



# Operation Manual

## EC20 Elevator Door Controller



# Content

|  |           |
|--|-----------|
| <b>1 Safety precautions</b> .....                    | <b>2</b>  |
| 1.1 Safety definition .....                          | 2         |
| 1.2 Warning symbols .....                            | 2         |
| 1.3 Safety guidelines .....                          | 3         |
| <b>2 Product overview</b> .....                      | <b>5</b>  |
| 2.1 Quick start-up .....                             | 5         |
| 2.2 Product specification .....                      | 7         |
| 2.3 Name plate .....                                 | 8         |
| 2.4 Type designation key .....                       | 8         |
| 2.5 Rated specifications .....                       | 9         |
| 2.6 Structure diagram .....                          | 9         |
| <b>3 Installation guidelines</b> .....               | <b>10</b> |
| 3.1 Mechanical installation .....                    | 10        |
| 3.2 Standard wiring .....                            | 12        |
| 3.3 Layout protection .....                          | 14        |
| <b>4 Keypad operation procedure</b> .....            | <b>16</b> |
| 4.1 Keypad introduction .....                        | 16        |
| 4.2 Keypad displaying .....                          | 18        |
| 4.3 Keypad operation .....                           | 19        |
| <b>5 Function parameters</b> .....                   | <b>21</b> |
| <b>6 Commissioning instruction</b> .....             | <b>51</b> |
| 6.1 Running commissioning .....                      | 51        |
| 6.2 Speed control mode .....                         | 51        |
| 6.3 Distance control mode 1 .....                    | 54        |
| 6.4 Distance control mode 2 .....                    | 56        |
| 6.5 CLOSE obstruction .....                          | 59        |
| <b>7 Fault</b> .....                                 | <b>61</b> |
| 7.1 Fault prevention .....                           | 61        |
| 7.2 Troubleshooting .....                            | 65        |
| <b>Appendix A Technical data</b> .....               | <b>71</b> |
| A.1 Ratings .....                                    | 71        |
| A.2 CE .....   | 72        |
| A.3 EMC regulations .....                            | 72        |
| <b>Appendix B Dimension drawings</b> .....           | <b>74</b> |
| B.1 External keypad (optional) structure .....       | 74        |
| B.2 Controller chart .....                           | 75        |
| <b>Appendix C Peripheral options and parts</b> ..... | <b>76</b> |
| C.1 Peripheral wiring .....                          | 76        |
| C.2 Power supply .....                               | 77        |
| C.3 Cables .....                                     | 77        |
| C.4 Breaker and electromagnetic contactor .....      | 78        |
| C.6 Filters .....                                    | 78        |
| C.7 Braking components .....                         | 79        |
| <b>Appendix D Further information</b> .....          | <b>81</b> |

# 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





|                                |  |
|--------------------------------|--|
| <b>Danger:</b>                 | Serious physical injury or even death may occur if not follow relevant requirements  |
| <b>Warning:</b>                | Physical injury or damage to the devices may occur if not follow relevant requirements   |
| <b>Note:</b>                   | Physical hurt may occur if not follow relevant requirements  |
| <b>Qualified electricians:</b> | People working on the device should take part in professional electrical and 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    |    |
|  Warning   | 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                 |  |
|  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

|  | <ul style="list-style-type: none"> <li>✧ Only qualified electricians are allowed to operate on the controller.</li> <li>✧ Do not carry out any wiring and inspection or changing components when the power supply is applied. Ensure all input power supply is disconnected before wiring and checking and always wait for at least the time designated on the controller or until the DC bus voltage is less than 36V. Below is the table of the wait time:</li> </ul> |                   |  |                   |          |             |
|--|---|-------------------|--|-------------------|----------|-------------|
|  | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="background-color: #cccccc;">Controller module</th> <th style="background-color: #cccccc;">Minimum wait time</th> </tr> </thead> <tbody> <tr> <td style="width: 33%;">1PH 220V</td> <td style="width: 33%;">0.4kW-2.2kW</td> <td style="width: 33%;">5 minutes</td> </tr> </tbody> </table>   | Controller module |  | Minimum wait time | 1PH 220V | 0.4kW-2.2kW |
| Controller module  |   | Minimum wait time |  |                   |          |             |
| 1PH 220V   | 0.4kW-2.2kW   | 5 minutes         |  |                   |          |             |
|  | <ul style="list-style-type: none"> <li>✧ Do not refit the controller unauthorized; otherwise fire, electric shock or other injury may occur.</li> </ul>   |                   |  |                   |          |             |
|  | <ul style="list-style-type: none"> <li>✧ The base of the radiator may become hot during running. Do not touch to avoid hurt.</li> </ul>   |                   |  |                   |          |             |
|  | <ul style="list-style-type: none"> <li>✧ The electrical parts and components inside the controller are electrostatic. Take measurements to avoid electrostatic discharge during relevant operation.</li> </ul>  |                   |  |                   |          |             |

#### 1.3.1 Delivery and installation

|  |   |
|--|---|
|  | <ul style="list-style-type: none"> <li>✧ Please install the controller on fire-retardant material and keep the controller away from combustible materials.</li> <li>✧ Connect the braking optional parts (braking resistors, braking units or feedback units) according to the wiring diagram.</li> <li>✧ Do not operate on the controller if there is any damage or components loss to the controller.</li> <li>✧ Do not touch the controller with wet items or body, otherwise electric shock may occur.</li> </ul> |
|--|---|


#### 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

|  |  |
|--|--|
|  | <ul style="list-style-type: none"> <li>◇ 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.</li> <li>◇ High voltage is present inside the controller during running. Do not carry out any operation except for the keypad setting.</li> <li>◇ The controller can not be used as "Emergency-stop device".</li> <li>◇ The controller can not be used to break the motor suddenly. A mechanical braking device should be provided.</li> </ul> |
|--|--|

#### 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

|  |   |
|--|---|
|  | <ul style="list-style-type: none"> <li>◇ Only qualified electricians are allowed to perform the maintenance, inspection, and components replacement of the controller.</li> <li>◇ Disconnect all power supplies to the controller before the terminal wiring. Wait for at least the time designated on the controller after disconnection.</li> <li>◇ Take measures to avoid screws, cables and other conductive matters to fall into the controller during maintenance and component replacement.</li> </ul> |
|--|---|

#### 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 Scrap treatment

|  |  |
|--|--|
|  | ◇ There are heavy metals in the controller. Deal with it as industrial effluent.   |
|  | ◇ When the life cycle ends, the product should enter the recycling system. Dispose of it separately at an appropriate collection point instead of placing it in the normal waste stream. |

## 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.  |
| 2. 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:

|  |
|--|
| 1. 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.<br><b>Note:</b> For the cabinet controller, the ambient temperature means the air temperature inside the cabinet. |
| 2. Check that the ambient temperature of the controller in actual usage is above -10°C. If not, add heating facilities.<br><b>Note:</b> 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.   |
| 4. 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. |
| 6. 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.  |
| 2. 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). |
| 3. Check that the controller is installed on non-flammable materials and the calorific accessories (reactors and brake resistors) are away from flammable materials.   |
| 4. Check that all control cables and power cables are run separately and the rotation complies with EMC requirement.   |
| 5. Check that all grounding systems are properly grounded according to the requirements of the controller.   |
| 6. Check that the free space during installation is sufficient according to the instructions in user's manual.   |
| 7. 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.   |
| 3. 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   |
|---------------------------|---|---|
| Power input               | Input voltage (V)   | AC 1PH 220V (-15%)~240V(+10%)   |
|                           | Input current (A)   | Refer to the rated value  |
|                           | Input frequency (Hz)  | 50Hz or 60Hz      Allowed range: 47~63Hz  |
| Power output              | Output motor capacity (kW)  | Refer to the rated value  |
|                           | Rated output (kVA)  | Refer to the rated value  |
|                           | Output current (A)  | Refer to the rated value  |
|                           | Output voltage (V)  | 0~input voltage   |
| Technical control feature | Control mode  | SVPWM, SVC  |
|                           | Adjustable-speed ratio  | 1:100   |
|                           | Speed control accuracy  | ±0.2% (SVC)   |
|                           | Speed fluctuation   | ± 0.3% (SVC)  |
|                           | Torque response   | <20ms (SVC)   |
|                           | Torque control accuracy   | 10%   |
|                           | Starting torque   | 0.5Hz/150% (SVC)  |
| Overload capability       | 150% of rated current: 1 minute<br>180% of rated current: 10 seconds<br>200% of rated current: 1 second |   |
| Peripheral interface      | 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 40K  |
|                           | Encoder port  | 12V encoder, support OC input, the Max. frequency: 10kHz  |
|                           | Relay output  | 2 programmable relay outputs<br>RO1A NO, RO1B NC, RO1C common terminal<br>RO2A NO, RO2B NC, RO2C common terminal<br>Contact capacity: 3A/AC250V |
| Others                    | Mountable method  | Wall and rail mountable   |
|                           | Braking unit  | Embedded  |
|                           | EMI filter  | Optional filter: meet the degree requirement of IEC61800-3 C2, IEC61800-3 C3  |



| Function |  | Specification   |
|----------|--|---|
|          | Temperature of the running environment | -10~50°C, derate above 40°C   |
|          | Altitude                               | <1000m<br>If the sea level is above 1000m, please derate 1% for every additional 100m.  |
|          | Protective degree                      | IP20<br>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. |
|          | Safety                                 | Meet the requirement of CE  |
|          | Cooling                                | Air-cooling   |

## 2.3 Name plate

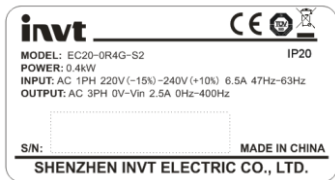


Figure 2-1 Name plate

**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 - 0R4G - S2**  
 ①                      ②                      ③

Figure 2-2 Product type

| Key                  | No. | Detailed description      | Detailed content                     |
|----------------------|-----|---------------------------|--------------------------------------|
| Product abbreviation | ①   | Product abbreviation      | EC20                                 |
| Rated power          | ②   | Power range+<br>Load type | 0R4-0.4kW<br>G: Constant torque load |
| Voltage degree       | ③   | 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.

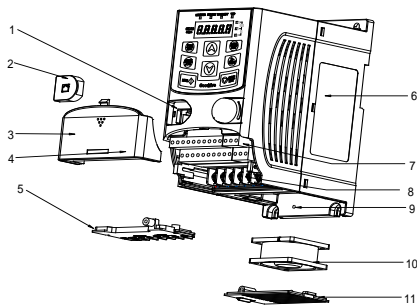



Figure 2-3 Product structure

| 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 the requirements of customers.

## 3 Installation guidelines

The chapter describes the mechanical installation and electric installation.

|  |   |
|--|---|
|  | <ul style="list-style-type: none"> <li>✧ Only qualified electricians are allowed to carry out what described in this chapter. Please operate as the instructions in <b>Safety Precautions</b>. Ignoring these may cause physical injury or death or damage to the devices.</li> <li>✧ Ensure the power supply of the controller is disconnected during the operation. Wait for at least the time designated after the disconnection if the power supply is applied.</li> <li>✧ 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.</li> </ul> |
|--|---|

### 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 | <p>-10°C~+50°C, and the temperature changing rate is less than 0.5°C/minute.</p> <p>If the ambient temperature of the controller is above 40°C, derate 1% for every additional 1°C.</p> <p>It is not recommended to use the controller if the ambient temperature is above 50°C.</p> <p>In order to improve the reliability of the device, do not use the controller if the ambient temperature changes frequently.</p> <p>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.</p> <p>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.</p> |
| Humidity                | <p>RH≤90%</p> <p>No condensation is allowed.</p>   |
| Storage                 | -40°C~+70°C, and the temperature changing rate is less than  |

| Environment                   | Conditions   |
|-------------------------------|--|
| temperature                   | 1°C/minute.  |
| Running environment condition | The installation site of the controller should:<br>keep away from the electromagnetic radiation source;<br>keep away from contaminative air, such as corrosive gas, oil mist and flammable gas;<br>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);<br>keep away from direct sunlight, oil mist, steam and vibration environment. |
| Altitude                      | Below 1000m<br>If the sea level is above 1000m, please derate 1% for every additional 100m.  |
| Vibration                     | $\leq 5.8\text{m/s}^2(0.6\text{g})$  |
| 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:

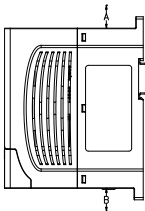


Figure 3-1 Wall mounting

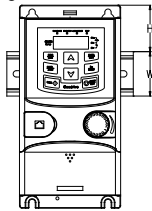


Figure 3-2 Rail mounting

**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

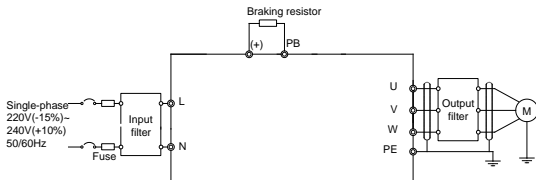


Figure 3-3 Connection diagram of main circuit

#### 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

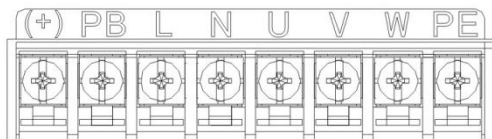


Figure 3-4 1PH terminals of main circuit

| 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.

2. 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

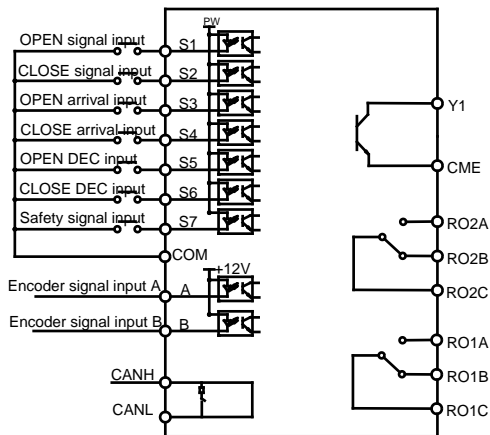


Figure 3-5 Wiring of control circuit

### 3.2.5 Terminals of control circuit

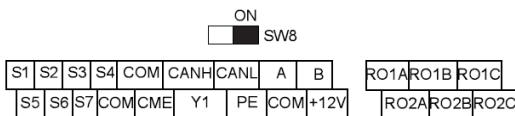


Figure 3-6 Terminals of control circuit

| Type                | Terminal name | Function description | Technical specifications  |
|---------------------|---------------|----------------------|---|
| Upper communication | CANH          | CAN communication    | CAN communication terminal, adopt CAN extension frame protocol, |
|                     | CANL          |                      |   |

| Type                 | Terminal name | Function description   | Technical specifications  |
|----------------------|---------------|------------------------|---|
|                      |               |                        | communication baud rate 40kHz   |
| Digital input/output | S1            | OPEN signal input      | 1. Internal impedance:3.3kΩ<br>2. Max. input frequency:1kHz<br>3. Only support NPN input, low electrical level is valid                             |
|                      | S2            | CLOSE signal input     |   |
|                      | S3            | OPEN arrival input     |   |
|                      | S4            | CLOSE arrival input    |   |
|                      | S5            | OPEN DEC input         |   |
|                      | S6            | CLOSE DEC input        |   |
|                      | S7            | Safety signal input    |   |
|                      | Y1            | Digital output         | 1. Switch capacity: 50mA/30V<br>2. Output frequency range: 0~1kHz   |
|                      | CME           |                        |   |
| Encoder input        | A             | A phase signal input   | 1. Support OC open loop output encoder<br>2. Pulse input frequency: MAX. 10Khz  |
|                      | B             | B phase signal input   |   |
| Encoder power        | +12V          | Encoder power          | 1. Output: 12Vdc (-10%)~12Vdc (+20%)<br>2. Output: MAX. 100mA   |
|                      | COM           |                        |   |
| Relay output         | RO1A          | Relay 1 NO contact     | RO1 relay output, RO1A NO, RO1B NC, RO1C common terminal<br>RO2 relay output, RO2A NO, RO2B NC, RO2C common terminal<br>Contact capacity: 3A/AC250V |
|                      | RO1B          | Relay 1 NC contact     |   |
|                      | RO1C          | Relay 1 common contact |   |
|                      | RO2A          | Relay 2 NO contact     |   |
|                      | RO2B          | Relay 2 NC contact     |   |
|                      | RO2C          | Relay 2 common contact |   |

### 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.

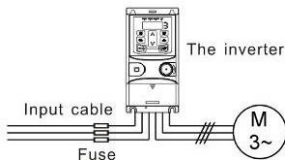


Figure 3-7 Fuse configuration

**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.

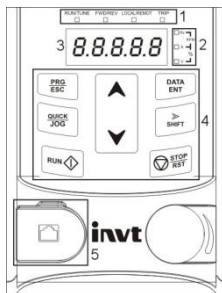










Figure 4-1 Keypad

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

| Serial No. | Name      | Description |  |
|------------|-----------|-------------|--|
| 1          | State LED | RUN/TUNE    | LED off means that the controller is in the stopping state; LED blinking means the controller is in the parameter autotune state; LED on means the controller is in the running state.   |
|            |           | FWD/REV     | FWD/REV LED<br>LED off means the controller is in the forward rotation state; LED on means the controller is in the reverse rotation state   |
|            |           | LOCAL/REMO  | LED for keypad operation, terminals operation and remote communication control<br>LED off means that the controller is in the keypad operation state; LED blinking means the controller is in the terminals operation state; LED on means the controller is in the remote communication control state. |

| Serial No. | Name                 | Description  |                     |  |                     |                 |                     |                 |                     |
|------------|----------------------|--|---------------------|--|---------------------|-----------------|---------------------|-----------------|---------------------|
|            |                      | TRIP   |                     | LED for faults<br>LED on when the controller is in the fault state; LED off in normal state; LED blinking means the controller is in the pre-alarm state.        |                     |                 |                     |                 |                     |
| 2          | Unit LED             | Mean the unit displayed currently  |                     |  |                     |                 |                     |                 |                     |
|            |                      |  | Hz                  | Frequency unit   |                     |                 |                     |                 |                     |
|            |                      |  | RPM                 | Rotating speed unit  |                     |                 |                     |                 |                     |
|            |                      |  | A                   | Current unit   |                     |                 |                     |                 |                     |
|            |                      |  | %                   | Percentage   |                     |                 |                     |                 |                     |
|            |                      | V  | Voltage unit        |  |                     |                 |                     |                 |                     |
| 3          | Code displaying zone | 5-figure LED display displays various monitoring data and alarm code such as set frequency and output frequency. |                     |  |                     |                 |                     |                 |                     |
|            |                      | Display ed word  | Corresp onding word | Display ed word  | Corresp onding word | Display ed word | Corresp onding word | Display ed word | Corresp onding word |
|            |                      | 0  | 0                   | 1  | 1                   | 2               | 2                   | 3               | 3                   |
|            |                      | 4  | 4                   | 5  | 5                   | 6               | 6                   | 7               | 7                   |
|            |                      | 8  | 8                   | 9  | 9                   | A               | A                   | b               | B                   |
|            |                      | C  | C                   | d  | D                   | E               | E                   | F               | F                   |
|            |                      | H  | H                   | i  | I                   | L               | L                   | n               | N                   |
|            |                      | n  | n                   | o  | o                   | P               | P                   | r               | r                   |
|            |                      | S  | S                   | t  | t                   | U               | U                   | v               | v                   |
| .          | .                    | -  | -                   |  |                     |                 |                     |                 |                     |
| 4          | Buttons              |                                 | Programming key     | Enter or escape from the first level menu and remove the parameter quickly   |                     |                 |                     |                 |                     |
|            |                      |                               | Entry key           | Enter the menu step-by-step<br>Confirm parameters  |                     |                 |                     |                 |                     |
|            |                      |                               | UP key              | Increase data or function code progressively   |                     |                 |                     |                 |                     |
|            |                      |                               | DOWN key            | Decrease data or function code progressively   |                     |                 |                     |                 |                     |
|            |                      |                               | Right-shift key     | Move right to select the displaying parameter circularly in stopping and running mode.<br>Select the parameter modifying digit during the parameter modification |                     |                 |                     |                 |                     |
|            |                      |                               | Run key             | This key is used to operate on the controller in   |                     |                 |                     |                 |                     |

| Serial No. | Name  | Description   |  |
|------------|---|---|--|
|            |   |   | key operation mode   |
|            |  | Stop/<br>Reset key  | This key is used to stop in running state.<br>This key is used to reset all control modes in the fault alarm state |
|            |  | Quick key   | The function of this key is confirmed by function code P07.02.   |
| 5          | Keypad port   | <p>External keypad port. When the external keypad with the function of parameter copying is valid, the local keypad LED is off; When the external keypad without the function of parameter copying is valid, the local and external keypad LEDs are on.</p> <p><b>Note:</b> Only the external keypad which has the function of parameters copy owns the function of parameters copy, other keypads do not have.</p> |  |



## 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  /SHIFT can shift the parameters from left to right,  (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.  LED on the keypad is on, while the  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  /SHIFT can shift the parameters from left to right,  (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 **PRG/ESC** 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 **DATA/ENT** into the displayed state of function parameter. On this state, press **DATA/ENT** to save the parameters or press **PRG/ESC** to escape.

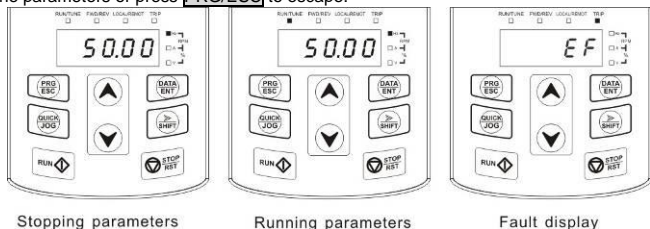


Figure 4-2 Displayed state

## 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 **PRG/ESC** and the **DATA/ENT** can return to the second-level menu from the third-level menu. The difference is: pressing **DATA/ENT** 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 **PRG/ESC** 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:

- 1) 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.

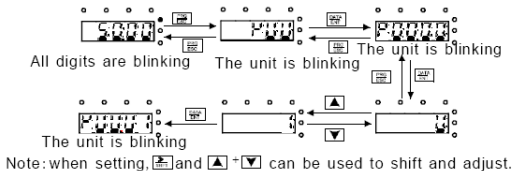


Figure 4-3 Sketch map of modifying parameters

### 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  $\text{PRG/ESC}$  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.

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  $\text{PRG/ESC}$  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.

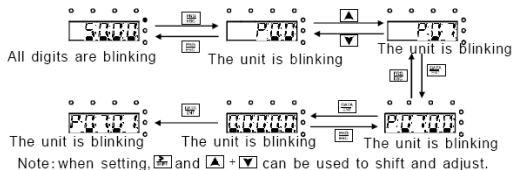


Figure 4-4 Sketch map of password setting

### 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.

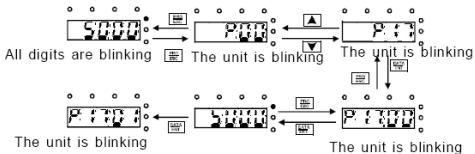


Figure 4-5 Sketch map of state watching

## 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:

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

"⊙": 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)

2. "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).

3. "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 "0.0.0.0.0." 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.

| Function code                         | Name                                 | Detailed instruction of parameters  | Setting range | Default value   | Modify |
|---------------------------------------|--------------------------------------|---|---------------|-----------------|--------|
| <b>P00 Group Basic function group</b> |                                      |   |               |                 |        |
| P00.00                                | Speed control mode                   | 1: SVC<br>2: SPWM   | 1~2           | 2               | ⊙      |
| P00.01                                | OPEN/CLOSE control mode              | 0: Speed control mode<br>1: Distance control mode 1 (need limit switch)<br>2: Distance control mode 2   | 0~2           | 0               | ⊙      |
| P00.02                                | Elevator door control mode           | 0: Keypad control mode (general inverter mode)<br>1: Terminal control mode (LED flickering)<br>2: Manual commissioning mode (FWD/REV command by keypad)<br>3: Auto-displaying mode<br>4: Communication control mode (CAN communication LED on)<br>5: Reserved | 0~4           | 0               | ⊙      |
| P00.03                                | Max. output frequency                | P00.04~250.00Hz (250.00Hz)  | 10.00~250.00  | 50.00Hz         | ⊙      |
| P00.04                                | Upper limit of the running frequency | P00.05~P00.03 (Max. output frequency)   | P00.05~P00.03 | 50.00Hz         | ⊙      |
| P00.05                                | Lower limit of the running frequency | 0.00Hz~P00.04 (Upper limit of the running frequency)  | 0.00~P00.04   | 0.00Hz          | ⊙      |
| P00.06                                | Keypad set frequency                 | 0.00Hz~P00.03 (Max. output frequency)   | 0.00~P00.03   | 10.00Hz         | ○      |
| P00.07                                | ACC time 1                           | 0.0~3600.0s   | 0.0~3600.0    | Depend on model | ○      |
| P00.08                                | DEC time 1                           | 0.0~3600.0s   | 0.0~3600.0    | Depend on model | ○      |
| P00.09                                | Running direction                    | 0: Runs at the default direction<br>1: Runs at the opposite direction   | 0~1           | 0               | ○      |

| Function code            | Name                                    | Detailed instruction of parameters   | Setting range | Default value   | Modify |
|--------------------------|---|--|---------------|-----------------|--------|
|                          | selection                               | 2: Reserved  |               |                 |        |
| P00.10                   | Carrier frequency setting               | 1.0~15.0kHz  | 1.0~15.0      | Depend on model | ○      |
| P00.11                   | Motor parameter autotuning              | 0: No operation<br>1: Rotation autotuning<br>2: Static autotuning 1 (autotune totally)<br>3: Static autotuning 2 (autotune partially)<br>Note: Valid in general inverter mode (P00.02=0) | 0~3           | 0               | ◎      |
| P00.12                   | AVR function selection                  | 0:Invalid<br>1:Valid during the whole procedure  | 0~1           | 1               | ○      |
| P00.13                   | Function restore parameter              | 0:No operation<br>1:Restore the default value<br>2:Clear fault records   | 0~2           | 0               | ◎      |
| <b>P02 Group Motor 1</b> |   |  |               |                 |        |
| P02.01                   | Rated power of asynchronous motor 1     | 0.1~4.0kW  | 0.1~4.0       | Depend on model | ◎      |
| P02.02                   | Rated frequency of asynchronous motor 1 | 0.01Hz~P00.03 (Max. output frequency)  | 0.01~P00.03   | 50.00Hz         | ◎      |
| P02.03                   | Rated speed of asynchronous motor 1     | 1~36000rpm   | 1~36000       | Depend on model | ◎      |
| P02.04                   | Rated voltage of asynchronous motor 1   | 0~1200V  | 0~1200        | Depend on model | ◎      |
| P02.05                   | Rated current of asynchronous motor 1   | 0.4~20.0A  | 0.4~20.0      | Depend on model | ◎      |



| Function code | Name   | Detailed instruction of parameters | Setting range | Default value   | Modify |
|---------------|--|------------------------------------|---------------|-----------------|--------|
| P02.06        | Stator resistor of asynchronous motor 1                    | 0.001~65.535Ω                      | 0.001~65.535  | Depend on model | ○      |
| P02.07        | Rotor resistor of asynchronous motor 1                     | 0.001~65.535Ω                      | 0.001~65.535  | Depend on model | ○      |
| P02.08        | Leakage inductance of asynchronous motor 1                 | 0.1~6553.5mH                       | 0.1~6553.5    | Depend on model | ○      |
| P02.09        | Mutual inductance of asynchronous motor 1                  | 0.1~6553.5mH                       | 0.1~6553.5    | Depend on model | ○      |
| P02.10        | Non-load current of asynchronous motor 1                   | 0.1~6553.5A                        | 0.1~6553.5    | Depend on model | ○      |
| P02.11        | Magnetic saturation coefficient 1 for the iron core of AM1 | 0.0~100.0%                         | 0.0~100.0     | 80.0%           | ◎      |
| P02.12        | Magnetic saturation coefficient 2 for the iron core of AM1 | 0.0~100.0%                         | 0.0~100.0     | 68.0%           | ◎      |
| P02.13        | Magnetic saturation coefficient 3 for the iron core of AM1 | 0.0~100.0%                         | 0.0~100.0     | 57.0%           | ◎      |
| P02.14        | Magnetic saturation coefficient 4                          | 0.0~100.0%                         | 0.0~100.0     | 40.0%           | ◎      |

| Function code                   | Name  | Detailed instruction of parameters  | Setting range | Default value | Modify |
|---------------------------------|---|---|---------------|---------------|--------|
|                                 | for the iron core of AM1                                      |   |               |               |        |
| P02.26                          | Motor 1 overload protection selection                         | 0: No protection<br>1: Common motor (with low speed compensation)<br>2: Frequency conversion motor (without low speed compensation) | 0~2           | 2             | ⊙      |
| P02.27                          | Motor 1 overload protection coefficient                       | 20.0%~120.0%  | 20.0~120.0    | 100.0%        | ○      |
| <b>P03 Group Vector control</b> |   |   |               |               |        |
| P03.00                          | Speed loop proportional gain1                                 | 0~200.0   | 0~200.0       | 10.0          | ○      |
| P03.01                          | Speed loop integral time1                                     | 0.000~10.000s   | 0.000~10.000  | 0.200s        | ○      |
| P03.02                          | Low switching frequency                                       | 0.00Hz~P03.05   | 0.00~P03.05   | 5.00Hz        | ○      |
| P03.03                          | Speed loop proportional gain 2                                | 0~200.0   | 0~200.0       | 10.0          | ○      |
| P03.04                          | Speed loop integral time 2                                    | 0.000~10.000s   | 0.000~10.000  | 0.200s        | ○      |
| P03.05                          | High switching frequency                                      | P03.02~P00.03 (Max. output frequency)   | P03.02~P00.03 | 10.00Hz       | ○      |
| P03.06                          | Speed loop output filter                                      | 0~8 (corresponds to 0~2 <sup>8</sup> /10ms)   | 0~8           | 0             | ○      |
| P03.07                          | Compensation coefficient of vector control electromotion slip | 50%~200%  | 50~200        | 100%          | ○      |
| P03.08                          | Compensation coefficient of vector control brake slip         | 50%~200%  | 50~200        | 100%          | ○      |

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

| Function code | Name  | Detailed instruction of parameters  | Setting range                         | Default value | Modify |
|---------------|---|---|---------------------------------------|---------------|--------|
|               |   | 3: 1.7th power low torque V/F curve<br>4: 2.0th power low torque V/F curve                    |                                       |               |        |
| P04.01        | Torque boost of motor 1                           | 0.0%: (automatic)0.1%~10.0%   | 0.0~10.0                              | 0.0%          | ○      |
| P04.02        | Torque boost close of motor 1                     | 0.0%~50.0% (relative to the rated frequency of motor 1)                                       | 0.0~50.0                              | 20.0%         | ○      |
| P04.03        | V/F frequency point 1 of motor 1                  | 0.00Hz~P04.05   | 0.00~P04.05                           | 0.00Hz        | ○      |
| P04.04        | V/F voltage point 1 of motor 1                    | 0.0%~110.0%(the rated voltage of motor 1)   | 0.0~110.0                             | 00.0%         | ○      |
| P04.05        | V/F frequency point 2 of motor 1                  | P04.03~ P04.07  | P04.03~ P04.07                        | 00.00Hz       | ○      |
| P04.06        | V/F voltage point 2 of motor 1                    | 0.0%~110.0% (the rated voltage of motor 1)  | 0.0~110.0                             | 00.0%         | ○      |
| 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) | P04.05~the rated frequency of motor 1 | 00.00Hz       | ○      |
| P04.08        | V/F voltage point 3 of motor 1                    | 0.0%~110.0% (the rated voltage of motor 1)  | 0.0~110.0                             | 00.0%         | ○      |
| P04.09        | V/F slip compensation gain of motor 1             | 0.0~200.0%  | 0.0~200.0                             | 10.0%         | ○      |
| P04.10        | Low frequency vibration control factor of motor 1 | 0~100   | 0~100                                 | 10            | ○      |
| P04.11        | High frequency                                    | 0~100   | 0~100                                 | 10            | ○      |

| Function code                    | Name   | Detailed instruction of parameters   | Setting range | Default value | Modifying |
|----------------------------------|--|--|---------------|---------------|-----------|
|                                  | vibration control factor of motor 1          |  |               |               |           |
| P04.12                           | Vibration control threshold of motor 1       | 0.00Hz~P00.03 (Max. output frequency)  | 0.00~P00.03   | 30.00 Hz      | ○         |
| P04.33                           | Weakening coefficient in constant power zone | 1.00~1.30  | 1.00~1.30     | 1.00          | ○         |
| <b>P05 Group Input terminals</b> |  |  |               |               |           |
| P05.01                           | S1 terminals function selection              | 0: No function<br>1: OPEN command<br>2: CLOSE command<br>3: OPEN limit signal input<br>4: CLOSE limit signal input<br>5: OPEN speed switching input<br>6: CLOSE speed switching input<br>7: Safety sensor input<br>8~9: Reserved | 0~63          | 1             | ◎         |
| P05.02                           | S2 terminals function selection              |  | 0~63          | 2             | ◎         |
| P05.03                           | S3 terminals function selection              |  | 0~63          | 3             | ◎         |
| P05.04                           | S4 terminals function selection              |  | 0~63          | 4             | ◎         |
| P05.05                           | S5 terminals function selection              |  | 0~63          | 5             | ◎         |
| P05.06                           | S6 terminals function selection              |  | 0~63          | 6             | ◎         |
| P05.07                           | S7 terminals function selection              |  | 0~63          | 7             | ◎         |
| P05.10                           | Polarity selection of the input terminals    |  | 0x000~0xFF    | 0x000~0xFF    | 0x000     |

| Function code | Name                                 | Detailed instruction of parameters | Setting range | Default value | Modify |
|---------------|--------------------------------------|------------------------------------|---------------|---------------|--------|
| P05.11        | Switch filter time                   | 0.000~1.000s                       | 0.000~1.000   | 0.010s        | ○      |
| P05.14        | S1 terminal switching on delay time  | 0.000~50.000s                      | 0.000~50.000  | 0.000s        | ○      |
| P05.15        | S1 terminal switching off delay time | 0.000~50.000s                      | 0.000~50.000  | 0.000s        | ○      |
| P05.16        | S2 terminal switching on delay time  | 0.000~50.000s                      | 0.000~50.000  | 0.000s        | ○      |
| P05.17        | S2 terminal switching off delay time | 0.000~50.000s                      | 0.000~50.000  | 0.000s        | ○      |
| P05.18        | S3 terminal switching on delay time  | 0.000~50.000s                      | 0.000~50.000  | 0.000s        | ○      |
| P05.19        | S3 terminal switching off delay time | 0.000~50.000s                      | 0.000~50.000  | 0.000s        | ○      |
| P05.20        | S4 terminal switching on delay time  | 0.000~50.000s                      | 0.000~50.000  | 0.000s        | ○      |
| P05.21        | S4 terminal switching off delay time | 0.000~50.000s                      | 0.000~50.000  | 0.000s        | ○      |
| P05.22        | S5 terminal switching on delay time  | 0.000~50.000s                      | 0.000~50.000  | 0.000s        | ○      |
| P05.23        | S5 terminal switching off delay time | 0.000~50.000s                      | 0.000~50.000  | 0.000s        | ○      |

| Function code                     | Name                                   | Detailed instruction of parameters  | Setting range | Default value | Modify |
|-----------------------------------|--|---|---------------|---------------|--------|
| P05.24                            | S6 terminal switching on delay time    | 0.000~50.000s   | 0.000~50.000  | 0.000s        | ○      |
| P05.25                            | S6 terminal switching off delay time   | 0.000~50.000s   | 0.000~50.000  | 0.000s        | ○      |
| P05.26                            | S7 terminal switching on delay time    | 0.000~50.000s   | 0.000~50.000  | 0.000s        | ○      |
| P05.27                            | S7 terminal switching off delay time   | 0.000~50.000s   | 0.000~50.000  | 0.000s        | ○      |
| <b>P06 Group Output terminals</b> |  |   |               |               |        |
| P06.01                            | Y1 output selection                    | 0: Invalid  | 0~30          | 3             | ○      |
| P06.03                            | Relay RO1 output selection             | 1: OPEN arrival signal output<br>2: CLOSE arrival signal output<br>3: Fault relay signal output | 0~30          | 1             | ○      |
| P06.04                            | Relay RO2 output selection             | 4: Reserved<br>5: Reserved  | 0~30          | 2             | ○      |
| P06.05                            | Polarity selection of output terminals | 00~0F   | 00~0F         | 00            | ○      |
| P06.06                            | Y1 open delay time                     | 0.000~50.000s   | 0.000~50.000  | 0.000s        | ○      |
| P06.07                            | Y1C off delay time                     | 0.000~50.000s   | 0.000~50.000  | 0.000s        | ○      |
| P06.10                            | RO1 switching on delay time            | 0.000~50.000s   | 0.000~50.000  | 0.000s        | ○      |
| P06.11                            | RO1 switching off delay time           | 0.000~50.000s   | 0.000~50.000  | 0.000s        | ○      |
| P06.12                            | RO2 switching                          | 0.000~50.000s   | 0.00~50.00    | 0.000s        | ○      |

| Function code                            | Name   | Detailed instruction of parameters   | Setting range | Default value | Modify |
|--|--|--|---------------|---------------|--------|
|  | on delay time                                    |  |               |               |        |
| P06.13                                   | RO2 switching<br>off delay time                  | 0.000~50.000s  | 0.00~50.00    | 0.000s        | ○      |
| <b>P07 Group Human-Machine Interface</b> |  |  |               |               |        |
| P07.00                                   | User's<br>password                               | 0~65535  | 0~65535       | 0             | ○      |
| P07.01                                   | Parameter<br>copy                                | 0:No operation<br>1:Upload the local function parameter to the keypad<br>2:Download the keypad function parameter to local address(including the motor parameters)<br>3:Download the keypad function parameter to local address (excluding the motor parameter of P02 and P12 group)<br>4:Download the keypad function parameters to local address (only for the motor parameter of P02 and P12 group) | 0~4           | 0             | ◎      |
| P07.02                                   | <b>QUICK/JOG</b><br>function<br>selection        | 0:No function<br>1: Jogging running<br>2: Shift the display state by the shifting key<br>3~6: Reserved<br>7: Quick commission mode (committee according to the non-factory parameter)  | 0~7           | 1             | ◎      |
| P07.05                                   | Displayed<br>parameters 1<br>of running<br>state | 0x0000~0xFFFF<br>BIT0: Running frequency (Hz on)<br>BIT1: Set frequency (Hz flickering)<br>BIT2: Bus voltage (V on)<br>BIT3: Output voltage (V on)<br>BIT4: Output current (A on)<br>BIT5: Rotating speed (rpm on)<br>BIT6: Output power (% on)<br>BIT7: Output torque (% on)<br>BIT8: Input terminals state   | 0~7FFF        | 0x00FF        | ○      |



| Function code | Name                                      | Detailed instruction of parameters   | Setting range | Default value | Modify |
|---------------|---|--|---------------|---------------|--------|
|               |   | BIT9: Output terminals state<br>BIT10: Percentage of motor overload (% on)<br>BIT11: Percentage of inverter overload (% on)<br>BIT12: Ramp frequency reference (Hz on)<br>BIT13: Linear speed<br>BIT14: AC incoming current<br>BIT15: Reserved |               |               |        |
| P07.07        | The parameter selection of the stop state | 0x0000~0xFFFF<br>BIT0: Set frequency (Hz on, frequency flickering slowly)<br>BIT1: Bus voltage (V on)<br>BIT2: Input terminals state<br>BIT3: Output terminals state<br>BIT4~BIT5: Reserved  | 0000~0000F    | 0x000F        | ○      |
| P07.08        | Frequency display coefficient             | 0.01~10.00<br>Displayed frequency=running frequency* P07.08  | 0.01~10.00    | 1.00          | ○      |
| P07.09        | Speed display coefficient                 | 0.1~999.9%<br>Mechanical rotation speed=120*displayed running frequency×P07.09/motor pole pairs  | 0.1~999.9%    | 100.0%        | ○      |
| P07.10        | Linear speed displayed coefficient        | 0.1~999.9%<br>Linear speed= Mechanical rotation speed×P07.10   | 0.1~999.9%    | 1.0%          | ○      |
| 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   |               |               | ●      |

| Function code | Name                              | Detailed instruction of parameters   | Setting range | Default value | Modifying |
|---------------|-----------------------------------|--|---------------|---------------|-----------|
| P07.17        | Inverter type                     | 0: G type<br>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<br>1:Controller module U phase protection(OUt1)<br>2:Controller module V phase protection(OUt2)<br>3:Controller module W phase protection(OUt3) |               |               | ●         |
| P07.28        | Previous fault type               | 4:OC1<br>5:OC2<br>6:OC3<br>7:OV1<br>8:OV2  |               |               | ●         |
| P07.29        | Previous 2 fault type             | 9:OV3<br>10:UV   |               |               | ●         |
| P07.30        | Previous 3                        | 11:Motor overload(OL1)   |               |               | ●         |

| Function code | Name                                      | Detailed instruction of parameters   | Setting range | Default value | Modify |
|---------------|---|--|---------------|---------------|--------|
|               | fault type                                | 12:The inverter overload(OL2)  |               |               |        |
| P07.31        | Previous 4 fault type                     | 13:Input side phase loss(SPI)<br>14:Output side phase loss(SPO)<br>15:Overheat of the rectifier module(OH1)  |               |               | ●      |
| P07.32        | Previous 5 fault type                     | 16:Overheat fault of the controller module(OH2)<br>17:External fault(EF)<br>18:485 communication fault(CE)<br>19:Current detection fault(ItE)<br>20:Motor antotune fault(tE)<br>21:EEPROM operation fault(EEP)<br>22:Reserved<br>23:Braking unit fault(bCE)<br>24:Running time arrival(END)<br>25:Electrical overload(OL3)<br>26:PCE<br>27:UPE<br>28:DNE<br>29~30:Reserved<br>31:CAN communication fault(E-CAN)<br>32:Grounding shortcircuit fault 1(ETH1)<br>33: Grounding shortcircuit fault 2(ETH2)<br>34~35:Reserved<br>36:Underload fault(LL)<br>37:Encoder offline fault(ENC1O)<br>38:Encoder reverse direction(ENC1D) |               |               | ●      |
| P07.33        | Current fault running frequency           |  |               | 0.00Hz        | ●      |
| P07.34        | Ramp reference frequency at current fault |  |               | 0.00Hz        | ●      |
| P07.35        | Output voltage at the current fault       |  |               | 0V            | ●      |

| Function code | Name  | Detailed instruction of parameters | Setting range | Default value | Modifying |
|---------------|---|------------------------------------|---------------|---------------|-----------|
| P07.36        | Output current at the current fault         |                                    |               | 0.0A          | ●         |
| P07.37        | Current bus voltage at the current fault    |                                    |               | 0.0V          | ●         |
| P07.38        | The Max. temperature at the current fault   |                                    |               | 0.0°C         | ●         |
| 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°C         | ●         |
| P07.47        | Input terminals state at previous fault     |                                    |               | 0             | ●         |

| Function code                       | Name  | Detailed instruction of parameters | Setting range | Default value | Modify |
|-------------------------------------|---|------------------------------------|---------------|---------------|--------|
| 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°C         | ●      |
| P07.55                              | Input terminals state at previous 2 faults    |                                    |               | 0             | ●      |
| P07.56                              | Output terminals state at previous 2 faults   |                                    |               | 0             | ●      |
| <b>P08 Group Enhanced functions</b> |   |                                    |               |               |        |
| P08.06                              | Jogging running frequency                     | 0.00~P00.03(Max. output frequency) | 0.00~P00.03   | 5.00Hz        | ○      |

| Function code | Name                                   | Detailed instruction of parameters   | Setting range | Default value   | Modify |
|---------------|--|--|---------------|-----------------|--------|
| P08.07        | Jogging running ACC time               | 0.0~3600.0s  | 0.0~3600.0    | Depend on model | ○      |
| P08.08        | Jogging running DEC time               | 0.0~3600.0s  | 0.0~3600.0    | Depend on model | ○      |
| P08.27        | Setting running time                   | 0~65535min   | 0~65535       | 0min            | ○      |
| P08.28        | Time of fault reset                    | 0~10   | 0~10          | 0               | ○      |
| P08.29        | Interval time of automatic fault reset | 0.1~3600.0s  | 0.1~3600.0    | 1.0s            | ○      |
| P08.37        | Energy Braking enable                  | 0:Disabled<br>1:Enabled  | 0~1           | 1               | ○      |
| P08.38        | Energy braking threshold voltage       | 200.0~2000.0V  | 200.0~500.0   | 380.0V          | ○      |
| P08.39        | Cooling fan running mode               | 0:Rated running mode<br>1:The fan keeps on running after power on  | 0~1           | 0               | ○      |
| P08.40        | PWM selection                          | 0x00~0x21<br>LED ones: PWM mode selection<br>0: PWM mode 1, three-phase modulation and two-modulation<br>1: PWM mode 2, three-phase modulation<br>LED tens: low-speed carrier frequency limit mode<br>0: Low-speed carrier frequency limit mode 1<br>1:Low-speed carrier frequency limit mode 2<br>2: No limit | 00~21         | 01              | ◎      |
| P08.41        | Over commission                        | 0: Invalid<br>1: Valid   | 0~1           | 1               | ◎      |

| Function code                          | Name  | Detailed instruction of parameters  | Setting range | Default value  | Modify |
|--|---|---|---------------|----------------|--------|
|  | selection                                       |   |               |                |        |
| P08.50                                 | Magnetic flux braking                           | 0: Invalid.<br>100~150: the bigger the coefficient, the bigger the braking strength.  | 0~150         | 0              | ○      |
| <b>P11 Group Protective parameters</b> |   |   |               |                |        |
| P11.00                                 | Phase loss protection                           | 0x00~0x11<br>LED ones:<br>0: Input phase loss protection disable<br>1: Input phase loss protection enable<br>LED tens:<br>0: Output phase loss protection disable<br>1: Output phase loss protection enable | 00~11         | 11             | ○      |
| P11.01                                 | Frequency-decreasing at sudden power loss       | 0: Disabled<br>1: Enabled   | 0~1           | 0              | ○      |
| P11.02                                 | Frequency decreasing ratio at sudden power loss | 0.00Hz~P00.03/s(Max. output frequency)  | 0.00Hz~P00.03 | 10.00Hz/s      | ○      |
| P11.03                                 | Overvoltage stall protection                    | 0: Disabled<br>1: Enabled   | 0~1           | 0              | ○      |
| P11.04                                 | Overvoltage stall voltage protection            | 120~150%(standard voltage)(220V) bus  | 110~150%      | 115%           | ○      |
| P11.05                                 | Current limit action                            | 0x00~0x12<br>LED ones: current limit<br>0: Invalid<br>1: Valid<br>LED tens: overload alarm of hardware current limit<br>0: Valid<br>1: Invalid  | 00~12         | 01             | ◎      |
| P11.06                                 | Automatic current limit                         | 50.0~200.0%   | 50.0~200.0    | G type: 160.0% | ◎      |

| Function code | Name                                       | Detailed instruction of parameters   | Setting range | Default value | Modify |
|---------------|--|--|---------------|---------------|--------|
|               | level                                      |  |               |               |        |
| P11.07        | The decreasing ratio during current limit  | 0.00~50.00Hz/s   | 0.00~50.00    | 10.00Hz/s     | ⊙      |
| P11.08        | Overload pre-alarm of the motor/ inverter  | 0x000~0x131<br>LED ones:<br>0:Overload pre-alarm of the motor, comply with the rated current of the motor<br>1:Overload pre-alarm of the controller, comply with the rated current of the controller<br>LED tens:<br>0:The inverter continues to work after underload pre-alarm<br>1:The inverter continues to work after underload pre-alarm and the controller stops to run after overload fault<br>2: The inverter continues to work after overload pre-alarm and the controller stops to run after underload fault<br>3. The inverter stops when overloading or underloading.<br>LED hundreds :<br>0:Detection all the time<br>1:Detection in constant running | 000~131       | 0x000         | ○      |
| P11.09        | Overload pre-alarm test level              | P11.11~200%  | P11.11~200    | G type: 150%  | ○      |
| P11.10        | Overload pre-alarm detection time          | 0.1~3600.0s  | 0.1~3600.0    | 1.0s          | ○      |
| P11.11        | Detection level of the underload pre-alarm | 0%~P11.09  | 0~P11.09      | 50%           | ○      |



| Function code                         | Name  | Detailed instruction of parameters  | Setting range | Default value | Modifying |
|---------------------------------------|---|---|---------------|---------------|-----------|
| P11.12                                | Detection time of the underload pre-alarm     | 0.1~3600.0s   | 0.1~3600.0    | 1.0s          | ○         |
| P11.13                                | Output terminal action selection during fault | 0x00~0x11<br>LED ones:<br>0:Action under fault undervoltage<br>1:No action under fault undervoltage<br>LED tens:<br>0:Action during the automatic reset<br>1:No action during the automatic reset | 00~11         | 0x00          | ○         |
| P11.14                                | Speed deviation detection                     | 0.0~50.0%   | 0.0~50.0      | 10.0%         | ○         |
| P11.15                                | Speed deviation detection time                | 0.0~10.0s (when P11.15=0.0, no speed deviation protection)  | 0.0~10.0      | 0.5s          | ○         |
| <b>P14 Group Modbus communication</b> |   |   |               |               |           |
| P14.00                                | Local communication address                   | 1~247, 0 is broadcast address   | 1~247         | 1             | ○         |
| P14.01                                | Communication baud ratio                      | 0: 1200BPS<br>1: 2400BPS<br>2: 4800BPS<br>3: 9600BPS<br>4: 19200BPS<br>5: 38400BPS<br>6: 57600BPS   | 0~6           | 4             | ○         |
| P14.02                                | Digital bit checkout                          | 0: No check (N,8,1)for RTU<br>1: Even check (E,8,1)for RTU<br>2: Odd check (O,8,1)for RTU<br>3: No check (N,8,2)for RTU<br>4: Even check (E,8,2)for RTU<br>5: Odd check(O,8,2)for RTU             | 0~5           | 1             | ○         |
| P14.03                                | Communication answer delay                    | 0~200ms   | 0~200         | 5             | ○         |
| P14.04                                | Communication                                 | 0.0 (invalid), 0.1~60.0s  | 0.0~60.0      | 0.0s          | ○         |

| Function code                      | Name                          | Detailed instruction of parameters   | Setting range | Default value | Modify |
|------------------------------------|-------------------------------|--|---------------|---------------|--------|
|                                    | n overtime fault time         |  |               |               |        |
| P14.05                             | Transmission fault processing | 0:Alarm and stop freely<br>1:No alarm and continue to run<br>2:No alarm and stop according to the stop means(only under the communication control)<br>3:No alarm and stop according to the stop means(under all control modes) | 0~3           | 0             | ○      |
| P14.06                             | Communication processing      | 0x00~0x11<br>LED ones:<br>0: Write with response<br>1: Write without response<br>LED tens:(reserved)<br>0: Communication encrypting valid<br>1: Communication encrypting invalid   | 00~11         | 0x00          | ○      |
| <b>P15 Group CAN communication</b> |                               |  |               |               |        |
| P15.00                             | Control door selection        | 0: Front door<br>1: Rear door  | 0~1           | 0             | ◎      |
| P15.01                             | CAN sending enabling          | Enable CAN sending<br>0: Disabled<br>1: Enabled  | 0~1           | 1             | ◎      |
| P15.02                             | CAN baud rate                 | 0: 1000k<br>1: 500k<br>2: 250k<br>3: 125k<br>4: 100k<br>5: 50k<br>6: 40k   | 0~6           | 6             | ○      |
| P15.03                             | CAN receiving ID high bit     | 0~0xFFFF   | 0~0xFFFF      | 0xC055        | ○      |
| P15.04                             | CAN receiving ID low bit      | 0~0xFFFF   | 0~0xFFFF      | 0x5405        | ○      |
| P15.05                             | CAN sending ID high bit       | 0~0xFFFF   | 0~0xFFFF      | 0xC055        | ○      |
| P15.06                             | CAN sending ID low bit        | 0~0xFFFF   | 0~0xFFFF      | 0x5507        | ○      |
| P15.08                             | CAN                           | 0~500ms  | 0~500         | 100           | ○      |

| Function code               | Name                              | Detailed instruction of parameters                       | Setting range  | Default value | Modify |
|-----------------------------|-----------------------------------|--|----------------|---------------|--------|
|                             | communication cycle               |  |                |               |        |
| P15.09                      | Communication overtime fault time | 0.0 (invalid), 0.1~60.0s                                 | 0.0~60.0       | 0.0s          | ○      |
| <b>P17 Group State view</b> |                                   |  |                |               |        |
| P17.00                      | Setting frequency                 | 0.00Hz~P00.03  | 0.00~P00.03    | 0.00Hz        | ●      |
| P17.01                      | Output frequency                  | 0.00Hz~P00.03  | 0.00~P00.03    | 0.00Hz        | ●      |
| P17.02                      | Ramp reference frequency          | 0.00Hz~P00.03  | 0.00~P00.03    | 0.00Hz        | ●      |
| P17.03                      | Output voltage                    | 0~1200V  | 0~1200         | 0V            | ●      |
| P17.04                      | Output current                    | 0.0~3000.0A  | 0.0~3000.0     | 0.0A          | ●      |
| P17.05                      | Motor speed                       | 0~65535RPM   | 0~65535        | 0RPM          | ●      |
| P17.06                      | Torque current                    | -3000.0~3000.0A  | -3000.0~3000.0 | 0.0A          | ●      |
| P17.07                      | Magnetized current                | -3000.0~3000.0A  | -3000.0~3000.0 | 0.0A          | ●      |
| P17.08                      | Motor power                       | -300.0~300.0% (relative to the rated power of the motor) | -300.0~300.0   | 0.0%          | ●      |
| P17.09                      | Output torque                     | -250.0~250.0%  | -250.0~250.0   | 0.0%          | ●      |
| P17.10                      | The motor frequency evaluation    | 0.00~P00.03  | 0.00~600.00    | 0.00Hz        | ●      |
| P17.11                      | DC bus voltage                    | 0.0~2000.0V  | 0.0~2000.0     | 0V            | ●      |
| P17.12                      | Switch input terminals state      | 0000~00FF  | 0000~00FF      | 0             | ●      |
| P17.13                      | Switch output terminals state     | 0000~000F  | 0000~000F      | 0             | ●      |

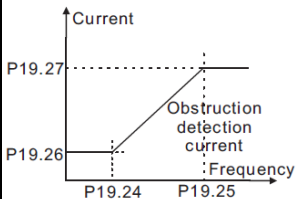
| Function code | Name                               | Detailed instruction of parameters   | Setting range  | Default value | Modifying |
|---------------|------------------------------------|--|----------------|---------------|-----------|
| P17.14        | Digital adjustment                 | 0.00Hz~P00.03  | 0.00~10.00     | 0.00V         | ●         |
| P17.15        | Torque reference                   | -300.0%~300.0% (motor rated current)   | -300.0~300.0   | 0.0%          | ●         |
| P17.23        | Door width pulse counting high bit | Door width pulse counting=door width pulse counting high bit*10000+door width pulse counting low bit | -32768~32767   | 0             | ●         |
| P17.24        | Door width pulse counting low bit  |  | 0-9999         | 0             | ●         |
| P17.28        | ASR controller output              | -300.0%~300.0% (motor rated current)   | -300.0~300.0   | 0.0%          | ●         |
| P17.32        | Magnetic flux linkage              | 0.0%~200.0%  | 0.0~200.0      | 0.0%          | ●         |
| P17.33        | Exciting current reference         | -3000.0~3000.0A  | -3000.0~3000.0 | 0.0A          | ●         |
| P17.34        | Torque current reference           | -3000.0~3000.0A  | -3000.0~3000.0 | 0.0A          | ●         |
| P17.35        | AC input current                   | 0.0~5000.0A  | 0.0~5000.0     | 0.0A          | ●         |
| P17.36        | Output torque                      | -3000.0Nm~3000.0Nm   | 0~65535        | 0.0Nm         | ●         |
| P17.37        | Motor overload counting            | 0~100 (OL1 when 100)   | 0~100          | 0             | ●         |
| P17.38        | Encoder actual frequency           | Positive when the motor runs forward, negative when the motor runs reversely<br>-3276.8~3276.7Hz     | -327688~32767  | 0             | ●         |
| P17.39        | Count value of encoder position    | 1 circle count value of encoder pulse, 4 fold-frequency<br>0-65535                                   | 0~65535        | 0             | ●         |
| P17.40        | High bit of accumulated            | Accumulated count value of encoder pulse=P17.40*10000+P17.41   | -32768~32767   | 0             | ●         |

| Function code                 | Name  | Detailed instruction of parameters | Setting range | Default value | Modifying |
|-------------------------------|---|------------------------------------|---------------|---------------|-----------|
|                               | count value of encoder pulse                        |                                    |               |               |           |
| P17.41                        | Low bit of accumulated count value of encoder pulse |                                    | 0~9999        | 0             | ●         |
| <b>P18 Group OPEN control</b> |   |                                    |               |               |           |
| P18.00                        | OPEN speed setting 1                                | 0.00Hz~P00.03                      | 0.00~P00.03   | 5.00Hz        | ○         |
| P18.01                        | OPEN ACC/DEC time 1                                 | 0.1s~1000.0s                       | 0.1~1000.0    | 1.0s          | ○         |
| P18.02                        | OPEN speed setting 2                                | 0.00Hz~P00.03                      | 0.00~P00.03   | 12.00Hz       | ○         |
| P18.03                        | OPEN ACC/DEC time 2                                 | 0.1s~1000.0s                       | 0.1~1000.0    | 2.0s          | ○         |
| P18.04                        | OPEN speed setting 3                                | 0.00Hz~P00.03                      | 0.00~P00.03   | 12.00Hz       | ○         |
| P18.05                        | OPEN ACC/DEC time 3                                 | 0.1s~1000.0s                       | 0.1~1000.0    | 2.0s          | ○         |
| P18.06                        | OPEN speed setting 4                                | 0.00Hz~P00.03                      | 0.00~P00.03   | 4.00Hz        |           |
| P18.07                        | OPEN ACC/DEC time 4                                 | 0.1s~1000.0s                       | 0.1~1000.0    | 2.0s          |           |
| P18.08                        | OPEN speed setting 5                                | 0.00Hz~P00.03                      | 0.00~P00.03   | 4.00Hz        | ○         |
| P18.09                        | OPEN ACC/DEC time 5                                 | 0.1s~1000.0s                       | 0.1~1000.0    | 2.0s          | ○         |
| P18.10                        | OPEN hold wait time                                 | 0.1s~1000.0s                       | 0.1~1000.0    | 0.5s          | ○         |
| P18.11                        | OPEN hold waiting speed                             | 0.00Hz~P00.03                      | 0.00~P00.03   | 0.5Hz         | ○         |
| P18.12                        | OPEN arrival hold speed                             | 0.00Hz~P00.03                      | 0.00~P00.03   | 3.00Hz        | ○         |

| Function code                  | Name                                 | Detailed instruction of parameters | Setting range | Default value | Modify |
|--------------------------------|--------------------------------------|------------------------------------|---------------|---------------|--------|
|                                | setting                              |                                    |               |               |        |
| P18.13                         | OPEN arrival hold torque             | 0.0%~150.0%                        | 0.0~150.0     | 20.0%         | ○      |
| P18.14                         | OPEN obstruction torque              | 0.0%~150.0%                        | 0.0~150.0     | 60.0%         | ○      |
| P18.15                         | OPEN obstruction judgment time       | 0.000s~10.000s                     | 0.000~10.000  | 0.000s        | ○      |
| P18.16                         | CLOSE limit signal separation timing | 0.1s~1000.0s                       | 0.1~1000.0    | 0.0s          | ○      |
| P18.17                         | OPEN speed change arrival timing     | 0.1s~1000.0s                       | 0.1~1000.0    | 0.0s          | ○      |
| P18.18                         | OPEN ACC/DEC selection               | 0: Linear<br>1: S curve            | 0~1           | 0             | ◎      |
| P18.19                         | OPEN S curve start time              | 0.0~20.0s                          | 0.0~20.0      | 0.1s          | ◎      |
| P18.20                         | OPEN S curve end time                | 0.0~20.0s                          | 0.0~20.0      | 0.1s          | ◎      |
| <b>P19 Group CLOSE control</b> |                                      |                                    |               |               |        |
| P19.00                         | CLOSE speed setting 1                | 0.00Hz~P00.03                      | 0.00~P00.03   | 5.00Hz        | ○      |
| P19.01                         | CLOSE ACC/DEC time 1                 | 0.1s~1000.0s                       | 0.1~1000.0    | 1.0s          | ○      |
| P19.02                         | CLOSE speed setting 2                | 0.00Hz~P00.03                      | 0.00~P00.03   | 14.00Hz       | ○      |
| P19.03                         | CLOSE ACC/DEC time 2                 | 0.1s~1000.0s                       | 0.1~1000.0    | 2.0s          | ○      |
| P19.04                         | CLOSE speed setting 3                | 0.00Hz~P00.03                      | 0.00~P00.03   | 14.00Hz       | ○      |
| P19.05                         | CLOSE ACC/DEC                        | 0.1s~1000.0s                       | 0.1~1000.0    | 2.0s          | ○      |

| Function code | Name                                | Detailed instruction of parameters  | Setting range | Default value | Modify |
|---------------|-------------------------------------|---|---------------|---------------|--------|
|               | time 3                              |   |               |               |        |
| P19.06        | CLOSE speed setting 4               | 0.00Hz~P00.03   | 0.00~P00.03   | 3.00Hz        | ○      |
| P19.07        | CLOSE ACC/DEC time 4                | 0.1s~1000.0s  | 0.1~1000.0    | 2.0s          | ○      |
| P19.08        | CLOSE speed setting 5               | 0.00Hz~P00.03   | 0.00~P00.03   | 3.00Hz        | ○      |
| P19.09        | CLOSE ACC/DEC time 5                | 0.1s~1000.0s  | 0.1~1000.0    | 2.0s          | ○      |
| P19.10        | CLOSE hold wait time                | 0.1s~1000.0s  | 0.1~1000.0    | 0.5s          | ○      |
| P19.11        | CLOSE hold waiting speed            | 0.00Hz~P00.03   | 0.00~P00.03   | 0.5Hz         | ○      |
| P19.12        | CLOSE speed change arrival timing   | 0.1s~1000.0s  | 0.1~1000.0    | 0.0s          | ○      |
| P19.13        | CLOSE arrival hold speed setting    | 0.00Hz~P00.03   | 0.00~P00.03   | 3.00Hz        | ○      |
| P19.14        | CLOSE arrival hold torque           | 0.0%~150.0%   | 0.0~150.0     | 20.0%         | ○      |
| P19.15        | CLOSE obstruction torque            | 0.0%~150.0%   | 0.0~150.0     | 70.0%         | ○      |
| P19.16        | CLOSE obstruction judgment time     | 0.000s~10.000s  | 0.000~10.000  | 0.000s        | ○      |
| P19.18        | OPEN limit signal separation timing | 0.1s~1000.0s  | 0.1~1000.0    | 0.0s          | ○      |
| P19.19        | CLOSE overtime judgment time        | 0.1s~1000.0s  | 0.1~1000.0    | 0.0           | ○      |
| P19.20        | CLOSE obstruction                   | When the slip ratio is smaller than the judgment slip, the obstruction signal | 0.0~100.0     | 50.0%         | ○      |

| Function code | Name   | Detailed instruction of parameters  | Setting range | Default value | Modify |
|---------------|--|---|---------------|---------------|--------|
|               | judgment slip (low speed)                    | becomes valid.<br>Slip=detection frequency/reference frequency  |               |               |        |
| P19.21        | CLOSE obstruction judgment slip (high speed) | No detection when the detection time is 0<br>Need to set P20.05 correctly (drive ratio between motor and encoder), ensure encoder detection speed is consistent with the set speed. | 0.0~100.0     | 70.0%         | ○      |
| P19.22        | CLOSE obstruction judgment switch frequency  |   | 0.00~P00.03   | 5.00Hz        | ○      |
| P19.23        | CLOSE obstruction slip detection time        |   | 0.000~10.000  | 0.000s        | ○      |
| P19.24        | Obstructed current detection frequency 1     |   | 0.00~P00.03   | 10.00Hz       | ○      |
| P19.25        | Obstructed current detection frequency 2     |   | 0.00~P00.03   | 50.00Hz       | ○      |
| P19.26        | Obstructed current detection current 1       |   | 0.0~100.0     | 100.0%        | ○      |
| P19.27        | Obstructed current detection current 2       |   | 0.0~100.0     | 100.0%        | ○      |
| P19.28        | Obstructed current detection time            |   | 0.000~10.000  | 0.000s        | ○      |
| P19.29        | Safety sensor function selection             | 0: When the sensor signal is valid, execute fault OPEN action<br>1: When the CLOSE signal and sensor signal are valid, execute fault  |               | 0             | ◎      |





| Function code                     | Name   | Detailed instruction of parameters   | Setting range | Default value | Modify |
|-----------------------------------|--|--|---------------|---------------|--------|
|                                   |  | CLOSE action<br>2: When the fault CLOSE signal is valid, execute fault CLOSE action                              |               |               |        |
| P19.30                            | CLOSE obstruction and OPEN arrival hold time | OPEN hold time after fault OPEN arrival, after time arrival, if the CLOSE command is valid, execute CLOSE action | 0~1000.0      | 3.0s          | ○      |
| P19.31                            | Abnormal DEC time                            | DEC time at CLOSE obstruction  | 0~1000.0      | 0.5s          | ○      |
| P19.32                            | CLOSE ACC/DEC selection                      | 0: Linear<br>1: S curve  | 0~1           | 0             | ◎      |
| P19.33                            | CLOSE S curve start time                     | 0.0~20.0s  | 0.0~20.0      | 0.1s          | ◎      |
| P19.34                            | CLOSE S curve end time                       | 0.0~20.0s  | 0.0~20.0      | 0.1s          | ◎      |
| P19.35                            | Speed setting 1 of slow speed CLOSE          | 0.00Hz~20.00Hz   | 0.00~20.00    | 3.00Hz        | ○      |
| P19.36                            | Speed setting 2 of slow speed CLOSE          | 0.00Hz~20.00Hz   | 0.00~20.00    | 5.00Hz        | ○      |
| P19.37                            | Speed setting 3 of slow speed CLOSE          | 0.00Hz~20.00Hz   | 0.00~20.00    | 5.00Hz        | ○      |
| P19.38                            | Speed setting 4 of slow speed CLOSE          | 0.00Hz~20.00Hz   | 0.00~20.00    | 5.00Hz        | ○      |
| P19.39                            | Speed setting 5 of slow speed CLOSE          | 0.00Hz~20.00Hz   | 0.00~20.00    | 2.00Hz        | ○      |
| <b>P20 Group Distance control</b> |  |  |               |               |        |
| P20.00                            | Door width autotuning                        | 0: Disabled<br>1: Enabled, in manual commissioning mode of elevator door   | 0~1           | 0             | ◎      |
| P20.01                            | Encoder pulse                                | 0-60000  | 0-60000       | 1024          | ◎      |

| Function code | Name                                  | Detailed instruction of parameters   | Setting range | Default value | Modify |
|---------------|---------------------------------------|--|---------------|---------------|--------|
|               | number                                |  |               |               |        |
| P20.02        | Encoder direction                     | 0: Forward<br>1: Reverse   | 0~1           | 0             | ☉      |
| P20.03        | Encoder offline detection time        | 0.0~10.0s  | 0~100         | 1.0s          | ○      |
| P20.04        | Encoder reverse detection time        | 0.0~100.0s   | 0~1000        | 0.8s          | ○      |
| 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.<br>Setting range: 0.001~65.535 | 0.001~65.535  | 1.000         | ○      |
| P20.06        | Door width autotuning speed           | 0.00~20.00Hz   | 0.00~20.00    | 3.00Hz        | ○      |
| P20.07        | High bit of door width pulse number   | 0~9999   | 0~9999        | 0             | ☉      |
| P20.08        | Low bit of door width pulse number    | 0~9999   | 0~9999        | 0             | ☉      |
| P20.09        | CLOSE arrival position                | 0.0%~10.0% (door width)  | 0.0~10.0      | 3.0%          | ○      |
| P20.10        | OPEN speed change position 1          | 0.0%~30.0% (door width)  | 0.0~30.0      | 10.0%         | ○      |
| P20.11        | OPEN speed change position 2          | 20.0%~80.0% (door width)   | 20.0~80.0     | 30.0%         | ○      |
| P20.12        | OPEN speed change position 3          | 80.0%~99.0% (door width)   | 80.0~99.0     | 70.0%         | ○      |
| P20.13        | OPEN speed change position 4          | 80.0%~99.0% (door width)   | 80.0~99.0     | 90.0%         | ○      |
| P20.14        | OPEN arrival position                 | 90.0%~100.0% (door width)  | 90.0~100.0    | 97.0%         | ○      |

| Function code                           | Name   | Detailed instruction of parameters   | Setting range | Default value | Modify                           |
|---|--|--|---------------|---------------|----------------------------------|
| P20.15                                  | CLOSE speed change position 1                    | 80.0%~99.0% (door width)   | 80.0~99.0     | 95.0%         | <input type="radio"/>            |
| P20.16                                  | CLOSE speed change position 2                    | 60.0%~90.0% (door width)   | 60.0~90.0     | 75.0%         | <input type="radio"/>            |
| P20.17                                  | CLOSE speed change position 3                    | 20.0%~80.0% (door width)   | 20.0~80.0     | 30.0%         | <input type="radio"/>            |
| P20.18                                  | CLOSE speed change position 4                    | 20.0%~80.0% (door width)   | 20.0~80.0     | 10.0%         | <input type="radio"/>            |
| P20.19                                  | Current pulse of door position                   | 0.0%~100.0% (door width)   |               |               | <input checked="" type="radio"/> |
| <b>P21 Group Demonstration function</b> |  |  |               |               |                                  |
| P21.00                                  | Demonstration OPEN arrival hold time             | 0.0s~1000.0s   | 0.0~1000.0    | 3.0s          | <input type="radio"/>            |
| P21.01                                  | Demonstration CLOSE arrival hold time            | 0.0s~1000.0s   | 0.0~1000.0    | 3.0s          | <input type="radio"/>            |
| P21.02                                  | Demonstration OPEN/ CLOSE set running times      | 0~65535  | 0~65535       | 0             | <input type="radio"/>            |
| P21.03                                  | Demonstration OPEN/ CLOSE operation times record | 0~65535  | 0~65535       | 0             | <input checked="" type="radio"/> |
| P21.04                                  | OPEN command delay time                          | Command delay valid time after OPEN/CLOSE command is cancelled (only valid at arrival) | 0.0~1000.0    | 0.0           | <input type="radio"/>            |
| P21.05                                  | CLOSE command delay time                         | When set to 1000.0, valid all the time after the command is cancelled                  | 0.0~1000.0    | 0.0           | <input type="radio"/>            |

## 6 Commissioning instruction

### 6.1 Running commissioning

1. Wiring properly according to manufacturer's instructions;
2. Motor parameter autotuning:
  - 1) P00.13=1, restore factory defaults;
  - 2) P00.01=0, general inverter mode;
  - 3) Set relevant motor parameters of P02 Group properly;
  - 4) 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;
  - 5) 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;
  - 7) 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:

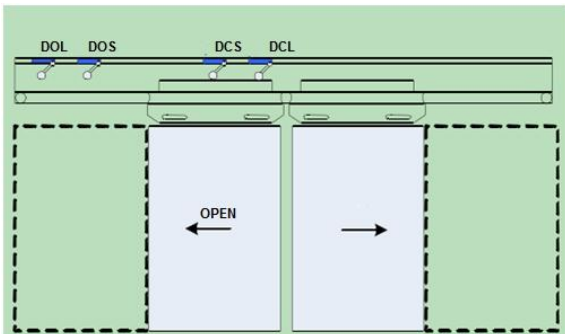


Figure 6-1 Travel switch

## 6.2.1 Wiring instruction in speed control mode

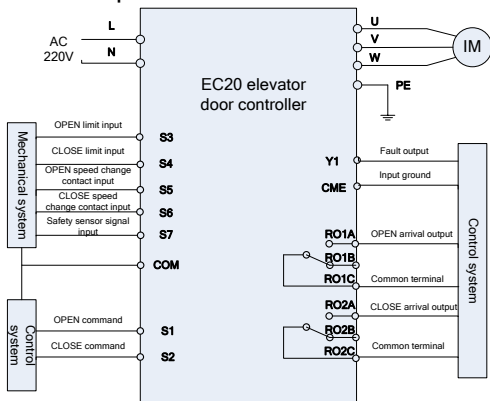


Figure 6-2 Wiring instruction in speed control mode

## 6.2.2 Function parameters setting

| Function code | Name                       | Setting value                             |
|---------------|----------------------------|---|
| P00.00        | Control mode               | 1: SVC<br>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

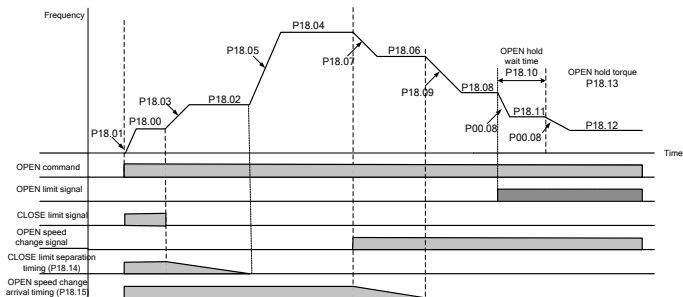


Figure 6-3 OPEN operation curve in speed control mode

Instruction of OPEN process in speed control mode:

- 1) When OPEN command is valid, the elevator door runs at the set speed P18.00 and the ACC time is P18.01;
- 2) When CLOSE limit signal becomes from valid to invalid, shift to the set speed P18.02 and the ACC time is P18.03; (if P18.14=0, go to the next step)
- 3) 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 P18.15=0, go to the next step)
- 5) 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;
- 7) 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

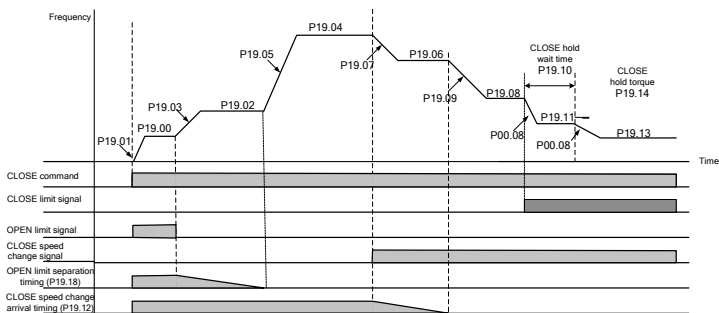


Figure 6-4 CLOSE operation curve in speed control mode

Instruction of CLOSE process in speed control mode:

- 1) When CLOSE command is valid, the elevator door runs at the set speed P19.00 and the ACC time is P19.01;
- 2) 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)
- 3) When OPEN limit separation timing P19.18 arrives, shift to the set speed P19.04 and the ACC time is P19.05;
- 4) 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)
- 5) When CLOSE speed change timing P19.15 arrives, shift to the set speed P19.08 and

the ACC time is P19.09;

- 6) When CLOSE limit signal is valid, 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.

### 6.3 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

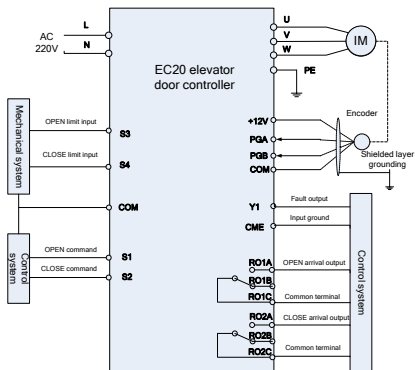


Figure 6-5 Wiring instruction in distance control mode 1

#### 6.3.2 Encoder setting

- 1) 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:

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

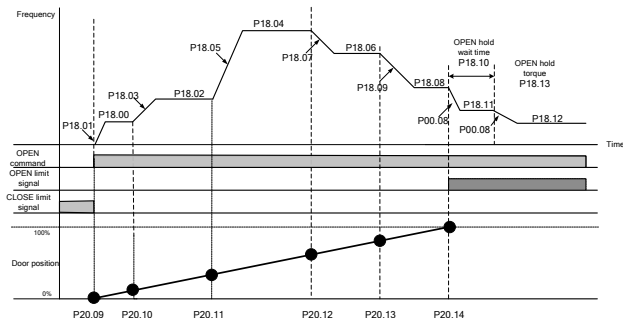


Figure 6-6 OPEN operation curve in distance control mode 1

Instruction of OPEN process in distance control mode 1:

- 1) When OPEN command is valid, the elevator door runs at the set speed P18.00 and the ACC time is P18.01;
- 2) When door position pulse number is larger than P20.10, shift to the set speed P18.02 and the ACC time is P18.03;
- 3) When door position pulse number is larger than P20.11, shift to the set speed P18.04 and the ACC time is P18.05;
- 4) 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;
- 6) When door position pulse number is larger than P20.14, shift to the set speed P18.10 and the ACC time is P00.08;
- 7) 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

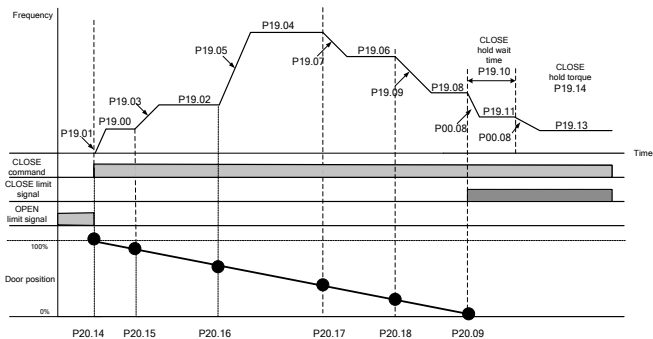


Figure 6-7 CLOSE operation curve in distance control mode 1

Instruction of CLOSE process in distance control mode 1:

- 1) When CLOSE command is valid, the elevator door runs at the set speed P19.00 and the ACC time is P19.01;
- 2) When door position pulse number is smaller than P20.15, shift to the set speed P19.02 and the ACC time is P19.03;
- 3) When door position pulse number is smaller than P20.16, shift to the set speed P19.04 and the ACC time is P19.05;
- 4) When door position pulse number is smaller than P20.17, shift to the set speed P19.06 and the ACC time is P19.07;
- 5) When door position pulse number is smaller than P20.18, shift to the set speed P19.08 and the ACC time is P19.09;
- 6) 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.

### 6.4 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

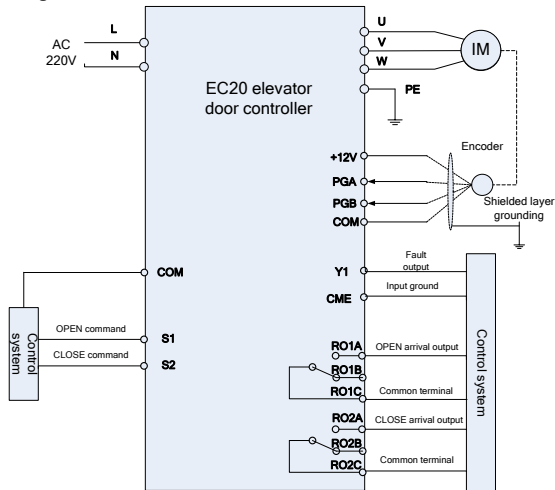


Figure 6-8 Wiring instruction in distance control mode 2

#### 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.

#### 6.4.4 Function parameters setting

| Function code | Name                    | Setting value                   |
|---------------|-------------------------|---------------------------------|
| P00.00        | Control mode            | 1: SVC<br>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)

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

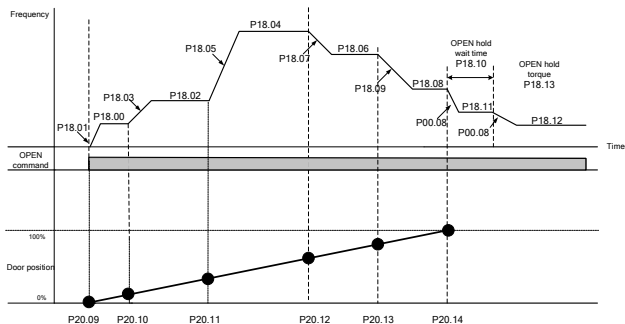


Figure 6-9 OPEN operation curve in distance control mode 2

Instruction of OPEN process in distance control mode 2:

- 1) When OPEN command is valid, the elevator door runs at the set speed P18.00 and the ACC time is P18.01;
- 2) When door position pulse number is larger than P20.10, shift to the set speed P18.02 and the ACC time is P18.03;
- 3) When door position pulse number is larger than P20.11, shift to the set speed P18.04 and the ACC time is P18.05;
- 4) 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;
- 6) When door position pulse number is larger than P20.14, shift to the set speed P18.10 and the ACC time is P00.08;
- 7) 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

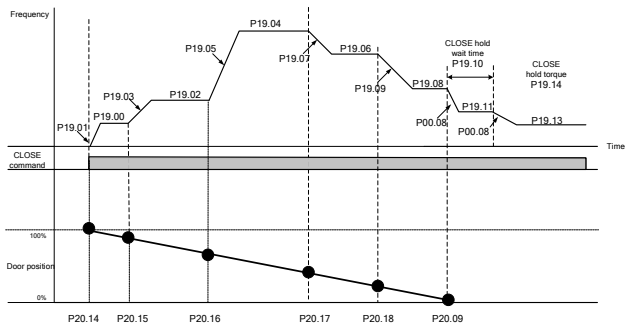


Figure 6-10 CLOSE operation curve in distance control mode 2

Instruction of CLOSE process in distance control mode 2:

- 1) When CLOSE command is valid, the elevator door runs at the set speed P19.00 and the ACC time is P19.01;
- 2) When door position pulse number is smaller than P20.15, shift to the set speed P19.02 and the ACC time is P19.03;
- 3) When door position pulse number is smaller than P20.16, shift to the set speed P19.04 and the ACC time is P19.05;
- 4) When door position pulse number is smaller than P20.17, shift to the set speed P19.06 and the ACC time is P19.07;
- 5) When door position pulse number is smaller than P20.18, shift to the set speed P19.08 and the ACC time is P19.09;
- 6) 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

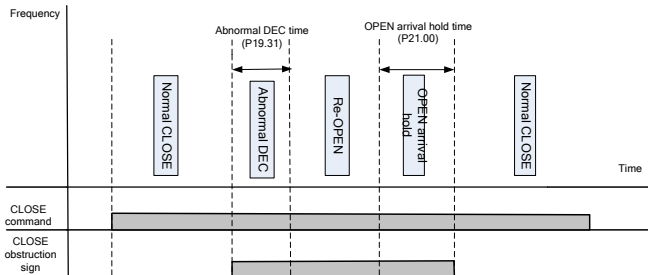


Figure 6-11 CLOSE obstruction

**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.
- 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)
- 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.
- 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.

| Checking            |                | Item   | Method                                 | Criterion  |
|---------------------|----------------|--|--|--|
| Ambient environment |                | Check the ambient temperature, humidity and vibration and ensure there is no dust, gas, oil fog or water drop. | Visual examination and instrument test | Conforming to the manual   |
|                     |                | Ensure there are no tools or other foreign or dangerous objects.   | Visual examination                     | There are no tools or dangerous objects.   |
| Voltage             |                | Ensure the main circuit and control circuit are normal.  | Measure with multimeter                | Conforming to the manual   |
| Keypad              |                | Ensure the display is clear enough.  | Visual examination                     | The characters are displayed normally.   |
|                     |                | Ensure the characters are displayed totally.   | Visual examination                     | Conforming to the manual   |
| Main circuit        | For public use | Ensure the screws are tightened securely.  | Tighten up                             | NA   |
|                     |                | Ensure there is no distortion, crackles, damage or color-changing caused by overheat and aging to the machine. | Visual examination                     | NA   |
|                     |                | Ensure there is no dust or dirtiness   | Visual examination                     | NA<br><b>Note:</b> If the color of copper blocks changes, it does not mean there is something wrong with the features. |

| Checking                   | Item   | Method  | Criterion   |
|----------------------------|--|---|---|
| Lead of conductors         | Ensure that there is no distortion or color-changing caused by overheat to the conductors. | Visual examination  | NA  |
|                            | Ensure that there are no crackles or color-changing to the protective layers.              | Visual examination  | NA  |
| Terminals seat             | Ensure that there is no damage.  | Visual examination  | NA  |
| Filter capacitors          | Ensure that there is no leakage, color-changing, crackles or casing expansion.             | Visual examination  | NA  |
|                            | Ensure the safety valve is in the right place.   | Estimate the life time according to the maintenance or measure the electrostatic capacity | NA  |
|                            | If necessary, measure the electrostatic capacity.  | Measure the capacity by instrument  | The capacity is above or equal to the original value *0.85. |
| Resistors                  | Ensure whether there is replacement and splitting caused by overheat.                      | Smelling and visual examination   | NA  |
|                            | Ensure that there is no offline.   | Visual examination or remove one end to coagulate or measure with multimeter              | The resistance is in $\pm 10\%$ of the standard value       |
| Transformer and reactor    | Ensure there is no abnormal vibration, noise or smelling                                   | Hearing, smelling and visual examination  | NA  |
| Electro-magnetic contactor | Ensure whether there is vibration noise in the workrooms.                                  | Hearing   | NA  |

| Checking        |                  | Item  | Method  | Criterion       |
|-----------------|------------------|---|---|-----------------|
|                 | and relay        | Ensure the contact is in good connection.   | Visual examination  | NA              |
| Control circuit | PCB and plug     | Ensure there are no loose screws or contactors.   | Tighten up  | NA              |
|                 |                  | Ensure there is no smelling or color-changing.  | Smelling and visual examination   | NA              |
|                 |                  | Ensure there are no crackles, damage, distortion or rust.                                   | Visual examination  | NA              |
|                 |                  | Ensure there is no leakage or distortion to the capacitors.                                 | Visual examination or estimate the life time according to the maintenance information | NA              |
| Cooling system  | Cooling fan      | Estimate whether there is abnormal noise and vibration.                                     | Hearing and Visual examination or rotate with hand                                    | Stable rotation |
|                 |                  | Estimate there is no loose screws.  | Tighten up  | NA              |
|                 |                  | Ensure there is no color-changing caused by overheat.                                       | Visual examination or estimate the life time according to the maintenance information | NA              |
|                 | Ventilating duct | Ensure whether there is no stuff or foreign objects in cooling fan, air inlet and air vent. | Visual examination  | NA              |

### 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

The DC bus capacitors must be reformed according to the operation instruction if the controller has been stored for a long time. The storing time is counted from the delivery date.

| 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 <ul style="list-style-type: none"> <li>• charging 25% rated voltage for 30 minutes</li> <li>• charging 50% rated voltage for 30 minutes</li> <li>• charging 75% rated voltage for 30 minutes</li> <li>• charging 100% rated voltage for 30 minutes</li> </ul> |
| Storing time more than 3 years | Use voltage-adjusting power supply to charge the controller <ul style="list-style-type: none"> <li>• charging 25% rated voltage for 2 hours</li> <li>• charging 50% rated voltage for 2 hours</li> <li>• charging 75% rated voltage for 2 hours</li> <li>• charging 100% rated voltage for 2 hours</li> </ul>             |

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*.

|  |  |
|--|--|
|  | <b>Ignoring the instructions would cause physical injury or death, or damage to the equipment.</b> |
|--|--|

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



|  |   |
|--|---|
|  | ◇ <b>Read and follow the instructions in chapter <i>Safety Precautions</i>. Ignoring the instructions would cause physical injury or death, or damage to the equipment.</b> |
|--|---|

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



|  |  |
|--|--|
|  | ◇ <b>Only qualified electricians are allowed to maintain the inverter. Read the safety instructions in <i>Safety precautions</i> before working on the inverter.</b> |
|--|--|

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

| Code | Fault                    | Cause   | Solution  |
|------|--------------------------|---|---|
| OV1  | Accelerating overvoltage | 1. The input voltage is abnormal.<br>2. There is large energy feedback.<br>3. No braking components.<br>4. Braking energy is not open   | 1. Check the input power<br>2. Check if the DEC time of the load is too short or the inverter starts during the rotation of the motor or it needs to increase the energy consumption components.<br>3. Install the braking components.<br>4. Check the setting of relative function codes.  |
| OV2  | Decelerating overvoltage |   |   |
| OV3  | Constant overvoltage     |   |   |
| OUt1 | IGBT U phase protection  | The acceleration is too fast;<br>There is damage to the internal to IGBT of the phase;<br>Interference causes faulty action;<br>The connection of the driving wires is not good;<br>The grounding is not good   | Increase ACC time;<br>Change the power unit;<br>Check the driving wires;<br>Check if there is strong interference to the external equipment   |
| OUt2 | IGBT V phase protection  |   |   |
| OUt3 | IGBT W phase protection  |   |   |
| OC1  | Accelerating overcurrent | 1. The acceleration or deceleration is too fast.<br>2. The voltage of the grid is too low.<br>3. The power of the inverter is too low.<br>4. The load transients or is abnormal.<br>5. The grounding is short circuited or the output is phase loss.<br>6. There is strong external interference.<br>7. The overvoltage stall protection is not open. | 1. Increase the ACC/DEC time<br>2. Check the input power<br>3. Select the controller with a larger power<br>4. Check if the load is short circuited (the grounding short circuited or the wire short circuited) or the rotation is not smooth.<br>5. Check the output configuration.<br>6. Check if there is strong interference.<br>7. Check the setting of relative function codes. |
| OC2  | Decelerating overcurrent |   |   |
| OC3  | Constant overcurrent     |   |   |
| UV   | Bus undervoltage fault   | 1. The voltage of the power supply is too low.<br>2. The overvoltage stall  | 1. Check the input power of the supply line.<br>2. Check the setting of relative  |

| Code | Fault                         | Cause   | Solution  |
|------|-------------------------------|---|---|
|      |                               | protection is not open.   | function codes.   |
| OL1  | Motor overload                | The voltage of the power supply is too low;<br>The setting of motor rated current is incorrect;<br>The motor stall or load transients is too strong                                   | Check the power of the supply line;<br>Reset the rated current of the motor<br>Check the load and adjust the torque lift  |
| OL2  | Inverter overload             | The acceleration is too fast;<br>Reset the rotating motor;<br>The voltage of the power supply is too low;<br>The load is too heavy;<br>The motor power is much larger than load power | Increase the ACC time;<br>Avoid the restarting after stopping;<br>Check the power of the supply line;<br>Select an inverter with bigger power;<br>Select a proper motor                                     |
| SPI  | Input phase loss              | Large fluctuation   | Check input power;<br>Check installation distribution   |
| SPO  | Output phase loss             | U, V, W phase loss output (or three phases of the load are seriously asymmetrical)  | Check the output distribution;<br>Check the motor and cable   |
| OH1  | Rectifying module<br>overheat | Air duct jam or fan damage;<br>Ambient temperature is too high;   | Dredge the air duct or change the fan;  |
| OH2  | Converter module<br>overheat  | The time of overload running is too long  | Low the ambient temperature   |
| EF   | External fault                | SI external fault input terminals action  | Check the external device input   |
| CE   | 485 communication<br>fault    | The baud rate setting is incorrect;<br>Fault occurs to the communication wiring;<br>The communication address is wrong;<br>There is strong interference to the communication          | Set proper baud rate;<br>Check the communication connection distribution;<br>Set proper communication address;<br>Change or replace the connection distribution or improve the anti-interference capability |
| ItE  | Current detection             | The connection of the control   | Check the connector and   |

| Code | Fault                      | Cause  | Solution  |
|------|----------------------------|--|---|
|      | fault                      | board is not good;<br>Hoare component is broken;<br>The modifying circuit is abnormal  | repatch;<br>Change the Hoare;<br>Change the main control board  |
| tE   | Motor autotuning fault     | The motor capacity does not comply with the inverter capacity;<br>The rated parameter of the motor does not set correctly;<br>The offset between the parameters from autotune and the standard parameter is huge;<br>Autotune overtime | Change the inverter model;<br>Set the rated parameter according to the motor name plate;<br>Empty the motor load and reidentify;<br>Check the motor connection and set the parameter;<br>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;<br>Damage to EEPROM   | Press <b>STOP/RST</b> to reset;<br>Change the main control board  |
| bcE  | Braking unit fault         | Braking circuit fault or damage to the braking pipes;<br>The external braking resistor is not sufficient   | Check the braking unit and change new braking pipes;<br>Increase the braking resistor   |
| END  | Running time arrival       | The actual running time of the inverter is above the internal setting running time   | Ask for the supplier and adjust the 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;<br>The keypad wire is too long and affected by strong interference;<br>There is circuit fault on the communication of the keypad and main board                              | Check the keypad wires and ensure whether there is mistake;<br>Check the environment and avoid the interference source;<br>Change the hardware and ask for service  |
| UPE  | Parameters                 | The connection of the keypad   | Check the environment and   |

| Code  | Fault                          | Cause   | Solution   |
|-------|--------------------------------|---|--|
|       | uploading fault                | wires is not good or broken;<br>The keypad wire is too long and affected by strong interference;<br>Communication fault   | eliminate interference source;<br>Change the hardware and ask for service;<br>Change the hardware and ask for service;                       |
| DNE   | Parameters downloading fault   | The connection of the keypad wires is not good or broken;<br>The keypad wire is too long and affected by strong interference;<br>There is mistake on the data storage of the keypad | Check the environment and eliminate interference source;<br>Change the hardware and ask for service;<br>Repack up the data in the keypad     |
| E-CAN | CANopen communication fault    | The connection is not good;<br>Corresponding resistor is not dialed;<br>The communication baud rate is uneven;<br>The ambient interference is too strong                            | Check the connection;<br>Draw out the corresponding resistor;<br>Set the same baud rate;<br>Check the environment and avoid the interference |
| ETH1  | Grounding shortcircuit fault 1 | The output of the inverter is short circuited with the ground;<br>There is fault in the current detection circuit   | Check if the connection of the motor is normal or not;<br>Change the Hoare;<br>Change the main control board                                 |
| ETH2  | Grounding shortcircuit fault 2 | The output of the inverter is short circuited with the ground;<br>There is fault in the current detection circuit   | Check if the connection of the motor is normal or not;<br>Change the Hoare;<br>Change the main control board                                 |
| ENC10 | Encoder offline fault          | Encoder signal cable offline;<br>Encoder damage   | Check the wiring of the encoder and reconnect;<br>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;  |

| Code | Fault                      | Cause  | Solution  |
|------|----------------------------|--|---|
|      |                            |  | Increase the detection time;<br>Check whether the control parameters are normal   |
| STo  | Maladjustment fault        | The control parameter of the synchronous motor is not set right;<br>The autotuning parameter is not correct;<br>The inverter is not connected to the motor | Check the load and ensure it is normal;<br>Check whether the control parameter is set properly or not;<br>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  |

### 7.2.5 Other faults

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

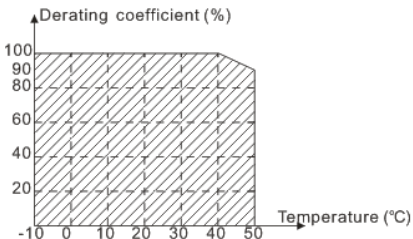
1. The maximum allowed motor shaft power is limited to  $1.5 \cdot P_N$ . If the limit is exceeded, motor torque and current are automatically restricted. The function protects the input bridge of the drive against overload.
2. The ratings apply at ambient temperature of  $40^\circ\text{C}$ .
3. It is important to check that in common DC systems the power flowing through the common DC connection does not exceed  $P_N$ .

#### A.1.2 Derating

The load capacity decreases if the installation site ambient temperature exceeds  $40^\circ\text{C}$ , the altitude exceeds 1000 meters or the switching frequency is changed from 4kHz to 8, 12 or 15kHz.

##### A.1.2.1 Temperature derating

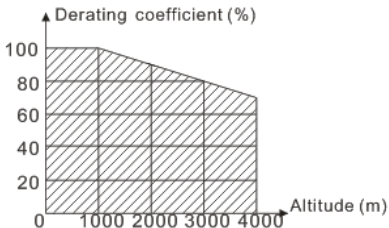
In the temperature range  $+40^\circ\text{C} \dots +50^\circ\text{C}$ , the rated output current is decreased by 1% for every additional  $1^\circ\text{C}$ . Refer to the below list for the actual derating.



##### 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.

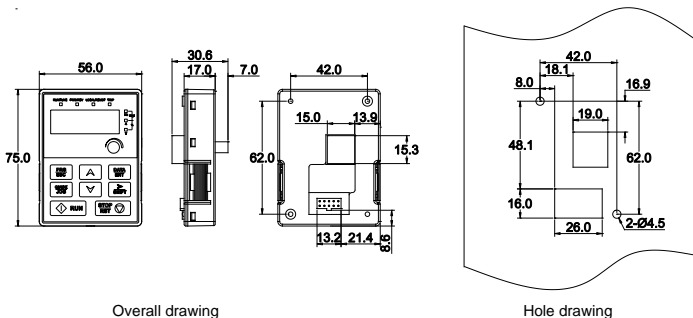


◇ **A drive of category C3 is not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference is expected if the drive is used on such a network.**

## Appendix B Dimension drawings

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

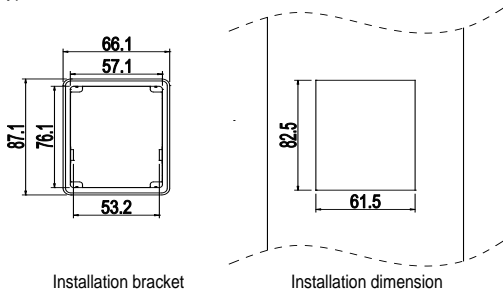
### B.1 External keypad (optional) structure



Overall drawing

Hole drawing

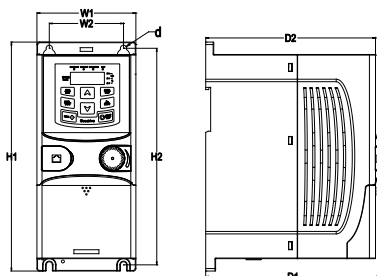
The external keypad can be mounted on the installation bracket and the bracket is optional.



Installation bracket

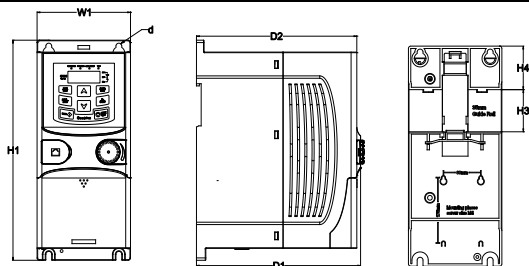
Installation dimension

## 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)

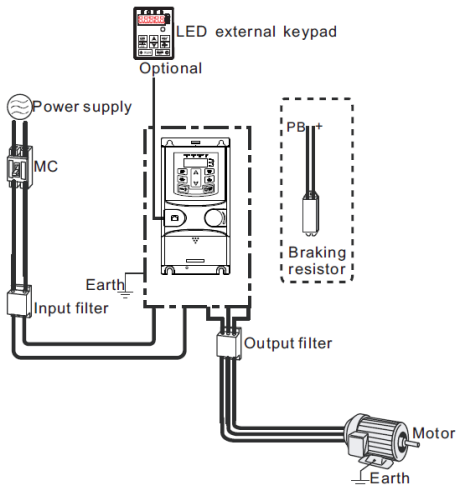
| Model        | W1   | H1    | H3   | H4   | D1    | D2    | Installation hole(d) |
|--------------|------|-------|------|------|-------|-------|----------------------|
| EC20-0R4G-S2 | 80.0 | 160.0 | 35.4 | 36.6 | 123.5 | 120.3 | 5                    |
| EC20-0R7G-S2 | 80.0 | 160.0 | 35.4 | 36.6 | 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 function of parameter copying.<br>When the external keypad with the function of parameter copying is valid, the local keypad is off;<br>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  |
|  | Breaker         | Prevent from electric shock and protect the power supply and the cables system from overcurrent when   |

| Pictures  | Name   | Descriptions  |
|---|--|---|
|   |  | short circuits occur. (Please select the breaker with the function of reducing high order harmonic and the rated sensitive 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.<br>Only braking resistors are needed for EC20 controllers.  |
|  | 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 releasing holes at the side | Apply to severe environment and improve protective effect.<br>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 (mm <sup>2</sup> ) |     | Connecting cable size (mm <sup>2</sup> ) |         |             |     | Terminal screw | Tightening torque (Nm) |
|--------------|---|-----|--|---------|-------------|-----|----------------|------------------------|
|              | RST UVW                                   | PE  | RST UVW                                  | P1, (+) | PB (+), (-) | PE  |                |                        |
| 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.
3. Where control cables must cross power cables make sure that they are arranged at an angle as near to 90 degrees as possible.
4. 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 filters 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 | FLT-PS2003L-C-G |
| EC20-0R7G-S2 |                 |

**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.

|  |   |
|--|---|
|    | <ul style="list-style-type: none"> <li>✧ <b>Only qualified electricians are allowed to design, install, commission and operate on the controller.</b></li> <li>✧ <b>Follow the instructions in “warning” during working. Physical injury or death or serious property may occur.</b></li> <li>✧ <b>Only qualified electricians are allowed to wire. Damage to the controller or braking options and part may occur.</b></li> <li>✧ <b>Read carefully the instructions of braking resistors or units before connecting them with the controller.</b></li> <li>✧ <b>Do not connect the braking resistor with other terminals except for PB and (+). Damage to the controller or braking circuit or fire may occur.</b></li> </ul> |
|  | <ul style="list-style-type: none"> <li>✧ <b>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.</b></li> </ul>   |



EC20 series controllers have internal braking units.



| Model        | Type of braking unit  | Braking resistor at 100% of the braking torque ( $\Omega$ ) | The consumed power of the braking resistor |             |             | Min. braking resistor ( $\Omega$ ) |
|--------------|-----------------------|---|--|-------------|-------------|------------------------------------|
|              |                       |   | 10% braking                                | 50% braking | 80% braking |                                    |
| EC20-0R4G-S2 | Internal braking unit | 361   | 0.06                                       | 0.30        | 0.48        | 42                                 |
| EC20-0R7G-S2 |                       | 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.

|  |   |
|--|---|
|  | ⚡ <b>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.</b> |
|  | ⚡ <b>Increase the power of the braking resistor properly in the frequent braking situation (the frequency usage ratio is more than 10%).</b>  |

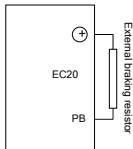
**C.7.2 Placing the brake resistor**

Use shielded cables for braking resistor cables.

Install all resistors in a place where they will cool.

|  |   |
|--|---|
|  | ⚡ <b>The materials near the brake resistor must be non-flammable. The surface temperature of the resistor is high. Air flowing from the resistor is of hundreds of degrees Celsius. Protect the resistor against contact.</b> |
|--|---|

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 [www.invt.com.cn](http://www.invt.com.cn).

### D.2 Feedback of INVT controllers manuals

Your comments on our manuals are welcome. Go to [www.invt.com.cn](http://www.invt.com.cn) 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 [www.invt.com.cn](http://www.invt.com.cn) and select *Service and Support of Document Download*.



Service line:86-755-86312859

Website:www.invt.com

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Two companies are commissioned to manufacture: (For product code, refer to the 2nd/3rd place of S/N on the name plate.)

**Shenzhen INVT Electric Co., Ltd.** (origin code: 01)

Address: INVT Guangming Technology Building, Songbai Road,  
Matian, Guangming District, Shenzhen, China

**INVT Power Electronics (Suzhou) Co., Ltd.** (origin code: 06)

Address: 1# Kunlun Mountain Road, Science&Technology Town,  
Gaoxin District, Suzhou, Jiangsu, China

**Industrial Automation:** ■ Frequency Inverter ■ Servo & Motion Control ■ Motor & Electric Spindle ■ PLC

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