EV3000 Series Inverter

User Manual

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Emerson Network Power provides customers with technical support. Users may contact the nearest Emerson local sales office or service center.

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Contents

Chapter 1 Introduction

Thank you for using EV3000 series high performance vector control inverter made by Emerson Network Power Co., Ltd.

EV3000 series inverter developed and manufactured by Emerson Network Power Co., Ltd. provides you with high quality, multi-function and low noise. Through decoupling control of the motor flux current and torque current, the inverter achieves quick response and accurate control of the torque, can operate under accurate, wide range speed control. The inverter features motor parameter auto tuning, zero servo control, online switching between speed control and torque control, spinning speed tracking, built-in PLC, built-in PID control, pulse generator (PG), input signal and feedback signal cable broken detection switching, load missing protection, fault signal memory, auto reset, built-in braking unit, built-in PG interface, 28 types of fault monitoring, abundant I/O interfaces, and up to ten speed setting modes, therefore can meet the spinning control requirement of various loads. The inverter provides LED to display operating data and fault code, and LCD to display status data and operation instructions (in Chinese/English optional). It provides parameter uploading and downloading. Background commissioning and monitoring software provides strong functions, can connect to inverters through built-in RS485 ports to achieve inverter networking and monitoring. The inverter can connect to PROFIBUS field bus control system compliant with international standard through TDS-PA01 bus adapter. The inverter's compact design contributes to flexible installation. The design and test conducted in compliance with international standard ensures the product quality, and abundant options are available for your flexible configuration.

Before using EV3000 series inverter, please read this manual carefully to ensure proper use. Improper use can cause inverter malfunction, reduce the inverter life, or even jeopardize personnel safety. So, you should read this manual carefully and use the inverter strictly following the instructions. This manual is delivered with the inverter, please save it for future reference in inverter repair and maintenance.

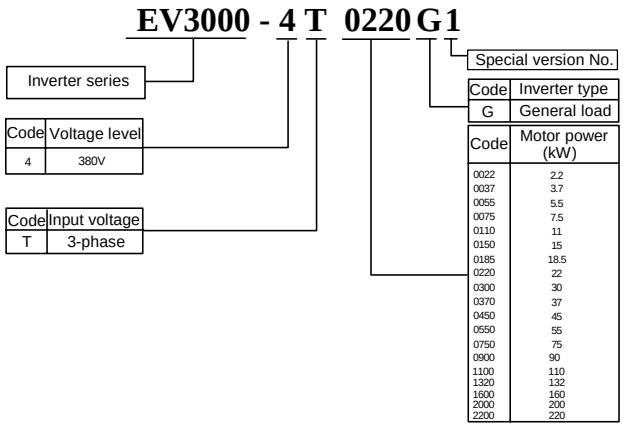
1.1 Notes For Unpacking Inspection

Upon unpacking, please confirm the following:

- Any damage occurred during transportation;
- Check whether the model and specifications on the nameplate of inverter are in accordance with your order.

If there is any error, please contact your supplier.

1.2 Model Description



1.3 Nameplate

The nameplate is on the right bottom of the case of the inverter. The contents are shown in Figure 1-1.

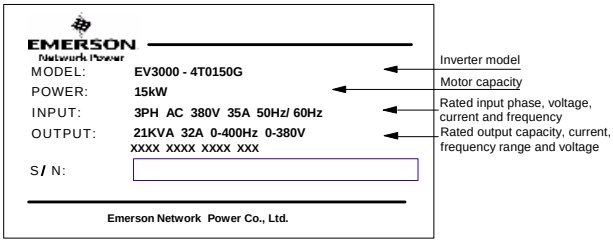


Figure 1-1 Inverter nameplate

1.4 Parts Of Inverter

Parts of inverter are shown in Figure 1-2.

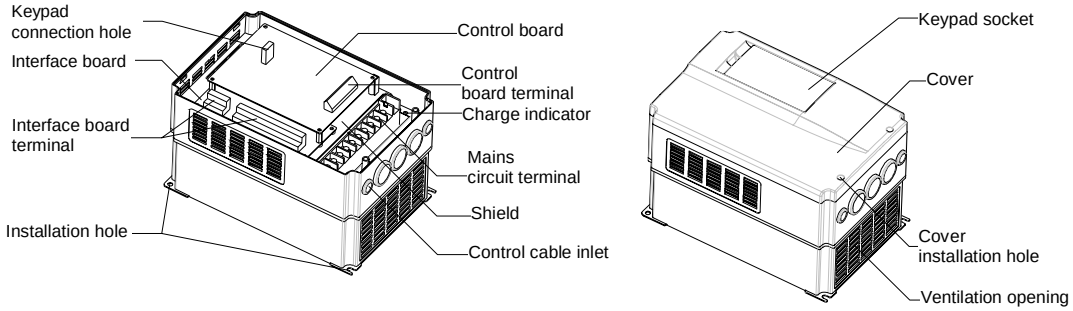


Figure 1-2 Parts of inverter

1.5 Safety Rules

Definition of "Danger" and "Attention":

Danger — Operations which are not performed according to requirements may cause serious equipment loss or personnel injury.

Attention — Operations which are not performed according to requirements may cause medium hurt or light hurt or material loss

1.5.1 Installation

Danger

Please install the inverter on metal or other nonflammable materialie, otherwise there is a danger of fire.
Please don't install it near combustible material, otherwise there is a danger of fire.
Please don't install the inverter in the site with explosive gases, otherwise there is a danger of explosion.

1.5.2 Cable Connection And Distribution

Danger

Only qualified personnel can perform wire-connection job otherwise there is a danger of shocking.
Wire-connection job can only be done when the mains are cut off, otherwise there is a danger of shocking.
The earth terminal of frequency converter must be connected to earth reliably, otherwise there is a danger of shocking.

Attention

Don't short circuit (+)P/P1/PB and (-), otherwise there is a danger of explosition or material loss.
Be sure to connect the main loop terminal with cable lug firmly, otherwise there is a danger of material loss.
Don't connect control terminals directly with 220V signal, otherwise there is a danger of material damage.
Bare part of lugs in main circuit must be bound with insulation tape, otherwise there is a danger of explosition or material loss.

Attention

Install the cover plate properly before power up, otherwise there is a danger of shock or explosion.
Don't mix input terminals and output terminals, otherwise there is a danger of explosion or material loss.
The inverters on shelf over 2 years should be ramped up by voltage regulator before power up, otherwise there is a danger of shock or explosion.
Do not touch the control terminals when it is live, otherwise there is a danger of shock.
Do not operate on inverter with wet hand, otherwise there is a danger of shock.

1.5.3 Maintenance

Attention

Maintenace can not be done until 10 minutes after the power off when the charge indicator is out or the voltage of positive/negative busbar is confirmed below 36V.
Only qualified personnel should replace the components. Do not leave any leads or metal in the inverter, otherwise there is a danger of fire .
After replacement of control panel, the parameters must be changed before power up, otherwise there is a danger of material loss.

1.6 Notes On Usage

1.6.1 Motor And Mechanical Loads

Parameter adjustment

Before using the inverter, you are required to adjust relevant parameters according to the motor type. Or else, the equipment may be damaged.

Compared to the standard frequency operation

EV3000 series inverters are voltage type inverter. Its output voltage is in PWM wave with some distortion. Therefore,

there are some increase in the temperature elevation, noise and vibration of motor.

Constant torque low speed running

When the inverter outputs to a common motor at low speed for a long term, the output rated torque should be derated due to the worsening radiating effect. If low speed constant torque long term running is required, then a special variable frequency motor is needed.

The electro-thermal protective value of motor

If the applicable motor is selected according to requirements, the inverter can perform the thermal protection to the motor. If the ratings of applied motor are not in compliance with the inverter, be sure to adjust the protective value to guarantee the safe running of motor.

Running at frequency above 50Hz

If running at frequency above 50Hz, besides the increment of vibration and noise, the ranges of running speed of motor shaft and mechanical device have to be guaranteed. Be sure to make an enquiry first.

Lubrication of mechanical devices

When the mechanical devices like deceleration box and gear motor, etc. run at low speed for long term, damages may occur due to the worsening lubricating effect. Be sure to make an enquiry first.

Negative torque load

The motor runs in 4 quadrants with Negative torque load, negative torque may occur in this condition. Braking units should be connected with the inverter, or over current and over voltage fault may happen. For EV3000-4T0022G ~ EV3000-4T0150G, EV3000-4T0185G1, EV3000-4T0220G1, only braking resistor is needed because the inverter has built-in braking unit. For EV3000-4T0185G ~ EV3000-4T2200G, external braking unit and braking resistors should be connected.

The mechanical resonance point of load

The inverter may encounter the mechanical resonance point of load within certain output frequency range. Jump frequencies have to set to avoid it.

1.6.2 About The Inverter

Capacitor and varistors

Because the inverter outputs PWM pulse wave, capacitor and varistors should not be connected with the output terminals of the inverter, or the inverter may trip or components may be damaged; as shown in Figure 1-3.

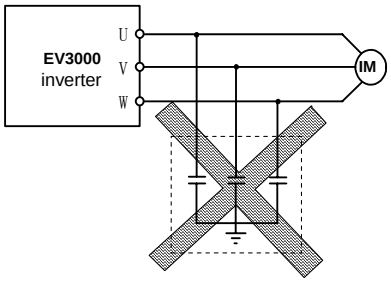


Figure 1-3 Capacitor connection with inverter output prohibited

Usage outside the range of rated voltage

The inverter is not applicable out of the specified range of operation voltage. If needed, please use corresponding voltage regulation device.

3-phase input modified into 2-phase input

The modification from 3-phase input to 2-phase input is not allowed, or fault may occur. If there are only two phases available, the phase-loss protection function should be disabled before the inverter is derated for operation.

Lightning strike protection

There are lightning overcurrent devices inside the inverter which has auto-protection function.

Altitude and deration

When the altitude is higher than 1000m, the cooling effect of inverter is deteriorated because of the rareness of air, derating must be considered. Figure 1-4 indicates the relationship between the altitude and rated current of inverter.

If the altitude is higher than 3000m, please contact the manufacturer.

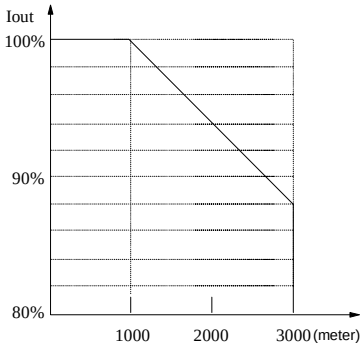


Figure 1-4 Altitude vs. inverter rated current

EMI emission

1. For category C2 product, in a domestic environment, this product may cause radio interference, in which case supplementary mitigation measures may be required.

2. For category C3 product:

1) This type of inverter is not intended to be used on a low-voltage public network which supplies domestic premises;

2) Radio frequency interference is expected if used on such a network.

3. For product whose rated input current is between 16 and 75A, the product is intended not to be connected to low-voltage systems interfacing with the public supply at the low-voltage level, but intended to be connected to low-voltage systems interfacing with the public supply only at the medium or high-voltage level.

4. For product whose rated input current is less than 16A and rated power is greater than 1kW, it is professional equipment with a total rated power greater than 1 kW, so no limits apply.

1.7 Notes Regarding Disposal

When you dispose the inverter, pay attention to:

Explosion risk of capacitor: The capacitors in the main circuits may explode when they are burned.

Waste gas when plastic parts are burned: Poisonous gas may be generated when front panel is burned.

Dispose method: Please dispose the inverter as industrial rubbish.

Chapter 2 Models And Specifications

2.1 Models

Models	Rated capacity (kVA)	Rated input current (A)	Rated output current (A)	Motor power (kW)
EV3000-4T0022G	3	6	5	2.2
EV3000-4T0037G	5.5	9	8	3.7
EV3000-4T0055G	8.5	16.1	13	5.5
EV3000-4T0075G	11	18	17	7.5
EV3000-4T0110G	17	26	25	11
EV3000-4T0150G	21	35	32	15
EV3000-4T0185G	24	38.5	37	18.5
EV3000-4T0185G1	24	38.5	37	18.5
EV3000-4T0220G	30	46.5	45	22
EV3000-4T0220G1	30	46.5	45	22
EV3000-4T0300G	40	62	60	30
EV3000-4T0370G	50	76	75	37
EV3000-4T0450G	60	92	90	45
EV3000-4T0550G	72	113	110	55
EV3000-4T0750G	100	157	152	75
EV3000-4T0900G	116	180	176	90
EV3000-4T1100G	138	214	210	110
EV3000-4T1320G	167	256	253	132
EV3000-4T1600G	200	307	304	160
EV3000-4T2000G	250	385	380	200
EV3000-4T2200G	280	430	426	220

2.2 Specifications

Items		Specifications
Input	Rated voltage, frequency	Three-phase, 380V; 50Hz/60Hz
	Range	Voltage: 320V~460V, Voltage unbalance rate<3%; frequency: ±5%
Output	Output voltage	Three-phase, 0~380V
	Output frequency	0Hz~400Hz
	Overload capability	150% rated current for 2 minutes, 180% rated current for 10 seconds
Control function	Modulation modes	Optimized space voltage vector PWM modulation
	Control mode	With PG feedback vector control / without PG feedback vector control/ V/F Control
	Running command input modes	Panel control; terminal control; control by serial port of host computer
	Speed setting mode	Ten kinds of setting modes: panel digital setting. analog setting; setup by serial port of host computer, and so on
	Speed setup definition	Digital setting: ±0.01% (-10°C~+40°C); analog setup: ±0.05% (25°C±10°C)
	Speed setup accuracy	Digital setting: 0.01Hz; analog setup: 1/2000 highest frequency
	Speed control accuracy	With PG feedback vector control: ±0.05%; (25°C±10°C) Without PG feedback vector control: ±0.5%; (25°C±10°C)
	Speed control range	With PG feedback vector control: 1: 1000; without PG feedback vector control: 1: 100
	Torque control response	With PG feedback vector control: < 150ms; without PG feedback vector control: < 200ms
	Start torque	With PG feedback vector control: 200%/0rpm; without PG feedback vector control: 150%/0.5Hz
	Torque control accuracy	±5%

Items		Specifications
Control I/O signal	Reference voltage output	2 branches, +/-10V, 5mA
	Control voltage output	24 V/100mA, or external power supply through PLC terminal
	External power input	1 branch, Control Signal Input terminal's working power supply can be obtained from external power supply of active contact (8~24V)
	Analog input	2 branches, -10V~+10 V DC, 11bit+ Sign Bit, 1 branch, 0~10V/0~20mA DC, 10bit, Selected by the jumpers' position at V or I
	Analog output	2 branches, 0~20mA, output programmable, 11 kinds of output selectable
	Running order input	2 branches, FWD/STOP and REV/STOP insutruction input
	Programmable relay output	8 programmable branches, 30 kinds of running control command can be selected such as fault reset, Pre-excitation and torque control
	PG input	A+, A−, B+, B− differential input/A−, B− open collector input
	FAM output	11 branches, frequency signal (the signal's frequency is the multiple of the inverter's output frequency)
	Open collector output	2 branches, 14 optional running states, the maximum output current is 50mA
	Programmable relay output	1 branch, 14 optional running states, contact capacity: 250V AC /3A or 30V DC /1A
	Alarm relay output	1 branch, contact capacity: 250V AC /3A or 30V DC /1A
	Serial port	RS-485 port
Display	4-digit display (LED)	16 kinds of parameters such as setup frequency , output frequency ,output voltage ,output current ,motor speed,output torque, Digital value terminals, program menu parameters and 28 kinds of Fault codes
	Chinese/English display (LCD)	Control mode and running direction display, program or monitor parameters display, alarm content, panel operation command
	Indicator (LED)	Parameter unit, setup direction, RUN/stopping state, special state description, Charge light description
Environment	Environment	Indoors, free from direct sunlight, dust, corrosive gas, combustible gas, oil mist, steam,water drop or salt
	Altitude	Lower than 1000m (deration is needed above 1000m)
	Ambient temperature	-10°C~+40°C
	Humidity	20%~90%RH, noncondensing
	Vibration	Lower than 5.9m/s^2 (0.6g)
	Storgae temperature	-20°C~+60°C
Structure	Protection level	IP20
	Coooling	Forced air cooling
Installation		Wall mounted

2.3 Size

2.3.1 Outline Size

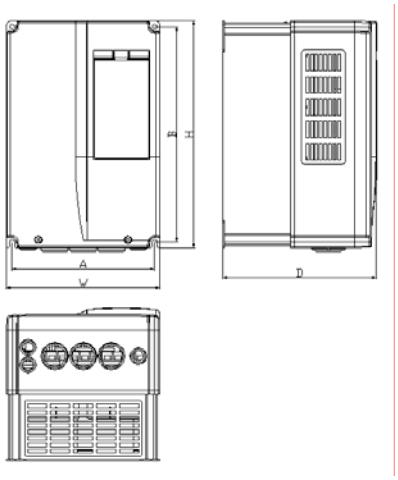


Figure a EV3000-4T0022G~EV3000-4T0150G, EV3000-4T0185G1~EV3000-4T0220G1

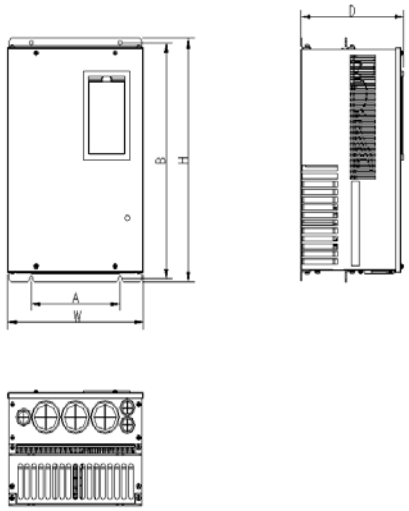


Figure b EV3000-4T0185G~EV3000-4T0220G

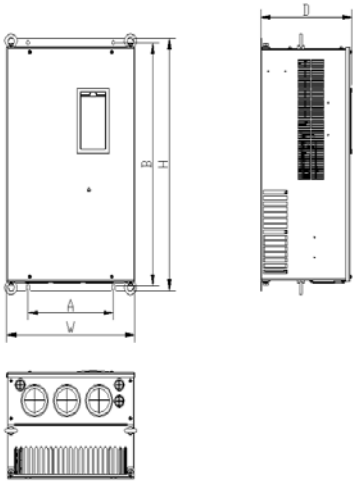


Figure c EV3000-4T0300G ~EV3000-4T0450G

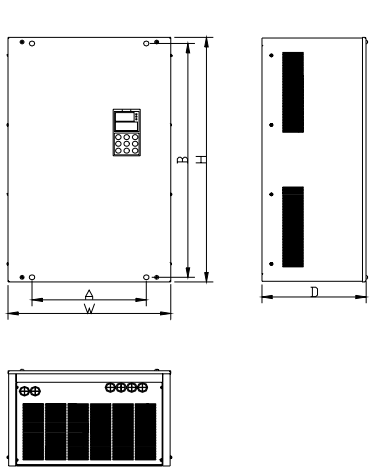


Figure d EV3000-4T0550G ~EV3000-4T0900G

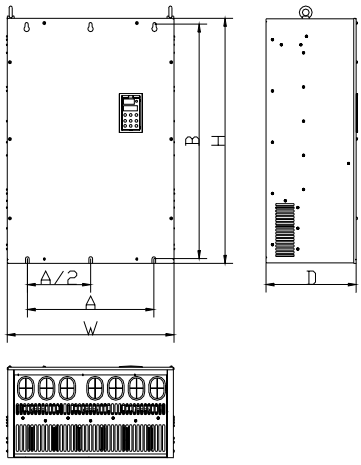


Figure e EV3000-4T01100G ~EV3000-4T2200G

Figure 2-1 EV3000 appearance

2.3.2 Model Vs. Mechanical Parameters Table

Table 2-1 Mechanical parameters of EV3000 series inverter

Inverter model	Motor (kW)	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Installation hole diameter (mm)	Appearance figure	Gross weight (kg)
EV3000-4T0022G	2.2	186	285	300	200	202	6.8	Figure a	7.5
EV3000-4T0037G	3.7								
EV3000-4T0055G	5.5								
EV3000-4T0075G	7.5								
EV3000-4T0110G	11	236	365	380	250	209	6.8		12
EV3000-4T0150G	15								
EV3000-4T0185G1	18.5	200	486	500	310	256	7		15
EV3000-4T0220G1	22								19

Inverter model	Motor (kW)	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	Installation hole diameter (mm)	Appearance figure	Gross weight (kg)
EV3000-4T0185G	18.5	180	421	435	275	209	7	Figure b	13
EV3000-4T0220G	22								15
EV3000-4T0300G	30	250	600	624	375	250	9	Figure c	35
EV3000-4T0370G	37								
EV3000-4T0450G	45								38
EV3000-4T0550G	55	300	747	770	468	301	10	Figure d	50
EV3000-4T0750G	75								
EV3000-4T0900G	90								90
EV3000-4T1100G	110	370	855	880	530	370	14	Figure e	100
EV3000-4T1320G	132								
EV3000-4T1600G	160								
EV3000-4T2000G	200	520	975	1000	680	370			140
EV3000-4T2200G	220								

Note: For 75kWG and above inverters, DC reactor is included in the standard configuration. The weight of DC reactor in the above table is not included in the gross weight. Outline and dimensions of DC reactor are shown below.

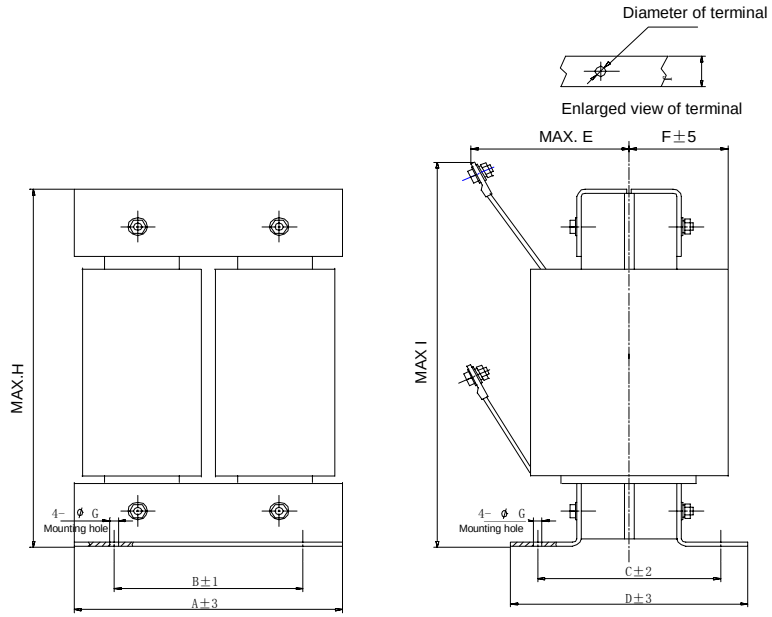


Figure 2-2 DC reactor appearance

Table 2-2 Mechanical parameters of DC reactor

Applicable inverter (kW)	DC reactor model	Recommended copper cable (mm^2)	Size (mm)											Gross weight (kg)
			A	B	C	D	E	F	G	H	I	J	Terminal hole diameter	
75G	TDL-4DI01-0900	60	190	160	125	161	120	80	10	250	280	25	Φ12	23
90G														
110G	TDL-4DI01-1100	100												25
132G	TDL-4DI01-1320	150	200	170	135	171		85		260		30		28
160G	TDL-4DI01-1600		210	180			130		12	280	320			32
200G	TDL-4DI01-2200	200	220	190			150	90		315	340	40	Φ15	40
220G		250												

Note:
1. Columns B and C are the sizes of mounting holes of DC reactor.
2. DC reactor should be installed at the bottom of the cabinet if it is to be installed inside a cabinet. The clearance between reactor and the drive should be at least 35cm, and the reactor should be as far away from the air inlet port of the drive as possible

2.3.3 Panel Size

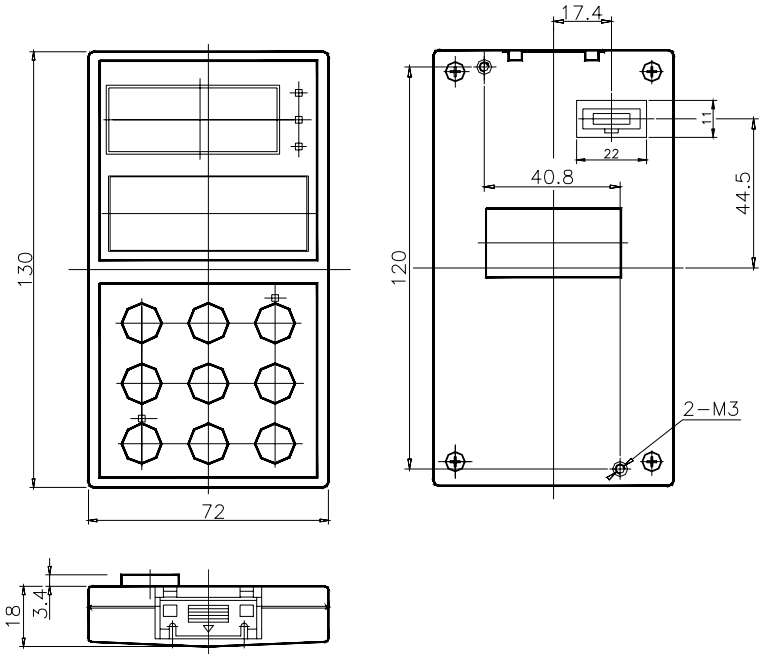


Figure 2-3 Panel size (unit: mm)

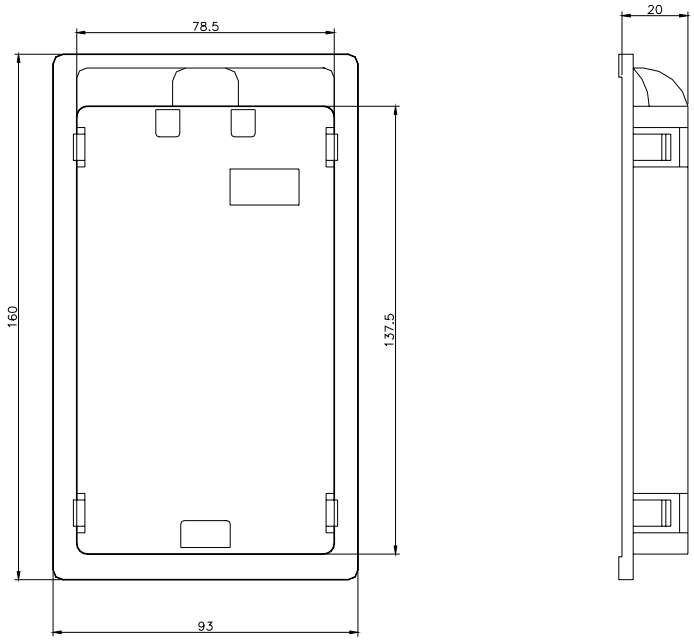


Figure 2-4 Keypad box size (unit: mm)

Chapter 3 Installation And Cable Connection

3.1 Installation

Please mount the inverter inside a well-ventilated location, generally in vertical way.

The selection of mounting environment should take the following items into account:

1. Ambient temperature: It is required to be within the range of -10°C~40°C. If the temperature is higher than 40°C, the inverter should be derated by 30% when the temperature rises by every 5°C, at the same time the ventilation and heat dissipation should be enhanced.

2. Humidity should be lower than 90% with no dew condensation.

3. Be away from the location full of dust or metal powder.

4. Mount in the location free of corrosive gas or combustible gas.

5. Mount in the location where vibration is less than 5.9m/ s^2 (0.6G).

6. Mount in the location free of direct sunlight.

7. The inverter should be installed in a metal cabinet, which can prevent unauthorized person from touching.

If there are any special requirements on mounting, please contact us in advance.

For the requirements on mounting space and distance, refer to Figure 3-1 and Figure 3-2.

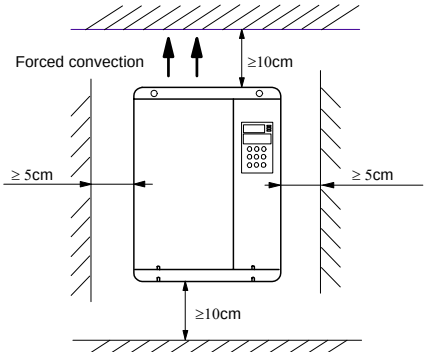


Figure 3-1 Mounting space (45kW and lower)

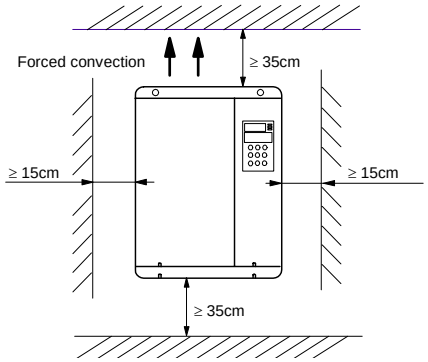


Figure 3-2 Mounting space (55kW and higher)

When several inverters are installed in one cabinet, they should be mounted in parallel with special incoming ventilation, outcoming ventilation and special fans. When two inverters are mounted up and down, an air flow diverting plate should be fixed in between to ensure good heat dissipation, as shown in Figure 3-3.

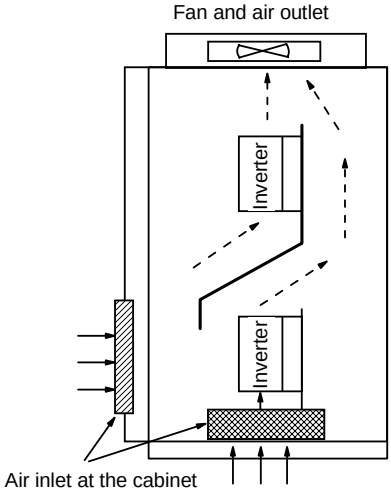


Figure 3-3 Mounting of multiple inverters

3.2 Removing And Mounting Operation Panel

3.2.1 Removing Operation Panel

Put your middle finger into the hole on the top of operation panel, press down the snapper and pull the panel outward as shown in Figure 3-4.

3.2.2 Mounting Operation Panel

Aim the holes in the bottom of panel at the hooks of the mounting groove, press down the snapper with your middle

finger, then press the panel inward to snap it on, as shown in Figure 3-4.

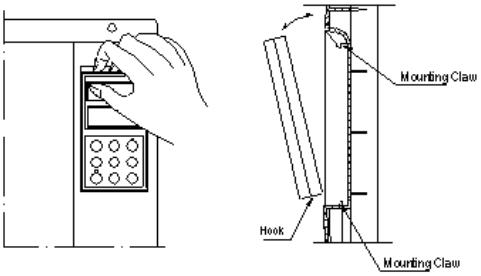


Figure 3-4 Removing and mounting operation panel

3.3 Removing And Mounting Cover

EV3000 series have two kinds of cover, plastic or metallic one. Follow the steps below to remove and mount the cover.

3.3.1 Removing And Mounting Plastic Cover

Figure 3-5 shows the removing and mounting of the plastic cover. 1. Removing procedures

1) Remove the operation panel.

2) Remove two screws at the bottom.

3) Lift the bottom of the cover up 5~10 degrees, move it upward at least 10mm until the mounting claws are out of the holes on the cabinet, then remove the front panel.

2. Mounting procedures

1) Tilt the cover for 5~10 degrees.

2) Insert the mounting claws at the top into the holes on the top of cabinet.

3) Align the mounting holes at the bottom, then screw them.

4) Install the operation panel.

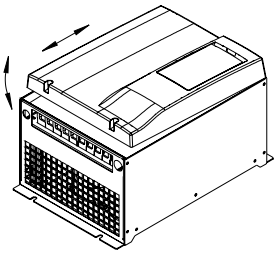


Figure 3-5 Removing and mounting plastic cover

Note

The plastic cover cannot be pulled out by force during removing and mounting, otherwise, the mounting claws would be damaged.

3.3.2 Removing And Mounting Metal Cover

Figure 3-6 shows the removing and mounting of the metal cover.

1. Removing procedures

1) Remove the operation panel.

2) Remove all the screws on the cover.

3) Take it out parallel.

2. Mounting procedures

1) Align all the mounting holes on both the cover and cabinet, and then screw them.

2) Install the operation panel.

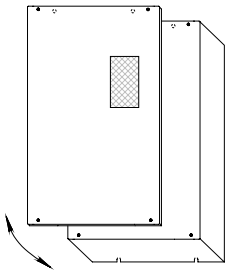


Figure 3-6 Removing and mounting metal cover

3.4 Wire Connection

Danger

The cover can be removed only when the power is switched off, all the LEDs on the panel are off and waiting at least for 10 minutes.
Wiring work can be performed only when the Charge light is off and the voltage between the (+) and (-) terminals is lower than 36V.
Wiring work can only be done by trained or professional personnel.
Wiring and connections must be checked before emergency stopping or protection circuit are to be connected.

Attention

Before usage, check whether the mains voltage meets the requirement of inverter input voltage;
The inverter has gone through voltage withstand test in factory. Users shall not conduct voltage withstand test again.
Refer to *Chapter 9 Options* if brake unit or resistor is needed.

Attention

The control terminals are single insulated and must not be touched.
If the control circuits are to be connected to other circuits classified as Safety Extra Low Voltage (SELV) (e.g. to personal computer), an additional isolation barrier must be included to maintain the SELF classification.
When connected to a PC, an RS485/232 isolation converter that complies with the safety requirements must be added.

> **Attention**
>
> If a residual current device (RCD) is used for protection in case of direct or indirect contact, only an RCD of Type B is allowed on the supply side of this product.

1. Fuse or MCCB must be connected between mains and inverter input terminals (R, S, T). Refer to Table 3-1 for the types of breakers and MCCB.

2. The PE terminal must be reliably connected to the protective earthing terminal of the supply. The cross section of earthing cable must be at least the same as the input cables, and the grounding resistance should not be higher than 0.2Ω.

3. Check that the inverter power cables are connected to the inverter properly.

4. After finishing the cable connection, please check:

1) Whether all the connections are right?

2)Whether there is any connection missed or forgotten?

3)Whether there is any short circuit in the cable connection?

Table 3-1 MCCB, circuit breaker and cable specifications

Model EV3000−	Input breaker	Input/output cables (mm^2)		Control cables (mm^2)
	MCCB (A)	Input	Output	Control terminals cable
4T0055G	32	4	4	1
4T0075G	40	6	6	
4T0110G	63	6	6	
4T0150G	63	6	6	
4T0185G (1)	100	10	10	
4T0220G (1)	100	16	16	
4T0300G	125	25	25	
4T0370G	160	25	25	
4T0450G	200	35	35	
4T0550G	200	35	35	
4T0750G	250	70	70	
4T0900G	315	70	70	
4T1100G	400	95	95	
4T1320G	400	150	150	
4T1600G	630	185	185	
4T2000G	630	240	240	
4T2200G	800	150×2	150×2	

3.4.1 Connecting Optional Parts

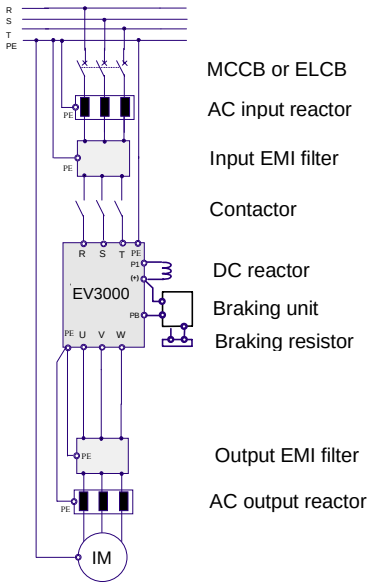


Figure 3-7 Wiring of optional parts

1. As the power switch of inverters, MCCB and ELCB can also protect the power source. Note that you cannot use MCCB/ELCB to control the start or stop of the inverter. See Table 3-1 for MCCB selection.

2. AC input reactor

You may choose AC input reactor to improve input power factor and reduce high harmonic current.

3. EMI filter at input side

You may choose EMI filter to suppress high frequency noise interference from the drive power lines.

4. Contactor

The contactor can be used to cut off power supply in case of fault. But do not use contactor to control the start or stop of the motor.

5. DC reactor

EV3000-4T0750G and above inverters include the DC reactor in standard configuration, EV3000-4T0550G and below inverters provide optional DC reactor.

In order to protect the inverter against power source interference and reduce high harmonic current, a DC reactor should be used in the following cases:

1) When a switch controlled reactive power compensation capacitor or a phase-controlled thyristor load shares the same power source with the inverter, the inverter input rectification circuit could be damaged when: a, the capacitor switchover causes sharp voltage change, or b, the phase-controlled thyristor load causes harmonic and wave breaches.

2) When the imbalance among the 3 AC input phases exceeds 3%.

3) When it is required to raise the power factor at inverter input side to 0.93.

4) When the inverter is in connection with a large capacity transformer, the current on the inverter power source may damage the rectification circuit. Generally a DC reactor should be used when the transformer capacity is larger than 550kVA.

6. EMI filter at output side.

You may use EMI filter to suppress the interference noise and leakage current at the inverter output side.

7. AC output reactor

When the cable between inverter and motor is longer than 20m, you can use a resistor at AC output side to suppress the overcurrent caused by cable capacitance. The reactor can also suppress inverter's EMI.

8. See *Chapter 9 Options* for the technical parameters of optional parts.

3.4.2 Basic Wiring Diagram

Applicable model: EV3000-4T0022G~EV3000-4T0150G, EV3000-4T0185G1, EV3000-4T0220G1

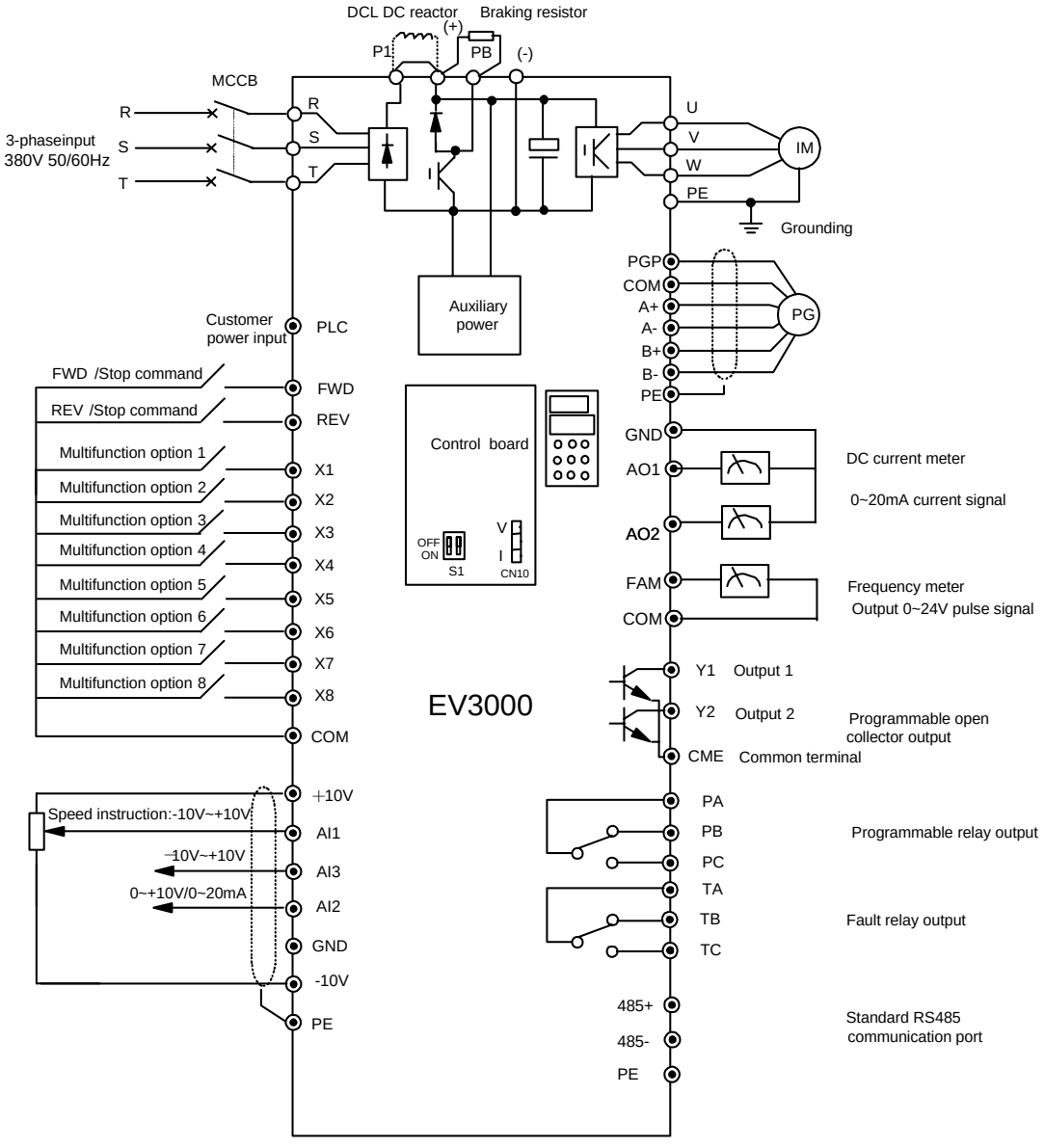


Figure 3-8 Basic wiring diagram 1

Note

1. AI2 can input voltage or current signal when the jumper of CN10 on the main control board is selected at V side or I side.
2. The auxiliary power source comes from the positive and negative bus P&N.
3. Having braking device inside. If the braking capacity is not enough, external braking devices can be connected between PB&P.
4. "O" in the figure stands for the main loop terminal, "? " for control terminals.
5. Refer to Chapter 5 Function Parameter Table and Chapter 6 Detailed Function Introduction for the usage of control terminals.

Applicable model: EV3000-4T0185G~EV3000-4T0450G

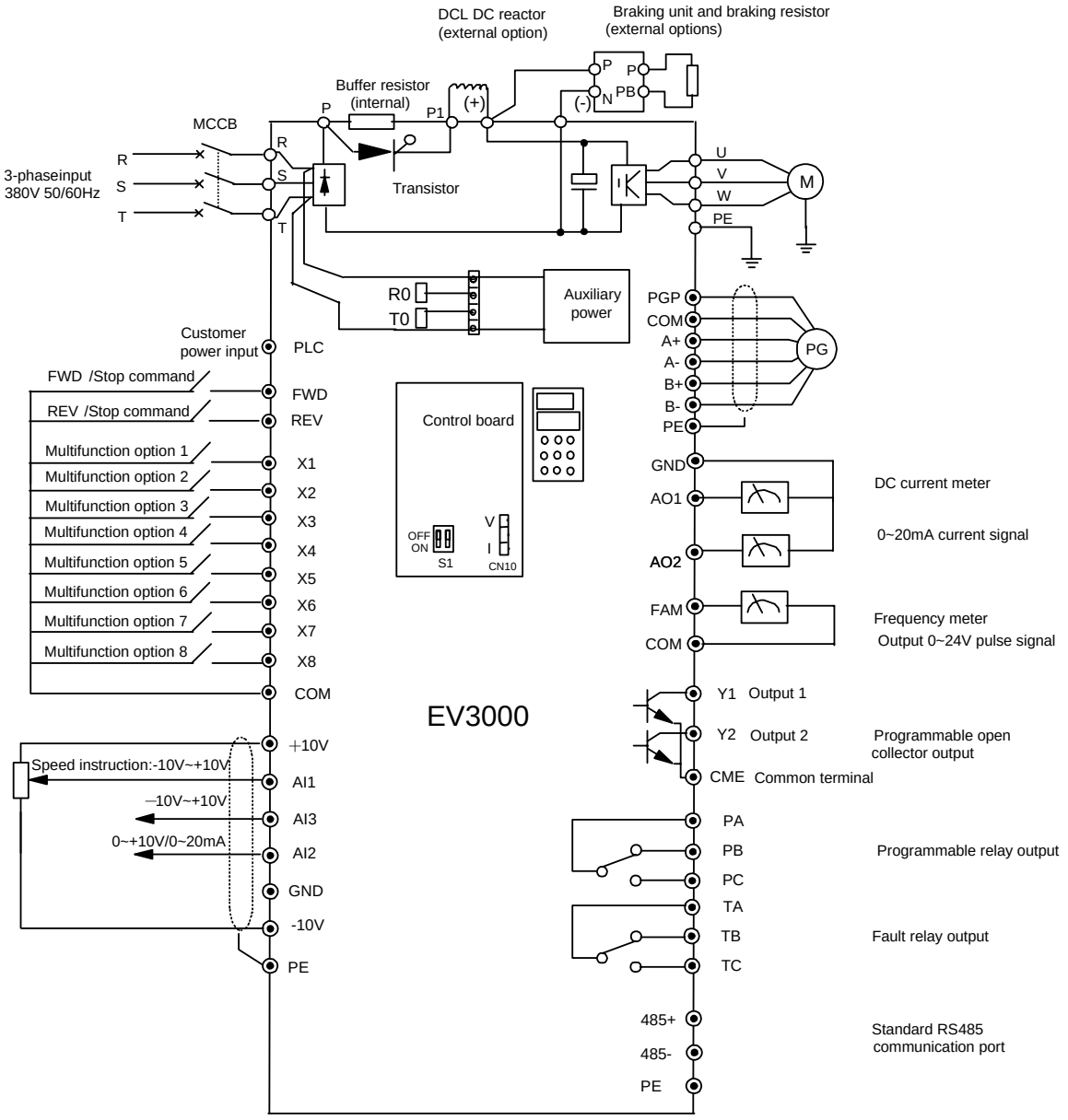


Figure 3-9 Basic wiring diagram 2

Note

1. AI2 can input voltage or current signal when the jumper of CN10 on the control board is selected at V side or I side.

2. The auxiliary power source of EV3000-4T0185G and EV3000-4T0220G comes from the positive bus and negative bus; the auxiliary power source of EV3000-4T0300G~EV3000-4T0450G comes from the R and T terminals of the 3-phase input. If users need to use external power source, connect the jumper on CN4 to CN3 before connecting the external power source to sockets R0 and T0.

3. If external braking parts are needed, then braking unit and braking resistors should be included; Pay attention to the polarity of the braking unit in wire connection.

4. "O" in the figure stands for the main loop terminal, "? " for control terminals.

5. Refer to Chapter 5 Function Parameter Table and Chapter 6 Detailed Function Introduction for the usage of control terminals.

Applicable model: EV3000-4T0550G~EV3000-4T2200G

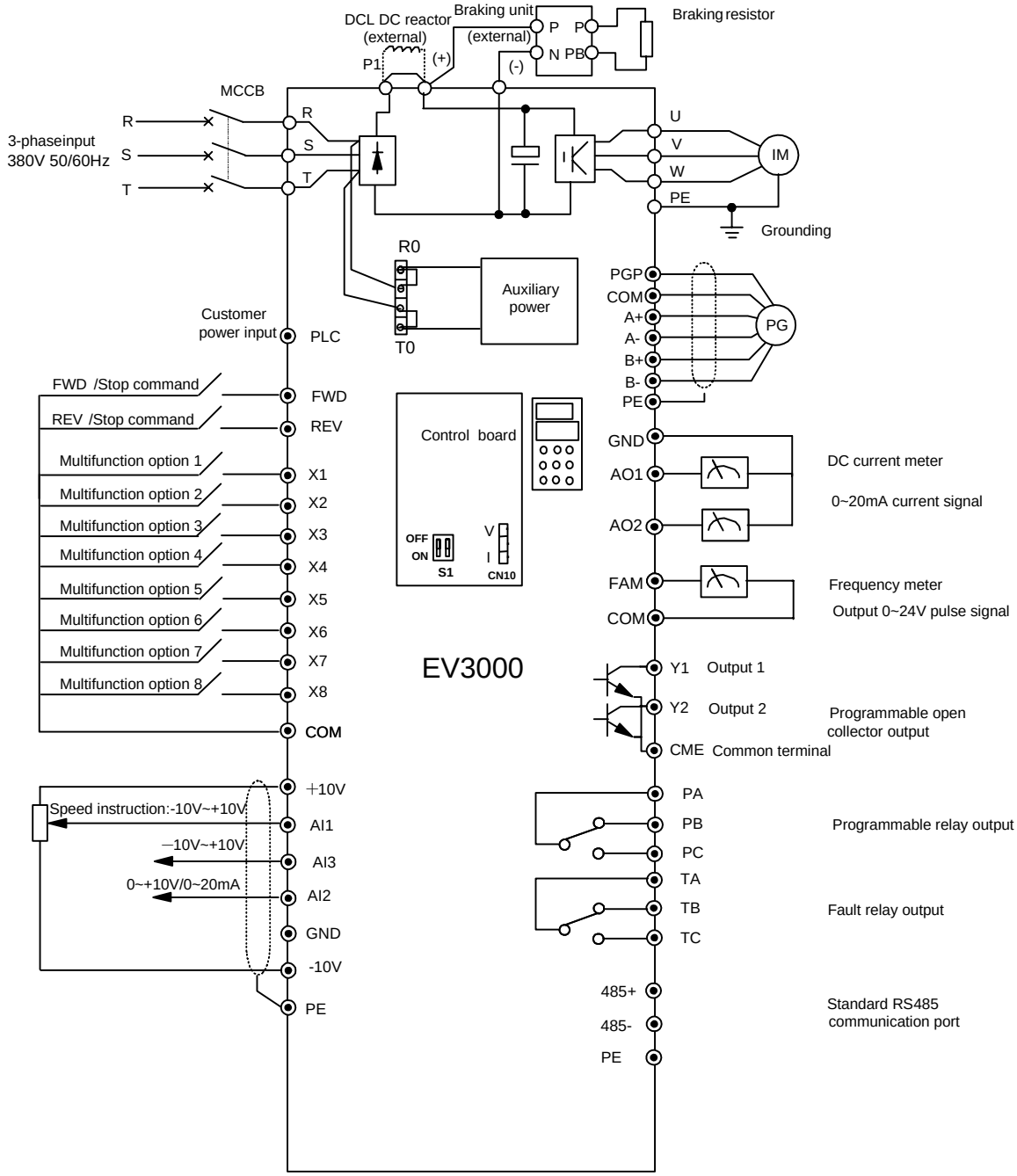


Figure 3-10 Basic wiring diagram 3

Note

1. AI2 can input voltage or current signal when the jumper of CN10 on the control board is selected at V side or I side.

2. The auxiliary power source comes from R0 & T0 which are shorted with R&T of 3-phase input. If users need to use external power source, the shorting bars between R&R0, T&T0 have to be removed before connecting the external power source via R0&T0. Otherwise, shorts will occur.

3. If external braking parts are needed, then braking unit and braking resistors should be included; Pay attention to the polarity of the braking unit in wire connection.

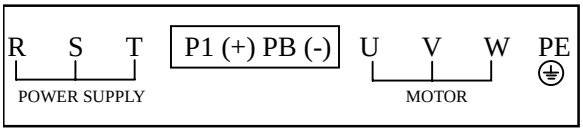
4. "O" in the figure stands for the main loop terminal, "? " for control terminals.

5. Refer to Chapter 5 Function Parameter Table and Chapter 6 Detailed Function Introduction for the usage of control terminals.

3.4.3 Connecting Input, Output, Earth Terminals

Danger
Before usage, PE must be confirmed to be connected with ground. Or fire accident may occur.

Applicable model: EV3000-4T0022G-EV3000-4T0150G



Applicable model: EV3000-4T0185G1, EV3000-4T0220G1

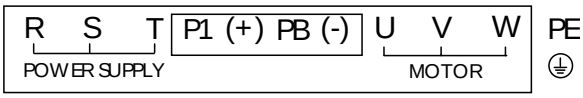


Table 3-2 Inverter terminal description 1

Terminal	Description
R, S, T	Three phase power input terminal, 380V/400V, 50/60Hz
P1, (+)	Reserved terminals for DC reactor. Shorted in factory
(+), PB	Reserved terminals for braking resistor
(-)	Output terminal for negative DC bus
U, V, W	AC output terminals
PE	Earth terminal

Applicable model: EV3000-4T0185G~EV3000-4T0450G

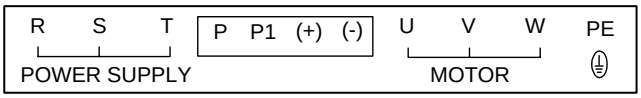


Table 3-3 Inverter terminal description 2

Terminal	Description
R, S, T	Three phase power input terminal, 380V, 50 / 60 Hz
P	Positive output terminal of rectifier bridge
P1, (+)	Reserved terminals for DC reactor. Shorted in factory
(+), (-)	Reserved terminals for braking resistor. (+) and (-) are respectively the positive and negative output terminals of the DC bus
U, V, W	AC output terminals
PE	Earth terminal

Applicable model: EV3000-4T0550G

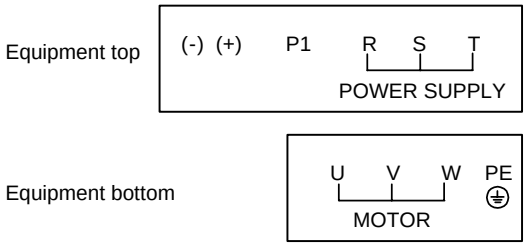


Table 3-4 Inverter terminal description 3

Terminal	Description
R, S, T	Three phase380V power input terminal
P1, (+)	Reserved terminals for DC reactor. Shorted in factory
(+), (-)	Reserved terminals for braking resistor. (+) and (-) are respectively the positive and negative output terminals of the DC bus
U, V, W	AC output terminals
PE	Shield earth terminal

Applicable model: EV3000-4T0750G~EV3000-4T2200G

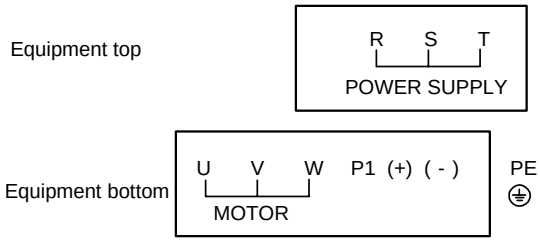


Table 3-5 Inverter terminal description 4

Terminal	Description
R, S, T	Three phase power input terminal, 380V, 50 / 60 Hz
P1, (+)	Reserved terminals for DC reactor. Shorted in factory
(+), (-)	Reserved terminals for braking resistor. (+) and (-) are respectively the positive and negative output terminals of the DC bus
U, V, W	AC output terminals
PE	Earth terminal

1. Mains input terminals (R, S, T)

1) Mains input terminals R, S and T must be connected with three-phase power via MCCB or ELCB. Generally, the phase sequence need not be considered.

2) Electro-magnetic contactor is recommended to be installed at the input side and the contactor must be interlock with output fault relay, so the fault part can be isolated and the safety is ensured.

3) In order to reduce the coupled noise from mains, suitable noise filter can be installed at the input side of Inverter.

2. Inverter output terminal (U, V, W)

1) It is strictly prohibited to connect the mains input terminals to the U, V, W output terminals, or connect the mains input terminals to the P1, (+), (-), PB terminals.

2) The U, V, W output terminals should be connected to three-phase AC motor in correct phase sequence. If the motor spinning direction is wrong, exchange the connections of any two phases.

3) Capacitors and surge suppressors are forbidden to be installed at the output side.

4) It is strictly prohibited to short or earth the output terminals of the inverter.

5) To suppress the EMI of the inverter, users may install the dedicated optional noise filter at the output side of the inverter, or lead the output cables through metal tubes and route them separately from the control cables, as shown in Figure 3-11.

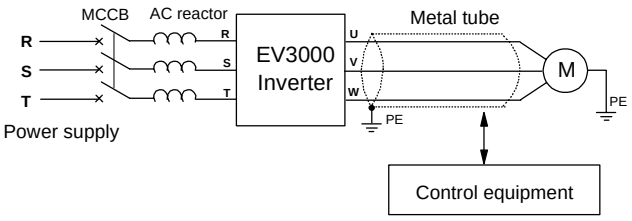


Figure 3-11 Suppressing the EMI of inverter

6) When the cable between the inverter and motor is too long, the high frequency current caused by distributed capacitors may make the inverter in protection state because of the over current, at the same time the current displaying accuracy falls because of the rising of leakage current; so the cable length should not be longer than 100m, if the cable is too long, then filter should be used or lower the carrier frequency.

3. Terminals for DC reactors (P1, (+))

1) DC reactor is used for improving the power factor. For 55kW and lower inverters, before delivery, a short circuit bar is connected between P1 and P, if DC reactors are needed, first remove the bar then connect the DC reactors.

2) If DC reactor is not needed, then the short circuit bar should not be removed. Also, you need to tighten the screws, or the inverter can not work normally.

4. Terminals for braking resistor ((+), PB)

1) In order to consume the energy during braking process, braking resistor should be connected between (+) and PB, refer to *Chapter 9 Options* for the specifications of braking resistor.

2) The cable of braking resistor should be shorter than 5m.

3) The temperature of the braking resistor will rise due to energy release. So in installation, ensure safety protection, good ventilation and heat dissipation.

4) For EV3000-4T0022G~EV3000-4T0150G, EV3000-4T0185G1, EV3000-4T0220G1 only braking resistor is needed because the inverter has built-in braking unit.

5. Terminals for external braking unit (+), (-)

1) EV3000-4T0185G~EV3000-4T2200G do not have an internal braking unit. A braking unit can be connected between (+) and (-), and the braking resistor can be connected between P and PB of the braking unit. Refer to *Chapter 9 Options* for the specifications of braking resistor and braking unit.

2) The cable between the inverter and braking unit should be shorter than 5m, so does the cable between braking resistor and braking unit.

3) Note: Do not mistaken the P and N poles of inverter and braking unit. The braking resistor cannot be connected between the terminals of P and N directly, or there may be fire accident.

6. Earth terminal ⏚PE

1) Earth terminal must be grounded well and the grounding resistor should not be higher than 10W so as to avoid electric shock and fire accident. The earth cable specifications are listed in Table 3-6.

Table 3-6 Earth cable specifications

Sectional area of the phase conductor (mm^2)	Min sectional area Sp of the corresponding earth cable (mm^2)
S≤16	S
16<S≤35	16
S>35	S/2

Note: This table assumes that the two conductors are made of the same metal; if not, the sectional area of the earth cables should be determined according to this table based on the method of equivalent conductance.

2) The inverter must have its own earth point. The earth cable should be as short as possible. It is recommended to use dedicated green-yellow earth cable.

3) When several inverters are earthed, to avoid the earth cables forming a loop circuit, better not use common earth cable.

3.4.4 Connecting Terminals Of Control Board And Interface Board

1. DSP control board terminal CN11

1) CN11 layout

485+	485−	PE	+10V	−10V	GND	AI1	AI2	AI3	GND	AO1	AO2

2) CN11 terminals are described in Table 3-7.

Table 3-7 Control board CN11 terminal description

Type	Terminal	Name	Terminal description	Specification
Communication	485+	Communication port	Positive terminal of 485 differential signal	Standard RS-485 Communication port please use shielding cable or twisted cables
	485-		Negative terminal of 485 differential signal	
Analog input	AI1-GND	Analog input 1	Use F6 function code to select input voltage and current range and polarity	Input voltage:0~±10V Input resistance: 20kΩ Definition:11bit+Sign bit
	AI3-GND	Analog input 3		
	AI2-GND	Analog input 2	Use V/I jumper of CN10 socket to select voltage or current input . Use F6 function code to select input voltage range and other functions	Input voltage/current: 0~10V/0~20mA Input resistance: 112kΩ/500Ω Definition: 10bit
Analog output	AO1-GND	Analog output 1	Use F6 function code to select output current gain and offset, there are 11 running states to be selected	Output range:0~20mA , can be converted to 0~10V Voltage signal through external resistor 500Ω
	AO2-GND	Analog output 2		
Power supply	+10V-GND	+10V power supply	Analog input uses +10V power supply	Max output current: 5mA
	-10V-GND	-10V power supply	Analog input uses -10V power supply	Max output current: 5mA
	GND	Ground of Internal power supply	Reference ground for analog signal and ±10V power supply	Isolated from COM and CME
shield	PE	Shield gound	Grounding terminal of shielding layer. Shielding layer of analog signal cable and 485 COM cable can be connected with this terminal	Connected to PE

3) Note on analog input connection

Because analog input signal is easily interfered by external disturbance, so shielded cables must be used, the cable length must be short and the shield layer must be grounded well, shown in Figure 3-12.

4) Note on serial communication port connection

① Connect the shield cable to the RS485 port on the control board, the shield layer should be grounded well.

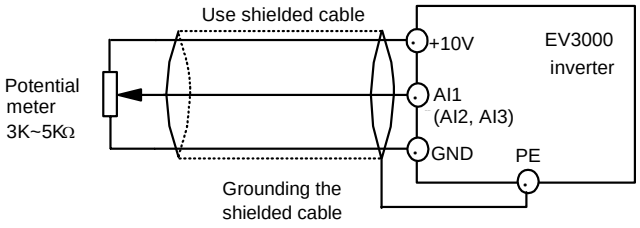


Figure 3-12 Connection of analog input terminals

② The inverter communicates with PC and PLC through standard RS485 port, thus the modification of function codes and direct monitoring can be realized by host computer.

③ TDS-PA01 bus adapter can be connected with PROFIBUS.

Connection of serial communication port is shown in Figure 3-13.

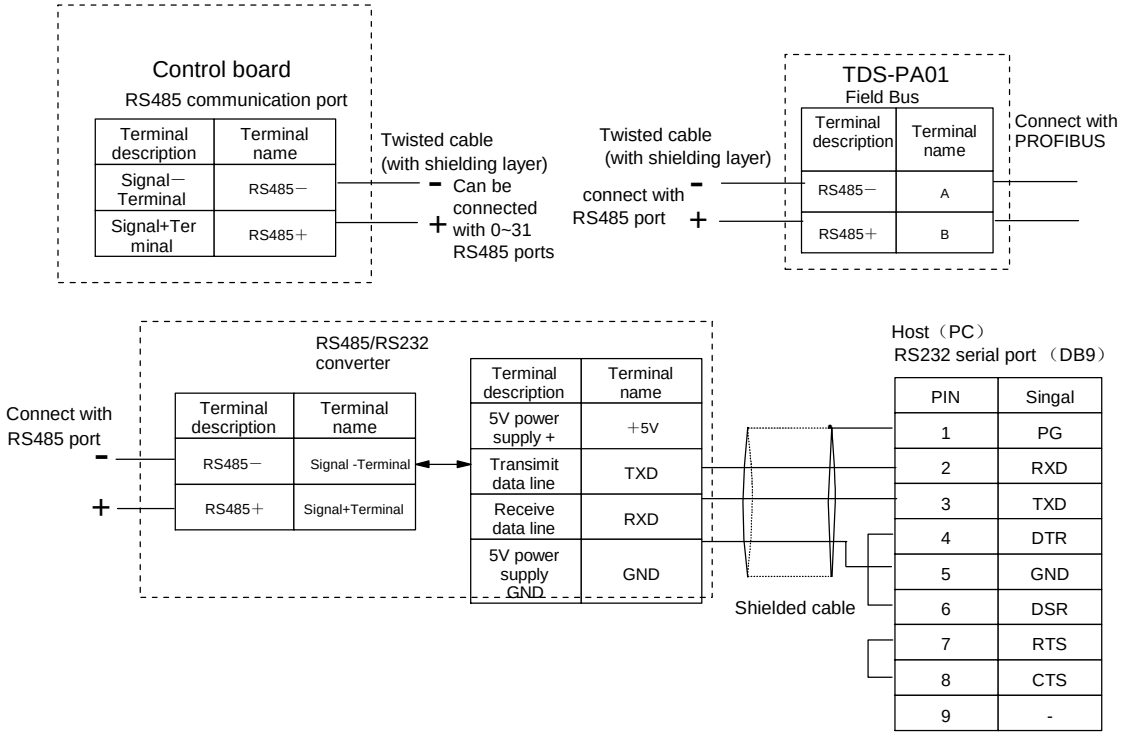


Figure 3-13 Connection of serial communication port

2. Interface board terminals CN1, CN2

1) CN1 layout

X1	X2	X3	X4	X5	COM	X6	X7	X8	Y1	Y2	CME
FWD	COM	REV	FAM	PLC	PE	PGP	COM	A+	A-	B+	B-

2) CN2 layout

PA	PB	PC
TA	TB	TC

3) Table 3-8 provides terminal description of CN1 and CN2.

Table 3-8 Terminal description of CN1 and CN2

Type	Terminal	Name	Terminal description	Specification
Input	FWD-COM	FWD/Stop terminal	FWD digital value command	Optical coupler isolation input: 24Vdc/ 5mA Highest frequency input of X1~X7 terminals:10Hz Highest frequency input of X8 terminals: 50kHz
	REV-COM	REV/Stop terminal	REV digital value command	
	X1-COM	Multifunction input selection 1	8 branch Programmable digital value input terminal. Use F5 function code to select 30 kinds of running command. When 12-bit binary setup is selected for the terminal, other functions is invalid. X8 terminal: use external frequency setup signal to decide the inverter running frequency	
	X2-COM	Multifunction input selection 2		
	X3-COM	Multifunction input selection 3		
	X4-COM	Multifunction input selection 4		
	X5-COM	Multifunction input selection 5		
	X6-COM	Multifunction input selection 6		
	X7-COM	Multifunction input selection 7		
	X8-COM	Multifunction input selection 8		
PG signal	A+	PG signal A	CN4 short circuit bar is in DI side, PG signal can be selected by the differential input of A+, A-, B+, B-. CN4 short circuit bar is in OCI side, PG signal can be selected by open collector input of A-, B-	Power supply voltage for PG signal:+8V~24V Highest frequency input:120kHz
	A-			
	B+	PG signal B		
	B-			

Type	Terminal	Name	Terminal description	Specification
Running state output	Y1-CME	Open collector output 1	Use F5 function code to slect 14 running states output	Max load: 24Vdc Max output current: 50mA Max resistance: 30~35Ω
	Y2-CME	Open collector output 2		
	CME	Common terminal of Y1and Y2 output	Common terminal Y1and Y2 transistors' collector output	Internally isolated from COM
	PA	Programmable relay output	Use F5 function code to slect 14 running states output	PA-PB: normally closed PA-PC: noramlly open Contact rating: 250Vac/3A 30Vdc/1A
	PB			
	PC			
	TA	Fault relay output	Relay output for fault alarm	TA-TB: normally closed TA-TC: noramlly open Contact rating: 250Vac/3A 30Vdc/1A
	TB			
	TC			
	FAM-COM	Frequency meter output	Frequency of output pulse is times of inverter running frequency (the rate can be selected by F5.19)	Output frequency range: 500Hz~10kHz/ 24V
Power supply	PGP-COM	+24V power supply	Power supply for ON/OFF signal terminals and PG	Max output current: 100mA
	PLC	Power supply Input terminal	Power supply input terminal	Input voltage range: 8~24V, PLC isolated from COM internally
	COM	Power supply Common terminal	3 common terminals, used with other other terminals	COM isolated from PE and CME internally
Shield	PE	Shielding ground	Grounding terminal of shielding layer	Connected to PE

4) Notes on terminal connection

Please use shielding cable or twisted cables (refer Table 3-1 for selection) to connect control terminals. When shielding cable is used, the shielding layer should be connected with PE terminal. Control cable should be far away from power cable and the distance is at least 20cm. Parallel arrangement is avoided so as to prevent wrong action of inverter.

5) Notes on PG connection

Different types of PG have different cable connections, but the short circuit bar of CN4 must be setup correctly.

Cable connections of differential output, open collector output, and push-pull output PGs are shown in Figures 3-14 to 3-16.

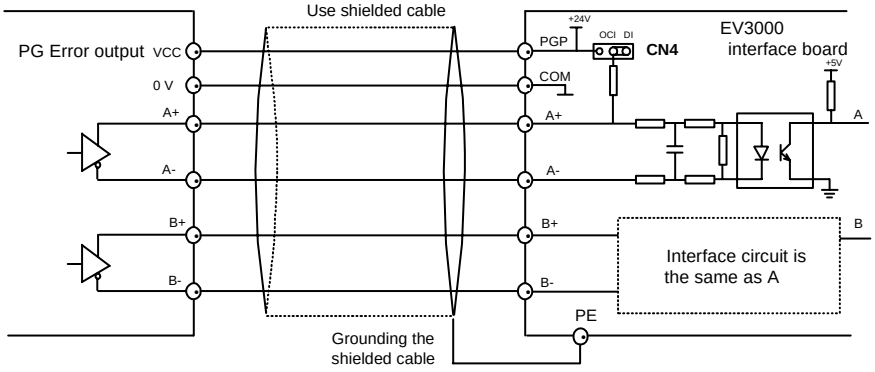


Figure 3-14 Cable connection of differential output PG

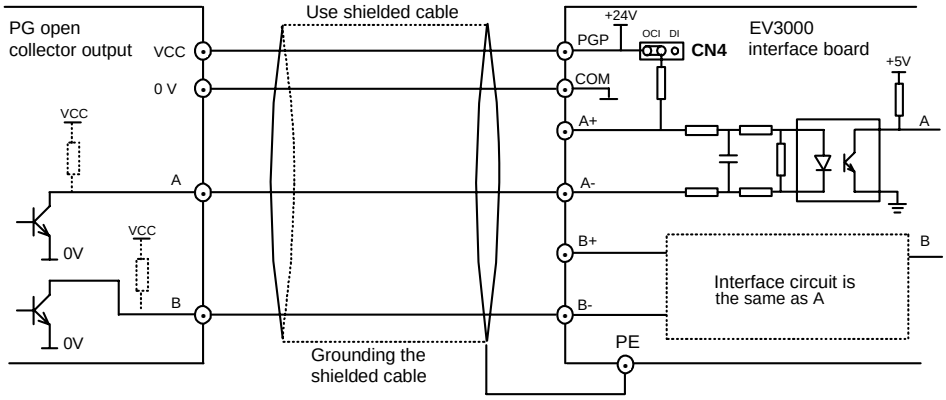


Figure 3-15 Cable connection of open collector output PG (dotted line included in the case of voltage-type output PG)

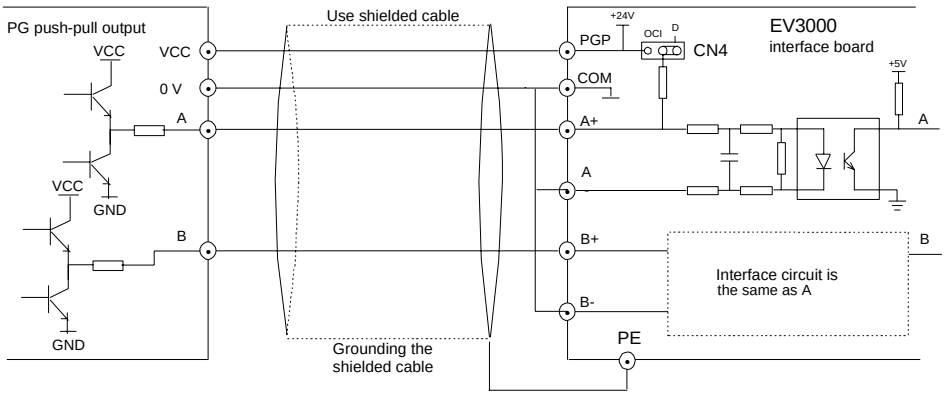


Figure 3-16 Cable connection of push-pull output PG

Note

During cable connection, be careful not to short PGP with COM, or the R11 resistor may be damaged.

6) Notes on relay cable connection

Please refer Table 3-1 for the selection of relay cable.

Surge suppressing circuit should be added for the inductive load (such as relay, contactor), for example: RC circuit (be careful that the leakage current should be lower than the relay maintenance current), voltage sensitive resistor, or diode (used in DC circuit, but the polarity must be paid attention). The components of suppressing circuits must be as close to the relays as possible, as shown in Figure 3-17.

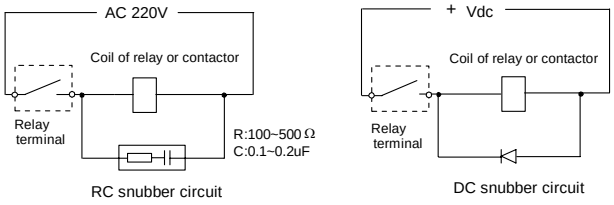


Figure 3-17 Surge suppressing circuit

7) Notes on connection of power supply terminals

Terminal for digital value input can be powered by the inverter's 24V power supply, shown in Figure 3-18.

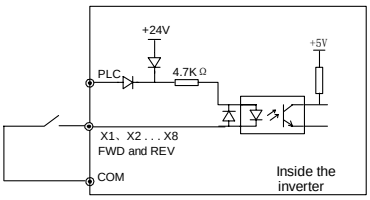


Figure 3-18 Connection to internal 24V power supply

Terminal for digital value input can be powered by external power supply (user power supply), this power supply should be connected with PLC terminal, shown in Figure 3-19.

In the figure, recommended voltage range of external power supply is 8~24V (suitable for X1~X7 terminals).

When X8 terminal is used, recommended voltage range of external power supply is 18~24V.

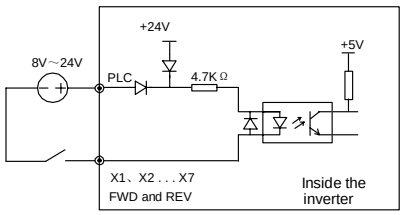


Figure 3-19 Connection to external power supply

Attention

External 24V power supply must be isolated from mains by at least Basic Insulation. Failure to observe this requirement will cause risk of electric shock.

Note

When the customer power source PLC terminal is used, the COM terminal cannot be used at the same time.

3. Setting jumpers and switch on the control board and interface board

Before usage, all the jumpers on the control board and interface boards must be set up in right mode. Position of jumpers and switches on the control board is shown in Figure 3-20, function of jumper is shown in Table 3-9.

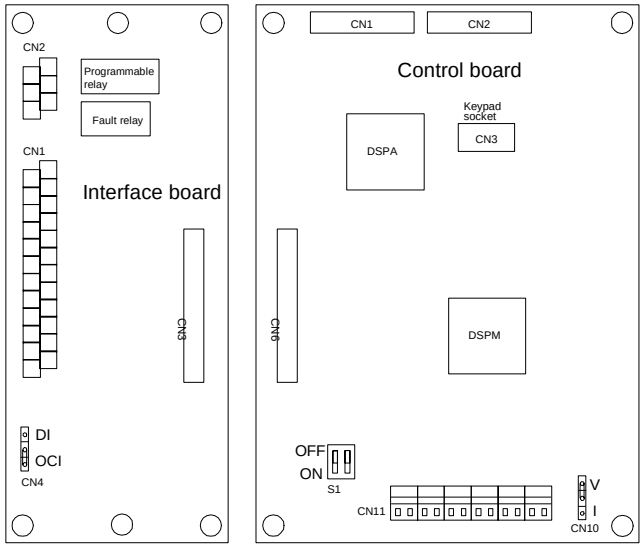


Figure 3-20 Jumpers and switch on the control board

Table 3-9 Description of jumpers and switch

Jumper	Position	Function	Default setting
CN4	Interface board	Short circuit bar is in DI side , PG signal can be selected by the differential input of A+, A-,B+ and B-; Short circuit bar is in OCI side, PG signal can be selected by open collector input of A-and B-	OCI side
CN10	Controlboard	AI2 input modes selection: If short circuit bar is in V side, select voltage input: 0~+10V; If short circuit bar is in I side, select current input:: 0~20mA	V side
S1	Control board	RS485 port setup selection Toggle Switch is ON: use terminal; Toggle Switch is OFF: do not use terminal Use terminal, when the RS485 is at the end of the RS485 COM network.	OFF

Chapter 4 Simple Running Of Inverter

4.1 Definitions Of Special Terms

This chapter defines the terms describing the control, running and state of inverter. Please read it carefully, it will help you to use the inverter correctly.

4.1.1 Control Mode

There are three control modes: without PG vector control, with PG vector control and V/F Control. Running control modes can be selected by F0.02 .

Mode 0: Without PG vector control, vector control without-speed sensor, or open loop vector control, suitable for applications with high requirement for start torque and speed control accuracy, and conventional V/F Control mode cannot satisfy such requirements.

Mode 1: With PG vector control, vector control with-speed sensor, or close loop vector control, suitable for applications with high requirement for torque response and speed control accuracy.

Mode 2: V/F Control mode. Besides application of regular V/F control, it can also be used in application of an inverter driving more than one motors.

Note

PG refers to the pulse generator.

4.1.2 Frequency Setting Mode

It refers to the method and physical channels to set inverter running frequency (speed).

There are ten frequency-setting modes which can be looked up in descriptions of F0.03 function in *Chapter 6 Detailed Function Introduction*.

4.1.3 Control Mode Of Running Commands

It means the physical channels by which inverter receives running commands like START, STOP, JOG and others.

The control modes are classified into three kinds that can be selected via F0.05:

1. Panel control: control by RUN, STOP and JOG keys on the operation panel;

2. Terminal control: control by terminals FWD and REV, or by digital terminals defined by F5 function codes;

3. Host control: The operations such as START and STOP can be controlled by upstream host through the inverter's internal serial communication ports.

Note

In a non-panel control mode, the function of STOP key can be defined by function code FA.02. Refer to the descriptions of FA parameter set in *Chapter 6 Detailed Function Introduction.*

4.1.4 Inverter Running States

There are five inverter running states: Stopping state, programming state, running state and alarm state, which are explained below:

Stopping state

The inverter is in stopping state before running control command is accepted after the power is on again or deceleration to stop. At this time, the running state indicator on the operation panel is off, LED/LCD display content can be selected through Fd.02, the other 7 stopping state display parameters defined by Fd.02 can also be displayed circularly through ►► key. The displaying mode is flashing.

Programming state

The inverter can be shifted to programming state in which the parameters can be read or modified through the MENU/ESC or the "Function codes selection" of the host .

Programming state can display function codes and parameters, the displaying mode for modified bit is flashing.

Running state

In stopping state and faultless state, after running control command is accepted, the inverter then enters running state.

In running state, the indicator on the front panel is on, the LED/LCD can display the state parameters defined in Fd.00 and Fd.01 circularly through ►► key, and the displaying mode is no-flash display.

Fault alarm state

The inverter detects the fault and displays the fault codes.

In this state, fault code is displayed in flashing mode, and the reset can be achieved by pressing STOP/RESET key or control terminals or communication commands. In alarm state, you can press the MENU/ESC key to exit fault code displaying state and enter programming state.

P.OFF state:

On the other hand, in stopping and running process, POFF is sometimes displayed, there are three reasons:

1. DC bus low voltage

2. Control power supply low voltage

3. Power on and Power off

In P.OFF state, the keypad is locked to prevent mis-operation.

4.2 Panel And Its Operation Methods

Panel (Keypad) is EV3000 inverter's standard configuration. User can perform parameter setup, monitor and running control through panel.

Being familiar with the function and usage of panel is a premise for operating EV3000 inverter. Read this section carefully before use.

4.2.1 Panel Description

The panel consists of LED, LED indicator, LCD and keys, as shown in Figure 4-1

1. Function description of panel keys

Function description of the panel keys is shown in Table 4-1.

Table 4-1 Functions of operation panel

Key	Name	Function
MENU ESC	Menu selection and switchover	Switchover of parameters and program menus In programming state, pressing this key returns to the previous menu
ENTER DATA	Function data	In program state, press this key to enter the next menu and finish saving the parameters in third level menu state
▲	Up	Increase of data or code
▼	Down	Decrease of data or code
▶▶	Shift	In the state of RUN and STOP, press this key to display parameters; when setting data, it can change the data's revising bit
RUN	Run	In the panel control mode, it is for starting the inverter, and for starting auto tuning in motor auto tuning state
STOP RESET	Stop Reset	The key is for stoping the running of the inverter in running state, and for resetting in fault state. Press this key double times for emergent stop. The function of the kay can be defined when the inverter is in non-keypad controlling mode, refer to FA.02
JOG	Jog	In the panel control mode, press this key for JOG operation, the inverter stops after you release the key
FWD REV	Running direction shift	Press this key to reverse the inverter's running direction

Note: When executing the emergent stop command, the inverter will stop output, and the motor will be in free stop state.

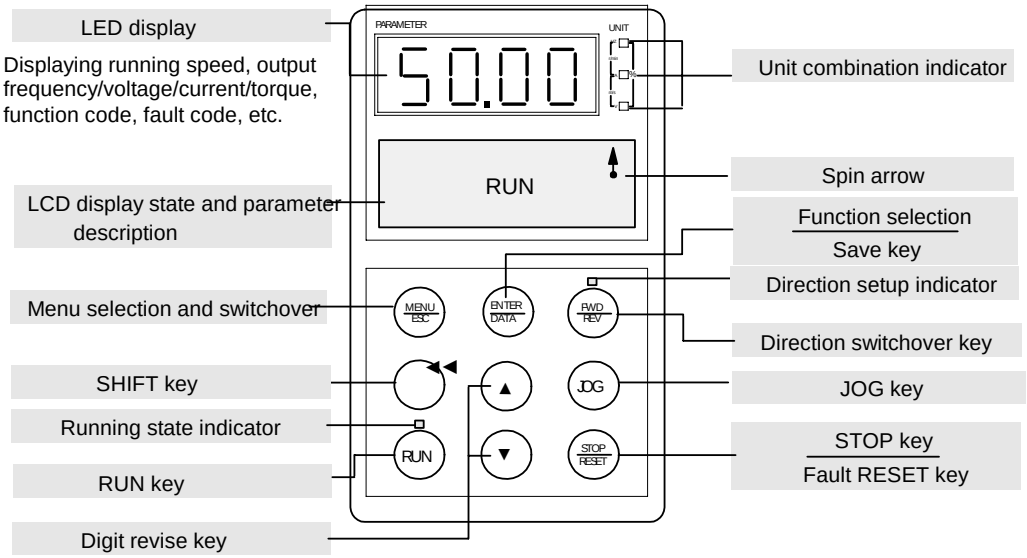


Figure 4-1 Panel and keys

2 LED function description

There are 5 LEDs on the panel, among them three LEDs are used for unit indication, one is for running state indication, and one is used for running direction indication. LEDs are in on, off or flashing state:

Running state indicator: The running state of inverter is indicated. If the LED is on that means the inverter is in running or tuning state; and off means the inverter is in stopping state.

Direction indicator: This LED is above the FWD/REV key. It has three states of on, off and flash, and is used for

indicating running direction. On means FWD direction, off means REV direction, flash means the inverter is in stopping mode under terminal running control mode.

Unit indicator: Formed by three indicators, located at the right side of the LED, different combinations of displaying states correspond to 6 kinds of unit indications, indicating the unit of the parameters displayed by the LED. The relationship between combination states and unit is shown in Figure 4-2

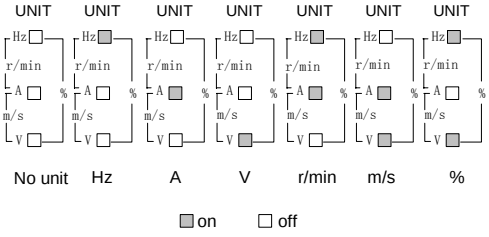


Figure 4-2 Indicator state vs. unit

3 Panel operating state

1) Initialization after power on

When the power is switched on, panel will start 5 second initiation process. During this process, panel's LCD displays "EV3000 ENYDRIVE", LED displays "8.8.8.8.", and LED indicator on the panel is in OFF state, as shown in Figure 4-3 .

Note

During power-on initialization, if the LED does not display “8.8.8.8.”, or does not display a complete “8.8.8.8.”, the LED is faulty. If the LED displays “8.8.8.8.” all the time after the power-on, or LDC displays “EV3000 ENYDRIVE” all the time, it could be caused by the communication failure due to bad connection between panel socket and control board. If the above faults cannot be removed, contact your supplier.

2) Stopping state

In stopping state, panel's state is shown in Figure 4-4. LED displays default parameters, and the LED in right side displays the unit of this parameters. The first line of LCD displays current control mode of inverter(panel control, terminal or host control mode), and the right side of the first line is the stopping mark. The second line of LCD is in shifting states of two pictures, one picture shows the names of the parameters such as "preset speed"; the other shows a description of keys operation, such as "press M/E to enter menu ", Press MENU/ESC key to enter program menu and set the parameters. When the inverter is in stopping state, running state indicator is in off state, and at this time, LED can display parameters in stopping state if ►► key is pressed.

3) Running state

In stopping state, the inverter enters running state after receiving running command, as shown in Figure 4-5. At this time, LEDs and the unit indicator in right side display the parameters and their units. The first line of LCD displays inverter's running information such as open loop vector, close loop vector, V/F, PLC, PID, JOG, torque control and others. The right side of the first line in LCD indicates the spinning direction, the spinning direction displays the real spinning direction: clockwise is positive direction , The second line of LCD is in shifting states of two pictures, one picture shows the names of the parameters such as "frequency setting". The other shows a description of keys operation, such as "►► shifting parameters", means that LED can displays running state parameters if you press this key.

In running state, running state indicator is on all the time. Direction indicator indicates the inverter's spinning direction: if the lamp is on, means the direction is positive. In this state, press MENU/ESC to enter program menu, and look up the parameters.

Note

1. Definition of positive spinning direction: For EV3000 inverters, the inverter output and motor spinning direction is defined positive when: 1), The inverter outputs U, V and W are connected respectively to motor’s X, Y and Z terminals. 2), The order of the three phases from ahead to behind is the U phase, the V phase and the W phase.

2. The spinning arrow and the direction indicator show the direction of the motor and inverter output respectively: clockwise or On for positive direction. When the inverter is in the terminal running control mode and stop state, the direction indicator blinks.

3. When the inverter is in the panel running control mode, pressing the FWD/REV key gives the direction change command, and the direction indicator will change accordingly. However, due to mechanical inertia, the actual direction of the motor does not change immediately, so does the spinning arrow which reflects the actual direction. Therefore the directions indicated by the direction indicator and the spinning arrow may be different. See Figure 4-6.

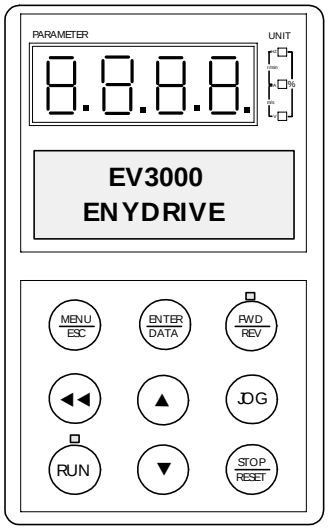


Figure 4-3 Power on

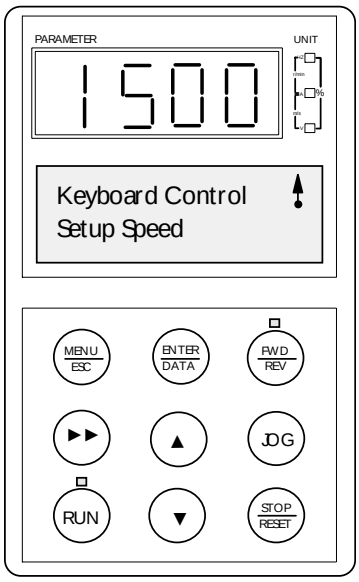


Figure 4-4 Stopping state

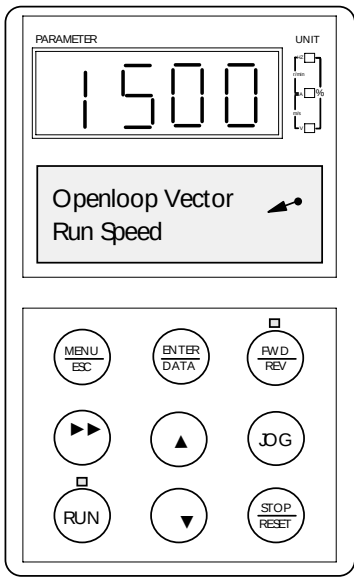


Figure 4-5 Running state

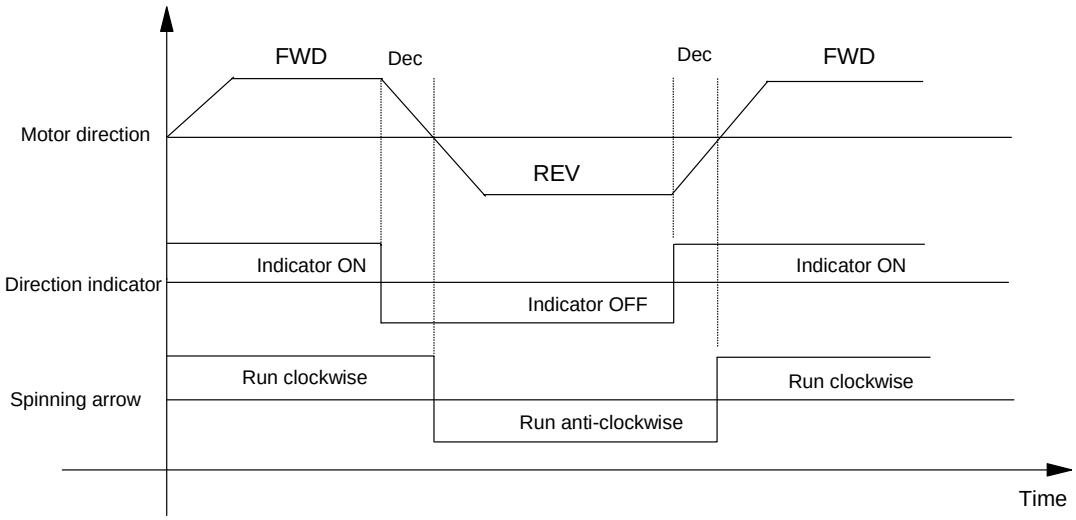


Figure 4-6 Sequences of direction indicator and running direction indication

(4) Fault state

In stopping state, running state or programming state, correspondent fault information will be reported if fault is detected as shown in Figure 4-7. At this time, LEDs display the fault code, and LCD displays the fault description. The inverter can enter program menu through MENU/ESC key. For looking up the fault log (E023 keypad read/write error not included), refer to *Chapter 7 Troubleshooting* for details.

When fault alarm occurs, the alarm picture is displayed, and the fault can be reset by pressing STOP/RESET. The inverter restores to normal operation upon clearing the fault and the fault code is displayed again if the fault has not been cleared.

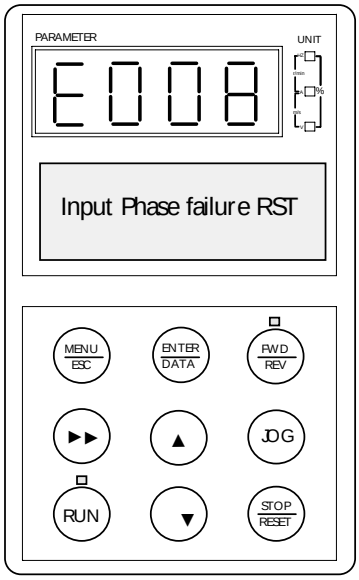


Figure 4-7 Fault alarm

4.2.2 Panel Operation Method

1. Panel operation procedure

Parameter setting method via panel: The three-level menu is used. Users can look up and modify the function codes very easily .

Three level menu: function parameters (first level)→function codes (second level)→value of function code (third level). Operation process is shown in Figure 4-8.

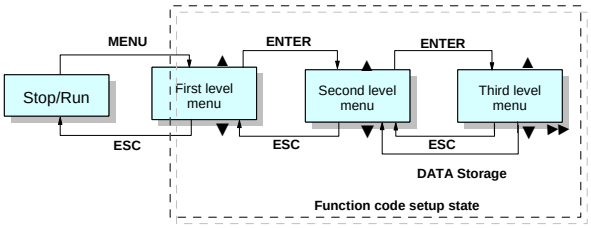


Figure 4-8 Panel operation procedure

The operation process is shown in Figure 4-9. In second and third level menu, not only the words but also the operation descriptions such as "ESC return" is displayed in the LCD.

When entering the second level menu operation, LCD displays operation description and the current read/write features (in right bottom part of LCD) that is related to the present state of inverter (for the read/write features of function code, refer to *Chapter 5 Function Parameter Table*).

R/W: When entering third level menu, this function code can be read and written.

R : When entering third level menu, this function code can only be read.

: This function code's parameters are protected by password..

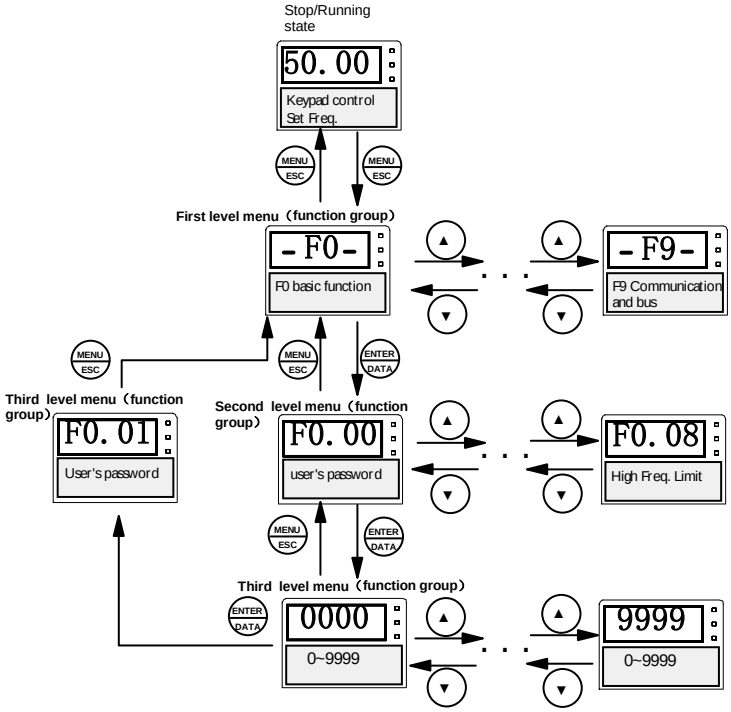


Figure 4-9 Menu operation procedure

In third level menu operation, user can return second level menu by pressing MENU key or SAVE key(shown in Figure 4-8 and Figure 4-9). The difference is : Parameter settings can be saved in control board if SAVE key is pressed, then LCD returns to second level menu and shifts to next function code automatically; If user presses MENU key, LCD returns to second level menu directly, but the parameters can not be saved and stop at current function code .

2. Parameter setup

Setting parameters of EV3000 inverter correctly is a premise for actualizing its performances. Parameter setting method via panel will be introduced in the following part with rated power as an example(Change 18.5kW into 7.5kW).

Operation process is shown in Figure 4-10. Press the SHIFT key with single direction shifting function to shift the flashing bit of parameters(that is modification bit). After finishing the parameters setup, press the MENU key twice to exit programming state. Enter the function code of last operation when returning to the programming state again(it has operation memorizing function).

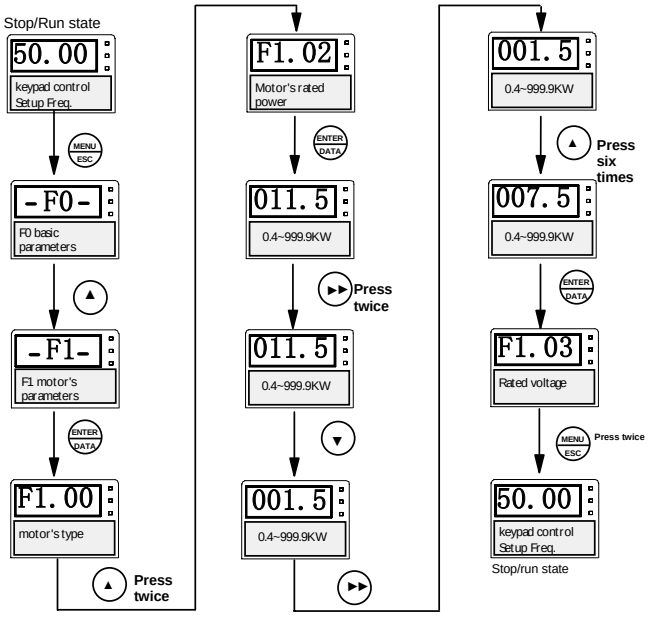


Figure 4-10 Parameter setup

3. Parameter display

In stopping state or running state, various state parameters of inverter can be displayed by LED. The displayed parameters can be decided by Fd.00~Fd.02 and can be scrolled through by pressing the SHIFT key. The following is an explanation for the parameters operation method in stopping and running state.

1) Switch of parameter display in stopping state

In stopping state, the inverter has 8 state parameters which can be scrolled by ►► key, they are: preset frequency, external counting value, digital value input terminal state, digital value output terminal state, analog input AI1, analog input AI2, analog input AI3 and DC bus voltage. Refer to the explanation of Fd.02.

The default value of Fd.02 is "preset frequency". If Fd.02 is operated according to Figure 4-11 (a), you can change default display parameters in stopping state into "DC bus voltage".

You can use ►► key to look up other parameters during stopping state: Every time you press ►► key, the next parameter in stopping state will be displayed, as shown in Figure 4-11 (b).

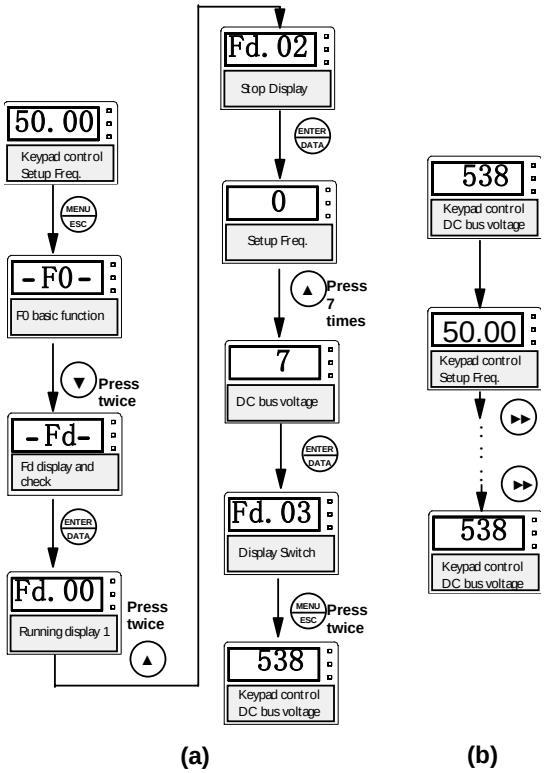


Figure 4-11 Parameters displayed in stop state

2) Switch of the running parameters

In running state, maximum 16 running state parameters can be displayed by EV3000 inverter via ►► key.

After converting value of Fd.00 and Fd.01 into binary codes, default running parameter displayed by LED is decided by the number of bit which is set as "1" in Fd.00 code; The number of "1" in binary codes of Fd.00 and Fd.01 decides the number of circularly displayed parameters.

For example, value of Fd.00 is 47(00101111B), and that of Fd.01 setup is 19(00010011B). The value of displayed parameters is shown in Table 4-2 .

Table 4-2 Running parameter setting example

Function	Fd.01	Fd.00
Function code setting (decimal)	19	47
Corresponding binary code	0001 0011 B	0010 1111 B
Total number of "1"	8	

In the example, the lowest bit which is set as "1" is bit0, so "running frequency" is displayed on LED by default. Total 8 running parameters can be displayed circularly by ►► key, which are correspondent to parameters represented by bit0, bit1, bit2, bit3 & bit5 in Fd.00 and bit0, bit1 & bit4 in Fd.01. Refer to the explanations of Fd.00 and Fd.01.

Note

Conversion from binary system to decimal system:

1. Determine the binary code according to the needed running state parameter

For example, for parameter Fd.01, the binary code should be set as 0001 0011 B, as shown below:

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	0	0	1	0	0	1	1

2. Change that binary code into a decimal number by using the formula: $\sum_{i=0}^{7} bit_i \cdot 2^i$

Where, i: 0~7. Through calculation, the decimal number is: $1\times2^0 + 1\times2^1 + 1\times2^4 = 19$.

Hence, the decimal value of parameter Fd.01 is 19.

4 Parameter-copy function

The panel has parameter copy and saving function This function can copy and save the parameter settings of inverter.

Parameter-copy is classified into two kinds: parameters uploading and downloading.

Parameters uploading: Upload the parameters saved in the control board to E^2PROM of panel.

Parameters downloading: Download the parameters stored in panel to the control board.

Note

1. Parameter copying can be conducted only among EV3000 inverters.

2. During download/upload process, to ensure data integrity and consistency, there should be no panel operation, and the process cannot be terminated.

3. Data upload/download can be done only in panel control mode (set via F0.05) and in stop state.

4. After the data download, user password (if any) will be changed accordingly.

5. During uploading, if data check error occurs, system will prompt fault code E023. You can reset it using the STOP/RESET key. To ensure data security, data download will be forbidden then.

6. During data downloading, the inverter will check the correctness of the data in E^2PROM. If the data is invalid, "E^2PROM data invalid" will be prompted. When download error occurs, fault code E023 will be prompted.

7. When E023 fault occurs, repeat the downloading operation for several times more to ensure it is not due to environment interference or bad connection. If the fault persists, the E^2PROM may have been damaged. Contact your supplier then.

Parameter operation procedure is shown in Figure 4-12.

In Figure 4-12, (a) shows the parameter uploading process, and (b) shows the parameter downloading process.

The parameter copying process is shown by bar drawings of the panel LCD.

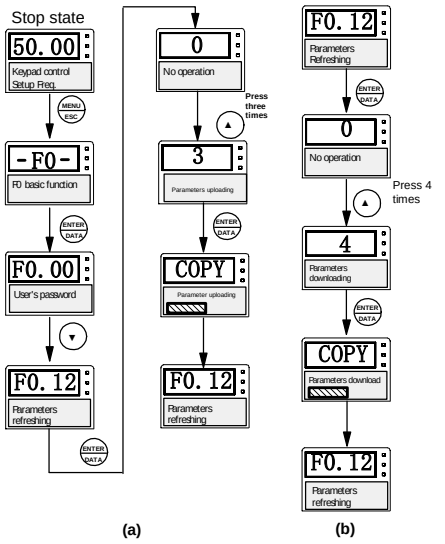


Figure 4-12 Parameter copy operation procedure

5. Users password function

In order to increase the reliability and safety of parameter settings, the panel has customer password function.

Figure 4-13 shows the operation procedure of user's password (F0.00 parameter).

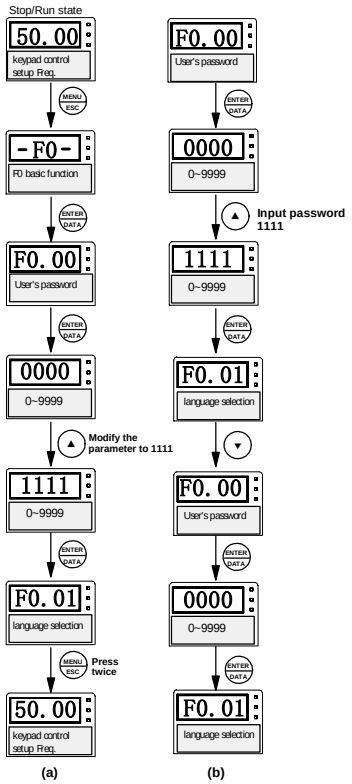


Figure 4-13 Password setup

Figure (a) shows how to set password with "1111" as an example; Be careful that the user's password should not be zero or it will be invalid.

After user's password is set up, if the second level menu is entered again, effective mark of will be displayed in the

right bottom corner of panel LCD, which means the user's password is set up successfully.

If the value of function code needs to be modified, right password must first be input in F0.00 parameters and be confirmed. The input password will be compared with saved password in panel automatically, if the two passwords are same, then password verification is passed, password setup mark disappears and panel restores to normal read and write state; if they are not same, password setup mark continues to exist, and modification operation is prohibited.

After exiting programming menu operation state, user's password will be effective again. If you need to enter programming menu to modify the function code again, the password must be input again and operation must be done through panel checking. Setting the password after the user finishes the adjustment is recommended in order to make the operation more convenient.

After the user's password is set up, please remember it. If you forget it, please contact us.

Figure (b) shows the process to cancel the user's password, with "1111" password value as an example. There are two procedures to cancel the user's password: First input right password "1111", then input "0000" to make the password invalid.

6. Motor auto-tuning procedure

Before selecting vector control, user should input correct motor parameters. EV3000 inverter can get standard motor's parameters according to the parameters on nameplate; In order to get better control performance, you can control the inverter to perform auto-tuning on the motor, so as to get accurate motor parameters.

Parameter tuning can be done through F1.10, but it is restricted by F1.09 (motor's auto-tuning protection), and for detailed explanation, refer to *Chapter 6 Detailed Function Introduction*.

For example, the parameters are: rated power 7.5kW, rated voltage 380V, rated current 17A, rated frequency 50.00Hz, and rated speed 1440rpm. Operation procedure of auto-tuning is shown in Figure 4-14.

7. Motor tuning operation procedure

Select 2 in F1.10 to enter tuning operation state. The panel displaying will guide the customer set the function codes' parameters needed by motor auto-tuning, then you can start the inverter to perform tuning and finish the auto-tuning operation.

In this state, three LED unit indicators flash at the same time, that means the inverter is in tuning operation state, at the same time, the A.T characters on the right bottom of LCD is the mark showing the tuning process that is shown in Figure 4-15.

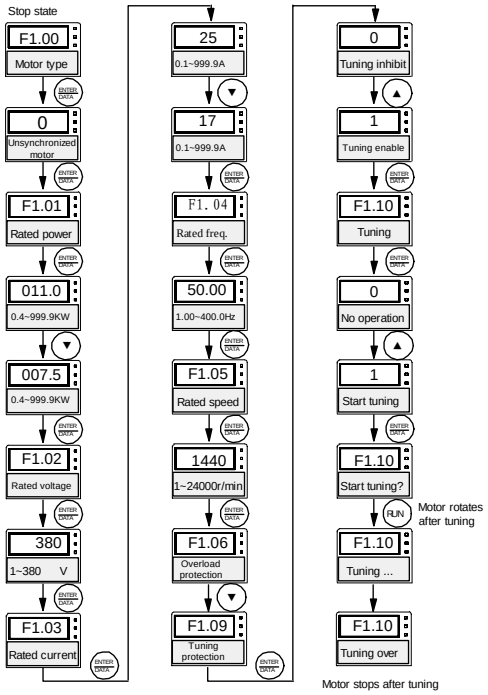


Figure 4-14 Motor auto-tuning procedure

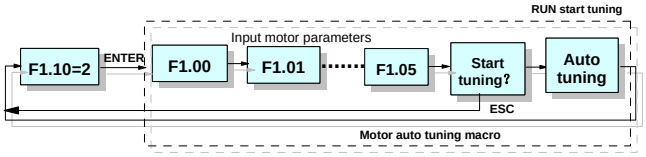


Figure 4-15 Motor auto-tuning process

8. Panel self-test function

In stopping state, press MENU/ESC and STOP/RESET at the same time to enter panel self-test function. Under panel self-testing state, the panel will check the LED, LED indicator, LCD display, the buttons and the keypad E^2PROM automatically. The checking is divided into four steps:

1. Light the LED according to low bit and high bit respectively so as to judge whether the digital tubes are normal;

2. Light a LED unit indicator every half second. Before this step is over, all the LEDs should be lighted;

3. The whole LCD displaying screen is black from left to right. Before this step is over, the LCD displaying screen must be black;

4. Perform read/write checking to every memory unit of E^2PROM in the keypad.

Note

1. When valid function code data is stored in E^2PROM, the panel self-test will skip the above step 4 to avoid damaging the stored data.

2. Do not run the inverter (via terminal running control) during the self-test process.

4.3 Simple Running

4.3.1 Operation Procedure

EV3000 operation procedure is shown in Table 4-3.

Table 4-3 EV3000 operation procedure

Procedure		Operation content	Reference content
Installation and using environment		Install the inverter in the place where the environment requirement is satisfied. Mainly consider if the environment (temperature and humidity) or the heat radiation can meet the requirements	Refer to Chapters 1~3
Cable connection		Input and output cable connection of mains; wiring of ground lines; cable connection of digital and analog terminals, speed measuring PG and communication ports	Refer to *Chapter 3 Installation And Cable Connection*
Check before switching on the power		Confirm whether the mains voltage is correct, connect circuit breaker into the input circuit; power cables must be connected to R, S and T power supply input terminals correctly; the U,V and W output terminals of inverter should be connected to motor correctly; PG wiring should be correct; Wiring of control terminals and various switches should all be correct	Refer to chapters 1~3 Refer to *Chapter 8 Preservation And Maintenance*
Check at start up		Check the inverter for any abnormal sound, smoke or smell; Panel displays normally with no alarm information; If there is any abnormal phenomenon, switch off the mains as soon as possible	Refer to *Chapter 8 Preservation And Maintenance*
Parameter initialization		If it is the first time for the inverter to run, or the inverter's control board or the motor is changed, the parameters of F0.12 are recommended to be initialized, then continue the following operations	Refer to F0 parameter description
Input the motor's parameters correctly		The parameters of motor must be input correctly, and must be checked by the user carefully or problem will occur.	Refer to F1 parameter description
Protection parameters settings of motor and inverter		Protection parameters settings of motor and inverter must be set up correctly. The parameters mainly includes highest frequency, high frequency limit, Fault lock, Motor overload protection, inverter overload protection, external fault input, Relay Fault output, and PG cable broken protection	Refer to parameter description of F0, F1, F2, F5, FA
auto-tuning		At the first running when vector control mode is selected, enter motor auto-tuning state so as to get accurate parameters of motor, and disconnect the motor and mechanical load before auto-tuning. if the motor is spinning, do not enter auto-tuning state	Refer to F1 parameter description. Refer to *4.2.2 Panel Operation Method*
Setting running control parameters	General parameters	According to driving condition, spinning direction , Acc time, Dec time, start frequency, start mode, Acc/Dec mode, and stop mode should be set up correctly	Refer to F0 parameter description. Refer to F2 parameter description
	Vector control	Decide the parameters of regulator according to the load. If necessary, set up torque control and parameter limitings again. For PG vector control, Setup the PG parameters correctly	Refer to F3 parameter description. Refer to Fb parameter description
	V/F control	Setup V/F curve, torque boost, slip compensation and AVR function according to load	Refer to F4 parameter description
running check without load		If the motor has no load, start the inverter by Keypad or control terminal. The motor has no load and the inverter is start by keypad or control terminals. Check the inverter's running state: Motor:smooth running, normal spinning, correct direction, normal Acc/Dec process, no abnormal vibration, no abnormal noise and no abnormal smell. Inverter:Panel normal display, fan normal spinning, relay normal trips and no vibration or noise. If there is any abnormal phenomenon, stop and check at once	Refer to *Chapter 8 Preservation And Maintenance*
Running check with load		If the running without load is normal, connect the load correctly. Start the inverter with Keypad or control terminal, and increase the load gradually. When the load is increased to 50% or 100%, running for some time and check whether the system running is normal; In running process, check completely, pay attention to the abnormal phenomenon; If there is any abnormal phenomenon, stop and check	Refer to *Chapter 8 Preservation And Maintenance*

Procedure			Operation content	Reference content
Normal running	Basic running		Start, running, stopping, FWD or REV running	Refer to F0, F2 , FA parameter description
	Function running	PLC running	Variable speed running can be set up as single cycle running or repeated cycle running. One cycle process contains 7 running phases. Running frequency, Acc/Dec time, running time, running direction of 7 running phases can be set up separately	Refer to F2, F8 parameter description
		PID running	Users can set up reference-input-channel, feedback channel, and parameters of PID regulator, and realize the control to industry process. Through this function, realize V/F Control with PG(speed close loop)	Refer to F7 parameter description. Refer to Fb parameter description
		Torque control	Torque control can be used in the control mode with PG vector. The motor's output torque can be controlled according to the torque command of analog input	Refer to F3 parameter description
		S Acc/Dec	In corder to make Acc/Dec process smooth and decrease mechanical impact, user can setup S curve of Acc/Dec function, make the speed of motor change smoothly during Acc and Dec process	Refer to F2 parameter description
		DC injection braking	Before start or in stop process, supply DC power to the spinning motor, braking torque is generated to make the motor stop quickly	Refer to F2 parameter description
		Zero servo	Not only the zero speed running is realized, but also 200% torque can be generated and simple servo running is realized	Refer to F3 parameter description
		Speed tracking	At start, the inverter tracks the motor's speed automaically due to inertial, setup the start process again according to the motor's present speed so as to reduce the start impact	Refer to F2 parameter description
		Drop control	Used to balance the motor's load when one mechanical load is driven by several motors	Refer to F2 parameter description
		Special terminal control	Digital input terminal has powerful functions. It can be used with external control devices to form various application solution. Before the special control function of the terminal is used, correspondent settings must be done to F5 function code, then use according to the function definition	Refer to F5 parameter description
Running check			Whether the motor runs smoothly; whether the motor's running direction is correct; whether there is any abnormal vibration or noise; whether Acc/Dec process is smooth; Whether the display of inverter's output state and panel are correct; whether the fan runs normally; whether there is any abnormal vibration or noise; If there is any abnormal phenomenon, stop the inverter imediately, switch off the mains and check	Refer to *Chapter 8 Preservation And Maintenance*

4.3.2 Basic Operation

Basic operation examples: An example, a 7.5kW inverter drives a 7.5kW three-phase AC motor.

The following is its operation process.

Motor parameters: rated power: 7.5kW; rated voltage: 380V; rated current: 17A; rated frequency: 50.00Hz; rated speed: 1440 rpm; PG pulse number: 1000 PPR.

1. Setup the frequency, start, stop, FWD/REV running process by Panel.

1) According to the cable connection of Figure 4-16, check to confirm the cable connection is correct, switch on the MCCB and supply power to the inverter.

Note

1. The CN4 jumper switch setting of the control board should match the PG model. See *Chapter 3 Installation And Cable Connection* for PG connection instructions.

2. Connect inverter with motor and PG properly. Ensure that the directions thus determined are clear (see the description of Fb.01 function code).

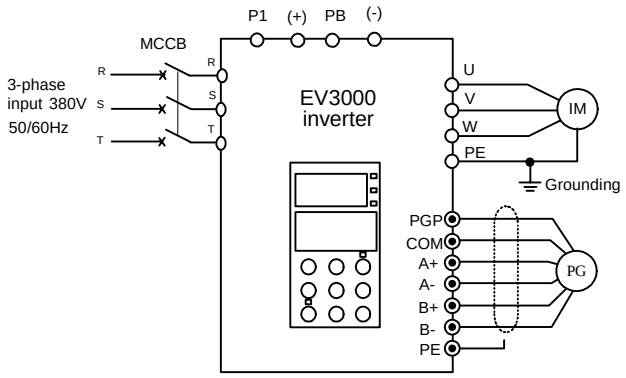


Figure 4-16 Basic wiring diagram 1

2) Press MENU/ESC to enter program menu;

3) Motor auto-tuning

① Set F1.00 parameter to 0 to select unsynchronized motor;

② Set F1.01 parameter that defines motor's rated power to 7.5kW;

③ Set F1.02 parameter that defines motor's rated voltage to 380V;

④ Set F1.03 parameter that defines motor's rated current to 17A;

⑤ Set F1.04 parameter that defines motor's rated frequency to 50Hz;

⑥ Set F1.05 Parameter that defines motor's rated speed to 1440 rpm;

⑦ Enter F1.09 parameter, setup auto-tuning enable;

⑧ Set F1.10 parameter to 1, press ENTER/DATA to confirm;

⑨ press RUN key to start motor auto-tuning.

After tuning, the motor stops.

For the description of motor's auto-tuning, refer to Table 4-3 and Figure 4-14.

4) Setup inverter's function parameters;

① Set F0.02 parameter to 1 to select close loop vector control mode;

② Set F0.03 parameter to 0 to select frequency setting mode as digital mode 1;

③ Enter F0.04 parameter, set frequency to 30.00Hz;

④ Set F0.05 parameter to 0 to select panel running command control mode;

⑤ Set Fb.00 parameter that defines PG pulse number to 1000PPR;

⑥ Set Fb.01 parameter to 0 to select PG positive direction.

5) Press MENU/ESC to exit program state and back to stopping state;

6) Press RUN key to start the inverter;

7) In running process, press ▲ or ▼ key to modify the present frequency setting of inverter;

8) In running process, press the FWD/REV key to change the motor's running direction;

9) Press STOP key, motor decelerates to stop;

10) Turn off MCCB, switch off the inverter.

2. Set frequency by Panel, Set the frequency, start, stop, FWD/REV running process by control terminal

1) According to the cable connection of Figure 4-17, check to confirm the correct cable connection, switch on MCCB to supply power to the inverter.

Note

Note on motor and PG connection is the same as that in example 1.

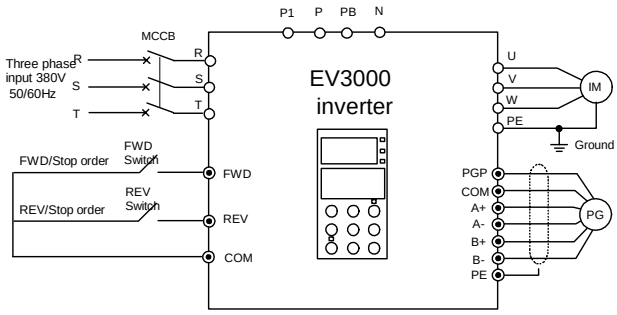


Figure 4-17 Basic wiring diagram 2

2) Press MENU/ESC key to enter program menu;

3) Motor auto-tuning;

The operation procedure is the same as that in example 1.

4) Setup the inverter function parameters;

① Set F0.02 parameter to 1 to select the close loop vector control mode;

② Set F0.03 parameter to 0 to select frequency setting mode as digital setting mode 1;

③ Enter F0.04 parameter, set frequency to 30.00Hz;

④ Set F0.05 parameter to 1 to select terminal control mode;

⑤ Enter Fb.00 parameter, set PG pulse number to 1000PPR;

⑥ Set Fb.01 parameter to 0 to select positive PG direction;

⑦ Set F5.00 parameter to 0 to select two-line control mode 1;

⑧ Set FA.02 parameter to 1 to select the STOP key as valid;

5) Press MENU/ESC to exit program state, and back to stopping state;

6) Turn on FWD switch, motor starts FWD spinning;

7) In running process, press ▲ or ▼ key to modify the present setting frequency of inverter;

8) In running process, turn off the FWD switch, then turn on the REV switch, motor's running direction is changed;

9) Turn off the FWD and REV switches, motor decelerates to stop; or press the STOP key, motor decelerates to stop;

10) Turn off MCCB to switch off the inverter.

3. Jog Running through panel operation

1) According to the wiring of Figure 4-16, check to confirm the correct cable connection, switch on the MCCB to supply power to the inverter;

Note: Note on motor and PG connection is the same as that in example 1.

2) Press MENU/ESC to enter program menu;

3) Motor auto-tuning;

The operation procedure is the same as that in example 1.

4) Setup inverter's function parameters;

① Set F0.02 parameter to 1 to select close loop vector control mode;

② Set F0.05 parameter to 0 to select panel control mode;

③ Set F2.15 parameter to select JOG frequency as 10.00Hz;

④ Enter F2.16 parameter, set Acc time to 10s;

⑤ Enter F2.17 parameter, set Dec time to 10s;

⑥ Enter Fb.00 parameter, set pulse number to 1000PPR;

⑦ Set Fb.01 parameter to 0 to select PG positive direction;

5) Press MENU/ESC to exit program state and back to stopping state;

6) Press FWD/REV to setup Jog running direction;

7) Press JOG key, the motor will accelerate to the Jog Setup frequency and keep Jog running state;

Note

In panel control JOG running process, if you press other keys, the JOG running may be interrupted.

8) Release JOG key, motor decelerates to stop;

9) Turn off MCCB to switch off the inverter.

4. Setup the frequency by analog terminals, use control terminal to control the running process

1) According to the wiring of Figure 4-18, check to confirm the correct cable connection, switch on the MCCB to supply power to the inverter;

Note: Note on motor and PG connection is the same as that in example 1.

Note: You can use 3k~5k precise multi-turn potentiometer for the setting of external analog signal.

Use screened cables for the connection of potentiometer. The shielding coat must be reliably grounded.

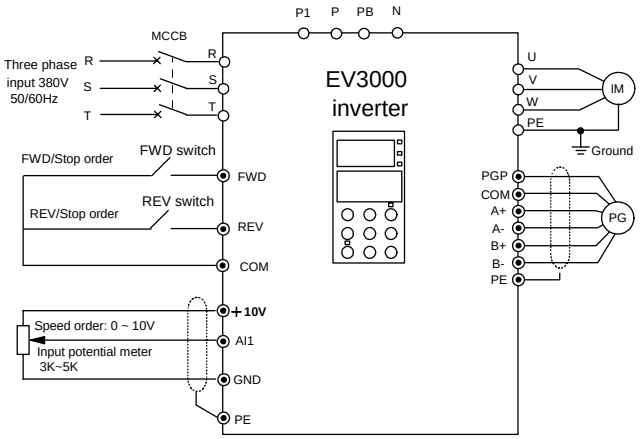


Figure 4-18 Basic wiring diagram 3

2) Press MENU/ESC to enter program menu;

3) Motor auto-tuning;

The operation procedure is the same as that in example 1.

4) Setup inverter's function parameters;

① Set F0.02 parameter to 1 to select close loop vector control;

② Set F0.03 parameter to 5 to select analog voltage/present frequency setting mode;

③ Set F0.05 parameter to 1 to select external terminal control mode;

④ Set F6.00 parameter to 0, analog channel AI1 select 0~10V range;

⑤ Set F6.04 parameter to 0 to select main reference-input-channel as AI1;

Note: If AI2 is selected as input channel, the position of CN10 on the control board should be selected correctly in V side .

⑥ Set F6.05 parameter to 0 to not to select auxiliary input channel;

⑦ Set Fb.00 parameter to select PG pulse number as 1000PPR;

⑧ Set Fb.01 parameter to 0 to select positive direction of PG;

⑨ Set F5.00 parameter to 0 to select two-line control mode 1 ;

⑩ Set FA.02 parameter to 1 to make panel's STOP key active.

5) press MENU/ESC to exit program state and back to stopping state;

6) Turn on the FWD switch, and motor starts FWD spinning;

7) In running process, adjust potential-meter to modify present frequency setting;

8) In running process, turn off FWD switch, then close REV switch, motor's running direction is changed;

9) Turn off the FWD and REV switches, motor decelerates to stop; or press panel's STOP key, motor decelerates to stop;

10) Turn off MCCB to switch off the inverter.

Chapter 5 Function Parameter Table

5.1 Function Table Description

1. EV3000 inverter function parameters are divided into 16 groups according to their functions, each group contains several function codes that can be set to different values. When use keypad operation, the parameter group corresponds to first level menu, function code corresponds to second level menu, function code's setting value corresponds to third level menu.

2. The symbol like F×.×× appearing in the table of functions or somewhere else in this manual stands for No. "××" function code in No. "×" group in the functions table. For example, "F2.01" stands for No. 1 function code in No. 2 group.

3. Contents of function table:

Column 1 "type": name and serial number of function parameters;

Column 2 "function code": serial number of function parameters;

Column 3 "Name": complete name of function parameters;

Column 4 "LCD display": function parameters' name which is displayed in on the LCD of Keypad;

Column 5 "Setting range": function parameters' valid setting range, displayed on the LCD of keypad;

Column 6 "Minimum Unit": function parameters' minimum unit;

Column 7 "Factory setting": function parameters' primary setting value before delivery;

Column 8 "revise": function parameters' revise characteristic (that is whether the function parameter can be revised):

In the column "revise" of the table of functions,

"O" means that the parameter can be revised during inverter's running and stopping state;

"×" means that the parameter can not be revised during running;

"*" means that the actually measured or fixed parameters can not be revised;

"—" means that the parameter is set by the manufacturer and can not be changed by the user.

Column 9 "PROFIBUS parameter No.": parameters' serial number used by PROFIBUS;

Column 10 "User's Setting": convenient for users to store revised setting value.

Note

1. Factory reserved parameters include some important inverter manufacturer parameters. Users are not allowed to revise them randomly. Otherwise, serious faults and major property loss may result.

2. The contents displayed on keypad LCD are based on this chapter. The parameter name and description in *Chapter 6 Detailed Function Introduction* are for detailed reference. It is possible that you may find some differences in the expression.

5.2 Function Table

5.2.1 F0 Basic Function

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F0.00	User password setting	User password	0~9999	1	0	○	0	
F0.01	Language selection	Language selection	0: Chinese 1: English	1	0	○	1	
F0.02	Control mode	Control mode	0: Open loop vector 1: Close loop vector 2: V/F Control	1	0	×	2	

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F0.03	Frequency setting mode	Setting mode	0: Digital setting 1 1: Digital setting 2 2: Digital setting 3 3: Digital setting 4 4: Digital setting 5 5: Analog given 6: Host setting mode 7: Combined setting mode 1 8: Combined setting mode 2 9: Switching frequency input	1	0	×	3	
F0.04	Setting freq. In digital mode	Frequency setting	(F0.09)~(F0.08)	0.01Hz	50.00Hz	○	4	
F0.05	Running command selection	Running selection	0: Keypad control 1: Terminal control 2: Host control	1	0	×	5	
F0.06	Spinning direction	Direction setting	0: FWD 1: REV 2: REV inhibit	1	0	×	6	
F0.07	Highest output frequency	Highest frequency	MAX{50.00~(F0.08)}~400.0Hz	0.01Hz	50.00Hz	×	7	
F0.08	High frequency limit	High frequency limit	(F0.09)~(F0.07)	0.01Hz	50.00Hz	○	8	
F0.09	Low frequency limit	Low frequency limit	0.00~(F0.08)	0.01Hz	0.00Hz	○	9	
F0.10	Acc time1	Acc time1	0.1~3600s	0.1s	20.0s	○	10	
F0.11	Dec time1	Dec time1	0.1~3600s	0.1s	20.0s	○	11	
F0.12	Parameter initialization	Parameters refreshing	0: No operation 1: Clear memory information 2: Recover factory setting 3: Parameter uploading 4: Parameter downloading Note: After executing 1~4 steps restores to zero automatically	1	0	×	12	

5.2.2 F1 Motor Parameters

Motor rating and protection parameters

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F1.00	Motor type selection	Motor type	0: Unsynchronized motor	1	0	×	30	
F1.01	Motor rated power	Rated power	0.4~999.9kW	0.1kW	Inverter rated value	×	31	
F1.02	Motor rated voltage	Rated voltage	0~inverter rated voltage	1V	Inverter rated value	×	32	
F1.03	Notor rated current	Rated current	0.1~999.9A	0.1A	Inverter rated value	×	33	
F1.04	Motor rated frequency	Rated frequency	1.00Hz~400.0Hz	0.01Hz	50.00Hz	×	34	
F1.05	Motor rated speed	Rated speed	1~24000rpm	1rpm	1440rpm	×	35	
F1.06	Motor overload protection mode selection	Over load protection	0: No action 1: Common motor 2: Variable frequency motor	1	1	○	36	
F1.07	Motor overload protection factor selection	Protection factor	20.0~110.0%	0.1%	100.0%	○	37	
F1.08	Motor pre-excitation selection	Pre-excitation selection	0: Valid under certain condition 1: Permanently invalid	1	0	×	38	

Motor tuning and the parameters

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F1.09	Motor auto-tuning protection	Tuning protection	0: Tuning disable 1:Tuning enable	1	0	×	39	
F1.10	Motor auto-tuning process	Tuning process	0:No operation 1:start tuning 2:Start tuning operation Note: start tuning at 0→1 and changed to 0 after finishing tuning automatically; start macro tuning at 0→2 and changed to 0 after finishing tuning automatically	1	0	×	40	
F1.11	Stator resistance	Stator resistance	0.000~9.999Ω	0.001Ω	Motor parameter	×	41	
F1.12	Stator inductance	Stator inductance	0.0~999.9mH	0.1mH	Motor parameter	×	42	
F1.13	Rotor resistance	Rotor resistance	0.000~9.999Ω	0.001Ω	Motor parameter	×	43	
F1.14	Rotor inductance	Rotor inductance	0.0~999.9mH	0.1mH	Motor parameter	×	44	
F1.15	Mutual inductance	Mutual inductance	0.0~999.9mH	0.1mH	Motor parameter	×	45	
F1.16	Excitation current with no load	Excitation current with no load	0.0~999.9A	0.1A	Motor parameter	×	46	

5.2.3 F2 Auxiliary Parameters

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F2.00	Start mode	Start mode	0:start from start frequency 1:first braking then restart 2:flying restart	1	0	×	60	
F2.01	Start frequency	Start frequency	0.00~10.00Hz	0.01Hz	1.00Hz	×	61	
F2.02	Start frequency holding time	Start holding time	0.0~10.0s	0.1s	0.0s	×	62	
F2.03	DC braking current at start	Brake current at start	0.0~150.0% (inverter rated current)	0.1%	0.0%	×	63	
F2.04	DC braking time at start	Brake time at start	0.0 (DC braking No action), 0.1~30.0s	0.1s	0.0s	×	64	
F2.05	Acc/Dec selection	Acc/Dec mode	0: Line Acc/Dec 1: S curve Acc/Dec	1	0	×	65	
F2.06	Time of S curve's initial part	S initial part	10.0~30.0% (Acc/Dec time) Note: (F2.06)+(F2.07)<=90%	0.1%	20.0%	×	66	
F2.07	Time of S curve's rising part	S rising part	10.0~70.0% (Acc/Dec time) Note: (F2.06)+(F2.07)<=90%	0.1%	60.0%	×	67	
F2.08	FWD/REV dead time	FWD/REV interval	0.1~3600s	0.1s	2.0s	×	68	
F2.09	Stopping mode	Stopping mode	0: Dec-to-stop 1 1: Coast to stop 2: Dec-to-stop 2	1	0	×	69	
F2.10	Initial frequency of DC injection braking	initial frequency of DC injection braking	0.00~10.00Hz	0.01Hz	10.00Hz	×	70	
F2.11	DC braking current	DC braking current	0.0~150.0% (inverter's rated current)	0.1%	0.0%	×	71	
F2.12	DC braking time	Brake time	0.0 (DC braking No action), 0.1~30.0s	0.1s	0.0s	×	72	
F2.13	Restart after power failure	restart after power failure	0: Prohibited 1: Enable	1	0	×	73	
F2.14	Delay time for restart after power failure	Delay time	0.0~5.0s (valid when F2.13=1)	0.1s	0.5s	×	74	
F2.15	Jog frequency setting	Jog frequency	0.10~10.00Hz	0.01Hz	2.00Hz	×	75	

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F2.16	Jog Acc time setting	Jog Acc time	0.1~60.0s	0.1s	1.0s	○	76	
F2.17	Jog Dec time setting	Jog Dec time	0.1~60.0s	0.1s	1.0s	○	77	
F2.18	Acc time2	Acc time2	0.1~3600s	0.1s	20.0s	○	78	
F2.19	Dec time2	Dec time2	0.1~3600s	0.1s	20.0s	○	79	
F2.20	Acc time3	Acc time3	0.1~3600s	0.1s	20.0s	○	80	
F2.21	Dec time3	Dec time3	0.1~3600s	0.1s	20.0s	○	81	
F2.22	Acc time4	Acc time4	0.1~3600s	0.1s	20.0s	○	82	
F2.23	Dec time4	Dec time4	0.1~3600s	0.1s	20.0s	○	83	
F2.24	Multi-frequency 1	Multi-frequency 1	(F0.09)~(F0.08)	0.01Hz	5.00Hz	○	84	
F2.25	Multi-frequency2	Multi-frequency2	(F0.09)~(F0.08)	0.01Hz	10.00Hz	○	85	
F2.26	Multi-frequency3	Multi-frequency3	(F0.09)~(F0.08)	0.01Hz	15.00Hz	○	86	
F2.27	Multi-frequency4	Multi-frequency4	(F0.09)~(F0.08)	0.01Hz	20.00Hz	○	87	
F2.28	Multi-frequency5	Multi-frequency5	(F0.09)~(F0.08)	0.01Hz	30.00Hz	○	88	
F2.29	Multi-frequency6	Multi-frequency6	(F0.09)~(F0.08)	0.01Hz	40.00Hz	○	89	
F2.30	Multi-frequency7	Multi-frequency7	(F0.09)~(F0.08)	0.01Hz	50.00Hz	○	90	
F2.31	Jump frequency1	Jump frequency1	(F0.09)~(F0.08)	0.01Hz	0.00Hz	×	91	
F2.32	Jump frequency2	Jump frequency2	(F0.09)~(F0.08)	0.01Hz	0.00Hz	×	92	
F2.33	Jump frequency3	Jump frequency3	(F0.09)~(F0.08)	0.01Hz	0.00Hz	×	93	
F2.34	Jump frequency range	Jump range	0.00~30.00Hz	0.01Hz	0.00Hz	×	94	
F2.35	Carrier frequency regulation	Carrier frequency	2.0kHz~16.0kHz	0.1kHz	Set according to type	×	95	
F2.36	Fault lock function selection	Fault start lock	0: Disable 1: Enable	1	0	×	96	
F2.37	Fault auto reset times	Reset times	0(without auto reset function), 1~3	1	0	×	97	
F2.38	Reset interval	Reset interval	2~20s	1s	5s	×	98	
F2.39	Over voltage stall function selection	Over voltage stall	0: Disable 1: Enable	1	0	×	99	
F2.40	Stall over voltage point	Stall over voltage point	120~150.0% (rated voltage peak value)	0.1%	130.0%	×	100	
F2.41	Stall over current point1	Stall over current1	20.0~200.0% (lower than motor rated frequency)	0.1%	150.0%	×	101	
F2.42	Stall over current point2	Stall over current2	20.0~150.0 (above motor rated frequency)	0.1%	120.0%	×	102	
F2.43	External frequency full range setting	External frequency full range	1.0kHz~50.0kHz (highest frequency)	0.1kHz	20.0kHz	×	103	
F2.44	Drop control	Drop control	0.00~9.99Hz	0.01Hz	0.00Hz	×	104	

5.2.4 F3 Vector Control

Speed regulator

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F3.00	ASR proportional gain 1	ASR1-P	0.000~6.000	0.001	1.000	×	120	
F3.01	ASR integration time 1	ASR1-I	0(No action), 0.032~32.00s	0.001s	1.000	×	121	
F3.02	ASR proportional gain 2	ASR2-P	0.000~6.000	0.001	2.000	×	122	
F3.03	ASR integration time 2	ASR2-I	0(No action), 0.032~32.00s	0.001s	0.500	×	123	
F3.04	ASR switching frequency	Switching frequency	0.00~400.0Hz	0.01Hz	5.00	×	124	
F3.05	Slip compensation gain	Slip compensation gain	50.0~250.0%	0.1%	100.0%	×	125	

Torque limit and control

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F3.06	Torque control	Torque control	0: Valid under certain condition 1: Permanently invalid	1	0	×	126	
F3.07	Motor torque limit	Motor torque limit	0.0~200.0%（inverter rated current）	0.1%	150.0%	×	127	
F3.08	Brak torque limit	Brak torque limit	0.0~200.0%（inverter rated current）	0.1%	150.0%	×	128	
F3.09	Torque control selection	Torque control selection	0: AI2 (high frequency limit is F0.08) 1: AI3 (high frequency limit is F0.08) 2: AI2 (high frequency limit is defined by AI1) 3: AI3 (high frequency limit is defined by AI1)	1	0	×	129	
F3.10	Speed/torque switching control delay time	Switch between speed/torque	0.01~1.00s	0.01s	0.04	×	130	
F3.11	Zero servo function selection	Zero servo function	0: Prohibited 1: Permanently invalid 2: Valid under certain condition	1	0	×	131	
F3.12	Proportional gain of zero servo position loop	Position loop gain	0.000~6.000	0.001	2.000	×	132	

5.2.5 F4 V/F Control

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F4.00	V/F curve Control mode	V/F curve	0: linear 1: square 2: self define	1	0	×	150	
F4.01	Torque boost	Torque boost	0.0~30.0% (manual torque boost)	0.1%	3.0%	×	151	
F4.02	Auto torque compensation	Torque compensation	0.0 (No action), 0.1~30.0%	0.1%	0.0%	×	152	
F4.03	Positive slip compensation	Positive slip compensation	0.00~10.00Hz	0.01Hz	0.00Hz	×	153	
F4.04	Negative slip compensation	Negative slip compensation	0.00~10.00Hz	0.01Hz	0.00Hz	×	154	
F4.05	AVR function	AVR function	0: No action 1: Action	1	0	×	155	

5.2.6 F5 Digital Value Terminal

Digital value input terminal

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F5.00	FWD/REV running mode	Control mode	0: Two line mode 1 1: Two line mode 2 2: Three line mode	1	0	×	170	
F5.01	Digital input terminal X1~X8 function	X1 terminal function	0: No function (can be selected again) 1: MS (multi-section) speed terminal 1 2: MS (multi-section) speed terminal 2 3: MS (multi-section) speed terminal 3 4: Multi-Acc/Dec time terminal1 5: Multi-Acc/Dec time terminal2 6: External fault normally open input 7: External fault normally closed input 8: External Reset(RESET) input	1	0	×	171	
F5.02		X2 terminal function		1	0	×	172	

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F5.03	Digital input terminal X1~X8 function	X3 terminal function	9: FWD&JOG control input (JOGF) 10: REV&JOG control input (JOGR) 11: Coast to Stop input (FRS) 12: Frequency increase command (UP) 13: Frequency decrease command (DOWN) 14: UP/DOWN terminal clear command 15: Acc/Dec prohibit command 16: 3-wire running control 17: External interrupt normally open contact input 18: External interrupt normally closed contact input 19: Pre-excitation command 20: DC braking command input 21: Reserved 22: Counter reset signal input 23: Counter trig signal input 24: Switch between AI1 input and AI2 input 25: Switcht between panel operation and external terminal command 26: Reserved 27: RS485 communication control enable 28: Simple PLC running command enable 29: Simple PLC pause 30: Reserved 31: Reserved 32: Speed/torque switch control 33: Zero servo signal	1	0	×	173	
F5.04		X4 terminal function		1	0	×	174	
F5.05		X5 terminal function		1	0	×	175	
F5.06		X6 terminal function		1	0	×	176	
F5.07		X7 terminal function		1	0	×	177	
F5.08		X8 terminal function		1	0	×	178	

Digital value output terminal

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F5.09	Open collector output terminal Y1 function selection	Y1 function selection	0: Inverter ready for running (READY) 1: Inverter running 1 signal (RUN1) 2: Inverter running 2 signal (RUN2) 3: Inverter zero speed running 4: Frequency/speed arrive signal 5: Frequency/speed uniform signal 6: Setup counter arrive 7: Specified counter arrive 8: Simple PLC Phase running finished indication 9: Under voltage locking(P.OFF) 10: Inverter over load pre-alarm 11: External fault Stop 12: Motor over load pre-alarm 13: Torque limit	1	4	×	179	
F5.10	Open collector output terminal Y2 function selection	Y2 function selection		1	5	×	180	
F5.11	Programmable relay output PA/B/C function selection	Relay function		1	1	×	181	
F5.12	Counter setting arrive input	Counter setting	0~9999	1	0	×	182	
F5.13	Specified counter arrive input	Specified counter	0~(F5.12)	1	0	×	183	
F5.14	FAR	Frequency effective range	0.0~20.0%(F0.07)	0.1%	5.0%	○	184	
F5.15	FDT level	FDT level	0.0~100.0%(F0.07)	0.1%	80.0%	○	185	
F5.16	FDT signal (lag)	FDT signal	0.0~100.0%(F0.07)	0.1%	5.0%	○	186	
F5.17	Inverter over load pre-alarm setup	INV overload predict	20.0~100.0%(inverter rated current)	0.1%	100.0%	○	187	
F5.18	Motor over load pre-alarm setup	Motor overload predict	100.0~250.0%(motor rated current)	0.1%	100.0%	○	188	

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F5.19	Frequency output multipling factor	Multiple-frequency output	100.0 (frequency table output invalid), 100.1~999.9	0.1	200.0	○	189	

5.2.7 F6 Analog Terminal

Analog input

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F6.00	AI1 voltage input selection	AI1 selection	0: 0~10V 1: 0~5V 2: 10~0V 3: 5~0V 4: 2~10V 5: 10~2V 6: -10~+10V	1	0	×	200	
F6.01	AI2 voltage/current input selection	AI2 selection	0: 0~10V/0~20mA 1: 0~5V/0~10mA 2: 10~0V/20~0mA 3: 5~0V/10~0mA 4: 2~10V/4~20mA 5: 10~2V/20~4mA	1	0	×	201	
F6.02	AI3 voltage input selection	AI3 selection	0: 0~10V 1: 0~5V 2: 10~0V 3: 5~0V 4: 2~10V 5: 10~2V 6: -10~+10V	1	0	×	202	
F6.03	Analog filter time	Filter time	0.012~5.000s	0.001s	0.1s	○	203	
F6.04	Main reference-input-channel selection	Main reference-input-channel	0: AI1 1: AI2 2: AI3	1	0	×	204	
F6.05	Auxiliary reference-input-channel selection	Auxiliary channel	0: No 1: AI2 2: AI3	1	0	×	205	
F6.06	Auxiliary adjusting value	Auxiliary adjusting value	0.0~20.0%	0.1%	0.0%	○	206	
F6.07	Feedback channel selection(valid when PID mode is selected)	Feedback channel	0: AI2 1: AI3 2: AI2+AI3 3: AI2-AI3 4: AI2*AI3 5: AI2/AI3 6: min(AI2, AI3) 7: max(AI2, AI3) 8: sqrt(AI2-AI3 9: sqrt(AI2)+sqrt(AI3)	1	0	×	207	

Analog output

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F6.08	AO1 multifunction Analog output terminal function selection	AO1 selection	0: Running frequency/spinning speed(0~MAX) 1: Setup frequency /spinning speed(0~MAX) 2: ASR speed error 3: Output current(0~2 times rating) 4: Torque command current 5: Torque current 6: Output voltage (0~1.2 times rating) 7: Feedback flux current 8: AI1 setup input 9: AI2 setup input 10: AI3 setup input	1	0	○	208	
F6.09	AO2 multifunction Analog output terminal function selection	AO2 selection			3	○	209	
F6.10	AO1 zero offset adjustment	AO1 zero adjustment	-99.9~100.0%	0.1%	0.0%	○	210	
F6.11	AO1 gain setup	AO1 gain	-9.99~+10.00	0.01	1.0	○	211	
F6.12	AO2 zero offset adjustment	AO2 zero adjustment	-99.9~+100.0%	0.1%	0.0%	○	212	
F6.13	AO2 gain setup	AO2 gain	-9.99~+10.00	0.01	1.0	○	213	

5.2.8 F7 PID Pocess

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F7.00	Close loop control function selection	Close loop control	0: Do not select PID 1: Analog close loop control 2: PG speed close loop	1	0	×	230	
F7.01	Reference selection	Reference selection	0: Reference input through keypad 1: Reference input through terminal	1	1	×	231	
F7.02	Reference digital setting	Digital setting	0.00~10.00V	0.01	0.00	○	232	
F7.03	Feedback input channel selection	feedback selection	0: Input via analog terminal	1	0	×	233	
F7.04	Reference of speed close loop	Speed close loop	0~24000rpm	1rpm	0rpm	○	234	
F7.05	Proportional gain P	Proportional gain	0.0~999.9%	0.1%	0.0%	○	235	
F7.06	Integration time Ti	Integration time	0.00 (no integration), 0.01~99.99s	0.01s	0.00s	○	236	
F7.07	Differential time Td	Differential time	0.00 (no differential), 0.01~99.99s	0.01s	0.0s	○	237	
F7.08	Sample cycle T	Sample cycle	0.00 (no selection sample cycle), 0.01~99.99s	0.01s	5.0s	○	238	
F7.09	Error limit	Error limit	0.0~20.0% (close loop reference)	0.1%	0.0%	○	239	
F7.10	High limit	High limit	100.0~200.0% (close loop reference, reserved)	0.1%	150.0%	○	240	
F7.11	Low limit	Low limit	0.0~50.0% (close loop reference, reserved)	0.1%	0.0%	○	241	

5.2.9 F8 Simple PLC

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F8.00	PLC running mode selection	PLC mode	0: No action 1: Single cycle 2: Continuous cycle 3: Maintain final value	1	0	×	260	
F8.01	Timing unit	Timing unit	0: Second (s) 1: Minute (m)	1	0	×	261	
F8.02	Phase 1 action selection	ST1 selection	0~7 (refer to *Chapter 6 Detailed Function Introduction*)	1	1	×	262	
F8.03	Phase 1 running time	ST1 time	0.0~5000m/s	0.1m/s	20.0s	×	263	
F8.04	Phase 2 action selection	ST2 selection	0~7（refer to *Chapter 6 Detailed Function Introduction*）	1	1	×	264	
F8.05	Phase 2 running time	ST2 time	0.0~5000m/s	0.1m/s	20.0s	×	265	
F8.06	Phase 3 action selection	ST3 selection	0~7（refer to *Chapter 6 Detailed Function Introduction*）	1	1	×	266	
F8.07	Phase 3 running time	ST3 time	0.0~5000m/s	0.1m/s	20.0s	×	267	
F8.08	Phase 4 action selection	ST4 selection	0~7（refer to *Chapter 6 Detailed Function Introduction*）	1	1	×	268	
F8.09	Phase 4 running time	ST4 time	0.0~5000m/s	0.1m/s	20.0s	×	269	
F8.10	Phase 5 action selection	ST5 selection	0~7（refer to *Chapter 6 Detailed Function Introduction*）	1	1	×	270	
F8.11	Phase 5 running time	ST5 time	0.0~5000m/s	0.1m/s	20.0s	×	271	
F8.12	Phase 6 action selection	ST6 selection	0~7（refer to *Chapter 6 Detailed Function Introduction*）	1	1	×	272	
F8.13	Phase 6 running time	ST6 time	0.0~5000m/s	0.1m/s	20.0s	×	273	
F8.14	Phase 7 action selection	ST7 selection	0~7（refer to *Chapter 6 Detailed Function Introduction*）	1	1	×	274	
F8.15	Phase 7 running time	ST7 time	0.0~5000m/s	0.1m/s	20.0s	×	275	

5.2.10 F9 COM And Bus

Communication control

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F9.00	Baud rate selection	Baud rate selection	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps 6: 125000bps	1	3	×	290	
F9.01	Data format	Data format	0: N, 8, 1 (1 start bit, 8 digital bits, 1 stop bit, no parity) 1: E, 8, 1 (1 start bit, 8 digital bits, 1 stop bit, even parity) 2: O, 8, 1 (1 start bit, 8 digital bits, 1 stop bit, odd parity)	1	0	×	291	
F9.02	Local address	Local address	2~126	1	2	×	292	

PROFI BUS control

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
F9.03	PPO mode selection	PPO mode	0: invalid control 1: PPO1 2: PPO2 3: PPO3 4: PPO4 5: PPO5	1	0	×	293	
F9.04	PZD2's connection value	PZD2 connection value	0~20 (corresponding to FF.00~FF.20)	1	0	×	294	
F9.05	PZD3's connection value	PZD3 connection value	0~20 (corresponding to FF.00~FF.20)	1	0	×	295	
F9.06	PZD4's connection value	PZD4 connection value	0~20 (corresponding to FF.00~FF.20)	1	0	×	296	
F9.07	PZD5's connection value	PZD5 connection value	0~20（corresponding to FF.00~FF.20）	1	0	×	297	
F9.08	PZD6's connection value	PZD6 connection value	0~20（corresponding to FF.00~FF.20）	1	0	×	298	
F9.09	PZD7's connection value	PZD7 connection value	0~20（corresponding to FF.00~FF.20）	1	0	×	299	
F9.10	PZD8's connection value	PZD8 connection value	0~20（corresponding to FF.00~FF.20）	1	0	×	300	
F9.11	PZD9's connection value	PZD9 connection value	0~20（corresponding to FF.00~FF.20）	1	0	×	301	
F9.12	Communication delay	Communication delay	0~20ms	1	0	×	302	

5.2.11 FA Enhanced Function

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
FA.00	Relay acts selection in fault auto reset	Fault output	0: No output (fault node has no action) 1: Output (fault node has action)	1	0	○	320	
FA.01	Relay acts selection in P.OFF period	POFF output	0: No output (fault node has no action) 1: Output (fault node has action)	1	0	○	321	
FA.02	Function selection of STOP key	STOP function	0~15 (refer to *Chapter 6 Detailed Function Introduction*)	1	10	×	322	
FA.03	Cooling fan control selection	Fan control	0: Auto running mode 1: Run all the time	1	0	○	323	
FA.04	Action selection at external analog frequency/speed command missing(open loop)	Missing Action	0: Stop (E022) 1: Running set by F0.04 2: High speed limit running 3: Low speed limit running 4: Running set by FA.09 Note: Only valid for 4~20mA/2~10V/20~4mA/10~2V input valid	1	0	×	324	
FA.05	Communication overtime	Communication overtime	0.0 (invalid), 0.1~100.0s	0.1s	0.0s	×	325	
FA.06	Communication error or action selection at communication overtime	Communication fail	0: Stop (E017) 1: F0.04 setup running 2: High speed limit running 3: Low speed limit running 4: F0.09 setup running	1	0	×	326	
FA.07	Action selection for PID reference missing	Input value missing	0: Stop (E022) 1: 100% AI running 2: 50% AI running 3: 25% AI running Note: Only valid for 4~20mA/2~10V/20~4mA /10~2V input	1	0	×	327	
FA.08	Action selection for PID feedback missing	Feedback missing	0: Stop (E021) 1: Running set by F0.04 2: High speed limit running 3: Low speed limit running 4: Running set by FA.09 Note: Only valid for 4~20mA/2~10V/20~4mA/10~2V input valid	1	0	×	328	

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
FA.09	Abnormal backup frequency/speed setup	Abnormal speed	0.0~100.0% (abnormal speed setup)	0.1%	0.0%	×	329	
FA.10	Brake utility rate	Brake utility rate	0: No braking 1: 2% 2: 5% 3: 10% 4: 20% 5: 50% 6: 80% 7: 100%	1	7	○	330	
FA.11	UP/DOWM speed limit setting	Increase/ decrease frequency	0.10~99.99Hz/s	0.01Hz/s	1.00Hz/s	○	331	
FA.12	Inverter input phase failure protection	Input phase failure	0: Protection disabled 1: Alarm 2: Protection enabled	1	2	○	332	
FA.13	Inverter output phase failure protection	Output phase failure	0: Protection disabled 1: Alarm 2: Protection enabled	1	2	○	333	
FA.14	Inverter load missing protection	Inverter load missing	0: Protection disabled 1: Alarm 2: Protection enabled	1	0	○	334	
FA.15	Inverter load missing protection level	Load missing level	0.0~100.0% (rated current)	0.1%	30.0%	×	335	
FA.16	Load missing protection detecting time	Load missing time	0.0~99.9s	0.1s	1.0s	×	336	

5.2.12 Fb PG Function

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
Fb.00	PG Pusle number selection	Pusle number selection	1~9999	1	1024	×	350	
Fb.01	PG direction selection	PG direction selection	0: FWD 1: REV	1	0	×	351	
Fb.02	PG cable broken action	PG cable broken action	0: Coast to stop (E025) 1: Continues running (only limited in V/F close loop)	1	0	×	352	
Fb.03	PG cable broken detection time	Cable broken detection time	2.0~10.0s	0.1s	2.0s	×	353	
Fb.04	Zero speed detection value	Zero speed detection value	0.0 (cable broken protection inhibit), 0.1~999.9rpm	0.1rpm	0.0rpm	×	354	

5.2.13 FC Reserved Function

Reserved function 0

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
FC.00	Reserved function	Reserved function	0	1	0	-	370	
FC.01	Reserved function	Reserved function	0	1	0	-	371	
FC.02	Reserved function	Reserved function	0	1	0	-	372	
FC.03	Reserved function	Reserved function	0	1	0	-	373	
FC.04	Reserved function	Reserved function	0	1	0	-	374	

Reserved function 1

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
FC.05	Reserved function	Reserved function	0	1	0	-	375	
FC.06	Reserved function	Reserved function	0	1	0	-	376	
FC.07	Reserved function	Reserved function	0	1	0	-	377	
FC.08	Reserved function	Reserved function	0	1	0	-	378	

Reserved function 2

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
FC.09	Reserved function	Reserved function	0	1	0	-	379	
FC.10	Reserved function	Reserved function	0	1	0	-	380	
FC.11	Reserved function	Reserved function	0	1	0	-	381	
FC.12	Reserved function	Reserved function	0	1	0	-	382	

5.2.14 Fd Display And Check

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
Fd.00	LED running display parameters selection 1	Running display 2	1~255 (refer to *Chapter 6 Detailed Function Introduction*)	1	31	○	400	
Fd.01	LED running display parameters selection 2	Running display 2	0~255 (refer to *Chapter 6 Detailed Function Introduction*)	1	0	○	401	
Fd.02	LED stop display parameters (flash)	Stop display	0: Frequency setting (Hz)/(speed (rpm)) 1: External counting value (no unit) 2: Digital value input (no unit) 3: Digital value output (no unit) 4: Analog input AI1 (V) 5: Analog input AI2 (V) 6: Analog input AI3 (V) 7: DC bus voltage (V-AVE)	1	0	○	402	
Fd.03	Frequency/speed display switch	Display switching	0: Frequency(Hz) 1: Speed (rpm)	1	0	○	403	
Fd.04	Line speed factor	Line speed factor	0.1~999.9%	0.1%	1.0%	○	404	
Fd.05	IPM heatsink temperature	Heatsink temperature1	0.0~100.0°C	0.1°C	Actual detection value	*	405	
Fd.06	Rectifier module heatsink temperature	Heatsink temperature 2	0.0~100.0°C	0.1°C	Actual detection value	*	406	

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
Fd.07	1st fault type	Fault 1	0: No abnormal record (clear abnormal record) 1: Acc over current (E001) 2: Dec over current (E002) 3: Over current in constant speed (E003) 4: Over voltage in Acc process (E004) 5: Over voltage in Dec process (E005) 6: Over voltage in constant speed (E006) 7: Control power supply over voltage (E007) 8: Input side phase failure (E008) 9: Output side phase failure (E009) 10: Power module Fault (E010) 11: Heatsink overheat (E011) 12: Rectifier over heat (E012) 13: Inverter overload (E013) 14: Motor overload (E014) 15: External equipment fault (E015) 16: W/R Fault (E016) 17: COM Fault (E017) 18: Contactor does not close (E018) 19: Current detection Fault (E019) 20: CPU Fault (E020) 21: Close loop feedback cable broken (E021) 22: External input cable broken (E022) 23: Keypad W/R Fault (E023) 24: Tuning fault (E024) 25: PG fault (E025) 26: Load-loss Fault (E026) 27: Brake failure (E027) 28: Parameter setting error (E028)	1	0	*	407	
Fd.08	2nd fault type	Fault 2		1	0	*	408	
Fd.09	3rd fault type	Fault 3		1	0	*	409	
Fd.10	Bus voltage at last fault	Fault voltage	0~999V	1V	0V	*	410	
Fd.11	Output current at last fault	Fault current	0.0~999.9A	0.1A	0.0A	*	411	
Fd.12	Running frequency at last fault	Fault frequency	0.00Hz~400.0Hz	0.01Hz	0.00Hz	*	412	
Fd.13	Input terminal's state at last fault	Fault terminal 1	0~1023	1	0	*	413	
Fd.14	Output terminal's state at last fault	Fault terminal 2	0~15	1	0	*	414	
Fd.15	Total operating time	Operating time	0~65535 hrs	1hr	0hr	*	415	

5.2.15 FE Factory Reserved

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
FE.00	Manufacturer password setup	Manufacturer password	**** Note: Input password correctly, display FE.01~FE.14.	1	Factory setting	–	430	

5.2.16 FF Communication Parameters

Note: The FF communication parameters are not displayed on LED or LCD.

Func. code	Name	Display on LCD	Setting range	Min. unit	Factory setting	Change	Profibus code	User's setting
FF.00	Running frequency	FF parameters are not displayed on LED or LCD	Running frequency (Hz)	0.01 Hz	–	*	470	
FF.01	Running speed		Running speed (rpm)	1rpm	–	*	471	
FF.02	Preset frequency		Preset frequency (Hz)	0.01 Hz	–	*	472	
FF.03	Preset speed		Preset speed (rpm)	1rpm	–	*	473	
FF.04	Output voltage		Output voltage (V-RMS)	1V	–	*	474	
FF.05	Output current1		Output current (A-RMS)	0.1A	–	*	475	
FF.06	Output power		Output power (%)	0.1%	–	*	476	
FF.07	Line speed		Line speed (m/s)	0.1m/s	–	*	477	
FF.08	Preset line speed		Preset line speed (m/s)	0.1m/s	–	*	478	
FF.09	External count value		External count value (no unit)	1	–	*	479	
FF.10	Motor output torque		Motor output torque (%)	0.1%	–	*	480	
FF.11	Motor flux		Motor flux (%)	0.1%	–	*	481	
FF.12	Digital input terminal's state		0~1023	1	–	*	482	
FF.13	Digital output terminal's state		0~15	1	–	*	483	
FF.14	Analog input AI1		Analog input AI1 (V)	0.01V	–	*	484	
FF.15	Analog input AI2		Analog input AI2 (V)	0.01V	–	*	485	
FF.16	Analog input AI3		Analog input AI3 (V)	0.01V	–	*	486	
FF.17	Analog output AO1		Analog output AO1 (V)	0.01V	–	*	487	
FF.18	Analog output AO2		Analog output AO2 (V)	0.01V	–	*	488	
FF.19	DC bus voltage		Bus voltage (V)	1V	–	*	489	
FF.20	Output current 2 (reserved)		Output current (A- instantaneous value)	0.1A	–	*	490	

5.3 Description Of Factory Reserved Functions

FE.00 function is for the factory to input its password so that parameter values from FE.01 to FE.20 set by the factory can be viewed or modified. These parameters include:

1. Version of control software:

2. Parameters corresponding to the inverter model;

3. Various voltage and current protection thresholds.

Users cannot not modify or view these parameters. Only during maintenance or when the control board needs to be replaced can the specialized personnel from the manufacturer modify these parameters.

Chapter 6 Detailed Function Introduction

Note

The values in "【】" are the factory settings.

6.1 Basic Function Parameters

F0.00 User password setting	Setting range: 0~9999【0】

XXXX: Set up any non zero number as user's password to enable password protection function.

0000: Clear user's password that has been already set up to disable password protection function.

EV3000 series inverter's factory setting is that the password protection function is invalid (F0.00= 0000).

Once user's password setting is valid, if you enter parameter setup state again, the parameters can only be read but cannot be revised by keypad.

If user password's protection function is enabled, LCD will display🔒.

F0.01 Language selection	Setting range: 0, 1【0】

EV3000's keypad has two kinds of LCD menu explanation in Chinese and English provided for customers.

0: Chinese

1: English

F0.02 Control mode	Setting range: 0, 1, 2【0】

0: Without PG vector (open loop vector)control

That is no speed sensor vector control running mode, which can be used for high performance variable speed general driving condition.

1: With PG vector control

That is vector control running mode with speed sensor, which is mainly used in the cases such as high accuracy speed control, torque control and simple servo control which have high requirements for control performance.

When the control mode is selected, generally, PG should be installed on the motor's terminal, and the PG's parameters should be set up correctly. For the setup and adjustment of the PG's parameters, refer to the explanation of Fb parameter group.

Note

1. Before running in the vector control mode for the first time, activate motor auto-tuning to get the correct motor parameters. After that, the motor parameters will be stored in the control panel for later use.

2. Correctly set the parameter of the speed regulator to ensure good static and dynamic control performance. See the description of F3 parameter group for related instructions.

3. When in the feedback vector control mode, one inverter can drive only one motor. Besides, the inverter and motor capacity should be close to each other. The inverter power can be two grades bigger or one grade smaller than the motor, otherwise its control performance may decrease, and the driving system may fail.

4. Using the vector control with PG requires the PG parameters in FB group be set correctly.

2: V/F control

When one inverter drives more than one motor, if motor auto-tuning cannot be performed or the motor's parameters can be acquired through other methods, please select V/F control mode.

V/F control mode is mainly applied in:

1) V/F control without PG: Can be used in the case when one inverter drives more than one motor;

2) V/F control with PG: Can be used in the case of simple speed feedback control, especially when PG is not directly installed on the shaft of motor .

When V/F control is selected, function code (F4 Parameter group)specially used by V/F control should be set correctly.

If V/F control with PG is selected, process PID function code (refer to F7 parameter group) and PG function code (Fb parameter group) must be set correctly.

F0.03 Frequency setting mode	Setting range: 0~9【0】

EV3000 series inverter has ten kinds of frequency setting mode, inverter's current frequency can be set when the inverter is in stopping state or running state.

0: Digital setting 1

When the inverter is switched on, set the value of F0.04 as inverter's present frequency directly.

When the inverter is in running or stopping state, inverter's present frequency can be changed through ▲ and ▼ keys on the keypad; frequency digital setting value which is stored in F0.04 cannot be revised. Only when the power fails (P.OFF), can the inverter's present frequency be saved in F0.04.

During running or stopping state, if you revise the value of F0.04, inverter's present frequency should also be updated .

1: Digital setting 2

Basic operation is the same with "Digital setting 1".

The only difference is: when the power fails, inverter's present frequency will not be saved in F0.04 .

2: Digital setting 3

In this mode, inverter's frequency can be set through external control terminal.

When this setting mode is selected, the following parameters should be set:

1) Among parameters of F5.01~F5.08, three external control terminals can be defined as 12 (Frequency increase command UP), 13 (Frequency decrease command DOWN), and 14 (UP/DOWN setup device clear command) separately;

2) Among parameters of FA.11, changing rate of setting value can be set when setting frequency through UP / DOWN terminals.

When digital setting modes 3 and 4 are selected, wiring diagram is shown below:

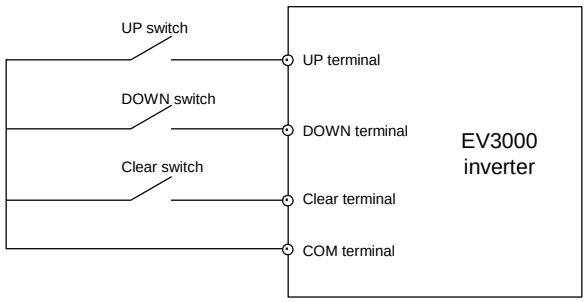


Figure 6-1 wiring diagram for digital setting mode 3 and 4

The relationship between three external switches' state combination and inverter's present frequency is shown in Table 6-1.

Table 6-1 UP/DOWN terminal switching state vs. present freq.

Setup device clear terminal switching state	UP terminal switching state	DOWN terminal switching state	Inverter's present frequency
Disconnect	Disconnect	Disconnect	Maintain
		Close	Decrease
		Disconnect	Increase
	Close	Close	Maintain
Close	Random	Random	Clear

During stopping process, the CLEAR command of controller is still active; while UP and DOWN terminals are disabled. During stopping state, three external control terminals are all disabled.

3: Digital setting 4

Basic operation is same with "Digital setting 3", the difference is:

When STOP command is accepted, STOP process starts, inverter's present frequency is memorized automatically, and it is the preset frequency of the next running process.

In stopping state, the CLEAR command of controller is still active, while UP and DOWN terminals are disabled.

4: Digital setting 5

In this mode, external control terminal needs not to be specially set, inverter's present frequency can be set through external switches of X1~X8 terminals.

Before using, X1~X8 terminals should be connected with COM terminals, as shown in Figure 6-2 .

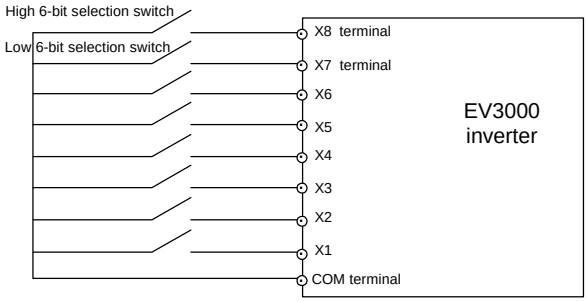


Figure 6-2 Digital setting 5 wiring figure

In this mode, terminals and states of external switches are defined below:

External switch Close: terminal ON state, input binary digit 1.

External switch Open: terminal OFF state, input binary digit 0.

When the inverter is in running or stopping state, inverter's present frequency can be set through X1~X8 terminals according to 12-bit binary code .

X6~X1 terminals are used for setup binary data, high 6-bit and low 6-bit of 12 bit binary code setting value can be determined in every effective setup.

X8 and X7 terminals can be used for selecting high 6-bit and low 6-bit of 12 bit binary code setting value, and control the input of binary operation.

Every time when the inverter is powered on, inverter's present frequency will be set to zero automatically.

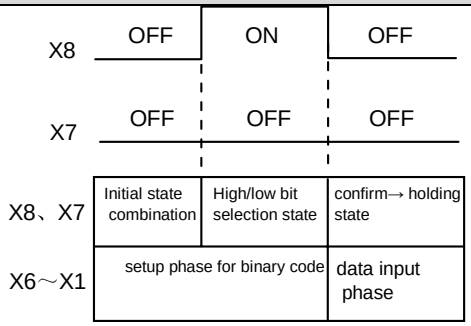
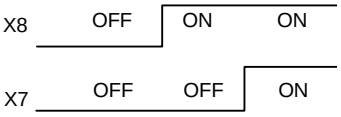
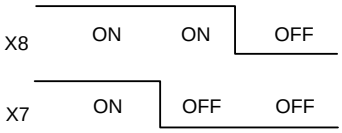
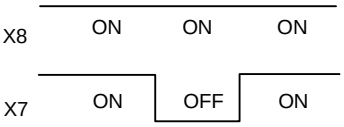
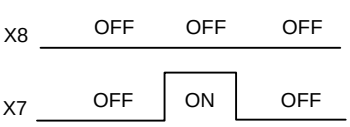
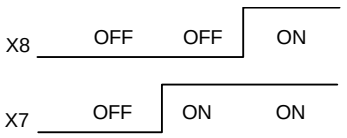
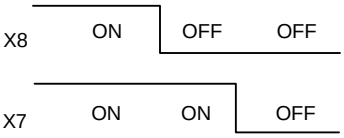
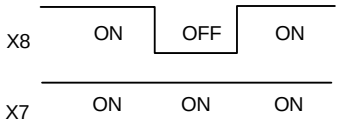
Before inputting high 6-bit and low 6-bit of 12 bit binary code setting value, X6~X1 terminal switch should be set.

When X8 and X7 terminals are ON or OFF at the same time, 12-bit binary code setting value is in holding state.

If combination state of X8 and X7 terminals changes one time, then high 6-bit or low 6-bit of 12 bit binary code setting value will be input once.

When setup the data, input low 6-bit first, then input high 6-bit.

When setting the binary digital value via terminals, the operation sequence of effective setting mode is shown in the following table.

Valid setting combination modes of X8 and X7 terminals		Action process of X7, X8	Binary setting value input from X6~X1
High 6-bit	Valid data setting mode 1		High 6-bit, bit11~bit6
	Valid data setting mode 2		
	Valid data setting mode 3		
	Valid data setting mode 4		
Low 6-bit	Valid data input setting mode 1		Low 6-bit, bit5~bit0
	Valid data setting mode 2		
	Valid data setting mode 3		
	Valid data setting mode 4		

In digital setting modes via terminals, all effective setting modes are shown in the following table:

Combination states of X8 and X7	Action Process of X8	Action Process of X7	Binary setting value input from X6~X1
OFF→OFF	OFF→ON→OFF	OFF	High 6-bit bit11~bit6
OFF→ON	Execute OFF→ON first	Execute OFF→ON later	
ON→OFF	Execute ON→OFF later	Execute ON→OFF first	
ON→ON	Maintain ON	ON→OFF→ON	
OFF→OFF	Maintain OFF	OFF→ON→OFF	Low 6-bit bit5~bit0
OFF→ON	Execute OFF→ON later	Execute OFF→ON first	
ON→OFF	Execute ON→OFF first	Execute ON→OFF later	
ON→ON	ON→OFF→ON	Maintain ON	

The following is the calculation method of inverter's present frequency:

Inverter's present frequency＝(highest frequency/4095)×(decimal setting value)

Decimal setting value＝bit11×2^{11}+bit10×2^{10}+…+bit0×2^{0}

12-bit binary code and inverter's present frequency are calculated below:

Set the highest frequency to 60.00Hz, high frequency limit to 60.00Hz, and low frequency limit to 0.00Hz.

12 -bit binary value		Decimal setting value	Inverter's present frequency	Remark
High 6-bit	Low 6-bit			
1 1 1 1 1 1	1 1 1 1 1 1	4095	60.00Hz	Highest frequency
1 0 1 0 1 0	1 0 1 0 1 0	2730	40.00Hz	
1 0 0 0 0 0	0 0 0 0 0 0	2048	30.01Hz	
0 0 1 0 1 0	1 0 1 0 1 1	683	10.01Hz	
0 0 0 0 0 0	1 0 0 0 0 0	32	0.47Hz	
0 0 0 0 0 0	0 0 0 0 0 0	0	0.00Hz	Low frequency limit

When selecting Digital setting 5, the functions of X1~X8 defined by F5.01~F5.08 will be disabled automatically.

When this setting mode is cancelled, the functions of X1~X8 defined by F5.01~F5.08 will be active again, please set all the terminals functions correctly.

5: Analog input

Analog input can be done through three interdependent physical channels: AI1, AI2 and AI3.

When selecting the single polarity analog signal input, if negative level signal is input, then absolute value should be chosen. No information of spinning-direction is contained in single polarity analog input signal.

When selecting double polarity analog signal input, information of spinning-direction is contained in double polarity analog signal of －10V~0V~+10V. At this time operation control function should be set: Keypad or terminals' direction control function is disabled automatically, and the spinning direction is not controlled by F0.06.

For double polarity analog signal (－10V~0V~+10V), we have the following rules:

0V~+10V, corresponding to 0~highest frequency, forward spinning;

0V~-10V, corresponding to 0~highest frequency, reverse spinning.

6: Communication (RS485 serial communication digital setting)

Through standard RS485 port of inverter, inverter's present frequency can be set.

For detail programming method, operation method and communication protocol. Refer to F9 explanation of parameter group.

These three input terminals can all be selected as main inputs. Among them, AI2 or AI3 can also be selected as auxiliary input.

AI1 and AI3 are voltage signal input channel, total seven kinds of analog signal input range can be selected.

AI2 is voltage/current signal input channel, total six kinds of signal input ranges can be selected. Voltage/current signal input can be selected through the position of CN10 on the control board. When selecting current input, CN10's Short circuit bar should be at I side, at this time the channel's input resistance is 500Ω. When selecting analog setting mode, application data can be defined in F6.00~F6.06 .

For the input/output characteristic curves of Analog input signal and frequency setting. Refer to the explanation of F6 parameter group.

Selection of three analog channel signal input range is shown in the following table.

Input channel / Input range	AI1	AI2		AI3	Remark
	Voltage signal	Voltage signal	Current signal	Voltage signal	
Input range1	0~10V	0~10V	0~20mA	0~10V	FWD action
Input range2	0~5V	0~5V	0~10mA	0~5V	FWD action
Input range 3	10~0V	10~0V	20~0mA	10~0V	REV action
Input range 4	5~0V	5~0V	10~0mA	5~0V	REV action
Input range 5	2~10V	2~10V	4~20mA	2~10V	FWD action, dead time
Input range 6	10~2V	10~2V	20~4mA	10~2V	REV action, dead time
Input range 7	-10~+10V	No definition	No definition	-10~+10V	FWD action, dead time

7: Combined input 1 (RS485 serial communication digital setting + analog setup)

Use the addition result of digital setting value and analog setting value as the inverter's present frequency.

When selecting this setting mode, you only need add these two values.

In this setting mode, when selecting analog input signal as double polarity input, take the absolute value of analog input signal, and the spinning-direction information should not be contained in the signal.

8: Combined input 2 (Analog setup+function code F0.04 digital setting)

Use the addition result of digital setting value of F0.04 and analog input signal as the inverter's present frequency.

When selecting this setting mode, you only need to add these two values.

In this setting mode, when selecting analog input signal as double polarity input, take the absolute value of analog input signal, and the spinning-direction information should not be contained.

In this setting mode, the part set by F0.04 in present frequency (that is digital setting value of preset frequency)

can be modified by the ▲ and ▼ keys on the keypad, while the digital setting cannot be revised.

In running or stopping state, if setting value stored in F0.04 should be revised, then digital setting value of frequency should also be revised.

In case of power failure (P.OFF), digital setting value of frequency is stored in F0.04 automatically.

9: digital setting of external switching frequency

Set the inverter's present frequency via external frequency signal.

External switching frequency signal must be input through X8 terminal, the range of signal amplitude is 18~24V, highest frequency input is 50kHz.

If selecting this setting mode, then function of terminal X8 defined by F5.08 is disabled and the value of F5.08 is set to 0 automatically.

When selecting this mode, F2.43 (external frequency setting) needs to be set and its setting value corresponds to the highest frequency setting value.

Note

1. If the frequency-setting mode is set to 0, 1, 2, 3, 5, 6 or 9, the frequency setting value can be adjusted by the UP/DOWN terminal. In this case, the frequency setting value in the aforesaid setting modes is the main input, the value adjusted by the UP/DOWN terminal is the auxiliary input, and the sum of the two inputs is the frequency setting value of the inverter.

Setting range of the UP/DOWN terminal : 0~highest frequency.

Only when the inverter is in operation state can the UP/DOWN terminal be used to adjust the frequency setting value.

The current value of adjustment amount done by the UP/DOWN terminal can be saved in the case of inverter stop or power failure. The frequency value adjusted by the UP/DOWN terminal can be cleared by the UP/DOWN terminal clear command input terminal.

2. In analog setting mode, if auxiliary input channel is selected, the auxiliary input, as the auxiliary adjustment frequency amount, plus the main input are the frequency setting value, which is limited by the high frequency limit and high frequency limit.

3. In analog setting mode, the auxiliary input signal is input through the selected auxiliary channel (AI2 or AI3) to generate bipolar auxiliary input adjustment amount (defined as a percentage of the highest frequency setting value), which generates corresponding auxiliary input adjustment frequency amount to adjust the main input frequency setting.

The relationship between the auxiliary input, auxiliary input adjustment amount, and auxiliary adjustment frequency amount generated by input signal of the auxiliary input channel is shown in Table 6-2.

4. In analog setting mode, the main input channel and auxiliary input channel can be set as the same analog input. In this case, the relationship between the frequency setting value and the analog input signal is relatively special, and should be determined taking into account the characteristics of the main input and auxiliary input.

5. In the following working modes, the inverter running frequency has nothing to do with the frequency setting value of the above 10 frequency setting modes:

Motor auto tuning running frequency, jog running frequency, MS speed running frequency, PLC running frequency, process PID running frequency, torque control running frequency, and backup running frequency in various abnormal conditions (refer to the FA parameter group).

6. In addition to the preceding 10 frequency setting modes, other special frequency setting modes include:

MS speed frequency settings 1~7 (refer to function codes F2.24~F2.30), running frequency settings of MS speed terminals 1, 2, 3 (refer to functions codes F5.01~F5.08), frequency settings of PLC running phases (refer to the F8 parameter group), process PID control frequency setting (refer to the F7 parameter group), abnormal backup frequency setting (refer to the FA parameter group).

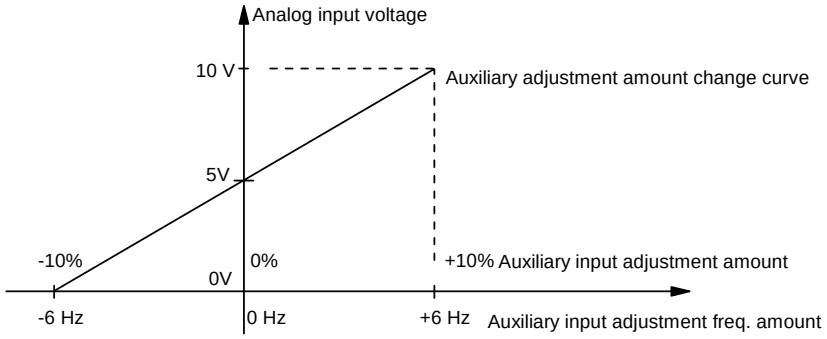
7. Keypad cable broken protection:

keypad cable broken protection is provided for keypad plugging-unplugging-plugging in inverter operation: The inverter current frequency setting or the digital setting part in the compound setting mode will be changed automatically to the setting value of F0.04. This protection is valid only for the frequency setting modes related to F0.04 (that is, protecting digital setting 1, digital setting 2, and the digital setting part of analog setting+F0.04 digital setting mode).

Table 6-2 Relationship between auxiliary input, auxiliary input adjustment amount, auxiliary input adjustment frequency amount

Auxiliary input channel input signal	Low limit value of auxiliary input channel input signal	Middle value of auxiliary input channel input signal	High limit value of auxiliary input channel input signal
Auxiliary input adjustment amount	Negative highest auxiliary input adjustment amount	Zero auxiliary input adjustment amount	Positive highest auxiliary input adjustment amount
Example: The highest frequency setting is 60 Hz, the analog signal input range setting is 0~10 V; the auxiliary input adjustment amount setting is ±10% (refer to the function codes F6.05 and F6.06); then, the voltage input signal, auxiliary input adjustment amount, and auxiliary input adjustment frequency amount input through the auxiliary input channel are respectively:			
0~10V	0V	5V	10V
0~±10%	−10%	0%	+10%
Auxiliary input adjustment frequency amount	−6 Hz	+0 Hz	+6Hz

Auxiliary input channel input signal	Low limit value of auxiliary input channel input signal	Middle value of auxiliary input channel input signal	High limit value of auxiliary input channel input signal



F0.04 Setting freq. in digital mode	Setting range: Low frequency limit~high frequency limit【50.00Hz】

F0.04 is active when the value of F0.03 is 0, 1 or 8.

Every time when the inverter is powered on, the value of F0.04 will be set as the inverter's present frequency directly, or when frequency setting mode is mode 8, the value of F0.04 will be set as the digital part of inverter's present frequency .

When the inverter is in running or stopping state, if setting value of F0.04 is revised, then the inverter's present frequency or the digital part of inverter's present frequency should be updated.

F0.04 can also be used as backup frequency in fault state (refer to FA Parameter group about relevant function codes' description).

In following condition, setting value of F0.04 will be revised automatically:

① If Low/high frequency limit is changed, setting value of F0.04 will be automatically limited in new setting range defined by the new Low/high frequency limit;

② If the frequency setting mode enables that the frequency setting can be automatically saved when power supply fails, then the inverter's present frequency can be saved in F0.04 automatically.

F0.05 Running command selection	Setting range: 0, 1, 2【0】

Select inverter's running control command, common running commands include: Start, Stop, FWD and REV.

Special running commands include JOG running and motor auto-tuning.

0: running command issued by keypad

Running command is issued by pressing the keys of RUN, STOP/RESET, JOG and FWD/REV on the Keypad.

If the LED on the top of FWD/REV key is on, that means the FWD command is enabled, if it is off, that means the REV command is disabled.

For the detail description of keypad usage, refer to *4.2 Panel And Its Operation Methods*.

1: Running command issued by External terminals

Running command is issued by external terminals such as FWD, REV, JOGF and JOGR (terminal function must be defined).

For three-wire control mode, A digital input terminal should be used and defined.

For the wiring method of External terminals Running command control mode, refer to *3.4 Wire Connection* and relevant description of F5 parameter group.

For the definitions of external terminal function, refer to relevant description of F5 parameter group.

2: Running command issued by RS485 serial communication port

Running command can be issued through internal RS485 serial communication port by host. Refer to F9 parameter group and relevant description.

Note

1. The switchover between the panel control and external terminal control, see the related description of F5 parameter group.

2. In a non-panel-control mode (F0.05=1/2), the function of the STOP key on the keypad is configurable. See the description of FA.02 function codes.

3. When the keypad LCD displays the fault code, you can press STOP/RESET key to reset the display.

4. When F0.05 is set to 1, and if you use the external control terminal to switch the control mode to panel control (see F5 parameter group, digital input terminal, function 25), the keypad can be used to conduct conventional control, but also special control such as motor auto-tuning.

5. The motor auto-tuning can be started only in the panel control mode.

F0.06 Spinning direction	Setting range: 0, 1, 2【0】

Select the relationship between inverter's actual output direction and the direction control command when the inverter is in running state.

0: The same with command direction

1: Contrary to command direction

2: REV prohibited

Note

1. When F0.06 is set to "2", in the stop state, all REV start commands are invalid;

while in the running state, the REV command received will be regarded as the stop command.

If PLC running is selected, in running process, the preset REV phase is regarded as the stop command.

2. If bipolar analog voltage setting mode is selected, function code F0.06 is invalid.

3. The running direction during the motor auto-tuning is controlled by this function code.

F0.07 highest output frequency	Setting range: MAX{50.00Hz, high frequency limit}~400.0Hz【50.00Hz】
F0.08 high frequency limit	Setting range: Low frequency limit~highest output frequency【50.00Hz】
F0.09 Low frequency limit	Setting range: 0.00 Hz~high frequency limit【0.00Hz】

The maximum output frequency is the maximum frequency which the inverter is able to output, shown in Figure 6-3 as F_{max}.

High frequency limit is the maximum frequency which the user is allowed to set, shown in Figure 6-3 as F_H.

Low frequency limit is the minimum frequency which the customer is allowed to set, shown in Figure 6-3 as F_L.

Fb in Figure 6-3 is basic running frequency, which is defined as the lowest output frequency when the inverter outputs the highest voltage in V/F control mode.

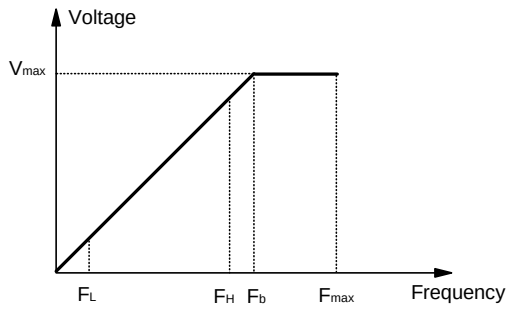


Figure 6-3 Frequency limits definition

Note

1. The parameters of highest output frequency and high/low frequency limit should be set carefully according to the motor's nameplate parameters and actual running state.

2. The frequency range defined by the high & low frequency limits does not apply to the JOG running and motor auto-tuning.

3. The inverter output frequency is also affected by, besides the high/low frequency limit, start frequency, initial frequency of DC injection braking and jump frequency.

4. The interrelation among highest output frequency, high frequency limit and low frequency limit is shown in Figure 6-3. Note their value sequence when setting them.

F0.10 Acc time1	Setting range: 0.1~3600s【20.0s】
F0.11 Dec time1	Setting range: 0.1~3600s【20.0s】

Acc time means the time during which the inverter output from zero frequency to the highest output frequency shown in Figure 6-4 as T1.

Dec time means the time during which the inverter outputs from the lowest output frequency to zero frequency shown in Figure 6-4 as T2.

There are four groups of Acc/Dec time of EV3000 series inverter, other Acc/Dec time (2, 3, 4) will be defined in F2.18~F2. 23.

Default Acc/Dec time is: Acc/Dec time 1 (F0.10, F0.11).

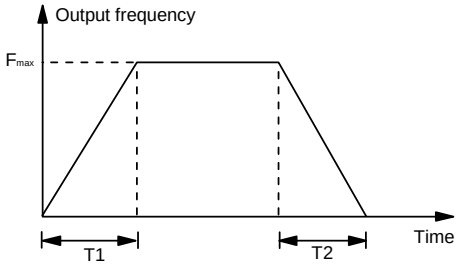


Figure 6-4 Definition of Acc/Dec time

Other Acc/Dec time must be selected through control terminals according to different groups (refer to F5 parameter group).

Simple PLC running, selection of Acc/Dec time group is setup in function code (refer to F8 parameter group).

Acc/Dec time is set according to Acc/Dec time 1 when inverter is in motor auto-tuning state.

Acc/Dec time should be defined by F2.16~F2.17 independently when inverter is in JOG running state.

Note

The Acc time includes only the normal acceleration process. The DC braking time at start and start frequency hold time are excluded.

The Dec time include only the normal deceleration process. The DC braking time is excluded.

F0.12 Parameter initialization	Setting range: 0~4【0】

0: No operation

Inverter is in normal parameter read/write state.

Whether the parameters can be revised is dependent on the setting state of the user password and inverter 's current running state.

1: Clear memory information

When you set F0.12 to 1 and confirm, inverter will clear the fault information.

For the detailed contents of relevant memorized information, refer to relevant description of Fd parameter group.

The fault information clearing operation will clear all the memorized parameters stored in the function codes between Fd.07~Fd.14 .

2: Recovery of factory setting value

Setup F0.12 to 2 and confirm, inverter will recover all the parameters between F0.00~F0.12 and F2.00~Fd.04 to the default factory setting value.

All the setting values of F1 parameter group will not be influenced when factory setting value is restored.

3: Parameter uploading

When set F0.12 to 3 and confirm, inverter will upload all the setting values of function codes between F0.00~Fd.04 to the E^2PROM in the keypad.

4: Parameter downloading

When set F0.12 to 4 and confirm, inverter will download all the setting values of function codes between F0.00~Fd.04 in the keypad to control board.

For the detail description of parameter uploading and downloading, refer to *4.2 Panel And Its Operation Methods*.

After 1~4 procedures are finished, setting value of F0.12 will restore to 0 automatically.

6.2 Motor And Its Protection Parameters

6.2.1 Motor's Rating Value And Protection

F1.00 Motor type selection	Setting range: 0【0】

0: Unsynchronized motor

F1.01 Motor rated power	Setting range: 0.4~999.9kW【inverter's rated value】
F1.02 Motor rated voltage	Setting range: 0~inverter rated voltage 【inverter's rated value】
F1.03 Motor rated current	Setting range: 0.1~999.9A【inverter's rated value】
F1.04 Motor rated frequency	Setting range: 1.00~400.0Hz【50.00Hz】
F1.05 Motor rated speed	Setting range: 1~24000rpm 【1440rpm】

Parameters of controlled motor.

Note

To ensure normal motor tuning, set the motor nameplate parameters correctly.

To ensure the control performance, the motor's power should fit the inverter power, generally within 2 grades below or 1 grade above.

F1.06 Motor overload protection mode selection	Setting range: 0, 1, 2【1】

0: Disabled

No motor overload protection (used when the motor is in short time overload working mode or when selecting external thermal relay). When selecting this mode, inverter has no over load protection to the motor.

1: Common motor (with low speed compensation)

Because the ventilation effect of common motor deteriorates in low speed running state, relevant electronic thermal protection parameters should also be adjusted; low speed compensation of motor's protection mode means when the running frequency is lower than 30Hz, motor's overload protection value will be decreased.

2: Variable frequency motor (without low speed compensation)

The variable frequency motor specially used by inverter applies forced air-cooling, the ventilation effect will not be affected by spinning speed, and the protection parameters need not be adjusted during low speed running.

F1.07 Motor overload protection factor selection	Setting range: 20.0~110.0% 【100.0%】

When the inverter drives a motor with matched capacity, the motor overload protection factor can be set to 100%, at this time if the output current is lower than 150% inverter's rated current, motor's overload protection function will be disabled; when the output current is equal to 150% inverter's rated current, motor overload protection will be disabled either, because the inverter overload protection will occur first, as shown in the following figure.

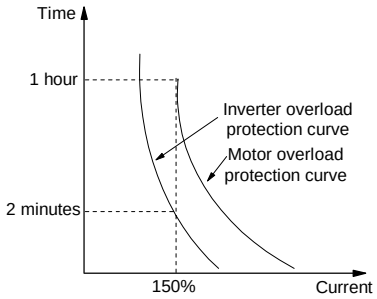


Figure 6-5 Inverter overload protection vs. motor overload protection

When the inverter's capacity is bigger than that of motor, in order to perform over load protection to motor with different specifications, please set the motor's over load protection factor, as shown in Figure 6-6.

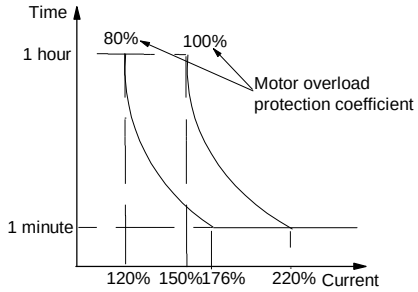


Figure 6-6 Motor overload protection factor selection

Protection factor is determined by the following formula:

$$\text{Motor overload protection factor} = \frac{\text{Motor's rated current}}{\text{Inverter's rated output current}} \times 100\%$$

Note

When the motor capacity does not match the inverter, the motor overload protection can be realized by setting F1.06~F1.07. The thermal protection value should also be set accordingly.

F1.08 Motor pre-excitation selection	Setting range: 0, 1【0】

0: Active under certain condition

Pre-excitation function when inverter starts, it is controlled by digital input terminals defined as pre-excitation, refer to F5 parameter description.

1: Permanently active

When the inverter starts, motor's pre-excitation function is activated.

Note

The pre-excitation function can better motor's startup performance.

6.2.2 Motor Tuning And Its Parameters

F1.09 Motor auto-tuning protection	Setting range: 0, 1【0】

0: Disabled: F1.10 is prohibited to be set to 1 and 2, (that means the auto-tuning is disabled).

1: Enable: F1.10 is allowed to be set to 1 and 2.

Upon power failure, the setting value of F1.09 is restored to 0 automatically.

F1.10 Motor auto-tuning process	Setting range: 0~2【0】

0: No motor auto-tuning

1: Auto-tuning

Before tuning, the parameters on the nameplate of the motor must be input correctly (F1.00~F1.05).

First set F1.10 to 1, after confirmation, then press the RUN key on the Keypad, inverter will perform auto-tuning functions.

2: Start Tuning Macro

After setting F1.10 to 2, inverter will start Tuning Macro operation (refer to *4.2.2 Panel Operation Method* for the operation method).

In Tuning Macro state, Panel's LCD display will guide the user to set the function code parameters needed by motor auto-tuning one by one automatically, then the user can starts inverter for tuning operation so as to finish the parameters' auto-tuning operation.

When the user switches on the inverter and starts tuning for the first time, selecting Tuning Macro function is recommended.

After tuning, value of F1.10 will be set to 0 automatically.

Note

1. If over-current/voltage occurs during the tuning process, you can adjust the Acc/Dec time (F0.10 and F0.11) and the torque boost (F4.01).

2. The motor must not be loaded in the tuning process.

3. Ensure the motor is still before starting tuning, or the tuning may fail.

4. The tuning operation is possible only in the panel control mode (F0.05=0)

5. It is suggested to set the fault auto-reset times (F2.37) to 0 before starting tuning, or the parameters that result from the tuning may be incorrect.

6. When it is inconvenient to conduct auto-tuning (e.g., when the motor cannot be detached from its load), or when users do not have strict requirement on motor control, the auto-tuning can be saved. Just input the motor nameplate parameters (F1.00~F1.05), and the inverter can obtain the corresponding motor parameter.

7. If auto-tuning is impossible, but accurate motor parameters are already clear, you should input the correct motor nameplate parameters first, (F1.00~F1.05), then input the known motor parameters (F1.11~F1.16). Make sure the setting is correct.

F1.11 Stator resistance	Setting range: 0.000~9.999Ω【motor value】
F1.12 Stator inductance	Setting range: 0.0~999.9mH【motor value】
F1.13 Rotor resistance	Setting range: 0.000~9.999Ω【motor value】
F1.14 Rotor inductance	Setting range: 0.0~999.9mH【motor value】
F1.15 Mutual inductance	Setting range: 0.0~999.9mH【motor value】
F1.16 Excitation current with no load	Setting range: 0.0~999.9A【motor value】

After finishing motor auto-tuning, the setting values of F1.11~F1.16 will be updated.

Every time after revising motor's parameters, the inverter will set parameters of F1.11~F1.16 as standard motor's parameters.

Specific meanings of motor parameters are described in Figure 6-7.

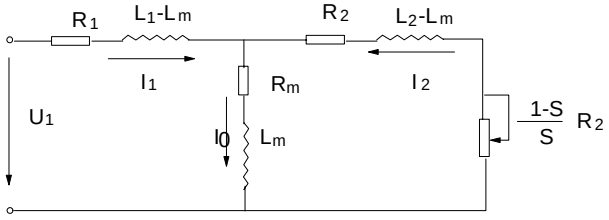


Figure 6-7 Electric circuit with asynchronous motor equivalent value under stable status

R_1, L_1. R_2, L_2, L_M, I_0 in Figure 6-7 represent respectively: stator resistance, stator inductance, rotor resistance, rotor inductance, mutual inductance and excitation current.

6.3 Auxiliary Function Parameters

F2.00 Start mode	Setting range: 0, 1, 2【0】

Start mode is valid when the inverter enters running state from stopping state, that is the inverter will start according to the selected start mode in the conditions of power recovery after first failure, reset after fault and run again after coast to stop.

0: Start from start frequency

When inverter begins running,, it starts from start frequency (F2.01) and runs for the preset. time at this frequency

2: Start on the fly (including direction judgement)

When the inverter begins running, first it detects the motor 's speed and direction, then it starts smoothly at the detected speed and direction. Smooth start without impaction should be performed on spinning motor.

When this start mode is selected, the system's inertia should be considered, and the setting value of Acc/Dec time should be increased properly.

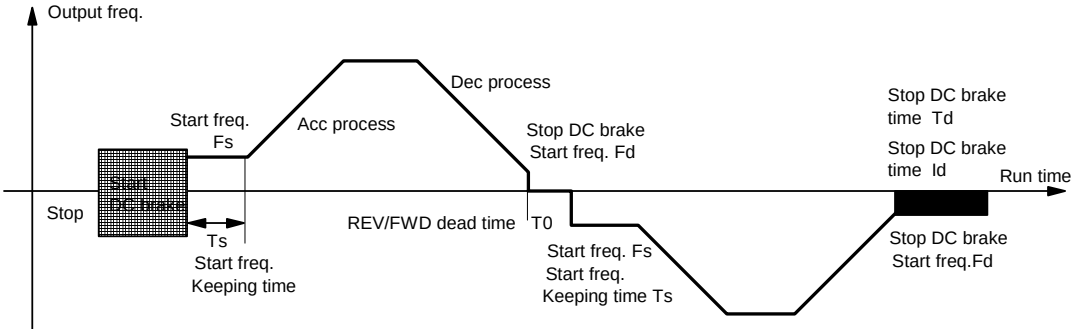


Figure 6-8 Start mode1 (FWD, REV, Stop and RUN) diagram

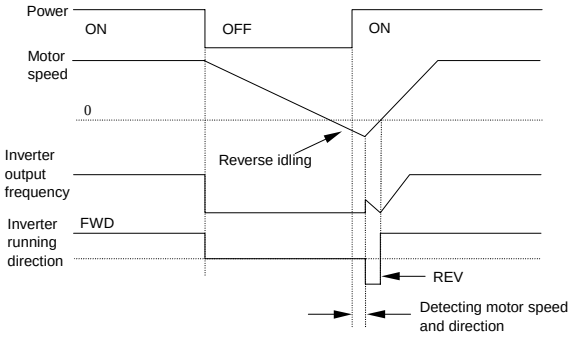


Figure 6-9 Start on the fly after power failure

Note

1. Start mode 0: Applicable when static friction torque is big, while load inertia is small, or when an external mechanical braking device is equipped, i.e., the motor shaft can keep still before the restart after a stop.

2. Start mode 1: Applicable when the rotation direction could be reversed in the inverter stop state.

3. Start mode 2: Particularly applicable upon restarts after various fault resets, or after transient power failure, etc.

4. In the FWD/REV switchover process, or when raising the set frequency, the Acc will be in start mode 0.

(F2.02)according to the setting values of F2.01 and F2.02; then it enters normal Acc mode according to preset Acc time and Acc/Dec mode parameters, at last it accelerates to preset frequency .

1: Brake first then start from start frequency

When inverter begins running, it starts DC injection braking process according to the preset DC injection braking current and time defined in F2.03 and F2.04. It starts from start frequency, and runs for the preset time at this frequency; and then enters normal Acc mode according to preset Acc time and Acc/Dec mode parameters, and at last accelerates to preset frequency. The process is shown in Figure 6-8.

After setting the function of "start on the fly", general process of restart after power failure is shown in Figure 6-9.

F2.01 Start frequency	Setting range: 0.00~10.00Hz【1.00Hz】
F2.02 Start frequency holding time	Setting range: 0.0~10.0s【0.0s】

Start frequency: It is the initial frequency when the inverter starts from zero frequency, shown as Fs in Figure 6-10.

In the Acc and Start process, if the preset frequency is lower than the start frequency, inverter's output frequency becomes zero.

Start frequency is effective in each Acc process in FWD and REV running process.

Start frequency holding time: the running time at start frequency in Acc/Start process, shown as Ts in Figure 6-10.

Start frequency holding time is effective in each Start process and FWD/REV running switching process.

F2.03 DC injection braking current at start	Setting range: 0.0~150.0% (inverter's rated current)【0.0%】
F2.04 DC injection braking time at start	Setting range: 0.0, 0.1~30.0s【0.0s】

DC braking current at start: percentage of braking current when the inverter starts in DC injection braking process.

DC braking time at start: holding time for output DC injection braking current when the inverter is in start process.

If DC injection braking time at start is set to 0.0 second, DC injection braking function is disabled.

Note

1. When the inverter capacity does not match the motor, the current and time parameters must be calculated and set carefully.

2. For loads with high speed and big inertia, the restart after DC injection braking is not applicable. It is suggested to use the start after speed tracking mode.

F2.05 Acc/Dec mode selection	Setting range: 0, 1【0】

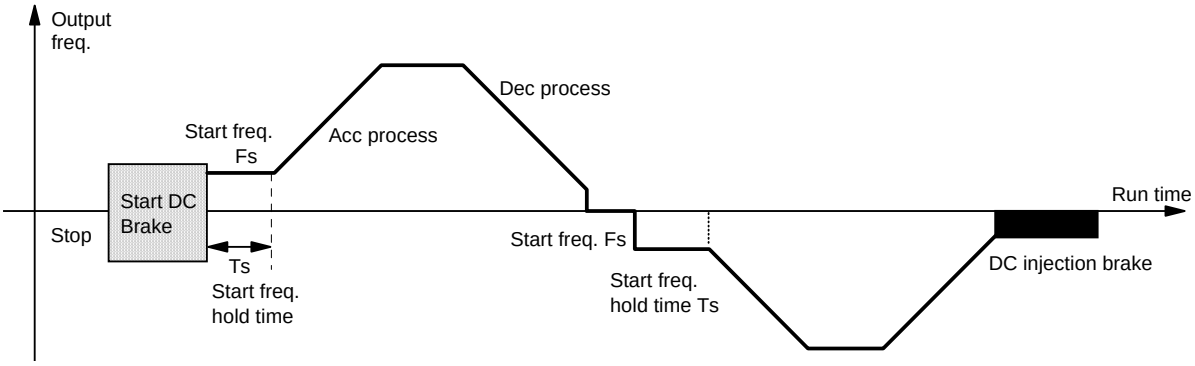


Figure 6-10 Start frequency and start frequency holding time

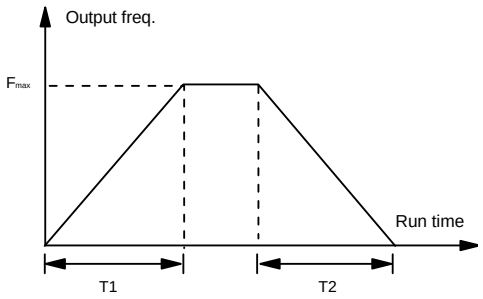


Figure 6-11 Linear Acc/Dec

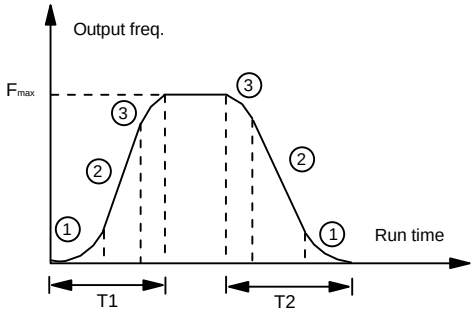


Figure 6-12 S Curve Acc/Dec

F2.06 Time of S curve's start part	Setting range: 10.0~30.0% (Acc/Dec time)【20.0%】
F2.07 Time of S curve's rising part	Setting range: 10.0~70.0% (Acc/Dec time)【60.0%】

The function codes of F2.06 and F2.07 define the Acc/Dec parameters of S curve.

Acc/Dec modes 0 and 1 are valid in Start, Stop, FWD/REV, Acc and Dec process.

0: Straight line mode

In Acc/Dec process, the relationship between output frequency and Acc/Dec time is linear. The output frequency increases or decreases at the constant slope as shown in Figure 6-11.

1: S curve mode

In Acc/Dec process, the relationship between output frequency and Acc/Dec time is nonlinear. The output frequency increases or decreases according to the S curve shown in Figure 6-12.

S curve start time is shown in Figure 6-12 as ①, which is the stage when the slope of output frequency rises gradually.

S curve rise time is shown in Figure 6-12 as ②, which is the stage when the slope of output frequency maintains Phase.

S curve end time is shown in Figure 6-12 as ③, which is the stage when the slope of output frequency decreases to zero.

The combination using of function codes F2.05~F2.07 is specially suitable for the start and stop process of conveying load.

Note

1. Limit of setting value: S curve start time+S curve rise time ⩽ 90% (Acc/Dec time).

2. In Acc/Dec Process, the parameters of S curve is set in symmetry.

F2.08 FWD/REV dead time	Setting range: 0.1~3600s【2.0s】

FWD/REV dead time: The waiting and holding time before the motor changes its spinning direction after the inverter's output frequency is decreased to zero. It is the time taken by the motor to change its spinning direction when the inverter receives REV command during its running process. The time is shown in Figure 6-13 as T0.

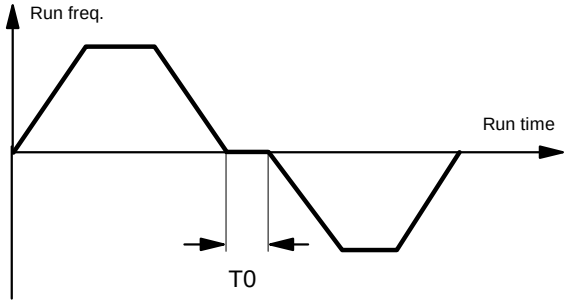


Figure 6-13 FWD/REV dead time

F2.09 Stopping mode	Setting range: 0, 1, 2【0】

0: Dec-to-stop mode 1 (DC injection braking +dynamic braking)

When the inverter receives stop command, it lowers its output frequency and decelerates to stop according to the preset Dec time and Acc/Dec mode.

In the process of Dec-to-stop, when the preset frequency is lower than the initial frequency of DC injection braking for stop (refer to F2.10), its output frequency is changed to zero; at this time, if the inverter has DC injection braking function, it will stop after DC injection braking process is finished; otherwise the inverter may stop directly.

If the user selects this stop mode, for the inverter (22kW or below) with internal braking unit, external braking resistor (optional) can be added, and the inverter can enter dynamic braking automatically when the DC bus voltage exceeds the limited value. For the inverter (30kW or above) without internal braking unit, braking unit and braking resistor (optional) should be added, which are used for dynamic braking.

This mode is used for conventional stopping and fast braking to stop (external braking unit and braking resistor should be connected).

1: Coast to stop mode (coast to stop)

After the inverter receives the stop command, it stops its output immediately; the motor will stop according to its inertia.

When selecting this mode, fast stopping can be realized through external mechanical braking.

2: Dec-to-stop mode 2 bus voltage adjustment + DC injection braking)

After the inverter receives stop command, it lowers its output frequency and decelerates to stop according to the preset Dec time and Acc/Dec mode.

In the process of Dec-to-stop, when the preset frequency is lower than the initial frequency of Stop DC injection braking (refer to F2.10), the inverter's output frequency is decreased to zero; at this time, if the user select DC injection braking function, the inverter will stop after DC injection braking process is finished; otherwise it may stop directly.

If the Dec time is set too short, the bus voltage will rise, then the inverter will activate bus-voltage adjustment function automatically, the Dec time will also be adjusted in order to avoid over voltage/current fault.

If the user selects this stopping mode, for the inverter above 30 kW, external braking device cannot be added for dynamic braking; for the inverter of 22 kW or below, which has internal braking unit, the dynamic braking is disabled even if external braking resistor is connected.

Note

1. In host control, the stop mode is not limited by this function code. Cost-to-stop mode has higher priority over Dec-to-stop mode 2, and Dec-to-stop mode 2 has higher priority over Dec-to-stop mode 1.

2. If neither F2.11 nor F2.12 is zero, the DC injection braking current will act.

3. In stopping mode 2, the inverter may adjust the Dec time automatically during Dec process.

F2.10 Initial frequency of DC injection braking	Setting range: 0.00~10.00Hz 【10.00Hz】

Initial frequency of DC injection braking: It is the frequency when the inverter's output frequency is decreased to zero along the Dec curve in Dec-to-stop process, shown in Figure 6-14 as Fd .

When the inverter is in Dec-to-stop process, if the preset frequency is lower than the initial frequency of DC injection braking, then the output frequency become zero.

Initial frequency of DC injection braking is valid in the Dec process when the inverter is switching between FWD and REV states.

If the user selects DC injection braking function, this frequency is also the initial frequency of DC injection braking in stopping process.

If the running condition has no strict requirements for braking, the initial frequency of DC injection braking should be set as low as possible.

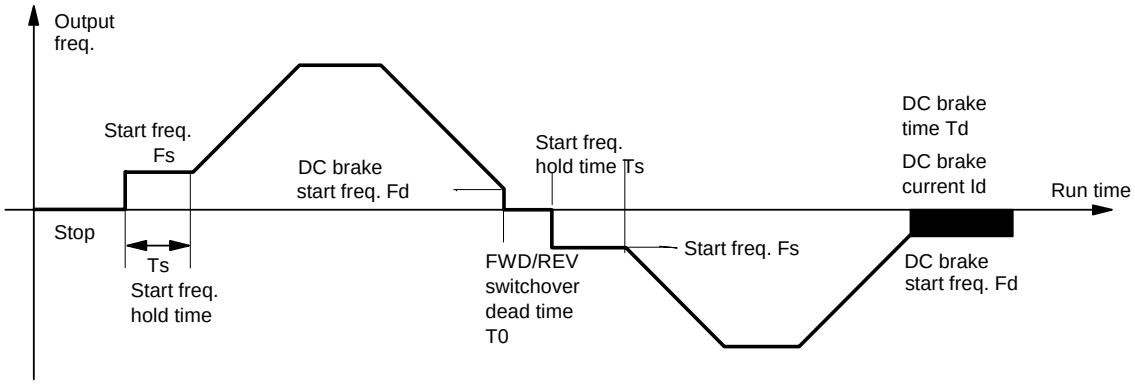


Figure 6-14 DC injection braking

F2.11 DC injection braking current	Setting range: 0.0~150.0% (inverter's rated current)【0.0%】
F2.12 DC injection braking time	Setting range: 0.0, 0.1~30.0s 【0.0s】

DC injection braking current: percentage of braking current when the inverter stops in DC injection braking mode.

DC injection braking time: the time for maintaining output DC injection braking current in inverter's stopping process.

When the DC injection braking time is set to 0.0, the DC injection braking function is disabled.

Note

1. When the inverter capacity does not match the motor, the current and time parameters must be calculated and set carefully.

2. If the external DC injection braking function is valid, the DC injection braking time parameter will be invalid.

F2.13 Restart after power failure	Setting range: 0, 1【0】

0: Disabled

In keypad control or host control mode, if power failure occurs, the running command will be cleared off automatically.

In external terminals control mode, if power failure occurs, then the combination states of terminals FWD/REV will be disabled after restart. Running command is enabled only when the running command is set again through control terminals.

1: Enable

Function of restarting after power failure is enabled when the utility power recovers.

Note

In external terminal running control mode, if the keypad STOP key is used to stop the inverter, the commands given through the external terminals will be invalid. The inverter will run only after the external run command goes through a valid-invalid-valid process.

F2.14 Delay time for restart after power failure	Setting range: 0.0~5.0 s 【0.5s】

When the power recovers from failures, the time before the inverter restarts is the delay time.

This time is set according to the time needed by other equipment to recover when the utility power recovers.

F2.15 Jog frequency setting	Setting range: 0.10~10.00Hz 【2.00Hz】
F2.16 Jog Acc time setting	Setting range: 0.1~60.0s【1.0s】
F2.17 Jog Dec time setting	Setting range: 0.1~60.0s【1.0s】

F2.15~F2.17 define the Jog running parameters, as shown in Figure 6-15.

In the above figure, f_1 is Jog running frequency, t_1 is Jog Acc time, t_3 is Jog Dec time and t_2 is Jog running time.

Jog running command can be issued through panel, control terminal or host.

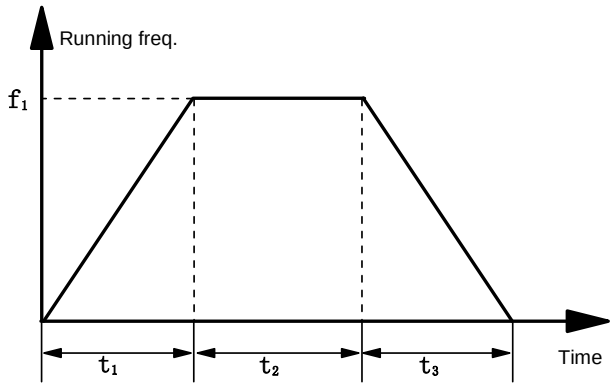


Figure 6-15 Jog running parameters

Note

1. Jog frequency is not limited by the upper/lower frequency.

2. Jog running is not limited by the start frequency, but by the DC injection braking start frequency.

F2.18 Acc time2	Setting range: 0.1~3600s【20.0s】
F2.19 Dec time2	Setting range: 0.1~3600s【20.0s】
F2.20 Acc time3	Setting range: 0.1~3600s【20.0s】
F2.21 Dec time3	Setting range: 0.1~3600s【20.0s】
F2.22 Acc time4	Setting range: 0.1~3600s【20.0s】
F2.23 Dec time4	Setting range: 0.1~3600s【20.0s】

F2.18~F2.23 define Acc/Dec time 2, 3 and 4 respectively.

Acc/Dec time 1, 2, 3 and 4 (Acc/Dec time 1 is defined in F0.10 and F0.11) can be selected through control terminals as inverter's Acc/Dec time in running process. They can also be defined as Acc/Dec time when the running frequency in each Phase is switching in PLC running process. Refer to F8 parameter group for explanations.

F2.24 Multi-frequency 1	Setting range: low frequency limit~high frequency limit【5.00Hz】
F2.25 Multi-frequency 2	Setting range: low frequency limit~high frequency limit【10.00Hz】
F2.26 Multi-frequency 3	Setting range: low frequency limit~high frequency limit【15.00Hz】
F2.27 Multi-frequency 4	Setting range: low frequency limit~high frequency limit【20.00Hz】
F2.28 Multi-frequency 5	Setting range: low frequency limit~high frequency limit【30.00Hz】
F2.29 Multi-frequency 6	Setting range: low frequency limit~high frequency limit【40.00Hz】
F2.30 Multi-frequency 7	Setting range: low frequency limit~high frequency limit【50.00Hz】

MS (multi-section) speed/frequency is set in F2.24~F2.30, which can be used in MS (multi-section) speed running and simple PLC running.

With MS (multi-section) speed running as an example, MS (multi-section) speed terminals can be set through control terminals of X1, X2 and X3 as:

When F5.01=1, F5.02=2 and F5.03=3, then MS (multi-section) speed control can be realized through external switch, as shown in Figure 6-16.

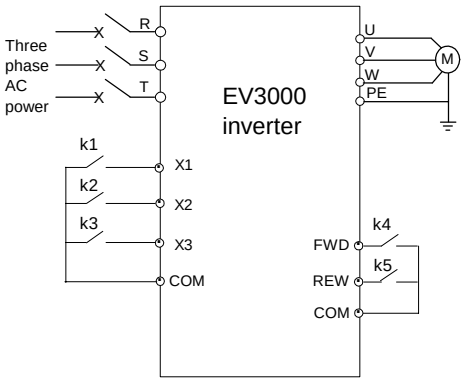


Figure 6-16 MS (multi-section) speed running

Through the combination of K1, K2 and K3, Multi-section running frequency can be selected according to Table 6-1, running process is shown in Figure 6-17.

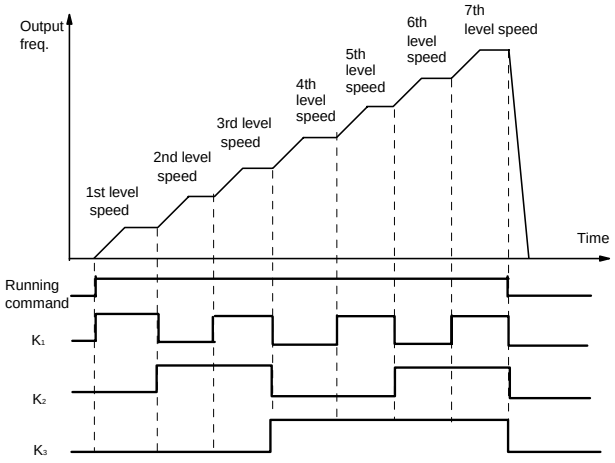


Figure 6-17 MS (multi-section) speed running

Table 6-3 MS (multi-section) speed running selection

K3	K2	K1	Frequency input
OFF	OFF	OFF	Non-multi-frequency running
OFF	OFF	ON	Multi-frequency 1
OFF	ON	OFF	Multi-frequency 2
OFF	ON	ON	Multi-frequency 3
ON	OFF	OFF	Multi-frequency 4
ON	OFF	ON	Multi-frequency 5
ON	ON	OFF	Multi-frequency 6
ON	ON	ON	Multi-frequency 7

Inverter's running, stop and running direction can be controlled by the combination of the states of switches K4 and K5.

For detailed combination, refer to the description of F5 parameter group.

F2.31 Jump frequency 1	Setting range: low frequency limit~high frequency limit【0.00Hz】
F2.32 Jump frequency 2	Setting range: low frequency limit~high frequency limit【0.00Hz】
F2.33 Jump frequency 3	Setting range: low frequency limit~high frequency limit【0.00Hz】
F2.34 Jump frequency range	Setting range: 0~30Hz【0.00Hz】

Jump frequency is set to prevent the output frequency of inverter from meeting the mechanical resonant point of load.

In Jump frequency parameters, set the system's mechanical resonant central frequency, at most three frequency values can be setup, shown in Figure 6-18.

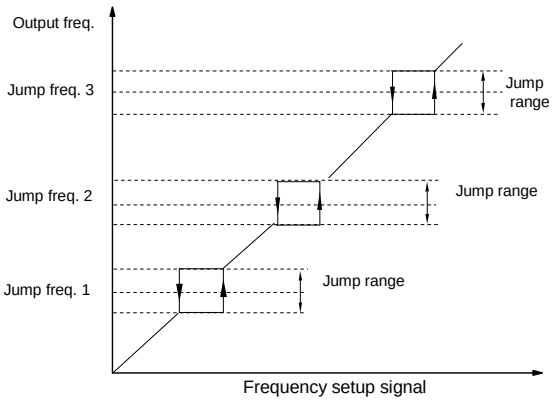


Figure 6-18 Jump frequency and its range

Among the parameters of F2.34, the frequency range of the widest resonant band can be set. After the jump frequency is set, even if the inverter's preset frequency is in the resonant frequency band of the drive system, the inverter's output frequency will be adjusted to be out of the resonant frequency band to avoid resonance.

Note

1. The three jump frequency ranges should not be overlapped.

2. In the Acc/Dec process, the inverter output frequency can cross the jump frequency range normally.

F2.35 Carrier frequency regulation	Setting range: 2.0~16.0kHz【depending on the inverter model】

Set the carrier frequency of inverter's output PWM wave:

Inverter power	Carrier frequency (factory setting)
2.2~7.5 kW	8kHz
11~22 kW	6kHz
30~220 kW	2kHz

Note

The carrier frequency decides motor operation noise. Usually you can set it to 3~5kHz. To achieve lower noise, you can set it to 6~8kHz.

The inverter power should be reduced by 5% for every 1kHz higher than the default carrier frequency.

F2.36 Fault lockfunction selection	Setting range: 0~1【0】

0: Lock prohibited

If the inverter is switched off when fault occurs, the last fault information will not be displayed after it is switched on again.

1: Lock enabled

If the inverter is switched off when fault occurs, the last fault information will be displayed after it is switched on again.

Note

1. If a fault has been reset, the inverter will not display its information after being switched on again.

2. This function is used to lock the fault automatically once the inverter is switched on after a fault tripping.

F2.37 Fault auto reset times	Setting range: 0~3【0】
F2.38 Reset interval	Setting range: 2~20s【5s】

After the inverter fails in running process, the inverter stops its output; then performs auto fault reset and continues running after the reset interval defined in F2.38.

Fault auto reset time is defined by F2.37. When the fault auto reset time is setup to 0, there is no auto-reset function, and only manual reset can be done.

Note: For the faults such as E008, E009, E010, E017, E021, E022, E023, E024, E025, E026 and E028, there is no fault auto reset function.

Note

1. Pay attention to the startup features of mechanical loads. This function cannot be used when the motor must be started with zero load, or when alarms must be raised when the inverter has no output.

2. During the reset interval, the inverter operates at zero frequency.

F2.39 Over voltage stall function selection	Setting range: 0~1【0】
F2.40 Stall over voltage point 1	Setting range: 120~150% (rated voltage peak value)【130.0%】

Over voltage stall function selection: 0: disabled; 1: enable.

In inverter's Dec process, the actual motor speed may be higher than the output synchronized speed of the inverter due to the load inertia. At this time, the motor will feed the energy back to the inverter, resulting in the voltage rise on the inverter's DC bus. If no measures being taken, tripping will occur due to over voltage.

The overvoltage stall protection function is that during the Dec running, the inverter detects the bus voltage and compare it with the stall overvoltage point defined by F39. If the bus voltage exceeds the stall overvoltage point, the inverter will stop reducing its output frequency. When the detected bus voltage is lower than the point, the Dec running will be restored as shown in Figure 6-19.

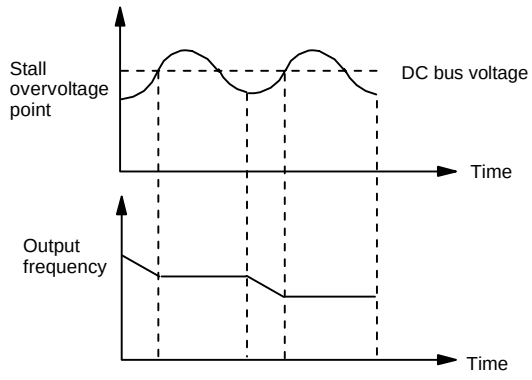


Figure 6-19 Over voltage stall function

F2.41 Stall over current point 1	Setting range: 20.0~200.0% (inverter's rated output current)【150.0%】
F2.42 Stall over current point 2	Setting range: 20.0~150.0% (inverter's rated output current)【120.0%】

During the Acc/Dec running, surge current occurs due to the mismatch of Dec time and motor inertia or the sudden change of load. Stall overcurrent protection is to detect the output current and compare it with the stall overcurrent point. When the actual current exceeds the stall overcurrent point, the inverter stops the Acc/Dec process till the current is lower than the point. Then, the inverter continues to accelerate as shown in Figure 6-20.

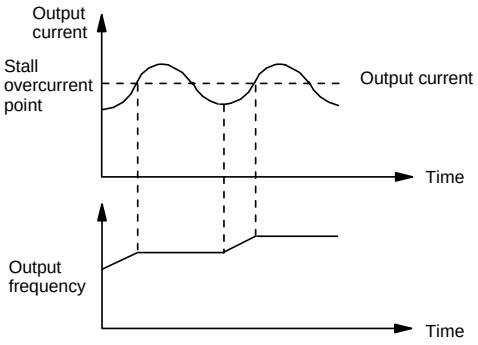
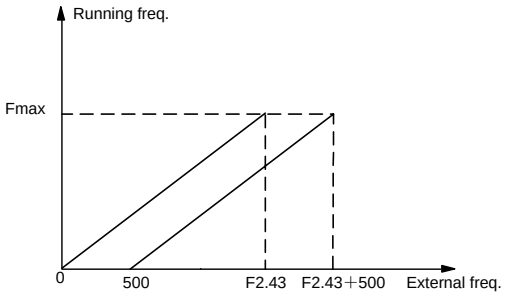


Figure 6-20 Stall overcurrent protection

F2.41 is used when the running frequency is lower than motor rated frequency, F2.42 is used when the running frequency is higher than the motor's rated frequency.

F2.43 External frequency full range setting	Setting range: 1.0k~50.0kHz【20.0kHz】

When F0.03 is set to 9, the frequency signal must be input from X8 terminal. F2.43+500Hz is defined as highest setting frequency that corresponds to the highest frequency input from terminal X8.



F2.44 Drop control	Setting range: 0.00~9.99Hz【0.00Hz】

When several motors drive one same load, each motor's load is different because of the difference of motor's rated speed. The load of different motors can be balanced through drop control function. This function can adjust the speed drop of the motors that drive the same load.

In EV3000 series inverters, the preset speed-drop corresponds to the frequency drop when the motor outputs rated torque. The calculation formula is shown below:

F2.44 =△N/synchronize speed×motor rated frequency

In the formula, △N is the difference between synchronous speed and motor's actual speed when motor drives rated load.

That is, △N= synchronize speed- actual speed.

6.4 Vector Control Function

F3.00 SR proportional gain 2	Setting range: 0.000~6.000【1.000】
F3.01 SR integration time 1	Setting range: 0, 0.032~32.00s【1.000】
F3.02 SR proportional gain 2	Setting range: 0.000~6.000【2.000】
F3.03 SR integration time 2	Setting range: 0, 0.032~32.00s【0.500】
F3.04 SR switching frequency	Setting range: 0.000~400.0Hz【5.00】

F3.00~F3.12 are only valid for vector control mode, and invalid for V/F control.

Through F3.00~F3.04, you can set the proportional gain P and integration time I of speed regulator, so as to change the speed response characteristic.

1. Speed regulator's (SR's) structure is shown in Figure 6-21. In the figure, KP is proportional gain P, KI is integration time I.

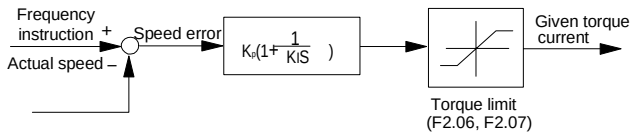
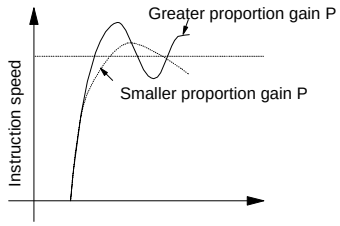


Figure 6-21 Simplified block diagram of ASR

When the integration time is set to 0 (F3.01=0, F3.03=0), integration function will be disabled, the speed loop will be a pure proportion regulator.

2. Adjustment of proportion gain P and integration time I.



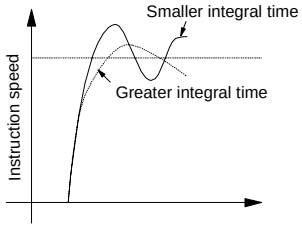


Figure 6-22 Jump response of ASR vs. P and I parameters

The system dynamic response can be faster if the proportion gain P is increased. However, if P is too large, the system tends to oscillate.

The system dynamic response can be faster if the integration time I is decreased. However, if I is too small, the system becomes over adjusted and tends to oscillate.

Proportion gain P is usually adjusted first. Under the condition that the system is immune from oscillation, P can be increased as big as possible. Then adjust integration time I so that the system responds fast and will not be over adjusted. Figure 6-8 gives a speed jump response curve with optimized P and I (This curve can be monitored through analog terminals AO1 and AO2. See sections related to F6 parameter group).

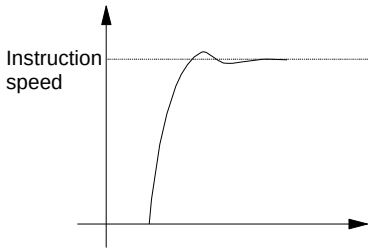


Figure 6-23 Speed jump response curve

3. PI parameters' adjustment in high/low speed running process

If the system has fast speed response requirements for high/low speed running with load, the user can set ASR switching frequency (F3.04). Generally when drive system is in low frequency running state, the user can increase proportional gain P and decrease integration time I to improve dynamic response characteristic. Adjust the parameters of speed regulator according to the following procedures:

Select proper switching frequency F3.04.

Adjust proportional gain F3.00 and integration time F3.01 in high speed running state, good dynamic response characteristic must be ensured without oscillation.

Adjust the proportional gain F3.02 and integration time F3.03 in low speed running state, good dynamic response characteristic must be ensured without oscillation.

Note

If parameters P&I are not properly adjusted, Dec overvoltage may occur when an inverter without external brake resistor or brake unit reaches high speed rapidly. That is due to the energy feedback during Dec after the speed overadjustment. This can also be avoided by adjusting the PI parameter.

F3.05 Slip compensation gain	Setting range: 0 (reserved), 50.0~250.0% 【100.0%】

Slip compensation gain is used to calculate slip frequency. Setting value of 100% represents that the rated torque current corresponds to the rated slip frequency. The static slip of the speed can be compensated by decreasing or increasing the slip compensation gain.

Note

1. This function is valid in the open loop vector running mode.

2. Set the slip compensation gain to 100% for the close loop running mode. Generally there is no need to adjust it.

F3.06 Torque control	Setting range: 0, 1【0】

0: Enabled under certain condition

When the control mode is close loop vector (F0.02=1) control, the user can select torque control or speed control through control terminal. Refer to the description of F5.01~F5.08 function codes.

1: Disabled

When the control mode is close loop vector (F0.02=1) control, the user can select torque control mode. The control diagram is shown below.

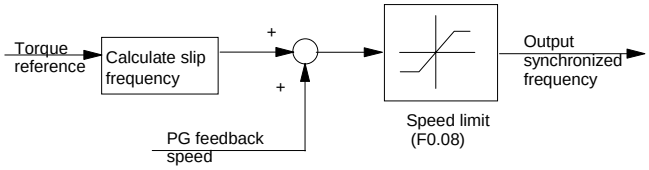


Figure 6-24 Torque control diagram

In torque control mode, speed regulator (ASR) and F3.00~F3.04 function codes are disabled.

In torque control mode, the speed cannot be controlled. When the reference torque is higher than load torque, motor's speed rises. Please set high frequency limit (F0.08) according to the actual condition

Set the torque reference value in torque control mode (refer to parameters of F3.09).

Note

1. The torque control is valid only in the close loop vector control mode.

2. During the torque control, when the inverter receives the stop command, it will switch to the close loop vector control automatically before stopping.

3. The control terminals X1 to X8 can be used to switch between speed control and torque control only when F3.06 is 0 and the inverter is in close loop vector control mode with PID, PLC, MS speed function disabled.

F3.07 Motor torque limit	Setting range: 0.0~200% (inverter's rated current)【150.0%】
F3.08 Braking torque limit	Setting range: 0.0~200% (inverter's rated current)【150.0%】

Torque limit is used to limit the torque current output by speed regulator.

Torque limit value 0.0~200% is the inverter's rated current percentage: If the torque limit value is 100%, then the torque current limit is the inverter's rated current. F3.07 and

F3.08 can limit the output torque in dynamoelectric and braking state respectively.

Block diagram of torque limiting is shown in Figure 6-25.

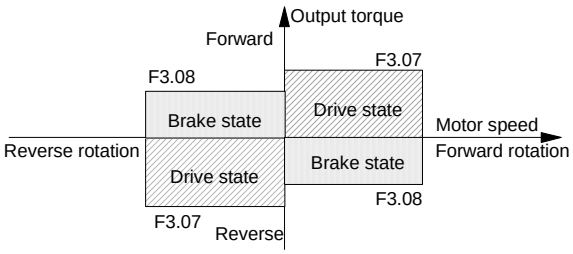


Figure 6-25 Block diagram for torque limiting principle

Note

1. In the regenerative braking state, the braking toque limit (F3.08) should be adjusted properly. When large braking torque is required, an external brake resistor or brake unit should be used, or overvoltage fault may occur.

2. The inverters of 15kW and below have built-in brake units. You only need to mount an external brake resistor.

Inverters of 18.5kW and above need both external brake unit and external brake resistor.

F3.09 Torque control selection	Setting range: 0~3【0】

Physics channel used to set the torque reference value is selected by this function code in torque control mode.

0: Reference torque value is input through analog terminals of AI2. The high frequency limit is defined by F0.08.

Highest voltage/current input through AI2 corresponds to 200% rated reference torque value, AI2 can only set positive reference torque value.

Short circuit bar of CN10 on the control board is at I side if current mode is selected. The short circuit bar is at V side if voltage input mode is selected.

1: Reference torque value is input through analog terminals of AI3. The high frequency limit is defined by F0.08.

Highest voltage input by AI3 corresponds to 200% rated reference torque value. If the input voltage range is -10V~+10V, then the negative voltage input corresponds to preset negative torque.

2: Reference torque value is input through analog terminals of AI2. The high frequency limit is defined by AI1.

Highest voltage/current input through AI2 corresponds to 200% rated reference torque value, AI2 can only set positive reference torque value.

Short circuit bar of CN10 on the control board is at I side if current mode is selected. The short circuit bar is at V side if voltage input mode is selected.

3: Reference torque value is input through analog terminals of AI3. The high frequency limit is defined by AI1.

Highest voltage input by AI3 corresponds to 200% rated reference torque value. If the input voltage range is -10V~+10V, then the negative voltage input corresponds to preset negative torque.

Note

Output torque's direction is determined by the negative or positive of torque, and has nothing to do with the running command's direction (FWD/REV and function code F0.06).

F3.10 Delay time for speed/torque switching control	Setting range: 0.01~1.00s【0.04】

Delay time for speed/torque shift control can be set by control terminal.

When the control terminals are defined as speed/torque switching control function, perform ON→OFF or OFF→ON operation on the terminals, and the speed/torque switching control function is enabled after the delay time is set up.

Note

1. If you need to use terminals X1~X8 to control speed/torque switching, set any one of F5.01~F5.08 to 32, and set F3.06 to 0.

2. The speed control in PLC, PID, MS speed running cannot be switched to torque control.

3. In the torque control mode, when the inverter receives a stop command, it will switch to close loop vector speed control automatically before stopping.

F3.11 Zero servo function selection	Setting range: 0, 1, 2【0】

0: Disabled

The motor is in speed control mode when the speed is zero, and zero servo function is now disabled.

1: Enabled

If the frequency is zero, and the motor's speed is lower than the zero servo threshold (internal setting is 0.3Hz), then the zero servo function is enabled, but DC injection braking function is prior to zero servo function.

2: Zero servo function enabled under certain condition

When the control terminal is closed (one of X1~X8, select function as 33), zero servo function is enabled.

Zero servo function diagram is shown in Figure 6-26.

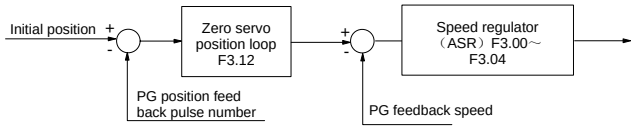


Figure 6-26 Zero servo function diagram

When the zero servo function is enabled, if the preset frequency is zero and the motor's speed is lower than the zero servo threshold, then the position control loop begins to operate. At this time, the motor's position is memorized. After applying the load or remove the load of the motor, the motor will be at the memorized position.

Position control accuracy and dynamic response of zero servo can be regulated through the proportional gain (F3.12) of position loop.

Zero servo function can only be used in close loop vector control mode, and disabled for open loop vector and V/F control mode.

F3.12 Proportional gain of zero servo position loop	Setting range: 0.000~6.000 【2.000】

First adjust the parameters of speed regulator(ASR), then adjust the proportional gain of position loop.

6.5 V/F Control Function

F4.00 V/F Curve control mode	Setting range: 0, 1, 2【0】

0: Linear voltage/frequency mode (constant torque load), as curve 0 in Figure 6-27.

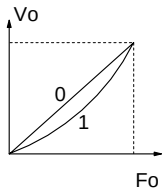


Figure 6-27 V/F curve

1: Square voltage/frequency mode (square torque load), as curve 1 in Figure 6-27.

2:V/F defined by user

The preset frequency is the same with the normal frequency setting, output voltage can be selected in F6.05 and set by the analog input of AI2/AI3.,

At this time, auxiliary reference-input-channel is disabled.

Note

For common loads, choose 0; for the square torque loads like fan and pump, choose 1.

F4.01 Torque boost	Setting range: 0~30% (inverter's rated voltage)【3.0%】

In order to compensate the low frequency torque, boost the output voltage in the low frequency zone as Vb shown in Figure 6-28.

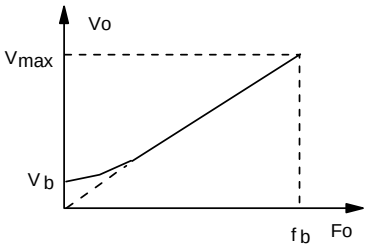


Figure 6-28 Manual torque boost

Note

Generally, use the default value: 3%. If overcurrent occurs at the startup, raise this parameter slowly from 0 until the fault is cleared. Note that this parameter, when adjusted too large, may damage the equipment.

F4.02 Auto torque compensation	Setting range: 0.0 (no action), 0.1~30.0% (inverter's rated voltage)【0.0%】

Auto torque compensation is realized by increasing the output voltage automatically through detecting the load current, the increasing range is defined by F4.02.

As shown in Figure 6-29, the area surrounded by dashed lines is the auto torque boost range.

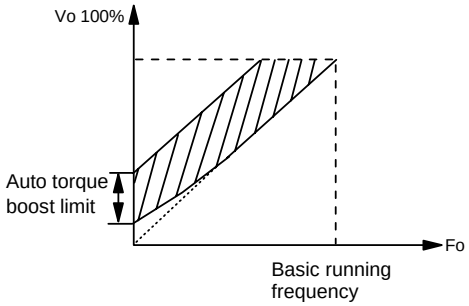


Figure 6-29 Auto torque boost compensation

Note

The value of auto torque compensation should be determined by the voltage decrease at the motor stator. Random increase of this parameter is harmful.

F4.03 Positive slip compensation	Setting range: 0.00~10.00Hz 【0.00Hz】
F4.04 Negative slip compensation limit	Setting range: 0.00~10.00Hz 【0.00Hz】

In V/F control mode, motor's speed will be decreased with load rising. In order to ensure the motor's speed be close to synchronous speed in rated load condition, slip compensation can be done according to the preset frequency.

Positive slip compensation is used when the inverter is in dynamoelectric running state, negative slip compensation is used when the inverter is in braking running state shown in Figure 6-30.

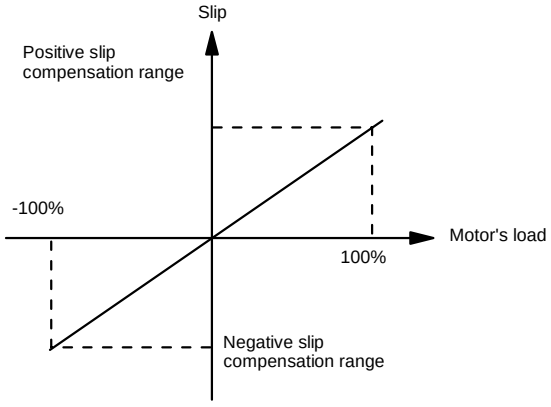


Figure 6-30 Auto slip compensation

Note

The motor rated slip determines the value of auto slip compensation. Random increase of this parameter is harmful.

F4.05 AVR function	Setting range: 0, 1【0】

0: Disabled

1: Enabled

AVR is auto voltage regulation. When the inverter's input voltage differs with the rated input voltage, the inverter's output voltage can be stabilized by adjusting the width of PWM wave.

This function is disabled when the output voltage is higher than input voltage.

6.6 Digital Value Input/Output Terminals' Function

F5.00 FWD/REV running mode	Setting range: 0~2【0】

0: Two-line control mode 1

K1	K2	Run command
0	0	Stop
1	0	FWD
0	1	REV
1	1	Stop

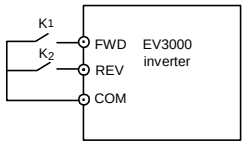


Figure 6-31 Two-line control mode 1

1: Two-line control mode 2

Run control K1	Direction control K2	Run command
0	0	Stop
0	1	Stop
1	0	FWD
1	1	REV

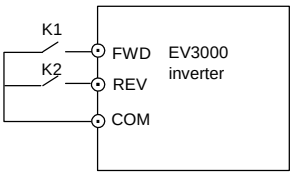


Figure 6-32 Two-line control mode 2

2: Three-line control mode

K	Direction selection
0	FWD
1	REV

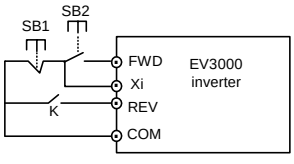


Figure 6-33 Three-line control mode

In Figure 6-33, SB1 is a normally closed button for stopping the motor, SB2 is a normally open button for running the motor. SB1 and SB2 are active at pulse edge.

K is a button for selecting running direction; Xi is defined as 3-line running control (16) terminals of X1~X8.

Note

1. In the external terminal running control mode, the STOP key on keypad can be defined as the emergency stop key.

2. In external terminal running control mode, if the keypad STOP key is used to stop the inverter, the commands given through the external terminals will be invalid. The inverter will run only after the external run command goes through a valid-invalid-valid process.

3. See the description of F2.13 Reset after power failure.

F5.01 Selecting the function of control terminal X1	Setting range: 0~33【0】
F5.02 Selecting the function of control terminal X2	Setting range: 0~33【0】
F5.03 Selecting the function of control terminal X3	Setting range: 0~33【0】
F5.04 Selecting the function of control terminal X4	Setting range: 0~33【0】
F5.05 Selecting the function of control terminal X5	Setting range: 0~33【0】
F5.06 Selecting the function of control terminal X6	Setting range: 0~33【0】
F5.07 Selecting the function of control terminal X7	Setting range: 0~33【0】
F5.08 Selecting the function of control terminal X8	Setting range: 0~33【0】

Control terminals X1~X8 are programmable digital input terminals. X1~X8 can be defined by setting the values of F5.01~F5.08, and for the settings of F5.01~F5.08, refer to Table 6-4. All the default values of F5.01~F5.08 are 0.

For example: Set F5.02 to 29, then the function of terminal X2 is defined as "simple PLC Pause Command". In simple PLC running process, if terminal X2 is ON, PLC running pause function can be realized.

Note

Terminal X8 is different with other terminals, that is, when F0.03=9, it can be set as digital setting input terminal for external switching frequency. At this time function of terminal X8 defined in F5.08 is disabled, and the setting value of F5.08 will be cleared automatically(No function). When set F0.03≠9 again, F5.08 must be set again if terminal X8 is used.

Programmable digital input terminal can be selected as "no function" repeatedly(that is, it can be set as 0 at the same time). In Table 6-4 function description is shown below:

1~3:MS (multi-section) speed running terminal

When the user select MS (multi-section) speed running, three digital terminals should be defined as MS running control terminal. With the ON/OFF state combination of these terminals, the user can select a multi-section frequency defined in F2.24~F2.30 as the inverter's present frequency. Refer to the description of F2.24~F2.30.

Table 6-4 Multifunction input selection

Content	Function	Content	Function	Content	Function
0	No function (can be selected repeatedly)	12	Frequency increase command (UP)	24	Mutual switch between AI1 and AI2
1	MS (multi-section) speed terminal 1	13	Frequency decrease command (DOWN)	25	Switch between panel control mode and external terminal control mode
2	MS (multi-section) speed terminal 2	14	UP/DOWN clear command	26	Reserved
3	MS (multi-section) speed terminal 3	15	Acc/Dec disabled command	27	RS485/PROFIBUS communication control enabled
4	Terminal for selecting Multi-Acc/Dec time 1	16	Three-line control (combined with FWD/REV)	28	Simple PLC running command enable (OFF: enable; ON: inhibit)
5	Terminal for selecting Multi-Acc/Dec time 2	17	Normally open contacts for inputting external interrupt command (stop without alarm, recoverable)	29	Simple PLC-operation pause command
6	Normally open terminal for inputting external fault	18	Normally close contacts for inputting external interrupt command (stop without alarm, recoverable)	30	Reserved
7	Normally closed terminal for inputting external fault	19	Pre-excitation	31	Reserved
8	Terminal for inputting external reset signal (RESET)	20	DC braking command	32	Switching between speed control and torque control
9	External FWD Jog running control signal (JOGF)	21	Reserved	33	Zero server signal
10	External REV Jog running control signal (JOGR)	22	Counter reset signal		
11	Terminal for inputting coast-to-stop signal (FRS)	23	Counter trig signal		

4~5: Terminal for selecting multi-Acc/Dec time

Through the ON/OFF state combination of Multi-Acc/Dec time terminals, the Acc/Dec time 1~4 can be selected (refer to the description of F0.10, F0.11, F2.18~F2.23). If the user has not defined this function, then the inverter will select Acc/Dec time 1 automatically except simple PLC running. Multi-Acc/Dec time terminal's state combination is shown in Table 6-5.

Table 6-5 Acc/Dec time selection

Terminal 1	Terminal 2	Acc or Dec time selection
OFF	OFF	Acc time1/Dec time1
ON	OFF	Acc time2/Dec time2
OFF	ON	Acc time3/Dec time3
ON	ON	Acc time4/Dec time4

6~7: Normally open/closed terminals for inputting external fault

External fault signal can be input through these terminals that are used by the inverter to monitor external equipments. After the inverter receives external equipment fault signal in running process, fault stop command should be executed and fault code of E015 will be displayed; but this fault signal is inactive when the inverter is executing stop order in normal condition. Normally open or closed input modes of external fault signal can be selected. As shown in Figure 6-34, define X5 as normally open input mode (setup as 6), X6 as normally closed input mode (setup as 7). KM1 and KM2 are external fault relay or contactor (use auxiliary contacts).

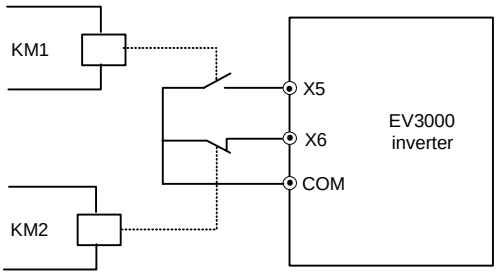


Figure 6-34 Normally open/closed terminals for inputting external equipment fault signal

8: Terminal for inputting external reset signal (RESET)

When fault alarm occurs, you can reset the inverter through this terminal whose function is valid at the rising part of pulse signal.

The function is same with that of STOP/RESET key on the Panel.

9~10: Terminal for external FWD/FWD Jog running control: JOGF/JOGR.

In terminal control mode (F0.05=1), Jog running control can be done by defining external terminals.

JOGF is Jog forward running (setup as 9), JOGR is Jog reverse running (setup as 10). Reference frequency and Acc/Dec time for Jog running are defined in F2.15~F2.17.

11: Terminal for inputting coast-to-stop signal (FRS)

When the function of this terminal is defined as ON, inverter stops output immediately and enter stopping state, the motor enters coast-to-stopping state.

12~13: Frequency increase command UP/decrease command DOWN

The running frequency can be set through external terminals, thus the running frequency can be set remotely. At this time F0.03 can be set to 2 or 3. When the terminal is ON, the frequency setting value is increased or decreased according to the speed set by FA.11. when the terminal is OFF, frequency setting value keeps constant. When these two terminals are ON at the same time, frequency setting value also keeps constant. Refer to F0.03 parameter description.

14: UP/DOWN clear command:

This terminal is used to clear the frequency set via external terminals (set the frequency by frequency increase command UP/decrease command DOWN).

When the terminal is ON, frequency setting value is cleared. This function is disabled for the frequency set by other setting modes. Refer to F0.03 parameter description.

15: Acc/Dec disabled command

When the terminal is ON, the inverter temporarily inhibits executing the Acc/Dec command and runs at current frequency; When the terminal is OFF, normal Acc/Dec commands can be executed. If there is any control signal with higher priority input such as external fault signal, the inverter will exit Acc/Dec inhibit state immediately and execute specified processing procedures.

16: Three-line running control

Note

The Acc/Dec disabling function is also effective in the normal Acc/Dec process. If it is necessary to stop the inverter when the Acc/Dec is disabled, press the STOP key on keypad twice to realize the emergency stop.

16: Three-line running control

In terminals control mode (F0.05=1), this function is used to define the terminals that input FWD/REV running command when three-line running control mode is selected. Refer to F5.00 for the introduction of three-line running control mode.

17~18: Normally Open/Closed contacts for inputting external interrupt signal

When the inverter is in running process, after external interrupt signal is received, the inverter will decrease its output frequency to zero according to the Acc/Dec mode and continues running at zero frequency; Once the external interrupt signal disappears, the inverter will continues to run at the frequency before interruption according to the preset Acc/Dec mode.

Two kinds of input modes for external interruption: Terminal 17 uses normally open input mode, and terminal 18 uses normally closed input mode.

Note

The fault signal input will cause the inverter to raise alarm and stop, while the input interrupt is different.

19: Pre-excitation order

Used in conjunction with F1.08. Motor's pre-excitation function in inverter's start process can be selected by terminals.

When this terminal is ON, inverter's pre-excitation function should be selected.

When this terminal is OFF, pre-excitation function can be selected by F1.08.

Control logic is shown in Table 6-6. Refer to description of F1.08.

Table 6-6 Pre-excitation function selection

F1.08	Terminal state	Inverter's Pre-excitation
0	ON	Select inverter's pre-excitation function
0	OFF	No pre-excitation function in inverter Start
1	ON	Select inverter's pre-excitation function
1	OFF	Select inverter's pre-excitation function

20: DC injection braking command

When the inverter is in Dec-to-stop process, and the running frequency is lower than initial frequency of DC injection braking defined in F2.10, this function is enabled. When the terminal is ON, DC injection braking is performed. DC injection braking is ended only when the terminal is OFF.

When this function is used, parameters about DC injection braking time are invalid. Refer to parameters' description of F2.10~F2.12.

21: Reserved

22: Counter's clear signal

This terminal is used to input the signal to clear the inverter's internal counter, and is used in conjunction with Function 23 "Counter trig signal".

When the terminal is ON , internal counter is cleared.

23: Counter trig signal

Terminal 23 is the input terminal of inverter's internal counter. If the input signal of the terminal changes from ON to OFF , the counting value is increased by 1.

Highest input frequency: 10Hz .

24: Alternative switch between AI1 input and AI2 input

Analog setting can be selected by this function in inverter's frequency setting mode (F0.03=5). When main reference-input-channel is selected as AI1 or AI2 (F6.04), this function is used for selecting main reference-input-channels.

When this terminal is OFF, main reference-input-channel is decided by the setting value of F6.04.

When this terminal is ON, main reference-input-channel will be switched to the channel that cannot be selected by F6.04 function code.

Function code setup	Terminal is OFF	Terminal is ON
F0.03=5, F6.04=0(AI1)	AI1 is main reference-input-channel	AI2 is main reference-input-channel
F0.03=5, F6.04=1(AI2)	AI2 is main reference-input-channel	AI1 is main reference-input-channel

25: Switch between panel control mode and external terminal control mode

This function is used for selecting the physics channel that inputs inverter's running control command: Selecting between keypad and external terminal to input control commands.

Commands input via external terminals include FWD, REV, JOGF, JOGR, RUN and STOP .

Used in conjunction with ON/OFF state of this terminal and the setting value of F0.05.

The control logic is shown in Table 6-7.

Table 6-7 Switch between panel control mode and external terminal control mode

F0.05	Terminal state	Inverter's control command source
0	ON	Inverter is controlled by external terminals
0	OFF	Inverter is controlled by Keypad
1	ON	Inverter is controlled by Keypad
1	OFF	Inverter is controlled by external terminals

Note

1. The control mode can be changed in inverter running process. However, note the way the inverter running state changes after the switchover.

2. When this terminal on an inverter running in panel control state is closed (ON), whether the inverter will keep running depends on whether the external control terminal running command is already valid. If valid (e.g., the FWD terminal is ON in the 2-line control mode), the inverter will keep running; otherwise, it will stop.

26: Reserved

27: RS485/PROFIBUS communication enabled

This function can select one control mode among keypad control/external terminal control and host control modes.

When the terminal is OFF, inverter can select keypad/external terminals /host control according to setting value of F0.05.

When the terminal is ON, if F0.05=0 or 1, the inverter is switched to host control mode.

28: Simple PLC running command enable

Whether the inverter performs simple PLC running is decided by this function.

When the terminal is OFF, PLC function is enabled; at this time if F8.00 sets PLC running enabled, then the inverter executes PLC running command.

When the terminal is ON, PLC function is disabled; even if F8.00 sets PLC running enabled, the inverter will not execute PLC running command.

Refer to description of F8.

Note

1. Only when function code F8.00 is not set to 0 (that is, PLC running is valid), the control function of this terminal is valid.

2. When the terminal is closed, the inverter switches from PLC running to common running, the frequency setting mode selected by F0.03 determines the running frequency setting. At this time, the parameter values of control mode, running command mode, running direction, Acc/Dec time are the parameters values in common running.

29: Simple PLC-operation pause command

This function is used to interrupt the PLC running. Refer to description of F8.

30: Reserved

31: Reserved

32: Speed/torque switch control when select torque control function enabled under certain condition, this function defines switching control terminals between torque control and speed control.

When this terminal is changed from OFF to ON, the inverter will be switched from speed control to torque control; When this terminal is changed from ON to OFF, the inverter is switched from torque control to speed control. Refer to description of F3 parameter group about torque control.

33: Zero servo command

When the user selects zero servo command enabled under certain condition, this function defines control terminals for inputting zero servo command.

When the terminal is ON, zero servo command is enabled; When the terminal is OFF, zero servo command is disabled.

The time sequence of zero servo is shown in Figure 6-35. Refer to description of F3 parameter group about zero servo function.

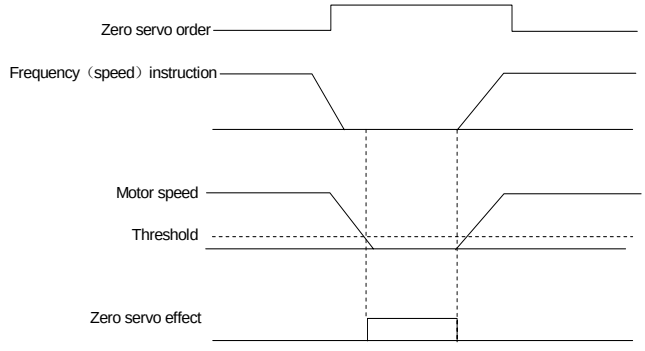


Figure 6-35 Zero servo time sequence

F5.09 Open collector output terminal Y1 function selection	Setting range: 0~13【4】
F5.10 Open collector output terminal Y2 function selection	Setting range: 0~13【5】
F5.11 Programmable relay output PA/PB/PC function selection	Setting range: 0~13【1】

Open collector output Y1&Y2 and relay output terminals are shown in Figure 6-36.

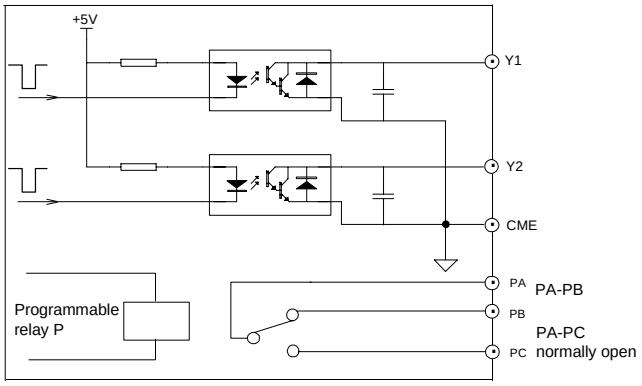


Figure 6-36 Open collector output terminals

There are two power supply modes for open collector output:(a)use inverter's internal power supply, (b)use external power supply, as shown in Figure 6-37. Refer to *3.4 Wire Connection*.

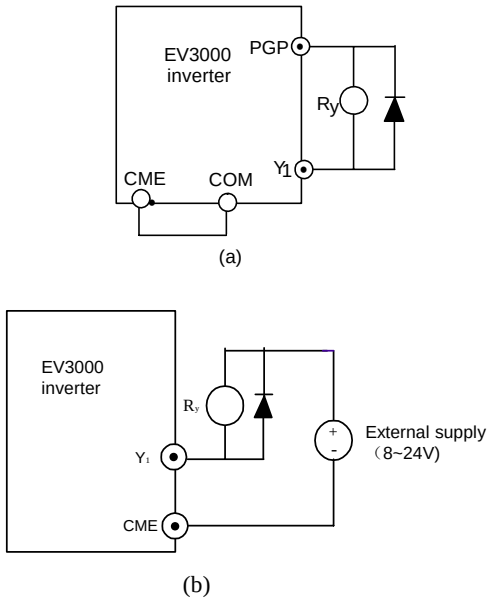


Figure 6-37 Open collector output terminal power supply

Function selection of open collector output and relay output is shown in the Table 6-8.

Table 6-8 Open collector output and relay output function

Content	Function	Content	Function
0	Inverter running preparation ready (READY)	7	Specified counter arrive signal
1	Inverter running 1 signal(RUN1)	8	Simple PLC running phase finished indication
2	Inverter running 2 signal(RUN2)	9	Low voltae lock (P.OFF)
3	Inverter zero speed running	10	Inverter over load pre-alarm
4	Frequency / speed arrive signal	11	External fault stop
5	Frequency / speed accordance signal	12	Motor over load pre-alarm
6	Counter setting arrive signal	13	Torque limit

Functions in Table 6-8 are described below:

0: Inverter running preparation ready (READY)

When the inverter is in normal waiting state, terminals output indication signal.

1: Inverter running 1 signal (RUN1)

When the inverter is in running state, terminals output indication signal.

2: Inverter running 2 signal (RUN2)

When the inverter is in DC Pre-excitation or DC injection braking process, terminals output indication signal.

3: Inverter zero speed running

When the inverter's running frequency is zero, terminals output indication signal.

For example, in the following three conditions the terminals output indication signal:

- FWD/REV dead time running period;
- The phase when the setup frequency is lower than the start frequency when the inverter starts from zero frequency;
- In Dec process output frequency is lower than initial frequency of DC injection braking.

4: Frequency / Speed arrive signal (FAR)

Refer to function description of parameters of F5.14.

5: Frequency/speed accordance signal (FDT)

Refer to function description of parameters F5.15~F5.16.

6: Setup counter arrive signal

Refer to function description of parameters F5.12~F5.13.

7: Specified counter arrive signal

Refer to function description of parameters F5.12~F5.13.

8: Simple PLC running phase finished indication

In simple PLC running process, after each phase is finished according to the setting mode. The terminal outputs pulse signal whose width is 1 second.

9: Low voltage lock (P.OFF)

When the DC bus voltage or control power supply voltage is too low, keypad's LED will display "POFF", at the same time the terminal outputs indication signal.

10: Inverter over load pre-alarm

According to F5.17 over load pre-alarm setup, when the output current is higher than the setting value, the terminal outputs indication signal.

11: External fault stop

In inverter's running process, when digital value input terminal receives external equipment fault signal, inverter reports E015 fault, at the same time the terminal outputs indication signal.

12: Motor over load pre-alarm

According to setup over load pre-alarm value defined in F5.18, if the output current is too high, the terminal outputs indication signal.

13: Torque limit

In vector control mode, if motor's torque is higher than setup torque, the terminal outputs indication signal.

For open collector output and relay's output function, repeated selection is enabled (several output terminals select one function).

F5.12 Counter setting arrive input	Setting range: 0~9999【0】
F5.13 Specified counter arrive input	Setting range: 0~F5.12【0】

F5.12 and F5.13 function codes are used to setup the values of the No. 6 and 7 functions in Table 6-8.

Setup counter arrive input: Input external pulse counter signal from Xi Digital Input terminal, inverter's internal counter counts this signal. When the counting value reaches F5.12 setting value, Yi outputs an indication signal. When the next external counting pulse signal comes, Yi 's output signal recovers, at the same time the counter starts counting again.

As shown in Figure 6-38, if you set F5.12=8, when Xi inputs the 8th pulse, Y1 outputs an indication signal; when Xi inputs 9th pulse, Y1 outputting signal recovers, the counter starts counting again.

Specified counter arrive input: When Xi inputs external counting pulse signal and the counting value reaches F5.13 setting value, Y2 outputs an indication signal, until Setup counter arrive signal Y1 recovers.

As shown in Figure 6-38, set F5.13=5, when Xi inputs the 5th pulse, then Y2 outputs an indication signal, this process continues until Y1 recovers.

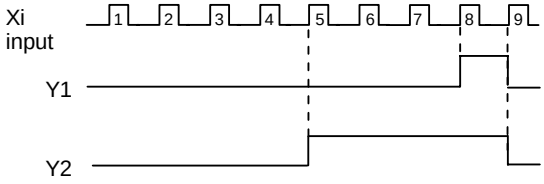


Figure 6-38 Setup counter arrive input and nominated counter arrive input

F5.14 Frequency arrive signal (FAR)	Setting range: 0.0%~20.0% (highest frequency)【5.0%】

F5.14 function code is used to setup the No. 4 function in Table 6-8.

As shown in Figure 6-39, when the inverter 's output frequency is in the negative/positive detection width of setup frequency, Yi outputs indication signal.

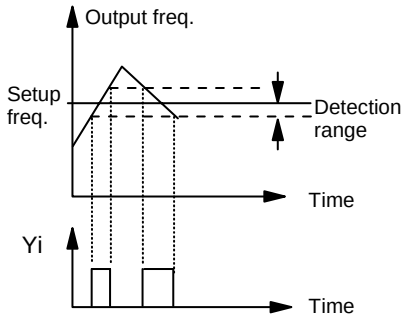


Figure 6-39 FAR and FAR detection width signal

F5.15 Frequency detected (FDT) signal level	Setting range: 0.0%~100.0% (highest frequency)【80.0%】
F5.16 FDT signal (lag)	Setting range: 0.0%~10.0% (highest frequency)【5.0%】

F5.15 and F5.16 function codes are used to setup No. 5 function in Table 6-8.

When inverter's output frequency exceeds certain value, Yi outputs indication signal, this signal is FDT level.

If the inverter's output frequency decreases, Yi will continue to outputs indication signal, until the output frequency is lowered to the FDT signal width and exceeds certain width, this width is called FDT signal lag as shown in Figure 6-40.

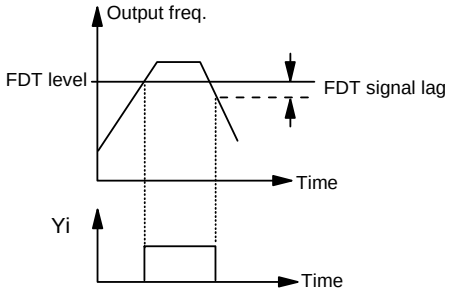


Figure 6-40 FDT detection level

F5.17 Inverter over load pre-alarm setup	Setting range: 20.0%~110.0% (inverter's rated current)【100.0%】

F5.17 function code is used to setup No. 10 function in Table 6-8. Inverter's over load pre-alarm current is indicated by the percentage of inverter's rated current. When the inverter's output current exceeds this setting value, the terminal outputs indication signal.

F5.18 Motor over load pre-alarm setup	Setting range: 100.0%~250.0% (motor's rated current)【100.0%】

F5.18 function code is used to setup No. 12 function in Table 6-8. Motor's over load pre-alarm current is indicated by the percentage of inverter's rated current, when the inverter's output current exceeds this setting value, the terminal outputs indication signal.

F5.19 Frequency output multipling factor	Setting range: 100.0, 100.1~999.9 (500Hz≤Fm=F×(F5.19)+500Hz≤10kHz) 【200.0】

This parameter defines the multiplication of inverter's output frequency and FAM terminal output pulse frequency.

100.0: Frequency output invalid

100.1~999.9: Frequency output multiplication factor

Fm=F×(F5.19)+500Hz

Fm is the output frequency of Frequency meter (that is FAM terminal), F means the inverter's Current output frequency.

Output frequency range of Frequency meter is 500Hz~10kHz. When the output of Frequency meter is lower than 500Hz, FAM terminal outputs low level; when output of Frequency meter output is higher than 10kHz, FAM terminal output frequency maintains at 10kHz.

6.7 Analog Input And Output Terminal Function

F6.00 AI1 voltage input selection	Setting range: 0~6【0】
F6.01 AI2 voltage/current input selection	Setting range: 0~5【0】
F6.02 AI3 voltage input selection	Setting range: 0~6【0】

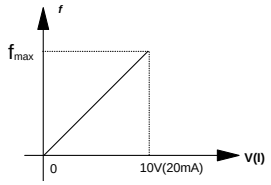
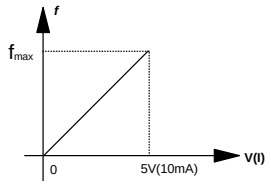
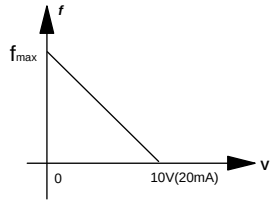
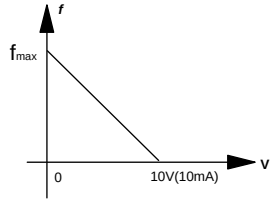
F6.00~F6.02 function codes are used for selecting Analog input signal.

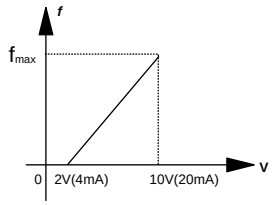
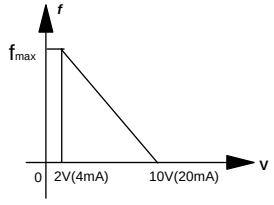
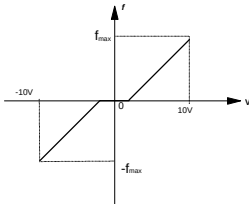
AI1 and AI3 are voltage signal input terminal, voltage signal with double polarity can be input.

AI2 is voltage/current signal Input terminal, selected by the CN10 jumper on the Control board. If current signal is input, the jumper's short circuit bar should be at I side.

When it is used as frequency reference-input-channel, Analog input signal and setup frequency's input/output features are shown in Table 6-9.

Table 6-9 Analog input signal and setup frequency input/output feature

F6.00/F6.02 setting value	F6.01 setting value	Voltage/current (AI2) input range	Setup frequency (f)range	Action mode	Relationship bet. input analog signal and setup frequency
0	0	0~10V or 0~20mA	0~Fmax	FWD action	
1	1	0~5V or 0~10mA	0~Fmax	FWD action	
2	2	10~0V or 20~0mA	0~Fmax	REV action	
3	3	5~0V or 10~0mA	0~Fmax	REV action	

F6.00/F6.02 setting value	F6.01 setting value	Voltage/current (AI2) input range	Setup frequency (f)range	Action mode	Relationship bet. input analog signal and setup frequency
4	4	2~10V or 4~20mA	0~Fmax	FWD action	
5	5	10~2V or 20~4mA	0~Fmax	REV action	
6	AI2 no definition	−10V~+10V	−Fmax~+Fmax	FWD action (setup control function automatically)	

Note

When the user selects analog input voltage range as −10V~+10V, operation control level's function can be setup automatically.

F6.03 Analog filter time	Setting range: 0.012~5.000s【0.1s】

Filter the analog signal input from AI1, AI2 and AI3 channels to eliminate the influence of interference signal.

If the filter time is setup too long, the response speed of the input signal may be lowered.

F6.04 Main reference-input-channel selection	Setting range: 0~2【0】

0: Select AI1 as main input

1: Select AI2 as main input

2: Select AI3 as main input.

Main input is the part of Analog input, its input/output characteristic is selected by (F6.00~F6.02).

F6.05 Auxiliary input channel selection	Setting range: 0~2【0】
F6.06 Auxiliary adjusting value	Setting range: 0.0%~20.0% (main input highest analog value)【0.0%】

0: No selection of auxiliary input

1: Select AI2 as auxiliary input

2: Select AI3 as auxiliary input

In Analog setting mode, auxiliary input is adjusted based on main input.

If auxiliary reference-input-channel is selected, then the Analog input will be added to main input with the form of auxiliary adjusting value to form total input; for example the frequency input in analog mode, or the analog close loop input.

The auxiliary input corresponding to auxiliary adjusting value is of double polarity, it is specified as below:

The central point of auxiliary input analog signal is correspondent to auxiliary adjusting zero value, the low limit of input range is correspondent to minus highest auxiliary adjusting value, the high limit of input range is correspondent to plus highest auxiliary adjusting value.

For example: setup AI2 as auxiliary input, select signal input range as 0~10V, F6.06 is setup as 20.0%; maximum frequency F0.07 is setup as 50.00Hz.

When AI2＝0V, auxiliary adjusting value is (−F6.06 ×F0.07) ＝ －10Hz.

When AI2＝5V, auxiliary adjusting value is 0 Hz.

When AI2＝10V, auxiliary adjusting value is (F6.06 ×F0.07) ＝10Hz.

The relationship between auxiliary adjusting value and Analog input signal is linear. Refer to F0.03 function code description.

Note

1. When F0.03 is set to 7 or 8, all analog input signals are regarded as absolute values. That is, analog input can only be added based on digital input or 485 serial communication input.

2. When selected as auxiliary input, all analog input signals are regarded as absolute values.

3. In TG close loop control of PID mode, all analog input signals are regarded as absolute values.

4. When the voltage input range of AI1 and AI3 is selected to -10V~+10V, the operation lever control function is automatically set: The direction control command is invalid automatically, the auxiliary input at this time is invalid too, and the auxiliary input

adjustment amount given by F6.06 determines the FWD/REV dead time.

5. Dead time: The input signal voltage range where the input signal is regarded as zero when operation lever control function is selected.

For example, when operation lever control function is selected, if setting F6.06 to 20.0%, then the analog input signal in the range -2V~+2V is regarded as zero, 2V~10V corresponds to 0Hz~max frequency, -2V~-10V corresponds to 0Hz~negative max frequency; that is, the dead time is -2V~+2V.

F6.07 Feedback channel selection	Setting range: 0~9【0】

Analog feedback channel is only used for PID control feedback.

The feedback channel has calculation function, the function is shown below.

F6.07 setting value	Feedback channel	Function description
0	AI2	Select AI2 as feedback value
1	AI3	Select AI3 as feedback value
2	AI2+AI3	Select (AI2+AI3)as feedback value
3	AI2-AI3	Select (AI2-AI3) as feedback value
4	AI2×AI3	Select the result of (AI2×AI3/highest Analog value) as feedback value
5	AI2/AI3	Select the result of ((AI2/AI3) ×highest Analog value) as feedback value
6	min (AI2, AI3)	Select the smaller one as feedback value
7	Max (AI2, AI3)	Select the bigger one as feedback value
8	Sqrt (AI-AI3)	Select the result of (sqrt (AI2-AI3) ×highest Analog value) as feedback value
9	Sqrt (AI2)-sqrt (AI3)	Select the result of sqrt(AI2×highest Analog value)-sqrt(AI3×highest Analog value) as feedback value

Note

1. “Sqrt” is square root calculation.

2. All the feedback signal should be converted to absolute value in PID running process. Highest analog value means the bigger one of the high limit of the AI2&AI3 analog value. The calculation result of feedback channel is limited by highest analog value.

F6.08 AO1 multi-function analog output terminal selection	Setting range: 0~10【0】
F6.09 AO2 multi-function analog output terminal selection	Setting range: 0~10【3】

AO1 and AO2 analog output terminals can output 0~20mA current signal.

Inverter's state represented by analog output signal is defined by the function codes of F6.08 and F6.09, as shown below.

F6.08/F6.09 setting value	Inverter state	Description
0	Running frequency/speed	Zero~highest running frequency, corresponding to 0~20mA analog output
1	Setup frequency /speed	Zero~highest setup frequency, corresponding to 0~20mA analog output
2	ASR speed error	The difference is: -50%~+50% highest frequency, corresponding to 0~20mA analog output
3	Output current	0~2×rated current, corresponding to 0~20mA analog output
4	Torque command current	-200%~+200% rated torque current, corresponding to 0~20mA analog output
5	Torque evaluated current	-200%~+200% rated torque current, corresponding to 0~20mA analog output
6	Output voltage	0~1.2×rated voltage, corresponding to 0~20mA analog output
7	Feedback flux current	0~100% rated flux current, corresponding to 0~20mA analog output
8	AI1 setup input	AI1 analog input range, corresponding to 0~20mA analog output
9	AI2 setup input	AI2 analog input range, corresponding to 0~20mA analog output
10	AI3 setup input	AI3 analog input range, corresponding to 0~20mA analog output

Note

Mounting a resistor of 250Ω (max. 500Ω) between AO1&GND and between AO2&GND can convert the output current signal into voltage signal, with 0~20mA corresponding to 0~5V (max. 10V).

F6.10 AO1 zero offset adjustment	Setting range: -99.9%~100.0% 【0.0%】
F6.12 AO2 zero offset adjustment	Setting range: -99.9%~100.0% 【0.0%】

This function code is used to setup zero offset adjustment of analog output current.

When the inverter's output state is single polarity, output zero offset current＝value of F6.10×20mA.

When the inverter's output state is double polarity, output zero bias current＝value of F6.10×10mA.

F6.11 AO1 gain setup	Setting range: -9.99~10.0【1.0】
F6.13 AO2 gain setup	Setting range: -9.99~10.0【1.0】

When the range of analog output signal is small, the output signal can be magnified through setting up the gain.

Note

"Total Analog Output Current" = "Gain Setup" * "Current Value Corresponding to Inverter State" + "Zero Offset Current of Output Signal"

Range of total analog output current: 0~20mA.

6.8 PID Function

1. F7.00~F7.11 function codes define the parameters of PID control function.

PID control function diagram is shown below.

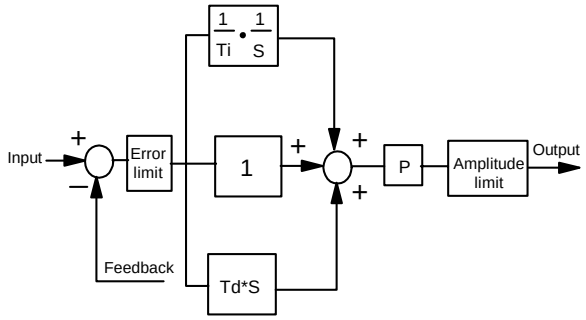


Figure 6-41 PID control function diagram

P is proportional gain, Ti is integration time, Td is differential time

Error limit (F7.09): When the PID regulation is performed, error limit is used for judging the error limit between input value and feedback value.

If the error is in error limit range, then PID regulation stops, PID output maintain constant; or PID regulation starts.

2. Use internal PID function, pressure control system formed by EV3000 inverter is shown below.

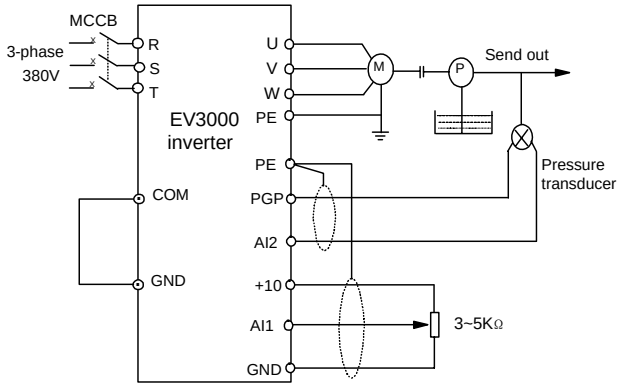


Figure 6-42 Internal PID feedback system

In the above figure, pressure input signal is setup by potentiometer; pressure feedback value is formed by the output signal of pressure transducer, input through inverter's analog signal input terminal AI2 (in the example, the signal is 0 (4)~20mA).

The above control system can be used in speed close loop control system using TG (speed measuring generator) as speed feedback device.

F7.00 Close loop control function selection	Setting range: 0, 1, 2【0】

0: no selection of close loop control function

1: Select analog Close loop control function (including the speed close loop with TG)

2: Select speed close loop with PG (V/F Control mode should be selected)

Note

When F7.00 is set to 2, F0.02 should be set to 2 (V/F control) at the same time.

F7.01 Reference selection	Setting range: 0, 1【1】

0: Digital input through keypad

If F7.00=1: decided by F7.02, if F7.00=2: decided by F7.04

1: External analog terminals' setup

F7.02 Reference digital setting	Setting range: 0.00V~10.00V【0.00】

Setup keypad digital input value.

Note

This function code is valid only when F7.00=1 (selecting analog close loop control) and F7.01=0 (selecting digital input through keypad). The keypad digital input value can not changed by using the ▲ and ▼ keys on the keypad, it can only be changed by setting the value of this function code.

F7.03 Feedback input channel selection	Setting range: 0【0】

0: Input feedback value through external analog terminal

Others: Reserved

Note

This function code is valid only when F7.00=1 (selecting analog close loop control).

F7.04 Reference of speed close loop	Setting range: 0~24000rpm【0rpm】

In V/F control mode, setup speed through Keypad with PG feedback loop.

Note

1. This function code is valid only when F7.00=2 (PG close loop control) and F7.01=0 (digital input through keypad).

2. When F7.00 is set to 2, F0.02 should be set to 2 (V/F control), or else, the inverter will report E028 error.

3. If PID close loop control function is selected, the configuration relationship between input, feedback, and control mode is as shown in the following table.

Process PID close loop control function	Input		Feedback	Control mode
	Keypad digital input F7.01=0	Analog input F7.01=1		
F7.00=1 analog close loop	F7.02 setting value	External analog terminal input	External analog terminal input	F0.02=0, 1, 2; generally set to 0 or 2
F7.00=2 PG close loop	F7.04 setting value		PG interface input	V/F control mode F0.02=2

F7.05 Proportional gain P	Setting range: 0.0~999.9%【0.0%】
F7.06 Integration time Ti	Setting range: 0.00 (no integration)~99.99s【0.00s】
F7.07 Differential time Td	Setting range: 0.00 (no differential)~99.99s【0.0s】
F7.08 Sample cycle T	Setting range: 0.00 (no selection sample)~99.99s【5.0s】

Setup parameters of PID regulator.

F7.09 Error limit	Setting range: 0.0~20.0% (corresponding to close loop input) 【0.0%】

Definition: relative error of close loop system＝｜input value-feedback value｜/ input value×100%.

If relative error of close loop system is bigger than the setting value of error limit, then the PID regulator will adjust the error.

If relative error of close loop system is in the Setting range of error limit, then stop PID regulating, PID regulator's output maintains constant.

F7.10 High limit (reserved)	Setting range: 100.0~200.0% (corresponding to close loop input value) 【150.0%】
F7.11 Low limit (reserved)	Setting range: 0.0~50.0% (corresponding to close loop input value)【0.0%】

6.9 Simple PLC Function

F8.00~F8.15 are function codes for simple PLC running.

Simple PLC running function and MS (multi section) speed running are used for realizing the inverter's variable speed running according to certain regulations. For MS (multi section) speed running, the switching of multi-frequency and the change of running direction is realized through external control terminals (such as X1, X2 and X3) and different combination of FWD and REV. For Simple PLC running function, not only one circulating Multi-frequency can be defined in function codes, but also the Multi-frequency running time, direction and circulation times can also be defined in function codes.

One cycle of PLC running diagram is shown in Figure 6-43. f1~f7 and T1~T7 in the figure are defined in the following function codes.

F8.00 PLC running mode selection	Setting range: 0, 1, 2, 3【0】

0: No action (no selection of simple PLC running mode);

1: Single circular (stop after running for one cycle);

2: Continuous circular (continuous circulation running according to setup phase parameters);

3: Maintain the final value (run at setup frequency in last phase after running for one cycle).

F8.01 Timing unit	Setting range: 0, 1【0】

0: Second(s) (Each Phase's running time is recorded by second);

1: Minute(m) (Each Phase's running time is recorded by minute).

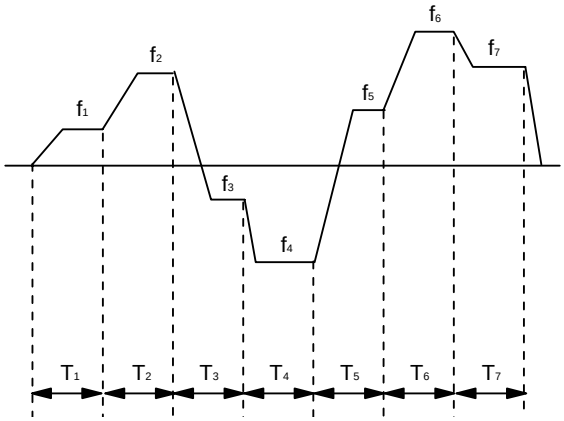


Figure 6-43 Simple PLC running

F8.02 Phase 1 running selection	Setting range: 0~7【1】

Setup frequency in No.1 Phase is defined in function code F2.24 (PLC's setup frequency is defined in F2 Parameter groups).

The parameter uses a 3-bit binary code to setup Acc/Dec time and Running command direction of No.1 phase, the binary code is defined below (use the decimal number corresponding to binary code to setup the parameters):

bit2:0—FWD, 1—REV;

bit1&bit0:

00—select Acc/Dec time 1, this time is defined in function codes F0.10&F0.11;

01—select Acc/Dec time 2, this time is defined in function codes F2.18&F2.19;

10—select Acc/Dec time 3, this time is defined in function codes F2.20&F2.21;

11—select Acc/Dec time 4, this time is defined in function codes F2.22&F2.23.

F8.03 Phase 1 running time	Setting range: 0.0~5000s/m【20.0s】

Running time of No.1 phase is defined in this function code, time unit is defined in F8.01. T2~T7 are defined in the following functions codes.

F8.04 Phase 2 running selection	Setting range: 0~7【1】
F8.05 Phase 2 running time	Setting range: 0.0~5000s/m【20.0s】
F8.06 Phase 3 running selection	Setting range: 0~7【1】
F8.07 Phase 3 running time	Setting range: 0.0~5000s/m【20.0s】
F8.08 Phase 4 running selection	Setting range: 0~7【1】
F8.09 Phase 4 running time	Setting range: 0.0~5000s/m【20.0s】
F8.10 Phase 5 running selection	Setting range: 0~7【1】
F8.11 Phase 5 running time	Setting range: 0.0~5000s/m【20.0s】
F8.12 Phase 6 running selection	Setting range: 0~7【1】
F8.13 Phase 6 running time	Setting range: 0.0~5000s/m【20.0s】
F8.14 Phase 7 running selection	Setting range: 0~7【1】
F8.15 Phase 7 running time	Setting range: 0.0~5000s/m【20.0s】

Setup frequency of No.2 phase is defined in function code F2.25, F8.04 binary setup is same with F8.02 .

Setup frequency of No.3 phase is defined in function code F2.26, F8.06 binary setup is same with F8.02.

Setup frequency of No.4 phase is defined in function code F2.27, F8.08 binary setup is same with F8.02.

Setup frequency of No.5 phase is defined in function code F2.28, F8.010 binary setup is same with F8.02.

Setup frequency of No.6 phase is defined in function code F2.29, F8.04 binary setup is same with F8.02.

Setup frequency of No.7 phase is defined in function code F2.30, F8.14 binary setup is same with F8.02.

Note

1. The PLC running start and stop commands are determined by the current running command control mode (defined by F0.05).

2. If the running time of a certain phase is set to 0, the PLC will skip this phase, thus facilitating the setting of the PLC phase number.

3. If a digital input terminal is set for simple PLC running enable function (setting value 28), the PLC running can be enabled through this terminal. When this terminal is ON, the PLC running is disabled; when this terminal is OFF, the PLC running is enabled.

4. If a digital input terminal is set for simple PLC pause function (setting value 29), this terminal can cause the PLC to pause. When this terminal is ON, the PLC pauses, the inverter runs at zero speed; when this terminal is OFF, the inverter returns to the state before PLC pause and continues to run.

5. When F0.06 is set to 2 (REV prohibited), if phase 1 running command direction is set to REV, simple PLC running is prohibited; if middle phase running command direction is set to REV, the inverter will stop.

6.10 Communication And Bus Control Function

F9.00 Baud rate selection	Setting range: 0~6【3】

Select baud rate of serial communication.

0: 1200bps 1: 2400bps 2: 4800bps

3: 9600bps 4: 19200bps 5: 38400bps

6: 125000bps

F9.01 Data format	Setting range: 0, 1, 2【0】

Data format of serial communication protocol.

0: 1 start bit, 8 digital bits, 1 stop bit, no parity (LCD display: N, 8, 1)

1: 1 start bit, 8 digital bits, 1 stop bit, even parity (LCD display: E, 8, 1)

2: 1 start bit, 8 digital bits, 1 stop bit, odd parity (LCD display: O, 8, 1)

F9.02 Local address	Setting range: 0, 1 , 2~126, 127【2】

When the host is communicating with several inverters, inverter's address is defined in this function code.

0: Reserved, setup inhibit

1: Reserved as address of main station

127: Broadcasting address, setup inhibit

F9.03 PPO mode selection	Setting range: 0~5【0】

PROFIBUS Control mode selection.

0: PROFIBUS invalid control

1~5: Corresponding to control modes of PPO1~PPO5

F9.04 PZD2 connection value	Setting range: 0~20【0】
F9.05 PZD3 connection value	Setting range: 0~20【0】
F9.06 PZD4 connection value	Setting range: 0~20【0】
F9.07 PZD5 connection value	Setting range: 0~20【0】
F9.08 PZD6 connection value	Setting range: 0~20【0】
F9.09 PZD7 connection value	Setting range: 0~20【0】
F9.10 PZD8 connection value	Setting range: 0~20【0】
F9.11 PZD9 connection value	Setting range: 0~20【0】

Select the data read out by PROFIBUS, 0~20 are corresponding to function codes FF.00~FF.20

F9.12 Communication delay	Setting range: 0~20ms【0】

F9.12 defines the response delay time in communication between the inverter and host.

6.11 Enhanced Function

FA.00 Relay acts selection in fault auto reset	Setting range: 0, 1【0】

0: In fault auto reset interval (F2.38), no action of fault relay.

1: In fault auto reset interval (F2.38), fault relay acts.

FA.01 Relay acts selection in P.OFF period	Setting range: 0, 1【0】

0: In P.OFF time, no action of the relay.

1: In P.OFF time, the relay acts.

FA.02 Function selection of STOP key	Setting range: 0~15【10】

In terminal or host control mode, function of STOP/RESET key can be set by a 4-bit binary code, if the corresponding bit is setup as 1, the function of this bit is valid. If it is setup as 0, the function defined by this bit is invalid. There are 4 kinds of function that can be setup at the same time, inverter will process according to the current working condition. Various bits of binary code are defined below.

Note

1. When the fault reset function is always enabled, the inverter will keep running after a fault reset if the Run command is not cleared.

2. When the fault reset function is enabled under certain conditions, the Run command must be cleared once before the fault reset operation can be enabled.

3. To ensure safety, when the fault reset function is always enabled, it is recommended to ensure that the Run command is OFF before you reset the inverter.

FA.03 Cooling fan control selection	Setting range: 0, 1【0】

0: Auto running mode.

When the inverter is running, the fan continues to run; when the inverter stops, if the heatsink's temperature is lower than 50°C, the fan stops running after delay for 30s, or the fan continues to run.

1: The fan runs all the time when the inverter is connected with AC power source.

FA.04 Action selection (open loop) at analog frequency/speed command missing	Setting range: 0, 1,2,3,4【0】

0: The inverter stops output, motor coasts to stop , the relay acts, E022 is displayed;

1: The inverter runs at speed setup by F0.04, the relay acts, E022 is displayed;

2: The inverter runs at speed setup by F0.08, the relay acts, E022 is displayed;

3: The inverter runs at speed setup by F0.09, the relay acts, E022 is displayed;

4: The inverter runs at speed setup by FA.09, the relay acts, E022 is displayed;

Only when FA.04=0, inverter's alarming and stopping occur at the same time when analog frequency/speed command lost;

If FA.04≠0, the inverter only alarms but will not stop, if the fault is removed, then the inverter runs at the setup frequency before fault, and the alarm picture disappears automatically.

Note

This function is valid only when the analog signal input range is selected as 4~20mA/2~10V or 20~4mA/10~2V.

FA.05 Communication overtime	Setting range: 0.0, 0.1~100.0s【0.0s】

The setting value is 0: No communication overtime protection.

The setting value is not 0, in RS485 communication control mode, if the communication between the inverter and the host is still abnormal in the time defined by FA.05, E017 fault is displayed and the inverter acts according to the setting value of FA.06.

FA.06 Communication error or action selection at communication overtime	Setting range: 0, 1, 2, 3, 4【0】

0: The inverter stops output, motor coasts to stop, the relay acts, E017 is displayed;

1: The inverter runs at speed setup by F0.04, the relay acts, E017 is displayed;

2: The inverter runs at speed setup by F0.08, the relay acts, E017 is displayed;

3: The inverter runs at speed setup by F0.09, the relay acts, E017 is displayed;

4: The inverter runs at speed setup by FA.09, the relay acts, E017 is displayed;

When FA.06=0, inverter will alarm and stop only when host communication error or communication overtime occurs; when FA.06≠0, the inverter only alarms but does not stop; if the fault is removed, then the inverter runs at the setup frequency before fault, and the alarm picture disappears automatically.

Note

This function code is valid only in host control mode.

FA.07 Action selection for PID reference missing	Setting range: 0, 1, 2, 3【0】

0: The inverter stops output, motor coasts to stop , the relay acts, E022 is displayed;

1: The inverter continues to run with 100% analog value as input, the relay acts, E022 is displayed;

2: The inverter continues to run with 50% analog value as input, the relay acts, E022 is displayed;

3: The inverter continues to run with 25% analog value as input, the relay acts, E022 is displayed.

When FA.07=0 , inverter will alarm and stop only when PID input lost;

When FA.07≠0, the inverter only alarms but does not stop, if the fault is removed, then the inverter runs at the setup frequency before fault, and the alarm picture disappears automatically.

Note

This function is valid only when the analog signal input range is selected as 4~20mA/2~10V or 20~4mA/10~2V.

FA.08 Action selection for PID feedback missing	Setting range: 0, 1, 2, 3, 4【0】

0: The inverter stops output, motor coasts to stop , the relay acts, E021 is displayed;

1: The inverter runs at speed setup by F0.04, the relay acts, E021 is displayed;

2: The inverter runs at speed setup by F0.08, the relay acts, E021 is displayed;

3: The inverter runs at speed setup by F0.09, the relay acts, E021 is displayed;

4: The inverter runs at speed setup by FA.09, the relay acts, E021 is displayed;

When FA.08=0 , the inverter will alarm and stop only when PID feedback lost;

When FA.08≠0, the inverter only alarms but does not stop, if the fault is removed, then the inverter runs at the setup frequency before fault, and the alarm picture disappears automatically.

Note

This function is valid only when the analog signal input range is selected as 4~20mA/2~10V or 20~4mA/10~2V.

FA.09 Abnormal backup frequency/speed setup	Setting range: 0.0%~100.0%【0.0%】

When abnormal condition occurs, the inverter continues to run at setup speed before abnormal condition occurs as frequency command.

Note

This function code is valid only when FA.04, FA.06 or FA.08 is set to 4.

FA.10 Braking utility rate	Setting range: 0, 1, 2, 3, 4, 5, 6, 7【7】

0: Without energy consumption brake 1: 2 % 2: 5 %

3: 10 % 4: 20 % 5: 50 %

6: 80 % 7: 100 %

FA.11 UP/DOWN speed limit setting	Setting range: 0.10~99.99Hz/ s【1.00Hz/s】

This function defines as setting up the change rate of the frequency when the frequency is setup through UP/DOWN terminals.

FA.12 Inverter input phase failure protection	Setting range: 0, 1, 2【2】

0: Input phase loss protection inhibit.

1: Input phase loss alarm: Detected time is 2s, the inverter displays E008, the relay does not act, the inverter continues running, if the input phase loss fault is removed after alarm, the alarm picture disappears automatically.

2: Input phase loss alarm protection: Detected time is 4s, the input phase is lost in this 4s, the inverter displays E008 and stops output, motor coasts to stop and the relay acts.

Note

If input phase loss alarm function is selected, in the case of input phase loss, the inverter must be derated. Generally, the load should not exceed 50% of the rated load.

FA.13 Inverter output phase failure protection	Setting range: 0, 1, 2【2】

0: Output phase loss protection inhibit.

1: Output phase loss alarm: Detected time is 30s, the inverter displays E009, the relay does not act, the inverter continues running, if the output phase loss fault is removed after alarm, the alarm picture disappears automatically.

2: Output phase loss alarm: Detected time is 60s, the output phase is lost in this 60s, the inverter displays E009 and stops output, motor coasts to stop and the relay acts.

Note

1. If the inverter output current is smaller than 33% of the inverter rated current, this function is invalid.

2. If the inverter output open circuit happens during pre-excitation process, the inverter will report E009 fault, the inverter will stops and the fault relay be activated.

3. The function that the inverter continues running after output phase loss alarm is mainly designed for asymmetric load, use this function with caution. Generally, do not use this function for a continuous long time.

FA.14 Inverter load missing protection	Setting range: 0, 1, 2【0】

0: Inverter load missing protection inhibit.

1: Inverter alarms when the load is missing, detected time is setup by FA.16, the inverter displays E026, the relay does not act, the inverter continues running, if the load loss fault is removed after alarm, the alarm picture disappears automatically.

2: The inverter load loss protection acts, detected time is setup by FA.16, if the load is lost in all the detected time,

alarm displays E026, inverter stops output, motor coasts to stop and the relay acts.

FA.15 Inverter load missing protection level	Setting range: 0.0%~100.0% 【30.0%】

The inverter load loss protection level is expressed by inverter's rated current percentage.

FA.16 Load missing protection detecting time	Setting range: 0.0~99.9 s 【1.0s】

Load loss protection detected time is defined as delayed time for protection action after load loss occurs.

6.12 PG Parameters

Fb.00 PG pulse number selection	Setting range: 0~9999【1024】

Setup according to the PG's pulse number per round (PPR).

Note

In running with speed sensor, be sure to set this parameter correctly.

Fb.01 PG direction selection	Setting range: 0, 1【0】

0: FWD 1: REV

If the direction decided by the wiring sequence of PG and the inverter's Interface board matches the direction decided by the wiring sequence of motor and the inverter, then the setting value is selected as "0" (FWD);or the value is selected as"1" (REV).

Revise this parameter, then direction decided by the wiring can be adjusted conveniently, and the user need not re-wire again.

Be careful that if the function code is setup incorrectly, the inverter will report PG REV fault E025.

Fb.02 PG cable broken action	Setting range: 0, 1【0】

0: Coast to stop

In vector control with PG running mode (or PG close loop V/F control running mode), If PG cable broken occurs, inverter alarms and displays E025, at the same time the inverter stops output, motor coasts to stop.

1: Continues running

In PG close loop V/F Control running mode, if PG cable broken fault occurs, after inverter alarms and displays E025, it switches to open loop V/F and continues running.

When the inverter alarms and continues running, this fault alarm cannot be reset; inverter maintains alarming and running state no matter whether the PG cables are connected or not, only the inverter stops can this kind of fault be reset.

Note

This function is invalid in zero servo or torque control. It is valid only for speed control mode.

Fb.03 PG cable broken detection time	Setting range: 2.0~10.0 s 【2.0s】

PG cable broken detection time can be confirmed through this function code.

Fb.04 Zero speed detection value	Setting range: 0.0~999.9rpm 【0.0rpm】

Zero speed detection value is defined for detecting PG cable broken.

When Zero speed detection value is set to zero, PG cable broken protection function is inhibited.

When the setup frequency is higher than the Zero speed detection value, while the PG feedback speed is lower than Zero speed detection value, after delay for the time defined in Fb.03, the inverter's PG cable broken protection acts.

6.13 Functions For Special Customers

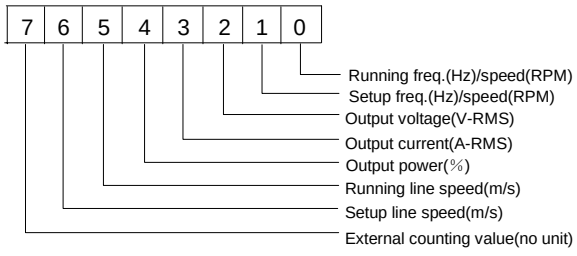
FC.00~FC.12 are functions reserved for special customers. Keypad does not display.

6.14 Display And Check Functions

Fd.00 LED running Display parameters selection 1	Setting range: 1~255

Eight kinds of inverter's basic running state parameters can be selected to be displayed through this function code. Each displayed parameter is corresponding to one bit of the 8-bit binary code: "1" means displaying this parameter, "0" means not displaying this parameter.

For example, bit0 decides whether to display running frequency: when bit0=0, this parameter will not be displayed; when bit0=1, the parameter is displayed. Each bit of Fd.00 binary code is corresponding to the following parameters.

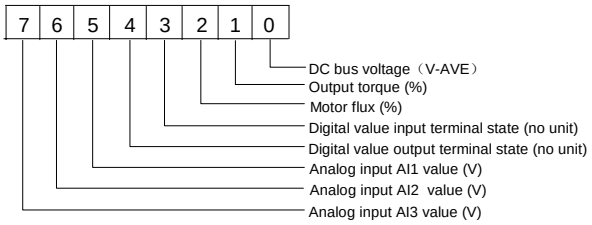


Fd.01 LED running display parameters selection 2	Setting range: 0~255【0】

Other 8 kinds of inverter's basic running state parameters can be selected to be displayed through this function code.

Each displayed parameter is corresponding to one bit of the 8-bit binary code: "1" means displaying this parameter, "0" means not displaying this parameter.

Each bit of Fd.01 binary code is corresponding to the following parameters.



Digital value Input terminal state description:

Digital value Input terminal state can be expressed by a 10-bit binary code; if the inverter detects that the corresponding terminal is closed, then this bit is set to "1", if the corresponding terminal is opened, then the bit is set to "0". The relationship between Digital value Input terminal and binary code is shown below.

Binary code	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Input terminal	REV	FWD	X8	X7	X6	X5	X4	X3	X2	X1

LED displaying value is the decimal number corresponding to the binary code.

Digital value output terminal state description:

Digital value output terminal state can be expressed by a 4-bit binary code; if corresponding terminal controlled by the inverter acts, then this bit is set to "1", if this terminal does not act, then this bit is set to "0". The relationship between digital value Input terminal and binary code is shown below.

Binary code	bit3	bit2	bit1	bit0
Output terminal	FR	PR	Y2	Y1

LED displaying value is the decimal number corresponding to the binary code.

Refer to *4.2.2 Panel Operation Method*.

Note

1. To set parameters Fd.00 and Fd.01, you need to determine a binary code according to the displayed state parameter, change that binary code into a decimal, which can then be used as the value of the Fd.00 or Fd.01.

2. In the inverter running state, you can use the ►► key on keypad to view circularly all the state parameters selected through Fd.00 and Fd.01.

Fd.02 LED stop display parameters (flash)	Setting range: 0~7【0】

EV3000 inverter has 8 state parameters in stopping state, the parameters can be displayed through ►► key in stop process.

Fd.02 function code setup inverter's default displaying state parameters, as shown below:

0: Setup frequency (Hz)/speed (rpm) (flash)

1: External count value (no unit)

2: Digital value Input terminal state (no unit)

3: Digital value output terminal state (no unit)

4: Analog input AI1 value (V)

5: Analog input AI2 value (V) (display Analog input voltage, or the voltage corresponding to Analog input current)

6: Analog input AI3 value (V)

7: DC bus voltage (V-AVE)

Fd.03 Frequency/speed display switching	Setting range: 0, 1【0】

Select the parameters' unit displayed by LED: frequency or speed.

Setup as 0: display running frequency (Hz);

setup as 1: display running speed (rpm).

Fd.04 Line speed factor	Setting range: 0.1%~999.9%【1.0%】

If displayed is line speed, line speed calculation factor: line speed = Freq. × Line speed factor.

Fd.05: IPM heatsink temperature	Display range: 0~100°C【actual value】
Fd.06: Rectifier heatsink temperature	Display range: 0~100°C【actual value】

Displays IPM heatsink temperature in real time, display accuracy: ±5%.

Display rectifier heatsink temperature in real time, display accuracy: ±5%.

Overheat protection action point: 85°C±5°C.

Note

For inverters of 45kW or below, the heatsinks of the IPM and rectifier are of the same temperature.

Fd.07: 1st fault type	Display range: 0~28【0】
Fd.08: 2nd fault type	Display range: 0~28【0】
Fd.09: 3rd fault type	Display range: 0~28【0】

Fd.07~Fd.09 are used for memorizing the latest three fault types, and can record the voltage, current, frequency and terminal state at the last fault (in Fd.10~Fd.14)for checking.

Refer to *Chapter 7 Troubleshooting* for fault description.

Fd.10: Bus voltage at last fault (V)	Display range: 0~999【0V】
Fd.11: Output current at last fault (A)	Display range: 0~999.9【0.0A】
Fd.12: Running frequency at last fault (Hz)	Display range: 0~400.0【0.00Hz】
Fd.13: Input terminal's state at last fault	Display range: 0~1023【0】

Fd.14: Output terminal's state at last fault	Display range: 0~15【0】
Fd.15: Total operating time (Hour)	Display range: 0~65535【0】

6.15 Communication Parameters

These parameter groups are used for displaying parameters through host communication control software, the parameters will not be displayed by keypad.

FF.00	Running frequency (Hz)【-】
FF.01	Running speed (rpm)【-】
FF.02	Setup frequency (Hz)【-】
FF.03	Setup speed (rpm)【-】
FF.04	Output voltage (V)【-】
FF.05	Output current (A)【-】
FF.06	Output power (%)【-】
FF.07	Line speed (m/s)【-】
FF.08	Preset line speed (m/s)【-】
FF.09	External count value (no unit)【-】
FF.10	Motor output torque (%)【-】
FF.11	Motor flux (%)【-】
FF.12	Digital input terminal's state (no unit)【-】
FF.13	Digital output terminal's state (no unit)【-】
FF.14	Analog input AI1 (V)【-】
FF.15	Analog input AI2 (V)【-】
FF.16	Analog input AI3 (V)【-】
FF.17	Analog output AO1 (V)【-】
FF.18	Analog input AO2 (V)【-】
FF.19	DC bus voltage (V)【-】
FF.20	Instantaneous output current (A) (reserved)【-】

Chapter 7 Troubleshooting

7.1 Fault Alarm And Troubleshooting

When the inverter is abnormal, protection function acts: LED displays fault code, LCD displays fault name, fault output relay acts, the inverter stops output and the motor coasts to stop (the action when fault alarm occurs is decided by enhanced function).

EV3000 series inverter's fault contents and troubleshooting is shown in Table 7-1, fault codes' display range is E001~E028.

After fault alarm occurs, fault phenomenon should be recorded in detail, the fault should be processed according to Table 7-1.

When in need of technical assistance, please contact your supplier.

Table 7-1 Alarms and troubleshooting

Fault code	Type of faults	Possible fault reasons	Troubleshooting
E001	Acc overcurrent	1. Acc time including the tuning process is too short. 2. V/F curve or torque boost setup is not suitable. 3. Restart the motor in running when momentary stop occurs. 4. Inverter capacity is too low. 5. PG fault or PG cable broken in Acc process	1. Adjust Acc time. 2. Adjust V/F curve or torque boost. 3. Set up start mode as speed tracking restart. 4. Select inverter with proper capacity. 5. Check the PG and its wire connection
E002	inverter Dec over current	1. Dec time is too short. 2. Potential load or load inertia is too big. 3. Low power of inverter. 4. PG fault or PG cable broken in Dec process	1. Please prolong Dec time. 2. Add suitable braking device. 3. Adjust utility rate. 4. Select inverter with proper capacity. 5. Check the PG and its wire connection
E003	Overcurrent at constant speed running	1. Acc time is short. 2. V/F curve is not suitable. 3. Restart the motor in running when momentary stop occurs. 4. PG cable broken in close loop vector high speed running process. 5. Too heavy load	1. Check input power supply. 2. Check whether input phase loss occurs. 3. Select inverter with proper capacity. 4. Set up start mode as speed tracking restart. 5. Check the PG and its wire connection. 6. Check the load or replace the inverter with the one with higher capacity
E004	Acc over voltage	1. Input voltage abnormal (including the tuning process). 2. In vector control mode, Speed regulator's parameters are incorrect. 3. Start the spinning motor (without speed tracking)	1. Check inputpower supply. 2. Adjust speed regulator's parameters, refer to F3 parameter group description.. 3. Set up start mode as speed tracking restart
E005	Dec overvoltage	1. Dec time is too short (including the tuning process). 2. Load inertia is too big. 3. Input voltage abnormal	1. Adjust Dec time. 2. Connect external braking resistor or braking unit 3. Check inputpower supply
E006	Overvoltage at constant speed running	1. Abnormal change of input voltage. 2. Inproper parameters of PI regulator	1. Mount input reactor. 2. Adjust the parameters of PI regulator, refer to F3 parameter group description
E007	Overvoltage of control power supply	Abnormal input voltage	1. Check input voltage. 2. Ask for service
E008	Phase missing at input side	Phase missing of input R.S.T	1. Check the input wiring. 2. Check the input voltage
E009	Phase missing at output side	1. Phase missing output of U.V.W (or three phase load are highly unsymmetric). 2. Inverter or motor's cables broken, or too long pre-excitation time	Check inverter's output wiring (or whether the load is symmetric)
E010	IPM fault	1. Instantaneous overcurrent inside inverter. 2. Short circuits in output 3 phases or earthing. 3. Blocked air duct or damaged fan. 4. Internal short circuit of bridge in IPM	1. Refer to overcurrent solutions. 2. Re-wiring. 3. Clear air duct or replace fan. 4. Ask for service

Fault code	Type of faults	Possible fault reasons	Troubleshooting
E011	Overheat of IPM heatsink	1. Too high ambient temperature. 2. Blocked air duct. 3. Damaged fan. 4. Abnormal temperature detection circuit	1. Lower the ambient temperature. 2. Clear air duct. 3. Replace fan. 4. Ask for service
E012	Overheat of rectifier bridge heatsink	1. Too high ambient temperature. 2. Blocked air duct. 3. Damaged fan. 4. Abnormal temperature detection circuit	1. Lower the ambient temperature. 2. Clear air duct. 3. Replace fan
E013	Inverter overload	1. Too short Acc time. 2. V/F curve is not suitable. 3. Restart the motor in running after momemtary stop. 4. Very low mains voltage. 5. Heavy load. 6. PG reverse in close loop vector control running state	1. Prolong Acc time. 2. Adjust V/F curve. 3. Set start mode as speed tracing start. 4. Check mains voltage. 5. Select inverters with bigger ratings. 6. Adjust the PG wiring or functions setup
E014	Motor overload	1. V/F curve is not suitable. 2. Very low mains voltage. 3. General motor runs with heavy load at low speed for long term. 4. Wrong setting of motor overload protection factor. 5. Motor choked or sudden change of load. 6. PG reverse in close loop vector control running state	1. Adjust V/F curve. 2. Check mains voltage. 3. Select special motors for long term low speed running. 4. Setup motor overload protection factor right. 5. Check load. 6. Adjust the PG wiring or functions setup
E015	Peripheral fault	Close of external fault terminals	Check the reason
E016	E2PROM read or write fault	1. Fault occurs in the read-write of control parameters. 2. Bad E2PROM	1. Press STOP/RESET to reset. 2. Ask for service
E017	communication fault	1. Wrong baud rate setup. 2. Communication fault in serial communication channel interference. 3. Communication time is too long	1. Adjust the baud rate. 2. Check the communication cables, whether they are connected well. 3. Retry
E018	Contactor not activated	1. Very low mains voltage. 2. Damaged contactor. 3. Damaged soft start Resistor. 4. Damaged control loop	1. Check mains voltage. 2. Replace contactor of main loop or ask for service. 3. Change the resistor and ask for service. 4. Ask for service
E019	Current detecting circuit fault	1. Loose wiring or terminal connections. 2. Damaged auxiliary power source. 3. Damaged Hall component. 4. Abnormal amplifier circuit or current detecting device	Ask for service
E020	CPU fault	Severe interference or double DSP communication error	1. Press STOP/RESET to reset. 2. Ask for service
E021	Analog close loop feedback cable broken error	In PID running mode, when the analog feedback channel is selected as 4 or 5, the feedback input signal cable is broken or is lower than 1V/2mA	1. Check wiring and re-wire again. 2. Adjust the feedback signal input type
E022	External analog voltage/current input signal cable broken fault	1. When select analog input mode (or PID close loop input) by F0.03, the analog input channel is selected as 4 or 5, the analog input signal cable is broken or is lower than 1V/2mA. 2. When selecting torque control mode and the analog torque input channel is selected as 4 or 5, the analog input signal cable is broken or is lower than 1V/2mA	1. Check wiring and re-wire again. 2. Adjust the feedback signal input type
E023	Keyboard E2PROM error	1. Read/write error of keyboard control parameters. 2. E2PROM is damaged	1. Reset by pressing STOP/RESET key, ask for services. 2. Ask for services
E024	tuning error	1. Inproper setting of motor rated parameters. 2. Significant deviation of parameters obtained after tuning comparing with the standard parameters. 3. Tuning time out	1. Set the rated parameters according to the motor's nameplate. 2. Check whether the motor is connected with the load. 3. Check motor connection and parameter setting

Fault code	Type of faults	Possible fault reasons	Troubleshooting
E025	Encoder error	1. When vector control with speed sensor is used, the PG signal line is broken. 2. When vector control with speed sensor is used, the PG signal line connection is reversed	1. Check encoder connection, make the new connection. 2. Check encoder connection, adjust connection, or adjust the PG direction
E026	Inverter is cut from load	1. In vector control mode, the load disappears or is reduced. 2. Relevant functions about load missing are setup incorrectly	1. Check the load. 2. Setup proper load missing protection parameters
E027	Brake unit fault	Brake circuit fault	Ask for services
E028	Parameters setup error	1. Motor's rated parameters are not setup correctly, the setup parameters exceed the limit value of rated motor's parameters. 2. The inverter does not match the motor with rated capacity. 3. Set up PG close loop PID (F7.00=2) at the same time the vector control mode is also setup	1. Set up the motor's parameters correctly. 2. Select the inverter which matches the motor. 3. Run PG close loop PID, set up V/F control mode

7.2 Alarm Reset

When faults start locking function is selected, if the fault has not been reset before power off, then the fault will be displayed after re-powering again.

When keyboard control mode is selected, the reset function of the keyboard is also active and the reset function of host is not active.

When terminal control mode is selected, the reset function of the keyboard can be selected by FA.02 function code and the reset function of host is not active.

When host control mode is selected, the reset function of the keyboard can be selected by FA.02 function code and the reset function of host is active.

When the input terminal function is setup as 8, the terminal reset function is valid.

Reset signal is effective during rising phase of the pulse.

Note

In terminal control, it is recommended to cancel terminal operation command before fault reset operation, so as to prevent accidents caused by the start of inverter when the terminal running command is not eliminated.

For the fault type which only makes the inverter alarm and not stop, reset first then eliminate.

Chapter 8 Preservation And Maintenance

Potential hazards exist due to aging, wear and tear of inverter internal components as well as environmental influences to the inverter, such as temperature, humidity, PH value, particles, vibration etc. Therefore, daily inspection, periodic preservation and maintenance must be performed to the inverter and its driving mechanism during their storage and operation.

If the inverter is transported for a long distance, routine inspections such as integrity of components and tightening of screws must be done before using the inverter.

During normal operation, clean the dust inside the inverter periodically, and check if the screws become loose.

If the inverter has not been used for a long time, it is recommended to energize it once every six months for more than half an hour to prevent the internal electronic elements from becoming unusable.

Danger

When power is turned on for inverters stored for more than two years, voltage regulator shall be used to increase the voltage slowly to avoid hazards of electric shock and explosion.

Danger

During inverter operation the voltage is very high.
Wrong operation may result in serious personal injuries.
Within a certain period of time after the power is cut off, dangerous high voltage is still present in the inverter.
Maintenance of inverters shall only be done by qualified professionals after training.
Before maintenance operation, maintenance personnel must take off personal metal articles such as: watches, rings. Working uniforms and tools used during the operation must satisfy insulation requirements to avoid electric shock.

Attention

The following must be verified before inspection and maintenance of inverter to avoid electric shock hazards:
Before the following four checks are completed, it is forbidden to touch main circuit terminals and any other parts inside the inverter directly or with metal tools;
Cut off power source of the inverter, and wait for no less than minutes;
Open the inverter cover board after all indicator LED lamps are off;
Charge indicator lamp at lower part inside inverter right side is off;
Measured voltage between main circuit terminals P and N is below
DC 36V using a DC voltmeter;

8.1 Daily Preservation And Maintenance

Daily preservation shall be implemented during routine operation to make sure that the operation environment is under good condition. Daily operation data, parameter setting data and parameter modifications shall be well recorded to set up complete inverter application logs.

Various abnormal working conditions can be discovered in time through daily preservation and inspection. This can facilitate prompt investigation of the abnormal conditions in order to solve the problems quickly. These routine preservation and maintenance can ensure normal operation of the equipment and can extend the lifetime of inverter.

Daily inspections to be performed are listed in Table 8-1.

Table 8-1 Daily inspections

Items to be checked	Main inspections			Criteria
	Inspection content	Frequency	Means/method	
Operation environment	(1) Temperature, humidity	At any time	(1) Point thermometer, hygrometer	(1) Ambient temperature shall be lower than 40°C, otherwise, the rated values should be decreased. Humidity shall meet the requirement
	(2) Dust, vapor, leakage		(2) Observation	(2) No dust accumulation, no traces of water leakage and no condensate
	(3) Gases		(3) Visual examination and smelling	(3) No abnormal color and smell

Items to be checked	Main inspections			Criteria
	Inspection content	Frequency	Means/method	
Inverter	(1) Vibration	At any time	(1) Comprehensive observation	(1) Smooth operation without vibration
	(2) Cooling and heating		(2) Point thermometer, comprehensive observation	(2) Fan is working in good condition. Speed and air flow are normal. No abnormal heat
	(3) Noise		(3) Listening	(3) No abnormal noise
Motor	(1) Vibration	At any time	(1) Comprehensive observation, listening	(1) No abnormal vibration and no abnormal noise
	(2) Heat		(2) Point thermometer	(2) No abnormal heat.
	(3) Noise		(3) Listening	(3) No abnormal noise.
Operation status parameters	(1) Power input voltage	At any time	(1) Voltmeter	(1) Satisfying the specification
	(2) Inverter output voltage		(2) Rectifying voltmeter	(2) Satisfying the specification
	(3) Inverter output current		(3) Ammeter	(3) Satisfying the specification
	(4) Internal temperature		(4) Point thermometer	(4) Temperature rise is lower than 40°C

8.2 Periodic Maintenance

Depending on the operation environment and periodic inspection can be made by the user at 3 to 6 months intervals in compliance with the maintenance precautions. The periodic maintenance can avoid inverter faults and can thus ensure the stable operation with high performance for a long time.

Note

1: Maintenance of the inverter can only be performed by qualified professionals after training.

2: Metal parts such as screws, washers, conductors and tools must not be left inside the inverter to avoid damages to the inverter.

3: Modification of inverter internal structure is strictly forbidden to ensure normal running of the inverter.

4: Do not touch directly the static sensitive IC elements on the control board inside the inverter.

General inspections:

1. Check if screws of control terminals are loose. If loose, tighten them with screw driver;

2. Check if the contact of main circuit terminals is good or not, and whether copper bus connections are overheated;

3. Check if there are damages on power cables and control cables, specially check if there are any cuts on the cable skin which is in contact with the metal surface;

4. Check if insulation binding tapes on power cable connection lugs fall off;

5. Clean thoroughly the dust on the printed circuit board and ventilation ducts. Vacuum cleaner is recommended;

6. Before performing insulation tests, all connections between inverter and power source as well as between inverter and motor should be removed, and all main circuit input/output terminals should be short-circuited with conductors. Then proceed insulation test to the ground. Certified 500V megohmmeter (or corresponding range of insulation tester) must be used. Do not use instruments with defects.

Insulation test of single main circuit terminal to ground is forbidden, otherwise the inverter might be damaged.

Do not perform insulation test to control terminals to avoid inverter damages.

After testing, short circuit conductors of main circuit terminals must be disconnected.

7. Precautions to be taken when the insulation test of motor is performed:

Before insulation test of the motor is performed, connections between the motor and the inverter must be dismantled. After dismantling, perform the insulation test of the motor separately to avoid damage of the inverter.

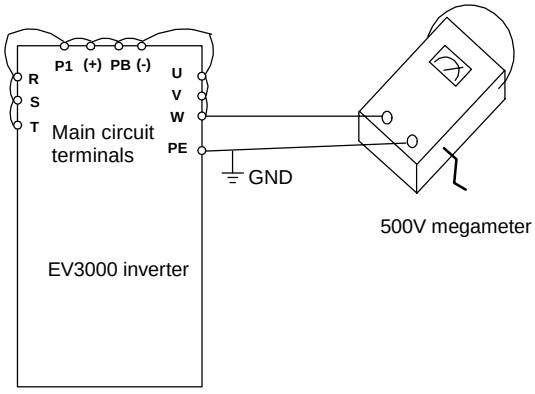


Figure 8-1 Insulation test of the inverter

Note

Dielectric test of the inverter is already done in the factory. It is not necessary for the user to make dielectric test again in order to avoid potential damage of its internal components.

8.3 Replacement Of Inverter Consumable Parts

Main consumable parts for the inverter are: cooling fan and electrolyte capacitors for filters. Their lifetimes depend largely on their application environment and preservation. Their lifetimes in normal conditions are listed below:

Part	Lifetime
Fan	30,000~40,000 hours
Electrolyte capacitors	40,000~50,000 hours
Relay TA/TB/TC	About 100,000 times

The user can determine normal replacement frequency according to the reference lifetime of these consumable parts and according to the inverter working conditions.

However, when anomaly is discovered during inspection, the component must be replaced at once.

During replacement, the types and electrical parameters of the elements should be completely consistent with or very much the same as the original ones.

Note

Replacing original elements using the spare elements of different type and different electrical parameters may damage the inverter!

1. Cooling fans

Possible cause of damages: Wear and tear of the bearing, aging of the fan vanes.

Criteria: After the power is cut off for the inverter, check if abnormal conditions such as crack exists on fan vanes and other parts. When the power is turned on for the inverter, check if inverter running is normal, and check if there is any abnormal vibration.

2. Electrolyte capacitors

Possible cause of damages: high ambient temperature and aging of electrolyte due to large pulse current induced by frequent leaping changes of loads.

Criteria: Check if frequent over-current or over-voltage failures occur during inverter start-up with load. Check if there is any leakage of liquids. Check if the safety valve protrudes. Measure static capacitance and insulation resistance.

8.4 Storage Of Inverter

1. Storage conditions shall satisfy storage requirements.

Table 8-2 Storage environment of inverter

Environmental conditions	Requirements	Remark	
Ambient temperature	-20°C~60°C	Ambient temperature shall not exceed 30°C during long term storage of the inverter, in order to prevent deterioration of capacitor properties	Condensation and freeze resulted by sudden temperature changes shall be avoided
Relative humidity	20~90%	Inverter can be covered by plastic films, and desiccant can be used	
Storage conditions	No direct sunlight, no dust, no corrosive or explosive gases, no oil fog, no vapor, water drops, and no vibration. Salt content shall also be controlled		

2. Long term storage can result in performance deterioration of electrolyte capacitor. Electrolyte capacitor shall be periodically energized for the purpose of preservation.

It is recommended to energize the inverter under long term storage once every 6 months for more than thirty minutes. The inverter can running without load.

8.5 Warranty Of Inverter

Warranty repair services will be provided by our company in case the following situations occur on the inverter (body):

1. The warranty range is confined to the drive only.

2. Warranty period is 18 months (starting from the product delivery date), within which period Emerson Network Power conducts free maintenance and repairing to the drive that has any fault or damage under the normal operation conditions. Emerson will charge reasonable fee for repair and maintenance outside the warranty period.

3. Even within 18 months, maintenance will also be charged in the following situations:

- Damages incurred to the drive due to mis-operations, which are not in compliance with the User Manual;
- Damages incurred to the drive due to fire, flood, abnormal voltage, etc;
- Damages incurred to the drive due to the improper use of drive functions.

4. The service fee will be charged according to the actual costs. If there is any contract, the contract prevails.

Chapter 9 Options

9.1 Braking Assembly

EV3000-4T0022G~EV3000-4T0150G, EV3000-4T0185G1, EV3000-4T0220G1 have built-in braking units, the user only needs to select external braking resistors.

For EV3000-4T0185G～EV3000-4T2200G, both external braking units and braking resistors should be used.

9.1.1 Braking Unit

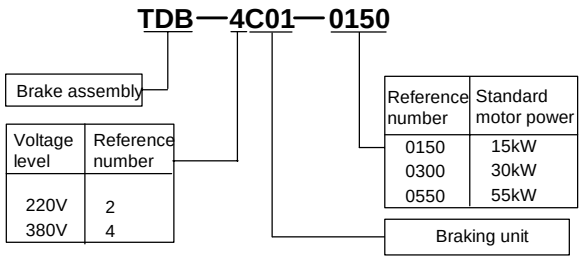


Figure 9-1 Model description of braking unit

9.1.2 Braking Resistor

To meet the requirement on braking torque of 100% and brake unit utility rate of 10% (ED%), the configuration of brake resistor and brake unit is listed below:

Table 9-1 Configuration of braking unit and braking resistor

Motor rated power (kW)	Inverter model EV3000-□	Braking resistor model	Braking unit model
2.2	4T0022G	660W, 220Ω	Built-in
3.7	4T0037G	1110W, 132Ω	Built-in
5.5	4T0055G	1650W, 89Ω	Built-in
7.5	4T0075G	2250W, 65Ω	Built-in
11	4T0110G	3300W, 43Ω	Built-in
15	4T0150G	4500W, 32Ω	Built-in
18.5	4T0185G1	5550W, 26Ω	Built-in
22	4T0220G1	6600W, 22Ω	Built-in
18.5	4T0185G	5550W, 26Ω	TDB-4C01-0150
22	4T0220G	6600W, 22Ω	TDB-4C01-0300
30	4T0300G	9000W, 16Ω	TDB-4C01-0300
37	4T0370G	11100W, 13Ω	TDB-4C01-0300
45	4T0450G	13500W, 10Ω	TDB-4C01-0550
55	4T0550G	16500W, 9Ω	TDB-4C01-0550
75	4T0750G	22500W, 6.5Ω	TDB-4C01-0550

For EV3000-4T0900G~EV3000-4T2200G inverters, please use multiple braking units (TDB-4C01-0550) in parallel.

Note

1. When the needed braking torque is not 100%, the adjustment of brake resistor should be inversely proportional to the braking torque.

Note that the braking torque should be within 150% of the motor rated torque. If larger braking torque is needed, please contact your technical support personnel.

2. After the brake resistor is chosen, the resistor power (P) can be calculated in the following methods:

1) Calculation for long-term operation:

$P = 700^2 / R$

Where, R is the brake resistor.

2) For weight lifting application, putting the weight down is also part of the work cycle. Besides, the process of putting down is usually intermittent. Therefore the utility rate ED% (FA.10) should be set according to the actual situation to minimize the brake resistor power. In that way, the braking resistor power "P" can be calculated through the following formula:

$P = a \times (700^2/R) \times ED\%$

Where, 'R' is the brake resistor, 'a' is derating factor of the brake resistor. In Table 9-1, 'a' is 3.

You can determine the value of 'a' according to the proportion that the brake resistor's work cycle amount to in the total work cycle, as well as the ventilation of the brake resistor.

3. The resistor value should ensure that the current through the resistor (Ic) is smaller than brake unit's current output capacity.

The current output capacities of various brake units are listed below for your reference:

Table 9-2 Current output capacity of brake units

Brake unit model	Max. transient current (A)
TDB-4C01-0150	50
TDB-4C01-0300	75
TDB-4C01-0550	100

The current through the brake resistor (Ic) can be calculated through the following formula:

$Ic = 800 / R$

9.1.3 Installation Size Of Braking Unit

The following figure shows the installation size of the braking unit.

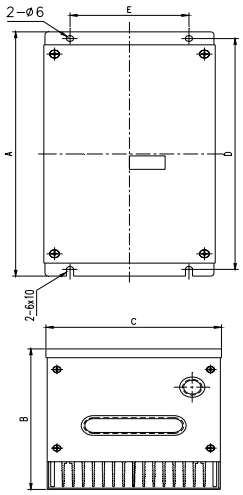


Figure 9-2 Installation size of braking unit

Table 9-3 Installation size (unit: mm) of braking unit

Braking unit model	A	B	C	D	E	Gross weight (kg)
TDB-4C01-0150	254	143	144	240	100	3
TDB-4C01-0300	254	143	144	240	100	3
TDB-4C01-0550	254	130	170	240	126	4

9.1.4 Connections And Functions Of External Braking Unit

1. Connection of braking unit and braking resistor is shown in Figure 9-3.

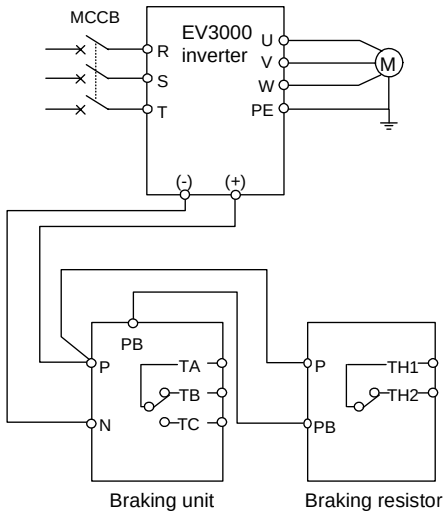


Figure 9-3 Connection of braking unit and braking resistor

TA-TB and TA-TC are fault relay contacts; TH1 and TH2 are temperature relay contact.

2. Main functions

Adjustable braking voltage

Brake resistor time out protection

Radiator overheat protection

Module abnormal alarm

Fault display and fault relay output

Automatic cut-off of braking resistor power and relay alarm output

Cables connecting braking unit with the inverter and cables connecting braking unit with braking resistor should be no longer than 5m. If the cable length exceeds 5m, twisted pair cables should be used. Max length to be used for twisted pair cables is 5m.

For details, refer to the TDB Series Brake unit & Resistor User Manual.

9.2 AC & DC Reactors

9.2.1 AC Input, Output Reactors

1. Model

AC input reactor: TDL-4AI01-0300, where 0300 represents its power rating, same as the inverter model.

AC output reactor: TDL-4AO01-0300, where 0300 represents its power rating, same as the inverter model.

2. Size

The AC input and output reactors have three different appearances, as shown in Figures 9-4 to 9-6. Their sizes are provided in Tables 9-4 to 9-6.

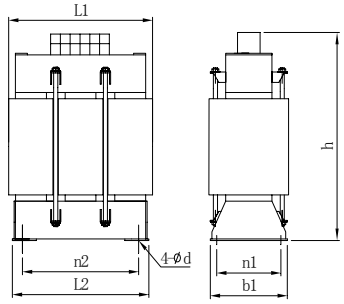


Figure 9-4 3-phase AC input, output reactors (appearance A)

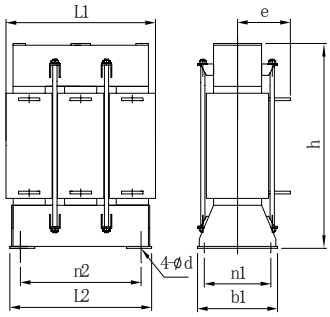


Figure 9-5 3-phase AC input, output reactors (appearance B)

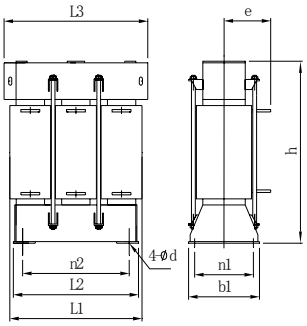


Figure 9-6 3-phase AC input, output reactors (appearance C)

3. Parameters of the 3-phase AC input reactor (TDL-4AI01-□□□□) are provided below.

Table 9-4 Parameters of 380V series 3-phase AC input reactor (2%)

Applicable inverter (kW)	Reactor model	Order No.	Figure No.	Size (mm)						Installation size (mm)			Weight (kg)	Iron loss PC (W)	Copper loss Pm (W)
				L_3	L_1	L_2	B_1	h	e	n_2	n_1	d			
5.5	TDL-4AI01-0075	K119—ER04	9-4		120	106	80	100		80	60	6.5	2.1	7	25
7.5		K119—ER05			120	106	80	100		80	75	6.5	3.0	8	30
11	TDL-4AI01-0150	K119—ER06			130	120	80	125		90	70	6.5	4.5	9	40
15		K119—ER07			165	148	80	135		120	70	6.5	6.0	12	55
18.5	TDL-4AI01-0220	K119—ER08	9-4		165	148	80	135		120	70	6.5	6.0	12	55
22		K119—ER09			165	148	80	135		120	70	6.5	6.3	12	55
30	TDL-4AI01-0370	K119—ER10			165	148	80	135		120	70	6.5	7.5	15	60
37		K119—ER11			165	148	80	135		120	70	6.5	7.8	15	60
45	TDL-4AI01-0550	K119—ER12	9-5		190	170	80	160	70	140	70	6.5	10	20	70
55		K119—ER13			190	170	80	160	70	140	70	6.5	11	20	70
75	TDL-4AI01-0900	K119—ER14			190	170	100	160	70	140	80	6.5	12	25	80
90		K119—ER15			215	200	120	200	90	170	100	6.5	22	50	130
110	TDL-4AI01-1320	K119—ER16			215	200	140	200	100	160	120	6.5	26	56	150
132		K119—ER17			215	200	140	200	100	160	120	6.5	26	56	150
160	TDL-4AI01-1600	K119—ER18	9-6	280	245	226	150	240	110	185	125	13	40	85	188
200	TDL-4AI01-2200	K119—ER19		280	245	226	150	240	110	185	125	13	40	85	188
220		K119—ER20		280	245	226	150	240	110	185	125	13	40	85	188

Table 9-5 Parameters of 380V series 3-phase AC input reactor (4%)

Applicable inverter (kW)	Reactor model	Order No.	Figure No.	Size (mm)						Installation size (mm)			Weight (kg)	Iron loss PC (W)	Copper loss Pm (W)
				L_3	L_1	L_2	B_1	h	e	n_2	n_1	d			
5.5	TDL-4AI01-0075	K119—EM28	9-4		130	120	80	125		90	70	6.5	4.5	9	40
7.5		K119—EM29			165	148	80	135		120	70	6.5	6.0	12	55
11	TDL-4AI01-0150	K119—EM30			165	148	80	135		120	70	6.5	6.0	12	55
15		K119—EM31			165	148	80	135		120	70	6.5	7.5	15	60
18.5	TDL-4AI01-0220	K119—EM32			165	148	80	135		120	70	6.5	7.5	15	60
22		K119—EM33	9-5		190	170	80	160	70	140	70	6.5	10	15	60
30	TDL-4AI01-0370	K119—EM34			190	170	100	160	70	140	80	6.5	12	20	70
37		K119—EM35			215	200	120	200	90	170	100	6.5	22	25	80
45	TDL-4AI01-0550	K119—EM36			215	200	120	200	90	170	100	6.5	22	50	130
55		K119—EM37			215	200	140	200	100	160	120	6.5	26	50	130

Applicable inverter (kW)	Reactor model	Order No.	Figure No.	Size (mm)						Installation size (mm)			Weight (kg)	Iron loss PC (W)	Copper loss Pm (W)
				L_3	L_1	L_2	B_1	h	e	n_2	n_1	d			
75	TDL-4AI01-0900	K119—EM38	9-6	280	245	226	150	240	110	185	125	13	40	56	150
90		K119—EM39		280	245	226	150	240	110	185	125	13	40	85	188
110	TDL-4AI01-1320	K119—EM40		310	280	256	150	260	110	220	125	13	50	85	188
132		K119—EM41		310	280	256	150	260	110	220	125	13	50	120	240
160	TDL-4AI01-1600	K119—EM42		310	280	256	150	260	110	220	125	13	50	120	240
200	TDL-4AI01-2200	K119—EM43		360	330	308	170	310	120	265	150	13	80	120	240
220		K119—EM44		360	330	308	170	310	120	265	150	13	80	170	360

4. Parameters of the 3-phase AC output reactor (TDL-4AO01-□□□□) are provided below.

Table 9-6 Parameters of 380V series 3-phase AC output reactor

Applicable inverter (kW)	Reactor model	Order No.	Figure No.	Size (mm)						Installation size (mm)			Weight (kg)	Iron loss PC (W)	Copper loss Pm (W)
				L3	L1	L2	B1	h	e	n2	n1	d			
5.5	TDL-4AO01-0075	K220—EM05	9-4		130	120	80	125		90	70	6.5	4.5	9	40
7.5															
11	TDL-4AO01-0150	K220—EM07			165	148	80	135		120	70	6.5	6.0	12	55
15															
18.5	TDL-4AO01-0220	K220—EM08			165	148	80	135		120	70	6.5	7.5	15	60
22		K220—EM09			165	148	80	135		120	70	6.5	7.5	15	60
30	TDL-4AO01-0370	K220—EM10	9-5		190	170	80	160	70	140	70	6.5	10	20	70
37		K220—EM11			190	170	100	160	70	140	80	6.5	12	25	80
45	TDL-4AO01-0550	K220—EM12			190	170	100	160	70	140	80	6.5	12	25	80
55		K220—EM13			190	170	100	160	70	140	80	6.5	12	25	80
75	TDL-4AO01-0900	K220—EM14			215	200	120	200	90	170	100	6.5	22	50	130
90		K220—EM15			215	200	120	200	90	170	100	6.5	23	50	132
110	TDL-4AO01-1320	K220—EM16			215	200	120	200	90	170	100	6.5	24	50	133
132		K220—EM17			215	200	120	200	90	170	100	6.5	24	50	135
160	TDL-4AO01-1600	K220—EM18			215	200	140	200	100	160	120	6.5	26	56	150
200	TDL-4AO01-2200	K220—EM19			215	200	140	200	100	160	120	6.5	26	56	151
220		K220—EM20	9-6	280	245	226	150	240	110	185	125	13	40	85	190

9.2.2 DC Reactor

1. Model

TDL-4DI01-0300 is used. The ‘0300’ represents its power level, same as the inverter model.

2. Size

The DC reactors have two different appearances, as shown in Figure 9-7 and Figure 9-8. Their sizes are provided in Table 9-7.

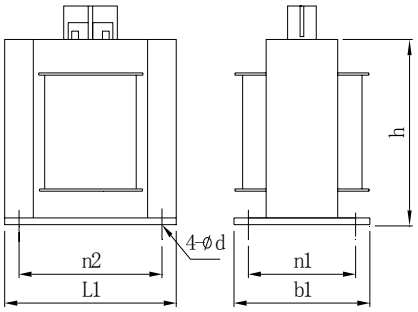


Figure 9-7 DC reactor (appearance A)

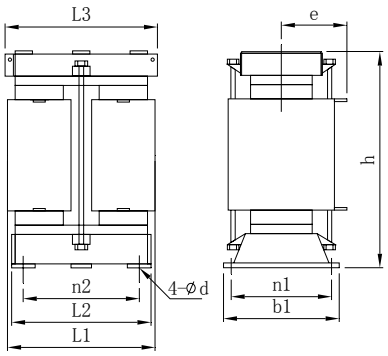


Figure 9-8 DC reactor (appearance B)

3. Parameters of DC reactor (TDL-4DI01-□□□□)

75kW and above inverters include the DC reactor in standard configuration. The following lists the recommended DC reactor models and parameters for 55kW and below inverters.

Table 9-7 Mechanical parameters of 380V series DC reactor

Applicable inverter (kW)	Reactor model	Order No.	Figure No.	Size (mm)			Installation size (mm)			Weight (kg)	Iron loss PC (W)	Copper loss Pm (W)
				L_1	b_1	h	n_2	n_1	d			
11	TDL-4DI01-0150	K424-EM02	9-7	114	100	98	100	80	6.5	4	15	23.5
15												
18.5	TDL-4DI01-0220	K424-EM04		134	100	114	120	80	6.5	6.8	24	30.6
22												
30	TDL-4DI01-0370	K424-EM05		134	120	114	120	100	6.5	8	28	33.2
37		K424-EM06		134	140	114	120	100	6.5	10	33	42.8
45	TDL-4DI01-0550	K424-EM07	9-8	134	140	114	120	100	6.5	10	33	42.8
55		K425-EM10		135	120	225	100	80	6.5	14	36	63.7

9.2.3 AC And DC Reactors Manufacturer Information

Qinghuangdao City Huashenglong Electric Co., Ltd..

Headquarters address: No. 3-20, Huanghe Road, Economics & Technology Development Zone, Qinghuangdao City; Zip code: 066004

Tel: (0335)8560000 Fax: (0335)8515333

Changzhou branch address: Furong Industry Park, Wujing Zone, Changzhou City

Zip code: 213118

Tel: (0519)8651555 Fax: (0519)8651777

Website: www.hslec.com

E-mail: whb2415@163.com

9.3 380V Series EMI Filter

9.3.1 EMI Filter

1. Model

DL-20EBT1: “DL” stands for the power filter series of the Changzhou Jianli Company, “20” represents the rated current value of the filter, “EB” means that the EMI filter adopts 3-phase 3-line system, “T1” and “K1” represent the internal circuit structure.

2. Size

The appearance of EMI filter is shown in Figure 9-9. Table 9-8 provides its size.

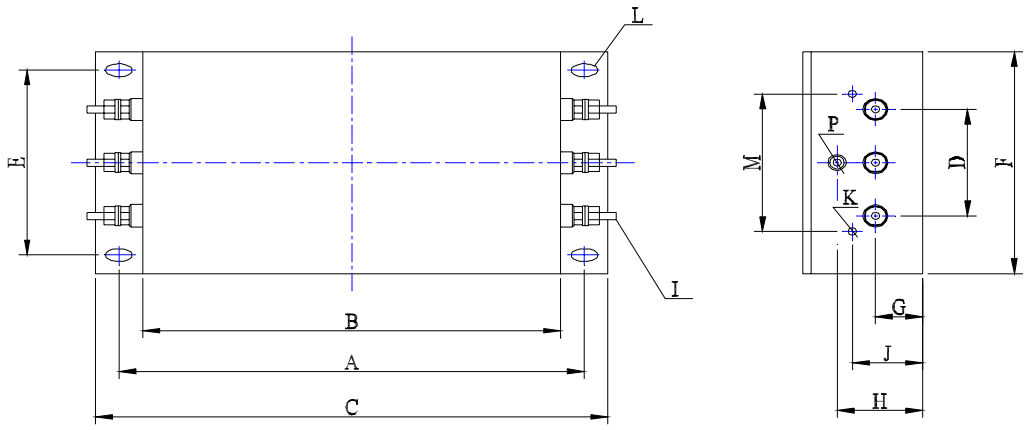


Figure 9-9 EMI filter appearance

3. Parameters of 380V series EMI filter (DL-□□EB□1)

Table 9-8 Mechanical parameters of EMI filter

Applicable inverter (kW)		Filter model	Size (mm)															Weight (kg)
			A	B	C	D	E	F	G	H	I	J	K	M	N	P	L	
5.5	7.5	DL-20EBT1	243	220	261	58	70	100	25	90	M6	58	M4	74	49	M6	6.4×9.4	3.5
11	15	DL-35EBT1	243	220	261	58	70	100	25	90	M6	58	M4	74	49	M6	6.4×9.4	4.0
18.5	22	DL-50EBT1	243	220	261	58	70	100	25	90	M6	58	M4	74	49	M6	6.4×9.4	4.0
30	37	DL-80EBT1	354	320	384	66	155	185	30	90	M8	62	M4	86	56	M8	6.4×9.4	8.5
45		DL-100EBK1	354	320	384	66	155	185	30	90	M8	62	M4	86	56	M8	6.4×9.4	9.0
55	75	DL-150EBK1	354	320	384	66	155	185	30	90	M8	62	M4	86	56	M8	6.4×9.4	9.5
90		DL-200EBK1	354	320	384	66	190	220	35	100	M8	62	M4	86	61	M8	6.4×9.4	13.0

9.3.2 EMI Filter Manufacturer Information

Changzhou Jianli Electronics Co., Ltd.

Address: No. 272, Qingtan Road, Changzhou City, Jiangsu Province, P. R. C. Zip code: 213015

Tel: (0519)6972136 6973215 6984439

Fax: (0519)6960580

Website: www.cnfilter.com

E-mail: jianli@cnfilter.com

9.4 Communication Software, Communication Bus Adapter

Communication software: TDS-DW31, where 31 stands for the software version.

Field bus adapter: TDS-PA01

PROFIBUS field bus in compliance with international standard can be connected through TDS-PA01 field bus adapter.

9.5 Keypad Communication Cable

Cable: TDC-CB0030, where 0030 stands for the cable length (unit in m).

Available cables (length): 1.5m, 3m.

9.6 Serial Communication Protocol & Host Monitoring Software Package

The RS485 serial communication protocol of EV3000 series inverter is open to users. If you need it, please contact Emerson.

The EV3000 general inverter provides host monitoring software package. The software uses serial communication protocol to communicate with the inverter. With this software package, functions like inverter networking, monitoring, commissioning, and so on, can be achieved. The software performs tasks like maintenance, backup, and filing of inverter function codes. If you need it, please contact your supplier or Emerson.

Appendix 1 Application Requirements In Dusty Environment

In a dusty environment, particularly where metal dust or floc may accumulate, proper dust-proof measures are necessary to ensure inverter normal operation.

Installation planning

1. The inverter should be installed inside the control cabinet.

2. It is recommended to install the inverter at the middle or lower part of the cabinet. Install it vertically. Do not mount bulky parts directly above or below the inverter to avoid blocking the wind path.

3. The clearance around the inverter should be at least 300mm, as shown by H1 & H2 in the following figure.

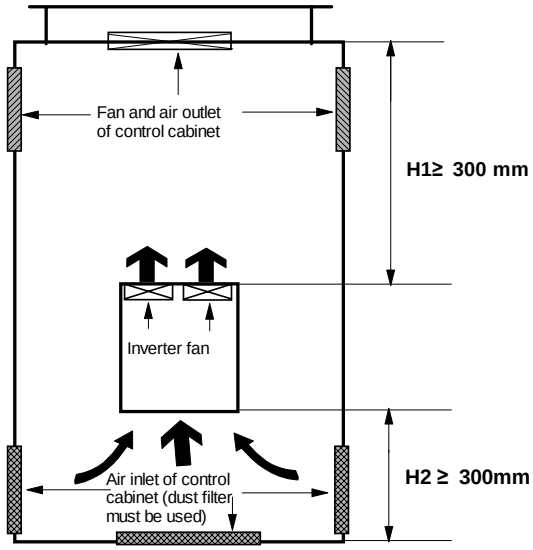


Figure 1 Inverter installation

4. If the keypad has to be removed in use, the holes on inverter front panel must be sealed with adhesive tape to keep the dust out.

If the tape is removed during maintenance, remember to seal the holes again before powering the inverter.

5. Inverters running in dusty environment must be cleaned periodically. The interval should be set to 2~3 months or shorter, for the more dust there is, the more risky it is to the inverter.

6. Follow other basic installation and operation requirements in this manual. Should there be any questions, please contact the technical support personnel in time.

Ventilation, dust control and maintenance of control cabinet

1. Overall requirement: The cabinet should be sealed, with specially designed inlet and outlet for ventilation.

On top of the cabinet there should be air outlet, protection grid and cover.

On top of the cabinet there should be bottom plate, cable inlet, air inlet and dust screen.

2. Design an effective air duct. Free airflow helps prevent dust accumulation.

3. The cabinet top should be mounted with protection grid and protection cover. The height of the protection cover should not block the ventilation.

4. The inlet of the axial flow fan inside the cabinet should be covered with protection grid. Make sure the fan rotation direction is correct, drawing wind from outside the cabinet.

5. Seal the seams on the cabinet to keep the dust out.

6. All the cable/air inlets on the cabinet should be covered with dust screen.

For easy clearing and maintenance, the dust screen should be movable and made of metal.

The size of the screen mesh should be small enough to keep the floc out.

7. The control cabinet must be cleaned periodically of dust and floc. In a very dusty environment, the interval for cleaning should be about a month.

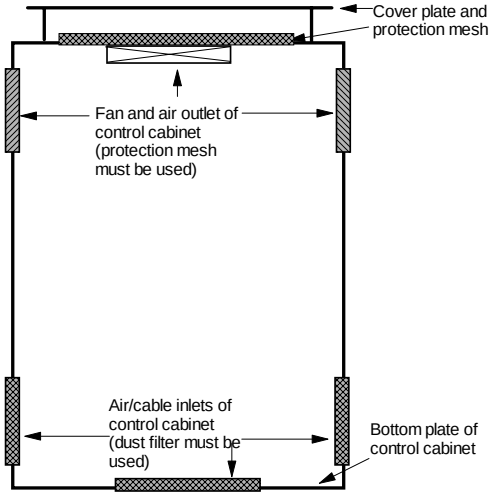


Figure 2 Inverter protection and ventilation

Use of dustproof cover

The models EV3000-4T0022G~4T0150G are of plastic cover. A dismountable dustproof cover is fixed to the top of the inverter. As an accessory, another 2 such covers are in the plastic bag in the inverter package. You can determine to use them or not according to the actual situation.

Appendix 2 Inverter EMC Design & Installation Instruction

For your reference, this section introduces inverter EMC design and installation instruction. The covered topics include: 1) Noise suppression. 2) Wiring. 3) Grounding. 4) Surge absorption by external equipment. 5) Current leakage. 6) Classification of safety areas and installation instructions. 7) Power source filter application. 8) Radiated noise handling.

Noise suppression

Noise is unavoidable during inverter operation. Its influence over peripheral equipment is related to the noise type, transmission means, as well as the design, installation, wiring and grounding of the driving system.

1. Noise type

See the following figure.

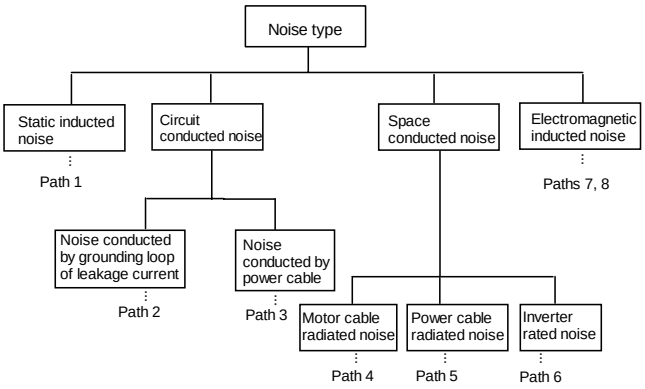


Figure 3 Noise type

2. Transmission means

See the following figure.

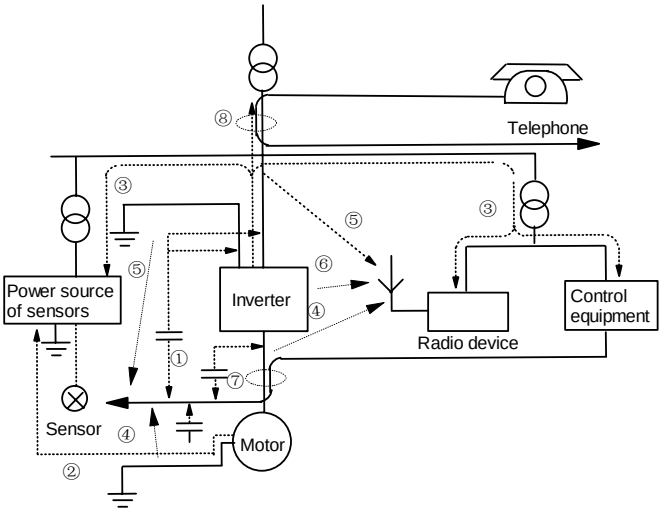


Figure 4 Means of noise transmission

3. Noise suppression methods

The methods of noise suppression are listed in the table below:

Noise suppression methods

Means of noise transmission	Noise and its suppression method
③	When peripheral equipment share the same power source with the inverter, the noise transmitted through the power line may misoperate the peripheral eqipment. Solution: Mount a noise filter at inverter input side, or isolate the peripheral equipment with an isolated transformer or power filter.
④ ⑤ ⑥	Electronic equipment such as computers, measuring meters, radio equipment and sensors, when in the same cabinet with inverter, with their wiring close to the inverter, may misoperate due to radio interference. Solution: 1) The susceptible equipment and its signal lines should be kept away from the inverter. Use shielded cable for the signal line. Ground the shielding coat. Protect the signal cable with a metal pipe and keep it off the inverter input/output cable. When crossing of the signal line and the inverter input/output cables is inevitable, make sure it is orthogonal. 2) Mount radio noise filter or linear noise filter (choke coil) to the input/output side of the inverter to suppress the radio noise. 3) The shielding coat for the cable connecting inverter and the motor should be thick. The wiring can be arranged through thick pipe (2mm or thicker) or cement trench. The cable should be through a metal pipe, and has its shilding coat grounded. You may use the 4-core cable as the motor power cable. Ground one core at inverter side, with the other end of it connected to the motor case
① ⑦ ⑧	When the signal cables are parallel to, or bound together with the power cables, the static and electromagnetic induction will cause the noise transmit through the signal cable, misoperating the related equipment. Solution: 1) Avoid laying the signal cables parallel to the power cable, or bind them together. 2) Keep the susceptible peripheral equipment away from the inverter. 3) Keep the susceptible signal cables away from the input/output cables of inverter. Shielded cables should be used as the signal or power cable. Lead them through metal pipes respectively would achieve better effect. The metal pipes should be at least 20cm away from each other
②	If a closed loop is formed between the peripheral equipment and the inverter wiring, the grounding leakage of the inverter will misoperate the equipment. Solution: Remove the grounding of the peripheral equipment

Wiring requirement

1. The control signal cables and power/motor cables should be laid separately and kept away as far as possible to avoid interference. This is particularly important when the cables are parallel and extend for a long distance.

When crossing of the control signal cable with power/motor cable is inevitable, the crossing must be orthogonal.

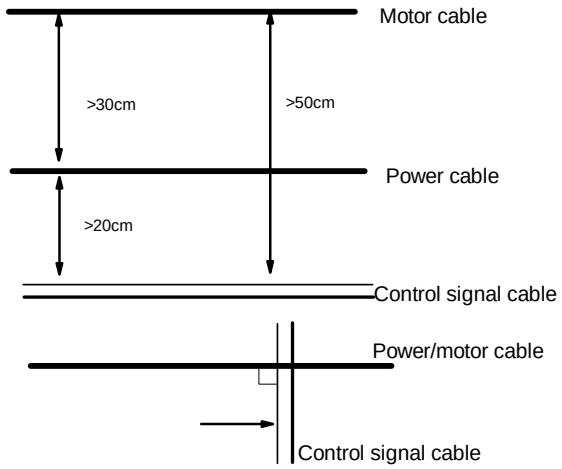


Figure 5 Wiring requirement

2. High-frequency low-resistance shielded/armored cables should be used.

3. Use shielded cable as the control cable. Besides, the shielding metal net must be connected to the metal case through cable clamps at both ends.

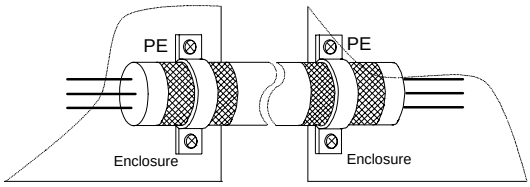


Figure 6 Correct shield grounding

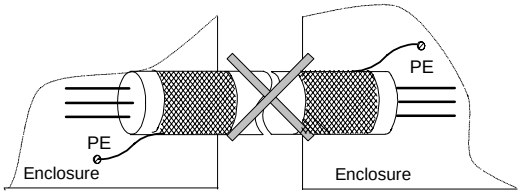


Figure 7 Incorrect shield grounding

Grounding

1. There are 3 grounding methods as listed below:

Dedicated grounding terminal (the best):

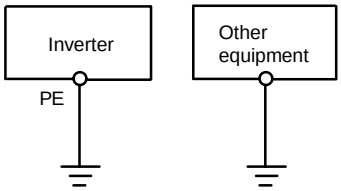


Figure 8 Dedicated grounding terminal

Shared grounding terminal (acceptable):

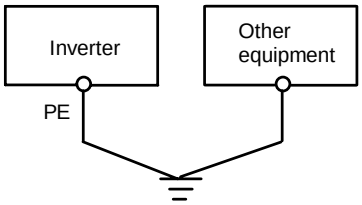


Figure 9 Shared grounding terminal

Shared grounding cable (unacceptable):

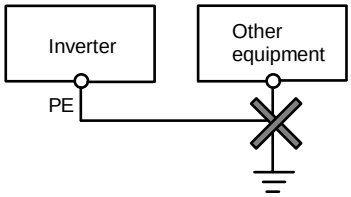


Figure 10 Shared grounding cable (a)

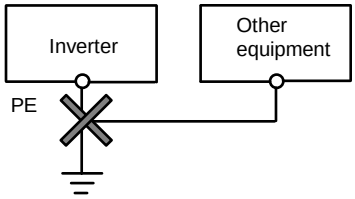


Figure 11 Shared grounding cable (b)

2. Grounding cable connection instructions

1) Reduce the grounding resistance to the minimum by selecting cables as thick as possible. Besides, the flat cable is preferable to the round cable, for the former one has lower high frequency impedance. Because the grounding cable should be the shorter the better, the grounding point should be near the inverter.

2) If 4-core cables are used, one of the 4 cores should be grounded at inverter side, with the other end of it grounded at motor side. It is most desirable if both motor and inverter have their own grounding terminals.

3) If various parts of the control system share the same grounding point, the noise due to grounding leakage current will affect the peripheral equipment. Therefore in a control system, the inverter and other vulnerable electronic equipment such as computer and sensors should be grounded separately.

4) In order to lower the high-frequency impedance, the fixing bolts of various equipment can be used as the high-frequency terminal that is connected to the cabinet rear panel. Note that the insulation paint must be removed.

5) The grounding cables should be laid away from the I/O cables of noise-sensitive equipment. Note that the grounding cable should be as short as possible.

Surge absorber is necessary when using relay, contactor and magnetic brake

When noise-generating devices such as relay, contactor and magnetic brake are used, wherever the installation position is, surge absorbers must be used.

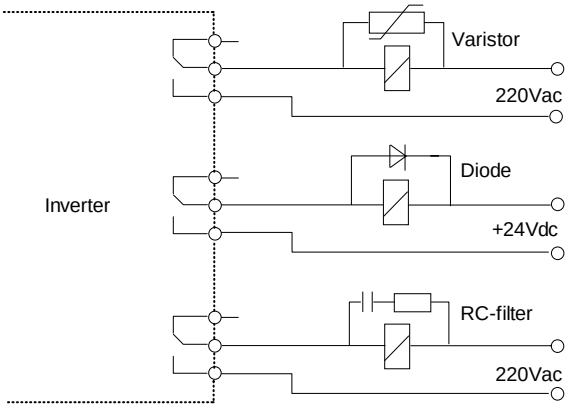


Figure 12 Surge absorber for noise-generating device

Leakage current and its handling method

The following figure shows the path of leakage current. The leakage can be classified into to-ground leakage and inter-cable leakage. The current strength is related to the carrier frequency and capacitor.

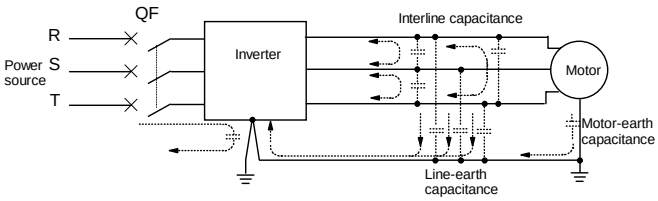


Figure 13 Leakage current path

1. To-ground leakage current

The to-ground leakage current will flow not only into the inverter, but also other equipment through the grounding cable. It may mis-operate equipment such as relays and leakage breakers. The leakage current is positively proportional to the carrier frequency and the length of motor cable.

Solution:

1) Lower the carrier frequency

2) Shorten the motor cable

3) In the inverter and control system, use the leakage breaker especially designed for high harmonic/surge equipment.

2. Inter-cable leakage current

The leakage current that flows through the capacitor among inverter output cables may generate high harmonic that can mis-operate the external thermal relay. The small capacity inverters (7.5kW or smaller) that has output cables longer than 50m is particularly apt to mis-operate the external thermal relay.

Solution:

1) Lower the carrier frequency

2) Install an AC output resistor at the output side.

3) It is recommended to use thermal sensor to monitor the motor temperature, or use the inverter's own overload protection function (electronic thermal relay) instead of external thermal relay.

Inverter EMC installation area classification and installation instruction

1. Installation area classification

In the inverter-motor drive system, the inverter and peripheral equipment such as control devices and sensors are usually mounted in the same cabinet.

You can suppress the interference from inside the cabinet by installing radio noise filter and AC resistor at the cabinet input.

It is necessary to consider the EMC of various equipments inside the cabinet as early as the system design stage.

In the inverter-motor drive system, the inverter, brake unit and contactor are all strong noise sources that can affect the normal operation of sensitive peripheral equipments such as sensors. You can install the peripheral equipments in different EMC areas according to their electrical natures to isolate them from the noise source. This is the best way to reduce interference. The inverter EMC installation areas are classified as shown in the following figure.

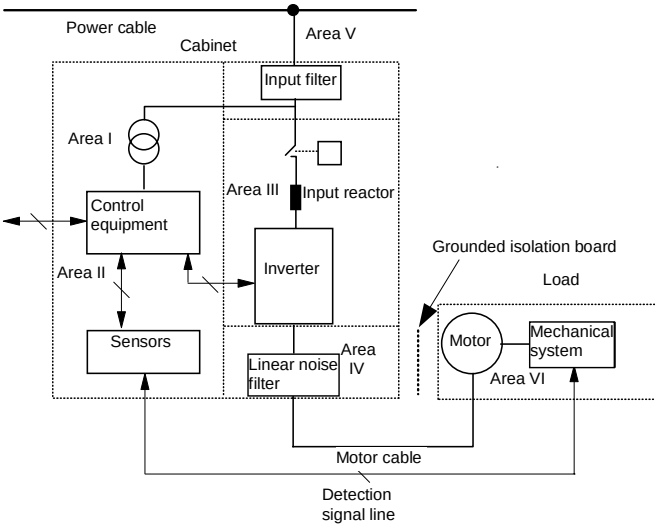


Figure 14 Inverter EMC installation area classification

The following is the description of the installation area classification.

1) Area I: transformer for control power supply, control system and sensor

2) Area II: interface for control signal and cables. The devices mounted here should have certain immunity level.

3) Area III: noise-generating devices such as input reactor, inverter, brake unit and contactors.

4) Area IV: output noise filter

5) Area V: Power source (including the cables connecting the radio noise filter)

6) Area VI: Motor and its cables

7) The areas should be all isolated and at least 20cm away from each other to realize electromagnetic decoupling effect.

8) Earthing bars should be used for decoupling among areas. The cables form different areas should be placed in different tubes.

9) Filters, when needed, should be installed at the interfaces between different areas.

10) All bus cables (such as RS485) and signal cables led out from the cabinet must be shielded.

2. Inverter electrical installation instruction

The inverter electrical installation is shown below:

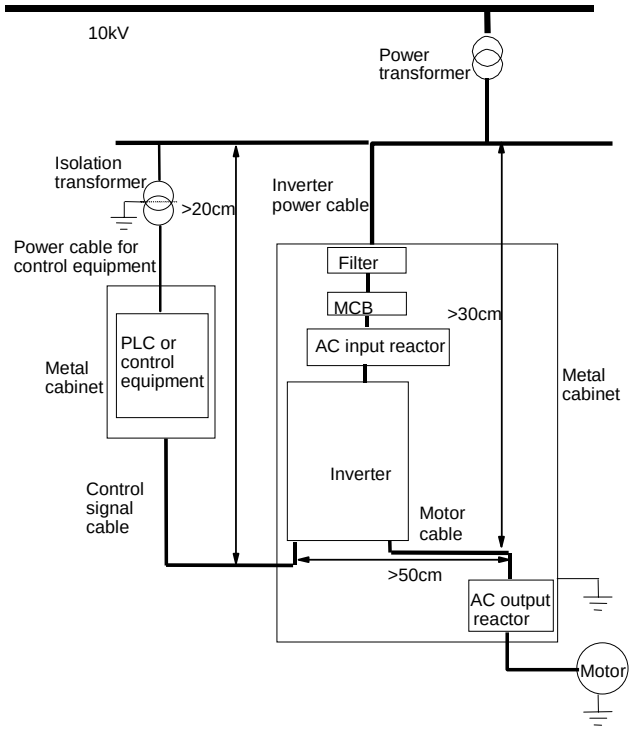


Figure 15 Inverter electrical installation

1) The motor cable is grounded at the inverter side, although it is recommended to ground the motor and inverter separately.

2) It is a must in the cabinet to use shielded/armored cables as the motor cable and control cable. Connect the shielding metal net with two ends of the grounding cable. The metal net should not be folded up lest the shielding effect should be reduced. Note that cable clamp must be used here.

3) Ensure good conductivity between the installation board/bolt and the inverter metal case. The serrate washer and conductive installation board are recommended.

4) If there is only one/two sensitive device(s), you can mount power filter directly near the sensitive device. That will be rather cost saving.

Power filter application instruction

Power source filter should be used in the equipment that may generate strong EMI, or in the equipment that is sensitive to EMI.

1. The effect of power source filter

1) The power line filter is a bi-directional low-pass filter through which only the DC current and 50Hz mains frequency current can pass. The EMI current with high frequency cannot pass it. Therefore its function is to prevent the EMI, to/from certain equipment, from passing through it.

2) The power line filer helps the equipment meet the EMC requirement on conducted emission and electromagnetic susceptibility. It also suppresses the radiated disturbance of the equipment.

2. Power line filter installation instruction

1) Inside the cabinet, the filter should be mounted close to the power cable inlet. The filter's own power cable in the cabinet should be as short as possible.

2) If the filter input and output cables are laid too close to each other, the high-frequency EMI will bypass the filter by coupling directly through the filer input and output cables. The filer will then be useless.

3) Usually there is a dedicated grounding terminal at filter's case. However, if a cable is used to connect the filter to the inverter casing, the filter would be useless in reducing high frequency EMI. That is because the cable's high-frequency impedance is so big that it cannot be used as a bypass. The correct installation method is to stick the filter directly to the conductive metal inverter casing. Note to remove the insulation paint and ensure reliable connection.

Inverter's radiated noise

Inverter's operating principle makes its radiated noise inevitable.

Usually inverters are installed in metal control cabinets. The equipment outside the metal cabinet is little affected by the inverter's radiated emissions. It is the inverter-motor power cable that is the major radiation source. Operate according to the cable connection requirements listed above, and you can suppress the cable radiated noise effectively.

As for the radiation on other peripheral equipment in the cabinet, you should consider it when designing the cabinet area division. The points to note include inter-area insulation, wiring layout, filtering and connection and application of power line filter.

Emerson Network Power Co. Ltd.

Maintenance Record (1)

Customer's company:	
Address:	
Post Code:	Contact person:
Tel:	Fax:
Drive's SN:	
Power:	Model:
Contract number:	Purchasing Date:
Service provider:	
Contact person:	Tel:
Servicing engineer:	Tel:
Maintenance date:	
Customer's comments on service quality: ☐**Excellent** ☐**Satisfactory** ☐ **Acceptable** ☐**Unsatisfactory** Other Opinions: Signature: DD MM YYYY	
Visiting Record of Customer Service Center: ☐**by phone-calls** ☐**by questionnaire** Others: Signature: DD MM YYYY(date)	

Note: This paper becomes invalid if the user cannot be revisited!

Emerson Network Power Co. Ltd.

Maintenance Record (2)

Customer's company:	
Address	
Post Code:	Contact person:
Tel:	Fax:
Drive's SN:	
Power:	Model:
Contract NO.	Purchasing Date:
Service provider:	
Contact person:	Tel:
Servicing person :	Tel:
Maintenance date:	
Customer's comments on service quality: ☐**Excellent** ☐**Satisfactory** ☐ **Acceptable** ☐**Unsatisfactory** Other Opinions: User's Signature: DD MM YYYY	
Visiting Record of Customer Service Center: ☐**by phone-calls** ☐**by questionnaire** Others: Signature: DD MM YYYY(date)	

Note: This paper becomes invalid if the user cannot be revisited!

Notice

1. The warranty range is confined to the drive only.

2. **Warranty period is 18 months**, within which period Emerson Network Power conducts free maintenance and repairing to the drive that has any fault or damage under the normal operation conditions.

3. **The start time of warranty period is the delivery date of the product**, of which the product SN is the sole basis of judgment. Drives without a product SN shall be regarded as out of warranty.

4. Even within 18 months, maintenance will also be charged in the following situations:

- Damages incurred to the drive due to mis-operations, which are not in compliance with the User Manual;
- Damages incurred to the drive due to fire, flood, abnormal voltage, etc;
- Damages incurred to the drive due to the improper use of drive functions.

5.The service fee will be charged according to the actual costs. If there is any contract, the contract prevails.

6.Please keep this paper and show this paper to the maintenance unit when the product needs to be repaired.

7. If you have any question, please contact the distributor or our company directly.

ENP Services China

Emerson Network Power Co., Ltd.

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Customer Service Hotline: +86 755 86010581

Complaint Hotline: +86 755 86010800

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Complaint Hotline: +86 755 86010800

To Customers:

Thank you for choosing our products. We are expecting your comments about the quality of the products, so that we can improve our work and serve you better. We really appreciate if you would fill in the form after the product has operated for 1 month, and then mail or fax it to the Customer Service Center of Emerson Network Power. We will send you an exquisite souvenir upon the receipt of the completed Product Quality Feedback Paper. You will receive a special gift if you can give us any advices on improving the product and service quality.

Customer Service Dept

Emerson Network Power Co., Ltd.

Product Quality Feedback Form

User's name		Tel:	
Address		Post code	
Product model		Installation date	
Product SN			
Product outline or structure			
Product performance			
Product package			
Product manual			
Product quality condition in using			
Your advices on product improvement			

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