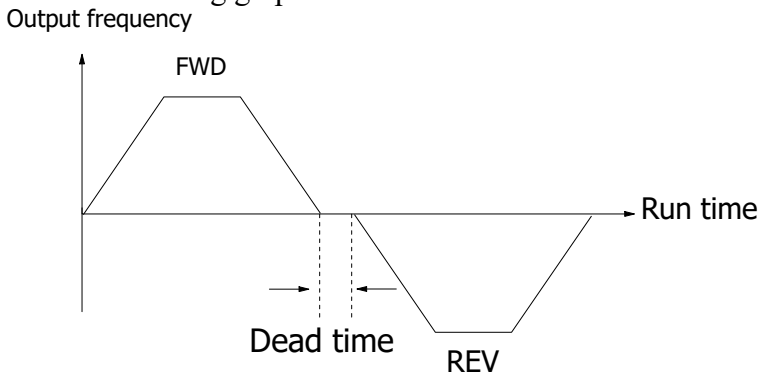
Braking time for stopping means the time for increasing enough amperage of direct current to stop converter; when the value comes to zero, it means that there is no DC braking during the process.




| | | | |
|---|---|---|---|
| **P2-09** | Dead time of FWD/REV | 0.0~50.0 s | Default: 0.0s |

It mainly applied to the setting of transient time for zero output frequency during the transient process between forward and reverse.

Please refer to the following graph:




| | | | |
|---|---|---|---|
| **P2-10** | Lower limitingfrequency for running control | 0：running in lowerlimitingfrequency<br>1：on standby<br>2：stopping | Default: 0 |

It's mainly applied to the setting of running status when preset frequency is less than lower limiting frequency.

0: Converter will be running in lower limiting frequency if preset frequency is less than lower limiting frequency.

1: Converter will be shut down when preset frequency is less than lower limiting frequency;

and it will be started again automatically when preset frequency is higher than or equivalent to lower limiting frequency.

2: This parameter is applicable to stop the converter in case that motor keeps running in a low speed.

**P3: Parameters of Motor**

| | | | |
|---|---|---|---|
| P3-00 | Rated frequency | F3（P4-05）～400Hz | Default: 50.0Hz |
| P3-01 | Rated voltage | 200～440V | Default: Depending on model |
| P3-02 | Rated current | 0.1～999.9A | Default: Depending on model |
| P3-03 | Rated power | 0.1～630.0KW | Default: Depending on model |
| P3-04 | Rated rotational Speed | 1～36000rpm | Default: 1440rpm |

 These parameters above must be set according to the information of nameplates on the motor.

These parameters of motor must be accurate in order to improve the performance of self-adaptive control. These parameters of typicalfour-pole motor which is compatible with this converter by default are included, which should be input when the capacity of motor is not in conformity with that of this converter.

| | | | |
|---|---|---|---|
| P3-05 | No-load current | 0.1～999.9A | Default: Depending on model |
| P3-06 | Statorresistance | 0.001～50.000Ω | Default: Depending on model |
| P3-07 | Excitation/Magnetic inductance | 0.1～5000.0mH | Default: Depending on model |

 These parameters above are mainly applied to the setting of basic electrical parameters, which are essential to complete the algorithm of self-adaptive control.

If the capacity ofthe matched motor is also the same as that of typical motor, the default parameters can be applicable.

They can also be input manually if those precise parameters can be obtained in advance. All the internal default parameters will be restored automatically according to its model during the process of initialization.

Precaution: Do not change or modify these parameters casually.

**P4:V/F Control Parameters**

| | | | |
|---|---|---|---|
| **P4-00** | V/F curve setting | 0：General V/F<br>1：2 power V/F<br>2：3 power V/F | Default: 0 |

| | | | |
|---|---|---|---|
| | | 3：high starting torque V/F<br>4：Self-setting V/F<br>5：Self-adaptive control | |

It's mainly applied to the setting of correspondingcurves for output voltage and output frequency according to differentconditions of loading.

0: General V/F is generally applicable to constant load torque;

1/2: 2 or 3 power V/F is applicable to the operation with centrifugal load, for example draught fan or pump, etc.

**3**: high starting torque V/F is applicable to the operating situations which require higher starting torque.

4: Self-setting V/F indicates that V/F curve can be preset randomly by the functional codes P4-01~P4-06, which is applicable to the operation with special load, for example dewaterer or centrifuge, etc.

5: Self-adaptive control can be applied to running regulation by adaptingitself to actual load automatically, which is applicable to the operating situations which require
greater low-frequency torque as well as strict control on speed.

Parameters must be set correctly according to the information of nameplate on the motor if this function needs to be enabled; it's only when the capacity ofthe motor is the same as that of this converter can its performance be improved greatly.

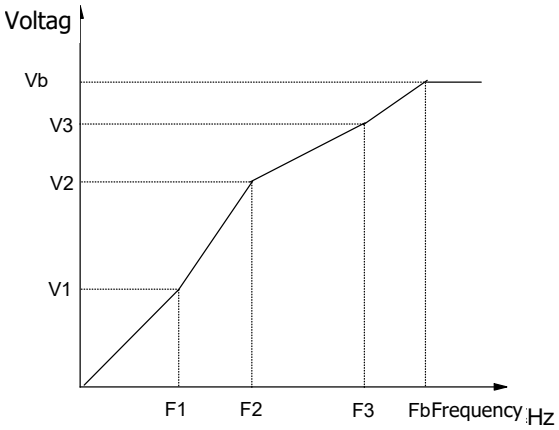
| | | | |
|---|---|---|---|
| **P4-01** | V/F Intermediate frequency 1 | 0.0Hz～P4-03 (Intermediate frequency 2) | Default: 5.0Hz |
| **P4-02** | V/F Intermediate voltage1 | 0~ rated voltage（P3-01) | Default: 38V |
| **P4-03** | V/F Intermediate frequency 2 | P4-01(Intermediate frequency 1)～P4-05 (Intermediate frequency) | Default: 25.0Hz |

| | | | |
|---|---|---|---|
| **P4-04** | V/F Intermediate voltage 2 | 0~ rated voltage（P3-01） | Default: 190V |
| **P4-05** | V/F Intermediate frequency 3 | P4-03 (Intermediate frequency 2) ～ P3-00(rated frequency) | Default: 50.0Hz |
| **P4-06** | V/F Intermediate voltage 3 | 0~ rated voltage（P3-01） | Default: 380V |

Multiple-phase V/F curves can be defined by these six parameters above (P4-01~ P4-06)

The set value of V/F curves is generally set according to the load characteristics of motor.

Precaution: motor may be overheated or even burned if preset low-frequency voltage is too high, which may activate its over current protection. V1＜V2＜V3，F1＜F2＜F3.




| | | | |
|---|---|---|---|
| **P4-07** | Torque upgrade | 0.0～15.0% | Default: 0 |

This parameter can make compensation for output voltage when converter is running in a low frequency, so that the characteristics of low-frequency torque which is controlled by V/F can be compensatedand upgraded.

If the setting of torque upgrade is too high, not only motor tends to be overheated but also over current may be caused by it. In general, the setting of torque upgrade must be no more than 10%. To prevent converter from over current effectively, this parameter must be adjusted properly. This parameter should be increased whenever there is heavy load; otherwise, please decrease this parameter.

| | | | |
|---|---|---|---|
| **P4-08** | Slip compensation | 0.0～10.0Hz | Default: 0.0 Hz |

The practical slip of motor varies from load to load. Output frequency can be adjusted automatically according to the condition of loading by this functional parameter, so that compensation can be made for the influence of load on rotational speed of motor.

| | | | |
|---|---|---|---|
| **P4-09** | AVR function | 0：Disabled<br>1：always enabled<br>2：only enabled in process of deceleration | Default: 1 |

AVR function is also known as Automatic Voltage Regulation function. Adjustment will be made automatically to stabilize output voltage whenever there is fluctuation of input voltage, so that it can prevent converter from overheat of motor caused by high output voltage or poor performance caused by low output voltage.

Effective period of AVR can be selected by this parameter. AVR option will be disabled when converter is stopped by decelerating; though the deceleration time is very short, the current is a little high. When AVR option is enabled, the deceleration time will be longer, but the current will be lower.

| | | | |
|---|---|---|---|
| **P4-10** | Energy-efficient running | 0：Disabled<br>1：Enabled | Default: 0 |

During the process of no-load or light-load running, output voltage can be adjusted properly to achieve automatic energy conservation by detecting load current.

This parameter is applicable to the load of draught fan or pump.

**P5:Input function parameters**

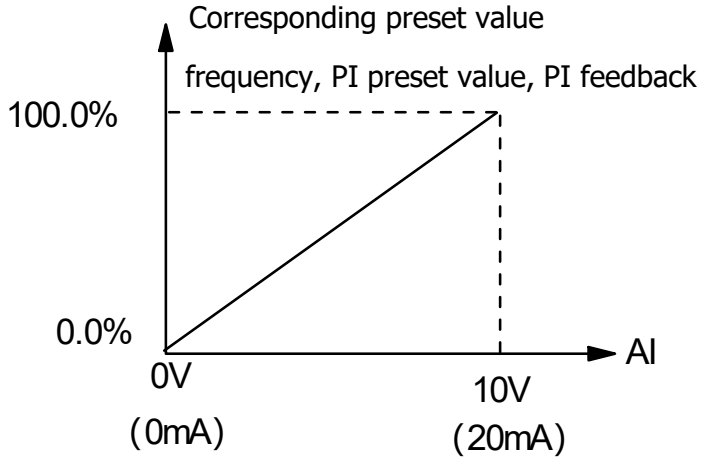
| | | | |
|---|---|---|---|
| **P5-00** | AI1 lower limiting value | 0～10.00V | Default: 0.00V |
| **P5-01** | Corresponding setting for AI1 lower limit | 0～100.0% | Default: 0.0% |
| **P5-02** | AI1 upper limiting value | AI1 lower limiting value～10.00V | Default: 10.00V |
| **P5-03** | Corresponding setting for AI1 upper limit | 0～100.0% | Default: 100.0% |
| **P5-04** | AI1 input filtering time | 0.0s～10.0s | Default: 0.1s |

The functional codes above define the relationships between analogue input voltage and corresponding setting of AI. Calculation will be based on the maximum or minimum one whenever analogue input voltage exceeds the range between preset maximum input and minimum input.

The correspondingnominal value of analogue setting varies from situation to situation. For detailed information, please refer to the relevant instructions for each parameter.

The following graphs are listed to demonstrate several situations of setting.

Precaution: preset lower limiting value of AI1 must be less than or equivalent to preset upper limiting value of AI1.




The sensitivity of analogue input is decided by AI1 input filtering time. The parameter must be increased to improve the anti-jamming capability which can prevent analog quantity from being interfered, so that malfunctions can be reduced somehow; however, it may reduce the sensitivity of analogue input.

| | | | |
|---|---|---|---|
| **P5-05** | AI2 lower limiting value | 0.00V～10.00V | Default: 0.00V |
| **P5-06** | Corresponding setting for AI2 lower limit | 0～100.0% | Default: 0.0% |
| **P5-07** | AI2 upper limiting value | AI2 lower limiting value～10.00V | Default: 10.00V |
| **P5-08** | Corresponding setting for AI2 upper limit | 0～100.0% | Default: 100.0% |
| **P5-09** | AI2 input filtering time | 0.0s～10.0s | Default: 0.1s |

The setting of AI2 function is similar to that of AI1. 0~20mA input current is equivalent to 0~10V input voltage when analogue input is preset as current input. 0~10V or 0~20mA input can

also be selected through jumper 4(J4).

| | | | |
|---|---|---|---|
| **P5-10** | Multi-functional Input Terminal X1 | 0: Disabled<br>1: Forward<br>2: Reverse<br>3：Three-wire control<br>4：Multi-phase reference velocity 1<br>5：Multi- phase reference velocity 2<br>6：Multi- phase reference velocity 3<br>7：JOG forward<br>8：JOG reverse<br>9：Increasing frequency<br>10：Decreasing frequency<br>11：Acc-Dec time selection 1<br>12：Acc-Dec time selection 2<br>13：Acc-Dec pause<br>14：External fault Input<br>15：Fault reset<br>16：Freely stopping<br>17：External count value input<br>18：count clear<br>19：program run<br>20：pause of program run | Default: 1 |
| **P5-11** | Multi-functional Input Terminal X2 | | Default: 2 |
| **P5-12** | Multi-functional Input Terminal X3 | | Default: 14 |
| **P5-13** | Multi-functional Input Terminal X4 | | Default: 4 |
| **P5-14** | Multi-functional Input Terminal X5 (CN1 needle base input) | | Default: 5 |
| **P5-15** | Multi-functional Input Terminal X6 | | Reserved |
| **P5-16** | Multi-functional Input Terminal X7 | | Reserved |
| **P5-17** | Multi-functional Input Terminal X8 | | Reserved |

It's mainly applied to the setting of corresponding functions for digital mutil-functional input terminals.

**Table of Functions**

| Set value | Functions | Descriptions |
|---|---|---|
| 0 | Disabled | Please set unused terminals to be invalid to avoid malfunction.<br>It's applied to the setting of terminals which have no function; those additional terminals can be set as non-functional terminals to prevent converter from malfunctioning |
| 1 | Forward | Set the forward and reverse of converter.<br>Please refer to description of P5-18<br>It's applied to the setting of terminals which control the running direction(forward/reverse) of converter; for detailed information, |
| 2 | Reverse | |

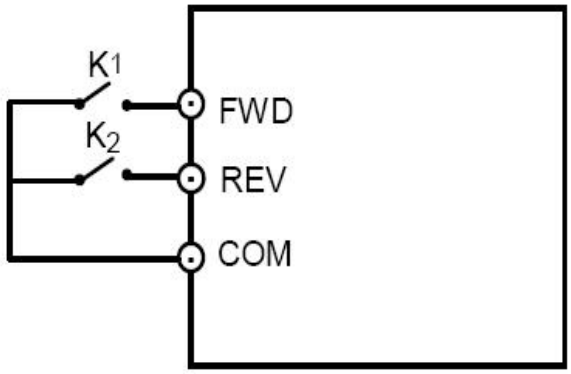
<table>
<tr><td></td><td></td><td>please refer to the instruction on Page5~18</td></tr>
<tr><td>3</td><td>3-wire control</td><td>Please refer to description of P5-18<br>It's applied to the setting of three-wire control terminals(it's activated only when three-wire control is enabled); for detailed information, please refer to the instruction on Page5~18</td></tr>
<tr><td>4</td><td>Multi-phase reference velocity 1</td><td rowspan="3">8 steps speed control can be realized by the combination of these four terminals.<br>Eight kinds of speeds can be set through the combination of numbers which are decided by three terminals separately
<table>
<tr><th>$S_3$</th><th>$S_2$</th><th>$S_1$</th><th>Frequency</th><th>Parameter</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>Multi-phase reference velocity 0</td><td>P0-03</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>Multi-phase reference velocity 1</td><td>P8-01</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>Multi-phase reference velocity 2</td><td>P8-02</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>Multi-phase reference velocity 3</td><td>P8-03</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>Multi-phase reference velocity 4</td><td>P8-04</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>Multi-phase reference velocity 5</td><td>P8-05</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>Multi-phase reference velocity 6</td><td>P8-06</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>Multi-phase reference velocity 7</td><td>P8-07</td></tr>
</table></td></tr>
<tr><td>5</td><td>Multi-phase reference velocity 2</td></tr>
<tr><td>6</td><td>Multi-phase reference velocity 3</td></tr>
<tr><td>7</td><td>Forward jogging</td><td rowspan="2">Set the jog forward and jog reverse of converter<br>It's applied to the setting of terminals which control jogging direction(forward/reverse)</td></tr>
<tr><td>8</td><td>Reverse jogging</td></tr>
<tr><td>9</td><td>Increasing frequency(Up)</td><td rowspan="2">The reference frequency of inverter can be adjusted by UPcommand and DOWN command.<br>It's applied to the setting of external terminals which can change or modify the instructions to increase or decrease frequency. Upward or downward adjustment of frequency can be made through these two functions when frequency is set decided by number.</td></tr>
<tr><td>10</td><td>Decreasing Increasing (Down)</td></tr>
<tr><td>11</td><td>Acc-Dec time Option 1</td><td rowspan="2">4 groups of ACC/DEC time can be selected by the combination of these two terminals.<br>Four kinds of Acc-Dec times can be set through the combination of numbers which are decided by two terminals separately
<table>
<tr><th>Terminal 2</th><th>Terminal 1</th><th>Acc-Dec time Options</th><th>Parameter</th></tr>
</table></td></tr>
<tr><td>12</td><td>Acc-Dec time Option2</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| | | 0 | 0 | Acc-Dec time 0 | P0-04、P0-05 |
| | | 1 | 1 | Acc-Dec time 1 | PA-00、PA-01 |
| | | 1 | 0 | Acc-Dec time 2 | PA-02、PA-03 |
| | | 1 | 1 | Acc-Dec time 3 | PA-04、PA-05 |
| 13 | Stop ofAcc/Dec | When the terminal is valid, in ACC/DEC situation, it is running as current frequency.<br>Acceleration or decelerationmode will be shut down when terminals are enabled; converter will be running in current frequency. | | | |
| 14 | External fault Input | Stop the inverter and output a alarm when a fault occurs in a peripheral device<br>Converter can detect fault and shut itself down automatically when external fault signal is received. | | | |
| 15 | Fault reset | Resets faults that have occurred. It has the same function a RESET key<br>It functions as RESET key functions, which can also be used to achieve remote control of fault reset. | | | |
| 16 | Regular stopping | The inverter blocks the output immediately. The motor coasts to stop by its mechanical inertia.<br>The process of stopping will not be affected by converter if there is no output signal sent to motor. It's applicable to any situation and the operation with large inertia load. | | | |
| 17 | External count value input | Outer count input/pulse input<br>Switching value of external count / pulse input | | | |
| 18 | Counter reset | To counter the state cleared<br>To reset the counter | | | |
| 19 | Program run | program is running according the terminal<br>Program can be started by the terminal | | | |
| 20 | Pause of program run | Keep the converter in current running frequency when the terminal is valid, and the running time is not include in program running time<br>It can keep converter running in current frequency when terminals are enabled; during this period, running time is not count into the time of program run | | | |
| 20~31 | Reserved | Reserved | | | |

| | | | |
|---|---|---|---|
| **P5-18** | Terminal control mode | 0: Two-wire controlmode 1<br>1: Two-wire control mode 2<br>2: Three-wire control mode 1<br>3: Three-wire control mode 2 | Default: 0 |

This parameter defines three different control modes of external terminals.

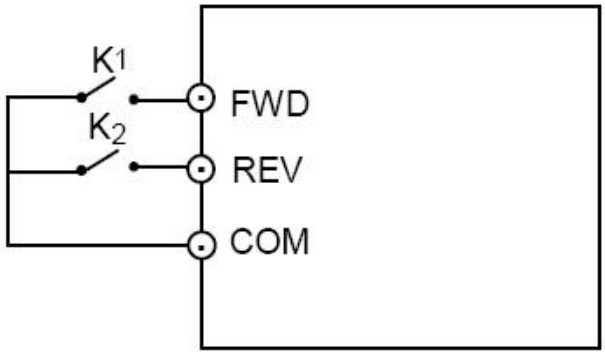
0: Two-wire control mode 1 is the most common two-wire mode, which can make directions conformed with each other; Forward or reverse direction will be decided by the instructions from FWD/REV terminals.




| K1 | K2 | Command code |
|---|---|---|
| OFF | OFF | Stop |
| ON | OFF | Forward |
| OFF | ON | Reverse |

node 1

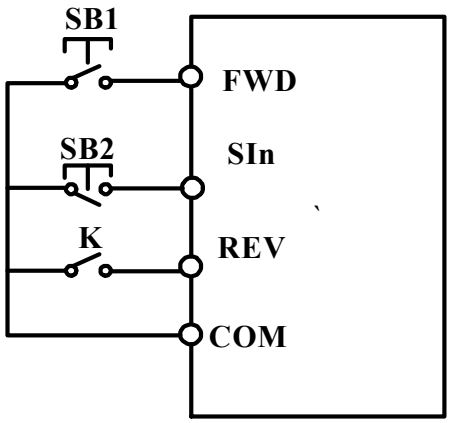
1: Two-wire control mode 2 can keep directions separated with each other; FWD terminal will be enabled while this mode is enabled; but direction will be decided by REV.




| K1 | K2 | Run command |
|---|---|---|
| OFF | OFF | Stop |
| OFF | ON | Stop |
| ON | OFF | Forward |
| ON | ON | Reverse |

2-wire control mode 2

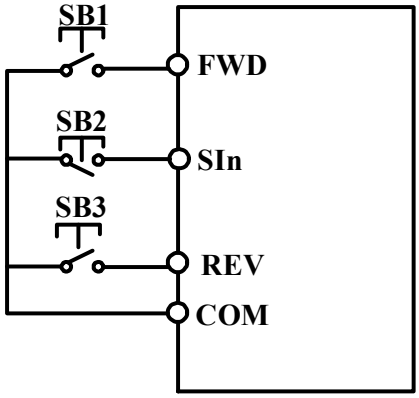
2: Rising edge of pulse and terminal SIn will be enabled while three-wire control mode 1 is enabled; direction is controlled by REV key; stop signal is controlled by input terminal SIn. The function of corresponding input terminal is defined by SIn terminal as No.3 function "three-wire control".




| | | |
|---|---|---|
| K | OFF | Forward |
| | ON | Reverse |
| SB1 | Run | |
| SB2 | Stop | |

3-wire control mode 1

3: Rising edge of pulse and terminal SIn will be enabled while three-wire control mode 2 is enabled; run command is controlled by both REV of FWD keys which control the running direction at the same time; stop signal is generated by a constant-closed input terminal SIn. The function of corresponding input terminal is defined by SIn terminal as No.3 function "three-wire control".




| | |
|---|---|
| SB1 | Forward running |
| SB2 | Stop |
| SB3 | Reverse running |

**3-wire control mode 2**

Tips: As for two-wire control mode, with the premise of the following two points, even control terminals FWD/REV remain enabled, converter will not be running any more after stop signal disappears:

1) FWD/REV terminals are enabled;

2) Converter is shut down because of stop signal generated by the other source;

FWD/REV terminals must be enabled again if converter needs to be started.

| | | | |
|---|---|---|---|
| **P5-19** | Terminal filtering time | 2ms~100 ms | Default: 10 ms |

It's mainly used to set the sensitivity of terminals from X1 to X8. The parameter must be

increased to improve the anti-jamming capability which can prevent DI terminals from being interfered, so that malfunctions can be reduced somehow; however, it may reduce the sensitivity of DI terminals.

| | | | |
|---|---|---|---|
| **P5-20** | The range of the UP/DOWN increasing decline | 0.0~50.0Hz | 0.1 |

When frequency increment/decrement with external terminal set, every time the frequency of the increase or decrease in value is decided by the P5-20.

**P6: Output function parameters**

| | | | |
|---|---|---|---|
| **P6-00** | Y1 output options | 0: Disabled<br>1: Running<br>2: Direction<br>3: Fault output<br>4: On standby<br>5: Frequency received<br>6: FDT<br>7: Upper limiting frequency received<br>8: Lower limiting frequency received<br>9: Setting count valuereceived<br>10: Designated count valuereceived | Default: 1 |
| **P6-01** | Y2 output options | | Default: 2 |
| **P6-02** | Relay output options | | Default: 3 |

**Table of Output Functions**

| Set value | Functions | Descriptions |
|---|---|---|
| 0 | Disabled | Output terminalswithout any function |
| 1 | Running | When the converter is running, output the close signal<br>It means that converter is running; closed signal is output. |
| 2 | Direction | On run reverse, output the close signal<br>It indicates the running direction of converter; closed signal is output when it's running in reverse direction. |
| 3 | Fault output | When the converter is out of work, output the close signal<br>Closed signal is output when it's malfunctioning. |
| 4 | On standby | Establish main circuit and control circuit power, the protection function of the converter is not change, and the converter is running, output the close signal |

| | | |
|---|---|---|
| | | Major loop and control circuit are established; protection function isn't enabled; converter is on standby; closed signal is output. |
| 5 | Frequency received | Please refer to the explanations of function code PA-11~13 |
| 6 | FDT | |
| 7 | Upper limiting frequency received | ON: Running frequency reaches the value of P0-09<br>Signal "ON" is output when running frequency reaches upper limiting frequency |
| 8 | Lower frequency limitingreceived | ON: Running frequency reaches the value of P0-10<br>Signal "ON" is output when running frequency is equivalent to or lower than lower limiting frequency |
| 9 | Setting count valuereceived | ON: the value of count reach the setting value of PA-14<br>Signal "ON" is output when count value reaches the value set by PA-14. |
| 10 | Designated count valuereceived | ON: the value of count reach the setting value of PA-15<br>Signal "ON" is output when count value reaches the value set by PA-15. |
| 11~15 | Reserved | Reserved |

| | | | |
|---|---|---|---|
| **P6-03** | AO1 options | 0: Operating frequency<br>1: Output current<br>2: Bus voltage<br>3:Output voltage | Default: 0 |

The standard range of analogue input current/voltage is 0~20mA/0~10V, which can be selected by Jumper 5. Output signals can be selected by the setting of this parameter, which correspond to output frequency or output current of converter.

Corresponding range of AO(0~10V/0~20mA) is as followed:

| Set value | Functions | Descriptions |
|---|---|---|
| 0 | Running frequency | 0～upper limiting frequency |
| 1 | Output current | 0~double rated current |
| 2 | Bus voltage | 0~ double rated voltage |
| 3 | Output voltage | 0~ double rated voltage |

| | | | |
|---|---|---|---|
| **P6-04** | AO correction coefficient | 0.0~250.0% | Default: 100.0% |

It's mainly not only applied to the correction of analogue output voltage but also used to adjust the range of analogue output voltage.

Analogue output voltage = Analogue output voltage ×AO correction coefficient

If the set value of parameter P6-03 is zero while the set value of parameter P6-04 is 100%, the corresponding AO of upper limiting frequency is +10V (20mA). AO correction coefficient can be increased properly to calibrate the analogue output voltage if practical AO is only 9.8V because of differences of circuit.

| | | | |
|---|---|---|---|
| **P6-05** | Stop delay time setting | 0~3000.0S | 0 |

When the inverter output signal when stop the machine open, until the P6-05, the output signal to shut down.

**P7: PI control parameters**

PI control is a common method to control the process. Output frequency can be adjusted by proportion&integral operations on the difference between the feedback signals of controlled variable and signals of objective variables.

| | | | |
|---|---|---|---|
| **P7-00** | PI preset source options | 0: Digital keyboard<br>1: Panel potentiometer<br>2: Analog channelAI1<br>3: Analog channelAI2 | Default: 0 |

This parameter functions if PI is chosen as frequency source, which means that the selection of P0-01 is option 4. The preset channel of objective variables for PI is determined by this parameter. The setting objective variables of PI are relative value; the percentage of the setting(100%) corresponds to the percentage of feedback signal(100%) in the controlled system. And operation is proceeded by the system according to the relative value(0~100%).

| | | | |
|---|---|---|---|
| **P7-01** | PI set value | 0.00~10.00V | Default: 0.00 |

When P7-00 equals zero, PI set value will be set by this parameter.

| | | | |
|---|---|---|---|
| **P7-02** | PI feedback source options | 0: Analog channel AI1<br>1: Analog channel AI2 | Default: 0 |

PI feedback channel is determined by this parameter.

| | | | |
|---|---|---|---|
| **P7-03** | PI output characteristics options | 0: Positive 1: Negative | Default: 0 |

Positive PI output characteristics: output frequency must be lowered to make it balance when the value of feedback signal is greater than PI set value, for example PI control on winding tension.

Negative PI output characteristics: output frequency must be increased to make it balance when the value of feedback signal is greater than PI set value, for example PI control on unwinding tension.

| | | | |
|---|---|---|---|
| **P7-04** | Proportional gain (P) | 0.0～10.0 | Default: 0.1 |
| **P7-05** | Integral time (I) | 0.0～100.0s | Default: 0.1s |

Proportional gain (P) determines the intensity of adjustment of PI regulator; the larger P value is, the higher the intensity of adjustment will be.

Integral time (I) determines the speed of integral regulation on the difference between PI feedback quantity and given quantity. The less integral time is, the higher the intensity of adjustment will be.

PI is the most common control method for process control; the function of each part is different from each other's. Please refer to the following brief introduction of operating principles and regulation methods:

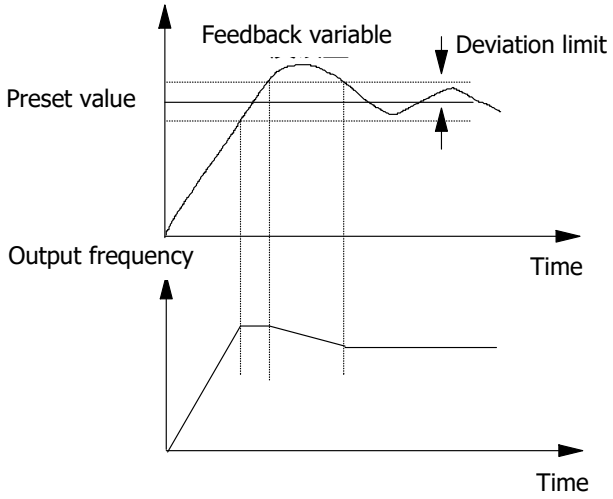
Proportional gain (P): There will be proportional adjustment between output and deviation if there is difference between feedback value and set value; if deviation is constant, regulating variable is also constant. Proportional control responses to the change of feedback quickly; however, error control can't be proceeded only by proportional control. The greater proportional gain is, the smaller adjusting speed of system will be. But the proportional gain is excessive, it may cause vibration. The adjustment method is to extend the integral time and make system running only by proportional control; meanwhile, set value should be changed in order to observe

its stable deviation(static error) between feedback signal and given quantity; if static error is in compatible with the change of given quantity, proportional gain can be increased continuously, for example increasing given quantity, or feedback quantity is always less than given quantity after system is stable; otherwise, please reduce it. The instruction above should be implemented repeatedly until deviation is optimized/minimized(tips: zero offset is almost impossible).

Integral time (I): when there is difference between feedback value and set value, regulating variable of output should be accumulated continuously; if the deviation can't be eliminated, the regulating variable should be increased continuously until there is no deviation. Deviation can be eliminated effectively by integral controller. However, overshoot may be caused repeatedly if the adjustment of integral controller is too much, which makes system unstable and even causes vibration. If vibration is caused by excessive integral action, following characteristics can be observed -- oscillation of feedback signal on given quantity, expanding amplitude of oscillation, even vibration. The parameter of integral time should be adjusted generally from maximum value to minimum value so that the integral time can be changed gradually. Observation should be made on the effect on the system. Adjustment can't be stopped until the sable speed of system meets the requirements.

| | | | |
|---|---|---|---|
| **P7-06** | Deviation limit of PI control | 0.00～2.00 | Default: 0.10 |

Deviation limit of PI control defines the comparison between PI system output and maximum deviation value which is limited by closed-loop set value. As is shown in the graph, PI regulator is shut down while it's within deviation limit. The precision and stability of PI system can be improved by setting this function code properly.




| | | | |
|---|---|---|---|
| **P7-07** | Sampling period(T) | 0.1～100.0s | Default: 0.5s |

Sampling period (T) means sampling period of feedback quantity; operation is performed by regulator once every one sampling period. The longer sampling period is, the slower response will be.

| | | | |
|---|---|---|---|
| **P7-08** | Detected value of feedback disconnection | 0.00～5.00 | Default: 0.10 |
| **P7-09** | Time for detecting feedback disconnection | 0.0～100.0s | Default: 1.0s |

The feedback variable of PI can be always detected by system; if feedback variable is less than the detected value of feedback disconnection, system will consider feedback signal to be disconnected by default; if feedback variable is still less than the detected value of feedback disconnection while actual time is more than the time for detecting feedback disconnection, PIE can be detected and sent out by the system.

| | | | |
|---|---|---|---|
| **P7-12** | Sleep time | 0～3000S | 600 |
| **P7-13** | Dormancy pressure | 0～10.00 | 0 |
| **P7-14** | Dormancy frequency | 0～50.0Hz | 0 |
| **P7-15** | Wake up the pressure | 0～10.00 | 0 |

Dormancy function description: when the back pressure value > dormancy pressure (P7-13), the frequency of running < dormancy frequency (P7-14). Waiting for the time of sleep (P7-12),

began to sleep. When the pressure of the feedback < wake up pressure (P7-15), will cease to dormancy, inverter will run again。

1.1Dormancy frequency (P7-14) Settings:

In under the condition of no water or gas, make the inverter running in the PID control mode (P0-01 = 0 or 1), start the inverter. Observation line pressure, slowly increase the frequency to the target according to user's requirements, record the current operating frequency after downtime. Set the dormant frequency (P7-14) just above the record frequency of 1-3 hz or so.

1.2 dormancy pressure (P7-13) set: dormancy pressure value slightly smaller than the target value.

1.3 when a dormant frequency P7-14 = 0 or resting pressure P7-13 = 0, don't start the sleep function.

**P8: Simple PLC and Multispeed Parameters**

| | | | |
|---|---|---|---|
| **P8-00** | Program run mode | 0: Disabled<br>1: Program stop after one-cycle running<br>2: Program operates as last program runs after one-cycle running<br>3: Circulatory running of program | Default: 0 |

0: Disabled

1: Program stop after one-cycle running

Converter will be stopped automatically after one-cycle running; only after run command is entered again will it be started.

2: Program operates as last program runs after one-cycle running

The operating frequency and direction in the last program will be remained to the end after one-cycle running.

3: Circulatory running of program

The next cycle of operation will be proceeded by converter automatically right after one-cycle running; system will not be shut down until stop command is received.

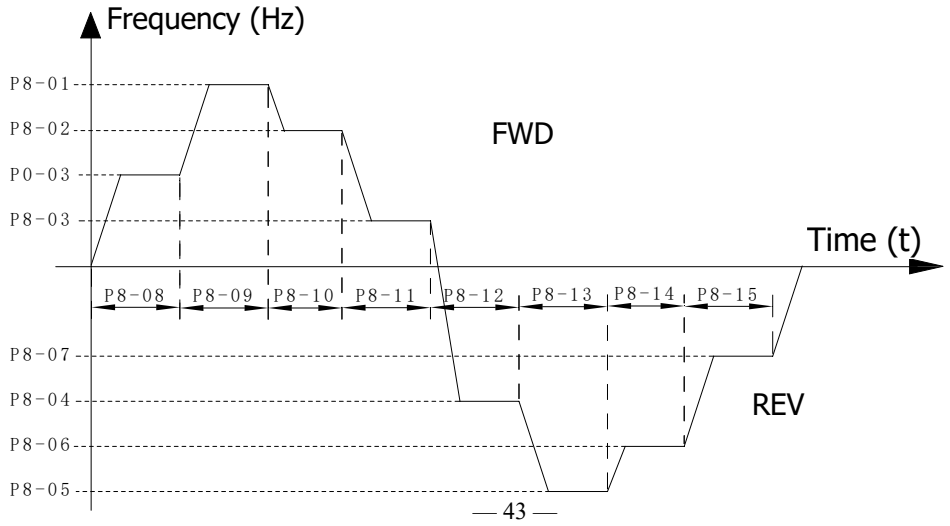
| | | | |
|---|---|---|---|
| **P8-01** | First phase speed | Lower limiting frequency ~ Upper limiting frequency | Default: 0.0Hz |
| **P8-02** | Second phase speed | Lower limiting frequency ~ Upper limiting frequency | Default: 0.0Hz |

| | | | |
|---|---|---|---|
| **P8-03** | Third phase speed | Lower limiting frequency ~ Upper limiting frequency | Default: 0.0Hz |
| **P8-04** | Forth phase speed | Lower limiting frequency ~ Upper limiting frequency | Default: 0.0Hz |
| **P8-05** | Fifth phase speed | Lower limiting frequency ~ Upper limiting frequency | Default: 0.0Hz |
| **P8-06** | Sixth phase speed | Lower limiting frequency ~ Upper limiting frequency | Default: 0.0Hz |
| **P8-07** | Seventh phase speed | Lower limiting frequency ~ Upper limiting frequency | Default: 0.0Hz |

These parameters above are mainly applied to the setting of seven different phase speeds;principal frequency is still controlled by parameter P0-03.

| | | | |
|---|---|---|---|
| **P8-08** | Runtime of principal frequency | 0~6400.0 | Default: 0.0 |
| **P8-09** | First phase time | 0~6400.0 | Default: 0.0 |
| **P8-10** | Second phase time | 0~6400.0 | Default: 0.0 |
| **P8-11** | Third phase time | 0~6400.0 | Default: 0.0 |
| **P8-12** | Forth phase time | 0~6400.0 | Default: 0.0 |
| **P8-13** | Fifth phase time | 0~6400.0 | Default: 0.0 |
| **P8-14** | Sixth phase time | 0~6400.0 | Default: 0.0 |
| **P8-15** | Seventh phase time | 0~6400.0 | Default: 0.0 |
| **P8-16** | Time unit of multi-velocity | 0: second<br>1: minute<br>2: hour | Default: 0 |

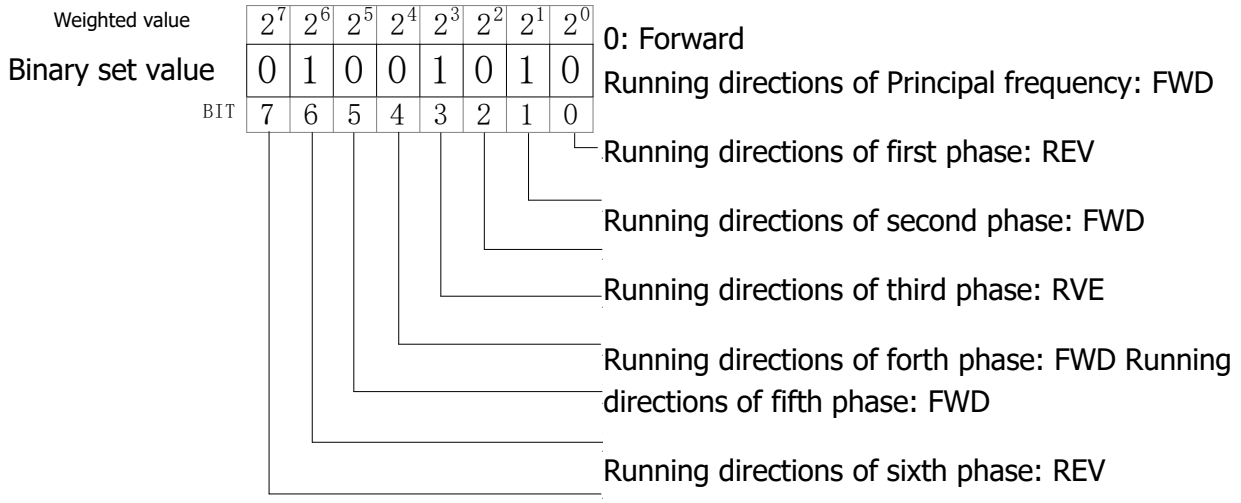
These parameters from P8-08 to P8-15 are mainly applied to the setting of run time for the velocity of each phase. Time unit can be preset by parameter P8-16.



| P8-17 | Runningdirections of programs | 0~255<br>BIT 0~7 indicates 0~7 directions<br>(0: Forward 1: Reverse) | Default: 0 |
|---|---|---|---|

It's mainly applied to the setting of running directions for each program, which is preset by binary mode (8 bit). Parameter can be entered only after the binary value is converted into decimal value.

Take the following settings for example:




Parameter values = bit7×$2^7$+bit6×$2^6$+bit5×$2^5$+bit4×$2^4$+bit3×$2^3$+bit2×$2^2$+bit1×$2^1$+bit0×$2^0$

=0×$2^7$+1×$2^6$+0×$2^5$+0×$2^4$+1×$2^3$+0×$2^2$+1×$2^1$+0×$2^0$

=0+64+0+0+8+0+2+0

=74

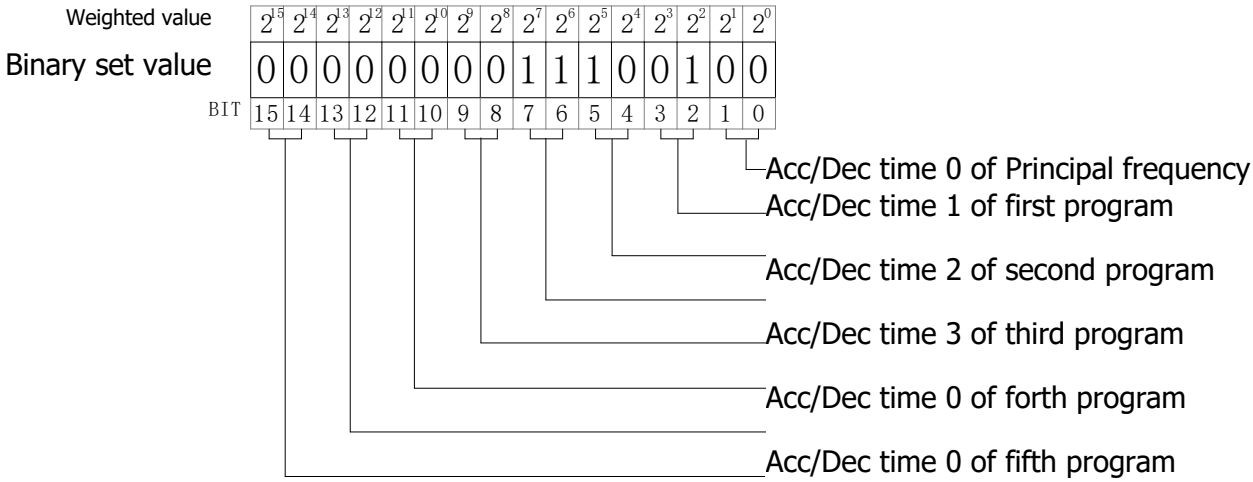
Namely (01001010)2 = (74)10

Hence P8-17 should be set as 74

| P8-18 | Timing for each program's Acc-Dec | 0~65535<br>BIT 0~15 indicates the ACC/DEC time of 0~7 | Default: 0 |
|---|---|---|---|

It's mainly applied to the setting of Acc/Dec time for each program, which is preset by binary mode (16 bit). Parameter can be entered only after the binary value is converted into decimal value.

**Take the following settings for example:**




Parameter values= $(0000000011100100)_2 = (228)_{10}$

Hence the P8-18should be set as 228

**P9: Protection Function parameters**

| | | | |
|---|---|---|---|
| **P9-00** | Options for overload protection | 0: Disabled<br>1: Enabled | Default: 0 |
| **P9-01** | Critical point of overload protection | 50~120% | Default: 110% |

These two parameters are mainly applied to the setting of real-time relay protection of load motor. Effective thermal protection of motor can be achieved by setting this parameter correctly when rated current of motor is not matched with rated current of converter.

Critical point of overload protection (motor) = (allowed max. load current / rated current of motor) * 100%

| | | | |
|---|---|---|---|
| **P9-02** | Overvoltage protection | 0: Disabled 1: Enabled | Default: 1 |
| **P9-03** | Critical point of Overvoltage | 110.0～150.0% | Default: 125 |

Due to the influence of inertia load, actual droop rate of motor's rotational speed may be lower than droop rate of output frequency while converter is decelerating; meanwhile, electrodes may feedback electric energy to converter, which may raise the bus voltage of converter. If no action is taken in time, stripping may be caused by over voltage of bus bar.

Overvoltage protection function will be enabled so that the decreasing output frequency of converter can be slowed down if bus voltage detected by converter while running exceeds the critical point of overvoltage defined by parameter P9-03(in comparison with standard bus voltage); if it's detected that the bus voltage is lower than the critical point, converter will continue to decelerate again.

| | | | |
|---|---|---|---|
| **P9-04** | Over-current protection | 0: Disabled<br>1: Enabled | Default: 1 |
| **P9-05** | Critical point of over-current | 100～180% | Default: 150 |

Because of excessive load, actual rate of rotational speed rise of motor may be lower than the rate of output frequency rise while converter is decelerating; if no action is taken in time, stripping may be caused by over current.

Over-current protection function will be enabled so that increasing output frequency of converter can be slowed down if bus current detected by converter while running exceeds the critical point of over current defined by parameter P9-05; if it's detected that output current is lower than the critical point, converter will continue to accelerate again.

| | | | |
|---|---|---|---|
| **P9-06** | Phase-failure protection **of** input | 0: Disabled<br>1: Enabled | Default: 0 |
| **P9-07** | Phase-failure protection **of** output | 0: Disabled<br>1: Enabled | Default: 0 |

Phase-failure protection of input: options are selected to enable or disable phase-failure protection for input

Phase-failure protection of output: options are selected to enable or disable phase-failure protection for output

| | | | |
|---|---|---|---|
| **P9-08** | Latest fault information | 0~20 | |
| **P9-09** | Last fault information | 0~20 | |
| **P9-10** | Last two fault messages | 0~20 | |

These parameters above can't be modified or changed; they are read-only.

The latest three fault types can be recorded by converter:

Zero means there is no malfunction

1~20 stands for twenty different malfunctions; for detailed information, please refer to Chapter 7 "Fault Correcting".

| | | | |
|---|---|---|---|
| **P9-11** | Operating frequency of latest fault | | |
| **P9-12** | Output current of latest fault | | |
| **P9-13** | Bus voltage of latest fault | | |
| **P9-14** | Input state of latest fault | | |
| **P9-15** | Output state of latest fault | | |

These parameters above can't be modified or changed; they are read-only.

Status information about the latest malfunctions can be recorded by converter, including its operating frequency, current and voltage.

| | | | |
|---|---|---|---|
| **P9-16** | Fault since the reset function | 0: invalid<br>1: under-voltage fault alarm automatic reset (unlimited)<br>2 ~ 20: fault self-recovery | 0 |

**Please set this function carefully, to ensure that the fault occurs again after the operation of the safety of person or equipment.**

After 2 ~ 20: frequency converter fault alarm automatically reset the number of times. Under-voltage alarm reset is always valid.

**Parameters of PA Enhancements**

| | | | |
|---|---|---|---|
| **PA-00** | Acceleration time 1 | 0.0～3600.0s | Default: 20.0s |
| **PA-01** | Deceleration time 1 | 0.0～3600.0s | Default: 20.0s |
| **PA-02** | Acceleration time 2 | 0.0～3600.0s | Default: 20.0s |
| **PA-03** | Deceleration time 2 | 0.0～3600.0s | Default: 20.0s |
| **PA-04** | Acceleration time 3 | 0.0～3600.0s | Default: 20.0s |
| **PA-05** | Deceleration time 3 | 0.0～3600.0s | Default: 20.0s |

Acc/Dec times are available to be selected, included three kinds of Acc/Dec times above, P0-04 and P0-05. They are all the same in definition; for detailed explanations, please refer to P0 series.

Acc/Dec time 0~3 can be selected through different combinations of multi-functional digital input terminals.

| | | | |
|---|---|---|---|
| **PA-06** | Jog acceleration time | 0.0～3600.0s | Default: 20.0s |
| **PA-07** | Jog deceleration time | 0.0～3600.0s | Default: 20.0s |

These two parameters above are applied to the definition of Acc/Dec time for jogging which can be started or stopped through direct starting or stop by decelerating.

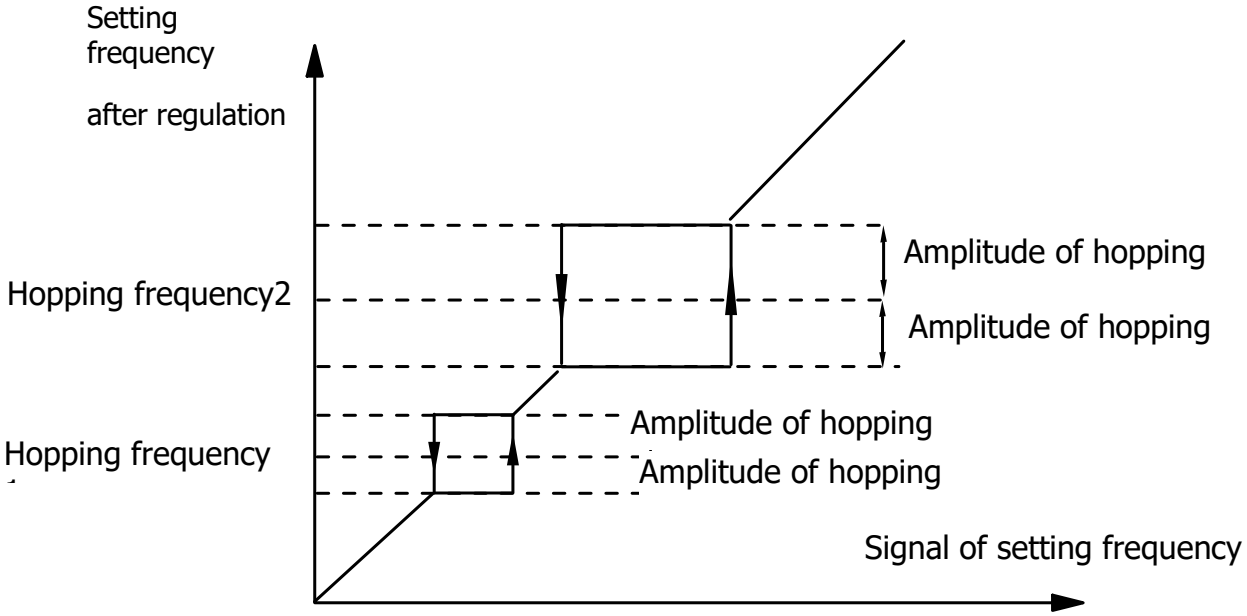
Jog acceleration time indicates the time for converter to accelerate from 0 Hz to maximum frequency (P0-08).

Jog deceleration time indicates the time for converter to decelerate from maximum frequency (P0-08) to 0 Hz.

| | | | |
|---|---|---|---|
| **PA-08** | Hopping frequency1 | 0.0～Upper limiting frequency（P0-09） | Default: 0.0Hz |
| **PA-09** | Hopping frequency2 | 0.0～Upper limiting frequency（P0-09） | Default: 0.0Hz |
| **PA-10** | Amplitude of Hopping frequency | 0.0～Upper limiting frequency（P0-09） | Default: 0.0Hz |

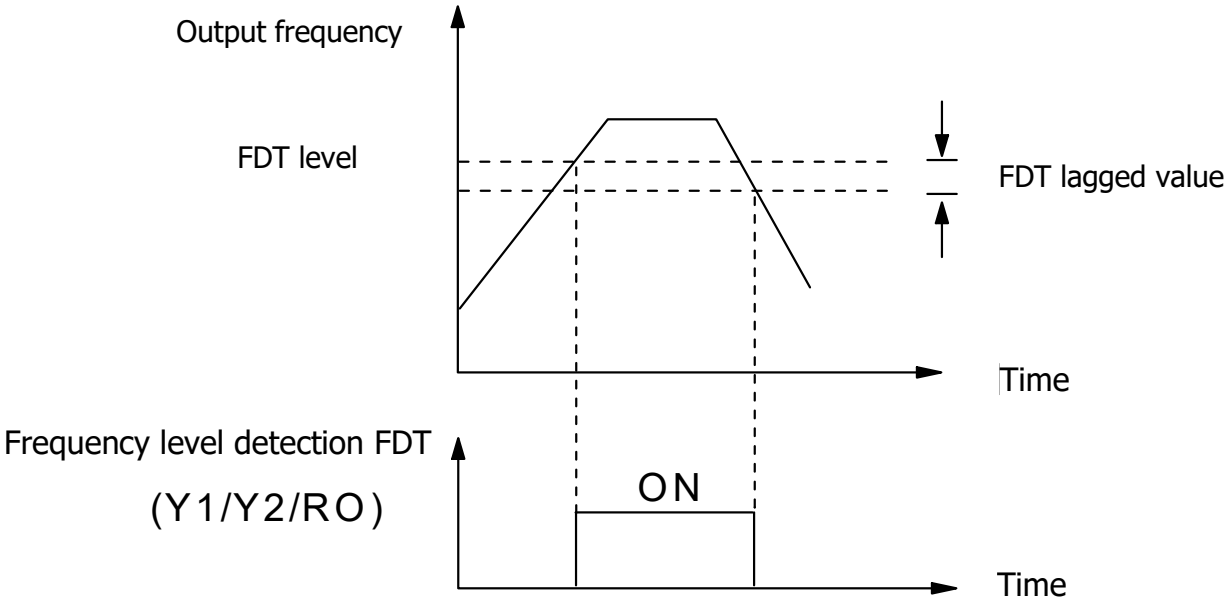
Actual operating frequency will be held at the boundary of hopping frequency which is closed to preset frequency when preset frequency is within the range of hopping frequency.

Converter can be kept away from the resonance point of load by the setting of hopping frequency. Two hopping points of frequency are set for this converter; if both of these two points are set as zero, this function will be disabled.



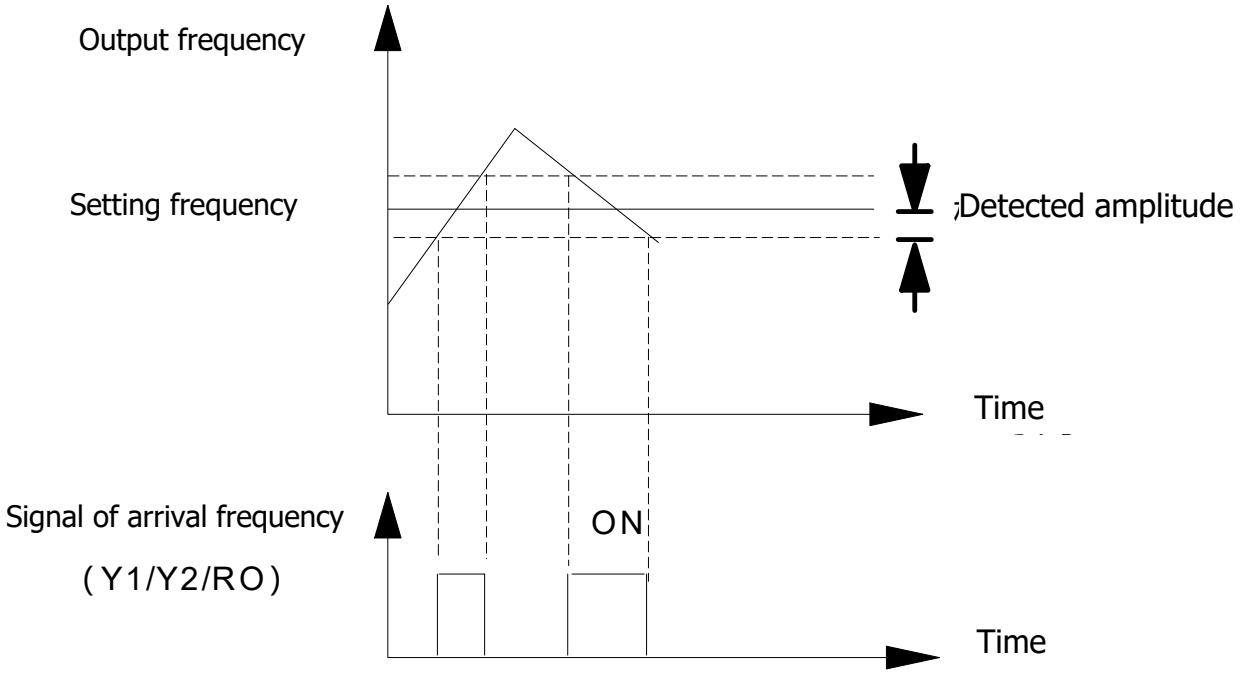

| | | | |
|---|---|---|---|
| **PA-11** | FDT level value | 0.0～Upper limiting frequency（P0-09） | Default: 0.0Hz |
| **PA-12** | FDT lagged value | 0.0～FDT level value（PA-11） | Default: 0.0Hz |

These two parameters above are mainly applied to the setting of the detected value of output frequency (PA-11) as well as lagged value obtained after output is enabled.




| | | | |
|---|---|---|---|
| **PA-13** | Amplitude of detected frequency FAR | 0.0～Upper limiting frequency（P0-09） | Default: 0.0Hz |

It's mainly applied to the setting of amplitude detection for detected frequency. Please refer to the following graph:




| | | | |
|---|---|---|---|
| **PA-14** | Setting count value | 1~65535 | Default: 1000 |
| **PA-15** | Specified count value | 1~65535 | Default: 1000 |

Counts of pulse signal or switching signal can be input by the counter which is installed in the multi-functional DI terminal.

When count value reaches up to preset count value, signal will be output by DO terminal to prove that preset count value is reached.

When count value reaches up to specified count value, signal will be output by DO terminal to prove that specified count value is reached. Counter will not stop until it reaches up to “setting count value”

Specified count valuePA-15 must be no more than setting count value PA-14.

| | | | |
|---|---|---|---|
| **PA-16** | Under clocking function for overload | 0: Disabled<br>1: Enabled | Default: 1 |

Converter’s current will also be increased as abnormal load transient boosts instantaneously; if no action is taken in time, stripping may be caused by over current.

Under clocking function for overload: if instantaneous current is increased up to the maximum, output frequency of converter must be decreased properly to restrain current from being increased so that converter can be prevented from stripping caused by instantaneous overload.

# Chapter 7 Fault Correcting

## 7-1 Malfunction and Solutions

| Fault indication | Code | Fault Type | Fault cause | Solutions |
|---|---|---|---|---|
| LU | 3 | Under voltage | Abnormal power supply or loose contact | Input voltage and wiring should be checked |
| OU | 4 | Overvoltage | 1、Input voltage<br>2、Rapid deceleration<br>3、Excessive inertia load | 1、check input voltage<br>2、increase deceleration time<br>3、select dynamic braking components |
| OC | 6 | Over current | 1、mismatch of capacity<br>2、low voltage of grid<br>3、Rapid acceleration and deceleration<br>4、high torque of inertia load<br>5、abnormal load | 1、select converter with large capacity<br>2、check power source and wiring<br>3、Increase Acc-Dec time<br>4、select applicable braking parts<br>5、detect and reduce load changing |
| OL | 5 | Overload (converter) | 1、please refer to fault cause of over current(OC)<br>2、overload(motor)<br>3、inapplicable setting of V/F curve | 1、please refer to solutions for over current(OC)<br>2、reduce motor load<br>3、reset parameters |
| OL1 | 15 | Overload (motor) | 1、low voltage of grid<br>2、Excessive motor stalling or load changing<br>3、inapplicable setting of V/F curve, rated current or critical point of overload protection | 1、check the voltage of grid<br>2、check motor load<br>3、reset parameters |
| SC | 9 | short-circuit output | 1、please refer to fault cause of over current(OC)<br>2、short circuit of output terminal(U,V,W) or earth terminal<br>3、loose plug-in units or wiring of control panel<br>4、damages of power module or other parts | 1、please refer to solutions for over current(OC)<br>2、check the state of insulation(motor & cable)<br>3、check the connection of plug-in units<br>4、seek technical support for damages |
| SPI | 7 | Input Failure | default phase of power source R,S,T | 1、check power source and its voltage<br>2、check the connection of power line |

| | | | | |
|---|---|---|---|---|
| SPO | 8 | Output failure | 1、 default phase of output terminals U，V，W<br>2、 unsymmetrical three-phase load | 1 、 check the connection of output line<br>2、check motor and its cables |
| OH | 13 | Overheat | 1、high ambient temperature<br>2、obstruction of ventilation duct or damage of cooling fan<br>3、excessive motor load | 1、Lower the ambient temperature<br>2、Clear the ventilation duct and replace the cooling fan<br>3、Reduce motor load or carrier frequency |
| PIE | 12 | PI fault | No detection of PI feedback signal for a certain time | Check on PI feedback signal and connection |
| EF | 11 | External fault | input terminal for external fault signal is enabled | Check the input of external devices |
| EEP | 1 | EEPROM fault | 1. R/W errors of parameter<br>2. Damage of EEPROM | 1. factory reset<br>2. seek technical support for damages |
| NCE | 16 | Contactor fault | 1、low voltage of grid<br>2、damage of contactor<br>3 、 the other damaged circuit | 1、check the voltage of grid<br>2 、 replace the contactor of major loop<br>3 、 seek technical support for damages |
| OPSE | 10 | System failure | Severe interference from external factors, e.g. noise | install additional filter or seek technical support for damages |
| CF | 20 | The current detecting signal failure | 1, the current sensor is damaged<br>2, signal lines, poor contact<br>3, other line fault | 1, change the current sensor<br>2, check the signal lines<br>3, seeking services |

## 7-2Common Faults and Processing Schemes

If the following situations are met during the application of converter; please refer to the instructions below:

- **No information display after power on**

  Please confirm whether the voltage of power source is compatible with the rated voltage of converter.

  Please check whether three-phase rectifier bridge is in good condition; if it's damaged, please seek for technical support.

  Please check if power indicator is on or not; if it's off, malfunction is mainly caused by abnormal rectifier and buffer resistance; if it's on, malfunction is mainly caused by switching power supply. Meanwhile, please seek for technical support.

- **Air switch of power source trips when power on**

  Please check whether power source is grounded or short-circuited; please solve it accordingly.

  Please check whether rectifier bridge is burned; if it's damaged, please seek for technical support.

- **Motor doesn't start running after converter is started**

  Please check whether there is three-phase symmetrical output among U, V, W. If there is, motor or its circuit is damaged mostly; or stalling may be caused by mechanical problem. please solve it accordingly.

  If three-phase output is unsymmetrical, then driver board or output module of converter may be damaged. Please seek for technical support.

  If there is output voltage, then driver board or output module may also be damaged. Please also seek for technical support.

- **Air switch of power source trips while running**

Please check whether output modules between phase and phase are short-circuited; if there is short circuit, please seek for technical support.

Please check whether motor lines are short-circuited or grounded; if they are, please solve it accordingly.

If stripping take places sometimes, not regularly; and there is a long distance between motor and converter, please take the installation of additional AC reactor into consideration.

# Chapter 8 Maintenance

Only the qualified engineer is allowed to conduct maintenance for converter; please pay attention to the following precautions:

- Maintenance must be conducted by qualified engineer in specified way;
- Only when converter is shut down for 5 minutes can maintenance be conducted;
- Do not touch the components on the PCB directly; otherwise, components can be damaged by static easily.
- Make sure that all the screws are fastened after the maintenance.

## 8-1 Daily Maintenance and Upkeep

Affected by environmental conditions(e.g. temperature, humidity or smog) and aging of internal components, converter may malfunction. Therefore, daily inspection and maintenance on converter must conducted during the process of storage and application. For the detailed information of daily inspection and maintenance, please refer to the following table:

| Items | examination period | | check points | criterion and maintenance |
|---|---|---|---|---|
| | non-periodical | regular | | |
| Environmental conditions | √ | | 1. temperature&humidity<br>2. dust&mist<br>3. Gas | 1. temperature <40 ℃ , humidity < 90%，no frost<br>2. No odor, Noflammable or explosive gas |
| Cooling system | | √ | 1.installationenvironment<br>2. built-in fan | 1. good ventilation, no obstruction of ventilation duct<br>2. normal operation of built-in fan,no abnormal noise |
| Converter | √ | | 1. vibration and temperature rise<br>2. noise | 1. stable vibration, normalblast temperature<br>2. No abnormal noise or odor |

| | | | | |
|---|---|---|---|---|
| | | | 3. dust or impurity<br>4. lead and terminals | 3. remove dust by dry compressed air<br>4. no loose screws |
| motor | √ | | 1.vibration and temperature rise<br>2. noise | 1. stable operation and normal temperature<br>2. No malfunction or abnormal noise |
| I/O parameters | √ | | 1. input voltage<br>2. output current | 1. Input voltage is within specified range<br>2. output current is lower than rated value |

**8-2 Inspection and replacement of damageable parts**

As for some of internal components, abrasion or performance degradation may be caused during use. To ensure stable and reliable operation, preventive maintenance on converter must be conducted. If necessary, please replace them:

Fan must be replaced after more than 20,000 hours' running

Electrolytic capacitor must be replaced after 30,000~40, 000 hours' running

## 8-3Storage

This product can't be taken out from box until it's about to be installed. To ensure that it's still valid for warranty and available for maintenance in the future during the period of storage, please pay attention to the following points:

- converter must be stored in a dry place where there is no dust;
- ambient temperature must be within the range between -20℃ and +60℃;
- relative humidity must be within the range between 0% and 95%; no condensation is permitted;
- it must be protected from caustic gas or liquid;
- it must be packed properly and put on the shelf or desk.

## 8-4 Product Warranty

Any of the following situations will be our company's responsibility, which will be considered and guaranteed:

- The warranty period for this product is 18months but only 12 months for final buyer. During the period, any damage or fault without any wrong operation will be our responsibility to fix, which is free of charge. Maintenance fee will be charged accordingly if warranty expires.
- Regarding the faults caused by the following points, extra fee will need to be charged as service fee:

1) fault caused by faulty operation which is not in conformity with manual or specification

2) fault caused by unauthorized maintenance modification;

3) damage caused during the transportation or improper safekeeping;

4) fault caused by misuse failure

5) As for the damages caused by fire, salt corrosion, gaseous corrosion, earthquake, storm, flood, thunderstrike, abnormal voltage and other irresistible factor, despite of the expiration of warranty, any compensable maintenance service will be provided by our company for good.

# Chapter 9 Communication Protocol

Modbus protocol is the main communication method applied in MAX300 series converter with RS485 interfaces, which is compliant with International Communication Standards. Centralized control can be implemented by PC/PLC as well as superior controller to adapt specific requirements for applications, including setting of control command, operating frequency, modification of parameters for relevant function code, monitoring of operating status or malfunction.

## 9.1 Protocol Content

Modbus, also known as serial communication protocol, has defined its frames and format during the asynchronous transmission, including the format of polling to the host, broadcast frames and response fames to slave controller. The frames generated by the host included slave address/broadcast address, executive command, data & error correction; and the response of the slave controller has the similar frames as the host, including confirmation of instructions, data feedback and error correction. If any error happens when the slave controller receives the frames, or any instruction requested by the host can't be done, it will generate a malfunction frame and send feedback to the host.

### 9.1.1Application mode

MAX300 series converter is compatible with control network equipped with RS485 bus which has single host & multiple slave controllers.

### 9.1.2Bus Structure

(1)Hardware interface

RS485 hardware interface

(2)Transmission mode

Serial&asynchronous, half-duplex transmission -- TXD and RXD can be done at the same time by either the host or the slave controller separately, which means there are only one sender and one receiver at a time. Data will be transmitted frame by frame in the format of message during the serial&asynchronous communication.

(3) System with single host & multiple slave controllers

The range of slave address should be 1~127; the number Zero stands for broadcast communication address. Every single salve address on the Internet is unique, which is the foundation of Modbus serial communication.

## 9.2Protocol Introductions

The protocol of MAX300 Series Converter is a kind of serial &asynchronous communication protocol with principal and subordinate Modbus; there is only one device(host) could set up protocol (named "query /command"), and the other devices(slave) can only response to the host's "query /command" by sending data, or issue commands/instructions according to the "query /command" from the host. The host herein mainly refers to personal computer, industrial control facility or Programmable Logic Controller (PLC); and the slave herein mainly refers to MAX300 Series Converter or the other control facilities with similar/same communication protocol. The host can not only communicate with a certain slave controller independently but also send broadcast message to all the slave controllers. As to any independent access to the host's "query /command", a message (called response) must be sent out from the slave controller; however, regarding the broadcast message issued by the host, it's not necessary for the slave controller to send feedback to the host.

## 9.3Frame Structure

The data format of Modbus communication protocol applied in the MAX300 Series Converter is RTU mode (Remote Terminal Unit)

In the RTU mode, the format of each byte is as follow: encoding system -- 8-bit binary system, there are two hexadecimal characters included in every 8-bit frame (hexadecimal characters include 0~9 & A~F). The transmission of new frame will always be restarted with a interval of 3.5 bytes transmission time. When it's connected with the Internet of which transmission rate is calculated by Baud rate, 3.5-byte transmission time is easy to be controlled. The data fields of transmission will be sent in sequence as below: slave address - operating command code - data & CRC check word; and transmission byte of each field are hexadecimal (0~9, A~F). The networking devices will always monitor the operation of communication bus; when the first domain (address information) is received, it will be confirmed again by each networking device; when the transmission of last byte is done, there will be a interval of 3.5 bytes transmission time to indentify the end of this frame. After that, transmission of new frame will be started again.

| Frame Format of RTU Data | | | | | |
|---|---|---|---|---|---|
| | MODBUS Message | | | | |
| Initiate: a interval of at least 3.5 bytes | Slave address | Function code | Data | Verification | Terminate:a interval of at least 3.5 bytes |

A frame message must be transmitted in a consecutivedata stream; if the interval is more than 1.5-byte

transmission time before transmission of the whole frame is finished, those incomplete messages will be cleared by the receiver which will take the next byte as part of address field of new frame by mistake; likewise, if the interval is less than 3.5-byte transmission time, the receiver will identify it as the extension of last frame. Because of disorder of frames, CRC value will be incorrect, which may result in malfunction.

Standard Structure of RUT Frame

| | |
|---|---|
| Frame header | T1-T2-T3-T4(3.5-byte transmission time) |
| Slave address field | Communication address: 0~147(decimal system) / (Zero stands for broadcast communication address) |
| Function domain (CMD) | 0x03: reading parameters of slave controller<br>0x06: programming parameters of slave controller |
| Data field<br>ENTER（N-1）<br>… ENTER（0） | 2*N-byte data is not only the main content of communication but also the core of data exchange during the communication. |
| Checksum | estimated value: CRC value (16BIT) |
| Frame ending | T1-T2-T3-T4 (3.5-byte transmission time) |

## 9.4Command code & data description

### 9.4.1Format of No.1 address for Setting as follows, setting frequency 50Hz (PO-03)

Superior host command:

| | |
|---|---|
| Frame header | 3.5-byte interval |
| Address | 0x01 |
| Function code | 0x06 |
| Register address | 0x0003 |
| Register information | 0x01F4 |
| Checksum | 0x79DD |
| END | 3.5-byte interval |

Converter's response:

| | |
|---|---|
| Frame header | 3.5-byte interval |
| Address | 0x01 |
| Function code | 0x06 |
| Register address | 0x0003 |
| Register information | 0x01F4 |
| Checksum | 0x79DD |
| END | 3.5-byte interval |

### 9.4.2 Format of No.1 address for reading as follows, setting frequency (PO-03)

Note: register number must be one only when reading

Superior host command:

| | |
|---|---|
| Frame header | 3.5-byte interval |
| Address | 0x01 |
| Function code | 0x03 |
| Register address | 0x0003 |
| Register number | 0x0001 |
| Checksum | 0x740A |
| END | 3.5-byte interval |

Converter's response:

| | |
|---|---|
| Frame header | 3.5-byte interval |
| Address | 0x01 |
| Function code | 0x03 |
| Register address | 0x02 |
| Register information | 0x01F4 |
| Checksum | 0xB853 |
| END | 3.5-byte interval |

### 9.4.3 Frame format of response error as follows, setting frequency 60Hz (P0-03)

Type of error:

01H -- data address overrun

02H -- number of data overrun& read-in data content exceeding bounds(ceiling & floor)

03H -- Operating, no read-in data are permitted

Superior host command:

| | |
|---|---|
| Frame header | 3.5-byte interval |
| Address | 0x01 |
| Function code | 0x06 |
| Register address | 0x0003 |
| Register information | 0x0258 |
| Checksum | 0x7950 |
| END | 3.5-byte interval |

Converter's response:

| | |
|---|---|
| Frame header | 3.5-byte interval |
| Address | 0x01 |
| Function code | 0x86 |
| Error code | 0x02 |
| Checksum | 0xC3A1 |
| END | 3.5-byte interval |

### 9.4.4 CRC Mode

RTU frame format is mainly applied to CRC (Cyclical Redundancy Check), error detecting field based on CRC is included in the message. CRC domain can detect all the information of message, which is two bytes with 16-bit binary value included. It will be added into the message after the calculation of transmission devices. The receiver will recalculate the CRC receiving the message, and compare it with the values in the CRC domain received by devices; if the CRC value is not equivalent to another one, it proves that there is error in the transmission.

CRC will write 0xFFFF in superior host, and call a program to process the consecutive 8 bytes in the message as well as the values in the register. Only 8-bit data of each character is valid to CRC, the others are all invalid, including start bit, stop bit and parity check bit.

During the operation of CRC, each of 8-bit character is exclusive(XOR) with register content separately; result will be inclined to the least significant bit(LSB) while the most significant bit will be filled with Zero. LSB will be extracted from the data for checking; if LSB is one, register will be exclusive(XOR) with preset value separately; if LSB is zero, calculation will not be conducted. This instruction of process will repeat for 8 times; when it comes to the last bit (8th bit), the next 8-bit bytes will be exclusive(XOR) with register value again. The final value in the register is the CRC value after the calculations of all the bytes in the message.

When CRC is added into the message, lower byte will be added first, then the high byte. The simple function of CRC is as follows:

```
unsignedintcrc_chk_value（unsignedchar*data_value,unsignedcharlength）{
                    unsignedintcrc_value=0xFFFF;
                    inti;
                    while（length--）{
                        crc_value^=*data_value++;
                        for（i=0;i<8;i++）{
                            if（crc_value&0x0001）
                {
                    crc_value=（crc_value>>1）
 ^0xa001
                                }
                                else
                                {
                    crc_value=（crc_value>>1）
                                }
                            }
                    }
                    return（crc_value）；
   }
```

## 9.5Read-write rules of parameter address for function code

This part defines the address of communication data; it's mainly used to control the operation of converter, get access to the status information as well as relevant function parameter setting. It helps converter to find the corresponding communication address for the parameter by the serial number of function code. Note: all the serial numbers(S/N) of function code's address is decimal number.

(1) Expression rules of parameter address for function code

The corresponding communication address for all the parameters between P0-00 and PA-26 is 0~191.

For example:

| Register address | Address S/N | Corresponding |
|---|---|---|
| 0x00 | 0 | P0-00 |
| 0x01 | 1 | P0-01 |
| 0x02 | 2 | P0-02 |
| ..... | ..... | ..... |
| 0x11 | 17 | P0-17 |
| 0x12 | 18 | P1-00 |
| 0x13 | 19 | P1-01 |
| ..... | ..... | ..... |
| 0x18 | 24 | P1-06 |
| 0x19 | 25 | P2-00 |
| 0x20 | 26 | P2-01 |
| ..... | ..... | ..... |
| 0x25 | 37 | P2-12 |
| 0x26 | 38 | P3-00 |
| 0x27 | 39 | P3-01 |
| ..... | ..... | ..... |
| 0x32 | 50 | P3-12 |
| 0x33 | 51 | P4-00 |
| 0x34 | 52 | P4-01 |
| ..... | ..... | ..... |
| 0x45 | 69 | P4-18 |
| 0x46 | 70 | P5-00 |
| 0x47 | 71 | P5-01 |
| ..... | ..... | ..... |
| 0x64 | 100 | P5-30 |
| 0x65 | 101 | P6-00 |
| 0x66 | 102 | P6-01 |
| ..... | ..... | ..... |
| 0x6D | 109 | P6-08 |
| 0x6E | 110 | P7-00 |
| 0x6F | 111 | P7-01 |
| ..... | ..... | ..... |
| 0x7D | 125 | P7-15 |
| 0x7E | 126 | P8-00 |
| 0x7F | 127 | P8-01 |
| ..... | ..... | ..... |
| 0x92 | 146 | P8-20 |
| 0x93 | 147 | P9-00 |
| 0x94 | 148 | P9-01 |
| ..... | ..... | ..... |
| 0xA4 | 164 | P9-17 |
| 0xA5 | 165 | PA-00 |
| 0xA6 | 166 | PA-01 |
| ..... | ..... | ..... |
| 0xBF | 191 | PA-26 |

(2) Descriptions of the other functions' address

Parameters address monitoring:

| Register address | Address S/N | Data description | Register address | Address S/N | Data description |
|---|---|---|---|---|---|
| 0xDC | 220 | Setting frequency | 0xE6 | 230 | PI preset value |
| 0xDD | 221 | Output frequency | 0xE7 | 231 | PIfeedback value |
| 0xDE | 222 | Output current | 0xE8 | 232 | Run time |
| 0xDF | 223 | Busbar voltage | 0xE9 | 233 | Input interface |
| 0xE0 | 224 | Motor speed | 0xEA | 234 | Output interface |
| 0xE1 | 225 | Percentage of current | 0xEB | 235 | Rated power |
| 0xE2 | 226 | IGBT temperature | 0xEC | 236 | Compensation |
| 0xE3 | 227 | Output voltage | 0xED | 237 | Compensation voltage |
| 0xE4 | 228 | Output power | 0xEE | 238 | Phase angle |
| 0xE5 | 229 | Count value | 0xEF | 239 | Load factors |

Control command
(valid when P0-02 is changed into 3)

| Register address | Address S/N | Data description |
|---|---|---|
| 0xC8 | 200 | 1: FWD run |
| | | 2: FWD jogging |
| | | 5: REV run |
| | | 6: REVjogging |
| | | 8: Stop |
| | | 16:Regular |
| | | 32: Reset |

Status of Converter

| Register address | Address S/N | Data description |
|---|---|---|
| OxF0 | 240 | 0: Operating |
| | | 1: FWD running |
| | | 2: REV running |
| | | 3: Malfunctioning |

Fault address

| Register address | Address S/N | Data description | |
|---|---|---|---|
| 0xF1 | 241 | 1: Storage fault | 10: System fault |
| | | 3: Undervoltage | 11: External fault |
| | | 4: Overvoltage | 12: PI fault |
| | | 5: Overload | 13: Overtemperature |
| | | 6: Overcurrent | 14: Overcurrent |
| | | 7: Input default | 15: Motor overload |
| | | 8: Output default | 16: Contactor off |
| | | 9: Output short | 20: Signal failure of current |

## 9.6Parameter description of communication

| Baud rate | Factory default | 9600 |
|---|---|---|

The parameter above is used to set transmission rate of the data between superior controller and converter. Note: the Baud rate of superior controller and converter should be the same; otherwise, communication cannot be conducted.

| Data format | Factory default | No checking: 8-N-1 |
|---|---|---|

The data format of superior controller and converter should be the same; otherwise, communication cannot be conducted.

| | | | |
|---|---|---|---|
| P0-15 | Local address | Factory default | 1 |
| | Setting range | 0-127 (Zero stands for broadcastaddress) | |

When local address is set to be zero (a.k.a. broadcast address), broadcast function will be activated on the superior controller. The local address is unique (except broadcast address), which is the foundation/premise to conduct point-to-point communication between superior controller and converter.

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