

# **Operation Manual**

# **EC20** Elevator Door Controller



SHENZHEN INVT ELECTRIC CO., LTD.

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# 1 Safety precautions

Please read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the controller. If ignored, physical injury or death may occur, or damage may occur to the devices.

If any physical injury or death or damage to the devices occurs for ignoring to the safety precautions in the manual, our company will not be responsible for any damages and we are not legally bound in any manner.

# 1.1 Safety definition

Danger:	Serious physical injury or even death may occur if not follow relevant
	requirements
Warning:	Physical injury or damage to the devices may occur if not follow relevant
	requirements
Note:	Physical hurt may occur if not follow relevant requirements
Qualified	People working on the device should take part in professional electrical and
electricians:	safety training, receive the certification and be familiar with all steps and
	requirements of installing, commissioning, operating and maintaining the
	device to avoid any emergency.

# 1.2 Warning symbols

Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment, and advice on how to avoid the danger. Following warning symbols are used in this manual:

Symbols	Name	Instruction	Abbreviation
Danger	Danger	Serious physical injury or even death may occur if not follow the relative requirements	A
	Warning	Physical injury or damage to the devices may occur if not follow the relative requirements	
Do not	Electrostatic discharge	Damage to the PCBA board may occur if not follow the relative requirements	A.
Hot sides	Hot sides	Sides of the device may become hot. Do not touch.	
Note	Note	Physical hurt may occur if not follow the relative requirements	Note

# 1.3 Safety guidelines

	¢	Only qualified electricians are allowed to operate on the controller.
2	¢	Do not carry out any wiring and inspection or changing components when the power

	supply is a checking a	pplied. Ensure all input power nd always wait for at least the	r supply is disconnected before wiring and e time designated on the controller or until
	the DC bus	voltage is less than 36V. Belo	ow is the table of the wait time:
	Co	ntroller module	Minimum wait time
	1PH 220V	0.4kW-2.2kW	5 minutes
$\wedge$	<ul> <li>Do not refit may occur.</li> </ul>	the controller unauthorized; o	otherwise fire, electric shock or other injury
	♦ The base o	f the radiator may become hol	during running. Do not touch to avoid hurt.
	♦ The electric	cal parts and components in	side the controller are electrostatic. Take
	measureme	ents to avoid electrostatic disc	harge during relevant operation.

#### 1.3.1 Delivery and installation

from combustible materials.
Connect the braking optional parts (braking resistors, braking units or feedback
· · · · · · · · · · · · · · · · · · ·
units) according to the wiring diagram.
Do not operate on the controller if there is any damage or components loss to the
controller.
Do not touch the controller with wet items or body, otherwise electric shock may
occur.

#### Note:

- Select appropriate moving and installing tools to ensure a safe and normal running of the controller and avoid physical injury or death. For physical safety, the erector should take some mechanical protective measurements, such as wearing exposure shoes and working uniforms.
- Ensure to avoid physical shock or vibration during delivery and installation.
- Do not carry the controller by its cover. The cover may fall off.
- Install away from children and other public places.
- The controller cannot meet the requirements of low voltage protection in IEC61800-5-1 if the sea level of installation site is above 2000m.
- The leakage current of the controller may be above 3.5mA during operation. Ground with proper techniques and ensure the grounding resistor is less than 10Ω. The conductivity of PE grounding conductor is the same as that of the phase conductor (with the same cross sectional area).
- L and N are the input terminals of the power supply, while U, V and W are the motor terminals. Please connect the input power cables and motor cables with proper techniques; otherwise the damage to the controller may occur.

#### 1.3.2 Commissioning and running

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A

Disconnect all power supplies applied to the controller before the terminal wiring and wait for at least the designated time after disconnecting the power supply.

¢	High voltage is present inside the controller during running. Do not carry out any
	operation except for the keypad setting.
$\diamond$	The controller can not be used as "Emergency-stop device".
$\diamond$	The controller can not be used to break the motor suddenly. A mechanical braking
	device should be provided.

#### Note:

- ♦ Do not switch on or off the input power supply of the controller frequently.
- For controllers that have been stored for a long time, check and fix the capacitance and try to run it ∻ again before utilization (see Maintenance and Hardware Fault Diagnose).
- Cover the front board before running, otherwise electric shock may occur.

#### 1.3.3 Maintenance and replacement of components

	♦	Only qualified electricians are allowed to perform the maintenance, inspection,
		and components replacement of the controller.
A	¢	Disconnect all power supplies to the controller before the terminal wiring. Wait for
<u>/ + \</u>		at least the time designated on the controller after disconnection.
	¢	Take measures to avoid screws, cables and other conductive matters to fall into
		the controller during maintenance and component replacement.

#### Note:

- ♦ Please select proper torque to tighten screws.
- Keep the controller, parts and components away from combustible materials during maintenance and component replacement.
- Do not carry out any isolation and pressure test on the controller and do not measure the control circuit of the controller by megameter.

#### 1.3.4 What to do after scrapping

⊹

There are heavy metals in the controller. Deal with it as industrial effluent.

# 2 Product overview

### 2.1 Quick start-up

#### 2.1.1 Unpacking inspection

Check as follows after receiving products:

1. Check that there are no damage and humidification to the package. If not, please contact with local agents or INVT offices.

Check the information on the type designation label on the outside of the package to verify that the drive is of the correct type. If not, please contact with local dealers or INVT offices.

3. Check that there are no signs of water in the package and no signs of damage or breach to the controller. If not, please contact with local dealers or INVT offices.

4. Check the information on the type designation label on the outside of the package to verify that the name plate is of the correct type. If not, please contact with local dealers or INVT offices.

5. Check to ensure the accessories (including user's manual and control keypad) inside the device is

complete. If not, please contact with local dealers or INVT offices.

#### 2.1.2 Application confirmation

Check the machine before beginning to use the controller:

1. Check the load type to verify that there is no overload of the controller during work and check that

whether the drive needs to modify the power degree.

2. Check that the actual current of the motor is less than the rated current of the controller.

3. Check that the control accuracy of the load is the same of the controller.

4. Check that the incoming supply voltage is correspondent to the rated voltage of the controller.

#### 2.1.3 Environment

Check as follows before the actual installation and usage:

Check that the ambient temperature of the controller is below 40°C. If exceeds, derate1% for every
additional 1°C. Additionally, the controller can not be used if the ambient temperature is above 50°C.

Note: For the cabinet controller, the ambient temperature means the air temperature inside the cabinet.

Check that the ambient temperature of the controller in actual usage is above -10°C. If not, add heating facilities.

Note: For the cabinet controller, the ambient temperature means the air temperature inside the cabinet.

3. Check that the altitude of the actual usage site is below 1000m. If exceeds, derate1% for every additional 100m.

 Check that the humidity of the actual usage site is below 90% and condensation is not allowed. If not, add additional protection controllers.

5. Check that the actual usage site is away from direct sunlight and foreign objects can not enter the

controller. If not, add additional protective measures.

Check that there is no conductive dust or flammable gas in the actual usage site. If not, add additional protection to controllers.

#### 2.1.4 Installation confirmation

Check as follows after the installation:

1. Check that the load range of the input and output cables meet the need of actual load.

 Check that the accessories of the controller are correctly and properly installed. The installation cables should meet the needs of every component (including reactors, input filters, output reactors, output filters, DC reactors, braking units and braking resistors).

Check that the controller is installed on non-flammable materials and the calorific accessories (reactors and brake resistors) are away from flammable materials.

Check that all control cables and power cables are run separately and the routation complies with EMC requirement.

5. Check that all grounding systems are properly grounded according to the requirements of the controller.

Check that the free space during installation is sufficient according to the instructions in user's manual.

 Check that the installation conforms to the instructions in user's manual. The drive must be installed in an upright position.

8. Check that the external connection terminals are tightly fastened and the torque is appropriate.

9. Check that there are no screws, cables and other conductive items left in the controller. If not, get them out.

#### 2.1.5 Basic commissioning

Complete the basic commissioning as follows before actual utilization:

1. Autotune. If possible, de-coupled from the motor load to start dynamic autotune. Or if not, static autotune is available.

2. Adjust the ACC/DEC time according to the actual running of the load.

Commission the device via jogging and check that the rotation direction is as required. If not, change the rotation direction by changing the wiring of motor.

4. Set all control parameters and then operate.

#### 2.2 Product specification

	Function	Specification
	Input voltage (V)	AC 1PH 220V (-15%)~240V(+10%)
Power input	Input current (A)	Refer to the rated value
	Input frequency (Hz)	50Hz or 60Hz Allowed range: 47~63Hz
Power	Output motor capacity	Refer to the rated value

	Function	Specification	
output (kW)			
	Rated output (kVA)	Refer to the rated value	
	Output current (A)	Refer to the rated value	
	Output voltage (V)	0~input voltage	
	Control mode	SVPWM, SVC	
	Adjustable-speed ratio	1:100	
	Speed control accuracy	±0.2% (SVC)	
Technical	Speed fluctuation	± 0.3% ( SVC)	
iecnnicai	Torque response	<20ms (SVC)	
feature	Torque control accuracy	10%	
reature	Starting torque	0. 5Hz/150% ( SVC)	
		150% of rated current: 1 minute	
	Overload capability	180% of rated current: 10 seconds	
		200% of rated current: 1 second	
	Digital input	7 common inputs, the Max. frequency: 1kHz	
	Digital output	1 Y1 terminal output; 2 programmable relay outputs	
	CAN communication	Protocol: extension frame, communication baud rate	
	CAN communication	40K	
Peripheral	Encoder port	12V encoder, support OC input, the Max. frequency:	
interface	Elicodel port	10kHz	
	Relay output	2 programmable relay outputs	
		RO1A NO, RO1B NC, RO1C common terminal	
		RO2A NO, RO2B NC, RO2C common terminal	
		Contact capacity: 3A/AC250V	
	Mountable method	Wall and rail mountable	
	Braking unit	Embedded	
	EMI filter	Optional filter: meet the degree requirement of	
		IEC61800-3 C2, IEC61800-3 C3	
	Temperature of the	-10~50°C. derate above 40°C	
	running environment		
0.1		<1000m	
Others	Altitude	If the sea level is above 1000m, please derate 1% tor	
		every additional 100m.	
		IP20	
	Protective degree	Note: The controller with plastic casing should be	
		installed in metal distribution cabinet, which conforms	
		to IP20 and of which the top conforms to IP3X.	
	Sarety Meet the requirement of CE		
	Cooling	Air-cooling	

# 2.3 Name plate

CE 🕲
IP20
)V (+10%) 6.5A 47Hz-63Hz )Hz-400Hz
MADE IN CHINA

Figure 2-1 Name plate

Note: This is the example of the name plate for the standard products, and CE/TUV/IP20 will be marked according to the actual situations.

### 2.4 Type designation key

The type designation contains information on the controller. The user can find the type designation on the type designation label attached to the controller or the simple name plate.

EC20 ·	- <u>0R4G</u>	-	<b>S2</b>
(1)	2		3

Figure 2-2 Product type

Кеу	No.	Detailed description	Detailed content		
Product abbreviation	1	Product abbreviation	EC20		
Rated power	d power (2) Power range+ Load type		0R4-0.4kW G: Constant torque load		
Voltage degree ③ Voltage degree		Voltage degree	S2: AC 1PH 220V(-15%)~240V(+10%)		

# 2.5 Rated specifications

Model	Rated output power(kW)	Rated input current(A)	Rated output current(A)
EC20-0R4G-S2	0.4	6.5	2.5
EC20-0R7G-S2	0.75	9.3	4.2

# 2.6 Structure diagram

Below is the layout figure of the controller.



Figure 2-3 Product structure

Serial No.	Name	Illustration				
1	External keypad port	Connect the external keypad				
2	Port cover	Protect the external keypad port				
3	Cover	Protect the internal parts and components				
4	Hole for the sliding cover	Fix the sliding cover				
5	Trunking board	Protect the inner components and fix the cables of the main circuit				
6	Name plate	See Product Overview for detailed information				
7	Control terminals	See Electric Installation for detailed information				
8	Main circuit terminals	See Electric Installation for detailed information				
9	Screw hole	Fix the fan cover and fan				
10	Cooling fan	See Maintenance and Hardware Fault Diagnose for detailed information				
11	Fan cover	Protect the fan				
Note: In above figure, the screws at 4 and 5 are provided with packaging and specific installation						
depends on t	depends on the requirements of customers.					

# 3 Installation guidelines

The chapter describes the mechanical installation and electric installation.

	Only qualified electricians are allowed to carry out what described in this chapter.
	Please operate as the instructions in Safety Precautions. Ignoring these may cause
	physical injury or death or damage to the devices.
	$\diamond$ Ensure the power supply of the controller is disconnected during the operation. Wait
A	for at least the time designated after the disconnection if the power supply is applied.
11	The installation and design of the controller should be complied with the requirement
	of the local laws and regulations in the installation site. If the installation infringes the
	requirement, our company will exempt from any responsibility. Additionally, if users
	do not comply with the suggestion, some damage beyond the assured maintenance
	range may occur.

# 3.1 Mechanical installation

### 3.1.1 Installation environment

The installation environment is the safeguard for a full performance and long-term stable functions of the controller. Check the installation environment as follows:

Environment	Conditions					
Installation site	Indoor					
Environment temperature	-10°C-+50°C, and the temperature changing rate is less than 0.5°C/minute. If the ambient temperature of the controller is above 40°C, derate 1% for every additional 1°C. It is not recommended to use the controller if the ambient temperature is above 50°C. In order to improve the reliability of the device, do not use the controller if the ambient temperature changes frequently. Please provide cooling fan or air conditioner to control the internal ambient temperature below the required one if the controller is used in a close space such as in the control cabinet. When the temperature is too low, if the controller needs to restart to run after a long stop, it is necessary to provide an external heating device to increase the internal temperature, otherwise damage to the devices may occur.					
Humidity	RH≤90%					
-	No condensation is allowed.					
Storage	-40°C~+70°C, and the temperature changing rate is less than					
temperature	1°C/minute.					
Running environment	The installation site of the controller should:					

Environment	Conditions
condition	keep away from the electromagnetic radiation source;
	keep away from contaminative air, such as corrosive gas, oil mist and flammable gas;
	ensure foreign objects, such as metal power, dust, oil, water can not enter into the controller(do not install the controller on the flammable materials such as wood); keep away from direct sunlight, oil mist, steam and vibration environment.
Altitude	Below 1000m If the sea level is above 1000m, please derate 1% for every additional 100m.
Vibration	≤ 5.8m/s <sup>2</sup> (0.6g)
Installation direction	The controller should be installed on an upright position to ensure sufficient cooling effect.

Note:

- EC20 series controllers should be installed in a clean and ventilated environment according to enclosure classification.
- Cooling air must be clean, free from corrosive materials and electrically conductive dust.

#### 3.1.2 Installation direction

The controller may be installed on the wall or in a cabinet.

The controller needs be installed in the vertical position. Check the installation site according to the requirements below. Refer to chapter **Dimension Drawings** in the appendix for frame details.

#### 3.1.3 Installation manner

The controller can be installed in two different ways, depending on the frame size:





Figure 3-1 Wall mounting

Figure 3-2 Rail mounting

Note: The minimum space of A and B is 100mm. H is 36.6mm and W is 35.0mm.

# 3.2 Standard wiring

#### 3.2.1 Connection diagram of main circuit



Figure 3-3 Connection diagram of main circuit

#### Note:

The fuse, braking resistor, input filter, output filter are optional parts. Please refer to Peripheral Optional Parts for detailed information.

#### 3.2.2 Terminals figure of main circuit



Figure 3-4 1PH terminals of main circuit

Terminal	Terminal function
L, N	1-phase AC input terminals which are generally connected with the power supply.
PB, (+)	PB and (+) are connected to the external resistor.
U, V, W	3-phase AC output terminals which are generally connected with the motor.
PE	Each machine should be grounded.

Note:

- Do not use asymmetrically motor cables. If there is a symmetrically grounding conductor in the motor cable in addition to the conductive shield, connect the grounding conductor to the grounding terminal at the controller and motor ends.
- Route the motor cable, input power cable and control cables separately.
- When selecting C3 input filters, connect the filters in parallel at the input side of the controller.

#### 3.2.3 Wiring of terminals in main circuit

1. Fasten the grounding conductor of the input power cable with the grounding terminal of the controller (PE) by 360 degree grounding technique. Connect the phase conductors to L and N terminals and fasten.

 Strip the motor cable and connect the shield to the grounding terminal of the controller by 360 degree grounding technique. Connect the phase conductors to U, V and W terminals and fasten.

3. Connect the optional brake resistor with a shielded cable to the designated position by the same procedures in the previous step.

4. Secure the cables outside the controller mechanically.

#### 3.2.4 Wiring diagram of control circuit



Figure 3-5 Wiring of control circuit

#### 3.2.5 Terminals of control circuit

SW8 S3 S4 COM CANH CANL А В RO1ARO1B RO1 PE +12\ **S**5 S6 сомсме Y1 сом RO2ARO2E

ON

Figure 3-6 Terminals of control circuit

Туре	Terminal name	Function description	Technical specifications
Unana	CANH		CAN communication terminal, adopt CAN
communication	CANL	CAN communication	extension frame protocol, communication baud rate 40kHz
Disital	S1	OPEN signal input	1. Internal impedance:3.3kΩ
input/output	S2	CLOSE signal input	2. Max. input frequency:1kHz
	S3	OPEN arrival input	3. Only support NPN input, low electric

Туре	Terminal name	Function description	Technical specifications			
	S4	CLOSE arrival input	level is valid			
	S5	Safety signal input				
	S6	OPEN DEC input				
	S7	CLOSE DEC input				
	Y1	Digital autout	1. Switch capacity: 50mA/30V			
	CME Digital output		2. Output frequency range: 0~1kHz			
Encoder input	А	A phase signal input	1. Support OC open loop output encoder			
Encoder input	В	B phase signal input	2. Pulse input frequency: MAX. 10Khz			
Encoder nower	+12V	Encoder power	1. Output: 12Vdc (-10%)~12Vdc (+20%)			
Encoder power	COM	Encoder power	2. Output: MAX. 100mA			
	RO1A	Relay 1 NO contact				
	RO1B	Relay 1 NC contact	RO1 relay output, RO1A NO, RO1B NC,			
Relay output	RO1C	Relay 1 common contact	RO1C common terminal			
	RO2A	Relay 2 NO contact	RO2 relay output, RO2A NO, RO2B NC,			
	RO2B	Relay 2 NC contact	Contact capacity: 34/4C250\/			
	RO2C	Relay 2 common contact	Contact Capacity: 57/AC250V			

# 3.3 Layout protection

#### 3.3.1 Protecting the controller and input power cable in short-circuit situations

Protect the controller and input power cable in short circuit situations and against thermal overload. Arrange the protection according to the following guidelines.



Figure 3-7 Fuse configuration

Note: Select the fuse as the manual indicated. The fuse will protect the input power cable from damage in short-circuit situations. It will protect the surrounding devices when the internal of the controller is short circuited.

#### 3.3.2 Protecting the motor and motor cables

The controller protects the motor and motor cable in a short-circuit situation when the motor cable is dimensioned according to the rated current of the controller. The controller has the function of motor thermal overload protection, which can protect the motor, stop output and cut off current when necessary.



If the controller is connected to multiple motors, a separate thermal overload switch or a circuit breaker must be used for protecting each cable and motor. These devices may require a separate fuse to cut off the short-circuit current.

# 4 Keypad operation procedure

# 4.1 Keypad introduction

The keypad is used to control EC20 series controllers, read the state data and adjust parameters. If the external keypad is needed, select the extension cable of the keypad.





Note: The external keypads are optional (including the external keypads with and without the function of parameter copying ).

Serial No.	Name	Description					
		RUN/TUNE	LED off means that the inverter is in the stopping state; LED blinking means the inverter is in the parameter autotune state; LED on means the inverter is in the running state.				
	1 State LED	FWD/REV	FED/REV LED LED off means the inverter is in the forward rotation state; LED on means the inverter is in the reverse rotation state				
1		LOCAL/REMOT	LED for keypad operation, terminals operation and remote communication control LED off means that the inverter is in the keypad operation state; LED blinking means the inverter is in the terminals operation state; LED on means the inverter is in the remote communication control state.				
		TRIP	LED for faults LED on when the inverter is in the fault state; LED off in				

1

Serial No.	Name	Description								
		normal state; LED blinking means the inverter is in the								
		pre-alarm state.								
		Mean the unit displayed currently								
		0-		Hz			Frequency	r unit		
2	Linit LED		_		RPM		R	otating spe	ed unit	
2	Onit LED	9		А		Current unit				
					%			Percenta	ige	
		,	)		V			Voltage u	unit	
		5-figure LE	ED display d	isplay	/s various n	nonito	ring data a	nd alarm co	ode such as set	
		frequency	and output f	reque	ency.					
		Displayed	Correspon	ding	Displayed	Corre	esponding	Displayed	Correspondin	
		word	word		word	١	word	word	g word	
		8	0		1		1	5	2	
		З	3		ч		4	5	5	
•	Code 3 displaying	8	6		3		7	8	8	
3		9	9		8		А	ъ	В	
	20116	5	С		6		d	8	E	
		Я	F		8		н	- B	1	
		E	L		8	-	Ν	0	n	
		0	0		٩		Р	r	r	
		5	S		8		t	8	U	
			v				-			
		PRG ESC	Program ming key	Enter or escape from the first level menu and remov parameter quickly					and remove the	
		DATA ENT	Entry key	Ente Con	er the menu firm param	i step- eters	by-step			
			UP key	Increase data or function code progressively					ly	
4 Buttor	Buttons		DOWN key	Decrease data or function code progressively					ely	
		SHIFT	Right-shif t key	Move right to select the dis f stopping and running mode Select the parameter mode modification			the display mode. modifying	ing parame digit during	ter circularly in	

Serial No.	Name			Description
			Run key	This key is used to operate on the inverter in key operation mode
		<b>Stop</b> RST	Stop/ Reset key	This key is used to stop in running state. In speed control mode, users need to press this key twice, the first is to stop EC20 and the second is to restore EC20 to normal state
			Quick key	The function of this key is confirmed by function code P07.02.
5	Keypad port	External k copying is the functio on. <b>Note:</b> Only the functio ≤2.2kW)	eypad port. valid, the k n of parame y the externa n of parame	When the external keypad with the function of parameter ocal keypad LED is off; When the external keypad without ter copying is valid, the local and external keypad LEDs are al keypad which has the function of parameters copy owns ters copy, other keypads do not have. (only for the inverters

#### 4.2 Keypad displaying

The keypad displaying state of EC20 series controllers is divided into stopping state parameter, running state parameter, function code parameter editing state and fault alarm state and so on.

#### 4.2.1 Displayed state of stopping parameter

When the controller is in the stopping state, the keypad will display stopping parameters which is shown in figure 4-2.

In the stopping state, various kinds of parameters can be displayed. Select the parameters to be displayed or not by P07.07. See the instructions of P07.07 for the detailed definition of each bit.

In the stopping state, there are 4 stopping parameters can be selected to be displayed or not. They are: set frequency, bus voltage, input terminals state and output terminals state. P07.07 can select the parameter to be displayed or not by bit and **JAHIFT** can shift the parameters form left to right, QUICK/JOG(P07.02–2) can shift the parameters from right to left.

#### 4.2.2 Displayed state of running parameters

After the controller receives valid running commands, the controller will enter into the running state and the keypad will display the running parameters. RUN/TUNE LED on the keypad is on, while the FWD/REV is determined by the current running direction which is shown as figure 4-2.

In the running state, there are 15 parameters can be selected to be displayed or not. They are: running

frequency, set frequency, bus voltage, output voltage, output current, rotating speed, output power, output torque, input terminals state, output terminals state, percentage of motor overload, percentage of controller overload, ramp given value, linear speed, AC input current. P07.05 and P07.06 can select the parameter to be displayed or not by bit and **JAHIFT** can shift the parameters form left to right, QUICK/JOG(P07.02=2) can shift the parameters from right to left.

#### 4.1.3 Displayed state of fault

If the controller detects the fault signal, it will enter into the fault pre-alarm displaying state. The keypad will display the fault code by flicking. The **TRIP** LED on the keypad is on, and the fault reset can be operated by the **STOP/RST** on the keypad, control terminals or communication commands.

#### 4.1.4 Displayed state of function codes editing

In the state of stopping, running or fault, press <u>PRG/ESC</u> to enter into the editing state (if there is a password, see P07.00). The editing state is displayed on two classes of menu, and the order is: function code group/function code number—function code parameter, press <u>DATA/ENT</u> into the displayed state of function parameter. On this state, press <u>DATA/ENT</u> to save the parameters or press <u>PRG/ESC</u> to escape.



Stopping parameters



### Fault display

#### 4.3 Keypad operation

Operate the controller via operation panel. See the detailed structure description of function codes in the brief diagram of function codes.

#### 4.3.1 How to modify the function codes of the controller

The controller has three levels menu, which are:

- 1. Group number of function code (first-level menu)
- 2. Tab of function code (second-level menu)
- 3. Set value of function code (third-level menu)

Remarks: Press both the <u>PRG/ESC</u> and the <u>DATA/ENT</u> can return to the second-level menu from the third-level menu. The difference is: pressing <u>DATA/ENT</u> will save the set parameters into the control panel, and then return to the second-level menu with shifting to the next function code automatically; while pressing <u>PRG/ESC</u> will directly return to the second-level menu without saving the parameters,

and keep staying at the current function code.

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

 This function code is not modifiable parameter, such as actual detected parameter, operation records and so on:

2) This function code is not modifiable in running state, but modifiable in stop state.

Example: Set function code P00.01 from 0 to 1.



Note: when setting, limit and ▲ + Y can be used to shift and adjust.

Figure 4-3 Sketch map of modifying parameters

#### 4.3.2 How to set the password of the controller

EC20 series controllers provide password protection function to users. Set P7.00 to gain the password and the password protection becomes valid instantly after quitting from the function code editing state. Press <u>PRG/ESC</u> again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the correct password, the operators cannot enter it.

Set P7.00 to 0 to cancel password protection function.

The password protection becomes effective instantly after retreating from the function code editing state. Press PRG/ESC again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the

correct password, the operators cannot enter it.



Figure 4-4 Sketch map of password setting

#### 4.3.3 How to watch the controller state through function codes

EC20 series controllers provide group P17 as the state inspection group. Users can enter into P17 directly to watch the state.



Figure 4-5 Sketch map of state watching

# **5** Function parameters

The function parameters of EC20 controllers have been divided into 30 groups (P00–P29) according to the function. Each function group contains certain function codes applying 3-level menus. For example, "P08.08" means the eighth function code in the P8 group function, P29 group is factory reserved, and users are forbidden to access these parameters.

For the convenience of function codes setting, the function group number corresponds to the first level menu, the function code corresponds to the second level menu and the function code corresponds to the third level menu.

1. Below is the instruction of the function lists:

The first line "Function code": codes of function parameter group and parameters;

The second line "Name": full name of function parameters;

The third line "Detailed instruction of parameters": detailed instruction of the function parameters;

The fourth line "Default value": the original factory values of the function parameter;

The fifth line "Modify": the modifying character of function codes (the parameters can be modified or not and the modifying conditions), below is the instruction:

"O": means the set value of the parameter can be modified on stop and running state;

"O": means the set value of the parameter cannot be modified on the running state;

"•": means the value of the parameter is the real detection value which cannot be modified.

(The controller has limited the automatic inspection of the modifying character of the parameters to help users avoid mismodifying)

 "Parameter radix" is decimal (DEC), if the parameter is expressed by hex, then the parameter is separated from each other when editing. The setting range of certain bits are 0-F (hex).

"Default value" means the function parameter will restore to the default value during default parameters restoring. But the detected parameter or recorded value will not be restored.

4. For a better parameter protection, the controller provides password protection to the parameters. After setting the password (set P07.00 to any non-zero number), the system will come into the state of password verification firstly after the user press PRG/ESC to come into the function code editing state. And then "0.0.0.0." will be displayed. Unless the user input right password, they cannot enter into the system. For the factory setting parameter zone, it needs correct factory password (remind that the users can not modify the factory parameters by themselves, otherwise, if the parameter setting is incorrect, damage to the controller may occur). If the password protection is unlocked, the user can modify the password freely and the controller will work as the last setting one. When P07.00 is set to 0, the password can be canceled. If P07.00 is not 0 during powering on, then the parameter is protected by the password. When modify the parameters by serial communication, the function of the password follows the above rules, too.

Note: The controller has carried out automatic inspection restraining on the modify attribute of the parameters to avoid wrong modifying.

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Function code	Name	Detailed instruction of parameters	Default value	Modify
P00 Group	Basic function grou	p		
P00.00	Speed control mode	1: SVC 2: SPWM	2	O
P00.01	OPEN/CLOSE control mode	0: Speed control mode 1: Distance control mode 1 (need limit switch) 2: Distance control mode 2	0	O
P00.02	Elevator door control mode	0: Keypad control mode (general inverter mode) 1: Terminal control mode (LED flickering) 2: Manual commissioning mode (FWD/REV command by keypad) 3: Auto-displaying mode 4: Communication control mode (CAN communication LED on) 5: Reserved	0	٥
P00.03	Max. output frequency	P00.04~250.00Hz (250.00Hz)	50.00Hz	0
P00.04	Upper limit of the running frequency	P00.05~P00.03 (Max. output frequency)	50.00Hz	O
P00.05	Lower limit of the running frequency	0.00Hz~P00.04 (Upper limit of the running frequency)	0.00Hz	0
P00.06	Keypad set frequency	0.00Hz~P00.03 (Max. output frequency)	10.00Hz	0
P00.07	ACC time 1	0.0~3600.0s	0.5s	0
P00.08	DEC time 1	0.0~3600.0s	0.5s	0
P00.09	Running direction selection	0: Runs at the default direction 1: Runs at the opposite direction 2: Reserved	0	0
P00.10	Carrier frequency setting	1.0~15.0kHz	Depend on model	0
P00.11	Motor parameter autotuning	0: No operation 1: Rotation autotuning 2: Static autotuning 1 (autotune totally) 3: Static autotuning 2 (autotune partially) Note: Valid in general inverter mode (P00.02=0)	0	0
P00.12	AVR function selection	0:Invalid 1:Valid during the whole procedure	1	0
P00.13	Function restore parameter	0:No operation 1:Restore the default value 2:Clear fault records	0	Ø
P01 Group	Start-up and stop co	ontrol		

EC20 elevator door controller

Function code	Name	Detailed instruction of parameters	Default value	Modify
P01.01	Starting frequency of direct start-up	0.00~50.00Hz	0.30Hz	0
P01.02	Retention time of the starting frequency	0.0~50.0s	0.0s	O
P01.13	Dead time of FWD/REV rotation	0.0~3600.0s	0.0s	0
P01.14	Switching between FWD/REV rotation	0:Switch after zero frequency 1:Switch after the starting frequency	0	O
P01.15	Stopping speed	0.00~100.00Hz	0.50Hz	0
P01.16	Detection of stopping speed	0: Detect at the setting speed 1: Detect at the feedback speed(only valid for vector control)	1	0
P01.17	Detection time of the feedback speed	0.00~100.00s (only valid when P01.16=1)	0.50s	O
P01.18	Terminal running protection selection when powering on	0: The terminal running command is invalid 1: The terminal running command is valid	0	0
P02 Group	Motor 1	1		
P02.01	Rated power of asynchronous motor 1	0.1~4.0kW	Depend on model	O
P02.02	Rated frequency of asynchronous motor 1	0.01Hz~P00.03 (Max. output frequency)	50.00Hz	O
P02.03	Rated speed of asynchronous motor 1	1~36000rpm	Depend on model	O
P02.04	Rated voltage of asynchronous motor 1	0~1200V	Depend on model	O
P02.05	Rated current of asynchronous motor 1	0.4~20.0A	Depend on model	O
P02.06	Stator resistor of asynchronous motor 1	0.001~65.535Ω	Depend on model	0
P02.07	Rotor resistor of asynchronous motor 1	0.001~65.535Ω	Depend on model	0
P02.08	Leakage inductance of asynchronous motor 1	0.1~6553.5mH	Depend on model	0
P02.09	Mutual inductance of asynchronous motor 1	0.1~6553.5mH	Depend on model	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
P02.10	Non-load current of asynchronous motor 1	0.1~6553.5A	Depend on model	0
P02.11	Magnetic saturation coefficient 1 for the iron core of AM1	0.0~100.0%	80.0%	0
P02.12	Magnetic saturation coefficient 2 for the iron core of AM1	0.0~100.0%	68.0%	0
P02.13	Magnetic saturation coefficient 3 for the iron core of AM1	0.0~100.0%	57.0%	0
P02.14	Magnetic saturation coefficient 4 for the iron core of AM1	0.0~100.0%	40.0%	O
P02.26	Motor 1 overload protection selection	0: No protection 1: Common motor (with low speed compensation) 2: Frequency conversion motor (without low speed compensation)	2	0
P02.27	Motor 1 overload protection coefficient	20.0%~120.0%	100.0%	0
P03 Group	Vector control			
P03.00	Speed loop proportional gain1	0~200.0	10.0	0
P03.01	Speed loop integral time1	0.000~10.000s	0.200s	0
P03.02	Low switching frequency	0.00Hz~P03.05	5.00Hz	0
P03.03	Speed loop proportional gain 2	0~200.0	10.0	0
P03.04	Speed loop integral time 2	0.000~10.000s	0.200s	0
P03.05	High switching frequency	P03.02~P00.03 (Max. output frequency)	10.00Hz	0
P03.06	Speed loop output filter	0~8 (corresponds to 0~2^8/10ms)	0	0
P03.07	Compensation	50%~200%	100%	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
	coefficient of vector control electromotion slip			
P03.08	Compensation coefficient of vector control brake slip	50%-200%	100%	0
P03.09	Current loop percentage coefficient P	0-65535	1000	0
P03.10	Current loop integral coefficient I	0~65535	1000	0
P03.20	Keypad setting of electromotion torque upper limit	0.0~300.0%(motor rated current)	180.0%	0
P03.21	Keypad setting of brake torque upper limit	0.0~300.0% (motor rated current)	180.0%	0
P03.22	Weakening coefficient in constant power zone	0.1-2.0	0.3	0
P03.23	The lowest weakening point in constant power zone	10%~100%	20%	0
P03.24	Max. voltage limit	0.0~120.0%	100.0%	0
P03.25	Pre-exciting time	0.000~10.000s	0.300s	0
P03.26	Weakening proportional gain	0~4000	1200	0
P03.27	Speed display selection of vector control	0: Display at the actual value 1: Display at the setting value	0	0
P04 Group	SVPWM control	1		
P04.00	V/F curve setting of motor 1	0:Straight line V/F curve 1: Multi-dots V/F curve 2: 1.3th power low torque V/F curve 3: 1.7th power low torque V/F curve 4: 2.0th power low torque V/F curve	0	0
P04.01	Torque boost of motor	0.0%: (automatic) 0.1%~10.0%	9.0%	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
P04.02	Torque boost close of motor 1	0.0%~50.0% (relative to the rated frequency of motor 1)	20.0%	0
P04.03	V/F frequency point 1 of motor 1	0.00Hz~P04.05	0.00Hz	0
P04.04	V/F voltage point 1 of motor 1	0.0%~110.0%(the rated voltage of motor 1)	00.0%	0
P04.05	V/F frequency point 2 of motor 1	P04.03~ P04.07	00.00Hz	0
P04.06	V/F voltage point 2 of motor 1	0.0%~110.0% (the rated voltage of motor 1)	00.0%	0
P04.07	V/F frequency point 3 of motor 1	P04.05~P02.02 (the rated frequency of motor 1)/P04.05~P02.16 (the rated frequency of motor 1)	00.00Hz	0
P04.08	V/F voltage point 3 of motor 1	0.0%~110.0% (the rated voltage of motor 1)	00.0%	0
P04.09	V/F slip compensation gain of motor 1	0.0~200.0%	0.0%	0
P04.10	Low frequency vibration control factor of motor 1	0~100	10	0
P04.11	High frequency vibration control factor of motor 1	0~100	10	0
P04.12	Vibration control threshold of motor 1	0.00Hz~P00.03 (Max. output frequency)	30.00 Hz	0
P04.33	Weakening coefficient in constant power zone	1.00~1.30	1.00	0
P05 Group	Input terminals			
P05.01	S1 terminals function selection	0: No function 1: OPEN command	1	0
P05.02	S2 terminals function selection	2: CLOSE command 3: OPEN limit signal input	2	O

Function code	Name	Detailed instruction of parameters	Default value	Modify
P05.03	S3 terminals function selection	4: CLOSE limit signal input 5: OPEN speed switching input	3	O
P05.04	S4 terminals function selection	6: CLOSE speed switching input 7: Safety sensor input	4	0
P05.05	S5 terminals function selection	8: Emergency stop signal input 9~10: Reserved	7	O
P05.06	S6 terminals function selection		5	O
P05.07	S7 terminals function selection		6	O
P05.10	Polarity selection of the input terminals	0x000~0xFF	0x6C	0
P05.11	Switch filter time	0.000~1.000s	0.010s	0
P05.14	S1 terminal switching on delay time	0.000~50.000s	0.000s	0
P05.15	S1 terminal switching off delay time	0.000~50.000s	0.000s	0
P05.16	S2 terminal switching on delay time	0.000~50.000s	0.000s	0
P05.17	S2 terminal switching off delay time	0.000~50.000s	0.000s	0
P05.18	S3 terminal switching on delay time	0.000~50.000s	0.000s	0
P05.19	S3 terminal switching off delay time	0.000~50.000s	0.000s	0
P05.20	S4 terminal switching on delay time	0.000~50.000s	0.000s	0
P05.21	S4 terminal switching off delay time	0.000~50.000s	0.000s	0
P05.22	S5 terminal switching on delay time	0.000~50.000s	0.000s	0
P05.23	S5 terminal switching off	0.000~50.000s	0.000s	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
	delay time			
P05.24	S6 terminal switching on delay time	0.000~50.000s	0.000s	0
P05.25	S6 terminal switching off delay time	0.000~50.000s	0.000s	0
P05.26	S7 terminal switching on delay time	0.000~50.000s	0.000s	0
P05.27	S7 terminal switching off delay time	0.000~50.000s	0.000s	0
P06 Group	Output terminals			
P06.01	Y1 output selection	0: Invalid	3	0
P06.03	Relay RO1 output selection	1: OPEN arrival signal output 2: CLOSE arrival signal output	1	0
P06.04	Relay RO2 output selection	3: Fault relay signal output 4: Reserved 5: Reserved	2	0
P06.05	Polarity selection of output terminals	00~0F	00	0
P06.06	Y1 open delay time	0.000~50.000s	0.000s	0
P06.07	Y1C off delay time	0.000~50.000s	0.000s	0
P06.10	RO1 switching on delay time	0.000~50.000s	0.000s	0
P06.11	RO1 switching off delay time	0.000~50.000s	0.000s	0
P06.12	RO2 switching on delay time	0.000~50.000s	0.000s	0
P06.13	RO2 switching off delay time	0.000~50.000s	0.000s	0
P07 Group	Human-Machine Inte	erface	-	
P07.00	User's password	0~65535	0	0
P07.01	Parameter copy	0:No operation 1:Upload the local function parameter to the keypad 2:Download the keypad function parameter to	0	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
		local address(including the motor parameters) 3:Download the keypad function parameter to local address (excluding the motor parameter of P02 and P12 group) 4:Download the keypad function parameters to local address (only for the motor parameter of P02 and P12 group) 0:No function	Value	
P07.02	QUICK/JOG function selection	1: Jogging running 2: Shift the display state by the shifting key 3~6: Reserved 7: Quick commission mode (committee according to the non-factory parameter)	1	0
P07.05	Displayed parameters 1 of running state	0x0000-0x7FFF BIT0: Running frequency (Hz on) BIT1: Set frequency (Hz flickering) BIT2: Bus voltage (V on) BIT3: Output voltage (V on) BIT4: Output current (A on) BIT5: Rotating speed (rpm on) BIT5: Rotating speed (rpm on) BIT6: Output torque (% on) BIT7: Output torque (% on) BIT7: Output torque (% on) BIT8: Input terminals state BIT9: Output terminals state BIT9: Output terminals state BIT10: Percentage of motor overload (% on) BIT11: Percentage of inverter overload (% on) BIT112: Ramp frequency reference (Hz on) BIT13: Linear speed BIT14: AC incoming current BIT15: Reserved	0x003F	0
P07.07	The parameter selection of the stop state	0x0000-0xFFFF BIT0: Set frequency (Hz on, frequency flickering slowly) BIT1: Bus voltage (V on) BIT2: Input terminals state BIT3: Output terminals state BIT4-BIT5: Reserved	0x000F	0
P07.08	Frequency display	0.01~10.00 Displayed frequency=running frequency*	1.00	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
		P07.08		
P07.09	Speed display coefficient	0.1~999.9% Mechanical rotation speed=120*displayed running frequencyxP07.09/motor pole pairs	100.0%	0
P07.10	Linear speed displayed coefficient	0.1~999.9% Linear speed= Mechanical rotation speedxP07.10	1.0%	0
P07.11	Rectifier bridge module temperature	0~100.0℃		•
P07.12	Converter module temperature	0~100.0°℃		•
P07.13	Software version	1.00~655.35		•
P07.14	Local accumulative running time	0~65535h		•
P07.17	Inverter type	0: G type 1: P type		•
P07.18	The rated power of the inverter	0.4~3000.0kW		•
P07.19	The rated voltage of the inverter	50~1200V		•
P07.20	The rated current of the inverter	0.1~6000.0A		•
P07.21	Factory bar code 1	0x0000~0xFFFF		•
P07.22	Factory bar code 2	0x0000~0xFFFF		•
P07.23	Factory bar code 3	0x0000~0xFFFF		•
P07.24	Factory bar code 4	0x0000~0xFFFF		•
P07.25	Factory bar code 5	0x0000~0xFFFF		•
P07.26	Factory bar code 6	0x0000~0xFFFF		•
P07.27	Current fault type	0:No fault		•
P07.28	Previous fault type	1:Controller module U phase protection(OUt1)		•
P07.29	Previous 2 fault type	2:Controller module V phase protection(OUt2)		•
P07.30	Previous 3 fault type	3:Controller module W phase protection(OUt3)		•
P07.31	Previous 4 fault type			•
P07.32	Previous 5 fault type	5:002 6:003 7:0V1 8:0V2 9:0V3		•

Function code	Name	Detailed instruction of parameters	Default value	Modify
		10:UV		
		11:Motor overload(OL1)		
		12:The inverter overload(OL2)		
		13:Input side phase loss(SPI)		
		14:Output side phase loss(SPO)		
		15:Overheat of the rectifier module(OH1)		
		16:Overheat fault of the controller module(OH2)		
		17:External fault(EF)		
		18:485 communication fault(CE)		
		19:Current detection fault(ItE)		
		20:Motor antotune fault(tE)		
		21:EEPROM operation fault(EEP)		
		22:Reserved		
		23:Braking unit fault(bCE)		
		24:Running time arrival(END)		
		25:Electrical overload(OL3)		
		26:PCE		
		27:UPE		
		28:DNE		
		29~30:Reserved		
		31:CAN communication fault(E-CAN)		
		32~35:Reserved		
		36:Underload fault(LL)		
		37:Encoder offline fault(ENC1O)		
		38:Encoder reverse direction(ENC1D)		
		39:Limit switch signal exception(E_ds)		
P07 33	Current fault running		0.00Hz	•
1 07.55	frequency		0.00112	•
	Ramp reference			
P07.34	frequency at current		0.00Hz	•
	fault			
P07 35	Output voltage at the		0\/	•
1 07.55	current fault		00	•
P07 36	Output current at the		0.04	•
101.00	current fault		0.04	•
P07 37	Current bus voltage at		0.01/	
FU7.37	the current fault		0.00	•
D07.29	The Max. temperature		0.0%	
PU1.38	at the current fault		0.00	•

Function code	Name	Detailed instruction of parameters	Default value	Modify
P07.39	Input terminals state at the current fault		0	•
P07.40	Output terminals state at the current fault		0	•
P07.41	Reference frequency at previous fault		0.00Hz	•
P07.42	Ramp reference frequency at previous fault		0.00Hz	•
P07.43	Output voltage at previous fault		0V	•
P07.44	The output current at previous fault		0.0A	•
P07.45	Bus voltage at previous fault		0.0V	•
P07.46	The Max. temperature at previous fault		0.0℃	•
P07.47	Input terminals state at previous fault		0	•
P07.48	Output terminals state at previous fault		0	•
P07.49	Reference frequency at previous 2 faults		0.00Hz	•
P07.50	Ramp reference frequency at previous 2 faults		0.00Hz	•
P07.51	Output voltage at previous 2 faults		0V	•
P07.52	Output current at previous 2 faults		0.0A	•
P07.53	Bus voltage at previous 2 faults		0.0V	•
P07.54	The Max. temperature at previous 2 faults		0.0℃	•
P07.55	Input terminals state at previous 2 faults		0	•
P07.56	Output terminals state at previous 2 faults		0	•

Function code	Name	Detailed instruction of parameters	Default value	Modify
P08 Group Enhanced functions				
P08.06	Jogging running frequency	0.00~P00.03(Max. output frequency)	5.00Hz	0
P08.07	Jogging running ACC time	0.0~3600.0s	Depend on model	0
P08.08	Jogging running DEC time	0.0~3600.0s	Depend on model	0
P08.27	Setting running time	0~65535min	0min	0
P08.28	Time of fault reset	0~10	3	0
P08.29	Interval time of automatic fault reset	0.1~3600.0s	1.0s	0
P08.37	Energy Braking enable	0:Disabled 1:Enabled	1	0
P08.38	Energy braking threshold voltage	200.0~2000.0V	380.0V	0
P08.39	Cooling fan running mode	0:Rated running mode 1:The fan keeps on running after power on 2:Running starts when the module temperature exceeds the set temperature (P21.08)	0	0
P08.40	PWM selection	0x00-0x21 LED ones: PWM mode selection 0: PWM mode 1, three-phase modulation and two-modulation 1: PWM mode 2, three-phase modulation LED tens: low-speed carrier frequency limit mode 0: Low-speed carrier frequency limit mode 1 1:Low-speed carrier frequency limit mode 2 2: No limit	01	٥
P08.41	Over commission	0: Invalid	1	0
	selection	1: Valid		
P08.50	Magnetic flux braking	0: Invalid. 100~150: the bigger the coefficient, the bigger the braking strength.	0	0
P11 Group Protective parameters				
P11.00	Phase loss protection	0x00-0x11 LED ones: 0: Input phase loss protection disable	10	0
Function code	Name	Detailed instruction of parameters	Default value	Modify
---------------	---	---	-------------------	--------
		1: Input phase loss protection enable LED tens:		
		0: Output phase loss protection disable 1: Output phase loss protection enable		
P11.01	Frequency-decreasing at sudden power loss	0:Disabled 1:Enabled	0	0
P11.02	Frequency decreasing ratio at sudden power loss	0.00Hz~P00.03/s(Max. output frequency)	10.00Hz/s	0
P11.03	Overvoltage stall protection	0:Disabled 1:Enabled	0	0
P11.04	Overvoltage stall voltage protection	110~150%(standard bus voltage)(220V)	125%	0
P11.05	Current limit action	0x00-0x12 LED ones: current limit 0: Invalid 1: Valid 2: Flow limit act invalid during DEC LED tens: overload alarm of hardware current limit 0: Valid 1: Invalid	01	٥
P11.06	Automatic current limit level	50.0~200.0%	G type: 160.0%	O
P11.07	The decreasing ratio during current limit	0.00~50.00Hz/s	10.00Hz/s	0
P11.08	Overload pre-alarm of the motor/ inverter	0x000-0x131 LED ones: 0:Overload pre-alarm of the motor, comply with the rated current of the motor 1:Overload pre-alarm of the controller, comply with the rated current of the controller LED tens: 0:The inverter continues to work after underload pre-alarm 1:The inverter continues to work after underload pre-alarm and the controller stops to run after overload fault	0x000	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
		2: The inverter continues to work after overload pre-alarm and the controller stops to run after underload fault		
		3. The inverter stops when overloading or		
		underloading.		
		LED hundreds :		
		0:Detection all the time		
		1:Detection in constant running		
P11.09	Overload pre-alarm test level	P11.11~200%	G type: 150%	0
P11.10	Overload pre-alarm detection time	0.1~3600.0s	1.0s	0
P11.11	Detection level of the underload pre-alarm	0%~P11.09	50%	0
P11.12	Detection time of the underload pre-alarm	0.1~3600.0s	1.0s	0
P11.13	Output terminal action selection during fault	0x00-0x11 LED ones: 0:Action under fault undervoltage 1:No action under fault undervoltage LED tens: 0:Action during the automatic reset 1:No action during the automatic reset	0x00	0
P11.14	Speed deviation detection	0.0~50.0%	10.0%	0
P11.15	Speed deviation detection time	0.0~10.0s (when P11.15=0.0, no speed deviation protection)	0.5s	0
P14 Group	Modbus communica	ition		
P14.00	Local communication address	1~247, 0 is broadcast address	1	0
P14.01	Communication baud ratio	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS	4	0
P14.02	Digital bit checkout	0: No check (N.8.1)for RTU	1	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
		1: Even check (E,8,1)for RTU		
		2: Odd check (O,8,1)for RTU		
		3: No check (N,8,2)for RTU		
		4: Even check (E,8,2)for RTU		
		5: Odd check(O,8,2)for RTU		
P14.03	Communication answer delay	0~200ms	5	0
P14.04	Communication overtime fault time	0.0 (invalid), 0.1~60.0s	0.0s	0
		0:Alarm and stop freely		
		1:No alarm and continue to run		
D44.05	Transmission fault	2:No alarm and stop according to the stop	0	~
P14.05	processing	means(only under the communication control)	0	0
		3:No alarm and stop according to the stop		
		means(under all control modes)		
		0x00~0x11		
	Communication	LED ones:		
		0: Write with response		
P14.06		1: Write without response	0x00	0
	processing	LED tens:(reserved)		
		0: Communication encrypting valid		
		1: Communication encrypting invalid		
P15 Group	CAN communication	1		
D45.00		0: Front door	0	
P15.00	Control door selection	1: Rear door	0	0
		Enable CAN sending		
P15.01	CAN sending enabling	0: Disabled	1	O
		1: Enabled		
		0: 1000k		
		1: 500k		
		2: 250k		
P15.02	CAN baud rate	3: 125k	6	0
		4: 100k		
		5: 50k		
		6: 40k		
P15.03	CAN receiving ID high bit	0~0xFFFF	0xC055	0
P15.04	CAN receiving	0~0xFFFF	0x5405	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
	ID low bit			
P15.05	CAN sending ID high bit	0~0xFFFF	0xC055	0
P15.06	CAN sending ID low bit	0~0xFFFF	0x5507	0
P15.08	CAN communication cycle	0~500ms	100	0
P15.09	Communication overtime fault time	0.0 (invalid), 0.1~60.0s	0.0s	0
P17 Group	State view		-	1
P17.00	Setting frequency	0.00Hz~P00.03	0.00Hz	•
P17.01	Output frequency	0.00Hz~P00.03	0.00Hz	•
P17.02	Ramp reference frequency	0.00Hz~P00.03	0.00Hz	•
P17.03	Output voltage	0~1200V	0V	•
P17.04	Output current	0.0~3000.0A	0.0A	•
P17.05	Motor speed	0~65535RPM	0RPM	•
P17.06	Torque current	-3000.0~3000.0A	0.0A	•
P17.07	Magnetized current	-3000.0~3000.0A	0.0A	•
P17.08	Motor power	-300.0~300.0% (relative to the rated power of the motor)	0.0%	•
P17.09	Output torque	-250.0~250.0%	0.0%	•
P17.10	The motor frequency evaluation	0.00~P00.03	0.00Hz	•
P17.11	DC bus voltage	0.0~2000.0V	0V	•
P17.12	Switch input terminals state	0000~00FF	0	•
P17.13	Switch output terminals state	0000~000F	0	•
P17.14	Digital adjustment	0.00Hz~P00.03	0.00V	•
P17.15	Torque reference	-300.0%~300.0% (motor rated current)	0.0%	•

Function code	Name	Detailed instruction of parameters	Default value	Modify
P17.23	Door width pulse counting high bit	Door width pulse counting=door width pulse	0	•
P17.24	Door width pulse counting low bit	counting low bit	0	•
P17.28	ASR controller output	-300.0%~300.0% (motor rated current)	0.0%	•
P17.32	Magnetic flux linkage	0.0%~200.0%	0.0%	•
P17.33	Exciting current reference	-3000.0~3000.0A	0.0A	•
P17.34	Torque current reference	-3000.0~3000.0A	0.0A	•
P17.35	AC input current	0.0~5000.0A	0.0A	•
P17.36	Output torque	-3000.0Nm~3000.0Nm	0.0Nm	•
P17.37	Motor overload counting	0~100 (OL1 when 100)	0	•
P17.38	Encoder actual frequency	Positive when the motor runs forward, negative when the motor runs reversely -3276.8~3276.7Hz	0	•
P17.39	Count value of encoder position	1 circle count value of encoder pulse, 4 fold-frequency 0-65535	0	•
P17.40	High bit of accumulated count value of encoder pulse	Accumulated count value of encoder	0	•
P17.41	Low bit of accumulated count value of encoder pulse	pulse=P17.40*10000+P17.41	0	•
P18 Group	OPEN control			
P18.00	OPEN speed setting 1	0.00Hz~P00.03	5.00Hz	0
P18.01	OPEN ACC/DEC time 1	0.1s~1000.0s	2.0s	0
P18.02	OPEN speed setting 2	0.00Hz~P00.03	12.00Hz	0
P18.03	OPEN ACC/DEC time 2	0.1s~1000.0s	2.0s	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
P18.04	OPEN speed setting 3	0.00Hz~P00.03	20.00Hz	0
P18.05	OPEN ACC/DEC time 3	0.1s~1000.0s	2.0s	0
P18.06	OPEN speed setting 4	0.00Hz~P00.03	4.00Hz	
P18.07	OPEN ACC/DEC time 4	0.1s~1000.0s	2.0s	
P18.08	OPEN speed setting 5	0.00Hz~P00.03	3.00Hz	0
P18.09	OPEN ACC/DEC time 5	0.1s~1000.0s	1.6s	0
P18.10	OPEN hold wait time	0.1s~1000.0s	1.0s	0
P18.11	OPEN hold waiting speed	0.00Hz~P00.03	2.5Hz	0
P18.12	OPEN arrival hold speed setting	0.00Hz~P00.03	1.50Hz	0
P18.13	OPEN arrival hold torque	0.0%~150.0%(Relative to the motor rated current in VF mode; relative to the motor rated torque in vector mode)	60.0%	0
P18.14	OPEN obstruction torque	0.0%~150.0%(Relative to the motor rated current in VF mode; relative to the motor rated torque in vector mode)	90.0%	0
P18.15	OPEN obstruction judgment time	0.000s~10.000s	0.000s	0
P18.16	CLOSE limit signal separation timing	0.1s~1000.0s	0.0s	0
P18.17	OPEN speed change arrival timing	0.1s~1000.0s	0.0s	0
P18.18	OPEN ACC/DEC selection	0: Linear 1: S curve	1	0
P18.19	OPEN S curve start time	0.0~20.0s	0.2s	O
P18.20	OPEN S curve end time	0.0~20.0s	0.2s	0
P19 Group	CLOSE control			
P19.00	CLOSE speed setting 1	0.00Hz~P00.03	5.00Hz	0
P19.01	CLOSE ACC/DEC time 1	0.1s~1000.0s	1.0s	0
P19.02	CLOSE speed setting	0.00Hz~P00.03	14.00Hz	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
	2			
P19.03	CLOSE ACC/DEC time 2	0.1s~1000.0s	2.0s	0
P19.04	CLOSE speed setting 3	0.00Hz~P00.03	18.00Hz	0
P19.05	CLOSE ACC/DEC time 3	0.1s~1000.0s	3.0s	0
P19.06	CLOSE speed setting 4	0.00Hz~P00.03	3.00Hz	0
P19.07	CLOSE ACC/DEC time 4	0.1s~1000.0s	1.5s	0
P19.08	CLOSE speed setting 5	0.00Hz~P00.03	0.60Hz	0
P19.09	CLOSE ACC/DEC time 5	0.1s~1000.0s	40.0s	0
P19.10	CLOSE hold wait time	0.1s~1000.0s	1.0s	0
P19.11	CLOSE hold waiting speed	0.00Hz~P00.03	0.6Hz	0
P19.12	CLOSE speed change arrival timing	0.1s~1000.0s	0.0s	0
P19.13	CLOSE arrival hold speed setting	0.00Hz~P00.03	0.6Hz	0
P19.14	CLOSE arrival hold torque	0.0%~150.0%(Relative to the motor rated current in VF mode; relative to the motor rated torque in vector mode)	60.0%	0
P19.15	CLOSE obstruction torque	0.0%~150.0%(Relative to the motor rated current in VF mode; relative to the motor rated torque in vector mode)	70.0%	0
P19.16	CLOSE obstruction judgment time	0.000s~10.000s	0.000s	0
P19.18	OPEN limit signal separation timing	0.1s~1000.0s	0.0s	0
P19.19	CLOSE overtime judgment time	0.1s~1000.0s	0.0	0
P19.20	CLOSE obstruction judgment slip (low speed)	When the slip ratio is smaller than the judgment slip, the obstruction signal becomes valid. Slip=detection frequency/reference frequency	50.0%	0
P19.21	CLOSE obstruction	No detection when the detection time is 0	70.0%	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
	judgment slip (high	Need to set P20.05 correctly (drive ratio		
	speed)	between motor and encoder), ensure encoder		
	CLOSE obstruction	detection speed is consistent with the set speed.		
P19.22	judgment switch		5.00Hz	0
	frequency			
P10 23	CLOSE obstruction		0.000e	0
1 13.25	slip detection time		0.0003	0
D10.24	Obstructed current		10.00	0
P19.24	detection frequency 1	A	10.00HZ	0
D10.05	Obstructed current	Current	50 00H-	0
P19.25	detection frequency 2	P19.27	50.00HZ	0
D10.06	Obstructed current	Obstruction	100.0%	0
P19.20	detection current 1	D10.26 detection	100.0%	0
P19 27	Obstructed current	P19.24 P19.25	100.0%	0
1 10.27	detection current 2	No detection when the detection time is 0	100.070	0
P10 28	Obstructed current		0.000e	0
1 13.20	detection time		0.0003	0
		0: When the sensor signal is valid, execute fault OPEN action		
	Safety sensor function	1: When the CLOSE signal and sensor signal		
P19.29	selection	are valid, execute fault CLOSE action	0	O
		2: When the fault CLOSE signal is valid.		
		execute fault CLOSE action		
	CLOSE obstruction	OPEN hold time after fault OPEN arrival, after		
P19.30	and OPEN arrival hold	time arrival, if the CLOSE command is valid,	3.0s	0
	time	execute CLOSE action		
P19.31	Abnormal DEC time	DEC time at CLOSE obstruction	0.5s	0
	CLOSE ACC/DEC	0: Linear		_
P19.32	selection	1: S curve	1	0
P19.33	CLOSE S curve start	0.0~20.0s	0.2s	0
P19.34	CLOSE S curve end	0.0~20.0s	0.2s	0
	time			-
P19.35	Speed setting 1 of	0.00Hz~20.00Hz	0.60Hz	0
	slow speed CLOSE		5.001.2	
P19.36	Speed setting 2 of slow speed CLOSE	0.00Hz~20.00Hz	5.00Hz	0
P19.37	Speed setting 3 of	0.00Hz~20.00Hz	5.00Hz	0

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Function code	Name	Detailed instruction of parameters	Default value	Modify
	slow speed CLOSE			
P19.38	Speed setting 4 of slow speed CLOSE	0.00Hz~20.00Hz	5.00Hz	0
P19.39	Speed setting 5 of slow speed CLOSE	0.00Hz~20.00Hz	2.00Hz	0
P20 Group	Distance control			
P20.00	Door width autotuning	0: Disabled 1: Enabled, in manual commissioning mode of elevator door	0	0
P20.01	Encoder pulse number	0-60000	1024	0
P20.02	Encoder direction	0: Forward 1: Reverse	0	O
P20.03	Encoder offline detection time	0.0~10.0s	1.0s	0
P20.04	Encoder reverse detection time	0.0~100.0s	0.8s	0
P20.05	Speed ratio between motor and encoder	When the encoder is not installed on the motor shaft and the drive ratio is not 1, need to set the parameter. Setting range: 0.001~65.535	1.000	0
P20.06	Door width autotuning speed	0.00~20.00Hz	3.00Hz	0
P20.07	High bit of door width pulse number	0~9999	0	0
P20.08	Low bit of door width pulse number	0~9999	0	0
P20.09	CLOSE arrival position	0.0%~10.0% (door width)	3.0%	0
P20.10	OPEN speed change position 1	0.0%~30.0% (door width)	10.0%	0
P20.11	OPEN speed change position 2	20.0%~80.0% (door width)	30.0%	0
P20.12	OPEN speed change position 3	80.0%~99.0% (door width)	70.0%	0
P20.13	OPEN speed change position 4	80.0%~99.0% (door width)	90.0%	0
P20.14	OPEN arrival position	90.0%~100.0% (door width)	97.0%	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
P20.15	CLOSE speed change position 1	80.0%~99.0% (door width)	95.0%	0
P20.16	CLOSE speed change position 2	60.0%~90.0% (door width)	75.0%	0
P20.17	CLOSE speed change position 3	20.0%~80.0% (door width)	30.0%	0
P20.18	CLOSE speed change position 4	20.0%~80.0% (door width)	10.0%	0
P20.19	Current pulse of door position	0.0%~100.0% (door width)		٠
P21 Group Demonstration function				
P21.00	Demonstration OPEN arrival hold time	0.0s~1000.0s	3.0s	0
P21.01	Demonstration CLOSE arrival hold time	0.0s~1000.0s	3.0s	0
P21.02	Demonstration OPEN/ CLOSE set running times	0~65535	0	0
P21.03	Demonstration OPEN/ CLOSE operation times record	0~65535	0	•
P21.04	OPEN command delay time	Command delay valid time after OPEN/CLOSE command is cancelled (only valid at arrival)	0.0	0
P21.05	CLOSE command delay time	When set to 1000.0, valid all the time after the command is cancelled	0.0	0
P21.07	Factory parameter			
P21.08	Fan starting temperature	The fan starts if the IGBT temperature is higher than P21.08; the fan stops with a delay of 30	<b>50.0</b> ℃	0
P21.09	Fan stop temperature	seconds if the IGBT temperature is lower than P21.09. When P08.39 is 2, this control is valid. Setting range of P21.08:0.0 $^{\circ}$ C-50.0 $^{\circ}$ Setting range of P21.09:0.0 $^{\circ}$ C-50.0 $^{\circ}$	<b>50.0</b> ℃	0
P21.10	Control parameter selection	Ones: Torque selection (Reserved) 0: Torque current 1: Actual torque Tens: Encoder pulse counting correction 0: No correction for either door opening or door	0x1020	0

Function code	Name	Detailed instruction of parameters	Default value	Modify
		closing		
		1: Correction for door opening		
		2: Correction for door closing		
		3: Correction for both door opening and door		
		closing		
		Hundreds: CAN communication settings		
		Bit0: CAN communication fault handling		
		0: Disable auto reset		
		1: Enable auto reset		
		Bit1: Reserved		
		Thousands: Auto running(valid only in speed		
		mode)		
		0: Disable		
		1: Enable(Terminal running signal used as		
		criterion)		
		Auto running control process:		
		1) If the last signal is the terminal door-closing		
		running command signal, after the running		
		command is removed, the door is closed at a		
		low speed (P19.35-P19.39) in the entire		
		process, regardless of the door location.		
		2) If the last signal is the terminal door-opening		
		running command signal, after the running		
		command is removed, the elevator runs in the		
		door opening direction in the entire process and		
		the door is opened at the normal speed.		
		<ol><li>If no running command is received after</li></ol>		
		re-power on, the door will close.		
		2: Enable(Limit switch signal used as criterion)		
		Auto running control process:		
		1) If the last signal is the door closing limit		
		signal, after the running command is removed,		
		the door is closed at a low speed		
		(P19.35-P19.39) in the entire process,		
		regardless of the door location.		
		<ol><li>If the last signal is the door opening limit</li></ol>		
		signal, after the running command is removed,		
		the elevator runs in the door opening direction in		
		the entire process and the door is opened at the		

Function code	Name	Detailed instruction of parameters	Default value	Modify
		normal speed. 3) If no running command is received after re-power on, the door will close.		
P21.11	User mode switching	This parameter is used to switch the set values of partial function parameters. 0: Factory parameters 1: DAT parameters	0	0

# **6** Commissioning instruction

### 6.1 Running commissioning

- 1. Wiring properly according to manufacturer's instructions;
- 2. Motor parameter autotuning:
  - P00.13=1, restore factory defaults;
  - P00.01=0, general inverter mode;
  - 3) Set relevant motor parameters of P02 Group properly;
  - P00.11=1 rotary autotuning (the motor can rotate and needs to de-couple from load), P00.11=2 static autotuning, depend on the actual conditions;
  - Check motor direction, OPEN direction is forward rotation and CLOSE direction is reverse rotation; if not, change any two phases in wiring of the motor;
  - 6) If the encoder is connected, set the pulse number correctly at first. Then, by P17.38 in accordance with the set frequency, check whether the counting direction is consistent with the running direction of the motor. If size is different, the pulse number is wrong; if direction is different, thus the counting direction is different, adjust P20.02;
  - After completing above steps, select proper control mode (P00.01) on the actual conditions and carry out commissioning according to the following instructions.

### 6.2 Speed control mode

Speed control mode, that is: motor+signal switch, needs to autotune motor parameters without encoder and not to autotune door width.

The speed control mode needs to install four travel switches for deceleration and limit processing by judging the decelerating point and limit switch signal. The travel switches are installed as follows:



Figure 6-1 Travel switch

### 6.2.1 Wiring instruction in speed control mode



Figure 6-2 Wiring instruction in speed control mode

### 6.2.2 Function parameters setting

Function code	Name	Setting value
P00.00	Control mode	1: SVC 2: SVPWM (arbitrary setting)
P00.01	OPEN/CLOSE control mode	0: Speed control mode
P00.02	Elevator door control mode	1: Terminal control mode (LED flickering)

### 6.2.3 OPEN operation curve in speed control mode



Figure 6-3 OPEN operation curve in speed control mode

Instruction of OPEN process in speed control mode:

- When OPEN command is valid, the elevator door runs at the set speed P18.00 and the ACC time is P18.01;
- When CLOSE limit signal becomes from valid to invalid, shift to the set speed P18.02 and the ACC time is P18.03; (if P18.16=0, go to the next step)
- When CLOSE limit separation timing P18.14 arrives, shift to the set speed P18.04 and the ACC time is P18.05;
- 4) When OPEN speed change signal is valid, shift to the set speed P18.06 and the ACC time is P18.07; (if P18.17=0, go to the next step)
- When OPEN speed change timing P18.15 arrives, shift to the set speed P18.08 and the ACC time is P18.09;
- 6) When OPEN limit signal is valid, shift to the set speed P18.10 and the ACC time is P00.08;
- When OPEN arrival wait time P18.10 reaches, shift to the stage of torque hold. The set speed is P18.12 and the torque hold is P18.13.

#### 6.2.4 CLOSE operation curve in speed control mode



Figure 6-4 CLOSE operation curve in speed control mode

Instruction of CLOSE process in speed control mode:

- When CLOSE command is valid, the elevator door runs at the set speed P19.00 and the ACC time is P19.01;
- When OPEN limit signal becomes from valid to invalid, shift to the set speed P19.02 and the ACC time is P19.03; (if P19.18=0, go to the next step)
- When OPEN limit separation timing P19.18 arrives, shift to the set speed P19.04 and the ACC time is P19.05;
- When CLOSE speed change signal is valid, shift to the set speed P19.06 and the ACC time is P19.07; (if P19.12=0, go to the next step)
- When CLOSE speed change timing P19.15 arrives, shift to the set speed P19.08 and the ACC time is P19.09;

- When CLOSE limit signal is valid, shift to the set speed P19.10 and the ACC time is P00.08;
- When CLOSE arrival wait time P19.10 reaches, shift to the stage of torque hold. The set speed is P19.13 and the torque hold is P19.14.

### 6.3 Distance control mode 1

The distance control mode needs to install the encoder on the elevator door and the controller judges door position by encoder counting. At first running, the mode needs autotuning door width pulse number and realizes deceleration and arrival processing at decelerating point by setting the parameters of OPEN/CLOSE curve. The distance control mode 1 needs to install OPEN/CLOSE limit switch and autotunes door width pulse number between two switches at door width autotuning.

#### 6.3.1 Wiring instruction in distance control mode 1



Figure 6-5 Wiring instruction in distance control mode 1

### 6.3.2 Encoder setting

Firm installation and reliable wiring;

2) Correct parameters setting, including pulse number and direction

#### Door width autotuning

The distance control mode needs door width autotuning before operation. In OPEN/CLOSE process under distance control, record the running pulse number at real time and combine with the data of door width pulse for OPEN/CLOSE arrival control and judgment.

During door width autotuning, the direction of the door will change automatically, so ensure personal safety before any operation. Please make sure OPEN/CLOSE limit switch can work normally according to OPEN/CLOSE limit signal arrival; if the switch is abnormal, the door width cannot be measured. The steps of measuring door width are:

- Set P00.01=1 (distance control mode 1), P00.02 = 2 (automatic control mode);
- Set P20.00=1, enable door width autotuning;

 After keypad reference operation signal, door width autotuning starts. Carry out door width pulse autotuning in the sequence of CLOSE->OPEN->CLOSE. After autotuning, door width pulse number will be restored in P20.07 and P20.08.

Note: Select appropriate speed for door width autotuning, too large easy strike, too small lack of force. Meanwhile, setting proper arrival torque detection (P18.14) can ensure the force is suitable for normal operation of the elevator door and avoid it is too large to detect arrival.

6.3.3 Function	parameters setting

Function code	Name	Setting value
P00.00	Control mode	1: SVC 2: SVPWM (arbitrary setting)
P00.01	OPEN/CLOSE control mode	0: Distance control mode 1
P00.02	Elevator door control mode	1: Terminal control mode (LED flickering)

### 6.3.4 OPEN operation curve in distance control mode 1



Figure 6-6 OPEN operation curve in distance control mode 1

Instruction of OPEN process in distance control mode 1:

- When OPEN command is valid, the elevator door runs at the set speed P18.00 and the ACC time is P18.01;
- When door position pulse number is larger than P20.10, shift to the set speed P18.02 and the ACC time is P18.03;
- When door position pulse number is larger than P20.11, shift to the set speed P18.04 and the ACC time is P18.05;
- When door position pulse number is larger than P20.12, shift to the set speed P18.06 and the ACC time is P18.07;
- 5) When door position pulse number is larger than P20.13, shift to the set speed P18.08 and the

ACC time is P18.09;

- When door position pulse number is larger than P20.14, shift to the set speed P18.10 and the ACC time is P00.08;
- When OPEN arrival wait time P18.10 reaches, shift to the stage of torque hold. The set speed is P18.12 and the torque hold is P18.13.

#### 6.3.5 CLOSE operation curve in distance control mode 1



Figure 6-7 CLOSE operation curve in distance control mode 1

Instruction of CLOSE process in distance control mode 1:

- When CLOSE command is valid, the elevator door runs at the set speed P19.00 and the ACC time is P19.01;
- When door position pulse number is smaller than P20.15, shift to the set speed P19.02 and the ACC time is P19.03;
- When door position pulse number is smaller than P20.16, shift to the set speed P19.04 and the ACC time is P19.05;
- When door position pulse number is smaller than P20.17, shift to the set speed P19.06 and the ACC time is P19.07;
- When door position pulse number is smaller than P20.18, shift to the set speed P19.08 and the ACC time is P19.09;
- When door position pulse number is smaller than P20.09, shift to the set speed P19.10 and the ACC time is P00.08;
- When CLOSE arrival wait time P19.10 reaches, shift to the stage of torque hold. The set speed is P19.13 and the torque hold is P19.14.

### 6.4 Distance control mode 2

The distance control mode needs to install the encoder on the elevator door and the controller judges door position by encoder counting. At first operation, the mode needs autotuning door width pulse number and realizes deceleration and arrival processing at decelerating point by setting the parameters of OPEN/CLOSE curve. The distance control mode 2 does not need to install OPEN/CLOSE limit switch and autotunes door width pulse number between OPEN and CLOSE arrival at door width autotuning.

### 6.4.1 Wiring instruction in distance control mode 2





### 6.4.2 Encoder setting

The same as distance control mode 1

#### 6.4.3 Door width autotuning

Distance control mode 2 also needs to autotune door width at first. The limit switches are not installed, the arrival is based on detecting arrival torque, so ensure there are no obstacles during door width autotuning. Except that, mode 2 is the same with mode 1.

Function code	Name	Setting value
P00.00	Control mode	1: SVC 2: SVPWM (set freely)
P00.01	OPEN/CLOSE control mode	0: Distance control mode 2
P00.02	Elevator door control mode	1: Terminal control mode (LED flickering)

#### 6.4.4 Function parameters setting

### 6.4.5 OPEN operation curve in distance control mode 2



Figure 6-9 OPEN operation curve in distance control mode 2

Instruction of OPEN process in distance control mode 2:

- When OPEN command is valid, the elevator door runs at the set speed P18.00 and the ACC time is P18.01;
- When door position pulse number is larger than P20.10, shift to the set speed P18.02 and the ACC time is P18.03;
- When door position pulse number is larger than P20.11, shift to the set speed P18.04 and the ACC time is P18.05;
- When door position pulse number is larger than P20.12, shift to the set speed P18.06 and the ACC time is P18.07;
- When door position pulse number is larger than P20.13, shift to the set speed P18.08 and the ACC time is P18.09;
- When door position pulse number is larger than P20.14, shift to the set speed P18.10 and the ACC time is P00.08;
- When OPEN arrival wait time P18.10 reaches, shift to the stage of torque hold. The set speed is P18.12 and the torque hold is P18.13.

#### 6.4.6 CLOSE operation curve in distance control mode 2



Figure 6-10 CLOSE operation curve in distance control mode 2

Instruction of CLOSE process in distance control mode 2:

- When CLOSE command is valid, the elevator door runs at the set speed P19.00 and the ACC time is P19.01;
- When door position pulse number is smaller than P20.15, shift to the set speed P19.02 and the ACC time is P19.03;
- When door position pulse number is smaller than P20.16, shift to the set speed P19.04 and the ACC time is P19.05;
- When door position pulse number is smaller than P20.17, shift to the set speed P19.06 and the ACC time is P19.07;
- When door position pulse number is smaller than P20.18, shift to the set speed P19.08 and the ACC time is P19.09;
- When door position pulse number is smaller than P20.09, shift to the set speed P19.10 and the ACC time is P00.08;
- 7) When CLOSE arrival wait time P19.10 reaches, shift to the stage of torque hold. The set speed is P19.13 and the torque hold is P19.14.

### 6.5 CLOSE obstruction

CLOSE obstruction refers to the following several states during CLOSE operation. For example, if light screen (elevator safety protection device)/touch board signal is valid and the output torque is larger than CLOSE obstruction torque, EC20 controller will re-open the door after CLOSE obstruction. There are many ways to judge CLOSE obstruction, such as time, torque and slip (distance control mode), shown as follows:

Current detection: by contrast of OPEN/CLOSE torque current and obstruction torque; Slip detection: slip during OPEN/CLOSE operation (only valid in distance control mode) Time detection: valid time of OPEN/CLOSE signal; Safety sensor detection: detect whether there is any obstacles by sensor.

#### 6.5.1 CLOSE obstruction process



Figure 6-11 CLOSE obstruction

Note: In speed control mode, when CLOSE limit signal is valid, there will be no CLOSE obstruction detection; in distance control mode, when the door position is larger than CLOSE arrival position, there will be no CLOSE obstruction detection.

#### 6.5.2 Common commissioning problems

- Encoder offline fault (ENC10): if the distance control mode 1 and 2 start, alarm "ENC10". Check whether the cables of the encoder are connected, including encoder voltage signal, A and B pulse signals.
- Encoder reverse fault (ENC1D): if the distance control mode 1 and 2 start, alarm "ENC1D". Check whether the A and B signal cables are connected properly and ensure the A and B signals of the encoder are connected to the A and B signals of the controller.
- At CLOSE operation, the elevator door has crashes. Adjust the operation curves of the elevator door, reduce CLOSE speed, P19.06 and P19.08.
- 4. Too large CLOSE obstruction torque (when obstructed, the thrust of the elevator door is so large that passengers may be easily nipped by the door). In speed control mode, suggest judging CLOSE obstruction by torque obstruction. When the obstruction torque is too large, adjust CLOSE obstruction torque and CLOSE obstruction judgment time and reduce P19.15 and P19.16.
- At CLOSE, the elevator door closes and then open: CLOSE obstruction misjudgment, increase time and judgment coefficient (torque obstruction: P19.15, P19.16; slip obstruction: P19.20, P19.21, P19.22, P19.23; current obstruction: P19.24, P19.25, P19.26, P19.27, P19.28)
- 6. The elevator door cannot open or close smoothly: the operation curves are set improperly. OPEN stuck: adjust P18.00, P18.02, P18.04, P18.06, P18.08 and set speed continuously, neither too high nor too low. CLOSE stuck: adjust P19.00, P19.02, P19.04, P19.06, P19.08 and set speed continuously, neither too high nor too low.
- 7. There is gap after CLOSE arrival: increase P19.14 and arrival hold torque.

# 7 Fault

## 7.1 Fault prevention

The chapter contains preventive maintenance instructions of the controller.

#### 7.1.1 Maintenance intervals

If installed in an appropriate environment, the controller requires very little maintenance. The table lists the routine maintenance intervals recommended by INVT. For more information about maintenance, please contact with us.

Che	cking	ltem	Method	Criterion	
		Check the ambient temperature,			
		humidity and vibration and	Visual examination	Conforming to the	
		ensure there is no dust, gas, oil	and instrument test	manual	
Ambient e	nvironment	fog or water drop.			
		Ensure there are no tools or			
		other foreign or dangerous	Visual examination	depressue chieste	
		objects.		dangerous objects.	
1/-1		Ensure the main circuit and	Measure with	Conforming to the	
VOI	lage	control circuit are normal.	multimeter	manual	
		Ensure the display is clear	Vieual exemination	The characters are	
Ka	mod	enough.	visual examination	displayed normally.	
Rey	/pau	Ensure the characters are	\/:	Conforming to the	
		displayed totally.	visual examination	manual	
		Ensure the screws are tightened	<b>T</b> 1.	NA	
		securely.	ngnien up	NA .	
		Ensure there is no distortion,			
		crackles, damage or			
		color-changing caused by	Visual examination	NA	
		overheat and aging to the			
	For public	machine.			
Main	use			NA	
circuit				Note: If the color of	
		Ensure there is no dust or		copper blocks	
		dirtinese	Visual examination	changes, it does not	
		untiness		mean there is	
					something wrong
				with the features.	
	Lead of	Ensure that there is no distortion	Visual examination	NA	
	conductors	or color-changing caused by	visual examination	110	

Checking		ltem	Method	Criterion
		overheat to the conductors.		
		Ensure that there are no		
		crackles or color-changing to	Visual examination	NA
		the protective layers.		
	Terminals seat	Ensure that there is no damage.	Visual examination	NA
		Ensure that there is no leakage,		
		color-changing, crackles or	Visual examination	NA
		casing expansion.		
			Estimate the life time	
		Encure the cofety value is in the	according to the	
	Filter	right place	maintenance or	NA
	capacitors	ngni piaco.	measure the	
			electrostatic capacity	
				The capacity is
		If necessary, measure the electrostatic capacity.	Measure the capacity by instrument	above or equal to
				the original value
				*0.85.
	Resistors	Ensure whether there is	Smelling and visual	NA
		replacement and splitting	examination	
		caused by overheat.		
		Ensure that there is no offline. Visual examination of the second	Visual examination or remove one end to	The resistance is in ±10% of the standard value
			coagulate or measure with multimeter	
	Transformer	Ensure there is no abnormal	Hearing, smelling and	NA
	and reactor	vibration, noise or smelling	visual examination	
	Electro-	Ensure whether there is		
Electro-		vibration noise in the	Hearing	NA
	contactor	workrooms.		
	and relay	Ensure the contact is in good connection.	Visual examination	NA
		Ensure there are no loose	Tightan un	NIA
Control	PCB and	screws or contactors.	ngnien up	
circuit	plug	Ensure there is no smelling or color-changing.	Smelling and visual examination	NA
		Ensure there are no crackles	Visual examination	NA

Checking		ltem	Method	Criterion
		damage, distortion or rust.		
			Visual examination or	
		Enguro thoro io no lookogo or	estimate the life time	
		distortion to the conscitute	according to the	NA
		distortion to the capacitors.	maintenance	
			information	
		Estimate whether there is	Hearing and Visual	
	Cooling fan	abnormal poise and vibration	examination or rotate	Stable rotation
		abhormarnoise and vibration.	with hand	
		Estimate there is no loose	Tighten un	NA
		screws.	nginen up	NA .
Cooling			Visual examination or	
system		Ensure there is no	estimate the life time	
system		color-changing caused by	according to the	NA
		overheat.	maintenance	
			information	
	Ventilating	Ensure whether there is no stuff		
	ventilating	or foreign objects in cooling fan,	Visual examination	NA
	udel	air inlet and air vent.		

### 7.1.2 Cooling fan

The controller's cooling fan has a minimum life span of 25,000 operating hours. The actual life span depends on the controller usage and ambient temperature.

The operating hours can be found through P07.14.

Fan failure can be predicted by the increasing noise from the fan bearings. If the controller is operated in a critical part of a process, fan replacement is recommended once these symptoms appear. Spare fans are also available.



Read and follow the instructions in chapter Safety Precautions. Ignoring the instructions would cause physical injury or death, or damage to the equipment.

1. Stop the controller and disconnect it from the AC power source and wait for at least the time designated on the controller.

- 2. Loosen the fan cable from the clip.
- 3. Disconnect the fan cable.
- 4. Remove the fan with screwdriver.
- 5. Install the new fan in the controller, put the fan cables in the clip and then fix the controller well.
- 6. Connect the power supply.

#### 7.1.3 Capacitors

#### Capacitors reforming

Fault

Time	Operational principle	
Storing time less than 1 year	Operation without charging	
Storing time 1-2 years	Connect with the power for 1 hour before first ON command	
Storing time 2-3 years	Use voltage-adjusting power supply to charge the controller • charging 25% rated voltage for 30 minutes • charging 50% rated voltage for 30 minutes • charging 75% rated voltage for 30 minutes • charging 100% rated voltage for 30 minutes	
Storing time more than 3 years	Use voltage-adjusting power supply to charge the controller • charging 25% rated voltage for 2 hours • charging 50% rated voltage for 2 hours • charging 75% rated voltage for 2 hours • charging 100% rated voltage for 2 hours	

Use voltage-adjusting power supply to charge the controller:

The right selection of the voltage-adjusting power supply depends on the supply power of the controller. The single-phase 220V AC/2A voltage regulator is applied to single/three-phase 220V AC controller. The single/three-phase controller can apply single-phase voltage-adjusting power supply for charging. All DC bus capacitors can charge at the same time because there is one rectifier.

High-voltage controller needs enough voltage during charging. The small capacitor power (2A is enough) can be used because the capacitor nearly does not need current when charging.

#### Change electrolytic capacitors



Read and follow the instructions in chapter Safety Precautions. Ignoring the instructions would cause physical injury or death, or damage to the equipment.

Change electrolytic capacitors if the working hours of electrolytic capacitors in the controller are above 35,000. Please contact with the local offices or dial our national service hotline (400-700-9997) for detailed operation.

### 7.1.4 Power cable



Read and follow the instructions in chapter Safety Precautions. Ignoring the instructions would cause physical injury or death, or damage to the equipment.

1. Stop the drive and disconnect it from the power line. Wait for at least the time designated on the controller.

2. Check the tightness of the power cable connections.

3. Connect the power supply.

### 7.2 Troubleshooting



Only qualified electricians are allowed to maintain the inverter. Read the safety instructions in Safety precautions before working on the inverter.

#### 7.2.1 Alarm and fault indications

Fault is indicated by LEDs. See **Operation procedure**. When TRIP light is on, an alarm or fault message on the keypad display indicates abnormal controller state. P07.27~P07.32 record current 6 times fault types. P07.33~P07.40, P07.41~P07.48 and P07.49~P07.56 record the operation data of the controller for current 3 times at fault. Using the information given in this chapter, most alarm and fault cause can be identified and corrected. If not, contact with the INVT office.

#### 7.2.2 Fault reset

The controller can be reset by pressing the keypad key STOP/RST, through digital input, or by switching the power light. When the fault has been removed, the motor can be restarted.

#### 7.2.3 Fault instruction and solution

Do as the following after the controller fault:

1. Check to ensure there is nothing wrong with the keypad. If not, please contact with the local INVT office.

2. If there is nothing wrong, please check P07 and ensure the corresponding recorded fault parameters to confirm the real state when the current fault occurs by all parameters.

3. See the following table for detailed solution and check the corresponding abnormal state.

4. Eliminate the fault and ask for relative help.

Code	Fault	Cause	Solution
0)/1	Accelerating		1. Check the input power
001	overvoltage		2. Check if the DEC time of the load
01/0	Decelerating	1. The input voltage is abnormal.	is too short or the inverter starts
002	overvoltage	2. There is large energy	during the rotation of the motor or it
		feedback.	needs to increase the energy
		3. No braking components.	consumption components.
OV3	Constant overvoltage	4. Braking energy is not open	3. Install the braking components.
			4. Check the setting of relative
			function codes.
01.144	IGBT U phase	The acceleration is too fast;	
OUti	protection	There is damage to the internal	Increase ACC time;
0.10	IGBT V phase	to IGBT of the phase;	Change the power unit;
Out2	protection	Interference causes faulty	Check the driving wires;
		action;	Check if there is strong interference
Out3	IGB1 W phase	The connection of the driving	to the external equipment
	protection	wires is not good;	

5. Check to eliminate the fault and carry out fault reset to run the controller.

Fault

Code	Fault	Cause	Solution
		The grounding is not good	
001	Accelerating	1. The acceleration or	
001	overcurrent	deceleration is too fast.	1. Increase the ACC/DEC time
0.00	Decelerating	2. The voltage of the grid is too	2. Check the input power
Code OC1 OC2 OC3 UV UV	overcurrent	low.	3. Select the controller with a larger
		3. The power of the inverter is	power
		too low.	4. Check if the load is short
		4. The load transients or is	circuited (the grounding short
		abnormal.	circuited or the wire short circuited)
		5. The grounding is short	or the rotation is not smooth.
OC3	Constant overcurrent	circuited or the output is phase	5. Check the output configuration.
		loss.	<ol><li>Check if there is strong</li></ol>
		<ol><li>There is strong external</li></ol>	interference.
		interference.	7. Check the setting of relative
		7. The overvoltage stall	function codes.
		protection is not open.	
		1. The voltage of the power	1. Check the input power of the
	Bus undervoltage fault	supply is too low.	supply line.
00		2. The overvoltage stall	2. Check the setting of relative
		protection is not open.	function codes.
		The voltage of the power supply	
		is too low;	Check the power of the supply line;
011	Motor overlaad	The setting of motor rated	Reset the rated current of the motor
OLI	WOUT Overload	current is incorrect;	Check the load and adjust the
		The motor stall or load transients	torque lift
		is too strong	
		The acceleration is too fast;	Increase the ACC time:
		Reset the rotating motor;	Avoid the restarting after stopping:
		The voltage of the power supply	Check the power of the supply line:
OL2	Inverter overload	is too low;	Select an inverter with bigger
		The load is too heavy;	power:
		The motor power is much larger	Select a proper motor
		than load power	
SPI	Input phase loss	Large fluctuation	Check input power;
351	Input phase loss	Large nucluation	Check installation distribution
SPO		U, V, W phase loss output (or	Check the output distribution;
300	Output phase loss	three phases of the load are	Check the motor and cable

Fault

Code	Fault	Cause	Solution
		seriously asymmetrical)	
OH1	Rectifying module overheat	Air duct jam or fan damage; Ambient temperature is too high;	Dredge the air duct or change the
OH2	Converter module overheat	The time of overload running is too long	ran; Low the ambient temperature
EF	External fault	SI external fault input terminals action	Check the external device input
CE	485 communication fault	The baud rate setting is incorrect; Fault occurs to the communication wiring; The communication address is wrong; There is strong interference to the communication	Set proper baud rate; Check the communication connection distribution; Set proper communication address; Change or replace the connection distribution or improve the anti-interference capability
ltE	Current detection fault	The connection of the control board is not good; Hoare component is broken; The modifying circuit is abnormal	Check the connector and repatch; Change the Hoare; Change the main control board
tE	Motor autotuning fault	The motor capacity does not comply with the inverter capacity; The rated parameter of the motor does not set correctly; The offset between the parameters from autotune and the standard parameter is huge; Autotune overtime	Change the inverter model; Set the rated parameter according to the motor name plate; Empty the motor load and reidentify; Check the motor connection and set the parameter; Check if the upper limit frequency is above 2/3 of the rated frequency
EEP	EEPROM operation fault	Error of controlling the write and read of the parameters; Damage to EEPROM	Press STOP/RST to reset; Change the main control board
bcE	Braking unit fault	Braking circuit fault or damage to the braking pipes; The external braking resistor is not sufficient	Check the braking unit and change new braking pipes; Increase the braking resistor
END	Running time arrival	The actual running time of the inverter is above the internal	Ask for the supplier and adjust the setting running time

Code	Fault	Cause	Solution
		setting running time	
OL3	Electrical overload	The inverter will report overload pre-alarm according to the set value	Check the load and the overload pre-alarm point
PCE	Keypad communication fault	The connection of the keypad wires is not good or broken; The keypad wire is too long and affected by strong interference; There is circuit fault on the communication of the keypad and main board	Check the keypad wires and ensure whether there is mistake; Check the environment and avoid the interference source; Change the hardware and ask for service
UPE	Parameters uploading fault	The connection of the keypad wires is not good or broken; The keypad wire is too long and affected by strong interference; Communication fault	Check the environment and eliminate interference source; Change the hardware and ask for service; Change the hardware and ask for service;
DNE	Parameters downloading fault	The connection of the keypad wires is not good or broken; The keypad wire is too long and affected by strong interference; There is mistake on the data storage of the keypad	Check the environment and eliminate interference source; Change the hardware and ask for service; Repack up the data in the keypad
E-CAN	CANopen communication fault	The connection is not good; Corresponding resistor is not dialed; The communication baud rate is uneven; The ambient interference is too strong	Check the connection; Draw out the corresponding resistor; Set the same baud rate; Check the environment and avoid the interference
ETH1	Grounding shortcircuit fault 1	The output of the inverter is short circuited with the ground; There is fault in the current detection circuit	Check if the connection of the motor is normal or not; Change the Hoare; Change the main control board
ETH2	Grounding shortcircuit fault 2	The output of the inverter is short circuited with the ground; There is fault in the current	Check if the connection of the motor is normal or not; Change the Hoare:

Code	Fault Cause		Solution			
		detection circuit	Change the main control board			
ENC10	Encoder offline fault	Encoder signal cable offline; Encoder damage	Check the wiring of the encoder and reconnect; Check encoder output			
ENC1D	Encoder reverse fault	Encoder is not connected or damaged or inverter wiring is wrong	Check the wiring of the encoder and reconnect			
dEu	Speed deviation fault	The load is too heavy or stalled	Check the load and ensure it is normal; Increase the detection time; Check whether the control parameters are normal			
STo	Maladjustment fault	The control parameter of the synchronous motor is not set right; The autotuning parameter is not correct; The inverter is not connected to the motor	Check the load and ensure it is normal; Check whether the control parameter is set properly or not; Increase the maladjustment detection time			
LL	Electronic underload fault	The inverter will report the underload pre-alarm according to the set value	Check the load and the underload pre-alarm point			
E_ds	Limit switch signal exception	The door-opening limit switch and door-closing limit switch act simultaneously.	Check both switches to determine which one malfunctions or is damaged.			

## 7.2.5 Other faults

Code	Fault	Cause	Solution		
PoFF	System power failure	The system is power-off or the	Check the environment of the power		
		bus voltage is too low	supply		

# Appendix A Technical data

# A.1 Ratings

### A.1.1 Capacity

Controller sizing is based on the rated motor current and power. To achieve the rated motor power given in the table, the rated current of the controller must be higher than or equal to the rated motor current. Also the rated power of the controller must be higher than or equal to the rated motor power. The power ratings are the same regardless of the supply voltage within one voltage range.

#### Note:

 The maximum allowed motor shaft power is limited to 1.5\*PN. If the limit is exceeded, motor torque and current are automatically restricted. The function protects the input bridge of the drive against overload.

2. The ratings apply at ambient temperature of 40°C.

3. It is important to check that in common DC systems the power flowing through the common DC connection does not exceed PN.

### A.1.2 Derating

The load capacity decreases if the installation site ambient temperature exceeds 40°C, the altitude exceeds 1000 meters or the switching frequency is changed from 4kHz to 8, 12 or 15kHz.

#### A.1.2.1 Temperature derating

In the temperature range +40°C...+50°C, the rated output current is decreased by 1% for every additional 1°C. Refer to the below list for the actual derating.



### A.1.2.2 Altitude derating

The device can output rated power if the installation site below 1000m. The output power decreases if the altitude exceeds 1000 meters. Below is the detailed decreasing range of the derating:



## A.2 CE

### A.2.1 CE marking

The CE mark is attached to the drive to verify that the drive follows the provisions of the European Low Voltage (2006/95/EC) and EMC Directives (2004/108/EC).

#### A.2.2 Compliance with the European EMC Directive

The EMC Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. The EMC product standard (EN 61800-3:2004) covers requirements stated for drives. See section EMC regulations

### A.3 EMC regulations

EMC product standard (EN 61800-3:2004) contains the EMC requirements to the controller.

First environment: domestic environment (includes establishments connected to a low-voltage network which supplies buildings used for domestic purposes).

Second environment includes establishments connected to a network not directly supplying domestic premises.

Four categories of the controller:

Controller of category C1: controller of rated voltage less than 1000V and used in the first environment.

Controller of category C2: controller of rated voltage less than 1000V other than pins, sockets and motion devices and intended to be installed and commissioned only by a professional electrician when used in the first environment.

Note: IEC/EN 61800-3 in EMC standard doesn't limit the power distribution of the controller, but it defines the upstage, installation and commission. The professional electrician has necessary skills in installing and/or commissioning power drive systems, including their EMC aspects.

Controller of category C3: controller of rated voltage less than 1000V and used in the second environment other than the first one

Controller of category C4: controller of rated voltage more than 1000V or the nominal current is above or equal to 400A and used in the complicated system in second environment

### A.3.1 Category C2

The emission limits are complied with the following provisions:

1. The optional EMC filter is selected according to the options and installed as specified in the EMC filter manual.

2. The motor and control cables are selected as specified in this manual.

3. The drive is installed according to the instructions given in this manual.

 In a domestic environment, this product may cause radio inference, in which case supplementary mitigation measures may be required.

### A.3.2 Category C3

The immunity performance of the drive complies with the demands of IEC/EN 61800-3, second environment.

The emission limits are complied with the following provisions:

1. The optional EMC filter is selected according to the options and installed as specified in the EMC filter manual.

2. The motor and control cables are selected as specified in this manual.

3. The drive is installed according to the instructions given in this manual.

A drive of category C3 is not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference is expected if the drive is used on such a network.

# **Appendix B Dimension drawings**

Dimension drawings of EC20 are shown below. The dimensions are given in millimeters.

## B.1 External keypad (optional) structure



The external keypad can be mounted on the installation bracket and the bracket is optional.



# **B.2 Controller chart**





Wall mounting (unit: mm)

Model	W1	W2	H1	H2	D1	D2	Installation hole(d)
EC20-0R4G-S2	80.0	60.0	160.0	150.0	123.5	120.3	5
EC20-0R7G-S2	80.0	60.0	160.0	150.0	123.5	120.3	5







Rail mounting (unit: mm)

Model	W1	H1	H3	H4	D1	D2	Installation hole(d)
EC20-0R4G-S2	80.0	160.0	35.4	36.6	123.5	120.3	5
EC20-0R7G-S2	80.0	160.0	35.4	36.6	123.5	120.3	5
# Appendix C Peripheral options and parts

This chapter describes how to select the options and parts of EC20 series.

# C.1 Peripheral wiring

Below is the peripheral wiring of EC20 series controllers.



Pictures	Name	Descriptions
	External keypad	Including the external keypads with and without the
LLLL		function of parameter copying.
0		When the external keypad with the function of parameter
$\frac{ \mathbf{x}_{i} }{ \mathbf{x}_{i} } = \frac{ \mathbf{x}_{i} }{ \mathbf{x}_{i} } = $		copying is valid, the local keypad is off; when the external
		keypad without the function of parameter copying is valid,
		the local and external keypads are on at the same time.
	Cables	Device to transfer the electronic signals
		Prevent from electric shock and protect the power supply
	Breaker	and the cables system from overcurrent when short
		circuits occur. (Please select the breaker with the function
		of reducing high order harmonic and the rated sensitive

Pictures	Name	Descriptions
		current to 1 controller should be above 30mA).
	Input filter	Control the electromagnetic interference generated from the controller, please install close to the input terminal side of the controller.
	Braking resistors	Shorten the DEC time. Only braking resistors are needed for EC20 controllers.
0	Output filter	Control the interference from the output side of the controller and please install close to the output terminals of the controller.
	Membrane of heat	Apply to severe environment and improve protective
	releasing holes at	effect.
	the side	Derate 10% of the machine.

## C.2 Power supply



Check that the voltage degree of the controller complies with the voltage of the supply power voltage.

## C.3 Cables

## C.3.1 Power cables

Dimension the input power and motor cables according to local regulations.

Note: A separate PE conductor is required if the conductivity of the cable shield is not sufficient for the purpose.

### C.3.2 Control cables

All analog control cables and the cable used for the frequency input must be shielded.

The relay cable needs the cable type with braided metallic screen.

Note: Run analog and digital signals in separate cables.

Check the insulation of the input power cable according to local regulations before connecting to the drive.

Model	Recommended cable size (mm²)		Connecting cable size (mm <sup>2</sup> )				Terminal	Tightening
	RST UVW	PE	RST UVW	P1, (+)	PB (+), (-)	PE	screw	torque (Nm)
EC20-0R4G-S2	1.5	1.5	1~4	1~4	1~4	1~4	M4	0.8
EC20-0R7G-S2	1.5	1.5	1~4	1~4	1~4	1~4	M4	0.8

#### Note:

1. It is appropriate to use the recommended cable size under 40°C and rated current. The wiring distance should be no more than 100m.

2. Terminals (+) and PB connects the braking resistors.

Where control cables must cross power cables make sure that they are arranged at an angle as near to 90 degrees as possible.

Moisture inside the motor casing will reduce the insulation resistance. If moisture is suspected, dry the motor and repeat the measurement.

## C.4 Breaker and electromagnetic contactor

It is necessary to add fuse for the avoidance of overload.

It is appropriate to use a breaker (MCCB) which complies with the controller power in the 3-phase AC power and input power and terminals. The capacity of the controller should be 1.5-2 times of the rated current.



Due to the inherent operating principle and construction of circuit breakers, independent of the manufacturer, hot ionized gases may escape from the breaker enclosure in case of a short-circuit. To ensure safe use, special attention must be paid to the installation and placement of the breakers. Follow the manufacturer's instructions.

It is necessary to install the electromagnetic contactor in the input side to control the switching on and off safety of the main circuit. It can switch off the input power supply when system faults.

Model	Fuse (A)	Breaker (A)	The rated working current of the contactor (A)
EC20-0R4G-S2	16	16	10
EC20-0R7G-S2	16	16	16

## C.6 Filters

### C.6.1 C3 Filter type instruction

C3 filers are optional for EC20 series controllers.

The input interference filter can decrease the interference of the controller to the surrounding equipments.

Output interference filter can decrease the radio noise cause by the cables between the controller and the motor and the leakage current of the conducting wires.

Our company configured some filters for the convenient of the users.

Model	Input filter	
EC20-0R4G-S2		
EC20-0R7G-S2	FLT-PS2003L-C-G	

#### Note:

1. The input EMI meet the requirement of C3 after adding input filters.

2. Above options are external, the customer should indicate when purchasing.

## C.6.2 C2 Filter type instruction

Model	Input filter	Output filter
EC20-0R4G-S2	FLT-PS2010H-B	FLT-L02010H-B
EC20-0R7G-S2	FLT-PS2010H-B	FLT-L02010H-B

#### Note:

1. The input EMI meet the requirement of C2 after adding input filters.

2. Above options are external, the customer should indicate when purchasing.

## C.7 Braking components

#### C.7.1 Select the braking components

It is appropriate to use braking resistor or braking unit when the motor brakes sharply or the motor is driven by a high inertia load. The motor will become a generator if its actual rotating speed is higher than the corresponding speed of the reference frequency. As a result, the inertial energy of the motor and load return to the controller to charge the capacitors in the main DC circuit. When the voltage increases to the limit, damage may occur to the controller. It is necessary to apply braking unit/resistor to avoid this accident happens.

A	$\diamond$ Only qualified electricians are allowed to design, install, commission and operate on the controller.					
	$\diamond$ Follow the instructions in "warning" during working. Physical injury or death					
	or serious property may occur.					
	$\diamond$ Only qualified electricians are allowed to wire. Damage to the controller or					
<u> </u>	braking options and part may occur.					
	A Read carefully the instructions of braking resistors or units before A					
	connecting them with the controller.					
	$\diamond$ Do not connect the braking resistor with other terminals except for PB and					
	(+). Damage to the controller or braking circuit or fire may occur.					
	$\diamond$ Connect the braking resistor or braking unit with the controller according to					
	the diagram. Incorrect wiring may cause damage to the controller or other					
	devices.					

EC20 series controllers have internal braking units.

	- /	Braking resistor at	The consu	Min.		
Model	Type of braking unit	100% of the braking torque (Ω)	10% braking	50% braking	80% braking	braking resistor (Ω))
EC20-0R4G-S2	Internal	361	0.06	0.30	0.48	42
EC20-0R7G-S2	braking unit	192	0.11	0.56	0.90	42

#### Note:

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

2. The braking resistor may increase the braking torque of the controller. The resistor power in the above table is designed on 100% braking torque and 10%, 50% and 80% braking usage ratio. If the users need more braking torque, the braking resistor can decrease properly and the power needs to be magnified.

A	Never use a brake resistor with a resistance below the minimum value specified for the particular drive. The drive and the internal chopper are not able to handle the overcurrent caused by the low resistance.
$\wedge$	$\diamond$ Increase the power of the braking resistor properly in the frequent braking situation (the frequency usage ratio is more than 10%).

## C.7.2 Placing the brake resistor

Use shielded cables for braking resistor cables.

Install all resistors in a place where they will cool.



Only external braking resistor is needed in EC20. PB and (+) are the terminals of the braking resistor.



# **Appendix D Further information**

# **D.1 Product and service inquiries**

Address any inquiries about the product to your local INVT offices, quoting the type designation and serial number of the unit in question. A listing of INVT sales, support and service contacts can be found by navigating to <u>www.invt.com.cn</u>.

# D.2 Feedback of INVT controllers manuals

Your comments on our manuals are welcome. Go to <u>www.invt.com.cn</u> and select Online Feedback of Contact Us.

## D.3 Document library on the internet

You can find manuals and other product documents in PDF format on the Internet. Go to <u>www.invt.com.cn</u> and select Service and Support of Document Download.



Service line:86-755-86312859 Webs

Website:www.invt.com

The products are owned by Shenzhen INVT Electric Co.,Ltd. Two companies are commissioned to manufacture: (For product code, refer to the 2nd/3rd place of S/N on the name plate.)

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