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Safety Precautions

Please pay close attention to all safety-related information in this user manual; otherwise there may be fatal consequences. Please note the manufacturer shall bear no liabilities to damages of any sorts resulting from false operations which is not following this user manual.

Warning --- potential risks. Fatality may be caused if not avoided.

WARNING

- Risk of electric shock!
- Wait at least 10 minutes after power off to remove the cover.
- Read the user manual and follow the safety instructions before use.

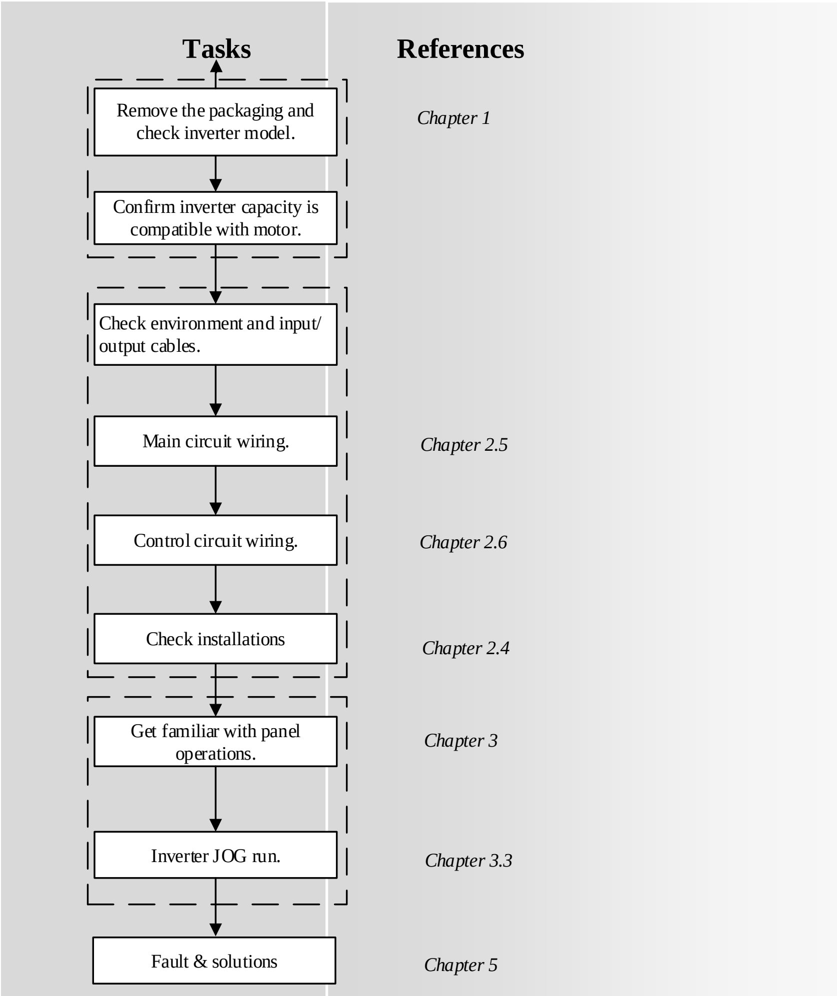
★ Attentions – please follow these instructions when using the inverter.

- Do not do wiring operations at power on;
- Only qualified electrical engineers can install & maintain the inverter;
- Power on the inverter only after the covers have been put back on. Do not remove the cover during power on;
- Please wait at least 10 minutes after power of to remove the cover; so as to let DC bus capacitors to fully discharge;
- Please make sure the rated input voltage is compatible with the power supply voltage. Otherwise, there may be risks of fire;
- Please do not operate the inverter with wet hands. The inverter has many semiconductor components inside;
- The inverter is not designed for voltage-withstanding tests;
- Do not alter the inverter;
- Do not install or use any inverter which is already broken or with faulty parts.

★ Attentions – when scrapping the inverter.

- Electrolytic capacitors on the PCBs of the inverters may explode if incinerated;
- Poisonous gas may emit if incinerated;
- Please dispose scrapped inverters as industrial waste.

Flowchart for installation & maintenance:

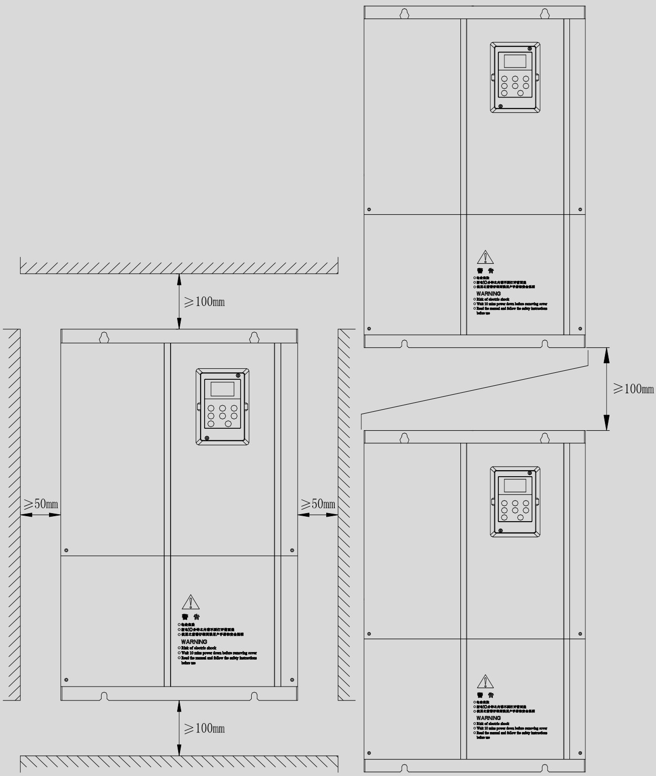


★ Attention: please follow inverter installation location requirements strictly.

Environmental requirements for installation of inverters:

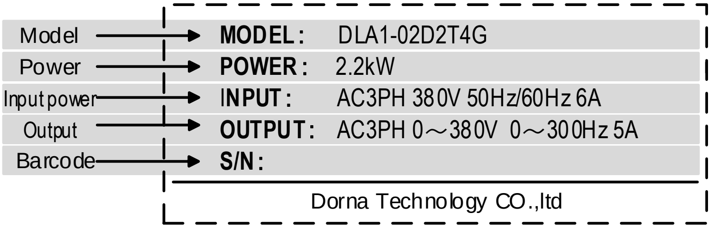
Temperature	-10°C to +40°C (derate 1% for every °C if the ambient temperature is between 40°C and 50°C)
Altitude	Less than 1000m (derate 10% for every 1000m if the altitude is above 1000m)
Other requirements	• Please install the inverter in a place which is not inclining to fierce shocks or vibrations. Maximum vibration is $5.8m/s^2$ (0.6g); • Please install the inverter in a place which is far from electromagnetic radiations; • Please install the inverter in a place where metal dust, normal dust, oil, or water is hard to enter inside the inverter; • Please do not install the inverter in a place which is exposed to direct sunlight, with combustible gas, oil smoke, vapor, drip or salt; • Humidity should be Less than 90%RH, without condensing.

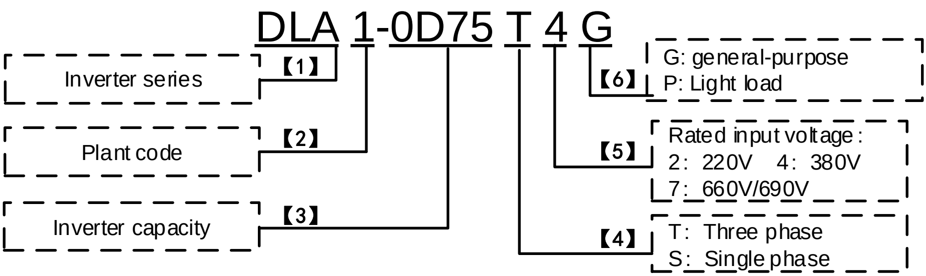
Spacing for inverter installations:



1 Summary

1.1 Name plate





1.2 Product series

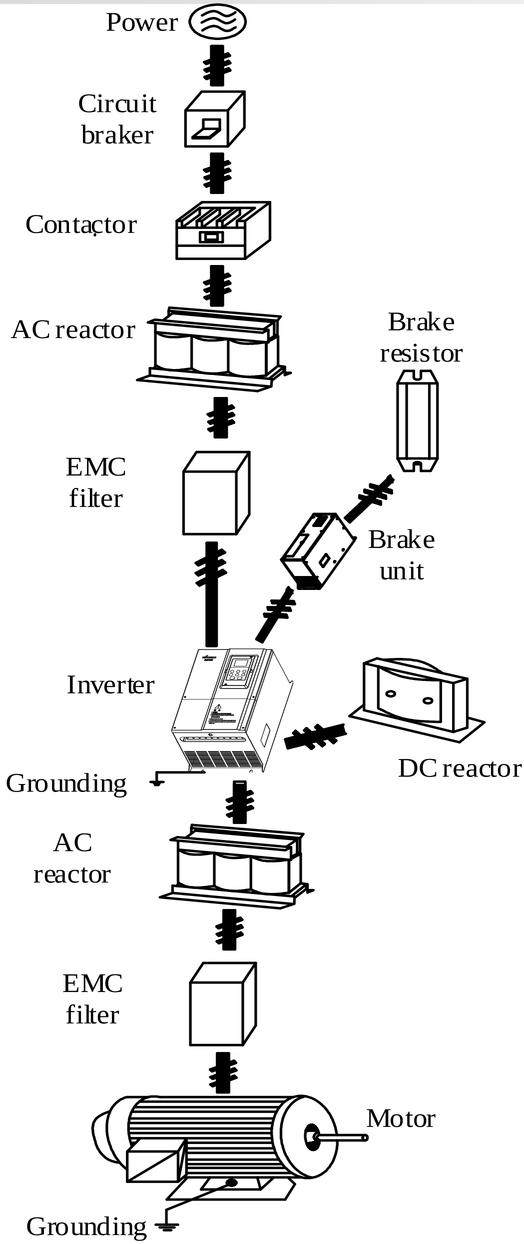
Inverter model	Rated output power (kW)	Rated input current (A)	Rated output current (A)
Single Phase input: AC 220V -15%~+10%, 50/60Hz			
DLA1-0D40S2G	**0.4**	5.9	**2.5**
DLA1-0D75S2G	**0.75**	8.3	**4**
DLA1-01D5S2G	**1.5**	14.1	**7**
Three phase input: AC 220V -15%~+10%, 50/60Hz			
DLA1-02D2T2G	**2.2**	11.8	**10**
Three phase input: AC 380V -15%~+10%, 50/60Hz			
DLA1-0D75T4G	**0.75**	4.3	**2.5**
DLA1-01D5T4G	**1.5**	5.2	**3.7**
DLA1-02D2T4G	**2.2**	6.0	**5**
DLA1-0004T4G	**4.0**	10.5	**8.5**
DLA1-05D5T4G	**5.5**	15.5	**13**

1.3 Technical standards

	Item	Specifications	
Basic functions	Control system	Current Vector General Purpose Inverter.	
	Compatible motor	Induction motors.	
	Maximum frequency	Vector control: 0~500Hz; V/F control: 0~500Hz.	
	Carrier frequency	0.8kHz~12kHz; Depending on load, can automatically adjust.	
	Input resolution	Digital: 0.01Hz;	Analog: maximum frequency×0.025%.
	Control modes	Open vector control (SVC); Closed loop vector control (FVC); V/F (scalar) control.	
	Starting torque	G type: 0.5Hz/150% (SVC); 0Hz/180% (FVC). P type: 0.5Hz/100%.	
	Speed range	1: 100 (SVC)	1: 1000 (FVC)
	Speed accuracy	±0.5% (SVC)	±0.02% (FVC)
	Torque accuracy	±5% (FVC)	
	Overload capacity	G type: 150% rated current 60s; 180% rated current 3s; P type: 120% rated current 60s; 150% rated current 3s.	
	Torque boost	Automatic	Manual 0.1%~30.0%
	V/F curve	• Straight-line V/F curve • Multi-point V/F curve • N-power V/F curve (2-power, 1.4-power, 1.6-power, 1.8-power, 2-power square)	
	V/F separation	Two types: complete separation; half separation. AVR output.	
	Ramp mode	• Straight-line ramp • S-curve ramp Four groups of acceleration/deceleration time: 0.0–6500.0s	
	DC braking	DC braking frequency: 0.00 Hz to maximum frequency Braking time: 0.0–36.0s Braking action current value: 0.0%–100.0%	
	JOG control	JOG frequency range: 0.00–50.00 Hz JOG acceleration/deceleration time: 0.0–6500.0s	
	Simple PLC	Up to 16 speeds via the simple PLC function or DI terminals	
	Onboard PID	Process-controlled closed loop control system	
	Auto voltage regulation (VR)	Keep constant output voltage automatically when grid voltage fluctuates.	
	Overvoltage/ Overcurrent stall control	The current and voltage are limited automatically during the running process so as to avoid frequent tripping due to overvoltage/overcurrent.	
	Fast current limit function	Protect inverter from overcurrent malfunctions.	
	Torque limit and control	It can limit the torque automatically and prevent frequent over current tripping during the running process. Torque control can be implemented in the FVC mode.	
	Power dip ride through	The regenerative energy from load compensates the voltage reduction so that the inverter can continue to run for a short time.	

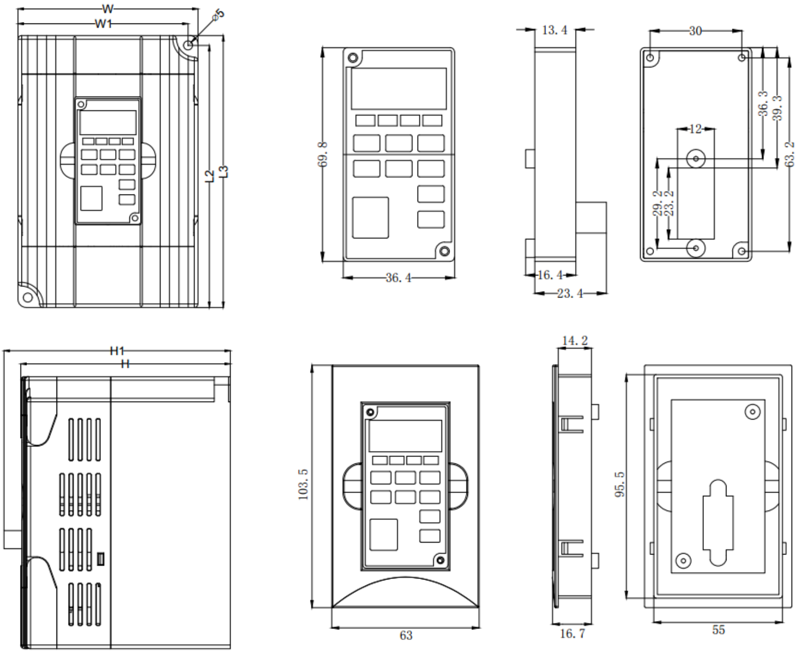
	Timing control	Time range: 0.0–6500.0 minutes
	Two-motor switchover	Two motors can be switched over via two groups of motor parameters.
	Fieldbuses	RS485
Operations	Command source	• Keyboard • Control terminals • Serial communication port You can perform switchover between these sources in various ways.
	Frequency source	10 frequency sources, such as digital setting, analog voltage setting, analog current setting, pulse setting and serial communication port setting. You can perform switchover between these sources in various ways.
	Auxiliary frequency source	10 auxiliary frequency sources. It can implement fine tuning of auxiliary frequency and frequency synthesis.
	Input terminal	5 digital input (DI) terminals; 2 analog input (AI) terminals which support 0–10 V voltage input or 0–20 mA current input.
	Output terminal	1 digital output (DO) terminal; 1 relay output terminal; 1 analog output (AO) terminals which support 0–20 mA current output or 0–10 V voltage.
Display and panel	LED display	Displays parameters.
	Key lock	It can lock the keys partially or completely and define the function range of some keys so as to prevent misconducts.
	Protection functions	Motor short-circuit detection at power-on, input/output phase loss protection, overcurrent protection, overvoltage protection, under voltage protection, overheat protection and overload protection
	Optional parts	PG card, brake unit, RS485 card, CAN card, Profibus-DP card
Environment	Location	Indoor, free from direct sunlight, dust, corrosive gas, combustible gas, oil smoke, vapor, drip or salt.
	Altitude	Less than 1000m.
	Ambient temperature	-10°C to +40°C (de-rated if the ambient temperature is between 40°C and 50°C)
	Humidity	Less than 90%RH, without condensing
	Vibration	Less than $5.8 m/s^2$ (0.6g).
	Storage temperature	-20°C~+60°C.

1.4 Peripheral Electrical Devices and System Configuration



1.5 Product outline and installation dimensions

1.5.1 Product outlines (unit: mm)

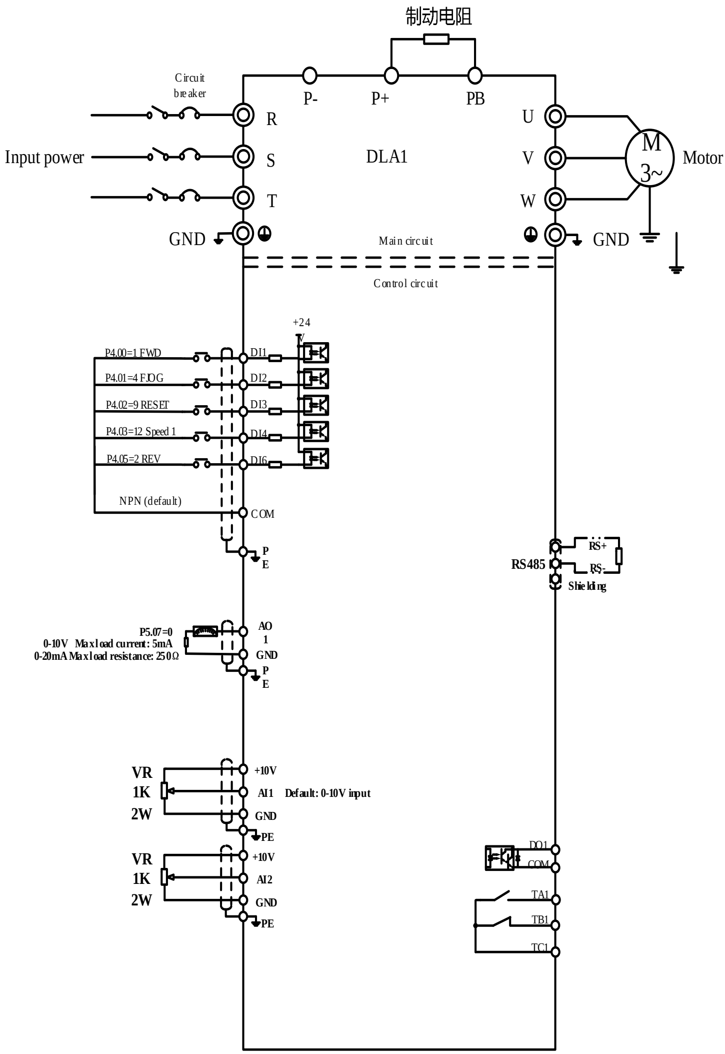


1.5.2 Production dimension table

<table>
<tr><th rowspan="2">Model</th><th colspan="6">Dimensions</th><th rowspan="2">Holes
(mm)</th><th rowspan="2">Net
(Kg)</th><th rowspan="2">Gross
(Kg)</th></tr>
<tr><th>L2
(mm)</th><th>L3
(mm)</th><th>W
(mm)</th><th>W1
(mm)</th><th>H
(mm)</th><th>H1
(mm)</th></tr>
<tr><td>DLA1-0D40S2G
DLA1-0D75S2G
DLA1-01D5S2G</td><td>136.5</td><td>142</td><td>85</td><td>79.5</td><td>112.5</td><td>122.5</td><td>M5</td><td></td><td></td></tr>
<tr><td>DLA1-0D75T4G
DLA1-01D5T4P</td><td rowspan="3">145.5</td><td rowspan="3">151</td><td rowspan="3">100</td><td rowspan="3">94.5</td><td rowspan="3">116.5</td><td rowspan="3">126.5</td><td rowspan="3">M5</td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td>DLA1-01D5T4G
DLA1-02D2T4P</td></tr>
<tr><td>DLA1-02D2T4G
DLA1-03D7T4P</td></tr>
<tr><td>DLA1-03D7T4G
DLA1-05D5T4P
DLA1-05D5T4G
DLA1-07D5T4P</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

2 Wirings

2.1 Standard wiring diagrams



2.2 Main circuit wirings

R	S	T	⏚

U	V	W	P+	PB

Terminals	**Functions**
R、S、T	Input power
P+、PB	External brake resistor
U、V、W	Output power
⏚	GND

2.3 Control circuit wirings

2.3.1 Control circuit signals

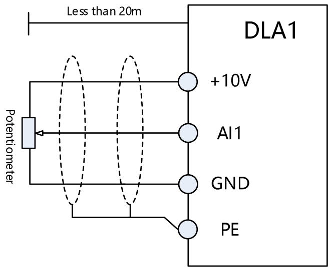
TC1	TB1	TA1	AGND	AI1	AI2	AO1	+10V	COM	DO1	DI1	DI2	DI3	DI4	DI6

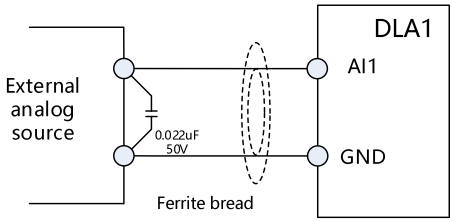
Type		Terminal	Name	Function	Specifications
Input	Digital	DI1	Input terminal X1	Default: Forward run (FWD)	Opti-coupler insulation DC24V/8mA External power voltage range: 9 ~ 30V. DI5 pulse input range: 0 ~ 100kHz.
		DI2	Input terminal X2	Default: Forward JOG (FJOG)	
		DI3	Input terminal X3	Default: Fault reset (RESET)	
		DI4	Input terminal X4	Default: Multi-speed terminal 1	
		DI6	Input terminal X6	Default: Reverse run (REV)	
		SP	Input terminal common	Default: +24V short-circuit with SP by Jumper J9	
	Analog	10V	Analog 10V Power	Output capacity: 10mA or below, 1kΩ~5kΩ	0 ~ 20mA input: input impedance is 500 ohms. 0 ~ 10V input: input impedance is 20K ohms.
		AI1	Analog setting 1	Default: 0 ~ 10V (resolution1/1000)	
		AI2	Analog setting 2	Default: 0 ~ 20mA (resolution1/1000)	
		AGND	Analog common	0V	
Output	Relay	TA1	A node output	Default setting: stop fault during operation TA1—TC1: normally open TB1—TC1: normally close	Node capacity: AC250V, 3A.
		TB1	B node output		
		TC1	Node output common terminal		
	Digital	DO1	Open collector output 1	Default: inverter in operation	Below DC24V, 50mA.
		COM	Digital common		
	Analog	AO1	Analog monitor output 1	Voltage or current output; Default: output frequency	Output voltage range: 0 ~ 10V; Output current range: 0 ~ 20mA.
		AGND	Analog common	0V	

2.3.2 Control circuit wiring notes

- Analog input wirings

As analog signals can be easily affected by external interference, shielded cables shall be used. Cables shall be as short as possible and not exceeding 20 meters. As shown in graphs below, in some severe circumstances, filter capacitor or ferrite bread shall be used in analog signal side.

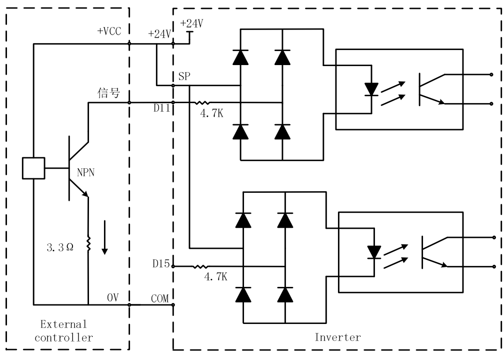




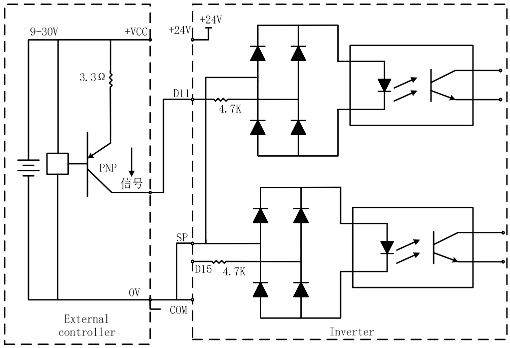
- Digital input wirings

Shielded cables shall be used. Cables shall be as short as possible and not exceeding 20 meters. When using active drive mode, user shall take necessary filter measures to counter power interference. It is recommended to use node control mode. Digital inputs can be NPN or PNP.

NPN input: Most common. Use internal 24V power; +24V terminal short-circuit with SP terminal; COM terminal is common; J9 is 23 jumped; also known as drain wiring mode.

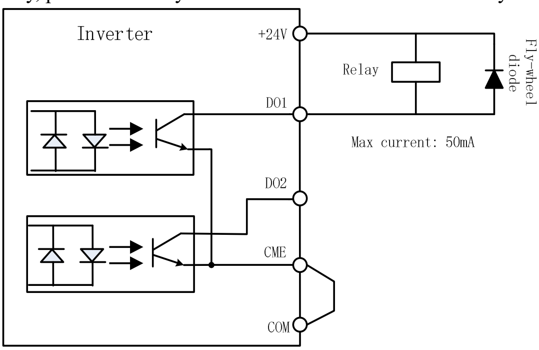


PNP input: Use external 24V power; external power negative node is connected with SP terminal; external terminal positive node is common; external power voltage range is 9~30V; J9 is 12 jumped; also known as source wiring mode.



- Output wirings

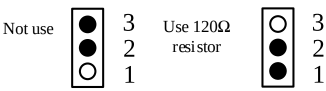
Digital output is open collector output. When using external power, please connect external power negative node to COM terminal. Maximum current is 50mA for open collector output. If external load is relay, please install fly-wheel diode to both ends of the relay.



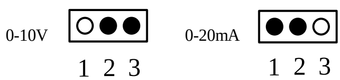
★Note: please install fly-wheel diode polar correctly, otherwise internal components will be damaged.

2.3.3 Control circuit jumpers

J5: RS485 matching resistor selection



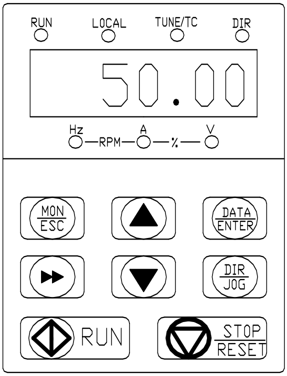
J1: AO1 output selection



3 Panel operations

3.1 Keyboard interface

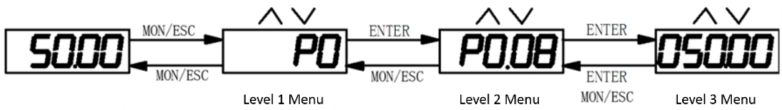
Keyboard outline is as below:



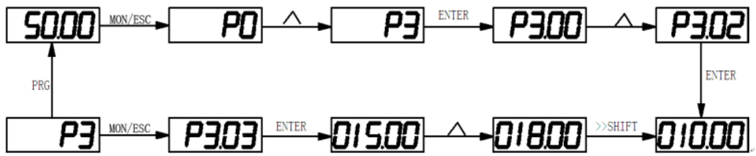
Keys/Lights	Function	Descriptions
DIR (light)	Rotating direction status	ON: FWD OFF: REV
RUN (light)	Operation status	ON: RUN OFF: STOP
LOCAL (light)	Command source status	ON: terminal control OFF: keyboard control BLINK: remote (communicational) control
TUNE/TC (light)	Tune/fault	ON: in torque control mode SLOW BLINK: in tuning status FAST BLINK: in fault status
Hz A V RPM (Hz+A) % (A+V) (lights)	Unit indications	* Hz: frequency unit *A: current unit *V: voltage unit *RPM (Hz+A): speed unit *% (A+V): percentage
Digital display area	Display settings, output frequency, monitor data, fault etc.	
MON/ESC	Program key: Enter level 1 menu or escape	
>>	Shit key: Select parameter or select place for editing.	
DATA/ENTER	Confirm key: Confirm parameters	
▲	Increase key	
▼	Decrease key	
DIR/JOG	Multi-function selection key: Function switching set by P7.01.	
RUN	Operation key: Start operation in keyboard operation mode.	
STOP/RESET	STOP/RESET key: Set by P7.02	

3.2 Parameter setting example

DLA1 inverter panel has a three-level structure: function code group (level 1menu) → function code (level 2 menu) → function code setting (level 3 menu).



Example: Change P3.02 from 10.00Hz to15.00Hz, as shown in graph below:



Parameter monitoring: please refer to P7.03, P7.04, P7.05 for parameter monitoring settings.

Password setting: when PP.00 is not 0, inverter is under password protection. The password is as shown in PP.00. To cancel password protection, user must enter the correct password and set PP.00=0.

3.3 Motor parameter auto-tuning

1) Set P0.02=0 (keyboard as command source channel)
2) Input motor parameters:

Motor selection	Parameters
Motor 1	P1.00: motor type selection; P1.01: rated power P1.02: rated voltage; P1.03: rated current P1.04: rated frequency; P1.05: rated speed

3) If (asynchronous) motor can separate from load, set P1.37=2 (asynchronous motor complete auto-tuning) and press RUN key. The inverter will automatically calculate parameters below:

Motor selection	Parameters
Motor 1	P1.06: asynchronous motor stator resistor P1.07: asynchronous motor rotor resistor P1.08: asynchronous motor leakage inductance P1.09: asynchronous motor mutual inductance P1.10: asynchronous motor no load current

4) If (asynchronous) motor cannot separate from load, set P1.37=1 and press RUN key.
5) Finish auto-tuning.

3.4 JOG run

DLA1 series default setting value

Parameter	Default value	
P0.01	0	Sensorless vector control (SVC)
P0.02	0	Keyboard command channel (LED OFF)
P0.03	0	Keyboard setting frequency (P0.08, UP/DOWN can edit, not retentive at power of)

After correctly set motor parameter P1.00-P1.05 and auto-tuning, user can control motor operation using keyboard DIR/JOG.

4 Function codes (Parameters)

Legends:

"★": this parameter's setting value is not editable when inverter is at operation status;

"●": this parameter's value is observed value, not editable;

"☆": this parameter's setting value is editable when inverter is at stop or operation status;

"▲": this parameter is "factory parameter" not for editing;

"-": this parameter is depending on model.

Def: factory default settings

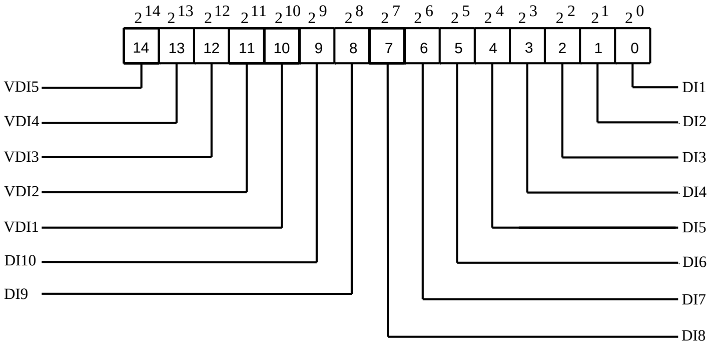
Res: restrictions when editing

4.1 Monitoring parameters: d0.00-d0.65

d0 group is used for monitoring inverter status. User can read by panel display or by remote communications. d0.00~d0.31 are defined by P7.03 & P7.04.

Function code	Name	Unit
d0.00	Running frequency (Hz)	0.01Hz
Absolute value of theoretical running frequency.		
d0.01	Set frequency (Hz)	0.01Hz
Absolute value of theoretical set frequency.		
d0.02	DC Bus voltage (V)	0.1V
Detected value of DC bus voltage		
d0.03	Output voltage (V)	1V
Actual value of inverter output voltage.		
d0.04	Output current (A)	0.01A
Effective value of inverter output current.		
d0.05	Output power (kW)	0.1kW
Value of inverter output power.		
d0.06	Output torque (%)	0.1%
Value of inverter output torque percentage.		
d0.07	DI input status	1
This displays the current state of DI terminals and the value is hexadecimal. Each bit corresponds to a DI. "1" indicates high level signal, and "0" indicates low level signal. The corresponding relationship between bits and DIs is described in the following table.		

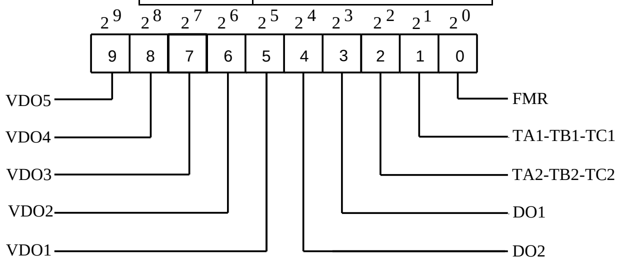
0~14 place	Input terminal status
0	invalid
1	valid



d0.08	DO output status	1

This displays the current state of DO terminals and the value is hexadecimal. Each bit corresponds to a DO. "1" indicates high level signal, and "0" indicates low level signal. The corresponding relationship between bits and DOs is described in the following table.

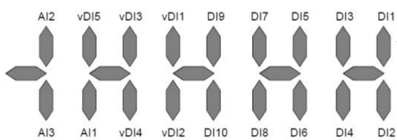
0~9 place	output terminal status
0	invalid
1	valid



d0.09	AI1 voltage after correction	V/mA
d0.10	AI2 current after correction	V/mA
d0.11	Keyboard command voltage	V/mA
d0.14	Load speed display	1
Motor actual running speed. Please refer to P7.12 for settings.		
d0.15	PID setting value	1
PID preset value percentage.		
d0.16	PID feedback	1
PID feedback value percentage.		
d0.18	HDI (DI5) pulse frequency	0.01kHz
HDI (DI5) input pulse frequency display.		
d0.19	Feedback speed	0.1Hz

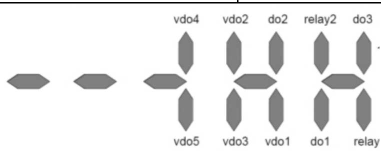
PG feedback speed, accurate to 0.1Hz. P7.12 determines location of decimal point for value of d0.19 & d0.29. • If P7.12=2, value range is -320.00Hz~320.00Hz; • If P7.12-1, value range is -500.0Hz~500.0Hz.		
d0.20	Remaining running time	0.1Min
Used for timer control. Refer to P8.42~P8.44.		
d0.21	AI1 voltage/current before correction.	0.001V
If P4.40=0, this displays voltage; if P4.40=1, this displays current.		
d0.22	AI2 voltage before correction.	0.001V
If P4.40=0, this displays voltage; if P4.40=1, this displays current.		
d0.23	Keyboard voltage before correction.	0.001V
If P4.40=0, this displays voltage; if P4.40=1, this displays current.		
d0.28	Communication setting value	0.01%
It displays the data written from the communication address 0x1000.		
d0.30	Main frequency X display	0.01Hz
P0.03 main frequency setting value		
d0.31	Auxiliary frequency Y display	0.01Hz
P0.04 auxiliary frequency setting value.		
d0.35	Target torque	0.1%
Target torque is current torque upper limit.		
d0.37	Power factor angle	-
d0.39	V/F separation target voltage	1V
Target voltage upon V/F separation		
d0.40	V/F separation output voltage	1V
Output voltage upon V/F separation		
d0.41	DI terminal status display	

ON: high electrical level;
OFF: low electrical level.



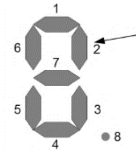
d0.42	DO terminal status display	

ON: high electrical level;
OFF: low electrical level.



d0.43	DI function display 1	

This uses 5 nixie tubes to display whether terminal functions 1~40 are valid. Each nixie tube can display 8 functions. From right to left: 1~8, 9~16, 17~24, 25~32, 33~40.



d0.44	DI function display 2	

Same as d0.43, this uses 3 nixie tubes to display whether terminal functions 41~59 are valid. From right to left: 41~48, 49~56, 57~59.

d0.59	Setting frequency percentage	%
d0.60	Running frequency percentage	%
d0.61	Inverter running status	

d0.61	Bit0	0: Stop; 1: FWD; 2: REV
	Bit1	
	Bit2	0: Constant speed; 1: Accelerate; 2: Decelerate
	Bit3	
	Bit4	0: DC bus normal; 1: under-voltage

d0.62	Current fault code	
d0.63	Point-to-point communication value sent	
d0.64	Number of slaves	
d0.65	Torque upper limit	

4.2 Basic functions group: P0.00-P0.28

Code	Description	Setting range		Def	Res
P0.00	Load type	G type	1	-	●
		P type	2		

This parameter is to display the delivered model and cannot be modified.
1: Applicable to constant torque load with rated parameters specified
2: Applicable to variable torque load (fan and pump) with rated parameters specified.

Code	Description	Setting range		Def	Res
P0.01	Speed control mode	Sensorless flux vector control (SVC)	0	2	★
		V/F control	2		

0: Sensorless flux vector control for asynchronous motors (SVC)
This is for high-performance control applications such as machine tool, centrifuge, wire drawing machine and injection molding machine. One inverter can only drive one motor.

2: Voltage/Frequency control (V/F)
It is applicable to applications with low load requirements or applications where one inverter operates multiple motors, such as fans and pumps.
Notes:
If vector control is used, motor auto-tuning must be performed because the advantages of vector control can only be utilized after correct motor parameters are obtained. Better performance can be achieved by adjusting speed regulator parameters in group P2.

For the permanent magnetic synchronous motor (PMSM), the DLA1 does not support SVC. FVC is used generally. In some low-power motor applications, you can also use V/F.

P0.02	Command source channel selection	Keyboard (LED OFF)	0	0	☆
		Terminals (LED ON)	1		
		Communication (LED blinks)	2		

This is to determine the input channel of the control commands, such as run, stop, forward rotation, reverse rotation and jog operation.

0: Keyboard ("LOCAL" indicator off)
Commands are given by pressing keys on the keyboard (keyboard).
1: Terminals ("LOCAL" indicator on)
Commands are given by means of multi-functional input terminals with functions such as FWD, REV, FJOG, and RJOG.
2: Communication ("LOCAL" indicator blinking)
Commands are given from communication with upper controllers. If this parameter is set to 2, a communication card (Modbus RTU, PROFIBUS-DP card, CANlink card or CANopen card) must be installed. Please refer to PD group function codes for communication settings.

P0.03	Main frequency source X selection	Keyboard setting (P0.08, UP/DOWN editable, not retentive at power off)	0	0	★
		Keyboard setting (P0.08, UP/DOWN editable, retentive at power off)	1		
		AI1 setting	2		
		AI2 setting	3		
		AI3 setting	4		
		Reserved	5		
		Multi-speed operation setting	6		
		Simple PLC setting	7		
		PID control setting	8		
		Remote communication setting	9		

This is used to select the setting channel of the main frequency X.

0: Keyboard setting (P0.08, UP/DOWN editable, not retentive at power off)
The initial value of the set frequency is the value of P0.08 (Preset frequency). You can change the frequency by pressing the keyboard (or using the UP/DOWN function of input terminals). When the inverter is powered on again after power off, the frequency reverts to the value of P0.08.

1: Keyboard setting (P0.08, UP/DOWN editable, retentive at power off)
The initial value of the set frequency is the value of P0.08 (Preset frequency). You can change the set frequency by pressing the keyboard (or using the UP/DOWN function of input terminals). When the inverter is powered on again after power off, the frequency is the value memorized at the moment of the last power off.
Note that P0.23 determines whether the set frequency is memorized or cleared when the inverter stops. It is related to stop rather than power off.

2: AI1
3: AI2

4: AI3 (keyboard potentiometer)

Jumper J6 determines whether to use AI3 terminal or keyboard potentiometer as command source. If AI3 terminal is selected, Jumper J5 determines whether to use 0-10V voltage input or 0-20 mA current input

6: Multi-speed operation setting
In multi-speed operation setting mode, combinations of different DI terminal states correspond to different set frequencies. The DLA1 supports maximum 16 speeds implemented by 16 state combinations of four DI terminals in Group PC. The multi-speed operation setting indicates percentages of the value of P0.10 (Maximum output frequency).
If a DI terminal is used for the multi-speed operation setting, you need to set in group P4.

7: Simple PLC setting
When the simple programmable logic controller (PLC) mode is used as the frequency source, the running frequency of the inverter can be switched over among the 16 frequency references. You can set the holding time and acceleration/deceleration time of the 16 frequency references. For details, refer to the descriptions of Group PC.

8: PID control setting
The output of PID control is used as the running frequency. PID control is generally used in on-site closed-loop control, such as constant pressure closed-loop control and constant tension closed-loop control. When applying PID as the frequency source, you need to set in group PA.

9: Remote communication setting (RS485)

P0.04	Auxiliary frequency source Y selection	Keyboard setting (P0.08, UP/DOWN editable, not retentive at power off)	0	0	★
		Keyboard setting (P0.08, UP/DOWN editable, retentive at power off)	1		
		AI1 setting	2		
		AI2 setting	3		
		AI3 setting	4		
		Reserved	5		
		Multi-speed operation setting	6		
		Simple PLC setting	7		
		PID control setting	8		
		Remote communication setting	9		

Refer to P0.03.

P0.05	Y reference in X and Y combination	Relative to P0.10	0	0	☆
		Relative to main frequency source X	1		
P0.06	Y range in X and Y combination	0%~150%		100%	☆

If X and Y combination is used, P0.05 and P0.06 are used to set the adjustment range of Y. You can set Y to be relative to either maximum frequency or main frequency X. If relative to main frequency X, the setting range of Y varies according to the main frequency X.

P0.07	Frequency source combination mode	One's place	Frequency source selection	00	☆
		Main frequency source X	0		
		Result of "X and Y combination"	1		

		X and Y switchover	2		
		X and "X and Y combination" switchover	3		
		Y and "X and Y combination" switchover	4		
		Ten's place: X and Y combinations			
		X+Y	0		
		X-Y	1		
		MAX [X, Y]	2		
		MIN [X, Y]	3		

The final output frequency can be simple X setting, or it can be a sophisticated result after Y is included and/or combined.

P0.08	Preset frequency setting	0.00Hz~ P0.10 (valid when frequency source is digital setting)	50.00Hz	☆

When frequency source selection is "digital setting" or "terminal UP/DOWN", this value is inverter frequency digital setting initial value.

P0.09	Operation direction selection	Same direction	0	0	☆
		Reverse direction	1		

You can change the rotation direction of the motor just by modifying this parameter without changing the motor wiring. Modifying this parameter is equivalent to exchanging any two of the motor's U, V, W wires.

The motor will resume running in the original direction after parameter initialization. Do not use this function in applications where changing the rotating direction of the motor is prohibited after system commissioning is complete.

P0.10	Maximum frequency	50.00Hz~320.00Hz	50.00Hz	★

When the frequency source is AI, pulse setting (DI5), or multi-speed, value of this parameter determines the 100% frequency.

The output frequency of the DLA1 can reach 3200 Hz. To take both frequency reference resolution and frequency input range into consideration, you can set the number of decimal places for frequency reference in P0.22.

• If P0.22 is set to 1, the frequency reference resolution is 0.1 Hz. In this case, the setting range of P0.10 is 50.0 to 3200.0 Hz.

• If P0.22 is set to 2, the frequency reference resolution is 0.01 Hz. In this case, the setting range of P0.10 is 50.00 to 320.00 Hz.

P0.11	Frequency source upper limit	P0.12 setting	0	0	★
		AI1	1		
		AI2	2		
		AI3	3		
		Reserved	4		
		Communication setting	5		

It is used to set the source of the frequency upper limit, including digital setting (P0.12), AI, or communication setting. If the frequency upper limit is set by means of AI1, AI2, AI3, or communication, the setting is similar to that of the main frequency source X. For details, see the description of P0.03.

For example, to avoid runaway in torque control mode in winding application, you can set the frequency upper limit by means of analog input. When the inverter reaches the upper limit, it will maintain at this speed.

P0.12	Frequency upper limit	Frequency lower limit P0.14 to maximum frequency P0.10	50.00Hz	☆
P0.13	Frequency upper limit offset	0.00Hz~ maximum frequency P0.10	0.00Hz	☆

When frequency is set by analog or pulse, P0.13 is used as setting value offset value, and then overlap with P0.11 to become final frequency upper limit.

P0.14	Frequency lower limit	0.00Hz~ upper limit frequency P0.12	0.00Hz	☆

If the frequency reference is lower than the value of this parameter, the inverter can stop, run at the frequency lower limit, or run at zero speed, determined by P8.14.

P0.15	Carrier frequency	0.5kHz~12.0kHz	-	☆

Please refer to table below:

Carrier frequency	Low → High
Motor noise	Big → Small
Output current waveform	Bad → Good
Motor temperature rise	High → Low
Inverter temperature rise	Low → High
Leakage current	Small → Large
External radiation interference	Small → Large

The factory setting of carrier frequency varies with the inverter power. If you need to modify the carrier frequency, note that if the set carrier frequency is higher than factory setting, it will lead to an increase in temperature of the inverter's heatsink. In this case, you need to de-rate the inverter. Otherwise, the inverter may overheat and alarm.

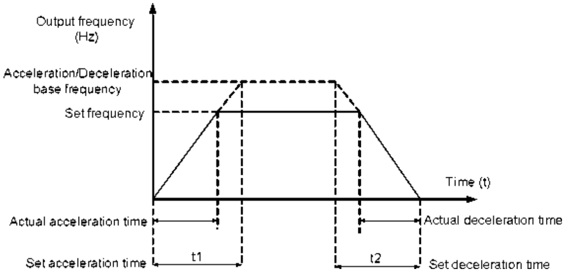
P0.16	Carrier frequency adjustment based on temperature	No	0	0	☆
		Yes	1		

It is used to set whether the carrier frequency is adjusted based on the temperature. The Inverter automatically reduces the carrier frequency when detecting that the heatsink temperature is high. The inverter sets the carrier frequency to the set value when the heatsink temperature becomes normal. This function reduces the overheat alarms.

P0.17	Acceleration time 1	0.00s~65000s	-	☆
P0.18	Deceleration time 1	0.00s~65000s	-	☆

Acceleration time is the time required by the inverter to accelerate from 0 Hz to "Acceleration/Deceleration base frequency" (P0.25), that is, t1 in figure below.

Deceleration time is the time required by the Inverter to decelerate from "Acceleration/Deceleration base frequency" (P0.25) to 0 Hz, that is, t2 in figure below.



The DLA1 provides totally four groups of acceleration/deceleration times. You can perform switchover by using a DI terminal.

- Group1: P0.17,P0.18
- Group2: P8.03,P8.04
- Group3: P8.05,P8.06
- Group4: P8.07,P8.08

P0.19	Acceleration/deceleration time unit	1s	0	1	★
		0.1s	1		
		0.01s	2		

DLA1 provides three acceleration/ deceleration time units, 1s, 0.1s and 0.01s. Modifying this parameter will make the displayed decimal places change and corresponding acceleration/deceleration time also change.

P0.21	Y offset	0.00Hz~ maximum frequency P0.10	0.00Hz	☆

This parameter is valid only when the frequency source is set to "X and Y combination".
The final frequency is obtained by adding the frequency offset set in this parameter to the X and Y combination result.

P0.22	Frequency reference resolution	0.01Hz	2	2	★
P0.23	Retentiveness of digital setting at stop	Not retentive	0	0	☆
		Retentive	1		

This parameter is valid only when the frequency source is digital setting.
If P0.23 is set to 0, the digital setting value resumes to the value of P0.08 (Preset frequency) after the inverter stops.
If P0.23 is set to 1, the digital setting value is the set frequency at the moment when the inverter stops.

P0.25	Acceleration/Deceleration time base frequency	Maximum frequency (P0.10)	0	0	★
		Set frequency	1		
		100Hz	2		

The acceleration/deceleration time indicates the time for the inverter between 0 Hz and the frequency set in P0.25.

P0.26	UP/DOWN base frequency at running	Running frequency	0	0	★
		Set frequency	1		

This parameter is valid only when the frequency source is digital setting.
It is used to set the base frequency to be modified by using keys and or the terminal UP/DOWN function.

P0.27	Binding frequency source to command source channels	One's place	Binding frequency source to keyboard		000	☆
		No binding		0		
		Digital setting		1		
		AI1		2		
		AI2		3		
		AI3		4		
		Reserved		5		
		Multi-speed		6		
		Simple PLC		7		
		PID		8		
		Communication		9		
		Ten's place	Binding frequency source to terminals			
		No binding		0		
		Digital setting		1		
		AI1		2		
		AI2		3		
		AI3		4		
		Reserved		5		
		Multi-speed		6		
		Simple PLC		7		
		PID		8		
		Communication		9		
		Hundred's place	Binding frequency source to communication			
		No binding		0		
		Digital setting		1		
		AI1		2		
		AI2		3		
		AI3		4		
		Reserved		5		
		Multi-speed		6		
		Simple PLC		7		
		PID		8		
		Communication		9		

4.3 First motor parameters: P1.00-P1.37

Code	Description	Setting range		Def	Res
P1.00	Motor type selection	Normal asynchronous motor	0	0	★
		Variable frequency asynchronous motor	1		
P1.01	Motor rated power	0.1kW~1000.0kW		-	★
P1.02	Motor rated voltage	1V~2000V		-	★
P1.03	Motor rated current	0.01A~655.35A (inverter rated power≦55kW) 0.1A~6553.5A (inverter rated power >55kW)		-	★
P1.04	Motor rated frequency	0.01Hz~ maximum frequency		-	★
P1.05	Motor rated speed	1rpm~65535rpm		-	★

Set these parameters according to the motor nameplate regardless of V/F control or vector control is adopted. To achieve better V/F or vector control performance, motor auto-tuning is required, which depends on the correct setting of motor nameplate parameters.

Code	Description	Setting range	Def	Res
P1.06	Asynchronous motor stator resistance	0.001Ω~65.535Ω (inverter rated power≦55kW) 0.0001Ω~6.5535Ω (inverter rated power >55kW)	-	★
P1.07	Asynchronous motor rotor resistance	0.001Ω~65.535Ω (inverter rated power ≦55kW) 0.0001Ω~6.5535Ω (inverter rated power >55kW)	-	★
P1.08	Asynchronous motor leakage inductive reactance	0.01mH~655.35mH (inverter rated power ≤55kW) 0.001mH~65.535mH (inverter rated power >55kW)	-	★
P1.09	Asynchronous motor mutual inductive reactance	0.1mH~6553.5mH (inverter rated power ≤55kW) 0.01mH~655.35mH (inverter rated power >55kW)	-	★
P1.10	Asynchronous motor no load current	0.01A~P1.03 (inverter rated power ≤55kW) 0.1A~P1.03 (inverter rated power >55kW)	-	★

The parameters in P1.06 to P1.10 are asynchronous motor parameters. These parameters are unavailable on the motor nameplate and are obtained by motor auto-tuning. Motor static auto-tuning can only obtain P1.06 to P1.08. Motor complete auto-tuning can obtain all parameters from P1.06 to P1.10.
Each time "Motor rated power" (P1.01) or "Motor rated voltage" (P1.02) is changed, the inverter automatically restores values of P1.06 to P1.10 to the parameter setting for the common standard Y series asynchronous motor.
If it is impossible to perform motor auto-tuning onsite, manually input the values of these parameters according to data provided by the motor manufacturer.

Code	Description	Setting range		Def	Res
P1.37	Auto-tuning selection	No auto-tuning	0	0	★
		Asynchronous motor static auto-tuning 1	1		
		Asynchronous motor complete auto-tuning	2		
		Asynchronous motor static auto-tuning 2	3		

1: Asynchronous motor static auto-tuning 1
It is applicable to scenarios where complete auto-tuning cannot be performed because the asynchronous motor cannot be disconnected from the load.
Before performing static auto-tuning, properly set the motor type and motor nameplate parameters of P1.00 to P1.05 first. The inverter will obtain parameters of P1.06 to P1.08 by static auto-tuning. Set this parameter to 1, and press RUN. Then, the inverter starts static auto-tuning 1.

2: Asynchronous motor complete auto-tuning
To perform this type of auto-tuning, ensure that the motor is disconnected from the load. During the process of complete auto-tuning, the inverter performs static auto-tuning first and then accelerates to 80% of the motor rated frequency within the acceleration time set in P0.17. The inverter keeps running for a certain period and then decelerates to stop within deceleration time set in P0.18.
Before performing complete auto-tuning, properly set the motor type, motor nameplate parameters of P1.00 to P1.05, "Encoder type" (P1.28) and "Encoder pulses per revolution" (P1.27) first.
The inverter will obtain motor parameters of P1.06 to P1.10, "A/B phase sequence of ABZ incremental encoder" (P1.30) and vector control current loop PI parameters of P3.13 to P3.16 by complete auto-tuning.
Set this parameter to 2, and press RUN. Then, the inverter starts complete auto-tuning.

3: Asynchronous motor static auto-tuning 1
This is applicable for asynchronous motors without encoders. During auto-tuning, the motor might vibrate slightly. Please pay attention to safety.
Set this parameter to 3, and press RUN. Then, the inverter starts static auto-tuning 2.

4.4 Vector control parameters: P2.00-P2.22

P2 group is valid for vector control, and invalid for V/F control.

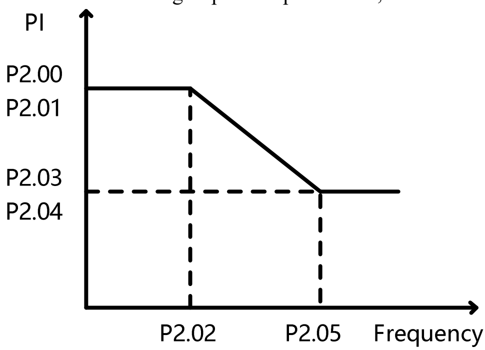
Code	Description	Setting range	Def	Res
P2.00	Speed loop proportional gain G1	1~100	30	☆
P2.01	Speed loop integral time T1	0.01s~10.00s	0.50s	☆
P2.02	Switchover frequency 1	0.00~P3.05	5.00Hz	☆
P2.03	Speed loop proportional gain G2	0~100	20	☆
P2.04	Speed loop integral time T2	0.01s~10.00s	1.00s	☆
P2.05	Switchover frequency 2	P3.02~P0.10	10.00Hz	☆

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

• If the running frequency is less than or equal to "Switchover frequency 1" (P2.02), the speed loop PI parameters are P2.00 and P2.01.

• If the running frequency is equal to or greater than "Switchover frequency 2" (P2.05), the speed loop PI parameters are P2.03 and P2.04.

• If the running frequency is between P2.02 and P2.05, the speed loop PI parameters are obtained from the linear switchover between the two groups of PI parameters, as shown in figure below.



The speed dynamic response characteristics in vector control can be adjusted by setting the proportional gain and integral time of the speed regulator.
To achieve a faster system response, increase the proportional gain and reduce the integral time. Be aware that this may lead to system oscillation.
The recommended adjustment method is as follows:

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

Improper PI parameter setting may cause serious speed overshoot, and overvoltage fault may even occur when the overshoot drops.

P2.06	Vector control slip gain	50%~200%	150%	☆

- For SVC, it is used to adjust speed stability accuracy of the motor. When the motor with load runs at a very low speed, increase the value of this parameter; when the motor with load runs at a very large speed, decrease the value of this parameter.
- For FVC, it is used to adjust the output current of the inverter with same load.

P2.07	SVC torque filter time constant	0.000s~0.100s	0.000s	☆
P2.09	Torque upper limit source in speed control	P2.10: 0 AI1: 1 AI2: 2 AI3: 3 Pulse (DI5): 4 Communication: 5 Min (AI1, AI2): 6 Max (AI1, AI2): 7	0	☆
P2.10	Torque upper limit in speed control	0.0%~200.0%	150.0%	☆

In speed control, the maximum output torque of the inverter is restricted by P2.09. If the torque upper limit is analog, pulse or communication setting, 100% of the setting corresponds to the value of P2.10, and 100% of the value of P2.10 corresponds to the inverter rated torque.

P2.13	Excitation adjustment proportional gain	0~20000	2000	☆
P2.14	Excitation adjustment integral gain	0~20000	1300	☆
P2.15	Torque adjustment proportional gain	0~20000	2000	☆
P2.16	Torque adjustment integral gain	0~20000	1300	☆

These are current loop PI parameters for vector control. These parameters are automatically obtained through "Asynchronous motor complete auto-tuning" and need not be modified.

The current loop integral regulator here is integral gain rather than integral time.

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

4.5 V/F control parameters: P3.00-P3.27

Group P3 is valid only for V/F control. The V/F control mode is applicable to low load applications (fan or pump) or applications where one inverter drives multiple motors or there is a large difference between the inverter power and the motor power.

Code	Description	Setting range	Def	Res
P3.00	V/F curve setting	Linear V/F: 0 Multi-point V/F: 1 Square V/F: 2 1.2-time V/F: 3 1.4-time V/F: 4 1.5-time V/F: 5 1.6-time V/F: 6 1.7-time V/F: 7 1.8-time V/F: 8 Reserved: 9 VF complete separation mode: 10 VF half separation mode: 11	0	☆

0: Linear V/F
It is applicable to common constant torque load.

1: Multi-point V/F
It is applicable to special load such as dehydrator and centrifuge. Any such V/F curve can be obtained by setting parameters of P3.03 to P3.08.

2: Square V/F
It is applicable to centrifugal loads such as fan and pump.

3 to 8: V/F curve between linear V/F and square V/F

10: V/F complete separation
In this mode, the output frequency and output voltage of the Inverter are independent. The output frequency is determined by the frequency source, and the output voltage is determined by "Voltage source for V/F separation" (P3.13).
It is applicable to induction heating, inverse power supply and torque motor control.

11: V/F half separation
In this mode, V and F are proportional and the proportional relationship can be set in P3.13. The relationship between V and F are also related to the motor rated voltage and motor rated frequency in Group P1.
Assume that the voltage source input is X (0 to 100%), the relationship between V and F is:
V/F = 2 * X * (motor rated voltage) / (motor rated frequency)

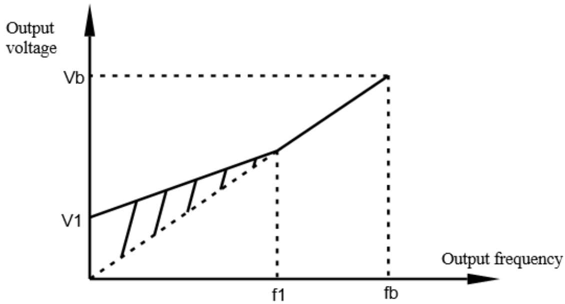
Code	Description	Setting range	Def	Res
P3.01	Torque boost	0.0%~30%	-	★
P3.02	Torque boost cut-off frequency	0.00Hz~ maximum frequency (P0.10)	50.00Hz	★

To compensate the low frequency torque characteristics of V/F control, user can boost the output voltage of the inverter at low frequency by modifying P3.01.

If the torque boost is set to too large, the motor may overheat, and the inverter may suffer overcurrent.

If the load is large and the motor startup torque is insufficient, increase the value of P3.01. If the load is small, decrease the value of P3.01. If it is set to 0.0, the inverter performs automatic torque boost. In this case, the inverter automatically calculates the torque boost value based on motor parameters including the stator resistance.

P3.02 specifies the frequency under which torque boost is valid. Torque boost becomes invalid when this frequency is exceeded.



V1 manual torque boost voltage Vb: maximum output voltage

f1: P3.02 setting fb: rated frequency

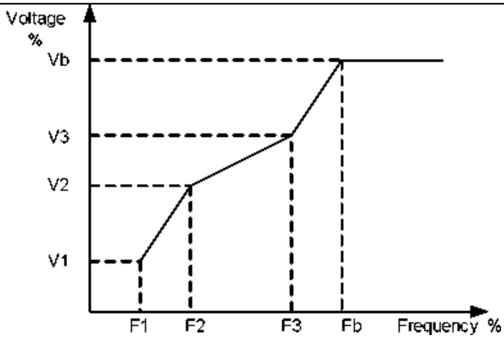
P3.03	Multi-point V/F frequency 1 (F1)	0.00Hz~P3.05	0.00Hz	★
P3.04	Multi-point V/F voltage 1 (V1)	0.0%~100.0%	0.0%	★
P3.05	Multi-point V/F frequency 2 (F2)	P3.03~P3.07	0.00Hz	★
P3.06	Multi-point V/F voltage 2 (V2)	0.0%~100.0%	0.0%	★
P3.07	Multi-point V/F frequency 3 (F3)	P3.05~ motor rated frequency (P1.04)	0.00Hz	★
P3.08	Multi-point V/F voltage 3 (V3)	0.0%~100.0%	0.0%	★

These six parameters are used to define the multi-point V/F curve.

The multi-point V/F curve is set based on the motor's load characteristic. The relationship between voltages and frequencies is:

V1 < V2 < V3, F1 < F2 < F3

At low frequency, higher voltage may cause overheat or even motor burn-out as well as overcurrent stall or overcurrent protection of the inverter.



V1~V3: 1st, 2nd and 3rd voltage percentages of multi-point V/F
F1~F3: 1st, 2nd and 3rd frequency percentages of multi-point V/F
Vb: motor rated voltage
Fb: motor rated running frequency

P3.09	V/F slip compensation gain	0%~200.0%	0.0 %	☆

This parameter is valid only for the asynchronous motor.

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

If this parameter is set to 100%, it indicates that the compensation when the motor bears rated load is the motor rated slip. The motor rated slip is automatically obtained by the inverter through calculation based on the motor rated frequency and motor rated rotational speed in group P1.

Generally, if the motor rotational speed is different from the target speed, slightly adjust P3.09.

P3.10	V/F over-excitation gain	0~200	64	☆

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

Increase the over-excitation gain if the inverter is liable to overvoltage error during deceleration. However, too large over-excitation gain may lead to an increase in the output current. Set P3.09 to a proper value in actual applications.

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

P3.11	V/F oscillation suppression gain	0~100	-	☆

Set this parameter to a value as small as possible in the prerequisite of efficient oscillation suppression to avoid influence on V/F control.

Set this parameter to 0 if the motor has no oscillation. Increase the value properly only when the motor has obvious oscillation. The larger the value is, the better the oscillation suppression result will be.

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

P3.13	Voltage source for V/F separation	Digital setting (P3.14)	0	0	☆
		AI1	1		
		AI2	2		
		AI3	3		
		Reserved	4		
		Multi-speed	5		
		Simple PLC	6		
		PID	7		
		Communication	8		
		100.0% corresponding to motor rated voltage (P1.02)			
P3.14	V/F separation voltage digital setting	0V~ motor rated voltage		0V	☆

V/F separation is generally applicable to scenarios such as induction heating, inverse power supply.

If V/F separation is enabled, the output voltage can be set in P3.14 or by means of analog, multi-speed, simple PLC, PID or communication. If you set the output voltage by means of non-digital setting, 100% of the setting corresponds to the motor rated voltage. If a negative percentage is set, its absolute value is used as the effective value.

0: Digital setting (P3.14)
The output voltage is set directly in P3.14.

1: AI1; 2: AI2; 3: AI3
The output voltage is set by AI terminals.

4: Reserved
5: Multi-speed
If the voltage source is multi-speed, parameters in group P4 and PC must be set to determine the corresponding relationship between setting signal and setting voltage. 100.0% of the multi-speed setting in group PC corresponds to the motor rated voltage.

6: Simple PLC
If the voltage source is simple PLC mode, parameters in group PC must be set to determine the setting output voltage.

7: PID
The output voltage is generated based on PID closed loop. For details, see the description of PID in group PA.

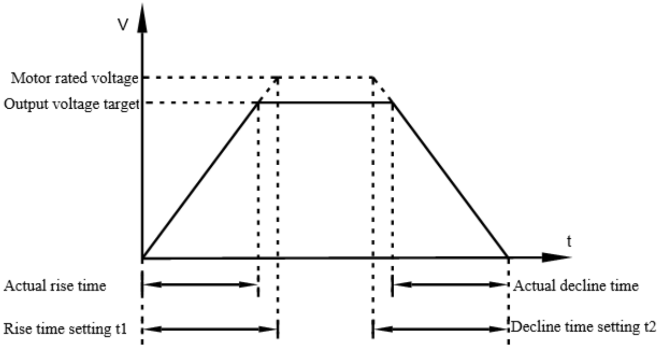
8: Communication setting
The output voltage is set by the host computer by means of communication.

The voltage source for V/F separation is set in the same way as the frequency source. For details, see P0.03. 100.0% of the setting in each source corresponds to the motor rated voltage. If the corresponding value is negative, its absolute value is used.

P3.15	Voltage rise time of V/F separation	0.0s~1000.0s	0.0s	☆
P3.16	Voltage decline time of V/F separation	0.0s~1000.0s	0.0s	☆

P3.15 indicates the time required for the output voltage to rise from 0 V to the motor rated voltage shown as t1 in the following figure.

P3.16 indicates the time required for the output voltage to decline from the motor rated voltage to 0 V, shown as t2 in the following figure.



P3.17	V/F separation stop mode selection	V & F reduce to 0 independently	0	0	☆
		F reduces after V reduces to 0	1		

0: Voltage reduces to 0 by P3.15; meanwhile Frequency reduces to 0 by P0.18.
1: Voltage reduces to 0 by P3.15; after that, Frequency reduces to 0 by P0.18.

P3.18	Overcurrent stall action current	50%~200%		150%	☆
P3.19	Overcurrent stall suppression enable	Invalid	0	1	☆
		Valid	1		
P3.20	Overcurrent stall suppression gain	0~100		20	☆
P3.21	Multiple overcurrent stall action compensation coefficient	50%~200%		50%	☆

In high frequency area, motor current is smaller and if below rated frequency, motor speed drops faster given same stall current. To improve motor performance, user can reduce stall action current above rated frequency. In applications (such as centrifugal) where running frequency is high, load inertia is large & multiple field-weakening is needed, this method can improve acceleration performance.

Stall action current above rated frequency = (fs/fn) * k * LimitCur, where:
fs: running frequency; fn: motor rated frequency; k: P3.21; LimitCur: P3.18

Remarks:

- (If) P3.18=150%, means 1.5 times of inverter rated current;
- For high power motors & carrier frequency below 2kHz, current pulsation can cause

shortage of torque. Under such circumstances, please reduce P3.18; • If DC bus voltage exceeds 760V, the whole mechatronic system is under generating status and overvoltage stall will take effects to adjust output frequency. This will prolong deceleration time. If actual deceleration cannot meet requirements, user can increase over-excitation gain.					
P3.22	Overvoltage stall action voltage	650V~800V		760V	☆
P3.23	Overvoltage stall enable	Invalid	0	1	☆
		Valid	1		
P3.24	Overvoltage stall frequency gain	0~100		30	☆
P3.25	Overvoltage stall voltage gain	0~100		30	☆
P3.26	Overvoltage stall maximum frequency rise limit	0~50Hz		5Hz	☆
Notes when using braking resistor or regenerative units: • Please set P3.11=0; otherwise can cause overcurrent; • Please set P3.23=0; otherwise may prolong deceleration time too much.					
P3.27	Slip compensation time constant	0.1~10.0s		0.5s	☆
The smaller this value, the more responsive. But too small setting will cause overvoltage alarm.					

4.6 Input terminals: P4.00-P4.39

DLA1 provides six DI terminals (DI5 can be used for high-speed pulse input) and three analog input (AI) terminals.

Code	Description	Setting range	Def	Res
P4.00	DI1 function selection	0~59	1	★
P4.01	DI2 function selection	0~59	4	★
P4.02	DI3 function selection	0~59	9	★
P4.03	DI4 function selection	0~59	12	★
P4.04	Reserved	0~59	13	★
P4.05	DI6 function selection	0~59	0	★

The following table lists the functions available for the DI terminals.

Value	Function	Description
0	No function	Set 0 for reserved terminals to avoid malfunction.
1	Forward RUN (FWD)	The terminal is used to control forward or reverse RUN of the inverter.
2	Reverse RUN (REV)	
3	Three-line mode control	The terminal determines three-line mode control of the inverter. For details, see the description of P4.11.
4	Forward JOG (FJOG)	The JOG frequency, acceleration time and deceleration time are described respectively in P8.00, P8.01 and P8.02.
5	Reverse JOG (RJOG)	
6	Terminal UP	If the frequency channel terminals, these two are used as increment and decrement commands for frequency modification. When the frequency source is digital setting, they are used to adjust the frequency.
7	Terminal DOWN	
8	Coast to stop	The inverter blocks its output, the motor coasts to rest and is not controlled by the inverter. It is the same as coast to stop described in P5.10.
9	Fault reset (RESET)	Same as RESET key on the keyboard. Remote fault reset is implemented by this function.
10	Pause	The inverter decelerates to stop, but the running parameters are all memorized. After this function is disabled, the Inverter resumes its status before stop.
11	External fault normally open (NO) input	If this signal is sent to the inverter, the inverter will output 15=E.EIOF and performs the fault protection action. For details please check P9.47.
12	Multi-speed terminal K1	The setting of 16 speeds or 16 other references can be implemented through combinations of 16 states of these four terminals. Please refer to the next table.
13	Multi-speed terminal K2	
14	Multi-speed terminal K3	

15	Multi-speed terminal K4	
16	Terminal 1 for acceleration/ deceleration time selection	Totally four groups of acceleration/deceleration time can be selected through combinations states of these two terminals.
17	Terminal 2 for acceleration/ deceleration time selection	
18	Frequency source switchover	This terminal is used to perform switchover between two frequency sources according to the setting in P0.07.
19	UP/DOWN setting clearance (terminal, keyboard)	If the frequency source is digital setting, the terminal is used to clear the modifications by using the UP/ DOWN function or the UP/DOWN key on keyboard, returning the set frequency to the value of P0.08.
20	Command source switchover terminal	If the command source is set to terminal control (P0.02 = 1), this terminal is used to perform switchover between terminal control and keyboard control. If the command source is set to communication control (P0.02 = 2), this terminal is used to perform switchover between communication control and keyboard control.
21	Acceleration/Decelerati on prohibited	It enables the inverter to maintain the current frequency output without being affected by external signals (except the STOP command).
22	PID pause	PID is invalid temporarily. The inverter maintains the current frequency output without PID adjustment of frequency source.
23	PLC status reset	The terminal is used to restore the original status of PLC control for the Inverter when PLC control is started again after a pause.
24	Swing pause	The inverter outputs the central frequency, and the swing frequency function pauses.
25	Counter input	This terminal is used to count pulses.
26	Counter reset	This terminal is used to clear the counter status.
27	Length count input	This terminal is used to count the length.
28	Length reset	This terminal is used to clear the length.
29	Torque control prohibited	The inverter is prohibited from torque control and enters the speed control mode.
30	Pulse input enabled (only for DI5)	DI5 is used for pulse input.
31	Reserved	Reserved.
32	Immediate DC braking	The inverter directly switches over to the DC braking state.
33	External fault normally closed (NC) input	If this signal is sent to the inverter, the inverter will output 15=E.EIOF and performs the fault protection action. For details please check P9.47.
34	Frequency modification prohibited	The inverter does not respond to any frequency modification.

35	PID action direction negation	The PID action direction is opposite to the direction set in PA.03.
36	External STOP terminal 1	This terminal can be used to stop the Inverter, equivalent to the STOP key on the keyboard.
37	Command source switchover terminal 2	It is used to perform switchover between terminal control and communication control. If the command source is terminal control, the system will switch to communication control after this terminal becomes ON.
38	PID integral pause	After this terminal becomes ON, the integral adjustment function pauses. However, the proportional and differentiation adjustment functions are still valid.
39	Switchover between main frequency source X and preset frequency	After this terminal becomes ON, the frequency source X is replaced by the preset frequency set in P0.08.
40	Switchover between auxiliary frequency source Y and preset frequency	After this terminal is enabled, the frequency source Y is replaced by the preset frequency set in P0.08.
41	Reserved	Reserved
42	Reserved	
43	PID parameter switchover	If the PID parameters switchover condition is DI terminal (PA.18 = 1) and this terminal is invalid, the valid PID parameters are PA.05 to PA.07; when this terminal becomes valid, the valid PID parameters are PA.15 to PA.17.
44	User-defined fault 1	If these two terminals become ON, the inverter reports 27=E.USt1 and 28=E.USt2 respectively, and performs fault protection actions based on the setting in P9.49.
45	User-defined fault 2	
46	Speed control/Torque control switchover	This terminal enables the inverter to switch between speed control and torque control. When this terminal becomes OFF, the inverter runs in the mode set in B0.00. When this terminal becomes ON, the inverter switches over to the other control mode.
47	Emergency stop	When this terminal becomes ON, the inverter stops within the shortest time. During stop, the current remains at the current upper limit. This function is used to for stopping the inverter in emergency situations.
48	External STOP terminal 2	In any control mode (keyboard, terminal or communication), it can be used to make the inverter decelerate to stop. In this case, the deceleration time is deceleration time 4.
49	Deceleration DC braking	When this terminal becomes ON, the inverter decelerates to frequency set in P6.11 and then switches to DC braking state.
50	Current running time clearance	When this terminal becomes ON, the inverter's current running time is cleared. This function needs to be supported by P8.42 and P8.53.
51~59	Reserved	Reserved

•

- Multi-speed control

K4	K3	K2	K1	Speed setting	Parameter
OFF	OFF	OFF	OFF	Speed 0	PC.00
OFF	OFF	OFF	ON	Speed 1	PC.01
OFF	OFF	ON	OFF	Speed 2	PC.02
OFF	OFF	ON	ON	Speed 3	PC.03
OFF	ON	OFF	OFF	Speed 4	PC.04
OFF	ON	OFF	ON	Speed 5	PC.05
OFF	ON	ON	OFF	Speed 6	PC.06
OFF	ON	ON	ON	Speed 7	PC.07
ON	OFF	OFF	OFF	Speed 8	PC.08
ON	OFF	OFF	ON	Speed 9	PC.09
ON	OFF	ON	OFF	Speed 10	PC.10
ON	OFF	ON	ON	Speed 11	PC.11
ON	ON	OFF	OFF	Speed 12	PC.12
ON	ON	OFF	ON	Speed 13	PC.13
ON	ON	ON	OFF	Speed 14	PC.14
ON	ON	ON	ON	Speed 15	PC.15

The value 100% of PC-00 to PC-15 corresponds to the value of P0.10 (maximum frequency). Multi-speed can be also used as the PID setting source or the voltage source for V/F separation.

- Acceleration/deceleration time setting

Two terminals for acceleration/deceleration time selection have four state combinations, as listed in the following table.

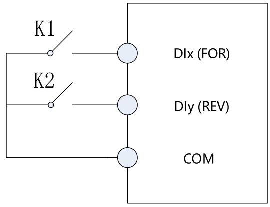
Terminal 2	Terminal 1	Acceleration/ deceleration time selection	Parameters
OFF	OFF	Acceleration/Deceleration time 1	P0.17, P0.18
OFF	ON	Acceleration/Deceleration time 2	P8.03, P8.04
ON	OFF	Acceleration/Deceleration time 3	P8.05, P8.06
ON	ON	Acceleration/Deceleration time 4	P8.07, P8.08

P4.10	DI filter time	0.000s~1.000s	0.010s	☆

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

P4.11	Terminal command mode	Two-line mode 1	0		0	☆
		Two-line mode 2	1			
		Three-line mode 1	2			
		Three-line mode 2	3			

0: Two-line mode 1



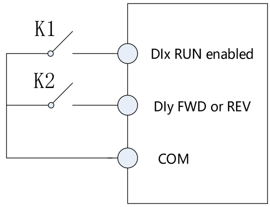
It is the most commonly used two-line mode, in which the forward/reverse rotation of the motor is decided by DI1x and DIy. The parameters are set as below:

Value	Function	Description
DIx	1	Forward operation (FWD)
DIy	2	Reverse operation (REV)

0: invalid; 1: valid.

K1	K2	Operation
0	0	Stop
0	1	REV
1	0	FWD
1	1	Stop

1: Two-line mode 2



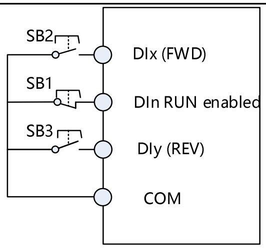
In this mode, DIx becomes 'RUN enabled' terminal, and DIy terminal decides operation directions.

Value	Function	Description
DIx	1	RUN enabled
DIy	2	Directions (FWD or REV)

0: invalid; 1: valid.

K1	K2	Operation
0	0	Stop
0	1	Stop
1	0	FWD
1	1	REV

2: Three-line mode 1



SB1: Stop button
SB2: FWD button
SB3: REV button

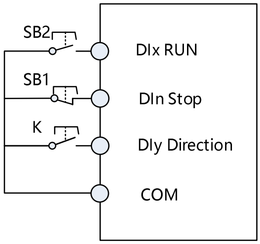
In this mode, DIn is enable terminal, and DIx & DIy terminal decides operation directions.

Value	Function	Description
DIx	1	Forward operation (FWD)
DIy	2	Reverse operation (REV)
DIn	3	RUN enabled

0: invalid; 1: valid; X: random.

SB1	SB2	SB3	Operation
0	X	X	Stop
1	1	0	FWD
1	0	1	REV
1	1	0->1	REV
1	0->1	1	FWD

3: Three-line mode 2;



SB1: Stop button
SB2: Run button

In this mode, DIx is enable terminal, DIn is stop terminal and DIy terminal decides operation directions.

Value	Function	Description
DIx	1	RUN
DIy	2	Direction
DIn	3	Stop

0: invalid; 1: valid; X: random.

SB1	SB2	K	Operation
0	X	X	Stop
1	1	0	FWD
1	1	1	REV

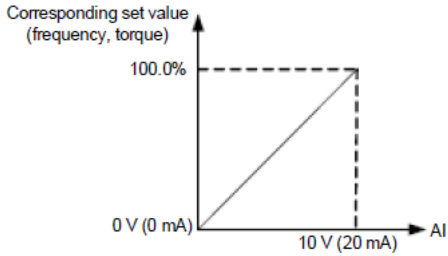
P4.12	Terminal UP/DOWN rate	0.01Hz/s~655.35Hz/s	1.00Hz/s	☆

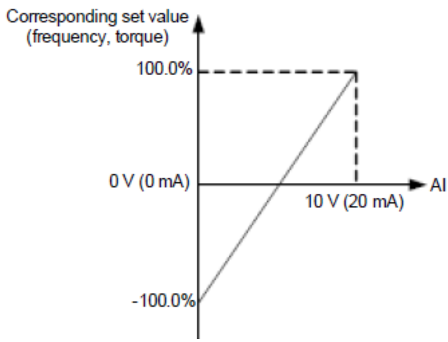
It is used to adjust the rate of change of frequency when the frequency is adjusted by means of terminal UP/DOWN.

- If P0.22 (Frequency reference resolution) is 2, the setting range is 0.001-65.535 Hz/s.
- If P0.22 (Frequency reference resolution) is 1, the setting range is 0.01-655.35 Hz/s.

P4.13	AI curve 1 minimum input	0.00V~P4.15	0.00V	☆
P4.14	AI curve 1 minimum input percentage	-100.00%~100.0%	0.0%	☆
P4.15	AI curve 1 maximum input	P4.13~10.00V	10.00V	☆
P4.16	AI curve 1 maximum input percentage	-100.00%~100.0%	100.0%	☆
P4.17	AI1 filter time	0.00s~10.00s	0.10s	☆

These parameters are used to define the relationship between analog input voltage and the corresponding setting. When the analog input voltage exceeds the maximum value (P4.15), the maximum value is used. When the analog input voltage is less than the minimum value (P4.13), the value set in P4.34 (Setting for AI less than minimum input) is used.





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

P4.17 (AI1 filter time) is used to set the software filter time of AI1. If the analog input is liable to interference, increase the value of this parameter to stabilize the detected analog input. However, increase of the AI filter time will slow the response of analog detection. Set this parameter properly based on actual conditions.

Graph on the right are two typical setting examples:

P4.18	AI curve 2 minimum input	0.00V~P4.20	0.00V	☆

P4.19	AI curve 2 minimum input percentage	-100.00%~100.0%	0.0%	☆
P4.20	AI curve 2 maximum input	P4.18~10.00V	10.00V	☆
P4.21	AI curve 2 maximum input percentage	-100.00%~100.0%	100.0%	☆
P4.22	AI2 filter time	0.00s~10.00s	0.10s	☆
P4.23	AI curve 3 minimum input	-10.00V~P4.25	0.10V	☆
P4.24	AI curve 3 minimum input percentage	-100.0%~100.0%	0.0%	☆
P4.25	AI curve 3 maximum input	P4.23~10.00V	4.00V	☆
P4.26	AI curve 3 maximum input percentage	-100.0%~100.0%	100.0%	☆
P4.27	AI3 filter time	0.00s~10.00s	0.10s	☆

These settings are same as AI curve 1 settings.

P4.33	AI curve selection	One’s place	AI1 curve selection	321	☆
		Curve 1 (2 points, see P4-13 to P4-16)	1		
		Curve 2 (2 points, see P4-13 to P4-16)	2		
		Curve 3 (2 points, see P4-13 to P4-16)	3		
		Ten’s place	AI2 curve selection		
		Curve 1 (2 points, see P4-13 to P4-16)	1		
		Curve 2 (2 points, see P4-13 to P4-16)	2		
		Curve 3 (2 points, see P4-13 to P4-16)	3		
		Hundred’s place	AI3 curve selection		
		Curve 1 (2 points, see P4-13 to P4-16)	1		
		Curve 2 (2 points, see P4-13 to P4-16)	2		
		Curve 3 (2 points, see P4-13 to P4-16)	3		

The one's place, ten's place and hundred's place of this parameter are respectively used to select the corresponding curve of AI1, AI2 and AI3. Any of the 3 curves can be selected for AI1, AI2 and AI3.

P4.34	Setting for AI less than minimum input	One’s place	AI1 setting	000	☆
		Minimum value	0		
		0.0%	1		
		Ten’s place	AI2 setting		
		Minimum value	0		
		0.0%	1		
		Hundred’s place	AI3 setting		
		Minimum value	0		
		0.0%	1		

This parameter is used to determine the corresponding setting when the analog input voltage is less than the minimum value. The unit's digit, ten's digit and hundred's digit of this parameter respectively correspond to the setting for AI1, AI2 and AI3.

If the value of a certain digit is 0, when analog input voltage is less than the minimum input, the corresponding setting of the minimum input (P4.14, P4.19, P4.24) is used.

If the value of a certain digit is 1, when analog input voltage is less than the minimum input, the corresponding value of this analog input is 0.0%.

P4.35	DI1 delay time	0.0s~3600.0s	0.0s	★
P4.36	DI2 delay time	0.0s~3600.0s	0.0s	★
P4.37	DI3 delay time	0.0s~3600.0s	0.0s	★

These parameters are used to set the delay time of the inverter when the status of DI terminals changes. Currently, only DI1, DI2 and DI3 support the delay time function.

P4.38	DI level selection 1	One's place	DI1 level selection	00000	★
		High level valid		0	
		Low level valid		1	
		Ten's place	DI2 level selection		
		High level valid		0	
		Low level valid		1	
		Hundred's place	DI3 level selection		
		High level valid		0	
		Low level valid		1	
		Thousand's place	DI4 level selection		
		High level valid		0	
		Low level valid		1	
P4.39	DI level selection 2	One's place	DI6 level selection	00000	★
		High level valid		0	
		Low level valid		1	

4.7 Output terminals: P5.00-P5.22

DLA1 provides one analog output (AO) terminals, one digital output (DO) terminal, and one relay terminal.

Code	Description	Setting range	Def	Res
P5.02	Relay 1 function (TA1-TB1-TC1)	0-41	2	☆
P5.04	DO1 function selection (open-collector output)	0-41	1	☆
P5.05	DO2 function selection (open-collector output)	0-41	4	☆

These five parameters are used to select the functions of the five digital output terminals. TA1-TB1-TC1and PA1-PB1-PC1are respectively the relays on the control board and the extension card.

The functions of the output terminals are described in the following table.

Value	Function	Description
0	No output	The terminal has no function.
1	Inverter running	When the inverter is running and has output frequency (can be zero), the terminal becomes ON.
2	Fault output (stop)	When the Inverter stops due to a fault, the terminal becomes ON.
3	Frequency-level detection FDT1 output	Refer to the descriptions of P8.19 and P8.20.
4	Frequency reached	Refer to the descriptions of P8.21.
5	Zero-speed running (no output at stop)	If the inverter runs with the output frequency of 0, the terminal becomes ON. If the Inverter is in the stop state, the terminal becomes OFF.
6	Motor overload pre-warning	The inverter judges whether the motor load exceeds the overload pre-warning threshold before performing the protection action. If the pre-warning threshold is exceeded, the terminal becomes ON. For motor overload parameters, see the descriptions of P9.00 to P9.02.
7	Inverter overload pre-warning	The terminal becomes ON 10s before the inverter overload protection action is performed.
8	Set count value reached	The terminal becomes ON when the count value reaches the value set in PB.08.
9	Designated count value reached	The terminal becomes ON when the count value reaches the value set in PB.09.
10	Length reached	The terminal becomes ON when the detected actual length exceeds the value set in PB.05.
11	PLC cycle completed	When simple PLC completes one cycle, the terminal outputs a pulse signal with width of 250 ms.
12	Accumulative running time reached	If the accumulative running time of the Inverter exceeds the time set in P8.17, the terminal becomes ON.

13	Frequency limited	If the set frequency exceeds the frequency upper limit or lower limit and the output frequency of the inverter reaches the upper limit or lower limit, the terminal becomes ON.
14	Torque limited	In speed control mode, if the output torque reaches the torque limit, the inverter enters stall protection state and meanwhile the terminal becomes ON.
15	Ready for RUN	If the inverter main circuit and control circuit power becomes stable, and the inverter detects no fault and is ready for RUN, the terminal becomes ON.
16	AI1 larger than AI2	When the input of AI1 is larger than the input of AI2, the terminal becomes ON.
17	Frequency upper limit reached	If the running frequency reaches the upper limit, the terminal becomes ON.
18	Frequency lower limit reached (no output at stop)	If the running frequency reaches the lower limit, the terminal becomes ON. In the stop state, the terminal becomes OFF.
19	Under voltage state output	If the inverter is in under voltage state, the terminal becomes ON.
20	Communication setting	Refer to the communication protocol.
21	Reserved	Reserved.
22	Reserved	Reserved.
23	Zero-speed running 2 (having output at stop)	If the output frequency of the inverter is 0, the terminal becomes ON. In the state of stop, the signal is still ON.
24	Accumulative power-on time reached	If the inverter accumulative power-on time (P7.13) exceeds the value set in P8.16, the terminal becomes ON.
25	Frequency level detection FDT2 output	Refer to the descriptions of P8.28 and P8.29.
26	Frequency 1 reached	Refer to the descriptions of P8.30 and P8.31.
27	Frequency 2 reached	Refer to the descriptions of P8.32 and P8.33.
28	Current 1 reached	Refer to the descriptions of P8.38 and P8.39.
29	Current 2 reached	Refer to the descriptions of P8.40 and P8.41.
30	Timing reached	If the timing function (P8.42) is valid, the terminal becomes ON after the current running time of the inverter reaches the set time.

31	AI1 input limit exceeded	If AI1 input is larger than the value of P8.46 (AI1 protection upper limit) or lower than the value of P8.45 (AI1 protection lower limit), the terminal becomes ON.
32	Load becoming 0	If the load becomes 0, the terminal becomes ON.
33	Reverse running	If the inverter is in the reverse running state, the terminal becomes ON.
34	Zero current state	Refer to the descriptions of P8.34 and P8.35.
35	Module temperature reached	If the heatsink temperature of the inverter module (P7.07) reaches the set module temperature threshold (P8.47), the terminal becomes ON.
36	Software current limit exceeded	Refer to the descriptions of P8.36 and P8.37.
37	Frequency lower limit reached (having output at stop)	If the running frequency reaches the lower limit, the terminal becomes ON. In the stop state, the signal is still ON.
38	Warning output	If a fault occurs on the inverter but the inverter continues to run, this signal outputs.
39	Motor overheat pre-warning	If the motor temperature reaches the temperature set in P9.58 (Motor overheat warning threshold), the terminal becomes ON. You can view the motor temperature by using d0.34.
40	Current running time reached	If the current running time of inverter exceeds the value of P8.53, the terminal becomes ON.
41	Fault output	Fault of coast to stop. No output at under voltage.

P5.07	AO1 output selection	0-16	0	☆

Value	Function	Description
0	Running frequency	0 to maximum output frequency
1	Set frequency	0 to maximum output frequency
2	Output current	0 to 2 times of motor rated current
3	Output torque	0 to 2 times of motor rated torque
4	Output power	0 to 2 times of rated power
5	Output voltage	0 to 1.2 times of inverter rated voltage
6	Pulse input	0.01-100.00kHz
7	AI1	0-10V (or 0-20 mA)
8	AI2	0-10V (or 0-20 mA)
9	AI3	0-10V (or 0-20 mA)
10	Length	0 to maximum set length

11	Count value	0 to maximum count value
12	Communication setting	0.0%-100.0%
13	Motor rotational speed	0 to rotational speed corresponding to maximum output frequency
14	Output current	0.0-1000.0A
15	Output voltage	0.0-1000.0V
16	Output torque (actual value)	-2 times of motor rated torque ~ +2 times of motor rated torque

P5.10	AO1 zero offset coefficient	-100.0%~+100.0%	0.0%	☆
P5.11	AO1 gain	-10.00~+10.00	1.00	☆

P5.10~P5.11 are used to correct the zero drift of analog output and the output amplitude deviation. They can also be used to define the desired AO curve.

If "b" represents zero offset, "k" represents gain, "Y" represents actual output, and "X" represents standard output, the actual output is: $Y = kX + b$. The zero offset coefficient 100% of AO1 corresponds to 10V (or 20mA). The standard output refers to the value corresponding to the analog output of 0 to 10V (or 0 to 20mA) with no zero offset or gain adjustment.

For example, if the analog output is used as the running frequency, and it is expected that the output is 8V (Y)when the frequency is 0 and 3V at the maximum frequency, the gain shall be set to -0.50 (k), and the zero offset (b) shall be set to 80%.

P5.18	Relay 1 output delay time	0.0s~3600.0s	0.0s	☆
P5.20	DO1 output delay time	0.0s~3600.0s	0.0s	☆

P5.22	DO logic selection	One's place	FMR logic selection	00000	☆
		Positive logic		0	
		Negative logic		1	
		Ten's place	RELAY 1 logic selection		
		Positive logic		0	
		Negative logic		1	
		Hundred's place	RELAY 2 logic selection		
		Positive logic		0	
		Negative logic		1	
		Thousand's place	DO1 logic selection		
		Positive logic		0	
		Negative logic		1	
		Ten thousand's place	DO2 logic selection		
		Positive logic		0	
		Negative logic		1	

0: Positive logicThe output terminal is valid when being connected with COM, and invalid when being disconnected from COM.
1: Negative logic
The output terminal is invalid when being connected with COM, and valid when being disconnected from COM.

4.8 Start/stop control: P6.00-P6.15

Code	Description	Setting range		Def	Res
P6.00	Start mode	Direct start	0	0	☆
		Speed tracking	1		
		Pre-excited start	2		

0: Direct start
-If the startup DC braking time is set to 0, the inverter starts to run from the startup frequency.
-If the startup DC braking time is not 0, the inverter performs DC braking first and then starts to run from the startup frequency. It is applicable to small-inertia load application where the motor is likely to free rotate at startup.

1: Speed tracking
The inverter judges the rotational speed and direction of the motor first and then starts from the tracked frequency. Such smooth start has no impact on the rotating motor. It is applicable to the restart upon instantaneous power failure of large-inertia load. To ensure the performance of rotational speed tracking restart, set the motor parameters in group P1 correctly.

2: Pre-excited start
It is valid only for asynchronous motor and used for building the magnetic field before the motor runs. For pre-excited current and pre-excited time, see parameters of P6.05 and P6.06.
-If the pre-excited time is 0, the inverter cancels pre-excitation and starts from startup frequency.
-If the pre-excited time is not 0, the inverter pre-excites first before startup, improving the dynamic response of the motor.

Code	Description	Setting range		Def	Res
P6.01	Speed tracking mode	From frequency at stop	0	0	★
		From industrial frequency	1		
		From maximum frequency	2		

To complete the rotational speed tracking process within the shortest time, select the proper mode in which the Inverter tracks the motor rotational speed.

0: From frequency at stop: It is the most common mode.
1: From zero frequency: It is applicable to restart after a long time of power failure.
2: From the maximum frequency: It is applicable to power-generating loads.

Code	Description	Setting range	Def	Res
P6.02	Speed tracking rate	1~100	20	☆

The larger this value is, the faster the tracking is. However, too large may cause unreliable tracking.

Code	Description	Setting range	Def	Res
P6.03	Startup frequency	0.00Hz~10.00Hz	0.00Hz	☆
P6.04	Startup frequency holding time	0.0s~100.0s	0.0s	★

To ensure the motor torque at inverter startup, set a proper startup frequency. In addition, to build excitation when the motor starts up, the startup frequency must be held for a certain period.

The startup frequency (P6.03) is not restricted by the frequency lower limit. If the target (digital setting) frequency is lower than the startup frequency, the inverter will not start and stays in the standby state.

During switchover between forward rotation and reverse rotation, the startup frequency holding time is disabled. The holding time is not included in the acceleration time but in the running time of simple PLC.

Example 1:
P0.03 = 0 The frequency source is digital setting.
P0.08 = 2.00Hz The digital setting frequency is 2.00 Hz.
P6.03 = 5.00Hz The startup frequency is 5.00 Hz.
P6.04 = 2.0s The startup frequency holding time is 2.0s.

In this example, the Inverter stays in the standby state and the output frequency is 0.00 Hz.

Example 2:
P0.03 = 0 The frequency source is digital setting.
P0.08 = 10.00Hz The digital setting frequency is 10.00 Hz.
P6.03 = 5.00Hz The startup frequency is 5.00 Hz.
P6.04 = 2.0s The startup frequency holding time is 2.0s.

In this example, the inverter accelerates to 5.00 Hz, and then accelerates to the set frequency 10.00Hz after 2s.

P6.05	Startup DC braking current/Pre-excited current	0%~100%	0%	★
P6.06	Startup DC braking time/Pre-excited time	0.0s~100.0s	0.0s	★

Startup DC braking is generally used during restart of the inverter after motor stops. Pre-excitation is used to make the inverter build magnetic field before startup to improve the responsiveness.

Startup DC braking is valid only for direct start (P6.00 = 0). In this case, the inverter performs DC braking at the set startup DC braking current. After the startup DC braking time, the inverter starts to run. If the startup DC braking time is 0, the inverter starts directly without DC braking. The larger the startup DC braking current is, the larger the braking force is.

If the startup mode is pre-excited start (P6.00 = 3), the inverter builds magnetic field based on the pre-excited current. After the pre-excited time, the inverter starts to run. If the pre-excited time is 0, the inverter starts directly without pre-excitation.

The startup DC braking current or pre-excited current is a percentage relative to the base value.

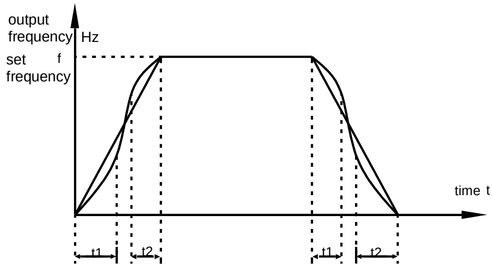
• If the motor rated current is less than or equal to 80% of the inverter rated current, the base value is the motor rated current.

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

P6.07	Acceleration/ Deceleration mode	Linear acceleration/deceleration	0	0	★
		S-curve acceleration/deceleration A	1		
		S-curve acceleration/deceleration B	2		

0: Linear acceleration/deceleration.
The output frequency increases or decreases in linear mode. The DLA1 provides four group of acceleration/deceleration time, which can be selected by using P4.00 to P4.08.

1: S-curve acceleration/deceleration A
The output frequency increases or decreases along the S curve. This mode is applicable where start and stop processes needs to be smooth, such as elevator and conveyor belt. P6.08 and P6.09 respectively define the time proportions of the start segment and the end segment.

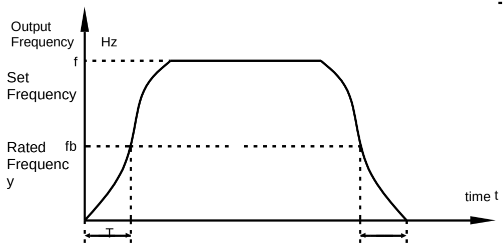


Graph4-11 S-curve acceleration/deceleration A

2: S-curve acceleration/deceleration B
In this curve, the motor rated frequency f_b is always the inflexion point. This mode is applicable where faster acceleration/deceleration is required above rated frequency. When the set frequency is higher than the rated frequency, the acceleration/ deceleration time is:

$$t = [(4/9) * (f/ f_b)^2+5/9] * T$$

f is set frequency;
f_b is motor rated frequency;
T is the acceleration time from 0 Hz to f_b.



Graph4.12 S-curve acceleration/deceleration B

P6.08	Time proportion of S-curve start segment	0.0%~ (100.0%-P6.09)	30.0%	★
P6.09	Time proportion of S-curve end segment	0.0%~ (100.0%-P6.08)	30.0%	★

P6.08+P6.09≤100.0%

P6.10	Stop mode	Decelerate to stop	0	0	☆
		Coast to stop	1		

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

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

P6.11	Stop DC braking initial frequency	0.00Hz~ maximum frequency	0.00Hz	☆
P6.12	Stop DC braking waiting time	0.0s~36.0s	0.0s	☆
P6.13	Stop DC braking current	0%~100%	0%	☆
P6.14	Stop DC braking time	0.0s~100.0s	0.0s	☆

- P6.11 (Stop DC braking initial frequency)

During the process of decelerating to stop, the inverter starts DC braking when the running frequency is lower than the value set in P6.11.

- P6.12 (Stop DC braking waiting time)

When the running frequency decreases to the initial frequency of stop DC braking, the inverter stops output for a certain period and then starts DC braking. This prevents faults such as overcurrent caused due to DC braking at high speed.

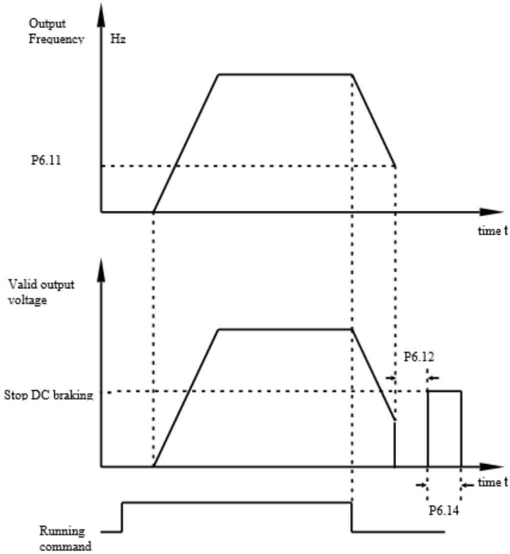
- P6.13 (Stop DC braking current)

This specifies the output current at DC braking and is a percentage relative to the base value.

  - If the motor rated current is less than or equal to 80% of the inverter rated current, the base value is the motor rated current.
  - If the motor rated current is greater than 80% of the inverter rated current, the base value is 80% of the inverter rated current.

- P6.14 (Stop DC braking time)

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



P6.15	Brake use ratio	0%~100%	100%	☆

It is valid only for the inverter with internal braking unit and is used to adjust the duty ratio of the braking unit. The larger this value, the better the braking result. However, too large value causes great fluctuation of the inverter bus voltage during the braking process.

4.9 Keyboard and display: P7.00-P7.14

Code	Description	Setting range		Def	Res
P7.01	DIR/JOG key	DIR/JOG disabled	0	0	★
		Switchover between keyboard control and terminal/communication control	1		
		Switchover between forward rotation and reverse rotation	2		
		Forward JOG	3		
		Reverse JOG	4		

DIR/JOG key is a multifunctional key.

0: DIR/JOG key disabled
This key is disabled.

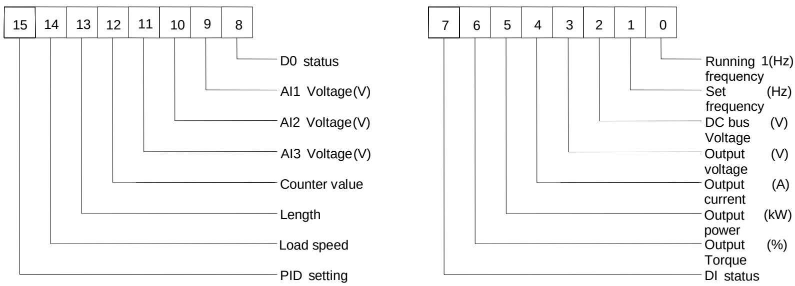
1: Switchover between keyboard control and terminal/communication control
You can perform switchover from the current command source to the keyboard control (local operation). If the current command source is keyboard control, this key is invalid.

2: Switchover between forward rotation and reverse rotation
You can change the direction of the frequency reference by using the DIR/JOG key. It is valid only when the current command source is keyboard control.

3: Forward JOG
You can perform forward JOG (FJOG) by using the DIR/JOG key.

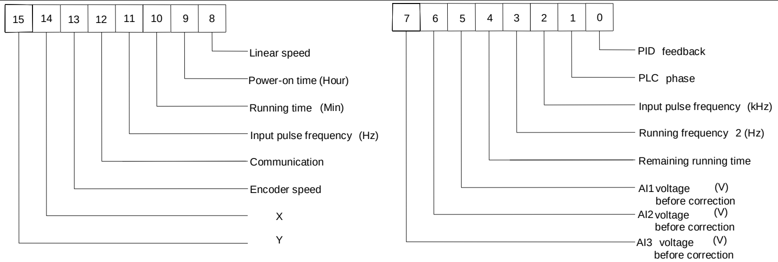
4: Reverse JOG
You can perform reverse JOG (FJOG) by using the DIR/JOG key.

P7.02	STOP/RESET key	Valid only in keyboard control	0	1	☆
		Valid in any operation mode	1		
P7.03	Running state display 1	0000~FFFF		1F	☆



If a parameter needs to be displayed at running, set the corresponding bit to 1, and set P7.03 to the hexadecimal equivalent of the binary number.

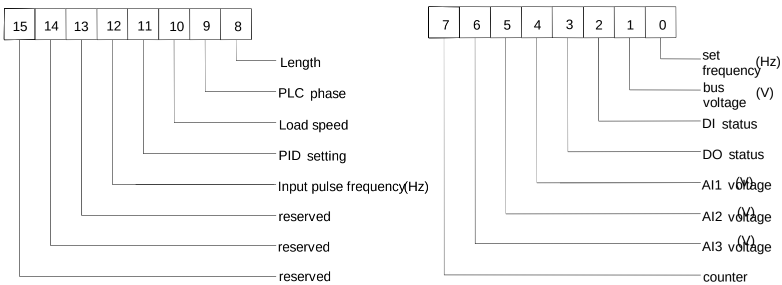
P7.04	Running state display 2	0000~FFFF	0	☆



If a parameter needs to be displayed at running, set the corresponding bit to 1, and set P7.04 to the hexadecimal equivalent of the binary number.

These two parameters are used to set the parameters that can be viewed when the inverter is in the running state. You can view a maximum of 32 running state parameters that are displayed starting from the lowest bit of P7.03.

P7.05	Stop state display	0000~FFFF	33	☆



If a parameter needs to be displayed at running, set the corresponding bit to 1, and set P7.04 to the hexadecimal equivalent of the binary number.

P7.06	Load speed display coefficient	0.0001~6.5000	1.0000	☆

This parameter is used to adjust the relationship between the output frequency of the inverter and the load speed. For details, see the description of P7.12.

P7.07	Heatsink temperature of inverting module	0.0°C~100.0°C	12°C	●

It is used to display the insulated gate bipolar transistor (IGBT) temperature of the inverter, and the IGBT overheat protection value of the inverter module depends on the model.

P7.08	Rectification module temperature	0.0°C~100.0°C	0°C	●
P7.09	Accumulative running time	0h~65535h	0h	●

It is used to display the accumulative running time of the inverter. After the accumulative running time reaches the value set in P8.17, the terminal with the digital output function 12 becomes ON.

P7.10	Product number	Inverter product number	-	●
P7.11	Software version	Software version of control board	-	●

P7.12	Number of decimal places for load speed display	One's Place		21	☆
		0 decimal place	0		
		1 decimal place	1		
		2 decimal place	2		
		3 decimal place	3		
		Ten's Place			
		1 decimal place	1		
		2 decimal place	2		

One's Place:
P7.12 is used to set the number of decimal places for load speed display. The following gives an example to explain how to calculate the load speed:

If P7.06 (Load speed display coefficient) is 2.000 and P7.12 one's place is 2. When the running frequency of the inverter is 40.00 Hz, the load speed is 40.00 x 2.000 = 80.00 (display of 2 decimal places).

If the inverter is in the stop state, the load speed is the speed corresponding to the set frequency, namely, "set load speed". If the set frequency is 50.00Hz, the load speed in the stop state is 50.00 x 2.000 = 100.00 (display of 2 decimal places).

Ten's place:
1: d0.19/d0.29 are both displayed by one decimal point;
2: d0.19/d0.29 are both displayed by two decimal points.

P7.13	Accumulative power-on time	0h~65535h	-	●

It is used to display the accumulative power-on time of the inverter since use. If the time reaches the set power-on time (P8.17), the terminal with the digital output function 24 becomes ON.

P7.14	Accumulative power consumption	0~65535 kWh	-	●

It is used to display the accumulative power consumption of the Inverter until now.

4.10 Auxiliary functions: P8.00-P8.54

Code	Description	Setting range	Def	Res
P8.00	JOG running frequency	0.00Hz~ maximum frequency	2.00Hz	☆
P8.01	JOG acceleration time	0.0s~6500.0s	20.0s	☆
P8.02	JOG deceleration time	0.0s~6500.0s	20.0s	☆

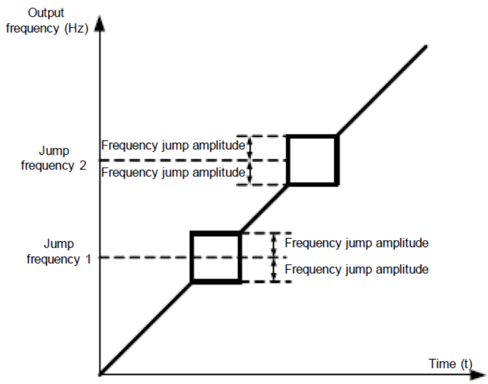
These parameters are used to define the set frequency and acceleration/deceleration time of the inverter when Jogging. The startup mode is "Direct start" (P6.00 = 0) and the stop mode is "Decelerate to stop" (P6.10 = 0) during jogging.

Code	Description	Setting range	Def	Res
P8.03	Acceleration time 2	0.0s~6500.0s	10.0s	☆
P8.04	Deceleration time 2	0.0s~6500.0s	10.0s	☆
P8.05	Acceleration time 3	0.0s~6500.0s	10.0s	☆
P8.06	Deceleration time 3	0.0s~6500.0s	10.0s	☆
P8.07	Acceleration time 4	0.0s~6500.0s	10.0s	☆
P8.08	Deceleration time 4	0.0s~6500.0s	10.0s	☆

The DLA1 provides a total of four groups of acceleration/deceleration time. P0.17 and P0.18 are the first group. Definitions of four groups are the same. You can switch over between the four groups through different combinations of DI terminals. For more details, see P4.01 to P4.05.

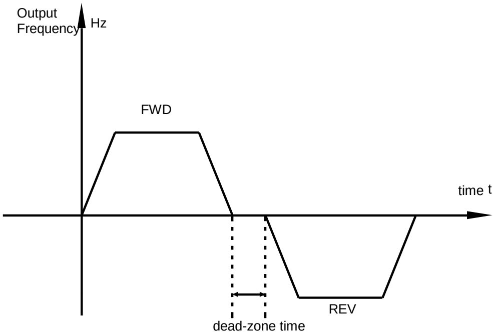
Code	Description	Setting range	Def	Res
P8.09	Jump frequency 1	0.00Hz~ maximum frequency	0.00Hz	☆
P8.10	Jump frequency 2	0.00Hz~ maximum frequency	0.00Hz	☆
P8.11	Frequency jump amplitude	0.00Hz~ maximum frequency	0.00Hz	☆

If the set frequency is within the frequency jump range, the actual running frequency is the jump frequency nearby. Setting jump frequency helps to avoid the mechanical resonance point of the load. DLA1 supports two jump frequencies. If both are set to 0, the frequency jump function is disabled. The principle of the jump frequencies and jump amplitude is shown in the following figure.



Code	Description	Setting range	Def	Res
P8.12	FWD/REV dead-zone time	0.00s~3000.0s	0.0s	☆

It is used to set the time when the output is 0 Hz at transition of the inverter forward rotation or reverse rotation, as shown in the following figure.



P8.13	Reverse control	Enabled	0	0	☆
		Disabled	1		

It is used to set whether the inverter allows reverse rotation. In the applications where reverse rotation is prohibited, set this parameter to 1.

P8.14	Running mode when set frequency lower than frequency lower limit	Run at lower limit	0	0	☆
		Stop (need start)	1		
		Run at zero speed	2		

This is to set the inverter running mode when the set frequency is lower than frequency lower limit.

P8.15	Droop control rate	0.00Hz~10.00Hz	0.00Hz	☆

Droop control allows for slight speed differences between master and slaves so as to avoid conflicts. The default value is 0.00Hz. Droop control is only needed when both master and slave are using speed control. Please fine tune to find the most appropriate droop control value.
Please do not set P8.15 too large; otherwise when load is large, steady state speed will drop. Both master and slave need to set droop control rates.
Droop speed = synchronous frequency * torque output * (P8.15/10)
For example, P8.15=1.00, synchronous frequency is 50Hz, torque output is 50%; then inverter actual frequency is 50 – 50*(50%)*(1.00/10) =47.5Hz

P8.16	Accumulative power-on time threshold	0h~65000h	0h	☆

If the accumulative power-on time (P7.13) reaches the value set in this parameter, the corresponding DO terminal becomes ON.
For example, combining DI/DO functions, to implement the function that the inverter reports an alarm when the actual accumulative power-on time reaches the threshold of 100 hours, perform the setting as follows:
1) Set DI1 to user-defined fault 1: P4.00 = 44.
3) Set DO1 to power-on time reached: P5.04 = 24.
4) Set the accumulative power-on time threshold to 100h: P8.16 = 100h.
Then, the inverter outputs 26=E.ArA when the accumulative power-on time reaches 100 hours.

P8.17	Accumulative running time threshold	0h~65000h	0h	☆

It is used to set the accumulative running time threshold of the Inverter. If the accumulative running time (P7.09) reaches the value set in this parameter, the corresponding DO terminal becomes ON.

P8.18	Startup protection	No	0	0	☆
		Yes	1		

This parameter is used to set whether to enable the safety protection. If it is set to 1, the inverter does not respond to the still valid run command upon inverter power-on (for example, an input terminal is ON before power-on). The inverter responds only after the run command is cancelled and becomes valid again.

In addition, the inverter does not respond to the still valid run command upon fault reset. The run protection can be disabled only after the run command is cancelled.

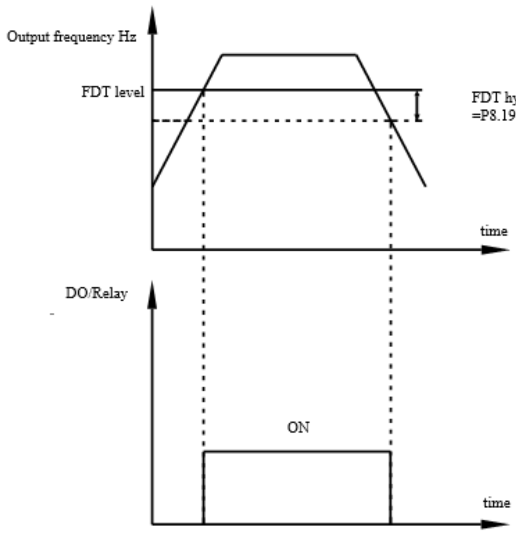
In this way, the motor can be protected from responding to run commands upon power-on or fault reset in unexpected conditions.

P8.19	Frequency detection value (FDT1)	0.00Hz~ maximum frequency	50.00Hz	☆
P8.20	Frequency detection hysteresis rate (FDT hysteresis 1)	0.0%~100.0% (FDT1 level)	5.0%	☆

If the running frequency is higher than the value of P8.19, the corresponding DO terminal becomes ON. If the running frequency is lower than value of P8.19, the DO terminal goes OFF

These two parameters are respectively used to set the detection value of output frequency and hysteresis value upon cancellation of the output. The value of P8.20 is a percentage of the hysteresis frequency to the frequency detection value (P8.19).

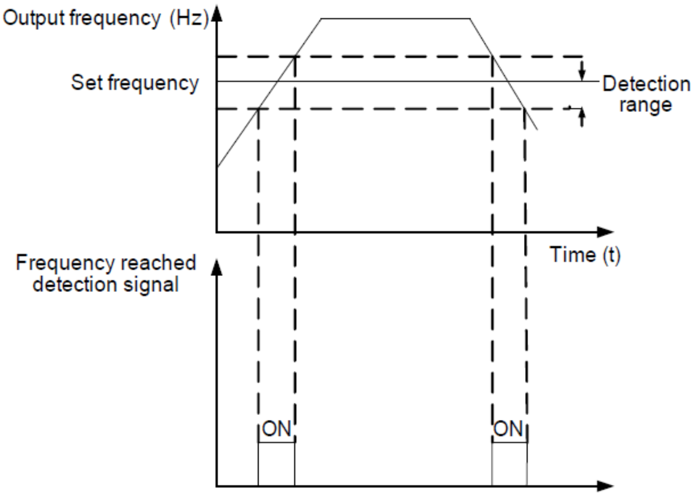
The FDT function is shown in the following figure.



P8.21	Frequency reached detection range	0~100% (maximum frequency)	0.0%	☆

If the Inverter running frequency is within this range of the set frequency, the corresponding DO terminal becomes ON.

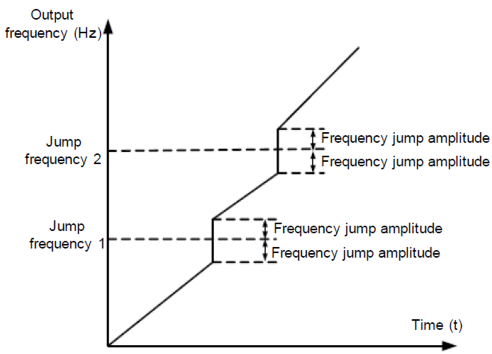
This parameter is used to set the range within which the output frequency is detected to reach the set frequency. The value of this parameter is a percentage relative to the maximum frequency. The detection range of frequency reached is shown in the following figure.



P8.22	Jump frequency validity in acceleration/deceleration	Disabled	0	0	☆
		Enabled	1		

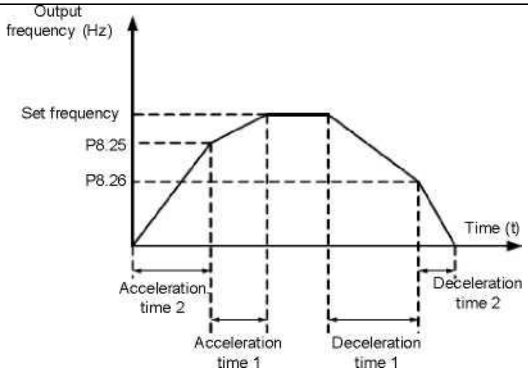
When P8.22=1, and the running frequency is within the frequency jump range, the actual running frequency will jump over the set frequency jump amplitude.

The figure shows when the jump frequencies are valid in acceleration/deceleration.



P8.25	Frequency switchover point between acceleration time 1 and acceleration time 2	0.00Hz~ maximum frequency	0.00Hz	☆
P8.26	Frequency switchover point between deceleration time 1 and deceleration time 2	0.00Hz~ maximum frequency	0.00Hz	☆

This function is valid when motor 1 is selected and acceleration/deceleration time switchover is not performed by DI terminal. It is used to select different groups of acceleration/ deceleration time based on the running frequency rather than DI terminal during the running process of the inverter.



During acceleration, if the running frequency is smaller than the value of P8.25, acceleration time 2 is selected. If the running frequency is larger than the value of P8.25, acceleration time 1 is selected.

During deceleration, if the running frequency is larger than the value of P8.26, deceleration time 1 is selected. If the running frequency is smaller than the value of P8.26, deceleration time 2 is selected.

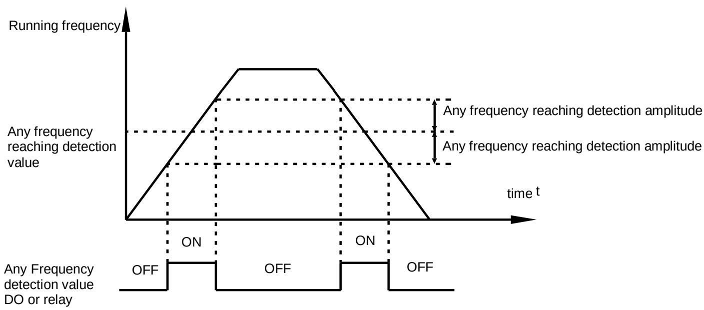
P8.27	Terminal JOG priority	Invalid	0	0	☆
		Valid	1		

If terminal JOG priority is valid, the inverter switches to terminal JOG running state when there is a terminal JOG command during the running process of the inverter.

P8.28	Frequency detection value (FDT2)	0.00Hz~ maximum frequency	50.00Hz	☆
P8.29	Frequency detection hysteresis (FDT hysteresis 2)	0.0%~100.0% (FDT2 Level)	5.0 %	☆

The frequency detection function is the same as FDT1 function. For details, refer to the descriptions of P8.19 and P8.20.

P8.30	Frequency reached detection value 1	0.00Hz~ maximum frequency	50.00Hz	☆
P8.31	Frequency reached detection amplitude 1	0.0%~100.0% (maximum frequency)	0.0%	☆
P8.32	Frequency reached detection value 2	0.00Hz~ maximum frequency	50.00Hz	☆
P8.33	Frequency reached detection amplitude 2	0.0%~100.0% (maximum frequency)	0.0%	☆

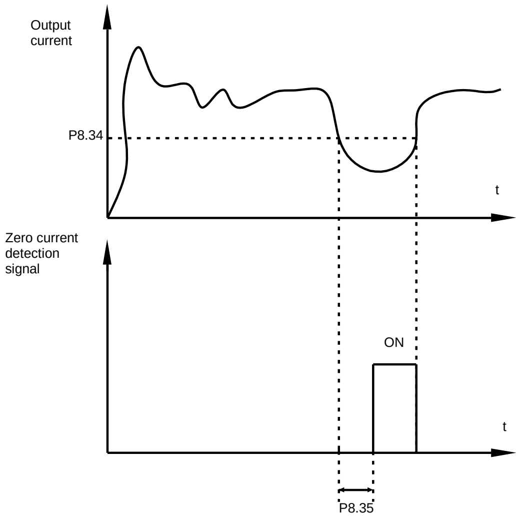


If the output frequency of the inverter is within the positive and negative amplitudes of frequency reached detection value, the corresponding DO (P5.01=26/27) becomes ON.

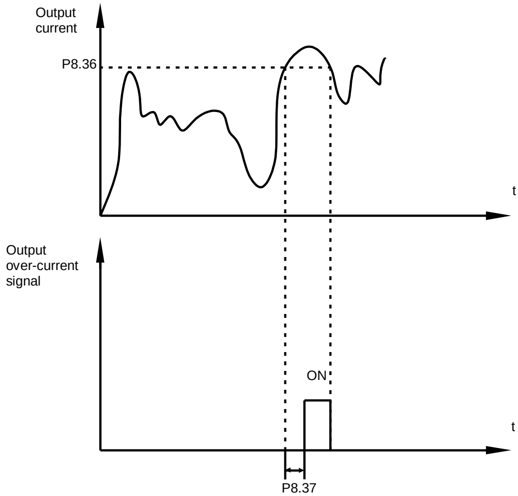
DLA1 provides two groups of frequency reached detection parameters, including frequency detection value and detection amplitude, as shown in the graph above.

P8.34	Zero current detection level	0.0%~300.0% (motor rated current)	5.0%	☆
P8.35	Zero current detection delay time	0.00s~600.00s	0.10s	☆

If the output current of the inverter is equal to or less than the zero current detection level and the duration exceeds the zero current detection delay time, the corresponding DO (P5.01=34) becomes ON. The zero current detection is shown in the following figure.



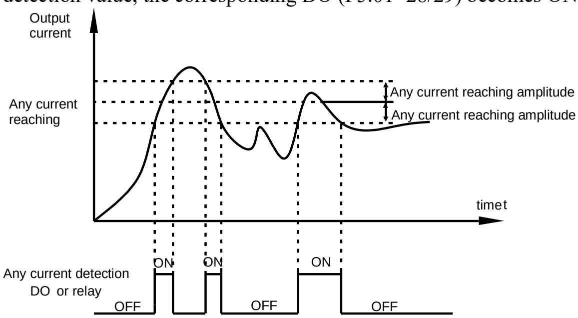
P8.36	Output over-current threshold	0.0% (No detection) 0.1%~300.0% (motor rated current)	200.0%	☆
P8.37	Output over-current detection delay time	0.00s~600.00s	0.00s	☆



If the output current of the inverter is equal to or higher than the overcurrent threshold and the duration exceeds the detection delay time, the corresponding DO (P5.01=36) becomes ON. The output overcurrent detection function is shown in the graph above.

P8.38	Current reached 1	0.0%~300.0% (motor rated current)	100.0%	☆
P8.39	Current reached amplitude 1	0.0%~300.0% (motor rated current)	0.0%	☆
P8.40	Current reached 2	0.0%~300.0% (motor rated current)	100.0%	☆
P8.41	Current reached amplitude 2	0.0%~300.0% (motor rated current)	0.0%	☆

If the output current of the inverter is within the positive and negative amplitudes of current reached detection value, the corresponding DO (P5.01=28/29) becomes ON.



P8.42	Timing function	Disabled	0	0	☆
		Enabled	1		
P8.43	Timing duration source	P8.44 setting	0	0	☆
		AI1	1		
		AI2	2		
		AI3	3		

P8.44	Timing duration	0.0Min~6500.0Min	0.0Min	☆

If P8.42 is set to 1, the inverter starts timing at startup. When the set timing duration is reached, the inverter stops automatically and meanwhile the corresponding DO (P5.01=30) becomes ON.
The inverter starts timing from 0 each time it starts up and the remaining timing duration can be queried by d0.20.
The timing duration is set in P8.43 and P8.44, in unit of minute.

P8.45	AI1 protection lower limit	0.00V~P8.46	3.10V	☆
P8.46	AI1 protection upper limit	P8.45~10.00V	6.80V	☆

These two parameters are used to set the limits of the input voltage to provide protection on the Inverter. When the AI1 input is larger than the value of P8.46 or smaller than the value of P8.45, the corresponding DO (P5.01=31) becomes ON, indicating that AI1 input exceeds the limit.

P8.47	Module temperature threshold	0.00℃~100℃	75℃	☆

When the heatsink temperature of the Inverter reaches the value of this parameter, the corresponding DO (P5.01=35) becomes ON, indicating that the module temperature reaches the threshold.

P8.49	Wakeup frequency	Dormant frequency (P8.51) ~ maximum frequency (P0.10)	0.00Hz	☆
P8.50	Wakeup delay time	0.0s~6500.0s	0.0s	☆
P8.51	Dormant frequency	0.00Hz~wakeup frequency (P8.49)	0.00Hz	☆
P8.52	Dormant delay time	0.0s~6500.0s	0.0s	☆

When the inverter is in running state, if the set frequency is lower than or equal to the dormant frequency (P8.51), the inverter enters the dormant state and stops automatically after the dormant delay time (P8.52).
When the inverter is in dormant state and the current running command is effective, if the set frequency is higher than or equal to the wakeup frequency (P8.49), the inverters starts up after the wakeup delay time (P8.50).
Generally, set the wakeup frequency equal to or higher than the dormant frequency. If the wakeup frequency and dormant frequency are set to 0, the dormant and wakeup functions are disabled.

When the dormant function is enabled, if the frequency source is PID, whether PID operation is performed in the dormant state is determined by PA.28. In this case, select PID operation enabled in the stop state (PA.28 = 1).

P8.53	Current running time reached	0.0Min~6500.0Min	0.0Min	☆

Check P5.01=40.

P8.54	Output power adjustment coefficient	0.0%~200.0%	100.0%	☆

When the output power (d0.05) is not equal to the required value, you can perform linear correction on output power by using this parameter.

4.11 Fault and protection: P9.00-P9.73

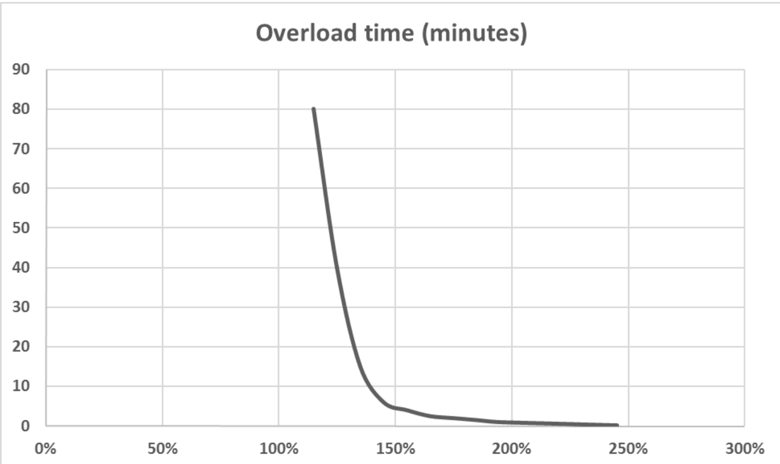
Code	Description	Setting range		Def	Res
P9.00	Motor overload protection selection	Disabled	0	1	☆
		Enabled	1		
P9.01	Motor overload protection (time) gain	0.20~10.00		1.00	☆

P9.00 = 0

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

P9.00 = 1
The inverter judges whether the motor is overloaded according to the inverse time-lag curve of the motor overload protection.
The inverse time-lag curve of the motor overload protection is:

Motor Current (percentage of motor rated current)	Overload time (minutes)
115%	80
125%	40
135%	15
145%	6
155%	4
165%	2.5
175%	2
185%	1.5
195%	1 (60s)
225%	0.5 (30s)
245%	0.17 (10s)



P9.01 can increase or decrease the overload time by linear proportions. If the value of P9.01 is set too large, damage to the motor may result because the motor overheats but the Inverter does not report the alarm.

- Example 1: Motor rated current is 100A.

If P9.01=1 (default), when motor current reaches 125% of 100A (125A) and lasts for 40 minutes, the inverter will output 11=E.oLt;
If P9.01=1.2, when motor current reaches 125% of 100A (125A) and lasts for 40*1.2=48 minutes, the inverter will output 11=E.oLt.

- Example 2: Inverters needs to output 11=E.oLt after motor running 2 minutes at 150% current.

150% (I) current is between 145% (I1) and 155% (I2); overload time should be between 6 minutes (T1) and 4 minutes (T2).

If P9.01=1 (default), T=T1+(T2-T1) * (I-I1)/(I2-I1) =4+(6-4) *(150%-145%)/ (155%-145%)=5 minutes.
To make this time to be 2 minutes, set P9.01=2/5=0.4.

P9.02	Motor overload pre-warning delay time coefficient	50%~100%	80%	☆

The inverter can give a pre-warning signal to the control system via DO or relay before motor overload protection. The larger this value is; the longer delay of the pre-warning will be.

For example, P9.01=1, P9.02=80%, when motor current reaches 145% and lasts for 4.8 minutes (80%*6), inverter will output motor overload pre-warning (P5.01=6).

P9.07	Power-on short-circuit to ground protection	Disabled	0	1	☆
		Enabled	1		

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

P9.08	Brake unit action initial voltage	700~800V	780V	☆

Requirement: 800V≥P9.08≥(1.414*Vs+30)

Vs: input voltage of inverter

P9.09	Fault auto reset times	0~20	0	☆

It is used to set the times of fault auto resets if this function is used. After the value is exceeded, the inverter will remain in the fault state.

P9.10	DO action during fault auto reset	No action	0	0	☆
		Action	1		

It is used to decide whether the DO acts during the fault auto reset if the fault auto reset function is selected.

P9.11	Time interval of fault auto reset	0.1s~100.0s	1.0s	☆

It is used to set the waiting time from the alarm of the Inverter to fault auto reset.

P9.12	Input phase loss protection	One's place	Input phase loss protection	11	☆
		Disabled		0	
		Enabled		1	
		Ten's place	Contactor energizing protection		
		Disabled		0	
		Enabled		1	

It is used to determine whether to perform input phase loss or contactor energizing protection. (Only available for DLA1 series inverter over 18.5KW models)

P9.13	Output phase loss protection selection	Disabled	0	1	☆
		Enabled	1		

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

P9.14	1st fault type	0~51	-	●
P9.15	2nd fault type	0~51	-	●
P9.16	3rd (latest) fault type	0~51	-	●

It is used to record the types of the most recent three faults of the inverter. 0 indicates no fault. For possible causes and solution of each fault, refer to Chapter 6.

Fault types:

Number	Fault display	Fault type
0	No	No fault
1	1=E.IGbt	IGBT protection
2	2=E.oCAC	Acceleration over current
3	3=E.oCdE	Deceleration over current
4	4=E.oCCo	Constant speed over current
5	5=E.oUAC	Acceleration over voltage
6	6=E.oUdE	Deceleration over voltage
7	7=E.oUCo	Constant speed over voltage
8	8=E.CPF	Control power fault
9	9=E.LU	Under voltage fault
10	10=E.oL1	Inverter overload
11	11=E.oLt	Motor overload
12	12=E.ILF	Input phase loss
13	13=E.oLF	Output phase loss
14	14=E.oH1	Module overheat
15	15=E.EIoF	External fault
16	16=E.CoF1	Communication fault
17	17=E.rECF	Contactor fault
18	18=E.HALL	Current detection fault
19	19=E.tUnE	Motor auto-tuning fault
20	20=E.PG1	Encoder fault
21	21=E.EEP	EEPROM read & write fault
22	22=E.HArd	Inverter hardware fault
23	23=E.SHot	Grounding fault
24	No	Reserved
25	No	Reserved
26	26=E.ArA	Accumulative running time reached fault
27	27=E.USt1	User defined fault 1
28	28=E.USt2	User defined fault2
29	29=E.APA	Power-on time reached
30	30=E.ULF	Load becoming 0 fault
31	31=E.PID	PID feedback lost during running
40	40=E.CbC	IGBT current limiting fault
41	41=E.tSr	Running motor switchover fault
42	42=E.SdL	Speed deviation too large
43	43=E.oSF	Motor over speed
45	45=E.oHt	Motor over heat
51	51=E.PoSF	Initial position fault

P9.17	3rd fault frequency		●

It displays the frequency when the latest fault occurs.

P9.18	3rd fault current		●

It displays the current when the latest fault occurs.

P9.19	3rd fault DC bus voltage		●

It displays the bus voltage when the latest fault occurs.

P9.20	3rd fault DI status		●

It displays the status of all DI terminals when the latest fault occurs. The sequence is as follows:

BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
DI0	DI9	DI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1

If a DI is ON, the setting is 1. If the DI is OFF, the setting is 0. The value is the equivalent decimal number converted from the DI status.

P9.21	3rd fault output status		●

It displays the status of all output terminals when the latest fault occurs. The sequence is as follows:

BIT4	BIT3	BIT2	BIT1	BIT0
DO2	DO1	REL2	REL1	FMP

If an output terminal is ON, the setting is 1. If the output terminal is OFF, the setting is 0. The value is the equivalent decimal number converted from the DI statuses

P9.22	3rd fault inverter status	Reserved	●
P9.23	3rd fault power-on time		●
It displays the present power-on time when the latest fault occurs.			
P9.24	3rd fault running time		●
It displays the present running time when the latest fault occurs.			
P9.27	2nd fault frequency		●
It displays the frequency when the 2nd fault occurs.			
P9.28	2nd fault current		●
It displays the current when the 2nd fault occurs.			
P9.29	2nd fault DC bus voltage		●
It displays the bus voltage when the 2nd fault occurs.			
P9.30	2nd fault DI status		●
Refer to P9.20			
P9.31	2nd fault output status		●
Refer to P9.21			
P9.32	2nd fault inverter status	Reserved	●
P9.33	Power-on time upon 2nd fault		●
It displays the present power-on time when the 2nd fault occurs.			
P9.34	2nd fault running time		●
It displays the present running time when the 2nd fault occurs.			
P9.37	1st fault frequency		●
It displays the frequency when the latest 1st occurs.			
P9.38	1st fault current		●
It displays the current when the 1st fault occurs.			
P9.39	1st fault DC bus voltage		●
It displays the bus voltage when the 1st fault occurs.			

P9.40	1st fault DI status		●
Refer to P9.20			
P9.41	1st fault output status		●
Refer to P9.21			
P9.42	1st fault inverter status	Reserved	●
P9.43	1st fault power-on time		●
It displays the present power-on time when the 1st fault occurs.			
P9.44	1st fault running time		●
It displays the present running time when the 1st fault occurs.			

P9.47	Protection action 1	One's place	11=E.oLt	Motor overload	00000	☆
		Coast to stop			0	
		Stop by stop mode selection			1	
		Resume running			2	
		Ten's place	12=E.ILF	Input phase loss		
		Coast to stop			0	
		Stop by stop mode selection			1	
		Resume running			2	
		Hundred's place	13=E.oLF	Output phase loss		
		Coast to stop			0	
		Stop by stop mode selection			1	
		Resume running			2	
		Thousand's place	15=E.EIoF	External fault		
		Coast to stop			0	
		Stop by stop mode selection			1	
		Resume running			2	
		Ten thousand's place	16=E.CoF1	Communication fault		
		Coast to stop			0	
		Stop by stop mode selection			1	

P9.48	Protection action 2	One's place	20=E.PG1	Encoder disk fault	00000		☆
		Coast to stop			0		
		Switch to V/F control, stop by stop mode selection			1		
		Switch to V/F control, resume running			2		
		Ten's place	21=E.EEP	EEPROM read & write fault			
		Coast to stop			0		
		Stop by stop mode selection			1		
		Hundred's place	Reserved				
		Thousand's place	45=E.oHt	Motor over heat			
		Coast to stop			0		
		Stop by stop mode selection			1		
		Resume running			2		
		Ten thousand's place	26=E.ArA	Accumulative running time reached fault			
		Coast to stop			0		
		Stop by stop mode selection			1		
		Resume running			2		
P9.49	Protection action 3	One's place	27=E.USt1	User defined fault 1	00000		☆
		Coast to stop			0		
		Stop by stop mode selection			1		
		Resume running			2		
		Ten's place	28=E.USt2	User defined fault2			
		Coast to stop			0		
		Stop by stop mode selection			1		
		Resume running			2		
		Hundred's place	29=E.APA	Power-on time reached			
		Coast to stop			0		
		Stop by stop mode selection			1		
		Resume running			2		
		Thousand's place	30=E.ULF	Load becoming 0 fault			
		Coast to stop			0		
		Stop by stop mode selection			1		
		Decelerate to 7% motor rated frequency. Resume running. If load becomes not 0, go back to set frequency.			2		
		Ten thousand's place	31=E.PID	PID feedback lost during running			
		Coast to stop			0		
		Stop by stop mode selection			1		
		Resume running			2		

P9.50	Protection action 4	One's place	42=E.SdL	Speed deviation too large		00000	☆
		Coast to stop			0		
		Stop by stop mode selection			1		
		Resume running			2		
		Ten's place	43=E.oSF	Motor over speed			
		Coast to stop			0		
		Stop by stop mode selection			1		
		Resume running			2		
		Hundred's place	51=E.PoSF	Initial position fault			
		Coast to stop			0		
		Stop by stop mode selection			1		
		Resume running			2		
		Thousand's place	Reserved				
		Ten thousand's place	Reserved				

If "Coast to stop" is selected, the inverter displays E.**** and directly stops.
If "Stop by stop mode" is selected, the inverter displays A.**** and stops according to the stop mode. After stop, the inverter displays E.****.
If "Resume running" is selected, the inverter continues to run and displays A.****. The running frequency is set in P9.54.

P9.54	Frequency selection for resuming running upon fault	Current running frequency	0	0	☆
		Set frequency	1		
		Frequency upper limit	2		
		Frequency lower limit	3		
		Backup frequency upon abnormality	4		
P9.55	Backup frequency upon abnormality	60.0%~100.0%		100.0%	☆

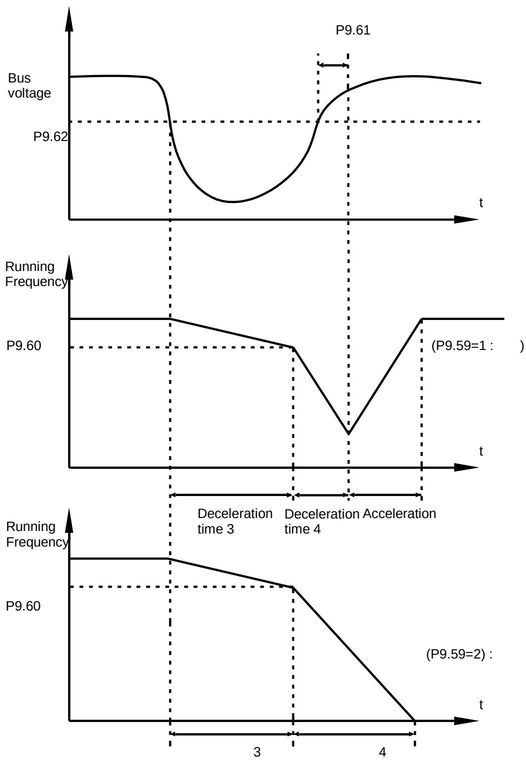
If a fault occurs during the running of the inverter and the handling of fault is set to "resume running", the inverter displays A.** and continues to run at the frequency set in P9.54.
The setting of P9.55 is a percentage relative to the maximum frequency.

P9.56	Motor temperature sensor type	No temperature sensor	0	0	☆
		PT100	1		
		PT1000	2		
P9.57	Motor overheat protection threshold	0°C~200°C		110°C	☆
P9.58	Motor overheat pre-warning threshold	0°C~200°C		90°C	☆

The signal of the motor temperature sensor needs to be connected to the optional I/O extension card. AI3x on the extension card can be used for the temperature signal input. The motor temperature sensor is connected to AI3 and PGND of the extension card. The AI3s terminal of the DLA1 supports both PT100 and PT1000. Set the sensor type correctly during the use. You can view the motor temperature via d0.34.
If the motor temperature exceeds the value set in P9.57, the inverter reports an alarm and acts according to the selected fault protection action.
If the motor temperature exceeds the value set in P9.58, the DO terminal on the inverter allocated with function 39 (Motor overheat pre-warning) becomes ON.

P9.59	Instantaneous power failure action selection	Invalid	0	0	☆
		DC bus voltage constant control	1		
		Decelerate to stop	2		
P9.60	Instantaneous power failure resuming voltage	85.0%~120.0%	85.0%	☆	
P9.61	Instantaneous power failure voltag judging time	0.00s~100.00s	0.50s	☆	
P9.62	Instantaneous power failure action DC bus voltage	60.0%~85.0% (Standard DC bus voltage)	80.0%	☆	
P9.71	Instantaneous power failure gain Kp	0~100	40	☆	
P9.72	Instantaneous power failure integral coefficient Ki	0~100	30	☆	
P9.73	Instantaneous power failure deceleration time	0~300.0s	20.0s	☆	

Upon instantaneous power failure or sudden voltage dip, the DC bus voltage of the inverter reduces. This function enables the inverter to compensate the DC bus voltage reduction with the load feedback energy by reducing the output frequency so as to keep the inverter running continuously.



• If P9.59 = 1, once the bus voltage resumes to normal, the inverter accelerates to the set frequency.

• If P9.59 = 2, upon instantaneous power failure or sudden voltage dip, the inverter will continue decelerating until 0Hz, stop and wait for next start command. This function is to ensure motor will not coast to stop at power failure or sudden voltage dip. When load inertia is high, coast to stop will take too much time. In addition, coast to stop can easily cause the inverter over-current or overload.

P9.63	Protection upon load becoming 0	Disabled	0	0	☆
		Enabled	1		
P9.64	Detection level of load becoming 0	0.0%~100.0% (motor rated current)		10.0%	☆
P9.65	Detection time of load becoming 0	0.0s~60.0s		1.0s	☆

If protection upon load becoming 0 is enabled, when the output current of the inverter is lower than the detection level (P9.64) and the lasting time exceeds the detection time (P9.65), the output frequency of the inverter automatically declines to 7% of the rated frequency. During the protection, the inverter automatically accelerates to the set frequency if the load resumes to normal.

P9.67	Over-speed detection value	0.0%~50.0% (maximum frequency)	20.0%	☆
P9.68	Over-speed detection time	0.0s~60.0s	1.0s	☆

This function is valid only when the inverter runs in the FVC mode.

If the actual motor rotational speed detected by the inverter exceeds the maximum frequency and the excessive value is greater than the value of P9.67 and the lasting time exceeds the value of P9.68, the inverter reports 43=E.oSF and acts according to the selected fault protection action.

If the over-speed detection time is 0.0s, the over-speed detection function is disabled.

P9.69	Detection value of too large speed deviation	0.0%~50.0% (maximum frequency)	20.0%	☆
P9.70	Detection time of too large speed deviation	0.0s~60.0s	5.0s	☆

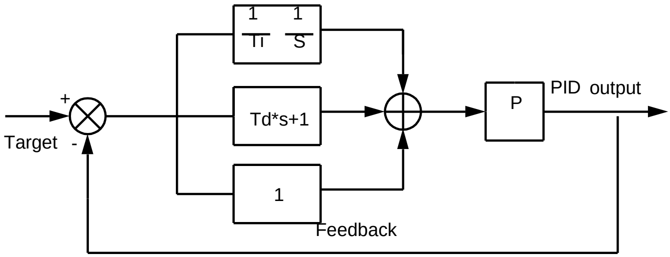
This function is valid only when the Inverter runs in the FVC mode.

If the inverter detects the deviation between the actual motor rotational speed detected by the inverter and the set frequency is greater than the value of P9.69 and the lasting time exceeds the value of P9.70, the inverter reports 42=E.Sdl and according to the selected fault protection action.

If P9.70 (Detection time of too large speed deviation) is 0.0s, this function is disabled.

4.12 PID functions: PA.00-PA.28

PID control is a general process control method. By performing proportional, integral and differential operations on the difference between the feedback signal and the target signal, it adjusts the output frequency and constitutes a feedback system to stabilize the controlled counter around the target value. It is applied to process control such as flow control, pressure control and temperature control. The following figure shows the principle block diagram of PID control.



Code	Description	Setting range		Def	Res
PA.00	PID setting source	PA.01 setting	0	0	☆
		AI1	1		
		AI2	2		
		AI3	3		
		Reserved	4		
		Communication setting	5		
		Multi-speed	6		
PA.01	PID digital setting	0.0%~100.0%		50.0%	☆
The PID setting is a relative value and ranges from 0.0% to 100.0%. The PID feedback is also a relative value. The purpose of PID control is to make the PID setting and PID feedback equal.					
PA.02	PID feedback source	AI1	0	0	☆
		AI2	1		
		AI3	2		
		Reserved	3		
		Communication setting	4		
		AI1	5		
		AI1+AI2	6		
		MAX (|AI1|, |AI2|)	7		
		MIN (|AI1|, |AI2|)	8		
This parameter is used to select the feedback signal channel of process PID. The PID feedback is a relative value and ranges from 0.0% to 100.0%.					
PA.03	PID action direction	Forward action	0	0	☆
		Reverse action	1		
0: Forward action					

When the feedback value is smaller than the PID setting, the inverter's output frequency rises. For example, the winding tension control requires forward PID action.

1: Reverse action
When the feedback value is smaller than the PID setting, the inverter's output frequency reduces. For example, the unwinding tension control requires reverse PID action.
Note that this function is influenced by the DI function 35 "Reverse PID action direction"

PA.04	PID feedback range	0~65535	1000	☆

This parameter is a non-dimensional unit. It is used for PID setting display (d0.15) and PID feedback display (d0.16).
Relative value 100% of PID setting feedback corresponds to the value of PA.04. If PA.04 is set to 2000 and PID setting is 100.0%, the PID setting display (d0.15) is 2000.

PA.05	Proportional gain K_{p1}	0.0~100.0	20.0	☆
PA.06	Integral time Ti_1	0.01s~10.00s	2.00s	☆
PA.07	Differential time Td_1	0.00~10.000	0.000s	☆

- Proportional gain K_{p1}:

It decides the regulating intensity of the PID regulator. The higher the K_{p1} is, the larger the regulating intensity is. The value 100.0 indicates when the deviation between PID feedback and PID setting is 100.0%, the adjustment amplitude of the PID regulator on the output frequency reference is the maximum frequency.

- Integral time Ti_1:

It decides the integral regulating intensity. The shorter the integral time is, the larger the regulating intensity is. When the deviation between PID feedback and PID setting is 100.0%, the integral regulator performs continuous adjustment for the time set in PA. 06. Then the adjustment amplitude reaches the maximum frequency.

- Differential time Td1:

It decides the regulating intensity of the PID regulator on the deviation change. The longer the differential time is, the larger the regulating intensity is. Differential time is the time within which the feedback value change reaches 100.0%, and then the adjustment amplitude reaches the maximum frequency.

PA.08	Cut-off frequency of PID reverse rotation	0.00~ maximum frequency	2.00Hz	☆

In some situations, only when the PID output frequency is a negative value (Inverter reverse rotation), PID setting and PID feedback can be equal. However, too high reverse rotation frequency is prohibited in some applications, and PA.08 is used to determine the reverse rotation frequency upper limit.

PA.09	PID deviation limit	0.0%~100.0%	0.0%	☆

If the deviation between PID feedback and PID setting is smaller than the value of PA.09, PID control stops. The small deviation between PID feedback and PID setting will make the output frequency stabilize, effective for some closed-loop control applications.

PA.10	PID differential limit	0．00%~100.00%	0.10%	☆

It is used to set the PID differential output range. In PID control, the differential operation may easily cause system oscillation. Thus, the PID differential regulation is restricted to a small range.

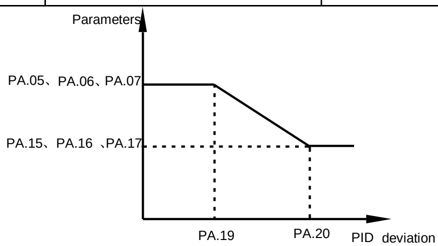
PA.11	PID setting change time	0.00s~650.00s	0.00s	☆

The PID setting change time indicates the time required for PID setting changing from 0.0% to 100.0%. The PID setting changes linearly according to the change time, reducing the impact caused by sudden setting change on the system.

PA.12	PID feedback filter time	0.00s~60.00s	0.00s	☆
PA.13	PID output filter time	0.00s~60.00s	0.00s	☆

PA.12 is used to filter the PID feedback, helping to reduce interference on the feedback but slowing the response of the process closed-loop system.
PA.13 is used to filter the PID output frequency, helping to weaken sudden change of the Inverter output frequency but slowing the response of the process closed-loop system.

PA.14	Reserved	-		-	-
PA.15	Proportional gain K_{p2}	0.0~100.0		20.0	☆
PA.16	Integral time Ti_2	0.01s~10.00s		2.00s	☆
PA.17	Differential timeTd_2	0.00~10.000		0.000 s	☆
PA.18	PID parameter switchover condition	No switchover	0	0	☆
		Switchover via DI	1		
		Automatic switchover based on deviation	2		
PA.19	PID parameter switchover deviation 1	0.0%~PA.20		20.0%	☆
PA.20	PID parameter switchover deviation 2	PA.19~100.0%		80.0%	☆



In some applications, PID parameters switchover is required when one group of PID parameters cannot satisfy the requirement of the whole running process.

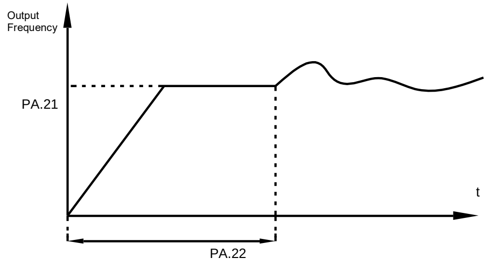
These parameters are used for switchover between two groups of PID parameters. Regulator parameters PA.15 to PA.17 are set in the same way as PA.05 to PA.07.

The switchover can be implemented either via a DI terminal or automatically implemented based on the deviation.
If you select switchover via a DI terminal, the DI must be allocated with function 43 "PID parameter switchover". If the DI is OFF, group 1 (PA.05 to PA.07) is selected. If the DI is ON, group 2 (PA.15 to PA.17) is selected.

If you select automatic switchover, when the absolute value of the deviation between PID feedback and PID setting is smaller than the value of PA.19, group 1 is selected. When the absolute value of the deviation between PID feedback and PID setting is higher than the value of PA.20, group 2 is selected. When the deviation is between PA.19 and PA.20, the PID parameters are the linear interpolated value of the two groups of parameter values.

PA.21	PID initial value	0.0%~100.0%	0.0%	☆

PA.22	PID initial value holding time	0.00s~650.00s	0.00s	☆



When the Inverter starts up, the PID starts closed-loop algorithm only after the PID output is fixed to the PID initial value (PA.21) and lasts the time set in PA.22.
This function is used to limit the deviation between two PID outputs (2 ms per PID output) to suppress the rapid change of PID output and stabilize the running of the Inverter.

PA.23	Maximum deviation between two PID outputs in forward direction	0.00%~100.00%	1.00%	☆
PA.24	Maximum deviation between two PID outputs in reverse direction	0.00%~100.00%	1.00%	☆

PA.23 and PA.24 respectively correspond to the maximum absolute value of the output deviation in forward direction and in reverse direction.

PA.25	PID integral property	One's place	Integral separation	00	☆
		Invalid	0		
		Valid	1		
		Ten's place	Selection when the output reaches the limit		
		Continue integral	0		
		Stop integral	1		
PA.26	Detection value of PID feedback loss	Not judging feedback loss	0.0%	0.0%	☆
		0.1%~100.0%	0.1%		
PA.27	Detection time of PID feedback loss	0.0s~20.0s		0s	☆

These parameters are used to judge whether PID feedback is lost.

If the PID feedback is smaller than the value of PA.26 and the lasting time exceeds the value of PA.27, the inverter reports 31=E.PID and acts according to the selected fault protection action.

PA.28	PID operation at stop	No PID operation	0	0	☆
		PID operation continues	1		

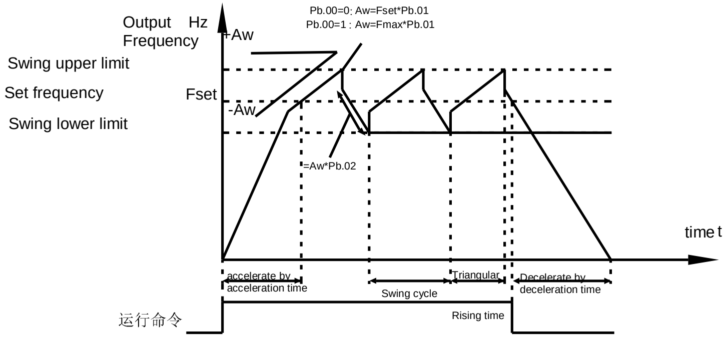
It is used to select whether to continue PID operation in the state of stop. Generally, the PID operation stops when the inverter stops.

4.13 Swing Frequency, Fixed Length and Count: PB.00-PB.09

The swing frequency function is applied to the textile and chemical fiber fields and the applications where traversing and winding functions are required.

The swing frequency function indicates that the output frequency of the inverter swings up and down with the set frequency as the center. The trace of running frequency at the time axis is shown in the following figure.

The swing amplitude is set in PB.00 and PB.01. When PB.01 is set to 0, the swing amplitude is 0 and the swing frequency does not take effect.



Code	Description	Setting range		Def	Res
PB.00	Swing frequency relativity setting	Relative to the central frequency	0	0	☆
		Relative to the maximum frequency	1		

0: Relative to the central frequency (P0.07 frequency source selection)
It is variable swing amplitude system. The swing amplitude varies with the central frequency (set frequency).
1: Relative to the maximum frequency (P0.10 maximum output frequency)
It is fixed swing amplitude system. The swing amplitude is fixed.

Code	Description	Setting range	Def	Res
PB.01	Swing frequency amplitude	0.0%~100.0%	0.0%	☆
PB.02	Swing jump frequency amplitude	0.0%~50.0%	0.0%	☆

These parameters are used to determine the swing amplitude and jump frequency amplitude. The swing frequency is limited by the swing frequency upper limit and swing frequency lower limit.

• If relative to the central frequency (PB.00 = 0), the actual swing amplitude AW is the calculation result of P0.07 (Frequency source selection) multiplied by PB.01.

• If relative to the maximum frequency (PB.00 = 1), the actual swing amplitude AW is the calculation result of P0.10 (Maximum frequency) multiplied by PB.01.

Swing jump frequency = Swing amplitude AW x PB.02 (Swing jump frequency amplitude). Swing jump frequency is a percentage related to PB.01.

• If relative to the central frequency (PB.00 = 0), the swing jump frequency is a variable value.

• If relative to the maximum frequency (PB.00 = 1), the swing jump frequency is a fixed value. The swing frequency is limited by the frequency upper limit and frequency lower limit.

PB.03	Swing frequency cycle	0.0s~3000.0s	10.0s	☆
PB.04	Triangular wave rising time coefficient	0.0%~100.0%	50.0%	☆

PB.03 specifies the time of a complete swing frequency cycle.

PB.04 specifies the time percentage of triangular wave rising time to PB.03 (Swing frequency cycle).

• Triangular wave rising time = PB.03 (Swing frequency cycle) x PB.04 (Triangular wave rising time coefficient, unit: s)

• Triangular wave falling time = PB.03 (Swing frequency cycle) x (1 - PB.04 Triangular wave rising time coefficient, unit: s)

PB.05	Set length	0m~65535m	1000m	☆
PB.06	Actual length	0m~65535m	0m	☆
PB.07	Number of pulses per meter	0.1~6553.5	100.0	☆

The preceding parameters are used for fixed length control.

The length information is collected by DI terminals. PB.06 (Actual length) is calculated by dividing the number of pulses collected by the DI terminal by PB.07 (Number of pulses each meter).

When the actual length PB.06 exceeds the set length in PB.05, the DO terminal allocated with function 10 (Length reached) becomes ON.

During the fixed length control, the length reset operation can be performed via the DI terminal allocated with function 28. For details, see the descriptions of P4.00 to P4.09.

Allocate corresponding DI terminal with function 27 (Length count input) in applications. If the pulse frequency is high, DI5 must be used.

PB.08	Set count value	1~65535	1000	☆
PB.09	Designated count value	1~65535	1000	☆

The count value needs to be collected by DI terminal. Allocate the corresponding DI terminal with function 25 (Counter input) in applications. If the pulse frequency is high, DI5 must be used.

When the count value reaches the set count value (PB.08), the DO terminal allocated with function 8 (Set count value reached) becomes ON. Then the counter stops counting.

When the counting value reaches the designated counting value (PB.09), the DO terminal allocated with function 9 (Designated count value reached) becomes ON. Then the counter continues to count until the set count value is reached.

PB.09 should be equal to or smaller than PB.08.

4.14 Multi-speed and simple PLC: PC.00-PC.51

DLA1 multi-speed has many functions. Besides multi-speed, it can be used as the setting source of the V/F separated voltage source and setting source of process PID.

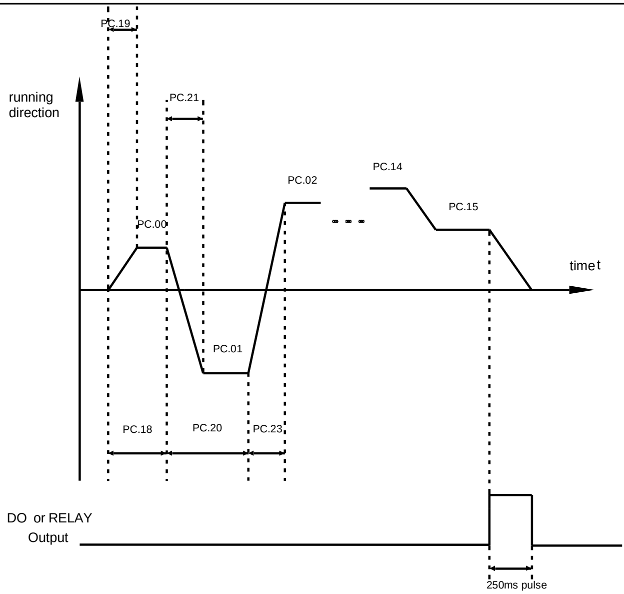
Code	Description	Setting range	Def	Res
PC.00	Multi-speed 0	-100.0%~100.0%	0.0%	☆
PC.01	Multi-speed 1	-100.0%~100.0%	0.0%	☆
PC.02	Multi-speed 2	-100.0%~100.0%	0.0%	☆
PC.03	Multi-speed 3	-100.0%~100.0%	0.0%	☆
PC.04	Multi-speed 4	-100.0%~100.0%	0.0%	☆
PC.05	Multi-speed 5	-100.0%~100.0%	0.0%	☆
PC.06	Multi-speed 6	-100.0%~100.0%	0.0%	☆
PC.07	Multi-speed 7	-100.0%~100.0%	0.0%	☆
PC.08	Multi-speed 8	-100.0%~100.0%	0.0%	☆
PC.09	Multi-speed 9	-100.0%~100.0%	0.0%	☆
PC.10	Multi-speed 10	-100.0%~100.0%	0.0%	☆
PC.11	Multi-speed 11	-100.0%~100.0%	0.0%	☆
PC.12	Multi-speed 12	-100.0%~100.0%	0.0%	☆
PC.13	Multi-speed 13	-100.0%~100.0%	0.0%	☆
PC.14	Multi-speed 14	-100.0%~100.0%	0.0%	☆
PC.15	Multi-speed 15	-100.0%~100.0%	0.0%	☆

Multi-speed can be the setting source of frequency, V/F separated voltage and process PID. The multi-speed is relative value and ranges from -100.0% to 100.0%.

As frequency source, it is a percentage relative to the maximum frequency. As V/F separated voltage source, it is a percentage relative to the motor rated voltage. As process PID setting source, it does not require conversion.

Multi-speed can be switched over based on different states of DI terminals. For details, see the descriptions of group P4.

PC.16	Simple PLC running mode	Stop after one cycle	0	0	☆
		Keep final values after one cycle	1		
		Repeat after one cycle	2		



0: Stop after one cycle
The inverter stops after running one cycle, and will not start up until receiving another command.

1: Keep final values after one cycle
The Inverter keeps the final running frequency and direction after running one cycle.

2: Repeat after one cycle
The inverter automatically starts another cycle after running one cycle, and will not stop until receiving the stop command.

Simple PLC can be either the frequency source or V/F separated voltage source.

When simple PLC is used as the frequency source, whether parameter values of PC.00 to PC.15 are positive or negative determines the running direction. If the parameter values are negative, it indicates that the inverter runs in reverse direction.

PC.17	Simple PLC retentive selection	One's place	Upon power off	00	☆
		No		0	
		Yes		1	
		Ten's place	Upon stop		
		No		0	
		Yes		1	

The inverter can memorize the PLC running section and running frequency upon power off and will continue to run from the memorized section after it is powered on again. If set to 0, the inverter restarts the PLC process after it is powered on again.
The inverter can also record the PLC running section and running frequency upon stop and will continue to run from the recorded moment after it starts up again. If the ten's place is set to 0, the inverter restarts the PLC process after it starts up again.

PC.18	Simple PLC section 0 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆

PC.19	Simple PLC section 0 running acceleration/deceleration time	0~3	0	☆
PC.20	Simple PLC section 1 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.21	Simple PLC section 1 running acceleration/deceleration time	0~3	0	☆
PC.22	Simple PLC section 2 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.23	Simple PLC section 2 running acceleration/deceleration time	0~3	0	☆
PC.24	Simple PLC section 3 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.25	Simple PLC section 3 running acceleration/deceleration time	0~3	0	☆
PC.26	Simple PLC section 4 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.27	Simple PLC section 4 running acceleration/deceleration time	0~3	0	☆
PC.28	Simple PLC section 5 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.29	Simple PLC section 5 running acceleration/deceleration time	0~3	0	☆
PC.30	Simple PLC section 6 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.31	Simple PLC section 6 running acceleration/deceleration time	0~3	0	☆
PC.32	Simple PLC section 7 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.33	Simple PLC section 7 running acceleration/deceleration time	0~3	0	☆
PC.34	Simple PLC section 8 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.35	Simple PLC section 8 running acceleration/deceleration time	0~3	0	☆
PC.36	Simple PLC section 9 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.37	Simple PLC section 9 running acceleration/deceleration time	0~3	0	☆
PC.38	Simple PLC section 10 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.39	Simple PLC section 10 running acceleration/deceleration time	0~3	0	☆
PC.40	Simple PLC section 11 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.41	Simple PLC section 11 running acceleration/deceleration time	0~3	0	☆
PC.42	Simple PLC section 12 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.43	Simple PLC section 12 running acceleration/deceleration time	0~3	0	☆
PC.44	Simple PLC section 13 running time	0.0s (h) ~6553.5s (h)	0.0s (h)	☆
PC.45	Simple PLC section 13 running acceleration/deceleration time	0~3	0	☆

PC.46	Simple PLC section 14 running time	0.0s (h) ~6553.5s (h)		0.0s (h)	☆
PC.47	Simple PLC section 14 running acceleration/deceleration time	0~3		0	☆
PC.48	Simple PLC section 15 running time	0.0s (h) ~6553.5s (h)		0.0s (h)	☆
PC.49	Simple PLC section 15 running acceleration/deceleration time	0~3		0	☆
PC.50	Time unit of simple PLC running	s (s)	0	0	☆
		h (hour)	1		
PC.51	Multi-speed 0 source selection	PC.00 setting	0	0	☆
		AI1	1		
		AI2	2		
		AI3	3		
		Pulse setting	4		
		PID	5		
		Set by P0.08, modified via UP/DOWN	6		

It determines the setting channel of multi-speed 0.

You can perform convenient switchover between the setting channels. When multi-speed or simple PLC is used as frequency source, the switchover between two frequency sources can be realized easily.

4.15 Communication parameters: PD.00-PD.06

Please refer to DLA1 communication protocol in Chapter 7.

Code	Description	Setting range			Def	Res
PD.00	Bit rate	One's place	MODBUS		6005	☆
		300BPS		0		
		600BPS		1		
		1200BPS		2		
		2400BPS		3		
		4800BPS		4		
		9600BPS		5		
		19200BPS		6		
		38400BPS		7		
		57600BPS		8		
		115200BPS		9		
PD.01	Data type	8-N-2		0	0	☆
		8-E-1		1		
		8-O-1		2		
		8-N-1		3		
PD.02	This device address	1-247, 0 is master station address			1	☆
PD.03	Response delay	0ms-20ms			2	☆
PD.04	Communication over-time	0.0 (invalid), 0.1s-60.0s			0.0	☆
PD.05	Data transfer format	One's place	MODBUS		30	☆
		Non-standard MODBUS protocol		0		
		Standard MODBUS protocol		1		
PD.06	Current resolution	0.01A		0	0	☆
		0.1A		1		

4.16 Function code management: PP.00-PP.04

Code	Description	Setting range		Def	Res
PP.00	User password	0~65535		0	☆

If it is set to any non-zero number, the password protection function is enabled. After a password has been set and taken effect, you must enter the correct password in order to enter the menu. If the entered password is incorrect you cannot view or modify parameters.
If PP.00 is set to 00000, the previously set user password is cleared, and the password protection function is disabled.

Code	Description	Setting range		Def	Res
PP.01	Parameter initialization	No operation	0	0	★
		Restore factory settings except motor parameters	1		
		Clear records	2		
		Backup current parameters to control board memory	4		
		Use control board memory to restore parameters	501		

Code	Description	Setting range			Def	Res
PP.02	Inverter parameter display property	One's place	Group d display selection		11	★
		No display		0		
		Display		1		
		Ten's place	Group B display selection			
		No display		0		
		Display		1		
PP.03	User's parameter display property	One's place	Display selection		00	☆
		No display		0		
		Display		1		
		Ten's place	Special parameter display			
		No display		0		
		Display		1		

Code	Description	Setting range		Def	Res
PP.04	Parameter modification property	Modifiable	0	0	
		Not modifiable	1		

It is used to set whether the parameters are modifiable to avoid mal-function. If it is set to 0, all parameters are modifiable. If it is set to 1, all parameters can only be viewed.

4.17 Torque control parameters: B0.00-B0.08

Code	Description	Setting range		Def	Res
B0.00	Speed/Torque control selection	Speed control	0	0	★
		Torque control	1		

DLA1 provides DI terminals with two torque related functions, function 29 (Torque control prohibited) and function 46 (Speed control/Torque control switchover). The two DI terminals need to be used together with B0.00 to implement speed control/torque control switchover.

If the DI terminal allocated with function 46 (Speed control/Torque control switchover) is OFF, the control mode is determined by B0.00. If the DI terminal allocated with function 46 is ON, the control mode is reverse to the value of B0.00.

However, if the DI terminal with function 29 (Torque control prohibited) is ON, the Inverter is fixed to run in the speed control mode.

Code	Description	Setting range		Def	Res
B0.01	Torque setting source selection	Digital setting (B0.03)	0	0	★
		AI1	1		
		AI2	2		
		AI3	3		
		Reserved	4		
		Communication setting	5		
		MIN (AI1, AI2)	6		
		MAX (AI1, AI2)	7		
B0.03	Torque digital setting	-200.0%~200.0%		150%	☆

B0.01 is used to set the torque setting source. There are a total of eight torque setting sources.

The torque setting is a relative value. 100.0% corresponds to the Inverter's rated torque. The setting range is -200.0% to 200.0%, indicating the inverter's maximum torque is twice of the inverter's rated torque.

If the torque setting is positive, the inverter rotates in forward direction. If the torque setting is negative, the inverter rotates in reverse direction.

Code	Description	Setting range	Def	Res
B0.05	Torque control forward maximum frequency	0.00Hz~ maximum frequency	50.00Hz	☆
B0.06	Torque control reverse maximum frequency	0.00Hz~ maximum frequency	50.00Hz	☆

Code	Description	Setting range	Def	Res
B0.07	Acceleration time in torque control mode	0.00s~65000s	0.00s	☆
B0.08	Deceleration time in torque control mode	0.00s~65000s	0.00s	☆

4.18 Control optimization parameters: B5.00-B5.09

Code	Description	Setting range		Def	Res
B5.00	DPWM switchover frequency upper limit	0.00Hz~15.00Hz		12.00Hz	☆

This parameter is valid only for V/F control.

It is used to determine the wave modulation mode in V/F control of asynchronous motor. If the frequency is lower than the value of this parameter, the waveform is 7-segment continuous modulation. If the frequency is higher than the value of this parameter, the waveform is 5-segment intermittent modulation.

The 7-segment continuous modulation causes more loss to switches of the Inverter but smaller current ripple. The 5-segment intermittent modulation causes less loss to switches of the Inverter but larger current ripple. This may lead to motor running instability at high frequency. Do not modify this parameter generally.

For instability of V/F control, refer to parameter P2.11. For loss to Inverter and temperature rise, refer to parameter P0.15.

Code	Description	Setting range		Def	Res
B5.01	PWM modulation mode	Asynchronous modulation	0	0	☆
		Synchronous modulation	1		

This parameter is valid only for V/F control.

Synchronous modulation indicates that the carrier frequency varies linearly with the change of the output frequency, ensuring that the ratio of carrier frequency to output frequency remains unchanged. Synchronous modulation is generally used at high output frequency, which helps improve the output voltage quality.

At low output frequency (100 Hz or lower), synchronous modulation is not required. This is because asynchronous modulation is preferred when the ratio of carrier frequency to output frequency is high.

Synchronous modulation takes effect only when the running frequency is higher than 85 Hz. If the frequency is lower than 85 Hz, asynchronous modulation is always used.

Code	Description	Setting range		Def	Res
B5.02	Dead zone compensation mode selection	No compensation	0	1	☆
		Compensation mode 1	1		

Generally, you need not modify this parameter. Try to use a different compensation mode only when there is special requirement on the output voltage waveform quality or oscillation occurs on the motor.

Code	Description	Setting range		Def	Res
B5.03	Random PWM depth	Random PWM invalid	0	0	☆
		Random PWM depth selection	1~10		

The setting of random PWM depth can make the shrill motor noise softer and reduce the electromagnetic interference. If this parameter is set to 0, random PWM is invalid.

Code	Description	Setting range		Def	Res
B5.04	Rapid current limit	Disabled	0	1	☆
		Enabled	1		

The rapid current limit function can reduce the inverter's overcurrent faults at maximum, guaranteeing uninterrupted running of the inverter.

However, long-time rapid current limit may cause the inverter to overheat, which is not allowed. If so, the inverter will output 40=E.CbC, indicating the inverter is overloaded and needs to stop.

B5.05	Current detection compensation	0~100	5	☆

It is used to set the Inverter current detection compensation. Too large value may lead to deterioration of control performance. Do not modify it generally.

B5.06	Under voltage threshold	210V ~ 420V	350V	☆

It is used to set the under voltage threshold of 9=E.LU. The under voltage threshold 100% of the inverter of different voltage classes corresponds to different nominal values, as listed in the following table.

Voltage Class	Nominal Value of Under voltage threshold
Single-phase 220 V	200 V
Three-phase 220 V	200 V
Three-phase 380 V	350 V
Three-phase 480 V	450 V
Three-phase 690 V	650 V

B5.07	SVC optimization mode selection	Optimization mode 1	1	1	☆
		Optimization mode2	2		

1: Optimization mode 1
It is used when the requirement on torque control linearity is high.

2: Optimization mode 2
It is used for the requirement on speed stability is high.

B5.08	Dead-zone time adjustment	100%~200%	150%	☆

It is only valid for 1140 V voltage class.
You can modify the value of this parameter to improve the voltage utilization rate. Too small value may system instability. Do not modify it generally.

B5.09	Overvoltage threshold	200.0V~2500.0V	810.0V	☆

It is used to set the overvoltage threshold of the inverter. The default values of different voltage classes are listed in the following table.

Voltage Class	Default Overvoltage Threshold
Single-phase 220 V	400.0 V
Three-phase 220 V	400.0 V
Three-phase 380 V	810.0 V
Three-phase 480 V	890.0 V
Three-phase 690 V	1300.0 V

5 Fault and solutions

5.1 Alarms and solutions

DLA1 provides a total of 51 fault information and protective functions. After a fault occurs, the inverter implements the protection function, and displays the fault code on the keyboard (if the keyboard is available).

Before contacting DORNA for technical support, you can first determine the fault type, analyze the causes, and perform troubleshooting according to the following tables. If the fault cannot be rectified, contact the official distributor or DORNA directly.

22=E.HArd is the inverter hardware over-current or over-voltage signal. In most situations, hardware over-voltage fault causes 22=E.HArd.

Fault	Display	Possible Causes	Solutions
IGBT protection	1=E.IGbt	1: The output circuit is grounded or short circuited. 2: The connecting cable of the motor is too long. 3: The module overheats. 4: Internal connections is loose. 5: Main control board is faulty. 6: The power board is faulty. 7: IGBT is faulty.	1: Eliminate external faults. 2: Install a reactor or an output filter. 3: Check the air filter and the fan. 4: Connect all cables properly. 5: Contact the distributor.
Acceleration over current	2=E.oCAC	1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The acceleration time is too short. 4: Manual torque boost or V/F curve is not appropriate. 5: The voltage is too low. 6: The startup operation is performed on the rotating motor. 7: A sudden load is added during acceleration. 8: The Inverter model is of too small power class.	1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Increase the acceleration time. 4: Adjust the manual torque boost or V/F curve. 5: Adjust the voltage to normal range. 6: Select rotational speed tracking restart or start the motor after it stops. 7: Remove the added load. 8: Select an Inverter of higher power class.
Deceleration over current	3=E.oCdE	1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The deceleration time is too short. 4: The voltage is too low. 5: A sudden load is added during deceleration. 6: The braking unit and braking resistor are not installed.	1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Increase the deceleration time. 4: Adjust the voltage to normal range. 5: Remove the added load. 6: Install the braking unit and braking resistor.

Fault Name	Display	Possible Causes	Solutions
Constant speed over current	4=E.oCCo	1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The voltage is too low. 4: A sudden load is added during operation. 5: The Inverter model is of too small power class.	1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Adjust the voltage to normal range. 4: Remove the added load. 5: Select an Inverter of higher power class.
Acceleration over voltage	5=E.oUAC	1: The input voltage is too high. 2: An external force drives the motor during acceleration. 3: The acceleration time is too short. 4: The braking unit and braking resistor are not installed.	1: Adjust the voltage to normal range. 2: Cancel the external force or install a braking resistor. 3: Increase the acceleration time. 4: Install the braking unit and braking resistor.
Deceleration over voltage	6=E.oUdE	1: The input voltage is too high. 2: An external force drives the motor during deceleration. 3: The deceleration time is too short. 4: The braking unit and braking resistor are not installed.	1: Adjust the voltage to normal range. 2: Cancel the external force or install the braking resistor. 3: Increase the deceleration time. 4: Install the braking unit and braking resistor.
Constant speed over voltage	7=E.oUCo	1: The input voltage is too high. 2: An external force drives the motor during deceleration.	1: Adjust the voltage to normal range. 2: Cancel the external force or install the braking resistor.
Control power fault	8=E.CPF	The input voltage is not within the allowable range.	Adjust the input voltage to the allowable range.
Under voltage	9=E.LU	1: Instantaneous power failure occurs on the input power supply. 2: The Inverter's input voltage is not within the allowable range. 3: The bus voltage is abnormal. 4: The rectifier bridge and buffer resistor are faulty. 5: The drive board is faulty. 6: The main control board is faulty.	1: Reset the fault. 2: Adjust the voltage to normal range. 3: Contact the official distributor or DORNA directly.
Inverter overload	10=E.oL1	1: The load is too heavy or locked-rotor occurs on the motor. 2: The Inverter model is of too small power class.	1: Reduce the load and check the motor and mechanical condition. 2: Select an Inverter of higher power class.

Fault Name	Display	Possible Causes	Solutions
Motor overload	11=E.oLt	1: F9-01 is set improperly. 2: The load is too heavy or locked- rotor occurs on the motor. 3: The Inverter model is of too small power class.	1: Set F9-01 correctly. 2: Reduce the load and check the motor and the mechanical condition. 3: Select an Inverter of higher power class.
Input phase loss	12=E.ILF	1: The three-phase power input is abnormal. 2: The drive board is faulty. 3: The lightening board is faulty. 4: The main control board is faulty.	1: Eliminate external faults. 2: Contact the official distributor or DORNA directly.
Output phase loss	13=E.oLF	1: The cable connecting the Inverter and the motor is faulty. 2: The Inverter's three-phase outputs are unbalanced when the motor is running. 3: The drive board is faulty. 4: The module is faulty.	1: Eliminate external faults. 2: Check whether the motor three-phase winding is normal. 3: Contact the official distributor or DORNA directly.
Module overheat	14=E.oH1	1: The ambient temperature is too high. 2: The air filter is blocked. 3: The fan is damaged. 4: The thermally sensitive resistor of the module is damaged. 5: The inverter module is damaged.	1: Lower the ambient temperature. 2: Clean the air filter. 3: Replace the damaged fan. 4: Replace the damaged thermally sensitive resistor. 5: Replace the inverter module.
External equipment fault	15=E.EIoF	1: External fault signal is input via DI. 2: External fault signal is input via virtual I/O.	Reset the operation.
Communication fault	16=E.CoF1	1: The host computer is in abnormal state. 2: The communication cable is faulty. 3: P0.28 is set improperly. 4: The communication parameters in group FD are set	1: Check the cabling of host computer. 2: Check the communication cabling. 3: Set P0.28 correctly. 4: Set the communication parameters properly.
Contactor fault	17=E.rECF	1: The drive board and power supply are faulty. 2: The contactor is faulty.	1: Replace the faulty drive board or power supply board. 2: Replace the faulty contactor.

Fault Name	Display	Possible Causes	Solutions
Current detection fault	18=E.HALL	1: The HALL device is faulty. 2: The drive board is faulty.	1: Replace the faulty HALL device. 2: Replace the faulty drive board.
Motor auto-tuning fault	19=E.tUnE	1: The motor parameters are not set according to the nameplate. 2: The motor auto-tuning times out.	1: Set the motor parameters according to the nameplate properly. 2: Check the cable connecting the Inverter and the motor.
Encoder fault	20=E.PG1	1: The encoder type is incorrect. 2: The cable connection of the encoder is incorrect. 3: The encoder is damaged. 4: The PG card is faulty.	1: Set the encoder type correctly based on the actual situation. 2: Eliminate external faults. 3: Replace the damaged encoder. 4: Replace the faulty PG card.
EEPROM read-write fault	21=E.EEP	The EEPROM chip is damaged.	Replace the main control board.
Inverter hardware fault	22=E.HArd	1: Overvoltage exists. 2: Overcurrent exists.	1: Handle based on overvoltage. 2: Handle based on overcurrent.
Short circuit to ground	23=E.SHot	The motor is short circuited to the ground.	Replace the cable or motor.
Accumulative running time reached	26=E.ArA	The accumulative running time reaches the setting value.	Clear the record through the parameter initialization function.
User-defined fault 1	27=E.USt1	1: The user-defined fault 1 signal is input via DI. 2: User-defined fault 1 signal is input via virtual I/O.	Reset the operation.
User-defined fault 2	28=E.Ust2	1: The user-defined fault 2 signal is input via DI. 2: The user-defined fault 2 signal is input via virtual I/O.	Reset the operation.
Accumulative power-on time reached	29=E.APA	The accumulative power-on time reaches the setting value.	Clear the record through the parameter initialization function.
Load becoming 0	30=E.ULF	The Inverter running current is lower than F9-64.	Check that the load is disconnected or the setting of F9-64 and F9-65 is correct.
PID feedback lost during running	31=E.PID	The PID feedback is lower than the setting of FA-26.	Check the PID feedback signal or set FA-26 to a proper value.

Fault Name	Display	Possible Causes	Solutions
Pulse-by-pulse current limit fault	40=E.CbC	1: The load is too heavy or locked- rotor occurs on the motor. 2: The Inverter model is of too small power class.	1: Reduce the load and check the motor and mechanical condition. 2: Select an Inverter of higher power class.
Motor switchover fault during running	41=E.tSr	Change the selection of the motor via terminal during running of the Inverter.	Perform motor switchover after the Inverter stops.
Too large speed deviation	42=E.SdL	1: The encoder parameters are set incorrectly. 2: The motor auto-tuning is not performed. 3: F9-69 and F9-70 are set incorrectly.	1: Set the encoder parameters properly. 2: Perform the motor auto-tuning. 3: Set F9-69 and F9-70 correctly based on the actual situation.
Motor over-speed	43=E.oSF	1: The encoder parameters are set incorrectly. 2: The motor auto-tuning is not performed.3: F9-69 and F9-70 are set incorrectly.	1: Set the encoder parameters properly. 2: Perform the motor auto-tuning. 3: Set F9-69 and F9-70 correctly based on the actual situation.
Motor overheat	45=E.oHt	1: The cabling of the temperature sensor becomes loose. 2: The motor temperature is too high.	1: Check the temperature sensor cabling and eliminate the cabling fault. 2: Lower the carrier frequency or adopt other heat radiation measures.
Initial position fault	51=E.PoSF	The motor parameters are not set based on the actual situation.	Check that the motor parameters are set correctly and whether the setting of rated current is too small.

5.2 Other fault and solutions

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

SN	Fault	Possible Causes	Solutions
1	There is no display at power-on.	1: There is no power supply to the Inverter or the power input to the Inverter is too low. 2: The power supply of the switch on the drive board of the Inverter is faulty. 3: The rectifier bridge is damaged. 4: The control board or the keyboard is faulty. 5: The cable connecting the control board and the drive board and the keyboard breaks.	1: Check the power supply. 2: Check the bus voltage. 3: Re-connect the 8-core and 28-core cables. 4: Contact the official distributor or DORNA directly for technical support.
2	"DLA1" is displayed at power-on and then stop immediately.	1: The cable between the drive board and the control board is in poor contact. 2: Related components on the control board are damaged. 3: The motor or the motor cable is short circuited to the ground. 4: The HALL device is faulty. 5: The power input to the Inverter is too low.	1: Re-connect the 8-core and 28-core cables. 2: Contact the official distributor or DORNA directly for technical support.
3	23=E.SHot is displayed at power-on.	1: The motor or the motor output cable is short-circuited to the ground. 2: The Inverter is damaged.	1: Measure the insulation of the motor and the output cable with a megger. 2: Contact the official distributor or DORNA directly for technical support.
4	The Inverter display is normal upon power- on. But "DLA1" is displayed after running and stops immediately.	1: The cooling fan is damaged or locked-rotor occurs. 2: The external control terminal cable is short circuited.	1: Replace the damaged fan. 2: Eliminate external fault.
5	14=E.oH1 (module overheat) fault is reported frequently.	1: The setting of carrier frequency is too high. 2: The cooling fan is damaged, or the air filter is blocked. 3: Components inside the Inverter are damaged (thermal coupler or others).	1: Reduce the carrier frequency (P0.15). 2: Replace the fan and clean the air filter. 3: Contact the official distributor or DORNA directly for technical support.

SN	Fault	Possible Causes	Solutions
6	The motor does not rotate after the Inverter runs.	1: Check the motor and the motor cables. 2: The Inverter parameters are set improperly (motor parameters). 3: The cable between the drive board and the control board is in poor contact. 4: The drive board is faulty.	1: Ensure the cable between the Inverter and the motor is normal. 2: Replace the motor or clear mechanical faults. 3: Check and re-set motor parameters.
7	The DI terminals are disabled.	1: The parameters are set incorrectly. 2: The external signal is incorrect. 3: The jumper bar across SP and +24 V becomes loose. 4: The control board is faulty.	1: Check and reset the parameters in group P4. 2: Re-connect the external signal cables. 3: Re-confirm the jumper bar across OP and +24 V. 4: Contact the official distributor or DORNA directly for technical support.
8	The motor speed is always low in FVC mode.	1: The encoder is faulty. 2: The encoder cable is connected incorrectly or in poor contact. 3: The PG card is faulty. 4: The drive board is faulty.	1: Replace the encoder and ensure the cabling is proper. 2: Replace the PG card. 3: Contact the official distributor or DORNA directly for technical support.
9	The Inverter reports overcurrent and overvoltage frequently.	1: The motor parameters are set improperly. 2: The acceleration/deceleration time is improper. 3: The load fluctuates.	1: Re-set motor parameters or re-perform the motor autotuning. 2: Set proper acceleration/ deceleration time. 3: Contact the official distributor or DORNA directly for technical support.

Warning:

※ Do not touch any component inside the device within 5 minutes after the (! CHARGE) light is off after power off, otherwise user is in danger of electric shock.

※ Do not touch the PCB or IGBT without electrostatic protections, otherwise the internal components can be damaged.

6 Repair and maintenance

6.1 Routine maintenance

The influence of the ambient temperature, humidity, dust and vibration will cause the aging of the devices in the Inverter, which may cause potential faults or reduce the service life of the Inverter. Therefore, it is necessary to carry out routine and periodic maintenance.

Routine maintenance involves checking:

Item	Details	Measures
Terminal screws	Are they loose?	Tighten the screws.
Heat sink	Is it dusty?	Blow away the dust with 4 ~ 6kg/cm2 pressure dry compressed air.
PCB	Is it dusty?	Blow away the dust with 4 ~ 6kg/cm2 pressure dry compressed air.
Cooling fan	Is it noisy and with abnormal oscillations?	Replace the cooling fan
Power components	Is it dusty?	Blow away the dust with 4 ~ 6kg/cm2 pressure dry compressed air.
DC bus aluminum electrolytic capacitor	Is it discolored, with peculiar smell or bubbles?	Replace the aluminum electrolytic capacitor

6.2 Replacement of vulnerable components

The vulnerable components of the inverter are cooling fan and aluminum electrolytic capacitor. Their service life is related to the operating environment and maintenance status. Generally, the service life is shown as follows:

- Cooling fan: 3 years
- Aluminum electrolytic capacitor: 5 years.

7 MODBUS communication protocol

7.1 Communication protocol

7.1.1 Protocol content

The serial communication protocol defines the information content and the use of serial communication transmission format, including: Host polling (or broadcast) format; host encoding method, including: action-requiring function code, data transfer & error correction; mortem response from the slave is the same structure, including: action confirmation, return data & error checking, etc. If an error occurs when the slave receives information, or host requested action cannot be completed, it will organize a fault as a feedback information to the host.

Application mode:

Inverter joins RS232/RS485 fieldbus compatible master-slavery PC/PLC control network.

Fieldbus structure:

(1) Interface mode

RS232/RS485 hardware interface

(2) Transmission mode

Asynchronous serial, half-duplex transmission mode. At the same time there can be only one master slave transmit data while the other can only receive data. Data on the serial asynchronous communication, is in the form of packets sent frame by frame.

(3) Topological structure:

Single master multi-slave system. Slave address setting range is 1 to 247, 0 is broadcast communication address. Network slave address must be unique.

7.1.2 Protocol

DLA1 series inverter is an asynchronous serial communication Modbus master-slave communication protocol. Only one device on the network (host) can establish an agreement (called "query/command"). Other devices (slave) can only respond to the host's "query/command" by providing data, or take actions according to the host's "query/command". The host can be personal computer (PC), industrial control equipment or a programmable logic controller (PLC); slave is DLA1 inverter. Host can communicate to an independent slave machine, or can broadcast information to all slaves. For independent host "query/command", slave returns information (known as the response). For broadcast information, slave no need to send response to the host.

DLA1 series inverter Modbus data communication protocol format is as follows: using RTU mode, sending a message must start with an at least 3.5 characters' interval time.

Transmittable characters are hexadecimal 0 ... 9, A... F. Network equipment keeps on detecting network bus, including interval time. When the first domain (address field) is received, each device decodes to determine whether it is sending to themselves. After the last transmitted characters, a pause of at least 3.5-character time marks ending the message. A new message can start after this pause.

Whole message must be transmitted as a continuous stream. If there is a pause time over 1.5 a character before completion, receiver will refresh and assumes that next byte is address domain of a new message. Also, if a new message starts within a time interval of less than 3.5 character after previous message, receiver will regard the new message as continuation of previous message. This will lead to an error, because at last the CRC domain value will be wrong.

RTU frame format:

Frame START	At least 3.5-character time
Slave address ADR	Communication address: 0~247
Command code CMD	03: Read slave parameter; 06: Write slave parameter
Data content DATA (N-1)	Information: function code parameter address, function code parameter quantity, function code parameter value etc.
Data content DATA (N-2)	
………………………	
Data content DATA0	
CRC CHK High place	Detection value: CRC value
CRC CHK Low place	
END	At least 3.5-character time

CMD (command instruction) and DATA (description).

Command code: 03H, read N words (max 12 words)
For example: Slave address is 01, start address is P0.02, continuously read 2 value.

Master command information

ADR	01H
CMD	03H
Start address high place	F0H
Start address low place	02H
Register number high place	00H
Register number low place	02H
CRC CHK low place	CRC CHK value
CRC CHK high place	

Slave response information

ADR	01H
CMD	03H
Byte number high place	00H
Byte number low place	04H
F002H high place	00H
F002H low place	00H
F003H high place	00H
F003H high place	01H
CRC CHK low place	CRC CHK value
CRC CHK high place	

Command code: 06H write one word

For example: write 5000 (1388H) to F00AH of slave address 02H

Master command information

ADR	02H
CMD	06H
Information address high place	F0H
Information address low place	0AH
Information content high place	13H
Information content low place	88H
CRC CHK low place	CRC CHK value
CRC CHK high place	

Slave response information

ADR	02H
CMD	06H
Information address high place	F0H
Information address low place	0AH
Information content high place	13H
Information content low place	88H
CRC CHK low place	CRC CHK value
CRC CHK high place	

7.2 Verification mode

CRC mode: CRC (Cyclical Redundancy Check) uses RTU frame format message, including error detection method based on CRC fields. CRC field detects the entire contents of the message. CRC field includes two bytes, and contains a 16-bit binary value. It adds to the message after calculations from the transmission equipment. The receiver recalculates the received CRC messages, and compares with CRC value in the domain. If the two CRC values do not equal, then the transmission has errors.

CRC firstly deposits 0xFFFF, then calls a consecutive 8-bit bytes in the message and processes with the value currently in the registry. Only 8-bit data from each character is valid for CRC; start and stop bits, and parity bit are invalid.

In CRC process, each 8-bit word XOR with registry separately. The result moves to the lowest valid place. Highest valid place is 0. If LSB is 1, registry value will XOR with preset values separately; if LSB is 0, then not execute. The whole process will repeat 8 times. When the last one (8th bit) completes, next 8-bit byte will start XOR with current value. CRC value is the value in the registry after all bytes are processed.

When adding CRC to a message, low byte adds first, then the high byte.

CRC calculation programs:

```
unsigned int cal_crc16 (unsigned char *data, unsigned int length)
{
unsigned int i, crc_result=0xffff;
while (length--)
{
crc_result^=*data++;
for (i=0; i<8; i++)
{
if (crc_result&0x01)
crc_result= (crc_result>>1) ^0xa001;
else
crc_result=crc_result>>1;
   }
  }
crc_result= ((crc_result&0xff) <<8) | (crc_result>>8);
return (crc_result);
```

7.3 Communication addresses

Function code address rules (EEPROM):

High place bytes: F0~FF (P0~PF), A0~AF (B0~BF) , 70~7F (D0~DF) .
Low place byte: 00~FF.

For example: P3.12, the address is expressed as F30C.

Note:
PF group: not readable or editable;
Group d: read-only and cannot be changed.

In addition, frequent EEPROM storage will reduce the life of the EEPROM. Some functions can be realized by changing the value of RAM. User needs to change high place byte A to 4.

Start/stop control parameters:

Address	Function
1000	Communication setting value (-10000~10000) (decimal)
1001	Running frequency
1002	DC bus voltage
1003	Output voltage
1004	Output current
1005	Output power
1006	Output torque
1007	Running speed
1008	DI input state
1009	DO output state
100A	AI1 voltage
100B	AI2 voltage
100C	AI3 voltage
100D	Counter input
100E	Length input
100F	Load speed
1010	PID setting
1011	PID feedback
1012	PLC sequence
1013	Input pulse frequency, unit 0.01kHz
1014	Feedback speed, unit 0.1Hz
1015	Remaining running time
1016	AI1 voltage before correction
1017	AI2 voltage before correction
1018	AI3 voltage before correction
1019	Linear speed
101A	Accumulative power-on time
101B	Accumulative running time
101C	Input pulse frequency, unit 1Hz
101D	Communication setting value
101E	Encoder feedback speed
101F	Main frequency X
1020	Auxiliary frequency Y

Note:
Communication setting value is relevant percentage value, 10000 corresponding to 100.00%, -10000 corresponding-100.00%. For frequency data, this percentage is relevant to maximum frequency (P0.10); torque data is percentage to P3.10 (torque upper limit).

Command input: (write only)

Command address	Command function
2000	0001: FWD operation
	0002: REV operation
	0003: FWD JOG
	0004: REV JOG
	0005: Coast to stop
	0006: Decelerate to stop
	0007: Fault reset

Read inverter status: (read only)

Status address	Status function
3000	0001: FWD operation
	0002: REV operation
	0003: stop

Parameter lock verification: (Return value 8888H means parameter lock passed)

Password address	Input password
1F00	*****

Digital output control: (write only)

Command address	Command content
2001	BIT0: DO1 output control BIT1: DO2 output control BIT2: RELAY1 output control BIT3: RELAY2 output control BIT4: FMR output control BIT5: VDO1 BIT6: VDO2 BIT7: VDO3 BIT8: VDO4 BIT9: VDO5

Analog output AO1 control: (write only)

Command address	Command content
2002	0~7FFF means 0%~100%

Analog output AO2 control: (write only)

Command address	Command content
2003	0~7FFF means 0%~100%

Pulse output control: (write only)

Command address	Command content
2004	0~7FFF means 0%~100%

Inverter fault description:

Inverter fault address	Inverter fault information
8000	0000: No fault 0001: reserved 0002: Over-current during acceleration 0003: Over-current during deceleration 0004: Over-current at constant speed 0005: Over-voltage during acceleration 0006: Over-voltage during deceleration 0007: Over-voltage at constant speed 0008: Control power supply fault 0009: Under-voltage 000A: Inverter over-load 000B: Motor overload 000C: Power input phase loss 000D: Power output phase loss 000E: Module over-heat 000F: External equipment fault 0010: Communication fault 0011: Contactor fault 0012: Current detection fault 0013: Motor auto-tuning fault 0014: Encoder/PG card fault 0015: EEPROM read-write fault 0016: Inverter hardware fault 0017: Motor short circuit to ground 0018: reserved 0019: reserved 001A: Accumulative running time reached 001B: User defined fault 1 001C: User defined fault 2 001D: Accumulative power-on time reached 001E: Load becomes 0 001F: PID feedback lost during running 0028: Pulse-by-pulse current limit fault 0029: Motor switchover fault during running 002A: Speed deviation too large 002B: Motor over-speed 002D: Motor over-heat 005A: Encoder line number setting fault

	005B: Encoder not connected 005C: Initial position fault 005E: Speed feedback fault

Communication fault information:

Communication fault address	Fault description
8001	0000: No fault 0001: Wrong password 0002: Command code fault 0003: CRC detection fault 0004: Invalid address 0005: Invalid parameter 0006: Parameter editing invalid 0007: System locked 0008: Writing EEPROM in operation

Appendix I: Brake accessories

Recommended value of brake units and brake resistors

220V class:

Inverter capacity	Brake unit		Recommended brake resistor (100% brake torque)	
	Specs	Quantity	Equivalent resistance/power	Quantity
0.4G	Built-in	1	200Ω/80W	1
0.75G		1	150Ω/80W	1
1.5G		1	100Ω/100W	1
2.2G		1	70Ω/200W	1

380V class:

Inverter capacity	Brake unit		Recommended brake resistor (100% brake torque)	
	Specs	Quantity	Specs	Quantity
0.75P/1.5G	Built-in	1	750Ω/120W	1
1.5G/2.2P		1	400Ω/300W	1
2.2G/3.7P		1	250Ω/300W	1
3.7G/5.5P		1	150Ω/500W	1
5.5G/7.5P		1	100Ω/500W	1