

K/iK series

AC Servo Driver

User's Manual 2020 (V2.6)

Preface

- Thank you for purchasing this AC servo driver.
- This Manual is the user manual for K/iK series products.
- To use this series of servo drivers correctly, please carefully read this Manual before use and keep this Manual properly for future reference. If this product is purchased for your customer, please send this product to the final user together with this Manual.










☆ Warm tips:

- ◇ For the user who uses this product for the first time, please carefully read this Manual. If there is any question with the function or performance of this product, please contact our technical support staff for help in order to use this product correctly.
- ◇ We have tried our best to improve the contents of this manual. However, if you find any problem in this Manual, please contact our technical support staff in time for us to make timely corrections.
- ◇ As we will constantly improve our servo driver products, we may make changes to the materials without prior notice.
- ◇ Without prior written consent of the Company, no part of this manual shall be reproduced.









Safety Precautions

Before product storage, installation, wiring, operation, check or maintenance, users must be familiar with and observe the following important notes to ensure safety during use of the product.

1. Electric Shock Injury Warning

|  Warning |
|--|
|  When the servo driver is powered on, the machine casing should not be opened so as to avoid electric shock. |
|  When the casing is opened, the servo driver should not be powered on so as to avoid electric shock resulting from exposed high voltage wire. |
|  In maintenance of the driver, wait for at least five minutes after cutting off the power, and detect both ends of the high-voltage capacitor using a voltmeter. The maintaining operation is allowed only when it is confirmed that the safe voltage range is reached. |
|  Power on only after reliable installation of the driver. |
|  Servo driver and servo motor must be reliably grounded. |
|  Do not touch the driver with wet hands for fear of electric shock. |
|  Wrong voltage or power supply polarity may cause an explosion or operational accidents. |
|  Ensure that the wire is properly insulated to avoid squeezing the wire and electric shock. |

2. Warning of Damage to Equipment

|  Warning |
|--|
|  Do not directly connect power to the U, V or W terminals of the driver for fear of damaging the driver. |
|  The servo motor and servo driver should be directly connected. Do not connect the U, V or W output ends of the driver to any capacitive element (e.g. noise suppression filter, pulse interference limiter, etc.) for fear of improper work of the driver. |
|  Connect the input end of the driver to a compliant power supply as required. |
|  Please verify the correctness and reliability of the cable connections before energizing. |
|  Please purchase and use motor as required, or damage to the driver or motor may occur. |
|  The rated torque of the servo motor should be higher than the effective continuous load torque. |
|  The ratio between the load inertia and servo motor inertia should be less than the recommended value. |

3. Fire Warring



Warning



The driver should not be installed on the surface of a combustibile and should be kept away from flammable materials. Otherwise, a fire accident may occur.



Do not use it at a place which is damp, full of corrosive gas or flammable gas for fear of a fire.

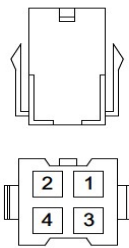
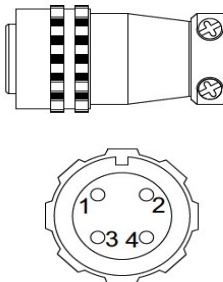
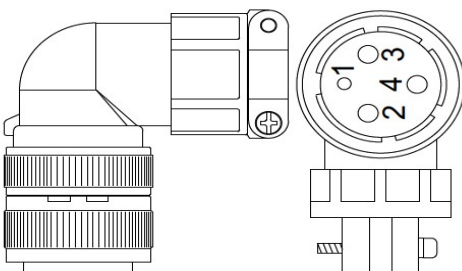


When any abnormal situation occurs while the driver operates, please immediately cut off the power for repair. Long-time overloaded operation of the driver may cause damage and fire.

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| 4芯AMP插头 | | | | | 4芯航插XS16K4 | | 4芯航插YD28K4/YD32K4 | | | |
|---|---|---|---|----|---|--|--|--|--|--|
|  | | | | |  | |  | | | |
| 正 视 | | | | | | | | | | |
| 系列 | U | V | W | PE | 1: PE 2: U | | 1: PE 2: U 3: V 4: W | | | |
| M | 1 | 3 | 2 | 4 | 3: V 4: W | | | | | |
| S | 1 | 2 | 3 | 4 | | | | | | |

| | |
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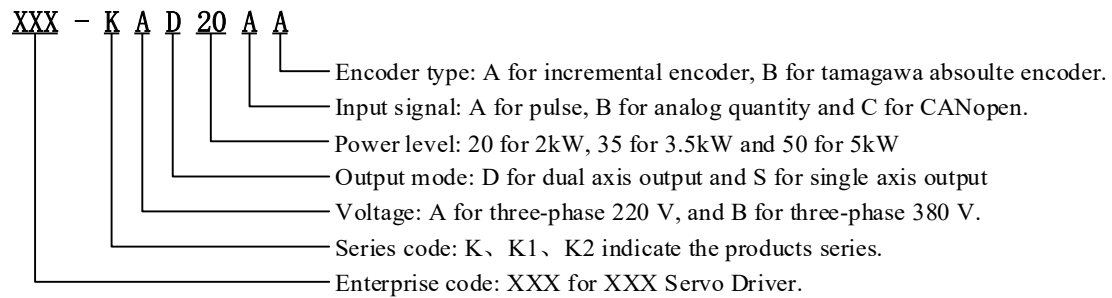
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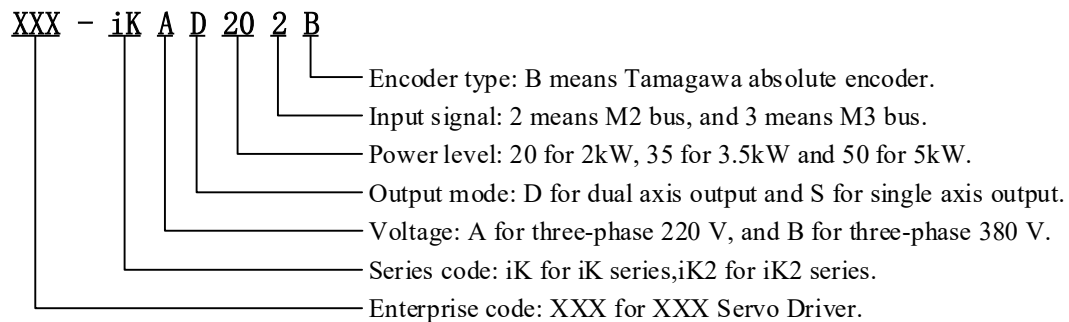
Chapter I Function Overview

1.1 Description of Servo Driver Models

Naming rule of K / K1 / K2 servo driver:



Naming rule of iK series bus servo driver:



Note: 3.5kW and 5kW products are single axis products

1.2 Description of servo motor

The description of universal type servo motor:

$\frac{130}{X1}$
 $\frac{ST}{X2}$
 -
 $\frac{M}{X3}$
 $\frac{050}{X4}$
 $\frac{15}{X5}$
 $\frac{\square}{X6}$
 -
 $\frac{\square}{X7}$

| X1: Flange size | |
|-----------------|---------------------|
| Code | Meaning |
| 40 | 40mm square flange |
| 60 | 60mm square flange |
| 80 | 80mm square flange |
| 90 | 90mm square flange |
| 100 | 100mm square flange |
| 110 | 110mm square flange |
| 130 | 130mm square flange |
| 150 | 150mm square flange |
| 180 | 180mm square flange |
| ... | ... |

| X2: Motor category | |
|--------------------|------------------|
| Code | Meaning |
| ST | 220V servo motor |
| HST | 380V servo motor |
| LST | 48V servo motor |

| X3: Encoder type | |
|------------------|---------------------------|
| Code | Meaning |
| M | Incremental standard type |
| AM | Absolute encoder |
| E | Magnetic encoder |
| X | Rotary encoder |

| X4: Rated torque | |
|------------------|---------|
| Code | Meaning |
| A00 | 100 N.m |
| A16 | 116 N.m |
| ... | ... |
| 050 | 5 N.m |
| 070 | 7.7 N.m |
| ... | ... |
| 001 | 0.1 N.m |
| 002 | 0.2 N.m |
| ... | ... |

| X5: Rated speed | |
|-----------------|-----------|
| Code | Meaning |
| 10 | 1000r/min |
| 15 | 1500r/min |
| 20 | 2000r/min |
| ... | ... |

| X6: Customized definition | |
|---------------------------|-----------------------|
| Code | Meaning |
| Blank | Standard definition |
| B | Electromagnetic brake |
| J | Without rabbet |
| T | Special-ordered |

| X7: Production line | |
|---------------------|-------------------|
| Code | Meaning |
| Blank | N production line |
| Z | Z production line |
| H | H production line |

The description of high performance type servo motor:

130 S D - A 102 20 30 D1 B
X1 X2 X3 X4 X5 X6 X7 X8 X9

| X1: Flange size | |
|-----------------|---------------------|
| Code | Meaning |
| 40 | 40mm square flange |
| 60 | 60mm square flange |
| 80 | 80mm square flange |
| 90 | 90mm square flange |
| 100 | 100mm square flange |
| 110 | 110mm square flange |
| 130 | 130mm square flange |
| 150 | 150mm square flange |
| 180 | 180mm square flange |
| ... | ... |

| X2: Motor series | |
|------------------|------------------|
| Code | Meaning |
| A | Zhishan A series |
| S | Zhishan S series |
| D | Zhishan D series |
| E | Zhishan E series |

| X3: Inertia | |
|-------------|----------------|
| Code | Meaning |
| S | Small inertia |
| D | Medium inertia |
| H | Large inertia |
| C | Super inertia |
| ... | ... |

| X4: Input voltage | |
|-------------------|---------|
| Code | Meaning |
| A | 220V |
| B | 380V |
| C | 48V |
| ... | ... |

| X5: Power | |
|-----------|---------|
| Code | Meaning |
| 201 | 200W |
| 401 | 400W |
| 751 | 750W |
| 102 | 1KW |
| 152 | 1.5KW |
| 202 | 2KW |
| 302 | 3KW |
| ... | ... |

| X6: Rated speed | |
|-----------------|-----------|
| Code | Meaning |
| 10 | 1000r/min |
| 15 | 1500r/min |
| 20 | 2000r/min |
| ... | ... |

| X7: Maximum speed | |
|-------------------|-----------|
| Code | Meaning |
| 30 | 3000r/min |
| 40 | 4000r/min |
| 50 | 5000r/min |
| ... | ... |

| X8: Encoder type | |
|------------------|--|
| Code | Meaning |
| D1 | TAMAGAWA incremental 2500 line |
| D2 | TAMAGAWA incremental save wire harness 2500 line |
| D3 | TAMAGAWA incremental 5000 line |
| D4 | TAMAGAWA absolute Multi-turn 17 bit |
| D5 | TAMAGAWA absolute Multi-turn 20 bit |
| D6 | TAMAGAWA absolute Single-turn 17 bit |
| D7 | TAMAGAWA absolute Single-turn 20 bit |
| D8 | TAMAGAWA winding-type one pair pole resolver |
| D9 | TAMAGAWA winding-type two pair pole resolver |
| K1 | Nikon absolute Single-turn 17 bit |
| K2 | Nikon absolute Multi-turn 17 bit |
| K3 | Nikon absolute Single-turn 23 bit |
| K4 | Nikon absolute Multi-turn 23 bit |
| A1 | AMS incremental Magnetic 1000 line |
| N1 | NEMICON incremental 2500 line |
| N2 | NEMICON incremental save wire harness 2500 line |
| N3 | NEMICON incremental 5000 line |
| ... | ... |

| X9: Special definition | |
|------------------------|-----------------------|
| Code | Meaning |
| Blank | Regular motor |
| B | Electromagnetic break |
| B2 | Permanent break |
| ... | ... |

1.3 Basic Functions

| Control mode | | Position control, JOG running, speed contact, etc. |
|-------------------------------|--------------------------------------|---|
| Encoder feedback | | 2500-line incremental standard and 17 bit incremental encoders |
| Use conditions | Ambient/storage temperature | Ambient temperature: 0~+50℃; storage temperature: -20~+85℃ |
| | Ambient/storage humidity | Under 90%RH (no freezing or condensation) |
| | Vibration/impact resistance strength | 4.9m/s ² /19.6m/s ² |
| Analog speed reference input | Reference voltage | DC±10V |
| | Input impedance | Appx. 20KΩ |
| Analog torque reference input | Reference voltage | DC±10V |
| | Input impedance | Appx. 20KΩ |
| IO input signal | Point | 8 points |
| | Function (distributable) | Servo ON (/S-ON), P action (/P-CON), positive-side over travel prohibited (P-OT), negative-side over travel prohibited (N-OT), alarm reset (/ALM-RST), positive-side torque |

| | | |
|--|--------------------------------------|---|
| | | limit (/P-CL), negative-side torque limit (/N-CL), position deviation clear (/CLR), internal set speed switch, etc. Distribution of above signals and change of positive/negative logics are available |
| IO output Signal | Point | 6 points |
| | Function (distributable) | Servo alarm (ALM), position complete (/COIN), velocity compliance detection (/V-CMP), servo motor rotation detection (/TGON), servo ready (/S-RDY), torque limit detection (/CLT), breaker (/BK), encoder zero point output (PGC) Distribution of above signals and change of positive/negative logics are available |
| Encoder divided frequency output | | A-phase, B-phase and C-phase: linear drive output; divided pulse count: can be set freely |
| RS-485 communication | Communication protocol | MODBUS |
| | 1:N communication | N = 127 stations at maximum |
| | Axial address setting | Set by parameters |
| CAN communication | Communication protocol | CANOpen (DS301 + DS402 guild regulations) |
| | 1:N communication | N = 127 stations at maximum |
| | Axial address setting | Set by parameters |
| Display functions | | CHARGE indicator, 7-segment digital tube 5 bit |
| Regeneration processing | | Built-in or external regeneration resistor (optional) |
| Overtravel (OT) prevention function | | Dynamic breaker (DB) stop, deceleration stop or free running stop during P-OT or N-OT input action |
| Protection functions | | Overcurrent, overvoltage, undervoltage, overload, overspeed, regeneration failure, encoder feedback error, etc. |
| Monitoring functions | | Rotation speed, current position, reference pulse accumulation, positional deviation, motor current, operating status, input and output terminal signal, etc. |
| Auxiliary functions | | Gain adjustment, alarm record, JOG running, origin search, inertia detection, etc. |
| Intelligent function | | Built-in gain auto tuning function |
| Applicable load inertia | | Less than 5 times of the motor inertia |
| Position control | Feed-forward compensation | 0~100% (set unit: 1%) |
| | Input pulse type | Sign + pulse sequence, CW+CCW pulse sequence, 90 ° phase difference two-phase pulse (A phase + B phase) |
| | Input pulse type | Linear drive and open connector supported |
| | Maximum input pulse frequency | Linear drive: Sign + pulse sequence, CW+CCW pulse sequence: 500Kpps 90 ° phase difference two-phase pulse (A phase + B phase): 500Kpps Open connector: Sign + pulse sequence, CW+CCW pulse sequence: 200Kpps 90 ° phase difference two-phase pulse (A phase + B phase): 200Kpps |

Chapter II Installation and Dimension

2.1 Servo Driver

K series servo drivers are base-mounted and improper installation may give rise to failures. Please install the servo driver properly by following the instructions below.

2.1.1 Storage Condition

The servo driver should be kept in a place with an ambient temperature of $[-20\sim+85]^{\circ}\text{C}$ when not used.

2.1.2 Installation Site

- Temperature: $0\sim55^{\circ}\text{C}$;
- Ambient humidity: not higher than 90% RH (no condensation);
- Sea level not higher than 1000 m;
- Maximum vibration: 4.9m/s^2 ;
- Maximum Impact: 19.6m/s^2 ;
- Other installation precautions:
 - Installed in a control cabinet

Attention should be paid to the size of the control cabinet, the placement mode of servo driver and cooling mode, in order to ensure that the ambient temperature for the servo driver is under 55°C . Please refer to description in Section 1.2.2 for operation details;

- Installed near heat source

The radiation of the heat source and temperature rise caused by convection should be under control, in order to ensure that the ambient temperature for the servo driver is under 55°C ;

- Installed near vibration source

A vibration isolation device should be installed to avoid vibration passing to the servo driver;

- Installed in a place exposed to corrosive air

Necessary measures should be taken to prevent the servo driver from exposing to corrosive air. Corrosive air may not immediately affect servo driver but will obviously cause the failure of electronic components and relevant elements of the contactor;

- Other occasions

Servo driver should not be put in occasions of high temperature, high humidity, condensation dripping, oil splashing, dust, scrap iron or radiation;

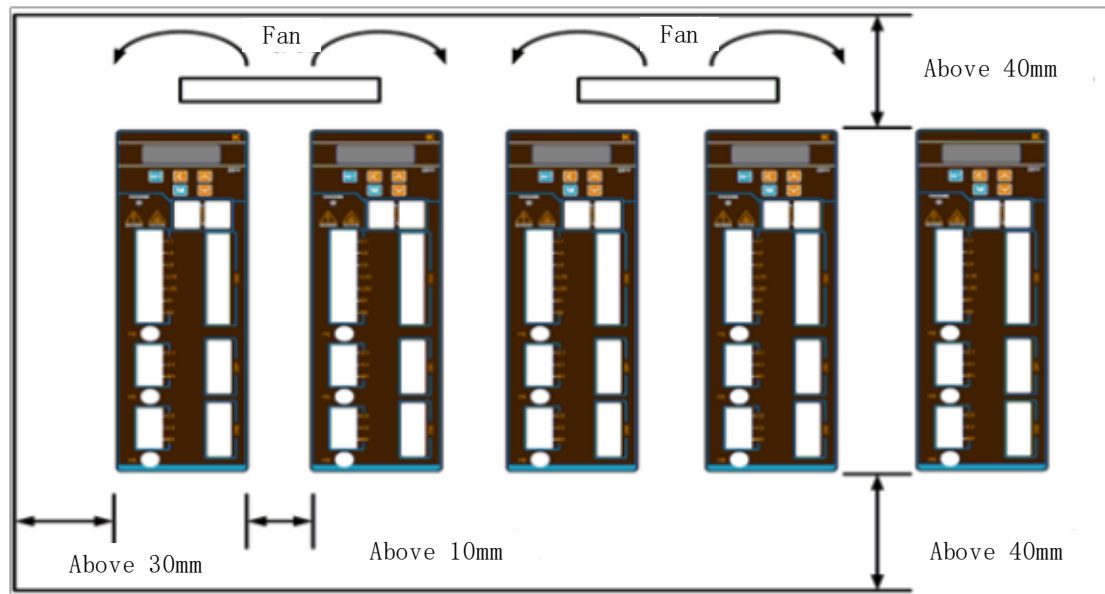
Note: when cutting off the power to store the servo driver, please put the driver in a place with the following environmental conditions: $-20\sim85^{\circ}\text{C}$, 90% RH below (no condensation)

2.1.3 Installation Direction

The direction of installation should be vertical to the mounting surface and two mounting holes should be used to reliably fix the servo driver on the installation base. If required, a fan should be installed to compulsorily cool the servo driver.

2.1.4 Installation of Several Servo Drivers

If more than one servo driver should be installed in a control cabinet in parallel, the space indicated below should be followed for installation and heat dissipation.



■ Installation direction of servo driver

The front (wiring side) of the servo driver should face the operator and should be vertical to the mounting base.

■ Cooling

Adequate space should be reserved around the servo driver to ensure cooling through a fan or free convection.

■ Parallel installation

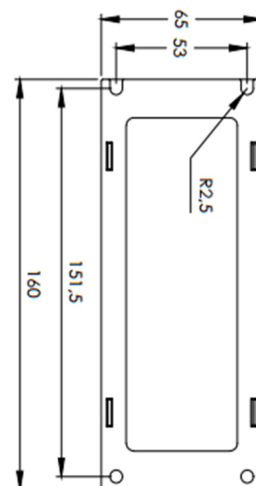
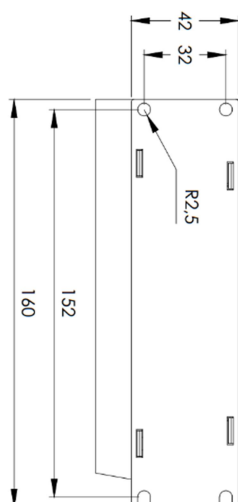
As shown above, a space of above 10 mm should be reserved at both sides of the horizontal direction and a space of above 50mm should be reserved at both sides of the vertical direction. The temperature inside the control cabinet should be kept even to avoid excess temperature in some parts of the servo driver. If necessary, a fan for compulsory cooling and convection should be installed above the servo driver.

■ Environmental condition for normal operation of servo driver

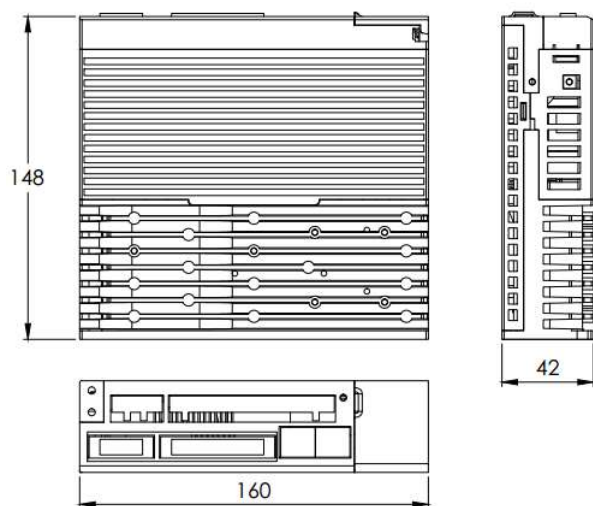
1. Temperature: 0~ 55℃
2. Humidity: below 90%RH (no condensation)
3. Vibration: below 4.9m/s²
4. To ensure long-term stable use, it is recommended to use the servo driver under an environmental temperature condition of 45℃ and below.

2.1.5 Dimension Description

(1) Installation dimension of K1/K2/iK2 series:

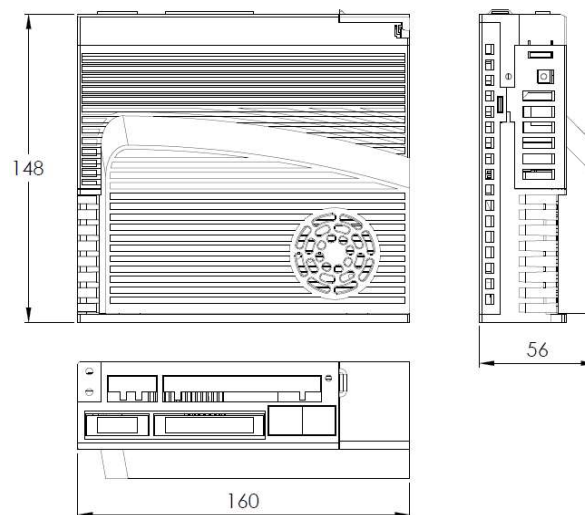


Installation of K1/K2/iK2 - 400W and 750W



Dimension of K1/K2/iK2-400W

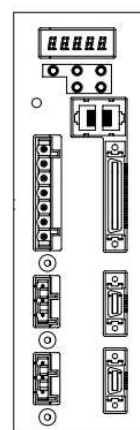
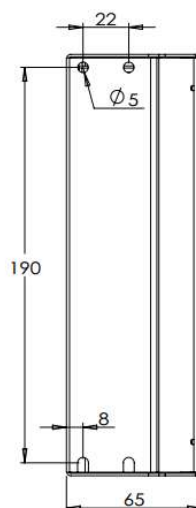
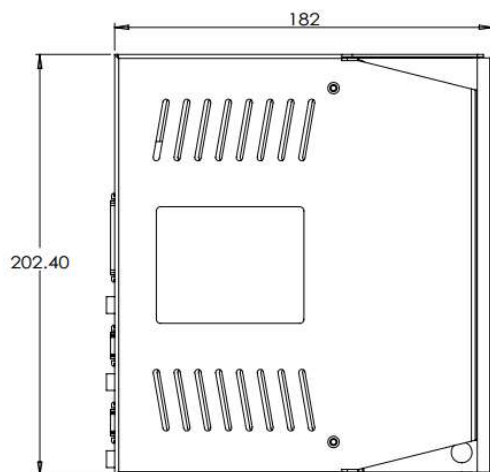
Installation of K1/K2/iK2- 1.5kW



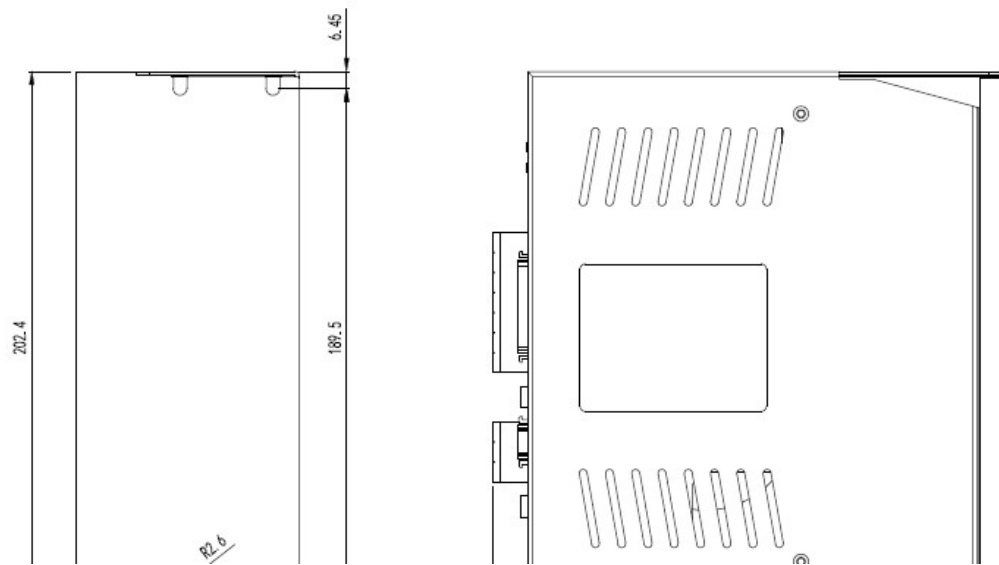
Dimension of K1/K2/iK2-750W

(2) K/iK series

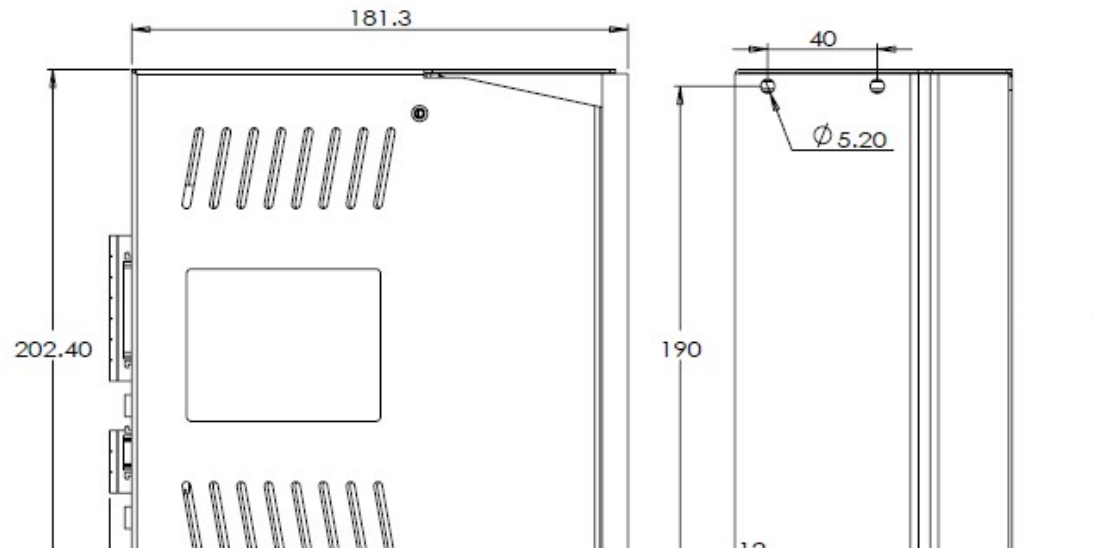
Dimension of 1.5kW / 2.0kW (220V) and 2.0kW / 3.5kW (380V) :



Dimension of 2.8kW:



Dimension of 3.5kW / 5.0kW (220V) 和 5.0kW / 7.5kW (380V) :



2.2 Servo Motor

The servo motor can be installed in horizontal or vertical direction. The service life of the servo motor will be shortened significantly or unexpected accident may occur if any mechanical mismatch occurs during installation. Please follow the instructions below for correct installation.

Precautions before installation:

Antirust agent is applied at the motor axis end and should be wiped off using a soft cloth dipped in diluent before installation.

When wiping off the antirust agent, attention should be paid to prevent the diluent from contacting other parts of the servo motor.

2.2.1 Storage Temperature

The servo motor should be kept in a place with an ambient temperature of $[-20\sim+60]^{\circ}\text{C}$ when not used.

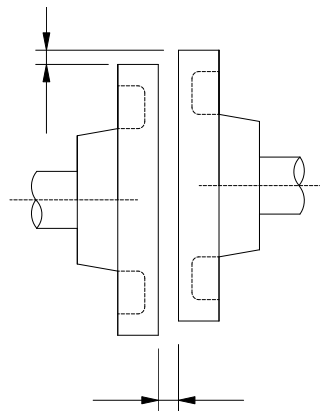
2.2.2 Direction

Servo motor should be installed indoor and the indoor space should meet the following environmental conditions.

- No corrosive, flammable or explosive air
- Good ventilation, little dust and dry environment
- Ambient temperature within $0\sim40^{\circ}\text{C}$
- Relative humidity within $26\%\sim80\%\text{RH}$ without condensation
- Easy for maintenance and cleaning

2.2.3 Installation Concentricity

Flexible coupling should be used as much as possible when connecting to machinery. In addition, axis of servo motor should be placed in a straight line with that of mechanical load. When installing servo motor, requirements for concentricity tolerance should be met as the following figure.



Measure at quarter of a circle to make sure that difference between max. value and min. value is lower than 0.03 mm. (rotating with coupling)

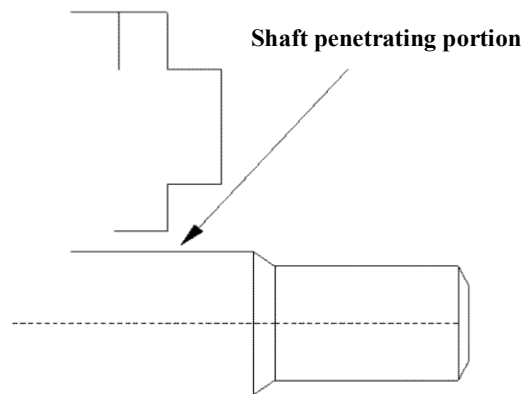
-
- **Mechanical vibration will be caused by large concentricity deviation and therefore will lead to damages to servo motor bearing.**
 - **When installing coupling, axial percussion is prohibited, otherwise damages will be caused to encoder of servo motor.**
-

2.2.4 Installation Direction

Servo motors can be installed horizontally, vertically or in random direction.

2.2.5 Protection Measures Against Water and Oil

When using in places containing water, oil or condensation, it is required to take special measures to motors as per protection requirements; however, motors with oil seals should be used since protection requirements for shaft penetrating portion should be satisfied when motors leaving factory. Shaft penetrating portion refers to interval between extension of motor end and end flange.



2.2.6 Cable Tension

Bending radius cannot be too small when connecting cables. It is also not suggested to exert too much tension in cables. Specially, diameter for core wire of signal line is usually very fine (0.2 or 0.3 mm), therefore too much tension cannot be exerted during wiring.

Chapter III Wiring

This section explains wiring examples of main circuit, functions of terminals in main circuit and power ON sequence.

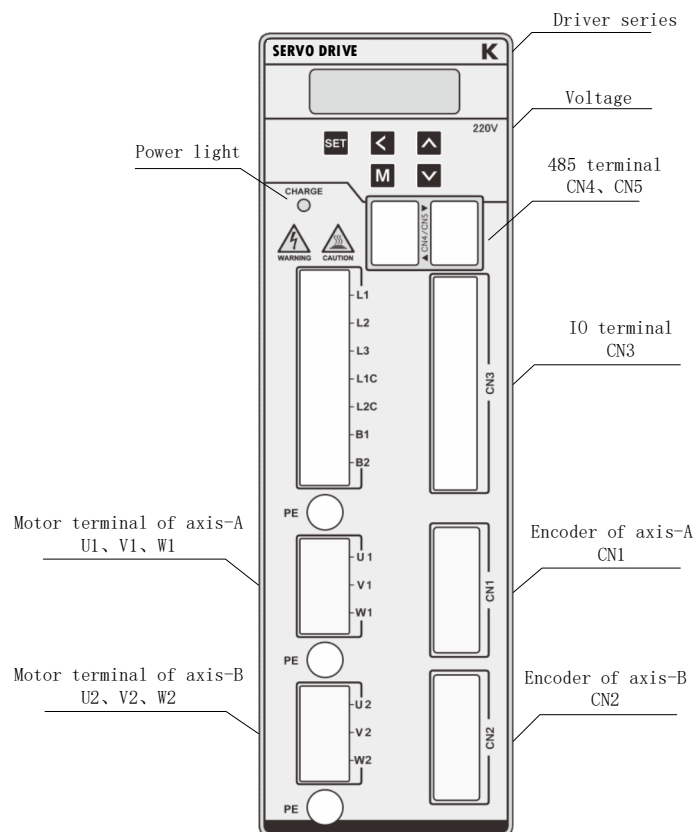


Notes

- (1) Do not lead power lines and signal lines to the same pipe, nor bind them together. During wiring, power lines should be kept over 30 cm away from signal line. Otherwise, malfunction may be caused.
- (2) Multi-stranded wires and multi-core shielded wire should be used as signal lines and feedback wires for encoder (PG). As for wire length, reference input wire should be 3m at most and 20 m at most for PG feedback wire.
- (3) High voltage may be maintained in the servo driver even the power is turned off. Do not touch power terminal within 5 minutes after power off. Inspection operation should be carried out when CHARGE indicator light is confirmed to be off.
- (4) Do not frequently turn on or off the power. If it is required to continuously turn on or off the power, frequency should be limited to 1 time/min below. Due to capacitance in power of servo unit, large charging current (charging for 0.2 s) will flow through when power is ON. Therefore, performance of components in main circuit within servo unit will be damaged if power is turned on/off frequently.

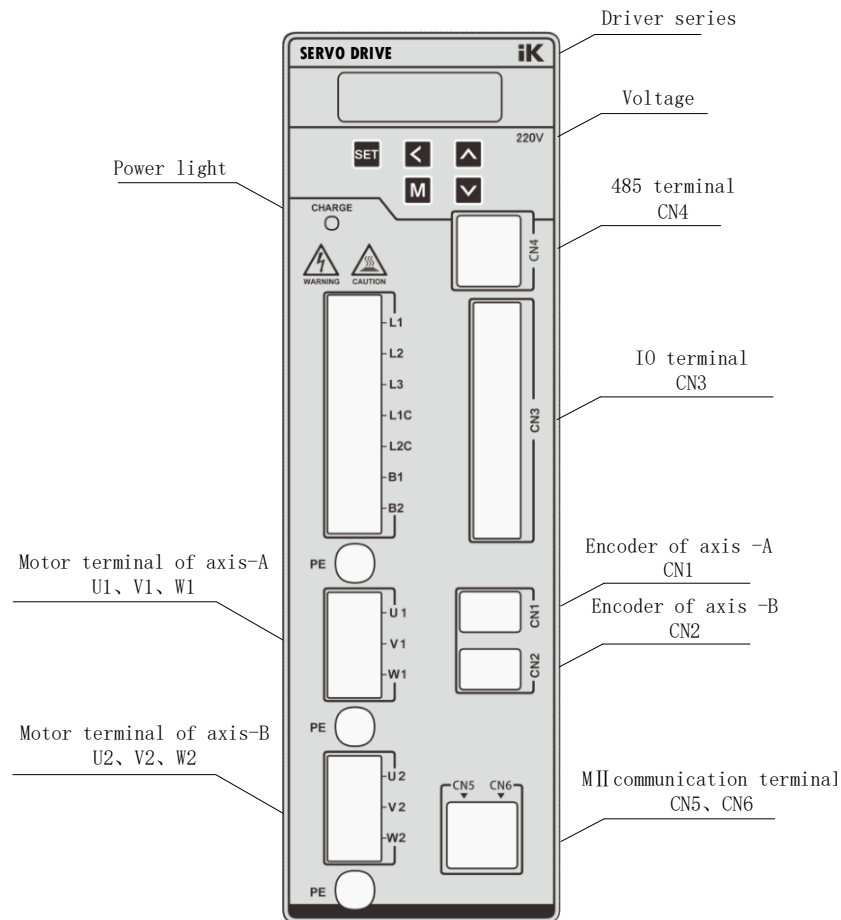
3.1 Profile of terminal

3.1.1 K series driver



☆ Note: There is only U1, V1, W1 and CN1 in single axis driver.

3.1.2 iK series driver



(1) Introduction of the main circuit terminal of K/iK series 220V driver

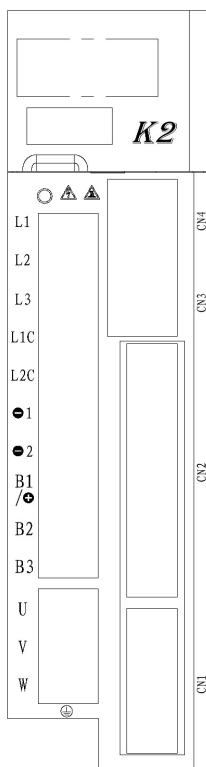
| Terminal | Functions | Precautions for operation |
|------------|--------------------------------------|---|
| U1, V1, W1 | Terminal of A-axis motor power line | Connected to A-axis servo motor |
| U2, V2, W2 | Terminal of b-axis motor power line | Connected to b-axis servo motor |
| L1, L2, L3 | Input terminal of main circuit power | Three phase 200 - 230VAC (-15%~+10%) (50/60Hz) |
| L1C, L2C | Power input terminal of control loop | Single phase 200 - 230VAC (-15%~+10%) (50/60Hz) |
| B1, B2 | Terminal of bleeder resistor | Resistor should be connected to B1 and B2 if external connection for bleeder resistor is required |
| PE | Earthing Terminal | Earthing measures should be carried out for connection of power earthing terminals and motor earthing terminals |

Notes: A axis refers to U1, V1 and W1; b axis refers to U2, V2 and W2 in the instruction.

(2) Introduction of the main circuit terminal of K/iK series 380V driver

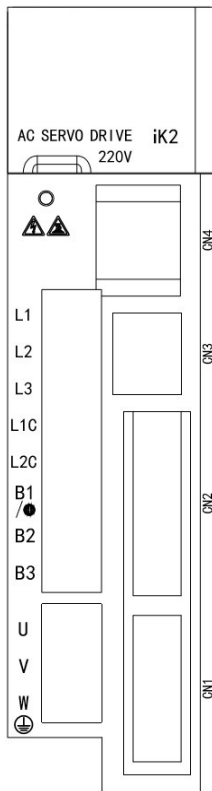
| Terminal | Functions | Precautions for operation |
|------------|--------------------------------------|---|
| U, V, W | Terminal of motor power line | Connected to servo motor |
| L1, L2, L3 | Input terminal of main circuit power | Three phase 380VAC (-15%~+10%) (50/60Hz) |
| 24V, 0V | Input terminal of control power | 20~32VDC |
| B1, B2 | Terminal of bleeder resistor | Resistor should be connected to B1 and B2 if external connection for bleeder resistor is required |
| PE | Earthing Terminal | Earthing measures should be carried out for connection of power earthing terminals and motor earthing terminals |

3.1.3 K1、K2 series driver



| Terminal | Functions | Precautions for operation |
|------------|--|---|
| L1、L2、L3 | Main circuit power | Three phase 220VAC (-15%~+10%) (50/60Hz) |
| L1C、L2C | Terminal of control power | Single phase 220VAC (-15%~+10%) (50/60Hz) |
| ⊖1、⊖2 | DC reactor | ⊖1 and ⊖2 are connected at factory . |
| B1/⊕、B2、B3 | Terminal of bleeder resistor | When using an external resistor, connect bleeder resistor between B1/⊕ and B2; Connect B2 and B3 when use internal bleeder resistor, (B2 and B3 is shorted at factory). |
| U、V、W、⊕ | Terminal of motor power line and earthing terminal | Must connected to the motor terminals UVW |
| CN1 | Terminal of motor encoder | see instructions in 3.2 |
| CN2 | Terminal of input and output | see instructions in 3.3.3 |
| CN3 | Communication terminal | Notice the definition of the terminal, see instructions in 6.1 |
| CN4 | | |

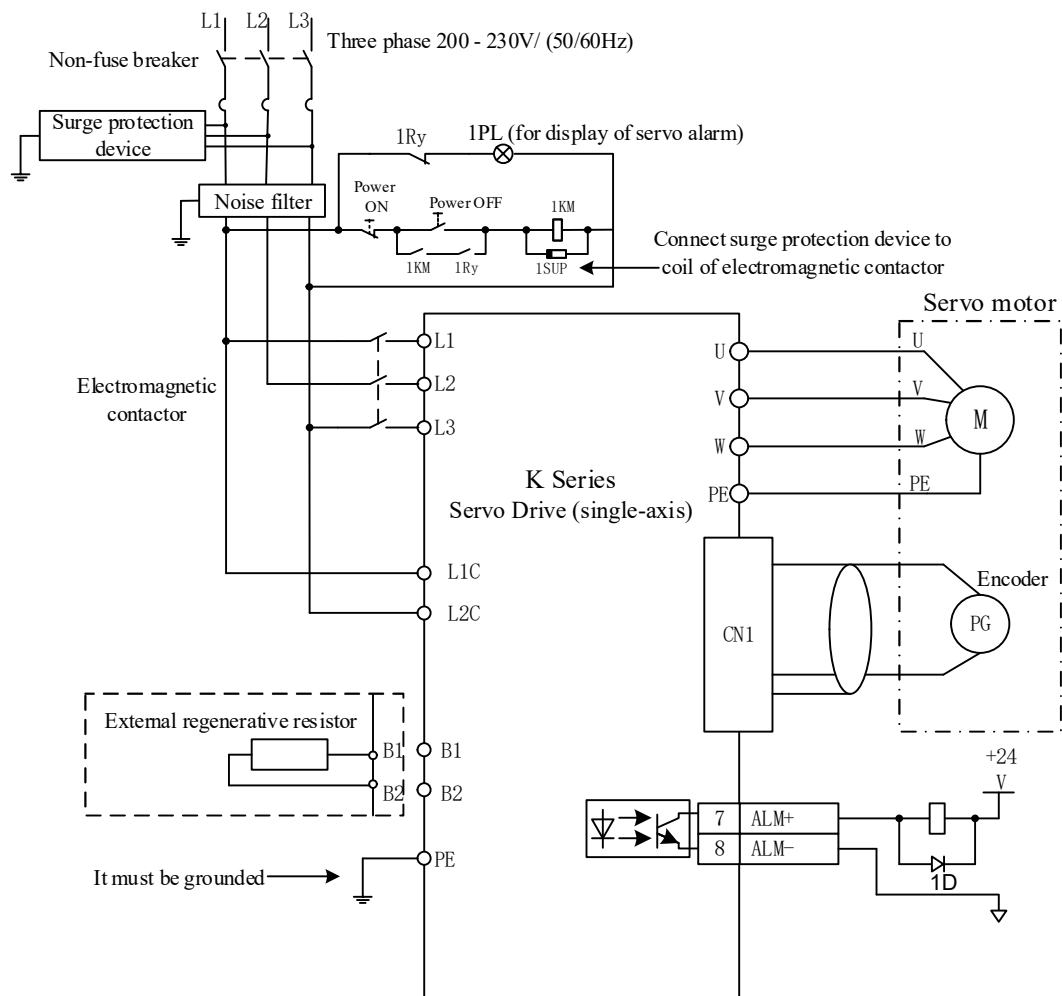
3.1.4 iK2 series driver



| Terminal | Functions | Precautions for operation |
|------------|--|---|
| L1、L2、L3 | Main circuit power | Three phase 220VAC (-15%~+10%) (50/60Hz) |
| L1C、L2C | Terminal of control power | Single phase 220VAC (-15%~+10%) (50/60Hz) |
| B1/⊕、B2、B3 | Terminal of bleeder resistor | When using an external resistor, connect bleeder resistor between B1/⊕ and B2; Connect B2 and B3 when use internal bleeder resistor, (B2 and B3 is shorted at factory). |
| U、V、W、⊕ | Terminal of motor power line and earthing terminal | Must connected to the motor terminals UVW |
| CN1 | Terminal of motor encoder | see instructions in 3.2 |
| CN2 | Terminal of input and output | see instructions in 3.3.3 |
| CN3 | Communication terminal | Notice the definition of the terminal, see instructions in 6.1 |
| CN4 | | |

3.2 Typical Examples for Main Circuit Wiring

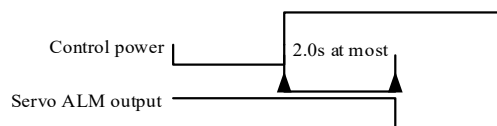
3.2.1 K/iK series single axis 220V



Notes: design of power ON sequence

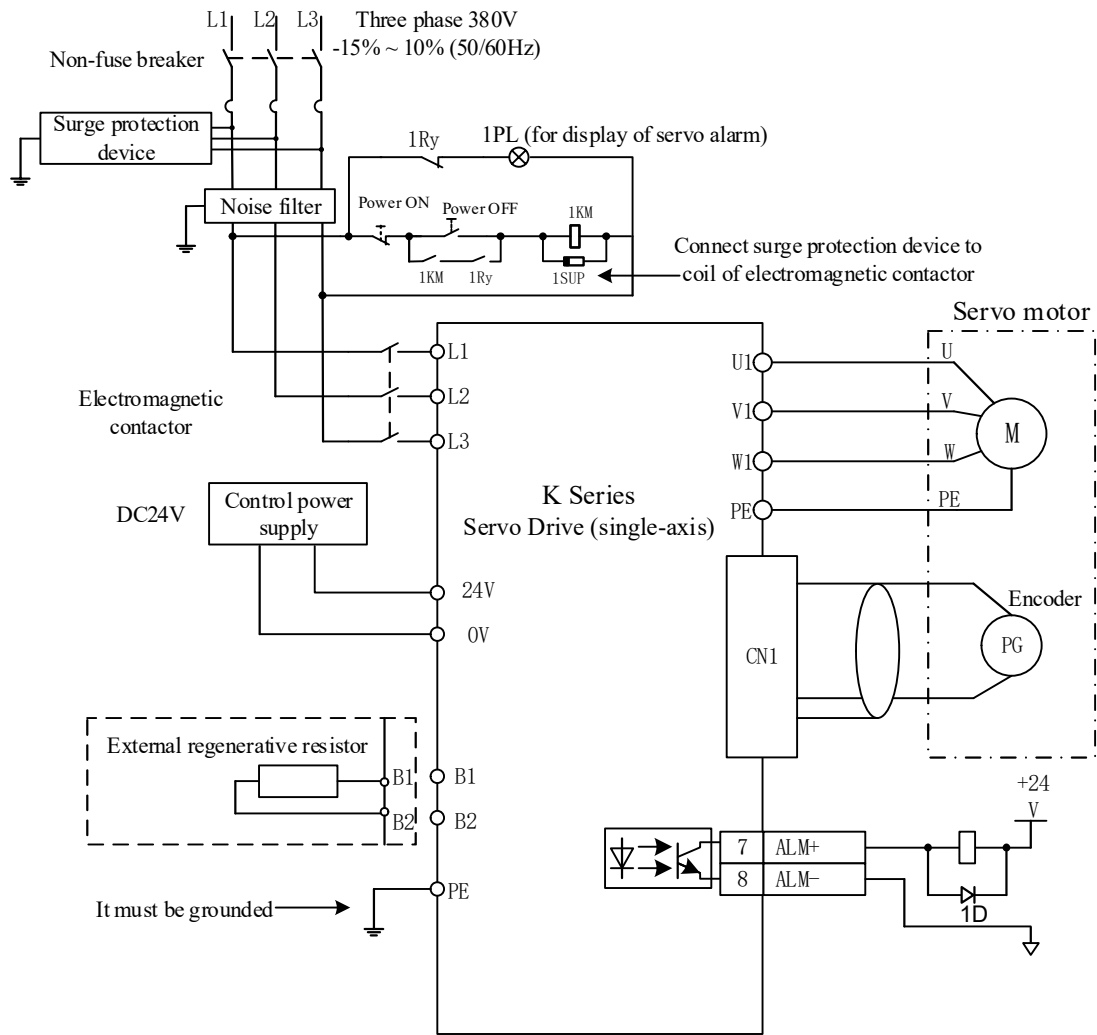
The following items should be considered during design of power ON sequence.

1. Design of power ON sequence: power should be OFF after output of signals of "servo alarm". (Refer to the above circuit diagram.)
2. Press the POWER ON button for over 2 s. When control power of servo unit is ON, output 2s "servo alarm" signal (1Ry: OFF). It is required to be done during initial setting of servo driver.

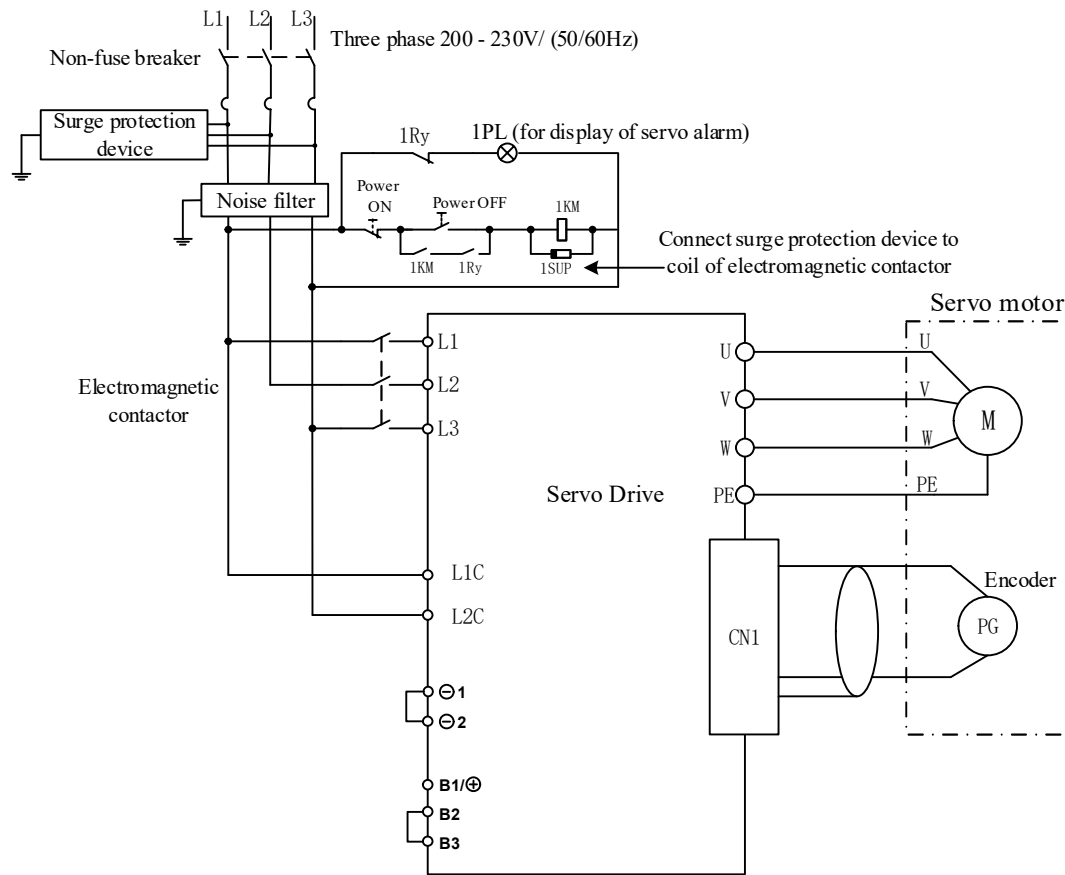


3. Power specification for used parts should match with input power.

3.2.2 K/iK series double axis 220V



3.2.4 K1/K2 series



1、DC reactor is connected between $\ominus 1$ and $\ominus 2$, and the two terminals are shorted when at factory.

2、400W has no internal brake resistor, 750W has internal brake resistor, When using an external resistor, connect bleeder resistor between B1 and B2; B2 and B3 is shorted at factory.

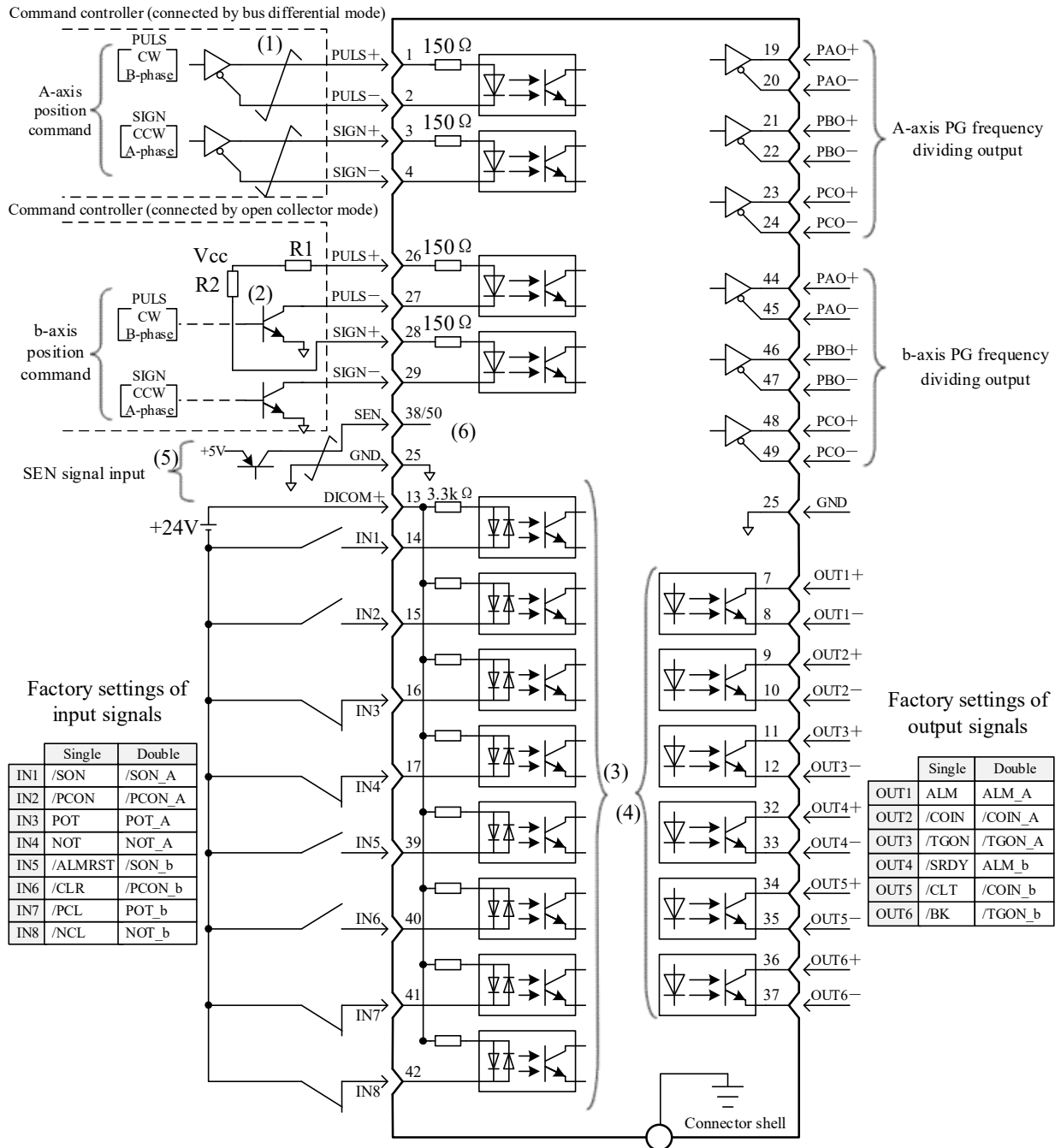
3、For iK2, There has not reactor terminal $\ominus 1$ and $\ominus 2$.

3.3 Control mode wiring

3.3.1 Control mode wiring of K/iK/K2

(1) Position Control Mode

Pin-out for signal wiring of single-axis driver should be subject to A-axis wiring pin-out. The b-axis pin-out will not be connected.



(1) Refers to shielded twisted pair cable

(2) When open collector is used as the input mode for position command pulse, external resistor should be connected:

$V_{CC}=24V$ 时, $R1=R2=2.2K\Omega$

$V_{CC}=12V$ 时, $R1=R2=1K\Omega$

$V_{CC}=5V$ 时, $R1=R2=180\Omega$

(3) Distribution change can be done by user parameter (P□509 - P□512) when inputting IN1 - IN8 signals

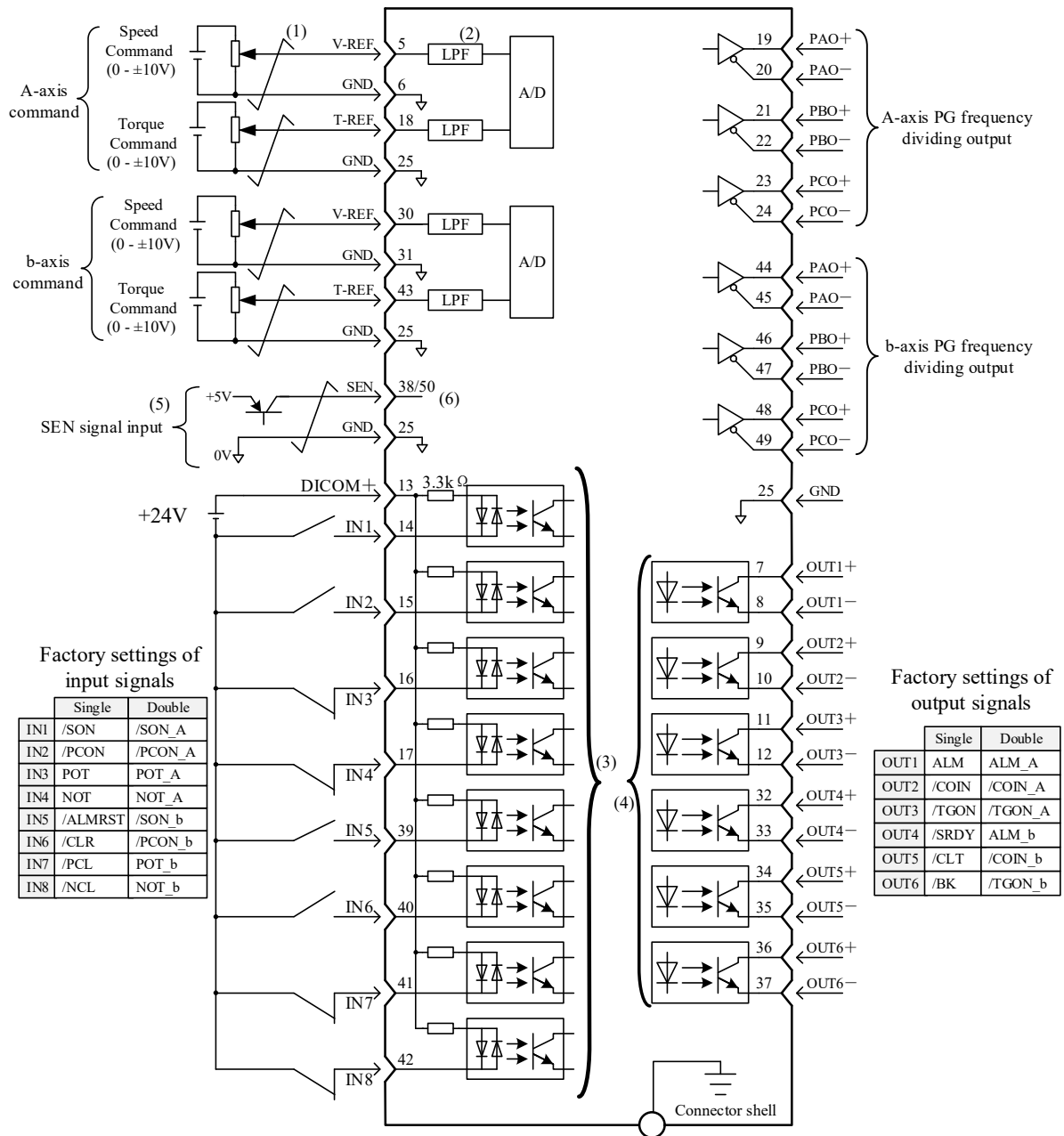
(4) Distribution change can be done by user parameter (P□513 - P□514) when outputting OUT1 - OUT6 signals

(5) With absolute encoder, connect to it when serial output is required for absolute data via PAO (P□001.0 = 0)

(6) CN3-38 is A-axis SEN input and CN3-50 is b-axis SEN input

(2) Speed/Torque Control Mode

Pin-out for signal wiring of single-axis driver should be subject to A-axis wiring pin-out. The b-axis pin-out will not be connected.



(1) Refers to shielded twisted pair cable

(2) Time parameter is 47 us for first filtering

(3) Distribution change can be done by user parameter (P□509 - P□512) when inputting IN1 - IN8 signals

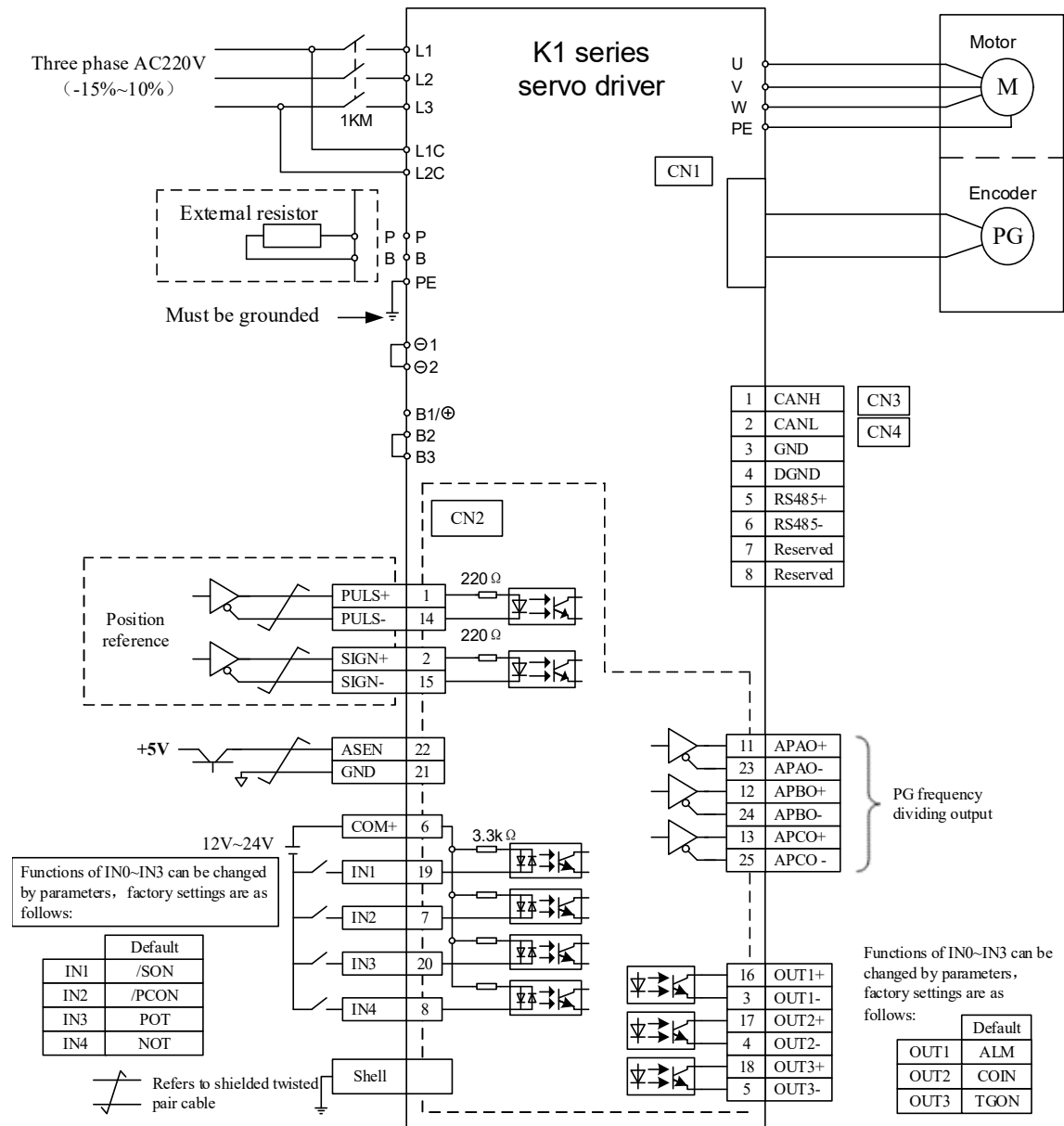
(4) Distribution change can be done by user parameter (P□513 - P□514) when outputting OUT1 - OUT6 signals

(5) With absolute encoder, connect to it when serial output is required for absolute data via PAO (P□001.0 = 0)

(6) CN3-38 is A-axis SEN input and CN3-50 is b-axis SEN input

3.3.2 Control mode wiring of K1 series

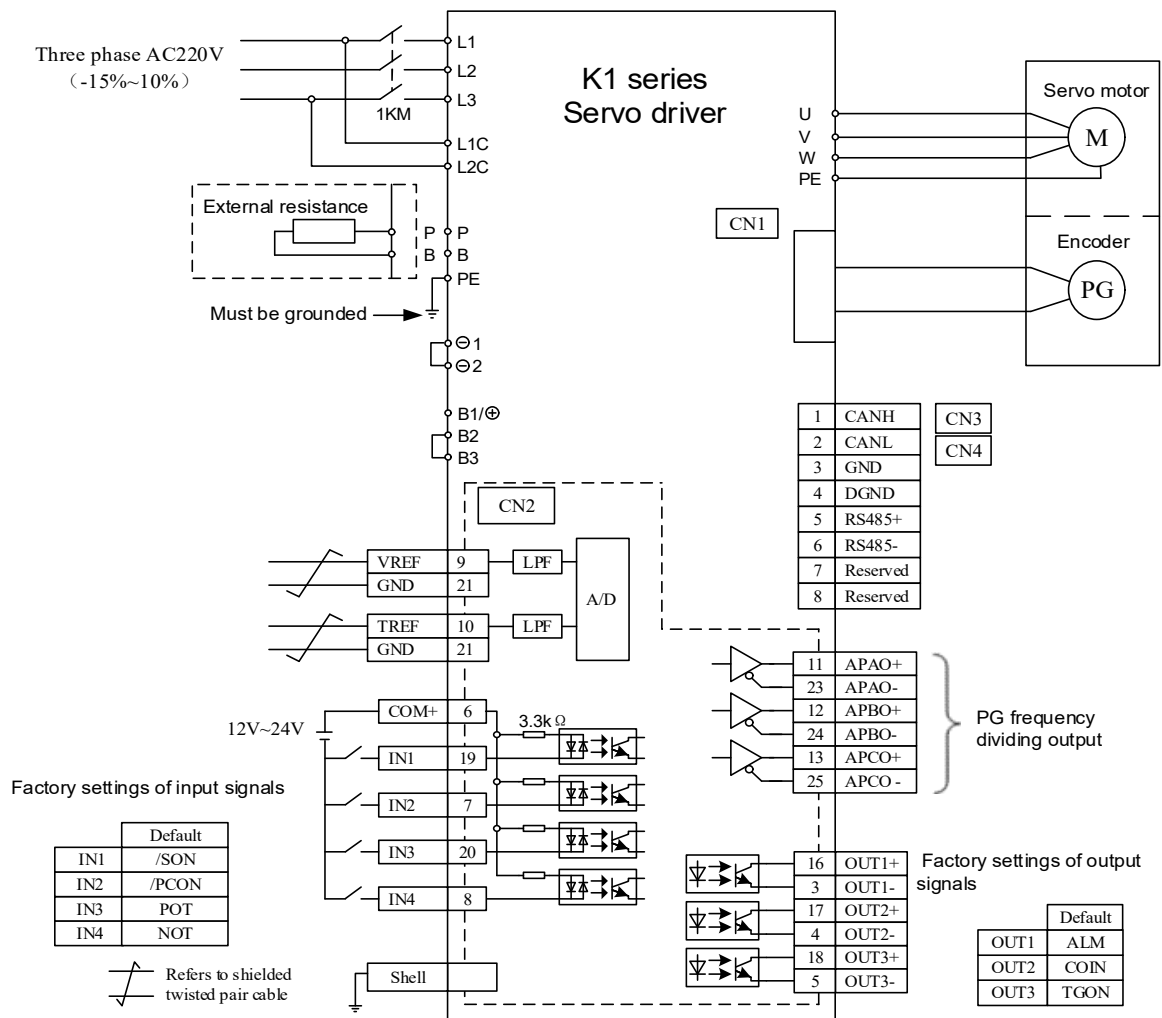
(1) Position control mode



1、DC reactor is connected between $\ominus 1$ and $\ominus 2$, and the two terminals are shorted when at factory.

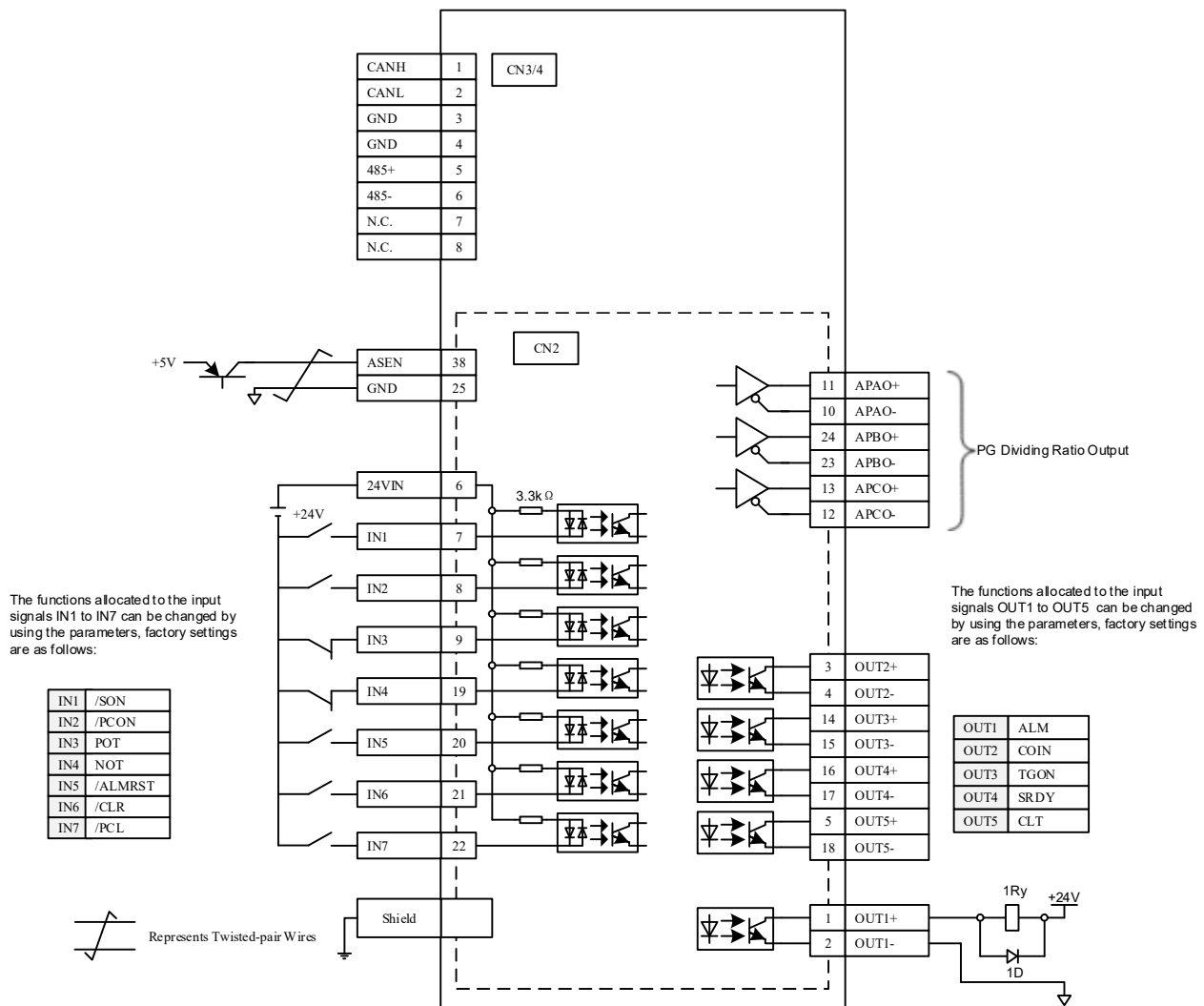
2、400W has no internal brake resistor, 750W has internal brake resistor, When using an external resistor, connect bleeder resistor between B1 and B2; B2 and B3 is shorted at factory.

(2) Speed/torque control mode



- 1、DC reactor is connected between Θ1 and Θ2, and the two terminals are shorted when at factory.
- 2、400W has no internal brake resistor, 750W has internal brake resistor, When using an external resistor, connect bleeder resistor between B1 and B2: B2 and B3 is shorted at factory.

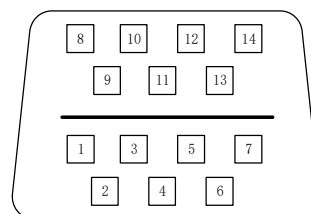
3.3.3 Control mode wiring of iK2 series



3.4 Encoder Signal Wiring

Connecting cables between encoder and servo driver and their wiring pin No. vary with servo motors.

3.4.1 K/K2/iK2 series encoder



3M, 14 pin, Type: 10214-52A2PL (E)

| Terminal No. | Signal name | | Terminal No. | Signal name | |
|-----------------|-------------|-------|-----------------|-------------|-------|
| | 2500 | 17bit | | 2500 | 17bit |
| 1 | A+ | — | 8 | U+ | — |
| 2 | A- | — | 9 | U- | — |
| 3 | B+ | — | 10 | V+ | — |
| 4 | B- | — | 11 | V- | — |
| 5 | C+ | E+ | 12 | W+ | SD+ |
| 6 | C- | E- | 13 | W- | SD- |
| 7 | PG5V | PG5V | 14 | PG0V | PG0V |

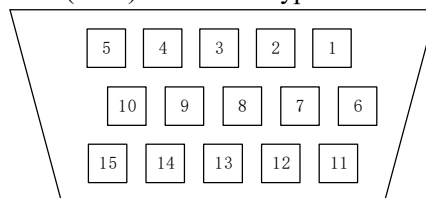
3.4.2 iK series encoder

Terminal type: 3E106 - 2230 KV

| Terminal No. | 1 | 2 | 3 | 4 | 5 | 6 | PE |
|--------------|------|------|----|----|-----|-----|-------|
| Signal name | PG5V | PG0V | E+ | E- | SD+ | SD- | Shell |

3.4.3 K1 series encoder

K1 series's encoder terminal (CN1) is DB15, Type: CD0515S21GO



K1 series's encoder

| Terminal No. | Signal name | | Terminal No. | Signal name | |
|-----------------|-------------|-------|-----------------|-------------|-------|
| | 2500 | 17bit | | 2500 | 17bit |
| 1 | PG0V | PG0V | 8 | V- | — |
| 2 | A+ | — | 9 | U- | — |
| 3 | A- | — | 10 | C+ | E+ |
| 4 | B+ | — | 11 | NC | NC |
| 5 | B- | — | 12 | W+ | SD+ |
| 6 | PG5V | PG5V | 13 | V+ | — |
| 7 | W- | SD- | 14 | U+ | — |
| — | — | — | 15 | C- | E- |

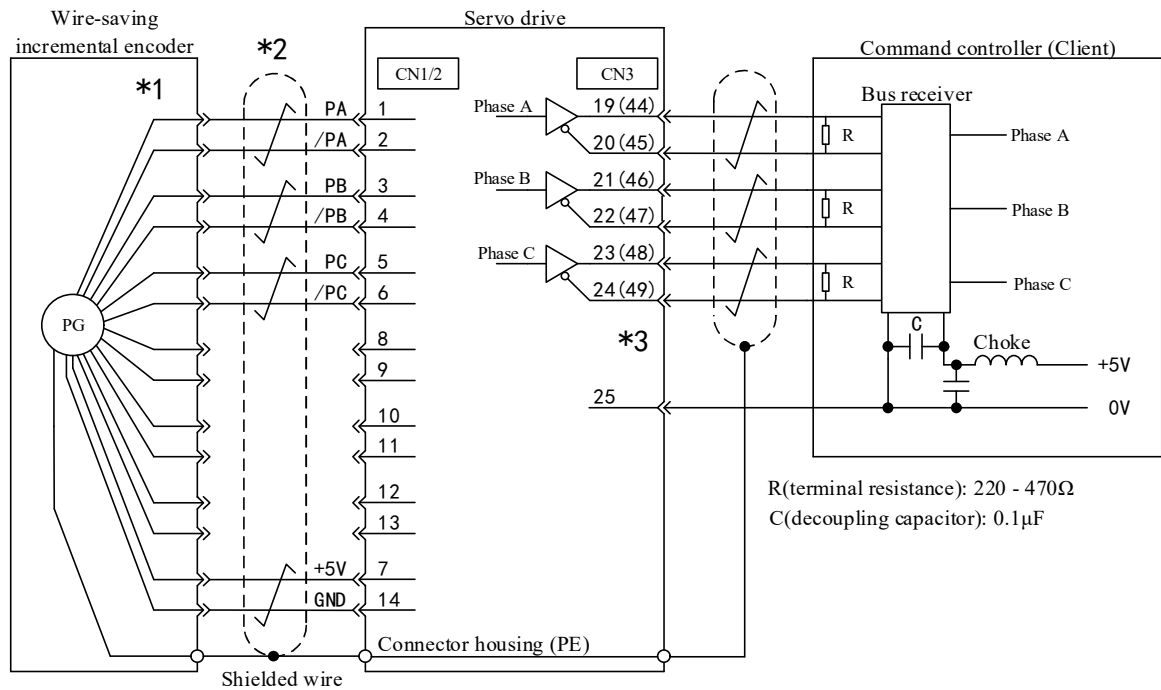
3.4.4 Connection with Encoder Interface (CN1/CN2) and Processing of Output Signal from CN3

In the figure: *1: connector wiring pin No. varies with used servo motor.

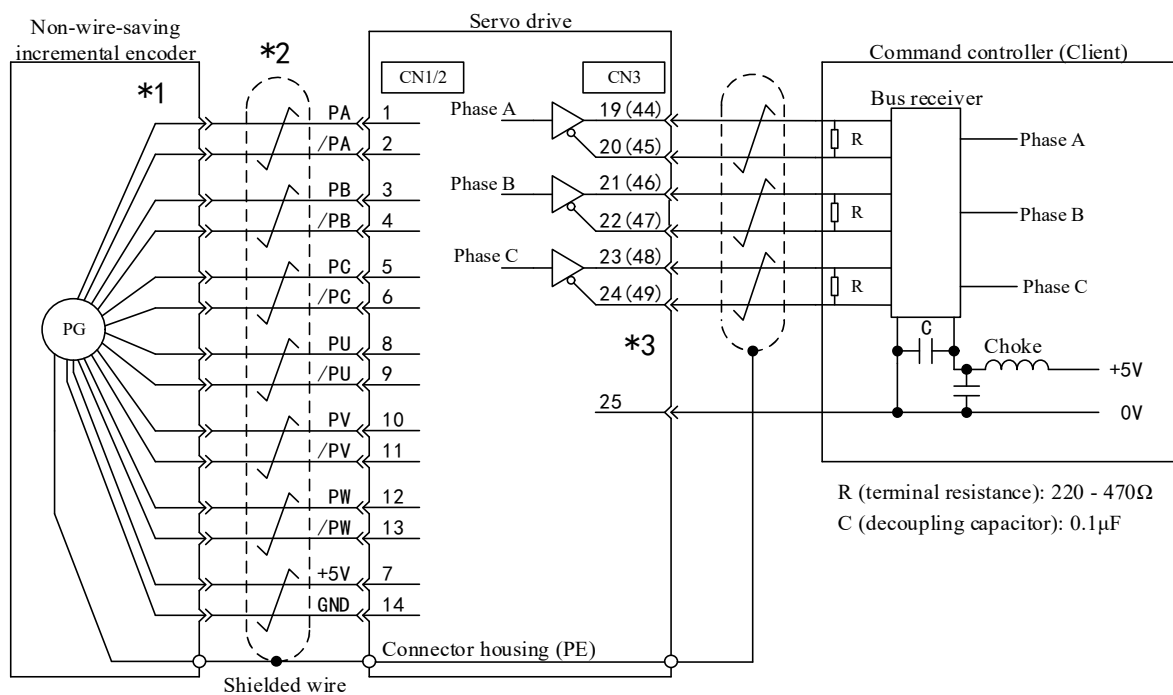
*2: refers to multi-stranded shielded wire.

*3: connector wiring pin No. varies with used servo motor. 19 -25 is pin number for axis A of single-axis or double axis motor; 44 - 49 is pin number of axis b of double-axis motor.

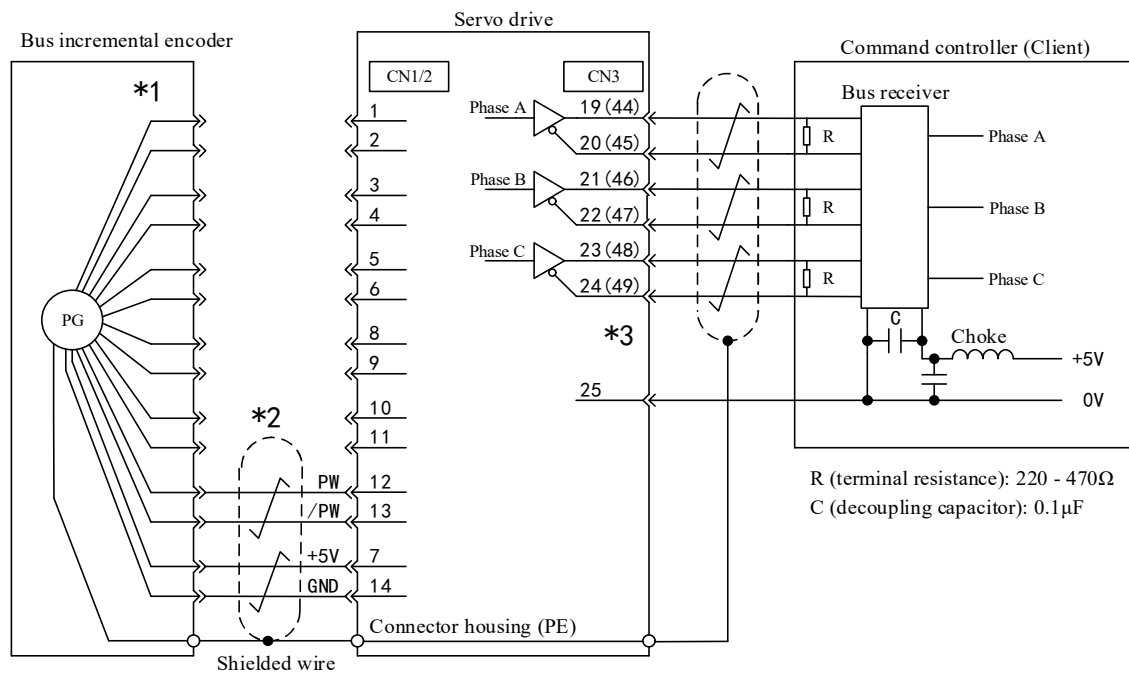
(1) 2500 incremental wire-saving encoder



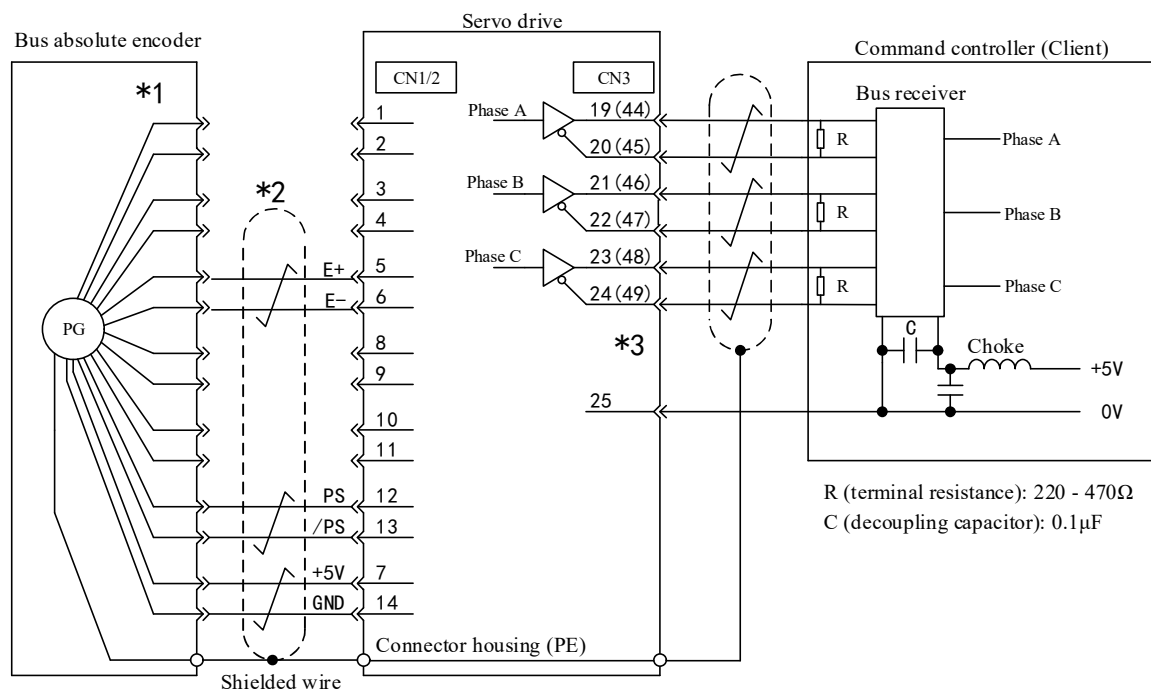
(2) 2500 incremental standard encoder



(3) Bus incremental encoder



(4) Bus absolute encoder



3.5 Input/Output Signal Wiring

3.5.1 K/iK/K2 series input/output terminal

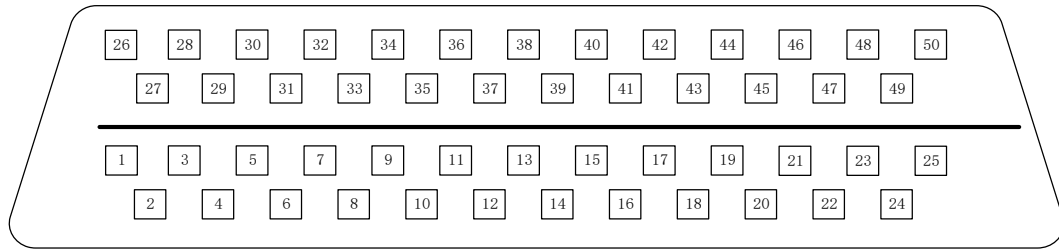


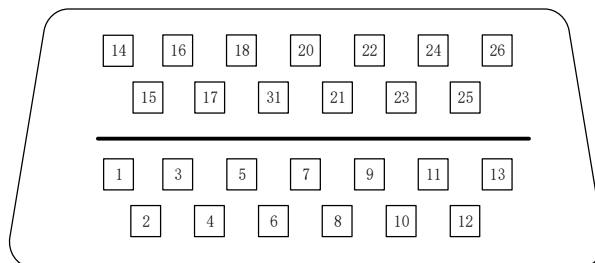
图 K/iK/K2 series I/O terminal (In the face of the plug welding)

3M, 50 pin, type: 10250-52A2PL。

| Terminal No. | Name | Functions | | Terminal No. | Name | Functions | |
|--------------|--------|--|--|--------------|--------|--|---|
| | | Single-axis driver | Double-axis driver | | | Single-axis driver | Double-axis driver |
| 1 | APULS+ | Reference pulse input | A-axis reference pulse input | 26 | BPULS+ | Reserved | b-axis reference pulse input |
| 2 | APULS- | | | 27 | BPULS- | | |
| 3 | ASIGN+ | Reference sign input | A-axis reference sign input | 28 | BSIGN+ | Reserved | b-axis reference sign input |
| 4 | ASIGN- | | | 29 | BSIGN- | | |
| 5 | AV-REF | Speed reference input | A-axis speed reference input | 30 | BV-REF | Reserved | b-axis speed reference input |
| 6 | GND | Signal ground | Signal ground | 31 | GND | Signal ground | Signal ground |
| 7 | OUT1+ | Output port 1, which can be reallocated (Factory setting:ALM) | Output port 1, which can be reallocated (Factory setting:A-axis ALM) | 32 | OUT4+ | Output port 4, which can be reallocated (Factory setting:/S-RDY) | Output port 4, which can be reallocated (Factory setting: b-axis ALM) |
| 8 | OUT1- | | | 33 | OUT4- | | |
| 9 | OUT2+ | Output port 2, which can be reallocated (Factory setting:/COIN) | Output port 2, which can be reallocated (Factory setting:A-axis/COIN) | 34 | OUT5+ | Output port 5, which can be reallocated (Factory setting:/CLT) | Output port 5, which can be reallocated (Factory setting: b-axis/COIN) |
| 10 | OUT2- | | | 35 | OUT5- | | |
| 11 | OUT3+ | Output port 3, which can be reallocated (Factory setting:/TGON) | Output port 3, which can be reallocated (Factory setting:A-axis/TGON) | 36 | OUT6+ | Output port 6, which can be reallocated (Factory setting:/BK) | Output port 6, which can be reallocated (Factory setting: b-axis/TGON) |
| 12 | OUT3- | | | 37 | OUT6- | | |
| 13 | DICOM | Common port of input signal | Common port of input signal | 38 | SEN | SEN signal input | A-axis SEN signal input |
| 14 | IN1 | Input port 1, which can be reallocated (Factory setting:/S-ON) | Input port 1, which can be reallocated (Factory setting:A-axis/S-ON) | 39 | IN5 | Input port 5, which can be reallocated (Factory setting:/ALM-RST) | Input port 5, which can be reallocated (Factory setting: b-axis/S-ON) |
| 15 | IN2 | Input port 2, which can be reallocated (Factory setting:/P-CON) | Input port 2, which can be reallocated (Factory setting:A-axis/P-CON) | 40 | IN6 | Input port 6, which can be reallocated (Factory setting:/CLR) | Input port 6, which can be reallocated (Factory setting: b-axis/P-CON) |
| 16 | IN3 | Input port 3, which can be reallocated (Factory setting: POT) | Input port 3, which can be reallocated (Factory setting:A-axis POT) | 41 | IN7 | Input port 7, which can be reallocated (Factory setting: /PCL) | Input port 7, which can be reallocated (Factory setting: b-axis POT) |
| 17 | IN4 | Input port 4, which can be reallocated (Factory setting: NOT) | Input port 4, which can be reallocated (Factory setting:A-axis NOT) | 42 | IN8 | Input port 8, which can be reallocated (Factory setting:/NCL) | Input port 8, which can be reallocated (Factory setting: b-axis NOT) |
| 18 | AT-REF | Torque reference input | A-axis torque reference input | 43 | BT-REF | Reserved | b-axis torque reference input |
| 19 | APAO+ | Phase A of PG frequency dividing output | Phase A of A-axis PG frequency dividing output | 44 | BPAO+ | Reserved | Phase A of b-axis PG frequency dividing output |
| 20 | APAO- | | | 45 | BPAO- | | |
| 21 | APBO+ | Phase B of PG frequency dividing output | Phase B of A-axis PG frequency dividing output | 46 | BPBO+ | Reserved | Phase B of b-axis PG frequency dividing output |
| 22 | APBO- | | | 47 | BPBO- | | |
| 23 | APCO+ | Phase C of PG frequency | Phase C of A-axis PG | 48 | BPCO+ | Reserved | Phase C of b-axis |

| | | | | | | | |
|----|-------|-----------------|---------------------------|----|-------|----------|------------------------------|
| 24 | APCO- | dividing output | frequency dividing output | 49 | BPCO- | | PG frequency dividing output |
| 25 | GND | Signal ground | Signal ground | 50 | BSEN | Reserved | b-axis SEN signal input |

3.5.2 iK2 series input/output terminal



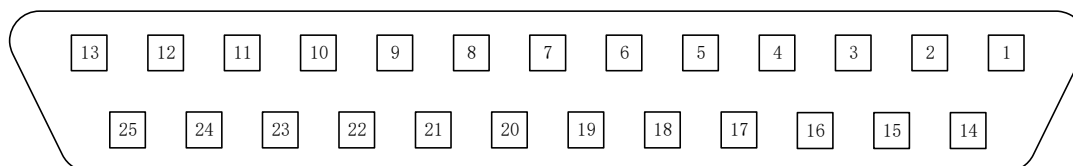
iK2 series I/O terminal (In the face of the plug welding)

3M, 26 pin, type: 10226-52A2PE。

| Pin No. | Name | Functions | Terminal No. | Name | Functions |
|---------|-------|--|--------------|-------|--|
| 1 | OUT1+ | Output port1, can be reallocated (ALM) | 14 | OUT3+ | Output port3, can be reallocated (/TGON) |
| 2 | OUT1- | | 15 | OUT3- | |
| 3 | OUT2+ | Output port2, can be reallocated (/COIN) | 16 | OUT4+ | Output port4, can be reallocated (/S-RDY) |
| 4 | OUT2- | | 17 | OUT4- | |
| 5 | OUT5+ | Output port5, can be reallocated (/CLT) | 18 | OUT5- | Output port5, can be reallocated (/CLT) |
| 6 | 24VIN | Commom port of input signal | 19 | IN4 | Input port4, can be reallocated (NOT) |
| 7 | IN1 | Input port1, can be reallocated (/S-ON) | 20 | IN5 | Input port5, can be reallocated (/ALM-RST) |
| 8 | IN2 | Input port2, can be reallocated (/P-ON) | 21 | IN6 | Input port6, can be reallocated (/CLR) |
| 9 | IN3 | Input port3, can be reallocated (POT) | 22 | IN7 | Input port7, can be reallocated (PCL) |
| 10 | APAO- | PG frequency dividing output phase A | 23 | APBO- | PG frequency dividing output phase B |
| 11 | APAO+ | | 24 | APBO+ | |
| 12 | APCO- | PG frequency dividing output phase C | 25 | GND | Signal ground |
| 13 | APCO+ | | 26 | ASEN | Reserved |

★ The above table in the brackets is the factory settings.

3.5.3 K1 series input/output terminal



K1 series I/O terminal (DB25, In the face of the plug welding)

| Definition | Terminal No | Signal name | Function description |
|------------|-------------|-----------------------------|---|
| DICOM | 6 | Commom port of input signal | Anode of the power supply of input terminal, used for driving the photoelectric coupler of the input terminal, DC12-24V, with the current no less than 100mA. |

| | | | |
|--|----------------------------------|---|---|
| IN1 IN2 IN3 IN4 | 19 7 20 8 | Control sequence of input IO port command | Factory settings: IN1: /SON; IN2: /PCON IN3: POT IN4: NOT |
| OUT1+ OUT1- OUT2+ OUT2- OUT3+ OUT3- | 16 3 17 4 18 5 | Control sequence of output IO port command | Factory settings: OUT1: ALM OUT2: COIN OUT3: TGON |
| PULS+ PULS- SIGN+ SIGN- | 1 14 2 15 | Pulse string input sequence | PULS+/SIGN+ is the positive end of differential pulse input. PULS-/SIGN- is the negative end of differential pulse input. |
| VREF TREF GND | 9 10 21 | Analog control sequence | VREF / GND is used as the speed reference input of analog control TREF / GND is used as the torque reference input of analog control |
| PAO+ PAO- PBO+ PBO- PCO+ PCO- | 11 23 12 24 13 25 | Encoder feedback | Used for the frequency-dividing output of encoder feedback, which will be provided for the host |
| SEN | 22 | SEN signal input | CZ/DGND is used for Z signal output of the open circuit of the collector, which will be provided for the host. |

3.5.4 Interface Circuit

Examples of connection of input/output signal of servo unit and its command controller are shown as below.

(1) Interfaces to reference input circuit

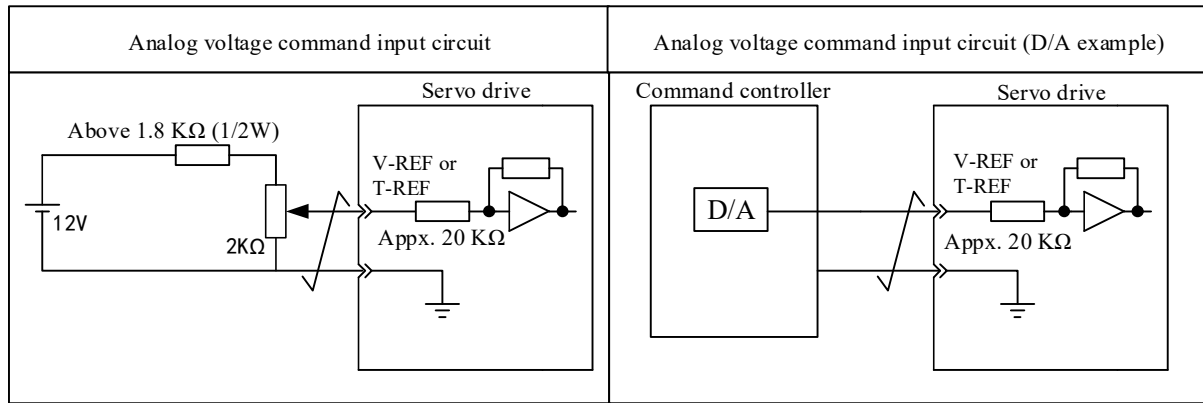
(a) Analog input circuit

The following is to describe 5-6 (speed reference input) terminals and 18-25 (torque reference input) terminals of CN3 connector.

Analog signal is the signal of speed reference or torque reference. Input impedance is shown as below.

- Speed reference input: appx. 20 K Ω
- Torque reference input: appx. 20 K Ω

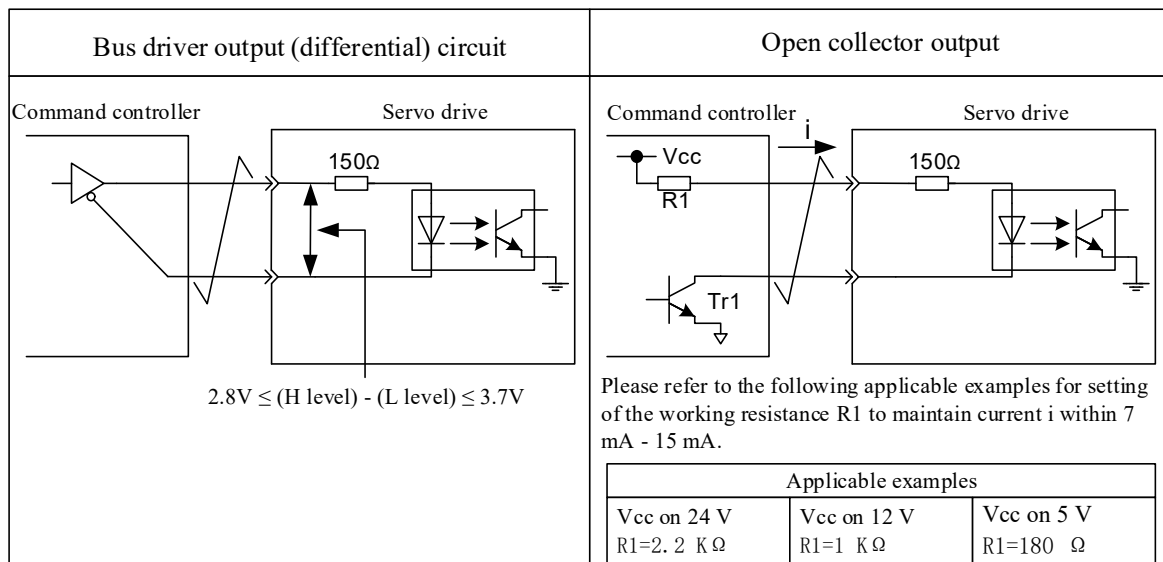
Maximum allowable voltage of input signal is 12 V.



(b) Position reference Input Circuit

The following is to describe 1-2 (reference pulse input) terminal and 3-4 (reference sign input) terminal of CN3 connector.

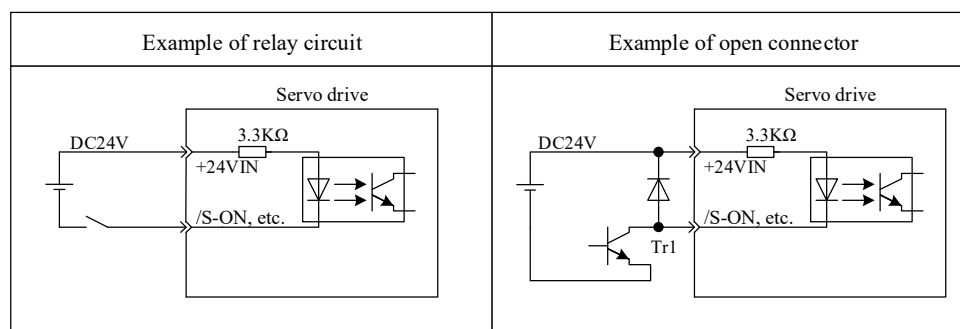
Reference pulse output circuit at the side of command controller can be optional between bus driver output and open-collector output, as classified as below.



(2) Interfaces to sequence control input circuit

The following is to describe IN1 - IN8 terminals of CN3 connector.

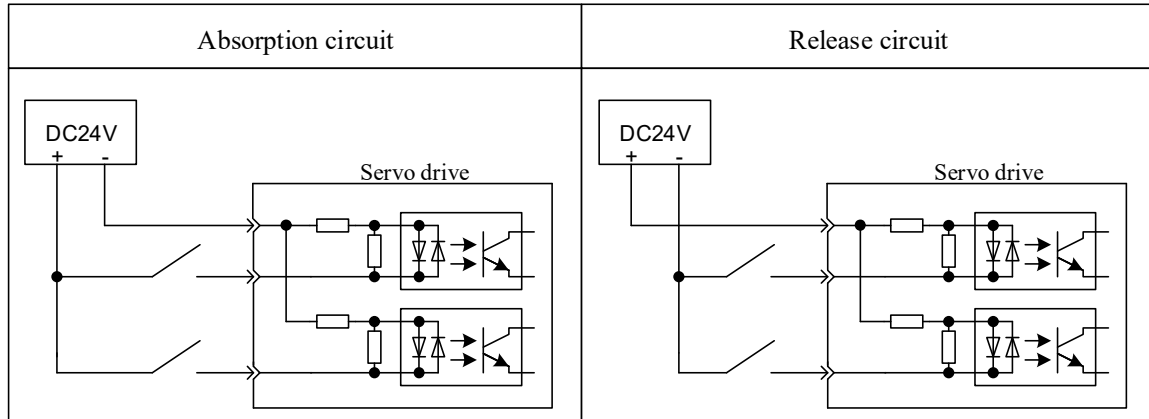
Connect through the transistor circuit of relay or open connector. Please select relay for small current when using relay for connection. If otherwise, bad contact will occur.



Note: For interface of SEN signal input circuit, please refer to Chapter "Usage of Absolute Value Encoder".

(3) Absorption circuit and release circuit

Use two-way photocoupler as input circuit of servo driver. Please select absorption circuit connection and release circuit connection according to the specification required for the machine.



(4) Interfaces to output circuit

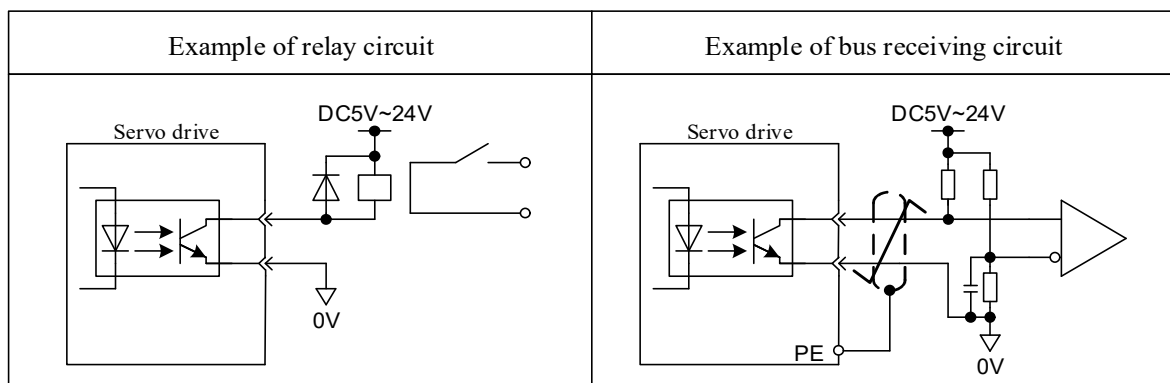
(a) Bus driver (differential) output circuit

The following is to describe 19-20 (A phase signal) terminals, 21-22 (B phase signal) terminals and 23-24 (C phase signal) terminals of CN3 connector.

Output signal (PAO/PAO, PBO/PBO), origin pulse signal (PCO/PCO) and S phase rotation quantity signal (PSO/PSO) that convert the 2 phases (A, B) of serial data for encoder are outputted by bus driver output circuit, which is generally used when servo unit forms position control system at the side of command controller through speed control. At the side of command controller, please use bus receiver circuit to receive.

(b) Photocoupler output circuit

Servo alarm (ALM), servo ready (/S - RDY) and other sequence signals are constituted by photocoupler output circuit and are connected through relay circuit or bus receiver circuit.



Note: maximum allowable voltage and current capacity of photocoupler output circuit are shown as below.

- Maximum voltage: DC 30 V
- Maximum current: DC 50 mA

3.6 Communication connection terminal signal definition

K series communication connection terminal signal definition are as follows:

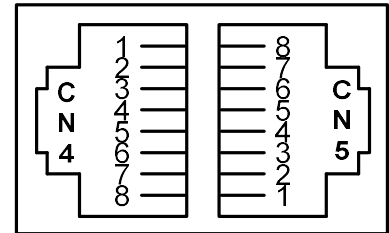
| Terminal No | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-------------|-----|------|------|-----|-----|--------|--------|---------------------------|----------|
| mane | CN4 | CANH | CANL | GND | GND | RS485+ | RS485- | Reserved | Reserved |
| | CN5 | CANH | CANL | GND | GND | RS485+ | RS485- | Built in 120 ohm resistor | |

★ **Note:**

K series 485 communication terminal is CN4、CN5;

iK series 485 communication terminal is CN4;

K1、K2/iK2 series 485 communication terminal is CN3、CN4;



3.7 Other wiring

3.7.1 Precautions

- For reference input and wiring leading to encoder, please use the specified cable. Please select the cable with shortest connection distance.
- Use heavy wire (above 2.0 mm²) whenever possible as grounding wire.
 - Grounding superior to D type (with grounding resistance of below 100 Ω) is recommended.
 - It must be one-point grounding.
 - Please directly ground the servo motor when servo motor and machine are insulated from each other.
- Do not blend or impose tension on the wire.

Core wire thickness of cable for signal is only 0.2 mm or 0.3 mm, so be careful when using it.
- For radio frequency interference, please use noise filter.
 - When it is used around residences or radio frequency interference is concerned, please insert noise filter at the input side of power wire.
 - Since servo unit is industrial equipment, no countermeasure is taken against radio frequency interference.

To prevent misoperation due to noise, the following approaches are effective.

 - Please locate reference input equipment and noise filter close to servo unit where possible.
 - Please be sure to install surge suppressor on the coils of relay, solenoid and electromagnetic contactor.
 - Please separate power wire (high voltage circuit of power wire, servo motor wiring, etc.) and signal wire while wiring, with the interval kept above 30 cm. Do not put them into the same pipeline or bind them.

- Do not use the same power as electric welding machine, electrical discharge machine, etc. Even if so, please insert noise filter at the input side of power wire when there is high frequency generator around.

6. Use molded case circuit breaker (QF) or fuse to protect power wire.

- The servo driver is directly connected to industrial power wire. To protect servo system from cross electric shock accident, please be sure to use molded case circuit breaker (QF) or fuse.

7. There is no built-in grounding protection circuit in servo driver. To form a safer system, please configure residual-current circuit breaker for both overload and circuit protection, or residual-current circuit breaker with supporting molded case circuit breaker for special protection of ground wire.

3.7.2 Anti-interference Wiring

(1) Example of anti-interference wiring

"High speed switch element" is used for the main circuit of this servo driver, which may be subject to the influence of switch and noise because of switch element depending on the peripheral wiring and grounding processing of servo driver. Therefore, proper grounding and wiring process are necessary.

Microprocessor (CPU) is built in the servo driver, so "noise filter" is required to be configured in place to prevent as much external interference as possible.

(2) Proper grounding processing

(a) Grounding of motor framework

Please be sure to connect the motor frame terminal "FG" of servo motor to the grounding terminal "PE" of servo unit. In addition, grounding terminal "PE" must be grounded.

When servo motor is grounded via a machine, switch interference current will flow from the power part of servo unit through the stray capacitance of servo motor.

The above are precautions for such influence.

(b) When there is interference on reference input wire

When there is interference on reference input wire, please ground the OV wire (GND) of the input wire. When passing the main circuit wiring of motor through a metal conduit, please ground the conduit and its junction box.

Please conduct one-point grounding for the above grounding processing.

(3) Usage of noise filter

Use blocking noise filter to prevent interference from power wire. Besides, insert noise filter for power wire of peripheral devices as required.

■ Noise filter for brake power

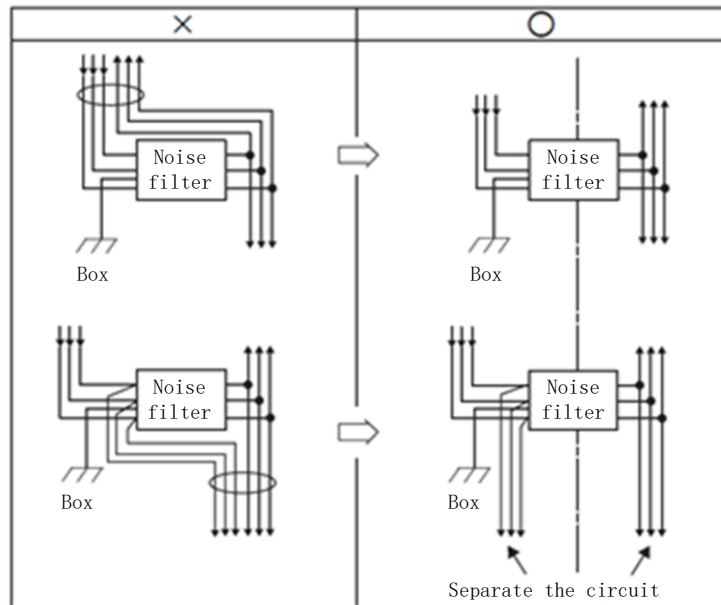
When using servo motor (below 400 W) with holding brake, please use the following noise filter at the power input of brake.

Model: FN2070-6/07 (manufactured by SCHAFFNER)

■ Precautions for operation of noise filter

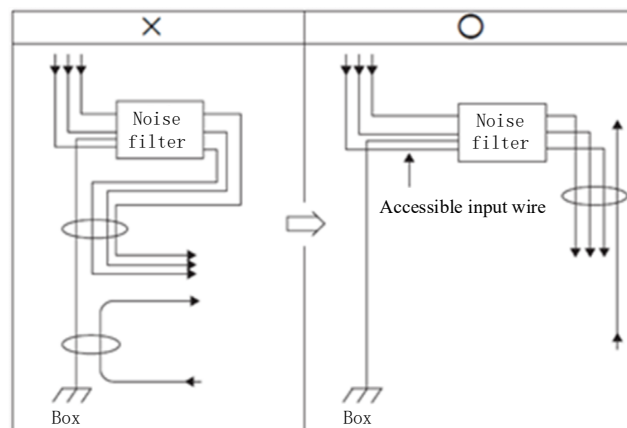
When installing and wiring noise filter, please follow the following precautions. In case of misoperation, noise filter will be greatly less effective.

1. Please separate input wiring from output wiring and do not put them into the same pipeline or bind them together.

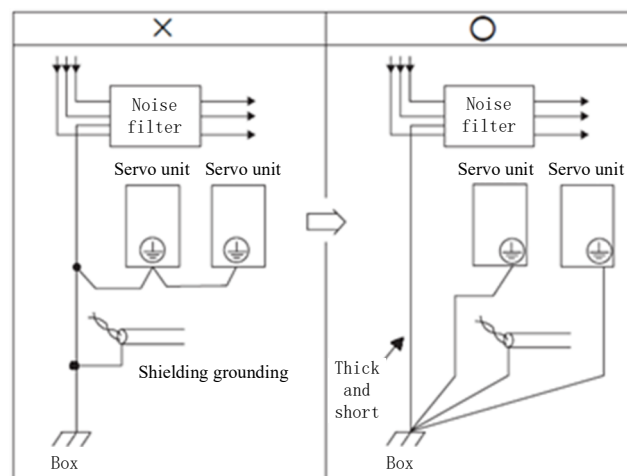


2. Separate the grounding wire of noise filter from its output wiring.

Please do not put the output wiring of noise filter and other signal wires and grounding wires into the same pipeline or bind them together.

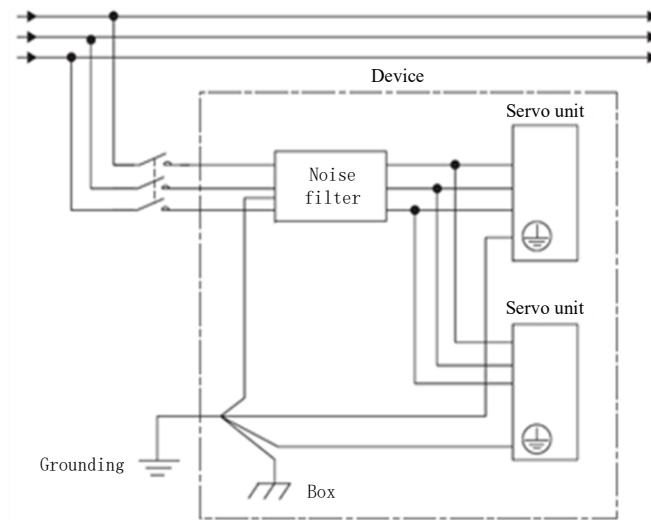


3. Connect the grounding wire of filter alone with grounding plate and do not connect other grounding wires.



4. Processing of grounding wire of noise filter within a device

When there is a noise filter within a certain device, please connect the grounding wire of this filter and that of other machines to the bound grounding plate and then proceed to grounding.



3.8 Wiring of Motor

3.8.1 Connector Terminal Wiring for Motor Power Supply

| 4芯AMP插头 | | | | | 4芯航插XS16K4 | | 4芯航插YD28K4/YD32K4 | | | |
|-------------|---|---|---|----|---------------------------|--|---------------------------|--|--|--|
| 正 视 | | | | | | | | | | |
| 系列 | U | V | W | PE | 1:PE 2:U 3:V 4:W | | 1:PE 2:U 3:V 4:W | | | |
| M | 1 | 3 | 2 | 4 | | | | | | |
| S | 1 | 2 | 3 | 4 | | | | | | |

3.8.2 Connector Terminal Wiring for Motor Encoder

(1) Non-wire saving encoder socket (15-pin AMP) of series less than or equal to 90.

| Terminal No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|--------------|----|----|-----|----|----|----|----|----|----|----|----|----|----|----|----|
| Signals | PE | 5V | GND | B+ | Z- | U+ | Z+ | U- | A+ | V+ | W+ | V- | A- | B- | W- |

(2) Non-wire saving encoder socket (15-pin) of series greater than or equal to 110. Vacancy of U+, U-, V+, V-, W+, W- for wire-saving encoder.

| Terminal No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|--------------|----|----|-----|----|----|----|----|----|----|----|----|----|----|----|----|
| Signals | PE | 5V | GND | A+ | B+ | Z+ | A- | B- | Z- | U+ | V+ | W+ | U- | V- | W- |

(3) Wire-saving encoder socket (3 rows and 9-pin AMP)

| Terminal No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------|----|-----|----|----|----|----|----|----|----|
| Signals | 5V | GND | A+ | A- | B+ | B- | Z+ | Z- | PE |

(4) Motor absolute encoder socket (7-pin):






| Terminal No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--------------|----|----|----|-----|-----|-----|-----|
| Signals | PE | E- | E+ | SD- | GND | SD+ | +5V |

Chapter IV Panel Operation

4.1 Basic Operation

4.1.1 Key Names and Functions

Through panel, such functions as switch of A-axis and b-axis display and operation, setting of various parameters, execution and status display of JOG running reference can be achieved. The following is a list of key names and functions.

| Symbol | Name | Functions |
|---|--------------|---|
|  | Function key | Basic function switch: status display, auxiliary function, parameter setting and monitoring Long press to switch between A-axis and b-axis display and operation |
|  | UP | Press UP to increase set value Functioning as start key of positive rotation during JOG running in auxiliary function mode |
|  | DOWN | Press DOWN to reduce set value Functioning as start key of negative rotation during JOG running in auxiliary function mode |
|  | Shift key | Press the key to shift the selected bit (the decimal point of which flickers) one bit to the left |
|  | SET | Press the key to display the setting and set value of parameters, and access parameter setting status and clear alarm |

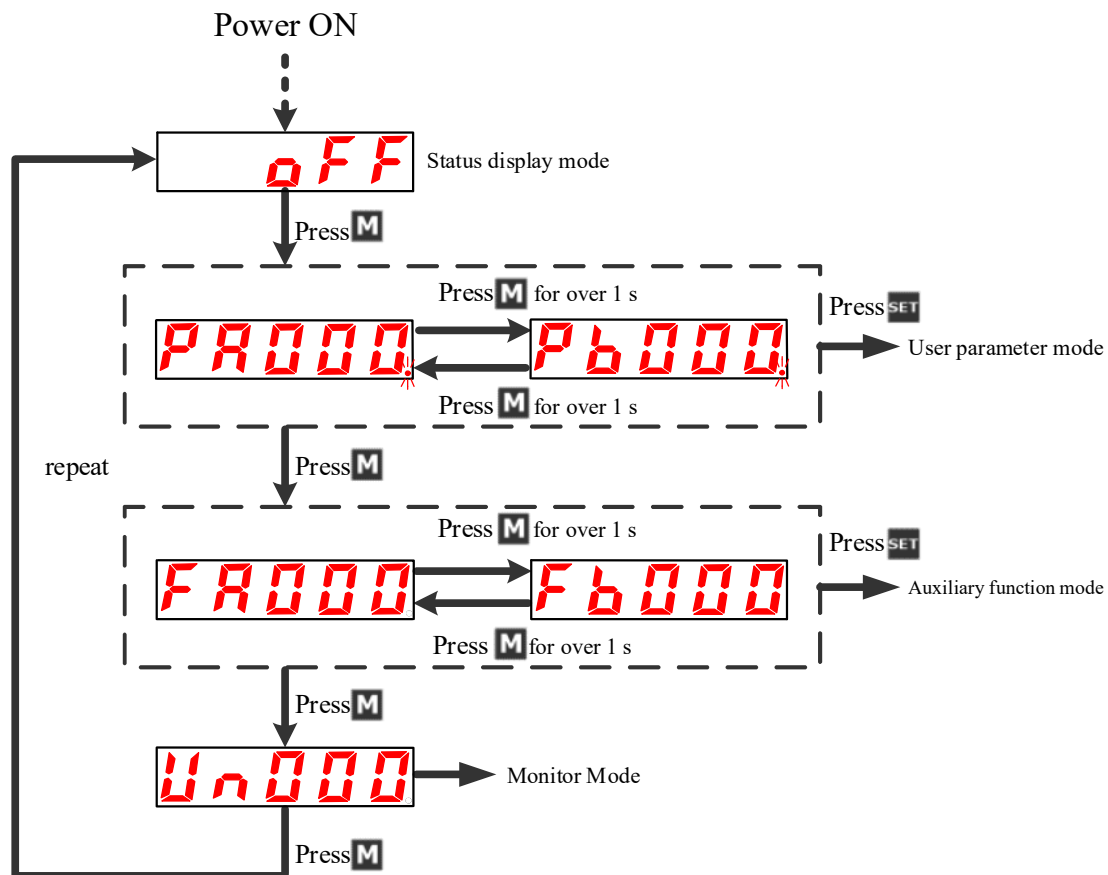
In the mode of status display, press SET to clear alarm, which can also be done by using alarm removal input signal/ALMRST.

Note: in case of alarm ringing, first eliminate alarm causes and then remove alarm.

4.1.2 Selection and Operation of Basic Mode

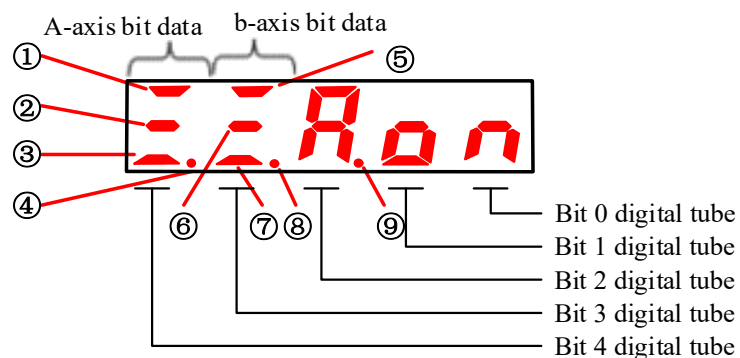
Through switching the basic modes of panel operator, such operations as running status display, parameter setting and running reference can be done.

Basic modes include status display mode, parameter setting mode, monitoring mode and auxiliary function mode. After Key M is pressed, the modes switch in the order as shown in the following figure.



4.1.3 Status Display

Distinguishing method of status display is shown as below:






■ Display content of bit data

| Item | Velocity/torque control mode | | Position control mode | |
|------|------------------------------|---|-----------------------|---|
| | Bit data | Display content | Bit data | Display content |
| ① | A axis Running | Light on when servo ON (power being supplied to motor) | A axis Running | Servo ON (power being supplied to motor) |
| ② | A axis Same speed | Light on when gap between motor | A axis Positioning | Light on when offset of actual |

| | | | | |
|---|---|--|---|---|
| | (/V-CMP) | speed and reference speed is lower than the specified value Specified value: PA503 (Factory default: 10 rpm) | completed (/COIN) | motor position and position reference is lower than the specified value Specified value: PA500 (Factory default: 10 pulse) |
| ③ | A axis Rotation detection (/TGON) | Light on when motor speed is higher than the specified value Specified value: PA502 (Factory default: 20 rpm) | A axis On rotation detection (/TGON) | Light on when motor speed is higher than the specified value Specified value: PA502 (Factory default: 20 rpm) |
| ④ | A axis P-OT/N-OT | Servo on limit: Light on indicates P-OT status Light off indicates N-OT status Flickering indicates P-OT/N-OT status | A axis P-OT/N-OT | Servo on limit: Light on indicates P-OT status Light off indicates N-OT status Flickering indicates P-OT/N-OT status |
| ⑤ | b axis Running | Light on when servo ON (power being supplied to motor) | b axis Running | Light on when servo ON (power being supplied to motor) |
| ⑥ | b axis Same speed (/V-CMP) | Light on when gap between motor speed and reference speed is lower than the specified value Specified value: PB503 (Factory default: 10 rpm) | b axis Positioning completed (/COIN)) | Light on when offset of actual motor position and position reference is lower than the specified value Specified value: PA500 (Factory default: 10 pulse) |
| ⑦ | b axis Rotation detection (/TGON) | Light on when motor speed is higher than the specified value Specified value: PA502 (Factory default: 20 rpm) | b axis Rotation detection (/TGON) | Light on when motor speed is higher than the specified value Specified value: PA502 (Factory default: 20 rpm) |
| ⑧ | b axis P-OT/N-OT | Servo on limit: Light on indicates P-OT status; Light off indicates N-OT status; Flickering indicates P-OT/N-OT status; | b axis P-OT/N-OT | Servo on limit: Light on indicates P-OT status; Light off indicates N-OT status; Flickering indicates P-OT/N-OT status |
| ⑨ | Main power supply Ready | Light on when main circuit power is normal; Light off when main circuit power is cut off | Main power supply Ready | Light on when main circuit power is normal; Light off when main circuit power is cut off |

■ Display content of abbreviated sign

| Abbreviated signs | Display content |
|---|--|
|  | A-axis and b-axis servos are OFF (no power being supplied to A-axis and b-axis motors) |
|  | A-axis servo is ON (power being supplied to A-axis motor) |
|  | b- axis servo is ON (power being supplied to b-axis motor) |

| | |
|--|---|
| | A-axis servo is P-OT/N-OT (required to be judged depending on P-OT/N-OT bits in A-axis bit display) |
| | b-axis servo is P-OT/N-OT (required to be judged depending on positive and negative rotation in b-axis bit display) |
| | A axis is in alarm state displaying alarm number |
| | b axis is in alarm state displaying alarm number |

4.2 Auxiliary Function Mode (F□□□□)

4.2.1 Execution Mode List of Auxiliary Functions

This part describes the application operation of digital operator for motor running and adjustment. The following lists the user parameters of auxiliary function execution modes and their functions.








| Auxiliary function NO. | Functions |
|------------------------|---|
| F□000 | Display of software version of servo |
| F□001 | Position demonstration (effective only in position mode) |
| F□002 | Jogging (JOG) mode running |
| F□003 | Identification of load inertia percentage (compared to inertia of motor body) |
| F□004 | User password authentication |
| F□005 | Motor model confirmation |
| F□006 | Manual adjustment of speed reference offset |
| F□007 | Manual adjustment of torque reference offset |
| F□008 | Automatic adjustment of (speed, torque) reference offset |
| F□009 | Clear of multi-coil information data of bus encoder |
| F□010 | Clear of internal errors of bus encoder |
| F□011 | Initialization of user parameter setting |
| F□012 | Display of history alarm data |

Note: in the list "□" displaying "A" indicates it is now in A-axis auxiliary function mode, and displaying "b" indicates it is now in b-axis auxiliary function mode.

4.2.2 Display of Software Version of Servo












The following are operation steps for display of A-axis software version.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|---------------|-------------------------|
| 1 | Press M function key and select auxiliary function mode to set the current mode as A-axis auxiliary function mode. | | |
| 2 | Press M function key (for more than 1 second) and switch to auxiliary function mode of b axis, which will display Fb000. | | |
| 3 | Press UP or DOWN and select the desired auxiliary function Fb000. | | |

| | | | |
|---|---|---|---|
| | |  | |
| 4 | Press SET and A-1.00 is displayed, which indicates processor program version is V1.00. |  |  |
| 5 | Press Shift key and P-1.00 is displayed, which indicates FPGA program version is V1.00. |  |  |
| 6 | Press SET key to return to the display of Fb000. |  |  |











4.2.3 Position Demonstration Operation




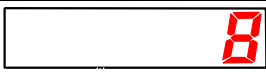

The following are operation steps for display of A axis position demonstration.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|---|--|---|
| 1 | Press M function key (for more than 1 second) and switch to auxiliary function mode of A axis, which will display FA000. |  |  |
| 2 | Press UP or DOWN and select the desired auxiliary function FA001. |   |  |
| 3 | Press SET and "2PCLr" is displayed and initiate position demonstration operation. |  |  |
| 4 | Press SET (for more than 1 second) until the display flickers "donE" to indicate position demonstration operation has been completed. |  |  |
| 5 | Press SET to return to the display of FA001. |  |  |

4.2.4 Identification of Inertia Percentage








The following are operations steps for display of A-axis inertia percentage detected in normal mode (by turning 3 circles clockwise and another 3 circles counterclockwise).

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|--|---|
| 1 | Press M function key to select parameter setting mode for A-axis. If PA127 is not displayed, press UP or DOWN to set. |  |  |
| 2 | Press SET to display "H1341.", whose decimal point in bit 0 flickers. |  |  |
| 3 | Press shift key for three times and select Bit 3 of the displayed number, after which "H1.341" is displayed and the decimal point in Bit 3 flickers. |  |  |
| 4 | Press UP and change the data to display "H2.341". |  |  |
| 5 | Press SET to return to the previous menu. |  |  |

| | | | |
|----|--|------------|---|
| 6 | Press M function key and select the desired auxiliary function FA003. | M |  |
| 7 | Press SET to display the operation interface "-JIn-" for display of inertia identification percentage. | SET |  |
| 8 | Press M function key, initiate inertia identification operation by rotating motor 3 circles clockwise and another 3 circles counterclockwise, after which display flickers "donE". | M |  |
| 9 | After detection, inertia percentage currently detected is displayed. | — |  |
| 10 | Press SET to return to the display of Fb000. | SET |  |



4.2.5 Confirmation of Motor Model

It is the function for confirming the model, capacity and encoder model of servo motor being controlled by servo driver.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|---------------|---|
| 1 | Press M function key to select A-axis auxiliary function mode. If FA005 is not displayed, press UP or DOWN to set. | M |  |
| 2 | Press SET, and "A.0004" is displayed. | SET |  |
| 3 | Press Shift key and "b.0220" is displayed. | < |  |
| 4 | Press Shift key and "C.0010" is displayed. | < |  |
| 5 | Press Shift key and "d.0020" is displayed. | < |  |
| 6 | Press SET, and "A.0004" is displayed. | < |  |
| 7 | Press SET to return to the display of Fb000. | SET |  |

4.2.6 Initialization of User Parameter Setup

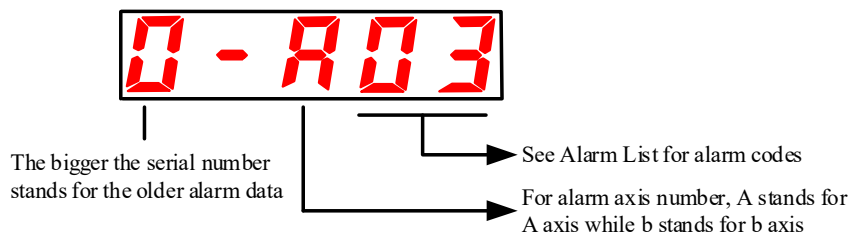
Operation steps to initialize A axis user parameter setup are as follows.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|-------------------|---|
| 1 | Press M function key to select auxiliary function mode for A axis. In case of failing to display FA011, press UP or DOWN to set. | ^ v |  |
| 2 | Press SET to start parameter initialization. | SET |  |

| | | | |
|---|--|-----|--|
| 3 | Press SET (for more than 1 second) until the display flickers "donE" to indicate A axis user parameter has been initialized. | SET | |
| 4 | Press SET to return to the display of FA011. | SET | |

4.2.7 Displaying History Alarm Data

Ten previous alarms can be validated at most. The history alarm records can be cleared by a long press on SET. The history alarm data will not be cleared by alarm reset or servo power-off. Moreover, the alarm history data will not impact the operation.



See "Abnormality Diagnosis and Treatment Methods" for alarm content.

- 1、 In case of continuous occurrence of the same alarm, the alarm history data will not update.
- 2、 The alarm history data displayed as "A--" or "b--" indicate zero alarm.

Validate the history alarm according to the following steps.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|---------------|-------------------------|
| 1 | Press M function key to select auxiliary function mode for A axis. In case of failing to display FA012 press UP or DOWN to set. | | |
| 2 | Press SET to display "0-A03" and the previous alarms. | SET | |
| 3 | Press UP to display the last history alarm (press DOWN to display the next new alarm). | | |
| 4 | Press UP to display the alarms in order. * "A--" or "b--" indicates "Zero Alarm". | | |
| 5 | Press SET to return to the display of Fb012. | SET | |

4.3 Operation under User Parameter Mode (P□□□□)

Functions can be selected or adjusted by setting parameters. User parameters consist of "Parameter Setting" and "Function Selection". Parameter Setting functions to change the parameter data to be adjusted in a certain range and Function Selection works to select the functions distributed to bit numbers of penal operator.

4.3.1 User Parameter Setting

(1) Parameter setting

















(a) Categories of "Parameter Setting"

See "List of User Parameters".

(b) Example to change "Parameter Setting"

The Parameter Setting based user parameters specify data by numerical values directly.

The range of change is validated by List of User Parameters. For example: the operation steps to change b axis user parameter Pb100 (Speed loop gain) from "40" to "100" are shown as follows.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|---|--|---|
| 1 | Press M function key to select parameter setting mode |  |  |
| 2 | Press M function key (for more than 1 second). Pb000 is displayed and the decimal point in Bit 0 flickers |  |  |
| 3 | Press shift key twice and select Bit 2 of the displayed number. Pb0.00 is displayed and the decimal point in Bit 2 flickers |  |  |
| 4 | Press UP to change the data and Pb1.00 is displayed |  |  |
| 5 | Press SET to display current Pb100 data |  |  |
| 6 | Press shift key twice and select Bit 2 of the displayed number. 000.40 is displayed and the decimal point in Bit 2 flickers |  |  |
| 7 | Press UP to change the data and 010.00 is displayed |  |  |
| 8 | Press SET to return to the display of Pb1.00. The content of b axis speed loop gain, Pb100, changes from "400" to "1000" |  |  |





(2) Function selection

(a) Categories of "Function Selection"

Also See "List of User Parameters".

(b) Example to change "Function Selection"

Example: the operation steps to change the control method (PA000.1) of basic switch PA000 for A axis function selection from speed to position are listed as follows.

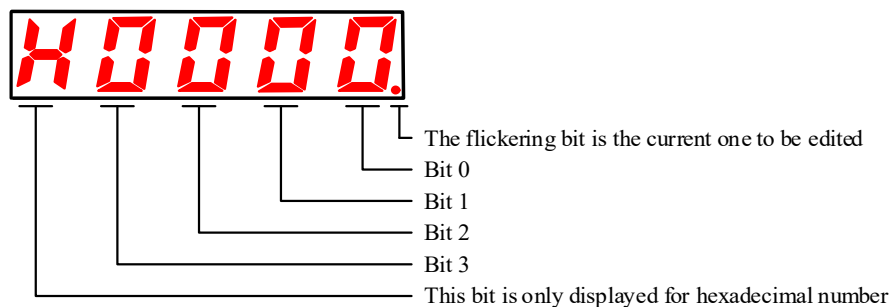
| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|--|---|
| 1 | Press M function key (for more than 1 second) and PA0.00 is displayed |  |  |
| 2 | Press SET to display current PA000 data. The decimal point in Bit 0 flickers |  |  |

| | | | |
|---|---|-----|--------|
| 3 | Press shift key and select Bit 1 of the displayed number. H000.0 is displayed and the decimal point in Bit 1 flickers | < | H000.0 |
| 4 | Press UP to change the data and H001.0 is displayed | ^ | H001.0 |
| 5 | Press SET to return to the display of PA0.00 and the control approach for A axis has changed to position control | SET | PA0.00 |

(c) User parametric representation of the Manual

The user parameters for function selection are represented with hexadecimal system and every bit of the set value has respective meaning.

User parameters for function selection in the Manual are represented as follows.



PA000.0 or A.Hxxx□ stands for the set value "0-bit data" of A axis user parameter "PA000".
 PA000.1 or A.Hxx□x stands for the set value "1-bit data" of A axis user parameter "PA000".
 PA000.2 or A.Hx□xx stands for the set value "2-bit data" of A axis user parameter "PA000".
 PA000.3 or A.H□xxx stands for the set value "3-bit data" of A axis user parameter "PA000".
 Pb000.0 or b.Hxxx□ stands for the set value "0-bit data" of b axis user parameter "Pb000".
 Pb000.1 or b.Hxx□x stands for the set value "1-bit data" of b axis user parameter "Pb000".
 Pb000.2 or b.Hx□xx stands for the set value "2-bit data" of b axis user parameter "Pb000".
 Pb000.3 or b.H□xxx stands for the set value "3-bit data" of b axis user parameter "Pb000".

4.3.2 Signal Distribution of Input Circuit

Input signals are distributed to the pins of input connector based on the user parameter setup.
 (Distribution list is shown as follows.)

(1) Factory setting

The default distribution is indicated in bold as follows.

(a) Factory settings of single-axis driver

PA509 = H.4321 PA510 = H.8765 PA511 = H.0000 PA512 = H.0000

(b) Factory settings of double-axis driver

PA509 = H.4321 PA510 = H.0000 PA511 = H.0000 PA512 = H.0000
 Pb509 = H.8765 Pb510 = H.0000 Pb511 = H.0000 Pb512 = H.0000

(2) Distribution change

User parameters are set based on the relation between use signal and input connector pin.
Moreover, when user parameters changes, the servo unit should be subject to "Power Off" →
"Power Restart" to make the user parameter take effect.

(a) List of input circuit signal distribution of single-axis driver:

| Signal | Input signal | CN3 Pin no. | | | | | | | | No connection required | |
|--|--------------|-------------|----------|----------|----------|----------|----------|----------|----------|------------------------|--------------|
| User parameter distribution | | 14 (IN1) | 15 (IN2) | 16 (IN3) | 17 (IN4) | 39 (IN5) | 40 (IN6) | 41 (IN7) | 42 (IN8) | Always invalid | Always valid |
| Servo ON PA509.0 = H.xxx□ | /S-ON | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Proportional action reference PA509.1 = H.xx□x | /P-CON | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Positive-side over travel prohibited PA509.2 = H.x□xx | POT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Negative over travel prohibited PA509.3 = H.□xxx | NOT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Alarm reset PA510.0 = H.xxx□ | /ALM-RST | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Deviation counter reset PA510.1 = H.xx□x | /CLR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Positive-side external torque limit PA510.2 = H.x□xx | /PCL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Negative side external limit PA510.3 = H.□xxx | /NCL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Gain switch PA511.0 = H.xxx□ | /G-SEL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Select internal position setting PA511.1 = H.xx□x | /POS0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Select internal position setting PA511.2 = H.x□xx | /POS1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Select internal position setting PA511.3 = H.□xxx | /POS2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Reference point switch PA512.0 = H.xxx□ | /HOME-REF | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Allow position start PA512.1 = H.xx□x | /POS-START | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Position change step PA512.2 = H.x□xx | /POS-STEP | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Homing start PA512.3 = H.□xxx | /START-HOME | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |

Note: when multiple signals are distributed to the same input circuit, the input signal level will influence all the distributed signals.

(b) List of input circuit signal distribution of double axis driver:

| Signal | Input signal | CN3 Pin no. | | | | | | | | No connection required | |
|--|--------------|-------------|----------|----------|----------|----------|----------|----------|----------|------------------------|--------------|
| User parameter distribution | | 14 (IN1) | 15 (IN2) | 16 (IN3) | 17 (IN4) | 39 (IN5) | 40 (IN6) | 41 (IN7) | 42 (IN8) | Always invalid | Always valid |
| Servo ON PA509.0 = H.xxx□ | /S-ON | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Proportional action reference PA509.1 = H.xx□x | /P-CON | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Positive-side over travel prohibited PA509.2 = H.x□xx | POT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Negative over travel prohibited PA509.3 = H.□xxx | NOT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Servo ON Pb509.0 = H.xxx□ | /S-ON | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Proportional action reference Pb509.1 = H.xx□x | /P-CON | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Positive-side over travel prohibited Pb509.2 = H.x□xx | POT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Negative over travel prohibited Pb509.3 = H.□xxx | NOT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Alarm reset P□510.0 = H.xxx□ | /ALM-RST | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Positive-side external torque limit P□510.2 = H.x□xx | /PCL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Negative side external limit P□510.3 = H.□xxx | /NCL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Gain switch P□511.0 = H.xxx□ | /G-SEL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Select internal position setting P□511.1 = H.xx□x | /POS0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Select internal position setting P□511.2 = H.x□xx | /POS1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Select internal position setting P□511.3 = H.□xxx | /POS2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Reference point switch P□512.0 = H.xxx□ | /HOME-REF | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Allow position start P□512.1 = H.xx□x | /POS-START | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Position change step P□512.2 = H.x□xx | /POS-STEP | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |
| Homing start P□512.3 = H.□xxx | /START-HOME | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 | 9 |

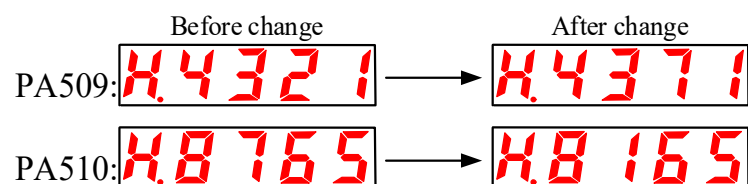
Note:

1. When multiple signals are distributed to the same input circuit, the input signal level will influence all the distributed signals.

2. The "□" of P□510、P□511、P□512 can be either "A" or "b".

(3) Example of input signal distribution

The steps to change the servo ON (/S-ON) distributed by single-axis driver to CN3-14 and the positive-side external torque limit (/PCL) distributed by single-axis driver to CN3-41 are listed as follows.



| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|---|---------------|-------------------------|
| 1 | Press M function key to select parameter setting mode. In case of failing to display PA509, press UP or DOWN to set. | M | |
| 2 | Press SET to display current PA509 data. (Distribute /S-ON to CN3-14.) | SET | |
| 3 | Press shift key and select Bit 1 of the displayed number. H.432.1 is displayed and the decimal point in Bit 1 flickers. | < | |
| 4 | Press UP or DOWN to set current bit as "7". | ^ v | |
| 5 | Press SET to return to the display of PA509. | SET | |
| 6 | Press UP or DOWN to set PA510. | ^ v | |
| 7 | Press SET to display current PA510 data. (Distribute /PCL to CN3-41.) | SET | |
| 8 | Press shift key twice and select Bit 2 of the displayed number. H.87.54 is displayed and the decimal point in Bit 2 flickers. | < | |
| 9 | Press UP or DOWN to set current bit as "1". | ^ v | |
| 10 | Press SET to return to the display of PA510 and distribute /S-ON to IN7 (CN3-41) and /PCL to IN1 (CN3-14). | SET | |

(4) Polarity reversal setting of input port active level

Single/double-axis driver can set active level parameters of input port signals (PA519 and PA520) to reverse IN1-IN7 active level polarity.

Note:

1. When signals of Servo ON, Forward drive prohibited, and reverse drive Prohibited are used under "Polarity Reverse" setting, in case of any abnormality caused by signal line-off, no action will be made to safe direction. If such setup has to be made, validation on action and safety must be performed.

2. The reversal parameters of input port active level of double-axis driver are PA519, PA520, Pb519 and Pb520 with other setting invalid.

4.3.3 Signal Distribution of Output Circuit

(1) Factory setting

(a) Factory settings of single-axis driver:

PA513 = H.4321 PA514 = H.0065 PA521 = H.0000 PA522 = H.0000

(b) Factory settings of double-axis driver:

PA513 = H.0321 PA514 = H.0000 Pb513 = H.0654 Pb514 = H.0000

(2) Distribution change

The output circuits for sequence signals as follows can be used for function distribution. Moreover, when user parameters change, the servo unit should be subject to "Power Off" → "Power Restart" to make the user parameter take effect. The default distribution is indicated in the following gray box.

(a) List of output circuit signal distribution of single-axis driver:

| CN3 Pin no. | | 7/(8) | | 9/(10) | | 11/(12) | | 32/(33) | | 34/(35) | | 36/(37) | |
|---|---|-----------------------------------|---|--------------|---|--------------|---|--------------|---|--------------|---|--------------|---|
| | | OUT1 | | OUT2 | | OUT3 | | OUT4 | | OUT5 | | OUT6 | |
| User parameter distribution | | Polarity setting of signal output | | | | | | | | | | | |
| | | PA521=H.xxx□ | | PA521=H.xx□x | | PA521=H.x□xx | | PA521=H.□xxx | | PA522=H.xxx□ | | PA522=H.xx□x | |
| | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| Servo alarm (ALM) PA513.0=H.xxx□ | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Positioning completed /same-speed detection (/COIN or /V-CMP) PA513.1=H.xx□x | 0 | Invalid | | | | | | | | | | L | H |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Motor rotation detection (/TGON) PA513.2=H.x□xx | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Servo ready (/S-RDY) PA513.3=H.□xxx | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Torque limit detection (/CLT) PA514.0=H.xxx□ | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Brake (/BK) PA514.1=H.xx□x | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Encoder origin pulse (/PGC) PA514.2=H.x□xx | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |

Note:

- 1、 When ALM signals and other signals are distributed to the same output circuit, the output circuit only output ALM signals.
- 2、 When PGC signals and other signals rather than ALM are distributed to the same output circuit, the output circuit only output PGC signals.
- 3、 Multiple signals (except for ALM and /PGC) distributed to the same output circuit will be output through OR circuit.

(b) List of output circuit signal distribution of double-axis driver:











| CN3 Pin no. | | 7/(8) | | 9/(10) | | 11/(12) | | 32/(33) | | 34/(35) | | 36/(37) | |
|---|---|-----------------------------------|---|--------------|---|--------------|---|--------------|---|--------------|---|--------------|---|
| | | OUT1 | | OUT2 | | OUT3 | | OUT4 | | OUT5 | | OUT6 | |
| User parameter distribution | | Polarity setting of signal output | | | | | | | | | | | |
| | | PA521=H.xxx□ | | PA521=H.xx□x | | PA521=H.x□xx | | PA521=H.□xxx | | PA522=H.xxx□ | | PA522=H.xx□x | |
| | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| Servo alarm (ALM) PA513.0=H.xxx□ | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Positioning completed /same-speed detection (/COIN or /V-CMP) PA513.1=H.xx□x | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Motor rotation detection (/TGON) PA513.2=H.x□xx | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| | | | | | | | | | | | | | |
| Servo alarm (ALM) Pb513.0=H.xxx□ | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Positioning completed /same-speed detection (/COIN or /V-CMP) Pb513.1=H.xx□x | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Motor rotation detection (/TGON) Pb513.2=H.x□xx | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| | | | | | | | | | | | | | |
| Servo ready (/S-RDY) P□513.3=H.□xxx | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Torque limit detection (/CLT) P□514.0=H.xxx□ | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Brake (/BK) P□514.1=H.xx□x | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |
| Encoder origin pulse (/PGC) P□514.2=H.x□xx | 0 | Invalid | | | | | | | | | | | |
| | 1 | L | H | | | | | | | | | | |
| | 2 | | | L | H | | | | | | | | |
| | 3 | | | | | L | H | | | | | | |
| | 4 | | | | | | | L | H | | | | |
| | 5 | | | | | | | | | L | H | | |
| | 6 | | | | | | | | | | | L | H |

Note:

- 1、 When ALM signals and other signals are distributed to the same output circuit, the output circuit only output ALM signals.
- 2、 When PGC signals and other signals rather than ALM are distributed to the same output circuit, the output circuit only output PGC signals.
- 3、 Multiple signals (except for ALM and /PGC) distributed to the same output circuit will be output through OR circuit.

(3) Example of output signal distribution

Steps to invalidate the default setting to distribute rotation detection (/TGON) to CN3-11(12) and replace CN3-11(12) with Brake Signal Distribution.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|---|----------------------|---|
| 1 | Press M function key to select parameter setting mode. In case of failing to display PA513, press UP or DOWN to set. | M |  |
| 2 | Press SET to display current PA513 data. (Distribute /TGON to CN3-11(12).) | SET |  |
| 3 | Press shift key twice and select Bit 2 of the displayed number. H.43.21 is displayed and the decimal point in Bit 2 flickers. | < |  |
| 4 | Press UP or DOWN to set current bit as "0". | ^ v |  |
| 5 | Press SET to return to the display of PA513. | SET |  |
| 6 | Press UP or DOWN to set PA514. | ^ v |  |
| 7 | Press SET to display current PA514 data. (Distribute /BK to CN3-36(37).) | SET |  |
| 8 | Press shift key and select Bit 1 of the displayed number. H.006.5 is displayed and the decimal point in Bit 5 flickers. | < |  |
| 9 | Press UP or DOWN to set current bit as "3". (Distribute TGON to CN3-11(12)) | ^ v |  |
| 10 | Press SET to return to the display of PA514 and distribute /TGON to OUT3:CN3-11(12). | SET |  |

4.4 Operation under Monitoring Mode (Un□□□)

Under monitoring mode, the reference value input to A axis or b axis servo driver, status of input/output signals and servo internal status can be monitored. Even though the servo motor is running, the monitoring mode can be changed.

4.4.1 List of Monitoring Mode

(1) Content displayed under monitoring mode

| Monitor number | Display content | Unit |
|----------------|--|-------------------|
| Un000 | Motor speed | 1r/min |
| Un001 | Rotation angle (electric angle) | 1deg |
| Un002 | Input reference pulse speed (only valid under position control mode) | 1 KHz |
| Un003 | Bus voltage | 1 V |
| Un004 | Speed reference value of analogue input | 1r/min |
| Un005 | Torque reference percentage of analogue input (relative rated torque) | 1 % |
| Un006 | Internal torque reference (relative rated torque or given motor currency) | 1% or 0.1A |
| Un007 | Input port signal monitoring | — |
| Un008 | Output port signal monitoring | — |
| Un009 | Encoder signal monitoring (only valid for incremental encoder) | — |
| Un010 | Input reference pulse counter (32-bit decimal display, only valid under position control mode) | 1-reference pulse |
| Un011 | Feedback pulse counter (four-octave frequency data of encoder pulse, 32-bit decimal display) | 1-reference pulse |
| Un012 | Position offset counter (only valid under position control mode) | 1-reference pulse |
| Un013 | Accumulative load rate (when rated torque is set as 100%) | 1 % |
| Un014 | Ratio of moment of inertia (the ratio of load moment inertia to motor moment inertia) | 1 % |
| Un015 | Actual encoder angle (32-bit decimal display) | 1-reference pulse |
| Un016 | Display rounds of encoder (only valid for turns of encoder) | 1 circle |

(2) Monitor display for input/output signals for sequence

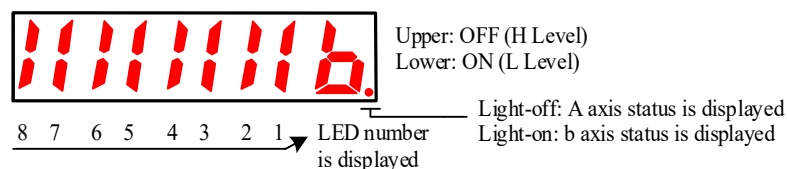
Monitor display for input/output signals for sequence

(a) Monitor display of input signal status

Display the input/output status of the signals distributed to input/output terminals.

When input/output is OFF (open circuit), the upper display segment (LED) will be on.

When input/output is ON (short circuit), the lower display segment (LED) will be on.



Validate the relation between input terminals and input signals according to "7.3.2 Signal Distribution of Input Circuit".

| Monitor number | LED number is displayed | Name of input terminal | Factory settings | |
|----------------|-------------------------|------------------------|------------------|---------------|
| | | | Single-axis | Double-axis |
| Un007 | 1 | IN1 (CN3-14) | /S-ON | A axis /S-ON |
| | 2 | IN2 (CN3-15) | /P-CON | A axis /P-CON |

| Monitor number | LED number is displayed | Name of input terminal | Factory settings | |
|----------------|-------------------------|------------------------|------------------|---------------|
| | | | Single-axis | Double-axis |
| | 3 | IN3 (CN3-16) | POT | A axis POT |
| | 4 | IN4 (CN3-17) | NOT | A axis NOT |
| | 5 | IN5 (CN3-39) | /ALM-RST | b axis /S-ON |
| | 6 | IN6 (CN3-40) | /CLR | b axis /P-CON |
| | 7 | IN7 (CN3-41) | /PCL | b axis POT |
| | 8 | IN8 (CN3-42) | /NCL | b axis NOT |

(b) Monitor display of output signal status

Display the status of the output signals distributed to output terminals.








When output is OFF (open circuit), the upper display segment (LED) will be on.





When output is ON (short circuit), the lower display segment (LED) will be on.

| Monitor number | LED number is displayed | Name of input terminal | Factory settings | |
|---|-------------------------|-------------------------------|--|-----------------------|
| | | | Single-axis | Double-axis |
| Un008 | 1 | OUT1 (CN3-7,-8) | ALM | A axis ALM |
| | 2 | OUT2 (CN3-9,-10) | /COIN or /V-CMP | A axis/COIN or /V-CMP |
| | 3 | OUT3 (CN3-11,-12) | /TGON | A axis/TGON |
| | 4 | OUT4 (CN3-32,-33) | /S-RDY | b axis ALM |
| | 5 | OUT5 (CN3-34,-35) | /CLT | b axis/COIN or /V-CMP |
| | 6 | OUT6 (CN3-36,-37) | /BK | b axis/TGON |
| Un009 (Only valid for incremental encoder) | 1 | PW (CN□-12,-13) | □ axis encoder W-phase (□ represents for 1 or 2) | |
| | 2 | PV (CN□-10,-11) | □ axis encoder V-phase | |
| | 3 | PU (CN□-8,-9) | □ axis encoder U-phase | |
| | 4 | UVW off line detection signal | □ axis UVW off line detection | |
| | 5 | PC (CN□-5,-6) | □ axis encoder C-phase | |
| | 6 | PB (CN□-3,-4) | □ axis encoder B-phase | |
| | 7 | PA (CN□-1,-2) | □ axis encoder A-phase | |
| | 8 | ABC off line detection signal | □ axis UVW off line detection | |

(3) Use of monitoring mode











Operation steps to display b axis Un000 data are listed as follows (when A axis and b axis servo motor rotate at 1000 and 1500 r/min respectively)

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|---|--|---|
| 1 | Press M mode key to select monitoring mode |  |  |
| 2 | Press UP or DOWN and select the desired monitor number Un000 |   |  |
| 3 | Press SET to display Un000. The decimal point of current Bit 0 is off, so A axis Un000 is displayed |  |  |

| | | | |
|---|--|--|---|
| 4 | Press UP or Down, the decimal point of current Bit 0 is on, so b axis Un000 is displayed |  |  |
| 5 | Press SET to return to the display of monitor number. |  |  |

(4) Monitor display of reference pulse, feedback pulse counter and actual angle of encoder

Operation steps to display b axis Un010 data are as follows.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|--|---|
| 1 | Press M function key to select A axis monitoring mode. In case of failing to display Un010, press UP or DOWN to set. |  |  |
| 2 | Press SET to display Un010. The decimal point of current Bit 0 is off, so low 16-bit of A axis Un010 is displayed. |  |  |
| 3 | Press UP or Down, the decimal point of current Bit 0 is on, so low 16-bit of b axis Un010 is displayed. |  |  |
| 4 | Press Shift key, the decimal point of current Bit 0 is on, so high 16-bit of b axis Un010 is displayed. |  |  |
| 5 | Press SET to return to the display of monitor number. |  |  |

Chapter V Operation

5.1 Trial Operation

Perform trial operation after wiring.

5.1.1 Trial Operation for Servo Motor Unit

Notes

- Disconnect the servo motor and machinery and only fix the servo motor unit.
To avoid accident, based on the instruction, trial operation is performed on a servo motor under unloaded status (where the servo motor unit connects with no coupling or belt).

Validate whether the power, motor main circuit and encoder cables are wired correctly. Usually, wiring mistake may cause the motor fail to rotate smoothly in trial operation. Please validate again.

When the wiring is validated as correct, perform trial operation for servo motor units based on the following serial number in order.

- Jogging (JOG) and mode running (F□002)

The following are operation steps for display of axis A JOG operation.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|-------------------|-------------------------|
| 1 | Press M function key (for more than 1 second) and switch to auxiliary function mode of axis A. | M | FA000 |
| 2 | Press M function key to select auxiliary function mode for A axis. In case of failing to display FA002, press UP or DOWN to set. | ^ v | FA002 |
| 3 | Press SET to start JOG operation. | SET | A-.JOG |
| 4 | Press M function key to turn the servo ON (the motor is powered on). | M | A-.JOG |
| 5 | Press UP (turn anti-clockwise/ positive) or DOWN (turn clockwise/ negative) to run the motor. | ^ v | A-.JOG |
| 6 | Press M function key to turn the servo OFF (the motor is powered off). | M | A-.JOG |
| 7 | Press SET to return to the display of FA002. | SET | FA002 |

| | | | | | | |
|--|---------------------|--------------|-----------------|--------------|----------|--------|
| P□304 | Jogging (JOG) speed | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 6000 | 1rpm | 500 | Not required | | |
| Set the motor speed command value for auxiliary function "Jogging (JOG) Mode Running (Fn002)". | | | | | | |

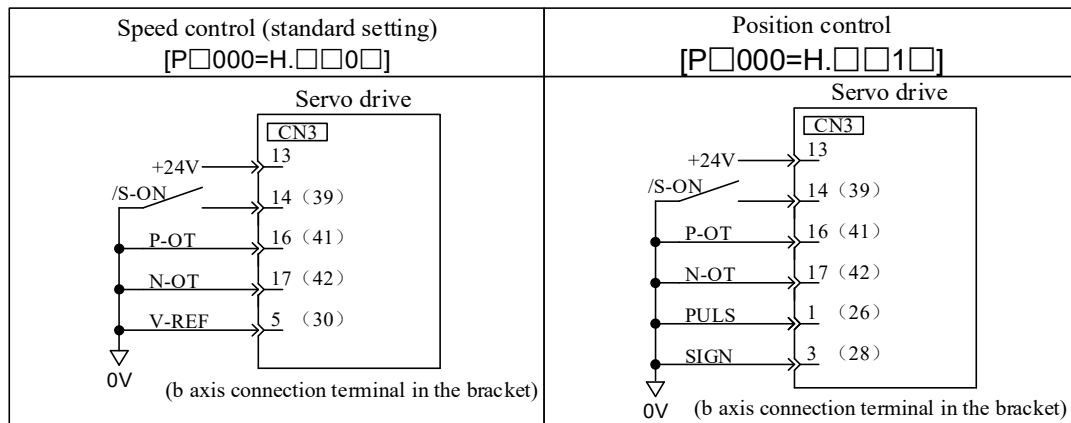
Pay attention, in the operation under jogging (JOG) mode, it is invalid to disable Forward Drive Prohibited (P-OT) or Reverse Drive Prohibited (N-OT).

5.1.2 Trial Operation for Servo Motor Unit with Superior Reference

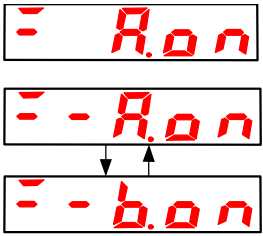
This item is to validate whether the servo motor moving reference and input/output signals from the command controller to the servo unit are correctly set, whether the wiring and polarity between command controller and servo unit are correct and whether the movement setting of servo unit is correct. This is the final validation before connecting the servo motor to machinery.

(1) Servo ON reference based on superior reference

The following external input signal circuits and equivalent signal circuits must be configured.

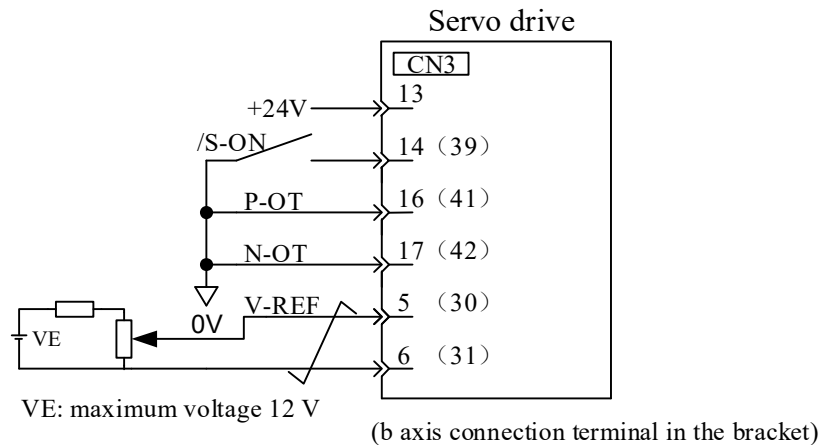


| Step | Content | Verification methods and supplementary instruction |
|------|--|--|
| 1 | <p>Form the input signal circuit required by servo ON.</p> <p>To turn the servo ON, the minimum required signal should be input. Please wire the input/output signal connector (CN3) in the circuit equivalent to the circuit shown in the preceding page, power it off and connect CN3 to servo unit.</p> | <p>Please set as follows.</p> <ol style="list-style-type: none"> 1. Input servo On and input signal (/S-ON) 2. Turn On (L level) input signals of Forward Drive Prohibited (P-OT) and Reverse Drive Prohibited (N-OT) (forward drive prohibited and reverse drive prohibited can be performed) 3. Do not input reference (0V reference or 0 pulse) <p>If the external wiring is to be omitted, the input signal distribution function based on user parameters can be used to set the function of input terminal as “Always Valid”, “Always Invalid” without signal input. Please refer to “Signal Distribution of Input Circuit”.</p> <p>When absolute value encoder is used, if “Use Absolute Encoder as Incremental Encoder (Pn001=H.□□□2)” is set temporarily, wiring for SEN signals can be omitted.</p> |
| 2 | <p>Please power on to check whether the panel operator displays content as follows.</p> <div style="display: flex; align-items: center;"> ← For single-axis </div> <div style="display: flex; align-items: center;"> ← For double-axis </div> | <p>If the content is not displayed as shown in the left figure, the setting of the input signals is incorrect. Please validate the input signals with input signal monitor (Un007).</p> <p>For single-axis: Un007= </p> <p>For single-axis: Un007= </p> <p>Turn the connected signal lines ON/Off to validate that the LED display of the digital operator changes as follows.</p> |
| 3 | <p>Input servo ON input signal (/S-ON) and validate that the display of panel operator is shown as follows.</p> | <p>When any alarm appears, see "Abnormality Diagnosis and Treatment Methods" to eliminate the alarm.</p> |

| | |
|---|--|
|  | <p>In case of interference in reference voltage during speed control, “-” in the upper left part of the panel operator will flash. When the servo is ON, the servo motor might run at dead slow speed. For such occasion, please refer to “Other Wiring” to take corresponding measures.</p> |
|---|--|

(2) Operation steps under speed control mode (P□000=H. □□0□)

The following external input signal circuits and equivalent signal circuits must be configured.



| Step | Content | Verification methods and supplementary instruction |
|------|---|--|
| 1 | Please check the power and input signal circuit again and check the speed reference input (voltage between V-REF and GND) is 0 V. | Please refer to the input signal circuit shown in the above figure. |
| 2 | Turn on the servo ON(/S-ON) input signal. | If the servo motor rotates at an extremely slow speed, see “Adjustment of Reference Shift”, and use the reference voltage offset to keep the servo motor from moving. |
| 3 | Increase the speed reference input voltage (between V-REF and GND) slowly from 0 V with. | Factory setting: 150(r/min)/V. |
| 4 | Please validate the speed reference (Un004[r/min]) value input to servo driver. | See "Selection and Operation of Basic Mode" for relevant display methods. |
| 5 | Please validate servo motor speed (Un000[r/min]). | See "Selection and Operation of Basic Mode" for relevant display methods. |
| 6 | Please validate the values of Step 4 and 5 (Un004 and Un000) are equivalent. | Change speed reference input voltage to validate whether Un004 = Un000 is valid when there are multiple speed reference values. |
| 7 | Please validate the speed reference input or motor rotation direction. | Refer to the following equation when speed reference input gain (P□300) changes. $Un004 = P□300[rpm/V] \times (V-REF \text{ voltage})[V]$ To change the motor rotation direction without changing speed reference input voltage polarity, see “Rotation Direction Switching of Motor”. Start from Step 2 after change. |
| 8 | If the servo is OFF when the speed input reference is set as 0 V, the trial operation of servo motor unit has completed. | |

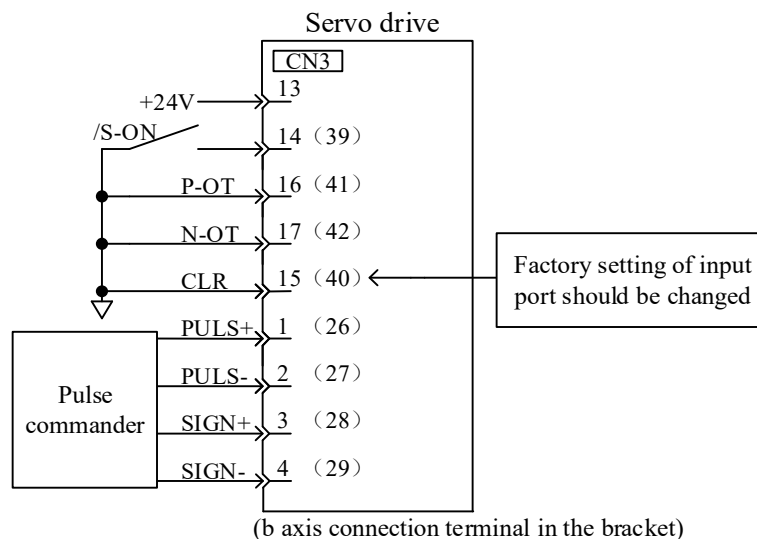
Note: The position control is configured in command controller

When servo is under speed control and subject to position control in command controller, please validate the following items after the said “Operation Steps under Speed Control Mode”.

| Step | Content | Verification methods and supplementary instruction |
|------|---|---|
| 9 | Please validate the power and input signal circuit again and validate the speed command input (voltage between V-REF and GND) is 0 V. | |
| 10 | Set servo ON(/S-ON) input signal as ON. | If the servo motor rotates at an extremely slow speed, see "Adjustment of Reference Shift", and use the reference voltage offset to keep the servo motor from moving. |
| 11 | Give the motor rotation reference (e.g., the motor rotates 1 round) easy to validate in advance from command controller and validate the motor rotation commanded and realized by visual inspection and monitoring motor actual angle (Un015[pulse]). | Motor rotation angle 1 (Un015[pulse]): the pulse count starting from original point. |
| 12 | In case of rotation difference of Step 11, please properly set the PG frequency dividing ratio (Pn201) that outputs encoder pulse from servo unit. | See "Encoder Signal Output" for relevant setting method. PG frequency dividing ratio (Pn201[P/Rev]): the encoder pulse count per rotation round. |
| 13 | If the servo is OFF when the speed input reference is set as 0 V, the trial operation to set the reference control as position control has completed. | |

(3) Operation steps under position control mode (P□000=H. □□1□)

The following external input signal circuits and equivalent signal circuits must be configured.



| Step | Content | Verification methods and supplementary instruction |
|------|---|--|
| 1 | Please validate the conformity between pulse shape and the pulse output from the superior pulse commander. | Reference pulse shape is set with P□200=H.××□×. Please refer to "Setting of User Parameter". |
| 2 | Set command unit and set electronic gear ratio based on command controller. | Electronic gear ratio is set with (Pn202/Pn203). Please refer to "Setting of Electronic Gear". |
| 3 | Power on and set servo ON(/S-ON) input signal as ON. | |
| 4 | Use the motor rotation to be easily validated in advance (e.g., motor rotates 1 round) to output slow reference pulse from command controller. | Set the reference pulse rate as the safe rate around 100 r/min. |
| 5 | Please validate the reference pulse count input to servo unit with the variation before and after inputting the reference of reference pulse counter ((Un010[pulse]). | See "Selection and Operation of Basic Mode" for relevant display methods. Un010(input reference pulse counter [pulse]) |
| 6 | Please validate the actual rotation of the motor before/after change of feedback pulse counter (Un011[pulse]). | See "Selection and Operation of Basic Mode" for relevant display methods. Feedback pulse counter (Un011 [pulse]) |
| 7 | Please validate that Step 5 and 6 meet the following conditions. | |

| | | |
|----|--|---|
| | Un011=Un010 | |
| 8 | Please validate the conformity of rotation direction with the servo motor giving reference. | Please validate the input pulse polarity and input reference pulse shape. Please refer to "Selection of Pulse Reference shape". |
| 9 | Please validate motor rotation direction. | To change the motor rotation direction without changing input reference pulse shape, see "Rotation Direction Switching of Motor". Start from Step 9 after change. |
| 10 | If the servo will be OFF when the pulse reference input stops, the trial operation under servo motor unit position control mode using superior position reference has completed. | |

5.1.3 Trial Operation Servomotor Connected to the Machine

| |
|---|
| Danger |
| <ul style="list-style-type: none"> Please carry out operations indicated in this section as per instructions. <p>Upon connection between servo motor and machinery, in case of operation mistake, not only damages to machinery but also personal injuries will be caused therefrom.</p> |

The steps are specified on the condition that trial operation has been completed in each control.

| Step | Content | Verification methods and supplementary instruction |
|------|--|--|
| 1 | Switch on power and set mechanical configuration in respect of protection functions for overtravel and brake. | Please refer to "Setting of General Basic Functions". When using servo motor with brake, measures against natural falling of machinery and vibration caused by external force should be taken prior to confirmation of brake operation. Please check whether operations for servo motor and brake are normal. Please refer to "Setting for Holding Brake". |
| 2 | Please set necessary parameters for users based on used control mode. | Based on used control mode, please refer to: the Speed Control (Analog Voltage Reference) Operation the Position Control Operation the Torque Control Operation |
| 3 | Please connect to servo motor and machinery via coupling with power being cut off. | Please refer to "Installation Precautions for Servo Motor". |
| 4 | When servo controller is turned to "Servo Off" mode (de-energized state), switch on power of command controller of machinery. Please confirm once again whether operation of protection functions in step 1 is normal. | Please refer to "Setting of General Basic Functions". In case of any abnormality during operation of following step, emergency stop may be carried out to safely stop operation. |
| 5 | Please carry out trial operation in accordance with objectives specified in the Trial Operation for Servo Motor Unit Based on Superior Reference upon completed installation of machinery and servo motor. | Please check whether results are in line with trial operation of servo motor unit. In addition, please check whether settings like reference unit conform to that of machinery. |
| 6 | Please confirm once again whether user parameter settings conform to control mode in step 2. | Please check whether servo motor operates according to specification for machinery operation. |
| 7 | Please adjust servo gain as necessary to improve responsiveness of servo motor. | Trial operation should be fully completed since insufficient "running-in" with machinery may occur in the trial operation. |
| 8 | Please record the user parameters set for maintenance in the 12.4 User Parameter Setting Memo. At this point, the Supporting Trial Operation for Machinery and Servo Motor is completed. | |

5.1.4 Trial Operation of Servomotor with Brakes

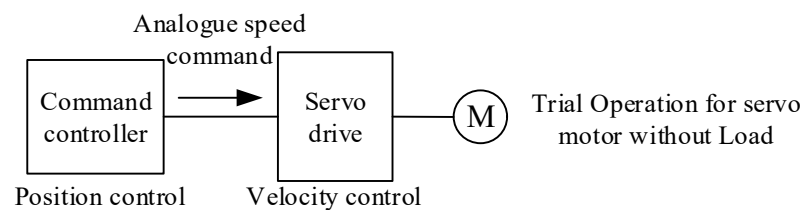
In terms of a servo motor with brake, operation for its holding brake should be controlled by interlocking output (/BK) signals of the brake in servo driver.

Measures against natural falling of machinery and vibration caused by external force should be taken prior to confirmation of brake operation. Please check operations of servo motor and holding brake upon disconnection between servo motor and machinery. If operations are normal, servo motor may be connected to machinery for trial operation.

Please refer to "Setting for Holding Brake" for wiring of servo motor with brake and settings for user parameters.

5.1.5 Position Controlled by Command Controller

According to the above mentioned, make sure that trial operation for servo motor unit should be conducted after disconnection of servo motor and machinery, Please confirm operation and specification of servo motor first based on the following table.



| Commands of command controller | Confirming matters | Confirming methods | Re-corrected content | Reference |
|---|--|---|--|-----------|
| JOG operation (Reference with certain speed input by command controller) | RPM of servo motor | Confirm speed of servo motor by the following methods. •RPM monitoring for motor using panel operator (Un000) •Try to operate servo motor at a lower speed. For example, input a speed reference of 60r/min and check whether the servo motor rotates 1 round per second. | Please determine whether input gain (P□300) of speed command is correct via confirmation of setting values of user parameters. | |
| Simple positioning | Rotation amount of servo motor | After inputting a reference to order the servo motor to rotate 1 round, visually inspect whether the shaft of servo motor rotates 1 round. | Please determine whether PG divider ratio (P□201) is correct via confirmation of setting values of user parameters. | |
| Overtravel operation (when using POT and NOT signals) | Input POT and NOT signals and check whether the servo motor stops. | During continuous rotation of servo motor, make sure that servo motor stops after POT and NOT signals is switched to be ON. | If it fails to be stopped, correct wiring of POT and NOT again. | |

5.2 Selection of Control Mode

Control modes applicable to servo driver are explained as follows:

| User Parameter | Control modes | Reference |
|----------------|---------------|-----------|
|----------------|---------------|-----------|

| | | | |
|-------|-----------------------|---|--|
| P□000 | H.□□0□ | Speed control (analog voltage reference) Control RPM of servo motor by reference of analog voltage speed in case of: · required RPM control · feedback from frequency dividing output by encoder of servo; setting position loop in command controller; and implementation of position control | |
| | H.□□1□ | Position control (pulse train reference) Control position of servo motor via reference of pulse train position. Control position via number of incoming pulse and control speed via frequency of incoming pulse. Use it if in need of positioning operation. | |
| | H.□□2□ | Torque control (analog voltage reference) Control output torque of servo motor by analog voltage torque reference which should be used if required amount of torque for operations such as pressing. | |
| | H.□□3□ | Speed control (selection of internal set speed) With 3 input signals (/P-CON, /P-CL and /N-CL), speed is controlled by operation speed set by servo in advance. 3 operation speeds can be set for the servo without analog voltage reference. | |
| | H.□□3□ · · · | It is supporting switching modes for the above 4 control modes. Please select an applicable switching mode of control mode for purposes of clients. | |
| | H.□□B□ H.□□C□ | Motion control mode | |

5.3 Setting of General Basic Functions

5.3.1 Servo ON Setting

Set the servo ON signal (/S-ON) which sends out commands for energized/de-energized state of servo motor.

(1) Servo ON signal (/S-ON)

| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|--|--------|--------------------------------|--------|---------------|---|
| | | A axis | B axis | | |
| Input | /S-ON | CN3-14 | CN3-39 | ON = L Level | Servo motor can operate in energized state (servo ON state). |
| | | | | OFF = H Level | Servo motor cannot operate in de-energized state (servo OFF state). |
| <div>■Attentions</div> <p>Make sure that commands are input to start/stop servo motor after sending servo ON signal. Do not use /SON signal to start/stop servo motor after inputting commands. In case of repeated switching between ON and OFF modes for AC power, accidents may be caused by aging of internal components.</p> <p>/S-ON signals may distribute inputted connector pin numbers to other places by user parameters.</p> | | | | | |

(2) Select to use/disuse servo ON signal

Regular servo ON can be set by user parameters without wiring of /S-ON, however, servo driver is switched to action state when power is on, therefore you should handle with care.

is switched to alarm state when power is on, therefore, you should handle with care.

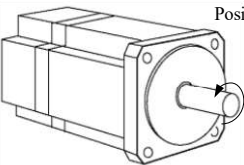
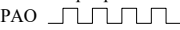

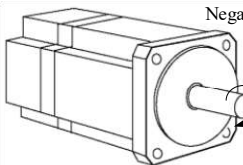
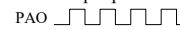

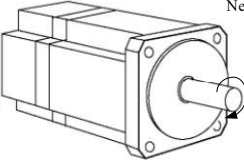


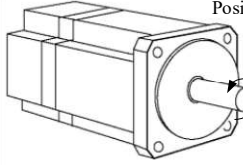


| User Parameter | | Meanings | |
|---|--------|----------|--|
| P□509 | A axis | H.□□1□ | Input /S-ON signal via the input terminal IN1(CN3-13) (factory setting) |
| | | H.□□9□ | Set the /S-ON signal to be "valid " in regular time |
| | B axis | H.□□5□ | Input /S-ON signal via the input terminal IN5 (CN3-39) (factory setting) |
| | | H.□□9□ | Set the /S-ON signal to be "valid " in regular time |
| <div>· Power must be turned on again upon changes to the user parameter so as to effect the setting.</div> <div>· When the signal is set to be "valid " in regular time, reset can be realized by power restarting in case of alarm (alarm reset is invalid).</div> | | | |

5.3.2 Rotation Direction Switching of Motor

In this case, only reverse the rotation direction of motor without changes to pulse and voltage polarity of commands being sent into servo driver.

At the same time, moving direction (+, -) of shaft is reversed but polarity for output signals from servo (such as pulse output of encoder and analog monitor signal) is kept unchanged.

In standard setting, "forward direction" is observed to be "counterclockwise rotation" from the loading side of servo motor.

| User Parameter | | Name | Command | |
|----------------|--------|---|--|---|
| | | | rotation reference | Negative rotation reference |
| P□000 | H.□□□0 | Standard setting (CCW refers to forward rotation) (Factory setting) |  <p>Positive rotation (CCW)</p> <p>Encoder output pulse PAO  A phase advance PBO  A phase advance</p> |  <p>Negative rotation (CW)</p> <p>Encoder output pulse PAO  B phase advance PBO  B phase advance</p> |
| | H.□□□1 | Negative rotation mode (CW refers to forward rotation) |  <p>Negative rotation (CW)</p> <p>Encoder output pulse PAO  A phase advance PBO  A phase advance</p> |  <p>Positive rotation (CCW)</p> <p>Encoder output pulse PAO  B phase advance PBO  B phase advance</p> |

In terms of direction switching of POT and NOT, CCW direction is POT if P□000= H.□□□0 (standard setting) and CW direction is POT if P□000= H.□□□1 (negative rotation mode).

5.3.3 Overtravel Setting

The overtravel limit function forces movable machine parts to stop if they exceed the allowable range of motion and turn ON a limit switch.

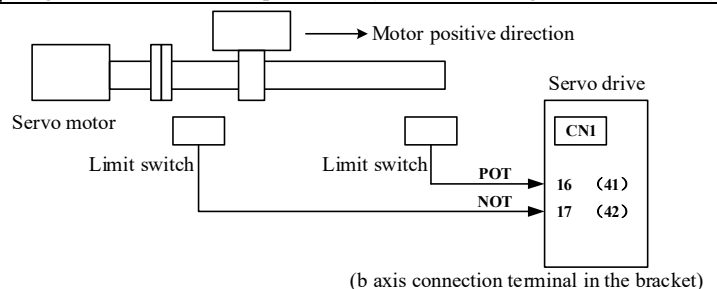
(1) Connection of overtravel signal

In order to use overtravel function, connect input signals of the following overtravel limit switch to corresponding pin numbers in CN3 connector of servo driver without fail.

| Type | Signal | Pin No. of connector (factory) | | Set | Meanings |
|-------|--------|--------------------------------|--------|---------------|---|
| | | A axis | B axis | | |
| Input | POT | CN3-16 | CN3-41 | ON = L Level | Positive-side over travel allowed. (normal operation) |
| | | | | OFF = H Level | Positive-side over travel prohibited (overtravel in positive rotation side) |
| Input | NOT | CN3-17 | CN3-42 | ON = L Level | Negative-side over travel allowed. (normal operation) |
| | | | | OFF = H Level | Negative-side over travel prohibited (overtravel in negative rotation side) |

In respect of linear drive, limit switches must be connected according to the following figure so as to avoid machinery damage.

Even in case of overtravel, it can also drive to the opposite side. For example, negative-side run can be enabled in case of positive-side overtravel.



■Attentions

During position control, position error pulse will occur if the motor is stopped by overtravel.
In order to clear position error pulse, clear signals (CLR) must be input.

Notes

Workpieces may fall under the overtravel state when using servo motor in vertical shaft.
In order to prevent workpieces from falling in case of overtravel, make sure to set P□000= H.1□□□ so as to switch on zero clamping state after stop. (Please refer to "Selection of Motor Stop Methods when Using Overtravel")

(2) Select to use/disuse overtravel signal

Internal user parameters of servo driver can be set to disuse overtravel signals. At this time, it is not required to use wiring of input signals for overtravel.

| User Parameter | | | Meanings |
|--|--------|--------|---|
| P□509 | A axis | H.□3□□ | Input positive-side over travel prohibited (POT) signal from IN3 (CN3-13). (Factory setting) |
| | | H.□9□□ | Disable the positive-side over travel prohibited (POT) signal (positive-side over travel can be conducted frequently) |
| | B axis | H.□7□□ | Input positive-side over travel prohibited (POT) signal from IN7 (CN3-41). (Factory setting) |
| | | H.□9□□ | Disable the positive-side over travel prohibited (POT) signal (positive-side over travel can be conducted frequently) |
| | A axis | H.4□□□ | Input negative-side over travel prohibited (NOT) signal from IN4 (CN3-14). (Factory setting) |
| | | H.9□□□ | Disable the negative-side over travel prohibited (NOT) signal (negative-side over travel can be conducted frequently) |
| | B axis | H.9□□□ | Input negative-side over travel prohibited (NOT) signal from IN8 (CN3-42). (Factory setting) |
| | | H.9□□□ | Disable the negative-side over travel prohibited (NOT) signal (negative-side over travel can be conducted frequently) |
| · Effective control modes: speed control, position control and torque control · Power must be turned on again upon changes to the user parameter so as to effect the setting. * POT and NOT signals may freely distribute inputted connector pin numbers by user parameters. See the Signal Distribution of Input Circuit for details. | | | |

(3) Motor stop method when using overtravel

Methods used to stop operation of motor when inputting overtravel signals (POT and NOT) during rotation of servo motor.

| User Parameter | | Methods for motor stop | After stop of motor | Meanings |
|---|--------|-----------------------------|--------------------------|--|
| P□000 | H.□0□□ | Plug braking stopping | Inertial operation state | Reduce speed to stop the servo motor by emergency stop torque (P□407). Servo motor will be in inertial operation (de-energized) state after stop. |
| | H.□1□□ | Inertial operation stopping | | Stop the servo motor in the same manner as servo OFF (inertial operation stop). The servo motor will be in inertial operation (de-energized) state after stop. |
| | H.0□□□ | Plug braking stopping | Inertial operation state | Reduce speed to stop the servo motor by emergency stop torque (P□407). Servo motor will be in inertial operation (de-energized) state after stop. |
| | H.1□□□ | Plug braking stopping | Zero clamping state | Reduce speed to stop the servo motor by emergency stop torque (P□407). Servo motor will be in zero clamping (servo locking) state after stop. |
| | H.2□□□ | Inertial operation stopping | Inertial operation state | Stop the servo motor in the same manner as servo OFF (inertial operation stop). The servo motor will be in inertial operation (de-energized) state after stop. |
| · Power must be turned on again upon changes to the user parameter so as to effect the setting. | | | | |

· During setting of inertial operation for H.□1□□, the servo motor may be controlled if servo ON signals are received.

■ Words and expressions

- Inertial operation stopping: naturally stop the motor by friction resistance arising from motor rotation other than braking.
- Plug braking stopping: stop the motor via deceleration (brake) torque (P□407).
- Zero clamping state: use state of position loop in zero configuration of position reference.

* See the Selection of Stop Methods in Servo OFF for stop methods in servo OFF and alarm condition.

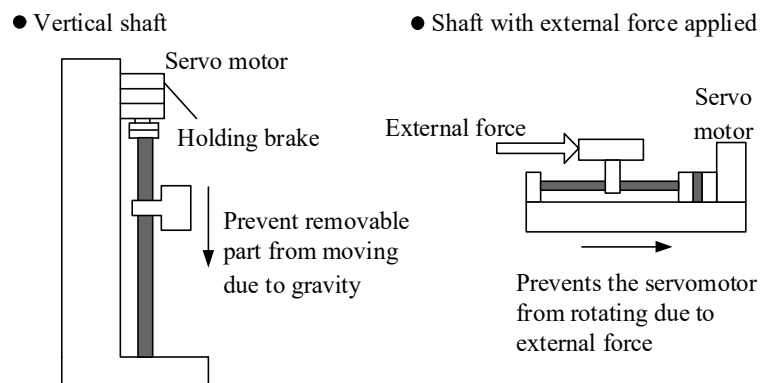
(4) Setting for stop torque in overtravel

| P□407 | Limit of plug braking torque | | | |
|-------|------------------------------|--------------|-----------------|--------------|
| | | | Speed | Position |
| | | | Torque | |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 300 | 1% | 300 | Not required |

• Set the stop torque used for inputting overtravel signals (POT and NOT).
 • Setting unit corresponds to a percent (%) of the rated torque. (rated torque is 100%)
 • The factory setting is 300% so that the setting is large enough a value to operate the servomotor at maximum torque. The maximum value of emergency stop torque that is actually available, however, is limited to the maximum torque of the servomotor.

5.3.4 Setting for Holding Brake

When the vertical shaft is driven by servo motor, it should be used. When power state of servo driver is OFF, use the servo motor with brake to prevent removable part from moving due to gravity. (Please refer to " Trial Operation for Servo Motor with Brake".)

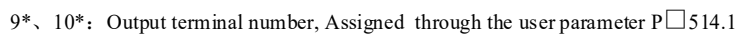


Note:

1. The brake built in the servo motor with brake should be a actuated-type holding brake without excitation, which cannot be used for braking. It should only be used to maintain the stop state of servo motor. Brake torque is over 120 % of rated torque of servo motor.
2. When operation of servo motor is enabled only by speed loop, servo and input reference should be set to OFF and "OV" respectively during operation of brake.
3. In configuration of position loop, mechanical brakes cannot move since servo is locking during servo motor's stop.

(1) Connection example

Order output signal "/BK" of servo driver and brake power constitute ON/OFF circuit of brake. Standard connection examples are as follows.



| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|---|--------|--------------------------------|--------|---------------|----------------|
| | | A axis | B axis | | |
| Output | /BK | Distribution through P□514 | | ON = L Level | Release brake. |
| | | | | OFF = H Level | Use brake. |
| When using servo motor with brake, it is the output signal of control brake. In addition, this output signal is not used in factory setting. Distribution for output signals is required (setting of P□514). Do not connect when using motor without brake. | | | | | |

Brake signals (/BK) cannot be used under the condition of factory setting. Therefore it is required to distribute output signals.

During factory setting, /BK signals should be output while /S-ON signals are set as OFF (servo OFF), however, timing of servo OFF can be changed by user parameters.

| | | | | | | |
|---|--|--------------|-----------------|---|---------|--------|
| P□506 | Brake command - delay time for servo OFF | | | Speed | Positon | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 500 | 10ms | 0 | Not required | | |
| <ul style="list-style-type: none">When used in vertical shaft, removable parts of machinery may move slightly due to gravity or external force with timing of brake ON. Such slight movement can be eliminated by servo OFF operation delay via this user parameter.This parameter changes the brake ON timing while the servomotor is stopped. See the Timing Setting of Brake ON (after Stop of Servo Motor) for brake operation during rotation of servo motor. | | | | <div><div>/S-ON</div><div>/BK Output</div><div>Energized state of motor</div></div> <div><div>Servo ON</div><div>Servo OFF</div><div>Brake release</div><div>Brake holding</div><div>Power to motor</div><div>No power to motor</div><div>P□506</div></div> | | |
| <div>■Attentions</div> <div>In case of alarm, servo motor will come into de-energized state immediately, which is unrelated to setting of user parameter.</div> <div>Machinery may move within period before brake operation due to gravity of removable parts of machinery or external force.</div> | | | | | | |

(5) Timing setting of brake ON (during rotation of servo motor)

If an alarm occurs while the servomotor is rotating, the servomotor will come to a stop and the brake signal will be turned OFF. The timing of brake signal output can be adjusted by setting the following parameter.

| | | | | | | |
|--------------|---|--------------|-----------------|--------------|----------|--------|
| P□507 | Brake Reference Output Speed Level | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 6000 | 1r/min | 100 | Not required | | |
| P□508 | Servo OFF - waiting time of brake command | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 10 ~ 100 | 10ms | 50 | Not required | | |

Output conditions for /BK signals during rotation of servo motor.
BK signals should be set as H level (brake initiates) if any of the following condition is met:

- RPM of motor is lower than P□507 after servo OFF
- Setting time for P□508 is exceeded after servo OFF

■ **Attentions**

- Even P□507 is set as a value higher than maximum RPM of used servo motor, operation of the motor will also be limited by its maximum RPM.
- Distribute motor rotation detection signal (/TGON) and brake signal (/BK) to other terminals.
- When brake signal (/BK) and motor rotation detection signal (/TGON) are distributed to the same output terminal, /TGON signal is changed to L level due to falling speed in the vertical shaft. Even conditions for the user parameter are met, /BK signal may also cannot be changed to H level. (Since output is completed by OR logic when several output signals are distributed to the same output terminal) Refer to "Signal Distribution of Output Circuit" for details of distribution of output signals.

5.3.5 Selection of Stop Methods in Servo OFF

Select stop methods for servo unit in servo off.

| User Parameter | | Methods for motor stop | After stop of motor | Meanings |
|----------------|--------|-----------------------------|--------------------------|--|
| P□000 | H.□0□□ | Plug braking stopping | Inertial operation state | Reduce speed to stop the servo motor by emergency stop torque (P□407). Servo motor will be in inertial operation (de-energized) state after stop. |
| | H.□1□□ | Inertial operation stopping | | Stop the servo motor in the same manner as servo OFF (inertial operation stop). The servo motor will be in inertial operation (de-energized) state after stop. |

Setting of user parameter is valid under the following conditions:

- /S-ON output signal OFF (servo OFF)
- Main power (L1, L2 and L3) OFF

■ **Words and expressions**

- Plug braking stopping: stop the motor via deceleration (brake) torque (P□407).
- Inertial operation stopping: naturally stop the motor by friction resistance arising from motor rotation other than braking.

■ **Attentions**

- When power of main circuit (L1, L2 and L3) or control power supply (L1C and L2C) is OFF, the following servo drivers will force to execute plug braking stop despite of the above setting of user parameter.
- In case of alarm from servo driver, the servo driver will execute inertial stop.

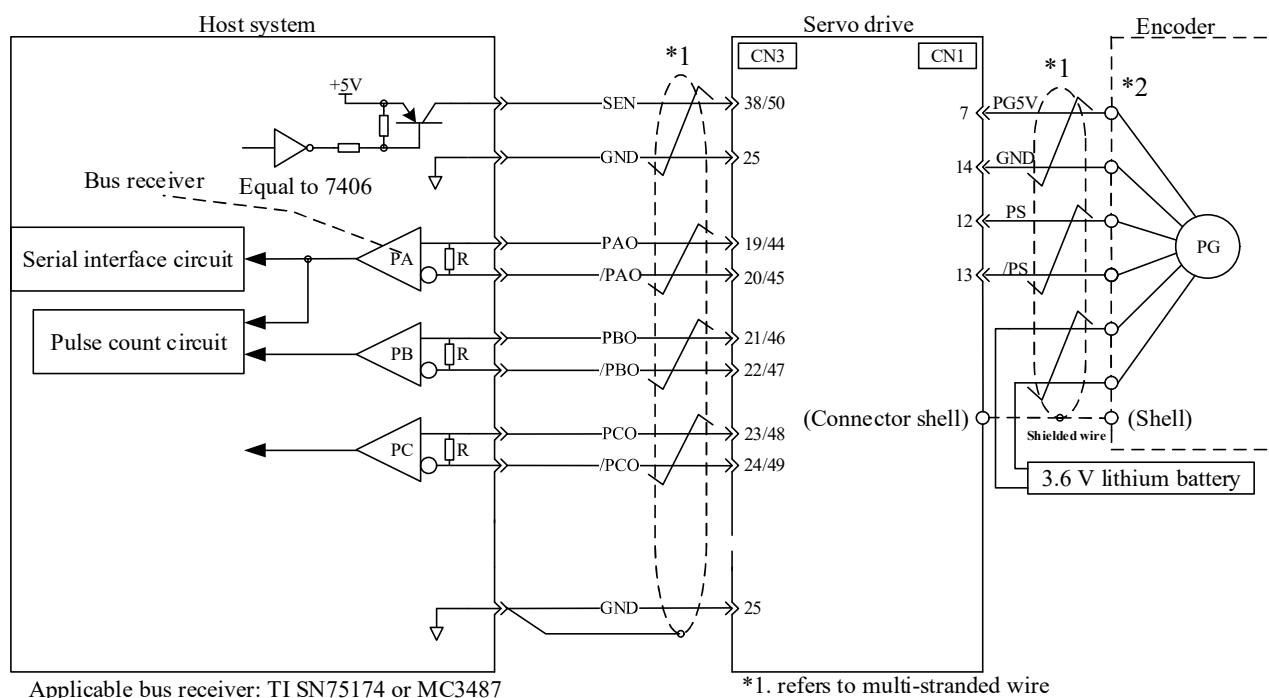
5.4 Use of Absolute Encoder

If a servo motor with absolute encoder is used, absolute value detection system can be configured in the command controller (host system). Results indicate that it can operate again directly without need of origin reset when power is ON again.

| Resolution of absolute encoder | Output range of multi-turn data | Operation when exceeding limit |
|------------------------------------|---------------------------------|--|
| 17 digit (*131072 pulse/circle) | -32768 ~ +32767 | When upper limit value (+32767) for positive direction is exceeded, multi-turn data is changed to -32768 When upper limit value (-32768) for negative direction is exceeded, multi-turn data is changed to +32767 |

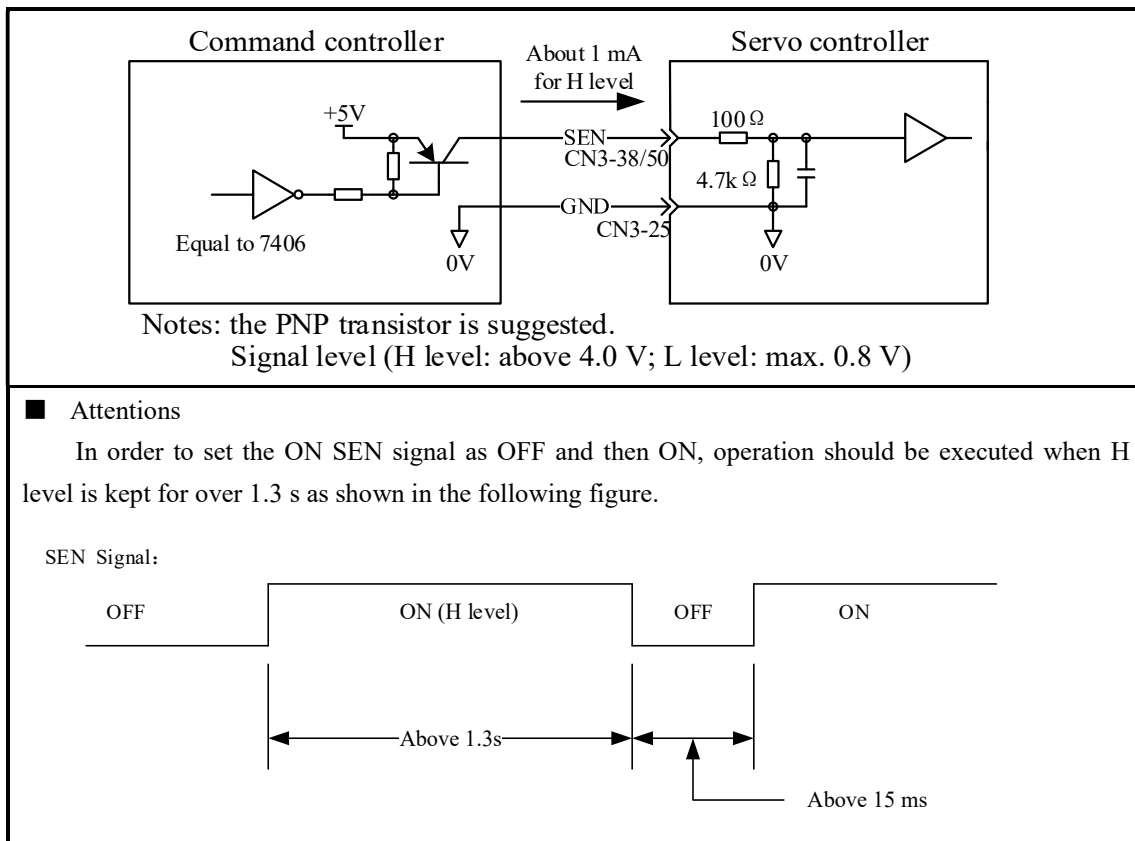
5.4.1 Interface Circuit

Standard connection of absolute encoder installed in the servo motor is as follows:



■ Connection of SEN signal

| Name | Signal | Pin No. of connector | Set | Meanings |
|--|--------|----------------------|--------------|----------------------------|
| Input | ASEN | CN3-38 | FF = L level | When power is supplied |
| | | | ON = H level | Absolute value is required |
| Input | BSEN | CN3-50 | FF= L level | When power is supplied |
| | | | ON = H level | Absolute value is required |
| <p>This input signal must be used to reference the servo driver to output absolute data. Please set the SEN signal as H level after the power is connected for 3 seconds.</p> <p>If SEN signal is switched between L level and H level, then multi-turn data and initial incremental pulse should be output.</p> <p>Before completion of these operations, the servo motor will not be energized even if servo ON signal (/S-ON) is in ON state. Operation panel displays "OFF".</p> | | | | |



5.4.2 Selection of Absolute Encoder

Absolute encoder can also be used as incremental encoder.

| User Parameter | | Meanings |
|--|--------|---|
| P□001 | n.□□□0 | Use absolute encoder as absolute encoder and enable serial output of absolute data (PG frequency dividing PAO □) |
| | n.□□□1 | Use absolute encoder as incremental encoder |
| | n.□□□2 | Use absolute encoder as absolute encoder and prevent serial output of absolute data (PG frequency dividing PAO □) |
| <ul style="list-style-type: none"> ● As an incremental encoder, SEN signal and battery is not required ● Power must be turned on again upon changes to the user parameter so as to effect the setting. | | |

5.4.3 How to Use Battery

Recommended battery specification: ER36V

■ Procedures for battery replacement

1. Please replace batteries when control power of servo unit is ON;
2. After batteries are replaced, use auxiliary function F□010 to remove alarm of absolute encoder so as to stop alarm of absolute encoder battery.
3. If no abnormal operation is found after restart of servo driver power, it indicates that replacement of battery is over

Attentions:

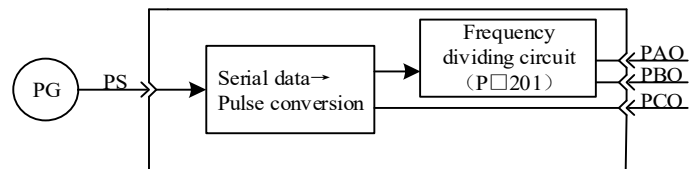
Data of absolute encoder will be lost if control power of servo driver is set as OFF and wires(including encoder cables) of battery is removed. At this time, setting operation for absolute encoder must be carried out. Please refer to "2.3.4 Setting of Absolute Encoder (F□009)"

5.4.4 Giving and Receiving Sequence of Absolute Data

After receipt of output from absolute encoder, the sequence used for the driver to send absolute data to the command controller is as follows.

(1) Summary of absolute signal

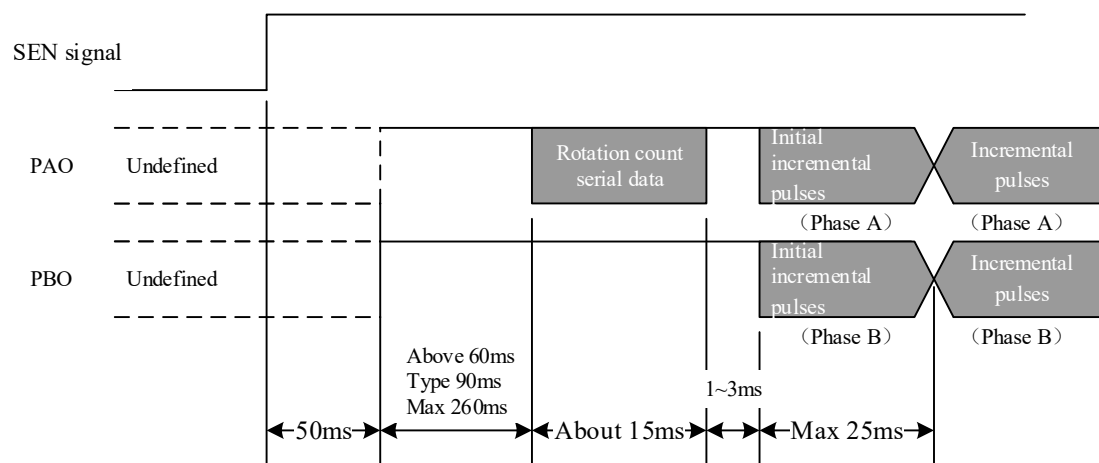
As shown below, serial data and pulse of absolute encoder are output by servo driver via "PAO, PBO and PCO".



| Signal | State | Signal content |
|--------|-------------------|--|
| PAO | At initialization | Serial data Initial incremental pulse |
| | Normal time | Incremental pulse |
| PBO | At initialization | Initial incremental pulse |
| | Normal time | Incremental pulse |
| PCO | Always | Origin pulse |

(2) Sending sequence and content of absolute data

- 1、Set SEN signal as H level
- 2、After 100 ms, wait state for serial data acceptance starts. Reversible counters used for incremental pulse count should be reset.
- 3、Receive serial data in 8 bytes
- 4、It will change to common incremental operation state after last serial data is received for 25 ms.

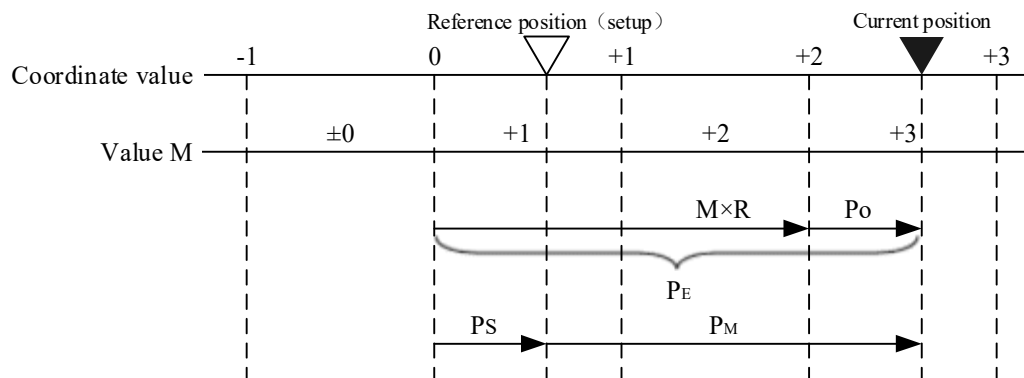


* Serial data

It indicates position of motor shaft after circuits of rotation from the reference position (as per setting value)

* Initial incremental pulse

Pulse should be output at the same speed as pulse for rotation of 1250rpm (factory setting is used for 17 byte frequency dividing pulse).



Final absolute data PM can be calculated by the following formula:

$$P_E = M \times R + P_0$$

$$P_M = P_E - P_S$$

Notes: the following formula is used in negative rotation mode ($Pn000.0 = 1$)

$$P_E = -M \times R + P_0$$

$$P_M = P_E - P_S$$

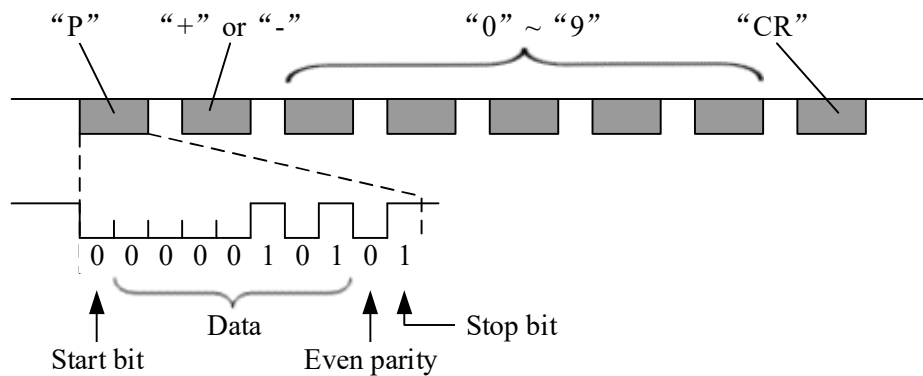
| | |
|-------|--|
| P_E | Current value read from encoder |
| M | Multi-turn data (number of turns of encoder) |
| P_0 | Count of initial incremental pulse |
| P_S | Count of initial incremental pulse read from the set point (this value is subject to storage and management of host) |
| P_M | Current value required in client system |
| R | Pulse count for 1 circle of rotating encoder (value after frequency dividing and value of $P_{□201}$) |

(3) Detailed specification of signal

(a) Specification of PAO serial data

Output rotation in 5 digits

| Data transmission method | Start-stop synchronism (ASYNC) |
|--------------------------|--|
| Baud rate | 9600 bps |
| Start bit | 1 bit |
| Stop bit | 1 bit |
| Parity | Even parity check |
| Character code | ASCII 7-bits coder |
| Data format | See the following figure for data in 5 characters. |



Note:

- 1, Data is "P+00000" (CR) or "P-00000" (CR) when the number of revolutions is zero.
- 2, The revolution range is "+32767" to "-32768". When this range is exceeded, the data changes from "+32767" to "-32768" or from "-32768" to "+32767".

5.4.5 Setting of Absolute Encoder (F□009/ F□010)

In addition, setting operation for absolute encoder must be carried out in case of:

- * initial startup of machinery
- * "Bus encoder multi-coil information error (A25 / b25)"
- * "Bus encoder multi-coil information overflow (A26 / b26)"
- * "Bus encoder battery alarm 1 (A27 / b27)"
- * requiring to set multi-turn data of absolute encoder as 0

Implement setting by panel operator.










Attentions:

- 1、 Setting operation of encoder only can be implemented under servo OFF state.
- 2、 When absolute encoder alarm is displayed, auxiliary function F□010 should be executed to stop alarm. Alarm reset (/ALM-RST) of servo driver cannot stop alarm.
 - * "Bus encoder multi-coil information error (A25 / b25)
 - * Bus encoder multi-coil information overflow (A26 / b26)
 - * Bus encoder battery alarm 1 (A27 / b27)
 - * Bus encoder battery alarm 2 (A28 / b28)
 - * Bus encoder overspeed (A41 / b41)

5.4.6 Clear of Multi-coil Data of Absolute Encoder









When using bus absolute encoder, the operation can be used to remove multi-coil information.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|---------------|-------------------------|
| 1 | Press M function key (for more than 1 second) and switch to auxiliary function mode of axis 1, which will display FA000. | M | FA000 |

| | | | |
|---|---|--|---|
| 2 | Press UP or DOWN and select the desired auxiliary function FA010. |   |  |
| 3 | Press SET to display "PoSCL" and clear multi-coil position operation. |  |  |
| 4 | Press function key to display "CLFIn" which indicates that multi-coil position is completely cleared. |  |  |
| 5 | Press SET to return to the display of FA009. |  |  |

5.4.7 Clear of Internal Errors of Bus Encoder

When using bus absolute encoder, the operation can be used to remove multi-coil information.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|---|---|---|
| 1 | Press M function key to select auxiliary function mode for A axis. In case of failing to display FA010 press UP or DOWN to set FA010. |  |  |
| 2 | Press SET to display "ErrCL". |  |  |
| 3 | Press M function key to display "CLFIn" and clear encoder multi-coil information completely. |  |  |
| 4 | Press SET to return to the display of FA009. |  |  |

5.5 Speed Control (Analog Voltage Reference) Operation

5.5.1 User Parameter Setting

| User Parameter | | Meanings |
|----------------|--------|---|
| P□000 | H.□□0□ | Selection of control mode: speed control (analog voltage reference) |

| | | | | | | |
|--------------|--------------------------|--------------|-----------------|--------------|----------|--------|
| P□300 | Speed command input gain | | | Speed | Position | Torque |
| | Setting range | Setting Unit | Factory setting | Power reboot | | |
| | 0 ~ 3000 | (r/min) /V | 150 | Not required | | |

■ For example,

P□300=150: 1 V voltage corresponds to inputting 150r/min (factory setting)

P□300=300: 1 V voltage corresponds to inputting 300r/min (factory setting)

5.5.2 Setting of Input Signal

(1) Speed reference input

If speed reference is sent to servo driver in the form of analog voltage reference, speed of servo motor is controlled in proportion to input speed.

| Name | Signal | Pin No. of connector (factory) | | Meanings |
|-------|--------|--------------------------------|--------|---|
| | | A axis | B axis | |
| Input | V-REF | CN3-5 | CN3-30 | Speed reference input |
| | GND | CN3-6 | CN3-31 | Signal ground for speed reference input |

It should be used for speed control (analog voltage reference) (P□000.1 = 0, 4, 7, 9, A)
P□300 is used to set speed reference input gain. Please refer to "Setting of User Parameter for details".

■ Input specification

- Input voltage range: DC ± 10V
- Maximum allowable input voltage: DC ± 12V

(2) Proportional action reference signal (/P-CON)

| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|-------|--------|--------------------------------|--------|---------------|--|
| | | A axis | B axis | | |
| Input | /P-C0N | CN3-15 | CN3-40 | ON = L Level | Operate servo driver by P control mode. |
| | | | | OFF = H Level | Operate servo driver by PI control mode. |

/P-CON signal is a signal that selects speed control modes from PI (proportional and integral) or P (proportional) control. If P control is set, motor rotation and slight vibration arising from input shift of speed reference can be reduced. Input reference: servo motor rotation due to 0 V shift can be reduced, but servo rigidity (support force) will decrease when rotation is stopped.

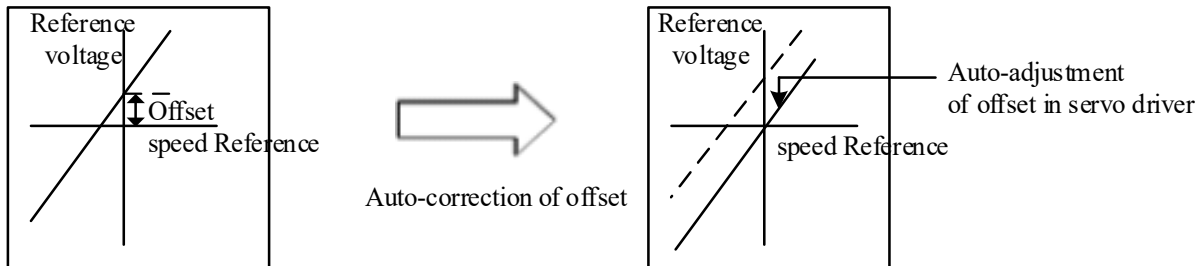
/P-CON signals may distribute inputted connector pin numbers to other places by user parameters. Please refer to "Signal Distribution of Input Circuit".

5.5.3 Adjustment of Reference Offset

In speed control mode, even if OV reference is sent under analog reference voltage, motor will rotate with low speed in case of small reference voltage offset (unit: mV) of superior control unit or in external circuit. In such case, reference offset can be automatically or manually adjusted by panel operator. See "5.2 Operation in Auxiliary Function Execution Mode" for details.

Auto-adjustment of analog (speed · torque) or reference offset is the function for offset measurement and auto-adjustment of voltage.

In case of voltage reference offset of the superior controller or in external circuit, servo driver will make following adjustment towards the automatic offset.



Once auto-adjustment of reference offset begins, offset will be saved in the servo driver.

Offset can be confirmed through manual adjustment of speed reference offset (F□006). See "5.5.3(2) Manual adjustment of speed reference offset" for details.

(1) Auto-adjustment of speed reference offset

When offset pulse is set as zero with the servo locked in the OFF state by the command controller equipped with a position loop, auto-adjustment of reference offset (F□008) is not available, instead, manual adjustment of speed reference offset (F□00A) should be applied.

Under speed reference of zero, function of zero clamping speed control which can lock the servo in a mandatory manner is provided. See "5.5.6 Use of Zero Clamping Function" for details.

Note: Auto-adjustment of zero analog offset should be conducted when the servo is OFF.

Auto-adjustment of speed reference offset of A axis is conducted as below.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|---------------|---|
| 1 | | | Set the servo unit as OFF, and input 0V reference voltage through reference controller or external circuit. |
| 2 | Press M function key to select auxiliary function mode for A axis. In case of failing to display FA008, press UP or DOWN to set. | M | FA008 |
| 3 | Press SET, and "rEF_o" is displayed. | SET | rEF_o |
| 4 | Press M function key to start auto-zeroing, and flickering "donE" is displayed. | M | donE |
| 5 | After completion of auto-zeroing, "rEF_o" instead of flickering "donE" is displayed. | — | rEF_o |
| 6 | Press SET to return to the display of FA008. | SET | FA008 |

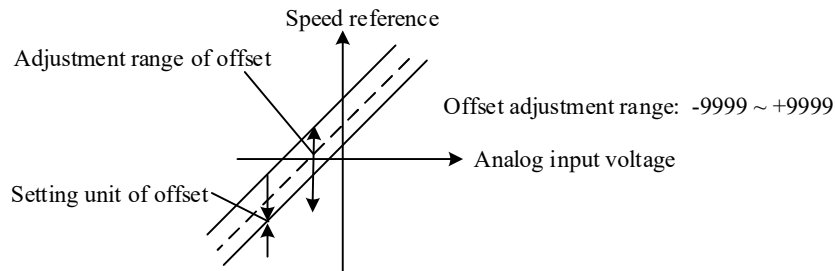
(2) Manual adjustment of speed reference offset

Manual adjustment of speed reference offset (F□006) should be applied in case that:

- the reference controller is equipped with a position loop to set the offset pulse as zero when the servo is locked in the OFF state
- offset is set as a certain value consciously
- offset set for auto-adjustment is applied

Basic function and auto-adjustment of analog (speed · torque) reference offset (F□008) are the same. But for manual adjustment (F□006), adjustment must be made along with direct input of offset.

Adjustment range of offset and setting unit are listed as below.



Auto-adjustment of speed reference offset of A axis is conducted as below.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|---------------|-------------------------|
| 1 | Press M function key to select auxiliary function mode for A axis. In case of failing to display FA006, press UP or DOWN to set. | M | FA006 |
| 2 | Press SET, and "A.SPd" is displayed. | SET | A SPd |
| 3 | Press SET for at least 1 s, and "0000" is displayed. | < | 0000 |
| 4 | Press UP or DOWN to set offset. | ^ v | 0083 |
| 5 | Press SET for at least 1 s to save offset. | < | A SPd |
| 6 | Press SET to return to the display of FA006. | SET | FA006 |

5.5.4 Soft Start

Soft start is the function to transfer step speed reference input to the reference with certain acceleration and deceleration in the servo driver.

(1) Trapezoidal start-up

| User Parameter | Meanings |
|----------------|----------------------------|
| P□309 | H.□□0 Trapezoidal start-up |

| | | | |
|--------------|--|--------------|-----------------|
| P□305 | Acceleration time of soft start Speed | | |
| | Setting range | Setting unit | Factory setting |
| | 0 ~ 10000 | 1ms | 0 |
| P□306 | Deceleration time of soft start Speed | | |
| | Setting range | Setting unit | Factory setting |
| | 0 ~ 10000 | 1ms | 0 |

While inputting step speed reference or selecting internal speed setting, smooth speed control is available. (set "0" for common speed control.)
Setting values are listed as below.

- P□305: time required from the OFF state to the speed of 1000r/min
- P□306: time required from the speed of 1000r/min to the OFF state

(2) S-curved start-up

| User Parameter | | Meanings |
|----------------|---------|--------------------|
| P□309 | H. □□□1 | S-curved start-up |
| | H. □0□□ | Close to linearity |
| | H. □1□□ | Low |
| | H. □2□□ | Central |
| | H. □3□□ | Height |

Selection of S curve ratio

| | | | |
|--------------|---|--------------|-----------------|
| P□308 | Rise time of S curve Speed | | |
| | Setting range | Setting unit | Factory setting |
| | 0 ~ 10000 | 1ms | 0 |

Power reboot: Not required

(3) Acceleration and deceleration filtering start-up

| User Parameter | | Meanings |
|----------------|---------|--|
| P□309 | H. □□□2 | Acceleration and deceleration filtering start-up |
| | H. □□0□ | First acceleration and deceleration filtering |
| | H. □□1□ | Second acceleration and deceleration filtering |

| | | | | |
|--------------|--|--------------|-----------------|--------------|
| P□307 | Time parameter of speed reference filter | | Speed | |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 10000 | 1ms | 0 | Not required |

Smooth speed reference through acceleration and deceleration filter.
A overlarge value set will reduce responsiveness.

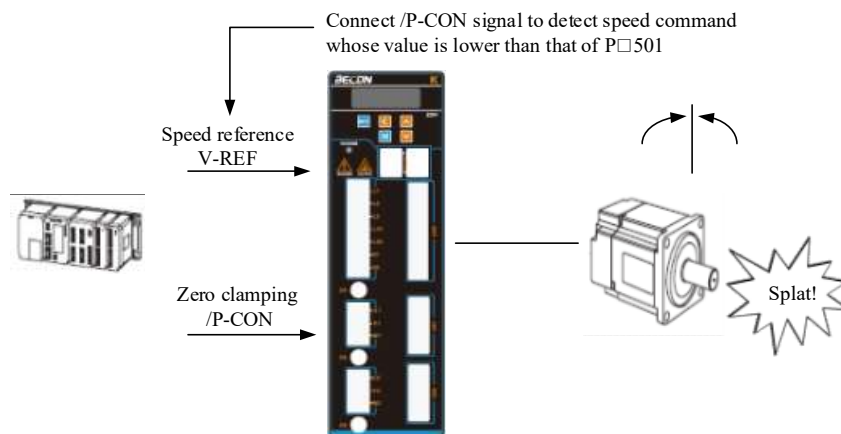
5.5.5 Use of Zero Clamping Function

(1) Meaning of zero clamping function

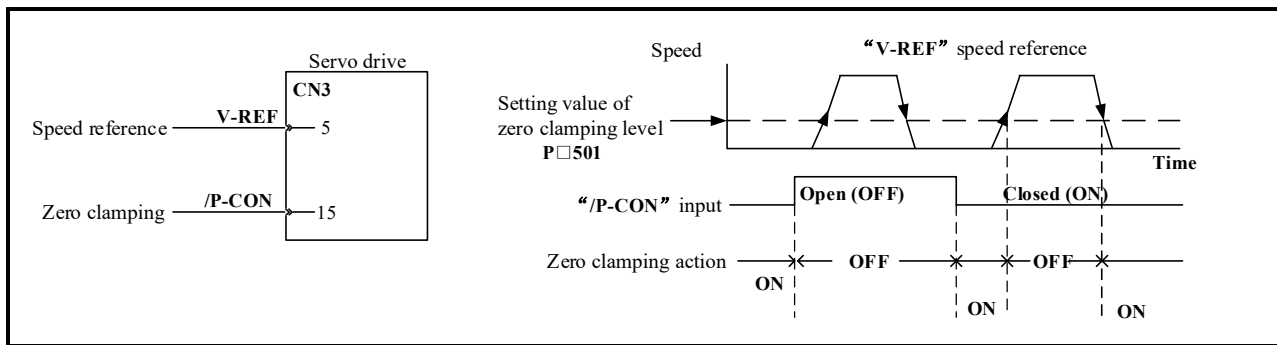
Zero clamping function refers to the function in the system where command controller is not equipped with position loops under speed control.

If the zero clamping (/P-CON) signal is set as ON, servo driver will be equipped with a position loop, and servo motor will fall into emergency stop with servo in the locked state regardless of speed reference when input voltage of speed reference (V-REF) is lower than the value corresponding to the rotation speed of P□501 (zero clamping level).

Servo motor is clamped within ± 1 pulse at the position where zero clamping takes effect. Even through external rotation, the servo motor will return to zero clamping.



| User Parameter | | Meanings |
|--|--------|--|
| P□000 | H.□□A□ | Control mode: speed control (analog voltage reference) \leftrightarrow zero clamping |
| Condition for switching of zero clamping action | | |
| When P□000 is set as H.□□A□, zero clamping will be activated in case of any of the followings: | | |
| · /P-CON is ON (L level) | | |
| · Speed reference (V-REF) is lower than the setting value of P□501 | | |



| | | | | |
|--------------|---------------------|--------------|-----------------|--------------|
| P□501 | Zero clamping level | | | Speed |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 10000 | 1r/min | 10 | Not required |

When speed control with zero clamping function(P□000=H.□□□A□) is selected, rotation speed to activate zero clamping should be set. Even if the value of P□501 exceeds the maximum rotation speed of the servo motor, maximum rotation speed of servo motor still adopts valid value.

(3) Setting of input signal

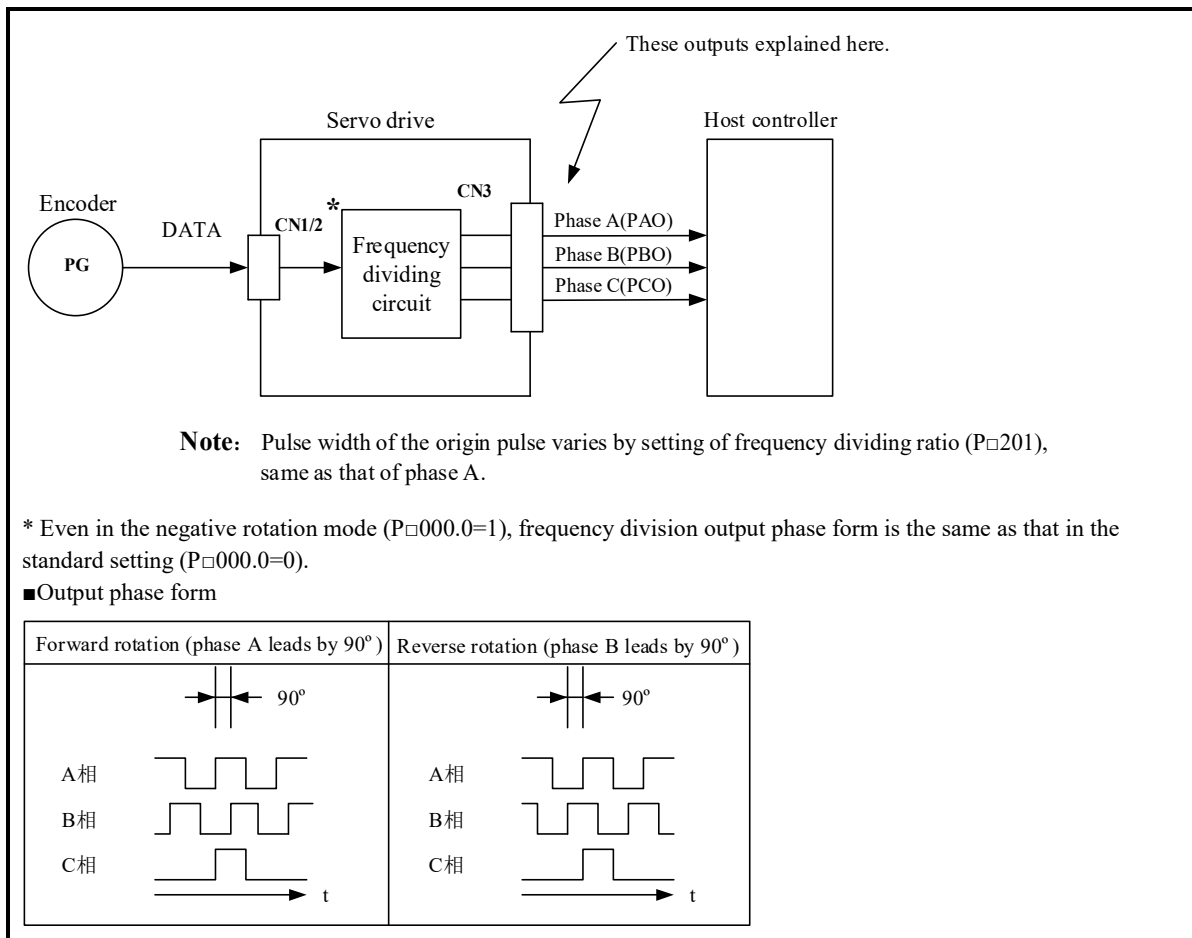
| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|-------|--------|--------------------------------|--------|---------------|--------------------------------------|
| | | A axis | B axis | | |
| Input | /P-C0N | CN3-15 | CN3-40 | ON = L Level | Zero clamping function ON (valid) |
| | | | | OFF = H Level | Zero clamping function OFF (invalid) |

It is the input signal to switch to zero clamping action.
 Anyone of /P-CON signal can be switched to zero clamping action.
 See "signal distribution of input circuit" for distribution

5.5.6 Encoder Signal Output

Feedback pulse of encoder is output after processing in servo unit.

| Name | Signal | Pin No. of connector | | Name |
|--------|--------|----------------------|--------|--|
| | | A axis | B axis | |
| Output | APAO+ | CN3-19 | CN3-44 | Encoder output Phase A+ |
| | APAO- | CN3-20 | CN3-45 | Encoder output Phase A- |
| Output | APBO+ | CN3-21 | CN3-46 | Encoder output Phase B+ |
| | APBO- | CN3-22 | CN3-47 | Encoder output Phase B- |
| Output | APCO+ | CN3-23 | CN3-48 | Encoder output Phase C+ |
| | APCO- | CN3-24 | CN3-49 | Encoder output Phase C- |
| Input | SEN | CN3-38 | CN3-50 | SEN signal input (valid when using absolute encoder) |
| | GND | CN3-25 | | Signal ground |

**Note:**

For bus encoder, C-phase pulse output of servo driver should be applied for mechanical origin reset after two cycles of rotation of servo motor.

· Setting of frequency dividing ratio of encoder pulse

| P□201 | PG frequency dividing | | | | Speed | Position | Torque |
|-------|-----------------------|--------------|-----------------|--------------|-------|----------|--------|
| | Setting range | Setting unit | Factory setting | Power reboot | | | |
| | 16 ~ 32768 | 1P/rev | 2500 | Required | | | |

Set output pulse of PG output signal (PAO,PBO) sent from servo driver.
Frequency of each cycle of feedback pulse from encoder is divided into the setting value of P□201 in the servo driver and output. (setting based on system specification of machinery and reference controller.)

■Output example
P□201=16 (16 pulse output in each cycle)

Setting value: 16

PAO

PBO

1 cycle

5.5.7 Same Speed Detection Output

| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|--------|--------|--------------------------------|--------|---------------|--------------------------|
| | | A axis | B axis | | |
| Output | /V-CMP | CN3-9 | CN3-34 | ON = L Level | State of same speed |
| | | CN3-10 | CN3-35 | OFF = H Level | State of different speed |

The output signal can be distributed to other output terminals through user parameter P□513.
See "Signal distribution of output circuit" for distribution of output signal.

5.6 Position Control Operation

5.6.1 User Parameter Setting


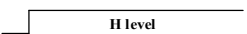


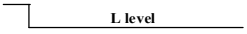



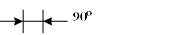

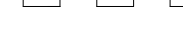
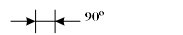

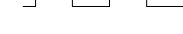
Following user parameters should be set for position control by pulse train.

(1) Control mode selection

| User Parameter | Meanings |
|----------------|---|
| P□000 | H.□□1□ Control mode selection: position control (pulse train reference) |

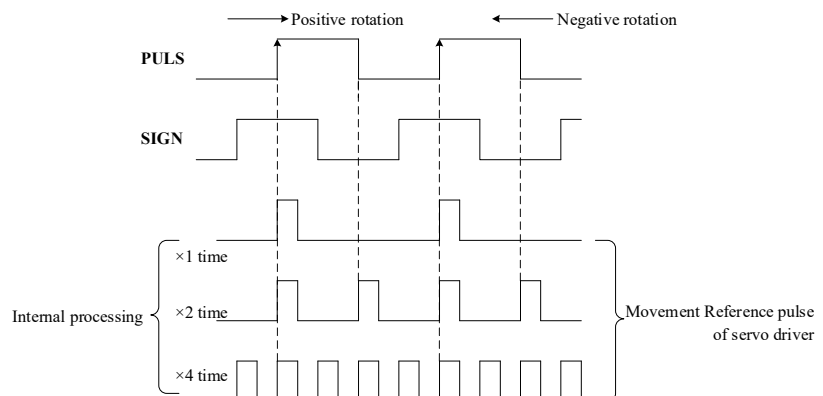
| Name | Signal | Pin No. of connector | | Name |
|-------|--------|----------------------|--------|-----------------------|
| | | A axis | B axis | |
| Input | PULS+ | CN3-1 | CN3-26 | Reference pulse input |
| | PULS- | CN3-2 | CN3-27 | Reference pulse input |
| | SIGN+ | CN3-3 | CN3-28 | Sign input |
| | SIGN- | CN3-4 | CN3-29 | Sign input |

(2) Selection of pulse reference form

| User Parameter | Reference form | Input multiple | Positive rotation reference | Negative rotation reference |
|----------------|----------------------------------|----------------|---|---|
| P□200 | H.□□0□ Sign + pulse train | — | PULS  SIGN  | PULS  SIGN  |
| | H.□□1□ CW+CCW | — | PULS  SIGN  | PULS  SIGN  |
| | H.□□2□ Two phase pulse train | ×1 |  PULS  SIGN  |  PULS  SIGN  |
| | H.□□3□ | ×2 | | |
| | H.□□4□ with 90° phase difference | ×4 | | |

■Supplement

Input multiplication can be set in the state of 90 phase difference under two phase pulse reference.



(3) Pulse instruction input complement

| User Parameter | Meanings |
|----------------|--|
| P□200 | H.□0□□ PULS input reverse, and SIGN input does not reverse |
| | H.□1□□ PULS input does not reverse and SIGN input reverse |

| | | |
|--|--------|---|
| | H.□2□□ | PULS input reverse, and SIGN input does not reverse |
| | H.□3□□ | PULS input reverse, and SIGN input does not reverse |
| Logic reverse for pulse reference is available by setting the parameter. | | |

(4) Selection of clear signal form

| Name | Signal | Pin No. of connector (factory) | | Name |
|-------|--------|--------------------------------|--------|-------------|
| | | A axis | B axis | |
| Input | /CLR | Distribution through P□510 | | Clear input |

If input is cleared, following actions can be performed.

- Offset counter in the servo driver is set as "0".
 - Action of position loop is set in the invalid state.
- In clear state, servo clamping does not work, and servo motor may rotate with a low speed due to drifting in the speed loop.

(5) Selection of clear action

In the condition other than clear signal CLR, regular clear of offset pulse can be selected based on state of servo driver. Three types of action mode of clear offset pulse can be selected through user parameter P□200.0.

| User Parameter | | Meanings |
|----------------|--------|--|
| P□200 | H.□□□0 | Under servo OFF, clear offset pulse; under over travel, not clear offset pulse |
| | H.□□□1 | Under servo OFF or over travel, not clear offset pulse |
| | H.□□□2 | Under servo OFF or over travel (excluding zero clamping), not clear offset pulse |

5.6.2 Setting of Electronic Gear

(1) Encoder pulse

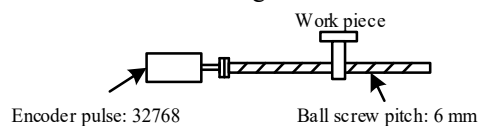
| Encoder type | Encoder pulse | |
|----------------------------|---------------|-----------|
| Common incremental encoder | 2500 P/R | |
| Bus encoder | 17 bits | 32768 P/R |

Note: Bits representing encoder resolution are different from pulse of signal output of encoder (phase A and phase B), and are four times of encoder pulse.

(2) Electronic gear

Electronic gear is the function to set any value for movement of workpiece with 1 pulse input reference by command controller. 1 pulse reference by command controller is "1 reference unit" as the smallest unit.

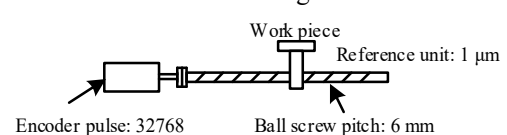
Without electronic gear



Workpiece movement of 10 mm

1 revolution is 6 mm. Therefore,
 $10 \div 6 = 1.6666$ cycles
 32768×4 pulses/cycle. Therefore,
 $1.6666 \times 32768 \times 4 = 218448$ pulses
 218448 pulses are input as reference pulses.
 The equation must be calculated at the host controller.

With electronic gear



Workpiece movement of 10 mm by "Reference unit"

1 reference unit is calculated as 1 μm
 Workpiece movement of 10 mm (equal to 10000 μm)
 1 pulse equal to 1 μm, Therefore,
 $10000 / 1 = 10000$ pulses
 Input 10000 pulses as reference pulses.

(3) Relevant user parameter

| | | | | |
|--|-------------------------------|--------------|-----------------|--------------|
| P□202 | Electronic gear (numerator) | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 65535 | — | 1 | Required |
| P□508 | Electronic gear (denominator) | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 65535 | — | 1 | Required |
| <p>If the deceleration ratio of the motor and the load shaft is given as n/m. Setting value of electronic gear ratio can be calculated by formula below.(M is the rotation of the motor and n is the rotation of the load shaft)</p> $\text{Electronic gear ratio: } \frac{B}{A} = \frac{P\Box 202}{P\Box 203} = \frac{\text{Encoder pulse} \times 4}{\text{Movement of loading axis with 1 cycle of rotation}} \times \frac{m}{n}$ <p>* In case of beyond the setting range, numerator and denominator should be reduced to the integer within the setting range. Note: electronic gear ratio (B/A) should not be changed.</p> <p>■Attentions Setting range of electronic gear ratio: $0.01 \leq \text{electronic gear ratio (B/A)} \leq 100$ In case of beyond the range, servo driver cannot work normally. In such case, mechanical structure or command unit should be changed.</p> | | | | |

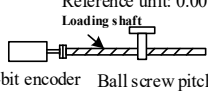
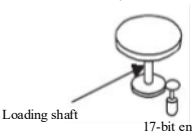
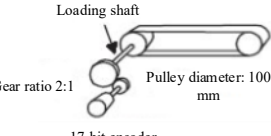
(4) Procedure for setting the electronic gear ratio

Electronic gear ratio should be set as below.

| Step | Content | Instruction |
|------|--|--|
| 1 | To confirm mechanical specifications | Reduction ratio, ball screw pitch, pulley diameter, etc. should be confirmed. |
| 2 | To confirm encoder pulse | Encoder pulse of servo motor should be confirmed. |
| 3 | To determine reference unit | 1 reference unit by command controller should be determined. Reference unit should be determined based on mechanical specifications and positioning accuracy. |
| 4 | To calculate movement of loading axis with 1 cycle of rotation | Reference units for 1 cycle of loading axis should be calculated based on determinate reference unit. |
| 5 | To calculate electronic gear ratio | Electronic gear ratio (B/A) should be calculated according to the related formula. |
| 6 | To set user parameter | The value calculated should be set as electronic gear ratio. |

(5) Example for setting of electronic gear ratio

Electronic gear ratio is determined based on several examples.

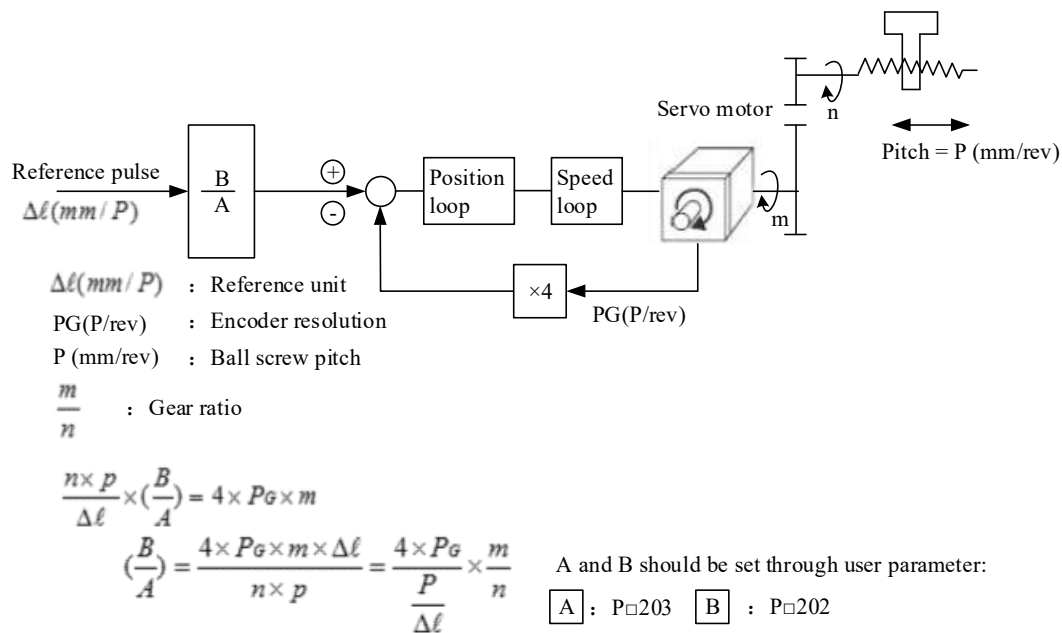
| Step | Content | Load configuration | | |
|------|------------------------------------|--|--|---|
| | | Ball screw | Disc table | Belt + pulley |
| | | <p>Reference unit: 0.001 mm</p>  <p>17-bit encoder Ball screw pitch: 6 mm</p> | <p>Reference unit: 0.1°</p>  <p>17-bit encoder Gear ratio 3:1</p> | <p>Reference unit: 0.02 mm</p>  <p>17-bit encoder Gear ratio 2:1 Pulley diameter: 100 mm</p> |
| 1 | Check mechanical structure | <ul style="list-style-type: none"> Ball screw pitch: 6 mm Gear ratio: 1/1 | Rotation angle of 1 cycle: 360° Gear ratio: 3/1 | Pulley diameter: 100 mm (Pulley perimeter: 341 mm) Gear ratio: 2/1 |
| 2 | Encoder | 17-bit: 32768P/R | 17-bit: 32768P/R | 17-bit: 32768P/R |
| 3 | Determine the reference unit used. | 1 reference unit: 0.001 mm (1 μm) | 1 reference unit: 0.1° | 1 reference unit: 0.02mm |

| | | | | | | | |
|---|---|--|----------|--|--------|---|--------|
| 4 | Calculate movement of loading axis with 1 cycle of rotation | 6mm/0.001mm=6000 | | 360°/0.1°=3600 | | 314 mm/0.02 mm=15700 | |
| 5 | Calculate the electronic gear ratio | $\frac{B}{A} = \frac{32768 \times 4}{6000} \times \frac{1}{1}$ | | $\frac{B}{A} = \frac{32768 \times 4}{3600} \times \frac{3}{1}$ | | $\frac{B}{A} = \frac{32768 \times 4}{15700} \times \frac{2}{1}$ | |
| 6 | Set user parameter | P□202 | 131072 * | P□202 | 393216 | P□202 | 262144 |
| | | P□203 | 6000 | P□203 | 3600 | P□203 | 15700 |

* Calculation result is not within the setting range. Hence numerator and denominator are reduced.

For example, numerator and denominator are reduced by 4. As a result, P□202 = 32768 and P□203 = 1500. Then the setting is completed.

(6) Equation of electronic gear ratio



5.6.3 Position Reference

Position of servo motor is controlled by the reference in the form of pulse train.

Pulse train output forms of command controller are listed as below.

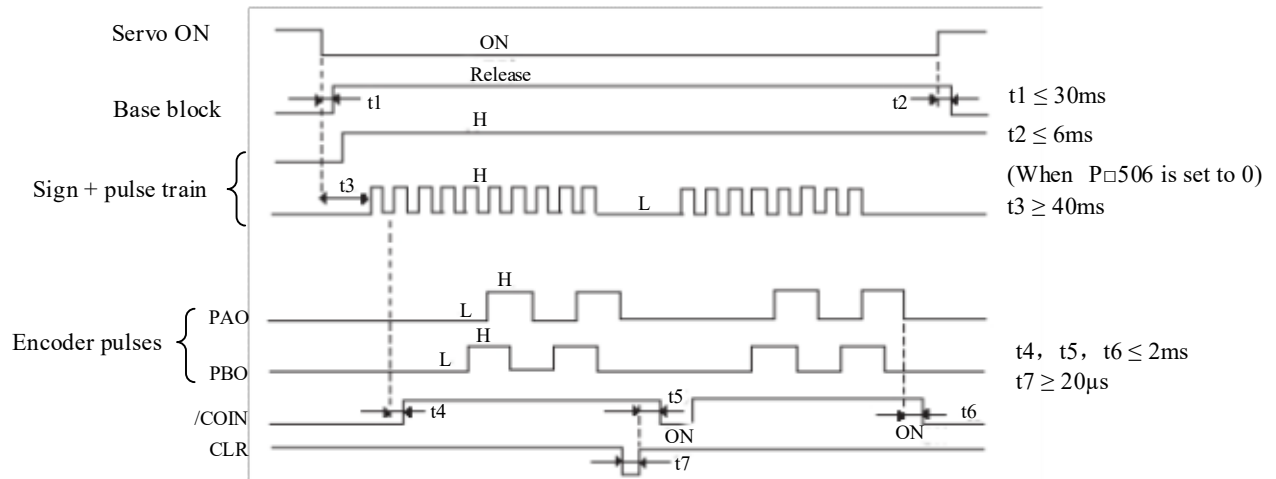
- Bus driver output
- +24V collector open circuit output
- +12 V collector open circuit output
- +5 V collector open circuit output

Note:

Note for collector open circuit output: when pulse output is conducted through collector open circuit, noise margin of input signal will reduce. In case of offset caused by noise, following user parameters should be changed.

| User Parameter | | Meanings |
|----------------|--------|---|
| P□200 | H.1□□□ | Reference input filtering for collector open-circuit signal |

(1) Timing example for input/output signal

**Note:**

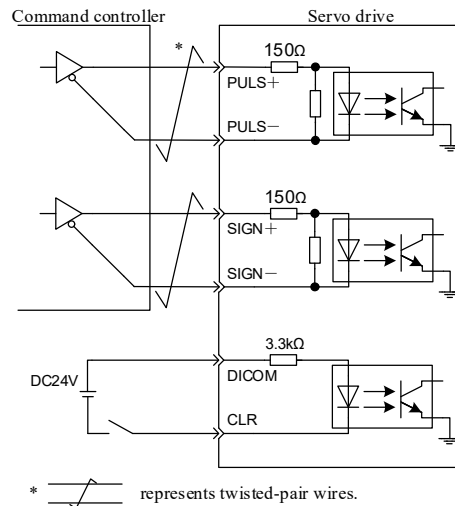
- Interval between ON set for servo ON signal to input of reference pulse should be more than 40 ms; Otherwise, the reference pulse may not be received by the servo driver.
- Clear signal ON should be set more than 200 μs .

Table: Timing for reference pulse input signal

| Reference pulse form | Electrical specification | | Remarks |
|---|--------------------------|---|--|
| Sign + pulse train input (SIGN + PULS signal) Maximum reference frequency: 500 kpps (In case of open-collector output, maximum reference frequency: 200 kpps) | | $t_1, t_2 \leq 0.1\mu\text{s}$ $t_3, t_7 \leq 0.1\mu\text{s}$ $t_4, t_5, t_6 > 3\mu\text{s}$ $\tau \geq 1.0\mu\text{s}$ $(\tau/T) \times 100 \leq 50\%$ | SIGN H = Forward reference L = Reverse reference |
| CW pulse + CCW pulse Maximum reference frequency: 500 kpps (In case of open-collector output, maximum reference frequency: 200 kpps) | | $t_1, t_2 \leq 0.1\mu\text{s}$ $t_3 > 3\mu\text{s}$ $\tau \geq 1.0\mu\text{s}$ $(\tau/T) \times 100 \leq 50\%$ | |
| Two phase pulse with 90° phase difference (Phase A + Phase B) Maximum reference frequency: × 1multiplier: 500kpps × 2multiplier: 400kpps × 4multiplier: 200kpps | | $t_1, t_2 \leq 0.1\mu\text{s}$ $\tau \geq 1.0\mu\text{s}$ $(\tau/T) \times 100 \leq 50\%$ | Multiplication mode can be setted through user parameter P□200.1. |

(2) Connection example**(a) Connection example of line driver output**

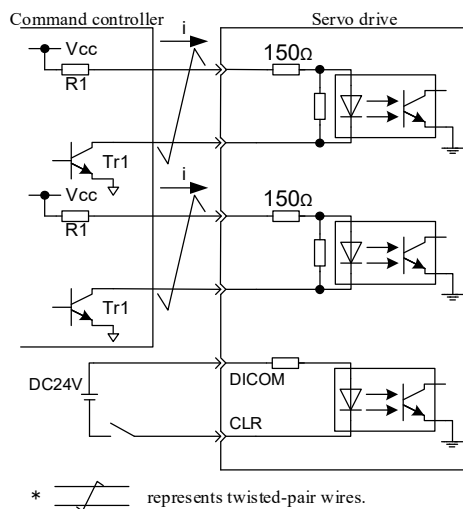
Applicable line driver: equivalent of TI SN75174 or MC3487



(b) Connection example of open- collector output

R1 value of limiting resistor should be selected to ensure that input current is within the range below.

Input current $i = 7\text{mA} \sim 15\text{mA}$



Please refer to the following applicable examples for setting of the working resistance R1 to maintain current i within 7 mA ~ 15 mA.

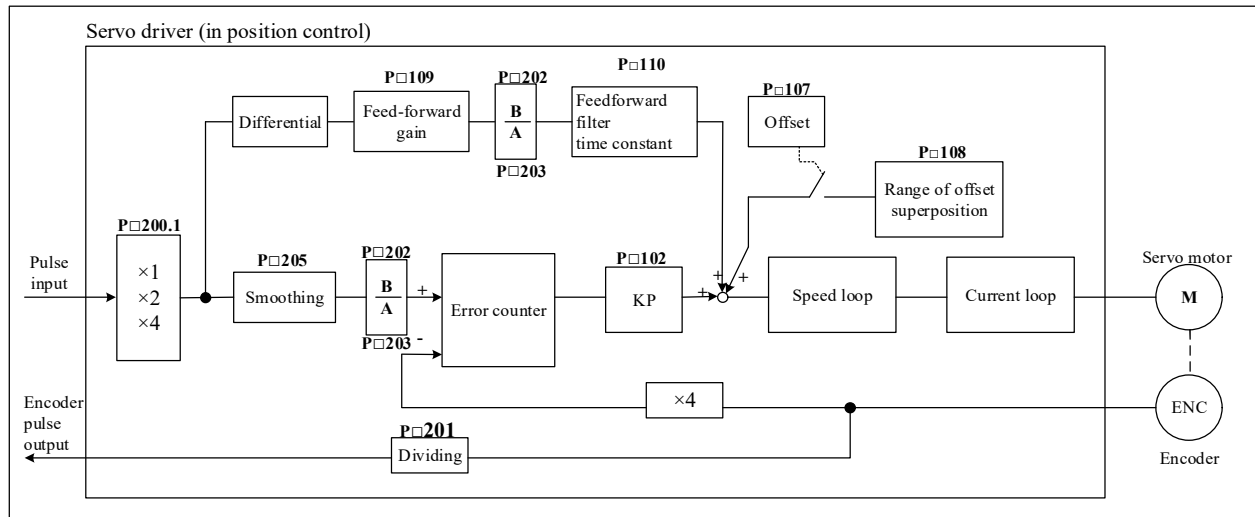
| Applicable examples | | |
|-----------------------------|---------------------------|---------------------------|
| When Vcc is 24V R1=2.2KΩ | When Vcc is 12V R1=1KΩ | When Vcc is 5V R1=180Ω |

(Note):

In case of open-collector outputs, noise margin of input signal will reduce. In case of offset caused by interference, user parameter P□200.3 should be set as "1".

(3) Chart of control box

Chart of control box is as below during position control.



5.6.4 Smoothing

Filtering is available in the servo unit through reference pulse input with certain frequency.

(1) Selection of position reference filter

| User Parameter | | Meanings |
|----------------|--------|--|
| P□206 | H.□□□0 | First acceleration and deceleration filtering |
| | H.□□□1 | Second acceleration and deceleration filtering |

(2) User parameter related to filter

| | | | | |
|--------------|---|--------------|-----------------|--------------|
| P□205 | Position reference acceleration/deceleration filter time constant | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 6400 | 0.1ms | 0 | Not required |

■ **Attentions**

Changing of position reference acceleration/deceleration time constant (Pn204) will take effects with no command pulse input and offset pulse of 0. To actually reflect the setting value, clear signal (CLR) should be input to disable reference pulse from command controller or to clear offset pulse as servo ON.

Even in following conditions, motor can be operated smoothly. In addition, the setting has no impact on movement (command pulse)

- When the host controller that outputs a reference cannot perform acceleration/deceleration processing.
- When the reference pulse frequency is too low.
- When the reference electronic gear ratio is too high (i.e., 10 times or more).

The graph illustrates the effect of the position reference acceleration/deceleration filter time constant (P□205) on the motor's response. The vertical axis represents the position percentage (0% to 100%), and the horizontal axis represents time (t). Two curves are shown: a solid line for 'Before filter applied' and a dashed line for 'After filter applied'. The 'Before filter applied' curve shows a sharp step response, while the 'After filter applied' curve shows a smooth, rounded response. The time constant P□205 is indicated on the x-axis for both the rise and fall times. The rise time is marked at 63.2% and the fall time at 36.8%.

5.6.5 Positioning Completed Output Signal

The signal represents completion of servo motor positioning during position control, and should be used when interlocking is confirmed by positioning completion of command controller.

| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|--------|--------|--------------------------------|--------|---------------|---------------------------|
| | | A axis | B axis | | |
| Output | /COIN | CN3-9 | CN3-34 | ON = L Level | Positioning completed |
| | | CN3-10 | CN3-35 | OFF = H Level | Positioning not completed |

Positioning completed signal can be distributed to other output terminals through user parameter P□513.
See "Signal distribution of output circuit" for distribution of output signal.

| P□500 | Positioning completion width | | | | Position |
|-------|------------------------------|------------------|-----------------|--------------|----------|
| | Setting range | Setting unit | Factory setting | Power reboot | |
| | 0 ~ 250 | 1 Reference unit | 10 | Not required | |

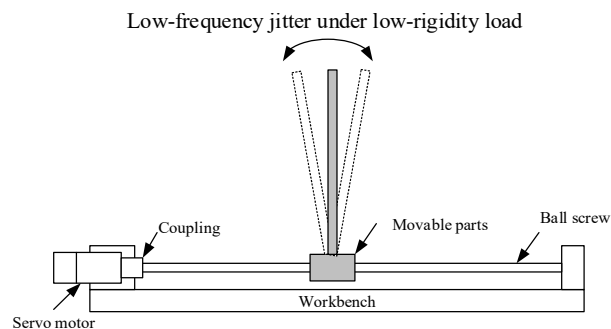
If difference (offset pulse) between the reference pulse from host controller and the movement of the servo motor is lower than the setting value of user parameter, positioning completed signal (/COIN) will be output.

Too large a value at this parameter may output only a small error during low-speed operation that will cause the /COIN signal to be output continuously.

The positioning completed width setting has no effect on final positioning accuracy.

5.6.6 Low-frequency Jitter Suppression

For low-rigidity load, rapid start-stop may produce continuous low-frequency jitter at early stage of loading, resulting in longer positioning and affecting production efficiency. Servo driver is equipped with jitter buffer control function which can suppress low-frequency jitter by estimating loading position and compensation.



(1) Scope of Application

Low-frequency jitter suppression is available in speed control mode and position control mode.

Low-frequency jitter suppression may not work normally or reach expected effects in case of:

- Intensive vibration cause by external force
- Jitter frequency not within 5.0 Hz - 50.0 Hz
- Mechanical gap between mechanical joint parts of vibration structure
- Moving time lower than one vibration cycle

(2) Setting of user parameter

| User Parameter | | Meanings |
|----------------|----------|--|
| P□004 | H. □0□□0 | Disable low-frequency jitter suppression |
| | H. □1□□1 | Enable low-frequency jitter suppression |

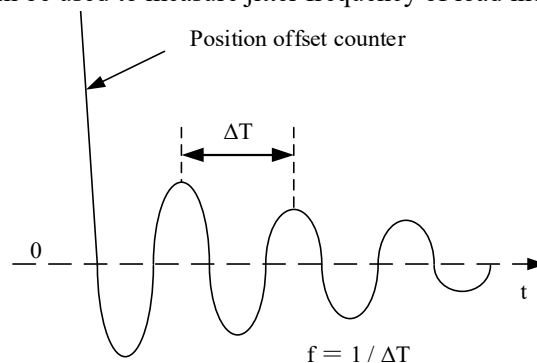
| | | | | |
|--------------|---|--------------|-----------------|-----------------|
| P□413 | B type vibration (low-frequency jitter) frequency | | Speed | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 10 ~ 1000 | 0.1Hz | 1000 | Not required |
| P□414 | B type vibration (low-frequency jitter) damping | | Speed | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 200 | — | 25 | Not required |

After inputting load jitter frequency measured into parameter P□413, P□413 can be slightly adjusted to obtain best suppression.

In case of continuous vibration of motor during shutdown, P□414 can be increased suitable. Ordinary, parameter P□414 don't need modification .

If jitter frequency can be directly measured by instrument, such as laser interferometer, frequency measured should be directly input into parameter P□413 in the unit of 0.1 Hz.

In case of no measuring instrument available, drawing or FFT analysis function of PC communication software can be used to measure jitter frequency of load indirectly.

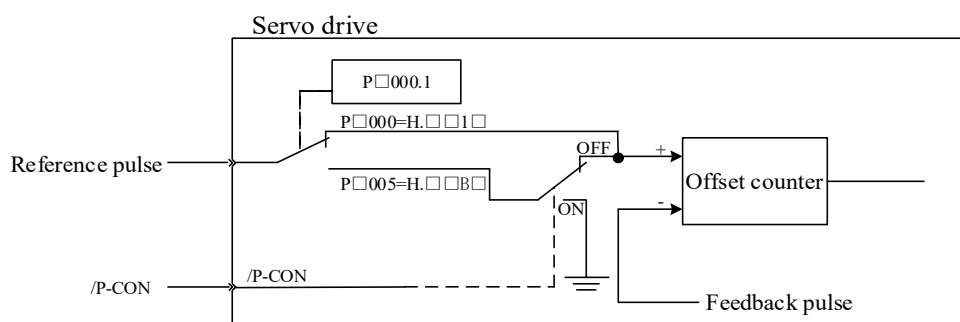


5.6.7 Inhibition Function of Reference Pulse (INHIBIT Function)

(1) Inhibition function of reference pulse (INHIBIT function)

It is the function to stop (inhibit) reference counting input pulses during position control.

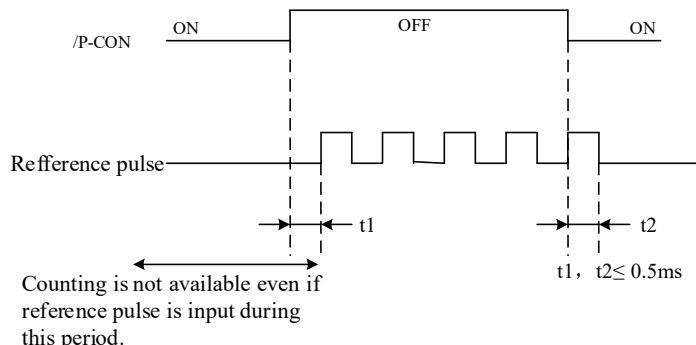
When the function is activated, servo locking (clamping) state is also activated.



(2) Setting of user parameter

| User Parameter | Meanings |
|----------------|---|
| P□000 | H.□□B□ Control mode: position control (pulse train reference) ↔ position inhibition |

- /P-CON signal is ON (L level)



(3) Setting of input signal

| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|-------|--------|-----------------------------------|--------|---------------|--|
| | | A axis | B axis | | |
| Input | /P-CON | CN3-15 | CN3-40 | ON = L Level | INHIBIT function ON (stop counting of reference pulse) |
| | | | | OFF = H Level | INHIBIT function OFF (counting of reference pulse) |

5.7 Torque Control Operation

5.7.1 User Parameter Setting

| User Parameter | | Meanings |
|----------------|------|---|
| P000 | H.02 | Control mode: torque control (analog voltage reference) |

| P□400 | Torque reference input gain | | Speed | Position | Torque |
|-------|-----------------------------|--------------------|----------------------|--------------|--------|
| | Setting range | Setting unit | Factory setting | Power reboot | |
| | 10 ~ 100 | 0.1 V/rated torque | 30 (3V/rated torque) | Not required | |

Set analog voltage level of torque reference (T-REF) for servo motor operation under rated torque.

■ For example,

P□400=30: rated torque of motor under 3 V input (factory setting)

P□400=1000: rated torque of motor under 10 V input

P□400=200: rated torque of motor under 2 V input

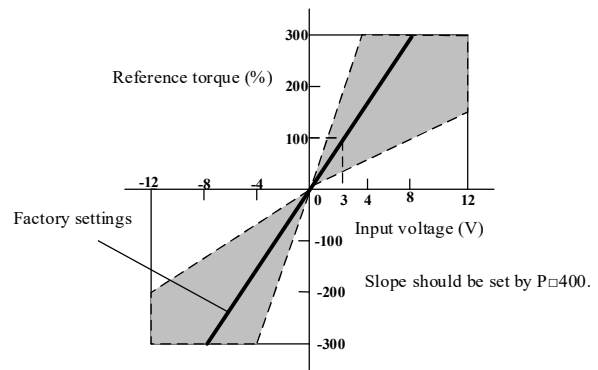
5.7.2 Torque Reference Input

If torque reference is sent to servo driver in the form of analog voltage reference, torque of servo motor is controlled in proportion to input voltage.

| Name | Signal | Pin No. of connector | | Name |
|---|--------|----------------------|--------|---|
| | | A axis | B axis | |
| Input | T-REF | CN3-18 | CN3-43 | Torque reference input |
| | GND | CN3-25 | CN3-50 | Signal earth for torque reference input |
| <p>It should be used for torque control (analog voltage reference) (P□000.1 = 2, 6, 8 or 9)</p> <p>P□400 is used to set torque reference input gain. Please refer to "8.7.1 Setting of User Parameter" for details.</p> | | | | |

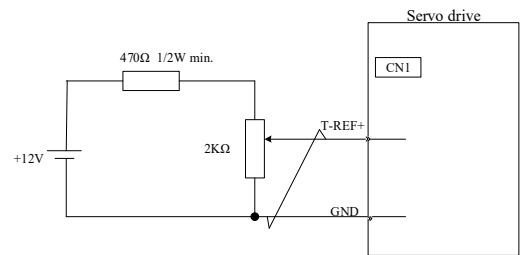
■ Input specification

- Input range: DC $\pm 1\text{V} \sim \pm 10\text{V}$ / rated torque
 - Maximum allowable input voltage: DC $\pm 12\text{V}$
 - Factory settings
 - P□400 = 30: rated torque under 3 V
 - +3V input: rated torque in the positive direction
 - +9 V input: 300% of rated torque in the positive direction
 - 0.3 V input: 10 % of rated torque in the negative direction
- Voltage input range can be changed through user parameter P□400.



■ Example of input circuit

To adopt effective measures to prevent interference, multi-stranded wire should be used for wiring.



Note:

Internal torque can be confirmed under monitoring mode (Un005). See "Operation under Monitoring Mode".

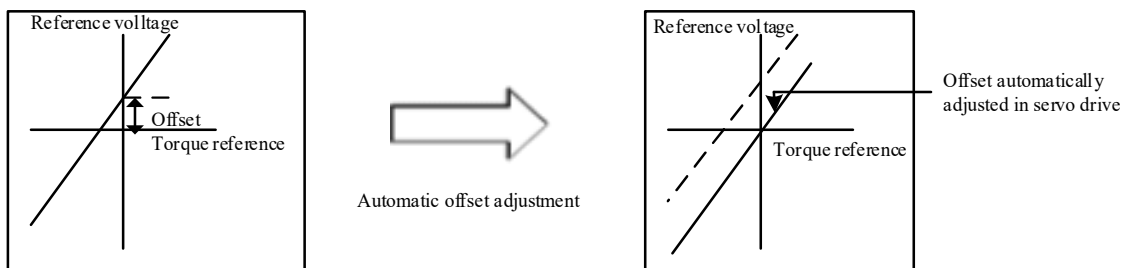
5.7.3 Adjustment of Reference Offset

(1) Auto-adjustment of torque reference offset

In the torque control mode, the servomotor may rotate at a minute speed with an analog voltage reference of 0 V. This occurs because the reference voltage of the host controller or external circuit has a minute offset of a few millivolts. In such case, the offset can be automatically or manually adjusted by panel operator.

Auto-adjustment of analog (speed · torque) or reference offset is the function for offset measurement and auto-adjustment of voltage.

In case of voltage reference offset of the host controller or in external circuit, servo driver will make following adjustment towards the automatic offset.



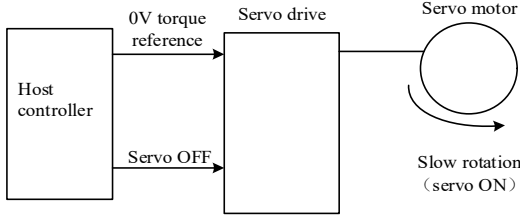





After auto-adjustment of reference offset, the value of offset will be saved in the servo driver.

Offset can be confirmed through manual adjustment of speed reference offset (F□006). When offset pulse is set as zero with the servo locked in the OFF state by the host controller equipped with a position loop, auto-adjustment of reference offset (F□008) is not available, instead, please use manual adjustment of speed reference offset (F□00A).

Under speed reference of zero, function of zero clamping speed control which can lock the servo in a mandatory manner is provided. See "Use of Zero Clamping Function" for details.

Note: Auto-adjustment of zero analog offset should be conducted when the servo is OFF.

Auto-adjustment of torque reference offset of A axis is conducted as below.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|---------------|---|
| 1 |  | | Turn OFF the servo drive, and input 0V reference voltage through host controller or external circuit. |
| 2 | Press M function key to select auxiliary function mode for A axis. In case of failing to display FA008, press UP or DOWN to set. | M |  |
| 3 | Press SET, and "rEF_o" is displayed. | SET |  |
| 4 | Press M function key to start auto-zeroing, and flickering "donE" is displayed. | M |  |
| 5 | After completion of auto-zeroing, "rEF_o" instead of flickering "donE" is displayed. | — |  |
| 6 | Press SET to return to the display of FA008. | SET |  |

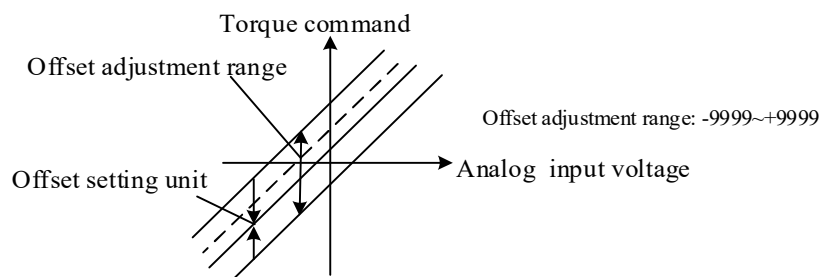
(2) Manual adjustment of torque reference offset

Manual adjustment of torque reference offset (F□007) should be applied in case that:

- the host controller is equipped with a position loop to set the offset pulse as zero when the servo is locked in the OFF state
- the offset is set as a certain value consciously
- check the offset data that was set in the auto-adjustment mode.

Basic function and auto-adjustment of analog (speed · torque) reference offset (F□008) are the same. But for manual adjustment (F□007), adjustment must be made along with direct input of offset.

Figure below shows adjustment range of offset and setting unit.



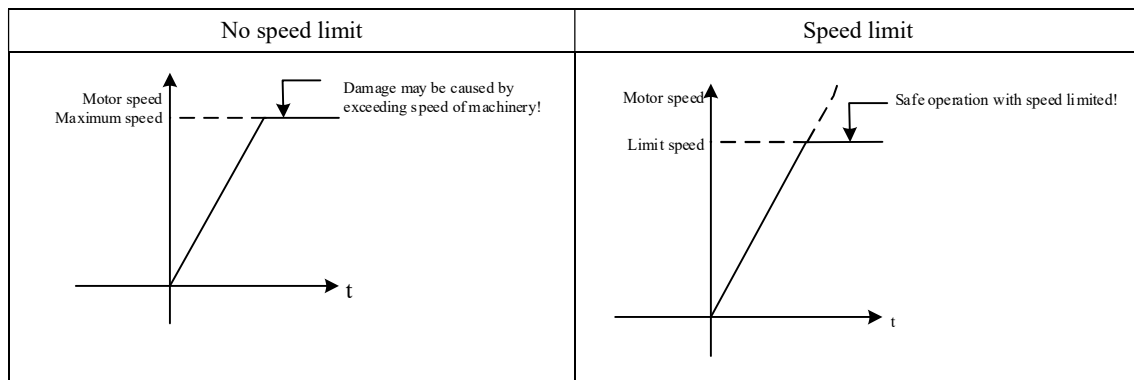
Auto-adjustment of torque reference offset of A axis is conducted as below.

| Operation steps | Operation instruction | Operation key | Display after operation |
|-----------------|--|---------------|-------------------------|
| 1 | Press M function key to select auxiliary function mode for A axis. In case of failing to display FA006, press UP or DOWN to set. | M | FA007 |
| 2 | Press SET, and "A.Tcr" is displayed. | SET | A.Tcr |
| 3 | Press SET for at least 1 s, and "0000" is displayed. | < | 0000 |
| 4 | Press UP or DOWN to set offset. | ^ v | 0083 |
| 5 | Press SET for at least 1 s to save offset. | < | A.Tcr |
| 6 | Press SET to return to the display of FA007. | SET | FA007 |

5.7.4 Speed Limit under Torque Control

Servo motor in torque control is controlled by the specified torque output, but the motor speed is not controlled. If an excessive reference torque is set for the load torque on the mechanical side, then it will exceed the torque of the machinery, which will lead to greatly increase of motor speed.

As a protective measure at the mechanical side, a function of limiting servo motor speed under torque control is provided.



(1) Selection of speed limit manner (torque limit option)

| User Parameter | Meanings |
|----------------|--|
| P□001 | H.□0□□ Value set in P□408 is used as speed limit. (Internal speed limiting function) |
| | H.□1□□ V-REF is used as external speed limit input. |

(2) Internal speed limiting function

| | | | | |
|--|-----------------------------------|--------------|-----------------|--------------|
| P□408 | Speed Limit During Torque Control | | | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 6000 | 1r/min | 1500 | Not required |
| <p>This parameter set the limit speed under torque control.</p> <p>When P□001=H.□□□□, the setting in this parameter take effect.</p> <p>The servomotor's maximum speed will be used when the setting in this parameter exceeds the maximum speed of the servomotor used.</p> | | | | |

(3) External speed limiting function

| Name | Signal | Pin No. of connector | | Name |
|---|--------|----------------------|--------|----------------------------|
| | | A axis | B axis | |
| Input | V-REF | CN3-5 | CN3-30 | External speed limit input |
| | GND | CN3-6 | CN3-31 | Signal ground |
| <p>Motor speed limit in case the torque limit is input under analog voltage reference.</p> <p>When P□001=H.□1□□, the smaller one of V-REF speed limit input and P□408 (speed limit under torque control) is the valid value.</p> <p>The setting in Pn300 determines the voltage level to be input as the limit value and it is not related to polarity.</p> | | | | |

| | | | | | | |
|-------|----------------------------|--------------|-----------------|--------------|----------|--------|
| P□300 | Speed reference input gain | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 3000 | (r/min) /V | 150 | Not required | | |

Under torque control, voltage level is set for the rotation speed for external speed limiting.
When P□300=150 (factory setting), if the voltage input to the V-REF is 6 V, the actual speed limit is 900 r/min.

Note: Principle of speed limit.

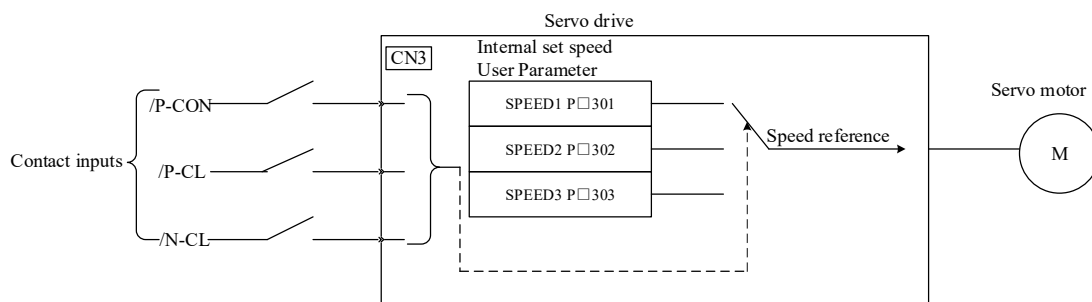
If the speed is out of the range of speed limit, it may return to the range of speed limit through negative feedback of torque proportional to the speed difference with the limited speed. Therefore, actual motor speed limit will fluctuate based on loading conditions.

5.8 Speed Control (Internal Speed Selection) Operation

- Meaning of internal set speed selection

This function allows speed control operation by externally selecting an input signal from among three servomotor speed settings made in advance with parameters in the servodrive.

There is no need to provide a speed generator or pulse generator externally.



5.8.1 User Parameter Settings for speed control with an internally set speed

| User Parameter | | Meanings |
|----------------|--------|---|
| P□000 | H.□□3□ | Selection of control manner: internal set speed control (contact reference) |

| | | | | |
|--|----------------------|--------------|-----------------|--------------|
| P□301 | Internal set speed 1 | | | Speed |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 6000 | 1r/min | 100 | Not required |
| P□302 | Internal set speed 2 | | | Speed |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 6000 | 1r/min | 200 | Not required |
| P□303 | Internal set speed 3 | | | Speed |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 6000 | 1r/min | 300 | Not required |
| Note: Even through the value set in P□301~P□303 is larger than the maximum speed of the used servo motor, the actual value is still limited to the maximum speed of the servo motor. | | | | |

5.8.2 Setting of Input Signal

| Name | Signal | Pin No. of connector | | Name |
|---|--------|----------------------|--------|--|
| | | A axis | B axis | |
| Input | /P-CON | CN3-15 | CN3-40 | Shift of rotation direction of servo motor |
| | /PCL | Need to distribute | | Selection of internal set speed |
| | /NCL | Need to distribute | | Selection of internal set speed |
| ■ As for input signal selection | | | | |
| For single-axis drive: /PCL and /NCL are respectively distributed to CN3-41 and CN3-42 when leaving factory. | | | | |
| For double-axis drive: /PCL and /NCL need to be distributed by parameter P□510. | | | | |
| Operation modes of the three input signals /P-CON, /P-CL and /N-CL are utilized (they are distributed in factory settings). | | | | |

5.8.3 Operation at Internal Set Speed

Operation is allowed through internal settings by ON/OFF combination of the following input signals.

| Input signal | | | Rotation direction of motor | |
|--------------|--------|--------|-----------------------------|--|
| /P-CON | /PCL | /NCL | | |
| OFF(H) | OFF(H) | OFF(H) | Positive rotation | Stop by the internal speed reference 0 |
| | OFF(H) | ON(L) | | P□301: internal set speed 1 (SPEED1) |
| | ON(L) | ON(L) | | P□302: internal set speed 2 (SPEED2) |
| | ON(L) | OFF(H) | | P□303: internal set speed 3 (SPEED3) |
| ON(L) | OFF(H) | OFF(H) | Negative | Stop by the internal speed reference 0 |
| | OFF(H) | ON(L) | | P□301: internal set speed 1 (SPEED1) |
| | ON(L) | ON(L) | | P□302: internal set speed 2 (SPEED2) |
| | ON(L) | OFF(H) | | P□303: internal set speed 3 (SPEED3) |

Note:

In case that the control mode is switching mode

When P□000.1 = 4, 5, 6, if the signal of either /PCL or /NCL is OFF (H level), then the control mode is shifted.

For example, P□000.1=5: when internal set speed is set to select position control (pulse train)

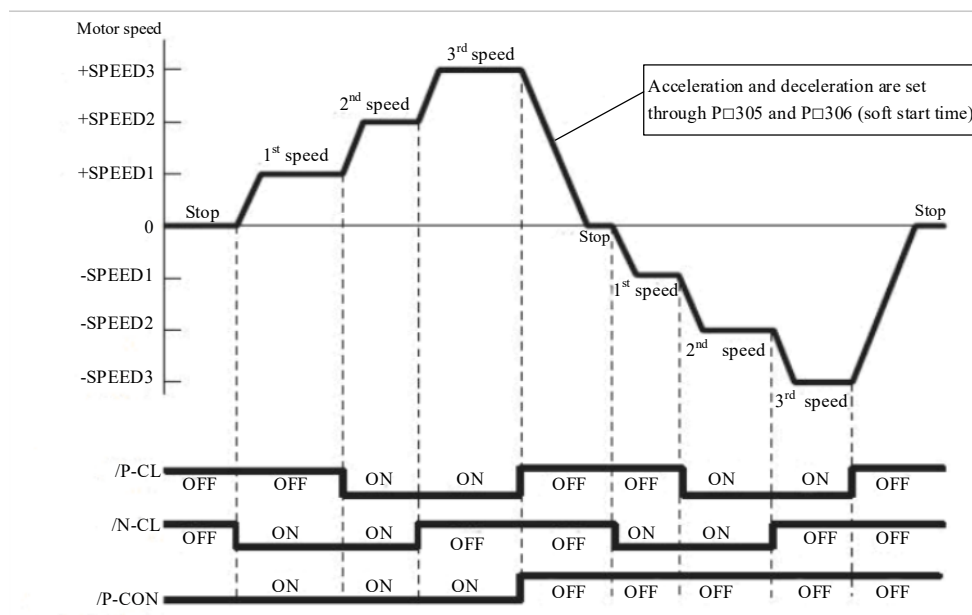
| Input signal | | Speed |
|--------------|--------|--|
| /PCL | /NCL | |
| OFF(H) | OFF(H) | Stop by the internal speed reference 0 |
| OFF(H) | ON(L) | P□301: internal set speed 1 (SPEED1) |
| ON(L) | ON(L) | P□302: internal set speed 2 (SPEED2) |
| ON(L) | OFF(H) | P□303: internal set speed 3 (SPEED3) |

Operation example based on internal speed setting selection

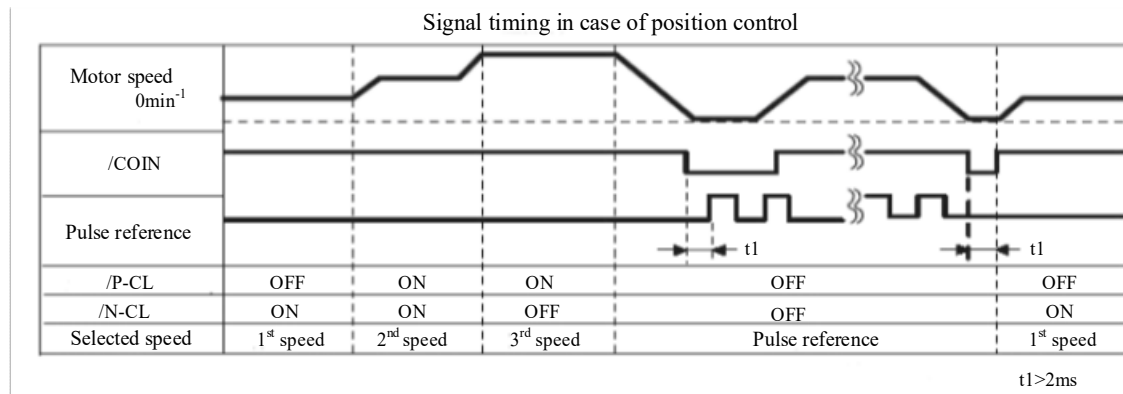
If soft start function is used, then the impact during speed shifting will decrease.

Please refer to "Soft start" for soft start.

Example: operation based on internal set speed + soft start



If "(P□000.1 = 5 internal set speed control" position control)" is set, the soft start function only works when the internal set speed is selected. The soft start function is not available when pulse reference is input. If it is shifted to pulse reference input during operation at any speed of speed 1-3, the servo drive will accept the pulse reference after output of positioning completion signal (/COIN). Please start output of pulse reference of user command controller only after output of positioning completion signal of servo drive. (Internal set speed + soft start) based <--> position control (operation example of pulse train reference)

**Note:**

1. The soft start function is used in the figure above.
2. Value of t₁ will not be affected by whether soft start function is used. Read-in of /PCL and /NCL may delay at most 2 ms.

5.9 Torque Limit

The servo driver provides the following four methods for limiting output torque to protect the machine.

| Method | Way of limit | Reference |
|--------|--|-----------|
| 1 | Internal torque limit | 5.9.1 |
| 2 | External torque limit | 5.9.2 |
| 3 | Torque limit by analog voltage reference | 5.9.3 |
| 4 | Torque limit by external torque limit + analog voltage reference | 5.9.4 |

5.9.1 Internal Torque Limit (Limitation on Output Torque Maximum Value)

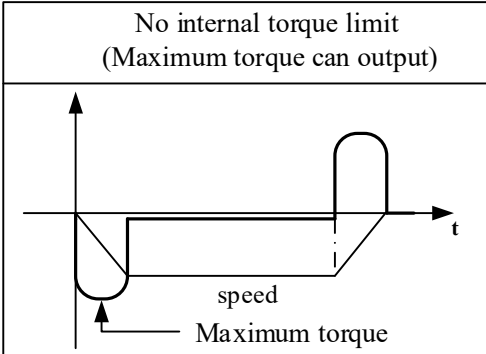
The function limits the maximum output torque through user parameters.

| | | | | | | |
|-------|-----------------------|--------------|-----------------|--------------|----------|--------|
| P□403 | Positive torque limit | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 300 | 1% | 300 | Not required | | |
| P□404 | Negative torque limit | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 300 | 1% | 300 | Not required | | |

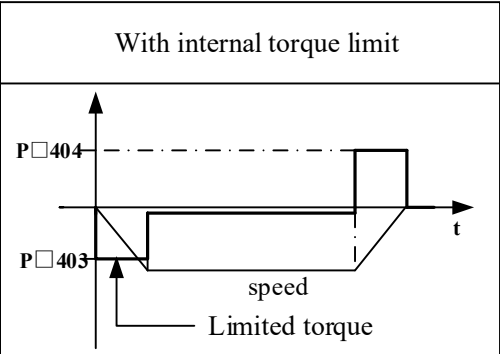
Set value of this parameter is constantly valid. Set unit corresponds to a percent (%) of motor rated torque.

Even through the value is set to exceed the maximum torque of the used servo motor, it will still be limited to be the actual maximum torque of the servo motor. Factory setting: equivalent to 300%.

No internal torque limit
(Maximum torque can output)



With internal torque limit



■ Supplement

Please note that if values of P□403 and P□404 are set to be too small, then torque may be insufficient during acceleration and deceleration of servo motor.

5.9.2 External Torque Limit (through Input Signal)

Use this function to limit torque by inputting a signal from the host controller at a specific times during machine operation, such as forced stop or hold operations for robot workpieces.

The torque limit value preset at the user parameter become valid through signal input.

(1) Related user parameter

| | | | | | | |
|--------------|-------------------------------------|--------------|-----------------|--------------|----------|--------|
| P□405 | Positive-side external torque limit | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 300 | 1% | 100 | Not required | | |
| P□406 | Negative-side external torque limit | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 300 | 1% | 100 | Not required | | |

Note: Setting unit corresponds to a percent (%) of the used servo motor rated torque. (Rated torque limits is 100%.)

(2) Input signal

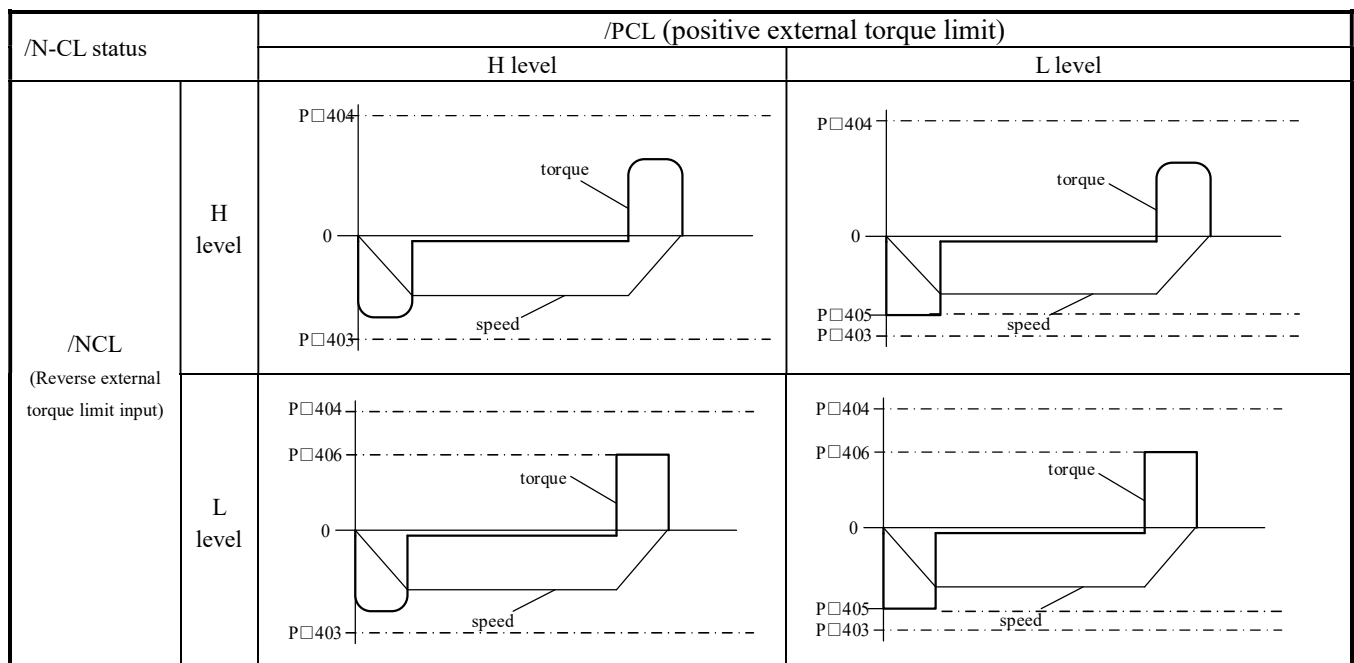
| Name | Signal | Pin No. of connector | | Set | Meanings | Limit value |
|------|--------|----------------------|--------|-----|----------|-------------|
| | | A axis | B axis | | | |

| | | | | | |
|-------|------|--|--------------|--|---|
| Input | /PCL | Different drives for single axis and double axis | ON = L Level | Positive-side external torque limit ON | The smaller value between Pn403 and Pn405 |
| | | | OFF=H Level | Positive-side external torque limit OFF | Pn403 |
| Input | /NCL | Different drives for single axis and double axis | ON = L Level | External torque limit at negative side OFF | The smaller value between Pn404 and Pn406 |
| | | | OFF=H Level | Negative-side external torque limit OFF | Pn404 |

For single-axis drive: /PCL and /NCL are respectively distributed to CN3-41 and CN3-42 when leaving factory.
For double-axis drive: /PCL and /NCL need to be distributed by parameter P□510.
When using external torque limit, please confirm whether to distribute other signals to the same terminal of /P-CL and /N-CL.
Since the logic becomes OR logic when several signals are distributed to a terminal, effects from ON/OFF of other signals distributed to the same terminal may be inevitable. Please refer to "Signal distribution of input circuit" for distribution of input signal.

(3) Changes in output torque during external torque limit

When external torque limit (P□403, P□404)=800%

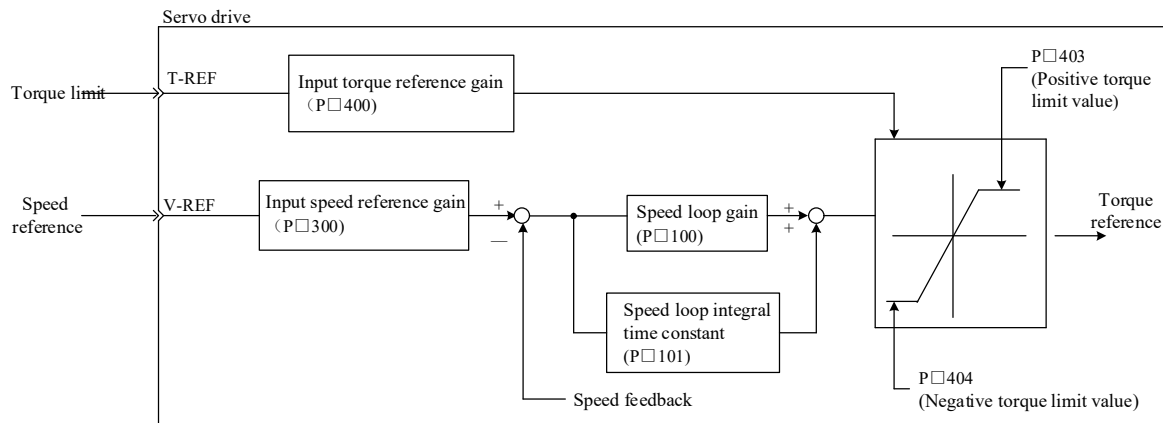


Note: Select motor rotation direction when setting P□000=H. □□□ 0 (standard setting [CCW as positive rotation direction]).

5.9.3 Torque Limit Based on Analog Voltage reference

Torque limiting by analog voltage reference limits torque by assigning a torque limit in an analog voltage to the T-REF terminals. This function can be used only during speed or position control, not during torque control.

Under speed control, the block diagram in the case of "torque limit based on analog voltage reference" is shown as below.

**Note:**

Input voltage for analog voltage reference of torque limit does not have polarity. The value is absolute value, no matter it is positive or negative, and the torque limit based on the absolute value is applicable to both positive and negative directions.

(1) Relevant user parameter

| User Parameter | Meanings |
|---|--|
| P□001 H. □□1□ | Speed control option: T-REF terminal is used as the external torque limit input. |
| If H. □□2□ is set, then T-REF terminal may also be used as the torque feed-forward input. However, please note that it cannot serve for these two input functions simultaneously. | |

(2) Input signal

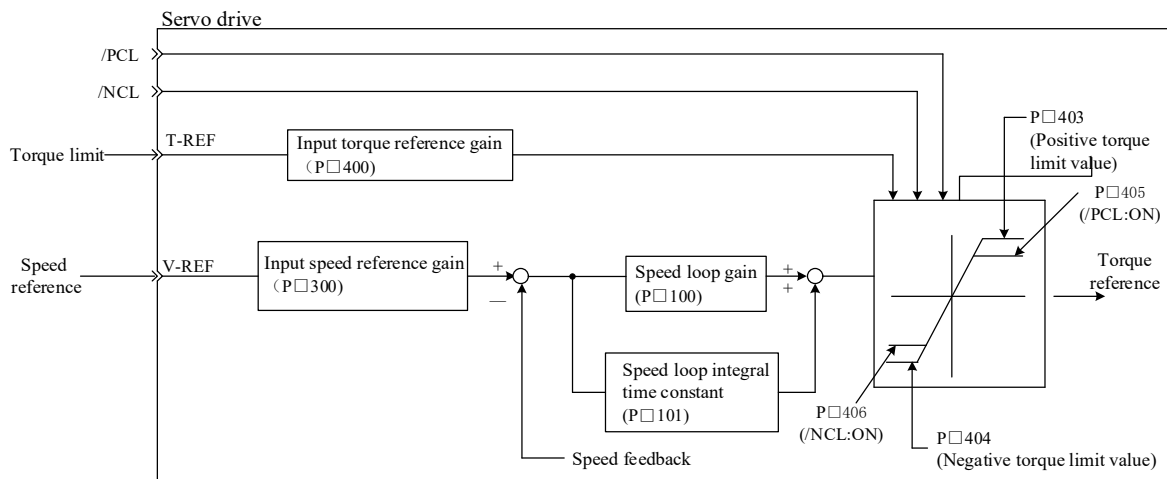
| Name | Signal | Pin No. of connector | | Name |
|--|--------|----------------------|--------|------------------------|
| | | A axis | B axis | |
| Input | T-REF | CN3-18 | CN3-30 | Torque reference input |
| | GND | CN3-25 | CN3-50 | Signal ground |
| P□400 is used to set torque reference input gain. Please refer to "Setting of user parameter". | | | | |

5.9.4 Torque Limit Based on External Torque Limit + Analog Voltage Reference

Torque limit based on external input signal and torque limit based on analog voltage reference can be used simultaneously.

For torque limit based on analog voltage reference, T-REF is used for input. Hence, it cannot work under torque control. For torque limit based on external input signal, /P-CL or /N-CL is used.

If signal of /P-CL (or /N-CL) is set to be ON, torque limit relies on the smaller one of torque limit based on analog voltage reference and the set value of P□405(or P□406).



(1) Relevant user parameter

| User Parameter | | Meanings | | | | |
|---|--|--|-----------------|--------------|----------|--------|
| P□001 | H. □□3□ | Speed control option: If /P-CL or /N-CL is valid, T-REF terminal is used as the external torque limit input. | | | | |
| If H. □□2□ is set, then T-REF terminal may also be used as the torque feed-forward input. However, please note that it cannot serve for these two input functions simultaneously. | | | | | | |
| P□405 | Positive-side external torque limit | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 300 | 1% | 100 | Not required | | |
| P□406 | External torque limit at negative side | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 300 | 1% | 100 | Not required | | |

(2) Input signal

| Name | Signal | Pin No. of connector | | Name |
|--|--------|----------------------|--------|------------------------|
| | | A axis | B axis | |
| Input | T-REF | CN3-18 | CN3-30 | Torque reference input |
| | GND | CN3-25 | CN3-50 | Signal ground |
| P□400 is used to set torque reference input gain. Please refer to "Setting of user parameter". | | | | |

| Name | Signal | Pin No. of connector | | Set | Meanings | Limit value |
|-------|--------|--|--------|--------------|--|--------------------------------------|
| | | A axis | B axis | | | |
| Input | /PCL | Different drives for single axis and double axis | | ON = L Level | Positive-side external torque limit ON | The smaller value at Pn403 and Pn405 |
| | | | | OFF=H Level | Positive-side external torque limit OFF | Pn403 |
| Input | /NCL | Different drives for single axis and double axis | | ON = L Level | External torque limit at negative side OFF | The smaller value in Pn404 and Pn406 |
| | | | | OFF=H Level | Negative-side external torque limit OFF | Pn404 |

For single-axis drive: /PCL and /NCL are respectively distributed to CN3-41 and CN3-42 when leaving factory.

For double-axis drive: /PCL and /NCL need to be distributed by parameter P□510.

When using external torque limit + torque limit based on analog voltage reference, please confirm whether to distribute other signals to the terminal same to /P-CL and /N-CL.

Since the logic becomes OR logic when several signals are distributed to a terminal, affect from ON/OFF of other signals distributed to the same terminal may be inevitable. Please refer to "Signal distribution of input circuit" for distribution of input signal.

5.9.5 Confirmation under Input Torque Limit

| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|--|--------|-----------------------------------|--------|---------------|--------------------------------------|
| | | A axis | B axis | | |
| Output | /CLT | Need to distribute | | ON = L Level | Motor input torque is under limiting |
| | | | | OFF = H Level | Not torque limit status |
| To use the signal in case of motor output torque limit, it is necessary to distribute output terminal through user parameter P□514. Please refer to "Signal distribution of output circuit". | | | | | |

5.10 Control Mode Selection

The servo drive can be used with various control modes for shifting. The shifting method and conditions are described as follows.

5.10.1 User Parameter Setting

Control mode can be any of the following combination. Please select based on customers' usage.

| User Parameter | | Meanings |
|----------------|---------|---|
| P□000 | H. □□4□ | Internal set speed control (contact reference) ↔ Speed control (analog reference) |
| | H. □□5□ | Internal set speed control (contact reference) ↔ Position control (pulse train reference) |
| | H. □□6□ | Internal set speed control (contact reference) ↔ Torque control (analog reference) |
| | H. □□7□ | Position control (pulse train reference) ↔ Speed control (analog reference) |
| | H. □□8□ | Position control (pulse train reference) ↔ Torque control (analog reference) |
| | H. □□9□ | Torque control (analog reference) ↔ Speed control (analog reference) |
| | H. □□A□ | Speed control (analog reference) ↔ Zero clamping |
| | H. □□B□ | Position control (pulse train reference) ↔ Position control (pulse prohibited) |

5.10.2 Shift of Control Mode

(1) Shift between internal set speed control (P□00.1 = 4, 5, 6)

| Name | Signal | Pin No. of connector | | Set | Meanings |
|---|--------|--|--------|---------------|-----------------------|
| | | A axis | B axis | | |
| Input | /PCL | Different drives for single axis and double axis | | OFF = H Level | Shift of control mode |
| Input | /NCL | Different drives for single axis and double axis | | OFF = H Level | |
| For single-axis drive: /PCL and /NCL are respectively distributed to CN3-41 and CN3-42 when leaving factory. For double-axis drive: /PCL and /NCL need to be distributed by parameter P□510. | | | | | |

(2) Shift beyond internal speed control (P□000.1=7, 8, 9, A, B)

Please use the following signal shift control mode. Conduct the following control mode shift based on signal status.

| Name | Signal | Pin No. of connector | | Set | Setting of P□000 | | | | |
|-------|--------|----------------------|--------|---------------|------------------|----------|---------|---------------|------------|
| | | A axis | B axis | | H.□□7□ | H. □□8□ | H. □□9□ | H. □□A□ | H. □□B□ |
| Input | /PCON | CN3-15 | CN3-40 | ON = L Level | Speed | Torque | Speed | Zero clamping | Prohibited |
| | | | | OFF = H Level | Position | Position | Torque | Speed | Position |

5.11 Other Output Signal

Describe other signals that can be output, although they have no direct relationship with various control manners.

5.11.1 Servo Alarm Output (ALM)

(1) Servo alarm output (ALM)

Refer to signals output when the servo drive detects any abnormalities.

| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|--|--------|--------------------------------|--------|---------------|------------------------------|
| | | A axis | B axis | | |
| Output | ALM | CN3-7 | CN3-32 | ON = L Level | Normal status of servo drive |
| | | CN3-8 | CN3-33 | OFF = H Level | Alarm status of servo drive |
| ■Attentions | | | | | |
| If constituting an external circuit, it is necessary to ensure the main circuit power supply of servo drive is set to be OFF when the alarm is output. | | | | | |

(2) Reset alarm

| Name | Signal | Pin No. of connector (factory) | | Name |
|---|----------|--|--------|------|
| | | A axis | B axis | |
| Input | /ALM-RST | Different drives for single axis and double axis | | |
| For single-axis drive: /PCL and /NCL are respectively distributed to CN3-41 and CN3-42 when leaving factory. For double-axis drive: /PCL and /NCL need to be distributed by parameter P□510. This signal may be distributed to other pin number through user parameter P□510. Please refer to "Signal distribution of input circuit" for detailed procedures. /ALM-RST signal is set based on distribution of external input signal, so it cannot be set to be "constantly valid". Please use the action of setting level from H to L to reset alarm. In case of "servo alarm (ALM)", finish troubleshooting and set this signal (/ALM-RST) from OFF (H level) to ON (L level) to reset to alarm status. In addition, alarm reset can also be done through panel operator or digital operator. Please refer to "Name and function of key". | | | | |

Note:

1. Sometimes alarms related encoder cannot reset after /ARM-RST signal input. In such cases, please cut down control power supply to reset.
2. In case of alarm, please reset only after troubleshooting.
 Troubleshooting methods for alarms are described in the "Alarm displays and treatment measures".

5.11.2 Rotation Detection Output (/TGON)

| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|---|--------|--------------------------------|--------|---------------|--|
| | | A axis | B axis | | |
| Output | /TGON | CN3-11 | CN3-36 | ON = L Level | Servo motor is rotating (motor speed is larger than the set value of P□502) |
| | | CN3-12 | CN3-37 | OFF = H Level | Servo motor stops rotating (motor speed is larger than the set value of P□502) |
| <div>■Attentions</div> <div>When brake signal (/BK) and rotation detection signal (/TGON) are distributed to the same output terminal, /TGON signal is changed to L level, but /BK signal may cannot change to H level. (The reason is that OR logic prevails for output when several output signals are distributed to the same output terminal) Please distribute (/TGON) signal and (/BK) signal to other terminals.</div> | | | | | |

5.11.3 Servo Ready Output (/S-RDY)

| Name | Signal | Pin No. of connector (factory) | | Set | Meanings |
|---|--------|--------------------------------|--------|---------------|------------------------|
| | | A axis | B axis | | |
| Output | /S-RDY | Need P□513 for distribution | | ON = L Level | Servo ready status |
| | | | | OFF = H Level | Servo not ready status |
| Indicate that servo unit is under the status ready for servo ON signal reception. | | | | | |
| Output when the main circuit power supply is ON and under the status of no servo alarm. | | | | | |

5.12 Mode Motion Sequence Manner

The Product supports 15 data sets that can set parameters in the parameter manner, 32 data sets that can set parameters in the communication manner. These data sets can start up independently or in sequence.

Data sets that can set parameters contain the setting about data set types and the setting of related goal value and subsequent data sets.

The following motion types are available in motion type:

- Invalid motion (null data)
- Absolute motion
- Relative motion

Data sets can start up through 2 different manners.

- Start up a single data set

For startup of a single data set, only the selected data set starts up. No other data sets will start up upon successful execution of the data set. Time coordination among several data sets is then completed through main control system (e.g. PLC).

- Start up a data set sequence (several data sets in sequence)

For startup of a sequence, the selected data set will start up first. When a data set is executed successfully and the transitional conditions are fulfilled, subsequent data sets will then start up. Time coordination among several data sets is then completed through the product.

5.12.1 Single Data Set Manner

In the single data set manner, 15 sets of internal motion tasks are available. Mode of motion can be incremental or absolute.

(1) Setting of user parameter

| User Parameter | | Meanings |
|----------------|--------|--|
| P□000 | H.□□C□ | Selection of control mode: mode motion sequence manner |
| P□764 | H.□□□0 | Selection of data set startup manner: single data set manner |

| | | | | |
|--|-----------------------------|-----------------------|-----------------|--------------|
| P□700 | Type of data set 0 | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 2 | --- | 0 | Required |
| 0: Data set is invalid. 1: The data set is an absolute movement. 2: The data set for the relative movement. | | | | |
| P□701 | Low position of data set 0 | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | -9999 ~ +9999 | 1-reference pulse | 0 | Required |
| P□702 | High position of data set 0 | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | -9999 ~ +9999 | 10000-reference pulse | 0 | Required |
| P□703 | Speed of data set 0 | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 6000 | 1r/min | 0 | Required |
| 1、Data set 1 parameters P□708 ~ P□711; Data set 2 parameters P□716 ~ P□719; Data set 3 parameters P□724 ~ P□727; Data set 4 parameters P□732 ~ P□735; Data set 5 parameters P□740 ~ P□743; Data set 5 parameters P□748 ~ P□751; Data set 7 parameters P□756 ~ P□759。 | | | | |

| | | | | |
|--------------|---|--------------|-----------------|--------------|
| P□765 | Acceleration of data set | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 60000 | 10r/min/s | 10000 | Required |
| P□766 | Deceleration of data set | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 60000 | 10r/min/s | 10000 | Required |
| P□767 | Emergency deceleration of data set | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 60000 | 10r/min/s | 60000 | Required |
| P□768 | Electronic gear of data set (numerator) | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 65535 | --- | 2 | Required |
| P□769 | Electronic gear of data set (denominator) | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 65535 | --- | 1 | Required |

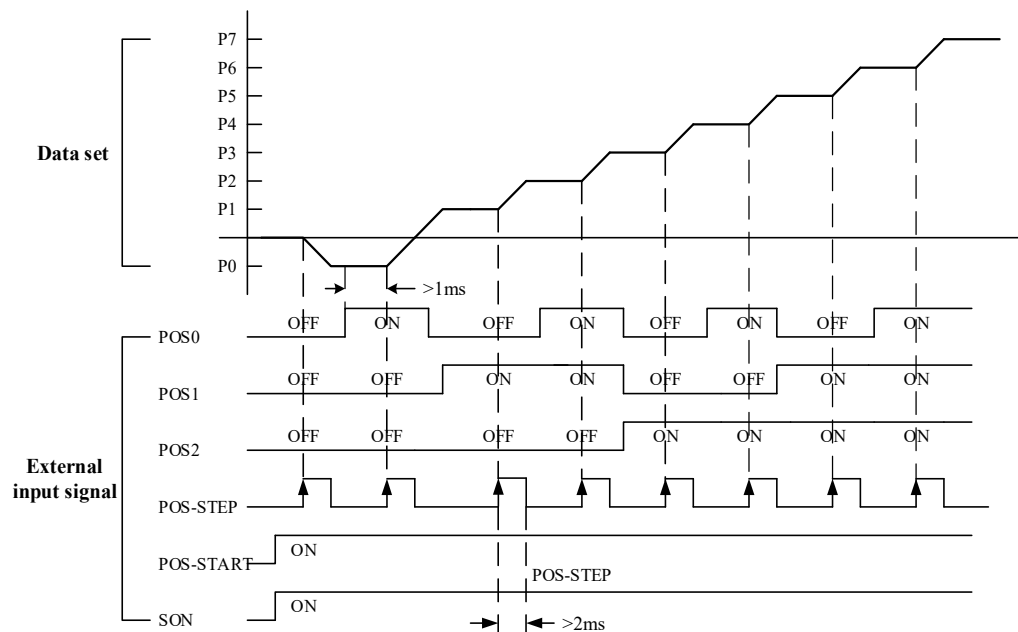
(2) Setting of input signal

| Name | Signal | Pin No. of connector | | Name |
|--|------------|-----------------------------|--------|---|
| | | A axis | B axis | |
| Input | /POS-START | Need P□512 for distribution | | Startup signal of mode motion sequence |
| Input | /POS-STEP | Need P□512 for distribution | | Step change signal of mode motion sequence |
| Input | /POS0 | Need P□511 for distribution | | Option switch 0 signal of data sets in mode motion sequence |
| Input | /POS1 | Need P□511 for distribution | | Option switch 1 signal of data sets in mode motion sequence |
| Input | /POS2 | Need P□511 for distribution | | Option switch 2 signal of data sets in mode motion sequence |
| Input | /PCON | Need P□509 for distribution | | Option switch 3 signal of data sets in mode motion sequence |
| In the single data set manner, when /POS-START signal is ON, the motor is allowed to operate; when it is OFF, the motor stops operation. | | | | |

For input signals (/POS-START, /POS-STEP, /POS0, /POS1, /POS2, /PCON), any of the 15 data sets are available for selection as the current data set to be executed. The data sets are as follows:

| Data set | /POS2 | /POS1 | /POS0 | /POS-START | /POS-STEP | Corresponding parameter |
|-----------|-------|-------|-------|------------|-----------|-------------------------|
| P0 | OFF | OFF | OFF | ON | ↑ | P□700 ~ P□703 |
| P1 | OFF | OFF | ON | ON | ↑ | P□708 ~ P□711 |
| P2 | OFF | ON | OFF | ON | ↑ | P□716 ~ P□719 |
| P3 | OFF | ON | ON | ON | ↑ | P□724 ~ P□727 |
| P4 | ON | OFF | OFF | ON | ↑ | P□732 ~ P□735 |
| P5 | ON | OFF | ON | ON | ↑ | P□740 ~ P□743 |
| P6 | ON | ON | OFF | ON | ↑ | P□748 ~ P□751 |
| P7 | ON | ON | ON | ON | ↑ | P□756 ~ P□759 |

Sequence diagram of input signals and data sets is as below:



5.12.2 Data Set Sequence Mode

The data set sequence manner supports 8 data sets in the parameter manner and 32 data sets in the communication manner. Mode of motion can be incremental or absolute.

(1) Setting of user parameter

| User Parameter | | Meanings |
|----------------|--------|--|
| P□000 | H.□□C□ | Selection of control mode: mode motion sequence manner |
| P□764 | H.□□0 | Selection of data set startup manner: single data set manner |

| | | | | |
|--|--------------------|--------------|-----------------|--------------|
| P□700 | Type of data set 0 | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 2 | --- | 0 | Required |
| 0: data set is invalid 1: data set is in absolute motion 2: data set is in relative motion | | | | |

| User Parameter | | Meanings |
|----------------|--------|---|
| P□704 | H.□□□0 | No step change condition, directly start up subsequent data sets; 2nd step change condition invalid. |
| | H.□□□1 | Delay step change, with delay time as "step change condition value 1" in the data set |
| | H.□□□2 | Pulse edge step change, with "step change condition value 1" in the data set determining validity of rising edge or falling edge. |
| | H.□□□3 | Level step change, with "step change condition value 1" in the data set determining validity of rising edge or falling edge. |

| User Parameter | | Meanings |
|----------------|--------|---|
| P□704 | H.□□0□ | No step change condition, directly start up subsequent data sets. |
| | H.□□1□ | No step change condition, directly start up subsequent data sets. |
| | H.□□2□ | Pulse edge step change, with "step change condition value 2" in the data set determining validity of rising edge or falling edge. |
| | H.□□3□ | Level step change, with "step change condition value 2" in the data set determining validity of rising edge or falling edge. |

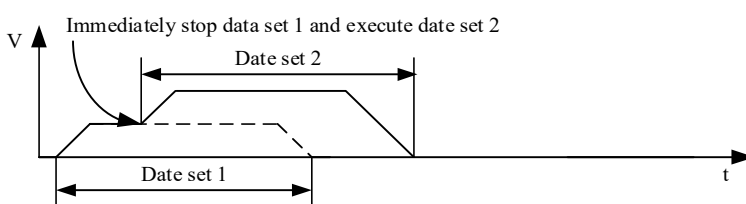
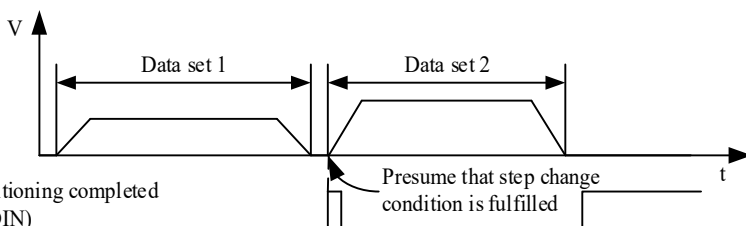
| | | | | |
|--|---|----------|-----------------|--------------|
| P□705 | Step change condition value of data set 0 | | | Position |
| | Set range | Set unit | Factory setting | Power reboot |
| | 0 ~ 65535 | --- | 0 | Required |
| The parameter significance depends on the types of data set step change condition 1, as below: <ul style="list-style-type: none"> • No step change condition <ul style="list-style-type: none"> — Insignificant • Delay step change <ul style="list-style-type: none"> — Delay time 0 ~ 65535, unit: ms • Pulse edge step change <ul style="list-style-type: none"> — Value 0: rising edge step change — Value 1: falling edge step change — Value 2: rising edge or falling edge step change — Other value: invalid • Pulse edge step change <ul style="list-style-type: none"> — Value 3: H level step change — Value 4: L level step change — Other value: invalid | | | | |

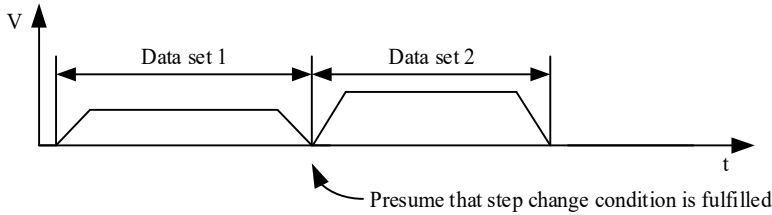
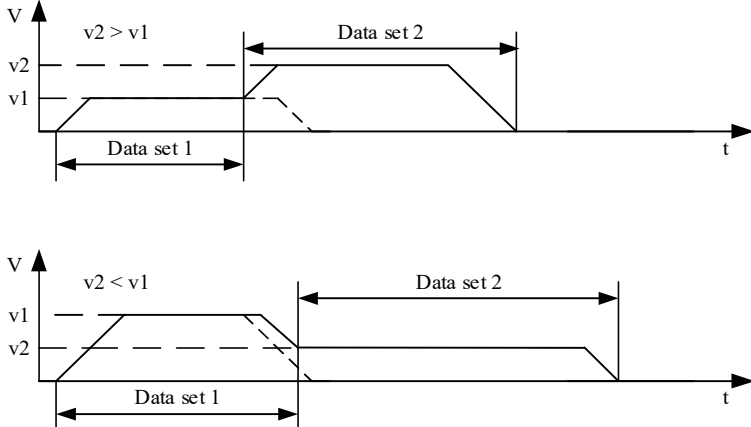
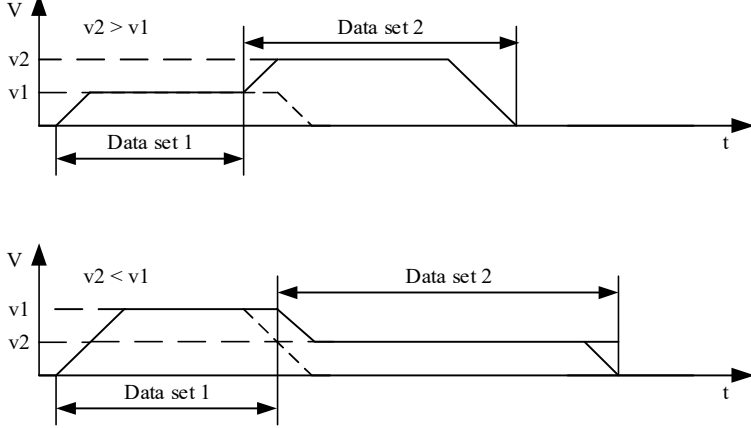
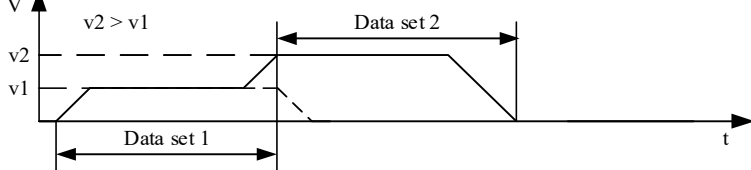
| | | | | |
|--------------|---|----------|-----------------|--------------|
| P□706 | Step change condition value of data set 2 | | | Position |
| | Set range | Set unit | Factory setting | Power reboot |
| | 0 ~ 65535 | — | 0 | Required |

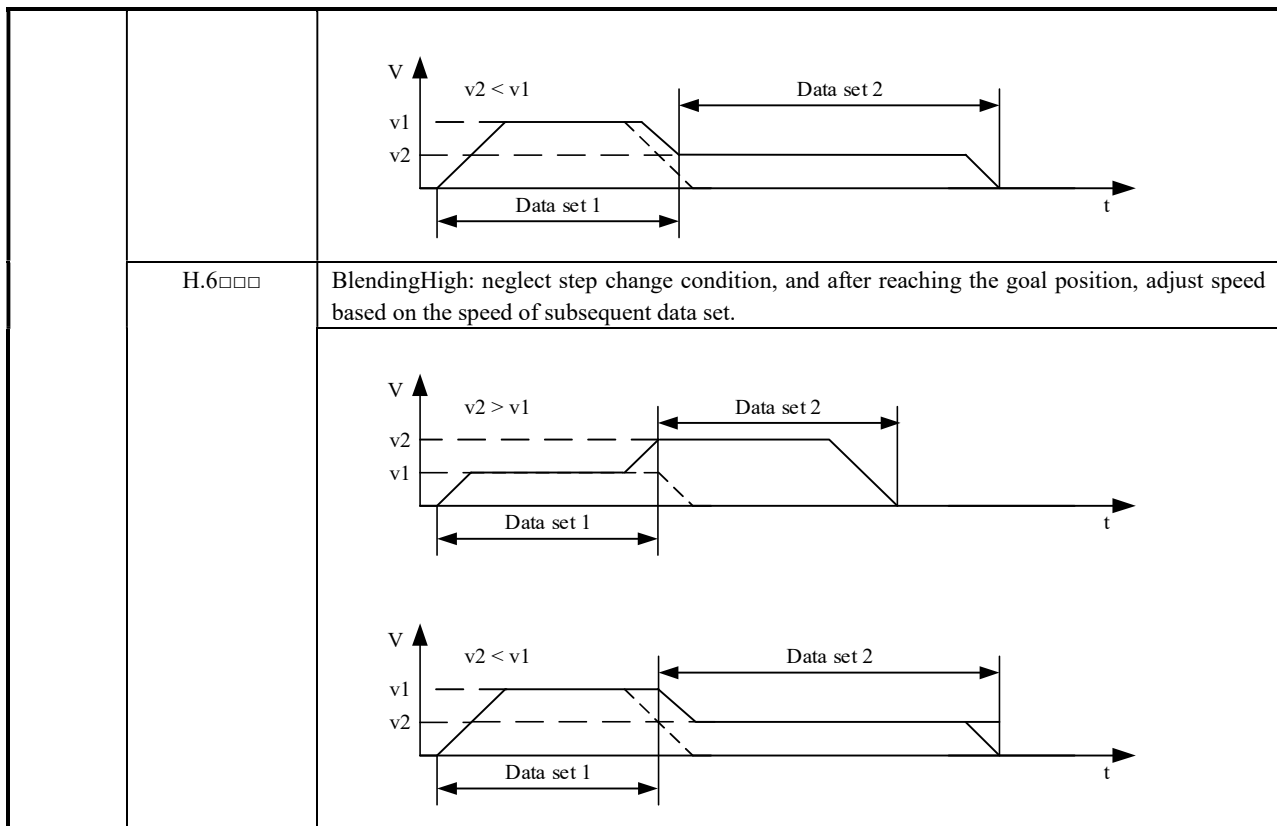
The parameter significance depends on the types of data set step change condition 2, as below:

- No step change condition
 - Insignificant
- Delay step change
 - Delay time 0 ~ 65535, unit: ms
- Pulse edge step change
 - Value 0: rising edge step change
 - Value 1: falling edge step change
 - Value 2: rising edge or falling edge step change
 - Other value: invalid
- Pulse edge step change
 - Value 3: H level step change
 - Value 4: L level step change
 - Other value: invalid

| User Parameter | | Meanings |
|----------------|--------|---|
| P□704 | H.□0□□ | No conjunction, step change condition 2 invalid |
| | H.□1□□ | "And" conjunction between condition 1 and 2. |
| | H.□2□□ | "Or" conjunction between condition 1 and 2. |

| User Parameter | | Meanings |
|----------------|--------|--|
| P□705 | H.0□□□ | <p>Aborting: neglect step change condition, immediately interrupt motion, and start up subsequent data sets.</p>  <p>The graph shows velocity (V) on the y-axis and time (t) on the x-axis. Data set 1 is a trapezoidal pulse. At its end, the velocity drops sharply to zero, and Data set 2 begins immediately. A label 'Immediately stop data set 1 and execute data set 2' points to the transition point.</p> |
| | H.1□□□ | <p>Standard: when the current motion is in place and the step change condition is fulfilled, start up subsequent data sets.</p>  <p>The graph shows velocity (V) on the y-axis and time (t) on the x-axis. Data set 1 is a trapezoidal pulse. After it ends, the velocity remains at zero for a period. A label 'Positioning completed (COIN)' points to the end of Data set 1. Then, after a delay, Data set 2 begins. A label 'Presume that step change condition is fulfilled' points to the start of Data set 2.</p> |
| | H.2□□□ | <p>Standard: after reaching the goal position and if the step change condition is fulfilled, start up subsequent data sets.</p> |

| | | |
|--------|--|---|
| | |  <p>Presume that step change condition is fulfilled</p> |
| H.3□□□ | BlendingLow: neglect step change condition, and after reaching the goal position, adjust speed based on the speed of subsequent data set. |  |
| H.4□□□ | BlendingPrevious: neglect step change condition, and after reaching the goal position, adjust speed based on the speed of subsequent data set. |  |
| H.5□□□ | BlendingNext: neglect step change condition, and after reaching the goal position, adjust speed based on the speed of subsequent data set. |  |



| P□707 | Subsequent data set number after data set 0 | | | Position |
|--|---|--------------|-----------------|--------------|
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 7 | 1r/min | 0 | Required |
| 1、Data set 1 parameters P□708 ~ P□715; Data set 3 parameters P□724 ~ P□731; Data set 5 parameters P□740 ~ P□747; Data set 7 parameters P□756 ~ P□763。 | | | | |
| Data set 2 parameters P□716 ~ P□713; Data set 4 parameters P□732 ~ P□739; Data set 6 parameters P□748 ~ P□755; | | | | |

| | | | | |
|--------------|---|--------------|-----------------|--------------|
| P□765 | Acceleration of data set | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 60000 | 10r/min/s | 10000 | Required |
| P□766 | Deceleration of data set | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 60000 | 10r/min/s | 10000 | Required |
| P□767 | Emergency deceleration of data set | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 60000 | 10r/min/s | 60000 | Required |
| P□768 | Electronic gear of data set (numerator) | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 65535 | — | 2 | Required |
| P□769 | Electronic gear of data set (denominator) | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 1 ~ 65535 | — | 1 | Required |

(2) Setting of input signal

| Name | Signal | Pin No. of connector | | Name |
|--|------------|-----------------------------|--------|--|
| | | A axis | B axis | |
| Input | /POS-START | Need P□512 for distribution | | Startup signal of mode motion sequence |
| Input | /POS-STEP | Need P□512 for distribution | | Step change signal of mode motion sequence |
| When /POS-START signal is from OFF → ON, the motor is allowed to operate; when it is OFF, the motor stops operation. | | | | |
| ■Attentions | | | | |
| Every time after servo is OFF (or alarm is solved) and before data set sequence is rerun, it is necessary to set /POS-START signal from ON to OFF and then ON so as to start up load data set. | | | | |

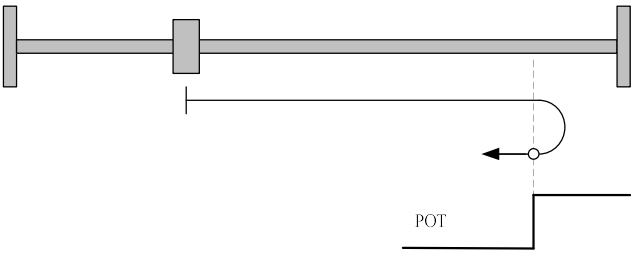
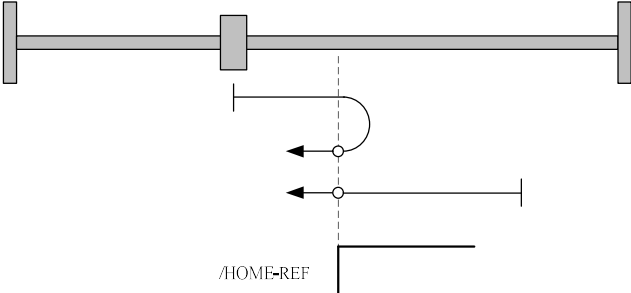
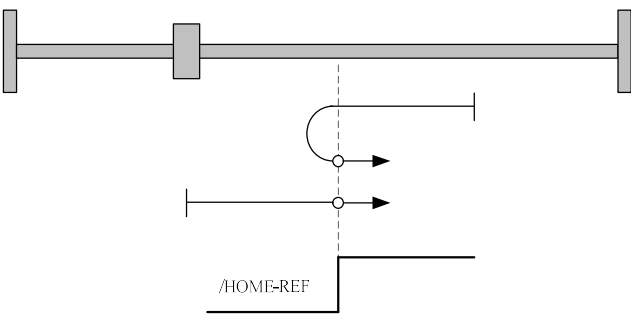
5.12.3 Operation of Seeking Reference Point (Return to Zero)

Zero point can also be determined through reference point and it is the reference point in the absolute motion in mode motion sequence manner.

(1) Setting of user parameter

| User Parameter | | Meanings |
|----------------|--------|--|
| P□770 | H.□□□0 | Current position is zero point |
| | H.□□□1 | For on-off operation of seeking NOT in the negative direction, C pulse is required |

| | | |
|--------|--|--|
| | | |
| H.□□□2 | For on-off operation of seeking POT in the negative direction, C pulse is required | |
| H.□□□3 | For on-off operation of seeking reference point in the negative direction, C pulse is required | |
| H.□□□4 | For on-off operation of seeking reference point in the positive direction, C pulse is required | |
| H.□□□5 | For on-off operation of seeking NOT in the negative direction, C pulse is not required | |

| | | |
|-------|--------|--|
| | H.□□□6 | For on-off operation of seeking POT in the negative direction, C pulse is not required |
| | |  |
| | H.□□□7 | For on-off operation of seeking reference point in the negative direction, C pulse is not required |
| | |  |
| | H.□□□8 | For on-off operation of seeking reference point in the positive direction, C pulse is not required |
| | |  |
| P□770 | H.0□□□ | Not return to zero automatically after power-on. |
| | H.1□□□ | After power-on, return to zero automatically after 1st servo is enabled, with the return to zero manner determined by P□770.0. |

| | | | | |
|--------------|---------------------------------------|--------------|-----------------|--------------|
| P□771 | On-off speed to meet reference point | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 6000 | 1r/min | 100 | Required |
| P□772 | On-off speed to leave reference point | | | Position |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 6000 | 1r/min | 30 | Required |

(2) Setting of input signal

| Name | Signal | Pin No. of connector | | Name |
|-------|------------|-----------------------------|--------|--|
| | | A axis | B axis | |
| Input | /POS-START | Need P□512 for distribution | | Startup signal of mode motion sequence |
| Input | /HOME-REF | Need P□512 for distribution | | Zero reference on-off |

| | | | |
|--|-----------------|-----------------------------|--|
| Input | /POS-START-HOME | Need P□512 for distribution | Start return to zero operation and seek for zero point as per P□770.0 setting. |
| When /POS-START signal is ON, the motor is allowed to operate (return to zero allowed); when it is OFF, the motor suspends operation (return to zero suspended). | | | |

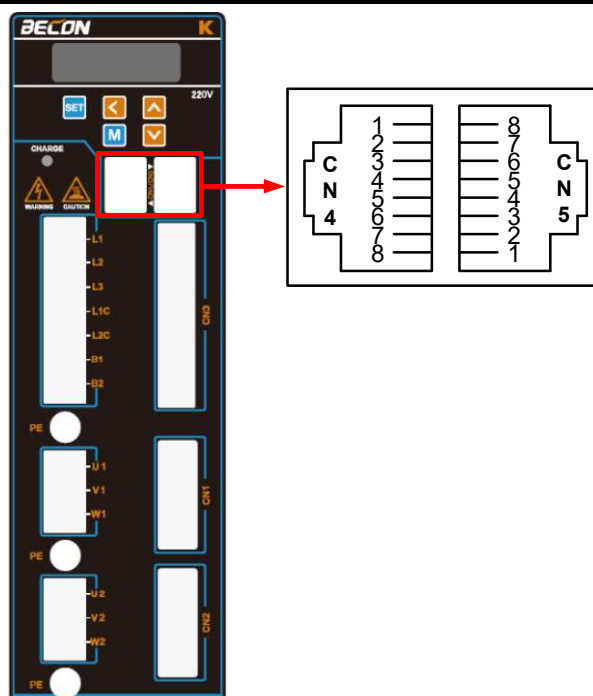
Chapter VI Communication

ZSD-K servo drives are equipped with standard MODBUS communication of RS485 interface and optional CANopen of CAN interface (conforming to DS301 and DS402 standard protocols). The Chapter mainly describes MODBUS communication.

6.1 Communication Wiring

Signal name and functions of communication connector are as follows:

| Terminal No. | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|--------------|-----|-------|------|-----|-----|--------|--------|-----------------------------|----------|
| Name | CN4 | CANH- | CANL | GND | GND | RS485+ | RS485- | Reserved | Reserved |
| | CN5 | CANH- | CANL | GND | GND | RS485+ | RS485- | Built-in 120 ohm resistance | |



Servo drive CN4 always acts as communication cable input terminal and CN5 always as communication cable output terminal. Wiring diagram of several servo drives are as follows:

6.2 User Parameter

| User Parameter | | Meanings |
|----------------|--------|--|
| P□600 | H.□□□0 | RS485 communication baud rate: 4800 bps |
| | H.□□□1 | RS485 communication baud rate: 9600 bps |
| | H.□□□2 | RS485 communication baud rate: 19200 bps |
| | H.□□□3 | RS485 communication baud rate: 38460 bps |
| | H.□□□4 | RS485 communication baud rate: 57600 bps |
| P□600 | H.□□0□ | ASCII, 7 data bits, no parity, 2 stop bits |
| | H.□□1□ | ASCII, 7 data bits, even parity bit, 1 stop bits |
| | H.□□2□ | ASCII, 7 data bits, odd parity bit, 1 stop bits |

| | |
|--------|--|
| H.□□3□ | ASCII, 8 data bits, no parity, 2 stop bits |
| H.□□4□ | ASCII, 8 data bits, even parity bit, 1 stop bits |
| H.□□5□ | ASCII, 8 data bits, odd parity bit, 1 stop bits |
| H.□□6□ | RTU, 8 data bits, no parity, 2 stop bit |
| H.□□7□ | RTU, 8 data bits, even parity bit, 1 stop bit |
| H.□□8□ | RTU, 8 data bits, odd parity bit, 1 stop bit |

| | | | | | | |
|---|-----------------------------------|--------------|-----------------------|--------------|----------|--------|
| P□601 | RS-485 communication axis address | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 1 ~ 127 | —— | 1 (A axis),2 (b axis) | Required | | |
| P□602 | RS-485 communication timeout | | | Speed | Position | Torque |
| | Setting range | Setting unit | Factory setting | Power reboot | | |
| | 0 ~ 1000 | 100ms | 0 | Not required | | |
| <ul style="list-style-type: none">• When P□602 is set to be zero, shut down communication timeout detection;• WhenP□602 is set to be larger than zero, indicate that communication shall be done within a set time, or else communication error will appear. For example, if P□602 is set to be 50, indicate that one time of communication with servo drive every 5 seconds is necessary. | | | | | | |

6.3 MODBUS Communication Protocol

In case of RS-485 communication, every servo drive must have parameters P□600 ~ P□601 preset.

In case of MODBUS protocol for communication, the following two modes are available:

ASCII mode

RTU mode.

The following is the description of MODBUS communication.

■ Code meaning

ASCII mode:

Every 8-bit datum consists of two ASCII characters. For example, one 1-byte datum 64_H (sexadecimal notation). ASCII code "64" indicates it includes ASCII code (36_H) of '6' and ASCII code (34_H) of '4'. ASCII codes of digits 0-9 and alphabets A-F are as shown in the table below:

| | | | | | | | | |
|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Character symbol | '0' | '1' | '2' | '3' | '4' | '5' | '6' | '7' |
| Corresponding ASCII code | 30 _H | 31 _H | 32 _H | 33 _H | 34 _H | 35 _H | 36 _H | 37 _H |
| Character symbol | '8' | '9' | 'A' | 'B' | 'C' | 'D' | 'E' | 'F' |
| Corresponding ASCII code | 38 _H | 39 _H | 41 _H | 42 _H | 43 _H | 44 _H | 45 _H | 46 _H |

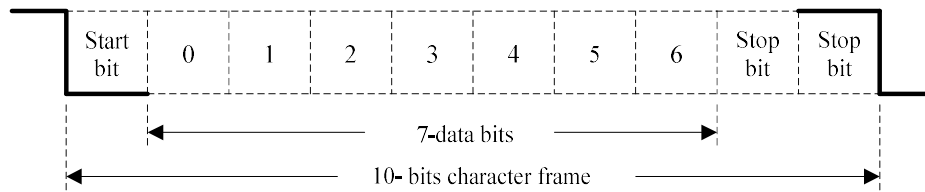
RTU mode:

Every 8-bit datum consists of two 4-bit sexadecimal data. For instance, decimal 100 presents to be 64_H when using 1-byte RTU data.

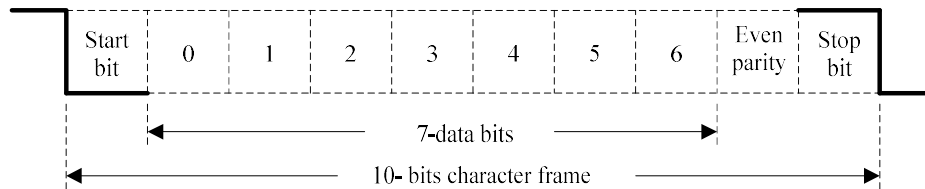
■ Character structure

10 bit character format (for 7-bit data)

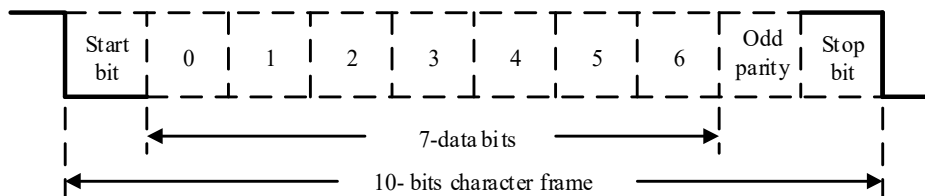
7, N, 2 (Modbus, ASCII)



7, E, 1 (Modbus, ASCII)



7, O, 1 (Modbus, ASCII)

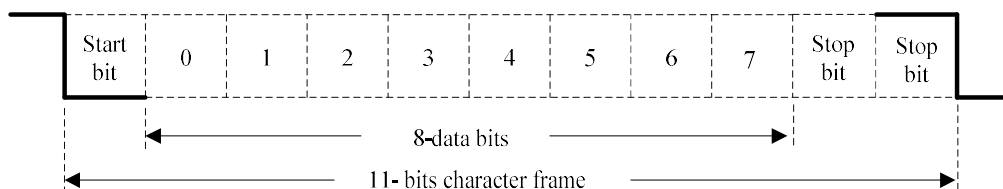


11

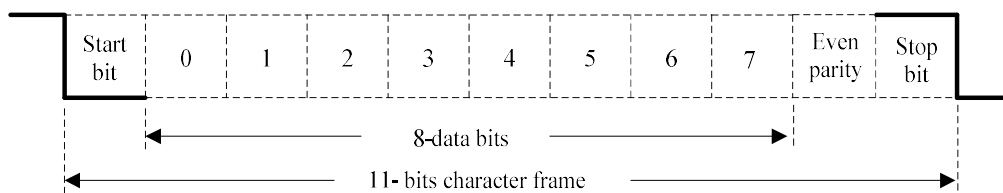
character format (for 8-bit data)

bit

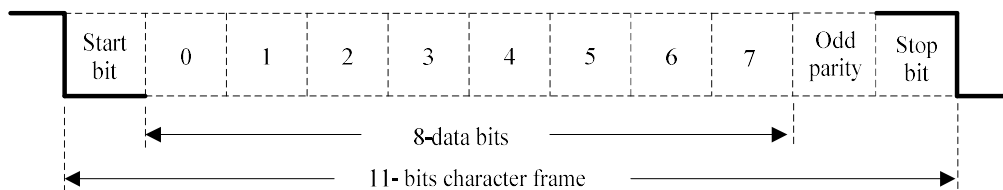
8, N, 2 (Modbus, ASCII/RTU)



8, E, 1 (Modbus, ASCII/RTU)



8, O, 1 (Modbus, ASCII/RTU)



■ Communication data structure

ASCII mode:

| | |
|-----------|--|
| STX | Beginning character ':' => (3A _H) |
| ADR | Communication address => 1-byte includes 2 ASCII codes |
| CMD | Command code => 1-byte includes 2 ASCII codes |
| DATA(n-1) | Data content => n-word=2n-byte includes 4n ASCII codes ($n \leq 12$) |
| ... | |
| DATA(0) | |
| LRC | Check code => 1-byte includes 2 ASCII codes |
| End 1 | End code 1 => (0D _H) (CR) |
| End 0 | End code 0 => (0A _H) (LF) |

RTU mode:

| | |
|-----------|---|
| STX | Rest time of at least four-byte transmission time |
| ADR | Communication address => 1-byte |
| CMD | Command code => 1-byte |
| DATA(n-1) | Data content => n-word=2n-byte, $n \leq 12$ |
| ... | |
| DATA(0) | |
| CRC | CRC code => 1-byte |
| End 1 | Rest time of at least four-byte transmission time |

Data format of communication protocol is described as follows:

STX (Communication starting)

ASCII mode: ':' character.

RTU mode: rest time of communication time (automatically changed based on different communication speed) for more than 4 bytes.

ADR (Communication address)

Legal communication address ranges from 1 to 254.

For example, communication for servo with address of 32 (sexadecimal 20):

ASCII mode: ADR='2', '0'=>'2'=32_H, '0'=30_H

RTU mode: ADR=20_H

CMD (Command) and DATA (Data)

Data format is determined based on command code. Common command codes are as follows:

Command code: 03_H, read N word (maximum of N is 20).

For example: Read 2 words from the starting address 0200_H in the servo with address of 01_H.

ASCII mode:

Command information

| | |
|------------------------|-----------|
| STX | '.' |
| ADR | '0' |
| | '1' |
| CMD | '0' |
| | '3' |
| Starting data position | '0' |
| | '2' |
| | '0' |
| | '0' |
| Number of data | '0' |
| | '0' |
| | '0' |
| | '2' |
| LCR Check | 'F' |
| | '8' |
| End 1 | (0DH)(CR) |
| End 0 | (0AH)(LF) |

Respond information

| | |
|---|-----------|
| STX | '.' |
| ADR | '0' |
| | '1' |
| CMD | '0' |
| | '3' |
| Number of data (calculated by byte) | '0' |
| | '4' |
| Content of starting data address (0200H) | '0' |
| | '0' |
| | 'B' |
| Content of second data address (0201H) | '1' |
| | 'F' |
| | '4' |
| | '0' |
| LCR Check | 'E' |
| | '8' |
| End 1 | (0DH)(CR) |
| End 0 | (0AH)(LF) |

RTU mode:**Command information**

| | |
|--|----------------|
| ADR | 01H |
| CMD | 03H |
| Starting data position | 02H(high byte) |
| | 00H(low byte) |
| Number of data (calculated by word) | 00H |
| | 02H |
| CRC Check Low | C5H(low byte) |
| CRC Check High | B3H(high byte) |

Respond information

| | |
|---|----------------|
| ADR | 01H |
| CMD | 03H |
| Number of data (calculated by byte) | 04H |
| Content of starting data address (0200H) | 00H(high byte) |
| | B1H(low byte) |
| Content of second data address (0201H) | 1FH(high byte) |
| | 40H(low byte) |
| CRC Check Low | A3H(low byte) |
| CRC Check High | D4H(high byte) |

Command code: 06_H, write in 1 word

For example: write 100(0064_H) in address 0200_H of servo with office number 01_H.

ASCII mode:**Command information**

| | |
|------------------------|-----------|
| STX | ‘.’ |
| ADR | ‘0’ |
| | ‘1’ |
| CMD | ‘0’ |
| | ‘6’ |
| Starting data position | ‘0’ |
| | ‘2’ |
| | ‘0’ |
| | ‘0’ |
| Content of data | ‘0’ |
| | ‘0’ |
| | ‘6’ |
| | ‘4’ |
| LCR Check | ‘9’ |
| | ‘3’ |
| End 1 | (0DH)(CR) |
| End 0 | (0AH)(LF) |

Respond information

| | |
|------------------------|-----------|
| STX | ‘.’ |
| ADR | ‘0’ |
| | ‘1’ |
| CMD | ‘0’ |
| | ‘6’ |
| Starting data position | ‘0’ |
| | ‘2’ |
| | ‘0’ |
| | ‘0’ |
| Content of data | ‘0’ |
| | ‘0’ |
| | ‘6’ |
| | ‘4’ |
| LCR Check | ‘9’ |
| | ‘3’ |
| End 1 | (0DH)(CR) |
| End 0 | (0AH)(LF) |

RTU mode:

Command information

| | |
|------------------------|----------------|
| ADR | 01H |
| CMD | 06H |
| Starting data position | 02H(high byte) |
| | 00H(low byte) |
| Content of data | 00H(high byte) |
| | 64H(low byte) |
| CRC Check Low | 89H(low byte) |
| CRC Check High | 99H(high byte) |

Respond information

| | |
|------------------------|----------------|
| ADR | 01H |
| CMD | 06H |
| Starting data position | 02H(high byte) |
| | 00H(low byte) |
| Content of data | 00H(high byte) |
| | 64H(low byte) |
| CRC Check Low | 89H(low byte) |
| CRC Check High | 99H(high byte) |

Calculation of detection error values of LRC (ASCII mode) and CRC (RTU mode):

LRC calculation of ASCII mode:

ASCII mode adopts LRC (Longitudinal Redundancy Check) detection error value. LRC detection error value is the sum of contents from ADR to the last data and the result is in the unit of 256 and removes exceeding part (for example, the result after totaling is hexadecimal 128_H and 28_H is then obtained), and then calculates its complement; thus the obtained results is the LRC detection error value.

For example, read 1 word from 0201 address of servo with official number 01_H.

| | |
|------------------------|-----------|
| STX | ‘:’ |
| ADR | ‘0’ |
| | ‘1’ |
| CMD | ‘0’ |
| | ‘3’ |
| Starting data position | ‘0’ |
| | ‘2’ |
| | ‘0’ |
| | ‘1’ |
| Number of data | ‘0’ |
| | ‘0’ |
| | ‘0’ |
| | ‘1’ |
| LCR Check | ‘F’ |
| | ‘8’ |
| End 1 | (0DH)(CR) |
| End 0 | (0AH)(LF) |

Add from ADR data to the last data:

01_H + 03_H + 02_H + 01_H + 00_H + 01_H = 08_H, 08_H becomes F8_H after applying complement of 2, so LRC is ‘F’, ‘8’.

CRC calculation of RTU mode:

RTU mode adopts CRC (Cyclical Redundancy Check) detection error value.

Steps for calculation of CRC detection error value are as follows:

Step 1: download a 16-bit register with content of FFFF_H (called as "CRC" register).

Step 2: conduct XOR operation on the first bit (bit0) of command message and the low order bit (LSB) of 16-bit CRC register, and save the result to CRC register;

Step 3: check the lowest order (LSB) of CRC register; if it is 0, right shift CRC register value a bit; if it is 1, right shift CRC register value a bit and then conduct XOR operation with A001_H;

Step 4: return to Step 3, until 8 times of execution of Step 3, and then move to Step 5;

Step 5: repeat Step 2-4 for the next bit of the command message, until all bits are processed; the content of CRC register now is CRC detection error value.

Note: after CRC detection error value is calculated, it is necessary to fill the CRC low order in the command message and then CRC high order. Please refer to the following example.

For example: read 2 words from 0101_H address of servo with official number of 01_H. The final content of CRC register calculated from ADR to the last bit of the data number is 3794_H, and then its command message is as shown below. Note that 94_H is transmitted prior to 37_H.

| | |
|---|--------------------------------------|
| ADR | 01 _H |
| CMD | 03 _H |
| Starting data address | 01 _H (address high order) |
| | 01 _H (address low order) |
| Data number (Calculated based on word) | 00 _H (high order) |
| | 02 _H (low order) |
| CRC check low order | 94 _H (check low order) |
| CRC check high order | 37 _H (check high order) |

End1, End0 (communication detection completed)

ASCII mode:

(0D_H) (i.e. character '\r' [carriage return]) and (0A_H) (i.e. '\n' [new line]) indicate end of communication.

RTU mode:

Exceeding the rest time of 4-byte communication time at the current communication rate indicates the end of communication.

Example:

The following uses C programming language to generate CRC value. The function needs two parameters:

```
unsigned char * data;
```

```
unsigned char length;
```

```
/*The function will pass back the CRC value in unsigned integer type.*/
```

```
unsigned int crc_chk(unsigned char * data,unsigned char length){
```

```
    int i,j;
```

```
    unsigned int crc_reg = 0xFFFF;
```

```
    while(length- -){
```

```
        crc_reg ^=*data++;
```

```
        for(j=0;j<8;j++){
```

```

        if(crc_reg & 0x01){
            crc_reg=( crc_reg >>1)^0xA001;
        }
        Else
        {
            crc_reg=crc_reg >>1;
        }
    }
}
return crc_reg;
}

```

■ Communication error

During communication, errors are possible, and common error sources are as follows:

- During parameters reading and writing, data address is wrong;
- During writing of a parameter, the data exceed the maximum of the parameter or are smaller than the parameter;
- Communication is interrupted, data transmission is wrong or check code is wrong.

In case of the first two communication errors, operation of servo drive will not be affected and meanwhile the servo drive will feedback an error frame. In case of the third error, transmitted data will be considered to be invalid and abandoned, without feedback of frame.

Error frame format is as follows:

Upper computer data frame:

| start | Slave station address | Command | Data address, data, etc. | Check |
|-------|-----------------------|---------|--------------------------|-------|
| | | Command | | |

Servo drive feedbacks error frame:

| start | Slave station address | Response code | Error code | Check |
|-------|-----------------------|---------------------------|------------|-------|
| | | Command + 80 _H | | |

Where the error frame response code = command + 80_H;

Error code = 00_H; communication is normal;

= 01_H: servo drive fails to identify the requested function;

= 02_H: data address given in request does not exist in servo drive;

= 03_H: data address given in request is not allowed in servo drive (due to exceeding the maximum or minimum value of parameter);

= 04_H: servo drive has started to execute request, but fails to complete the request;

For example: the axis number of servo drive is 03_H and datum 06_H is written in parameter Pn100; since the range of parameter Pn100 is 0-6, the written data will not be allowed and the servo drive will return a error frame, with error code of 03_H (exceeding the maximum or minimum value of parameter) and the structure as below:

Upper computer data frame:

| start | Slave station address | Command | Data address, data, etc. | Check |
|-------|-----------------------|-----------------|-------------------------------------|-------|
| | 03 _H | 06 _H | 0002 _H 0006 _H | |

Servo drive feedbacks error frame:

| start | Slave station address | Response code | Error code | Check |
|-------|-----------------------|-----------------|-----------------|-------|
| | 03 _H | 86 _H | 03 _H | |

In addition, if the slave station address in data frame sent by upper computer is 00_H, indicate that the data of the frame are broadcast data and the servo drive will not return any frame.

6.4 MODBUS Communication Address

| Communication data address | Meaning | Instruction | Operation |
|---------------------------------------|---|---|----------------|
| Hexadecimal system | | | |
| 0000 _h ~ 03FF _h | Parameter area | Correspond to parameters in parameter table | Read and write |
| 0400 _h ~ 0409 _h | Alarm information storage area | 10 history alarms | Read only |
| 0410 _h | Speed reference zero offset | | Read only |
| 0411 _h | Torque reference zero offset | | Read only |
| 0412 _h | Iu zero offset | | Read only |
| 0413 _h | Iv zero offset | | Read only |
| 0420 _h ~ 0437 _h | Monitoring data | | Read only |
| 0420 _h | Motor speed | Unit: 1 r/min | Read only |
| 0422 _h | Rotation angle (electric angle) | Unit: 1deg | Read only |
| 0424 _h | Input reference pulse speed | Unit: 1kHz | Read only |
| 0426 _h | Bus voltage | Unit: 1 V | Read only |
| 0428 _h | Speed reference value of analogue input | Unit: 1 r/min | Read only |
| 042A _h | Analog input torque reference percent | Unit: 1% | Read only |
| 042C _h | Internal torque reference percent | Unit: 1% or 0.1A | Read only |
| 042E _h | Input signal monitoring | — | Read only |
| 0430 _h | Output signal monitoring | — | Read only |
| 0432 _h | Encoder signal monitoring | — | Read only |
| 0434 _h | Input reference pulse counter | Unit: 1 reference pulse | Read only |
| 0436 _h | Feedback pulse counter | Unit: 1 reference pulse | Read only |
| 0438 _h | Position error counter | Unit: 1 reference pulse | Read only |
| 043A _h | Accumulated load | Unit: 1% | Read only |

| Communication data address | Meaning | Instruction | Operation |
|----------------------------|---|--|----------------|
| Hexadecimal system | | | |
| 043C_h | Rotational inertia percent | Unit: 1% | Read only |
| 043E_h | Actual angle of encoder | Unit: 1 reference pulse | Read only |
| 0440_h | Encoder multi-circle position | Unit: 1 circle | Read only |
| | | | |
| 044A_h | Current alarm | | Read only |
| 0451_h | Communication IO signal *1 | Power failure not saved | Read and write |
| 0452_h | Communication output port reverse | Power failure not saved | Read and write |
| 0453_h | Speed reference | Power failure not saved | Read and write |
| 0454_h | Torque reference | Power failure not saved | Read and write |
| 0457_h | Servo operation status *2 | | Read only |
| 045E_h | Software version | | Read only |
| 045F_h | FPGA version number | | Read only |
| 0460_h | First electronic gear ratio (numerator) | Power failure not saved | Read and write |
| 0461_h | Second electronic gear ratio (numerator) | Power failure not saved | Read and write |
| 0462_h | First electronic gear ratio (denominator) | Power failure not saved | Read and write |
| | | | |
| 0520_h | Clear history alarm | 1: Clear history alarm | Read and write |
| 0521_h | Clear current alarm | 1: Clear current alarm | Read and write |
| 0522_h | Clear bus encoder alarm | 1: Clear bus encoder alarm | Read and write |
| 0523_h | Clear bus encoder multi-circle data | 1: Clear bus encoder multi-circle data | Read and write |
| | | | |
| 0528_h | Speed JOG (speed as set in P□304) | BIT15:1 JOG servo enable BIT01:1 JOG- (JOG positive) BIT00:1 JOG+ (JOG negative) | Read and write |
| 0529_h | Position JOG (speed as set in P□304) | BIT15:1 Enter position jog mode BIT01:1 JOG- BIT00:1 JOG+ | Read and write |
| | | | |
| 0540_h | Factory reset | 1: Factory reset | Writable |
| 0541_h | Reset | 1: Reset | Writable |
| | | | |
| 05F0_h | Number of data set under operation | | Read only |

| Communication data address | Meaning | Instruction | Operation |
|-------------------------------|--|--|----------------|
| Hexadecimal system | | | |
| 05F1_h | Number of data set to be operated | | Read only |
| 05F2_h | Actual position is 16 bits lower | Position contacts position after electronic gear | Read only |
| 05F3_h | Actual position is 16 bits higher | | Read only |
| 05F4_h | Position node manner | 0: Task 1: External | Read only |
| 05F5_h | Acceleration | 10rpm/s/s | Read and write |
| 05F6_h | Deceleration | 10rpm/s/s | Read and write |
| 05F7_h | Emergency deceleration | 10rpm/s/s | Read and write |
| 05F8_h | Position contact electronic gear numerator | | Read and write |
| 05F9_h | Position contact electronic gear denominator | | Read and write |
| 05FA_h | Reference point seeking manner | | Read and write |
| 05FB_h | Reference point seeking on-off speed | 0~6000 rpm | Read and write |
| 05FC_h | On-off speed to leave reference point | 0~6000 rpm | Read and write |
| 05FD_h | Demonstration position low byte | | Read and write |
| 05FE_h | Demonstration position high byte | | Read and write |
| Data set 0 parameter: | | | |
| 0600_h | Destination position low byte | | Read and write |
| 0601_h | Destination position high byte | | Read and write |
| 0602_h | Target speed | rpm | Read and write |
| 0603_h | Step change attribute *3 | | Read and write |
| 0604_h | Step change condition 1 value | | Read and write |
| 0605_h | Step change condition 2 value | | Read and write |
| 0606_h | Subsequent data set number | | Read and write |
| 0607_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 1 parameter: | | | |
| 0608_h | Destination position low byte | | Read and write |
| 0609_h | Destination position high byte | | Read and write |
| 060A_h | Target speed | rpm | Read and write |
| 060B_h | Step change condition attribute | | Read and write |
| 060C_h | Step change condition 1 value | | Read and write |
| 060D_h | Step change condition 2 value | | Read and write |
| 060E_h | Subsequent data set number | | Read and write |

| Communication data address | Meaning | Instruction | Operation |
|-------------------------------|---------------------------------|--------------------------------------|----------------|
| Hexadecimal system | | | |
| 060F_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 2 parameter: | | | |
| 0610_h | Destination position low byte | | Read and write |
| 0611_h | Destination position high byte | | Read and write |
| 0612_h | Target speed | rpm | Read and write |
| 0613_h | Step change condition attribute | | Read and write |
| 0614_h | Step change condition 1 value | | Read and write |
| 0615_h | Step change condition 2 value | | Read and write |
| 0616_h | Subsequent data set number | | Read and write |
| 0617_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 3 parameter: | | | |
| 0618_h | Destination position low byte | | Read and write |
| 0619_h | Destination position high byte | | Read and write |
| 061A_h | Target speed | rpm | Read and write |
| 061B_h | Step change condition attribute | | Read and write |
| 061C_h | Step change condition 1 value | | Read and write |
| 061D_h | Step change condition 2 value | | Read and write |
| 061E_h | Subsequent data set number | | Read and write |
| 061F_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 4 parameter: | | | |
| 0620_h | Destination position low byte | | Read and write |
| 0621_h | Destination position high byte | | Read and write |
| 0622_h | Target speed | rpm | Read and write |
| 0623_h | Step change condition attribute | | Read and write |
| 0624_h | Step change condition 1 value | | Read and write |
| 0625_h | Step change condition 2 value | | Read and write |
| 0626_h | Subsequent data set number | | Read and write |
| 0627_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 5 parameter: | | | |
| 0628_h | Destination position low byte | | Read and write |
| 0629_h | Destination position high byte | | Read and write |

| Communication data address | Meaning | Instruction | Operation |
|-------------------------------|---------------------------------|--------------------------------------|----------------|
| Hexadecimal system | | | |
| 062A_h | Target speed | rpm | Read and write |
| 062B_h | Step change condition attribute | | Read and write |
| 062C_h | Step change condition 1 value | | Read and write |
| 062D_h | Step change condition 2 value | | Read and write |
| 062E_h | Subsequent data set number | | Read and write |
| 062F_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 6 parameter: | | | |
| 0630_h | Destination position low byte | | Read and write |
| 0631_h | Destination position high byte | | Read and write |
| 0632_h | Target speed | rpm | Read and write |
| 0633_h | Step change condition attribute | | Read and write |
| 0634_h | Step change condition 1 value | | Read and write |
| 0635_h | Step change condition 2 value | | Read and write |
| 0636_h | Subsequent data set number | | Read and write |
| 0637_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 7 parameter: | | | |
| 0638_h | Destination position low byte | | Read and write |
| 0639_h | Destination position high byte | | Read and write |
| 063A_h | Target speed | rpm | Read and write |
| 063B_h | Step change condition attribute | | Read and write |
| 063C_h | Step change condition 1 value | | Read and write |
| 063D_h | Step change condition 2 value | | Read and write |
| 063E_h | Subsequent data set number | | Read and write |
| 063F_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 8 parameter: | | | |
| 0640_h | Destination position low byte | | Read and write |
| 0641_h | Destination position high byte | | Read and write |
| 0642_h | Target speed | rpm | Read and write |
| 0643_h | Step change condition attribute | | Read and write |
| 0644_h | Step change condition 1 value | | Read and write |
| 0645_h | Step change condition 2 value | | Read and write |
| 0646_h | Subsequent data set number | | Read and write |
| 0647_h | Data set type | 0: NULL; 1: Absolute; 2: | Read and write |

| Communication data address | Meaning | Instruction | Operation |
|----------------------------|---------------------------------|-----------------------------------|----------------|
| Hexadecimal system | | | |
| | | Relative | |
| Data set 9 parameter: | | | |
| 0648_h | Destination position low byte | | Read and write |
| 0649_h | Destination position high byte | | Read and write |
| 064A_h | Target speed | rpm | Read and write |
| 064B_h | Step change condition attribute | | Read and write |
| 064C_h | Step change condition 1 value | | Read and write |
| 064D_h | Step change condition 2 value | | Read and write |
| 064E_h | Subsequent data set number | | Read and write |
| 064F_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 10 parameter: | | | |
| 0650_h | Destination position low byte | | Read and write |
| 0651_h | Destination position high byte | | Read and write |
| 0652_h | Target speed | rpm | Read and write |
| 0653_h | Step change condition attribute | | Read and write |
| 0654_h | Step change condition 1 value | | Read and write |
| 0655_h | Step change condition 2 value | | Read and write |
| 0656_h | Subsequent data set number | | Read and write |
| 0657_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 11 parameter: | | | |
| 0658_h | Destination position low byte | | Read and write |
| 0659_h | Destination position high byte | | Read and write |
| 065A_h | Target speed | rpm | Read and write |
| 065B_h | Step change condition attribute | | Read and write |
| 065C_h | Step change condition 1 value | | Read and write |
| 065D_h | Step change condition 2 value | | Read and write |
| 065E_h | Subsequent data set number | | Read and write |
| 065F_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 12 parameter: | | | |
| 0660_h | Destination position low byte | | Read and write |
| 0661_h | Destination position high byte | | Read and write |
| 0662_h | Target speed | rpm | Read and write |

| Communication data address | Meaning | Instruction | Operation |
|-------------------------------|---------------------------------|--------------------------------------|----------------|
| Hexadecimal system | | | |
| 0663_h | Step change condition attribute | | Read and write |
| 0664_h | Step change condition 1 value | | Read and write |
| 0665_h | Step change condition 2 value | | Read and write |
| 0666_h | Subsequent data set number | | Read and write |
| 0667_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 13 parameter: | | | |
| 0668_h | Destination position low byte | | Read and write |
| 0669_h | Destination position high byte | | Read and write |
| 066A_h | Target speed | rpm | Read and write |
| 066B_h | Step change condition attribute | | Read and write |
| 066C_h | Step change condition 1 value | | Read and write |
| 066D_h | Step change condition 2 value | | Read and write |
| 066E_h | Subsequent data set number | | Read and write |
| 066F_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 14 parameter: | | | |
| 0670_h | Destination position low byte | | Read and write |
| 0671_h | Destination position high byte | | Read and write |
| 0672_h | Target speed | rpm | Read and write |
| 0673_h | Step change condition attribute | | Read and write |
| 0674_h | Step change condition 1 value | | Read and write |
| 0675_h | Step change condition 2 value | | Read and write |
| 0676_h | Subsequent data set number | | Read and write |
| 0677_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 15 parameter: | | | |
| 0678_h | Destination position low byte | | Read and write |
| 0679_h | Destination position high byte | | Read and write |
| 067A_h | Target speed | rpm | Read and write |
| 067B_h | Step change condition attribute | | Read and write |
| 067C_h | Step change condition 1 value | | Read and write |
| 067D_h | Step change condition 2 value | | Read and write |
| 067E_h | Subsequent data set number | | Read and write |
| 067F_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |

| Communication data address | Meaning | Instruction | Operation |
|-------------------------------|---------------------------------|-----------------------------------|----------------|
| Hexadecimal system | | | |
| | | | |
| Data set 16 parameter: | | | |
| 0680 _h | Destination position low byte | | Read and write |
| 0681 _h | Destination position high byte | | Read and write |
| 0682 _h | Target speed | rpm | Read and write |
| 0683 _h | Step change condition attribute | | Read and write |
| 0684 _h | Step change condition 1 value | | Read and write |
| 0685 _h | Step change condition 2 value | | Read and write |
| 0686 _h | Subsequent data set number | | Read and write |
| 0687 _h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| | | | |
| Data set 17 parameter: | | | |
| 0688 _h | Destination position low byte | | Read and write |
| 0689 _h | Destination position high byte | | Read and write |
| 068A _h | Target speed | rpm | Read and write |
| 068B _h | Step change condition attribute | | Read and write |
| 068C _h | Step change condition 1 value | | Read and write |
| 068D _h | Step change condition 2 value | | Read and write |
| 068E _h | Subsequent data set number | | Read and write |
| 068F _h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| | | | |
| Data set 18 parameter: | | | |
| 0690 _h | Destination position low byte | | Read and write |
| 0691 _h | Destination position high byte | | Read and write |
| 0692 _h | Target speed | rpm | Read and write |
| 0693 _h | Step change condition attribute | | Read and write |
| 0694 _h | Step change condition 1 value | | Read and write |
| 0695 _h | Step change condition 2 value | | Read and write |
| 0696 _h | Subsequent data set number | | Read and write |
| 0697 _h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| | | | |
| Data set 19 parameter: | | | |
| 0698 _h | Destination position low byte | | Read and write |
| 0699 _h | Destination position high byte | | Read and write |
| 069A _h | Target speed | rpm | Read and write |
| 069B _h | Step change condition attribute | | Read and write |

| Communication data address | Meaning | Instruction | Operation |
|-------------------------------|---------------------------------|-----------------------------------|----------------|
| Hexadecimal system | | | |
| 069C_h | Step change condition 1 value | | Read and write |
| 069D_h | Step change condition 2 value | | Read and write |
| 069E_h | Subsequent data set number | | Read and write |
| 069F_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 20 parameter: | | | |
| 06A0_h | Destination position low byte | | Read and write |
| 06A1_h | Destination position high byte | | Read and write |
| 06A2_h | Target speed | rpm | Read and write |
| 06A3_h | Step change condition attribute | | Read and write |
| 06A4_h | Step change condition 1 value | | Read and write |
| 06A5_h | Step change condition 2 value | | Read and write |
| 06A6_h | Subsequent data set number | | Read and write |
| 06A7_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 21 parameter: | | | |
| 06A8_h | Destination position low byte | | Read and write |
| 06A9_h | Destination position high byte | | Read and write |
| 06AA_h | Target speed | rpm | Read and write |
| 06AB_h | Step change condition attribute | | Read and write |
| 06AC_h | Step change condition 1 value | | Read and write |
| 06AD_h | Step change condition 2 value | | Read and write |
| 06AE_h | Subsequent data set number | | Read and write |
| 06AF_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 22 parameter: | | | |
| 06B0_h | Destination position low byte | | Read and write |
| 06B1_h | Destination position high byte | | Read and write |
| 06B2_h | Target speed | rpm | Read and write |
| 06B3_h | Step change condition attribute | | Read and write |
| 06B4_h | Step change condition 1 value | | Read and write |
| 06B5_h | Step change condition 2 value | | Read and write |
| 06B6_h | Subsequent data set number | | Read and write |
| 06B7_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |

| Communication data address | Meaning | Instruction | Operation |
|-------------------------------|---------------------------------|-----------------------------------|----------------|
| Hexadecimal system | | | |
| Data set 23 parameter: | | | |
| 06B8 _h | Destination position low byte | | Read and write |
| 06B9 _h | Destination position high byte | | Read and write |
| 06BA _h | Target speed | rpm | Read and write |
| 06BB _h | Step change condition attribute | | Read and write |
| 06BC _h | Step change condition 1 value | | Read and write |
| 06BD _h | Step change condition 2 value | | Read and write |
| 06BE _h | Subsequent data set number | | Read and write |
| 06BF _h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| | | | |
| Data set 24 parameter: | | | |
| 06C0 _h | Destination position low byte | | Read and write |
| 06C1 _h | Destination position high byte | | Read and write |
| 06C2 _h | Target speed | rpm | Read and write |
| 06C3 _h | Step change condition attribute | | Read and write |
| 06C4 _h | Step change condition 1 value | | Read and write |
| 06C5 _h | Step change condition 2 value | | Read and write |
| 06C6 _h | Subsequent data set number | | Read and write |
| 06C7 _h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| | | | |
| Data set 25 parameter: | | | |
| 06C8 _h | Destination position low byte | | Read and write |
| 06C9 _h | Destination position high byte | | Read and write |
| 06CA _h | Target speed | rpm | Read and write |
| 06CB _h | Step change condition attribute | | Read and write |
| 06CC _h | Step change condition 1 value | | Read and write |
| 06CD _h | Step change condition 2 value | | Read and write |
| 06CE _h | Subsequent data set number | | Read and write |
| 06CF _h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| | | | |
| Data set 26 parameter: | | | |
| 06D0 _h | Destination position low byte | | Read and write |
| 06D1 _h | Destination position high byte | | Read and write |
| 06D2 _h | Target speed | rpm | Read and write |
| 06D3 _h | Step change condition attribute | | Read and write |
| 06D4 _h | Step change condition 1 value | | Read and write |

| Communication data address | Meaning | Instruction | Operation |
|-------------------------------|---------------------------------|--------------------------------------|----------------|
| Hexadecimal system | | | |
| 06D5_h | Step change condition 2 value | | Read and write |
| 06D6_h | Subsequent data set number | | Read and write |
| 06D7_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 27 parameter: | | | |
| 06D8_h | Destination position low byte | | Read and write |
| 06D9_h | Destination position high byte | | Read and write |
| 06DA_h | Target speed | rpm | Read and write |
| 06DB_h | Step change condition attribute | | Read and write |
| 06DC_h | Step change condition 1 value | | Read and write |
| 06DD_h | Step change condition 2 value | | Read and write |
| 06DE_h | Subsequent data set number | | Read and write |
| 06DF_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 28 parameter: | | | |
| 06E0_h | Destination position low byte | | Read and write |
| 06E1_h | Destination position high byte | | Read and write |
| 06E2_h | Target speed | rpm | Read and write |
| 06E3_h | Step change condition attribute | | Read and write |
| 06E4_h | Step change condition 1 value | | Read and write |
| 06E5_h | Step change condition 2 value | | Read and write |
| 06E6_h | Subsequent data set number | | Read and write |
| 06E7_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 29 parameter: | | | |
| 06E8_h | Destination position low byte | | Read and write |
| 06E9_h | Destination position high byte | | Read and write |
| 06EA_h | Target speed | rpm | Read and write |
| 06EB_h | Step change condition attribute | | Read and write |
| 06EC_h | Step change condition 1 value | | Read and write |
| 06ED_h | Step change condition 2 value | | Read and write |
| 06EE_h | Subsequent data set number | | Read and write |
| 06EF_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 30 parameter: | | | |

| Communication data address | Meaning | Instruction | Operation |
|--|---------------------------------|-----------------------------------|----------------|
| Hexadecimal system | | | |
| 06F0_h | Destination position low byte | | Read and write |
| 06F1_h | Destination position high byte | | Read and write |
| 06F2_h | Target speed | rpm | Read and write |
| 06F3_h | Step change condition attribute | | Read and write |
| 06F4_h | Step change condition 1 value | | Read and write |
| 06F5_h | Step change condition 2 value | | Read and write |
| 06F6_h | Subsequent data set number | | Read and write |
| 06F7_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 31 parameter: | | | |
| 06F8_h | Destination position low byte | | Read and write |
| 06F9_h | Destination position high byte | | Read and write |
| 06FA_h | Target speed | rpm | Read and write |
| 06FB_h | Step change condition attribute | | Read and write |
| 06FC_h | Step change condition 1 value | | Read and write |
| 06FD_h | Step change condition 2 value | | Read and write |
| 06FE_h | Subsequent data set number | | Read and write |
| 06FF_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |
| Data set 32 parameter (next data set of operating data set): | | | |
| 0700_h | Destination position low byte | | Read and write |
| 0701_h | Destination position high byte | | Read and write |
| 0702_h | Target speed | rpm | Read and write |
| 0703_h | Step change condition attribute | | Read and write |
| 0704_h | Step change condition 1 value | | Read and write |
| 0705_h | Step change condition 2 value | | Read and write |
| 0706_h | Subsequent data set number | | Read and write |
| 0707_h | Data set type | 0: NULL; 1: Absolute; 2: Relative | Read and write |

Address description:

*1. Communication IO input (0451_h)

Input signal can be given through communication IO input (0451_h) register of MODBUS communication. The definition of the register is as follows:

| | | | | |
|--------------|--------------------------------------|--------------|-----------------|--------------|
| P□503 | Width of same-speed detection signal | | | Speed |
| | Setting range | Setting unit | Factory setting | Power reboot |
| | 0 ~ 100 | 1r/min | 10 | Not required |

If the difference between motor speed and reference speed is smaller than the set value of P□503, then "/V-CMP" signal is output.

■ For example,
At P□503=100 and reference speed of 2000 r/min, if motor speed ranges from 1900 to 2100r/min, "/V-CMP" is set to be ON.

Motor speed

Reference speed

P□503

Output "/V-CMP" in this range.

■ Supplement
"/V-CMP" is the output signal under speed control. In case of position control, then the function will automatically change to "/COIN"; in case of torque control, it will automatically change to "OFF(H level)".

Chapter VII Maintenance and Inspection

7.1 Abnormality Diagnosis and Treatment Methods

7.1.1 Overview of Alarm Display

Relationship between alarm display and alarm code output ON/OFF is as shown in the table below. The method to stop motor in case of alarm: free-running stop: without braking, natural stop by friction resistance at the time of motor rotation.

| Alarm display | ALM output | Alarms | Alarm contents | Clear or not |
|---------------|------------|--|---|--------------|
| □01 | H | Encoder PA, PB, PC disconnection | Encoder disconnection or cable welding problem. | Clear |
| □02 | H | Encoder PU, PV, PW disconnection | Encoder disconnection or cable welding problem. | Clear |
| □03 | H | Overload | Continuous running at a certain torque exceeding the rated value | Clear |
| □04 | H | A/D switch channel abnormal | A/D switch channel abnormal | Clear |
| □05 | H | PU, PV, PW false code | PU, PV, PW signals are all high or low | Clear |
| □06 | H | PU, PV, PW phases incorrect | PU, PV, PW signals are all high or low | Clear |
| □08 | H | The BOOTLOADER is abnormal | Contact manufacturer | No |
| □09 | H | Alarm of locked-rotor | Set the locked-rotor torque by P□148, Set the locked-rotor time by P□149. The servo driver will alarm 07 when the motor torque is greater than the locked-rotor torque and the speed is less than 10RPM | No |
| □10 | H | Overcurrent | Servo drive IPM module current is overlarge. | Clear |
| □11 | H | Overvoltage | Servo drive main circuit voltage is too high. | No |
| □12 | H | Undervoltage | Servo drive main circuit voltage is too low. | No |
| □13 | H | Parameter damage | EEROM data in servo drive is abnormal. | Clear |
| □14 | H | Over-speed | Servo motor speed is extremely high | Clear |
| □15 | H | Deviation counter overflow | Internal position deviation counter overflow | Clear |
| □16 | H | Position deviation is overlarge | Position deviation pulse exceeds the set value of parameter P□504. | Clear |
| □17 | H | Electronic gear fault | Electronic gear is unreasonably set or pulse frequency is too high | Clear |
| □18 | H | 1st channel of current detection is abnormal | Current detection abnormal | Clear |
| □19 | H | 2nd channel of current detection is abnormal | Current detection abnormal | Clear |
| □20 | H | The motor model is abnormal | Contact manufacturer | No |
| □22 | H | Motor model is incorrect | Servo drive parameters do not match with those of motor | Clear |
| □23 | H | Servo drive does not match with motor | Servo drive does not match with motor | Clear |

| Alarm display | ALM output | Alarms | Alarm contents | Clear or not |
|---------------|------------|---|---|--------------|
| □25 | H | Bus encoder multi-circle information error | Multi- circle information error | Clear |
| □26 | H | Bus encoder multi-circle information overflow | Multi- circle information overflow | Clear |
| □27 | H | Bus encoder battery alarm 1 | Battery voltage is lower than 2.5 V, multi-circle information is lost | Clear |
| □28 | H | Bus encoder battery alarm 2 | Battery voltage is lower than 3.1 V, battery voltage is relatively low | Clear |
| □30 | H | Bleeder resistor disconnection alarm | Braking resistor damage. | Clear |
| □31 | H | Regeneration overload | Regeneration processing circuit is abnormal. | No |
| □33 | H | Momentary outage alarm. | There is outage of over one power cycle under AC current. | Clear |
| □34 | H | Rotary transformer is abnormal | Rotary transformer communication is abnormal. | Clear |
| □40 | H | Bus encoder communication is abnormal | Servo drive and encoder cannot realize communication. | Clear |
| □41 | H | Bus encoder overspeed | When power is ON, encoder rotates at high speed | Clear |
| □42 | H | Bus encoder absolute status error | Encoder damage or encoder decoding circuit damage | Clear |
| □43 | H | Bus encoder counting error | Encoder damage or encoder decoding circuit damage | Clear |
| □44 | H | Check error in bus encoder control field | Encoder signal is interrupted or encoder decoding circuit damage | Clear |
| □45 | H | Check error in bus encoder communication data | Encoder signal is interrupted or encoder decoding circuit damage | Clear |
| □46 | H | Stop bit error in bus encoder status field | Encoder signal is interrupted or encoder decoding circuit damage | Clear |
| □47 | H | Stop bit error in bus encoder SFOME | Encoder signal is interrupted or encoder decoding circuit damage | Clear |
| □48 | H | Bus encoder data are not initialized | Bus encoder SFOME data are null | Clear |
| □49 | H | Sum check error in bus encoder data | Sum check in bus encoder EEPROM data is abnormal | Clear |
| □60 | H | MODBUS communication timeout | Drive fails to accept data normally at the set time in P□602 | Clear |
| □61 | H | CANopen master station heartbeat timeout | Drive fails to accept master station heartbeat message normally at the set time | Clear |
| □70 | H | Drive overheat alarm | Drive internal IPM module temperature is too high | Clear |
| □90 | H | Software does not match with hardware | Parameter is wrongly set or software does not match with hardware | No |
| □-- | L | No error display | Display normal action status | Clear |

Note:

1. "□" in alarm display may be "A" or "b", referring to A axis alarm or b axis alarm respectively.

2. Alarms of □25, □26, □27, □41 can be reset only after alarms in encoder is cleared through auxiliary function mode.

7.1.2 Alarm Displays and Their Causes and Treatment Measures

In case of abnormalities of the servo drive, the panel operator will display alarm information of A□□ or b□□. Alarm displays and their treatment measures are as follows:

If the abnormal condition still exists after treatment, please contact with service department of our company.

(1) List of alarm displays

| Alarm | Alarm contents | Circumstance | Cause | Treatment measures |
|-------|-------------------------------------|---|---|--|
| □01 | Incremental encoder ABC disconnects | When power supply is on or during operation | Wiring of encoder is wrong | Correct wiring of encoder |
| | | | Encoder cables are interfered due to different specifications | Change cable specifications to stranded wire or stranded shielded wire with core wire over 0.12 mm ² and stranded wire made of tinned soft copper |
| | | | Encoder cables are interfered due to overlength | The max. wiring distance should be 20 m. |
| | | | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | | | Encoder cables are bound with high current line or their distance is too close | Lay encoder cables at places free from surge voltage |
| | | | Change in FG potential due to influence by motor side equipment (welding machine, etc.) | Connect equipment ground wire to prevent shunting to FG at PG side |
| | | | Signal line of encoder is interfered | Take anti-interference measures for encoder wiring. |
| | | | Encoder failure | Replace servo motor |
| □02 | Incremental encoder UVW disconnects | When power supply is on or during operation | Servo drive circuit board develops fault | Replace the servo drive |
| | | | Wiring of encoder is wrong | Correct wiring of encoder |
| | | | Encoder cables are interfered due to different specifications | Change cable specifications to stranded wire or stranded shielded wire |
| | | | Encoder cables are interfered due to overlength | The max. wiring distance should be 20 m. |
| | | | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | | | Encoder cables are bound with high current line or their distance is too close | Lay encoder cables at places free from surge voltage |

| Alarm | Alarm contents | Circumstance | Cause | Treatment measures |
|-------|--|---|---|--|
| | | | Change in FG potential due to influence by motor side equipment (welding machine, etc.) | Connect equipment ground wire to prevent shunting to FG at PG side |
| | | | Signal line of encoder is interfered | Take anti-interference measures for encoder wiring. |
| | | | Encoder failure | Replace servo motor |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □03 | Overload | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |
| | | During servo ON | Motor wiring is abnormal (poor condition in wiring and connection) | Revise motor wiring |
| | | | Encoder wiring is abnormal (poor wiring and connection) | Correct wiring of encoder |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | When the servo motor fails to rotate during inputting of commands | Motor wiring is abnormal (poor condition in wiring and connection) | Revise motor wiring |
| | | | Encoder wiring is abnormal (poor wiring and connection) | Correct wiring of encoder |
| | | | Starting torque exceeds the max. torque | Review loading condition, operation condition or motor capacity |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | Normally during operation | Effective torque exceeds rated torque or starting torque exceeds rated torque substantially | Review loading condition, operation condition or motor capacity |
| | | | Temperature within storage tray of the servo drive is high | Reduce the temperature within storage tray below 55° |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □05 | Incremental encoder UVW signal is abnormal | When control power supply is on | Wiring of encoder is wrong | Correct wiring of encoder |
| | | | Encoder failure | Replace servo motor |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □10 | Overcurrent | When control power supply is on | Overload alarm reset for several times due to power off | Change reset method of alarms |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | When main power circuit is on or overcurrent during motor operation | A faulty connection occurs between U, V, W and ground wire. | Check wiring and connect correctly. |
| | | | Ground wire wraps around other terminals | |
| | | | A short circuit occurs between U, V, W used by main circuit of motor and ground wire | Revise or replace the cables used by main circuit of motor |
| | | | A short circuit occurs between U, V, and W used by main circuit of motor | |
| | | | An error occurs to regenerative resistor wiring. | Check wiring and connect |

| Alarm | Alarm contents | Circumstance | Cause | Treatment measures |
|-------|--|--|--|--|
| | | | | correctly. |
| | | | A short circuit occurs between U, V, W of the servo drive and ground wire | Replace the servo drive |
| | | | Servo drive develops fault (current feedback circuit, power transistor or circuit board fault) | |
| | | | A short circuit occurs between U, V, W used by main circuit of motor and ground wire | Replace servo motor |
| | | | A short circuit occurs between U, V, and W used by main circuit of motor | |
| | | | Overload alarm reset for several times due to power off | Change reset method of alarms |
| | | | Position speed reference changes violently | Re-evaluate reference value. |
| | | | Whether the load is too much and whether regeneration handling capacity is exceeded | Review loading condition and operation condition (check specifications of inertia of load) |
| | | | The installation (direction, interval with other parts) of servo drive is improper (whether there is storage disk is releasing heat while the surrounding is heating) | Reduce ambient temperature of the servo drive to below 55 °C |
| | | | Encoder slips | Replace servo motor |
| | | | Servo unit fan stops rotating | Replace the servo drive |
| | | | Servo drive circuit board develops fault | |
| □11 | Overvoltage * Detect when main circuit power is on | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |
| | | When main circuit power is on | AC supply voltage is too high | Adjust AC supply voltage to normal range |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | Normally during operation | Check AC supply voltage (whether voltage changes substantially) | Adjust AC supply voltage to normal range |
| | | | Number of turns is high and moment of inertia of load is too large (insufficient regeneration capacity) | Review loading condition and operation condition (check specifications of inertia of load) |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | When the servo motor decelerates Occurrence | Number of turns is high and moment of inertia of load is too large | Review loading condition and operation condition |
| □12 | Undervoltage * Detect when main circuit power is on | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |
| | | When main circuit power is on | AC supply voltage is too low | Adjust AC supply voltage to normal range |
| | | | Servo unit fuse burns out | Replace the servo drive |
| | | | Limiting resistor of surge current disconnects | Replace servo unit (confirm |

| Alarm | Alarm contents | Circumstance | Cause | Treatment measures |
|-------|---|---|--|---|
| | | | (whether power voltage is abnormal and whether limiting resistor of surge current is overload) | power voltage and reduce frequency of main circuit ON/OFF) |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | Normally during operation | AC supply voltage is low (whether there is oversized voltage drop) | Adjust AC supply voltage to normal range |
| | | | Power failure occurs instantaneously. | Restart operation through reset |
| | | | Cable short circuit of motor main circuit | Revise or replace the cables used by main circuit of motor |
| | | | Servo motor short circuit | Replace servo motor |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □13 | Parameter damage | When control power supply is on | Power is turned off when parameters are being set | Execute user parameters initialization (F□011) |
| | | | Power is turned off when alarm is being entered | |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □14 | Over-speed | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |
| | | During servo ON | The phase sequence of U, V and M of motor wiring is at fault | Correct motor wiring |
| | | | Wiring of encoder is wrong | Correct wiring of encoder |
| | | | Encoder wiring is malfunctioned due to interference | Take anti-interference measures for encoder wiring. |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | When the servo motor starts operation or during high-speed rotation | The phase sequence of U, V and M of motor wiring is at fault | Correct motor wiring |
| | | | Wiring of encoder is wrong | Correct wiring of encoder |
| | | | Encoder wiring is malfunctioned due to interference | Take anti-interference measures for encoder wiring. |
| | | | Input value of position/speed reference is too much | Lower reference value |
| | | | Speed reference input gain setting is wrong | Correct reference input gain |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □15 | Position counter overflow | When the servo motor starts operation or during high-speed rotation | Motor stalling | Check the load |
| | | | Input reference frequency is abnormal | Reduce frequency of command computer |
| | | | Wiring is wrong | Correct wiring |
| □16 | Position error is too large (position error with servo ON exceeds user parameter overflow | When control power supply is on | Excessive position offset alarm level (P□504) is incorrect | Set value of user parameter P□504 to any value other than 0 |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | During high-speed rotation | Wiring of U, V and W of the servo motor is abnormal (incomplete connection) | Correct motor wiring |
| | | | | Correct wiring of encoder |

| Alarm | Alarm contents | Circumstance | Cause | Treatment measures |
|-------|--|---|---|---|
| | level P□504 setting) | | Servo drive circuit board develops fault | Replace the servo drive |
| | | When the servo motor fails to rotate after sending position reference | Wiring of U, V and W of the servo motor is poor | Revise motor wiring |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | During long reference with normal action | Gain adjustment of servo drive is poor | Increase speed loop gain (P□100) and position loop gain (P□102) |
| | | | Position reference pulse frequency is too high | Slow reduce position reference frequency |
| | | | | Add smoothing function |
| | | | | Reassess electronic gear ratio |
| | | | Excessive position offset alarm level (P□504) is incorrect | Set user parameter P□504 to correct value |
| | | | Load conditions (torque and moment of inertia) inconsistent with motor specifications | Review reassessed load or motor capacity |
| □17 | Electronic gear fault | When control power supply is on | Setting of electronic gear is incorrect | Reset P□202 and P□203 |
| | | When the servo motor starts operation | | |
| □18 | 1st channel of current detection is abnormal | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |
| | | When the servo motor starts operation | | |
| □19 | 1st channel of current detection is abnormal | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |
| | | When the servo motor starts operation | | |
| □22 | Motor model is incorrect | When control power supply is on | Drive motor parameter setting is abnormal | Replace the servo drive |
| | | | Parameters written into encoder are abnormal | Replace the servo motor (encoder) |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □23 | Drive does not match with motor | When control power supply is on | Servo unit capacity and motor capacity are not suitable for motor capacity | Match servo unit capacity with servo motor capacity |
| | | | Parameters written into encoder are abnormal | Replace the servo motor (encoder) |
| | | | Drive motor parameter setting is abnormal | Replace the servo drive |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □25 | Multi-circle data of bus encoder goes wrong | When control power supply is on | Multi-circle data of absolute encoder is abnormal | Execute bus encoder multi-coil position cleanout (F□09) and bus encoder alarm register cleanout (F□010) |
| | | During operation of servo motor | | |

| Alarm | Alarm contents | Circumstance | Cause | Treatment measures |
|-------|--|---|--|---|
| □26 | Bus encoder multi-circle data overflow | When control power supply is on | Multi-circle data of absolute encoder is abnormal | Execute bus encoder multi-coil position cleanout (F□09) and bus encoder alarm register cleanout (F□010) |
| | | During operation of servo motor | | |
| □27 | Bus encoder battery alarm 1 | When control power supply is on | | |
| □28 | Bus encoder battery alarm 2 | When control power supply is on | | |
| □30 | Regeneration is abnormal | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |
| | | When main circuit power is on | Circumscribed regenerative resistor is not connected | Connect circumscribed regenerative resistor |
| | | | Check whether the wiring of regenerative resistor is in good condition or broken | Revise the wiring of circumscribed regenerative resistor |
| | | | Jumper wire between B2 and B3 comes off (when using built-in regenerative resistor) | Correct wiring |
| | | Normally during operation | Check whether the wiring of regenerative resistor is in good condition or comes off | Revise the wiring of circumscribed regenerative resistor |
| | | | Regenerative resistor disconnects (whether regeneration energy is too much) | Replace regenerative resistor or servo drive (review load and operation conditions) |
| | | | Servo drive develops fault (fault in regenerative transistor and voltage detecting part) | Replace the servo drive |
| □31 | Regeneration overload | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |
| | | When main circuit power is on | Power supply voltage exceeds 270 V | Correct voltage |
| | | Normally during operation (regenerative resistor temperature increases significantly) | Regenerative energy is too much | Reselect regenerative resistor capacity or review load and operation conditions. |
| | | | Under continuous regeneration status | |
| | | Normally during operation (regenerative resistor temperature increases slightly) | Servo drive circuit board develops fault | Replace the servo drive |
| □32 | Power supply has open phase | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |
| | | | | |

| Alarm | Alarm contents | Circumstance | Cause | Treatment measures |
|-------|---|----------------------------------|---|--|
| | (When main power supply is ON, any of L1, L2 and L3 phases is under low voltage for over 1 s) * Detect when main circuit power is on | When main power supply is on | Three-phase electric wire has poor wiring | Correct wiring |
| | | | Three-phase electric wire is unbalanced | Correct unbalance of power supply (exchange of phase position) |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | When the servo motor is actuated | Three-phase electric wire has poor wiring | Correct wiring |
| | | | Three-phase electric wire is unbalanced | Correct unbalance of power supply (exchange of phase position) |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □33 | Momentary outage alarm. | Normally during operation | There is outage of over one power cycle under AC current | Check supply circuit |
| □40 | Bus encoder is abnormal | When control power supply is on | Wiring of encoder is wrong | Correct wiring of encoder |
| | | | Encoder failure | Replace servo motor |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | During operation | Wiring of encoder is wrong | Correct wiring of encoder |
| | | | Encoder cables are interfered due to different specifications | Change cable specifications to stranded wire or stranded shielded wire with core wire over 0.12 mm ² and stranded wire made of tinned soft copper |
| | | | Encoder cables are interfered due to overlength | The max. wiring distance should be 20 m. |
| | | | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | | | Encoder cables are bound with high current line or their distance is too close | Lay encoder cables at places free from surge voltage |
| | | | Change in FG potential due to influence by motor side equipment (welding machine, etc.) | Connect equipment ground wire to prevent shunting to FG at PG side |
| | | | Signal line of encoder is interfered | Take anti-interference measures for encoder wiring. |
| | | | Encoder failure | Replace servo motor |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □41 | Bus encoder overspeed | When control power supply is on | Servo motor rotates at a speed of over 100 r/min when PG power is on | PG power is set ON when servo rotating speed is less than 100 r/min |
| | | | Encoder failure | Replace servo motor |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| | | During operation | Encoder failure | Replace servo motor |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □42 | Bus encoder FS status | Normally during | Encoder failure | Replace servo motor |

| Alarm | Alarm contents | Circumstance | Cause | Treatment measures |
|-------|---|---|---|--|
| | is wrong | operation | Servo drive circuit board develops fault | Replace the servo drive |
| □43 | Bus encoder counter goes wrong | Normally during operation | Servo drive circuit board develops fault | Replace the servo drive |
| □44 | Checkout in bus encoder control field is wrong | When control power supply is on or during operation | Encoder cables are interfered due to different specifications | Change cable specifications to stranded wire or stranded shielded wire with core wire over 12 mm ² and stranded wire made of tinned soft copper |
| | | | Encoder cables are interfered due to overlength | The max. wiring distance should be 20 m. |
| | | | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | | | Encoder cables are bound with high current line or their distance is too close | Lay encoder cables at places free from surge voltage |
| | | | Change in FG potential due to influence by motor side equipment (welding machine, etc.) | Connect equipment ground wire to prevent shunting to FG at PG side |
| | | | Signal line of encoder is interfered | Take anti-interference measures for encoder wiring. |
| □45 | Bus encoder communication data checkout is wrong | When control power supply is on or during operation | Wiring of encoder is wrong | Correct wiring of encoder |
| | | | Encoder cables are interfered due to different specifications | Change cable specifications to stranded wire or stranded shielded wire with core wire over 12 mm ² and stranded wire made of tinned soft copper |
| | | | Encoder cables are interfered due to overlength | The max. wiring distance should be 20 m. |
| | | | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | | | Encoder cables are bound with high current line or their distance is too close | Lay encoder cables at places free from surge voltage |
| | | | Change in FG potential due to influence by motor side equipment (welding machine, etc.) | Connect equipment ground wire to prevent shunting to FG at PG side |
| | | | Signal line of encoder is interfered | Take anti-interference measures for encoder wiring. |
| | | | Encoder failure | Replace servo motor |
| □46 | Cut-off position in bus encoder status field is wrong | When control power supply is on or during operation | Servo drive circuit board develops fault | Replace the servo drive |
| | | | Wiring of encoder is wrong | Correct wiring of encoder |
| □46 | Cut-off position in bus encoder status field is wrong | When control power supply is on or during operation | Encoder cables are interfered due to different specifications | Change cable specifications to stranded wire or stranded shielded wire with core wire over 12 mm ² and stranded wire |

| Alarm | Alarm contents | Circumstance | Cause | Treatment measures |
|-------|---|---|---|---|
| | | | | made of tined soft copper |
| | | | Encoder cables are interfered due to overlength | The max. wiring distance should be 20 m. |
| | | | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | | | Encoder cables are bound with high current line or their distance is too close | Lay encoder cables at places free from surge voltage |
| | | | Change in FG potential due to influence by motor side equipment (welding machine, etc.) | Connect equipment ground wire to prevent shunting to FG at PG side |
| | | | Signal line of encoder is interfered | Take anti-interference measures for encoder wiring. |
| | | | Encoder failure | Replace servo motor |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □47 | When control power supply is on or during operation | When control power supply is on or during operation | Wiring of encoder is wrong | Correct wiring of encoder |
| | | | Encoder cables are interfered due to different specifications | Change cable specifications to stranded wire or stranded shielded wire with core wire over 12 mm ² and stranded wire made of tined soft copper |
| | | | Encoder cables are interfered due to overlength | The max. wiring distance should be 20 m. |
| | | | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | | | Encoder cables are bound with high current line or their distance is too close | Lay encoder cables at places free from surge voltage |
| | | | Change in FG potential due to influence by motor side equipment (welding machine, etc.) | Connect equipment ground wire to prevent shunting to FG at PG side |
| | | | Signal line of encoder is interfered | Take anti-interference measures for encoder wiring. |
| | | | Encoder failure | Replace servo motor |
| □48 | Bus encoder data is not initialized | When control power supply is on or during operation | Encoder EEROM is not initialized | Replace servo motor |
| | | | | |
| □49 | Sum check of bus encoder data is wrong | When control power supply is on or during operation | Wiring of encoder is wrong | Correct wiring of encoder |
| | | | Encoder cables are interfered due to different specifications | Change cable specifications to stranded wire or stranded shielded wire with core wire over 12 mm ² and stranded wire made of tined soft copper |
| | | | Encoder cables are interfered due to overlength | The max. wiring distance |

| Alarm | Alarm contents | Circumstance | Cause | Treatment measures |
|-------|---------------------------------------|--|---|--|
| | | | | should be 20 m. |
| | | | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | | | Encoder cables are bound with high current line or their distance is too close | Lay encoder cables at places free from surge voltage |
| | | | Change in FG potential due to influence by motor side equipment (welding machine, etc.) | Connect equipment ground wire to prevent shunting to FG at PG side |
| | | | Signal line of encoder is interfered | Take anti-interference measures for encoder wiring. |
| | | | Encoder failure | Replace servo motor |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □70 | Overheating | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |
| | | | Overload alarm reset for several times due to power off | Change reset method of alarms |
| | | Cooling fin is overheated when main power supply is ON or during motor operation | Load exceeds rated load. | Review loading condition, operation condition or motor capacity |
| | | | Ambient temperature of the servo drive exceeds 55 °C | Reduce ambient temperature of the servo drive to below 55 °C |
| | | | Servo drive circuit board develops fault | Replace the servo drive |
| □90 | Software does not match with hardware | When control power supply is on | Servo drive circuit board develops fault | Replace the servo drive |

7.1.3 Causes and Treatment Measures of Other Abnormalities

See the following table for causes and proper treatment measures of other abnormalities without alarm display. In case such abnormalities cannot be resolved after treatment, please contact agents or service technicians of the Company.

| Abnormalities | Cause | Check method | Treatment measures |
|----------------------------|---|--|--|
| | | Note: Checking and treatment should only be made after power supply of servo system is set to OFF. | |
| Servo motor fails to start | Control power supply is not connected | Check voltage between control power supply terminals | Correct control power supply ON circuit |
| | Main circuit power is not connected | Check voltage between main circuit power terminals | Correct main circuit power ON circuit |
| | Input/Output (CN3 connector) wiring is wrong or comes off | Check installation and wiring of CN3 connector | Correctly wire CN3 connector |
| | Wiring of servo motor and encoder comes off | Inspect wiring | Connect wiring |
| | Overload occurs | Conduct no-load trial operation | Reduce load or replace with servo motor with larger capacity |

| Abnormalities | Cause | Check method | Treatment measures |
|--|--|--|---|
| | | Note: Checking and treatment should only be made after power supply of servo system is set to OFF. | |
| | Speed/position reference is not input | Check input pin | Correctly input speed/position reference |
| | Setting of input signal selection P□509 - P□512 is wrong | Check setting of input signal selection P□509 - P□512 | Correctly set input signal selection P□509 - P□512 |
| | Servo ON (/S-ON) input remains OFF | Confirm set value of user parameter P□50A.0 | Correctly set user and set servo ON (/S-ON) input to ON |
| | SEN input remains OFF | Check SEN signal input (when using absolute encoder) | Set SEN signal input to ON |
| | Mode selection for reference pulse is wrong | Check use parameters setting and reference pulse shape | Correctly set user parameter P□200.1 |
| | Speed reference input is improper during speed control | Confirm control method and input are consistent or check between V-REF and GND | Correctly set or input control parameter |
| | Torque reference input is improper during torque control | Confirm control method and input are consistent or check between T-REF and GND | Correctly set or input control parameter |
| | Position reference input is improper during position control | Check P□200.1 reference pulse signal shape or sign or sign+ pulse signal | Correctly set or input control parameter |
| | Shift pulse cleanout input (CLR) remains ON | Check CLR input | Set CLR input signal to OFF |
| | Positive rotation drive prohibited (P-OT) and negative rotation drive prohibited (N-OT) input signal remains OFF | Check POT or NOT input signal | Set POT or NOT input signal to ON |
| | Servo drive fault | Servo drive circuit board develops fault | Replace the servo drive |
| Servo motor stops after surge | Motor wiring is wrong | Check motor wiring | Correctly wire motor |
| | Encoder wiring is wrong | Check encoder wiring | Correctly wire encoder |
| Motor stops suddenly during operation and becomes motionless | Alarm reset (ALM-RST) signal remains ON and alarm goes off | Check alarm reset signal | Remove cause of alarm and set alarm reset signal from ON to OFF |
| Motor rotates unstably | Servo motor wiring is in bad contact | Power line (U, V and W phases) and encoder connector are in unstable connection | Tighten loose fastening part between treatment terminal and connector |
| Motor rotates when no reference has been sent | Speed reference input is improper during speed control | Confirm control method and input are consistent or check between V-REF and GND | Correctly set or input control parameter |
| | Torque reference input is | Confirm control method and input | Correctly set or input control parameter |

| Abnormalities | Cause | Check method | Treatment measures |
|-------------------------|---|---|--|
| | | Note: Checking and treatment should only be made after power supply of servo system is set to OFF. | |
| | improper during torque control | are consistent or check between T-REF and GND | |
| | Speed reference offset | Offset adjustment of servo drive is poor | Adjust offset of servo drive |
| | Position reference input is improper during position control | Check P□200.1 reference pulse signal shape or sign or sign+ pulse signal | Correctly set or input control parameter |
| | Servo drive fault | Servo drive circuit board develops fault | Replace the servo drive |
| Motor sounds abnormally | Machines are improperly installed | Whether mounting screws of servo motor are loosed? | Tighten mounting screws |
| | | Whether coupling core is aligned? | Align coupling core |
| | | Whether coupling is unbalanced? | Restore coupling to balance |
| | Bearing is abnormal inside | Check sounds and vibration near bearing | Please contact service technicians of the Company in case of any abnormality |
| | Supporting machines have vibration source | Whether any moving part at machine side has foreign objects or is damaged or deformed? | Please inquire relevant manufacturers |
| | Input signal lines are interfered due to different specifications | Whether stranded wire or stranded shielded wire has core wire over 0.12 mm ² and is made of tined soft copper? | Enable input signal line meet relevant specifications |
| | Input signal line is interfered due to length beyond range of application | Confirm that the max. wiring length is 3 m and its impedance is less than 100 Ω | Enable length of input signal line meet relevant specifications |
| | Encoder cables are interfered due to different specifications | Whether stranded wire or stranded shielded wire has core wire over 0.12 mm ² and is made of tined soft copper? | Enable encoder cables meet relevant specifications |
| | Encoder cables are interfered due to length beyond range of application | The max. wiring distance should be 20 m. | Enable encoder cables meet relevant specifications |
| | Encoder cables are interfered due to damages | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | Interference to encoder cable is too great | Whether encoder cables are too close with high current line? | Lay encoder cables at places free from surge voltage |
| | Change in FG potential due to influence by servo motor side equipment (welding machine, etc.) | What is grounding state (not grounded or incomplete grounding) of welding machine, etc. at servo motor side? | Connect equipment ground wire to prevent shunting to FG at PG side |

| Abnormalities | Cause | Check method | Treatment measures |
|--|---|---|---|
| | | Note: Checking and treatment should only be made after power supply of servo system is set to OFF. | |
| | Servo drive pulse counter goes wrong due to interference | Whether signal line of encoder is interfered? | Take anti-interference measures for encoder wiring. |
| | Encoder is affected by excessive vibration shock) | Mechanical vibration or motor installation is not in condition (Accuracy, fastening and core shift of mounting surface) | Reduce mechanical vibration or properly install servo motor |
| | Encoder failure | Encoder failure | Replace servo motor |
| | | | |
| Motor with frequency around 200 - 400 Hz vibrates | Speed gain P□100 is set too high | Factory setting: $K_v = 40.0 \text{ Hz}$ | Correctly set speed loop gain P□100 |
| | Position loop gain P□102 is set too high | Factory setting: $K_p = 40.0/\text{s}$ | Correctly set position loop gain P□102 |
| | Speed loop integral time constant P□101 is improperly set | Factory setting: $T_i = 20.00 \text{ ms}$ | Correctly set speed loop integral time parameter P□101 |
| | Machine stiffness is improperly set during autotune | Reassess selection of machine stiffness setting | Correctly select machine stiffness setting |
| | Ratio of moment of inertia is inappropriate when not using autotune | Check ratio of moment of inertia P□103 | Correct ratio of moment of inertia P□103 |
| Starting and stopping rotating overtravel is too large | Speed gain P□100 is set too high | Factory setting: $K_v = 40.0 \text{ Hz}$ | Correctly set speed loop gain P□100 |
| | Position loop gain P□102 is set too high | Factory setting: $K_p = 40.0/\text{s}$ | Correctly set position loop gain P□102 |
| | Speed loop integral time parameter P□101 is improperly set | Factory setting: $T_i = 20.00 \text{ ms}$ | Correctly set speed loop integral time parameter P□101 |
| | Machine stiffness is improperly set during autotune | Reassess selection of machine stiffness setting | Correctly select machine stiffness setting |
| | Ratio of moment of inertia is inappropriate when not using autotune | Check ratio of moment of inertia P□103 | Correct ratio of moment of inertia P□103 |
| | | | Use module switch function |
| Position offset of absolute encoder is wrong (Position saved by command controller during outage is different from position when the power supply is on next time) | Encoder cables are interfered due to different specifications | stranded wire or stranded shielded wire has core wire over 0.12 mm^2 and is made of tinned soft copper | Enable encoder cables meet relevant specifications |
| | Encoder cables are interfered due to length beyond range of application | The max. wiring distance should be 20 m. | Enable encoder cables meet relevant specifications |
| | Encoder cables are interfered due to damages | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | Interference to encoder cable is too great | Whether encoder cables are bound with high current line or their distance is too close? | Lay encoder cables at places free from surge voltage |
| | Fluctuation of FG potential due | What is grounding state (not | Connect equipment ground wire to |

| Abnormalities | Cause | Check method | Treatment measures |
|--|--|---|---|
| | | Note: Checking and treatment should only be made after power supply of servo system is set to OFF. | |
| | to interference by motor side equipment (welding machine, etc.) | grounded or incomplete grounding) of welding machine, etc. at servo motor side? | prevent shunting to FG at PG side |
| | Servo drive pulse counter goes wrong due to interference | Whether signal line of encoder is interfered? | Take anti-interference measures for encoder wiring. |
| | Encoder is affected by excessive vibration shock | Mechanical vibration or motor installation is not in condition (Accuracy, fastening and core shift of mounting surface) | Reduce mechanical vibration or properly install servo motor |
| | Encoder failure | Encoder failure (no change in pulse) | Replace servo motor |
| | Servo drive fault | Servo drive fails to send multi-turn data | Replace the servo drive |
| | Command controller multi-turn data read error | Check error detection of command controller | Restore error detection function of command controller |
| | | Whether data (odd-even) check is executed on command controller? | Execute odd-even check of multi-turn data |
| | | Signal line between servo drive and command controller is interfered | Interference effect occurs when no checkout is done (above) |
| Overtravel (OT) (Exceeding scope specified by command controller) | Positive/negative rotation drive prohibited input signal reaches (POT or NOT is at H level) | Whether external power supply (+24 V) of input signal is correct? | Correct external power supply of +24 V |
| | | Whether action state of overtravel limit SW is correct? | Correct state of overtravel limit SW |
| | | Whether wiring of overtravel limit SW is correct? | Correct wiring of overtravel limit SW |
| | Positive/negative rotation drive prohibited input signal is malfunctioning (POT or NOT changes constantly) | Whether external power supply (+24 V) of input signal changes? | Remove cause of change in external power supply of +24 V |
| | | Whether action of overtravel limit SW is unstable? | Make action of overtravel limit SW unstable |
| | | Whether wiring of overtravel limit SW is correct? (Cable damage and screw fastening) | Correct wiring of overtravel limit SW |
| | Positive/negative rotation drive prohibited input signal P-OT/N-OT signal selection is wrong | Check POT signal selection P□510.2 | Correct POT signal selection P□510.2 |
| | | Check NOT signal selection P□510.3 | Correct NOT signal selection P□510.3 |
| | Motor stop method selection is wrong | What is the selection for inertial operation stop when servo is OFF? | Check P□000.2 and P□000.3 |
| | | What is the setting for inertial operation during torque control? | Check P□000.2 and P□000.3 |

| Abnormalities | Cause | Check method | Treatment measures |
|--|---|---|--|
| | | Note: Checking and treatment should only be made after power supply of servo system is set to OFF. | |
| | Overtravel position is not proper | OT position is shorter than operation distance | Properly set Ot position |
| | Encoder cables are interfered due to different specifications | Whether stranded wire or stranded shielded wire has core wire over 0.12 mm ² and is made of tined soft copper? | Enable encoder cables meet relevant specifications |
| | Encoder cables are interfered due to length beyond range of application | The max. wiring distance should be 20 m. | Enable encoder cables meet relevant specifications |
| | Encoder cables are interfered due to damages | Signal lines are interfered due to engaging-in and damage in sheath of encoder cables | Correct layout of encoder cables |
| | Interference to encoder cable is too great | Whether encoder cables are bound with high current line or their distance is too close? | Lay encoder cables at places free from surge voltage |
| | Change in FG potential due to influence by servo motor side equipment (welding machine, etc.) | What is grounding state (not grounded or incomplete grounding) of welding machine, etc. at servo motor side? | Connect equipment ground wire to prevent shunting to FG at PG side |
| | Servo unit pulse counter goes wrong due to interference | Whether signal line of encoder is interfered? | Take anti-interference measures for encoder wiring. |
| | Encoder is affected by excessive vibration shock | Mechanical vibration or motor installation is not in condition (accuracy, fastening and core shift of mounting surface) | Reduce mechanical vibration or properly install servo motor |
| | Encoder failure | Encoder failure (no change in pulse) | Replace servo motor |
| | Servo drive fault | Servo drive fails to send multi-turn data | Replace the servo drive |
| Position offset (alarm fails and causes position offset) | Coupling between machine and servo motor is abnormal | Whether coupling between machine and servo motor has offset? | Correctly connect coupling between machine and servo motor |
| | Input signal lines are interfered due to different specifications | Whether stranded wire or stranded shielded wire has core wire over 0.12 mm ² and is made of tined soft copper? | Enable input signal line meet relevant specifications |
| | Input signal line is interfered due to length beyond range of application | Confirm that the max. wiring length is 3 m and its impedance is less than 100 Ω | Enable length of input signal line meet relevant specifications |
| | Encoder failure (no change in pulse) | Encoder failure (no change in pulse) | Replace servo motor |

7.2 Maintenance and Check of Servo Drive

7.2.1 Check of Servo Motor

Since AC servo motor is not equipped with electric brush, only simple daily check is required. The table lists general standards of checking period which should be properly determined based on actual using conditions and environment.

| Check item | Check period | Tips for check and maintenance | Remarks |
|--------------------------------------|---|---|--|
| Confirmation of vibration and sound | Everyday | Determine based on feeling and hearing | Compare with normal condition to detect any increase |
| Appearance inspection | Based on contamination | Clean up with brush or air gun | — |
| Measurement of insulation resistance | Once every year | Disconnect from servo unit and measure insulation resistance with 500 V megameter. Resistance over 10 MΩ is considered as normal. | Please contact local dealer in case the resistance is less than 10 MΩ. |
| Replacement of oil seal | Once at least every 5000 h | Please contact local dealer. | Only for servo motor with oil seal |
| Comprehensive check | Once every five years or at least every 20000 h | Please contact local dealer. | — |

7.2.2 Check of Servo Drive

Daily check is not required, but more than one check is needed every year.

| Check item | Check period | Tips for check and maintenance | Remarks |
|---|-----------------|---|-------------------------------|
| Cleaning of main body and circuit board | Once every year | Please contact local dealer. | Please further secure screws. |
| Loosening of screws | | Mounting screws of terminal board and connector should be firmly secured without loosening. | |

7.2.3 General Standards of Replacement of Internal Parts of Servo Drive

Mechanical abrasion and aging will occur to electric and electronic parts. Therefore, regular check is required for safety purpose. In need of replacement of parts, local dealer should be contacted. Use parameters of servo drives overhauled by the Company will be restored to factory setting and user parameters for using should be set before operation.

| Part Name | Years of revision of standards | Use conditions |
|-------------|--------------------------------|-----------------------------|
| Cooling fan | 4-5 years | Ambient temperature: annual |

| | | |
|---|-------------|---------------------------------|
| Smoothing capacitor | 7 - 8 years | average of 30 °C |
| Relays | — | Load rate: below 80% |
| Fuse | 10 years | Operating ratio: less than 20 h |
| Aluminium electrolytic capacitor on PCB | 5 years | every day |

Appendix A Summary of User Parameters

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|-----------------------------------|--------------|-----------------|--------------|---------|
| P□000 | Basic function selection switch | — | — | 0010 | Y | |
| | <div><div>H<div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>Rotation direction selection</div><div><div>0</div><div>CCW (counter clockwise) is the positive rotation direction</div></div><div><div>1</div><div>CW (clockwise) is the positive rotation direction (in reserve mode)</div></div></div><div><div>Control mode selection</div><div><div>0</div><div>Speed control (analog reference)</div></div><div><div>1</div><div>Position control (pulse train reference)</div></div><div><div>2</div><div>Torque control (analog reference)</div></div><div><div>3</div><div>Internal set speed control (contact reference)</div></div><div><div>4</div><div>Internal set speed control (contact reference) ↔ Speed control (analog reference)</div></div><div><div>5</div><div>Internal set speed control (contact reference) ↔ Position control (pulse train reference)</div></div><div><div>6</div><div>Internal set speed control (contact reference) ↔ Torque control (analog reference)</div></div><div><div>7</div><div>Position control (pulse train reference) ↔ Speed control (analog reference)</div></div><div><div>8</div><div>Position control (pulse train reference) ↔ Speed control (analog reference)</div></div><div><div>9</div><div>Torque control (analog reference) ↔ Speed control (analog reference)</div></div><div><div>A</div><div>Speed control (analog reference) ↔ Zero clamping</div></div><div><div>B</div><div>Position control (pulse train reference) ↔ Position control (pulse prohibited)</div></div><div><div>C</div><div>Internal position control</div></div></div><div><div>Stop method when servo is OFF</div><div><div>0</div><div>Reverse braking the motor decelerates to a stop, then Set it to free-running status</div></div><div><div>1</div><div>Set motor to inertial operation state</div></div></div><div><div>Stop method during overtravel (OT)</div><div><div>0</div><div>Reverse braking the motor decelerates to a stop, then Set it to free-running status</div></div><div><div>1</div><div>Reverse braking the motor decelerates to a stop, then Set it to free-running status</div></div><div><div>2</div><div>Set motor to inertial operation state</div></div></div></div> | | | | | |
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| | P□001 | Basic function selection switch 1 | — | — | 0001 | Y |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|--------------|-----------------|--------------|---------|
| | <div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div> <div><div><div>Use method of encoder</div><div><div>0</div><div>Use absolute encoder as absolute encoder and enable serial output of absolute data (PG frequency dividing PAO□)</div></div><div><div>1</div><div>Use absolute encoder as incremental encoder</div></div><div><div>2</div><div>Use absolute encoder as absolute encoder and disable serial output of absolute data</div></div></div><div><div><div>Speed control option (T-REF distribution)</div><div><div>0</div><div>N A</div></div><div><div>1</div><div>Use T-REF as external torque limit input</div></div><div><div>2</div><div>Use T-REF as torque feedforward input</div></div><div><div>3</div><div>Use T-REF as external torque limit input when P-CL and N-CL are enabled</div></div></div><div><div><div>Torque control option (V-REF distribution)</div><div><div>0</div><div>N A</div></div><div><div>1</div><div>Use V-REF as external torque limit input</div></div></div><div><div><div>Accelerated speed feedforward mode selection</div><div><div>0</div><div>Accelerated speed feedforward type 1 (filtering calculation)</div></div><div><div>1</div><div>Accelerated speed feedforward type 2 (rapid calculation)</div></div></div></div></div></div></div> | | | | | |
| P□002 | Basic function selection switch 2 | — | — | 1100 | Y | |
| | <div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div> <div><div><div>Second electronic gear enabled</div><div><div>0</div><div>Disable second electronic gear and use /P-CON signal as P/PI switch</div></div><div><div>1</div><div>Enable second electronic gear and use /P-CON signal as second electronic gear switch</div></div></div><div><div><div>Preset constant (do not change)</div><div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Reserved</div></div></div><div><div><div>Preset constant (do not change)</div><div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Reserved</div></div></div><div><div><div>Preset constant (do not change)</div><div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Reserved</div></div></div></div></div></div></div> | | | | | |
| P□003 | Basic function selection switch 3 | — | — | 1000 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|--------------|-----------------|--------------|---------|
| | <div><div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div><div><div><div>Common encoder (non-serial encoder) alarm enable switch</div><div><div>0</div><div>Disable A05 - A08 or b05 - b08 alarm detection</div></div><div><div>1</div><div>Enable A05 - A08 or b05 - b08 alarm detection</div></div></div><div><div><div>Preset constant (do not change)</div><div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Reserved</div></div></div><div><div><div>Momentary outage alarm enable switch</div><div><div>0</div><div>No alarm for momentary outage of one cycle</div></div><div><div>1</div><div>Alarm for momentary outage of one cycle</div></div></div><div><div><div>Overload enhancement enable switch</div><div><div>0</div><div>Disable overload enhancement function</div></div><div><div>1</div><div>Enable overload enhancement function (enhance overload capacity, suitable for occasion with frequent start and stop)</div></div></div></div></div></div></div></div> | | | | | |
| P□004 | Basic function selection switch 4 | — | — | 0100 | Y | |
| | <div><div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div><div><div><div>Preset constant (do not change)</div><div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Reserved</div></div></div><div><div><div>Preset constant (do not change)</div><div><div>0</div><div>Reserved</div></div></div><div><div><div>Low-frequency jitter suppression enable switch</div><div><div>0</div><div>Disable low-frequency jitter suppression</div></div><div><div>1</div><div>Enable low-frequency jitter suppression</div></div></div><div><div><div>Out-of-tolerance alarm enable switch</div><div><div>0</div><div>Disable out-of-tolerance alarm detection</div></div><div><div>1</div><div>Enable out-of-tolerance alarm detection (alarm will be given when offset counter value exceeds P□504)</div></div><div><div>4</div><div>Shielding the alarm of number 17(Electronic gear is wrong)</div></div></div></div></div></div></div></div> | | | | | |
| P□006 | Set the motor manufacturers and encoder type | | | | Y | |
| | <div><div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div><div><div><div>Set the encoder type</div><div><div>0</div><div>Non wire -saving encoder</div></div><div><div>1</div><div>Tamagawa wire -saving encoder</div></div><div><div>2</div><div>Reserved</div></div><div><div>3</div><div>Tamagawa / Nemicon / Yuheng 17bit multi-turn</div></div><div><div>4</div><div>Nikon</div></div><div><div>5</div><div>Reserved</div></div><div><div>6</div><div>Tamagawa / Nemicon / Yuheng 23bit multi-turn</div></div><div><div>7</div><div>Yuheng 17bit single-turn</div></div><div><div>8</div><div>Tamagawa 17bit single-turn</div></div></div><div><div><div>Set the motor manufacture</div><div><div>0</div><div>HD-LFB、HD-LMDD</div></div><div><div>1</div><div>HD-LMBB、HD-HB</div></div><div><div>2</div><div>MG</div></div></div><div><div><div>Reserved</div></div></div><div><div><div>Reserved</div></div></div></div></div></div> | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|----------------------|-----------------|--------------|----------------------|
| P□008 | Set the line of incremental encoder,For example set P□008 to 5000,it indicates that the line of incremental encoder is 5000 | 0 ~ 8192 | | 0 | Y | |
| P□100 | Speed loop gain | 1 ~ 2500 | 0.1 Hz | 400 | N | |
| P□101 | Speed loop integral time constant | 1 ~ 4000 | 0.01ms | 2000 | N | |
| P□102 | Position loop gain | 1 ~ 2000 | 0.1/s | 400 | N | |
| P□103 | Moment of inertia ratio | 0 ~ 20000 | 1 % | 0 | N | |
| P□104 | Second speed loop gain | 1 ~ 2500 | 0.1 Hz | 400 | N | |
| P□105 | Second speed loop integral time constant | 1 ~ 4000 | 0.01ms | 2000 | N | |
| P□106 | Second position loop gain | 1 ~ 2000 | 0.1/s | 400 | N | |
| P□107 | Offset (speed offset) | 0 ~ 450 | 1r/min | 0 | N | |
| P□108 | Scope of offset stack | 0 ~ 5000 | 1reference pulse | 10 | N | |
| P□109 | Feedforward gain | 0 ~ 100 | 1 % | 0 | N | |
| P□110 | Feedforward filter time constant | 0 ~ 640 | 0.1ms | 0 | N | |
| P□111 | Accelerated speed freeforward percentage | 0 ~ 100 | 1 % | 0 | N | |
| P□112 | Accelerated speed feedforward filter time constant | 0 ~ 640 | 0.1ms | 0 | N | |
| P□113 | Application function for gain select switch | 0000 ~ 0064 | —— | 0000 | Y | |
| | <div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>H</div><div><div></div><div></div><div></div><div></div></div></div><div><div><div>Module switch selection</div><div><div>0</div><div>Use internal torque reference as the condition (level setting: P□114)</div></div><div><div>1</div><div>Use speed as the condition (level setting: P□115)</div></div><div><div>2</div><div>Use acceleration as the condition (level setting: P□116)</div></div><div><div>3</div><div>Use position error pulse as the condition (level setting: P□117)</div></div><div><div>4</div><div>No mode switch function</div></div></div></div><div><div><div>Selection of auto gain switch conditions</div><div><div>0</div><div>Non-auto gain switch (fixed to first group gain)</div></div><div><div>1</div><div>External switch gain switch (G-SEL signal)</div></div><div><div>2</div><div>Torque percentage switch</div></div><div><div>3</div><div>Switch only under position offset</div></div><div><div>4</div><div>Given accelerated speed value (10 r/min/s)</div></div><div><div>5</div><div>Given speed value</div></div><div><div>6</div><div>With position reference input</div></div></div></div><div><div><div>Reserved</div></div></div><div><div><div>Reserved</div></div></div></div> | | | | | |
| P□114 | Mode switch (torque reference) | 0 ~ 300 | 1 % | 200 | N | |
| P□115 | Mode switch (speed reference) | 0 ~ 10000 | 1r/min | 0 | N | |
| P□116 | Mode switch (accelerated speed reference) | 0 ~ 3000 | 10 r/min/s | 0 | N | |
| P□117 | Mode switch (offset pulse) | 0 ~ 10000 | 1-reference pulse | 0 | N | |
| P□118 | Gain switch delay time | 0 ~ 20000 | 0.1 ms (single axis) | 0 | N | 0.2 ms (double axis) |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|--|---|---------------|----------------------|-----------------|--------------|----------------------|
| P□119 | Gain switch range | 0 ~ 20000 | free | 0 | N | |
| | When P□113.1 = 2, the unit is 1% | | | | | |
| | When P□113.1 = 3, the unit is 1 reference pulse | | | | | |
| | When P□113.1 = 4, the unit is 10 r/min/s | | | | | |
| | When P□113.1 = 5, the unit is 1 r/min | | | | | |
| | When P□113.1 = 6, the unit is 1 reference pulse | | | | | |
| P□120 | Position gain switch time | 0 ~ 20000 | 0.1 ms (single axis) | 0 | N | 0.2 ms (double axis) |
| P□121 | Gain switch hysteresis | 0 ~ 20000 | 1-reference pulse | 0 | N | |
| P□122 | Friction load | 0 ~ 3000 | 1‰ | 0 | N | |
| P□123 | Friction compensation speed hysteresis area | 0 ~ 100 | 1r/min | 0 | Y | |
| P□124 | Viscous friction load | 0 ~ 20000 | 1 ‰/1 krpm | 0 | N | |
| P□125 | Friction gain | 0 ~ 30000 | | 0 | N | |
| P□126 | Speed observer period | 0 ~ 100 | 0.1ms | 0/35/70 | N | |
| P□127 | Online autotune switches | —— | —— | 1340 | Y/N | |
| <div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>H</div><div><div><div>Real-time auto gain setting</div><div>Power reboot</div></div><div><div>0</div><div>Non-real-time auto gain adjustment</div></div><div><div>1</div><div>Normal mode (suitable for operations without change in load inertia)</div></div><div><div>2</div><div>Normal mode (suitable for operations with little change in load inertia)</div></div><div><div>3</div><div>Normal mode (suitable for operations with great change in load inertia)</div></div><div><div>4</div><div>Vertical load (suitable for operations without change in load inertia)</div></div><div><div>5</div><div>Vertical load (suitable for operations with little change in load inertia)</div></div><div><div>6</div><div>Vertical load (suitable for operations with great change in load inertia)</div></div><div><div>Selection of machine stiffness for real-time auto gain</div><div>Power reboot</div></div><div><div>0</div><div>Machine stiffness during real-time auto gain adjustment may be selected. The larger the parameter value is, the quicker the response will be.</div></div><div><div>...</div><div>If this parameter is set very high all at once, system gain will change significantly, leading to great shock to machine.</div></div><div><div>F</div><div>It is recommended to set a small value and gradually select larger stiffness while monitoring operating status of machine.</div></div></div><div><div>Reserved</div></div><div><div><div>Normal auto adjustment mode setting</div><div>Power reboot</div></div><div><div>0</div><div>Rotating circles: 1; direction: CCW → CW</div></div><div><div>1</div><div>Rotating circles: 2; direction: CCW → CW</div></div><div><div>2</div><div>Rotating circles: 3; direction: CCW → CW</div></div><div><div>3</div><div>Rotating circles: 4; direction: CCW → CW</div></div><div><div>4</div><div>Rotating circles: 1; direction: CW → CCW</div></div><div><div>5</div><div>Rotating circles: 2; direction: CW → CCW</div></div><div><div>6</div><div>Rotating circles: 3; direction: CW → CCW</div></div><div><div>7</div><div>Rotating circles: 4; direction: CW → CCW</div></div></div></div></div> | | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|--------------|-----------------|--------------|---------|
| P□141 | Speed observer setting | | | | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 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| | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | |
|---------------|--|--|--------------|-----------------|--------------|---------|--|
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Offset pulse clearing method</div><div><div>0</div><div>Clear error pulse(servo OFF); Does not clear error pulse(over travel)</div></div><div><div>1</div><div>Does not clear offset pulse(servo OFF or over travel)</div></div><div><div>2</div><div>Clear offset pulse (servo OFF or over travel ,except for zero clamping position)</div></div></div><div><div>Reference pulse form</div><div><div>0</div><div>Sign + pulse</div></div><div><div>1</div><div>CW+CCW</div></div><div><div>2</div><div>A phase + B phase (1x frequency)</div></div><div><div>3</div><div>A phase + B phase (2x frequency)</div></div><div><div>4</div><div>A phase + B phase (4x frequency)</div></div></div><div><div>Reverse setting of reference pulse signal</div><div><div>0</div><div>Does not reverse PULS and SIGN</div></div><div><div>1</div><div>Does not reverse PULS, reverse SIGN</div></div><div><div>2</div><div>Reverse PULS , does not reverse SIGN</div></div><div><div>3</div><div>Reverse PULS and SIGN</div></div></div><div><div>Filter selection</div><div><div>0</div><div>Bus driver signal reference input filter</div></div><div><div>1</div><div>Collector open-circuit signal reference input filter</div></div></div></div></div> | | | | | | |
| | P□201 | PG frequency dividing | 16 ~ 32768 | 1 P/rev | 2500 | Y | |
| | P□202 | First electronic gear ratio (numerator) | 1 ~ 65535 | —— | 1 | Y | |
| | P□203 | First electronic gear ratio (denominator) | 1 ~ 65535 | —— | 1 | Y | |
| | P□204 | Second electronic gear ratio (numerator) | 1 ~ 65535 | —— | 1 | Y | |
| | P□205 | Position reference acceleration/deceleration time constant | 0 ~ 6400 | 0.1ms | 0 | N | |
| | P□206 | Position reference filter form selection | 0 ~ 1 | —— | 0 | Y | |
| | P□212 | Electronic gear numerator adjustment factor | 1 ~ 65535 | | 1 | | |
| | | This parameter×P□202 = Electronic gear numerator | | | | | |
| | P□213 | Electronic gear denominator adjustment factor | 1 ~ 65535 | | 1 | | |
| | | This parameter×P□203 = Electronic gear denominator | | | | | |
| | P□300 | Speed reference input gain | 0 ~ 3000 | (r/min)/V | 150 | N | |
| | P□301 | Internal set speed 1 | 0 ~ 6000 | 1r/min | 100 | N | |
| | P□302 | Internal set speed 2 | 0 ~ 6000 | 1r/min | 200 | N | |
| | P□303 | Internal set speed 3 | 0 ~ 6000 | 1r/min | 300 | N | |
| | P□304 | Jogging (JOG) speed | 0 ~ 6000 | 1r/min | 500 | N | |
| | P□305 | Acceleration time of soft start | 0 ~ 10000 | 1 ms | 0 | N | |
| | P□306 | Deceleration time of soft start | 0 ~ 10000 | 1 ms | 0 | N | |
| P□307 | Speed reference filter constant | 0 ~ 10000 | 1 ms | 0 | N | | |
| P□308 | Rise time of S curve | 0 ~ 10000 | 1 ms | 0 | N | | |
| P□309 | Z signal inversion | —— | —— | 0000 | Y | | |

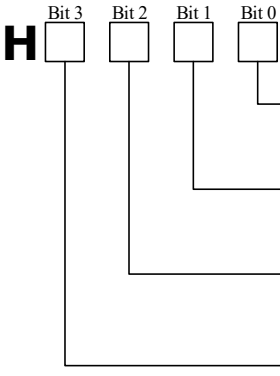
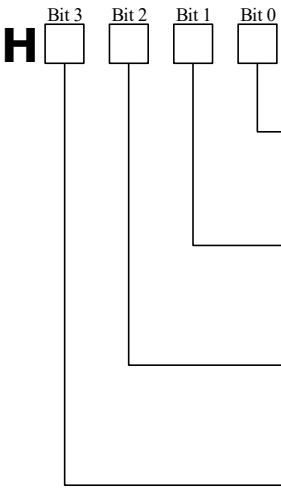
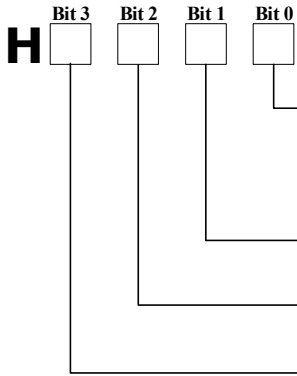
| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|--------------------|-----------------|--------------|----------------------|
| | | | | | | |
| P□400 | Torque reference input gain | 10 ~ 100 | 0.1V/rated torque | 30 | N | |
| P□401 | Torque reference filter time constant | 0 ~ 250 | 0.1ms | 4 | N | |
| P□402 | Second torque reference filter time constant | 0 ~ 250 | 0.1ms | 4 | N | |
| P□403 | Forward torque limit | 0 ~ 300 | 1 % | 300 | N | |
| P□404 | Reverse torque limit | 0 ~ 300 | 1 % | 300 | N | |
| P□405 | Forward external torque limit | 0 ~ 300 | 1 % | 100 | N | |
| P□406 | Reverse external torque limit | 0 ~ 300 | 1 % | 100 | N | |
| P□407 | Plug braking torque limit | 0 ~ 300 | 1 % | 300 | N | |
| P□408 | Speed limit during torque control | 0 ~ 6000 | 1r/min | 1500 | N | |
| P□409 | Frequency of notch filter section 1 | 50 ~ 5000 | 1Hz | 5000 | N | |
| P□410 | Depth of notch filter section 1 | 0 ~ 100 | — | 10 | N | |
| P□411 | Frequency of notch filter section 2 | 50 ~ 5000 | 1 Hz | 5000 | N | |
| P□412 | Depth of notch filter section 2 | 0 ~ 100 | — | 10 | N | |
| P□413 | Vibration frequency of B type | 10 ~ 1000 | 0.1 Hz | 1000 | N | |
| P□414 | Vibration damping of B type | 0 ~ 200 | — | 25 | N | |
| P□500 | Positioning completion width | 0 ~ 5000 | 1 reference unit | 10 | N | |
| P□501 | Zero clamping level | 0 ~ 3000 | 1r/min | 10 | N | |
| P□502 | Rotation detection of electric level | 0 ~ 3000 | 1r/min | 20 | N | |
| P□503 | Same-speed signal detection width | 0 ~ 100 | 1r/min | 10 | N | |
| P□504 | Offset pulse overflow level | 1 ~ 32767 | 256 reference unit | 1024 | N | |
| P□505 | Waiting time of servo ON | 0 ~ 2000 | ms | 0 | N | |
| P□506 | Brake command - delay time of servo OFF | 0 ~ 500 | 10ms | 0 | N | |
| P□507 | Level for output speed of brake command | 0 ~ 6000 | 1r/min | 100 | N | |
| P□508 | Brake command wait time when servo is OFF | 10 ~ 100 | 10ms | 50 | N | |
| P□509 | Input signal selection 1 | — | — | 9901 | Y | 8765 (double axis/b) |
| | Parameter of K/K2 series: | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|--|--------------|-----------------|--------------|---------|
| H | Bit 3 | | | | | |
| | Bit 2 | | | | | |
| | Bit 1 | | | | | |
| | Bit 0 | | | | | |
| | /S-ON signal distribution | | | | | |
| | 0 | Set signal fixed to be "inactive" | | | | |
| | 1 | Active when IN1 (CN3-14) input signal is ON | | | | |
| | 2 | Active when IN2 (CN3-15) input signal is ON | | | | |
| | 3 | Active when IN3 (CN3-16) input signal is ON | | | | |
| | 4 | Active when IN4 (CN3-17) input signal is ON | | | | |
| | 5 | Active when IN5 (CN3-39) input signal is ON | | | | |
| | 6 | Active when IN6 (CN3-40) input signal is ON | | | | |
| | 7 | Active when IN7 (CN3-41) input signal is ON | | | | |
| | 8 | Active when IN8 (CN3-42) input signal is ON | | | | |
| | 9 | Set signal fixed to be "active" | | | | |
| | /P-CON signal distribution (P control when input signal is ON) | | | | | |
| | 0-9 | Ditto | | | | |
| | P-OT signal distribution (positive rotation drive prohibited when OFF) | | | | | |
| | 0 | Set signal fixed to be "positive rotation drive prohibited" | | | | |
| | 1 | Active when IN1 (CN3-14) input signal is ON | | | | |
| | 2 | Active when IN2 (CN3-15) input signal is ON | | | | |
| | 3 | Active when IN3 (CN3-16) input signal is ON | | | | |
| | 4 | Active when IN4 (CN3-17) input signal is ON | | | | |
| | 5 | Active when IN5 (CN3-39) input signal is ON | | | | |
| | 6 | Active when IN6 (CN3-40) input signal is ON | | | | |
| | 7 | Active when IN7 (CN3-41) input signal is ON | | | | |
| | 8 | Active when IN8 (CN3-42) input signal is ON | | | | |
| | 9 | Set signal fixed to be "positive rotation drive allowed" | | | | |
| | N-OT signal distribution (negative drive prohibited when input signal is OFF) | | | | | |
| | 0 | Set signal fixed to be "negative rotation side drive prohibited" | | | | |
| | 1 | Active when IN1 (CN3-14) input signal is ON | | | | |
| | 2 | Active when IN2 (CN3-15) input signal is ON | | | | |
| | 3 | Active when IN3 (CN3-16) input signal is ON | | | | |
| | 4 | Active when IN4 (CN3-17) input signal is ON | | | | |
| | 5 | Active when IN5 (CN3-39) input signal is ON | | | | |
| | 6 | Active when IN6 (CN3-40) input signal is ON | | | | |
| | 7 | Active when IN7 (CN3-41) input signal is ON | | | | |
| | 8 | Active when IN8 (CN3-42) input signal is ON | | | | |
| | 9 | Set signal fixed to be "negative rotation side drive allowed" | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|--|--|--------------|-----------------|--------------|---------|---|-----------------------------------|---|---|---|--|---|---|---|--|---|---------------------------------|-----|-------|---|---|---|---|---|--|---|---|---|--|---|--|---|--|---|---|---|--|---|---|---|--|---|---|
| | Parameter of K1 series: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div> | <div><div>/S-ON signal distribution</div><table><tr><td>0</td><td>Set signal fixed to be "inactive"</td></tr><tr><td>1</td><td>Active when IN1 (CN2-19) input signal is ON</td></tr><tr><td>2</td><td>Active when IN2 (CN2-7) input signal is ON</td></tr><tr><td>3</td><td>Active when IN3 (CN2-20) input signal is ON</td></tr><tr><td>4</td><td>Active when IN4 (CN2-8) input signal is ON</td></tr><tr><td>9</td><td>Set signal fixed to be "active"</td></tr></table></div> <div><div>/P-CON signal distribution (P control when input signal is ON)</div><table><tr><td>0-9</td><td>Ditto</td></tr></table></div> <div><div>P-OT signal distribution (positive rotation drive prohibited when OFF)</div><table><tr><td>0</td><td>Set signal fixed to be "positive rotation drive prohibited"</td></tr><tr><td>1</td><td>Active when IN1 (CN2-19) input signal is ON</td></tr><tr><td>2</td><td>Active when IN2 (CN2-7) input signal is ON</td></tr><tr><td>3</td><td>Active when IN3 (CN2-20) input signal is ON</td></tr><tr><td>4</td><td>Active when IN4 (CN2-8) input signal is ON</td></tr><tr><td>9</td><td>Set signal fixed to be "positive rotation drive allowed"</td></tr></table></div> <div><div>N-OT signal distribution (negative drive prohibited when input signal is OFF)</div><table><tr><td>0</td><td>Set signal fixed to be "negative rotation side drive prohibited"</td></tr><tr><td>1</td><td>Active when IN1 (CN2-19) input signal is ON</td></tr><tr><td>2</td><td>Active when IN2 (CN2-7) input signal is ON</td></tr><tr><td>3</td><td>Active when IN3 (CN2-20) input signal is ON</td></tr><tr><td>4</td><td>Active when IN4 (CN2-8) input signal is ON</td></tr><tr><td>9</td><td>Set signal fixed to be "negative rotation side drive allowed"</td></tr></table></div> | | | | | 0 | Set signal fixed to be "inactive" | 1 | Active when IN1 (CN2-19) input signal is ON | 2 | Active when IN2 (CN2-7) input signal is ON | 3 | Active when IN3 (CN2-20) input signal is ON | 4 | Active when IN4 (CN2-8) input signal is ON | 9 | Set signal fixed to be "active" | 0-9 | Ditto | 0 | Set signal fixed to be "positive rotation drive prohibited" | 1 | Active when IN1 (CN2-19) input signal is ON | 2 | Active when IN2 (CN2-7) input signal is ON | 3 | Active when IN3 (CN2-20) input signal is ON | 4 | Active when IN4 (CN2-8) input signal is ON | 9 | Set signal fixed to be "positive rotation drive allowed" | 0 | Set signal fixed to be "negative rotation side drive prohibited" | 1 | Active when IN1 (CN2-19) input signal is ON | 2 | Active when IN2 (CN2-7) input signal is ON | 3 | Active when IN3 (CN2-20) input signal is ON | 4 | Active when IN4 (CN2-8) input signal is ON | 9 | Set signal fixed to be "negative rotation side drive allowed" |
| 0 | Set signal fixed to be "inactive" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Active when IN1 (CN2-19) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Active when IN2 (CN2-7) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Active when IN3 (CN2-20) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Active when IN4 (CN2-8) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Set signal fixed to be "active" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0-9 | Ditto | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Set signal fixed to be "positive rotation drive prohibited" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Active when IN1 (CN2-19) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Active when IN2 (CN2-7) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Active when IN3 (CN2-20) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Active when IN4 (CN2-8) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Set signal fixed to be "positive rotation drive allowed" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Set signal fixed to be "negative rotation side drive prohibited" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Active when IN1 (CN2-19) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Active when IN2 (CN2-7) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Active when IN3 (CN2-20) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Active when IN4 (CN2-8) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Set signal fixed to be "negative rotation side drive allowed" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|--|--------------------------|---------------|--------------|--------------------|--------------|--------------------|
| P□510 | Input signal selection 2 | — | — | 8765 (single axis) | Y | 0000 (double axis) |
| Parameter of K/K2 series: | | | | | | |
| <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>/ALM-RST signal distribution (Clear alarm when turning from OFF to ON)</div><div><div>0</div><div>Set signal fixed to be "OFF"</div></div><div><div>1</div><div>Active when IN1 (CN3-14) input signal is ON</div></div><div><div>2</div><div>Active when IN2 (CN3-15) input signal is ON</div></div><div><div>3</div><div>Active when IN3 (CN3-16) input signal is ON</div></div><div><div>4</div><div>Active when IN4 (CN3-17) input signal is ON</div></div><div><div>5</div><div>Active when IN5 (CN3-39) input signal is ON</div></div><div><div>6</div><div>Active when IN6 (CN3-40) input signal is ON</div></div><div><div>7</div><div>Active when IN7 (CN3-41) input signal is ON</div></div><div><div>8</div><div>Active when IN8 (CN3-42) input signal is ON</div></div><div><div>9</div><div>Set signal fixed to be "ON"</div></div></div><div><div><div>/CLR signal distribution</div><div><div>0-9</div><div>Same with /S-ON signal conversion</div></div></div><div><div><div>/P-CL signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div><div><div><div>/N-CL signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div></div></div></div></div></div> | | | | | | |
| Parameter of K1 series: | | | | | | |
| <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>/ALM-RST signal distribution (Clear alarm when turning from OFF to ON)</div><div><div>0</div><div>Set signal fixed to be "OFF"</div></div><div><div>1</div><div>Active when IN1 (CN2-19) input signal is ON</div></div><div><div>2</div><div>Active when IN2 (CN2-7) input signal is ON</div></div><div><div>3</div><div>Active when IN3 (CN2-20) input signal is ON</div></div><div><div>4</div><div>Active when IN4 (CN2-8) input signal is ON</div></div><div><div>9</div><div>Set signal fixed to be "ON"</div></div></div><div><div><div>/CLR signal distribution</div><div><div>0-9</div><div>Same with /S-ON signal conversion</div></div></div><div><div><div>/P-CL signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div><div><div><div>/N-CL signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div></div></div></div></div></div> | | | | | | |
| P□511 | Input signal selection 3 | — | — | 0000 | Y | |
| <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>/G-SEL signal distribution</div><div><div>0-9</div><div>Same with /S-ON signal conversion</div></div></div><div><div><div>/POS0 signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div><div><div><div>/POS1 signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div><div><div><div>/POS2 signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div></div></div></div></div></div> | | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|--|---------------------------|---------------|--------------|-----------------|--------------|--|
| P□512 | Input signal selection 4 | — | — | 0000 | Y | |
| <div> <div> <div>H</div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> </div> <div> <div>/HOME-REF</div> <div>0-9 Same with /S-ON signal conversion</div> </div> <div> <div>/POS-START</div> <div>0-9 Same with /S-ON signal conversion</div> </div> <div> <div>/POS-STEP</div> <div>0-9 Same with /S-ON signal conversion</div> </div> <div> <div>/POS-START-HOME</div> <div>0-9 Same with /S-ON signal conversion</div> </div> </div> | | | | | | |
| P□513 | Output signal selection 1 | — | — | 4321 | Y | 0321 (double axis/A) 0654 (double axis/b) |
| <div> <div>Parameter of K/K2 series:</div> <div> <div>H</div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> </div> <div> <div>Servo alarm signal distribution (ALM)</div> <div> <div>0 Inactive (not using the signal)</div> <div>1 Output such signal via OUT1 (CN3-7 and CN3-8)</div> <div>2 Output such signal via OUT2 (CN3-9 and CN3-10)</div> <div>3 Output such signal via OUT3 (CN3-11 and CN3-12)</div> <div>4 Output such signal via OUT4 (CN3-32 and CN3-33)</div> <div>5 Output such signal via OUT5 (CN3-34 and CN3-35)</div> <div>6 Output such signal via OUT6 (CN3-36 and CN3-37)</div> </div> <div> <div>Positioning completion signal distribution (/COIN)/same-speed detection signal distribution (/V-CMP)</div> <div>0-6 Ditto</div> </div> <div> <div>Motor rotation detection signal distribution (/TGON)</div> <div>0-6 Ditto</div> </div> <div> <div>Servo ready signal distribution (/S-RDY)</div> <div>0-6 Ditto</div> </div> </div> <div> <div>Parameter of K1 series:</div> <div> <div>H</div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> </div> <div> <div>Servo alarm signal distribution (ALM)</div> <div> <div>0 Inactive (not using the signal)</div> <div>1 Output such signal via OUT1 (CN2-16 and CN2-3)</div> <div>2 Output such signal via OUT2 (CN2-17 and CN2-4)</div> <div>3 Output such signal via OUT3 (CN2-18 and CN2-5)</div> </div> <div> <div>Positioning completion signal distribution (/COIN)/same-speed detection signal distribution (/V-CMP)</div> <div>0-3 Ditto</div> </div> <div> <div>Motor rotation detection signal distribution (/TGON)</div> <div>0-3 Ditto</div> </div> <div> <div>Servo ready signal distribution (/S-RDY)</div> <div>0-3 Ditto</div> </div> </div> </div> </div> | | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|--------------|-----------------|--------------|--------------------|
| P□514 | Output signal selection 2 | — | — | 0065 | Y | 0000 (double axis) |
| |  <div style="margin-left: 100px;"> <p>Torque limit output signal distribution (/CLT)</p> <p>0-6 Same with ALM signal conversion</p> <p>Brake signal distribution (/BK)</p> <p>0-6 Ditto</p> <p>Encoder origin signal distribution (/PGC)</p> <p>0-6 Ditto</p> <p>Reserved</p> </div> | | | | | |
| P□515 | Output signal selection 3 | — | — | 0000 | Y | |
| |  <div style="margin-left: 100px;"> <p>Current data set number bit 0 signal distribution when internal position control is in place (/InPosNum0)</p> <p>0-6 Ditto</p> <p>Current data set number bit 1 signal distribution when internal position control is in place (/InPosNum1)</p> <p>0-6 Ditto</p> <p>Current data set number bit 2 signal distribution when internal position control is in place (/InPosNum2)</p> <p>0-6 Ditto</p> <p>Current data set number bit 3 signal distribution when internal position control is in place (/InPosNum3)</p> <p>0-6 Ditto</p> </div> | | | | | |
| P□516 | Instruction source selection | — | — | — | N | |
| |  <div style="margin-left: 100px;"> <p>Source of pulse command</p> <p>1 Receive pulse command from A-axis pulse input port</p> <p>2 Receive pulse command from B-axis pulse input port</p> <p>Resered</p> <p>Resered</p> <p>Source of analog voltage reference</p> <p>0 Analog input port</p> <p>1 485</p> </div> | | | | | |
| P□517 | Input port filter time constant | 0 ~ 1000 | 0.1ms | 1 | N | |
| P□518 | Alarm input filter time constant | 0 ~ 3 | 0.1ms | 1 | N | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | | |
|---------------|--|---|-------------------------------------|-----------------|--------------|---------|---|--|
| P□519 | Active input port signal level selection 1 | —— | —— | 0000 | N | | | |
| | Parameter of K/K2 series: | | | | | | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>CN3-14 active input level selection</div><div>0Active when input signal is ON (L level)</div><div>1Active when input signal is OFF (H level)</div></div><div><div>CN3-15 active input level selection</div><div>0-1Ditto</div></div><div><div>CN3-16 active input level selection</div><div>0-1Ditto</div></div><div><div>CN3-17 active input level selection</div><div>0-1Ditto</div></div></div> | | | | | | | |
| | Parameter of K1 series | | | | | | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>CN2-19 active input level selection</div><div>0Active when input signal is ON (L level)</div><div>1Active when input signal is OFF (H level)</div></div><div><div>CN2-7 active input level selection</div><div>0-1Ditto</div></div><div><div>CN2-20 active input level selection</div><div>0-1Ditto</div></div><div><div>CN2-8 active input level selection</div><div>0-1Ditto</div></div></div> | | | | | | | |
| | P□520 | Input port signal logic selection 2 | —— | —— | 0000 | N | | |
| | | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>CN3-39 active input level selection</div><div>0-1Same with CN3-14 input level selection</div></div><div><div>CN3-40 active input level selection</div><div>0-1Ditto</div></div><div><div>CN3-41 active input level selection</div><div>0-1Ditto</div></div><div><div>CN3-42 active input level selection</div><div>0-1Ditto</div></div></div> | | | | | | |
| | | P□521 | Output port signal reverse select 1 | —— | —— | 0000 | N | |
| | | | Parameter of K/K2 series: | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---------------------------------------|---------------|--------------|-----------------|--------------|---------|
| | <p>Parameter of K1 series:</p> | | | | | |
| P□522 | Output port signal inverse select 2 | — | — | 0000 | N | |
| | | | | | | |
| P□523 | Select initial status display content | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|--------------|-----------------|--------------|------------|
| | <div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> <div>H</div> <div> <div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> </div> <div> <div>Select initial status display content</div> <div>The status of the servo drive</div> <div>Low 4 bit of the feedback pulse</div> <div>High 4 bit of the feedback pulse</div> <div>Current speed of the motor</div> <div>Low 4 bit of the electronic gear numerator</div> <div>High 4 bit of the electronic gear numerator</div> <div>Low 4 bit of the electronic gear denominator</div> <div>High 4 bit of the electronic gear denominator</div> </div> </div> <div>Reserved</div> <div>Reserved</div> <div>Reserved</div> </div> | | | | | |
| P□600 | RS-485 communication parameter selection switch | — | — | 2151 | Y | |
| | <div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> <div>H</div> <div> <div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> </div> <div> <div>Communication baud rate select</div> <div>4800 bps</div> <div>9600 bps</div> <div>19200 bps</div> <div>38400 bps</div> <div>57600 bps</div> <div>115200 bps</div> </div> </div> <div> <div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> </div> <div> <div>Communication protocol select</div> <div>7, N, 2</div> <div>7, E, 1</div> <div>7, O, 1</div> <div>8, N, 2</div> <div>8, E, 1</div> <div>8, O, 1</div> <div>8, N, 2</div> <div>8, E, 1</div> <div>8, O, 1</div> <div>8, N, 1</div> </div> <div>Modbus, ASCII</div> <div>Modbus, RTU</div> </div> </div> <div>Reversed</div> <div>Reversed</div> | | | | | |
| P□601 | RS-485 communication axis address | 1 ~ 127 | — | 1 (A axis) | Y | 2 (b axis) |
| P□602 | RS-485 communication timeout parameter | 0 ~ 1000 | 100 ms | 0 | N | |
| P□603 | Reserved | — | — | 0000 | N | |
| P□604 | Reserved | — | — | 0000 | N | |
| P□605 | Reserved | — | — | 0000 | N | |
| P□606 | Reserved | — | — | 0000 | N | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------------|-----------------|--------------|---------|
| P□607 | Reserved | —— | —— | 0000 | N | |
| P□608 | Reserved | —— | —— | 0000 | N | |
| P□609 | Reserved | —— | —— | 0000 | N | |
| P□610 | Type of data set 8 | 0 ~ 2 | —— | 0 | Y | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | |
| P□611 | Low byte value of Data Set 8 | -9999~+9999 | 1-reference pulse | 0 | Y | |
| P□612 | High byte value of Data Set 8 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□613 | Speed of data set 8 | 0 ~ 6000 | rpm | 100 | Y | |
| P□614 | Step change attribute in Data Set 8 | —— | —— | 0000 | Y | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div> | | | | | |
| P□615 | Step change condition value 1 in data set 8 | 0 ~ 65535 | —— | 0 | Y | |
| | -Unconditional: no transitional condition value - Delay: value 0 ~ 65535: latency time 0 ~ 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------------|-----------------|--------------|---------|
| | - Level required for step change: Value 3: 1 level Value 4: 0 level | | | | | |
| P□616 | Step change condition value 2 in data set 8 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□617 | Follow-up data set number of data set 8 | 0 ~ 14 | —— | 9 | Y | |
| P□618 | Type of data set 9 | 0 ~ 2 | —— | 0 | Y | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | |
| P□619 | Low byte value of Data Set 9 | -9999~+9999 | 1-reference pulse | 0 | Y | |
| P□620 | High byte value of Data Set 9 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□621 | Speed of data set 9 | 0 ~ 6000 | rpm | 100 | Y | |
| P□622 | Step change attribute in Data Set 9 | —— | —— | 0000 | Y | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div> | | | | | |
| P□623 | Step change condition value 1 in data set 9 | 0 ~ 65535 | —— | 0 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------------|-----------------|--------------|---------|
| | - Unconditional: no transitional condition value - Delay: value 0 ~ 65535: latency time 0 ~ 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level | | | | | |
| P□624 | Step change condition value 2 in data set 9 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□625 | Follow-up data set number of data set 9 | 0 ~ 14 | —— | 10 | Y | |
| P□626 | Type of data set 10 | 0 ~ 2 | —— | 0 | Y | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | |
| P□627 | Low byte value of Data Set 10 | -9999~+9999 | 1-reference pulse | 0 | Y | |
| P□628 | High byte value of Data Set 10 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□629 | Speed of data set 10 | 0 ~ 6000 | rpm | 100 | Y | |
| P□630 | Step change attribute in Data Set 10 | —— | —— | 0000 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|--------------|-----------------|--------------|---------|
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div> | | | | | |
| P□631 | Step change condition value 1 in data set 10 | 0 ~ 65535 | —— | 0 | Y | |
| | <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time 0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div>Value 0: rising edge</div><div>Value 1: falling edge</div><div>Value 2: rising edge or falling edge</div></div> <div>- Level required for step change:<div>Value 3: 1 level</div><div>Value 4: 0 level</div></div> | | | | | |
| P□632 | Step change condition value 2 in data set 10 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□633 | Follow-up data set number of data set 10 | 0 ~ 14 | —— | 11 | Y | |
| P□634 | Type of data set 11 | 0 ~ 2 | —— | 0 | Y | |
| | <div>0: data set is null</div> <div>1: data set is in absolute motion</div> <div>2: data set is in relative motion</div> | | | | | |
| P□635 | Low byte value of Data Set 11 | -9999~+9999 | 1-reference | 0 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | |
|---------------|--|--|-----------------------|-----------------|--------------|---------|--|
| | | | pulse | | | | |
| P□636 | High byte value of Data Set 11 | -9999~+9999 | 10000-reference pulse | 0 | Y | | |
| P□637 | Speed of data set 11 | 0 ~ 6000 | rpm | 100 | Y | | |
| P□638 | Step change attribute in Data Set 11 | —— | —— | 0000 | Y | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div> | | | | | | |
| | P□639 | Step change condition value 1 in data set 11 | 0 ~ 65535 | —— | 0 | Y | |
| | | <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time 0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div><div>Value 0: rising edge</div><div>Value 1: falling edge</div><div>Value 2: rising edge or falling edge</div></div></div> <div>- Level required for step change:<div><div>Value 3: 1 level</div><div>Value 4: 0 level</div></div></div> | | | | | |
| | P□640 | Step change condition value 2 in data set 11 | 0 ~ 65535 | —— | 0 | Y | |
| | | Ditto | | | | | |
| | P□641 | Follow-up data set number of data | 0 ~ 14 | —— | 12 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------------|-----------------|--------------|---------|
| | set 11 | | | | | |
| P□642 | Type of data set 12 | 0 ~ 2 | —— | 0 | Y | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | |
| P□643 | Low byte value of Data Set 12 | -9999~+9999 | 1-reference pulse | 0 | Y | |
| P□644 | High byte value of Data Set 12 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□645 | Speed of data set 12 | 0 ~ 6000 | rpm | 100 | Y | |
| P□646 | Step change attribute in Data Set 12 | —— | —— | 0000 | Y | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div> | | | | | |
| P□647 | Step change condition value 1 in data set 12 | 0 ~ 65535 | —— | 0 | Y | |
| | <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time 0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div><div>Value 0: rising edge</div><div>Value 1: falling edge</div><div>Value 2: rising edge or falling edge</div></div></div> <div>- Level required for step change:</div> | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------------|-----------------|--------------|---------|
| | Value 3: 1 level Value 4: 0 level | | | | | |
| P□648 | Step change condition value 2 in data set 12 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□649 | Follow-up data set number of data set 12 | 0 ~ 14 | —— | 13 | Y | |
| P□650 | Type of data set 13 | 0 ~ 2 | —— | 0 | Y | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | |
| P□651 | Low byte value of Data Set 13 | -9999~+9999 | 1-reference pulse | 0 | Y | |
| P□652 | High byte value of Data Set 13 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□653 | Speed of data set 13 | 0 ~ 6000 | rpm | 100 | Y | |
| P□654 | Step change attribute in Data Set 13 | —— | —— | 0000 | Y | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div> | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| P□655 | Step change condition value 1 in data set 13 | 0 ~ 65535 | —— | 0 | Y | |
| | - Unconditional: no transitional condition value | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------------|-----------------|--------------|---------|
| | - Delay: value 0 ~ 65535: latency time 0 ~ 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level | | | | | |
| P□656 | Step change condition value 2 in data set 13 | 0 ~ 65535 | — | 0 | Y | |
| | Ditto | | | | | |
| P□657 | Follow-up data set number of data set 13 | 0 ~ 14 | — | 14 | Y | |
| P□658 | Type of data set 14 | 0 ~ 2 | — | 0 | Y | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | |
| P□659 | Low byte value of Data Set 14 | -9999~+9999 | 1-reference pulse | 0 | Y | |
| P□660 | High byte value of Data Set 14 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□661 | Speed of data set 14 | 0 ~ 6000 | rpm | 100 | Y | |
| P□662 | Step change attribute in Data Set 14 | — | — | 0000 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|--------------|-----------------|--------------|---------|
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div> | | | | | |
| P□663 | Step change condition value 1 in data set 14 | 0 ~ 65535 | — | 0 | Y | |
| | <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div>Value 0: rising edge</div><div>Value 1: falling edge</div><div>Value 2: rising edge or falling edge</div></div> <div>- Level required for step change:<div>Value 3: 1 level</div><div>Value 4: 0 level</div></div> | | | | | |
| P□664 | Step change condition value 2 in data set 14 | 0 ~ 65535 | — | 0 | Y | |
| | Ditto | | | | | |
| P□665 | Follow-up data set number of data set 14 | 0 ~ 14 | — | 0 | Y | |
| P□700 | Type of data set 0 | 0 ~ 2 | — | 0 | Y | |
| | <div>0: data set is null</div> <div>1: data set is in absolute motion</div> <div>2: data set is in relative motion</div> | | | | | |
| P□701 | Low byte value of Data Set 0 | -9999~+9999 | 1-reference | 0 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------------|-----------------|--------------|---------|
| | | | pulse | | | |
| P□702 | High byte value of Data Set 0 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□703 | Speed of data set 0 | 0 ~ 6000 | rpm | 100 | Y | |
| P□704 | Step change attribute in Data Set 0 | —— | —— | 0000 | Y | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div> | | | | | |
| P□705 | Step change condition value 1 in data set 0 | 0 ~ 65535 | —— | 0 | Y | |
| | <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time 0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div><div>Value 0: rising edge</div><div>Value 1: falling edge</div><div>Value 2: rising edge or falling edge</div></div></div> <div>- Level required for step change:<div><div>Value 3: 1 level</div><div>Value 4: 0 level</div></div></div> | | | | | |
| P□706 | Step change condition value 2 in data set 0 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□707 | Follow-up data set number of data set 0 | 0 ~ 14 | —— | 1 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---------------|-----------------------|-----------------|--------------|---------|---------------------------------------|--|---|--------------|---|-------|---|--|---|-----------------------------------|---------------------------------------|--|---|--------------|---|-------|---|--|---|-----------------------------------|---|--|---|----------------|---|-----|---|----|---------------------------------|--|---|----------|---|----------|---|----------|---|-------------|---|------------------|---|--------------|---|--------------|
| P□708 | Type of data set 1 | 0 ~ 2 | —— | 0 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□709 | Low byte value of Data Set 1 | -9999~+9999 | 1-reference pulse | 0 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□710 | High byte value of Data Set 1 | -9999~+9999 | 10000-reference pulse | 0 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□711 | Speed of data set 1 | 0 ~ 6000 | rpm | 100 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□712 | Step change attribute in Data Set 1 | —— | —— | 0000 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><table><tr><th colspan="2">Data set step change condition 1 type</th></tr><tr><td>0</td><td>No condition</td></tr><tr><td>1</td><td>Delay</td></tr><tr><td>2</td><td>Pulse edge of signal input (/POS-STEP)</td></tr><tr><td>3</td><td>Level of signal input (/POS-STEP)</td></tr></table><table><tr><th colspan="2">Data set step change condition 2 type</th></tr><tr><td>0</td><td>No condition</td></tr><tr><td>1</td><td>Delay</td></tr><tr><td>2</td><td>Pulse edge of signal input (/POS-POS0)</td></tr><tr><td>3</td><td>Level of signal input (/POS-POS0)</td></tr></table><table><tr><th colspan="2">Logic between step change condition 1 and 2</th></tr><tr><td>0</td><td>No conjunction</td></tr><tr><td>1</td><td>AND</td></tr><tr><td>2</td><td>OR</td></tr></table><table><tr><th colspan="2">Step change transitional manner</th></tr><tr><td>0</td><td>Aborting</td></tr><tr><td>1</td><td>Standard</td></tr><tr><td>2</td><td>Buffered</td></tr><tr><td>3</td><td>BlendingLow</td></tr><tr><td>4</td><td>BlendingPrevious</td></tr><tr><td>5</td><td>BlendingNext</td></tr><tr><td>6</td><td>BlendingHigh</td></tr></table></div></div> | | | | | | Data set step change condition 1 type | | 0 | No condition | 1 | Delay | 2 | Pulse edge of signal input (/POS-STEP) | 3 | Level of signal input (/POS-STEP) | Data set step change condition 2 type | | 0 | No condition | 1 | Delay | 2 | Pulse edge of signal input (/POS-POS0) | 3 | Level of signal input (/POS-POS0) | Logic between step change condition 1 and 2 | | 0 | No conjunction | 1 | AND | 2 | OR | Step change transitional manner | | 0 | Aborting | 1 | Standard | 2 | Buffered | 3 | BlendingLow | 4 | BlendingPrevious | 5 | BlendingNext | 6 | BlendingHigh |
| Data set step change condition 1 type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | No condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Delay | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Pulse edge of signal input (/POS-STEP) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Level of signal input (/POS-STEP) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Data set step change condition 2 type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | No condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Delay | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Pulse edge of signal input (/POS-POS0) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Level of signal input (/POS-POS0) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Logic between step change condition 1 and 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | No conjunction | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | AND | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Step change transitional manner | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Aborting | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Buffered | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | BlendingLow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | BlendingPrevious | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | BlendingNext | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | BlendingHigh | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□713 | Step change condition value 1 in data set 1 | 0 ~ 65535 | —— | 0 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div>Value 0: rising edge</div><div>Value 1: falling edge</div><div>Value 2: rising edge or falling edge</div></div> <div>- Level required for step change:<div>Value 3: 1 level</div><div>Value 4: 0 level</div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------------|-----------------|--------------|---------|
| P□714 | Step change condition value 2 in data set 1 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□715 | Follow-up data set number of data set 1 | 0 ~ 14 | —— | 2 | Y | |
| P□716 | Type of data set 2 | 0 ~ 2 | —— | 0 | Y | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | |
| P□717 | Low byte value of Data Set 2 | -9999~+9999 | 1-reference pulse | 0 | Y | |
| P□718 | High byte value of Data Set 2 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□719 | Speed of data set 2 | 0 ~ 6000 | rpm | 100 | Y | |
| P□720 | Step change attribute in Data Set 2 | —— | —— | 0000 | Y | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div></div><div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div></div><div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div></div><div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div></div> | | | | | |
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| | | | | | | |
| P□721 | Step change condition value 1 in data set 2 | 0 ~ 65535 | —— | 0 | Y | |
| | <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div>Value 0: rising edge</div></div> | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------------|-----------------|--------------|---------|
| | Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level | | | | | |
| P□722 | Step change condition value 2 in data set 2 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□723 | Follow-up data set number of data set 2 | 0 ~ 14 | —— | 3 | Y | |
| P□724 | Type of data set 3 | 0 ~ 2 | —— | 0 | Y | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | |
| P□725 | Low byte value of Data Set 3 | -9999~+9999 | 1-reference pulse | 0 | Y | |
| P□726 | High byte value of Data Set 3 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□727 | Speed of data set 3 | 0 ~ 6000 | rpm | 100 | Y | |
| P□728 | Step change attribute in Data Set 3 | —— | —— | 0000 | Y | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div> | | | | | |
| P□729 | Step change condition value 1 in | 0 ~ 65535 | —— | 0 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|-----------------------|-----------------|--------------|---------|
| | data set 3 | | | | | |
| | - Unconditional: no transitional condition value - Delay: value 0 ~ 65535: latency time0 ~ 65535, unit: ms - Pulse edge required for step change: Value 0: rising edge Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level | | | | | |
| P□730 | Step change condition value 2 in data set 3 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□731 | Follow-up data set number of data set 3 | 0 ~ 14 | —— | 4 | Y | |
| P□732 | Type of data set 4 | 0 ~ 2 | —— | 0 | Y | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | |
| P□733 | Low byte value of Data Set 4 | -9999~+9999 | 1-reference pulse | 0 | Y | |
| P□734 | High byte value of Data Set 4 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□735 | Speed of data set 4 | 0 ~ 6000 | rpm | 100 | Y | |
| P□736 | Step change attribute in Data Set 4 | —— | —— | 0000 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|--------------|-----------------|--------------|---------|
| | <div><div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div> | | | | | |
| P□737 | Step change condition value 1 in data set 4 | 0 ~ 65535 | — | 0 | Y | |
| | <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div><div>Value 0: rising edge</div><div>Value 1: falling edge</div><div>Value 2: rising edge or falling edge</div></div></div> <div>- Level required for step change:<div><div>Value 3: 1 level</div><div>Value 4: 0 level</div></div></div> | | | | | |
| P□738 | Step change condition value 2 in data set 4 | 0 ~ 65535 | — | 0 | Y | |
| | Ditto | | | | | |
| P□739 | Follow-up data set number of data set 4 | 0 ~ 14 | — | 5 | Y | |
| P□740 | Type of data set 5 | 0 ~ 2 | — | 0 | Y | |
| | <div>0: data set is null</div> <div>1: data set is in absolute motion</div> <div>2: data set is in relative motion</div> | | | | | |
| P□741 | Low byte value of Data Set 5 | -9999~+9999 | 1-reference | 0 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------------|-----------------|--------------|---------|
| | | | pulse | | | |
| P□742 | High byte value of Data Set 5 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□743 | Speed of data set 5 | 0 ~ 6000 | rpm | 100 | Y | |
| P□744 | Step change attribute in Data Set 5 | —— | —— | 0000 | Y | |
| | <div><div>H<div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div><div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div><div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div><div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div></div></div></div></div> | | | | | |
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| P□745 | Step change condition value 1 in data set 5 | 0 ~ 65535 | —— | 0 | Y | |
| | <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div>Value 0: rising edge</div><div>Value 1: falling edge</div><div>Value 2: rising edge or falling edge</div></div> <div>- Level required for step change:<div>Value 3: 1 level</div><div>Value 4: 0 level</div></div> | | | | | |
| P□746 | Step change condition value 2 in data set 5 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□747 | Follow-up data set number of data set 5 | 0 ~ 14 | —— | 6 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|--|-----------------------|-----------------|--------------|---------|---------------------------------------|--|---|--------------|---|-------|---|--|---|-----------------------------------|---------------------------------------|--|---|--------------|---|-------|---|--|---|-----------------------------------|---|--|---|----------------|---|-----|---|----|---------------------------------|--|---|----------|---|----------|---|----------|---|-------------|---|------------------|---|--------------|---|--------------|
| P□748 | Type of data set 6 | 0 ~ 2 | —— | 0 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| P□749 | Low byte value of Data Set 6 | -9999~+9999 | 1-reference pulse | 0 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□750 | High byte value of Data Set 6 | -9999~+9999 | 10000-reference pulse | 0 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□751 | Speed of data set 6 | 0 ~ 6000 | rpm | 100 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□752 | Step change attribute in Data Set 6 | —— | —— | 0000 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div> <div><table><tr><th colspan="2">Data set step change condition 1 type</th></tr><tr><td>0</td><td>No condition</td></tr><tr><td>1</td><td>Delay</td></tr><tr><td>2</td><td>Pulse edge of signal input (/POS-STEP)</td></tr><tr><td>3</td><td>Level of signal input (/POS-STEP)</td></tr></table></div> <div><table><tr><th colspan="2">Data set step change condition 2 type</th></tr><tr><td>0</td><td>No condition</td></tr><tr><td>1</td><td>Delay</td></tr><tr><td>2</td><td>Pulse edge of signal input (/POS-POS0)</td></tr><tr><td>3</td><td>Level of signal input (/POS-POS0)</td></tr></table></div> <div><table><tr><th colspan="2">Logic between step change condition 1 and 2</th></tr><tr><td>0</td><td>No conjunction</td></tr><tr><td>1</td><td>AND</td></tr><tr><td>2</td><td>OR</td></tr></table></div> <div><table><tr><th colspan="2">Step change transitional manner</th></tr><tr><td>0</td><td>Aborting</td></tr><tr><td>1</td><td>Standard</td></tr><tr><td>2</td><td>Buffered</td></tr><tr><td>3</td><td>BlendingLow</td></tr><tr><td>4</td><td>BlendingPrevious</td></tr><tr><td>5</td><td>BlendingNext</td></tr><tr><td>6</td><td>BlendingHigh</td></tr></table></div> | | | | | | Data set step change condition 1 type | | 0 | No condition | 1 | Delay | 2 | Pulse edge of signal input (/POS-STEP) | 3 | Level of signal input (/POS-STEP) | Data set step change condition 2 type | | 0 | No condition | 1 | Delay | 2 | Pulse edge of signal input (/POS-POS0) | 3 | Level of signal input (/POS-POS0) | Logic between step change condition 1 and 2 | | 0 | No conjunction | 1 | AND | 2 | OR | Step change transitional manner | | 0 | Aborting | 1 | Standard | 2 | Buffered | 3 | BlendingLow | 4 | BlendingPrevious | 5 | BlendingNext | 6 | BlendingHigh |
| | Data set step change condition 1 type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 | No condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | Delay | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2 | Pulse edge of signal input (/POS-STEP) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3 | Level of signal input (/POS-STEP) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Data set step change condition 2 type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 | No condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | Delay | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Pulse edge of signal input (/POS-POS0) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Level of signal input (/POS-POS0) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Logic between step change condition 1 and 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | No conjunction | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | AND | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Step change transitional manner | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Aborting | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Buffered | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | BlendingLow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | BlendingPrevious | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | BlendingNext | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | BlendingHigh | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□753 | Step change condition value 1 in data set 6 | 0 ~ 65535 | —— | 0 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div>Value 0: rising edge</div><div>Value 1: falling edge</div><div>Value 2: rising edge or falling edge</div></div> <div>- Level required for step change:<div>Value 3: 1 level</div><div>Value 4: 0 level</div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---|--|---------------|-----------------------|-----------------|--------------|---------|
| P□754 | Step change condition value 2 in data set 6 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□755 | Follow-up data set number of data set 6 | 0 ~ 14 | —— | 7 | Y | |
| P□756 | Type of data set 7 | 0 ~ 2 | —— | 0 | Y | |
| | 0: data set is null 1: data set is in absolute motion 2: data set is in relative motion | | | | | |
| P□757 | Low byte value of Data Set 7 | -9999~+9999 | 1-reference pulse | 0 | Y | |
| P□758 | High byte value of Data Set 7 | -9999~+9999 | 10000-reference pulse | 0 | Y | |
| P□759 | Speed of data set 7 | 0 ~ 6000 | rpm | 100 | Y | |
| P□760 | Step change attribute in Data Set 7 | —— | —— | 0000 | Y | |
| | <div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>H</div><div><input type="checkbox"/></div><div><input type="checkbox"/></div><div><input type="checkbox"/></div><div><input type="checkbox"/></div></div></div> | | | | | |
| | <div><div><div><div></div><div></div></div><div><div>Data set step change condition 1 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-STEP)</div></div><div><div>3</div><div>Level of signal input (/POS-STEP)</div></div></div></div></div> | | | | | |
| | <div><div><div><div></div><div></div></div><div><div>Data set step change condition 2 type</div><div><div>0</div><div>No condition</div></div><div><div>1</div><div>Delay</div></div><div><div>2</div><div>Pulse edge of signal input (/POS-POS0)</div></div><div><div>3</div><div>Level of signal input (/POS-POS0)</div></div></div></div></div> | | | | | |
| | <div><div><div><div></div><div></div></div><div><div>Logic between step change condition 1 and 2</div><div><div>0</div><div>No conjunction</div></div><div><div>1</div><div>AND</div></div><div><div>2</div><div>OR</div></div></div></div></div> | | | | | |
| <div><div><div><div></div><div></div></div><div><div>Step change transitional manner</div><div><div>0</div><div>Aborting</div></div><div><div>1</div><div>Standard</div></div><div><div>2</div><div>Buffered</div></div><div><div>3</div><div>BlendingLow</div></div><div><div>4</div><div>BlendingPrevious</div></div><div><div>5</div><div>BlendingNext</div></div><div><div>6</div><div>BlendingHigh</div></div></div></div></div> | | | | | | |
| P□761 | Step change condition value 1 in data set 7 | 0 ~ 65535 | —— | 0 | Y | |
| | <div>- Unconditional: no transitional condition value</div> <div>- Delay: value 0 ~ 65535: latency time0 ~ 65535, unit: ms</div> <div>- Pulse edge required for step change:<div>Value 0: rising edge</div></div> | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|--------------|-----------------|--------------|---------|
| | Value 1: falling edge Value 2: rising edge or falling edge - Level required for step change: Value 3: 1 level Value 4: 0 level | | | | | |
| P□762 | Step change condition value 2 in data set 7 | 0 ~ 65535 | —— | 0 | Y | |
| | Ditto | | | | | |
| P□763 | Follow-up data set number of data set 7 | 0 ~ 14f | —— | 0 | Y | |
| P□764 | Data set start method | 0 ~ 1 | —— | 0 | Y | |
| | 0: internal method (single data set method) 1: task mode (data set sequence) | | | | | |
| P□765 | Acceleration of data set | 0 ~ 60000 | 10 rpm/s | 10000 | Y | |
| P□766 | Deceleration of data set | 0 ~ 60000 | 10 rpm/s | 10000 | Y | |
| P□767 | Emergency deceleration of data set | 0 ~ 60000 | 10 rpm/s | 60000 | Y | |
| P□768 | Data set position electronic gear ratio (numerator) | 1 ~ 65535 | —— | 1 | Y | |
| P□769 | Data set position electronic gear ratio (denominator) | 1 ~ 65535 | —— | 1 | Y | |
| P□770 | Zero returning method selection switch | —— | —— | 0000 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|-----------------------|-----------------|--------------|---------|
| | <div><div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div><div><div><div>Zero returning method setting</div><div><div>0</div><div>DS402 METHOD 35 (set current position as zero point)</div></div><div><div>1</div><div>DS402 METHOD 1 (for on-off operation of seeking for NOT switch in the reverse direction, C pulse is required)</div></div><div><div>2</div><div>DS402 METHOD 2 (for on-off operation of seeking for POT switch in the forward direction, C pulse is required)</div></div><div><div>3</div><div>DS402 METHOD 3 (for on-off operation of seeking for reference point switch in the forward direction, C pulse is required)</div></div><div><div>4</div><div>DS402 METHOD 4 (for on-off operation of seeking for reference point switch in the forward direction, C pulse is required)</div></div><div><div>5</div><div>DS402 METHOD 5 (for on-off operation of seeking for reference point switch in the reverse direction, C pulse is required)</div></div><div><div>6</div><div>DS402 METHOD 6 (for on-off operation of seeking for reference point switch in the reverse direction, C pulse is required)</div></div><div><div>7</div><div>DS402 METHOD 17 (for on-off operation of seeking for NOT switch in the reverse direction, C pulse is not required)</div></div><div><div>8</div><div>DS402 METHOD 18 (for on-off operation of seeking for POT switch in the forward direction, C pulse is not required)</div></div><div><div>9</div><div>DS402 METHOD 19 (for on-off operation of seeking for reference point switch in the forward direction, C pulse is not required)</div></div><div><div>10</div><div>DS402 METHOD 20 (for on-off operation of seeking for reference point switch in the forward direction, C pulse is not required)</div></div><div><div>11</div><div>DS402 METHOD 21 (for on-off operation of seeking for reference point switch in the reverse direction, C pulse is not required)</div></div><div><div>12</div><div>DS402 METHOD 22 (for on-off operation of seeking for reference point switch in the reverse direction, C pulse is not required)</div></div></div></div><div><div>Reserved</div></div><div><div>Reserved</div></div><div><div>Enable back zero switch when powering on</div><div><div>0</div><div>Do not switch on back zero when powering on</div></div><div><div>1</div><div>Switch on back zero automatically after the first SON when powering on</div></div></div></div> | | | | | |
| P□771 | On-off speed to meet reference point | 0 ~ 6000 | rpm | 100 | Y | |
| P□772 | On-off speed to leave reference point | 0 ~ 6000 | rpm | 30 | Y | |
| P□773 | Low byte of speed/position switching reference point | 0 ~ 9999 | 1-reference pulse | 0 | N | |
| P□774 | High byte of speed/position switching reference point | 0 ~ 9999 | 10000-reference pulse | 0 | N | |
| | Set whether read the motor encoder | | | | | |
| P□858 | <div><div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div><div><div>Reservation constant (do not change)</div></div><div><div>Reservation constant (do not change)</div><div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Do not read the encoder type when writing motor parameters</div></div></div></div> <div><div>Reservation constant (do not change)</div></div> <div><div>Reservation constant (do not change)</div></div> | | | | | |

Appendix B Table of iK Series M2 Drive Parameters

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---|-----------------------------------|---------------|--------------|-----------------|--------------|---------|
| P□000 | Basic function selection switch | —— | —— | 0010 | Y | |
| <div><div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div><div><div><div>Rotation direction selection</div><div><div>0</div><div>CCW (couter clockwise) is the positive rotation direction</div></div><div><div>1</div><div>CW (clockwise) is the positive rotation direction (in reserve mode)</div></div></div><div><div><div>Control mode selection</div><div><div>0</div><div>Speed control (analog reference)</div></div><div><div>1</div><div>Position control (pulse train reference)</div></div><div><div>2</div><div>Torque control (analog reference)</div></div><div><div>3</div><div>Internal set speed control (contact reference)</div></div><div><div>4</div><div>Internal set speed control (contact reference) ↔ Speed control (analog reference)</div></div><div><div>5</div><div>Internal set speed control (contact reference) ↔ Position control (pulse train reference)</div></div><div><div>6</div><div>Internal set speed control (contact reference) ↔ Torque control (analog reference)</div></div><div><div>7</div><div>Position control (pulse train reference) ↔ Speed control (analog reference)</div></div><div><div>8</div><div>Position control (pulse train reference) ↔ Speed control (analog reference)</div></div><div><div>9</div><div>Torque control (analog reference) ↔ Speed control (analog reference)</div></div><div><div>A</div><div>Speed control (analog reference) ↔ Zero clamping</div></div><div><div>B</div><div>Position control (pulse train reference) ↔ Position control (pulse prohibited)</div></div><div><div>C</div><div>Internal position control</div></div></div><div><div><div>Stop method when servo is OFF</div><div><div>0</div><div>Reverse braking the motor decelerates to a stop, then Set it to free-running status</div></div><div><div>1</div><div>Set motor to inertial operation state</div></div></div><div><div><div>Stop method during overtravel (OT)</div><div><div>0</div><div>Reverse braking the motor decelerates to a stop, then Set it to free-running status</div></div><div><div>1</div><div>Reverse braking the motor decelerates to a stop, then Set it to free-running status</div></div><div><div>2</div><div>Set motor to inertial operation state</div></div></div></div></div></div></div></div> | | | | | | |
| P□001 | Basic function selection switch 1 | —— | —— | 0001 | Y | |
| <div><div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div><div><div><div>Use method of encoder</div><div><div>0</div><div>Use absolute encoder as absolute encoder and enable serial output of absolute data (PG frequency dividing PAO□)</div></div><div><div>1</div><div>Use absolute encoder as incremental encoder</div></div><div><div>2</div><div>Use absolute encoder as absolute encoder and disable serial output of absolute data</div></div></div><div><div><div>Speed control option (T-REF distribution)</div><div><div>0</div><div>N A</div></div><div><div>1</div><div>Use T-REF as external torque limit input</div></div><div><div>2</div><div>Use T-REF as torque feedforward input</div></div><div><div>3</div><div>Use T-REF as external torque limit input when P-CL and N-CL are enabled</div></div></div><div><div><div>Torque control option (V-REF distribution)</div><div><div>0</div><div>N A</div></div><div><div>1</div><div>Use V-REF as external torque limit input</div></div></div><div><div><div>Accelerated speed feedforward mode selection</div><div><div>0</div><div>Accelerated speed feedforward type 1 (filtering calculation)</div></div><div><div>1</div><div>Accelerated speed feedforward type 2 (rapid calculation)</div></div></div></div></div></div></div></div> | | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---|--|---------------|--------------|-----------------|--------------|---------|
| P□002 | Basic function selection switch 2 | —— | —— | 1100 | Y | |
| <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Second electronic gear enabled</div><div>0</div><div>Disable second electronic gear and use /P-CON signal as P/PI switch</div></div><div><div>1</div><div>Enable second electronic gear and use /P-CON signal as second electronic gear switch</div></div></div><div><div><div>Preset constant (do not change)</div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Reserved</div></div></div><div><div><div>Preset constant (do not change)</div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Reserved</div></div></div><div><div><div>Preset constant (do not change)</div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Reserved</div></div></div></div> | | | | | | |
| P□003 | Basic function selection switch 3 | —— | —— | 1000 | Y | |
| <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Common encoder (non-serial encoder) alarm enable switch</div><div>0</div><div>Disable A05 - A08 or b05 - b08 alarm detection</div></div><div><div>1</div><div>Enable A05 - A08 or b05 - b08 alarm detection</div></div></div><div><div><div>Preset constant (do not change)</div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Reserved</div></div></div><div><div><div>Momentary outage alarm enable switch</div><div>0</div><div>No alarm for momentary outage of one cycle</div></div><div><div>1</div><div>Alarm for momentary outage of one cycle</div></div></div><div><div><div>Overload enhancement enable switch</div><div>0</div><div>Disable overload enhancement function</div></div><div><div>1</div><div>Enable overload enhancement function (enhance overload capacity, suitable for occasion with frequent start and stop)</div></div></div></div> | | | | | | |
| P□004 | Basic function selection switch 4 | —— | —— | 0100 | Y | |
| <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Preset constant (do not change)</div><div>0</div><div>Reserved</div></div><div><div>1</div><div>Reserved</div></div></div><div><div><div>Preset constant (do not change)</div><div>0</div><div>Reserved</div></div></div><div><div><div>Low-frequency jitter suppression enable switch</div><div>0</div><div>Disable low-frequency jitter suppression</div></div><div><div>1</div><div>Enable low-frequency jitter suppression</div></div></div><div><div><div>Out-of-tolerance alarm enable switch</div><div>0</div><div>Disable out-of-tolerance alarm detection</div></div><div><div>1</div><div>Enable out-of-tolerance alarm detection (alarm will be given when offset counter value exceeds P□504)</div></div><div><div>4</div><div>Shielding the alarm of number 17(Electronic gear is wrong)</div></div></div></div> | | | | | | |
| P□006 | Set the motor manufacturers and encoder type | | | | | |

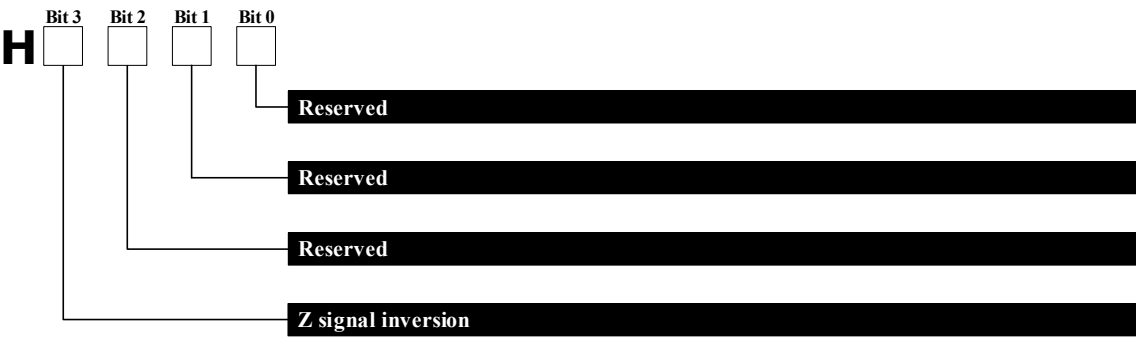
| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|---|---------------|-------------------|-----------------|--------------|---------|----------------------|--|---|--------------------------|---|-------------------------------|---|----------|---|--|---|-------|---|----------|---|--|---|--------------------------|---|----------------------------|---------------------------|--|---|----------------|---|---------------|---|----|
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><table><tr><th colspan="2">Set the encoder type</th></tr><tr><td>0</td><td>Non wire -saving encoder</td></tr><tr><td>1</td><td>Tamagawa wire -saving encoder</td></tr><tr><td>2</td><td>Reserved</td></tr><tr><td>3</td><td>Tamagawa / Nemicon / Yuheng 17bit multi-turn</td></tr><tr><td>4</td><td>Nikon</td></tr><tr><td>5</td><td>Reserved</td></tr><tr><td>6</td><td>Tamagawa / Nemicon / Yuheng 23bit multi-turn</td></tr><tr><td>7</td><td>Yuheng 17bit single-turn</td></tr><tr><td>8</td><td>Tamagawa 17bit single-turn</td></tr></table><table><tr><th colspan="2">Set the motor manufacture</th></tr><tr><td>0</td><td>HD-LFB、HD-LMDD</td></tr><tr><td>1</td><td>HD-LMBB、HD-HB</td></tr><tr><td>2</td><td>MG</td></tr></table><div>Reserved</div><div>Reserved</div></div></div> | | | | | | Set the encoder type | | 0 | Non wire -saving encoder | 1 | Tamagawa wire -saving encoder | 2 | Reserved | 3 | Tamagawa / Nemicon / Yuheng 17bit multi-turn | 4 | Nikon | 5 | Reserved | 6 | Tamagawa / Nemicon / Yuheng 23bit multi-turn | 7 | Yuheng 17bit single-turn | 8 | Tamagawa 17bit single-turn | Set the motor manufacture | | 0 | HD-LFB、HD-LMDD | 1 | HD-LMBB、HD-HB | 2 | MG |
| Set the encoder type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Non wire -saving encoder | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Tamagawa wire -saving encoder | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Tamagawa / Nemicon / Yuheng 17bit multi-turn | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Nikon | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Tamagawa / Nemicon / Yuheng 23bit multi-turn | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Yuheng 17bit single-turn | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Tamagawa 17bit single-turn | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Set the motor manufacture | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | HD-LFB、HD-LMDD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | HD-LMBB、HD-HB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | MG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□100 | Speed loop gain | 1 ~ 2500 | 0.1 Hz | 400 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□101 | Speed loop integral time constant | 1 ~ 4000 | 0.01 ms | 2000 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□102 | Position loop gain | 1 ~ 2000 | 0.1/s | 400 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□103 | Ratio of moment of inertia | 0 ~ 20000 | 1 % | 0 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□104 | Second speed loop gain | 1 ~ 2500 | 1 Hz | 40 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□105 | Second speed loop integral time constant | 1 ~ 4000 | 0.1ms | 200 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□106 | Second position loop gain | 1 ~ 2000 | 1/s | 40 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□107 | Offset (speed offset) | 0 ~ 450 | 1r/min | 0 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□108 | Scope of offset stack | 0 ~ 5000 | 1-reference pulse | 10 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□109 | Feedforward | 0 ~ 100 | 1 % | 0 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□110 | Feedforward filter time constant | 0 ~ 640 | 0.1ms | 0 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□111 | Accelerated speed freeforward percentage | 0 ~ 100 | 1 % | 0 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□112 | Accelerated speed feedforward filter time constant | 0 ~ 640 | 0.1ms | 0 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P□113 | Gain application switch | 0000 ~ 0064 | —— | 0000 | Y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | |
|--|--------------------------|---|--------------|----------------------|--------------|---------|-------------------------|
| <div><div>H<div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>Module switch selection</div><div><div>0</div><div>Use internal torque reference as the condition (level setting: P□114)</div></div><div><div>1</div><div>Use speed as the condition (level setting: P□115)</div></div><div><div>2</div><div>Use acceleration as the condition (level setting: P□116)</div></div><div><div>3</div><div>Use position error pulse as the condition (level setting: P□117)</div></div><div><div>4</div><div>No mode switch function</div></div></div><div><div>Selection of auto gain switch conditions</div><div><div>0</div><div>Non-auto gain switch (fixed to first group gain)</div></div><div><div>1</div><div>External switch gain switch (G-SEL signal)</div></div><div><div>2</div><div>Torque percentage switch</div></div><div><div>3</div><div>Switch only under position offset</div></div><div><div>4</div><div>Given accelerated speed value (10 r/min/s)</div></div><div><div>5</div><div>Given speed value</div></div><div><div>6</div><div>With position reference input</div></div></div><div><div>Reserved</div></div><div><div>Reserved</div></div></div></div></div> | | | | | | | |
| | P□114 | Mode switch (torque reference) | 0 ~ 300 | 1 % | 200 | N | |
| | P□115 | Mode switch (speed reference) | 0 ~ 10000 | 1r/min | 0 | N | |
| | P□116 | Mode switch (accelerated speed reference) | 0 ~ 3000 | 10 r/min/s | 0 | N | |
| | P□117 | Mode switch (offset pulse) | 0 ~ 10000 | 1-reference pulse | 0 | N | |
| | P□118 | Gain switch delay time | 0 ~ 20000 | 0.1 ms (single axis) | 0 | N | 0.2 ms (double axis) |
| | P□119 | Gain switch range | 0 ~ 20000 | free | 0 | N | |
| | | When P□113.1 = 2, the unit is 1% When P□113.1 = 3, the unit is 1 reference pulse When P□113.1 = 4, the unit is 10 r/min/s When P□113.1 = 5, the unit is 1 r/min When P□113.1 = 6, the unit is 1 reference pulse | | | | | |
| | P□120 | Position gain switch time | 0 ~ 20000 | 0.1 ms (single axis) | 0 | N | 0.2 ms (double axis) |
| | P□121 | Gain switch hysteresis | 0 ~ 20000 | 1-reference pulse | 0 | N | |
| | P□122 | Friction load | 0 ~ 3000 | 1‰ | 0 | N | |
| | P□123 | Friction compensation speed hysteresis area | 0 ~ 100 | 1r/min | 0 | Y | |
| | P□124 | Viscous friction load | 0 ~ 20000 | 1 ‰/1 krpm | 0 | N | |
| | P□125 | Friction gain | 0 ~ 30000 | | 0 | N | |
| | P□126 | Speed observer cycle | 0 ~ 100 | 0.1ms | 0/35/70 | N | |
| P□127 | Online autotune switches | — | — | 1340 | Y/N | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---|---|-----------------|--------------|---------------------|
| P□141 | <div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> <div> <div>H</div> <div></div> <div></div> <div></div> </div> </div> | Real-time auto gain setting | | | | Power reboot |
| | | 0 | Non-real-time auto gain adjustment | | | |
| | | 1 | Normal mode (suitable for operations without change in load inertia) | | | |
| | | 2 | Normal mode (suitable for operations with little change in load inertia) | | | |
| | | 3 | Normal mode (suitable for operations with great change in load inertia) | | | |
| | | 4 | Vertical load (suitable for operations without change in load inertia) | | | |
| | | 5 | Vertical load (suitable for operations with little change in load inertia) | | | |
| | | 6 | Vertical load (suitable for operations with great change in load inertia) | | | |
| | | Y | | | | |
| | | Selection of machine stiffness for real-time auto gain | | | | Power reboot |
| | | 0 | Machine stiffness during real-time auto gain adjustment may be selected. The larger the parameter value is, the quicker the response will be. | | | |
| | | ... | If this parameter is set very high all at once, system gain will change significantly, leading to great shock to machine. | | | |
| | | F | It is recommended to set a small value and gradually select larger stiffness while monitoring operating status of machine. | | | |
| | | N | | | | |
| | | Reserved | | | | |
| | | Normal auto adjustment mode setting | | | | Power reboot |
| | | 0 | Rotating circles: 1; direction: CCW → CW | | | |
| | | 1 | Rotating circles: 2; direction: CCW → CW | | | |
| | | 2 | Rotating circles: 3; direction: CCW → CW | | | |
| | | 3 | Rotating circles: 4; direction: CCW → CW | | | |
| | | 4 | Rotating circles: 1; direction: CW → CCW | | | |
| | | 5 | Rotating circles: 2; direction: CW → CCW | | | |
| | | 6 | Rotating circles: 3; direction: CW → CCW | | | |
| | | 7 | Rotating circles: 4; direction: CW → CCW | | | |
| | | N | | | | |
| P□141 | Speed observer setting | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|-----------------|-----------------|--------------|---------|
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>Coefficient of Speed observer</div><div>Acceleration coefficient of Speed observer</div><div>Enable speed observer</div><div>0Disable speed observer</div><div>1Enable speed observer</div></div></div> | | | | | |
| P□145 | Function select | | | | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>Torque arrival signal distribution</div><div>0Invalid (Not using this signal)</div><div>1Output this signal via OUT1 (CN3-7、 8)</div><div>2Output this signal via OUT2 (CN3-9、 10)</div><div>3Output this signal via OUT3 (CN3-11、 12)</div><div>4Output this signal via OUT4 (CN3-32、 33)</div><div>5Output this signal via OUT5 (CN3-34、 35)</div><div>6Output this signal via OUT6 (CN3-36、 37)</div></div><div><div>To select the function of power-down brake</div><div>0Disable the function of power-down brake</div><div>1Enable the function of power-down brake</div></div><div><div>Shield the</div><div>0Enable No. 42 alarm</div><div>1Disable No. 42 alarm</div></div><div><div>Reserved</div></div></div> | | | | | |
| P□146 | Set the torque arrival value | 0~3000 | 1% rated torque | 100 | | |
| P□147 | Set the lasting time of torque arrival time | 0~3000 | ms | 100 | | |
| P□148 | Set the locked-rotor torque | 0~3000 | 1% rated torque | 100 | | |
| P□149 | Set the locked-rotor time | 0~6000 | ms | 300 | | |
| P□200 | Position control reference form selection switch | — | — | 0000 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | |
|--|---------------------------------|---|--------------|-----------------|--------------|---------|--|
| <div><div><div>H</div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div></div><div><div><div>Offset pulse clearing method</div><div><div>0</div><div>Clear error pulse(servo OFF); Does not clear error pulse(over travel)</div></div><div><div>1</div><div>Does not clear offset pulse(servo OFF or over travel)</div></div><div><div>2</div><div>Clear offset pulse (servo OFF or over travel ,except for zero clamping position)</div></div></div><div><div><div>Reference pulse form</div><div><div>0</div><div>Sign + pulse</div></div><div><div>1</div><div>CW+CCW</div></div><div><div>2</div><div>A phase + B phase (1x frequency)</div></div><div><div>3</div><div>A phase + B phase (2x frequency)</div></div><div><div>4</div><div>A phase + B phase (4x frequency)</div></div></div><div><div><div>Reverse setting of reference pulse signal</div><div><div>0</div><div>Does not reverse PULS and SIGN</div></div><div><div>1</div><div>Does not reverse PULS, reverse SIGN</div></div><div><div>2</div><div>Reverse PULS , does not reverse SIGN</div></div><div><div>3</div><div>Reverse PULS and SIGN</div></div></div><div><div><div>Filter selection</div><div><div>0</div><div>Bus driver signal reference input filter</div></div><div><div>1</div><div>Collector open-circuit signal reference input filter</div></div></div></div></div></div></div></div> | | | | | | | |
| | P□201 | PG frequency dividing | 16 ~ 32768 | 1 P/rev | 2500 | Y | |
| | P□202 | First electronic gear ratio (numerator) | 1 ~ 65535 | — | 1 | Y | |
| | P□203 | First electronic gear ratio (denominator) | 1 ~ 65535 | — | 1 | Y | |
| | P□204 | Second electronic gear ratio (numerator) | 1 ~ 65535 | — | 1 | Y | |
| | P□205 | Position reference acceleration/deceleration time parameter | 0 ~ 6400 | 0.1ms | 0 | N | |
| | P□206 | Position reference filter form selection | 0 ~ 1 | — | 0 | Y | |
| | P□212 | Electronic gear numerator adjustment factor | 1 ~ 65535 | | 1 | | |
| | | This parameter×P□202 = Electronic gear numerator | | | | | |
| | P□213 | Electronic gear denominator adjustment factor | 1 ~ 65535 | | 1 | | |
| | | This parameter×P□203 = Electronic gear denominator | | | | | |
| | P□300 | Speed reference input gain | 0 ~ 3000 | (r/min)/V | 150 | N | |
| | P□301 | Internal speed 1 | 0 ~ 6000 | 1r/min | 100 | N | |
| | P□302 | Internal speed 2 | 0 ~ 6000 | 1r/min | 200 | N | |
| | P□303 | Internal speed 3 | 0 ~ 6000 | 1r/min | 300 | N | |
| P□304 | Jogging (JOG) speed | 0 ~ 6000 | 1r/min | 500 | N | | |
| P□305 | Acceleration time of soft start | 0 ~ 10000 | 1 ms | 0 | N | | |
| P□306 | Deceleration time of soft start | 0 ~ 10000 | 1 ms | 0 | N | | |
| P□307 | Speed reference filter constant | 0 ~ 10000 | 1 ms | 0 | N | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---|--|---------------|--------------------|-----------------|--------------|---------|
| P□308 | Rise time of S curve | 0 ~ 10000 | 1 ms | 0 | N | |
| P□309 | Z signal inversion | —— | —— | 0000 | Y | |
|  <p>Bit 3 Bit 2 Bit 1 Bit 0</p> <p>Reserved</p> <p>Reserved</p> <p>Reserved</p> <p>Z signal inversion</p> | | | | | | |
| P□400 | Torque reference input gain | 10 ~ 100 | 0.1V/rated torque | 30 | N | |
| P□401 | Torque reference filter time constant | 0 ~ 250 | 0.1ms | 4 | N | |
| P□402 | Second torque reference filter time constant | 0 ~ 250 | 0.1ms | 4 | N | |
| P□403 | Forward torque limit | 0 ~ 300 | 1 % | 300 | N | |
| P□404 | Reverse torque limit | 0 ~ 300 | 1 % | 300 | N | |
| P□405 | Forward external torque limit | 0 ~ 300 | 1 % | 100 | N | |
| P□406 | Reverse external torque limit | 0 ~ 300 | 1 % | 100 | N | |
| P□407 | Plug braking torque limit | 0 ~ 300 | 1 % | 300 | N | |
| P□408 | Speed limit during torque control | 0 ~ 6000 | 1r/min | 1500 | N | |
| P□409 | Frequency of notch filter section 1 | 50 ~ 5000 | 1 Hz | 5000 | N | |
| P□410 | Depth of notch filter section 1 | 0 ~ 100 | —— | 10 | N | |
| P□411 | Frequency of notch filter section 2 | 50 ~ 5000 | 1 Hz | 5000 | N | |
| P□412 | Depth of notch filter section 2 | 0 ~ 100 | —— | 10 | N | |
| P□413 | B type vibration frequency | 10 ~ 1000 | 0.1 Hz | 1000 | N | |
| P□414 | B type vibration damping | 0 ~ 200 | —— | 25 | N | |
| P□500 | Positioning completion width | 0 ~ 5000 | 1 reference unit | 10 | N | |
| P□501 | Zero clamping level | 0 ~ 3000 | 1r/min | 10 | N | |
| P□502 | Rotation detection of electric level | 0 ~ 3000 | 1r/min | 20 | N | |
| P□503 | Same-speed signal detection width | 0 ~ 100 | 1r/min | 10 | N | |
| P□504 | Offset pulse overflow level | 1 ~ 32767 | 256 reference unit | 1024 | N | |
| P□505 | Latency time for servo to turn on | 0 ~ 2000 | ms | 0 | N | |
| P□506 | Waiting time of servo ON | 0 ~ 500 | 10ms | 0 | N | |
| P□507 | Brake command - delay time of servo OFF | 0 ~ 6000 | 1r/min | 100 | N | |
| P□508 | Brake command wait time when servo is OFF | 10 ~ 100 | 10ms | 50 | N | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|--------------|-----------------|--------------|----------------------|
| P□509 | Input signal selection 1 | —— | —— | 4321 | Y | 8765 (double axis/b) |
| | Parameter of iK series: | | | | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>/S-ON signal distribution</div><div><div>0</div><div>Set signal fixed to be "inactive"</div></div><div><div>1</div><div>Active when IN1 (CN3-14) input signal is ON</div></div><div><div>2</div><div>Active when IN2 (CN3-15) input signal is ON</div></div><div><div>3</div><div>Active when IN3 (CN3-16) input signal is ON</div></div><div><div>4</div><div>Active when IN4 (CN3-17) input signal is ON</div></div><div><div>5</div><div>Active when IN5 (CN3-39) input signal is ON</div></div><div><div>6</div><div>Active when IN6 (CN3-40) input signal is ON</div></div><div><div>7</div><div>Active when IN7 (CN3-41) input signal is ON</div></div><div><div>8</div><div>Active when IN8 (CN3-42) input signal is ON</div></div><div><div>9</div><div>Set signal fixed to be "active"</div></div></div></div><div><div><div>/P-CON signal distribution (P control when input signal is ON)</div><div><div>0-9</div><div>Ditto</div></div></div></div><div><div><div>P-OT signal distribution (positive rotation drive prohibited when OFF)</div><div><div>0</div><div>Set signal fixed to be "positive rotation drive prohibited"</div></div><div><div>1</div><div>Active when IN1 (CN3-14) input signal is ON</div></div><div><div>2</div><div>Active when IN2 (CN3-15) input signal is ON</div></div><div><div>3</div><div>Active when IN3 (CN3-16) input signal is ON</div></div><div><div>4</div><div>Active when IN4 (CN3-17) input signal is ON</div></div><div><div>5</div><div>Active when IN5 (CN3-39) input signal is ON</div></div><div><div>6</div><div>Active when IN6 (CN3-40) input signal is ON</div></div><div><div>7</div><div>Active when IN7 (CN3-41) input signal is ON</div></div><div><div>8</div><div>Active when IN8 (CN3-42) input signal is ON</div></div><div><div>9</div><div>Set signal fixed to be "positive rotation drive allowed"</div></div></div></div><div><div><div>N-OT signal distribution (negative drive prohibited when input signal is OFF)</div><div><div>0</div><div>Set signal fixed to be "negative rotation side drive prohibited"</div></div><div><div>1</div><div>Active when IN1 (CN3-14) input signal is ON</div></div><div><div>2</div><div>Active when IN2 (CN3-15) input signal is ON</div></div><div><div>3</div><div>Active when IN3 (CN3-16) input signal is ON</div></div><div><div>4</div><div>Active when IN4 (CN3-17) input signal is ON</div></div><div><div>5</div><div>Active when IN5 (CN3-39) input signal is ON</div></div><div><div>6</div><div>Active when IN6 (CN3-40) input signal is ON</div></div><div><div>7</div><div>Active when IN7 (CN3-41) input signal is ON</div></div><div><div>8</div><div>Active when IN8 (CN3-42) input signal is ON</div></div><div><div>9</div><div>Set signal fixed to be "negative rotation side drive allowed"</div></div></div></div></div> | | | | | |

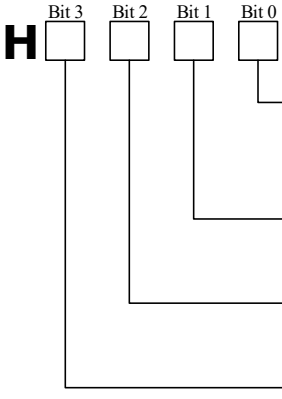
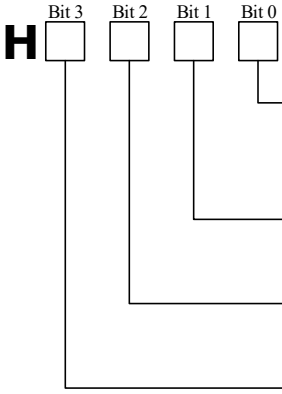
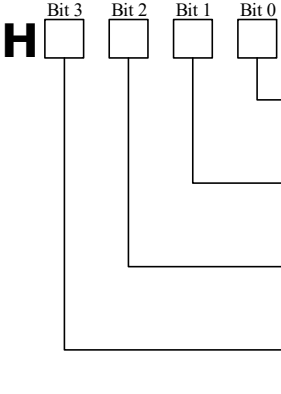
| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|---------------|--------------|-----------------|--------------|---------|---------------------------|--|---|-----------------------------------|---|--|---|--|---|---|---|---|---|---|---|---|---|---|---|---------------------------------|--|--|-----|-------|--|--|---|---|---|--|---|--|---|---|---|---|---|---|---|---|---|---|---|--|---|--|---|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Parameter of iK2 series: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><table><tr><th colspan="2">/S-ON signal distribution</th></tr><tr><td>0</td><td>Set signal fixed to be "inactive"</td></tr><tr><td>1</td><td>Active when IN1 (CN2-8) input signal is ON</td></tr><tr><td>2</td><td>Active when IN2 (CN2-9) input signal is ON</td></tr><tr><td>3</td><td>Active when IN3 (CN2-10) input signal is ON</td></tr><tr><td>4</td><td>Active when IN4 (CN2-19) input signal is ON</td></tr><tr><td>5</td><td>Active when IN5 (CN2-20) input signal is ON</td></tr><tr><td>6</td><td>Active when IN6 (CN2-21) input signal is ON</td></tr><tr><td>7</td><td>Active when IN7 (CN2-22) input signal is ON</td></tr><tr><td>9</td><td>Set signal fixed to be "active"</td></tr></table><table><tr><th colspan="2">/P-CON signal distribution (P control when input signal is ON)</th></tr><tr><td>0-9</td><td>Ditto</td></tr></table><table><tr><th colspan="2">P-OT signal distribution (positive rotation drive prohibited when OFF)</th></tr><tr><td>0</td><td>Set signal fixed to be "positive rotation drive prohibited"</td></tr><tr><td>1</td><td>Active when IN1 (CN2-8) input signal is ON</td></tr><tr><td>2</td><td>Active when IN2 (CN2-9) input signal is ON</td></tr><tr><td>3</td><td>Active when IN3 (CN2-10) input signal is ON</td></tr><tr><td>4</td><td>Active when IN4 (CN2-19) input signal is ON</td></tr><tr><td>5</td><td>Active when IN5 (CN2-20) input signal is ON</td></tr><tr><td>6</td><td>Active when IN6 (CN2-21) input signal is ON</td></tr><tr><td>7</td><td>Active when IN7 (CN2-22) input signal is ON</td></tr><tr><td>9</td><td>Set signal fixed to be "positive rotation drive allowed"</td></tr></table><table><tr><th colspan="2">N-OT signal distribution (negative drive prohibited when input signal is OFF)</th></tr><tr><td>0</td><td>Set signal fixed to be "negative rotation side drive prohibited"</td></tr><tr><td>1</td><td>Active when IN1 (CN3-14) input signal is ON</td></tr><tr><td>2</td><td>Active when IN2 (CN3-15) input signal is ON</td></tr><tr><td>3</td><td>Active when IN3 (CN3-16) input signal is ON</td></tr><tr><td>4</td><td>Active when IN4 (CN3-17) input signal is ON</td></tr><tr><td>5</td><td>Active when IN5 (CN3-39) input signal is ON</td></tr><tr><td>6</td><td>Active when IN6 (CN3-40) input signal is ON</td></tr><tr><td>7</td><td>Active when IN7 (CN3-41) input signal is ON</td></tr><tr><td>8</td><td>Active when IN8 (CN3-42) input signal is ON</td></tr><tr><td>9</td><td>Set signal fixed to be "negative rotation side drive allowed"</td></tr></table></div></div> | | | | | | /S-ON signal distribution | | 0 | Set signal fixed to be "inactive" | 1 | Active when IN1 (CN2-8) input signal is ON | 2 | Active when IN2 (CN2-9) input signal is ON | 3 | Active when IN3 (CN2-10) input signal is ON | 4 | Active when IN4 (CN2-19) input signal is ON | 5 | Active when IN5 (CN2-20) input signal is ON | 6 | Active when IN6 (CN2-21) input signal is ON | 7 | Active when IN7 (CN2-22) input signal is ON | 9 | Set signal fixed to be "active" | /P-CON signal distribution (P control when input signal is ON) | | 0-9 | Ditto | P-OT signal distribution (positive rotation drive prohibited when OFF) | | 0 | Set signal fixed to be "positive rotation drive prohibited" | 1 | Active when IN1 (CN2-8) input signal is ON | 2 | Active when IN2 (CN2-9) input signal is ON | 3 | Active when IN3 (CN2-10) input signal is ON | 4 | Active when IN4 (CN2-19) input signal is ON | 5 | Active when IN5 (CN2-20) input signal is ON | 6 | Active when IN6 (CN2-21) input signal is ON | 7 | Active when IN7 (CN2-22) input signal is ON | 9 | Set signal fixed to be "positive rotation drive allowed" | N-OT signal distribution (negative drive prohibited when input signal is OFF) | | 0 | Set signal fixed to be "negative rotation side drive prohibited" | 1 | Active when IN1 (CN3-14) input signal is ON | 2 | Active when IN2 (CN3-15) input signal is ON | 3 | Active when IN3 (CN3-16) input signal is ON | 4 | Active when IN4 (CN3-17) input signal is ON | 5 | Active when IN5 (CN3-39) input signal is ON | 6 | Active when IN6 (CN3-40) input signal is ON | 7 | Active when IN7 (CN3-41) input signal is ON | 8 | Active when IN8 (CN3-42) input signal is ON | 9 | Set signal fixed to be "negative rotation side drive allowed" |
| /S-ON signal distribution | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Set signal fixed to be "inactive" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Active when IN1 (CN2-8) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Active when IN2 (CN2-9) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Active when IN3 (CN2-10) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Active when IN4 (CN2-19) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Active when IN5 (CN2-20) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Active when IN6 (CN2-21) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Active when IN7 (CN2-22) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Set signal fixed to be "active" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| /P-CON signal distribution (P control when input signal is ON) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0-9 | Ditto | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P-OT signal distribution (positive rotation drive prohibited when OFF) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Set signal fixed to be "positive rotation drive prohibited" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Active when IN1 (CN2-8) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Active when IN2 (CN2-9) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Active when IN3 (CN2-10) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Active when IN4 (CN2-19) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Active when IN5 (CN2-20) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Active when IN6 (CN2-21) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Active when IN7 (CN2-22) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Set signal fixed to be "positive rotation drive allowed" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| N-OT signal distribution (negative drive prohibited when input signal is OFF) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Set signal fixed to be "negative rotation side drive prohibited" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Active when IN1 (CN3-14) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Active when IN2 (CN3-15) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Active when IN3 (CN3-16) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Active when IN4 (CN3-17) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Active when IN5 (CN3-39) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Active when IN6 (CN3-40) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Active when IN7 (CN3-41) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Active when IN8 (CN3-42) input signal is ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Set signal fixed to be "negative rotation side drive allowed" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

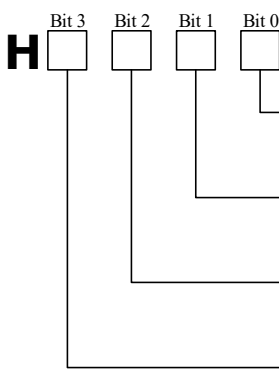
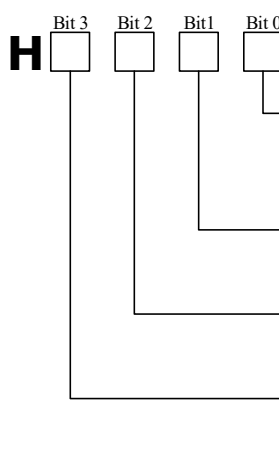
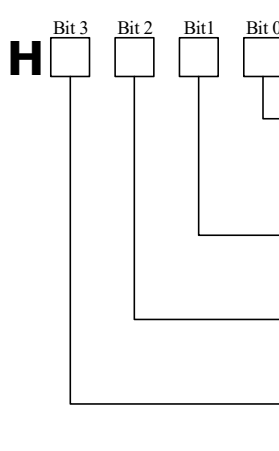
| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks | |
|---------------|--|--------------------------|--------------|--------------------|--------------|--------------------|--|
| P□510 | Input signal selection 2 | —— | —— | 8765 (single axis) | Y | 0000 (double axis) | |
| | Parameter of iK series: | | | | | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>/ALM-RST signal distribution (Clear alarm when turning from OFF to ON)</div><div><div>0</div><div>Set signal fixed to be "OFF"</div></div><div><div>1</div><div>Active when IN1 (CN3-14) input signal is ON</div></div><div><div>2</div><div>Active when IN2 (CN3-15) input signal is ON</div></div><div><div>3</div><div>Active when IN3 (CN3-16) input signal is ON</div></div><div><div>4</div><div>Active when IN4 (CN3-17) input signal is ON</div></div><div><div>5</div><div>Active when IN5 (CN3-39) input signal is ON</div></div><div><div>6</div><div>Active when IN6 (CN3-40) input signal is ON</div></div><div><div>7</div><div>Active when IN7 (CN3-41) input signal is ON</div></div><div><div>8</div><div>Active when IN8 (CN3-42) input signal is ON</div></div><div><div>9</div><div>Set signal fixed to be "ON"</div></div></div></div><div><div><div>/CLR signal distribution</div><div><div>0-9</div><div>Same with /S-ON signal conversion</div></div></div></div><div><div><div>/P-CL signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div></div><div><div><div>/N-CL signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div></div></div> | | | | | | |
| | Parameter of iK2 series: | | | | | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div><div>/ALM-RST signal distribution (Clear alarm when turning from OFF to ON)</div><div><div>0</div><div>Set signal fixed to be "OFF"</div></div><div><div>1</div><div>Active when IN1 (CN2-8) input signal is ON</div></div><div><div>2</div><div>Active when IN2 (CN2-9) input signal is ON</div></div><div><div>3</div><div>Active when IN3 (CN2-10) input signal is ON</div></div><div><div>4</div><div>Active when IN4 (CN2-19) input signal is ON</div></div><div><div>5</div><div>Active when IN5 (CN2-20) input signal is ON</div></div><div><div>6</div><div>Active when IN6 (CN2-21) input signal is ON</div></div><div><div>7</div><div>Active when IN7 (CN2-22) input signal is ON</div></div><div><div>9</div><div>Set signal fixed to be "ON"</div></div></div></div><div><div><div>/CLR signal distribution</div><div><div>0-9</div><div>Same with /S-ON signal conversion</div></div></div></div><div><div><div>/P-CL signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div></div><div><div><div>/N-CL signal distribution</div><div><div>0-9</div><div>Ditto</div></div></div></div></div> | | | | | | |
| | P□511 | Input signal selection 3 | —— | —— | 0000 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|--------------|-----------------|--------------|---------|
| | <div> <div>H</div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> </div> <div> <div>/G-SEL signal distribution</div> <div>0-9 Same with /S-ON signal conversion</div> </div> <div> <div>/POS0 signal distribution</div> <div>0-9 Ditto</div> </div> <div> <div>/POS1 signal distribution</div> <div>0-9 Ditto</div> </div> <div> <div>/POS2 signal distribution</div> <div>0-9 Ditto</div> </div> | | | | | |
| P□512 | Input signal selection 4 | — | — | 0000 | Y | |
| | <div> <div>H</div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> </div> <div> <div>/HOME-REF</div> <div>0-9 Same with /S-ON signal conversion</div> </div> <div> <div>/POS-START</div> <div>0-9 Same with /S-ON signal conversion</div> </div> <div> <div>/POS-STEP</div> <div>0-9 Same with /S-ON signal conversion</div> </div> <div> <div>/POS-START-HOME</div> <div>0-9 Same with /S-ON signal conversion</div> </div> | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|--------------|-----------------|--------------|--|
| P□513 | Output signal selection 1 | —— | —— | 4321 | Y | 0321 (double axis/A) 0654 (double axis/b) |
| | <div>Parameter of iK series:</div> <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>Servo alarm signal distribution (ALM)</div><div><div>0</div><div>Inactive (not using the signal)</div></div><div><div>1</div><div>Output such signal via OUT1 (CN3-7 and CN3-8)</div></div><div><div>2</div><div>Output such signal via OUT2 (CN3-9 and CN3-10)</div></div><div><div>3</div><div>Output such signal via OUT3 (CN3-11 and CN3-12)</div></div><div><div>4</div><div>Output such signal via OUT4 (CN3-32 and CN3-33)</div></div><div><div>5</div><div>Output such signal via OUT5 (CN3-34 and CN3-35)</div></div><div><div>6</div><div>Output such signal via OUT6 (CN3-36 and CN3-37)</div></div></div><div><div>Positioning completion signal distribution (/COIN)/same-speed detection signal distribution (/V-CMP)</div><div><div>0-6</div><div>Ditto</div></div></div><div><div>Motor rotation detection signal distribution (TGON)</div><div><div>0-6</div><div>Ditto</div></div></div><div><div>Servo ready signal distribution (/S-RDY)</div><div><div>0-6</div><div>Ditto</div></div></div></div> | | | | | |
| P□514 | Output signal selection 2 | —— | —— | 0065 | Y | 0000 (double axis) |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|--------------|-----------------|--------------|---------|
| | <p>H Bit 3 Bit 2 Bit 1 Bit 0</p> <p>Torque limit output signal distribution (/CLT) 0-6 Same with ALM signal conversion</p> <p>Brake signal distribution (/BK) 0-6 Ditto</p> <p>Encoder origin signal distribution (/PGC) 0-6 Ditto</p> <p>Reserved</p> | | | | | |
| P□515 | Output signal selection 3 | — | — | 0000 | Y | |
| | <p>H Bit 3 Bit 2 Bit 1 Bit 0</p> <p>Current data set number bit 0 signal distribution when internal position control is in place (/InPosNum0) 0-6 Ditto</p> <p>Current data set number bit 1 signal distribution when internal position control is in place (/InPosNum1) 0-6 Ditto</p> <p>Current data set number bit 2 signal distribution when internal position control is in place (/InPosNum2) 0-6 Ditto</p> <p>Current data set number bit 3 signal distribution when internal position control is in place (/InPosNum3) 0-6 Ditto</p> | | | | | |
| P□516 | Instruction source selection | — | — | — | N | |
| | <p>H Bit 3 Bit 2 Bit 1 Bit 0</p> <p>Source of pulse command 1 Receive pulse command from A-axis pulse input port 2 Receive pulse command from B-axis pulse input port</p> <p>Resered</p> <p>Resered</p> <p>Source of analog voltage reference 0 Analog input port 1 485</p> | | | | | |
| P□517 | Input port filter time constant | 0 ~ 1000 | 0.1ms | 1 | N | |
| P□518 | Alarm input filter time constant | 0 ~ 3 | 0.1ms | 1 | N | |
| P□519 | Active input port signal level selection 1 | — | — | 0000 | N | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------|--------------|-----------------|--------------|---------|
| | Parameter of iK series:  <div style="display: flex; flex-direction: column; align-items: flex-start;"> <div> CN3-14 active input level selection 0 Active when input signal is ON (L level) 1 Active when input signal is OFF (H level) </div> <div> CN3-15 active input level selection 0-1 Ditto </div> <div> CN3-16 active input level selection 0-1 Ditto </div> <div> CN3-17 active input level selection 0-1 Ditto </div> </div> Parameter of iK2 series:  <div style="display: flex; flex-direction: column; align-items: flex-start;"> <div> CN2-8 active input level selection 0 Active when input signal is ON (L level) 1 Active when input signal is OFF (H level) </div> <div> CN2-9 active input level selection 0-1 Ditto </div> <div> CN2-10 active input level selection 0-1 Ditto </div> <div> CN2-19 active input level selection 0-1 Ditto </div> </div> | | | | | |
| P□520 | Input port signal logic selection 2 | — | — | 0000 | N | |
| | Parameter of iK series:  <div style="display: flex; flex-direction: column; align-items: flex-start;"> <div> CN3-39 active input level selection 0-1 Same with CN3-14 input level selection </div> <div> CN3-40 active input level selection 0-1 Ditto </div> <div> CN3-41 active input level selection 0-1 Ditto </div> <div> CN3-42 active input level selection 0-1 Ditto </div> </div> | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|--------------|-----------------|--------------|---------|
| | Parameter of iK2 series:  <div style="margin-left: 200px;"> CN2-20 active input level selection 0-1 Same with CN3-14 input level selection CN2-21 active input level selection 0-1 Ditto CN2-22 active input level selection 0-1 Ditto Reserved </div> | | | | | |
| P□521 | Output port signal reverse select 1 | — | — | 0000 | N | |
| | Parameter of iK series:  <div style="margin-left: 200px;"> OUT1 (CN3-7 and CN3-8) output reverse select 0 Does not inverse 1 Inverse OUT2 (CN3-9 and CN3-10) output reverse select 0-1 Ditto OUT3 (CN3-11 and CN3-12) output reverse select 0-1 Ditto OUT4 (CN3-32 and CN3-33) output reverse select 0-1 Ditto </div> Parameter of iK2 series:  <div style="margin-left: 200px;"> OUT1 (CN2-1 and CN2-2) output reverse select 0 Does not inverse 1 Inverse OUT2 (CN2-3 and CN2-4) output reverse select 0-1 Ditto OUT3 (CN2-14 and CN2-15) output reverse select 0-1 Ditto OUT4 (CN2-16 and CN2-17) output reverse select 0-1 Ditto </div> | | | | | |
| P□522 | Output port signal reverse select 2 | — | — | 0000 | N | |
| | Parameter of iK series: | | | | | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|--------------|-----------------|--------------|---------|
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>OUT5 (CN3-34 and CN3-35) output reverse select</div><div>0-1 Ditto</div></div><div><div>OUT6 (CN3-36 and CN3-37) output reverse select</div><div>0-1 Ditto</div></div><div><div>Reserved</div></div></div> <p>Parameter of iK2 series:</p> <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>OUT5 (CN2-5 and CN2-18) output reverse select</div><div>0-1 Ditto</div></div><div><div>Reserved</div></div></div> | | | | | |
| P□523 | Select initial status display content | | | | | |
| | <div><div><div>H</div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div><div>Select initial status display content</div><div>0 The status of the servo drive</div><div>1 Low 4 bit of the feedback pulse</div><div>2 High 4 bit of the feedback pulse</div><div>3 Current speed of the motor</div><div>4 Low 4 bit of the electronic gear numerator</div><div>5 High 4 bit of the electronic gear numerator</div><div>6 Low 4 bit of the electronic gear denominator</div><div>7 High 4 bit of the electronic gear denominator</div></div><div><div>Reserved</div></div><div><div>Reserved</div></div><div><div>Reserved</div></div></div> | | | | | |
| P□600 | RS-485 communication parameter selection switch | — | — | 2151 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|---|---------------|--------------|-----------------|--------------|------------|
| | <div><div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div>H<div></div><div></div><div></div><div></div></div></div><div><div><div><div>Communication baud rate select</div><div><div>0</div><div>4800 bps</div></div><div><div>1</div><div>9600 bps</div></div><div><div>2</div><div>19200 bps</div></div><div><div>3</div><div>38400 bps</div></div><div><div>4</div><div>57600 bps</div></div><div><div>5</div><div>115200 bps</div></div></div></div><div><div><div><div>Communication protocol select</div><div><div>0</div><div>7, N, 2</div></div><div><div>1</div><div>7, E, 1</div></div><div><div>2</div><div>7, O, 1</div></div><div><div>3</div><div>8, N, 2</div></div><div><div>4</div><div>8, E, 1</div></div><div><div>5</div><div>8, O, 1</div></div><div><div>6</div><div>8, N, 2</div></div><div><div>7</div><div>8, E, 1</div></div><div><div>8</div><div>8, O, 1</div></div><div><div>9</div><div>8, N, 1</div></div></div><div><div>Modbus, ASCII</div></div><div><div>Modbus, RTU</div></div></div></div><div><div>Reversed</div></div><div><div>Reversed</div></div></div></div> | | | | | |
| P□601 | RS-485 communication axis address | 1 ~ 127 | — | 1 (A axis) | Y | 2 (b axis) |
| P□602 | RS-485 communication timeout parameter | 0 ~ 1000 | 100 ms | 0 | N | |
| P□603 | CANopen communication parameter selection switch | — | — | 0004 | Y | |
| | <div><div><div><div>Bit 3</div><div>Bit 2</div><div>Bit 1</div><div>Bit 0</div></div><div>H<div></div><div></div><div></div><div></div></div></div><div><div><div><div>CAN communication baud rate</div><div><div>0</div><div>50K bps</div></div><div><div>1</div><div>100K bps</div></div><div><div>2</div><div>125K bps</div></div><div><div>3</div><div>250K bps</div></div><div><div>4</div><div>500K bps</div></div><div><div>5</div><div>1M bps</div></div></div></div><div><div>Reserved</div></div><div><div>Reserved</div></div><div><div><div><div>CANopen communication enable switch</div><div><div>0</div><div>Disable CANopen communication</div></div><div><div>1</div><div>Enable CANopen communication</div></div></div></div></div></div></div> | | | | | |
| P□604 | CANopen communication axis address | 1 ~ 127 | — | 1 (A axis) | Y | 2 (b axis) |
| P□605 | Metratrolink communication parameter | — | — | 0011 | Y | |

| Parameter No. | Name | Setting range | Setting unit | Factory setting | Power reboot | Remarks |
|---------------|--|---------------------------|------------------|-----------------|--------------|---------------|
| | <div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> <div>H</div> <div> <div>Communication speed setting</div> <div>0 4M bps (M-I)</div> <div>1 10M bps (M-II)</div> </div> <div> <div>Transmission byte setting</div> <div>0 17 bytes</div> <div>1 32 bytes</div> </div> <div> <div>Parameter mode</div> <div>0 Standard mode</div> <div>1 YASKAWA mode</div> </div> <div>Reserved</div> </div> | | | | | |
| P□606 | Metratrolink station address | 0000 - 001F | — | 0001 | Y | 0001 (b axis) |
| P□620 | Linear acceleration | 1 ~ 65535 | 10000 p/s/s | 100 | N | |
| P□621 | Linear deceleration | 1 ~ 65535 | 10000 p/s/s | 100 | N | |
| P□622 | Emergency deceleration | 1 ~ 65535 | 10000 p/s/s | 10000 | N | |
| P□623 | External positioning displacement distance | -1073741823 ~ +1073741823 | 1 reference unit | 100 | N | |
| P□625 | Zero return mode setting | — | — | 1 | Y | |
| | <div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> <div>H</div> <div> <div>Zero return direction</div> <div>0 Set as positive rotation direction</div> <div>1 Set as negative rotation direction</div> </div> <div>Reserved</div> <div>Reserved</div> <div>Reserved</div> </div> | | | | | |
| P□626 | Reference point seeking switch speed | 0 ~ 65535 | 100 p/s | 150 | Y | |
| P□627 | Zero return closing speed | 0 ~ 65535 | 100 p/s | 50 | Y | |
| P□628 | Zero return displacement distance | | | | Y | |
| P□858 | Set whether read the motor encoder | | | | | |
| | <div> <div> <div>Bit 3</div> <div>Bit 2</div> <div>Bit 1</div> <div>Bit 0</div> </div> <div>H</div> <div> <div>Reservation constant (do not change)</div> <div> <div>Reservation constant (do not change)</div> <div>0 Reserved</div> <div>1 Do not read the encoder type when writing motor parameters</div> </div> <div>Reservation constant (do not change)</div> <div>Reservation constant (do not change)</div> </div> </div> | | | | | |

Remarks:

1. Parameter mode

Standard mode ($P\Box605.2 = 0$):

Parameter access address is parameter No. in the table (decimal)

2. YASKAWA mode ($P\Box605.2 = 1$):

Parameter access address reflects partly YASKAWA common parameters and the remaining addresses use parameter No. in the table (hexadecimal)

Reflection Parameter Table:

| Reflection Parameter No. ($P\Box605.2=1$) | Name | Original parameter No. ($P\Box605.2=0$) | Reflection Parameter No. ($P\Box605.2=1$) | Name | Original parameter No. ($P\Box605.2=0$) |
|---|-----------------------------|---|---|---|---|
| P□100 | Speed loop gain | P□100 | P□506 | Brake command latency time when servo is OFF | P□508 |
| P□101 | Speed loop integral | P□101 | P□50A | Input signal selection 1 | P□509 |
| P□102 | Position loop gain | P□102 | P□50B | Input signal selection 2 | P□510 |
| P□212 | Encoder frequency divider | P□201 | P□50E | Output signal selection 1 | P□513 |
| P□203 | Electronic gear numerator | P□202 | P□50F | Output signal selection 2 | P□514 |
| P□210 | Electronic gear denominator | P□203 | P□510 | Output signal selection 3 | P□515 |

Examples:

In standard mode ($P\Box605.2 = 0$), speed loop gain parameter access address is 100 (hexadecimal 0x0064) and torque reference filtering time parameter access address is 401 (hexadecimal 0x0191);

In YASKAWA mode ($P\Box605.2 = 1$), speed loop gain parameter access address is 256 (hexadecimal 0x0100) and torque reference filtering time parameter access address is 1025 (hexadecimal 0x0401).

Appendix C List of Alarm Display

| Alarm display | ALM output | Alarms | Alarm contents | Clear or not |
|---------------|------------|--|---|--------------|
| □01 | H | Encoder PA, PB, PC disconnection | Encoder disconnection or cable welding problem. | Clear |
| □02 | H | Encoder PU, PV, PW disconnection | Encoder disconnection or cable welding problem. | Clear |
| □03 | H | Overload | Continuous running at a certain torque exceeding the rated value | Clear |
| □04 | H | A/D switch channel abnormal | A/D switch channel abnormal | Clear |
| □05 | H | PU, PV, PW false code | PU, PV, PW signals are all high or low | Clear |
| □06 | H | PU, PV, PW phases incorrect | PU, PV, PW signals are all high or low | Clear |
| □08 | H | The BOOTLOADER is abnormal | Contact manufacturer | No |
| □09 | H | Alarm of locked-rotor, | Set the locked-rotor torque by P□148, Set the locked-rotor time by P□149. The servo driver will alarm 07 when the motor torque is greater than the locked-rotor torque and the speed is less than 10RPM | No |
| □10 | H | Overcurrent | Servo drive IPM module current is overlarge. | Clear |
| □11 | H | Overvoltage | Servo drive main circuit voltage is too high. | No |
| □12 | H | Undervoltage | Servo drive main circuit voltage is too low. | No |
| □13 | H | Parameter damage | EEROM data in servo drive is abnormal. | Clear |
| □14 | H | Over-speed | Servo motor speed is extremely high | Clear |
| □15 | H | Deviation counter overflow | Internal position deviation counter overflow | Clear |
| □16 | H | Position deviation is overlarge | Position deviation pulse exceeds the set value of parameter P□504. | Clear |
| □17 | H | Electronic gear fault | Electronic gear is unreasonably set or pulse frequency is too high | Clear |
| □18 | H | 1st channel of current detection is abnormal | Current detection abnormal | Clear |
| □19 | H | 2nd channel of current detection is abnormal | Current detection abnormal | Clear |
| □20 | H | The motor model is abnormal | Contact manufacturer | No |
| □22 | H | Motor model is incorrect | Servo drive parameters do not match with those of motor | Clear |
| □23 | H | Servo drive does not match with motor | Servo drive does not match with motor | Clear |
| □25 | H | Bus encoder multi-coil information error | Multi-coil information error | Clear |
| □26 | H | Bus encoder multi-coil information overflow | Multi-coil information overflow | Clear |
| □27 | H | Bus encoder battery alarm 1 | Battery voltage is lower than 2.5 V, multi-coil information is lost | Clear |
| □28 | H | Bus encoder battery alarm 2 | Battery voltage is lower than 3.1 V, battery voltage is relatively low | Clear |
| □30 | H | Bleeder resistor disconnection alarm | Braking resistor damage. | Clear |
| □31 | H | Regeneration overload | Regeneration processing circuit is abnormal. | No |

| Alarm display | ALM output | Alarms | Alarm contents | Clear or not |
|---------------|------------|---|---|--------------|
| □33 | H | Momentary outage alarm. | There is outage of over one power cycle under AC current. | Clear |
| □34 | H | Rotary transformer is abnormal | Rotary transformer communication is abnormal. | Clear |
| □40 | H | Bus encoder communication is abnormal | Servo drive and encoder cannot realize communication. | Clear |
| □41 | H | Bus encoder overspeed | When power is ON, encoder rotates at high speed | Clear |
| □42 | H | Bus encoder absolute status error | Encoder damage or encoder decoding circuit damage | Clear |
| □43 | H | Bus encoder counting error | Encoder damage or encoder decoding circuit damage | Clear |
| □44 | H | Check error in bus encoder control field | Encoder signal is interrupted or encoder decoding circuit damage | Clear |
| □45 | H | Check error in bus encoder communication data | Encoder signal is interrupted or encoder decoding circuit damage | Clear |
| □46 | H | Stop bit error in bus encoder status field | Encoder signal is interrupted or encoder decoding circuit damage | Clear |
| □47 | H | Stop bit error in bus encoder SFOME | Encoder signal is interrupted or encoder decoding circuit damage | Clear |
| □48 | H | Bus encoder data are not initialized | Bus encoder SFOME data are null | Clear |
| □49 | H | Sum check error in bus encoder data | Sum check in bus encoder EEPROM data is abnormal | Clear |
| □60 | H | MODBUS communication timeout | Drive fails to accept data normally at the set time in P□602 | Clear |
| □61 | H | CANopen master station heartbeat timeout | Drive fails to accept master station heartbeat message normally at the set time | Clear |
| □63 | H | Mechatrolink Communication warning | Error in mechatrolink communication | No |
| □77 | H | AD Sampling operation timeout | Contact manufacturer | No |
| □70 | H | Drive overheat alarm | Drive internal IPM module temperature is too high | Clear |
| □90 | H | Software does not match with hardware | Parameter is wrongly set or software does not match with hardware | No |
| □-- | L | No error display | Display normal action status | Clear |

Note: 1. "□" in alarm display may be "A" or "b", referring to A axis alarm or b axis alarm respectively

Appendix D Guidelines for Motor Model by Users

| Steps | Operation instruction | Operation key | Display after operation |
|-------|--|---------------|-------------------------|
| 1 | Gently press M function key for several times to switch to A axis parameter setting mode. | M | PA000 |
| 2 | Gently press “^” key for six times and set FA006. | ^ | PA006 |
| 3 | <p>Press SET key to display current PA000 data. The decimal point in bit 0 currently displayed flickers. Set motor manufacturer and encoder type with Shift key and “^” key.</p> | SET | HA000 |
| 4 | Press SET to return to the display of FA006. | | PA006 |
| 5 | Gently press “v” key once to set FA005. | v | PA005 |
| 6 | Gently press SET key to start motor model code setting. | SET | 00039 |
| 7 | Modify the value according to appendix (motor adaption table) and set value at each bit with Shift key. | | |
| 8 | Gently press SET key to exit motor model code setting. | SET | PA005 |

Note:

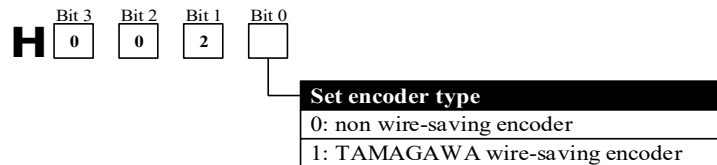
1. In case of double-axis servo drive, M function key should be press for a long time (continuously for above 1 s) during setting of b axis motor model to switch to b axis parameter and then follow step 9-12.
2. After setting motor model code, it is required to turn off and reboot servo drive to make modified parameters effective.

Motor Adaption Table

Note: Before selecting motor model, please set motor manufacturer and encoder type first which can both be set via PA006.

1、Universal type servo motor

If the motor is universal type servo motor, refer to PA006 setting below:



(1) 220V servo motor

| Motor model | Voltage V | Torque N•m | Rotation speed rpm | Power kW | Motor type Pn005 |
|-------------|--------------|---------------|-----------------------|-------------|---------------------|
|-------------|--------------|---------------|-----------------------|-------------|---------------------|

| Motor model | Torque N•m | Speed rpm | Power kW | Cutrrrent A | Motor manufacturer code Pn006 | Motor type Pn005 |
|------------------|---------------|--------------|-------------|----------------|----------------------------------|---------------------|
| 40ST-M00130 | 0.16 | 3000 | 0.05 | 0.4 | 2 | 41 |
| 40ST-M00330 | 0.30 | 3000 | 0.1 | 0.6 | 2 | 42 |
| 40ED-A1013050D4B | 0.318 | 3000 | 0.1 | 1.1 | 8 | 1 |
| 60EST-M00630 | 0.64 | 3000 | 0.2 | 1.7 | 2 | 58 |
| 60EST-M00630B | 0.6 | 3000 | 0.2 | 1.7 | 2 | 94 |
| 60ST-M00630 | 0.637 | 3000 | 0.2 | 1.2 | 2 | 0 |
| 60ST-M01330 | 1.27 | 3000 | 0.4 | 2.8 | 2 | 1 |
| 60ST-M01930 | 1.91 | 3000 | 0.6 | 3.5 | 2 | 2 |
| 60ED-A4013050D4B | 1.27 | 3000 | 0.4 | 3.3 | 8 | 2 |
| 80ST-M01330 | 1.27 | 3000 | 0.4 | 2 | 2 | 3 |
| 80ST-M03520 | 3.5 | 2000 | 0.73 | 3 | 2 | 5 |
| 80EST-M02430B | 2.39 | 3000 | 0.75 | 5 | 2 | 95 |
| 80ST-M02430 | 2.39 | 3000 | 0.75 | 3 | 2 | 4 |
| 80ST-M03230 | 3.2 | 3000 | 1.0 | 4 | 2 | 45 |
| 80ST-M03530 | 3.5 | 3000 | 1.0 | 4.5 | 2 | 43 |
| 80ST-M04025 | 4.0 | 2500 | 1.0 | 4.4 | 2 | 6 |
| 80ST-AM04030 | 4.0 | 3000 | 1.2 | 5.2 | 2 | 38 |
| 90ST-M03520 | 3.5 | 2000 | 0.73 | 3 | 2 | 8 |
| 90ST-M02430 | 2.4 | 3000 | 0.75 | 3 | 2 | 7 |

| Motor model | Torque N•m | Speed rpm | Power kW | Cutrrrent A | Motor manufacturer code Pn006 | Motor type Pn005 |
|-------------------|---------------|--------------|-------------|----------------|----------------------------------|---------------------|
| 90ST-M04025 | 4.0 | 2500 | 1.0 | 4 | 2 | 9 |
| 100ST-M03230 | 3.2 | 3000 | 1.0 | 5 | 2 | 60 |
| 100ST-M06430 | 6.4 | 3000 | 2.0 | 9.9 | 2 | 61 |
| 110ST-M02030 | 2.0 | 3000 | 0.6 | 2.5 | 2 | 10 |
| 110ST-M04020 | 4.0 | 2000 | 0.8 | 3.5 | 2 | 11 |
| 110ST-M04030 | 4.0 | 3000 | 1.2 | 5.0 | 2 | 12 |
| 110ST-M06020 | 6.0 | 2000 | 1.2 | 4.5 | 2 | 14 |
| 110ST-M05030 | 5.0 | 3000 | 1.5 | 6.0 | 2 | 13 |
| 110ST-M08020 | 8 | 2000 | 1.6 | 6.5 | 2 | 46 |
| 110ST-M06030 | 6.0 | 3000 | 1.8 | 6.0 | 2 | 15 |
| 110ST-M10020 | 10 | 2000 | 2.0 | 8.5 | 2 | 47 |
| 130ST-M04010 | 4 | 1000 | 0.4 | 2.5 | 2 | 48 |
| 130ST-M05015 | 5 | 1500 | 0.75 | 4.0 | 2 | 32 |
| 130ST-M06015 | 6 | 1500 | 0.9 | 4.3 | 2 | 39 |
| 130ST-M04025 | 4.0 | 2500 | 1.0 | 4.0 | 2 | 16 |
| 130AST-M04025 | 4.0 | 2500 | 1.0 | 4.5 | 2 | 62 |
| 130ST-M05020 | 5 | 2000 | 1 | 4 | 8 | 0 |
| 130ST-M10010 | 10.0 | 1000 | 1.0 | 4.5 | 2 | 20 |
| 130ST-M04030 | 4 | 3000 | 1.2 | 5.5 | 2 | 50 |
| 130ST-M06020 | 6 | 2000 | 1.2 | 4.5 | 2 | 70 |
| 130AST-M05025 | 5.0 | 2500 | 1.3 | 5.3 | 2 | 63 |
| 130ST-M05025 | 5.0 | 2500 | 1.3 | 5.0 | 2 | 17 |
| 130ED-A1021520D4B | 6.4 | 1500 | 1 | 5 | 8 | 4 |
| 130ED-A2022030D4B | 9.6 | 2000 | 2 | 13.8 | 8 | 3 |
| 130ST-M05030 | 5 | 3000 | 1.5 | 5.8 | 2 | 51 |
| 130AST-M06025 | 6.0 | 2500 | 1.5 | 5.9 | 2 | 64 |
| 130ST-M06025 | 6.0 | 2500 | 1.5 | 6.0 | 2 | 18 |
| 130AST-M10015 | 10 | 1500 | 1.5 | 6 | 2 | 66 |
| 130ST-M10015 | 10.0 | 1500 | 1.5 | 6.0 | 2 | 21 |
| 130ST-M15010 | 15 | 1000 | 1.5 | 7.3 | 2 | 44 |
| 130ST-M07720 | 7.7 | 2000 | 1.6 | 6.5 | 2 | 49 |
| 130ST-M06030 | 6 | 3000 | 1.8 | 7 | 2 | 85 |

| Motor model | Torque N•m | Speed rpm | Power kW | Cutrrrent A | Motor manufacturer code Pn006 | Motor type Pn005 |
|----------------|---------------|--------------|-------------|----------------|----------------------------------|---------------------|
| 130AST-M07725 | 7.7 | 2500 | 2 | 7.5 | 2 | 65 |
| 130ST-M07725 | 7.7 | 2500 | 2.0 | 7.5 | 2 | 19 |
| 130AST-M15015 | 15 | 1500 | 2.3 | 9.4 | 2 | 67 |
| 130ST-M15015 | 15.0 | 1500 | 2.3 | 9.5 | 2 | 23 |
| 130ST-M07730 | 7.7 | 3000 | 2.5 | 10 | 2 | 86 |
| 130ST-M17015 | 17 | 1500 | 2.6 | 11.5 | 2 | 57 |
| 130AST-M10025B | 10 | 2500 | 2.6 | 10 | 2 | 68 |
| 130ST-M10025 | 10.0 | 2500 | 2.6 | 10 | 2 | 22 |
| 130ST-M15025 | 15.0 | 2500 | 3.8 | 13.5 | 2 | 24 |
| 130ST-M15030 | 15 | 3000 | 4.7 | 19 | 2 | 96 |
| 150ST-M18010 | 18 | 1000 | 1.8 | 8 | 2 | 53 |
| 150ST-M23010 | 23 | 1000 | 2.3 | 11 | 2 | 71 |
| 150ST-M15020 | 15 | 2000 | 3.0 | 14 | 2 | 52 |
| 150ST-M18020 | 18 | 2000 | 3.6 | 17 | 2 | 54 |
| 150ST-M15025 | 15 | 2500 | 3.8 | 17 | 2 | 73 |
| 150ST-M23020 | 23 | 2000 | 4.7 | 21 | 2 | 55 |
| 150ST-M27020 | 27 | 2000 | 5.5 | 27 | 2 | 56 |
| 180ST-M17215 | 17.2 | 1500 | 2.7 | 10.5 | 2 | 25 |
| 180ST-M19015 | 19.0 | 1500 | 3.0 | 12 | 2 | 26 |
| 180ST-M21520 | 21.5 | 2000 | 4.5 | 16 | 2 | 27 |
| 180ST-M27010 | 27 | 1000 | 2.9 | 12 | 2 | 28 |
| 180ST-M27015 | 27.0 | 1500 | 4.3 | 16 | 2 | 29 |
| 180ST-M35010 | 35 | 1000 | 3.7 | 16 | 2 | 30 |
| 180ST-M35015 | 35.0 | 1500 | 5.5 | 24 | 2 | 31 |
| 180ST-M17230 | 17.2 | 3000 | 5.5 | 19 | 2 | 33 |

(2) 380V servo motor

| Motor model | Torque N•m | Speed rpm | Power kW | Cutrrrent A | Motor manufacturer code Pn006 | Motor type Pn005 |
|---------------|---------------|--------------|-------------|----------------|----------------------------------|---------------------|
| 80HST-M03520 | 3.5 | 2000 | 0.73 | 1.8 | 2 | 93 |
| 130HST-M04025 | 4 | 2500 | 1.0 | 2.6 | 2 | 69 |
| 130HST-M10010 | 10 | 1000 | 1.0 | 2.5 | 2 | 87 |
| 130HST-M05025 | 5 | 2500 | 1.3 | 3 | 2 | 80 |

| Motor model | Torque N•m | Speed rpm | Power kW | Cutrrrent A | Motor manufacturer code Pn006 | Motor type Pn005 |
|----------------|---------------|--------------|-------------|----------------|----------------------------------|---------------------|
| 130HST-M06025 | 6 | 2500 | 1.5 | 3.7 | 2 | 81 |
| 130HST-M10015 | 10 | 1500 | 1.5 | 3.5 | 2 | 97 |
| 130HST-M07725 | 7.7 | 2500 | 2.0 | 4.7 | 2 | 82 |
| 130HST-M15015 | 15 | 1500 | 2.3 | 5 | 2 | 98 |
| 130HST-M10025 | 10 | 2500 | 2.5 | 5.9 | 2 | 59 |
| 130HST-M15025 | 15.0 | 2500 | 3.8 | 7.4 | 2 | 83 |
| 150HST-M15020 | 15 | 2000 | 3.0 | 6.8 | 2 | 99 |
| 150HST-M18020 | 18 | 2000 | 3.6 | 8.5 | 2 | 88 |
| 150HST-M15025 | 15.0 | 2500 | 3.8 | 9.5 | 2 | 84 |
| 150HST-M23020 | 23 | 2000 | 4.7 | 12 | 2 | 89 |
| 150HST-AM23025 | 23 | 2500 | 6 | 14.5 | 2 | 75 |
| 150HST-M27020 | 27 | 2000 | 5.5 | 14.5 | 2 | 90 |
| 180HST-M17215 | 17.2 | 1500 | 2.7 | 6.5 | 2 | 91 |
| 180HST-M27010 | 27 | 1000 | 2.9 | 7.5 | 2 | 35 |
| 180HST-M19015 | 19 | 1500 | 3.0 | 7.5 | 2 | 34 |
| 180HST-M35010 | 35 | 1000 | 3.5 | 10 | 2 | 72 |
| 180HST-M27015 | 27 | 1500 | 4.3 | 10 | 2 | 77 |
| 180HST-M21520 | 21.5 | 2000 | 4.5 | 9.5 | 2 | 78 |
| 180HST-M35015 | 35 | 1500 | 5.5 | 12 | 2 | 76 |
| 180HST-M48015 | 48 | 1500 | 7.2 | 20 | 2 | 79 |
| 180HST-M21520 | 21.5 | 2000 | 4.5 | 9.5 | 2 | 92 |
| 200HST-AM30015 | 30 | 1500 | 4.7 | 9.2 | 2 | 74 |

2、A Series

| Motor model | Torque N•m | Speed rpm | Power kW | Cutrrrent A | Motor manufacturer code Pn006 | Motor type Pn005 |
|----------------|---------------|--------------|-------------|----------------|----------------------------------|---------------------|
| 130AD-A1521530 | 9.6 | 1500 | 1.5 | 10 | 0 | 41 |
| 130AD-A1321530 | 8.4 | 1500 | 1.3 | 9.5 | 0 | 42 |
| 130AD-A6511530 | 4.2 | 1500 | 0.65 | 5.5 | 0 | 43 |
| 130AD-A8511530 | 5.4 | 1500 | 0.85 | 6.5 | 0 | 44 |
| 130AD-A1021530 | 6.4 | 1500 | 1.0 | 8.0 | 0 | 45 |
| 130AD-A1221530 | 7.5 | 1500 | 1.2 | 9.0 | 0 | 46 |
| 130AD-A1821520 | 11.5 | 1500 | 1.8 | 9.0 | 0 | 47 |

| | | | | | | |
|----------------|------|------|------|------|---|----|
| 130AD-A1821530 | 11.5 | 1500 | 1.8 | 12.5 | 0 | 48 |
| 130AD-A2321520 | 14.6 | 1500 | 2.3 | 11.0 | 0 | 49 |
| 130AD-A2321530 | 14.6 | 1500 | 2.3 | 16.0 | 0 | 50 |
| 110AD-A8812030 | 4.2 | 2000 | 0.88 | 4.5 | 0 | 51 |
| 110AD-A1122030 | 5.4 | 2000 | 1.1 | 5.5 | 0 | 52 |
| 110AD-A1322030 | 6.4 | 2000 | 1.3 | 6.5 | 0 | 53 |
| 110AD-A1622030 | 7.5 | 2000 | 1.6 | 8.0 | 0 | 54 |

3、S Series

| Motor model | Torque N•m | Speed rpm | Power kW | Cutrrrent A | Motor manufacturer code Pn006 | Motor type Pn005 |
|------------------|---------------|--------------|-------------|----------------|----------------------------------|---------------------|
| 60SS-A4013050 | 1.27 | 3000 | 0.4 | 2.8 | 6 | 80 |
| 80SS-A7513050 | 2.39 | 3000 | 0.75 | 4.0 | 6 | 81 |
| 130SD-A1022030 | 4.77 | 2000 | 1.0 | 6.0 | 6 | 82 |
| 130SD-A2022030 | 9.55 | 2000 | 2.0 | 10.5 | 6 | 83 |
| 60SS-A2013050D4 | 0.64 | 3000 | 0.2 | 1.9 | 6 | 84 |
| 130SD-A3022030D4 | 14.3 | 2000 | 3 | 13.8 | 6 | 85 |
| 130SD-A1522030D1 | 7.16 | 2000 | 1.5 | 8.2 | 6 | 86 |
| 130SD-A1521015 | 14.3 | 1000 | 1.5 | 7.2 | 6 | 87 |

4、HD-LFB series

| Motor model | Torque N•m | Speed rpm | Power kW | Cutrrrent A | Motor manufacturer code Pn006 | Motor type Pn005 |
|----------------|---------------|--------------|-------------|----------------|----------------------------------|---------------------|
| 80ST-M01330LB | 1.3 | 3000 | 0.4 | 2.6 | 0 | 0 |
| 80ST-M02430LB | 2.4 | 3000 | 0.75 | 4.2 | 0 | 1 |
| 80ST-M03330LB | 3.3 | 3000 | 1.0 | 4.2 | 0 | 2 |
| 110ST-M02030LB | 2.0 | 3000 | 0.6 | 4.0 | 0 | 3 |
| 110ST-M04030LB | 4.0 | 3000 | 1.2 | 5.0 | 0 | 4 |
| 110ST-M05030LB | 5.0 | 3000 | 1.5 | 6.0 | 0 | 5 |
| 110ST-M06020LB | 6.0 | 2000 | 1.2 | 6.0 | 0 | 6 |
| 110ST-M06030LB | 6.0 | 3000 | 1.6 | 8.0 | 0 | 7 |
| 130ST-M04025LB | 4.0 | 2500 | 1.0 | 4.0 | 0 | 8 |
| 130ST-M05020LB | 5.0 | 2000 | 1.0 | 5.0 | 0 | 9 |
| 130ST-M05025LB | 5.0 | 2500 | 1.3 | 5.0 | 0 | 10 |
| 130ST-M06025LB | 6.0 | 2500 | 1.5 | 6.0 | 0 | 11 |

| | | | | | | |
|-----------------|-----|------|-----|------|---|----|
| 130ST-M07720LB | 7.7 | 2000 | 1.6 | 6.0 | 0 | 12 |
| 130ST-M07725LB | 7.7 | 2500 | 2.0 | 7.5 | 0 | 13 |
| 130ST-M07730LB | 7.7 | 3000 | 2.4 | 9.0 | 0 | 14 |
| 130ST-M10015LB | 10 | 1500 | 1.5 | 6.0 | 0 | 15 |
| 130ST-M10025LB | 10 | 2500 | 2.6 | 10.0 | 0 | 16 |
| 130ST-M15015LB | 15 | 1500 | 2.3 | 9.5 | 0 | 17 |
| 130ST-M15025LB | 15 | 2500 | 3.8 | 17.0 | 0 | 18 |
| 150ST-M15025LB | 15 | 2500 | 3.8 | 16.5 | 0 | 19 |
| 150ST-M18020LB | 18 | 2000 | 3.6 | 16.5 | 0 | 20 |
| 150ST-M23020LB | 23 | 2000 | 4.7 | 20.5 | 0 | 21 |
| 150ST-M27020LB | 27 | 2000 | 5.5 | 20.5 | 0 | 22 |
| 130ST-F06025LFC | 6.0 | 2500 | 1.0 | | 0 | 23 |
| 130ST-F07720LFC | 7.7 | 2000 | | | 0 | 24 |
| 130ST-F10015LFC | 10 | 1500 | 1.5 | | 0 | 25 |
| 130ST-F15015LFC | 15 | 1500 | | | 0 | 26 |
| 110ST-M05030LFC | 5.0 | 3000 | 1.5 | | 0 | 27 |