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# EDC Series AC Servo User's Manual

(Version: V1.00)



Estun Industrial Automation Co., Ltd  
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## General Precautions >>>

### ■ Power supply voltage should be AC 220V.

This EDC servo system requires a power supply of AC 220V±15% voltage.

### ■ Don't connect the servo motor directly to local electric network.

It's prohibited to connect the servo motor directly to local electric network. Otherwise, the servo motor is very likely to get damaged. The servo motor will not rotate without support of servo drive.

### ■ Don't plug in or unplug the connectors when power is ON.

Internal circuit and motor encoder might be damaged if the plug in or unplug operations are performed during power ON. Always turn the power OFF first before plugging in or unplugging the connectors.

### ■ Wait for at least five minutes before doing inspection work on the servo system after turning power OFF.

Please be noted that even when the power is turned off, there will still be some electric energy remained in the capacitors of the internal circuit. In order to avoid electrical shock, please make sure inspection work is started five minutes after Charge indicator is OFF.

### ■ There should be at least 10 mm distance between the servo drive and any other devices mounted in the electrical cabinet.

The servo drive produces heat during working, heat dissipation should be considered in design of mounting layout. At least 10 mm lateral separation and 50 mm longitudinal separation are required from servo drive to other equipments when doing installation. Please install the Servo drive in an environment which is free from condensation, vibration and shock.

### ■ Noise rejection treatment and grounding.

The noise from signal wires causes easily the mechanical vibration and malfunctions. Please comply with the following rules strictly:

1. Run high-voltage power cables separately from low-voltage cables.
2. Shorten cable length as much as possible
3. Apply single point grounding (ground resistance is required to be less than 100Ω) for the mounting of servo motor and servo drive.
4. It's prohibited to apply power input noise filter between servo drive and servo motor.

### ■ Withstand voltage test of servo drive should meet following conditions:

1. Input voltage: AC 1500Vms, 1 minute
2. Interrupt/Break current: 100mA
3. Frequency: 50/60Hz
4. Forcing point: Between Terminal R or Terminal T and Terminal E.

### ■ Apply a fast-response leakage protector

It's required to use a fast-response leakage protector or a leakage protector for PWM inverter designated by supplier. Do not use a time-delay type leakage protector.

### ■ Avoid extreme adjustments or changes

Don't make extreme adjustments or changes to servo drive's parameters, which will cause terrible mechanical vibration and result in unnecessary property loss.

### ■ Don't run the servo motor by switching on/off the power supply directly.

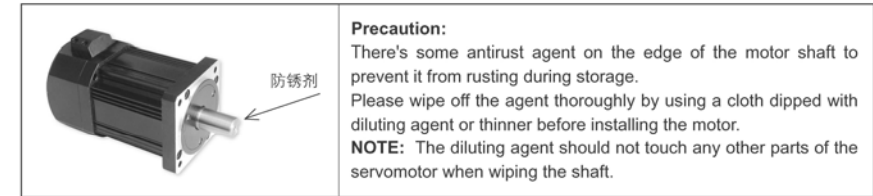
Frequent power on/off will cause fast aging to servo's internal elements, which will reduce the lifetime of servo drive. It's required to use reference signals to control the running of servo motor.

## Installation and dimension >>>

### [ Servo motor ]

Servomotor can be installed either horizontally or vertically. However, if the servomotor is installed with incorrect mechanical fittings, the servo motor's lifetime will be greatly shortened and unexpected accidents will occur.

Please make installation according to the instructions as below:



#### 1) Storage temperature

When the servomotor is not in use, it should be kept in a place with an environment temperature between -20°C and +60°C.

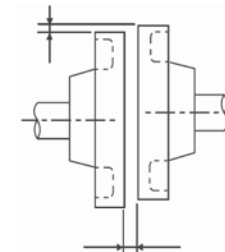
#### 2) Installation site

Servomotor should be installed indoors, and the environment should meet following conditions:

- a) Free from corrosive, inflammable or explosive gases
- b) Well ventilated and free from dust and moisture
- c) Ambient temperature is between 0°C and 40°C
- d) Relative humidity is between 20% and 80% RH (non-condensing)
- e) Maintenance and cleaning can be performed easily

#### 3) Installation concentricity

Use elastic shaft couplings as many as possible for mechanical connections. The axis centers of servo motor and mechanical load should be kept in the same line. If a shaft coupling is used when installing servo motor, it has to meet the requirement of concentricity tolerance as shown in the figure below.



Measure this at four different positions of a cycle. The difference between the maximum and minimum measured value must be less than 0.03mm. (Rotate together with shaft couplings).

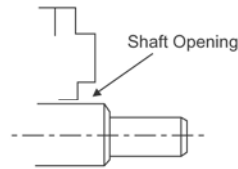
- If the concentricity tolerance is too big, mechanical vibration will occur, resulting in damage to the bearings of servo motor
- Never strike at the axis direction when installing shaft couplings, this could damage the servo encoder.

**4) Installation direction**

The servomotors can be installed, horizontally, vertically or in any direction.

**5) Handling oil and water**

If the servomotor is installed at a location subject to water, oil, or condensation, the motors require special treatment to meet protection requirements. If the motors are required to meet the protection requirement before leaving the factory, it's necessary to designate the exact motor types with oil seal. Shaft through section means the gap as shown in the following picture:



**6) Cable tension**

When connecting the cables, the bending radius shouldn't be too small, do not apply big pulling force to cables. The radius of signal cable wires is very small, around 0.2 mm to 0.3 mm, therefore handle the cables with adequate care and do not cause excessive cable tension while doing wiring.

**[ Servo drive ]**

EDC series of servo drives are all base-mounted. Incorrect mounting will definitely cause problems. Always mount the servo drives according to following installation instructions:

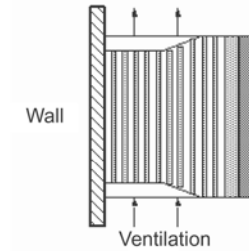
**1) Installation site**

The notes on installation of servo drive are as below:

| Condition                                      | Safety notes  |
|--|---|
| Installed inside a control cabinet             | A unified design for the cabinet size, configuration of servo drive, and the cooling method is required so that the ambient temperature around the servo drive is always below 55 °C (131 °F)   |
| Installed near a heating unit                  | Minimize the heat radiating from the heating units by taking advantage of heat dissipation measures such as natural convection current, forced-air cooling, to ensure working the temperature around the servo drive is always below 55 °C (131 °CF).   |
| Installed near a vibration source              | A vibration isolator should be mounted underneath the base surface to prevent vibration.  |
| Installed at a site exposed to corrosive gases | Appropriate measures should be taken to prevent corrosive gases from getting in. Corrosive gases does not have immediate influence on the servo drive but they will eventually cause problems on electronic components, which will definitely have influence on the running stability of servo drive. |
| Other situations                               | Do not install the servo drive in hot, humid locations  |

**2) Installation orientation**

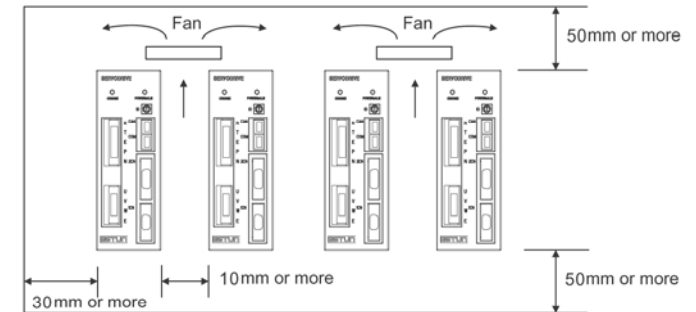
As shown in the following picture, the installation direction should be vertically mounted onto the wall, firmly fixed on the surface with two mounting holes.



A cooling fan can be mounted for forced-air cooling of the servo drive at request.

**3) Installation of several servo drives**

When several servo drives are required to be installed side by side inside one control cabinet, installation must be performed according to the gap requirement as shown below :



**■ Installation orientatio**

Install the servo drive vertically onto the wall so the front panel(connection board side) of servo drive faces the operator.

**■ Cooling**

As shown in the figure above, give sufficient space around each Servo drive for cooling by cooling fans or natural convection.

**■ Side-by-side installation**

When installing servo drives side by side as shown in the figure above, reserve at least 10 mm between two horizontal sides and at least 50 mm between two vertical sides. The temperature in the control cabinet needs to be kept evenly distributed, subject to no overheat at any part of servo drive. If necessary, install forced-air cooling fans above the servo drives to avoid excessive temperature rise.

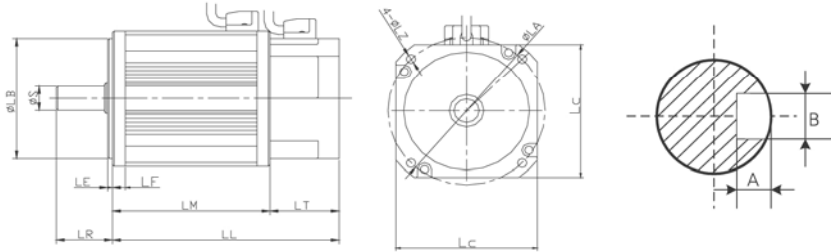
**■ Normal Working Conditions for Servo Drive**

1. Ambient Temperature: 0 to 55° C
2. Humidity: 90% RH or less, no condensing
3. Vibration: 4.9 m/s<sup>2</sup> or less
4. To ensure a long tem stability of the drive, it's suggested the ambient temperature during servo drive's running always be maintained below 45° C.

**4) Storage condition**

When the servo drive is not in use, it should be kept in a place with an environment temperature between -20° C and +85° C.

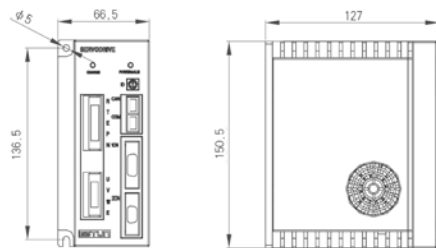
**[ Mounting dimension of servo motors ]**



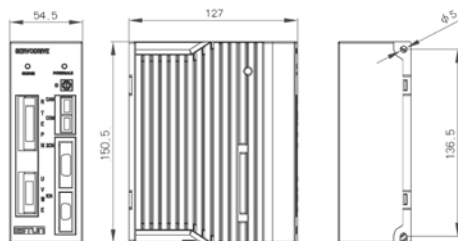
| Motor type      | LA  | LB | LC | LE | LF | LM  | LZ   | S   | LR | LL  | LT | A | B |
|-----------------|-----|----|----|----|----|-----|------|-----|----|-----|----|---|---|
| EMS-02AH□□-Z006 | 70  | 50 | 60 | 3  | 7  | 56  | Φ4.5 | Φ14 | 30 | 96  | 40 | 3 | 5 |
| EMS-04AH□□-Z013 | 70  | 50 | 60 | 3  | 7  | 81  | Φ4.5 | Φ14 | 30 | 121 | 40 | 3 | 5 |
| EMS-05AH□□-A016 | 90  | 70 | 80 | 3  | 13 | 88  | Φ5.5 | Φ19 | 35 | 129 | 41 | 4 | 6 |
| EMS-08AH□□-A024 | 90  | 70 | 80 | 3  | 13 | 106 | Φ5.5 | Φ19 | 35 | 147 | 41 | 4 | 6 |
| EMS-08AH□□-C024 | 100 | 80 | 90 | 3  | 9  | 98  | Φ6.0 | Φ16 | 35 | 139 | 41 | 3 | 5 |

**[ Mounting dimension of servo drives ]**

With cooling fan



Without cooling fan



**Wiring and connection >>>**

Always comply with the following instructions when making wiring or connections. Notices:

**! Notes**

- Neither run power wires and signal wires in the same conduit pipe nor bind them together. There should be at least 30 cm's distance between power wires and signal wires.
- Whole shielded twisted pair wires are required for signal wires and encoder feedback wires, shield layer must be connected to the shell of the plugs. Wire length requirement: reference signal input wires are maximum 3 meters, and encoder feedback wires are 20 meters to the maximum.
- Please be noted that even when the power is turned off, there will still be some electric energy remained in the internal circuit. In order to avoid electrical shock, please make sure inspection work is started five minutes after Charge indicator is OFF.
- Don't turn power ON and OFF frequently. If required, turning power ON and OFF should be controlled under once a minute. There are some high capacity capacitors being installed in the internal circuit of servo drive, when power is switched on, high charging electric current will flow though the capacitors within several dozens of ms, therefore, frequent power on/off will cause fast aging to servo's internal elements.

**[ Names and Functions of Main Circuit Terminals ]**

| Terminal symbol | Function                                  | Description   |
|-----------------|---|---|
| R, T            | Servo drive's power supply input terminal | Single-phase 200-230VAC <sup>+10%</sup> <sub>-15%</sub> , 50/60HZ   |
| U, V, W         | Servo Motor connection terminals          | Connects to power supply terminal of servo motor  |
| E               | Grounding terminals                       | Connected individually to power supply grounding terminals and servo motor grounding terminal.  |
| P, N            | Connection terminals of regenerative unit | To connect an external regenerative unit. Notes: It's prohibited to connect a regenerative resistor directly between P and N. motor grounding terminal. |

**[ Function list of I/O signals (1CN) ]**

| Signal name                    | Pin number           | Function  |   |
|--------------------------------|----------------------|---|---|
| +24VIN                         | 16                   | Control power supply input for I/O signals: Users need to prepare the +24V power supply. Effective voltage range: +11V~+25V                 |   |
| S-ON                           | 15                   | Servo ON: Servo motor is switched on  |   |
| ALM-RST                        | 6                    | Alarm reset: Release the servo alarm.   |   |
| CLR                            | 7                    | Clear signal input: Clear the error counter during position control.  |   |
| SPD_SEL2                       | 8                    | Internal speed selection: switch combinations up to 8 sorts of internal speed   |   |
| SPD_SEL1                       | 9                    |   |   |
| SPD_SELO                       | 17                   |   |   |
| PL                             | 1                    | Reference open collector power supply: To provide +5VDC power supply when PULS and SIGN reference signals are open collector input signals. |   |
| PULS<br>/PULS<br>SIGN<br>/SIGN | 11<br>12<br>13<br>14 | Reference pulse input:<br>Line drive or<br>open collector   | Input modes:<br>* SIGN + Pulse train<br>* CCW + CW Pulse<br>* 2-phase pulse( × 4) |
| ALM                            | 4                    | Servo alarm: OFF status output is given when the drive detects an error   |   |
| COIN                           | 3                    | Positioning complete signal   |   |
| BRK                            | 2                    | Braking inter-lock  |   |
| COM                            | 5                    | I/O output signal common grounding  |   |
| CZ                             | 18                   | Open collector output of Encoder C signals  |   |
| GND                            | 20                   | Open collector output grounding of Encoder C signals  |   |
| PCO<br>/PCO                    | 10<br>19             | Differential output of Encoder C signals  |   |
| FG                             | Shell                | Connect shielded wires of I/O signal cables to shell of 1CN, that is equal to the connection of the shell and the grounding wire.           |   |

**[ Signal list of connectors (2CN) ]**

The 2CN terminals are arranged as shown below:

| Terminal No. | Name | Description        | Terminal No. | Name | Description                                       |
|--------------|------|--------------------|--------------|------|---|
| 1            | PB   | Encoder B + input  | 8            | PC   | Encoder C + input                                 |
| 2            | /PB  | Encoder B - input  | 9            | /PC  | Encoder C - input                                 |
| 3            | PA   | Encoder A + input  | 10           | PU   | Encoder U + input                                 |
| 4            | /PA  | Encoder A - input  | 11           | /PU  | Encoder U - input                                 |
| 5            | PV   | Encoder V + input  | 12           | PW   | Encoder W + input                                 |
| 6            | /PV  | Encoder V - input  | 13           | /PW  | Encoder W - input                                 |
| 7            | PG5V | Encoder power + 5V | 14           | GND  | Encoder power grounding                           |
|              |      |                    |              | FG   | Shield wires are connected to the connector frame |

**Notes:** It's suggested large core wires or multi core wires should be used for power supply and grounding.

**Encoder terminal of motor:**

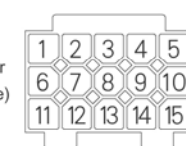
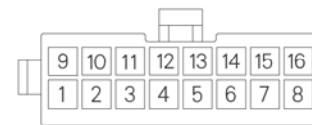
EMS-08AH□□C024 Motor

EMS-02AH□□Z006, EMS-04AH□□Z013,

EMS-05AH□□A016, EMS-08AH□□A024 Motor

| Terminal Number | Description        |
|-----------------|--------------------|
| 1               | FG (Shield)        |
| 2               | +5V(Power supply)  |
| 3               | GND (Power supply) |
| 4               | Channel A output   |
| 5               | Channel/A output   |
| 6               | Channel B output   |
| 7               | Channel/B output   |
| 8               | Channel C output   |
| 9               | Channel/C output   |
| 10              | Channel U output   |
| 11              | Channel/U output   |
| 12              | Channel V output   |
| 13              | Channel/V output   |
| 14              | Channel W output   |
| 15              | Channel/Woutput    |

| Terminal Number | Description        |
|-----------------|--------------------|
| 1               | FG (Shield)        |
| 2               | +5V(Power supply)  |
| 3               | GND (Power supply) |
| 4               | Channel B output   |
| 5               | Channel /C output  |
| 6               | Channel U output   |
| 7               | Channel C output   |
| 8               | Channel /U output  |
| 9               | Channel A output   |
| 10              | Channel V output   |
| 11              | Channel W output   |
| 12              | Channel /V output  |
| 13              | Channel /A output  |
| 14              | Channel /B output  |
| 15              | Channel /W output  |

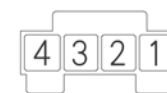


**Notes:**

The corresponding relations between pin number of encoder and signal may be different for different types of motors. Please refer to motor instructions.

EMS-08AH□□C024 Motor

| Name | Function |
|------|----------|
| 1    | PE       |
| 2    | U        |
| 3    | V        |
| 4    | W        |



EMS-02AH□□Z006, EMS-04AH□□Z013,  
EMS-05AH□□A016, EMS-08AH□□A024 Motor

| Name | Function |
|------|----------|
| 4    | PE       |
| 1    | U        |
| 3    | V        |
| 2    | W        |



**Notes:**

The corresponding relations between pin number of power wire and signal may be different for different types of motors. Please refer to motor instructions.

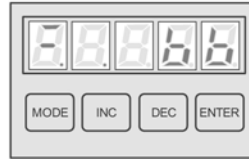
## Operation instructions of Hand-held operator >>>

### [ Basic operations ]

#### 1) Functions of Operator

It's also available for EDC series of servo drives to make parameter setting, status monitoring and auxiliary functions via an external hand-held manipulator. The following picture shows the initial display status of the hand-held operator:

| Name      | Function   |
|-----------|--|
| INC key   | Press INC key to increase the set value(a long and hold on press will implement fast increasing)   |
| DEC key   | Press DEC key to decrease the set value.(a long and hold on press will implement fast increasing)  |
| MODE key  | Press this key to select the status display mode, parameter setting mode, monitor mode, or auxiliary function mode.<br>Press this key to cancel setting when setting the parameters. |
| ENTER key | Press this key to display the parameter settings and set values.   |



#### 2) Reset Servo Alarms

Clear current alarm

When alarm occurs, in the status display mode of the hand-held operator, press ENTER key and hold on for seconds to reset current alarm status. The current alarm can also be removed by using 1CN-6(ALM\_RST) input signal.

The alarm state could also be cleared by using 1CN-14(/ALM-RST) input signal.

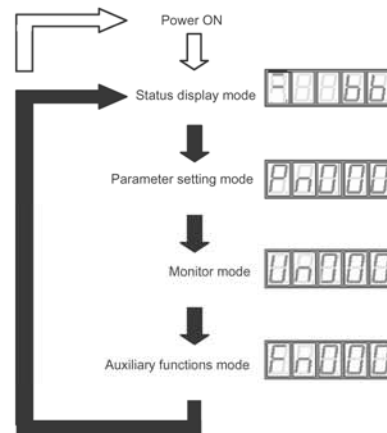
The alarm state can be cleared by turning the main power supply OFF, then turning the control power supply OFF.

- Notes:**
1. Only the alarms with the \* symbol displayed in the alarm list can be cleared.
  2. Please give the alarm reason, and input signal 1CN-6(ALM\_RST) , system will clear current alarm immediately.
  3. During the signal 1CN-6(ALM-RST) being active, motor is in free status, which is equal to Servo OFF status.

#### 3) Selection of basic modes

With the hand-held operator, display of current running status and parameter settings can be performed. The operator consists of following basic modes:

Status display, Parameter setting, Monitoring and Auxiliary functions.  
Press MODE key to switch among different modes.



#### 4) Operations in Status Display Mode

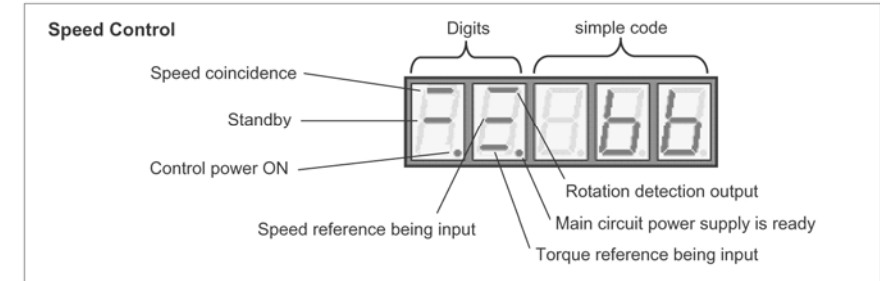
In status display mode, the digits and simple code are used to show the status of servo drive.

##### ■ Selection of Status Display Mode

The status display mode is displayed when the power is turned ON. If current mode is not the status display mode, press MODE key to switch to required mode.

##### ■ Contents displayed in Status Display Mode

Contents displayed in the mode are different in Position Control Mode and Speed Control Mode.

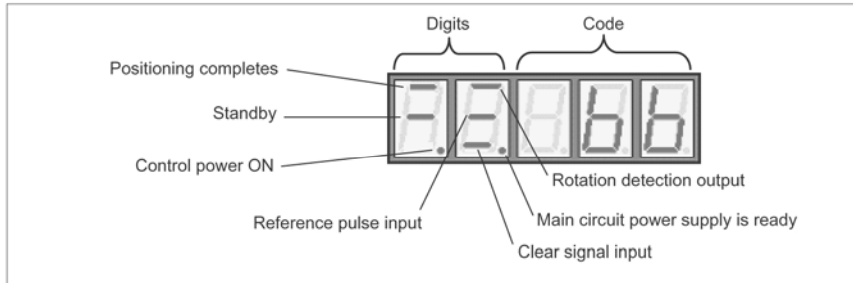


#### Contents of digit display

| Digit data                         | Digit data  |
|------------------------------------|---|
| Control power is ON                | Lamp is lit when control power of servo drive is ON   |
| Standby                            | Lamp is lit when on standby;<br>Lamp is extinct when servo is ON  |
| Positioning                        | When offset value between position reference and actual motor position is within allowable value, lamp is lit.<br>Allowable value: Pn 30 (10 pulses are the standard) |
| Rotation detection output          | When motor speed exceeds allowable value, lamp is lit.<br>When motor speed is lower than allowable value, lamp is extinct.<br>Allowable value: 10% of rated speed     |
| Reference pulse being input        | Lamp is lit during reference pulse input;<br>Lamp is extinct when there's no input of reference pulse.  |
| Clear signal being input           | Lamp is lit during clear signal input;<br>Lamp is extinct when there's no input of clear signal.  |
| Main circuit power supply is ready | Lamp is lit when main circuit power supply is OK;<br>Lamp is extinct when main circuit power supply is OFF.   |

#### Contents of code display

| Code | Description                                   |
|------|---|
| 866  | On standby;<br>Servo OFF (motor power is OFF) |
| 800  | Running;<br>Servo ON (motor power is ON)      |
| 801  | Alarm Status;<br>Displays the alarm code.     |



**Contents of digit display**

| Digit data                         | Description   |
|------------------------------------|---|
| Control power is ON                | Lamp is lit when control power of servo drive is ON   |
| Standby                            | Lamp is lit when on Standby;<br>Lamp is extinct when servo is ON  |
| Speed coincidence                  | When offset value between position reference and actual motor position is within allowable value, lamp is lit.<br>Allowable value: Pn 30 (10 pulses are the standard) |
| Rotation detection output          | When motor speed exceeds allowable value, lamp is lit.<br>When motor speed is lower than allowable value, lamp is extinct.<br>Allowable value: 10% of rated speed     |
| Reference pulse input              | Lamp is lit during reference pulse input;<br>Lamp is extinct when there's no input of reference pulse.  |
| Clear signal input                 | Lamp is lit during clear signal input;<br>Lamp is extinct when there's no input of clear signal.  |
| Main circuit power supply is ready | Lamp is lit when main circuit power supply is OK;<br>Lamp is extinct when main circuit power supply is OFF.   |

**Contents of code display**

| Code | Description                                |
|------|--|
| 888  | On standby;<br>/S-OFF (Motor power is OFF) |
| 88n  | Running;<br>/S-ON (motor power is ON)      |
| 8.00 | Alarm Status;<br>Displays the alarm code.  |

**5) Operation in Parameter Setting Mode**

Select or adjust the functions by setting parameters. See the Parameter List in appendix for details.

Following is an example to show the steps for changing date of Pn 019 from 100 to 85:

|  |  |
|--|--|
| a) Press MODE key to select parameter setting mode.  |  |
| b) Press INC key or DEC key to select parameter number.  |  |
| c) Press ENTER key to display parameter data selected in step 2.   |  |
| d) Press INC or DEC to change the data to the desired number 85. Hold the button to accelerate the change of value. When the data reaches the max. or Min. value, the value will stay unchanged, even if INC/DEC key is presses. |  |
| e) Press ENTER, the data glimmers and then the date is saved.  |  |
| f) Press ENTER again to go back to parameter display.  |  |

**6) Operation in Monitor Mode**

In monitor mode, external reference values, status of I/O signals, and internal status of servo drive are monitored. User can switch to Monitor Mode even if motor is running.

Contents of Monitor Mode display

| Monitor number | Contents  | Digits to display Internal status |
|----------------|---|-----------------------------------|
| Un000          | Actual motor speed: r/min   |                                   |
| Un001          | Input speed reference value: r/min                                  |                                   |
| Un002          | Percentage of feedback torque:% (with respect to rated torque)      |                                   |
| Un003          | Percentage of feedback torque:% (with respect to rated torque)      |                                   |
| Un004          | Number of pulses of Encoder angles                                  |                                   |
| Un005          | I/O signal monitor  |                                   |
| Un006          | Encoder signal monitor  |                                   |
| Un007          | Speed given by pulse (when electronic gear ratio is 1:1)            |                                   |
| Un008          | Current motor position is 5 digits lower (× 1 reference pulse)      |                                   |
| Un009          | Current motor position is 5 digits higher (× 10000 reference pulse) |                                   |
| Un010          | Position reference is 5 digits lower (× 1 reference pulse)          |                                   |
| Un011          | Position reference is 5 digits higher (× 10000 reference pulse)     |                                   |
| Un012          | Position offset is 5 digits lower (× 1 reference pulse)             |                                   |
| Un013          | Position offset is 5 digits higher (× 10000 reference pulse)        |                                   |

- Notes:** a. Position pulse value is subject to electronic gear ratio of 1:1;  
 b. Unit of pulse numbers is the internal pulse unit. Number of pulses are represented with 5 digits higher + 5 digits lower, whose calculation method is as below:  
 Pulse quantity = value of 5 digits higher × 10000 + value of 5 digits lower  
 Value of pulse quantity will not change any more when it reaches 327679999.  
 The decimal point in Maximum Un 009, Un 011 and Un 013 means the value is negative.  
 For instance:



Un009 is displayed as:  
 It means the value of Un009 is -3560000.

- c. When the speed given by pulse is below electric gear ratio of 1:1, encoder shows the theoretical rotation speed of the increment type 2500 lines of electric motor.  
 d. Pulse numbers of encoder angles shows the relative rotor's position in respect to in one complete round, one round is regarded as one cycle.  
 e. Contents of encoder signal display is shown in the following table:

| Monitor No. | No. of digits | I/O          | Contents displayed  | Relevant I/O Signals |
|-------------|---------------|--------------|---------------------|----------------------|
| Un006       | 0             | Input signal | Signal of Encoder W | 2CN-12\13(PG-W)      |
|             | 1             |              | Signal of Encoder V | 2CN-5\6(PG-V)        |
|             | 2             |              | Signal of Encoder U | 2CN-10\11 (PG-U)     |

f. Contents of I/O terminal signals are in the following table:

| Monitor No. | No. of digits               | I/O                             | Contents displayed                    | Relevant I/O Signals |
|-------------|-----------------------------|---------------------------------|---------------------------------------|----------------------|
| Un005       | 0                           | Input signal                    | Servo ON                              | 1CN-15 (/S-ON)       |
|             | 1                           |                                 | Alarm reset                           | 1CN-6(/ALM_RST)      |
|             | 2                           |                                 | Clear error counter                   | 1CN-7(/CLR)          |
|             | 3                           |                                 | Internal speed is selected as 0       | 1CN-17(/SPD_SEL0)    |
|             | 4                           |                                 | Internal speed is selected as 1       | 1CN-9(/SPD_SEL1)     |
|             | 5                           | Internal speed is selected as 2 | 1CN-8(/SPD_SEL2)                      |                      |
|             | 6                           | No signal                       |                                       |                      |
|             | 7                           | Servo alarm                     | 1CN-4 (/ALM)                          |                      |
|             | 8                           | Input signal                    | Positioning complete (speed achieves) | 1CN-3 (/COIN)        |
| 9           | Mechanical braking released |                                 | 1CN-2 (/BRK)                          |                      |

The relative LED is lit to show some I/O signal is active.

**Operation steps to use Monitor Mode**

Following is an example to show steps for monitoring of Un 001.

|   |  |
|---|--|
| a) Press MODE key to select monitor mode.                                 |  |
| b) Press INC key or DEC key to select the monitor number to be displayed. |  |
| c) Press ENTER to display the monitored data selected in Step b.          |  |
| d) Press ENTER once more to go back to monitor number display.            |  |

**[ Application Operation ]**

In Auxiliary Function Mode, some application operations can be done with the digital operator. The functions details are shown as below:

| Function No. | Content  |
|--------------|--|
| Fn000        | Display alarm history                                  |
| Fn001        | Restore to factory setting values                      |
| Fn002        | JOG mode   |
| Fn003        | Automatic offset adjustment of motor current detection |
| Fn004        | Software version display                               |
| Fn005        | System running time                                    |

**1) Operations on alarm history display**

The last 8 alarms are displayed in the alarm history library.

Take following steps to get a display of alarm history:

|   |                                    |
|---|------------------------------------|
| a. Press MODE key to select auxiliary function mode                     |                                    |
| b. Press INC or DEC to select function number of alarm history display. |                                    |
| c. Press ENTER to display the latest alarm code.                        | <p>Alarm Serial No. Alarm code</p> |
| d. Press INC or DEC key to display other alarm codes occurred recently. |                                    |
| e. Press ENTER to return to function number display.                    |                                    |

If an alarm occurs right now, the alarm codes will be updated immediately. The alarm with a serial number of 0 is the current alarm, and the alarm with a serial number of 7 is the last alarm. If the user wants to clear all the history data, just press ENTER key and hold for one second while alarm codes are being displayed, then all alarm history is deleted.



## 2) Operation of restoring to factory settings





Restore parameters to factory settings according to following steps:

|   |  |
|---|--|
| a) Press MODE key to select auxiliary function mode.                                      |  |
| b) Press INC or DEC key to select function number of restoring to factory setting values. |  |
| c) Press ENTER to enter parameter restoring mode.   |  |
| d) Hold ENTER key for one second to restore all the parameters to default values.         |  |
| e) Release ENTER key to return to function number display.                                |  |

**Notes:** In Step c, the parameter restoring operation can be cancelled by a short press on the ENTER key and quit.

## 3) Motor run in JOG mode

The following are operation steps for motor running in JOG mode:

|  |  |
|--|--|
| a) Press MODE key to select auxiliary function mode.   |  |
| b) Press INC or DEC key to select JOG. Function.   |  |
| c) Press ENTER key to enter JOG mod, meanwhile, servo is OFF.  |  |
| d) Press MODE key to enable Servo ON /S-ON.  |  |
| e) Press MODE to switch between servo ON and Servo OFF.  |  |
| f) Press INC or DEC key, motor runs when pressing the keys. FWD/REV rotation of motor is displayed as below: |  <br>  |
| g) Press ENTER to return to function number display. At this moment, servo motor is OFF)                     |  |

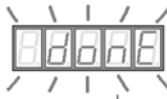

## 4) Automatic Offset Adjustment of motor current checking signals

The servo drive will check the checking signals of motor current every time the servo is initializing upon power on and will adjust automatically if required, therefore, user needn't do any manual adjustment in normal situations. If the torque is a bit too large, user may manually start current offset adjustment to lower down the torque or to get higher running accuracy.

### Notes:

The automatic offset adjustment of motor current checking is only available when servo is OFF.

Follow the procedures below to adjust the reference offset automatically:

|   |   |
|---|---|
| a) Press Mode key to select auxiliary function mode.  |   |
| b) Press INC or DEC key to select function number of automatic offset Adjustment of motor current checking.       |   |
| c) Press ENTER key.   |   |
| d) Press MODE and hold for one second, DonE is displayed and glimmers, the offset is then adjusted automatically. | <br>Release the key ↓<br> |
| e) Press ENTER key to return to function number display.  |   |

## 5) Servo Software version confirmation

Take following steps to display software version of the servo drive:

|  |  |
|--|--|
| a) Press MODE key and select Auxiliary Function Mode;                              |  |
| b) Press INC key or DEC key to select function number of software version display; |  |
| c) Press ENTER key to display current software version;                            |  |
| d) Press ENTER key again to return to function number display.                     |  |

## 6) System run time

Take following steps to display system running time:

|   |  |
|---|--|
| a) Press MODE key and select Auxiliary Function Mode;   |  |
| b) Press INC key or DEC key to select function number of system run time display;   |  |
| c) Press ENTER key to display the run time. Here is an example of system run time display, the time is 1 hour and 28 minutes. |  |
| d) Press ENTER key again to return to function number display.  |  |

The above run time is the run time after system is started, the date is not refreshed in real time. If user wants to refresh the data, please repeat the operations in Step c) and Step d).

Parameter list >>>

| Para. No. | Name and description   | Unit  | Range of setting | Default | Remarks |
|-----------|--|-------|------------------|---------|---------|
| Pn000     | Uses servo ON input signal (/S-ON) or not<br>[0] Uses servo ON input signal<br>[1] Use internal servo ON   | -     | 0~1              | 0       | ①       |
| Pn001     | Reserved   | -     | 0~1              | 0       |         |
| Pn002     | Reserved   | -     | 0~1              | 0       |         |
| Pn003     | Operation performed at recovery from instantaneous power loss<br>[0] No servo alarm output when there's instantaneous power loss (ALM)<br>[1] Alarm output when there's instantaneous power loss(ALM)  | -     | 0~1              | 0       | ①       |
| Pn004     | How to stop when Servo OFF or alarm occurs<br>[0] Stops the motor by applying dynamic brake (DB) and then release the brake<br>[1] Coast to a stop<br>[2] Performs DB when Servo OFF or alarm occurs, coasts to a stop after motor stops<br>[3] Motor coasts to stop when Servo OFF or alarm occurs, stop DB braking   | -     | 0~3              | 0       | ①       |
| Pn005     | If the error counter cleared when Servo OFF<br>[0] clear the error counter when Servo OFF<br>[1] does not clear the error counter when Servo OFF   | -     | 0~1              | 0       | ①       |
| Pn006     | Rotation Direction Selection<br>[0] Forward rotation is defined as CCW rotation when viewed from the motor end.<br>[1] Forward rotation is defined as CW rotation when viewed from the motor end.  | -     | 0~1              | 0       | ①       |
| Pn007     | Reserved   | -     | 0~1              | 0       |         |
| Pn008     | Reference pulse form<br>[0] Sign + Pulse<br>[1] CW + CCW<br>[2] A+B(x4 multiplication)   | -     | 0~2              | 0       | ①       |
| Pn009     | Reference pulse form<br>[0] does not invert PULSE reference pulse logic, does not invert SIGN reference pulse logic<br>[1] does not invert PULSE reference pulse logic, inverts SIGN reference pulse logic<br>[2] inverts PULSE reference pulse logic, does not invert SIGN reference pulse logic<br>[3] inverts PULSE reference pulse logic, inverts SIGN reference pulse logic | -     | 0~3              | 0       | ①       |
| Pn010     | Reserved   | -     | 0                | 0       |         |
| Pn011     | Reserved   | -     | 0                | 0       |         |
| Pn012     | Reserved   | -     | 0                | 0       |         |
| Pn013     | Speed loop gain  | Hz    | 1~3000           | 160     | ②       |
| Pn014     | Speed loop integration time constant   | ms    | 1~2000           | 250     | ②       |
| Pn015     | Position loop gain   | 1/s   | 1~1000           | 40      |         |
| Pn016     | Speed bias   | r/min | 0~300            | 0       |         |
| Pn017     | Position feed forward  | %     | 0~100            | 0       |         |
| Pn018     | Torque reference filter time constant  | %     | 0~500            | 0       |         |
| Pn019     | Soft start accelerating time   | ms    | 0~10000          | 100     |         |
| Pn020     | Soft start decelerating time   | ms    | 0~10000          | 100     |         |
| Pn021     | S-shaped accelerating and decelerating time  | ms    | 0~1000           | 0       |         |
| Pn022     | Electronic gear B  | -     | 1~32767          | 1       |         |
| Pn023     | Electronic gear A  | -     | 1~32767          | 1       |         |

| Para. No. | Name and description  | Unit    | Range of setting | Default | Remarks |
|-----------|---|---------|------------------|---------|---------|
| Pn024     | Smoothing   | ms      | 0~1000           | 0       |         |
| Pn025     | Feed-forward filter   | ms      | 0~1000           | 0       |         |
| Pn026     | Forward rotation torque limit   | %       | 0~300            | 250     | ②       |
| Pn027     | Reverse rotation torque limit   | %       | 0~300            | 250     | ②       |
| Pn028     | Speed detection filter  | %       | 0~500            | 0       |         |
| Pn029     | Speed coincidence error   | r/min   | 0~100            | 10      |         |
| Pn030     | Positioning Complete Error  | 指令单位    | 0~500            | 10      |         |
| Pn031     | Range of error counter overflow   | 256指令单位 | 1~32767          | 1024    |         |
| Pn032     | JOG speed   | r/min   | 0~3000           | 500     |         |
| Pn033     | SPEED0  | r/min   | -5000~5000       | 0       |         |
| Pn034     | SPEED1  | r/min   | -5000~5000       | 100     |         |
| Pn035     | SPEED2  | r/min   | -5000~5000       | 200     |         |
| Pn036     | SPEED3  | r/min   | -5000~5000       | 300     |         |
| Pn037     | SPEED4  | r/min   | -5000~5000       | 400     |         |
| Pn038     | SPEED5  | r/min   | -5000~5000       | 500     |         |
| Pn039     | SPEED6  | r/min   | -5000~5000       | 600     |         |
| Pn040     | SPEED7  | r/min   | -5000~5000       | 700     |         |
| Pn041     | Control mode selection<br>[0] Position control (pulse train reference)<br>[1] Speed control(contact reference)<br>[2] Sspeed control ( parameter reference) | -       | 0~2              | 0       | ①       |
| Pn042     | Reserved  | -       | 0                | 0       |         |
| Pn043     | Time delay from servo ON signal till Servo actually ON  | ms      | 20~2000          | 200     |         |
| Pn044     | Time delay from the time a brake signal is output until servo OFF status occurs   | ms      | 0~5000           | 10      |         |
| Pn045     | Speed level for brake signal output during operation  | r/min   | 10~500           | 100     |         |
| Pn046     | Time delay from brake signal until servo OFF  | ms      | 10~1000          | 500     |         |
| Pn047     | Position error pulse overflow alarm<br>[0] no alarm output<br>[1] alarm output  | -       | 0~1              | 0       |         |
| Pn048     | Speed when parameter speed reference functions  | r/min   | -3000~3000       | 500     |         |
| Pn049     | Reserved  | -       | 0                | 0       |         |
| Pn050     | Reserved  | -       | 0~100            | 0       |         |
| Pn051     | Reserved  | -       | 0~100            | 0       |         |
| Pn052     | Reserved  | -       | 0~32             | 0       |         |
| Pn053     | Filter time when input I/O signals  | ms      | 0~1000           | 100     |         |
| Pn054     | Invert input signal   | -       | 0~63             | 0       |         |
| Pn055     | Invert output signal  | -       | 0~7              | 0       |         |

Note:

- ① After changing the setting, always turn the power OFF, then ON. This makes the new setting valid.
- ② The parameter may vary for motors of different types.

## Malfunction Diagnostics and Troubleshootings >>>

### [ Parameter list ]

Servo drive will output an alarm when abnormal event is detected.

The LED for POWER&ALM on the front panel of the servo drive will turn red when alarm occurs(The LED is green in normal status), meanwhile, the drive outputs an alarm. If an external hand-held operator is installed, current alarm code can be displayed on the operator.

| Alarm display on digital operator | Alarm output | Alarm Name                       | Meaning  |
|-----------------------------------|--------------|----------------------------------|--|
| A. 01                             | ×            | Parameter breakdown              | Checksum results of parameters are abnormal.   |
| A. 02                             | ×            | Current detection error          | Internal detection circuit problem   |
| A. 03 *                           | ×            | Overspeed                        | Rotation speed of the motor has exceeded 1.1 times of maximum speed  |
| A. 04 *                           | ×            | Overload                         | The motor was running for several seconds to several tens of seconds under a torque largely exceeding ratings. |
| A. 05                             | ×            | Position error counter overflows | Internal position error counter has exceeded the value   |
| A. 06                             | ×            | Position error pulse overflows   | Position error pulse has exceeded the value set in parameter Pn-031.   |
| A. 09                             | ×            | Pulse loss of Encoder C          | PC is disconnected or have interference  |
| A. 10                             | ×            | Encoder disconnected             | At least one of PA, PB, PC, PU, PV or PW is disconnected   |
| A. 11                             | ×            | Encoder UVW code violation       | Encoder UVW code violation   |
| A. 12                             | ×            | Power module error               | Power module failure   |
| A. 13 *                           | ×            | overheat                         | Power module overheat  |
| A. 14 *                           | ×            | Voltage error                    | Overvoltage or undervoltage of main circuit  |
| A. 15 *                           | ×            | Frequency error of input pulse   | Pulse frequency input is too high, has exceeded the allowance  |
| A. 16                             | ×            | Parameter error                  | Parameter saved in external storage has errors   |
| A. 17                             | ×            | I/O data error                   | I/O data error, such as ALM, BRK, COIN, Relay, LED lamps, etc. errors  |
| A. 21 *                           | ×            | Watchdog reset                   | A power interruption exceeding one cycle occurred in AC power supply.  |
| A. 25                             | ×            | power loss error                 | System reset by watchdog   |
| A. 99                             | ○            | Not an error                     | Normal operation status  |

○:Photo-coupler is ON(ON)

×:Photo-coupler is OFF (OFF)

\* :Alarm can be cleared

Clear alarms in following ways when alarm occurs:

- Set 1CN-6 signal active(alarm reset signal ALM\_RST)
- Clear alarm with hand-held operator (please see 6.1.2 for reference)
- Through matched PC communication software
- Turn power OFF and then ON again.

#### Notes:

1. When alarm occurs, always find out the alarm reasons and remove alarm failures before clearing alarm.
2. Only the alarm codes listed below can be cleared: A.03, A.04, A.13, A.14, A.15, A.21.

### [ Alarm Reasons and Troubleshooting ]

Find out the alarm reasons with help of the alarm codes displayed on the hand-held operator or view via the communication software in a PC.

Only the last 8 alarm records are saved in the servo drive, which can be viewed via the operator or PC communication software.

The alarms without the sign of \* are not able to be removed. To clear the alarms, user has to turn power OFF and ON again.

| No.  | Name                            | Status  | Possible reasons  | Treatments   |
|------|---------------------------------|---|---|--|
| 01   | Para. breakdown                 | During system acceleration or deceleration; During system running | Checksum results of parameters saved in external storage are abnormal.  | <ul style="list-style-type: none"> <li>➢ Power On again and check if the same problem still exists.</li> <li>➢ If problem still exists, the chip needs to be replaced because external storage of the drive has been damaged.</li> </ul>   |
| 02   | Current detection error         | System is Power ON  | Sampling circuit damaged  | <ul style="list-style-type: none"> <li>➢ Check reference power supply of A/D circuit on the servo drive, to see if the reference supply has been damaged;</li> <li>➢ Check if the mainboard and control plate are reliably connected.</li> </ul>   |
| 03 * | Overspeed                       | During system running   | <p>Motor speed has exceeded 1.1 times of maximum speed.</p> <ul style="list-style-type: none"> <li>➢ reference pulse input too high;</li> <li>➢ Acceleration /Deceleration time constant too short, which cause speed overshoot;</li> <li>➢ Electric gear ratio is too big</li> <li>➢ P-Gain value(Pn015) is too small</li> </ul> | <p>When motor overspeed happens, please take following actions:</p> <ul style="list-style-type: none"> <li>➢ Reduce set speed(reference value)</li> <li>➢ Increase appropriately the value of smoothing time constant (Pn024)</li> <li>➢ Increase appropriately the value of position proportional gain (Pn015)</li> <li>➢ Check gear ratio, the ratio should be set within the range as below: input pulse frequency × Electric gear 500 KHZ</li> </ul> |
| 04 * | overload                        | During system acceleration or deceleration; During system running | <p>System run over rated torque for seconds and tens of seconds:</p> <ul style="list-style-type: none"> <li>➢ Acceleration /Deceleration time constant too short</li> <li>➢ capacity of drive and motor not enough</li> <li>➢ Load is too big</li> <li>➢ start stop frequency is too high</li> </ul>                              | <ul style="list-style-type: none"> <li>➢ Ncrease Acceleration /Deceleration time;</li> <li>➢ Use drive and motor of larger power instead</li> <li>➢ Check load</li> <li>➢ Reduce start stop frequency</li> </ul>   |
| 05   | Position error counter overflow | During system running   | <p>Absolute value of position error counter has exceeded 2<sup>19</sup>.</p> <ul style="list-style-type: none"> <li>➢ Motor is stuck mechanically</li> <li>➢ Input reference pulse is abnormal</li> </ul>   | <ul style="list-style-type: none"> <li>➢ Check and see if motor rotates according to reference pulse</li> <li>➢ Check mechanical parts of load</li> <li>➢ Check reference pulse</li> <li>➢ Check motor encoder cables</li> </ul>   |

| No. | Name                           | Status                                   | Possible reasons  | Treatments   |
|-----|--------------------------------|--|---|--|
| 06  | Position error pulse overflows | During system running                    | <p>Position error pulses has exceeded limit value of position error counter overflow(Pn031)</p> <ul style="list-style-type: none"> <li>➢ Motor is mechanically stuck</li> <li>➢ Input reference pulse is abnormal</li> </ul>  | <ul style="list-style-type: none"> <li>➢ Check motor encoder cables</li> <li>➢ Check mechanical parts of load</li> <li>➢ Readjust increment, increase P-Gain value(Pn015)</li> <li>➢ Increase value of Pn031(position error counter overflow)</li> <li>➢ Increase value of position feed forward(Pn017)</li> <li>➢ Reduce load value and speed</li> </ul>  |
| 09  | Pulse loss of Encoder C        | During system running                    | <p>Motor runs for several cycles, no C pulse signal appears.</p> <ul style="list-style-type: none"> <li>➢ Cable problems: improper cable connection or cable disconnected</li> <li>➢ Cable not well shielded</li> <li>➢ Encoder damaged</li> <li>➢ Shielded grounding wires are not connected well</li> <li>➢ Circuit failure of encoder interface</li> </ul> | <ul style="list-style-type: none"> <li>➢ Check cable connection, do not bind encoder signal cables together with motor input power wires.</li> <li>➢ Check interface circuit of encoder</li> </ul>   |
| 10  | Encoder disconnected           | During system power on or system running | <p>At least one of PA, PB, PC, PU, PV or PW is disconnected</p>   | <ul style="list-style-type: none"> <li>➢ Check connection cables of motor encoder</li> <li>➢ Check encoder signals</li> <li>➢ If the above items are OK, there might be some problem in th internal parts of servo drive</li> </ul>  |
| 11  | Encoder UVW code violation     | During system power on or system running | <p>Encoder UVW code violation is detected (UVW signals are all high level or all low level). Please be noted the UVW signal of encoder is different from UVW of power signal.</p> <ul style="list-style-type: none"> <li>➢ Incorrect encoder cable connection</li> <li>➢ Encoder damaged</li> </ul>   | <p>Please make sure power supply of encoder is 5V +/-5%. This has to be met especially when the cables are very long. Don't bind encoder input cables together with motor input power wires, and shield wired have to be connected to the frame.</p> <ul style="list-style-type: none"> <li>➢ Correct encoder cable connection according to connection diagram</li> <li>➢ Replace servo motor</li> </ul>   |
| 12  | Power module error             | During system power on or system running | <p>Too high current flow through the power module or VCC4 control voltage is a little lower.</p>  | <ul style="list-style-type: none"> <li>➢ Take away the motor power wire signal(U, V, W), power ON. Servo is disabled, is this problem still happens, it's most likely the power module has been damaged</li> <li>➢ Check connection of U, V and W</li> <li>➢ Check isolation resistance between (U,V,W)and grounding wires, if the resistance is a bit lower, that means motor isolation is worse, motor needs to be replaced.</li> <li>➢ Check if the capacity between motor and drive is matched or not</li> <li>➢ Check to see if the control power VCC4 of the power module is OK or not(Alarm occurs when it's a little lower)</li> <li>➢ Increase acceleration /deceleration time</li> <li>➢ Check to see is DB relay is damaged or not</li> </ul> |

| No.  | Name                           | Status                                   | Possible reasons   | Treatments   |
|------|--------------------------------|--|--|--|
| 13 * | Overheat                       | During system running                    | <p>Power module overheat</p> <ul style="list-style-type: none"> <li>➢ Drive is running at heavy load for a long time, which causes module overheat</li> <li>➢ Frequent start stop</li> <li>➢ Ambient temperature is too high, or air ventilation is bad</li> </ul> | <ul style="list-style-type: none"> <li>➢ Replace the drive</li> <li>➢ Change environment condition, improve air ventilation or convection</li> </ul>   |
| 14 * | Voltage error                  | During Power ON or during system running | <p>Overvoltage or undervoltage of main circuit</p>   | <ul style="list-style-type: none"> <li>➢ Measure voltage at input terminal(between R and T) to see if the input voltage is within required range</li> <li>➢ Increase Acceleration /Deceleration time</li> <li>➢ Lower down start stop frequency</li> </ul>   |
| 15 * | Frequency error of input pulse | During system running                    | <p>Pulse frequency input is too high, has exceeded the allowance</p>   | <ul style="list-style-type: none"> <li>➢ Please set an appropriate reference frequency</li> <li>➢ Take actions to remove the noise</li> <li>➢ Adjust value of Pn022 and Pn023, decrease the multiplication factor to ensure reference pulse frequency is less than 500Kpps. (Reference pulse frequency = input reference frequency × dividing multiplication frequency)</li> </ul> |
| 16   | Parameter error                | During system running                    | <p>Parameter saved in external storage has errors</p>  | <ul style="list-style-type: none"> <li>➢ Check if parameter settings are correct or not</li> <li>➢ Load in default parameters, check is the data is correct or not</li> <li>➢ Replace U3 chip</li> </ul>   |
| 17   | I/O data error                 | During system Power ON                   | <p>I/O data error, such as ALM, BRK, COIN, Relay, LED lamps, etc.</p>  | <ul style="list-style-type: none"> <li>➢ Chip U7 failure</li> <li>➢ Chip U15 failure</li> </ul>  |
| 21 * | Instantaneous power loss error | During system running                    | <p>A power interruption exceeding one cycle occurred in AC power supply.</p>   | <ul style="list-style-type: none"> <li>➢ Check if input voltage of drive is normal</li> </ul>  |
| 25   | Watchdog reset                 | During system running                    | <p>System reset by watchdog</p>  | <ul style="list-style-type: none"> <li>➢ Current detection error</li> <li>➢ External serial COM is abnormal</li> </ul>   |