

# FALDIC- $\alpha$ Fuji AC Servo System

RYS-R Type

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## User's Manual

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**SAFETY INSTRUCTIONS**

In all stages of the basic planning of this equipment, its transport, installation, operation, maintenance and check, reference must be made to this manual and other related documents. The correct understanding of the equipment, information about safety and other related instructions are essential for this system.

Cautionary indications DANGER and CAUTION are used in this manual to point out particular hazards and to highlight some unusual information which must be specially noted.

| Cautionary indications   | Description  |
|--|--|
|  <b>DANGER</b>  | Indicates that death or severe personal injury will result if proper precautions are not taken.          |
|  <b>CAUTION</b> | Indicates that personal injury or property damage alone will result if proper precautions are not taken. |

Pictorial symbols are used as necessary.

| Pictorial symbol   | Description        | Pictorial symbol   | Description                     |
|--|--------------------|--|---------------------------------|
|  | Do not disassemble |  | Electrical shock hazard warning |

**Warning display**

The warning display in Fig. B is located at the arrows in Fig. A.

Fig. A

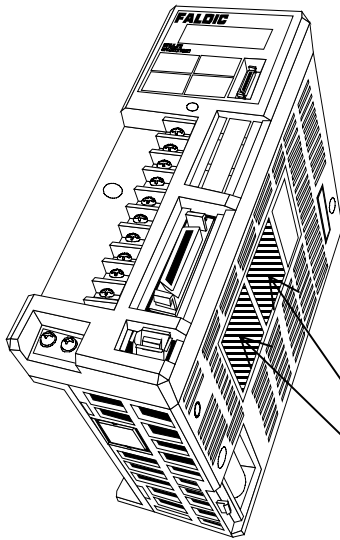



Fig. B



Warning display

Fig. B shows following contents :  
There is a risk of electric shock.

Do not touch the amplifier when a commercial power is applied and for at least five minutes after de-energization.

Be sure to ground (applicable for Japan only : grounding equal to 3rd class grounding structure of Japanese standard (grounding resistance 100 [ ] or less)) must be connected with the terminal marked “”.

 **DANGER**

**Prior to inspection, turn off power and wait for at least five minutes. Otherwise, there is a risk of electric shock.**

**Do not touch the amplifier when the commercial power is supplied. Otherwise, there is a risk of electric shock.**

 **CAUTION**

**Do not disassemble the motor. Otherwise, the operation may be abnormal, thereby damaging the coupled machine.**

**Do not hit the motor with hammer or any other instruments. The integrated (built-in) encoder may break causing the motor to run at an excessive speed.**

**Do not connect a commercial power supply directly to the motor. Otherwise, it may break.**

**Supplying other than 200 [V] or 100 [V] (according to input voltage class of amplifier) to the amplifier may break it.**

**Do not turn on and off the commercial power repeatedly. Otherwise, the amplifier rectifier may break.**

**The motor must be firmly tightened to the mounting base or the driven machine. If rapid acceleration or deceleration is attempted without this firm tightening, the motor may become dislocated.**

**Withstand voltage and insulation test with megger must not be conducted.**

Products introduced in this manual have not been designed or manufactured for such applications in a system or equipment that will affect human bodies or lives. Customers, who want to use the products introduced in this manual for special systems or devices such as for atomic-energy control, aerospace use, medical use, and traffic control, are requested to consult the Fuji. Customers are requested to prepare safety measures when they apply the products introduced in this manual to such systems or facilities that will affect human lives or cause severe damage to property if the products become faulty.

The technical data and dimensions are subject to change without notice in the individual pages of this document.

The illustrations are for reference-only.

The company names and product names described herein are generally the registered trade names.

Although this manual indicates technical units given in SI units, the indications (rating plate, etc.) on the products themselves may be in units other than SI units.

## 1. GENERAL

### 1.1 Outline

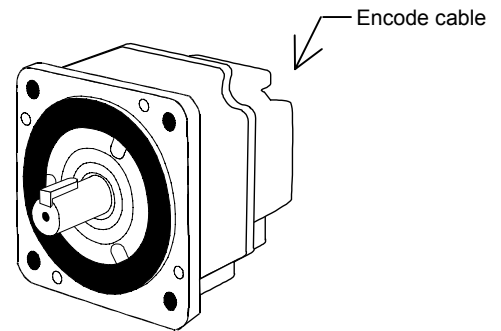
The FALDIC- series which corresponds to a upper level interface is an AC servo system for motion-control necessary for a driven machine.

#### (1) Model type in this manual

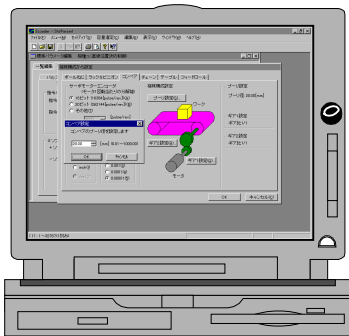
- (a) Amplifier (\*) : RYS      S3-RPS , RSS    and RTS
- (b) Motor (\*) : GYC      DC1-S\* - \* \* \* \*
- GYS      DC1-S\* - \* \* \* \*
- (c) Gear head : GYN      SAG-G
- GRN      SAG-G

#### (1) Main features of product

- (a) Save-wiring 16 bit serial pulse encoder (encoder) (65536 pulses/rev.)
  - (i) On the motor, an encoder for any of INC and ABS systems is mounted.
  - (ii) If a battery is mounted on the amplifier, it is usable as ABS system.
  - (iii) Encoder cabling consists of 2 wires for power supply and 2 for signal, of totally 4 wires. For ABS system, 2 wires for battery must be added.
  - (iv) A motor of a different output [kW] can be driven without changing the encoder setting provided that it has a rated output of frame No. (size) equal to the output to apply, one step smaller or greater. Refer to 9.3 (3) (d) .
  - (v) The basic resolution is 65536 pulses/rev., and the frequency dividing output is 16 to 16384 pulses/rev.



#### (b) Preparing a PC (\*) loader



- (i) Servo system support tools capable of controlling the para. (\*) editing, monitoring, test (trial) running, etc. are available.
- (ii) Fault diagnostic function alarm can be detected and fault cause covering the mechanical equipment system can be assumed.

- (\*) Amplifier : Servo-amplifier
- Motor : Servo-motor
- PC : Personal computer
- Para. : Parameter(s)

(c) Closely mountable amplifiers

(i) Several amplifiers can be mounted sidewise spaced by less than 5 [mm] between themselves. In that case, however, the operation duty is not continuous but 80%ED. Refer to 3.2 (2) .

(ii) Control power supply input terminals are provided. Maintenance is available at a status where the main circuit power supply is turn off.

(iii) PN terminals for harmonics suppression are provided. A DC reactor can be mounted.

(iv) A keypad (touch) panel is provided.

(v) You can select a control function from 3 types:

1) Pulse train input /speed control type (RYS-V type amplifier : Input frequency 500 [kHz] max.)

2) Linear positioning function (RYS-L type amplifier : Maximum command value  $\pm 79,999,999$ )

A linear positioning system combined with ball-screw or other mechanisms.

3) Rotation indexing system (RYS-R type amplifier : Maximum indexing number 30000)

A rotation indexing system combined with ATC, tool magazine, etc. or other mechanisms.

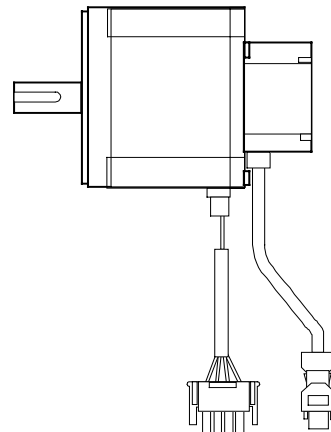
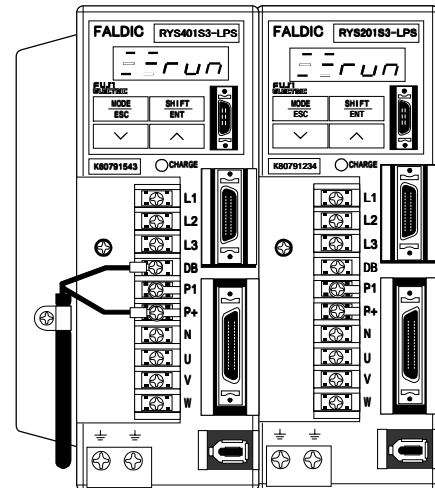
(d) Cubic/slim type motors

Cubic type of approximately half the depth of our basic type motor and slim type of flange of approximately half size are obtained.

(i) The degree of protection (motor enclosure protection) is IP55. Optionally, IP67 can be supplied.

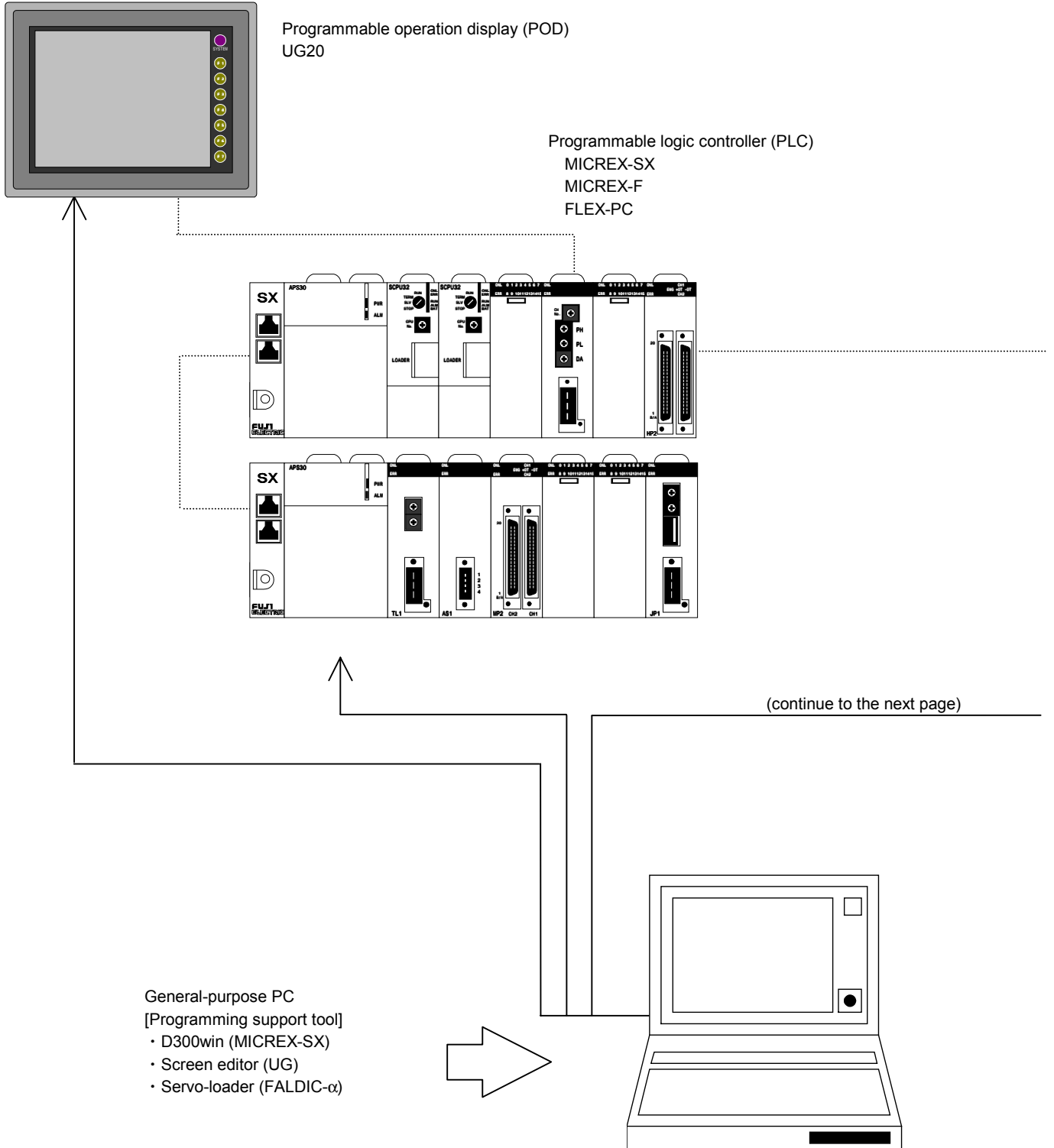
(ii) 0.03 to 5 [kW] are available.

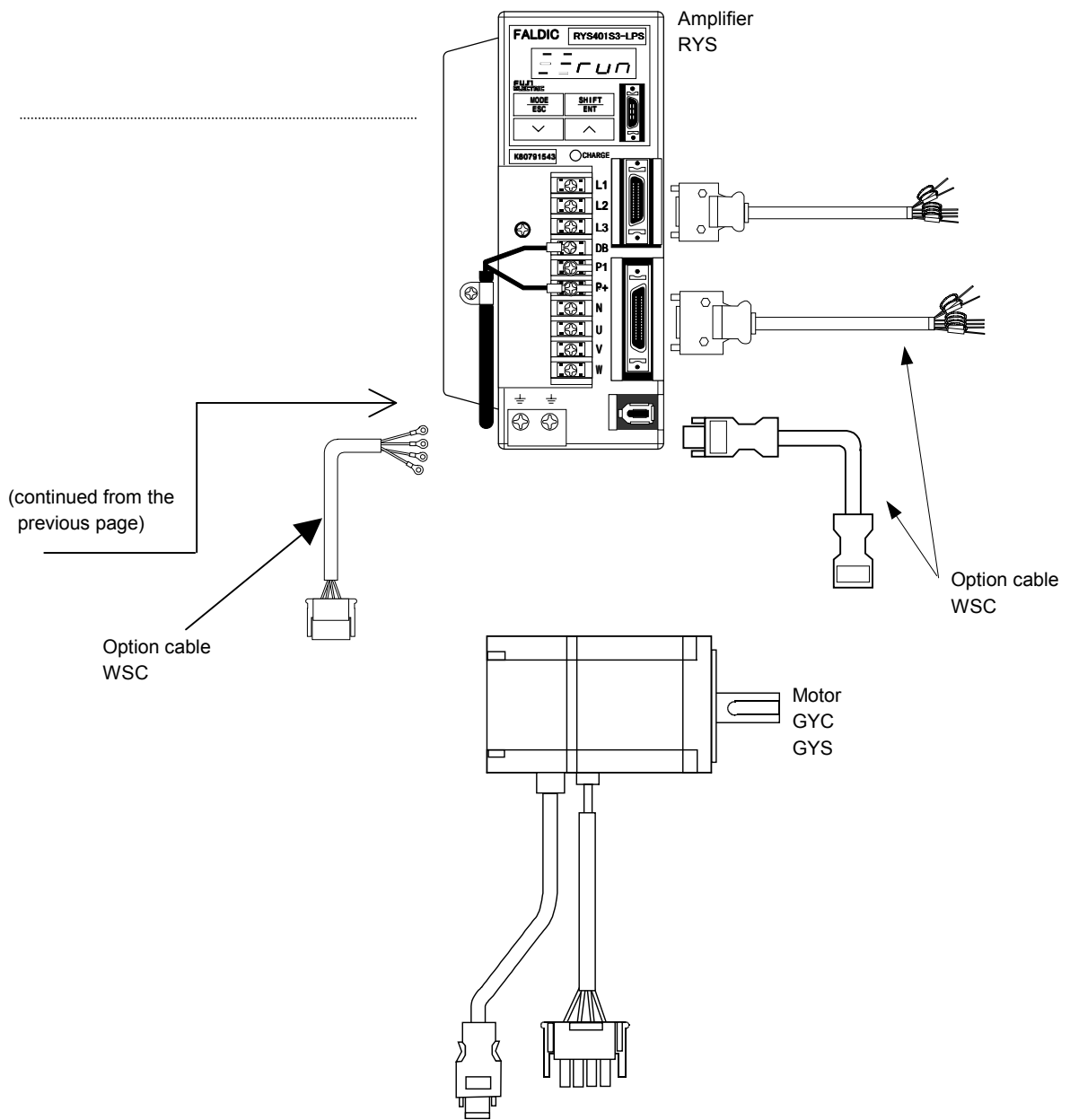
(iii) Acceptable acceleration vibration is  $49 [m/s^2]$  and the slit plate material of 16 bit serial encoder is non-glass film.



## 1.2 System configuration

The following illustrates related devices of FALDIC- $\alpha$  system.







### 1.3 Functions

The FALDIC- $\alpha$  series has 3 types of control function for particular applications.

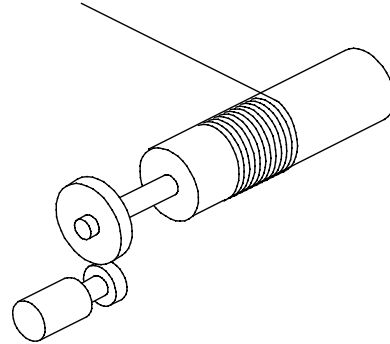
#### (1) RYS-V type : Pulse train/speed control (velocity)

Maximum input frequency 500 [kHz]

Rotates according to pulse train from host control equipment, or speed command from encoder or variable resistor.

The upper level interface has :

- DI/DO speed (minimum DI/DO),
- SX bus,
- Open network, etc.



#### (2) RYS-L type : Linear positioning system (linear motion)

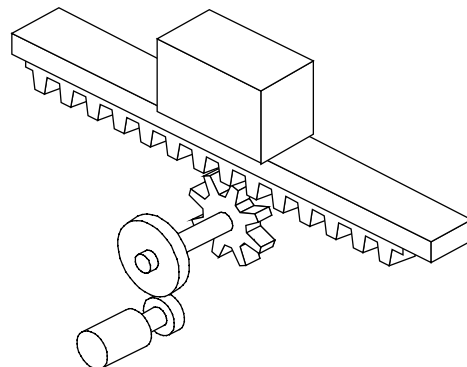
Maximum command value  $\pm 79,999,999$

The amplifier can compose a linear positioning system, combined with ball-screw, timing belt, rack and pinion or other mechanisms.

As positioning data, 99 sets (points) of position, current (present) position output, immediate positioning, M-code output etc. can be registered.

The upper level interface has :

- DI/DO position (expanded DI/DO),
- SX bus,
- T-link,
- Open network, etc.



#### (3) RYS-R type : Rotation indexing system (rotation)

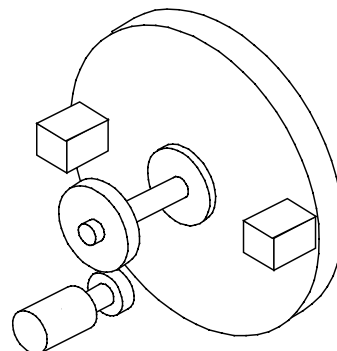
Maximum indexing number 30000

The amplifier can compose a rotation indexing system, combined with ATC, tool magazine, loader/unloader, etc. or other mechanisms.

The rotation indexing system is usable for shorted route control, 2nd origin, one-point halt, single-direction infinite rotation, etc.

The upper level interface has :

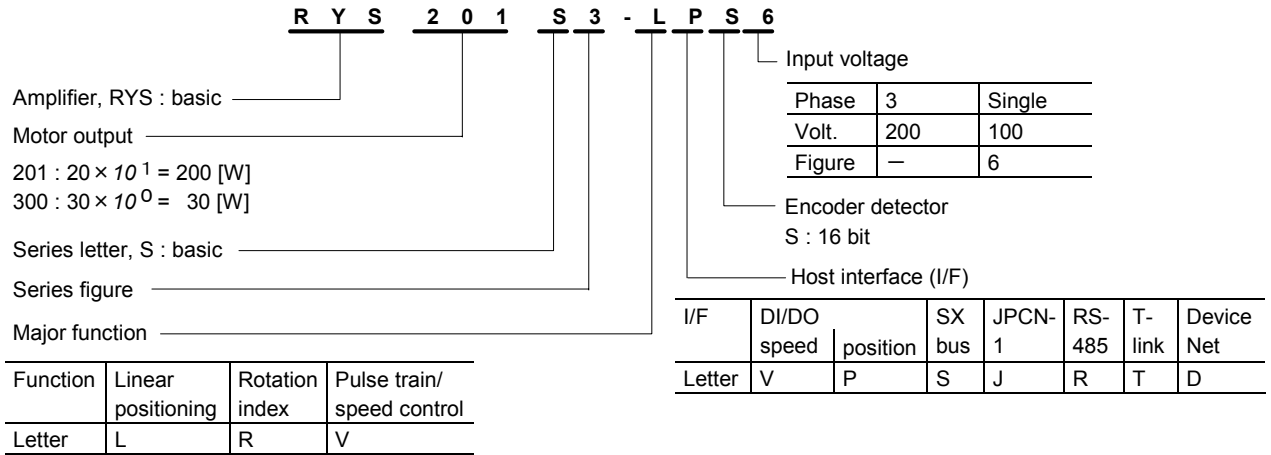
- DI/DO position (expanded DI/DO),
- SX bus,
- T-link,
- RS-485,
- Open network, etc.



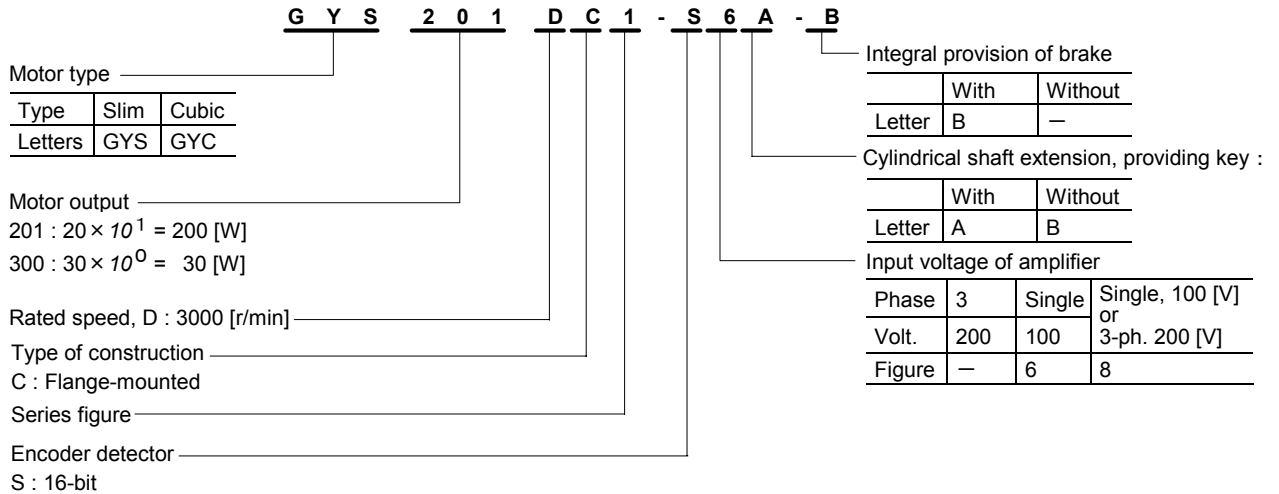
### 1.4 Explanation of model type

Model type of amplifier and motor is expressed with a combination of figures and letters :

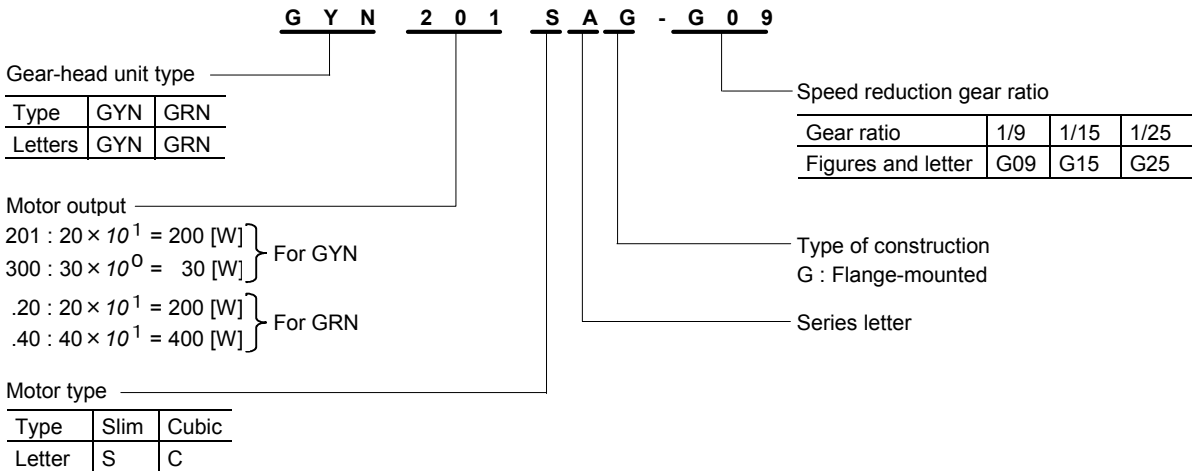
#### (a) Amplifier



#### (b) GYS/GYC type motor



#### (c) Gear-head unit



## 2. SPECIFICATIONS

### 2.1 Motor

#### (1) Cubic type motor (0.1 to 5 [kW])

(a) Basic design

(i) 0.1 to 1.5 [kW]

| Type  | GYC   | DC1-SA                 | 101  | 201       | 401       | 751       | 102                | 152       |
|---|---|------------------------|--|-----------|-----------|-----------|--------------------|-----------|
| Rated output  |   | [kW]                   | 0.1  | 0.2       | 0.4       | 0.75      | 1                  | 1.5       |
| Rated torque  |   | [N • m]                | 0.318                                      | 0.637     | 1.27      | 2.39      | 3.18               | 4.78      |
| Speed   | [r/min]   | Rated                  | 3000                                       |           |           |           |                    |           |
|   |   | Max.                   | 5000                                       |           |           |           |                    |           |
| Max. (breakdown) torque (*3)                            |   | [N • m]                | 0.955/1.43                                 | 1.91/2.87 | 3.82/5.73 | 7.17/10.7 | 9.55/12.7          | 14.3/19.1 |
| Moment of inertia of motor rotor ( $\times 10^{-3}$ ) J |   | [kg • m <sup>2</sup> ] | 0.00538                                    | 0.0216    | 0.0412    | 0.121     | 0.326              | 0.451     |
| Current   | [A]   | Rated                  | 1  | 1.5       | 2.6       | 4.8       | 6.7                | 9.7       |
|   |   | Max. (*3)              | 3/4.5                                      | 4.5/6.8   | 7.8/11.8  | 14.4/21.6 | 20.1/26.8          | 28.8/38.4 |
| Winding insulation class                                | B   |                        |  |           |           |           | F                  |           |
| Operation duty type                                     | Continuous  |                        |  |           |           |           |                    |           |
| Degree of enclosure protection                          | Totally enclosed, IP55 except for shaft sealing                       |                        |  |           |           |           |                    |           |
| Electrical connection terminals                         | Motor power   |                        | With 0.3 [m] flexible leads and connectors |           |           |           | With connectors    |           |
|   | Encoder detector  |                        |  |           |           |           |                    |           |
| Temp. detection   | Without providing   |                        |  |           |           |           |                    |           |
| Type of construction (mounting)                         | IMB5, IMV1, IMV3, flange-mounted                                      |                        |  |           |           |           |                    |           |
| Shaft extension, cylindrical                            | With key  |                        |  |           |           |           |                    |           |
| Final color for external non-machined surface           | Munsell N1.5  |                        |  |           |           |           |                    |           |
| Pulse encoder   | 16-bit serial encoder   |                        |  |           |           |           |                    |           |
| Vibration level, peak to peak amplitude                 | 5 [ $\mu$ m]  |                        |  |           |           |           | 10 [ $\mu$ m] (*1) |           |
| Install location  | For indoors, 1000 [m] and below of site-altitude                      |                        |  |           |           |           |                    |           |
| Ambient climatic conditions                             | Temperature : - 10 to +40°C, humidity : 90% RH max. (no condensation) |                        |  |           |           |           |                    |           |
| Acceleration vibration, acceptable (max.)               | [m/s <sup>2</sup> ]   |                        | 49   |           |           |           | 24.5               |           |
| Mass (weight)   |   | [kg]                   | 0.75                                       | 1.3       | 1.9       | 3.5       | 5.7                | 7         |
| External dimension :                                    | See (1) (a) of 3.3 External dimensions.                               |                        |  |           |           |           |                    |           |

(b) Additional data for motor with providing brake

(i) 0.1 to 1.5 [kW]

| Type                 | GYC                                     | DC1-SA-B | 101   | 201   | 401  | 751  | 102  | 152  |
|----------------------|---|----------|-------|-------|------|------|------|------|
| Rated output         |   | [kW]     | 0.1   | 0.2   | 0.4  | 0.75 | 1    | 1.5  |
| Rated torque         |   | [N • m]  | 0.318 | 0.637 | 1.27 | 2.39 | 3.18 | 4.78 |
| Braking torque       |   | [N • m]  | 0.318 | 1.27  |      | 2.39 | 17   |      |
| Rated voltage DC     |   | [V]      | 24    |       |      |      |      |      |
| Attraction time      |   | [ms]     | 60    | 80    |      | 50   | 120  |      |
| Releasing time       |   | [ms]     | 40    |       |      | 80   | 30   |      |
| Brake input          |   | [W]      | 6.5   | 9     |      | 8.5  | 12   |      |
| Mass (weight)        |   | [kg]     | 1     | 1.9   | 2.6  | 4.3  | 8    | 9.8  |
| External dimension : | See (1) (b) of 3.3 External dimensions. |          |       |       |      |      |      |      |

(c) Additional data for motor with providing reduction gear, gear head unit

(i) Motor with gear ratio 1/9

1) 0.1 to 1.5 [kW]

|                                  |         |         |   |      |      |      |      |      |
|----------------------------------|---------|---------|---|------|------|------|------|------|
| Type                             | GYN     | CAG-G09 | 101                                     | 201  | 401  | 751  | 102  | 152  |
| Motor output                     |         | [kW]    | 0.1                                     | 0.2  | 0.4  | 0.75 | 1    | 1.5  |
| Actual reduction gear ratio      |         |         | 1/9                                     |      |      |      |      |      |
| Speed                            | [r/min] | Rated   | 333.3                                   |      |      |      |      |      |
|                                  |         | Max.    | 555.5                                   |      |      |      |      |      |
| Rated torque                     |         | [N · m] | 2.45                                    | 4.9  | 9.8  | 18.1 | 25.4 | 38.2 |
| Max. (breakdown) torque          |         | [N · m] | 7.35                                    | 14.7 | 29.4 | 54.4 | 76.4 | 116  |
| Direction of motor rotation (*2) |         |         | CCW                                     |      |      |      |      |      |
| Backlash (max.) (*4)             |         | [min]   | 40                                      | 30   |      |      |      |      |
| Mass (weight)                    |         | [kg]    | 0.72                                    | 2.1  | 3.8  | 7.8  |      |      |
| External dimension               |         |         | See (1) (e) of 3.3 External dimensions. |      |      |      |      |      |

(ii) Motor with gear ratio 1/25 or 1/15

1) 0.1 to 1.5 [kW]

|                                  |         |                |   |      |      |      |            |       |  |
|----------------------------------|---------|----------------|---|------|------|------|------------|-------|--|
| Type                             | GYN     | CAG-G25 or G15 | 101<br>G25                              | 201  | 401  | 751  | 102<br>G15 | 152   |  |
| Motor output                     |         | [kW]           | 0.1                                     | 0.2  | 0.4  | 0.75 | 1          | 1.5   |  |
| Actual reduction gear ratio      |         |                | 1/25                                    |      |      |      | 1/15       |       |  |
| Speed                            | [r/min] | Rated          | 120                                     |      |      |      | 200        |       |  |
|                                  |         | Max.           | 200                                     |      |      |      | 333.3      |       |  |
| Rated torque                     |         | [N · m]        | 6.37                                    | 12.7 | 25.5 | 48   | 39.2       | 57.8  |  |
| Max. (breakdown) torque          |         | [N · m]        | 19.1                                    | 38.2 | 76.4 | 144  | 117.6      | 173.4 |  |
| Direction of motor rotation (*2) |         |                | CCW                                     |      |      |      |            |       |  |
| Backlash (max.) (*4)             |         | [min]          | 40                                      | 30   |      |      |            |       |  |
| Mass (weight)                    |         | [kg]           | 0.72                                    | 2.1  | 3.8  | 7.8  |            |       |  |
| External dimension               |         |                | See (1) (f) of 3.3 External dimensions. |      |      |      |            |       |  |

(\*1) 15 [μm] for over the rated speed.

(\*2) Direction of shaft rotation is CCW (counter-clockwise), when motor shaft rotates forward (\*).  
The direction is viewed from a point facing the drive-end of motor.

(\*3) Max. (breakdown) torque and maximum current values are selected in accordance with the following paired combination of amplifier and motor types.

Lower value/higher value :

When the same output [kW] rating of amplifier and motor/when amplifier size is one step larger than the motor frame No. size corresponding with amplifier.

Refer to 2.3 Torque-speed data.

(\*4) Motor with 3 [min] backlash (max.) can be supplied, on request.

Note : (\*) The direction of motor rotation (when viewed from a point facing the drive-end of motor) is designed according to Japanese standards:

- Forward direction : Counterclockwise rotation (CCW)
- Reverse direction: Clockwise rotation (CW)

**(1) Cubic type motor (0.1 to 5 [kW]) (cont'd)**

(a) Basic design

(ii) 2 to 5 [kW]

| Type  | GYC  | DC1-SA                 | 202   | 302 | 402 | 502 |
|---|--|------------------------|-------|-----|-----|-----|
| Rated output  |  | [kW]                   | 2     | 3   | 4   | 5   |
| Rated torque  |  | [N • m]                | 6.37  | -   | -   | -   |
| Speed   | [r/min]  | Rated                  | 3000  |     |     |     |
|   |  | Max.                   | 5000  |     |     |     |
| Max. (breakdown) torque                                 |  | [N • m]                | 19.1  | -   | -   | -   |
| Moment of inertia of motor rotor ( $\times 10^{-3}$ ) J |  | [kg • m <sup>2</sup> ] | 0.575 | -   | -   | -   |
| Current   | [A]  | Rated                  | 12.6  | -   | -   | -   |
|   |  | Max.                   | 37.8  | -   | -   | -   |
| Winding insulation class                                | F  |                        |       |     |     |     |
| Operation duty type                                     | Continuous   |                        |       |     |     |     |
| Degree of enclosure protection                          | Totally enclosed, IP55 except for shaft sealing                      |                        |       |     |     |     |
| Electrical connection terminals                         | Motor power  | With connectors        |       |     |     |     |
|   | Encoder detector   |                        |       |     |     |     |
| Temp. detection   | Without providing  |                        |       |     |     |     |
| Type of construction (mounting)                         | IMB5, IMV1, IMV3, flange-mounted                                     |                        |       |     |     |     |
| Shaft extension, cylindrical                            | With key   |                        |       |     |     |     |
| Final color for external non-machined surface           | Munsell N1.5   |                        |       |     |     |     |
| Pulse encoder   | 16-bit serial encoder  |                        |       |     |     |     |
| Vibration level, peak to peak amplitude                 | 10 [ $\mu$ m] (*1)   |                        |       |     |     |     |
| Install location  | For indoors, 1000 [m] and below of site-altitude                     |                        |       |     |     |     |
| Ambient climatic conditions                             | Temperature : - 10 to +40 , humidity : 90% RH max. (no condensation) |                        |       |     |     |     |
| Acceleration vibration, acceptable (max.)               |  | [m/s <sup>2</sup> ]    | 24.5  |     |     |     |
| Mass (weight)   |  | [kg]                   | 8.2   | -   | -   | -   |
| External dimension :                                    | See (1) (a) of 3.3 External dimensions.                              |                        |       |     |     |     |

(b) Additional data for motor with providing brake

(ii) 2 to 5 [kW]

| Type                 | GYC                                     | DC1-SA-B | 202  | 302 | 402 | 502 |
|----------------------|---|----------|------|-----|-----|-----|
| Rated output         |   | [kW]     | 2    | 3   | 4   | 5   |
| Rated torque         |   | [N • m]  | 3.18 | -   | -   | -   |
| Braking torque       |   | [N • m]  | 17   | -   | -   | -   |
| Rated voltage DC     |   | [V]      | 24   |     |     |     |
| Attraction time      |   | [ms]     | 120  | -   | -   | -   |
| Releasing time       |   | [ms]     | 30   | -   | -   | -   |
| Brake input          |   | [W]      | 12   | -   | -   | -   |
| Mass (weight)        |   | [kg]     | 11   |     |     |     |
| External dimension : | See (1) (b) of 3.3 External dimensions. |          |      |     |     |     |

(c) Additional data for motor with providing reduction gear, gear head unit

(i) Motor with gear ratio 1/9

2) 2 to 5 [kW]

| Type                             | GYN   | CAG-G09 | 202                                     | 302 | 402 | 502 |
|----------------------------------|-------|---------|---|-----|-----|-----|
| Motor output                     |       | [kW]    | 2                                       | 3   | 4   | 5   |
| Actual reduction gear ratio      |       |         | 1/9                                     | -   |     |     |
| Speed [r/min]                    | Rated |         | 333.3                                   | -   |     |     |
|                                  | Max.  |         | 555.5                                   | -   |     |     |
| Rated torque                     |       | [N • m] | 50.9                                    | -   | -   | -   |
| Max. (breakdown) torque          |       | [N • m] | 152                                     | -   | -   | -   |
| Direction of motor rotation (*2) |       |         | CCW                                     |     |     |     |
| Backlash (max.) (*4)             |       | [min]   | 30                                      | -   | -   | -   |
| Mass (weight)                    |       | [kg]    | 12.2                                    | -   | -   | -   |
| External dimension :             |       |         | See (1) (e) of 3.3 External dimensions. |     |     |     |

(ii) Motor with gear ratio 1/25 or 1/15

2) 2 to 5 [kW]

| Type                             | GYN   | CAG-G15 | 202                                     | 302 | 402 | 502 |
|----------------------------------|-------|---------|---|-----|-----|-----|
| Motor output                     |       | [kW]    | 2                                       | 3   | 4   | 5   |
| Actual reduction gear ratio      |       |         | 1/15                                    | -   |     |     |
| Speed [r/min]                    | Rated |         | 200                                     | -   |     |     |
|                                  | Max.  |         | 333.3                                   | -   |     |     |
| Rated torque                     |       | [N • m] | 77.4                                    | -   | -   | -   |
| Max. (breakdown) torque          |       | [N • m] | 232                                     | -   | -   | -   |
| Direction of motor rotation (*2) |       |         | CCW                                     |     |     |     |
| Backlash (max.) (*4)             |       | [min]   | 30                                      | -   | -   | -   |
| Mass (weight)                    |       | [kg]    | 12.2                                    | -   | -   | -   |
| External dimension :             |       |         | See (1) (f) of 3.3 External dimensions. |     |     |     |

(\*1) 15 [μm] for over the rated speed.

(\*2) Direction of shaft rotation is CCW (counter-clockwise), when motor shaft rotates forward.  
The direction is viewed from a point facing the drive-end of motor.

(\*4) Motor with 3 [min] backlash (max.) can be supplied, on request.

**(2) Slim type motor (0.03 to 5 [kW]) for 200 [V] class input voltage of amplifier**

(a) Basic design

(i) 0.03 to 0.75 [kW]

| Type  | GYS<br>S8B, SB or SA  | DC1-<br>S8B | 300<br>S8B                                 | 500     | 101<br>SB | 201<br>SA | 401       | 751       |
|---|---|-------------|--|---------|-----------|-----------|-----------|-----------|
| Rated output  | [kW]  |             | 0.03                                       | 0.05    | 0.1       | 0.2       | 0.4       | 0.75      |
| Rated torque  | [N • m]   |             | 0.095                                      | 0.159   | 0.318     | 0.637     | 1.27      | 2.39      |
| Speed   | [r/min]   | Rated       | 3000                                       |         |           |           |           |           |
|   |   | Max.        | 5000                                       |         |           |           |           |           |
| Max. (breakdown) torque (*3)                            | [N • m]   |             | 0.287                                      | 0.478   | 0.955     | 1.91/2.87 | 3.82/5.73 | 7.17/10.7 |
| Moment of inertia of motor rotor ( $\times 10^{-3}$ ) J | [kg • m <sup>2</sup> ]  |             | 0.00253                                    | 0.00341 | 0.00517   | 0.0137    | 0.0249    | 0.0861    |
| Current   | [A]   | Rated       | 0.6  | 0.93    | 0.9       | 1.5       | 2.6       | 4.8       |
|   |   | Max. (*3)   | 1.8  | 2.8     | 2.7       | 4.5/6.8   | 7.8/11.8  | 14.4/21.6 |
| Winding insulation class                                | B   |             |  |         |           |           |           |           |
| Operation duty type                                     | Continuous  |             |  |         |           |           |           |           |
| Degree of enclosure protection                          | Totally enclosed, IP55 except for shaft sealing                       |             |  |         |           |           |           |           |
| Electrical connection terminals                         | Motor power   |             | With 0.3 [m] flexible leads and connectors |         |           |           |           |           |
|   | Encoder detector  |             |  |         |           |           |           |           |
| Temp. detection   | Without providing   |             |  |         |           |           |           |           |
| Type of construction (mounting)                         | IMB5, IMV1, IMV3, flange-mounted                                      |             |  |         |           |           |           |           |
| Shaft extension, cylindrical                            | Without key (*5)  |             |  |         |           | With key  |           |           |
| Final color for external non-machined surface           | Munsell N1.5  |             |  |         |           |           |           |           |
| Pulse encoder   | 16-bit serial encoder   |             |  |         |           |           |           |           |
| Vibration level, peak to peak amplitude                 | 5 [ $\mu$ m]  |             |  |         |           |           |           |           |
| Install location  | For indoors, 1000 [m] and below of site-altitude                      |             |  |         |           |           |           |           |
| Ambient climatic conditions                             | Temperature : - 10 to +40°C, humidity : 90% RH max. (no condensation) |             |  |         |           |           |           |           |
| Acceleration vibration, acceptable (max.)               | [m/s <sup>2</sup> ]   |             | 49   |         |           |           |           |           |
| Mass (weight)   | [kg]  |             | 0.4  | 0.45    | 0.55      | 1.2       | 1.8       | 3.4       |
| External dimension :                                    | See (1) (g) of 3.3 External dimensions.                               |             |  |         |           |           |           |           |

(b) Additional data for motor with providing brake

(i) 0.03 to 0.75 [kW]

| Type                 | GYS<br>S8B-B, SB-B or SA-B              | DC1-<br>S8B-B | 300<br>S8B-B | 500   | 101<br>SB-B | 201<br>SA-B | 401  | 751  |
|----------------------|---|---------------|--------------|-------|-------------|-------------|------|------|
| Rated output         | [kW]                                    |               | 0.03         | 0.05  | 0.1         | 0.2         | 0.4  | 0.75 |
| Rated torque         | [N • m]                                 |               | 0.095        | 0.159 | 0.318       | 0.637       | 1.27 | 2.39 |
| Braking torque       | [N • m]                                 |               | -            | 0.3   |             | 1.27        |      | 2.45 |
| Rated voltage DC     | [V]                                     |               | -            | 24    |             |             |      |      |
| Attraction time      | [ms]                                    |               | -            | 35    |             | 40          |      | 60   |
| Releasing time       | [ms]                                    |               | -            | 10    |             | 20          |      | 25   |
| Brake input          | [W]                                     |               | -            | 6.1   |             | 7.3         |      | 8.5  |
| Mass (weight)        | [kg]                                    |               | -            | 0.62  | 0.72        | 1.7         | 2.3  | 4.2  |
| External dimension : | See (1) (h) of 3.3 External dimensions. |               |              |       |             |             |      |      |

(c) Additional data for motor with providing reduction gear, gear head unit

(i) Motor with gear ratio 1/9

1) 0.03 to 0.75 [kW]

| Type                             |         | SAG-G09 | GYN                                     |      |       | GRN  |      | GYN  |
|----------------------------------|---------|---------|---|------|-------|------|------|------|
|                                  |         |         | 300                                     | 500  | 101   | .20  | .40  | 751  |
| Motor output                     | [kW]    |         | 0.03                                    | 0.05 | 0.1   | 0.2  | 0.4  | 0.75 |
| Actual reduction gear ratio      |         |         | -                                       | 1/9  |       |      |      |      |
| Speed                            | [r/min] | Rated   | -                                       |      | 333.3 |      |      |      |
|                                  |         | Max.    | -                                       |      | 555.5 |      |      |      |
| Rated torque                     |         | [N • m] | -                                       | 1.23 | 2.54  | 4.9  | 9.8  | 18.1 |
| Max. (breakdown) torque          |         | [N • m] | -                                       | 3.68 | 7.36  | 14.7 | 29.4 | 54.3 |
| Direction of motor rotation (*2) |         |         | -                                       |      |       |      |      |      |
| Backlash (max.) (*4)             |         | [min]   | -                                       |      |       | 40   |      |      |
| Mass (weight)                    |         | [kg]    | -                                       |      |       | 0.7  |      | 2.1  |
| External dimension :             |         |         | See (1) (k) of 3.3 External dimensions. |      |       |      |      |      |

(ii) Motor with gear ratio 1/25 or 1/15

1) 0.03 to 0.75 [kW]

| Type                             |         | SAG-G25 | GYN                                     |      |      | GRN  |      | GYN  |
|----------------------------------|---------|---------|---|------|------|------|------|------|
|                                  |         |         | 300                                     | 500  | 101  | .20  | .40  | 751  |
| Motor output                     | [kW]    |         | 0.03                                    | 0.05 | 0.1  | 0.2  | 0.4  | 0.75 |
| Actual reduction gear ratio      |         |         | -                                       |      | 1/25 |      |      |      |
| Speed                            | [r/min] | Rated   | -                                       |      | 120  |      |      |      |
|                                  |         | Max.    | -                                       |      | 200  |      |      |      |
| Rated torque                     |         | [N • m] | -                                       | 3.19 | 6.37 | 12.7 | 25.5 | 48   |
| Max. (breakdown) torque          |         | [N • m] | -                                       | 9.56 | 19.1 | 38.2 | 76.4 | 144  |
| Direction of motor rotation (*2) |         |         | -                                       |      |      |      |      |      |
| Backlash (max.) (*4)             |         | [min]   | -                                       |      |      | 40   |      |      |
| Mass (weight)                    |         | [kg]    | -                                       |      |      | 0.7  |      | 2.1  |
| External dimension :             |         |         | See (1) (l) of 3.3 External dimensions. |      |      |      |      |      |

(\*2) Direction of shaft rotation is CCW (counter-clockwise), when motor shaft rotates forward.

The direction is viewed from a point facing the drive-end of motor.

(\*3) Max. (breakdown) torque and maximum current values are selected in accordance with the following paired combination of amplifier and motor types.

Lower value/higher value :

When the same output [kW] rating of amplifier and motor/when amplifier size is one step larger than the motor frame No. size corresponding with amplifier.

Refer to 2.3 Torque-speed data.

(\*4) Motor with 3 [min] backlash (max.) can be supplied, on request.

(\*5) When a motor with GYN or GRN type gear-head unit is supplied, the shaft extension of this motor is provided with a key.



**(2) Slim type motor (0.03 to 5 [kW]) for 200 [V] class input voltage of amplifier (cont'd)**

(a) Basic design

(ii) 1 to 5 [kW]

|  |   |                        |                 |           |       |       |      |      |
|--|---|------------------------|-----------------|-----------|-------|-------|------|------|
| Type   | GYS   | DC1-SA                 | 102             | 152       | 202   | 302   | 402  | 502  |
| Rated output   |   | [kW]                   | 1               | 1.5       | 2     | 3     | 4    | 5    |
| Rated torque   |   | [N • m]                | 3.18            | 4.78      | 6.37  | 9.55  | 12.7 | 15.9 |
| Speed  | [r/min]   | Rated                  | 3000            |           |       |       |      |      |
|  |   | Max.                   | 5000            |           |       |       |      |      |
| Max. (breakdown) torque (*3)                             |   | [N • m]                | 9.55/12.7       | 14.3/19.1 | 19.1  | 28.7  | 38.2 | 47.8 |
| Moment of inertia of motor rotor( × 10 <sup>-3</sup> ) J |   | [kg • m <sup>2</sup> ] | 0.174           | 0.238     | 0.302 | 0.873 | 1.12 | 1.37 |
| Current  | [A]   | Rated                  | 7.1             | 9.6       | 12.6  | 18.5  | 24.5 | 30   |
|  |   | Max. (*3)              | 21.3/28.4       | 28.8/38.4 | 37.8  | 55.5  | 73.5 | 90   |
| Winding insulation class                                 | F   |                        |                 |           |       |       |      |      |
| Operation duty type                                      | Continuous  |                        |                 |           |       |       |      |      |
| Degree of enclosure protection                           | Totally enclosed, IP55 except for shaft sealing                       |                        |                 |           |       |       |      |      |
| Electrical connection terminals                          | Motor power   |                        | With connectors |           |       |       |      |      |
|  | Encoder detector  |                        |                 |           |       |       |      |      |
| Temp. detection  | Without providing   |                        |                 |           |       |       |      |      |
| Type of construction (mounting)                          | IMB5, IMV1, IMV3, flange-mounted                                      |                        |                 |           |       |       |      |      |
| Shaft extension, cylindrical                             | With key  |                        |                 |           |       |       |      |      |
| Final color for external non-machined surface            | Munsell N1.5  |                        |                 |           |       |       |      |      |
| Pulse encoder  | 16-bit serial encoder   |                        |                 |           |       |       |      |      |
| Vibration level, peak to peak amplitude                  | 10 [μm] (*1)  |                        |                 |           |       |       |      |      |
| Install location   | For indoors, 1000 [m] and below of site-altitude                      |                        |                 |           |       |       |      |      |
| Ambient climatic conditions                              | Temperature : - 10 to +40°C, humidity : 90% RH max. (no condensation) |                        |                 |           |       |       |      |      |
| Acceleration vibration, acceptable (max.)                | 24.5 [m/s <sup>2</sup> ]  |                        |                 |           |       |       |      |      |
| Mass (weight)  |   | [kg]                   | 4.4             | 5.2       | 6.3   | 11    | 13.5 | 16   |
| External dimension :                                     | See (1) (g) of 3.3 External dimensions.                               |                        |                 |           |       |       |      |      |

(b) Additional data for motor with providing brake

(ii) 1 to 5 [kW]

|                      |   |          |      |      |      |      |      |      |
|----------------------|---|----------|------|------|------|------|------|------|
| Type                 | GYS                                     | DC1-SA-B | 102  | 152  | 202  | 302  | 402  | 502  |
| Rated output         |   | [kW]     | 1    | 1.5  | 2    | 3    | 4    | 5    |
| Rated torque         |   | [N • m]  | 3.18 | 4.78 | 6.37 | 9.55 | 12.7 | 15.9 |
| Braking torque       |   | [N • m]  | 6.86 |      | 17   |      |      |      |
| Rated voltage DC     |   | [V]      | 24   |      |      |      |      |      |
| Attraction time      |   | [ms]     | 60   |      | 120  |      |      |      |
| Releasing time       |   | [ms]     | 10   |      | 30   |      |      |      |
| Brake input          |   | [W]      | 17   |      | 12   |      |      |      |
| Mass (weight)        |   | [kg]     | 5.9  | 6.8  | 7.9  | 13   | 15.5 | 18   |
| External dimension : | See (1) (h) of 3.3 External dimensions. |          |      |      |      |      |      |      |

(c) Additional data for motor with providing reduction gear, gear head unit

(ii) Motor with gear ratio 1/9

2) 1 to 5 [kW]

|                                  |         |         |   |      |      |     |     |     |
|----------------------------------|---------|---------|---|------|------|-----|-----|-----|
| Type                             | GYN     | SAG-G09 | 102                                     | 152  | 202  | 302 | 402 | 502 |
| Motor output                     |         | [kW]    | 1                                       | 1.5  | 2    | 3   | 4   | 5   |
| Actual reduction gear ratio      |         |         | 1/9                                     |      |      |     |     |     |
| Speed                            | [r/min] | Rated   | 333.3                                   |      |      |     |     |     |
|                                  |         | Max.    | 555.5                                   |      |      |     |     |     |
| Rated torque                     |         | [N • m] | 25.4                                    | 38.2 | 50.9 | -   | -   | -   |
| Max. (breakdown) torque          |         | [N • m] | 74.4                                    | 114  | 152  | -   | -   | -   |
| Direction of motor rotation (*2) |         |         | CCW                                     |      |      |     |     |     |
| Backlash (max.) (*4)             |         | [min]   | 30                                      |      |      | -   | -   | -   |
| Mass (weight)                    |         | [kg]    | 7.8                                     |      |      | -   | -   | -   |
| External dimension :             |         |         | See (1) (k) of 3.3 External dimensions. |      |      |     |     |     |

(ii) Motor with gear ratio 1/25 or 1/15

2) 1 to 5 [kW]

|                                  |         |         |   |      |      |     |     |     |
|----------------------------------|---------|---------|---|------|------|-----|-----|-----|
| Type                             | GYN     | SAG-G15 | 102                                     | 152  | 202  | 302 | 402 | 502 |
| Motor output                     |         | [kW]    | 1                                       | 1.5  | 2    | 3   | 4   | 5   |
| Actual reduction gear ratio      |         |         | 1/15                                    |      |      |     |     |     |
| Speed                            | [r/min] | Rated   | 200                                     |      |      | -   |     |     |
|                                  |         | Max.    | 333.3                                   |      |      | -   |     |     |
| Rated torque                     |         | [N • m] | 39.2                                    | 57.8 | 77.4 | -   | -   | -   |
| Max. (breakdown) torque          |         | [N • m] | 117                                     | 173  | 232  | -   | -   | -   |
| Direction of motor rotation (*2) |         |         | CCW                                     |      |      |     |     |     |
| Backlash (max.) (*4)             |         | [min]   | 30                                      |      |      | -   | -   | -   |
| Mass (weight)                    |         | [kg]    | 7.8                                     |      |      | -   | -   | -   |
| External dimension :             |         |         | See (1) (l) of 3.3 External dimensions. |      |      |     |     |     |

(\*1) 15 [μm] for over the rated speed.

(\*2) Direction of shaft rotation is CCW (counter-clockwise), when motor shaft rotates forward.

The direction is viewed from a point facing the drive-end of motor.

(\*3) Max. (breakdown) torque and maximum current values are selected in accordance with the following paired combination of amplifier and motor types.

Lower value/higher value :

When the same output [kW] rating of amplifier and motor/when amplifier size is one step larger than the motor frame No. size corresponding with amplifier.

Refer to 2.3 Torque-speed data.

(\*4) Motor with 3 [min] backlash (max.) can be supplied, on request.

**(3) Slim type motor (0.03 to 0.2 [kW]) for 100 [V] class input voltage of amplifier**

**(a) Basic design**

| Type  | GYS DC1-S6B or S8B     | 300 S8B   | 500     | 101 S6B | 201    |
|---|------------------------|---|---------|---------|--------|
| Rated output  | [kW]                   | -   | 0.05    | 0.1     | 0.2    |
| Rated torque  | [N • m]                | -   | 0.159   | 0.318   | 0.637  |
| Speed   | [r/min] Rated          | -   | 3000    |         |        |
|   | Max.                   | -   | 5000    |         |        |
| Max. (breakdown) torque                                 | [N • m]                | -   | 0.478   | 0.955   | 1.91   |
| Moment of inertia of motor rotor ( $\times 10^{-3}$ ) J | [kg • m <sup>2</sup> ] | -   | 0.00341 | 0.00517 | 0.0137 |
| Current   | [A] Rated              | -   | 0.85    | 1.5     | 2.7    |
|   | Max.                   | -   | 2.55    | 4.5     | 8.1    |
| Winding insulation class                                |                        | B   |         |         |        |
| Operation duty type                                     |                        | Continuous  |         |         |        |
| Degree of enclosure protection                          |                        | Totally enclosed, IP55 except for shaft sealing                       |         |         |        |
| Electrical connection terminals                         | Motor power            | With 0.3 [m] flexible leads and connectors                            |         |         |        |
|   | Encoder detector       |   |         |         |        |
| Temp. detection   |                        | Without providing   |         |         |        |
| Type of construction (mounting)                         |                        | IMB5, IMV1, IMV3, flange-mounted                                      |         |         |        |
| Shaft extension, cylindrical                            |                        | Without key (*5)  |         |         |        |
| Final color for external non-machined surface           |                        | Munsell N1.5  |         |         |        |
| Pulse encoder   |                        | 16-bit serial encoder   |         |         |        |
| Vibration level, peak to peak amplitude                 |                        | 5 [ $\mu$ m]  |         |         |        |
| Install location  |                        | For indoors, 1000 [m] and below of site-altitude                      |         |         |        |
| Ambient climatic conditions                             |                        | Temperature : - 10 to +40°C, humidity : 90% RH max. (no condensation) |         |         |        |
| Acceleration vibration, acceptable (max.)               | [m/s <sup>2</sup> ]    | 49  |         |         |        |
| Mass (weight)   | [kg]                   | -   | 0.45    | 0.55    | 1.2    |
| External dimension :                                    |                        | See (2) (a) of 3.3 External dimensions.                               |         |         |        |

**(b) Additional data for motor with providing brake**

| Type                 | GYS DC1-S6B-B or S8B-B | 300 S8B-B                               | 500   | 101 S6B-B | 201   |
|----------------------|------------------------|---|-------|-----------|-------|
| Rated output         | [kW]                   | 0.03                                    | 0.05  | 0.1       | 0.2   |
| Rated torque         | [N • m]                | -                                       | 0.159 | 0.318     | 0.637 |
| Braking torque       | [N • m]                | -                                       | 0.34  |           | 1.27  |
| Rated voltage DC     | [V]                    | -                                       | 24    |           |       |
| Attraction time      | [ms]                   | -                                       | 35    |           | 40    |
| Releasing time       | [ms]                   | -                                       | 10    |           | 20    |
| Brake input          | [W]                    | -                                       | 6.1   |           | 7.3   |
| Mass (weight)        | [kg]                   | -                                       | 0.62  | 0.72      | 1.7   |
| External dimension : |                        | See (2) (b) of 3.3 External dimensions. |       |           |       |

**(c) Additional data for motor with providing reduction gear, gear-head unit**

**(i) Motor with gear ratio 1/9**

| Type                             | SAG-G09       | GYN                                     | GRN   |      |
|----------------------------------|---------------|---|-------|------|
|                                  |               | 300                                     | .20   |      |
| Rated output                     | [kW]          | 0.03                                    | 0.2   |      |
| Actual reduction gear ratio      |               | 1/9                                     |       |      |
| Speed                            | [r/min] Rated | -                                       | 333.3 |      |
|                                  | Max.          | -                                       | 555.5 |      |
| Rated torque                     | [N • m]       | -                                       | 1.23  | 4.9  |
| Max. (breakdown) torque          | [N • m]       | -                                       | 3.68  | 14.7 |
| Direction of motor rotation (*2) |               | -                                       | CCW   |      |
| Backlash (max.) (*4)             | [N • m]       | -                                       | 40    | 30   |
| Mass (weight)                    | [kg]          | -                                       | 0.7   | 2.1  |
| External dimension :             |               | See (1) (k) of 3.3 External dimensions. |       |      |

(c) Additional data for motor with providing reduction gear, gear-head unit (cont'd)

(ii) Motor with gear ratio 1/25

| Type                             |         | SAG-G25 | GYN                                     |      |      | GRN  |
|----------------------------------|---------|---------|---|------|------|------|
|                                  |         |         | 300                                     | 500  | 101  | .20  |
| Rated output                     | [kW]    |         | 0.03                                    | 0.05 | 0.1  | 0.2  |
| Actual reduction gear ratio      |         |         | 1/25                                    |      |      |      |
| Speed                            | [r/min] | Rated   | -                                       | 120  |      |      |
|                                  |         | Max.    | -                                       | 200  |      |      |
| Rated torque                     | [N • m] |         | -                                       | 3.19 | 6.37 | 12.7 |
| Max. (breakdown) torque          | [N • m] |         | -                                       | 9.56 | 19.1 | 38.2 |
| Direction of motor rotation (*2) |         |         | -                                       | CCW  |      |      |
| Backlash (max.) (*4)             | [min]   |         | -                                       | 40   |      | 30   |
| Mass (weight)                    | [kg]    |         | -                                       | 0.7  |      | 2.1  |
| External dimension :             |         |         | See (1) (l) of 3.3 External dimensions. |      |      |      |

(\*2) Direction of shaft rotation is CCW (counter-clockwise), when motor shaft rotates forward.

The direction is viewed from a point facing the drive-end of motor.

(\*4) Motor with 3 [min] backlash (max.) can be supplied, on request.

(\*5) When a motor with GYN or GRN type gear-head unit is supplied, the shaft extension of this motor is provided with a key.

## 2.2 Amplifier

### (1) Basic specification for 200 [V] input voltage of amplifier

(a) 0.03 to 0.75 [kW]

| Amplifier type               | RYS                    | S3-RPS   | 300  | 500                          | 101 | 201 | 401  | 751  |
|------------------------------|------------------------|--|--|------------------------------|-----|-----|--|------|
| Applicable motor output (*1) |                        | [kW]   | 0.03   | 0.05                         | 0.1 | 0.2 | 0.4  | 0.75 |
| Input                        | Phase, freq.           |  | 3-phase for power supply, single-phase for control, 50/60 [Hz]   |                              |     |     |  |      |
|                              | Voltage                |  | 200/200-220-230 [V], +10 to - 15%  |                              |     |     |  |      |
| Control data                 | System                 |  | Sinusoidal wave PWM current control (all digital)  |                              |     |     |  |      |
|                              | Carrier freq.          |  | [kHz] 10   |                              |     |     |  |      |
|                              | Feedback               |  | 16-bit serial encoder (one-rotation resolution 16 bit, multiple-rotation 16 bit)   |                              |     |     |  |      |
|                              | Speed control accuracy | Loading  | ± 1 [r/min]  | for 0 to 100% deviation      |     |     |  |      |
|                              |                        | Supply volt.   | max.   | For - 10 to +10% fluctuation |     |     |  |      |
|                              |                        | Amb. temp.   | ± 0.2% max. for 25°C ± 10% variation (at analog volt. input)   |                              |     |     |  |      |
|                              | Speed range            |  | 1 : 5000 (at rated load)   |                              |     |     |  |      |
|                              | Freq. response         |  | 600 [Hz] (at $J_L = J_M$ (*2))   |                              |     |     |  |      |
|                              | Load inertia. max.     |  | 100 times of the motor rotor inertia, permissible  |                              |     |     |  |      |
|                              | Overload capability    |  | 300% for approx. 3 [s]   |                              |     |     | 300% for approx. 3 [s], 450% for approx. 1.5 [s] |      |
| Function                     | Braking                |  | Regenerating, dynamic with external braking resistor   |                              |     |     |  |      |
|                              | Protection             |  | OC (output overcurrent), OS (overspeed), $L_V$ (low voltage, undervoltage), $H_V$ (high voltage, overvoltage), Et (encoder trouble), Ct (circuit trouble, amplifier trouble), dE (data error, memory error), CE (combination error), rH <sub>2</sub> (resistor heat 2), EC (encoder communication error), CtE (cont (control signal) error), OL (motor overload), rH (resistor heat, braking (OB) resistor overheat), OF (over flow, deviation excessive), AH (amp. heat, amplifier overheat), EH (encoder heat, encoder overheat), AL (absolute data lost), AF (absolute data over flow), Fb (fuse blown) |                              |     |     |  |      |
|                              | Display, setting       |  | CHARGE (red), 7-segment LED with 5 digit and 4 operation keys  |                              |     |     |  |      |
| Ambient condition            | Install location       |  | For indoors, 1000 [m] and below of site-altitude, under clean atmosphere, no explosive hazardous gas and vapour is existing.<br>In the case of compliance with the European standard :<br>Pollution degree = 2, Over voltage category =  |                              |     |     |  |      |
|                              | Temp., humidity        |  | - 10 to +55°C, 90% RH max. (no condensation)   |                              |     |     |  |      |
|                              | Vibration / shock      |  | 4.9 [m/s <sup>2</sup> ] / 19.6 [m/s <sup>2</sup> ] acceleration, acceptable (max.)   |                              |     |     |  |      |
| Others                       |                        | DC reactor terminals (P1, P+) for harmonics suppression.<br>UL/cUL (compliance with UL508), European standards (compliance with EN50178) |  |                              |     |     |  |      |
| Mass (weight)                |                        | [kg]   | 0.9  |                              |     |     | 1.2  | 1.5  |

(\*1) Use amplifier and motor as a specified pair of types.

Fox GYC type motor with 0.1 to 1.5 [kW] or GYS type motor with 0.2 to 1.5 [kW] rated output :

If the RYS401 (0.4 [kW]) type amplifier and GYS201 (0.2 [kW]) motor (which is a step smaller than the optimum combination) is combined as a pair, allowable max. (breakdown) torque of 0.2 [kW] motor can be obtained as 450% (in the case of the max. torque of the motor is 450%) of the rated torque.

Furthermore, in this case, other data are as follows :

- The moment of load inertia after conversion into motor shaft extension is at most 30 times the moment of inertia of motor rotor.
- Acceleration/deceleration time up to rated speed is 2 [ms] or more.
- The motor shaft extension is directly mechanically connected and is subjected to no external radial or thrust force.

(\*2) Moment of inertia

$J_L$  : Moment of load inertia after conversion into motor shaft extension

$J_M$  : Moment of inertia of motor rotor

## (b) 1 to 5 [kW]

| Amplifier type               | RYS                    | S3-RPS   | 102  | 152  | 202 | 302                          | 402 | 502 |
|------------------------------|------------------------|--|--|--|-----|------------------------------|-----|-----|
| Applicable motor output (*1) |                        | [kW]   | 1  | 1.5  | 2   | 3                            | 4   | 5   |
| Input                        | Phase, freq.           |  | 3-phase for power supply, single-phase for control, 50/60 [Hz]   |  |     |                              |     |     |
|                              | Voltage                |  | 200/200-220-230 [V], +10 to - 15%  |  |     |                              |     |     |
| Control data                 | System                 |  | Sinusoidal wave PWM current control (all digital)  |  |     |                              |     |     |
|                              | Carrier freq. [kHz]    |  | 10   |  |     | 5                            |     |     |
|                              | Feedback               |  | 16-bit serial encoder (one-rotation resolution 16 bit, multiple-rotation 16 bit)   |  |     |                              |     |     |
|                              | Speed control accuracy | Loading  |  | ± 1 [r/min]  |     | for 0 to 100% deviation      |     |     |
|                              |                        | Supply volt.   |  | max.   |     | For - 10 to +10% fluctuation |     |     |
|                              |                        | Amb. temp.   |  | ± 0.2% max. for 25°C ± 10% variation (at analog volt. input) |     |                              |     |     |
|                              | Speed range            |  | 1 : 5000 (at rated load)   |  |     |                              |     |     |
|                              | Freq. response         |  | 600 [Hz] (at $J_L = J_M$ (*2) )  |  |     |                              |     |     |
|                              | Load inertia. max.     |  | 100 times of the motor rotor inertia, permissible  |  |     |                              |     |     |
|                              | Overload capability    |  | 300% for approx. 3 [s],<br>450% for approx. 1.5 [s]  |  |     | 300% for approx. 3 [s]       |     |     |
| Function                     | Braking                |  | Regenerating, dynamic with external braking resistor   |  |     |                              |     |     |
|                              | Protection             |  | OC (output overcurrent), OS (overspeed), $L_V$ (low voltage, undervoltage), $H_V$ (high voltage, overvoltage), Et (encoder trouble), Ct (circuit trouble, amplifier trouble), dE (data error, memory error), CE (combination error), $rH_2$ (resistor heat 2), EC (encoder communication error), CtE (cont (control signal) error), OL (motor overload), rH (resistor heat, braking (OB) resistor overheat), OF (over flow, deviation excessive), AH (amp. heat, amplifier overheat), EH (encoder heat, encoder overheat), AL (absolute data lost), AF (absolute data over flow) , Fb (fuse blown) for 2 [kW] and more |  |     |                              |     |     |
|                              | Display, setting       |  | CHARGE (red), 7-segment LED with 5 digit and 4 operation keys  |  |     |                              |     |     |
| Ambient condition            | Install location       |  | For indoors, 1000 [m] and below of site-altitude, under clean atmosphere, no explosive hazardous gas and vapour is existing.<br>In the case of compliance with the European standard :<br>Pollution degree = 2, Over voltage category =  |  |     |                              |     |     |
|                              | Temp., humidity        |  | - 10 to +55°C, 90% RH max. (no condensation)   |  |     |                              |     |     |
|                              | Vibration / shock      |  | 4.9 [m/s <sup>2</sup> ] / 19.6 [m/s <sup>2</sup> ] acceleration, acceptable (max.)   |  |     |                              |     |     |
| Others                       |                        | DC reactor terminals (P1, P+) for harmonics suppression.<br>UL/cUL (compliance with UL508), European standards (compliance with EN50178) |  |  |     |                              |     |     |
| Mass (weight)                |                        | [kg]   | 2  | 4.6  | 4.7 | 5.2                          |     |     |

(\*1) Use amplifier and motor as a specified pair of types.

Fox GYC type motor with 0.1 to 1.5 [kW] or GYS type motor with 0.2 to 1.5 [kW] rated output :

If the RYS401 (0.4 [kW]) type amplifier and GYS201 (0.2 [kW]) motor (which is a step smaller than the optimum combination) is combined as a pair, allowable max. (breakdown) torque of 0.2 [kW] motor can be obtained as 450% (in the case of the max. torque of the motor is 450%) of the rated torque.

Furthermore, in this case, other data are as follows :

- The moment of load inertia after conversion into motor shaft extension is at most 30 times the moment of inertia of motor rotor.
- Acceleration/deceleration time up to rated speed is 2 [ms] or more.
- The motor shaft extension is directly mechanically connected and is subjected to no external radial or thrust force.

(\*2) Moment of inertia

$J_L$  : Moment of load inertia after conversion into motor shaft extension

$J_M$  : Moment of inertia of motor rotor

**(2) Basic specification for 100 [V] class input voltage of amplifier**

0.05 to 0.2 [kW]

| Amplifier type               | RYS                    | S3-RPS6  | 500   | 101                          | 201 |
|------------------------------|------------------------|--|---|------------------------------|-----|
| Applicable motor output (*1) |                        | [kW]   | 0.05  | 0.1                          | 0.2 |
| Input                        | Phase, freq.           |  | Single-phase for power supply, for control, 50/60 [Hz]  |                              |     |
|                              | Voltage                |  | 100 to 115 [V], +10 to - 15%  |                              |     |
| Control data                 | System                 |  | Sinusoidal wave PWM current control (all digital)   |                              |     |
|                              | Carrier freq.          |  | [kHz] 10  |                              |     |
|                              | Feedback               |  | 16-bit serial encoder (one-rotation resolution 16 bit, multiple-rotation 16 bit)  |                              |     |
|                              | Speed control accuracy | Loading  | ± 1 [r/min]   | for 0 to 100% deviation      |     |
|                              |                        | Supply volt.   | max.  | For - 10 to +10% fluctuation |     |
|                              |                        | Amb. temp.   | ± 0.2% max. for 25°C ± 10% variation (at analog volt. input)  |                              |     |
|                              | Speed range            |  | 1 : 5000 (at rated load)  |                              |     |
|                              | Freq. response         |  | 600 [Hz] (at $J_L = J_M$ (*2) )   |                              |     |
|                              | Load inertia. max.     |  | 100 times of the motor rotor inertia, permissible   |                              |     |
|                              | Overload capability    |  | 300% for approx. 3 [s]  |                              |     |
| Function                     | Braking                |  | Regenerating, dynamic with external braking resistor  |                              |     |
|                              | Protection             |  | OC (output overcurrent), OS (overspeed), $L_V$ (low voltage, undervoltage), $H_V$ (high voltage, overvoltage), Et (encoder trouble), Ct (circuit trouble, amplifier trouble), dE (data error, memory error), CE (combination error), rH <sub>2</sub> (resistor heat 2), EC (encoder communication error), CtE (cont (control signal) error), OL (motor overload), rH (resistor heat, braking (OB) resistor overheat), OF (over flow, deviation excessive), AH (amp. heat, amplifier overheat), EH (encoder heat, encoder overheat), AL (absolute data lost), AF (absolute data over flow) |                              |     |
|                              | Display, setting       |  | CHARGE (red), 7-segment LED with 5 digit and 4 operation keys   |                              |     |
| Ambient condition            | Install location       |  | For indoors, 1000 [m] and below of site-altitude, under clean atmosphere, no explosive hazardous gas and vapour is existing.<br>In the case of compliance with the European standard :<br>Pollution degree = 2, Over voltage category =   |                              |     |
|                              | Temp., humidity        |  | - 10 to +55°C, 90% RH max. (no condensation)  |                              |     |
|                              | Vibration / shock      |  | 4.9 [m/s <sup>2</sup> ] / 19.6 [m/s <sup>2</sup> ] acceleration, acceptable (max.)  |                              |     |
| Others                       |                        | DC reactor terminals (P1, P+) for harmonics suppression.<br>UL/cUL (compliance with UL508), European standards (compliance with EN50178) |   |                              |     |
| Mass (weight)                |                        | [kg]   | 0.9   | 1.2                          |     |

(\*1) Use amplifier and motor as a specified pair of types : For example, “RYS500” type amplifier can be combined with the acceptable “GYS500” type motor only.

(\*2) Moment of inertia

$J_L$  : Moment of load inertia after conversion into motor shaft extension

$J_M$  : Moment of inertia of motor rotor

**(3) Functional specification : Basic type, RYS S3-RPS type amplifier**

| Signal name                 | Function  | Terminal symbol   |
|-----------------------------|---|---|
| Upper Level interface (I/F) | DI/DO (+24 [V] DC)  | -   |
| Pulse train                 | Input   | Freq. 500 [kHz] max. (differential input)   |
|                             | Form  | (1) Command pulse and code, (2) Forward and reverse pulse, (3) Two 90° phase-different signal |
| Freq. dividing output       | Output  | Freq. 500 [kHz] max. (differential output)  |
|                             | Form  | Two 90° phase-different signal  |
|                             | Pulse   | 16 to 16384 [pulse/rev] (in 1 step)   |
| Speed command               | Power supply  | +10 ± 0.4 [V] (output current 30 [mA] max.)   |
|                             | Input   | ± 10 [V] (20 k input impedance)   |
| Monitor output 1/2          | For analog-meter (two/one-way deflection), (1) Speed command, (2) Speed feedback, (3) Torque command, (4) Position deviation              | MON1<br>MON2  |
| Power supply for I/F        | +24 [V] DC, 300 [mA] (supplied from external)   | P24, M24  |
| Control input               | +24 [V] DC, 10 [mA] (one-point) source input<br>Signal assign terminals of control input  | CONT1 to<br>CONT21  |
| OUT output                  | +30 [V] DC, 50 [mA] max. sink output<br>Signal assign terminals of control output   | OUT1 to<br>OUT10  |
| External backup             | Input terminals of backup power supply from external to pulse encoder   | BAT+, BAT -   |
| Control function            |   |   |
| Position control            | Auto start (station No. specify)<br>Manual operation (analog voltage, multistep speed, manual indexing), pulse train input, origin return |   |
| Origin setting              | Origin LS and Z-phase, position preset  |   |
| Position data               | 30000   |   |
| Reduction gear ratio        | / ( = 1 to 9999, = 1 to 9999, in 1 step)  |   |
| Others                      | Override, brake timing output, 2nd origin, etc.   |   |

**(4) Functional specification : SX type, RYS S3-RSS type amplifier**

| Signal name                 | Function   | Terminal symbol   |
|-----------------------------|--|---|
| Upper Level interface (I/F) | SX bus (IQ area, 16 word)  | (IN, OUT)   |
| Pulse train                 | Input  | Freq. 500 [kHz] max. (differential input)   |
|                             | Form   | (1) Command pulse and code, (2) Forward and reverse pulse, (3) Two 90° phase-different signal |
|                             | Power supply   | 5 [V] DC, 200 [mA] (max.)   |
| Freq. dividing output       | Output   | Freq. 500 [kHz] max. (differential output)  |
|                             | Form   | Two 90° phase-different signal  |
|                             | Pulse  | 16 to 16384 [pulse/rev] (in 1 step)   |
| Monitor output 1/2          | For analog-meter (two/one-way deflection), (1) Speed command, (2) Speed feedback, (3) Torque command, (4) Position deviation | MON1<br>MON2  |
| Power supply for I/F        | +24 [V] DC, 300 [mA] (supplied from external)  | P24, M24  |
| Control input               | +24 [V] DC, 10 [mA] (one-point) source input<br>Signal assign terminals of control input                                     | CONT1 to<br>CONT5   |
| OUT output                  | +30 [V] DC, 50 [mA] max. sink output<br>Signal assign terminals of control output  | OUT1 and<br>OUT2  |
| External backup             | Input terminals of backup power supply from external to pulse encoder  | BAT+, BAT -   |
| Control function            |  |   |
| Position control            | Auto start (station No. specify)<br>Manual operation (multistep speed, manual indexing), pulse train input, origin return    |   |
| Origin setting              | Origin LS and Z-phase, position preset   |   |
| Position data               | 30000  |   |
| Reduction gear ratio        | / ( = 1 to 9999, = 1 to 9999, in 1 step)   |   |
| Others                      | Override, brake timing output, 2nd origin, etc.  |   |



**(5) Functional specification : T-link type, RYS S3-RTS type amplifier**

| Signal name                 | Function   |  | Terminal symbol    |
|-----------------------------|--|--|--------------------|
| Upper Level interface (I/F) | T-link (WB area, 8 word)   |  | T2, T1, SD         |
| Pulse train                 | Input  | Freq. 500 [kHz] max. (differential input)  | CA, *CA<br>CB, *CB |
|                             | Form   | (1) Command pulse and code, (2) Forward and reverse pulse,<br>(3) Two 90° phase-different signal |                    |
|                             | Power supply   | 5 [V] DC, 200 [mA] (max.)  | P5                 |
| Freq. dividing output       | Output   | Freq. 200 [kHz] max. (open collector)  | FA, FB, FZ,        |
|                             | Form   | Two 90° phase-different signal   |                    |
|                             | Pulse  | 16 to 16384 [pulse/rev.] (in 1 step)   |                    |
| Monitor output 1/2          | For analog-meter (two/one-way deflection), (1) Speed command, (2) Speed feedback, (3) Torque command, (4) Position deviation |  | MON1<br>MON2       |
| Power supply for I/F        | +24 [V] DC, 100 [mA] (supplied from external)  |  | P24, M24           |
| Control input               | +24 [V] DC, 10 [mA] (one-point) source input<br>Signal assign terminals of control input                                     |  | CONT1 to<br>CONT8  |
| OUT output                  | +30 [V] DC, 50 [mA] max. sink output<br>Signal assign terminals of control output  |  | OUT1 to<br>OUT4    |
| External backup             | Input terminals of backup power supply from external to pulse encoder  |  | BAT+, BAT-         |
| <b>Control function</b>     |  |  |                    |
| Position control            | Auto start (station No. specify)<br>Manual operation (multistep speed, manual indexing), pulse train input, origin return    |  |                    |
| Origin setting              | Origin LS and Z-phase, position preset   |  |                    |
| Position data               | 30000  |  |                    |
| Reduction gear ratio        | / ( = 1 to 9999, = 1 to 9999, in 1 step)   |  |                    |
| Others                      | Override, brake timing output, 2nd origin, etc.  |  |                    |

**(6) Optional cables, connection kits, battery and external braking resistors**

See (3) of 4.1 Amplifier, motor and optional devices layout, and 10.8 Optional cables, connector kits, battery and external braking resistors.

### 2.3 Torque-speed data

Shown below are the torque characteristic with each motor and amplifier combination.

(a) Within the range of “(A) Acceleration/deceleration area 1” and “(B) Acceleration/deceleration area 2” are used for accel./decel. (\*) the motor.

(i) **(A) Acceleration/deceleration area 1** : Output torque is available at accel./decel. In case of the same output [kW] rating of the amplifier and motor combination.

(ii) **(B) Acceleration/deceleration area 2** : Output torque is available at accel./decel.. When the amplifier size is one step larger than the motor frame No. size corresponding with the amplifier. Refer to 9.3 (3) (d).

(iii) In the case of (A) and (B), a torque higher than rated cannot be outputted continuously.

(b) Within the range of “(C) Continuous operation area”, the motor can continuously be operated (at rated speed or lower). Above the rated speed, the rated torque cannot be outputted continuously.

(c) The overload detecting time (guidepost) is as follows.

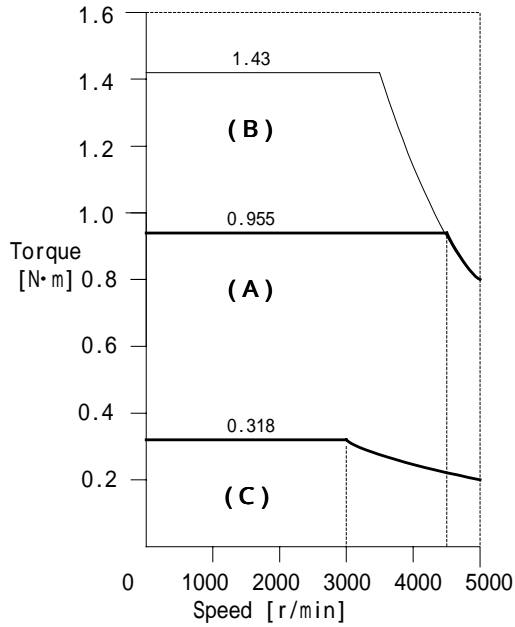
|                                     |                                     |     |     |     |     |     |
|-------------------------------------|-------------------------------------|-----|-----|-----|-----|-----|
| Output torque [%]                   | 100 (rated torque)                  | 125 | 150 | 200 | 300 | 450 |
| Overload detecting time approx. [s] | Continuous operation is acceptable. | 35  | 18  | 9   | 3   | 1.5 |

Before tripping by overload, an early warning signal can be outputted. See 5.6.5 Overload early warning.

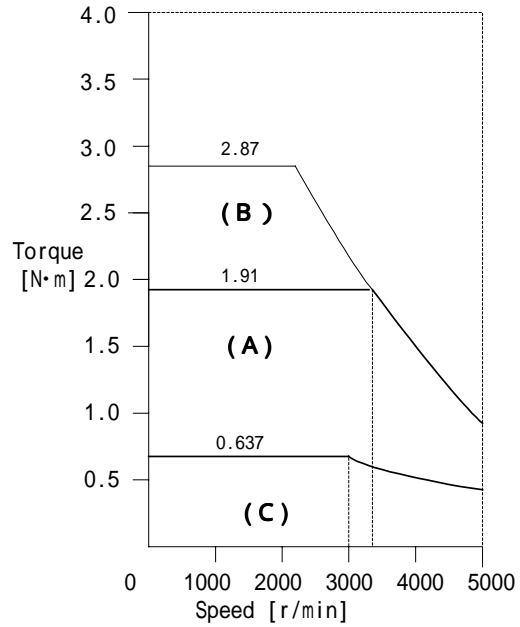
Note: (\*) Accel. : Accelerating or acceleration  
Decel. : Decelerating or deceleration

(1) GYC motor, cubic type, for 200 [V] class input voltage of amplifier

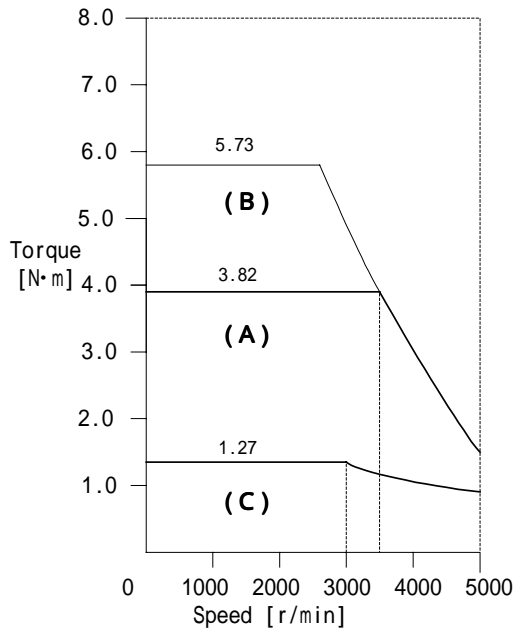
• GYC 1 0 1 DC 1 - SA ( 0 . 1 [ kW ] )



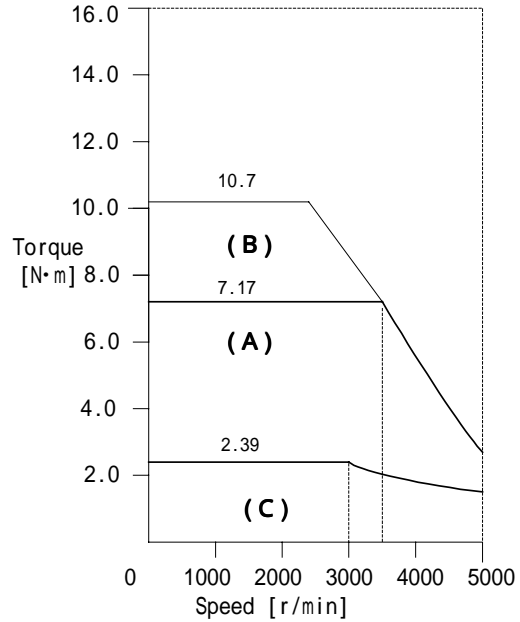
• GYC 2 0 1 DC 1 - SA ( 0 . 2 [ kW ] )



• GYC 4 0 1 DC 1 - SA ( 0 . 4 [ kW ] )



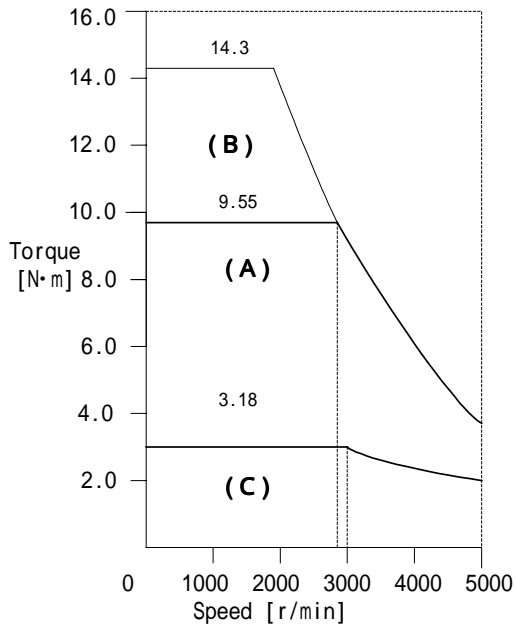
• GYC 7 5 1 DC 1 - SA ( 0 . 7 5 [ kW ] )



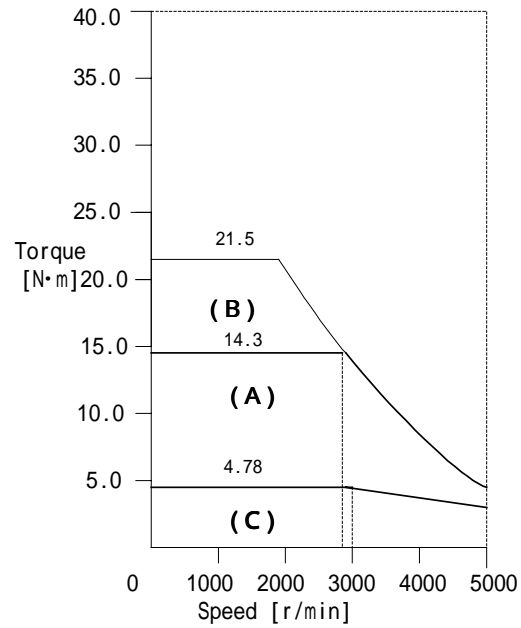
- (A) Acceleration/deceleration area 1
- (B) Acceleration/deceleration area 2
- (C) Continuous operation area

(1) GYC motor, cubic type, for 200 [V] class input voltage of amplifier (cont'd)

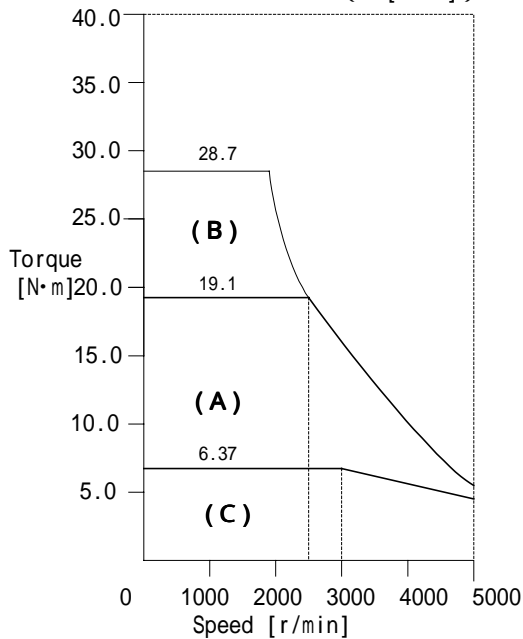
• GYC 1 0 2 DC 1 - SA ( 1 [kW] )



• GYC 1 5 2 DC 1 - SA ( 1 . 5 [kW] )



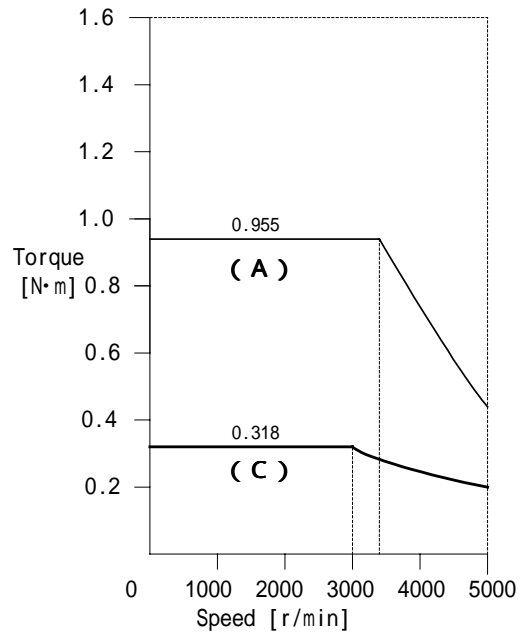
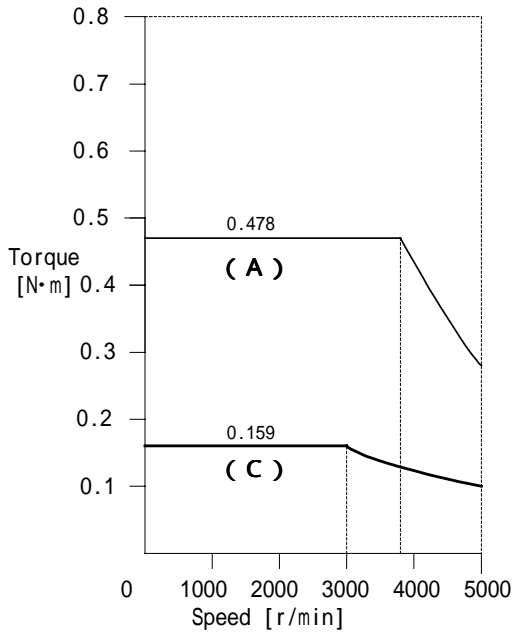
• GYC 2 0 2 DC 1 - SA ( 2 [kW] )



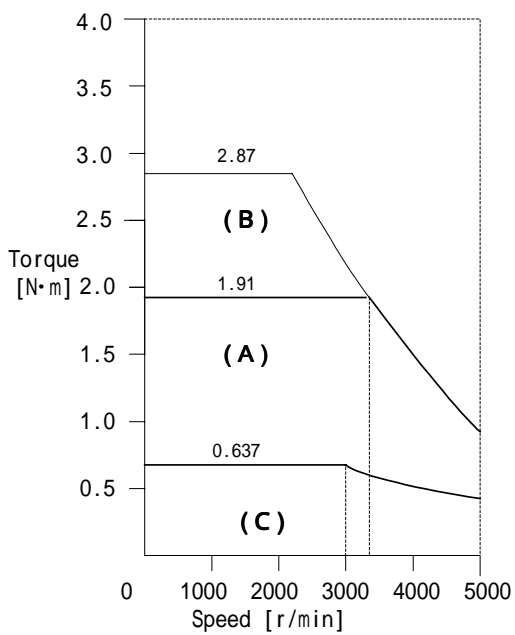
- (A) Acceleration/deceleration area 1
- (B) Acceleration/deceleration area 2
- (C) Continuous operation area

(2) GYS motor, slim type, for 200 [V] class input voltage of amplifier

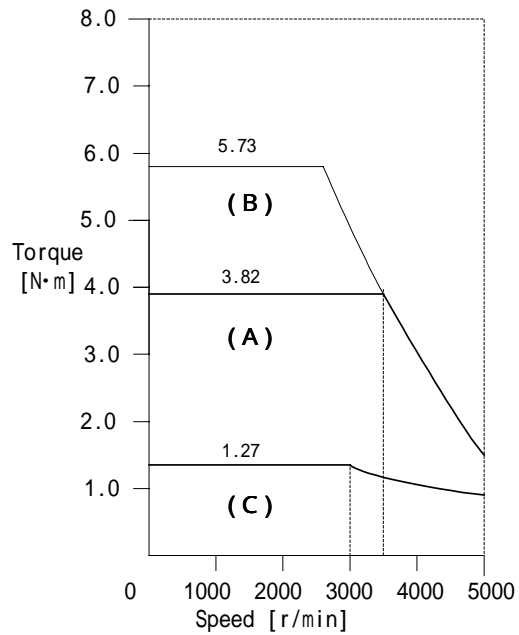
• GYS 5 0 0 DC 1 - S 8 B ( 0 . 0 5 [kW] ) • GYS 1 0 1 DC 1 - S B ( 0 . 1 [kW] )



• GYS 2 0 1 DC 1 - S A ( 0 . 2 [kW] )

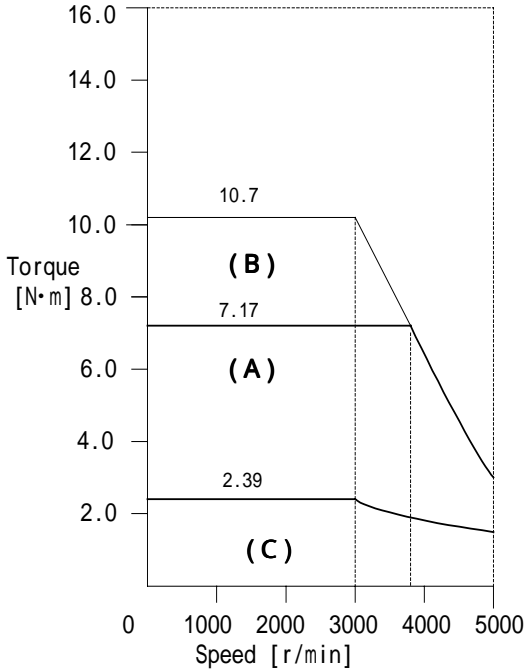


• GYS 4 0 1 DC 1 - S A ( 0 . 4 [kW] )

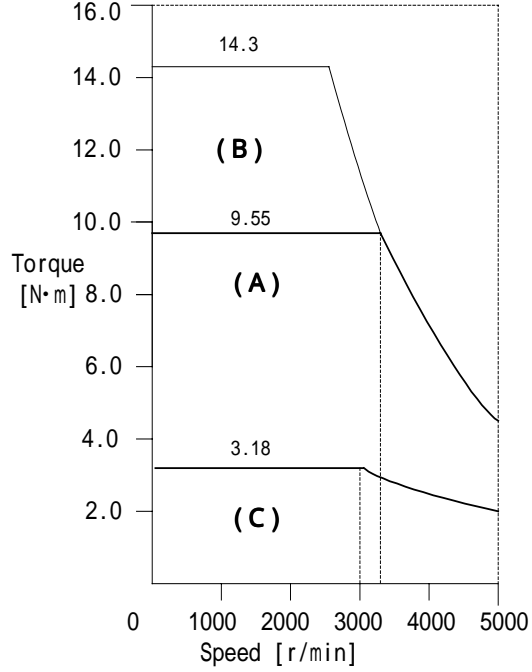


(2) GYS motor, slim type, for 200 [V] class input voltage of amplifier (cont'd)

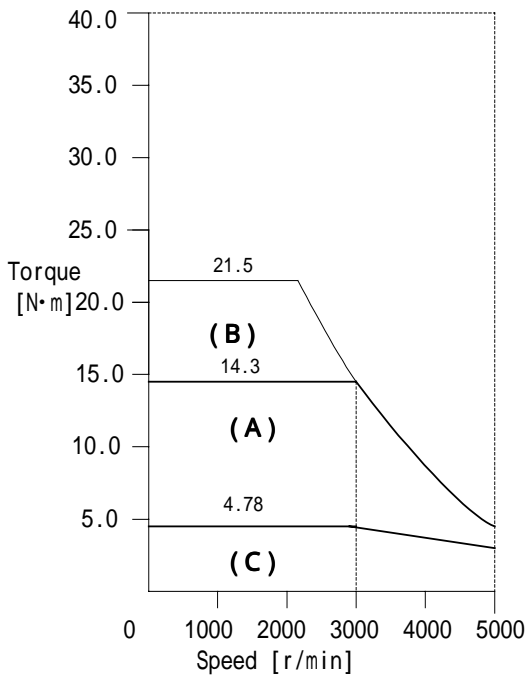
• GYS 7 5 1 DC 1 - SA ( 0 . 7 5 [ kW ] )



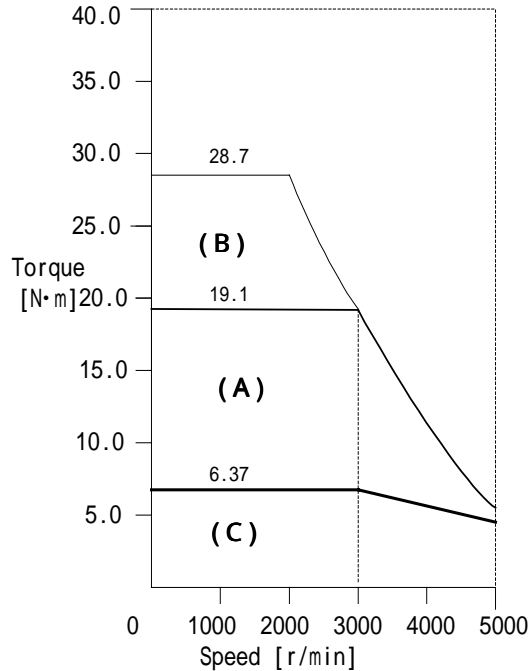
• GYS 1 0 2 DC 1 - SA ( 1 [ kW ] )



• GYS 1 5 2 DC 1 - SA ( 1 . 5 [ kW ] )



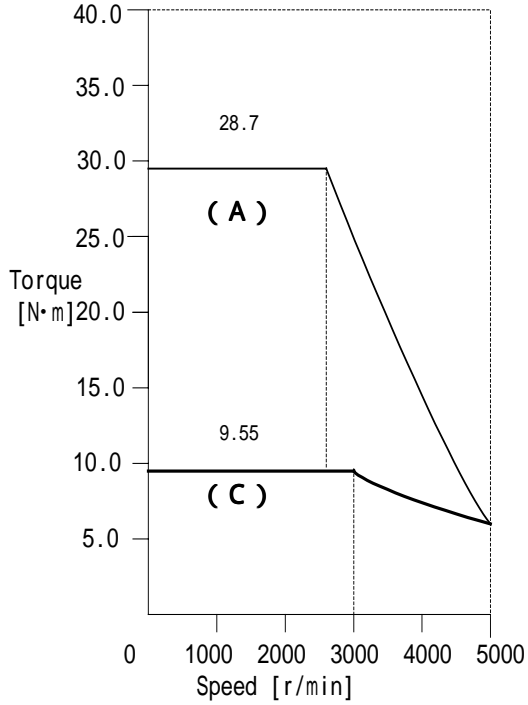
• GYS 2 0 2 DC 1 - SA ( 2 [ kW ] )



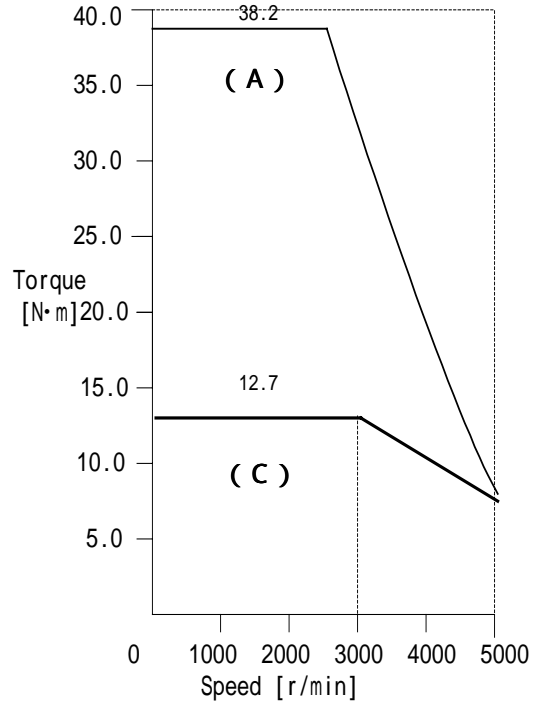
- (A) Acceleration/deceleration area 1
- (B) Acceleration/deceleration area 2
- (C) Continuous operation area

(2) GYS motor, slim type, for 200 [V] class input voltage of amplifier (cont'd)

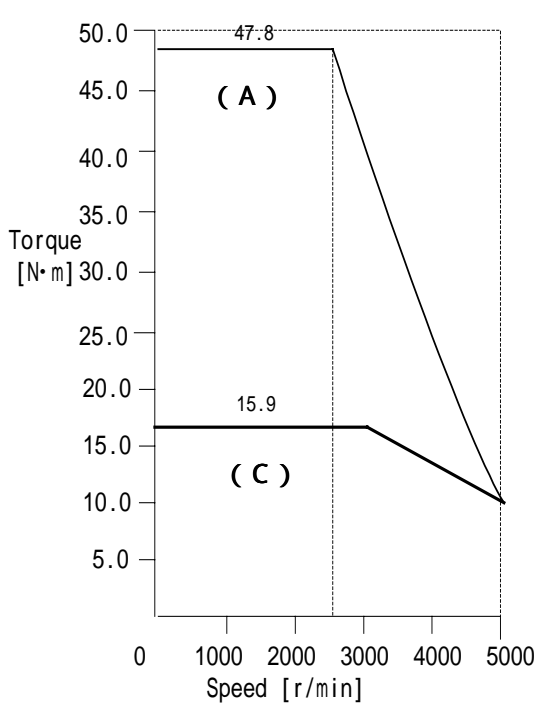
• GYS 3 0 2 DC 1 - SA ( 3 [kW] )



• GYS 4 0 2 DC 1 - SA ( 4 [kW] )

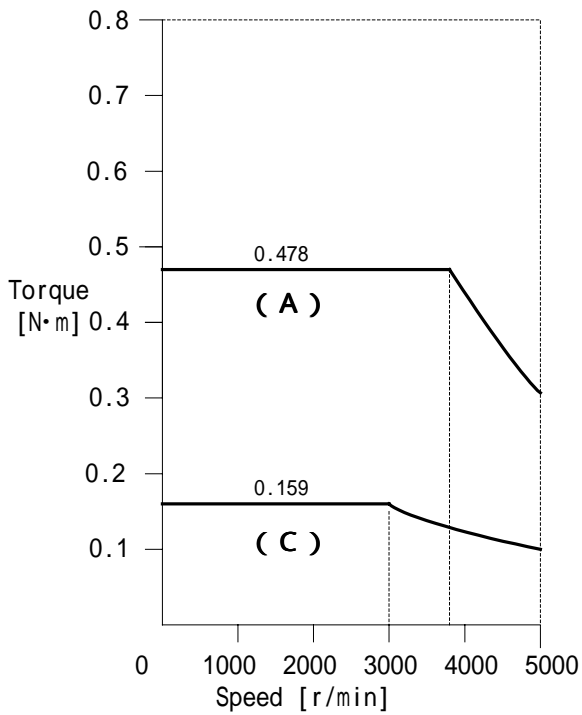


• GYS 5 0 2 DC 1 - SA ( 5 [kW] )

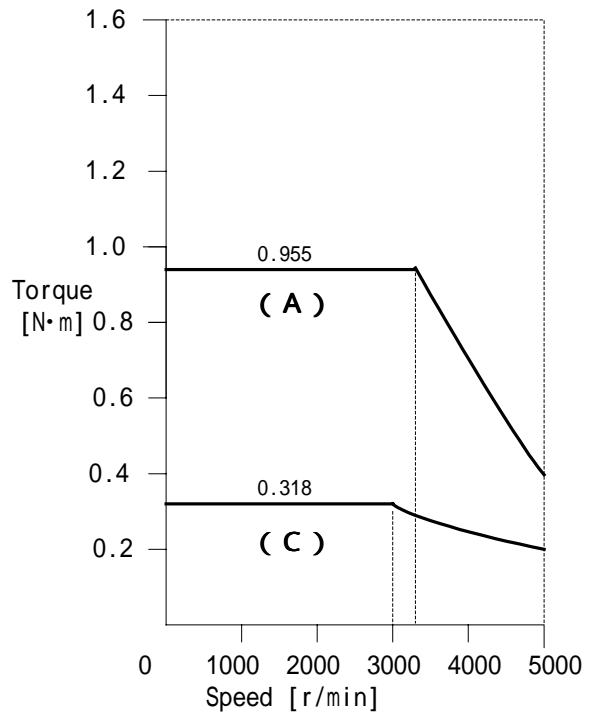


(3) GYS motor, slim type, for 100 [V] class input voltage of amplifier

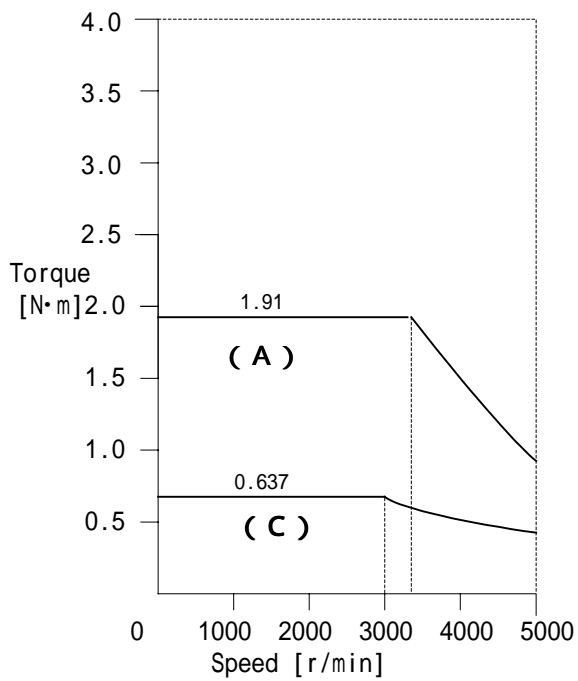
• GYS 5 0 0 DC 1 - S 8 B ( 0 . 0 5 [ kW ] )



• GYS 1 0 1 DC 1 - S 6 B ( 0 . 1 [ kW ] )



• GYS 2 0 1 DC 1 - S 6 B ( 0 . 2 [ kW ] )





### 3. INSTALLATION

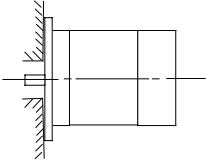
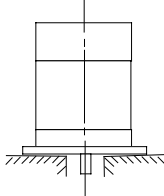
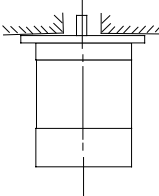
#### 3.1 Motor

##### (1) Installation environment

See 3.2 (1) (a)

##### (2) Type of construction (mounting)

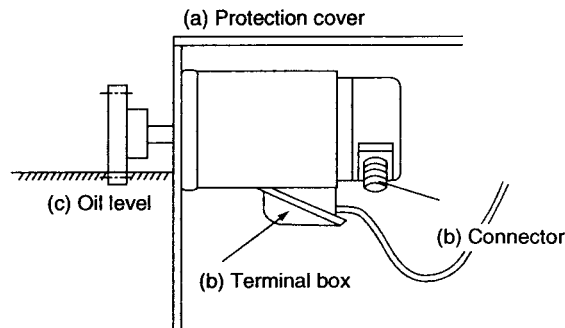
Each motor allows the following methods of mounting.

| Flange-mounted  |   |   |
|---|---|---|
| IMB5  | IMV1  | IMV3  |
|  |  |  |

##### (3) No-oil or no-water-drop protection

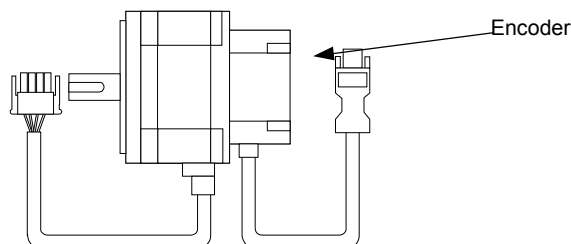
In case oil or water drop splashes the motor, the motor should be protected with a suitable cover (example : "a" of figure), which will not close ventilation, and the motor should be mounted so that the terminal box, connector or connection cable should also be protected ("b" of figure). Do not allow oil or water drop to enter the inside of motor through the shaft extension.

For mechanical connection with an oil-lubricated reduction gear unit, its oil level should always be lower than in the motor bearing-housing ("c" of figure).



##### (4) Rotary encoder detector

- An encoder is used for detecting the position, speed of motor.
- The motor and encoder have been factory-aligned in the circumferential direction at the time of assembly. Therefore, the mounting position of the encoder should not be changed.





#### DO NOT DISASSEMBLE

Do not disassemble the motor unit. There is a risk that the machine can be broken due to abnormal operation.



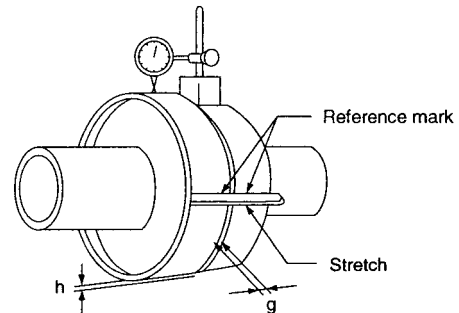
#### CAUTION

Never give shocks to the encoder, motor and shaft extension, for example by hitting them with a hammer etc. In addition, be careful not to apply a load to the encoder during installation.

### (5) Mechanical coupling

#### (a) Motor with flexible coupling

- (i) Provide a reference mark on the peripheral surface of the coupling.
  - (ii) Connect both halves of the coupling with a single-bolt, in order to allow them to rotate together.
  - (iii) Attach a dial gauge securely to one half of the coupling so that its feeler rests lightly on the other half.
  - (iv) Bring the reference mark to the top of the coupling and, then, measure dimension "g" with a thickness gauge and dimension "h" with a dial gauge.
  - (v) Turn the coupling and carry out the measurements described in (iv) above at 90 ° intervals until the reference mark appears at the top again.
  - (vi) Conduct adjustments so that the difference between the maximum and the minimum measurements is held to within 0.03mm. Be sure to bolt the motor and driven machine to the base prior to marking adjustments.
- If a coupling is too small to allow a dial gauge to be attached to it, attach a stretch (rectangular steel bar) to one half of the coupling and measure the clearance value of the stretch and the surface of the other half of the coupling.



#### (b) Motor for external gear drive

If a gear drive is used, the shafts of both machines should be exactly parallel, to avoid subjecting the gear teeth to an excessive load at the contact points.

#### (c) Motor for timing belt connection

When using a timing belt, obtain necessary data from the belt supplier, and contact Fuji.

### (6) Power supply to motor



#### CAUTION

Do not connect commercial power supply to the motor terminals.

### (7) Dimensional tolerances

Tolerances of motor at the time of shipment from the factory are as follows.

The maximum and minimum values through one slow revolution of the shaft are then read on the indicator.

The difference between the readings will not exceed the values given in the following table.

#### (a) Shaft extension run-out

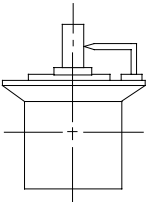
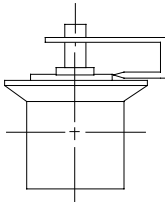
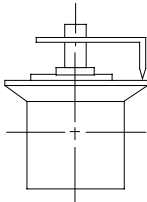
The probe of the indicator is attached to the shaft midway along its length.

#### (b) Concentricity of spigot and the shaft for flange-mounted motor

The indicator is fitted rigidly on the shaft extension.

(c) Perpendicularity of mounting face of flange to shaft for flange-mounted motor  
 The indicator is fitted rigidly on the shaft extension.

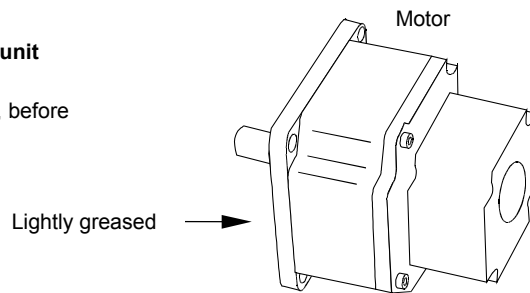
[unit : mm]

| (a)   | (b)   | (c)   |
|---|---|---|
| Flange-mounted  | Flange-mounted  | Flange-mounted  |
|  |  |  |
| 0.02  | 0.06  | 0.08  |

**(8) Mounting instruction of GYN and GRN type gear-head unit**

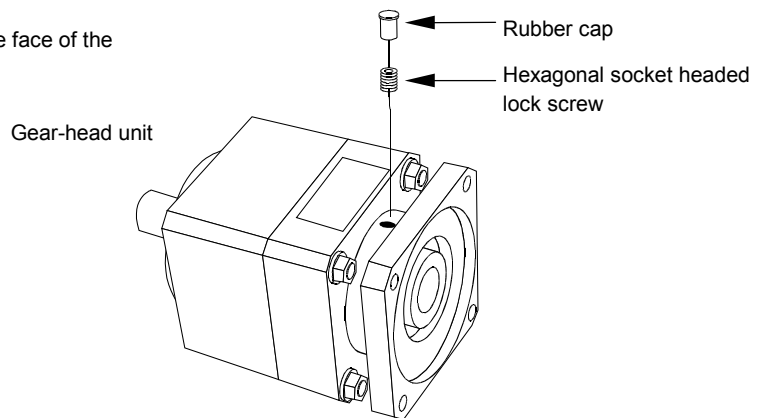
(a) Greasing to the shaft extension

Apply grease lightly to the output shaft extension of the motor, before mounting a GYC or GYS motor to gear-head unit.



(b) Preparation for mounting

Remove the rubber cap from a deep point of the flange face of the gear-head unit.

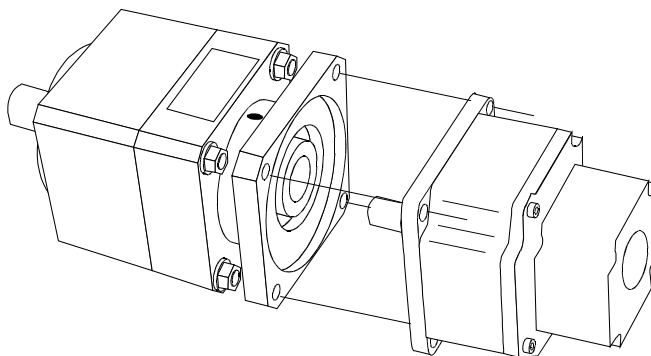


(c) Match the position of the key of the gear-head input-shaft with the position of the rubber cap hole.

Loosen the "hexagonal socket headed lock screw", which is located in the rubber cap hole. The hexagonal socket headed lock screw is positioned on the gear-head input-shaft.

(d) Mounting of motor

Insert the motor shaft extension with the key position matched with the gear-head input-shaft. Fasten the motor's flange face to the gear-head unit's flange face by the screws provided for the gear-head unit.



(e) Screw sizes

|                |     |     |            |     |     |     |     |     |     |     |
|----------------|-----|-----|------------|-----|-----|-----|-----|-----|-----|-----|
| Motor type     | GYS |     |            |     |     |     | GYC |     |     |     |
| Gear-head type | GYN | SAG | GRN<br>SAG |     | GYN | SAG | GYN | CAG |     |     |
|                | 500 | 101 | .20        | .40 | 751 |     | 101 | 201 | 401 | 751 |

(i) Screws for fastening of flanges

|                         |            |            |            |            |
|-------------------------|------------|------------|------------|------------|
| Screw size [mm]         | M4 x 12    | M5 x 12    | M4 x 12    | M5 x 12    |
| Screw q'ty              | 4          |            |            |            |
| Tightening torque [N·m] | 1.8 ± 0.21 | 3.5 ± 0.42 | 1.8 ± 0.21 | 3.5 ± 0.42 |

(ii) Lock screws

|                         |            |
|-------------------------|------------|
| Screw size [mm]         | M4 x 4     |
| Tightening torque [N·m] | 1.8 ± 0.21 |

Tighten the "hexagonal socket headed lock screw" after fastening of flange faces.

Fit rubber cap in the original position.

**3.2 Amplifier**

**(1) Installation environment**

(a) Ambient climatic conditions

| Ambient conditions                     |              | Amplifier       | Motor        |
|--|--------------|-----------------|--------------|
| In transportation and storage (*1)     | Temperature  | - 20 to + 80    | - 10 to + 70 |
|  | Humidity     | 90% RH max.     |              |
|  | Air pressure | 86 to 106 [kPa] |              |
| Control rooms and equipment rooms (*1) | Temperature  | - 10 to + 55    | - 10 to + 40 |
|  | Humidity     | 90% RH max.     |              |
|  | Air pressure | 86 to 106 [kPa] |              |
| Install location (*2)                  |              | For indoors     |              |

(\*1) Free from condensation, no condensation, no formation of ice

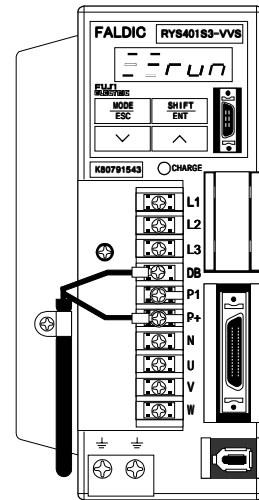
(\*2) Site-altitude should be 1000 [m] and below.

(b) Avoid use under the following conditions.

- (i) Location near oil, steam or corrosive gas
- (ii) Location where strong electric or magnetic field exists
- (iii) Accommodation in the same panel together with high voltage (2 [kV] or higher) equipment
- (iv) Sharing of the same power supply with the equipment which generates large noise.
- (v) In vacuum
- (vi) In explosive atmosphere
- (vii) Under acceleration vibration

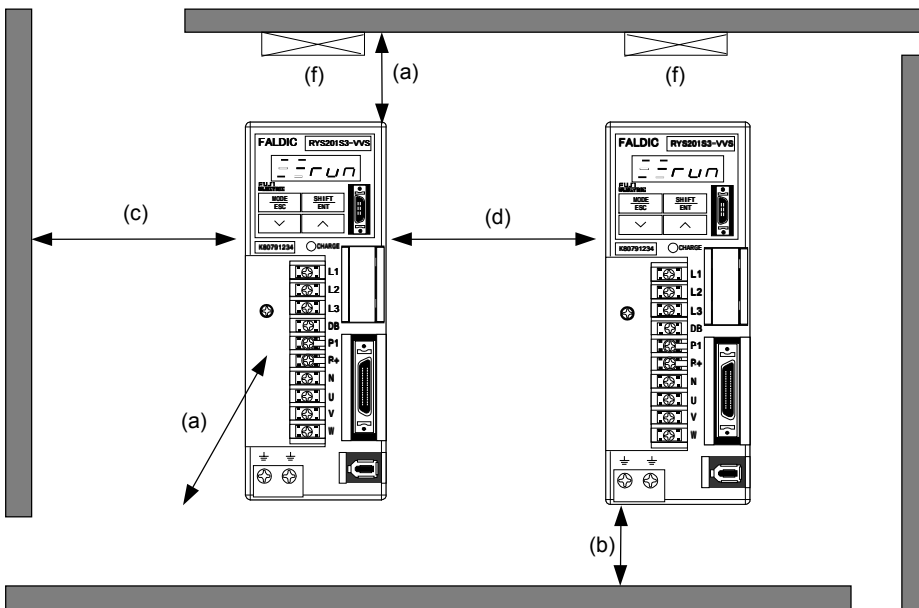
**(2) Mounting**

(a) Amplifier should be mounted upright so that character “FALDIC” on the front panel can be seen horizontal.



(b) Avoid overheating of the amplifier

When accommodating multiple amplifiers in the same panel, they should be installed side by side with the sufficient clearance distances below secured.



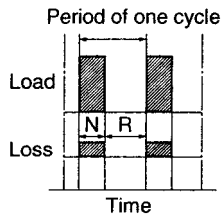
[unit : mm (min.)]

| (a)<br>Upper and front | (b)<br>Lower | (c)<br>Left and right | (d)<br>Between amplifiers   |
|------------------------|--------------|-----------------------|---|
| 50                     | 40           | 10                    | (i) 5<br><br>(ii) If the clearance is 4.9 [mm] and below, operation duty type of amplifier is reduced to 80%ED (*), instead of continuous duty. |

(f) Fan mounting

(\*) 80%ED : Cyclic duration factor operating duty is 80% : Intermittent periodic duty  
 The factor is defined as

$$\frac{N \text{ (operation under rated conditions)}}{N \text{ (operation under rated conditions)} + R \text{ (at rest and de-energized)}} \times 100 [\%]$$



Intermittent periodic duty involve alternating operating and loading times and pauses during which a motor (or amplifier) is at a standstill (or de-energized).  
 The loading and standstill times of one cycle, which has a duration of 10 minutes, are so short that the steady-state temperature cannot be attained. The cycle duration factor is the ratio between the operating or loading time and cycle duration.

An ambient temperature of the amplifier must be kept at 55 °C maximum, at different points around the amplifier, at a distance of 50 [mm] maximum from the amplifier.

To keep the above mentioned ambient temperature of amplifier, the amplifier should be mounted in a forced-fan-ventilated panel or equivalent cooling conditions.

Avoid the excessive temperature rise due to heat losses by the regenerating braking resistor etc. in the panel.

(c) Forced-fan-ventilated panel

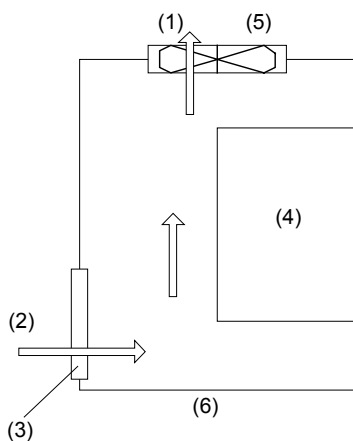
Provide an exhaust port and an air intake (suction) port in the panel, and mount a fan to the exhaust port to forced ventilate the internal air. Also, mount an air filter to the air intake port in order to maintain an environment better than IEC664 pollution degree 2 (\*) in the panel. For the air volume and the opening size of the air intake, refer to the following table.

Refer to technical document No. MHT221f (Engl.), chapter 2.2

(\*) Pollution degree 2: An environment in which only non-conductive pollution is generated, except for occasional occurrence of temporary conductivity due to condensation.

|  |           |        |        |        |        |
|--|-----------|--------|--------|--------|--------|
| Amplifier output [kW]                                      | 0.05, 0.1 | 0.2    | 0.4    | 0.75   | 1      |
| Air volume of forced-ventilation-fan [m <sup>3</sup> /min] | 0.06      | 0.11   | 0.23   | 0.43   | 0.57   |
| Opening size of air intake (suction air) [m <sup>2</sup> ] | 0.0009    | 0.0019 | 0.0038 | 0.0071 | 0.0095 |

|  |        |        |        |        |        |
|--|--------|--------|--------|--------|--------|
| Amplifier output [kW]                                      | 1.5    | 2      | 3      | 4      | 5      |
| Air volume of forced-ventilation-fan [m <sup>3</sup> /min] | 0.85   | 1.14   | 1.7    | 2.27   | 2.84   |
| Opening size of air intake (suction air) [m <sup>2</sup> ] | 0.0142 | 0.0189 | 0.0284 | 0.0378 | 0.0473 |

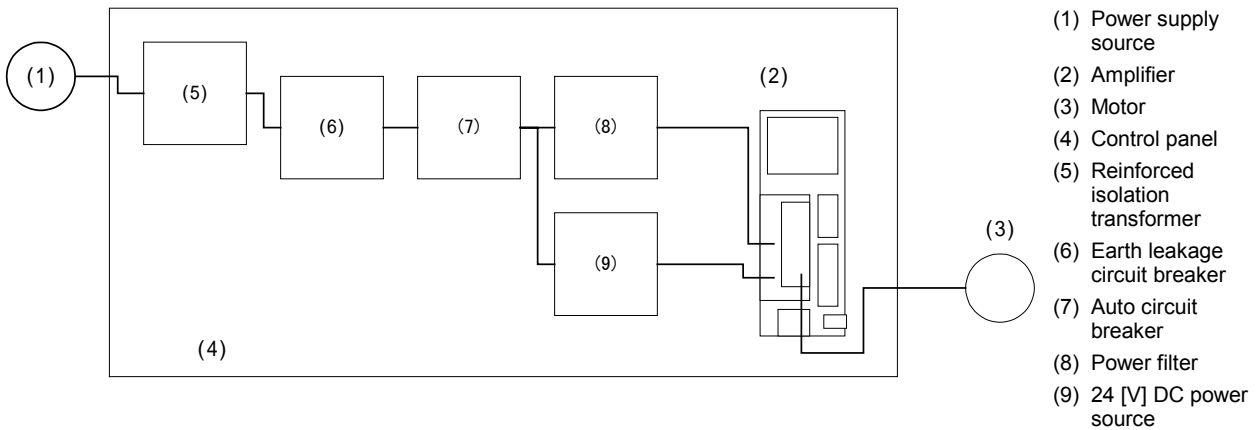


- (1) Exhaust air
- (2) Air intake, suction air
- (3) Air filter
- (4) Amplifier
- (5) Fan
- (6) Forced-fan-ventilated panel

Compliance with EC directives

- This product should be installed in the electrical cabinet.
- Servo driver is used under the "pollution degree 2" environment as specified in IEC664.

**(3) Peripheral equipment**

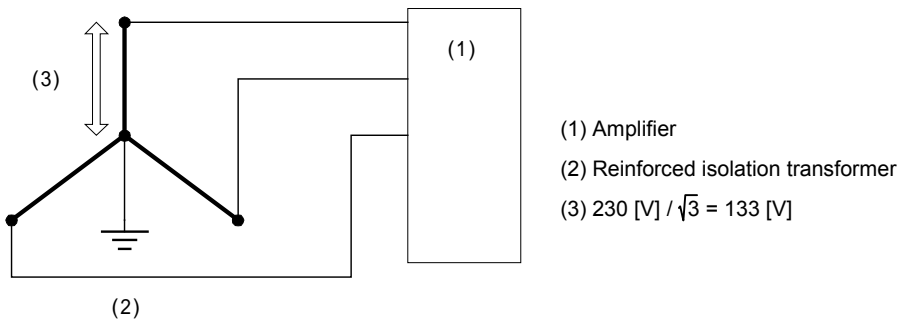


**(a) Power supply**

The amplifier is used under the "over voltage category II" environment as specified in IEC 664.

The power input unit uses a reinforced isolation transformer based on IEC/EN standards.

A 3-phase, star-connected transformer should be used without regard to single-phase and 3-phase models. The transformer should be grounded at the neutral point. The phase (line to earth) voltage must not exceed 120 [V].



For the interface power source, use a 24 [V] DC power source with reinforced isolation type input and output.

**(b) Power filter**

Regarding the EMI terminal disturbance voltage, a power filter is required.

| Input voltage class | [V]     | 100                                  | 200         |           |      |      |      |      |      |
|---------------------|---------|--------------------------------------|-------------|-----------|------|------|------|------|------|
| Amplifier output    | [kW]    | 0.05 to 0.2                          | 0.03 to 0.4 | 0.75 to 1 | 1.5  | 2    | 3    | 4    | 5    |
| Power filter type   | HF A-TM | 3005                                 |             | 3010      | 3015 | 3020 | 3030 | 3040 | 3050 |
| Current             | [A]     | 5                                    |             | 10        | 15   | 20   | 30   | 40   | 50   |
| Voltage             |         | 250[V] AC                            |             |           |      |      |      |      |      |
| Leakage current     |         | 1.5 [mA] max. at 250 [V] AC, 60 [Hz] |             |           |      |      |      |      |      |

(c) Earthing (grounding)

To prevent electric shocks, the amplifier protection earth terminal and the control panel protection earth terminal should be connected to the ground.

When connecting earth cables to the protection earth terminal, do not tighten the cable terminals together.

The amplifier has two protection earth terminals. Do not connect copper cables directly to the amplifier terminals.

For the earth connection avoid direct contact between aluminum and copper.

Tin-plated cable lugs can be used if the plating does not contain zinc.

When tightening the screws take care not to damage the thread in the aluminum frame.

(d) Auto circuit breaker

Connect EN/IEC-approved auto circuit breaker between the power supply source and the power filter. Refer to 10.2.

(e) Residual-current-operated protective device (RCD)

Where residual-current-operated protective device (RCD) is used for protection in case of direct or indirect contact, only RCD of type B is allowed on the supply side of this electric equipment (EE). Otherwise another protective measure should be applied such as separation of the EE from the environment by double or reinforced insulation or isolation of EE and supply system by a transformer.

(f) Conformity to EMC requirements

When the amplifier and motor have been finally installed with a driven machine and devices, they may not conform to the EMC requirements because the installation, wiring, etc. are different according to the final conditions. The driven machine and devices must therefore be measured for conformity to the EMC requirements under the final conditions with the amplifier and motor installed.

Compliance with UL standards

(a) Auto circuit breaker

For compliance with UL standards, connect UL-approved (with LISTED UL mark) auto circuit breaker between the power supply source and the power filter.

| Input voltage class  |             | [V]  | 100       |      | 200         |      |          |      |          |          |
|----------------------|-------------|------|-----------|------|-------------|------|----------|------|----------|----------|
| Amplifier output     |             | [kW] | 0.05, 0.1 | 0.2  | 0.03 to 0.2 | 0.4  | 0.75, 1  | 1.5  | 2, 3     | 4, 5     |
| Amplifier type       | RYS         | S3-  | 6         |      |             |      |          |      |          |          |
|                      |             |      | 500, 101  | 201  | 300 to 201  | 401  | 751, 102 | 152  | 202, 302 | 402, 502 |
| Auto circuit breaker | type BU-ECA |      | 3005      | 3010 | 3005        | 3010 | 3015     | 3020 | 3030     | 3050     |
|                      | current     | [A]  | 5         | 10   | 5           | 10   | 15       | 20   | 30       | 50       |

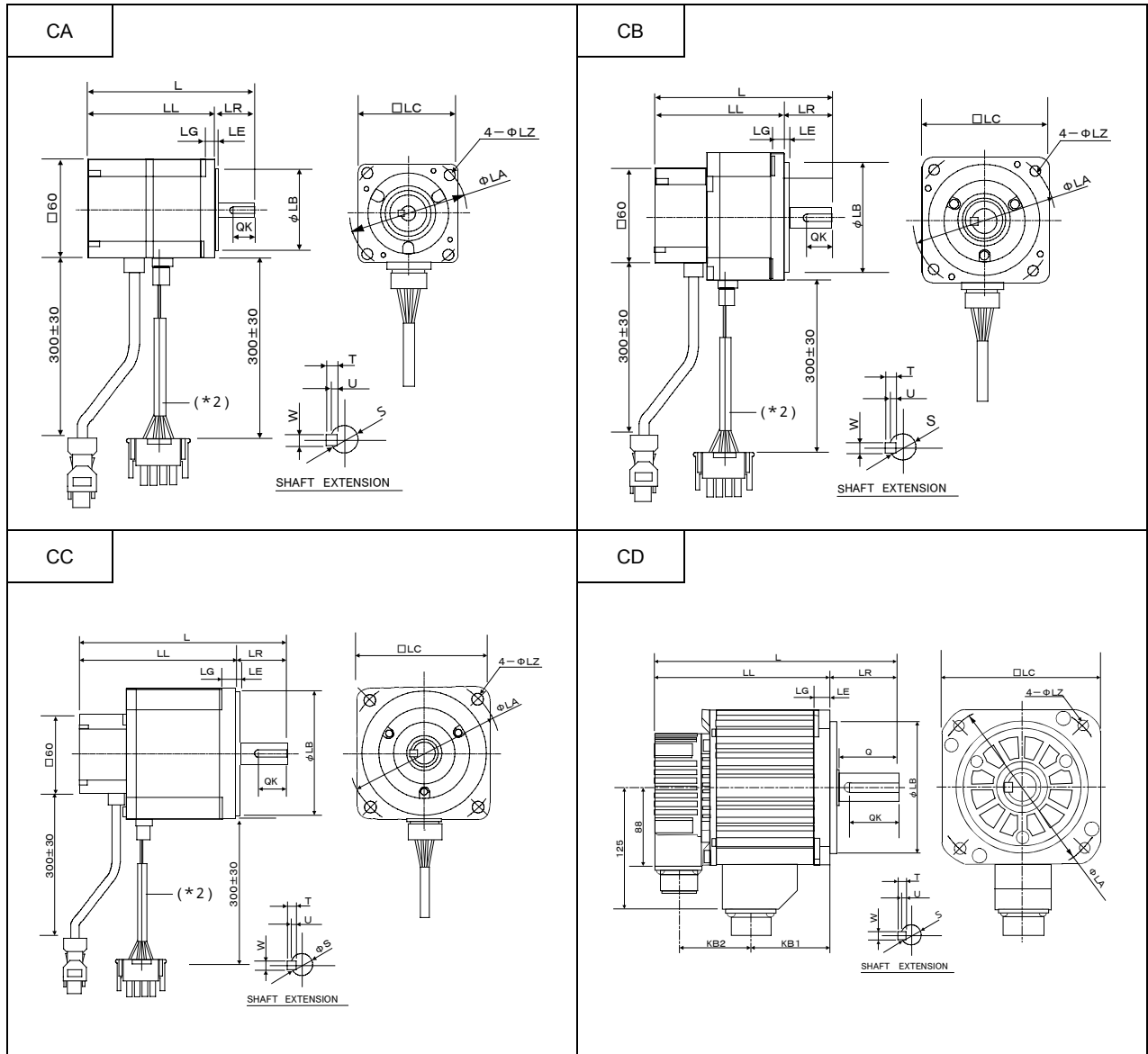


3.3 External dimensions [unit : mm]

(1) Motor, flange-mounted, for 200 [V] class input voltage of amplifier

(a) Basic design, GYC cubic type

GYC101 to 502DC1-SA type, 0.1 to 5 [kW]



| Type      | Fig | Q  | QK | QR | S    | T | U   | W | (*1) | L     | LL    | LR | LG | LE | LA  | LB    |
|-----------|-----|----|----|----|------|---|-----|---|------|-------|-------|----|----|----|-----|-------|
| GYC       |     |    |    |    | (*3) |   |     |   |      |       |       |    |    |    |     | (*3)  |
| 101DC1-SA | CA  | -  | 14 | -  | 8h6  | 3 | 1.8 | 3 | -    | 100   | 75    | 25 | 6  | 3  | 70  | 50h7  |
| 201DC1-SA | CB  | -  | 16 | -  | 14h6 | 5 | 3   | 5 | -    | 112   | 82    | 30 | 8  | 3  | 90  | 70h7  |
| 401DC1-SA | CB  | -  | 16 | -  | 14h6 | 5 | 3   | 5 | -    | 127   | 97    | 30 | 8  | 3  | 90  | 70h7  |
| 751DC1-SA | CC  | -  | 22 | -  | 16h6 | 5 | 3   | 5 | -    | 156.5 | 116.5 | 40 | 10 | 3  | 115 | 95h7  |
| 102DC1-SA | CD  | 50 | 40 | -  | 24h6 | 7 | 4   | 8 | -    | 201.5 | 143.5 | 58 | 12 | 6  | 145 | 110h7 |
| 152DC1-SA | CD  | 50 | 40 | -  | 24h6 | 7 | 4   | 8 | -    | 216.5 | 158.5 | 58 | 12 | 6  | 145 | 110h7 |
| 202DC1-SA | CD  | 50 | 40 | -  | 24h6 | 7 | 4   | 8 | -    | 231.5 | 173.5 | 58 | 12 | 6  | 145 | 110h7 |
| 302DC1-SA |     |    |    |    |      |   |     |   |      |       |       |    |    |    |     |       |
| 402DC1-SA |     |    |    |    |      |   |     |   |      |       |       |    |    |    |     |       |
| 502DC1-SA |     |    |    |    |      |   |     |   |      |       |       |    |    |    |     |       |

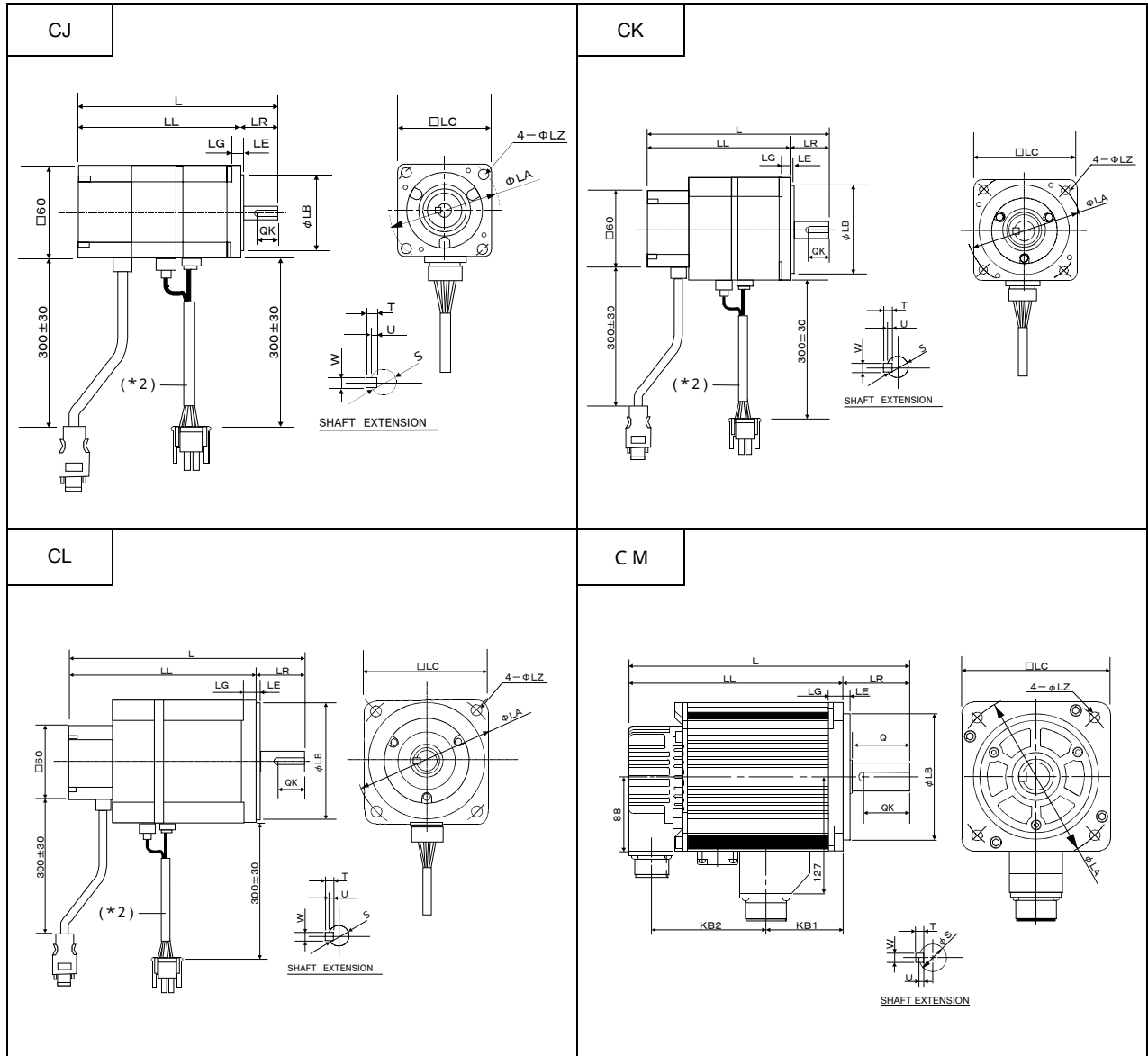
(\*1) Screw hole (metric diameter x depth) of shaft extension (\*2) Insulating protection tube

(\*3) Shaft extension ( S ) and flanged spigot ( LB ) are machining finished with h6 or h7 fits.

(a) Basic design, GYC cubic type (cont'd)  
 GYC101 to 502DC1-SA type, 0.1 to 5 [kW]

|  | LC  | L1 | L2 | L3 | LZ  | IE | IL | C | KB1  | KB2 | Mass<br>[kg] |
|--|-----|----|----|----|-----|----|----|---|------|-----|--------------|
|  | 60  | -  | -  | -  | 5.5 | -  | -  | - | -    | -   | 0.75         |
|  | 80  | -  | -  | -  | 7   | -  | -  | - | -    | -   | 1.3          |
|  | 80  | -  | -  | -  | 7   | -  | -  | - | -    | -   | 1.9          |
|  | 100 | -  | -  | -  | 9   | -  | -  | - | -    | -   | 3.5          |
|  | 130 | -  | -  | -  | 9   | -  | -  | - | 65.5 | 59  | 5.5          |
|  | 130 | -  | -  | -  | 9   | -  | -  | - | 80.5 | 59  | 7            |
|  | 130 | -  | -  | -  | 9   | -  | -  | - | 95.5 | 59  | 8.2          |
|  |     |    |    |    |     |    |    |   |      |     |              |
|  |     |    |    |    |     |    |    |   |      |     |              |

(b) With providing brake, GYC cubic type  
 GYC101 to 502DC1-SA-B type, 0.1 to 5 [kW]



| Type<br>GYC | Fig | Q  | QK | QR | S<br>(*3) | T | U   | W | (*1) | L     | LL    | LR | LG | LE | LA  | LB<br>(*3) |
|-------------|-----|----|----|----|-----------|---|-----|---|------|-------|-------|----|----|----|-----|------------|
| 101DC1-SA-B | CJ  | -  | 14 | -  | 8h6       | 3 | 1.8 | 3 | -    | 128   | 103   | 25 | 6  | 3  | 70  | 50h7       |
| 201DC1-SA-B | CK  | -  | 16 | -  | 14h6      | 5 | 3   | 5 | -    | 143.5 | 113.5 | 30 | 8  | 3  | 90  | 70h7       |
| 401DC1-SA-B | CK  | -  | 16 | -  | 14h6      | 5 | 3   | 5 | -    | 158.5 | 128.5 | 30 | 8  | 3  | 90  | 70h7       |
| 751DC1-SA-B | CL  | -  | 22 | -  | 16h6      | 5 | 3   | 5 | -    | 189   | 149   | 40 | 10 | 3  | 115 | 95h7       |
| 102DC1-SA-B | CM  | 50 | 40 | -  | 24h6      | 7 | 4   | 8 | -    | 243.5 | 185.5 | 58 | 12 | 6  | 145 | 110h7      |
| 152DC1-SA-B | CM  | 50 | 40 | -  | 24h6      | 7 | 4   | 8 | -    | 258.5 | 200.5 | 58 | 12 | 6  | 145 | 110h7      |
| 202DC1-SA-B | CM  | 50 | 40 | -  | 24h6      | 7 | 4   | 8 | -    | 273.5 | 215.5 | 58 | 12 | 6  | 145 | 110h7      |
| 302DC1-SA-B |     |    |    |    |           |   |     |   |      |       |       |    |    |    |     |            |
| 402DC1-SA-B |     |    |    |    |           |   |     |   |      |       |       |    |    |    |     |            |
| 502DC1-SA-B |     |    |    |    |           |   |     |   |      |       |       |    |    |    |     |            |

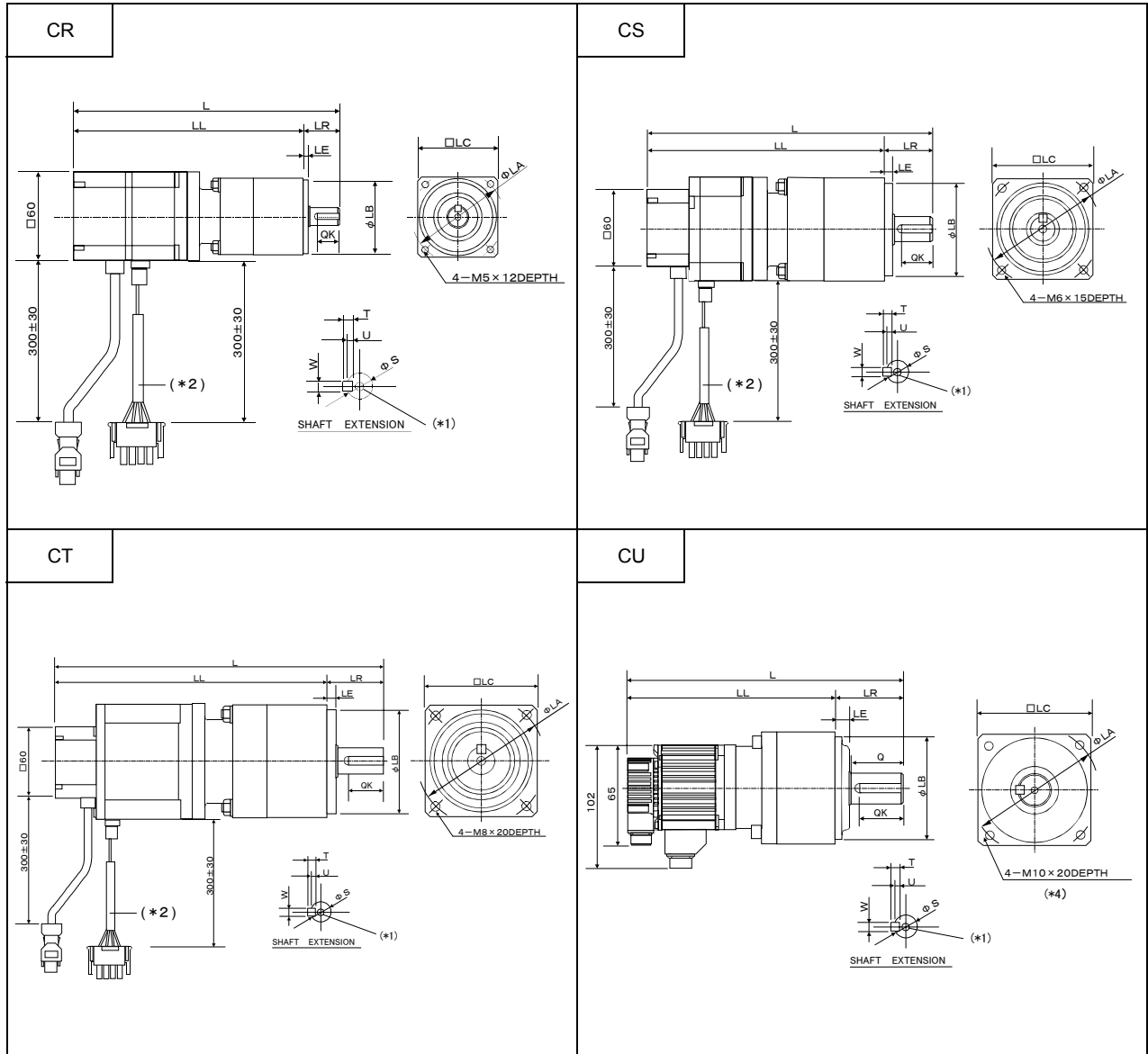
(\*1) Screw hole (metric diameter x depth) of shaft extension (\*2) Insulating protection tube

(\*3) Shaft extension ( S ) and flanged spigot ( LB ) are machining finished with h6 or h7 fits.

(b) With providing brake, GYC cubic type (cont'd)  
 GYC101 to 502DC1-SA -B type, 0.1 to 5 [kW]

|  | LC  | L1 | L2 | L3 | LZ  | IE | IL | C | KB1  | KB2 | Mass<br>[kg] |
|--|-----|----|----|----|-----|----|----|---|------|-----|--------------|
|  | 60  | -  | -  | -  | 5.5 | -  | -  | - | -    | -   | 1.0          |
|  | 80  | -  | -  | -  | 7   | -  | -  | - | -    | -   | 1.9          |
|  | 80  | -  | -  | -  | 7   | -  | -  | - | -    | -   | 2.6          |
|  | 100 | -  | -  | -  | 9   | -  | -  | - | -    | -   | 4.3          |
|  | 130 | -  | -  | -  | 9   | -  | -  | - | 67.5 | 99  | 8.0          |
|  | 130 | -  | -  | -  | 9   | -  | -  | - | 82.5 | 99  | 9.8          |
|  | 130 | -  | -  | -  | 9   | -  | -  | - | 97.5 | 99  | 11.0         |
|  |     |    |    |    |     |    |    |   |      |     |              |
|  |     |    |    |    |     |    |    |   |      |     |              |

(c) With providing speed reduction gear unit, GYC cubic type, gear ratio 1/9  
 GYC101 to 202DC1-SA type, and gear head, 0.1 to 2 [kW]

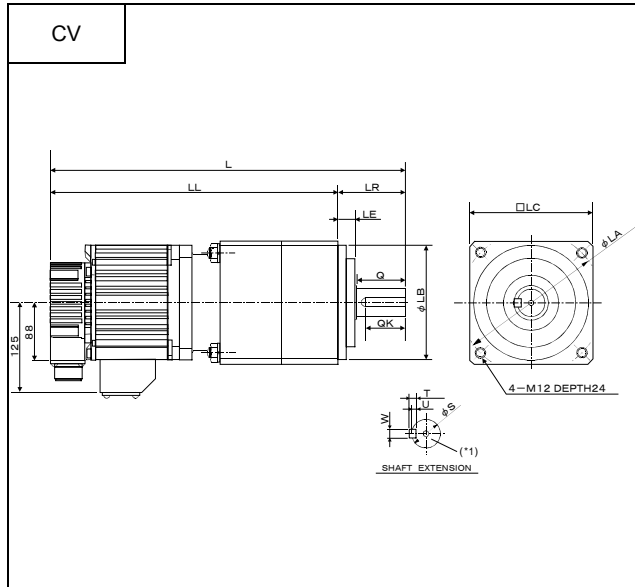


| Type GYC  | Fig | Q  | QK | QR | φS                                 | T | U   | W  | (*1)  | L     | LL    | LR | LG | LE | φLA | φLB                                 |
|-----------|-----|----|----|----|------------------------------------|---|-----|----|-------|-------|-------|----|----|----|-----|-------------------------------------|
| 101DC1-SA | CR  | -  | 15 | -  | 12 <sup>+0</sup> <sub>-0.011</sub> | 4 | 2.5 | 4  | M4x8  | 178   | 153   | 25 | -  | 4  | 60  | 50 <sup>+0</sup> <sub>-0.025</sub>  |
| 201DC1-SA | CS  | -  | 23 | -  | 19 <sup>+0</sup> <sub>-0.013</sub> | 6 | 3.5 | 6  | M5x13 | 218   | 181   | 37 | -  | 6  | 90  | 70 <sup>+0</sup> <sub>-0.03</sub>   |
| 401DC1-SA | CS  | -  | 23 | -  | 19 <sup>+0</sup> <sub>-0.013</sub> | 6 | 3.5 | 6  | M5x13 | 233   | 196   | 37 | -  | 6  | 90  | 70 <sup>+0</sup> <sub>-0.03</sub>   |
| 751DC1-SA | CT  | -  | 30 | -  | 24 <sup>+0</sup> <sub>-0.013</sub> | 7 | 4   | 8  | M6x15 | 282.5 | 233.5 | 49 | -  | 8  | 115 | 90 <sup>+0</sup> <sub>-0.035</sub>  |
| 102DC1-SA | CU  | 55 | 45 | -  | 32 <sup>+0</sup> <sub>-0.016</sub> | 8 | 5   | 10 | M6x15 | 362.5 | 298.5 | 64 | -  | 8  | 135 | 110 <sup>+0</sup> <sub>-0.035</sub> |
| 152DC1-SA | CU  | 55 | 45 | -  | 32 <sup>+0</sup> <sub>-0.016</sub> | 8 | 5   | 10 | M6x15 | 377.5 | 313.5 | 64 | -  | 8  | 135 | 110 <sup>+0</sup> <sub>-0.035</sub> |
| 202DC1-SA | CV  | 55 | 45 | -  | 32 <sup>+0</sup> <sub>-0.016</sub> | 8 | 5   | 10 |       | 431.5 | 354.5 | 77 | -  | 20 | 160 | 130 <sup>+0</sup> <sub>-0.04</sub>  |
| -         | -   | -  | -  | -  | -                                  | - | -   | -  | -     | -     | -     | -  | -  | -  | -   | -                                   |
| -         | -   | -  | -  | -  | -                                  | - | -   | -  | -     | -     | -     | -  | -  | -  | -   | -                                   |
| -         | -   | -  | -  | -  | -                                  | - | -   | -  | -     | -     | -     | -  | -  | -  | -   | -                                   |

(\*1) Screw hole (metric diameter x depth) of shaft extension (\*2) Insulating protection tube

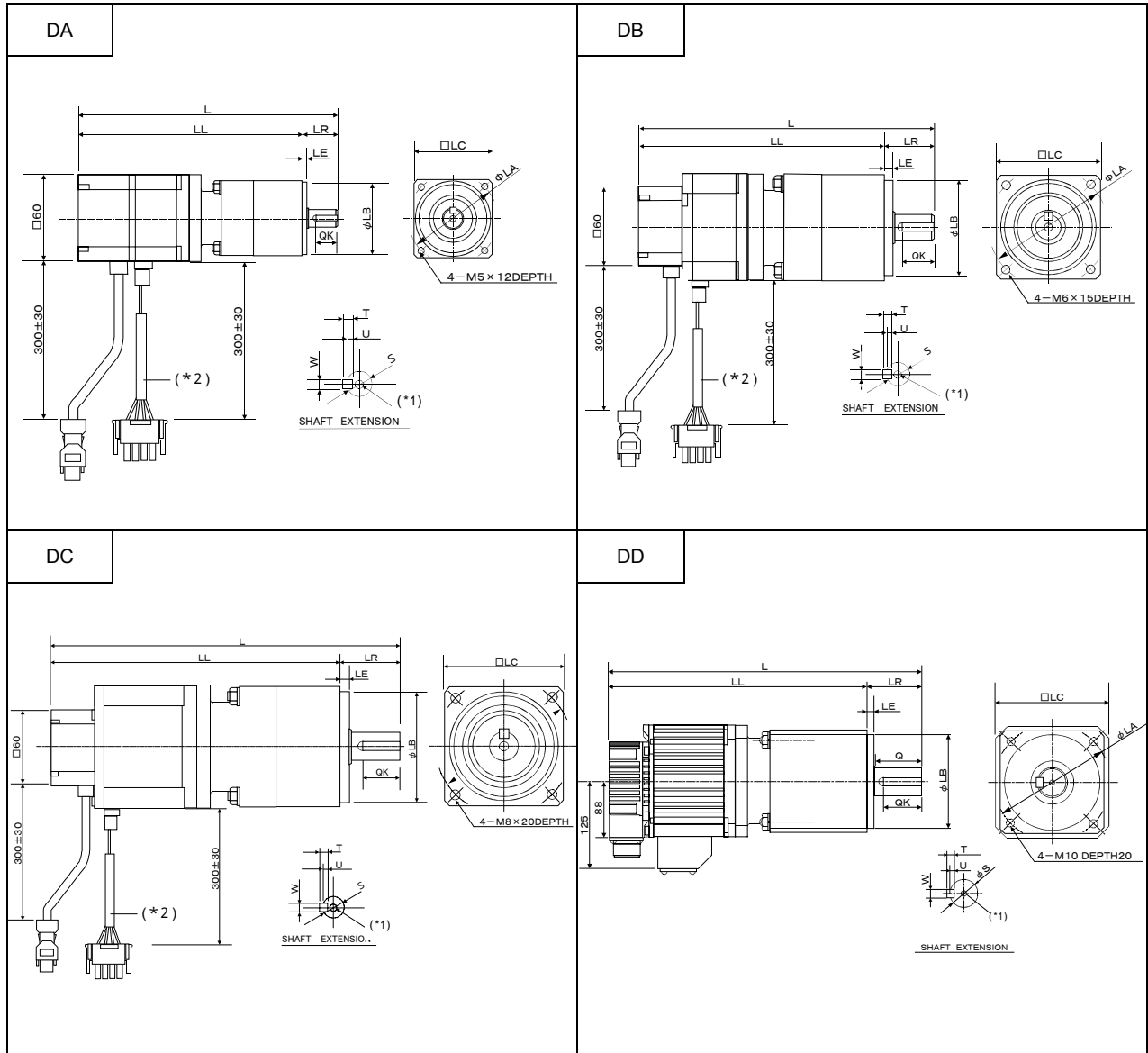
(\*4) For 152 type, 1.5 [kW] : 4 - M12 x 24 DEPTH

(c) With providing speed reduction gear unit, GYC cubic type, gear ratio 1/9 (cont'd)  
 GYC101 to 202DC1-SA type, and gear head, 0.1 to 2 [kW]



|  | LC  | L1 | L2 | L3 | LZ | IE | IL | C | KB1 | KB2 | Mass [kg] |
|--|-----|----|----|----|----|----|----|---|-----|-----|-----------|
|  | 52  | -  | -  | -  | -  | -  | -  | - | -   | -   | 1.47      |
|  | 78  | -  | -  | -  | -  | -  | -  | - | -   | -   | 3.4       |
|  | 78  | -  | -  | -  | -  | -  | -  | - | -   | -   | 4.0       |
|  | 98  | -  | -  | -  | -  | -  | -  | - | -   | -   | 7.3       |
|  | 120 | -  | -  | -  | -  | -  | -  | - | -   | -   | 13.3      |
|  | 120 | -  | -  | -  | -  | -  | -  | - | -   | -   | 14.8      |
|  | 140 | -  | -  | -  | -  | -  | -  | - | -   | -   | 20.4      |
|  |     |    |    |    |    |    |    |   |     |     |           |
|  |     |    |    |    |    |    |    |   |     |     |           |

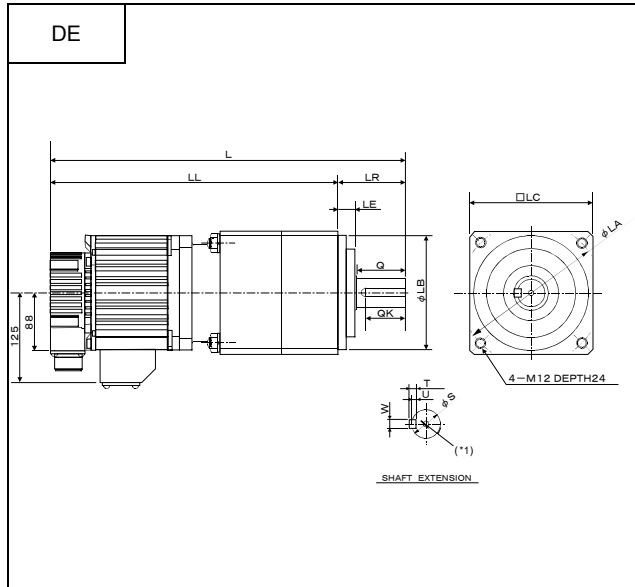
(d) With providing speed reduction gear unit, GYC cubic type, gear ratio 1/25 (for 101 to 751 types) or 1/15 (for 102 to 202 types) GYC101 to 202DC1-SA type, and gear head, 0.1 to 2 [kW]



| Type GYC  | Fig | Q  | QK | QR | S                                  | T | U   | W  | (*1)  | L     | LL    | LR | LG | LE | LA  | LB                                  |
|-----------|-----|----|----|----|------------------------------------|---|-----|----|-------|-------|-------|----|----|----|-----|-------------------------------------|
| 101DC1-SA | DA  | -  | 15 | -  | 12 <sup>+0</sup> <sub>-0.011</sub> | 4 | 2.5 | 4  | M4x8  | 178   | 153   | 25 | -  | 4  | 60  | 50 <sup>+0</sup> <sub>-0.025</sub>  |
| 201DC1-SA | DB  | -  | 23 | -  | 19 <sup>+0</sup> <sub>-0.013</sub> | 6 | 3.5 | 6  | M5x13 | 218   | 181   | 37 | -  | 6  | 90  | 70 <sup>+0</sup> <sub>-0.03</sub>   |
| 401DC1-SA | DB  | -  | 23 | -  | 19 <sup>+0</sup> <sub>-0.013</sub> | 6 | 3.5 | 6  | M5x13 | 233   | 196   | 37 | -  | 6  | 90  | 70 <sup>+0</sup> <sub>-0.03</sub>   |
| 751DC1-SA | DC  | -  | 30 | -  | 24 <sup>+0</sup> <sub>-0.013</sub> | 7 | 4   | 8  | M6x15 | 282.5 | 233.5 | 49 | -  | 8  | 115 | 90 <sup>+0</sup> <sub>-0.035</sub>  |
| 102DC1-SA | DD  | 55 | 45 | -  | 32 <sup>+0</sup> <sub>-0.016</sub> | 8 | 5   | 10 |       | 362.5 | 298.5 | 64 | -  | 8  | 135 | 110 <sup>+0</sup> <sub>-0.035</sub> |
| 152DC1-SA | DD  | 55 | 45 | -  | 32 <sup>+0</sup> <sub>-0.016</sub> | 8 | 5   | 10 |       | 377.5 | 313.5 | 64 | -  | 8  | 135 | 110 <sup>+0</sup> <sub>-0.035</sub> |
| 202DC1-SA | DE  | 55 | 45 | -  | 32 <sup>+0</sup> <sub>-0.016</sub> | 8 | 5   | 10 |       | 431.5 | 354.5 | 77 | -  | 20 | 160 | 130 <sup>+0</sup> <sub>-0.04</sub>  |
|           |     |    |    |    |                                    |   |     |    |       |       |       |    |    |    |     |                                     |

(\*1) Screw hole (metric diameter x depth) of shaft extension (\*2) Insulating protection tube

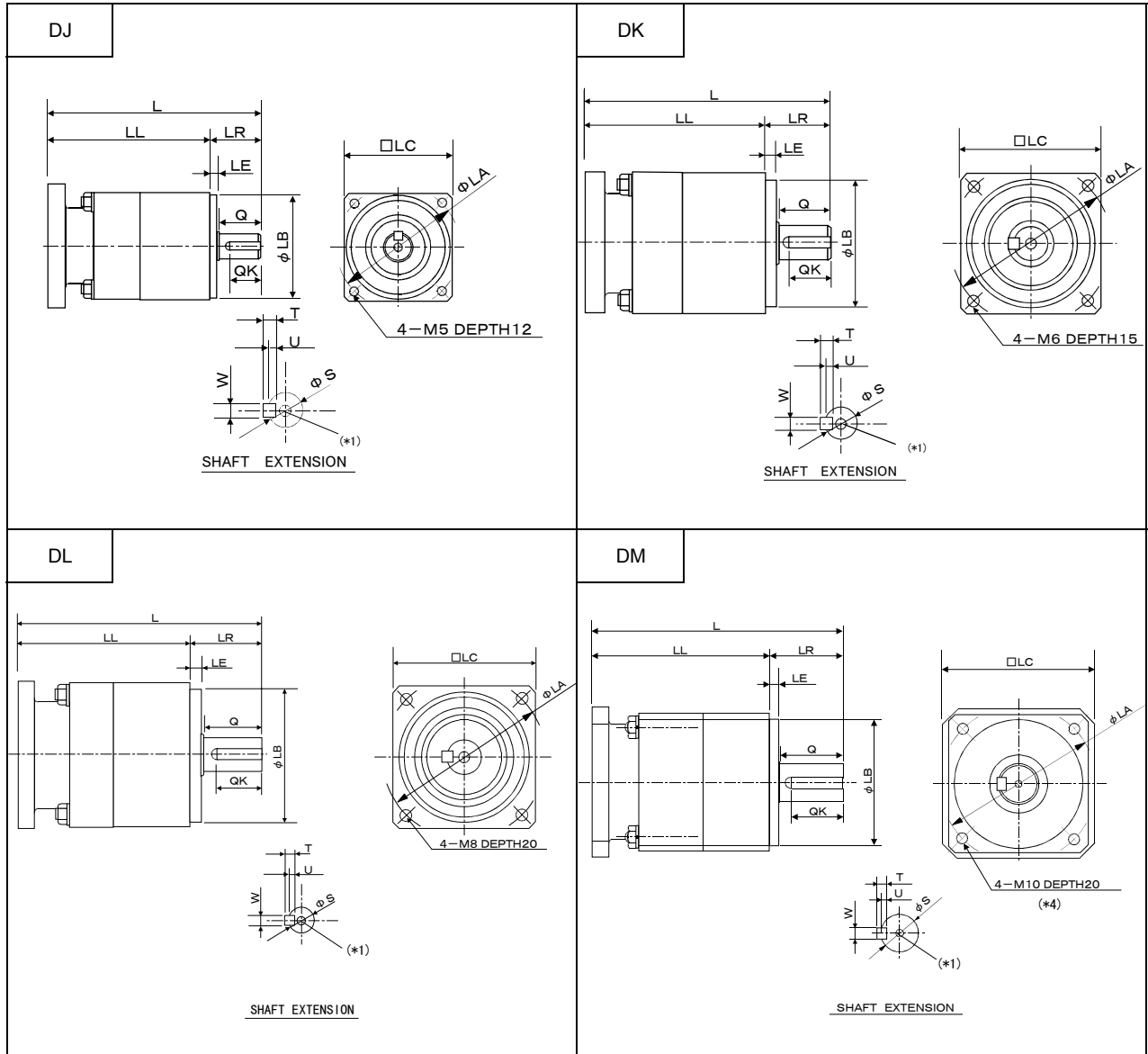
(d) With providing speed reduction gear unit, GYC cubic type, gear ratio 1/25 (for 101 to 751 types) or 1/15 (for 102 to 202 types), (cont'd)  
 GYC101 to 202DC1-SA type, and gear head, 0.1 to 2 [kW]



|  | LC  | L1 | L2 | L3 | LZ | IE | IL | C | KB1 | KB2 | Mass [kg] |
|--|-----|----|----|----|----|----|----|---|-----|-----|-----------|
|  | 52  | -  | -  | -  | -  | -  | -  | - | -   | -   | 1.47      |
|  | 78  | -  | -  | -  | -  | -  | -  | - | -   | -   | 3.4       |
|  | 78  | -  | -  | -  | -  | -  | -  | - | -   | -   | 4.0       |
|  | 98  | -  | -  | -  | -  | -  | -  | - | -   | -   | 7.3       |
|  | 120 | -  | -  | -  | -  | -  | -  | - | -   | -   | 13.3      |
|  | 120 | -  | -  | -  | -  | -  | -  | - | -   | -   | 14.8      |
|  | 140 | -  | -  | -  | -  | -  | -  | - | -   | -   | 20.4      |
|  |     |    |    |    |    |    |    |   |     |     |           |
|  |     |    |    |    |    |    |    |   |     |     |           |



(e) Gear-head unit for GYC cubic type motor, gear ratio 1/9  
 GYN101 to 202CAG - G09 type, 0.1 to 2 [kW]

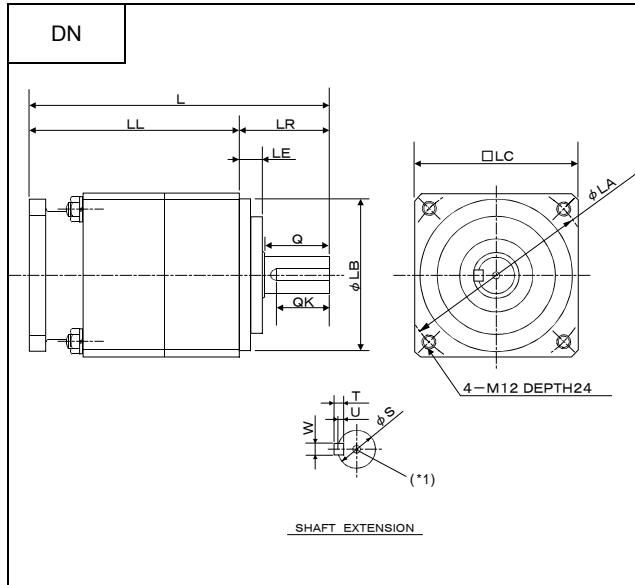


| Type<br>GYN | G09 | Fig | Q  | QK | QR | $\phi S$           | T | U   | W  | (*1)  | L   | LL  | LR | LG | LE | $\phi LA$ | $\phi LB$           | □LC | Mass<br>[kg] |
|-------------|-----|-----|----|----|----|--------------------|---|-----|----|-------|-----|-----|----|----|----|-----------|---------------------|-----|--------------|
| 101CAG-     |     | DJ  | 20 | 15 | -  | $12^{+0}_{-0.011}$ | 4 | 2.5 | 4  | M4x8  | 103 | 78  | 25 | -  | 4  | 60        | $50^{+0}_{-0.025}$  | 52  | 0.72         |
| 201CAG-     |     | DK  | 30 | 23 | -  | $19^{+0}_{-0.013}$ | 6 | 3.5 | 6  | M5x13 | 136 | 99  | 37 | -  | 6  | 90        | $70^{+0}_{-0.03}$   | 78  | 2.1          |
| 401CAG-     |     | DK  | 30 | 23 | -  | $19^{+0}_{-0.013}$ | 6 | 3.5 | 6  | M5x13 | 136 | 99  | 37 | -  | 6  | 90        | $70^{+0}_{-0.03}$   | 78  | 2.1          |
| 751CAG-     |     | DL  | 40 | 30 | -  | $24^{+0}_{-0.013}$ | 7 | 4   | 8  | M6x15 | 166 | 117 | 49 | -  | 8  | 115       | $90^{+0}_{-0.035}$  | 98  | 3.8          |
| 102CAG-     |     | DM  | 55 | 45 | -  | $32^{+0}_{-0.016}$ | 8 | 5   | 10 | M6x15 | 219 | 155 | 64 | -  | 8  | 135       | $110^{+0}_{-0.035}$ | 120 | 7.8          |
| 152CAG-     |     | DM  | 55 | 45 | -  | $32^{+0}_{-0.016}$ | 8 | 5   | 10 | M6x15 | 219 | 155 | 64 | -  | 8  | 135       | $110^{+0}_{-0.035}$ | 120 | 7.8          |
| 202CAG-     |     | DN  | 55 | 45 | -  | $32^{+0}_{-0.016}$ | 8 | 5   | 10 |       | 258 | 181 | 77 | -  | 20 | 160       | $130^{+0}_{-0.04}$  | 140 | 12.2         |
| -           |     |     |    |    |    |                    |   |     |    |       |     |     |    |    |    |           |                     |     |              |
| -           |     |     |    |    |    |                    |   |     |    |       |     |     |    |    |    |           |                     |     |              |
| -           |     |     |    |    |    |                    |   |     |    |       |     |     |    |    |    |           |                     |     |              |

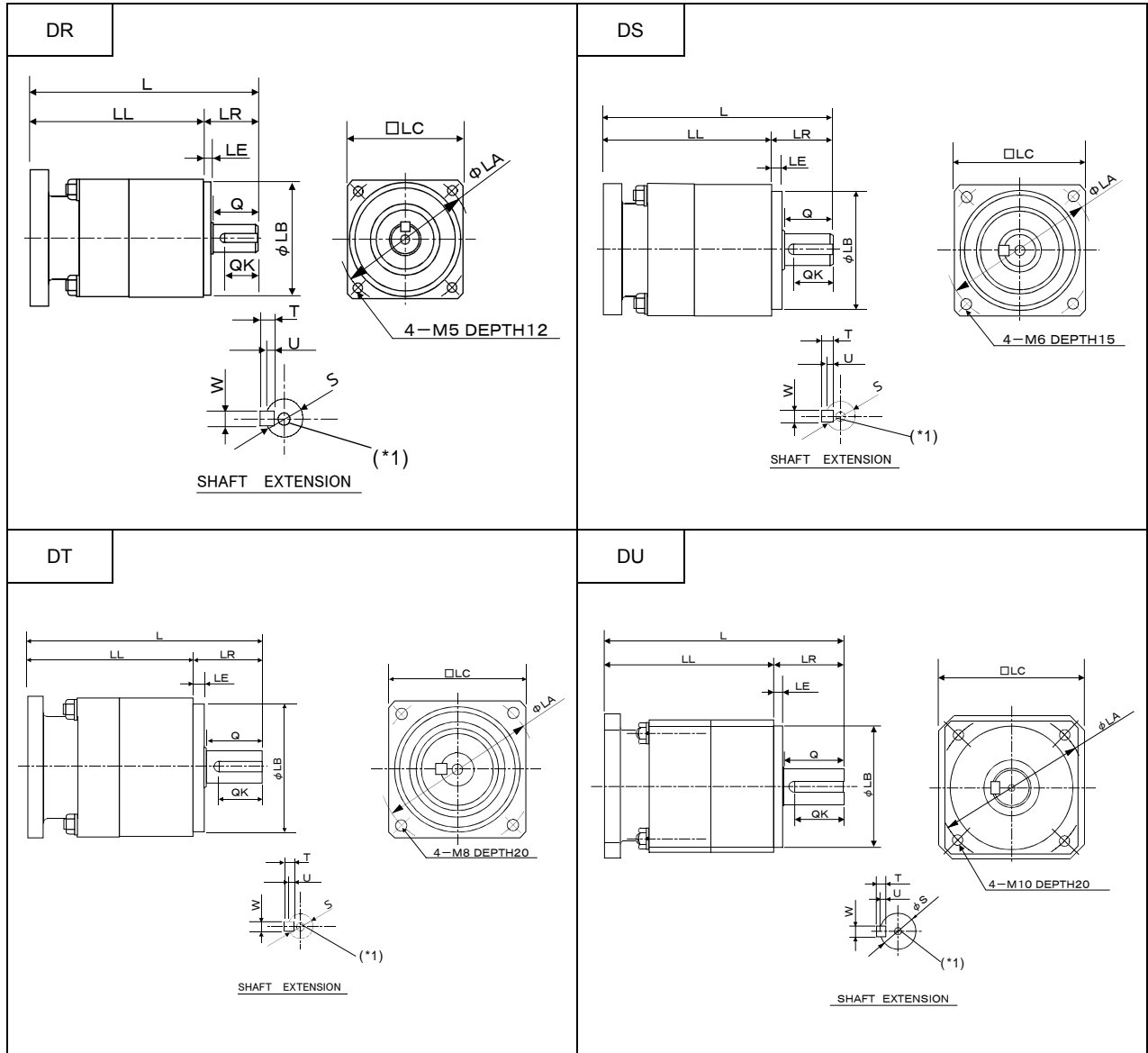
(\*1) Screw hole (metric diameter x depth) of shaft extension

(\*4) For 152 type, 1.5 [kW] : 4 - M12 x 24 DEPTH

(e) Gear-head unit for GYC cubic type motor, gear ratio 1/9 (cont'd)  
GYN101 to 202CAG-G09 type, 0.1 to 2 [kW]



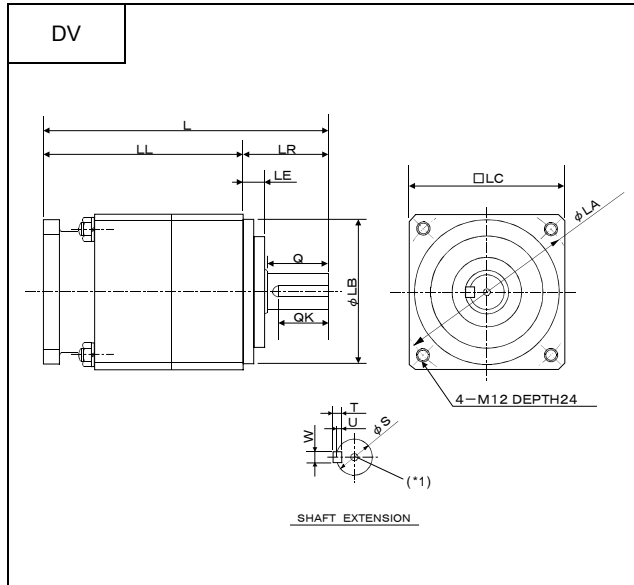
(f) Gear-head unit for GYC cubic type motor, gear ratio 1/25 (for 101 to 751 types) or 1/15 (for 102 to 202 types)  
 GYN101 to 202CAG - G25 or G15, 0.1 to 2 [kW]



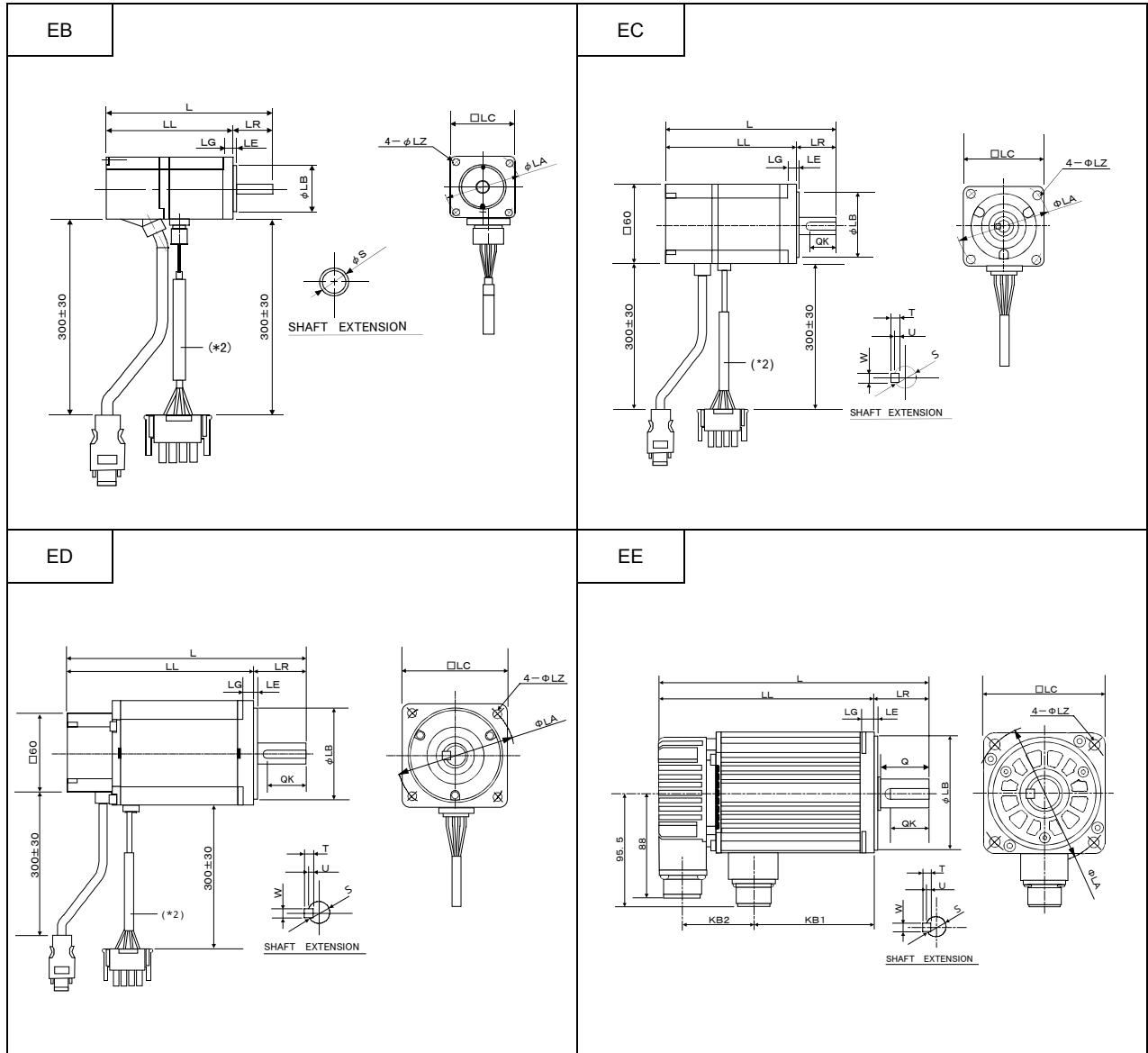
| Type<br>GYN | Fig | Q  | QK | QR | S                                  | T | U   | W  | (*1)  | L   | LL  | LR | LG | LE | LA  | LB                                  | LC  | Mass<br>[kg] |
|-------------|-----|----|----|----|------------------------------------|---|-----|----|-------|-----|-----|----|----|----|-----|-------------------------------------|-----|--------------|
| 101CAG-G25  | DR  | 20 | 15 | -  | 12 <sup>+0</sup> <sub>-0.011</sub> | 4 | 2.5 | 4  | M4x8  | 103 | 78  | 25 | -  | 4  | 60  | 50 <sup>+0</sup> <sub>-0.025</sub>  | 52  | 0.72         |
| 201CAG-G25  | DS  | 30 | 23 | -  | 19 <sup>+0</sup> <sub>-0.013</sub> | 6 | 3.5 | 6  | M5x13 | 136 | 99  | 37 | -  | 6  | 90  | 70 <sup>+0</sup> <sub>-0.03</sub>   | 78  | 2.1          |
| 401CAG-G25  | DS  | 30 | 23 | -  | 19 <sup>+0</sup> <sub>-0.013</sub> | 6 | 3.5 | 6  | M5x13 | 136 | 99  | 37 | -  | 6  | 90  | 70 <sup>+0</sup> <sub>-0.03</sub>   | 78  | 2.1          |
| 751CAG-G25  | DT  | 40 | 30 | -  | 24 <sup>+0</sup> <sub>-0.013</sub> | 7 | 4   | 8  | M6x15 | 166 | 117 | 49 | -  | 8  | 115 | 90 <sup>+0</sup> <sub>-0.035</sub>  | 98  | 3.8          |
| 102CAG-G15  | DU  | 55 | 45 | -  | 32 <sup>+0</sup> <sub>-0.016</sub> | 8 | 5   | 10 |       | 219 | 155 | 64 | -  | 8  | 135 | 110 <sup>+0</sup> <sub>-0.035</sub> | 120 | 7.8          |
| 152CAG-G15  | DU  | 55 | 45 | -  | 32 <sup>+0</sup> <sub>-0.016</sub> | 8 | 5   | 10 |       | 219 | 155 | 64 | -  | 8  | 135 | 110 <sup>+0</sup> <sub>-0.035</sub> | 120 | 7.8          |
| 202CAG-G15  | DV  | 55 | 45 | -  | 32 <sup>+0</sup> <sub>-0.016</sub> | 8 | 5   | 10 |       | 258 | 181 | 77 | -  | 20 | 160 | 130 <sup>+0</sup> <sub>-0.04</sub>  | 140 | 12.2         |
| -           | -   | -  | -  | -  | -                                  | - | -   | -  | -     | -   | -   | -  | -  | -  | -   | -                                   | -   | -            |
| -           | -   | -  | -  | -  | -                                  | - | -   | -  | -     | -   | -   | -  | -  | -  | -   | -                                   | -   | -            |
| -           | -   | -  | -  | -  | -                                  | - | -   | -  | -     | -   | -   | -  | -  | -  | -   | -                                   | -   | -            |

(\*1) Screw hole (metric diameter x depth) of shaft extension

(f) Gear-head unit for GYC cubic type motor, gear ratio 1/25 (for 101 to 751 types) or 1/15 (for 102 to 202 types) (cont'd)  
GYN101 to 202CAG-G25 or G15, 0.1 to 2 [kW]



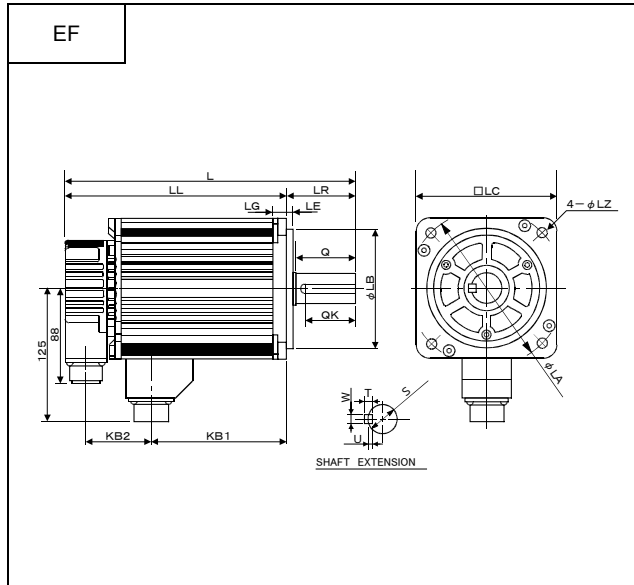
(g) Basic design, GYS slim type  
 GYS300 to 502DC1-S8B, SB or SA type, 0.03 to 5 [kW]



| Type       | Fig | Q  | QK | QR | S (*3) | T | U | W | (*1) | L     | LL    | LR | LG | LE  | LA  | LB (*3) |
|------------|-----|----|----|----|--------|---|---|---|------|-------|-------|----|----|-----|-----|---------|
| GYS        |     |    |    |    |        |   |   |   |      |       |       |    |    |     |     |         |
| 300DC1-S8B |     |    |    |    |        |   |   |   |      |       |       |    |    |     |     |         |
| 500DC1-S8B | EB  | -  | -  | -  | 6h6    | - | - | - | -    | 103   | 78    | 25 | 5  | 2.5 | 46  | 30h7    |
| 101DC1-SB  | EB  | -  | -  | -  | 8h6    | - | - | - | -    | 121   | 96    | 25 | 5  | 2.5 | 46  | 30h7    |
| 201DC1-SA  | EC  | -  | 20 | -  | 14h6   | 5 | 3 | 5 | -    | 126.5 | 96.5  | 30 | 6  | 3   | 70  | 50h7    |
| 401DC1-SA  | EC  | -  | 20 | -  | 14h6   | 5 | 3 | 5 | -    | 154.5 | 124.5 | 30 | 6  | 3   | 70  | 50h7    |
| 751DC1-SA  | ED  | -  | 30 | -  | 16h6   | 5 | 3 | 5 | -    | 180   | 140   | 40 | 8  | 3   | 90  | 70h7    |
| 102DC1-SA  | EE  | 40 | 32 | -  | 24h6   | 7 | 4 | 8 | -    | 198   | 153   | 45 | 10 | 3   | 115 | 95h7    |
| 152DC1-SA  | EE  | 40 | 32 | -  | 24h6   | 7 | 4 | 8 | -    | 220.5 | 175.5 | 45 | 10 | 3   | 115 | 95h7    |
| 202DC1-SA  | EE  | 40 | 32 | -  | 24h6   | 7 | 4 | 8 | -    | 243   | 198   | 45 | 10 | 3   | 115 | 95h7    |
| 302DC1-SA  | EF  | 55 | 46 | -  | 28h6   | 7 | 4 | 8 | -    | 266.5 | 203.5 | 63 | 12 | 6   | 145 | 110h7   |
| 402DC1-SA  | EF  | 55 | 46 | -  | 28h6   | 7 | 4 | 8 | -    | 296.5 | 233.5 | 63 | 12 | 6   | 145 | 110h7   |
| 502DC1-SA  | EF  | 55 | 46 | -  | 28h6   | 7 | 4 | 8 | -    | 326.5 | 263.5 | 63 | 12 | 6   | 145 | 110h7   |

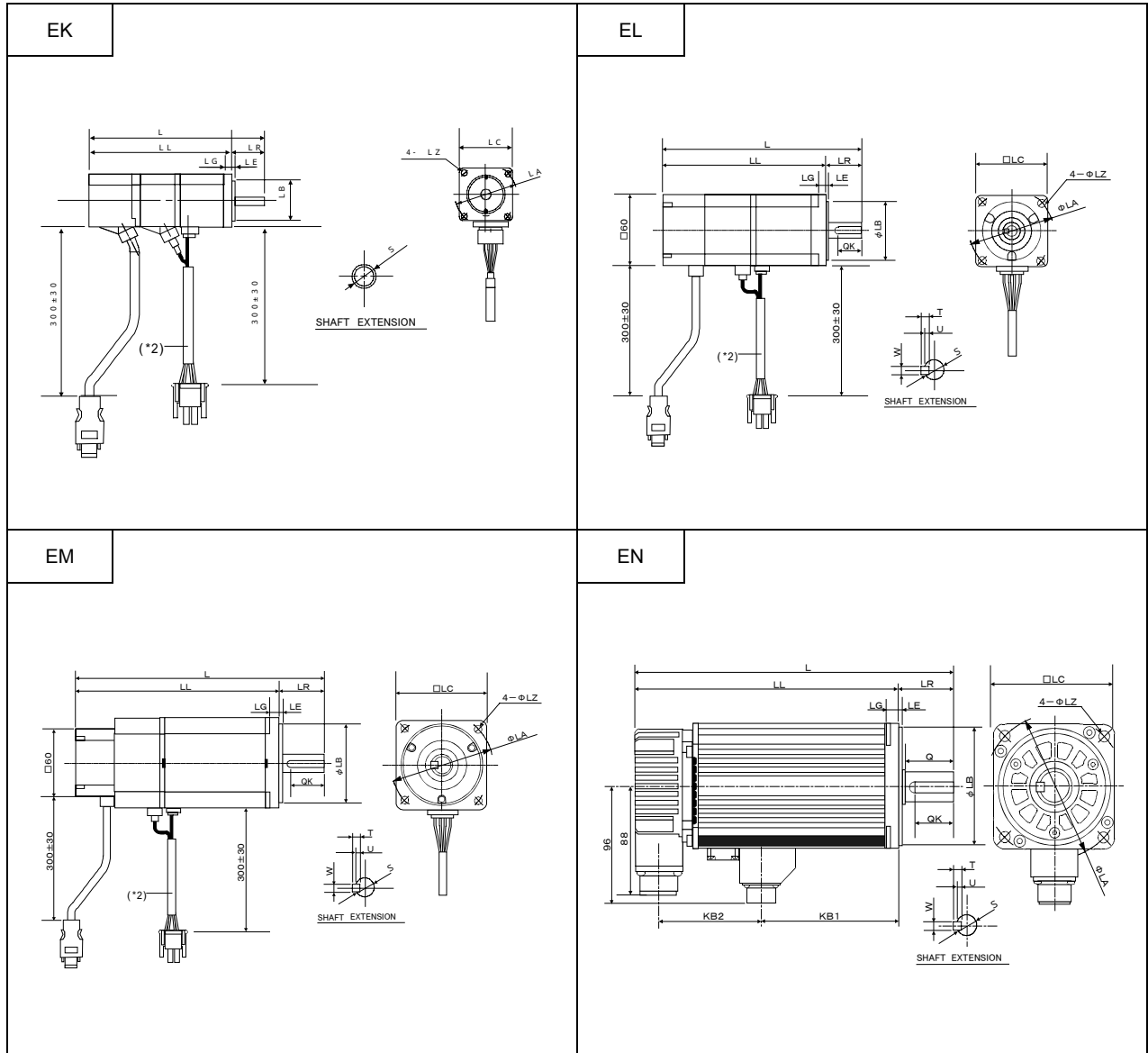
(\*1) Screw hole (metric diameter x depth) of shaft extension (\*2) Insulating protection tube  
 (\*3) Shaft extension ( S ) and flanged spigot ( LB ) are machining finished with h6 or h7 fits.

(g) Basic design, GYS slim type (cont'd)  
 GYS300 to 502DC1-S8B, SB or SA type, 0.03 to 5 [kW]



|  | LC  | L1 | L2 | L3 | LZ  | IE | IL | C | KB1   | KB2 | Mass [kg] |
|--|-----|----|----|----|-----|----|----|---|-------|-----|-----------|
|  | 40  | -  | -  | -  | 4.3 | -  | -  | - | -     | -   | 0.45      |
|  | 40  | -  | -  | -  | 4.3 | -  | -  | - | -     | -   | 0.55      |
|  | 60  | -  | -  | -  | 5.5 | -  | -  | - | -     | -   | 1.2       |
|  | 60  | -  | -  | -  | 5.5 | -  | -  | - | -     | -   | 1.8       |
|  | 80  | -  | -  | -  | 7   | -  | -  | - | -     | -   | 3.4       |
|  | 100 | -  | -  | -  | 9   | -  | -  | - | 77    | 57  | 4.4       |
|  | 100 | -  | -  | -  | 9   | -  | -  | - | 99.5  | 57  | 5.2       |
|  | 100 | -  | -  | -  | 9   | -  | -  | - | 122   | 57  | 6.3       |
|  | 130 | -  | -  | -  | 9   | -  | -  | - | 122.5 | 59  | 11.0      |
|  | 130 | -  | -  | -  | 9   | -  | -  | - | 155.5 | 59  | 13.5      |
|  | 130 | -  | -  | -  | 9   | -  | -  | - | 185.5 | 59  | 16.0      |

(h) With providing brake, GYS slim type  
 GYS300 to 502DC1-S8B, SB or SA-B type, 0.03 to 5 [kW]

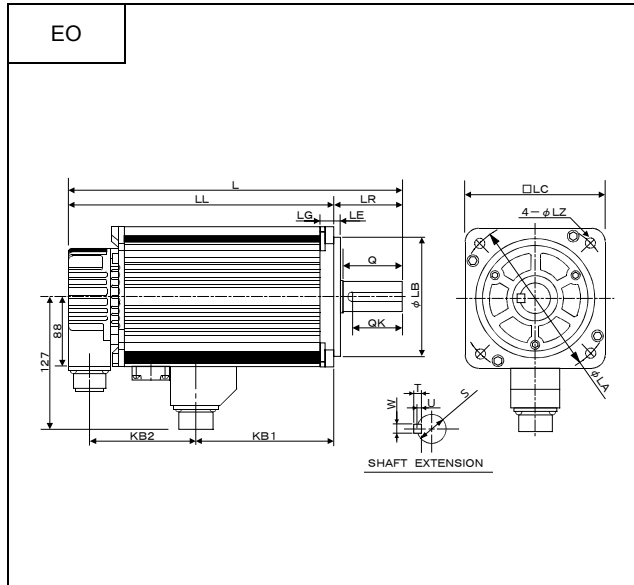


| Type<br>GYS | Fig | Q  | QK | QR | S<br>(*3) | T | U | W | (*1) | L     | LL    | LR | LG  | LE  | LA  | LB<br>(*3) |
|-------------|-----|----|----|----|-----------|---|---|---|------|-------|-------|----|-----|-----|-----|------------|
| 300DC1-S8-B |     |    |    |    |           |   |   |   |      |       |       |    |     |     |     |            |
| 500DC1-S8-B | EK  | -  | -  | -  | 6h6       | - | - | - | -    | 140   | 115   | 25 | 2.5 | 2.5 | 46  | 30h7       |
| 101DC1-SB-B | EK  | -  | -  | -  | 8h6       | - | - | - | -    | 158   | 133   | 25 | 2.5 | 2.5 | 46  | 30h7       |
| 201DC1-SA-B | EL  | -  | 20 | -  | 14h6      | 5 | 3 | 5 | -    | 165   | 135   | 30 | 6   | 3   | 70  | 50h7       |
| 401DC1-SA-B | EL  | -  | 20 | -  | 14h6      | 5 | 3 | 5 | -    | 193   | 163   | 30 | 6   | 3   | 70  | 50h7       |
| 751DC1-SA-B | EM  | -  | 30 | -  | 16h6      | 5 | 3 | 5 | -    | 216.5 | 176.5 | 40 | 8   | 3   | 90  | 70h7       |
| 102DC1-SA-B | EN  | 40 | 32 | -  | 24h6      | 7 | 4 | 8 | -    | 239   | 194   | 45 | 10  | 3   | 115 | 95h7       |
| 152DC1-SA-B | EN  | 40 | 32 | -  | 24h6      | 7 | 4 | 8 | -    | 261.5 | 216.5 | 45 | 10  | 3   | 115 | 95h7       |
| 202DC1-SA-B | EN  | 40 | 32 | -  | 24h6      | 7 | 4 | 8 | -    | 284   | 239   | 45 | 10  | 3   | 115 | 95h7       |
| 302DC1-SA-B | EO  | 55 | 46 | -  | 28h6      | 7 | 4 | 8 | -    | 308.5 | 245.5 | 63 | 12  | 6   | 145 | 110h7      |
| 402DC1-SA-B | EO  | 55 | 46 | -  | 28h6      | 7 | 4 | 8 | -    | 338.5 | 275.5 | 63 | 12  | 6   | 145 | 110h7      |
| 502DC1-SA-B | EO  | 55 | 46 | -  | 28h6      | 7 | 4 | 8 | -    | 368.5 | 305.5 | 63 | 12  | 6   | 145 | 110h7      |

(\*1) Screw hole (metric diameter x depth) of shaft extension (\*2) Insulating protection tube

(\*3) Shaft extension ( S) and flanged spigot ( LB) are machining finished with h6 or h7 fits.

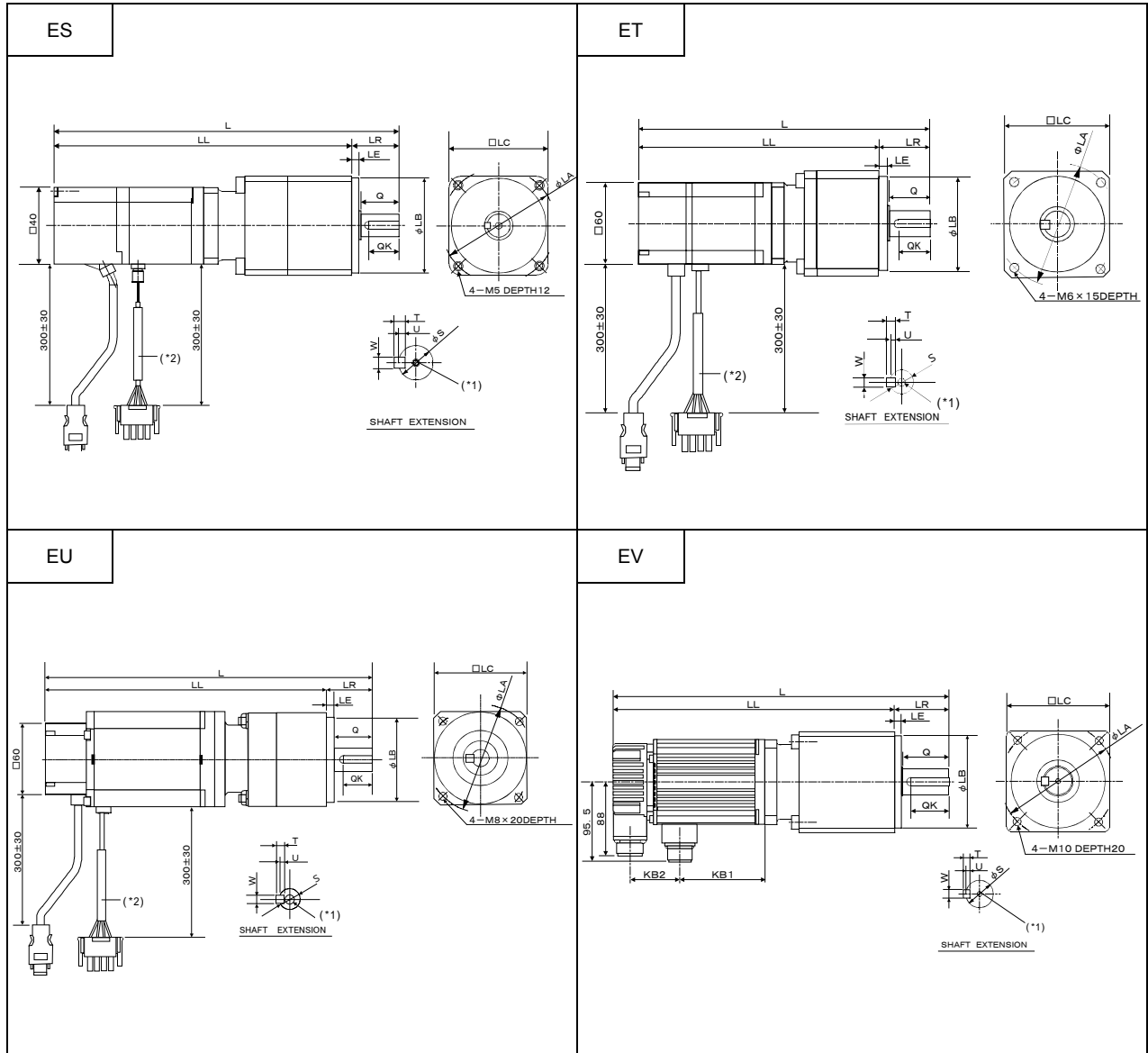
(h) With providing brake, GYS slim type, (cont'd)  
 GYS300 to 502DC1-S8B, SB or SA-B type, 0.03 to 5 [kW]



|     | LC  | L1 | L2 | L3 | LZ  | IE | IL | C | KB1   | KB2 | Mass [kg] |
|-----|-----|----|----|----|-----|----|----|---|-------|-----|-----------|
| --- | 40  | -  | -  | -  | 4.3 | -  | -  | - | -     | -   | 0.6       |
| --- | 40  | -  | -  | -  | 4.3 | -  | -  | - | -     | -   | 0.7       |
| --- | 60  | -  | -  | -  | 5.5 | -  | -  | - | -     | -   | 1.7       |
| --- | 60  | -  | -  | -  | 5.5 | -  | -  | - | -     | -   | 2.3       |
| --- | 80  | -  | -  | -  | 7   | -  | -  | - | -     | -   | 4.2       |
| --- | 100 | -  | -  | -  | 9   | -  | -  | - | 79    | 96  | 5.9       |
| --- | 100 | -  | -  | -  | 9   | -  | -  | - | 101.5 | 96  | 6.8       |
| --- | 100 | -  | -  | -  | 9   | -  | -  | - | 124   | 96  | 7.9       |
| --- | 130 | -  | -  | -  | 9   | -  | -  | - | 127.5 | 99  | 13.0      |
| --- | 130 | -  | -  | -  | 9   | -  | -  | - | 157.5 | 99  | 15.5      |
| --- | 130 | -  | -  | -  | 9   | -  | -  | - | 187.5 | 99  | 18.0      |



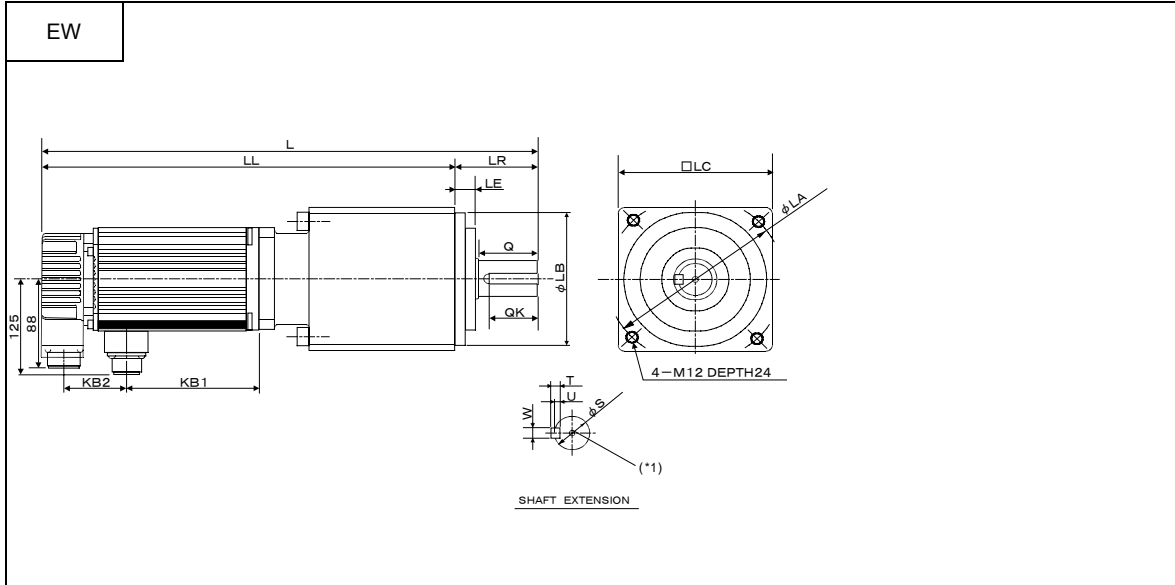
(i) With providing speed reduction gear unit, GYS slim type, gear ratio 1/9  
 GYS300 to 502DC1-S8B, SB or SA type, and gear head, 0.03 to 5 [kW]



| Type       | Fig | Q  | QK | QR | S<br>(*3) | T | U   | W  | (*1)  | L     | LL    | LR | LG | LE | LA  | LB<br>(*3) |
|------------|-----|----|----|----|-----------|---|-----|----|-------|-------|-------|----|----|----|-----|------------|
| GYS        |     |    |    |    |           |   |     |    |       |       |       |    |    |    |     |            |
| 300DC1-S8B |     |    |    |    |           |   |     |    |       |       |       |    |    |    |     |            |
| 500DC1-S8B | ES  | 20 | 16 | -  | 12h6      | 4 | 2.5 | 4  |       | 208   | 197   | 21 | -  | 4  | 60  | 50h7       |
| 101DC1-SB  | ES  | 20 | 16 | -  | 12h6      | 4 | 2.5 | 4  |       | 236   | 215   | 21 | -  | 4  | 60  | 50h7       |
| 201DC1-SA  | ET  | 30 | 23 | -  | 19h6      | 6 | 3.5 | 6  | M4x8  | 232.5 | 195.5 | 37 | -  | 6  | 90  | 70h7       |
| 401DC1-SA  | ET  | 30 | 23 | -  | 19h6      | 6 | 3.5 | 6  | M4x8  | 260.5 | 223.5 | 37 | -  | 6  | 90  | 70h7       |
| 751DC1-SA  | EU  | 40 | 31 | -  | 24h6      | 7 | 4   | 8  | M6x15 | 306   | 257   | 49 | -  | 8  | 115 | 90h7       |
| 102DC1-SA  | EV  | 55 | 45 | -  | 32h6      | 8 | 5   | 10 |       | 372   | 308   | 64 | -  | 8  | 135 | 110h7      |
| 152DC1-SA  | EV  | 55 | 45 | -  | 32h6      | 8 | 5   | 10 |       | 394.5 | 330.5 | 64 | -  | 8  | 135 | 110h7      |
| 202DC1-SA  | EW  | 55 | 45 | -  | 32h6      | 8 | 5   | 10 |       | 456   | 379   | 77 | -  | 20 | 160 | 130h7      |
| 302DC1-SA  |     |    |    |    |           |   |     |    |       |       |       |    |    |    |     |            |
| 402DC1-SA  |     |    |    |    |           |   |     |    |       |       |       |    |    |    |     |            |
| 502DC1-SA  |     |    |    |    |           |   |     |    |       |       |       |    |    |    |     |            |

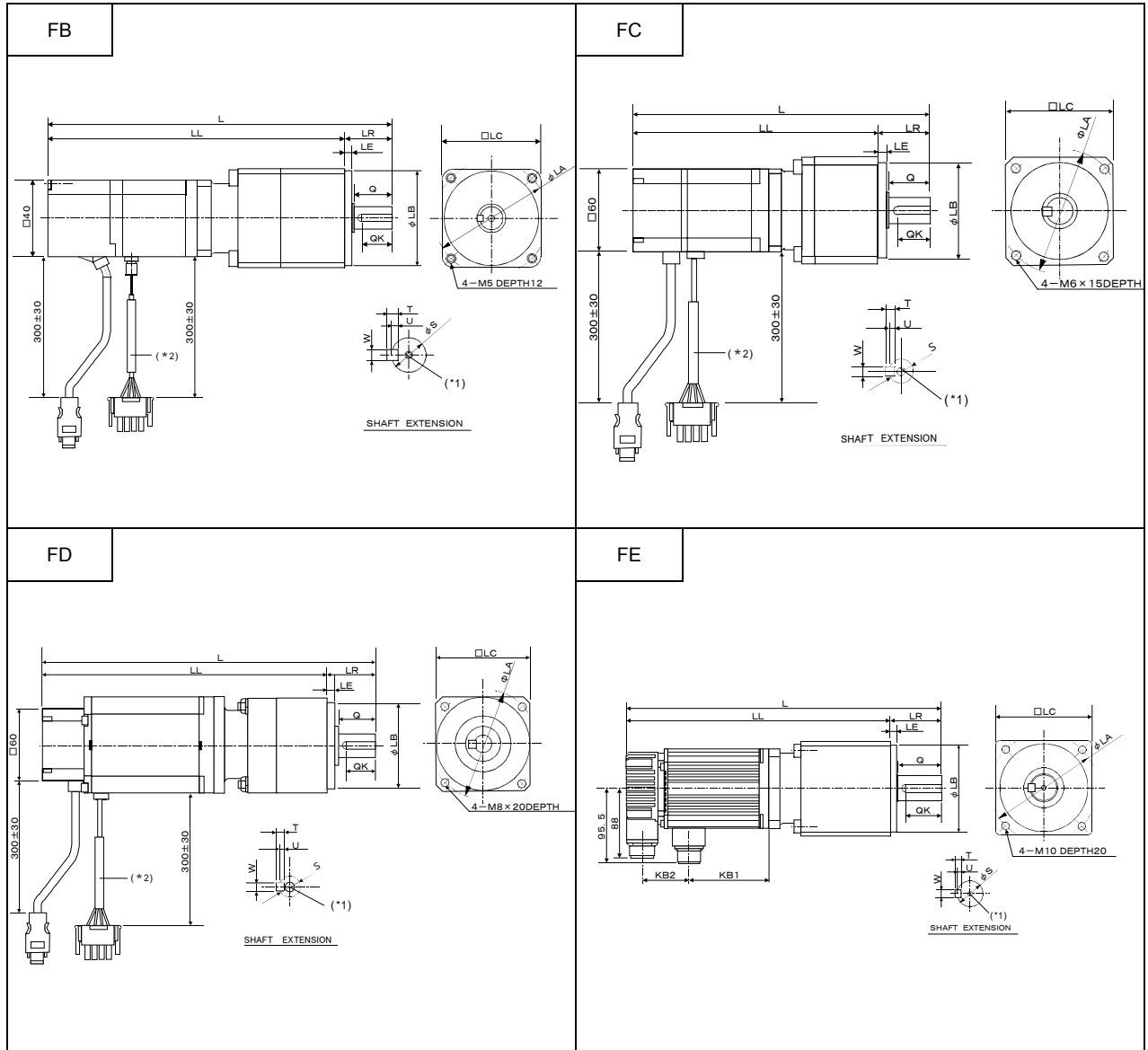
(\*1) Screw hole (metric diameter x depth) of shaft extension (\*2) Insulating protection tube  
 (\*3) Shaft extension ( S) and flanged spigot ( LB) are machining finished with h6 or h7 fits.

(i) With providing speed reduction gear unit, GYS slim type, gear ratio 1/9 (cont'd)  
 GYS300 to 502DC1-S8B, SB or SA type, and gear head, 0.03 to 5 [kW]



|  | LC  | L1 | L2 | L3 | LZ | IE | IL | C | KB1  | KB2 | Mass [kg] |
|--|-----|----|----|----|----|----|----|---|------|-----|-----------|
|  | 52  | -  | -  | -  | -  | -  | -  | - | -    | -   | 1.15      |
|  | 52  | -  | -  | -  | -  | -  | -  | - | -    | -   | 1.25      |
|  | 78  | -  | -  | -  | -  | -  | -  | - | -    | -   | 3.3       |
|  | 78  | -  | -  | -  | -  | -  | -  | - | -    | -   | 3.9       |
|  | 98  | -  | -  | -  | -  | -  | -  | - | -    | -   | 7.2       |
|  | 120 | -  | -  | -  | -  | -  | -  | - | 77   | 57  | 12.2      |
|  | 120 | -  | -  | -  | -  | -  | -  | - | 99.5 | 57  | 13.0      |
|  | 140 | -  | -  | -  | -  | -  | -  | - | 122  | 57  | 18.5      |
|  |     |    |    |    |    |    |    |   |      |     |           |
|  |     |    |    |    |    |    |    |   |      |     |           |
|  |     |    |    |    |    |    |    |   |      |     |           |

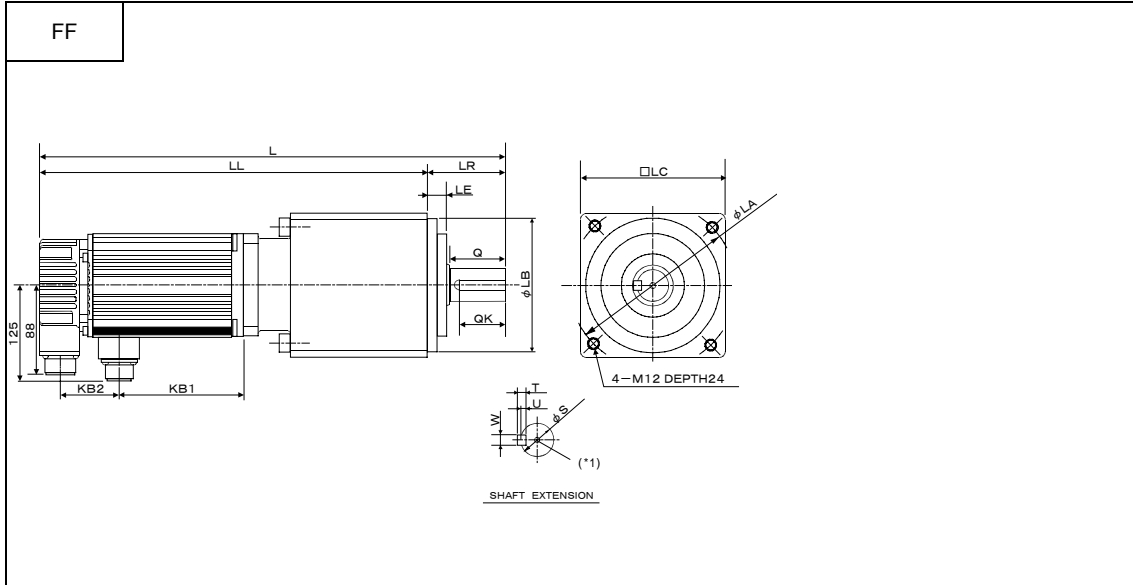
(j) With providing speed reduction gear unit, GYS slim type, gear ratio 1/25 or 1/15 ( for 102 to 202 types)  
 GYS300 to 502DC1-S8B, SB or SA type, and gear head, 0.03 to 5 [kW]



| Type<br>GYS | Fig | Q  | QK | QR | S<br>(*3) | T | U   | W  | (*1)  | L     | LL    | LR | LG | LE | LA  | LB<br>(*3) |
|-------------|-----|----|----|----|-----------|---|-----|----|-------|-------|-------|----|----|----|-----|------------|
| 300DC1-S8B  |     |    |    |    |           |   |     |    |       |       |       |    |    |    |     |            |
| 500DC1-S8B  | FB  | 20 | 16 | -  | 12h6      | 4 | 2.5 | 4  |       | 208   | 197   | 21 | -  | 4  | 60  | 50h7       |
| 101DC1-SB   | EB  | 20 | 16 | -  | 12h6      | 4 | 2.5 | 4  |       | 236   | 215   | 21 | -  | 4  | 60  | 50h7       |
| 201DC1-SA   | FC  | 30 | 23 | -  | 19h6      | 6 | 3.5 | 6  | M4x8  | 232.5 | 195.5 | 37 | -  | 6  | 90  | 70h7       |
| 401DC1-SA   | FC  | 30 | 23 | -  | 19h6      | 6 | 3.5 | 6  | M4x8  | 260.5 | 223.5 | 37 | -  | 6  | 90  | 70h7       |
| 751DC1-SA   | FD  | 40 | 31 | -  | 24h6      | 7 | 4   | 8  | M6x15 | 306   | 257   | 49 | -  | 8  | 115 | 90h7       |
| 102DC1-SA   | FE  | 55 | 45 | -  | 32h6      | 8 | 5   | 10 |       | 372   | 308   | 64 | -  | 8  | 135 | 110h7      |
| 152DC1-SA   | FE  | 55 | 45 | -  | 32h6      | 8 | 5   | 10 |       | 394.5 | 330.5 | 64 | -  | 8  | 135 | 110h7      |
| 202DC1-SA   | FF  | 55 | 45 | -  | 32h6      | 8 | 5   | 10 |       | 456   | 379   | 77 | -  | 20 | 160 | 130h7      |
| 302DC1-SA   |     |    |    |    |           |   |     |    |       |       |       |    |    |    |     |            |
| 402DC1-SA   |     |    |    |    |           |   |     |    |       |       |       |    |    |    |     |            |
| 502DC1-SA   |     |    |    |    |           |   |     |    |       |       |       |    |    |    |     |            |

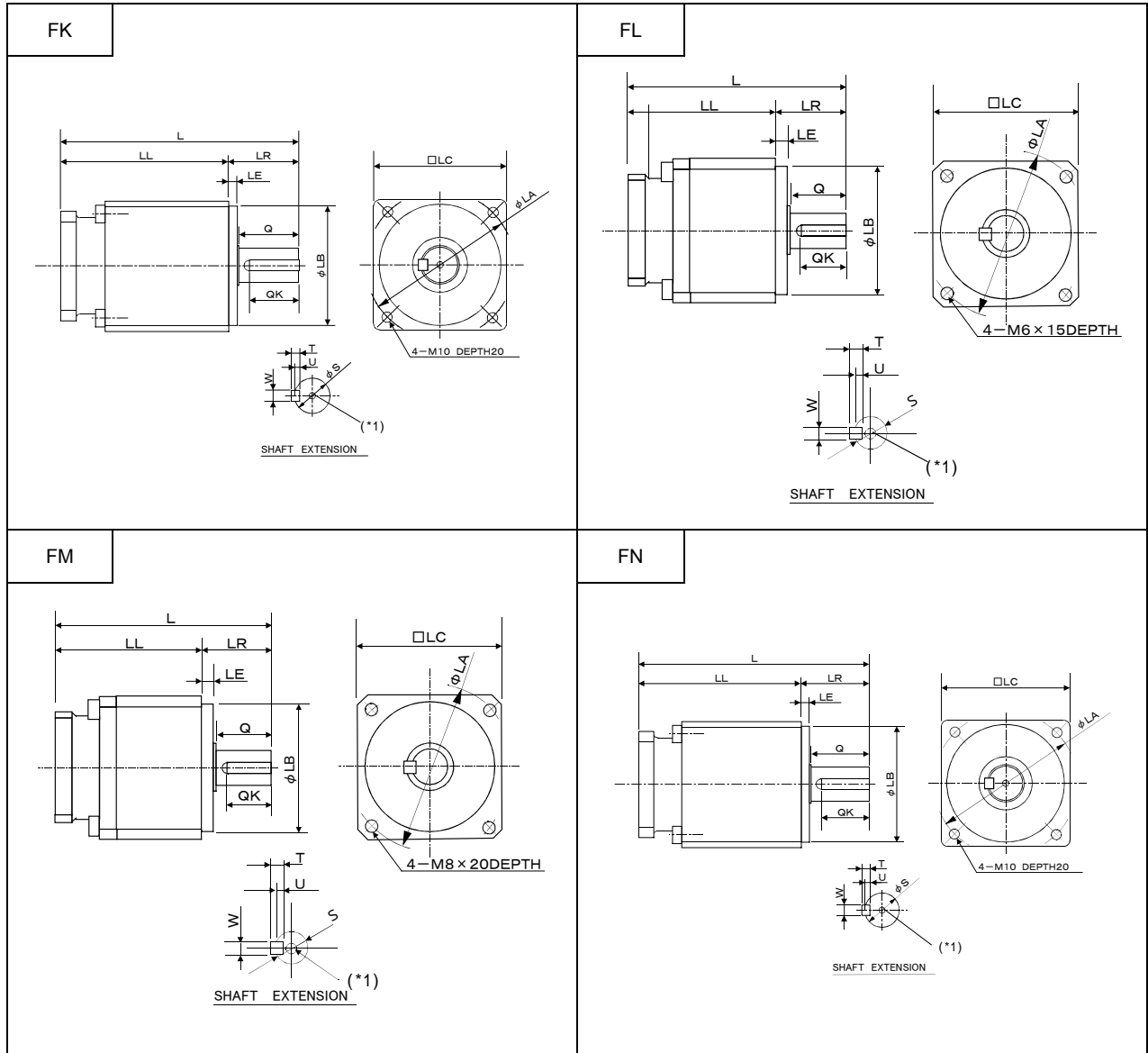
(\*1) Screw hole (metric diameter x depth) of shaft extension (\*2) Insulating protection tube  
 (\*3) Shaft extension ( S) and flanged spigot ( LB) are machining finished with h6 or h7 fits.

(j) With providing speed reduction gear unit, GYS slim type, gear ratio 1/25 or 1/15 ( for 102 to 202 types) (cont'd)  
 GYS300 to 502DC1-S8B, SB or SA type, and gear head, 0.03 to 5 [kW]



|  | LC  | L1 | L2 | L3 | LZ | IE | IL | C | KB1  | KB2 | Mass [kg] |
|--|-----|----|----|----|----|----|----|---|------|-----|-----------|
|  | 52  | -  | -  | -  | -  | -  | -  | - | -    | -   | 1.15      |
|  | 52  | -  | -  | -  | -  | -  | -  | - | -    | -   | 1.25      |
|  | 78  | -  | -  | -  | -  | -  | -  | - | -    | -   | 3.3       |
|  | 78  | -  | -  | -  | -  | -  | -  | - | -    | -   | 3.9       |
|  | 98  | -  | -  | -  | -  | -  | -  | - | -    | -   | 7.2       |
|  | 120 | -  | -  | -  | -  | -  | -  | - | 77   | 57  | 12.2      |
|  | 120 | -  | -  | -  | -  | -  | -  | - | 99.5 | 57  | 13.0      |
|  | 140 | -  | -  | -  | -  | -  | -  | - | 122  | 57  | 18.5      |
|  |     |    |    |    |    |    |    |   |      |     |           |
|  |     |    |    |    |    |    |    |   |      |     |           |
|  |     |    |    |    |    |    |    |   |      |     |           |

(k) Gear-head unit for GYS slim type motor, gear ratio 1/9  
 GYN300 to 101 and 751 to 502, GRN.20 to .40SAG-G09, 0.03 to 5 [kW]

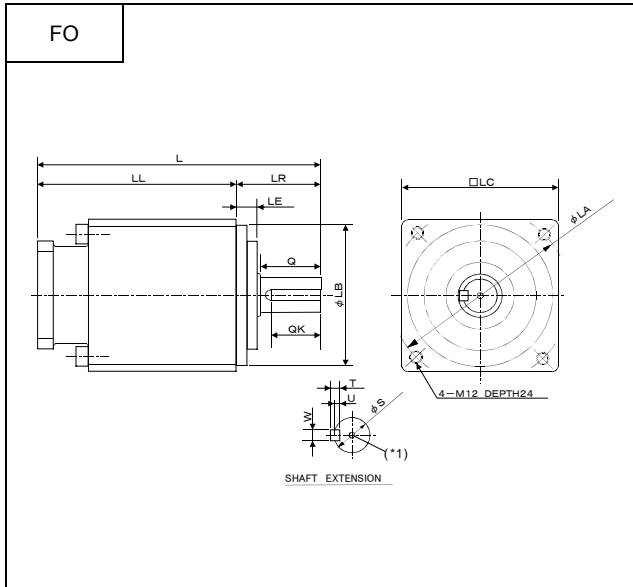


| Type       | Fig | Q  | QK | QR | S (*3) | T | U   | W  | (*1)  | L   | LL  | LR | LG | LE | LA  | LB (*3) | LC  | Mass [kg] |
|------------|-----|----|----|----|--------|---|-----|----|-------|-----|-----|----|----|----|-----|---------|-----|-----------|
| G09        |     |    |    |    |        |   |     |    |       |     |     |    |    |    |     |         |     |           |
| GYN300SAG- |     |    |    |    |        |   |     |    |       |     |     |    |    |    |     |         |     |           |
| GYN500SAG- | FK  | 20 | 16 | -  | 12h6   | 4 | 2.5 | 4  |       | 103 | 78  | 25 | -  | 4  | 60  | 50h7    | 52  | 0.7       |
| GYN101SAG- | FK  | 20 | 16 | -  | 12h6   | 4 | 2.5 | 4  |       | 103 | 78  | 25 | -  | 4  | 60  | 50h7    | 52  | 0.7       |
| GRN.20SAG- | FL  | 30 | 23 | -  | 19h6   | 6 | 3.5 | 6  | M4x8  | 136 | 99  | 37 | -  | 6  | 90  | 70h7    | 78  | 2.1       |
| GRN.40SAG- | FL  | 30 | 23 | -  | 19h6   | 6 | 3.5 | 6  | M4x8  | 136 | 99  | 37 | -  | 6  | 90  | 70h7    | 78  | 2.1       |
| GYN751SAG- | FM  | 40 | 31 | -  | 24h6   | 7 | 4   | 8  | M6x15 | 166 | 117 | 49 | -  | 8  | 115 | 90h7    | 98  | 3.9       |
| GYN102SAG- | FN  | 55 | 45 | -  | 32h6   | 8 | 5   | 10 |       | 219 | 155 | 64 | -  | 8  | 135 | 110h7   | 120 | 7.8       |
| GYN152SAG- | FN  | 55 | 45 | -  | 32h6   | 8 | 5   | 10 |       | 219 | 155 | 64 | -  | 8  | 135 | 110h7   | 120 | 7.8       |
| GYN202SAG- | FO  | 55 | 45 | -  | 32h6   | 8 | 5   | 10 |       | 258 | 181 | 77 | -  | 20 | 160 | 130h7   | 140 | 12.2      |
| GYN302SAG- |     |    |    |    |        |   |     |    |       |     |     |    |    |    |     |         |     |           |
| GYN402SAG- |     |    |    |    |        |   |     |    |       |     |     |    |    |    |     |         |     |           |
| GYN502SAG- |     |    |    |    |        |   |     |    |       |     |     |    |    |    |     |         |     |           |

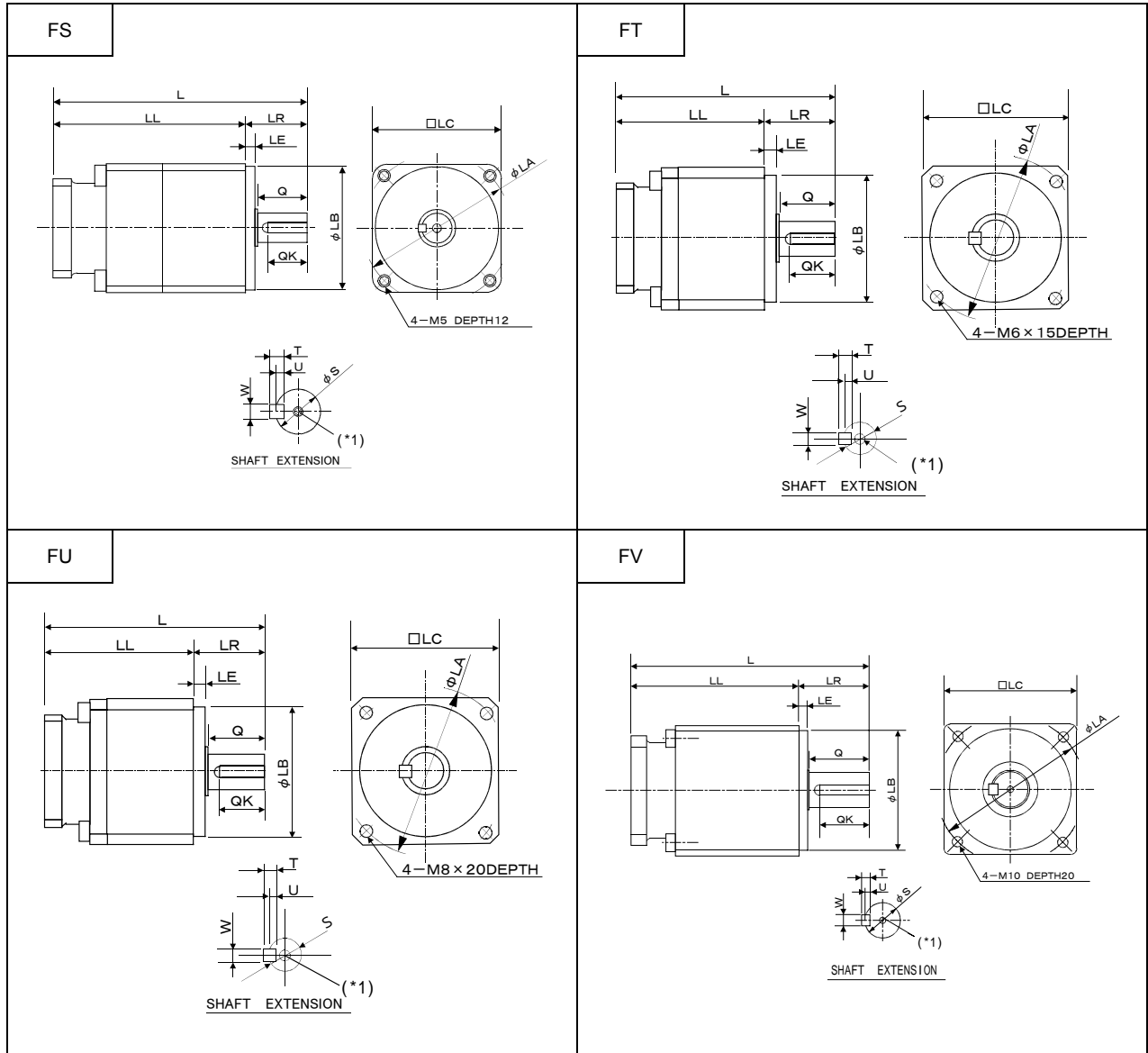
(\*1) Screw hole (metric diameter x depth) of shaft extension

(\*3) Shaft extension ( S ) and flanged spigot ( LB ) are machining finished with h6 or h7 fits.

(k) Gear-head unit for GYS slim type motor, gear ratio 1/9 (cont'd)  
GYN300 to 101 and 751 to 502, GRN.20 to .40SAG-G09, 0.03 to 5 [kW]



(I) Gear-head unit for GYS slim type motor, gear ratio 1/25 (for 300 to 751 types) or 1/15 (for 102 to 502 types)  
 GYN300 to 101 and 751 to 502, GRN.20 to .40SAG-G25 or G15, 0.03 to 5 [kW]

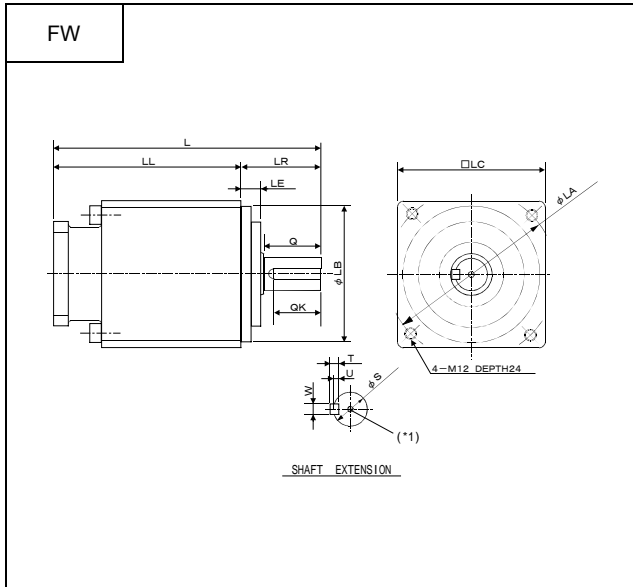


| Type          | Fig | Q  | QK | QR | S<br>(*3) | T | U   | W  | (*1)  | L   | LL  | LR | LG | LE | LA  | LB<br>(*3) | LC  | Mass<br>[kg] |
|---------------|-----|----|----|----|-----------|---|-----|----|-------|-----|-----|----|----|----|-----|------------|-----|--------------|
| GYN300SAG-G25 |     |    |    |    |           |   |     |    |       |     |     |    |    |    |     |            |     |              |
| GYN500SAG-G25 | FS  | 20 | 16 | -  | 12h6      | 4 | 2.5 | 4  |       | 103 | 78  | 25 | -  | 4  | 60  | 50h7       | 52  | 0.7          |
| GYN101SAG-G25 | FS  | 20 | 16 | -  | 12h6      | 4 | 2.5 | 4  |       | 103 | 78  | 25 | -  | 4  | 60  | 50h7       | 52  | 0.7          |
| GRN.20SAG-G25 | FT  | 30 | 23 | -  | 19h6      | 6 | 3.5 | 6  | M4x8  | 136 | 99  | 37 | -  | 6  | 90  | 70h7       | 78  | 2.1          |
| GRN.40SAG-G25 | FT  | 30 | 23 | -  | 19h6      | 6 | 3.5 | 6  | M4x8  | 136 | 99  | 37 | -  | 6  | 90  | 70h7       | 78  | 2.1          |
| GYN751SAG-G25 | FU  | 40 | 31 | -  | 24h6      | 7 | 4   | 8  | M6x15 | 166 | 117 | 49 | -  | 8  | 115 | 90h7       | 98  | 3.9          |
| GYN102SAG-G15 | FV  | 55 | 45 | -  | 32h6      | 8 | 5   | 10 |       | 219 | 155 | 64 | -  | 8  | 135 | 110h7      | 120 | 7.8          |
| GYN152SAG-G15 | FV  | 55 | 45 | -  | 32h6      | 8 | 5   | 10 |       | 219 | 155 | 64 | -  | 8  | 135 | 110h7      | 120 | 7.8          |
| GYN202SAG-G15 | FW  | 55 | 45 | -  | 32h6      | 8 | 5   | 10 |       | 258 | 181 | 77 | -  | 20 | 160 | 130h7      | 140 | 12.2         |
| GYN302SAG-G15 |     |    |    |    |           |   |     |    |       |     |     |    |    |    |     |            |     |              |
| GYN402SAG-G15 |     |    |    |    |           |   |     |    |       |     |     |    |    |    |     |            |     |              |
| GYN502SAG-G15 |     |    |    |    |           |   |     |    |       |     |     |    |    |    |     |            |     |              |

(\*1) Screw hole (metric diameter x depth) of shaft extension

(\*3) Shaft extension ( S ) and flanged spigot ( LB ) are machining finished with h6 or h7 fits.

(I) Gear-head unit for GYS slim type motor, gear ratio 1/25 (for 300 to 751 types) or 1/15 (for 102 to 502 types) (cont'd)  
GYN300 to 101 and 751 to 502, GRN.20 to .40SAG-G25 or G15, 0.03 to 5 [kW]

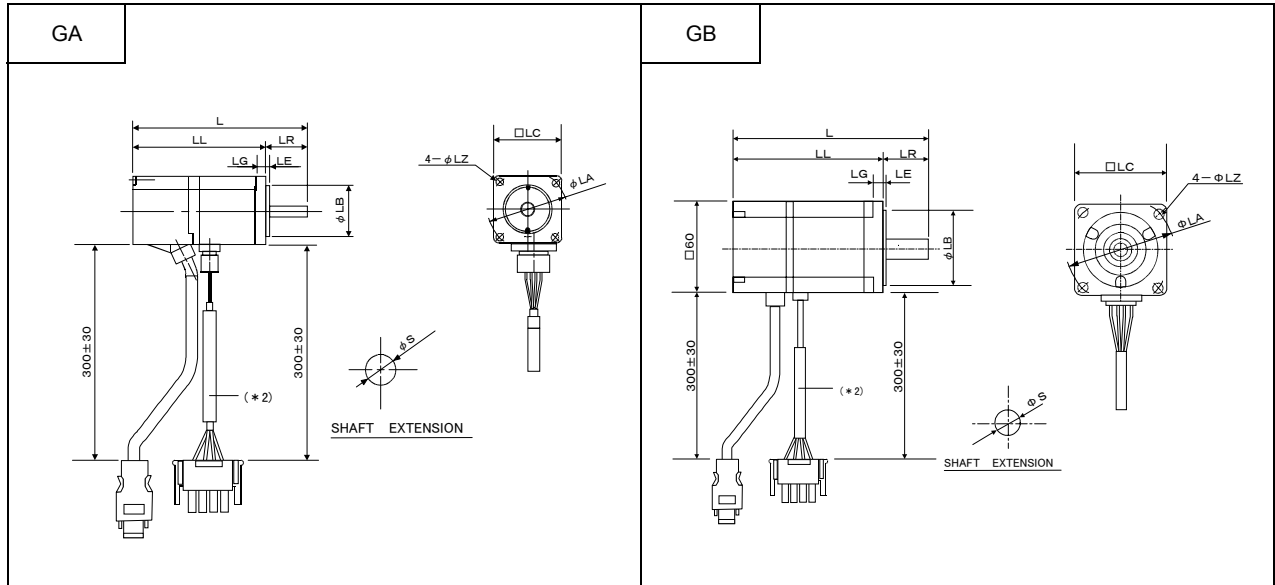




**(2) Motor, flange-mounted, for 100 [V] class input voltage of amplifier**

(a) Basic design, GYS slim type

GYS300 to 201DC1-S8B or S6B type, 0.03 to 0.2 [kW]

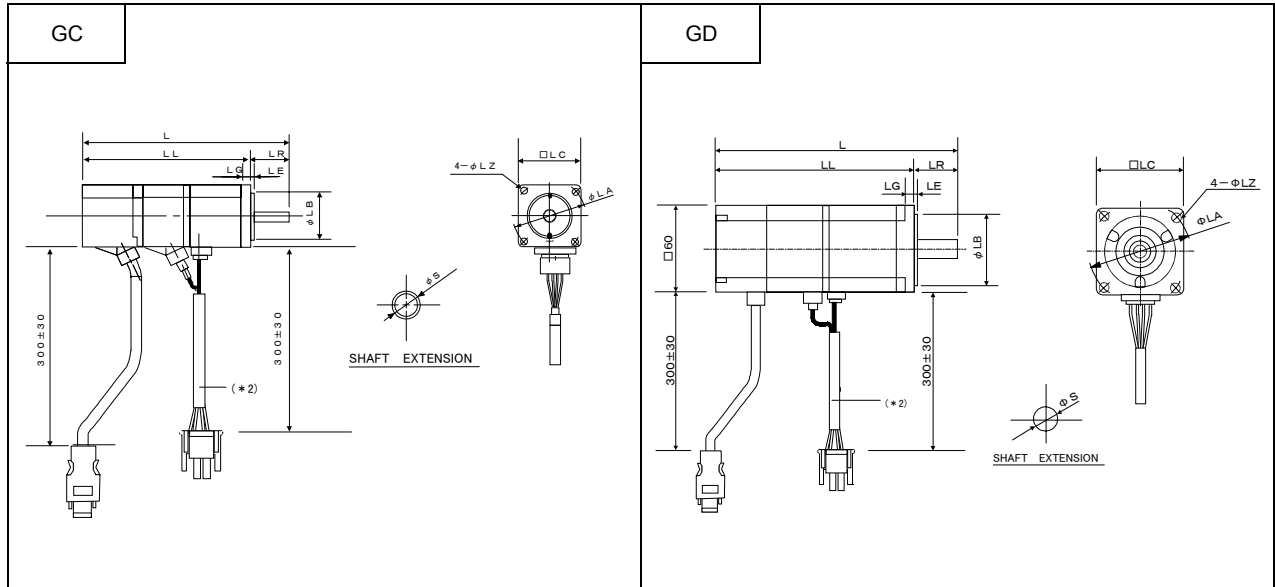


| Type       | Fig | QK | φ S<br>(*3) | T | U | W | L     | LL   | LR | LG | LE  | φ LA | φ LB<br>(*3) | DLC | φ LZ | Mass<br>[kg] |
|------------|-----|----|-------------|---|---|---|-------|------|----|----|-----|------|--------------|-----|------|--------------|
| GYS        |     |    |             |   |   |   |       |      |    |    |     |      |              |     |      |              |
| 300DC1-S8B |     |    |             |   |   |   |       |      |    |    |     |      |              |     |      |              |
| 500DC1-S8B | GA  | -  | 6h6         | - | - | - | 103   | 78   | 25 | 5  | 2.5 | 46   | 30h7         | 40  | 4.3  | 0.45         |
| 101DC1-S6B | GB  | -  | 8h6         | - | - | - | 121   | 96   | 25 | 5  | 2.5 | 46   | 30h7         | 40  | 4.3  | 0.55         |
| 201DC1-S6B | GB  | -  | 14h6        | - | - | - | 126.5 | 96.5 | 30 | 6  | 3   | 70   | 50h7         | 60  | 5.5  | 1.2          |

(\*2) Insulating protection tube

(\*3) Shaft extension (φ S) and flanged spigot (φ LB) are machining finished with h6 or h7 fits.

(b) With providing brake, GYS slim type  
 GYS300 to 201DC1-S8B or S6B-B type, 0.03 to 0.2 [kW]



| Type         | Fig | QK | $\phi S$<br>(*3) | T | U | W | L   | LL  | LR | LG | LE  | $\phi LA$ | $\phi LB$<br>(*3) | DLC | $\phi LZ$ | Mass<br>[kg] |
|--------------|-----|----|------------------|---|---|---|-----|-----|----|----|-----|-----------|-------------------|-----|-----------|--------------|
| GYS          |     |    |                  |   |   |   |     |     |    |    |     |           |                   |     |           |              |
| 300DC1-S8B-B |     |    |                  |   |   |   |     |     |    |    |     |           |                   |     |           |              |
| 500DC1-S8B-B | GC  | -  | 6h6              | - | - | - | 140 | 115 | 25 | 5  | 2.5 | 46        | 30h7              | 40  | 4.3       | 0.6          |
| 101DC1-S6B-B | GD  | -  | 8h6              | - | - | - | 158 | 133 | 25 | 5  | 2.5 | 46        | 30h7              | 40  | 4.3       | 0.7          |
| 201DC1-S6B-B | GD  | -  | 14h6             | - | - | - | 165 | 135 | 30 | 6  | 3   | 70        | 50h7              | 60  | 5.5       | 1.7          |

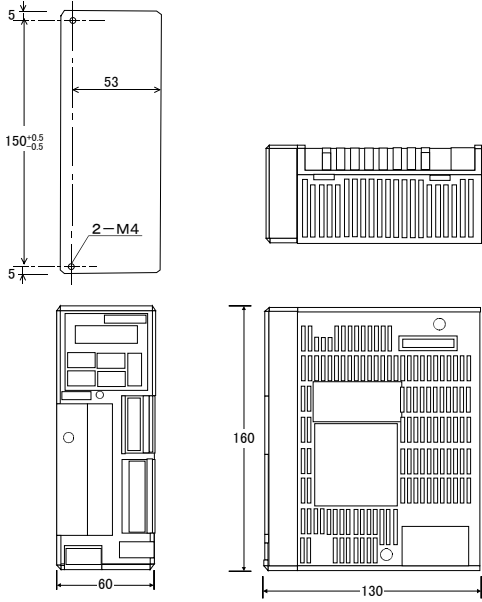
(\*2) Insulating protection tube

(\*3) Shaft extension ( $\phi S$ ) and flanged spigot ( $\phi LB$ ) are machining finished with h6 or h7 fits.

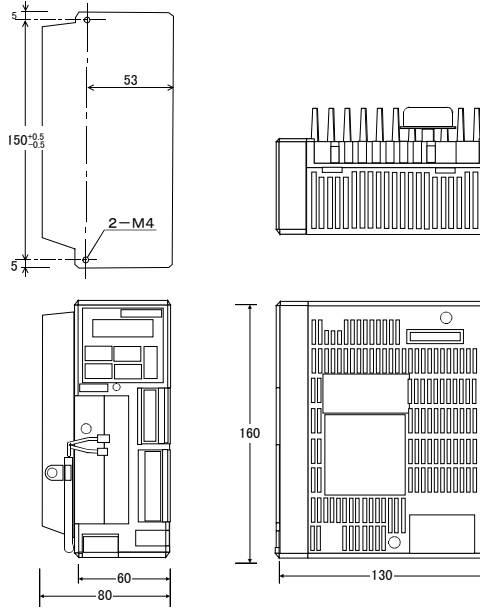
**(3) RYS amplifier**

(a) 200 [V] class input voltage of amplifier

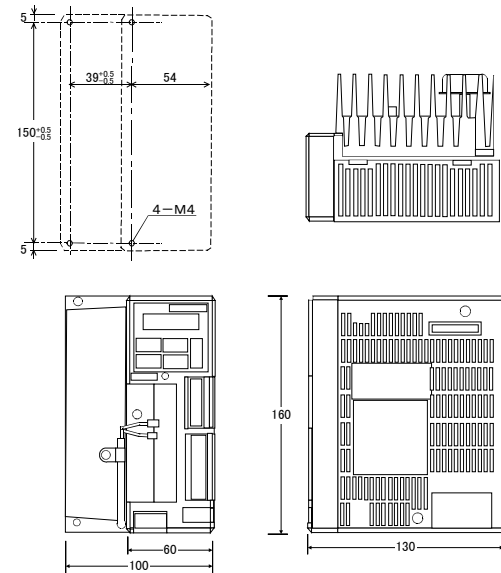
(i) 0.03 to 0.2 [kW]



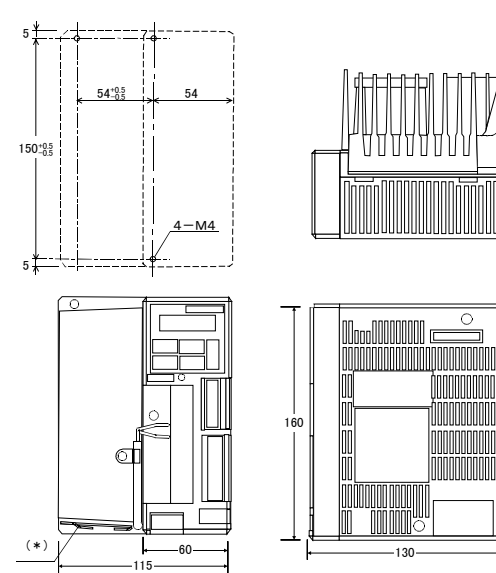
(ii) 0.4 [kW]



(iii) 0.75 [kW]

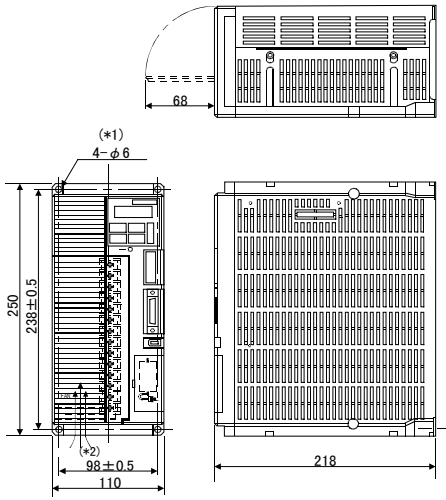


(iv) 1, 1.5 [kW]

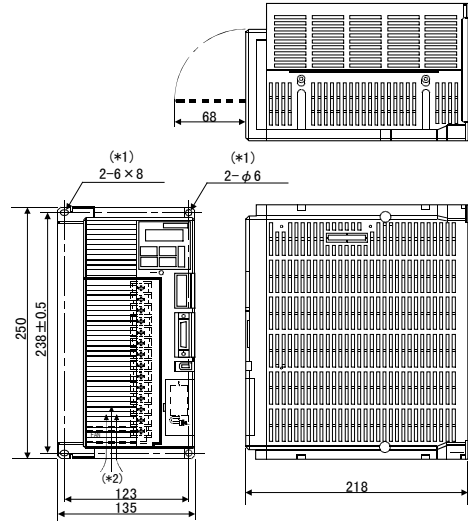


(\* ) Ventilation cooling fan

(v) 2, 3 [kW]

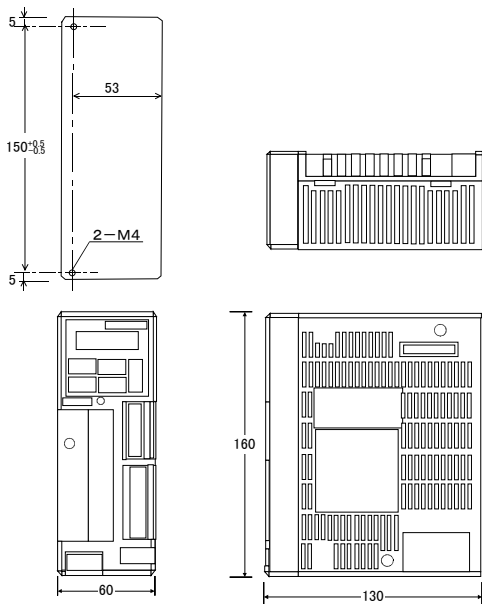


(vi) 4, 5 [kW]

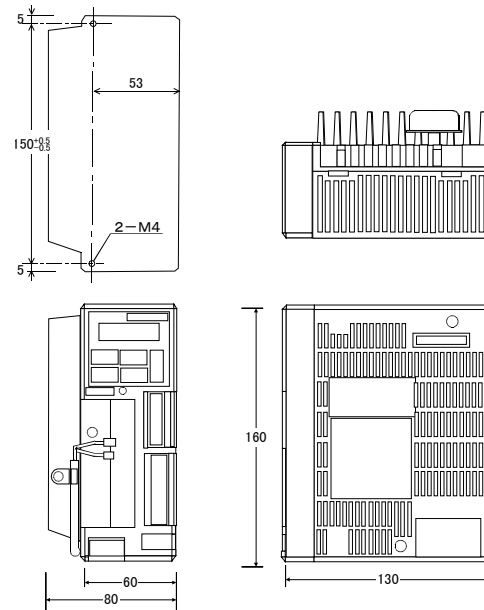


(\*1) Panel mounting hole  
 (\*2) Ventilation cooling-air inlet

(b) 100 [V] class input voltage of amplifier  
 (i) 0.05, 0.1 [kW]



(ii) 0.2 [kW]

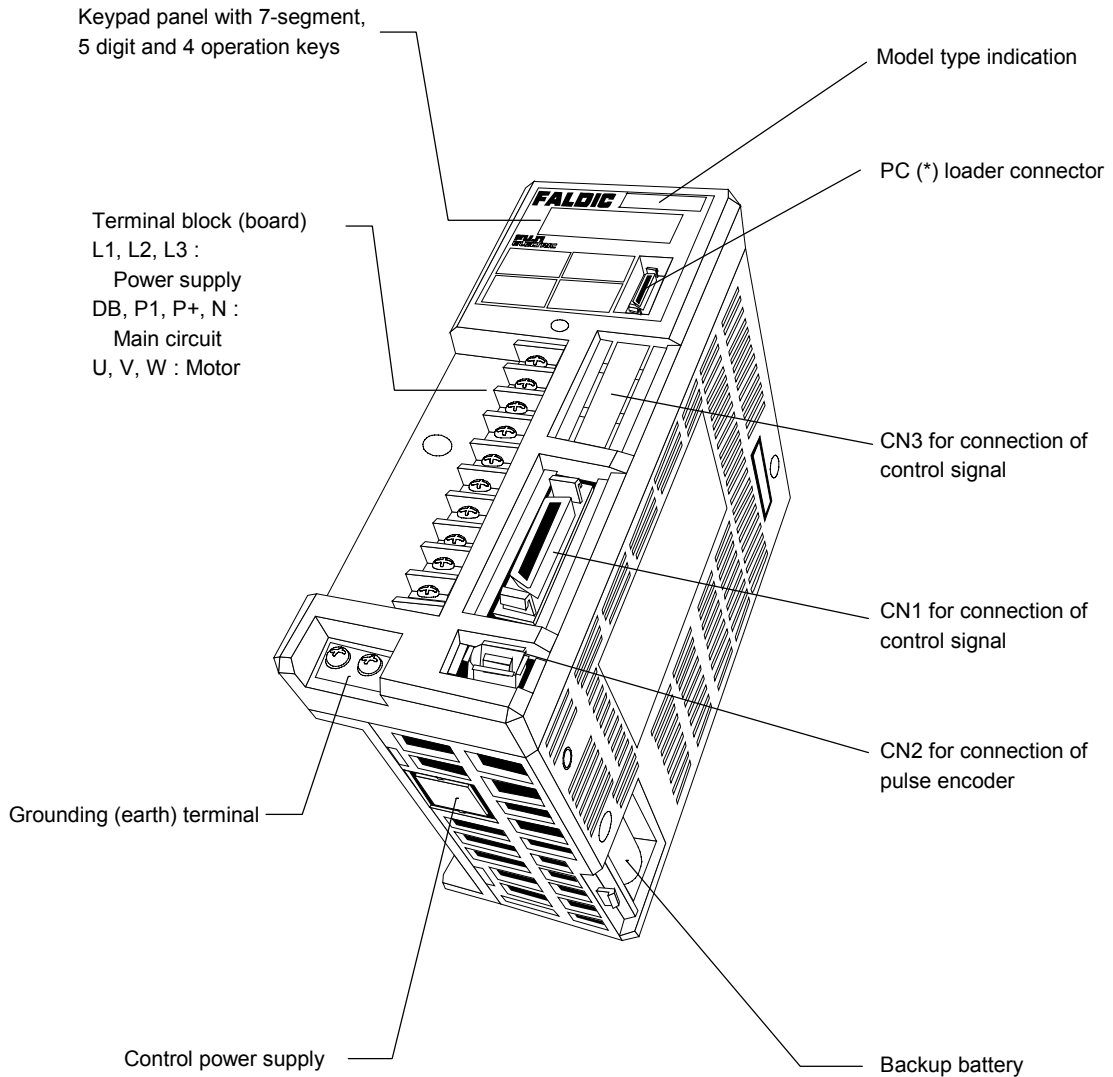


#### 4. TERMINAL DIAGRAMS AND WIRING

##### 4.1 Amplifier, motor and optional devices layout

###### (1) Amplifier

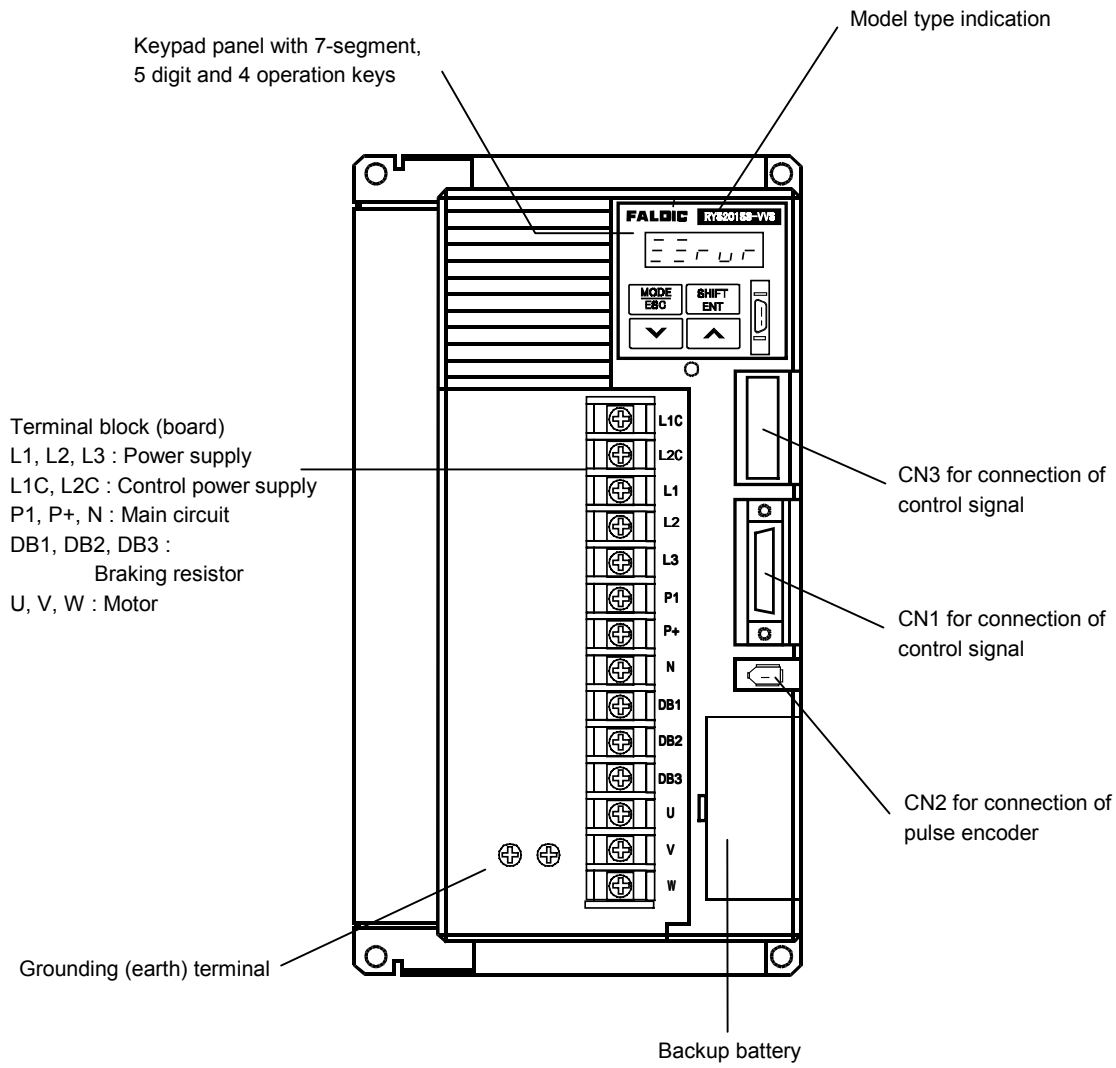
(a) 0.03 to 1.5 [kW]



Remark : Actual amplifier may differ in details.

(\*) PC : Personal computer

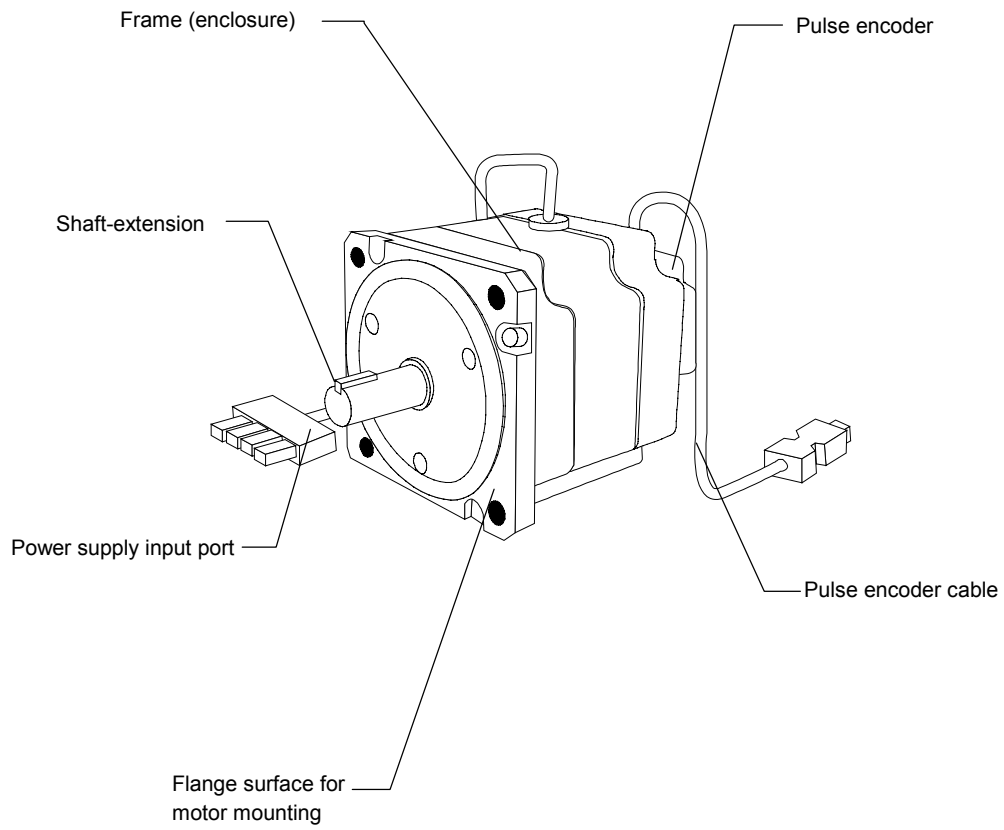
**(1) Amplifier (cont'd)**  
 (b) 2 to 5 [kW]



Remarks :

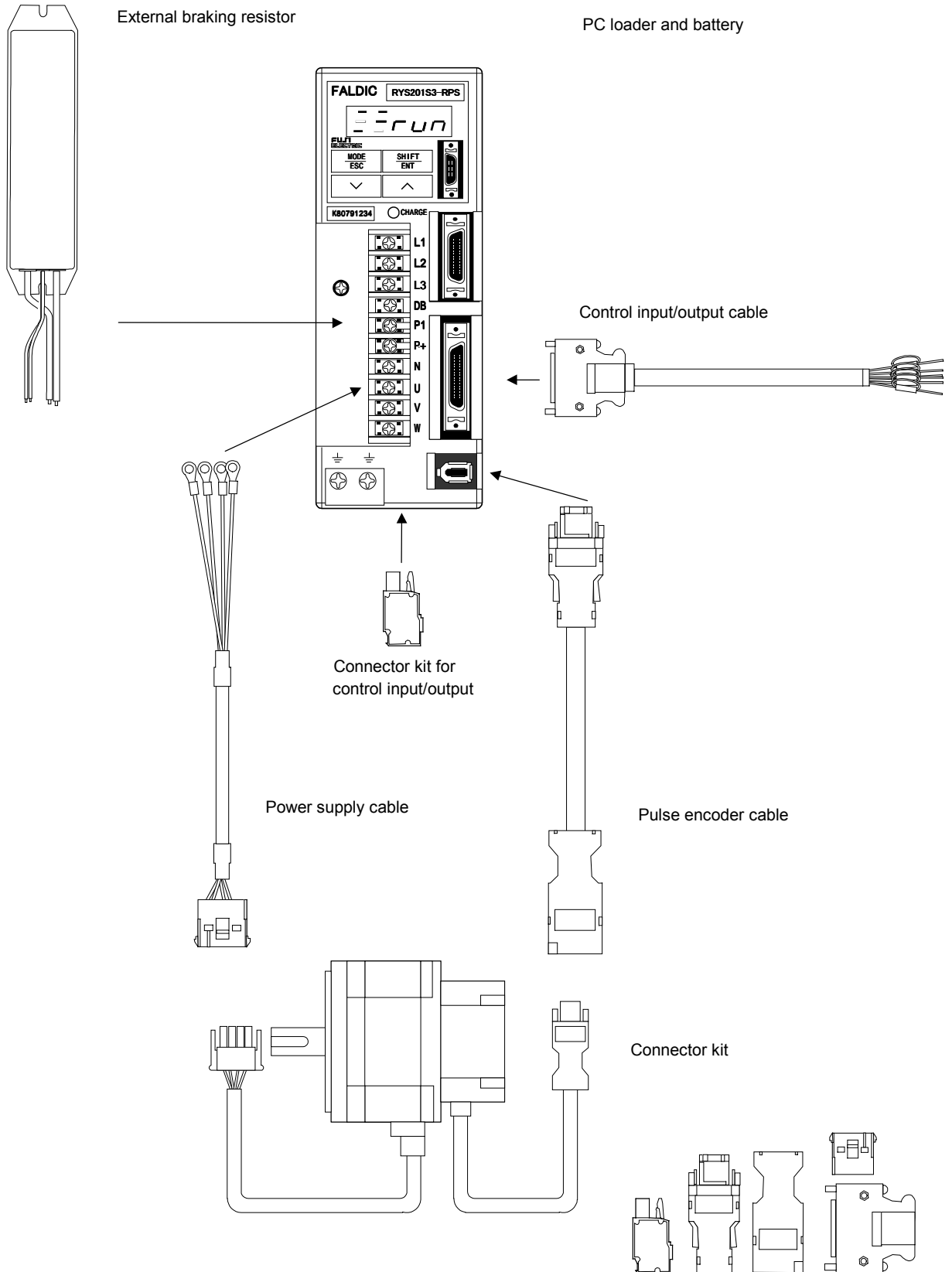
- (1) This figure indicates the state where the cover of terminal block (board) is open. The cover should be closed before power on.
- (2) Actual amplifier may differ in details.

**(2) Motor**



Remark : Actual motor may differ in details.

(3) **Optional devices** : Refer to the next page.





**Optional cables, connector kits, battery and external braking resistors** : See 10.8 Optional cables, connector kits, battery and external braking resistors.

| Reference letter or figure : See previous page | Description (*)         |                           |  |  |                     |  |                        |                  |                            |                                  | Type      |         |         |  |
|--|-------------------------|---------------------------|--|--|---------------------|--|------------------------|------------------|----------------------------|----------------------------------|-----------|---------|---------|--|
| 10.8   |                         |                           |  |  |                     |  |                        |                  |                            |                                  |           |         |         |  |
| (1)  | a                       | Control cable             |  | Expanded (CN3) for L, R type amplifier |                     |  | 3 [m] lg.              |                  |                            | WSC - D20P03<br>D26P03<br>D36P03 |           |         |         |  |
|  | b                       |                           |  | SX bus, T-link, RS485 types (CN1)      |                     |  |                        |                  |                            |                                  |           |         |         |  |
|  | c                       |                           |  | Basic type (DI/DO) (CN1)               |                     |  |                        |                  |                            |                                  |           |         |         |  |
|  | d                       | Pulse encoder cable       |  | Molex-Molex (*)                        | 0.75 [kW] and below |  | 5 [m] lg.              |                  |                            | P06P05                           |           |         |         |  |
|  |                         |                           |  |  |                     |  | 10 [m] lg.             |                  |                            | P06P10                           |           |         |         |  |
|  |                         |                           |  |  |                     |  | 20 [m] lg.             |                  |                            | P06P20                           |           |         |         |  |
|  |                         |                           |  | e                                      | Molex-Canon (*)     | 1 [kW] and above                       |                        | 5 [m] lg.        |                            |                                  | P06P05-C  |         |         |  |
|  |                         |                           |  |  |                     |  |                        | 10 [m] lg.       |                            |                                  | P06P10-C  |         |         |  |
|  |                         |                           |  |  |                     |  |                        | 20 [m] lg.       |                            |                                  | P06P20-C  |         |         |  |
|  | f                       | Molex (*)                 | Provide the connector connection for motor by others |  | 5 [m] lg.           |  |                        | P06P05-W         |                            |                                  |           |         |         |  |
|  |                         |                           |  |  | 10 [m] lg.          |  |                        | P06P10-W         |                            |                                  |           |         |         |  |
|  |                         |                           |  |  | 20 [m] lg.          |  |                        | P06P20-W         |                            |                                  |           |         |         |  |
| g  | Power supply cable      |                           | Motor without brake                                  | AMP (*)                                | 0.75 [kW] and below |  | 5 [m] lg.              |                  |                            | M04P05                           |           |         |         |  |
|  |                         |                           |  |  |                     |  | 10 [m] lg.             |                  |                            | M04P10                           |           |         |         |  |
|  |                         |                           |  |  |                     |  | 20 [m] lg.             |                  |                            | M04P20                           |           |         |         |  |
|  |                         |                           | h  | Motor with brake                       | AMP (*)             | 5 [m] lg.                              |                        |                  | M06P05                     |                                  |           |         |         |  |
|  |                         |                           |  |  |                     | 10 [m] lg.                             |                        |                  | M06P10                     |                                  |           |         |         |  |
|  |                         |                           |  |  |                     | 20 [m] lg.                             |                        |                  | M06P20                     |                                  |           |         |         |  |
| (2)  | a                       | Connector kit             |  | Control (CN1, CN3)                     |                     | Expanded (CN3) for L, R type amplifier |                        |                  | WSK - D20P<br>D26P<br>D36P |                                  |           |         |         |  |
|  | b                       |                           |  |  |                     | SX bus, T-link, RS485 types (CN1)      |                        |                  |                            |                                  |           |         |         |  |
|  | c                       |                           |  |  |                     | Basic type (DI/DO) (CN1)               |                        |                  |                            |                                  |           |         |         |  |
|  | d                       | Pulse encoder (CN2)       |  | Molex (*) (amplifier side)             | 0.75 [kW] and below |  | 5 [m] lg.              |                  |                            | P06P-M                           |           |         |         |  |
|  |                         |                           |  |  |                     |  | Molex (*) (motor side) | 10 [m] lg.       |                            |                                  | P06P-F    |         |         |  |
|  |                         |                           |  |  |                     |  |                        | Canon (*)        | 1 [kW] and above           |                                  |           | P06P-C  |         |  |
|  | g                       | Motor without brake       |  | AMP (*)                                | 0.75 [kW] and below |  | 5 [m] lg.              |                  |                            | M04P                             |           |         |         |  |
|  |                         |                           |  |  |                     |  | Canon (*)              | GYS, 1 to 2 [kW] |                            | 10 [m] lg.                       |           |         | M04P-CA |  |
|  |                         |                           |  |  |                     |  |                        | GYS, 1 [kW]      |                            | } and above                      |           |         | M04P-CB |  |
|  |                         |                           |  |  |                     |  |                        | GYS, 3 [kW]      |                            |                                  |           |         |         |  |
|  | h                       | Motor with brake          |  | AMP (*)                                | 0.75 [kW] and below |  | 5 [m] lg.              |                  |                            | M06P                             |           |         |         |  |
|  |                         |                           |  |  |                     |  | Canon (*)              | GYS, 1 to 2 [kW] |                            | 10 [m] lg.                       |           |         | M06P-CA |  |
| GYS, 1 [kW]                                    |                         |                           |  |  |                     |  |                        | } and above      |                            |                                  | M06P-CB   |         |         |  |
| GYS, 3 [kW]                                    |                         |                           |  |  |                     |  |                        |                  |                            |                                  |           |         |         |  |
| (3)  | a                       | External braking resistor |  |  | 0.4 [kW] and below  |  |                        | WSR- 401         |                            |                                  |           |         |         |  |
|  | b                       |                           |  |  | 0.75 [kW]           |  |                        | 751              |                            |                                  |           |         |         |  |
|  | c                       |                           |  |  | 1, 1.5 [kW]         |  |                        | 152              |                            |                                  |           |         |         |  |
|  | d                       |                           |  |  | 2, 3 [kW]           |  |                        | DB11-2           |                            |                                  |           |         |         |  |
|  | e                       |                           |  |  | 4, 5 [kW]           |  |                        | DB22-2           |                            |                                  |           |         |         |  |
|  | PC loader               |                           |  |  |                     |  |                        |                  |                            |                                  | WSL - PC  |         |         |  |
|  | Loader cable, 2 [m] lg. |                           |  |  |                     |  |                        |                  |                            |                                  | NP4H- CNV |         |         |  |
| (2)  | n                       | Battery                   |  |  |                     |  |                        |                  |                            |                                  |           | WSB - S |         |  |
|  | m                       | Connector kit             | Control  |  | 1.5 [kW] and below  |  |                        | WSK - L02P       |                            |                                  |           |         |         |  |
|  | SX bus cables           |                           | Type   | NP1C- P3                               | P6                  | P8                                     | 02                     | 05               | 10                         | 25                               |           |         |         |  |
|  |                         |                           | Cable lg.  | [m]                                    | 0.3                 | 0.6                                    | 0.8                    | 2                | 5                          | 10                               | 20        |         |         |  |

(\*) lg. : Cable length

Molex, Canon, AMP : Supplier's product name of connector and terminal

## 4.2 Commercial power supply

Supply commercial power to the amplifier.

### (1) Power supply

(a) 200 [V] 3-phase input voltage of amplifier

Supply 200 [V] commercial power to the amplifier.

Connect it to terminals L1, L2 and L3.

- Voltage : 200/200-220-230 [V] +10%/ -15%.
- Frequency : 50/60 [Hz]
- Phase : 3-phase (main circuit power supply) / single-phase (control power supply)

(b) 100 [V] single-phase input voltage of amplifier

Supply 100 [V] commercial power to the amplifier.

Connect it to terminals L1 and L2.

- Voltage : 100 to 115 [V] +10%/ -15%
- Frequency : 50/60 [Hz]
- Phase : Single-phase (main circuit and control power supply)

### (2) Power supply capacity

The power supply capacity required for each amplifier is as follows.

The power supply capacity is applied for cabling with specified cable and 20 [m] max. wiring length. If the power capacity is 500 [kVA] or more, AC reactor for impedance matching should be provided. See 10.5 AC reactor (reactor for impedance matching).

(a) 200 [V] 3-phase input voltage of amplifier

|                      |     |                       |            |           |           |     |      |     |     |     |     |     |     |
|----------------------|-----|-----------------------|------------|-----------|-----------|-----|------|-----|-----|-----|-----|-----|-----|
| Amplifier type       | RYS | S3                    | 500        | 101       | 201       | 401 | 751  | 102 | 152 | 202 | 302 | 402 | 502 |
| Motor type (example) | GYS | DC1-<br>S8B, SB or SA | 500<br>S8B | 101<br>SB | 201<br>SA | 401 | 751  | 102 | 152 | 202 | 302 | 402 | 502 |
| Motor output         |     | [kW]                  | 0.05       | 0.1       | 0.2       | 0.4 | 0.75 | 1   | 1.5 | 2   | 3   | 4   | 5   |
| Power capacity       |     | [kVA]                 | 0.15       |           | 0.6       | 1.2 | 1.8  | 3   | 4.5 | 6   | 9   | 10  | 15  |

(b) 100 [V] single-phase input voltage of amplifier

|                      |     |                  |            |            |     |
|----------------------|-----|------------------|------------|------------|-----|
| Amplifier type       | RYS | S3-<br>* * * 6   | 500        | 101        | 201 |
| Motor type (example) | GYS | DC1-<br>S8B, S6B | 500<br>S8B | 101<br>S6B | 201 |
| Motor output         |     | [kW]             | 0.05       | 0.1        | 0.2 |
| Power capacity       |     | [kVA]            | 0.15       | 0.6        | 1.2 |

### (3) Harmonics suppression

If a (harmonics suppressing) reactor is connected to RYS type amplifier, see 10.5 AC reactor or 10.7 DC reactor.

**(4) Control power supply input**

The wiring procedure for control power supply of 1.5 [kW] and below is as follows.

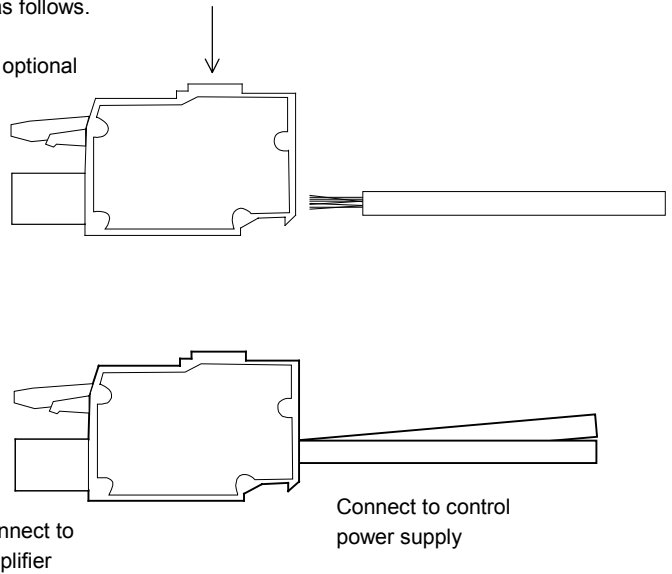
**(a) Connector**

Use a connector of WSK-L02P type. See (3) of 4.1 Amplifier, motor and optional devices layout and (2) m of 10.8 optional cables, connector kits, battery and external braking resistors.

**(b) Wiring**

Remove the insulation covering of wire by approx. 13[mm] length and, while strongly pressing the arrow part in the figure by the operation lever furnished with the connector or flat head screwdriver, insert the wire.

After connecting 2 wires, engage the connector with the control power supply and amplifier.




**4.3 Wiring between motor and pulse encoder**

**(1) Motor wiring**

Connect the power line of the motor to the output U, V, W terminals of the amplifier.

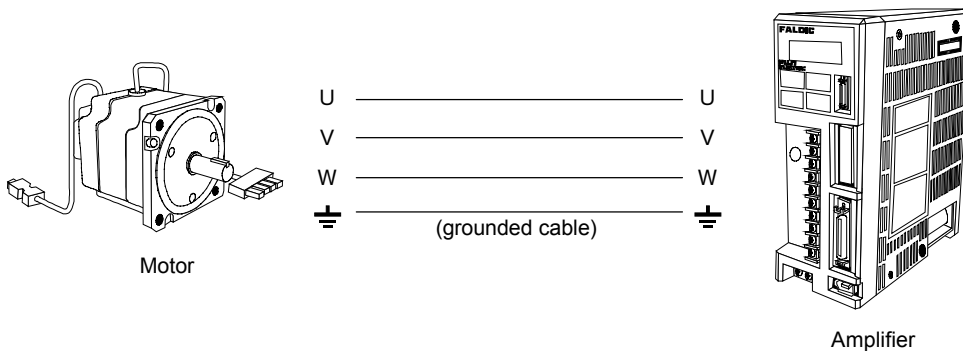
Do not connect commercial power supply to the motor terminals.

The direction of rotation of the motor cannot be changed by changing the phase sequence of the motor terminals. It can be achieved by system para.



**CAUTION**

**Do not connect commercial power supply directly to the motor. Otherwise, motor may break.**



The wiring length between amplifier and motor should be within 50[m].

It is not permitted to perform on/off of the wiring between the amplifier and motor by magnetic contactors. It is not permitted to turning on/off multiple motors with a single amplifier.

Furthermore, it is not permitted to wiring the following equipment along the wiring between amplifier and motor :

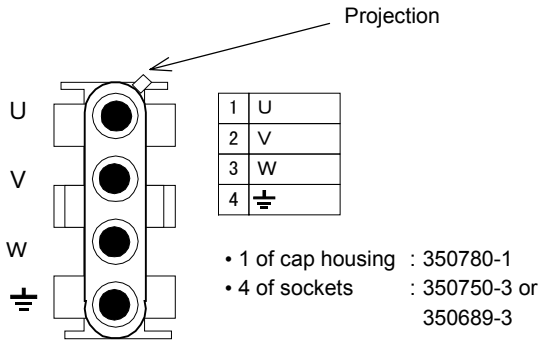
Phase advancing capacitor, reactor, power filter, surge suppressor (surge killer)

Terminal workings of motor power supply cables are as follows :

(a) GYC/GYS type motor : 0.75 [kW] and below

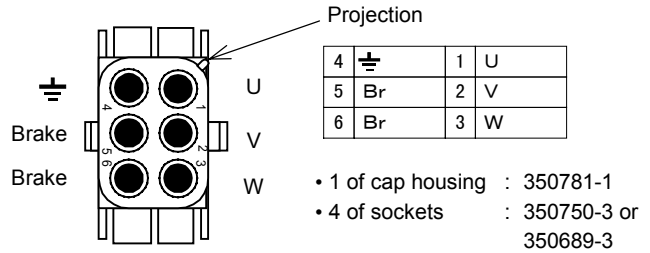
(i) Motor without providing brake

• Viewed from socket inserting side



(ii) Motor with providing brake

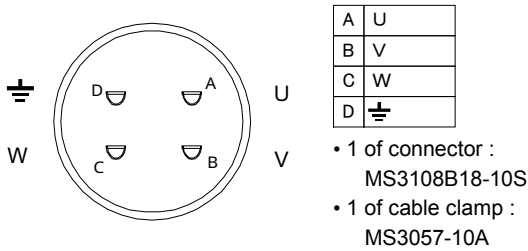
• Viewed from socket inserting side



(b) GYC/GYS type motor : 1 [kW] and above

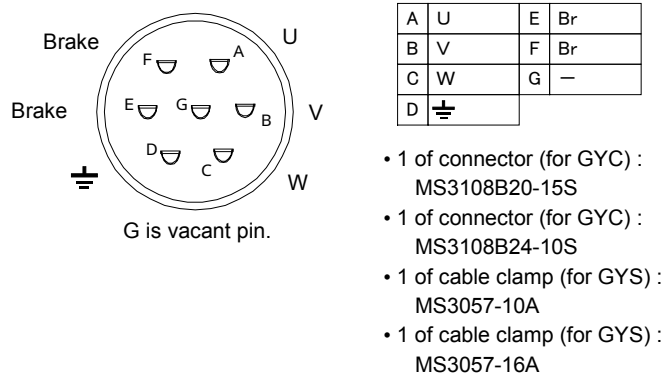
(i) Motor without providing brake

• View of plug wiring side



(ii) Motor with providing brake

• View of plug wiring side



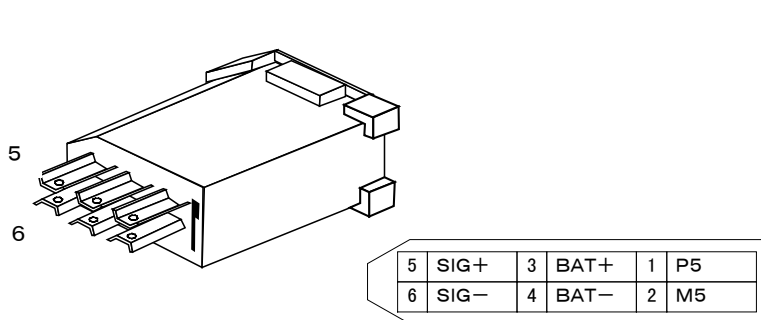
## (2) Pulse encoder wiring

Connect the pulse encoder wiring to CN2 of the amplifier.

The wiring length between amplifier and encoder should be within 50 [m].

(a) 0.75 [kW] and below (GYC/GYS type motor)

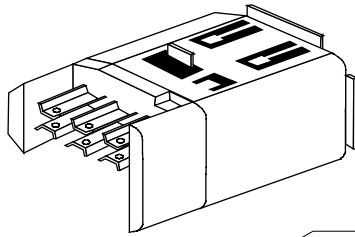
(i) Wiring to amplifier



• View of housing wiring side

- Housing : 54180-0611
- Shell body clamp : 58299-0600
- Shell body cover : 58300-0600
- Mold cover : 54181-0615
- Mold cover : 54182-0605
- Cable clamp : 58303-0000
- Clamp screw (M2x4) : 59832-0009

(ii) Wiring to motor

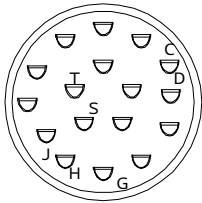


|   |      |   |      |   |    |
|---|------|---|------|---|----|
| 6 | SIG- | 4 | BAT- | 2 | M5 |
| 5 | SIG+ | 3 | BAT+ | 1 | P5 |

• View of housing wiring side

|                    |              |
|--------------------|--------------|
| Housing            | : 53988-0611 |
| Shell body clamp   | : 58302-0600 |
| Mold cover         | : 53989-0605 |
| Mold cover         | : 53990-0650 |
| Cable clamp        | : 58303-0000 |
| Clamp screw (M2x4) | : 53982-0009 |

(b) 1 [kW] and above (GYC/GYS type motor)



|   |        |
|---|--------|
| H | P5     |
| G | M5     |
| C | SIG+   |
| D | SIG-   |
| T | BAT+   |
| S | BAT-   |
| J | Shield |

• View of housing wiring side

1 of connector :  
MS3108B20-29S  
1 of cable clamp :  
MS3057-12A

(c) Wiring cable

If the optional pulse encoder wiring cable is not used, use wiring with the following cable or equivalent.

- Cross-link polyethylene insulated, vinyl sheath cable :

AWG No.25 / 2P+AWG No.23/2C(\*), (twisted-pair cable), RMCV-SB (UL2464) type

The wiring length should be within 20[m].

- Cross-link polyethylene insulated, vinyl sheath cable :

AWG No.25 / 2P+AWG No.16/2C(\*), (twisted-pair cable), RMCV-SB (UL2464) type

The wiring length should be within 50 [m].

(\* ) 2P (pairs), 2C (core) twisted-pair cable of different wire sizes. Use the enlarged sectional area of wires for power supply.

(d) Connection

It is not allowed to extend the wiring distance by connecting two or more cables of short wiring length.



**CAUTION**

**Do not extend the wiring distance by connecting two or more encoder wiring cables.  
A voltage drop by contact resistance of connector may stop the operation abruptly.**

Remark : The wire size conversion between AWG and [mm] is as follows.

| Gauge |      | Diameter |        | Sectional area |                 |
|-------|------|----------|--------|----------------|-----------------|
| A W G | mm G | mil      | mm     | Circular mil   | mm <sup>2</sup> |
|       |      |          |        | CM             | mm <sup>2</sup> |
| 16    | 1.4  | 55.12    | 1.400  | 3038           | 1.539           |
|       | 1.2  | 50.82    | 1.291  | 2583           | 1.309           |
|       |      | 47.24    | 1.200  | 2232           | 1.131           |
| 23    | .55  | 22.57    | 0.5773 | 509.4          | 0.2581          |
| 24    |      | 21.65    | 0.5500 | 468.7          | 0.2376          |
|       |      | 20.10    | 0.5106 | 404.0          | 0.2047          |
| 25    | .50  | 19.69    | 0.5000 | 387.7          | 0.1963          |
|       |      | 17.90    | 0.4547 | 320.4          | 0.1623          |
|       |      | 17.72    | 0.4500 | 314.0          | 0.1590          |

#### 4.4 Host interface (I/F)

Connect signals to and from host controller to RYS-R type amplifier are as follow :

- Basic type (DI/DO position)
- SX bus type (SX bus direct connection)
- T-link type (T-link direct connection)

##### (1) Basic type (DI/DO position)

RYS□□□S3-RPS type amplifier operates in accordance with the control input signal (CONTn) at CN3 and CN1. Control output signal (OUTn) is directed to the host controller.

Signal (indexing positioning and current positioning etc.) between amplifier and host controller transmits using DI/DO level of DC +24 [V]. PLC output is of 21 points and PLC input is of 10 points (at maximum) per axis.

##### (a) CN3 (upper side)

Connect control input/output signals.

|    |        |   |        |    |        |    |        |
|----|--------|---|--------|----|--------|----|--------|
| 2  | P 2 4  | 1 | M 2 4  | 12 | OUT 6  | 11 | OUT 7  |
| 4  | CONT14 | 3 | CONT15 | 14 | OUT 8  | 13 | OUT 9  |
| 6  | CONT16 | 5 | CONT17 | 16 | CONT 9 | 15 | OUT 10 |
| 8  | CONT18 | 7 | CONT19 | 18 | CONT11 | 17 | CONT10 |
| 10 | CONT20 | 9 | CONT21 | 20 | CONT13 | 19 | CONT12 |

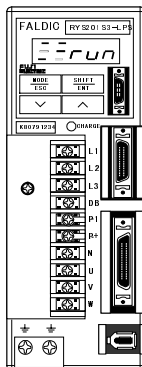
Plug : 10120-3000VE  
Shell kit : 10320-52A0-008

##### (b) CN1 (lower side)

Connect control input/output signals.

|    |        |    |        |    |        |    |        |
|----|--------|----|--------|----|--------|----|--------|
| 35 | CA     | 36 | * CA   | 17 | NREF   | 18 | M5     |
| 33 | CB     | 34 | * CB   | 15 | -      | 16 | MON 1  |
| 31 | FA     | 32 | * FA   | 13 | M5     | 14 | MON 2  |
| 29 | FB     | 30 | * FB   | 11 | P 1 0  | 12 | BAT-   |
| 27 | FZ     | 28 | * FZ   | 9  | M5     | 10 | BAT+   |
| 25 | M5     | 26 | OUT 3  | 7  | OUT 4  | 8  | OUT 5  |
| 23 | CONT 7 | 24 | CONT 8 | 5  | OUT 1  | 6  | OUT 2  |
| 21 | CONT 1 | 22 | CONT 2 | 3  | CONT 5 | 4  | CONT 6 |
| 19 | M 2 4  | 20 | P 2 4  | 1  | CONT 3 | 2  | CONT 4 |

Plug : 10136-3000VE  
Shell kit : 10336-52A0-008



CN3 ←→ DI/DO

CN1 ←→ DI/DO

(c) Terminal function  
 (i) CN3 (upper side)

| Terminal symbol   | Connector pin No.   | Terminal name        | Function   |
|---|---|----------------------|--|
| P24<br>M24  | 2<br>1  | Control power supply | +24 [V] DC, 0.2 [A]  |
| CONT9<br>CONT10<br>CONT11<br>CONT12<br>CONT13<br>CONT14<br>CONT15<br>CONT16<br>CONT17<br>CONT18<br>CONT19<br>CONT20<br>CONT21 | 16<br>17<br>18<br>19<br>20<br>4<br>3<br>6<br>5<br>8<br>7<br>10<br>9 | Control input        | +24 [V] DC, 10 [mA]<br>Initially assigned at factory :<br>CONT 9 : —<br>CONT10 : VEL0 (rotation speed selection)<br>CONT11 : DIR (shorted route valid)<br>CONT12 : SIGN (rotational direction)<br>CONT13 : EMG (forced stop)<br>CONT14 : D0 (station No.)<br>CONT15 : D1 (station No.)<br>CONT16 : D2 (station No.)<br>CONT17 : D3 (station No.)<br>CONT18 : D4 (station No.)<br>CONT19 : D5 (station No.)<br>CONT20 : —<br>CONT21 : — |
| OUT6<br>OUT7<br>OUT8<br>OUT9<br>OUT10   | 12<br>11<br>14<br>13<br>15  | Control output       | +30 [V] DC, 50 [mA] max.<br>Initially assigned at factory :<br>OUT6 : PD1<br>OUT7 : PD2<br>OUT8 : PD3<br>OUT9 : PD4<br>OUT10 : PD5   |

## (ii) CN1(lower side)

| Terminal symbol (*)  | Connector pin No.                        | Terminal name                   | Function  |
|--|--|---------------------------------|---|
| P24<br>M24   | 20<br>19                                 | Control power supply            | +24 [V] DC, 0.2 [A]   |
| CONT1<br>CONT2<br>CONT3<br>CONT4<br>CONT5<br>CONT6<br>CONT7<br>CONT8 | 21<br>22<br>1<br>2<br>3<br>4<br>23<br>24 | Control input                   | +24 [V] DC, 10 [mA]<br>Initially assigned at factory :<br>CONT1 : RUN (run command)<br>CONT2 : FWD (forward command) (*)<br>CONT3 : REV (reverse command) (*)<br>CONT4 : RST (alarm reset)<br>CONT5 : START (auto start)<br>CONT6 : Position preset<br>CONT7 : X1 (multistep speed selection X1)<br>CONT8 : — |
| OUT1<br>OUT2<br>OUT3<br>OUT4<br>OUT5                                 | 5<br>6<br>26<br>7<br>8                   | Control output                  | +30 [V] DC, 50 [mA] max.<br>Initially assigned at factory :<br>OUT1 : RDY (ready)<br>OUT2 : WPSET (indexing end)<br>OUT3 : Data error<br>OUT4 : Address error<br>OUT5 : PDO   |
| P10<br>M5  | 11<br>13                                 | Analog input power supply       | Input for speed command and torque command<br>+10 [V] DC, 200 [mA]  |
| NREF   | 17                                       | Speed command input             | Input terminal for speed command voltage  |
| MON1<br>MON2<br>M5   | 16<br>14<br>9                            | Monitor 1<br>Monitor 2 (output) | Analog voltage.<br>Initially assigned at factory :<br>MON1 : Speed monitor<br>MON2 : Torque monitor   |
| CA, *CA<br>CB, *CB<br>M5   | 35, 36<br>33, 34<br>25                   | Pulse train input               | Input freq. : 500 [kHz] max. (differential input)   |
| FA, *FA<br>FB, *FB<br>FZ, *FZ  | 31, 32<br>29, 30<br>27, 28               | Freq. dividing output           | Freq. dividing terminal.<br>Two 90° phase-different signal is outputted, in proportion with rotational quantity of motor.   |
| BAT+<br>BAT-   | 10<br>12                                 | External backup (input)         | Power supply for serial encoder backup  |
| —  | 15                                       | —                               | (unused)  |

(\*) Each of terminal M5 is internally connected. They are not connected with terminal M24.

## Note : (\*)

Direction of motor shaft rotation (when viewed from a point facing the drive-end of motor) is designed according to Japanese standards:

- Forward direction : Counterclockwise (CCW) rotation
- Reverse direction : Clockwise (CW) rotation



**(2) SX bus type (SX bus direct connection)**

Host controller can be direct-connected to an SX bus of MICREX-SX series. 16 word of the IQ area are reserved, and position control is executed on the amplifier side.

It is possible to extend an amplifier with one SX bus extension cable.

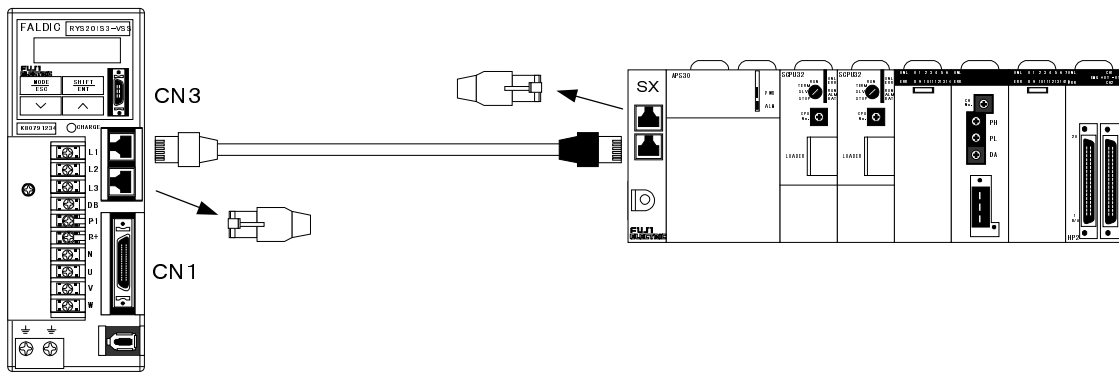
The IQ area of the CPU is of 512 word (at maximum).

RYS□□□S3-RSS type amplifier connects an SX bus to CN3.

Control input/output signals are connected to CN1.

**(a) CN3 (upper side)**

An SX bus extension cable is connected to CN3. An SX bus loop-back plug is connected to the termination.



**(b) CN1 (lower side)**

Connect control input/output signals.

|    |       |    |       |    |        |    |        |
|----|-------|----|-------|----|--------|----|--------|
| 26 | M 5   | 25 | * CB  | 13 | P 5    | 12 | M 5    |
| 24 | CB    | 23 | * CA  | 11 | MON 1  | 10 | MON 2  |
| 22 | CA    | 21 | * F Z | 9  | M 2 4  | 8  | P 2 4  |
| 20 | F Z   | 19 | * F B | 7  | OUT 2  | 6  | OUT 1  |
| 18 | F B   | 17 | * F A | 5  | CONT 5 | 4  | CONT 4 |
| 16 | F A   | 15 | BAT - | 3  | CONT 3 | 2  | CONT 2 |
| 14 | BAT + |    |       | 1  | CONT 1 |    |        |

Plug : 10126-3000V  
Shell kit : 10326-52A0-008

External sensors such as origin LS are connected to the control input signal (CONTn).

Control output signal (OUTn) is used in case signals are outputted from the amplifier.

(c) IQ area, 16 word (SX bus type)

• IQ area

| Address | 15   | 14        | 13        | 12         | 11         | 10         | 9          | 8          | 7          | 6                       | 5          | 4          | 3          | 2          | 1                  | 0               |  |
|---------|--|-----------|-----------|------------|------------|------------|------------|------------|------------|-------------------------|------------|------------|------------|------------|--------------------|-----------------|--|
| 0       | Current position, current deviation, basic para., system para. /LS-Z phase pulse<br>(Low order word PC ← Amplifier)  |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 1       | Current position, current deviation, basic para., system para. /LS-Z phase pulse<br>(High order word PC ← Amplifier) |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 2       | Current speed (Low order word PC ← Amplifier)  |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 3       | Current speed (High order word PC ← Amplifier)   |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 4       | Current torque/current timer data (PC ← Amplifier)   |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 5       | -  |           |           | Alarm code |            |            |            |            |            | -                       |            |            |            |            |                    |                 |  |
| 6       | -  |           |           |            |            |            | CSEL<br>2  | CSEL<br>1  | CSEL<br>0  | Para. No. current value |            |            |            |            |                    |                 |  |
| 7       | OUT<br>3   | OUT<br>4  | OUT<br>5  | OUT<br>6   | OUT<br>7   | OUT<br>8   | OUT<br>9   | OUT<br>10  | OUT<br>11  | OUT<br>12               | OUT<br>13  | OUT<br>14  | OUT<br>15  | OUT<br>16  | Rewrite<br>end     | Read<br>end     |  |
| 8       | Station No./basic para./system para. (Low order word PC → Amplifier)   |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 9       | Station No./basic para./system para. (High order word PC → Amplifier)  |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 10      | Speed command (Low order word PC → Amplifier)  |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 11      | Speed command (High order word PC → Amplifier)   |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 12      | -  |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 13      | -  |           |           |            |            |            |            |            |            |                         |            |            |            |            |                    |                 |  |
| 14      | -  |           |           |            |            |            | SEL2       | SEL1       | SEL0       | Para. No. setting value |            |            |            |            |                    |                 |  |
| 15      | CONT<br>6  | CONT<br>7 | CONT<br>8 | CONT<br>9  | CONT<br>10 | CONT<br>11 | CONT<br>12 | CONT<br>13 | CONT<br>14 | CONT<br>15              | CONT<br>16 | CONT<br>17 | CONT<br>18 | CONT<br>19 | Rewrite<br>command | Read<br>command |  |

The data to read or to rewrite can be selected by on/off of SEL0, SEL1, SEL2 at bit 8 to 10 in word +14.

Read/rewrite data selection

| SEL2 | SEL1 | SEL0 | IQ area (Upper line : 0 to 7W, Lower line : 8 to 15W)  |
|------|------|------|--|
| OFF  | OFF  | OFF  | Current command position, current speed, current torque, alarm code<br>Station No., speed command  |
| OFF  | OFF  | ON   | Current feedback position, current speed, current torque, alarm code<br>Station No., speed command |
| OFF  | ON   | OFF  | Current deviation, current speed, current torque, alarm code<br>Station No., speed command         |
| OFF  | ON   | ON   | -<br>Station No.   |
| ON   | OFF  | OFF  | Basic para. current value<br>Basic para. setting value / Station No.                               |
| ON   | OFF  | ON   | System para. current value<br>System para. setting value / Station No.                             |
| ON   | ON   | OFF  | -<br>Station No.   |
| ON   | ON   | ON   | Current value between LS-Z phase<br>Station No.  |

(d) Terminal function  
CN1 (lower side)

| Terminal symbol (*)                       | Connector pin No.          | Terminal name                      | Function   |
|---|----------------------------|------------------------------------|--|
| P24<br>M24                                | 8<br>9                     | Control power supply               | +24 [V] DC, 0.2 [A]  |
| CONT1<br>CONT2<br>CONT3<br>CONT4<br>CONT5 | 1<br>2<br>3<br>4<br>5      | Control input                      | +24 [V] DC, 10 [mA]<br>Initially assigned at factory :<br>CONT1 : – (unassigned)<br>CONT2 : – (unassigned)<br>CONT3 : – (unassigned)<br>CONT4 : – (unassigned)<br>CONT5 : – (unassigned) |
| OUT1<br>OUT2                              | 6<br>7                     | Control output                     | +30 [V] DC, 50 [mA] max.<br>Initially assigned at factory :<br>OUT1 : Brake timing<br>OUT2 : Dynamic braking   |
| MON1<br>MON2<br>M5                        | 11<br>10<br>12             | Monitor 1<br>Monitor 2<br>(output) | Analog voltage.<br>Initially assigned at factory :<br>MON1 : Speed monitor<br>MON2 : Torque monitor  |
| CA, *CA<br>CB, *CB<br>M5                  | 22, 23<br>24, 25<br>26     | Pulse train input                  | Input freq. : 500 [kHz] max. (differential input)  |
| FA, *FA<br>FB, *FB<br>FZ, *FZ             | 16, 17<br>18, 19<br>20, 21 | Freq. dividing output              | Freq. dividing terminal.<br>Two 90° phase-different signal is outputted, in proportion with rotational quantity of motor.  |
| BAT+<br>BAT–                              | 14<br>15                   | External backup (input)            | Power supply for serial encoder backup   |

(\*) Each of terminal M5 is internally connected. They are not connected with terminal M24.

**(3) T-link type (T-link direct connection)**

Host controller can be direct connected to a T-link, that is a save-wiring I/O-link of MICREX-F series. 8 word of the WB area are reserved, and position control is executed on the amplifier side.

It is possible to extend an amplifier with one T-link extension cable.

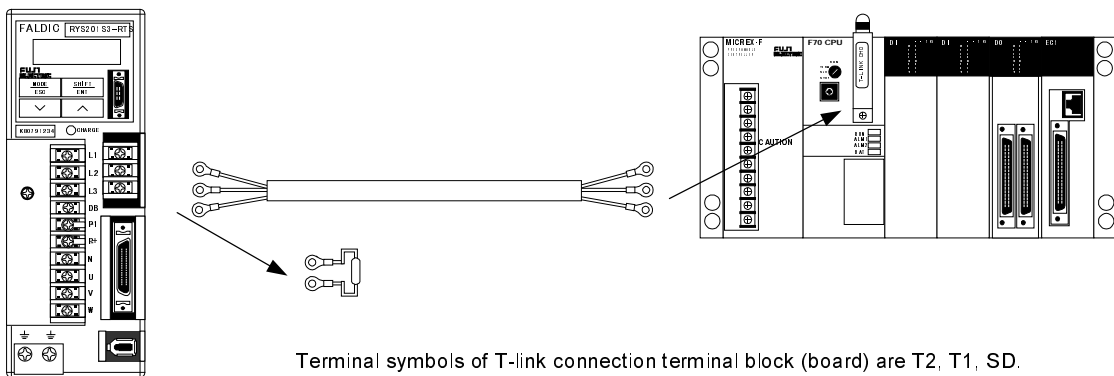
The B area of the CPU is of 100 word (per line).

RYS□□□S3-RTS type amplifier connects a T-link cable to CN3.

Control input/output signals are connected to CN1.

**(a) CN3 (upper side)**

The wiring of a T-link is of the method to connect the multiple devices in a "daisy-chain" style, and a terminating resistance is connected to its termination.



**(b) CN1 (lower side)**

|    |        |    |        |    |        |    |        |
|----|--------|----|--------|----|--------|----|--------|
| 26 | M 5    | 25 | P 5    | 13 | M 5    | 12 | CB     |
| 24 | MON 2  | 23 | * CB   | 11 | CA     | 10 | FZ     |
| 22 | * CA   | 21 | BAT +  | 9  | FB     | 8  | FA     |
| 20 | OUT 4  | 19 | OUT 3  | 7  | OUT 2  | 6  | OUT 1  |
| 18 | CONT 8 | 17 | CONT 7 | 5  | CONT 4 | 4  | CONT 3 |
| 16 | CONT 6 | 15 | CONT 5 | 3  | CONT 2 | 2  | CONT 1 |
| 14 | M 2 4  |    |        | 1  | P 2 4  |    |        |

Plug : 10126-3000V  
Shell kit : 10326-52A0-008

External sensors such as origin LS are connected to the control input signal (CONTn).  
Control output signal (OUTn) is used in case signals are outputted from the amplifier.

(c) WB area, 8 word (T-link type)

| Address | 0                             | 1                        | 2          | 3          | 4          | 5          | 6                  | 7               | 8               | 9          | A          | B          | C          | D          | E          | F          |
|---------|-------------------------------|--------------------------|------------|------------|------------|------------|--------------------|-----------------|-----------------|------------|------------|------------|------------|------------|------------|------------|
| +0      | OUT<br>5                      | OUT<br>6                 | OUT<br>7   | OUT<br>8   | OUT<br>9   | OUT<br>10  | OUT<br>11          | OUT<br>12       | OUT<br>13       | OUT<br>14  | OUT<br>15  | OUT<br>16  | OUT<br>17  | OUT<br>18  | OUT<br>19  | OUT<br>20  |
| +1      | OUT<br>21                     | ALM4                     | ALM3       | ALM2       | ALM1       | ALM0       | Rewrite<br>end     | Read<br>end     | -               |            |            |            |            |            |            |            |
| +2      | Read data (High order word    |                          |            |            |            |            |                    |                 | PC ← Amplifier) |            |            |            |            |            |            |            |
| +3      | Read data (Low order word     |                          |            |            |            |            |                    |                 | PC ← Amplifier) |            |            |            |            |            |            |            |
| +4      | CONT<br>9                     | CONT<br>10               | CONT<br>11 | CONT<br>12 | CONT<br>13 | CONT<br>14 | CONT<br>15         | CONT<br>16      | CONT<br>17      | CONT<br>18 | CONT<br>19 | CONT<br>20 | CONT<br>21 | CONT<br>22 | CONT<br>23 | CONT<br>24 |
| +5      | CONT<br>25                    | Read/rewrite data select |            |            |            |            | Rewrite<br>command | Read<br>command | Address No.     |            |            |            |            |            |            |            |
| +6      | Rewrite data (High order word |                          |            |            |            |            |                    |                 | PC → Amplifier) |            |            |            |            |            |            |            |
| +7      | Rewrite data (Low order word  |                          |            |            |            |            |                    |                 | PC → Amplifier) |            |            |            |            |            |            |            |

The data to read or to rewrite can be selected by on/off of bit 1 to 5 in ward +5.

Read/rewrite data selection

| +1  | +2  | +3  | +4  | +5  | WB area (when reading)    | WB area (when rewriting)  |
|-----|-----|-----|-----|-----|---------------------------|---------------------------|
| OFF | OFF | OFF | OFF | OFF | Current feedback position | -                         |
| OFF | OFF | OFF | OFF | ON  | Feedback speed            | -                         |
| OFF | OFF | OFF | ON  | OFF | Torque command            | -                         |
| OFF | OFF | OFF | ON  | ON  | Deviation amount          | -                         |
| OFF | OFF | ON  | OFF | OFF | LS-Z phase pulse          | -                         |
| OFF | OFF | ON  | OFF | ON  | -                         | -                         |
| OFF | OFF | ON  | ON  | OFF | -                         | -                         |
| OFF | OFF | ON  | ON  | ON  | -                         | -                         |
| OFF | ON  | OFF | OFF | OFF | -                         | -                         |
| OFF | ON  | OFF | OFF | ON  | Basic para.               | Basic para.               |
| OFF | ON  | OFF | ON  | OFF | System para.              | System para.              |
| OFF | ON  | OFF | ON  | ON  | -                         | -                         |
| OFF | ON  | ON  | OFF | OFF | -                         | -                         |
| OFF | ON  | ON  | OFF | ON  | -                         | Current feedback position |
| OFF | ON  | ON  | ON  | OFF | Current command position  | -                         |
| OFF | ON  | ON  | ON  | ON  | Command speed             | -                         |
| ON  | OFF | OFF | OFF | OFF | -                         | Speed command [FWD/REV]   |

## (d) Terminal function

## (i) CN1 (lower side)

| Terminal symbol (*1)   | Connector pin No.                        | Terminal name                | Function   |
|--|--|------------------------------|--|
| P24<br>M24   | 1<br>24                                  | Control power supply         | +24 [V] DC, 0.2 [A]  |
| CONT1<br>CONT2<br>CONT3<br>CONT4<br>CONT5<br>CONT6<br>CONT7<br>CONT8 | 2<br>3<br>4<br>5<br>15<br>16<br>17<br>18 | Control input                | +24 [V] DC, 10 [mA]<br>Initially assigned at factory :<br>CONT1 : - (unassigned)<br>CONT2 : - (unassigned)<br>CONT3 : - (unassigned)<br>CONT4 : - (unassigned)<br>CONT5 : - (unassigned)<br>CONT6 : - (unassigned)<br>CONT7 : - (unassigned)<br>CONT8 : - (unassigned) |
| OUT1<br>OUT2<br>OUT3<br>OUT4   | 6<br>7<br>19<br>20                       | Control output               | +30 [V] DC, 50 [mA] max.<br>OUT1 : - (unassigned)<br>OUT2 : - (unassigned)<br>OUT3 : - (unassigned)<br>OUT4 : - (unassigned)   |
| MON2<br>M5   | 24<br>26                                 | Monitor 2 (output)           | Analog voltage.<br>Initially assigned at factory :<br>MON2 : Torque monitor  |
| P5<br>M5   | 25<br>13                                 | Power supply for pulse train | +5 [V] DC, 200 [mA]  |
| CA, *CA<br>CB, *CB   | 11, 22<br>12, 23                         | Pulse train input            | Input freq. : 500 [kHz] max. (differential input) (*2)   |
| FA<br>FB<br>FZ   | 8<br>9<br>10                             | Freq. dividing output        | Freq. dividing terminal.<br>Two 90° phase-different signal is outputted, in proportion with rotational quantity of motor. (*2)   |
| BAT+   | 21                                       | External backup (input)      | Power supply for serial encoder backup (*2)  |

(\*1) Each of terminal M5 is internally connected. They are not connected with terminal M24.

(\*2) Reference potential is M5 terminal.

(e) Interface circuits

| Signal name                       | Specification                           | Interface circuit |
|-----------------------------------|---|-------------------|
| Control input                     | +24 [V] DC, 10 [mA]<br>(each one-point) |                   |
| Control output                    | +30 [V] DC, 50 [mA] (max.)              |                   |
| Analog input                      | 20 [kΩ] impedance                       |                   |
| Analog output<br>(monitor output) | Voltage output                          |                   |
| Pulse train input                 | Differential input                      |                   |
| Pulse train output                | Differential output                     |                   |

#### 4.5 External connection diagrams (normal, example)

##### (1) External connection diagrams of RYS-S3-RPS type amplifier and GYC, GYS type motor

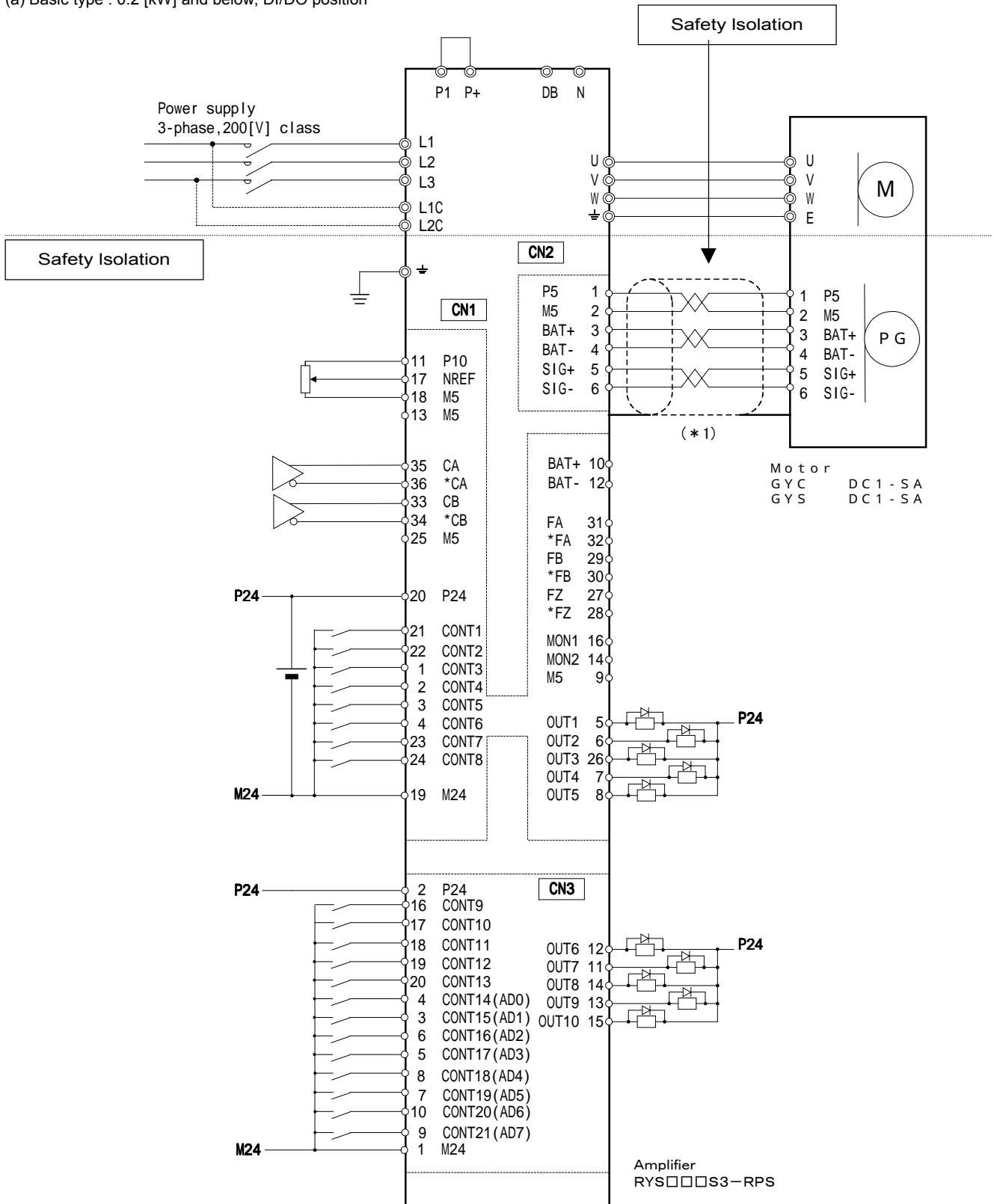
|   | Page |
|---|------|
| (a) Basic type : 0.2 [kW] and below, DI/DO position   | 4-21 |
| (b) Basic type : 0.4 and 0.75 [kW], DI/DO position  | 4-22 |
| (c) Basic type : 1 and 1.5 [kW], DI/DO position   | 4-23 |
| (d) Basic type : 2 to 5 [kW], DI/DO position  | 4-24 |
| (e) Basic type : 0.05 and 0.1 [kW] for 100 [V] class input voltage of amplifier, DI/DO position | 4-25 |
| (f) Basic type : 0.2 [kW] for 100 [V] class input voltage of amplifier, DI/DO position          | 4-26 |
| (g) Motor with providing brake  | 4-27 |
| (h) SX bus type : 0.2 [kW] and below  | 4-28 |
| (i) SX bus type : 0.4 and 0.75 [kW]   | 4-30 |
| (j) SX bus type : 1 and 1.5 [kW]  | 4-31 |
| (k) SX bus type : 2 to 5 [kW]   | 4-32 |
| (l) SX bus type : 0.05 and 0.1 [kW] for 100 [V] class input voltage of amplifier                | 4-33 |
| (m) SX bus type : 0.2 [kW] for 100 [V] class input voltage of amplifier                         | 4-34 |
| (n) T-link type : 0.2 [kW] and below  | 4-35 |
| (o) T-link type : 0.4 and 0.75 [kW]   | 4-37 |
| (p) T-link type : 1 and 1.5 [kW]  | 4-38 |
| (q) T-link type : 2 to 5 [kW]   | 4-39 |
| (r) T-link type : 0.05 and 0.1 [kW] for 100 [V] class input voltage of amplifier                | 4-40 |
| (s) T-link type : 0.2 [kW] for 100 [V] class input voltage of amplifier                         | 4-41 |

##### (2) External connection diagrams of RYS-V type amplifier and GYC type motor

|  |      |
|--|------|
| (a) Positioning unit : AD75              | 4-42 |
| (b) Position control unit : C200HW-NC113 | 4-43 |



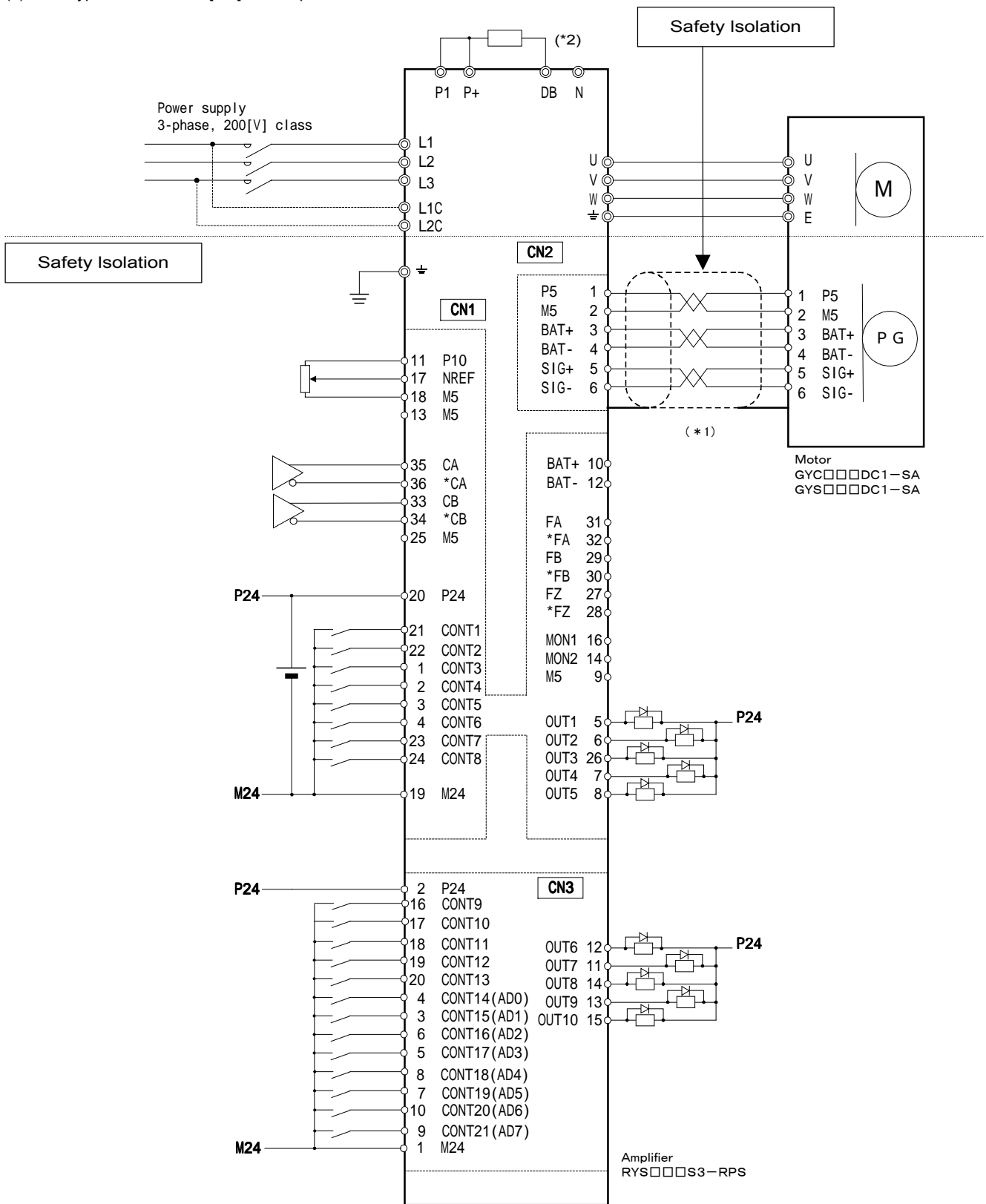
(a) Basic type : 0.2 [kW] and below, DI/DO position



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

- CONT and OUT terminals are assigned at factory : Refer to (1) (c) of 4.4 host interface (I/F).
- The unit can be operate, even if no wiring is made to control power supply terminals L1C, L2C.

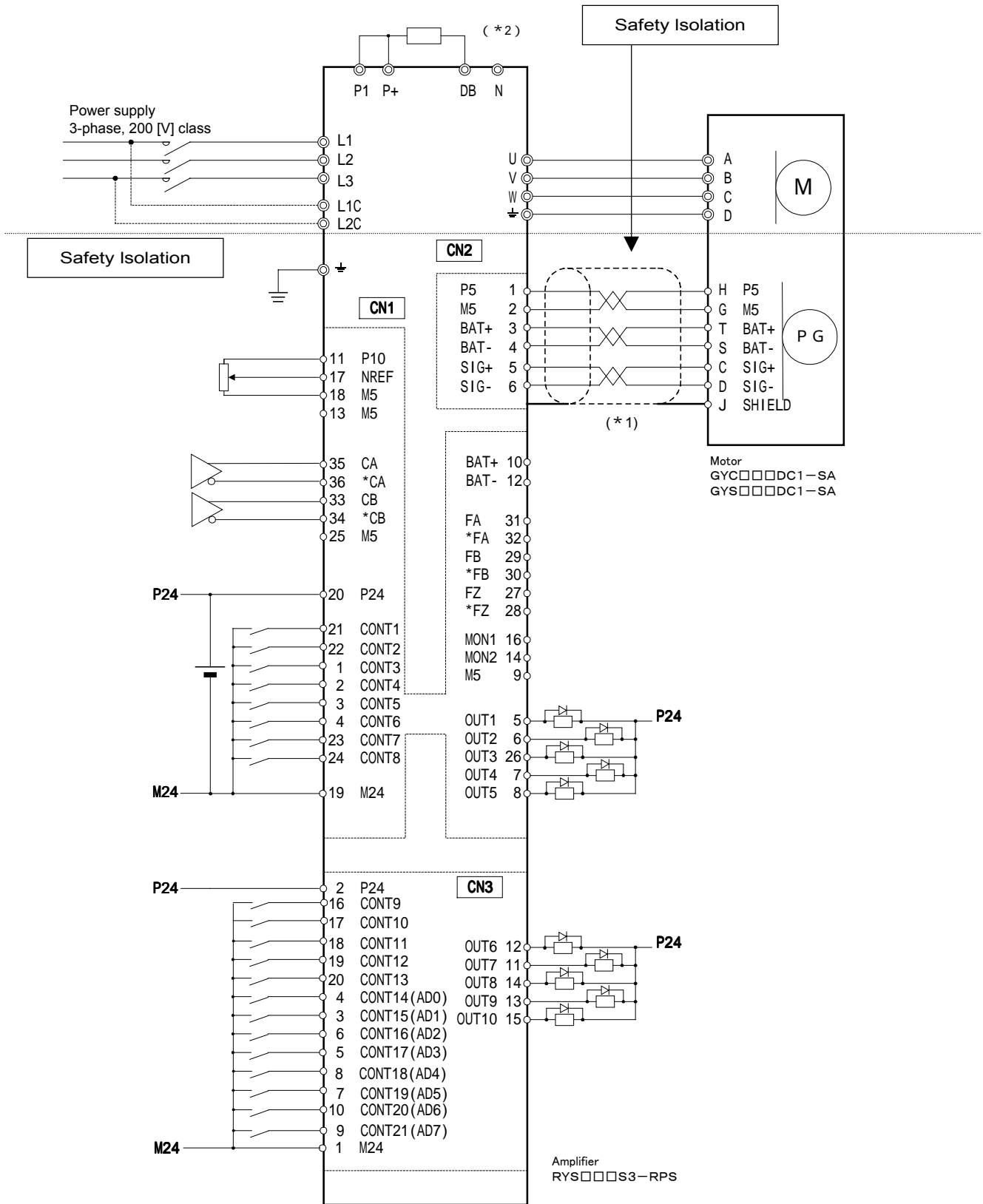
(b) Basic type : 0.4 and 0.75 [kW], DI/DO position



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

(\*2) A braking resistor is provided (built-in) with amplifier.

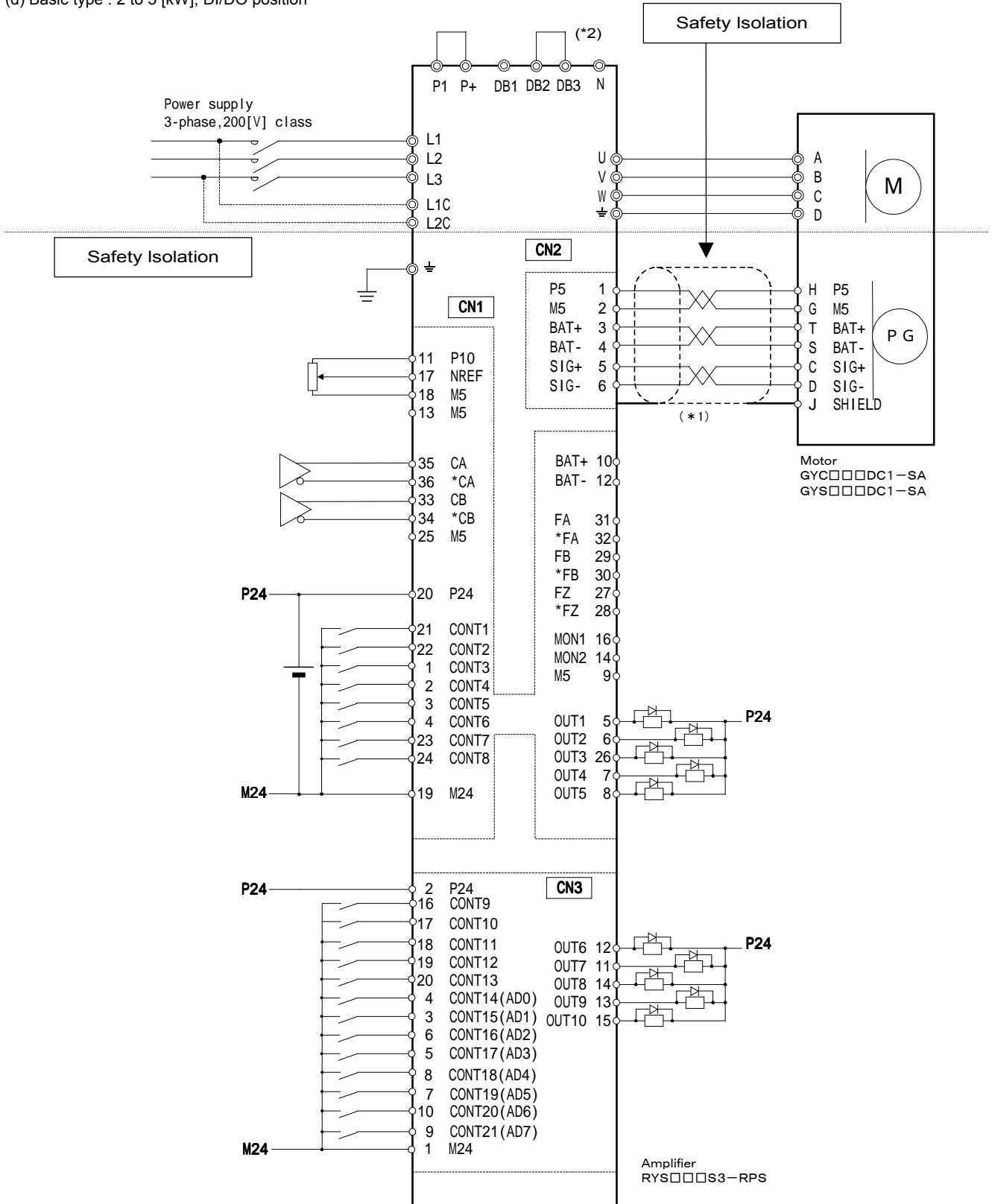
(c) Basic type : 1 and 1.5 [kW], DI/DO position



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

(\*2) A braking resistor is provided (built-in) with amplifier.

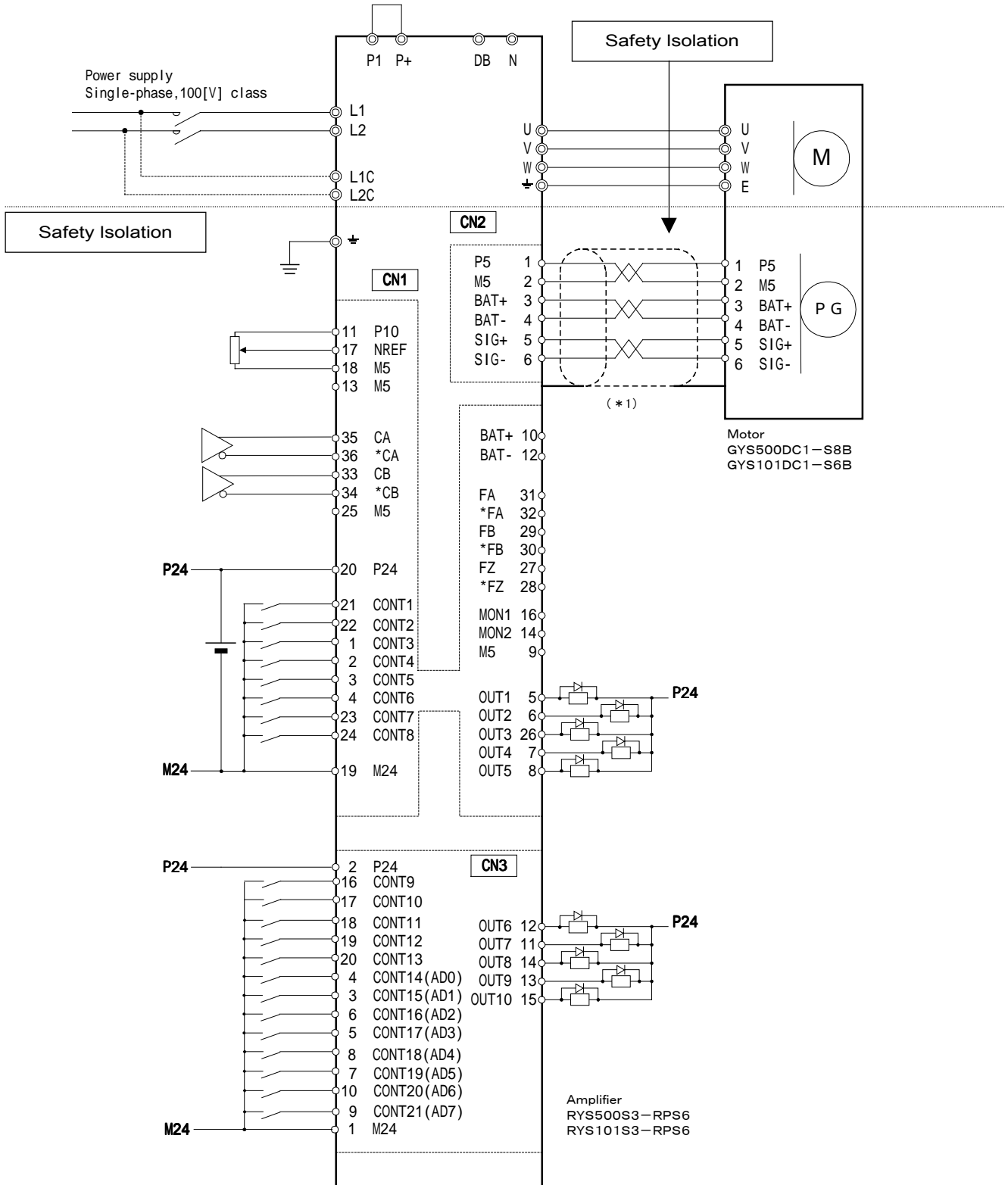
(d) Basic type : 2 to 5 [kW], DI/DO position



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

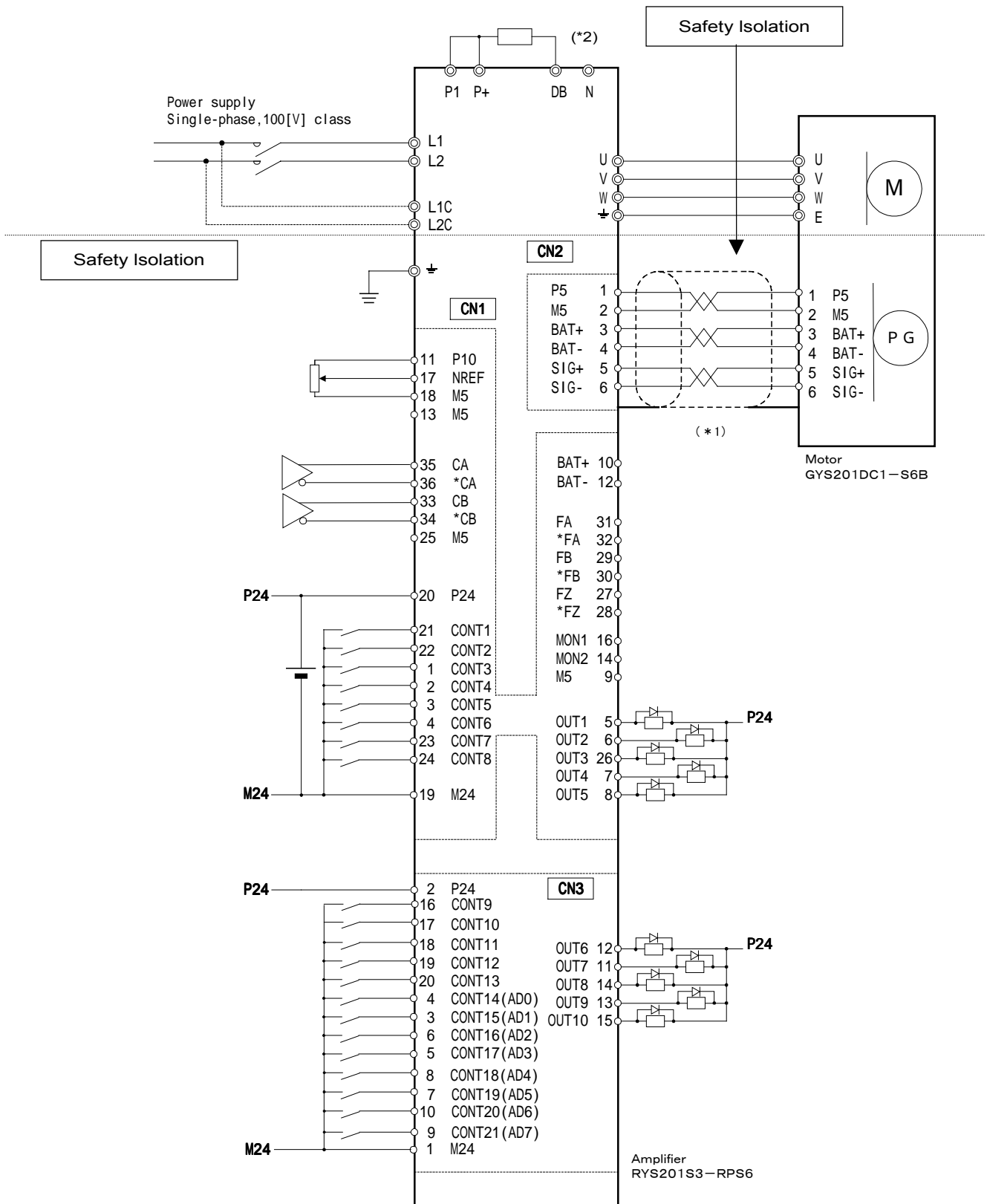
(\*2) A braking resistor is provided (built-in) with amplifier.

(e) Basic type : 0.05 and 0.1 [kW] for 100 [V] class input voltage of amplifier, DI/DO position



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

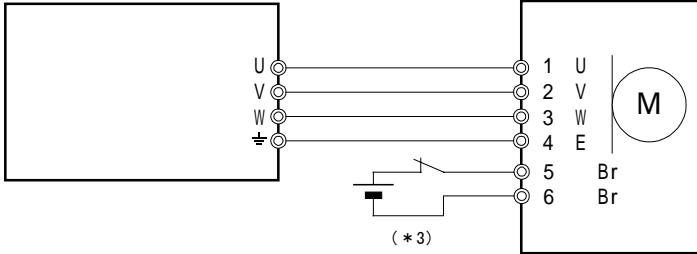
(f) Basic type : 0.2 [kW] for 100 [V] class input voltage of amplifier, DI/DO position



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

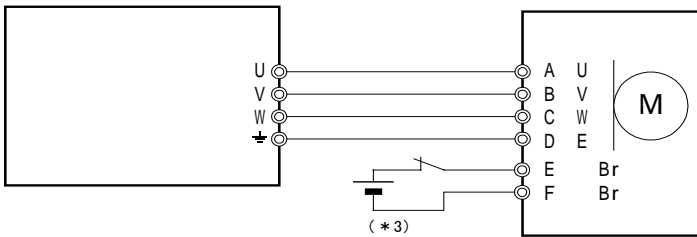
(\*2) A braking resistor is provided (built-in) with amplifier.

- (g) Motor with providing brake  
 (i) 0.75 [kW] and below



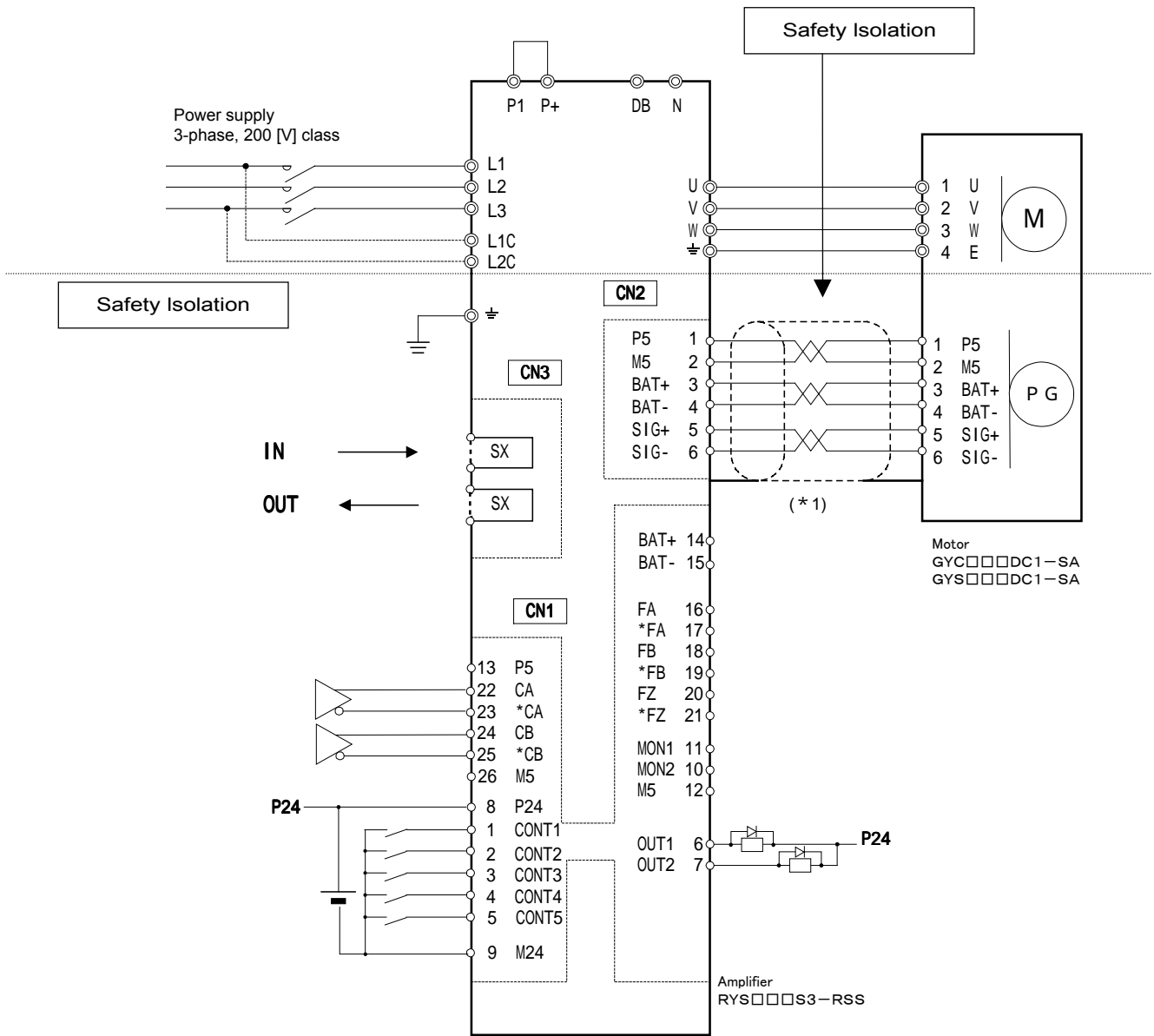
| Motor type              | GYC       |     | GYS           |     | GYC, GYS |      |
|-------------------------|-----------|-----|---------------|-----|----------|------|
| Rated output [kW]       | 0.1       | 0.2 | 0.1 and below | 0.2 | 0.4      | 0.75 |
| (*3) Brake power supply | 24 [V] DC |     |               |     |          |      |
| Brake input [W]         | 6.5       | 9   | 6.1           | 7.3 | 9        | 8.5  |

- (ii) 1 to 2 [kW]



| Motor type              | GYC, GYS  |     |   |
|-------------------------|-----------|-----|---|
| Rated output [kW]       | 1         | 1.5 | 2 |
| (*3) Brake power supply | 24 [V] DC |     |   |
| Brake input [W]         | 12        |     |   |

(h) SX bus type : 0.2 [kW] and below



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

• CONT and OUT terminals are assigned at factory :

| Terminal symbol | CONT1 to CONT5 | OUT1 and OUT2 |
|-----------------|----------------|---------------|
| Function        | -              | -             |

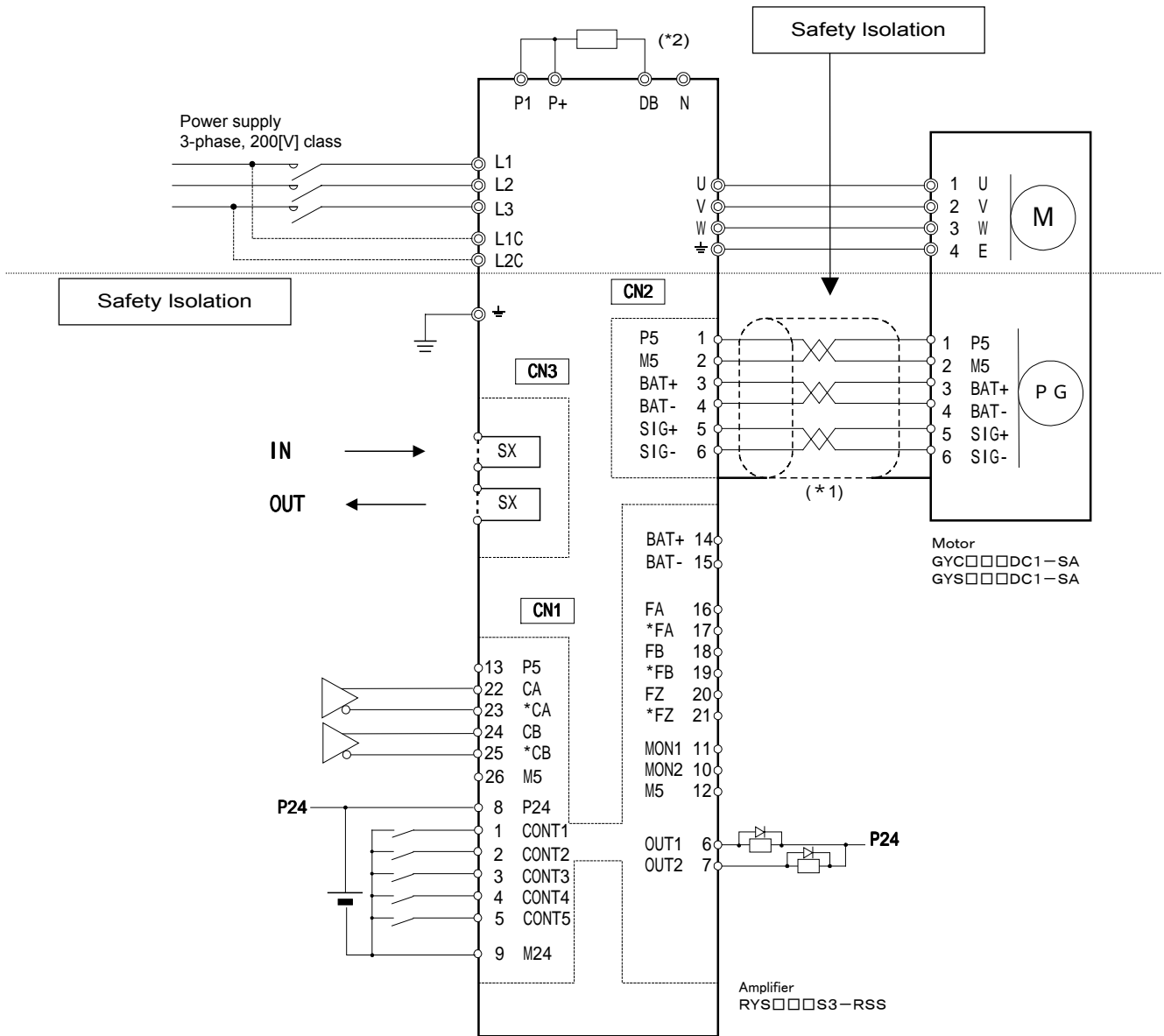


Initial factory setting value of IQ area is as follows : See 5.8 IQ area (SX bus type).

| Address | 15   | 14        | 13           | 12         | 11            | 10               | 9         | 8         | 7         | 6                       | 5                  | 4 | 3 | 2 | 1                  | 0               |  |
|---------|--|-----------|--------------|------------|---------------|------------------|-----------|-----------|-----------|-------------------------|--------------------|---|---|---|--------------------|-----------------|--|
| 0       | Current position, current deviation, basic para., system para. /LS-Z phase pulse<br>(Low order word PC Amplifier)  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 1       | Current position, current deviation, basic para., system para. /LS-Z phase pulse<br>(High order word PC Amplifier) |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 2       | Current speed (Low order word PC ←Amplifier)   |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 3       | Current speed (High order word PC ←Amplifier)  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 4       | Current torque (PC ←Amplifier)   |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 5       | -  |           |              | Alarm code |               |                  |           |           |           | -                       |                    |   |   |   |                    |                 |  |
| 6       | -  |           |              |            |               |                  | CSEL<br>2 | CSEL<br>1 | CSEL<br>0 | Para. No. current value |                    |   |   |   |                    |                 |  |
| 7       | RDY  | W<br>PSET | CPU<br>ready | ALM        | Data<br>error | Address<br>error | -         | -         | -         | -                       | -                  | - | - | - | Rewrite<br>end     | Read<br>end     |  |
| 8       | Station No./basic para./system para. (Low order word PC →Amplifier)  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 9       | Station No./basic para./system para. (High order word PC →Amplifier)   |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 10      | Speed command (Low order word PC →Amplifier)   |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 11      | Speed command (High order word PC →Amplifier)  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 12      | -  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 13      | -  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |  |
| 14      | -  |           |              |            |               |                  | SEL2      | SEL1      | SEL0      | Para. No. setting value |                    |   |   |   |                    |                 |  |
| 15      | RUN  | FWD       | REV          | RST        | START         | ORG              | X1        | VEL0      | VEL1      | DIR                     | Position<br>preset | - | - | - | Rewrite<br>command | Read<br>command |  |

The unit can be operated, even if no wiring is made to control power supply terminals L1C, L2C.

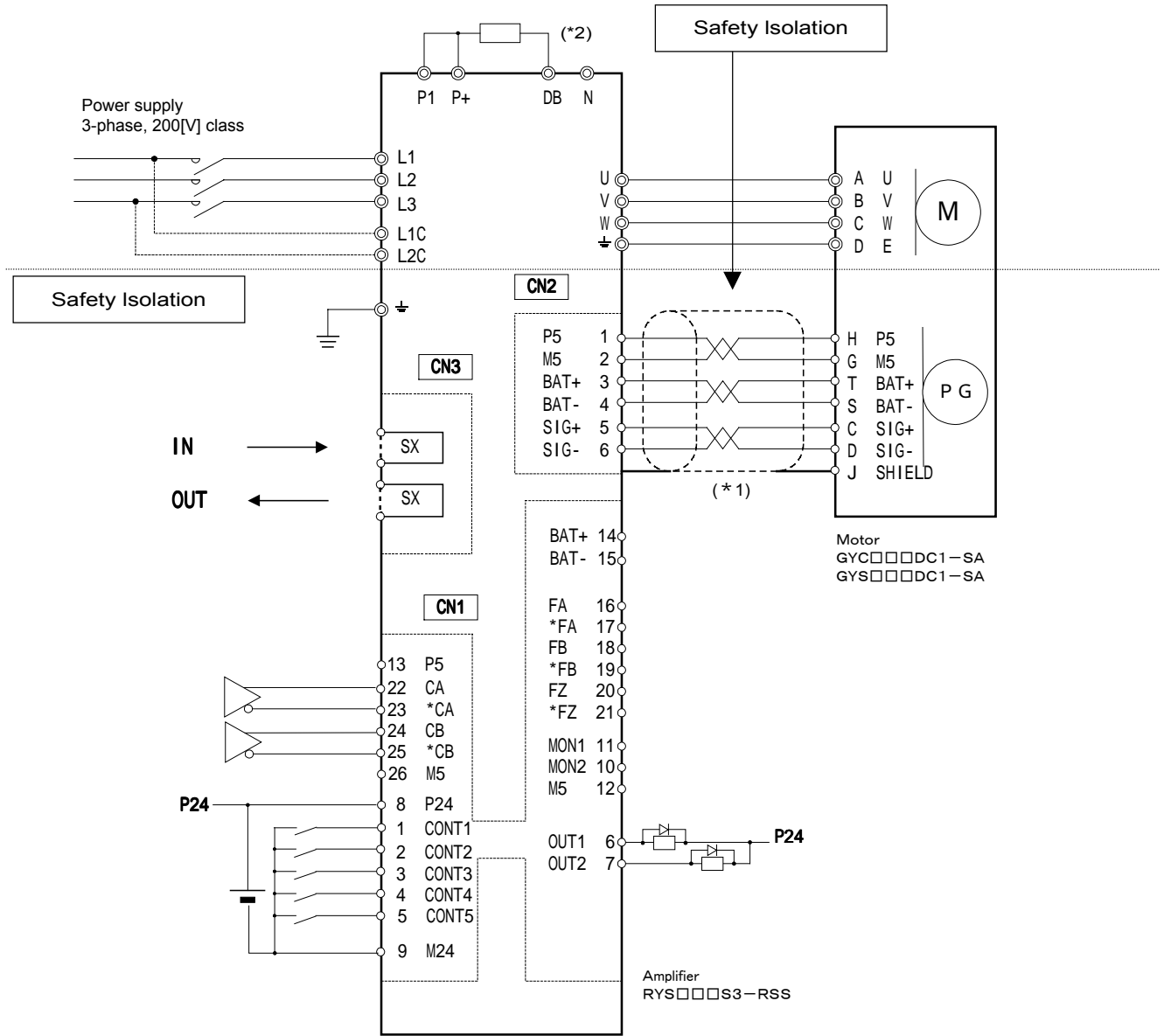
(i) SX bus type : 0.4 and 0.75 [kW]



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

(\*2) A braking resistor is provided (built-in) with amplifier.

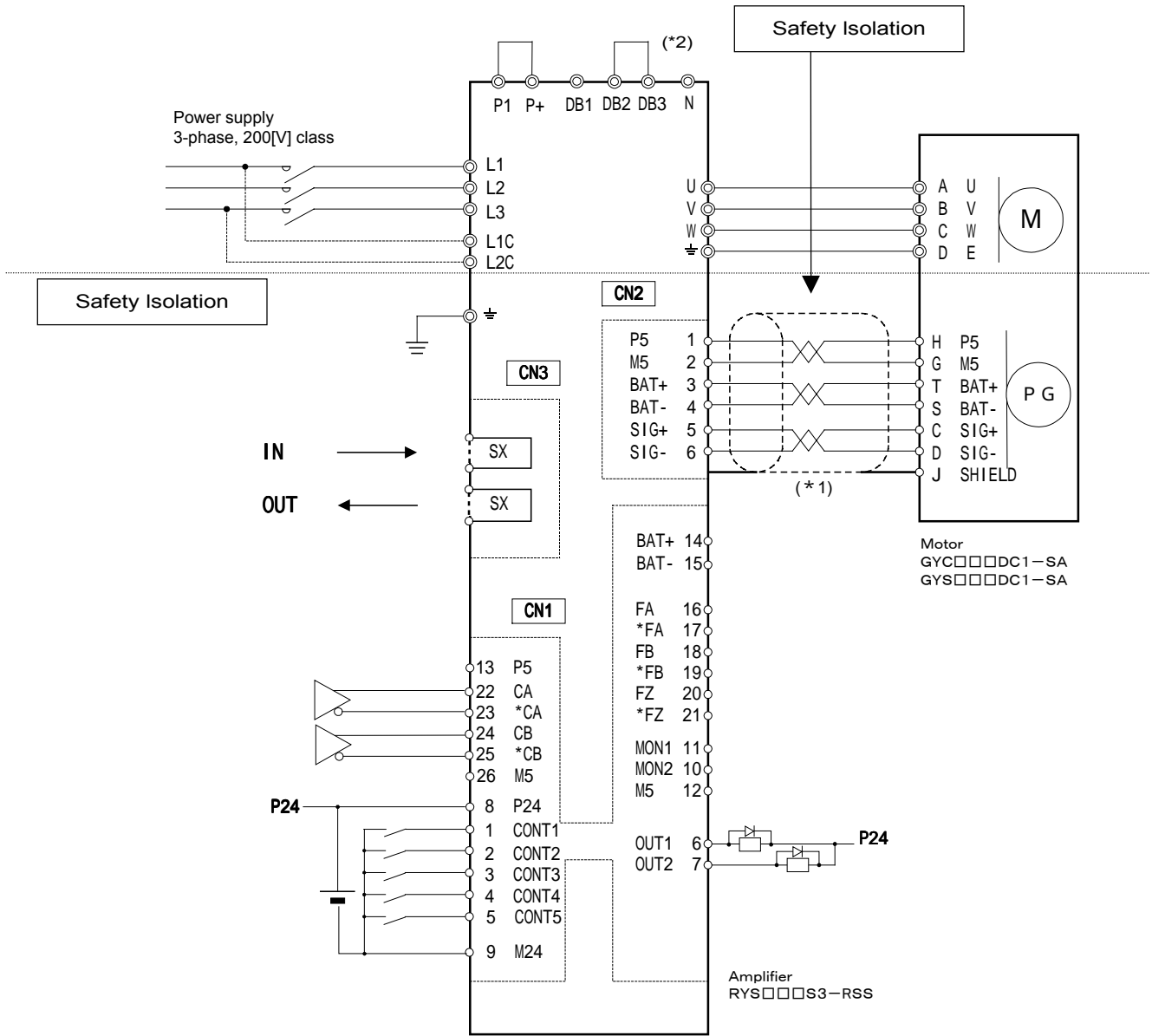
(j) SX bus type : 1 and 1.5 [kW]



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

(\*2) A braking resistor is provided (built-in) with amplifier.

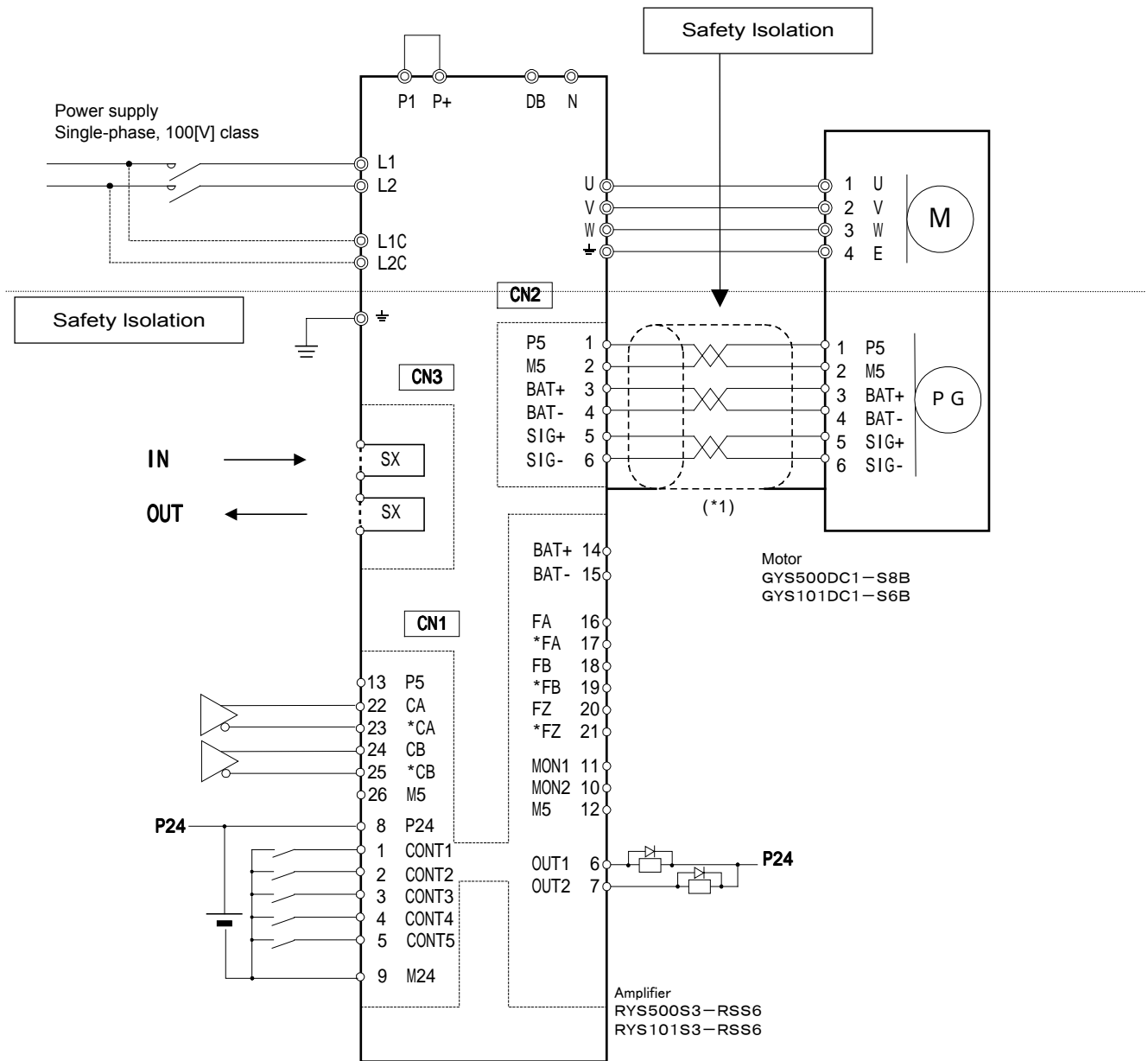
(k) SX bus type : 2 to 5 [kW]



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

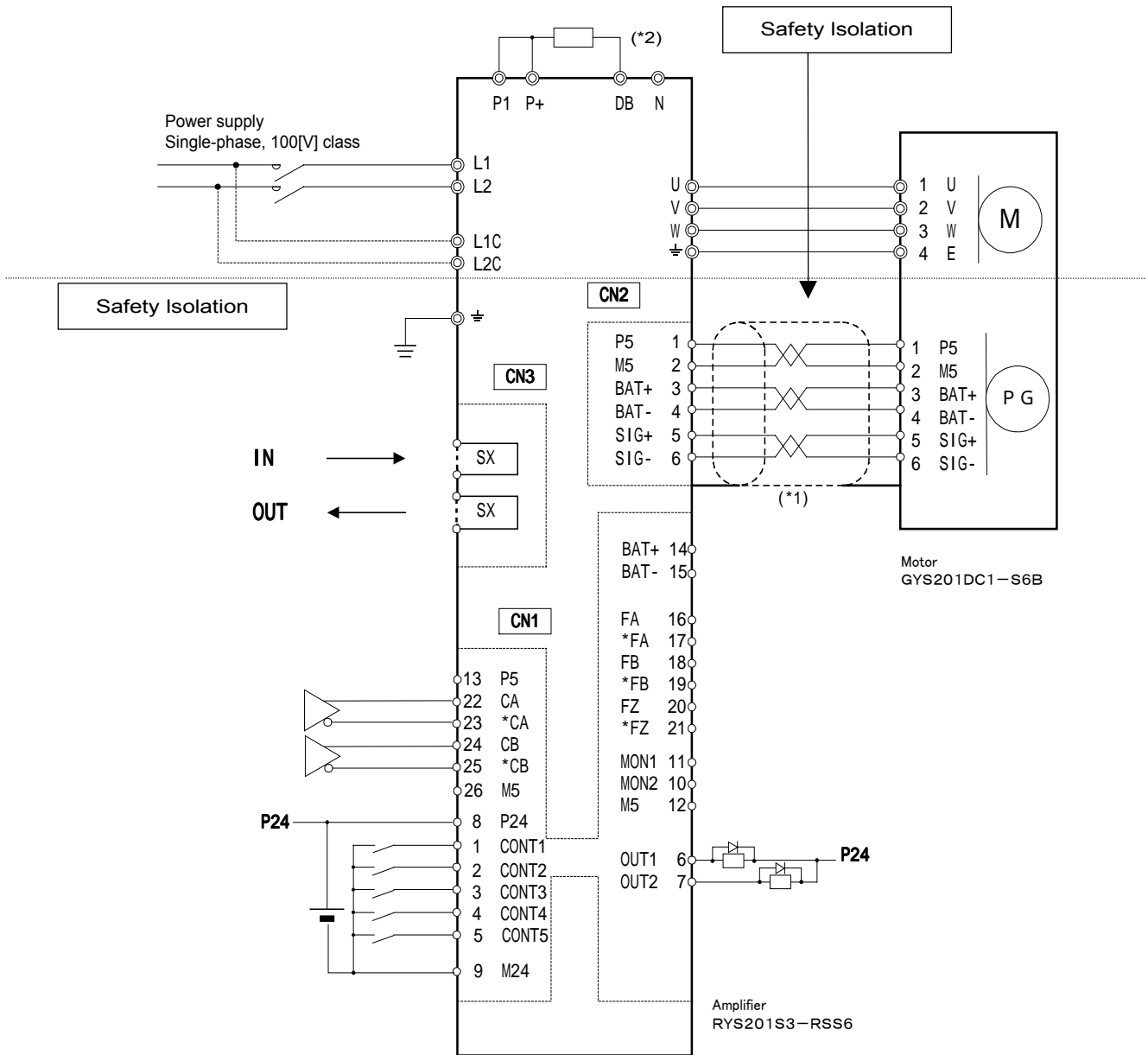
(\*2) A braking resistor is provided (built-in) with amplifier.

(I) SX bus type : 0.05 and 0.1 [kW] for 100 [V] class input voltage of amplifier



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

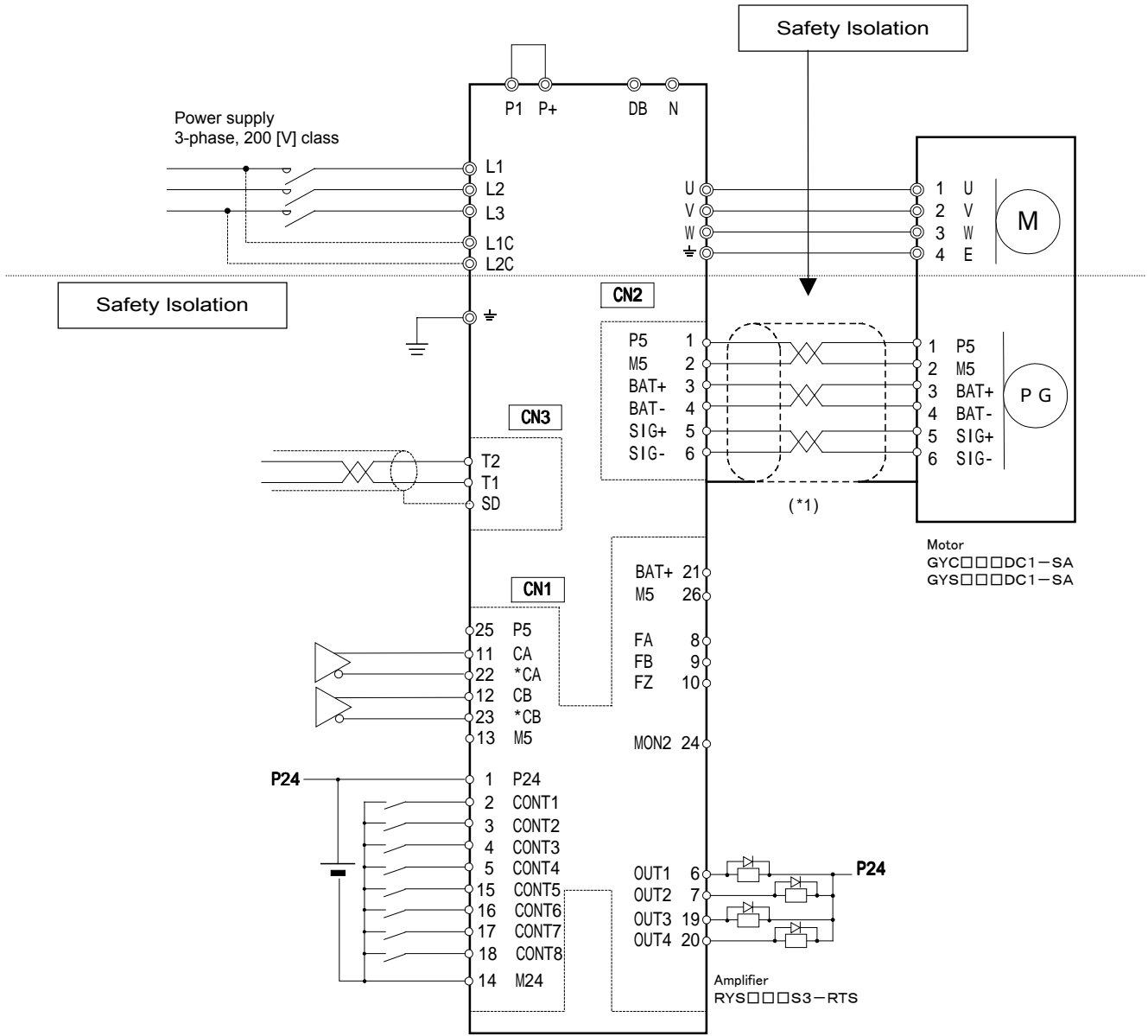
(m) SX bus type : 0.2 [kW] for 100 [V] class input voltage of amplifier



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

(\*2) A braking resistor is provided (built-in) with amplifier.

(n) T-link type : 0.2 [kW] and below



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

• CONT and OUT terminals are assigned at factory :

| Terminal symbol | CONT1 to CONT8 | OUT1 to OUT4 |
|-----------------|----------------|--------------|
| Function        | -              | -            |

Initial factory setting value of WB area is as follow : refer to 5.9 WB area (T-link type)

| Address | 0                             | 1                        | 2         | 3            | 4             | 5    | 6               | 7            | 8           | 9          | A               | B               | C | D | E | F |  |
|---------|-------------------------------|--------------------------|-----------|--------------|---------------|------|-----------------|--------------|-------------|------------|-----------------|-----------------|---|---|---|---|--|
| +0      | RDY                           | WPSET                    | CPU ready | Alarm detect | Address error | —    | —               | LS detect    | EMG detect  | Data error | —               | —               | — | — | — | — |  |
| +1      | —                             | ALM4                     | ALM3      | ALM2         | ALM1          | ALM0 | Rewrite end     | Read end     | —           |            |                 |                 |   |   |   |   |  |
| +2      | Read data (High order word    |                          |           |              |               |      |                 |              |             |            | PC ← Amplifier) |                 |   |   |   |   |  |
| +3      | Read data (Low order word     |                          |           |              |               |      |                 |              |             |            | PC ← Amplifier) |                 |   |   |   |   |  |
| +4      | RUN                           | START                    | FWD       | REV          | ORG           | EMG  | RST             | VEL0         | VEL1        | DIR        | X1              | Position preset | — | — | — | — |  |
| +5      | —                             | Read/rewrite data select |           |              |               |      | Rewrite command | Read command | Address No. |            |                 |                 |   |   |   |   |  |
| +6      | Rewrite data (High order word |                          |           |              |               |      |                 |              |             |            | PC → Amplifier) |                 |   |   |   |   |  |
| +7      | Rewrite data (Low order word  |                          |           |              |               |      |                 |              |             |            | PC → Amplifier) |                 |   |   |   |   |  |

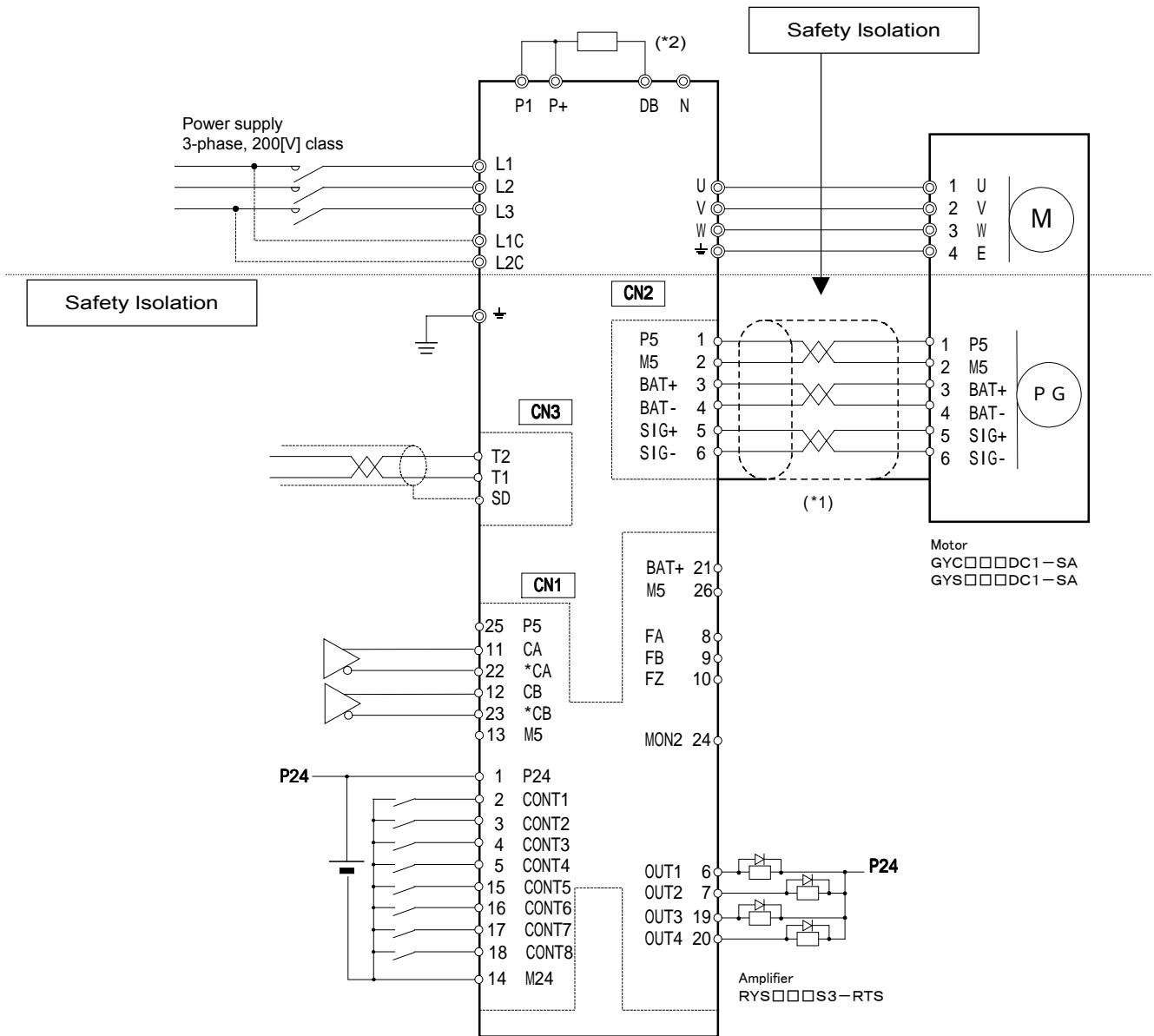
Read/rewrite data selection

| +1  | +2  | +3  | +4  | +5  | WB area (when reading)    | WB area (when rewriting) |
|-----|-----|-----|-----|-----|---------------------------|--------------------------|
| OFF | OFF | OFF | OFF | OFF | Current feedback position | —                        |
| OFF | OFF | OFF | OFF | ON  | Feedback speed            | —                        |
| OFF | OFF | OFF | ON  | OFF | Torque command            | —                        |
| OFF | OFF | OFF | ON  | ON  | Deviation amount          | —                        |
| OFF | OFF | ON  | OFF | OFF | LS-Z phase pulse          | —                        |
| OFF | OFF | ON  | OFF | ON  | —                         | —                        |
| OFF | OFF | ON  | ON  | OFF | —                         | —                        |
| OFF | OFF | ON  | ON  | ON  | —                         | —                        |
| OFF | ON  | OFF | OFF | OFF | —                         | —                        |
| OFF | ON  | OFF | OFF | ON  | Basic para.               | Basic para.              |
| OFF | ON  | OFF | ON  | OFF | System para.              | System para.             |
| OFF | ON  | OFF | ON  | ON  | —                         | —                        |

The unit can be operated, even if no wiring is made to control power supply terminals L1C, L2C.



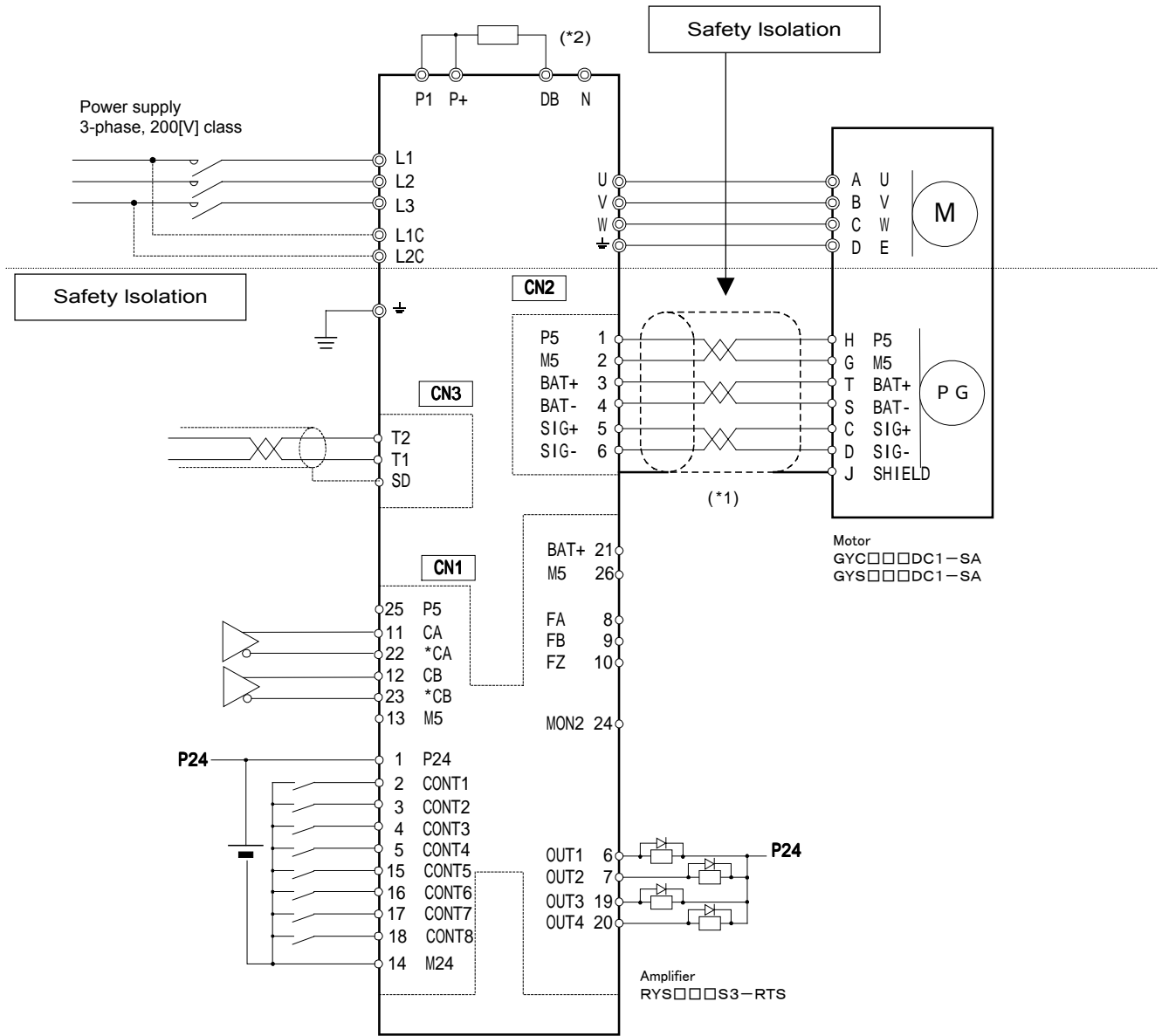
(o) T-link type : 0.4 and 0.75 [kW]



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

(\*2) A braking resistor is provided (built-in) with amplifier.

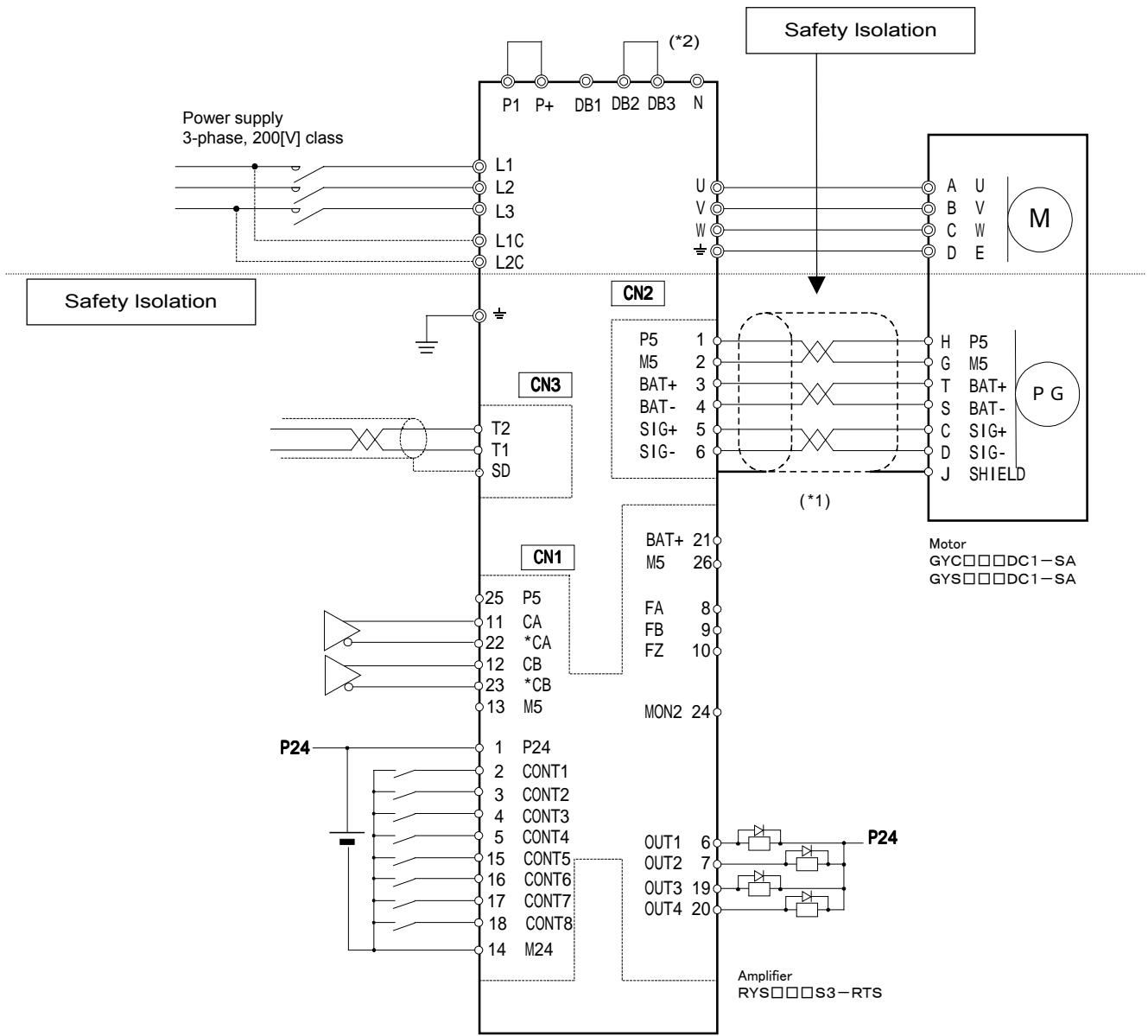
(p) T-link type : 1 and 1.5 [kW]



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

(\*2) A braking resistor is provided (built-in) with amplifier.

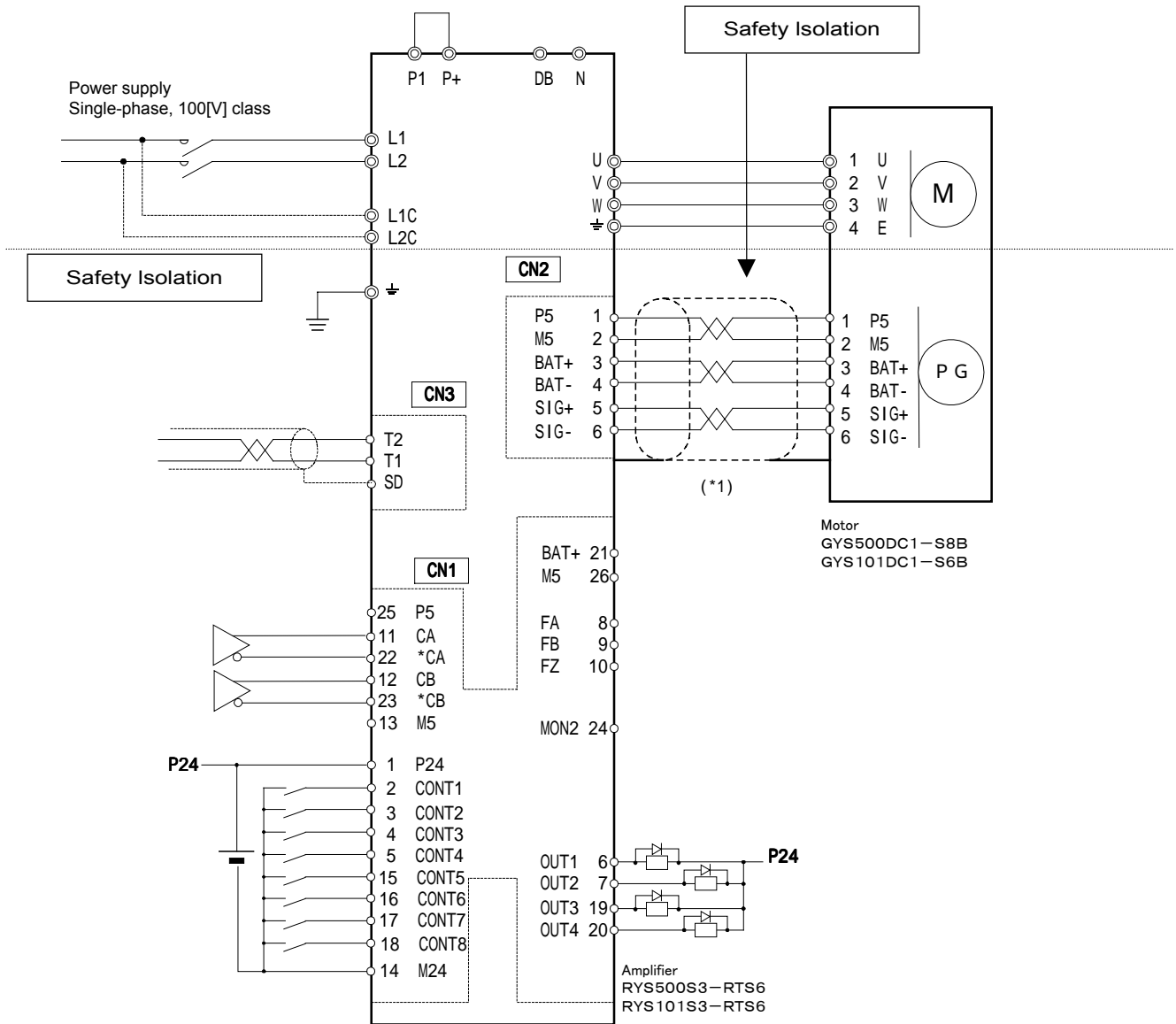
(q) T-link type : 2 to 5 [kW]



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

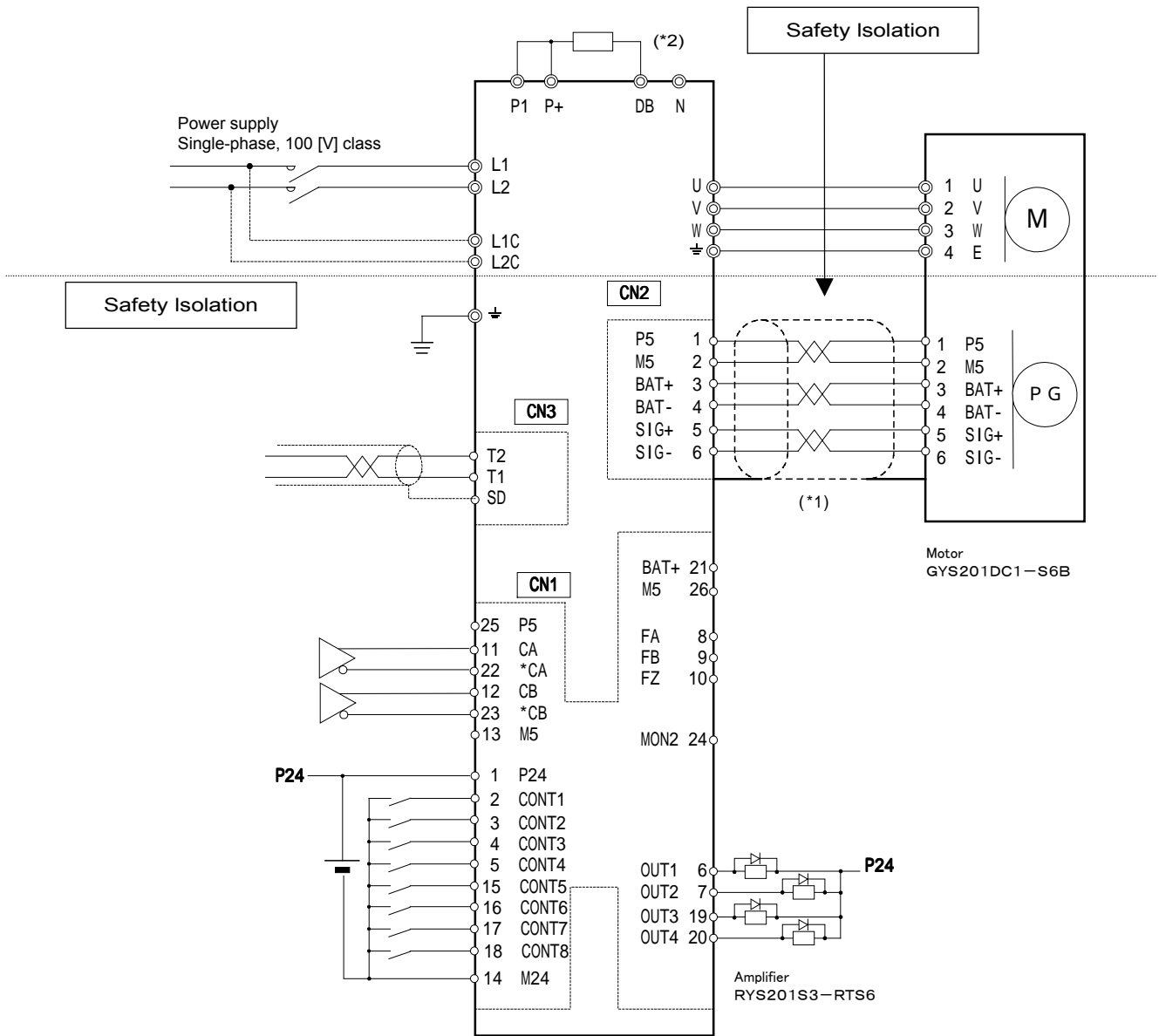
(\*2) A braking resistor is provided (built-in) with amplifier.

(r) T-link type : 0.05 and 0.1 [kW] for 100 [V] class input voltage of amplifier



(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

(s) T-link type : 0.2 [kW] for 100 [V] class input voltage of amplifier



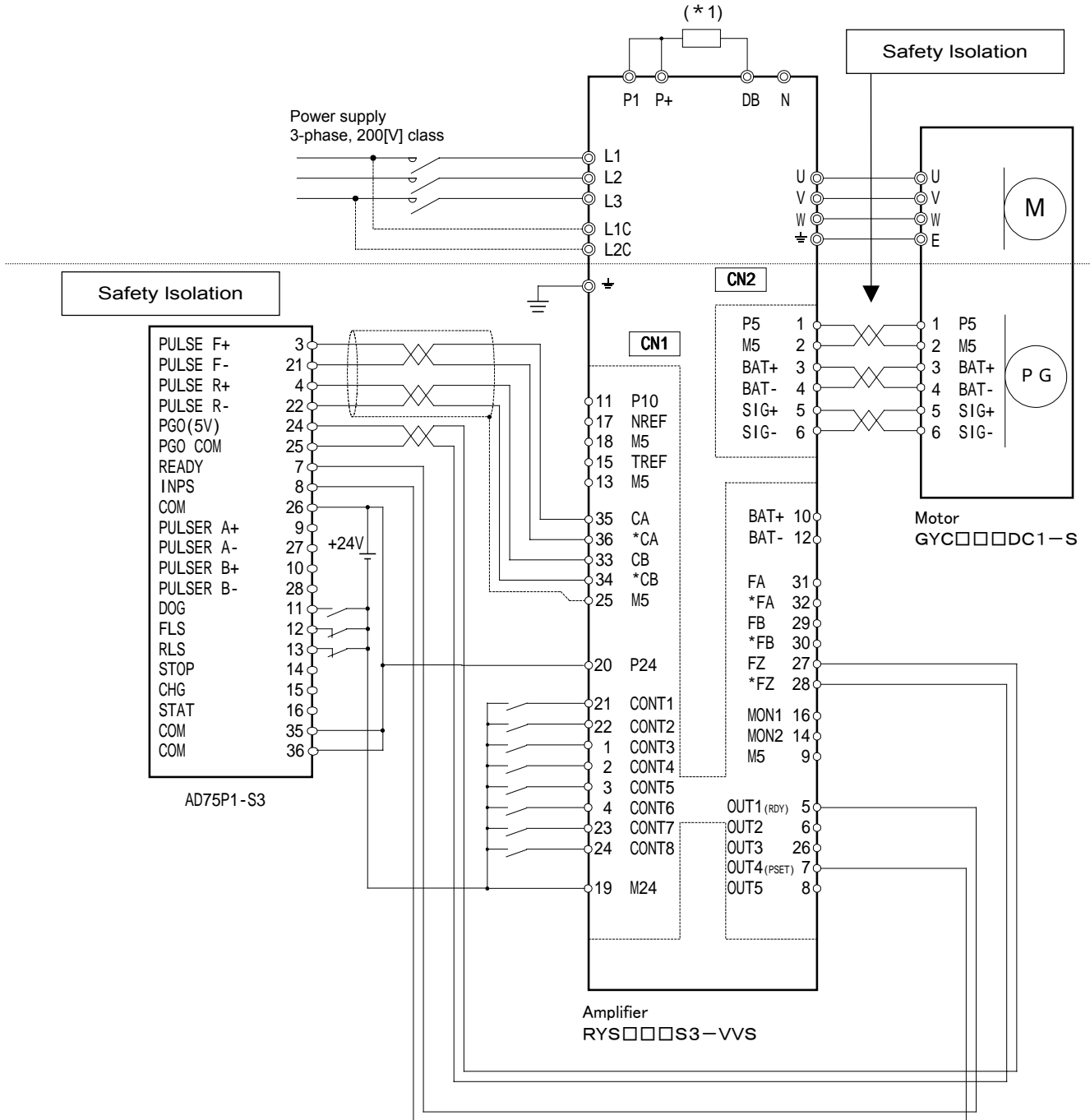
(\*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

(\*2) A braking resistor is provided (built-in) with amplifier.

**(2) External connection diagrams of RYS-V type amplifier and GYC type motor**

(a) Positioning unit : AD75

Typical connection with AD75 type positioning unit (Mitsubishi Electric Corp.)



Notes :

(\*1) For 0.2 [kW] and below, braking resistor is not provided (is not built-in) with amplifier.

- The pulse output mode is used for CW/CCW (\*2) pulse output.
- CONT and OUT of CN1 terminals are initially assigned at factory :

| Terminal symbol | CONT1 | CONT2 | CONT3 | CONT4 | CONT5                      | CONT6                      | CONT7                  | CONT8                  |
|-----------------|-------|-------|-------|-------|----------------------------|----------------------------|------------------------|------------------------|
| Function (*4)   | RUN   | FWD   | REV   | RST   | Multispeed selection<br>X1 | Multispeed selection<br>X2 | Pulse train<br>ratio 1 | Positioning<br>control |

| Terminal symbol | OUT1 | OUT2   | OUT3  | OUT4 (*3) | OUT5 |
|-----------------|------|--------|-------|-----------|------|
| Function (*4)   | RDY  | CPURDY | NZERO | PSET      |      |

(\*2) Direction of motor shaft rotation (when viewed from a point facing the drive-end of motor) is designed according to Japanese standards :

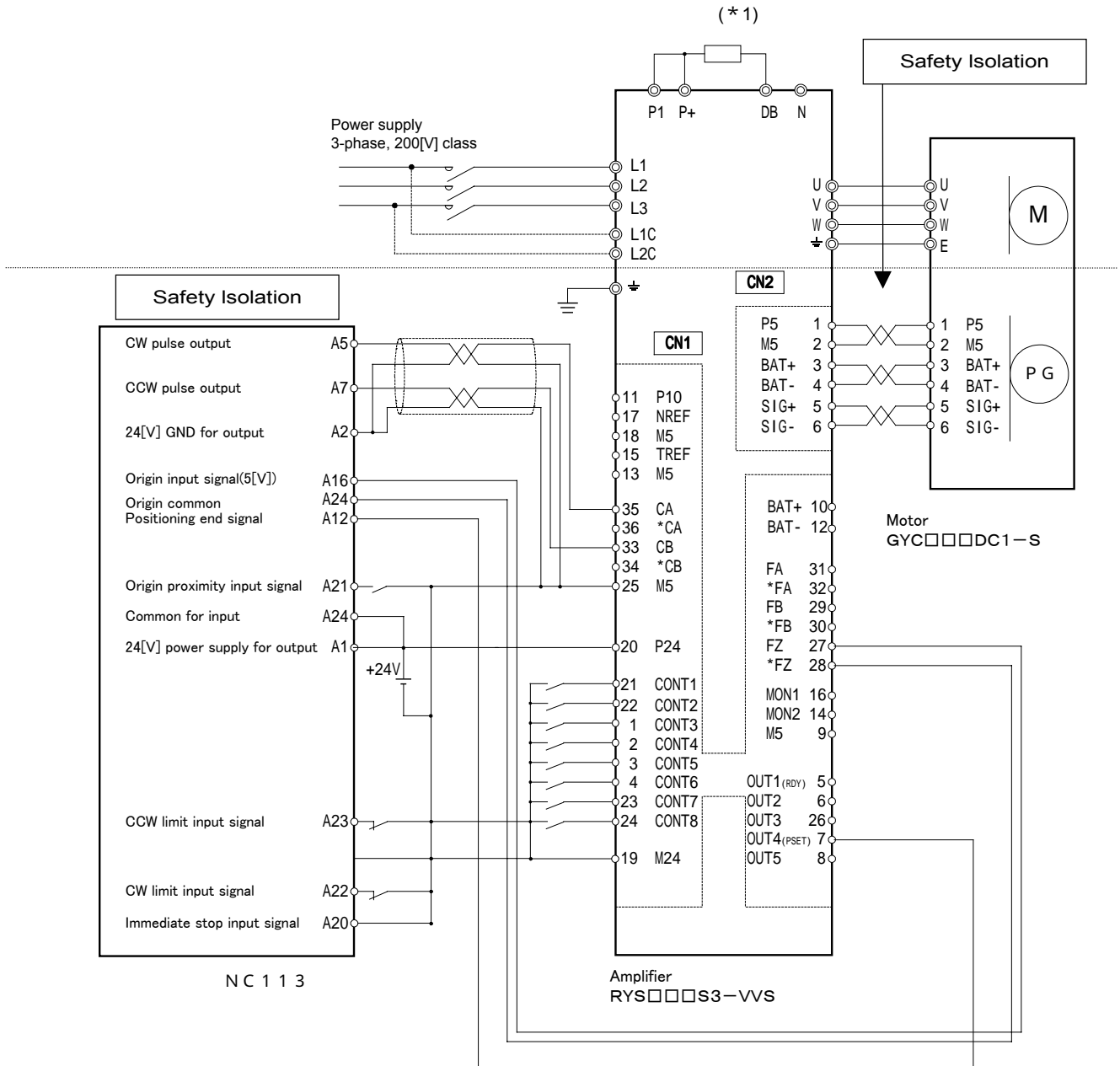
- Forward direction : Counterclockwise (CCW) rotation
- Reverse direction : Clockwise (CW) rotation

(\*3) The assign number for positioning end [PSET] is "2".

- (\*4) CPURDY : CPU ready
- FWD : Forward command
- NZERO : Speed zero
- PSET : Positioning end
- RDY : Ready
- REV : Reverse command
- RST : Alarm reset
- RUN : Run command

(b) Position control unit : C200HW-NC113

Typical connection with C200HW-NC113 type position control unit (Omron Corp.) is shown below .



Notes :

(\*1) For 0.2 [kW] and below, braking resistor is not provided (is not built-in) with amplifier.

- The pulse output mode is used for CW/CCW (\*2) pulse output.
- CONT and OUT of CN1 terminals are initially assigned at factory :

| Terminal symbol | CONT1 | CONT2 | CONT3 | CONT4 | CONT5                           | CONT6 | CONT7                  | CONT8                  |
|-----------------|-------|-------|-------|-------|---------------------------------|-------|------------------------|------------------------|
| Function (*4)   | RUN   | FWD   | REV   | RST   | Multispeed selection<br>X1   X2 |       | Pulse train<br>ratio 1 | Positioning<br>control |

| Terminal symbol | OUT1 | OUT2   | OUT3  | OUT4 (*3) | OUT5 |
|-----------------|------|--------|-------|-----------|------|
| Function (*4)   | RDY  | CPURDY | NZERO | PSET      |      |

(\*2) Direction of motor shaft rotation (when viewed from a point facing the drive-end of motor) is designed according to Japanese standards :

- Forward direction : Counterclockwise (CCW) rotation
- Reverse direction : Clockwise (CW) rotation

(\*3) The assign number for positioning end [PSET] is "2".

- (\*4) CPURDY : CPU ready                      PSET : Positioning end                      RST : Alarm reset  
 FWD : Forward command                      RDY : Ready    RUN : Run command  
 NZERO : Speed zero                              REV : Reverse command

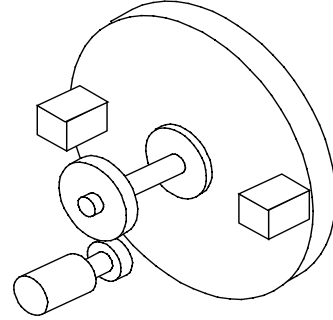


## 5. CONTROL FUNCTIONS

### 5.1 Summary

The RYS-R type amplifier can compose a rotation indexing system, combined with conveyor, chain or other mechanical equipment systems.

The number of division must be specified, but programming is not necessary.



For RYS-R type amplifier, following three kinds of upper level interface is available.

**RYS S3-RPS type, Basic type (DI/DO position)**

Controls motor according to control input/output signal (DI/DO level).

**RYS S3-RSS type, SX bus type (SX bus direct connection)**

Controls motor via SX bus. (\*1)

**RYS S3-RTS type, T-link type (T-link direct connection)**

Controls motor via T-link. (\*2)

(\*1) High speed serial bus (25 [MHz]) of MICREX-SX series PLC

(\*2) Save-wiring I/O link (total wiring length 1 [km]) of MICREX-F series PLC

The control function of each type is almost same but is a little different, depending on the upper level interface.

For the control functions, see

- 5.2 Run command
- 5.3 Manual operation
- 5.4 Origin return
- 5.5 Auto start
- 5.6 Signal for safety
- 5.7 Incidental functions

For SX bus type, see 5.8 IQ area (SX bus type)  
 For T-link type, see 5-9 WB area (T-link type)

The main control functions of RYS-R type are as follows.

- Run command [RUN]
- Powers on the motor or makes the motor free-run.
- Forward command [FWD]/Reverse command [REV]
- Rotates the motor for the arbitrary time period.
- Origin return [ORG]/Origin LS [LS]

Detects the machine origin point.

- Auto start [START]

Indexing is executed when a station number is specified and the auto start signal is given.

- Incidental functions

Functions of temporary stop, positioning cancel, override, pulse train input (manual pulse generator), manual indexing, etc. are provided.

The main output signals from amplifier are as follows.

- Ready [RDY]

This signal turns on when the motor can be rotated.

- Indexing end [WPSET]

This signal turns on when the indexing is complete.

- Incidental functions

The signals of current position output, origin return end, torque limit detection, etc. can be outputted.

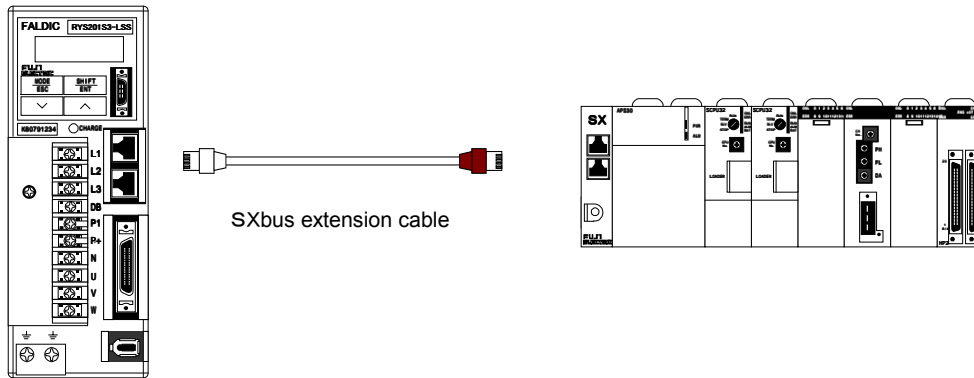
The signal form of the [START] and the current position output varies depending on the upper level interface.

Auto start

| Amplifier                              | Setting of position data   |
|--|--|
| Basic type (DI/DO position)            | Sets the data of specified station as the control input.             |
| SX bus type (SX bus direct connection) | Writes the data of the specified station and the speed into IQ area. |
| T-link type (T-link direct connection) | Writes the data of the specified station into WB area.               |

Current position output

| Amplifier                              | Current position output                       |
|--|---|
| Basic type (DI/DO position)            | Current position can be outputted.            |
| SX bus type (SX bus direct connection) | Current position can be outputted to IQ area. |
| T-link type (T-link direct connection) | Current position can be outputted to WB area. |



5.2 Run command

This section explains the signals to run the motor and the signals to reset alarm detection.

Control input signal : • Run command [RUN] (1)  
• Alarm reset [RST] (11)

Control output signal : • Ready [RDY] ( 1)  
• CPU ready [CPURDY] (28)  
• Alarm detection [ALM] (16)  
• Alarm code 0 [ALM0] (32)  
• Alarm code 1 [ALM1] (33)  
• Alarm code 2 [ALM2] (34)  
• Alarm code 3 [ALM3] (35)  
• Alarm code 4 [ALM4] (36)

5.2.1 Run command [RUN]

The signal allows the motor to rotate.

---

Run command [RUN] (Control input signal)

---

Function

While the [RUN] signal is on, the motor is powered on and can rotate.

Even if commercial power is applied to amplifier, the motor will not start running while [RUN] is off.

When turning off this [RUN] signal while motor is running, motor decelerates quickly until it stops. After the stoppage, it is not held. No holding torque is available after the motor stops.

While the [RUN] signal is turned off, all rotational commands are ignored.

Basically, motor can be rotated when [RUN] is on and the forced stop [EMG] signal is on.

While the [RUN] signal is on and other signals are off, the motor is in stopping condition.

#### Parameter setting

To allocate the [RUN] signal to the control input terminal, set (1) to the system para.(\*). If this signal is not allocated to the control input terminal, this signal is deemed "always off".

#### Related item

For the [EMG] signal, see 5.6.1 Forced stop [EMG]/Forced stop detection.

### 5.2.2 Ready [RDY]

This signal turns on when the motor can be rotated.

---

#### Ready [RDY] (Control output signal)

---

#### Function

Listed below are five conditions for turning on this signal.

- 1) Run command [RUN] (1) signal on
- 2) Forced stop [EMG] (10) signal on
- 3) Alarm detection (16) signal off
- 4) External fault input (34) signal on
- 5) Free-run [BX] (54) signal off

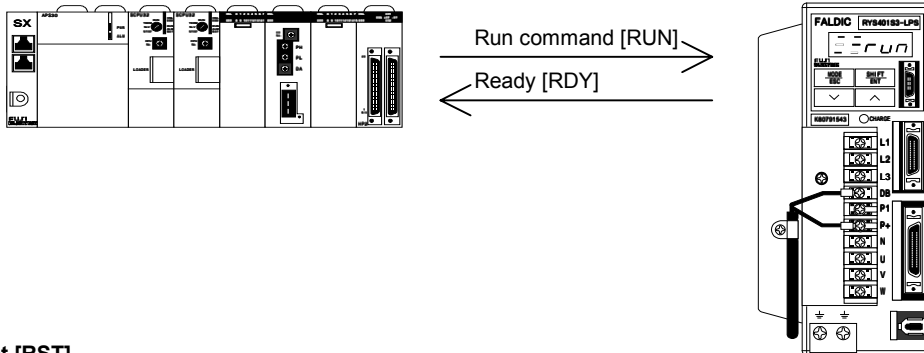
When the host controller receives the on/off status of [RDY] signal, it recognizes that the motor can be rotated.

#### Parameter setting

To allocate the [RDY] signal to the control output terminal, set (1) to the system para..

#### Related item

The amplifier can output the CPU ready [CPURDY] (28) signal, which is turned on when the power is being supplied to amplifier and the internal CPU is processing normally.



### 5.2.3 Alarm reset [RST]

This signal input resets the alarm detection from the amplifier.

---

#### Alarm reset [RST] (Control input signal)

---

#### Function

At the ON edge of [RST] signal of control input signals, the alarm detection can be reset. Alarm detection can also be reset in the test running mode [ F n 0 0 4 ] by keypad panel. Alarm detection can also be reset by turning on power supply again.

#### Parameter setting

To allocate the [RST] signal to the control input terminal, set (11) to the system para. If this signal is not allocated to the control input terminal, this signal is deemed "always off".

Note: (\*) para.: parameter

Related item

Resetting method of the alarm detection is as listed below:

- 1) At the ON edge of [RST] signal of control input signal
  - 2) ENT key operation in the test running mode [ F n 0 0 4 ]
  - 3) Press key and key simultaneously (longer than 1 [s]) at alarm detection [ S n 0 0 3 ].
  - 4) Press key and key simultaneously (longer than 1 [s]) at alarm history [ S n 0 0 4 ].
  - 5) Turn power off and turn on again
- To initialize the history [ F n 0 0 5 ] of alarm detection, press ENT key in the test running mode.

### 5.2.4 Alarm detection [ALM]

This signal is turned on, when the amplifier protective function is activated (detects an alarm).

---

#### Alarm detection [ALM] (Control output signal)

---

Function

This signal is on when amplifier detects alarm, and retained by amplifier. The signal is turned off at the ON edge of alarm reset [RST] signal after the cause of alarm is removed (Motor running is enable).

Alarm or no alarm can be recognized, when the host controller receives the on/off status of the [ALM] signal. This also can be recognized whether the ready [RDY] signal is off when the run command [RUN] is on.

Parameter setting

To allocate the [ALM] signal to the control output terminal, set (16) to the system para..

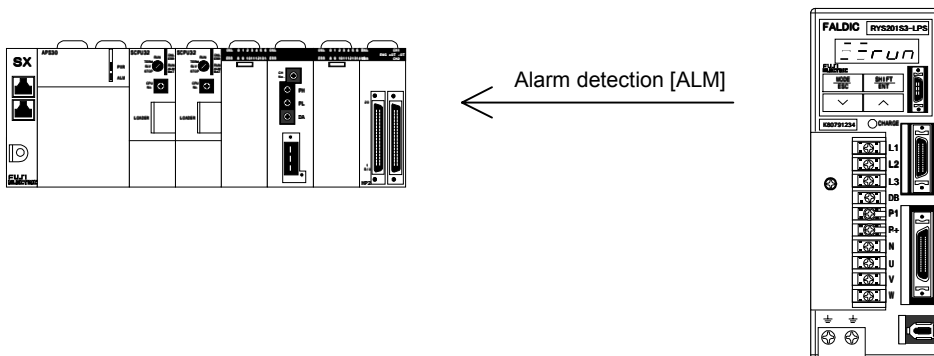
Related item

The contents of alarm detection can also be outputted to the control output terminals by alarm code.

- Alarm code 4 [ALM4] (36)                      Alarm code 3 [ALM3] (35)
- Alarm code 2 [ALM2] (34)                      Alarm code 1 [ALM1] (33)
- Alarm code 0 [ALM0] (32)

For SX bus type (SX bus direct connection), alarm code is outputted at +5 word position of IQ area.

For T-link type (T-link direct connection), alarm code is outputted at +1 word position of WB area.



| [ALM4] | [ALM3] | [ALM2] | [ALM1] | [ALM0] | Detection contents (*2)                   | Indication         | Order of priority |
|--------|--------|--------|--------|--------|---|--------------------|-------------------|
| OFF    | OFF    | OFF    | OFF    | OFF    | (No detection)                            | AL---              | 22                |
| OFF    | OFF    | OFF    | OFF    | ON     | Motor overload                            | AL OL              | 14                |
| OFF    | OFF    | OFF    | ON     | OFF    | -   | -                  | -                 |
| OFF    | OFF    | OFF    | ON     | ON     | Amplifier overheat                        | AL AH              | 17                |
| OFF    | OFF    | ON     | OFF    | OFF    | Braking resistor overheat                 | AL rH              | 15                |
| OFF    | OFF    | ON     | OFF    | ON     | Deviation excessive                       | AL OF              | 16                |
| OFF    | OFF    | ON     | ON     | OFF    | Overcurrent                               | AL OC              | 2                 |
| OFF    | OFF    | ON     | ON     | ON     | Overspeed                                 | AL OS              | 3                 |
| OFF    | ON     | OFF    | OFF    | OFF    | Overvoltage                               | AL H <sub>u</sub>  | 5                 |
| OFF    | ON     | OFF    | OFF    | ON     | Undervoltage                              | AL L <sub>u</sub>  | 4                 |
| OFF    | ON     | OFF    | ON     | OFF    | Encoder trouble (*3)                      | AL EE              | 6                 |
| OFF    | ON     | OFF    | ON     | ON     | -   | -                  | -                 |
| OFF    | ON     | ON     | OFF    | OFF    | Control power trouble (*3)                | AL CE              | 7                 |
| OFF    | ON     | ON     | OFF    | ON     | Memory error (*3)                         | AL dE              | 8                 |
| OFF    | ON     | ON     | ON     | OFF    | -   | -                  | -                 |
| OFF    | ON     | ON     | ON     | ON     | Fuse blown                                | AL Fb              | 9                 |
| ON     | OFF    | OFF    | OFF    | OFF    | Encoder communication error               | AL EC              | 12                |
| ON     | OFF    | OFF    | OFF    | ON     | Motor combination error                   | AL CE              | 10                |
| ON     | OFF    | OFF    | ON     | OFF    | Resistor overheat 2                       | AL rH <sub>2</sub> | 11                |
| ON     | OFF    | OFF    | ON     | ON     | Control signal error (*3)                 | AL CE              | 13                |
| ON     | OFF    | ON     | OFF    | OFF    | Encoder overheat                          | AL EH              | 18                |
| ON     | OFF    | ON     | OFF    | ON     | ABS (absolute) data lost (*4)             | AL AL              | 19                |
| ON     | OFF    | ON     | ON     | OFF    | -   | -                  | -                 |
| ON     | OFF    | ON     | ON     | ON     | Bus communication error                   | AL EE              | 20                |
| ON     | ON     | OFF    | OFF    | OFF    | -   | -                  | -                 |
| ON     | ON     | OFF    | OFF    | ON     | Address error (BCD error) (*1)            | -                  | -                 |
| ON     | ON     | OFF    | ON     | OFF    | Address error (out of range) (*1)         | -                  | -                 |
| ON     | ON     | OFF    | ON     | ON     | Data error (BCD error) (*1)               | -                  | -                 |
| ON     | ON     | ON     | OFF    | OFF    | Data error (out of range) (*1)            | -                  | -                 |
| ON     | ON     | ON     | OFF    | ON     | Data error (negative sign specified) (*1) | -                  | -                 |
| ON     | ON     | ON     | ON     | OFF    | -   | -                  | -                 |
| ON     | ON     | ON     | ON     | ON     | System error                              | AL SE              | 1                 |

(\*1) BCD error, out of range, and negative sign specified are not included in the alarm detection (protective function activation).

(\*2) If several alarms are simultaneously detected, the output priority is given as on the table above.

(\*3) The [RST] signal cannot release the alarm detection. Turn on power supply again.

(\*4) The [RST] signal cannot release the alarm detection. Reset it by inputting the position preset signal.

The contents of detected alarm can be outputted in code.  
When alarm detection is released, all of the output is turned off.

### 5.3 Manual operation

The section explains the control input signals to run or control the motor speed at the ON level.

- |  |  |
|--|--|
| Control input signal : <ul style="list-style-type: none"> <li>• Forward command [FWD] (2)</li> <li>• Reverse command [REV] (3)</li> <li>• Pulse train ratio 1 (27)</li> <li>• Pulse train ratio 2 (28)</li> <li>• Deviation clear (50)</li> <li>• Multistep speed selection X 1 [X1] (51)</li> <li>• Multistep speed selection X 2 [X2] (52)</li> <li>• Multistep speed selection X 3 [X3] (53)</li> <li>• Acceleration/deceleration time selection [ACC0] (14)</li> <li>• Speed command [NREF] (fixed)</li> </ul> | Control output signal : <ul style="list-style-type: none"> <li>• Deviation zero (23)</li> <li>• Deviation excessive [OF] (alarm detection is issued)</li> <li>• Speed zero [NZERO] (24)</li> <li>• Speed arrive [NARV] (25)</li> </ul> |
|--|--|

#### 5.3.1 Forward command [FWD] / Reverse command [REV]

These signals rotate the motor.

---

Forward command [FWD] / Reverse command [REV] (Control input signal)

---

##### Function

While the [FWD] ([REV]) signal is on, the motor rotates forward (in reverse). Acceleration starts at the ON edge, deceleration starts at the OFF edge.

Simultaneous turning on both [FWD] and [REV], does not stop the motor.

The motor rotates at a speed selected by multistep speed selection [X1], [X2] or [X3].

##### Multistep speed selection [X1], [X2], [X3]

| [X3] | [X2] | [X1] | Speed                       |
|------|------|------|-----------------------------|
| OFF  | OFF  | OFF  | (See below.)                |
| OFF  | OFF  | ON   | Speed set by basic para. 01 |
| OFF  | ON   | OFF  | Speed set by basic para. 02 |
| OFF  | ON   | ON   | Speed set by basic para. 03 |
| ON   | OFF  | OFF  | Speed set by basic para. 04 |
| ON   | OFF  | ON   | Speed set by basic para. 05 |
| ON   | ON   | OFF  | Speed set by basic para. 06 |
| ON   | ON   | ON   | Speed set by basic para. 07 |

Min. value in IQ area and WB area is equivalent to 0.01 [r/min].

Basic type (DI/DO) : [NREF] terminal

SX bus type (SX bus direct connection) : IQ area (+10, +11)

T-link type (T-link direct connection) : WB area (+7, +8)

##### Parameter setting

To allocate the [FWD] signal to the control input terminal, set (2) to the system para. (set (3) for the [REV]).

If these signals are not allocated to the control input terminal, these signals are deemed "always off".

##### Related items

(1) Changeover of acceleration/deceleration time

The accel. and decel.(\*) time of motor can be set by basic para. 21 to 24. The accel. time and decel. time can be set separately.

The accel. time is set by the basic para. 21 or 23, regardless of rotational direction.

Note: (\*) Accel. : Acceleration, Decel. : Deceleration

Accel. time (basic para. 21 or 23) can be selected by the accel./decel. time selection [ACC0] setting.

Selection of acceleration and deceleration time

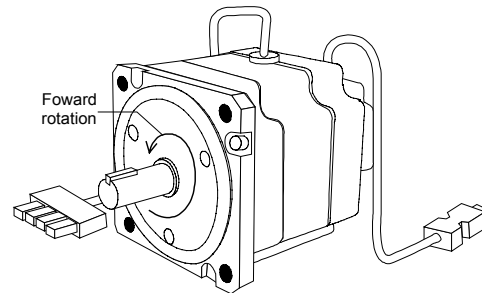
| [ACC0] (14) | Accel. time    | Decel. time    |
|-------------|----------------|----------------|
| OFF         | Basic para. 21 | Basic para. 22 |
| ON          | Basic para. 23 | Basic para. 24 |

To allocate the [ACC0] signal to the control input terminal, set (14) to the system para.. If this signal is not allocated to the control input terminal, this signal is deemed "always off".

(2) Changeover of rotational direction

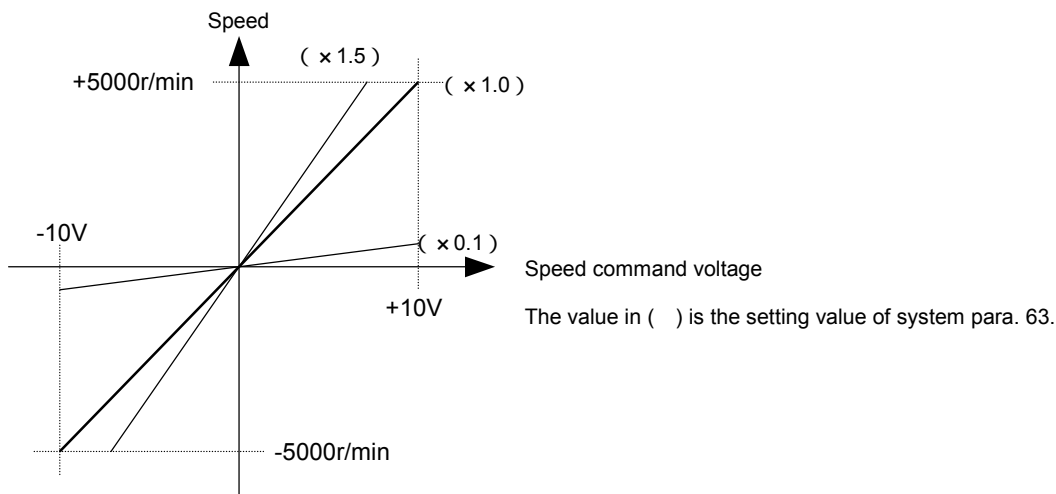
The rotational direction of motor output shaft for the [FWD] can be changed by the system para. 80.

When the para. 80 is initial value (\*1), motor rotates in forward (counter-clockwise (\*2) viewed from shaft extension) direction for forward command. In case the motor rotates opposite to the normal movement of mechanical equipment system, set 1 at the para. 80. The setting change of the system para. becomes valid after turning on power again.



(3) Gain for speed command [NREF] terminal : Basic type (DI/DO position) only

At factory setting, the motor rotates forward at 5000 [r/min] against +10 [V] of the speed command voltage. By setting the system para. 63, the motor speed can be adjusted against the set speed command voltage.



If the system para. 63 has been set at 0.1, the speed can be adjusted to 500 [r/min] against +10 [V] of the speed command voltage.

(4) Resolution of speed command voltage : Basic type (DI/DO position) only

The [NREF] terminal has a 14 bit resolution at full scale.

(5) Torque limit

Motor output torque can be limited by using the torque limit [TLMT] (30) signal. For details, see 5.6.3 Torque limit [TLMT]/Torque limit detection.

Notes :

(\*1) Initial value has been set individually, at the time of shipment from our factory.

(\*2) Direction of motor shaft rotation (when viewed from a point facing the drive-end of motor) is designed according to Japanese standard :

- Forward direction : Counter-clockwise (CCW) rotation
- Reverse direction : Clockwise (CW) rotation

(6) Non-linear (S-curve) acceleration/deceleration

S-curve accel./decel. can be carried out by basic para. 25 setting.

The speed slowly increases by drawing an S-curve, and a mechanical shock during acceleration can be reduced.

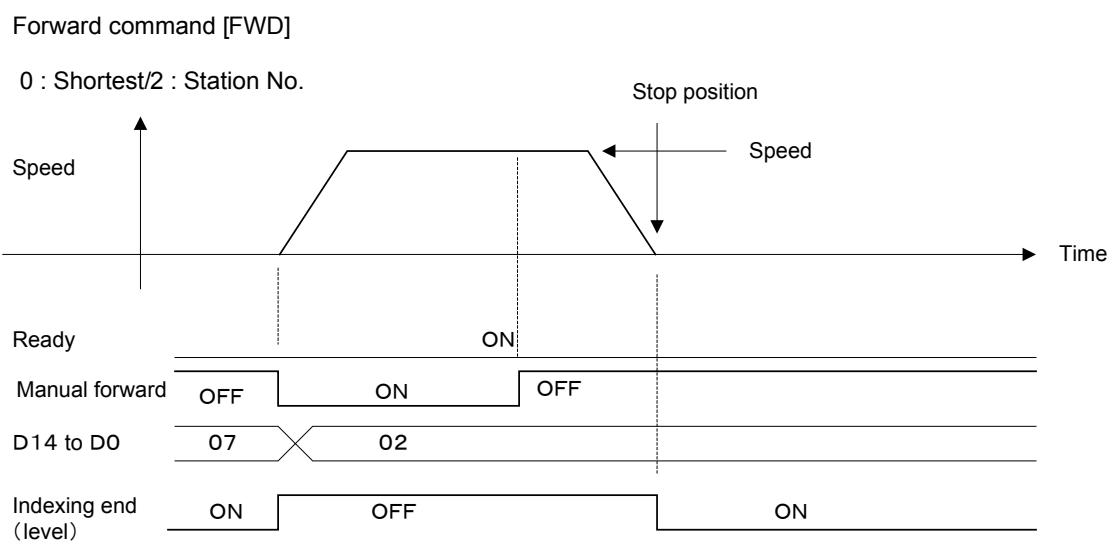
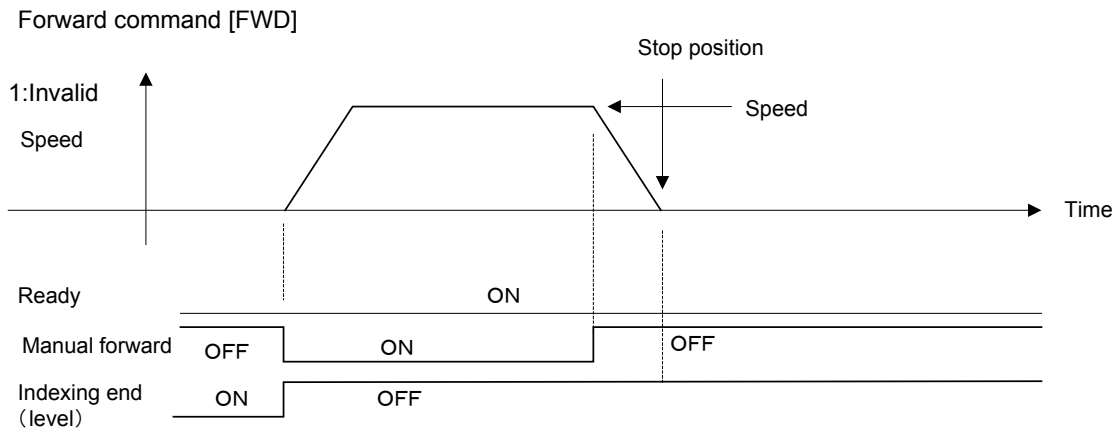
(7) Manual indexing

The stop position when the [FWD] signal is off depends on the setting of basic para. 81.

Basic parameter 81

| Setting range  | Stop position   |
|----------------|---|
| 0: Shortest    | Stops at the shortest station with the preset decel. time.  |
| 1: Invalid     | Decelerates and stops when the forward (reverse) command is off. Does not stop at the station position. |
| 2: Station No. | Stops at the station number position at the ON edge of the forward (reverse) command.                   |

Note: To stop at the station, origin return action (or equivalent) must have been completed.





When the manual indexing selection 0 (48) or the manual indexing selection 1 (49) is allocated to the control input terminal (control input), the stop position can be changed by the on/off status of those input. The setting of basic para. 81 is ignored.

**Manual indexing selection 1/Manual indexing selection 0**

| Manual indexing 1 | Manual indexing 0 | Stop position   |
|-------------------|-------------------|---|
| OFF               | OFF               | Stops at the shortest station with the preset decel. time.  |
| OFF               | ON                | Decelerates and stops when the forward (reverse) command is off. Does not stop at the station position. |
| ON                | OFF               | Stops at the station number position at the ON edge of the forward (reverse) command.                   |
| ON                | ON                | Stops at the shortest station with the preset decel. time.  |

Note: To stop at the station, origin return action (or equivalent) must have been completed.

The station number specified by D14 to D0 can be changed between binary code and BCD code with system para. 98 setting. Not all of D14 to D0 need to be allocated to the control input terminal. For RYS S3-RPS type, the initial values are binary, and 6 bits of D5 to D0 are allocated. For RYS S3-RSS and RTS types, the initial values are BCD.

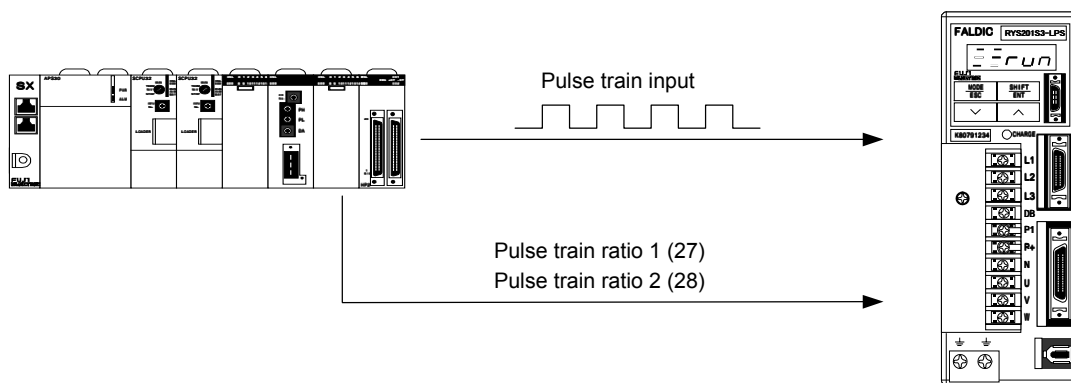
**5.3.2 Pulse train ratio 1/Pulse train ratio 2**

The signal validates a pulse train from the manual pulse generator, etc.

**Pulse train ratio 1 / Pulse train ratio 2 (Control input signal)**

**Function**

While the pulse train ratio 1 (27) is turned on, the pulse train input is valid. Turning it off ignores the pulse train input.



Pulse train ratio 1 validates the pulse train ratio 1 by basic para. 93, or pulse train ratio 2 validates the pulse train ratio 2 by basic para. 94. While the pulse train ratio 1 or pulse train ratio 2 is on, and the pulse train input is valid, the manual feed (forward/reverse command [FWD]/[REV]), origin return [ORG], and auto start [START] do not become valid. The temporary stop and positioning cancel signals are invalid to the pulse train input is on.

**Parameter setting**

To allocate the pulse train ratio 1 to the control input terminal, set (27) to the system para.. Set (28) for the pulse train ratio 2. If these signals are not allocated to the control input terminals, these signals are deemed "always off".

Related items

(1) Pulse train ratio 1 (basic para. 93)/Pulse train ratio 2 (basic para. 94)

The motor rotates by the rotational quantity per encoder 1 [pulse] in response to 1 [pulse] of pulse train input.

In normal encoder, one rotation of motor shaft corresponds to 65536 [pulse].

The move amount of mechanical equipment system can also be changed, using the pulse train ratio 1 (27) and 2 (28) setting of the control input signals.

Basic parameter 93, 94

| Para. | Name                | Setting range                 | Initial value | Change |
|-------|---------------------|-------------------------------|---------------|--------|
| 93    | Pulse train ratio 1 | 0.01 to 100.00 (in 0.01 step) | 1.00          | Always |
| 94    | Pulse train ratio 2 | 0.01 to 100.00 (in 0.01 step) | 10.00         | Always |

5.3.3 Deviation clear

When this signal turns on, the difference (deviation) between current command position and current feedback position is cleared to zero.

Deviation clear (Control input signal)

Function

While this signal is on, the difference (deviation) is kept to zero.

The deviation clear is valid during the on period of the speed zero [NZERO] signal.

Current command position is assigned as current feedback position.

Parameter setting

To allocate the deviation clear signal to the control input terminal, set (50) to the system para..

Related items

All of the rotation commands are ignored, while the deviation clear signal is on.

Even if the deviation clear is carried out, the current feedback position does not change.

The remaining deviation due to the contact stoppage can be cleared to zero when the work is released, in order to avoid movement corresponding to the deviation quantity.

When the deviation clear is carried out, the deviation zero signal of the control output is on.

5.3.4 Deviation zero

Check can be done that the motor is near the command position.

Deviation zero (Control output signal)

Function

This signal turns on, when the difference (deviation) between the current command position and current feedback position is within the value set by basic para. 53.

The level of setting value of basic para. 53 has no relation with the positioning accuracy.

Increasing the setting expedites outputting a deviation zero signal for stopping.

Parameter setting

To allocate the deviation zero signal to the control output terminal, set (23) to the system para..

Related item

Basic parameter 53

| Para. | Name                 | Setting range                   | Initial value | Change |
|-------|----------------------|---------------------------------|---------------|--------|
| 53    | Deviation zero width | 10 to 10000 [pulse] (in 1 step) | 200           | Always |

Setting is made by encoder pulse count.

### 5.3.5 Deviation excessive [OF]

This function sets the deviation amount of deviation excessive (alarm detection) of amplifier.

Sets the pulse count for alarm detection about [OF]. Initial value at factory setting is 10000, and detects the deviation amount with 1000000 [pulse]. At factory setting, [OF] is detected, when the difference (deviation) between the current command position and current feedback position becomes approximately 15.2 [revolution] when converted to motor rotation.

Parameter setting

The deviation excessive width is setting for use with alarm detection, and cannot be assigned to control output terminal.

Related items

Basic parameter 54

| Para. | Name                      | Setting range                            | Initial value | Change |
|-------|---------------------------|--|---------------|--------|
| 54    | Deviation excessive width | 10 to 65535 (in 1 step)<br>[x 100 pulse] | 10000         | Always |

Setting is made by encoder pulse count (65536 [pulse/rev]).

### 5.3.6 Speed zero [NZERO]

This signal is turned on when the motor speed is near zero.

---

Speed zero [NZERO] (Control output signal)

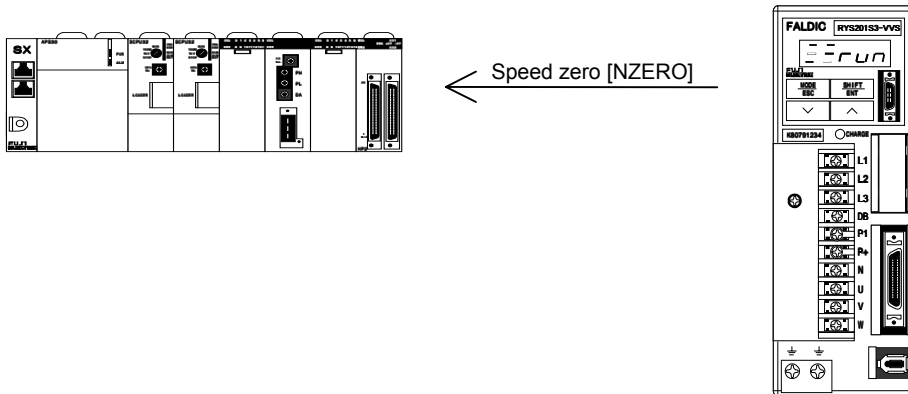
---

Function

This signal turns on when the motor speed is below the value set by basic para. 52.

Parameter setting

To allocate the [NZERO] signal to the control output terminal, set (24) to the system para..



### 5.3.7 Speed arrive [NARV]

Check can be done that the motor rotation reaches the command speed.

---

Speed arrive [NARV] (Control output signal)

---

Function

This signal turns on, when motor speed reaches within setting value of basic para. 51 from the command speed. The command speed involves speed setting by para., speed data from positioning data and speed command voltage.

This signal will not be turned on for the following conditions:

- 1) Forward command [FWD] signal or reverse command [REV] signal is off.
- 2) When the motor speed does not reach the command speed due to the max. speed setting (basic para. 16).
- 3) Accel./decel. time is long and the speed does not reach the command speed.

#### Parameter setting

To allocate the speed arrive [NARV] signal to the control input terminal, set (25) to the system para.. If this signal is not allocated to the control input terminal, this signal is deemed "always off".

#### Related items

(1) Speed matching zone (width) (basic para. 51)

The [NARV] signal is turned on, when the motor speed is near the command speed (set by para.). As the initial value is 50 [r/min], the [NARV] signal is on when the motor speed reaches the command speed  $\pm 50$  [r/min].

When the motor speed does not reach the command speed due to the max. speed setting (basic. para. 16) or override setting, this signal turns off. When [FWD] or [REV] signal is off, the [NARV] signal does not turn on.

(2) Max. speed (basic para. 16)

This parameter specifies the max. value of motor speed.

If motor speed exceeds the max. speed by the override, the motor rotates at the setting value.

The setting of max. speed is not valid, during position control using pulse train input.

## 5.4 Origin return

The section explains origin return for determining a coordinate system and position preset.

Control input signal : • Origin return [ORG] (5)  
 • Origin LS [LS] (6)  
 • Position preset (16)

Control output signal : • Origin return end (22)  
 • Origin LS detection (40)  
 • Position preset end (75)

### 5.4.1 Origin return [ORG]

This function executes the origin return action and determines the origin.

---

Origin return [ORG] (Control input signal)

---

#### Function

This function executes the origin return action at the ON edge of [ORG] (5).

Origin return action depends on basic para. setting 72 to 77.

#### Parameter setting

To allocate the [ORG] signal to the control input terminal, set (5) to the system para..

#### Setting value to system parameter

| Signal name         | Setting value to system para. |
|---------------------|-------------------------------|
| Origin return [ORG] | 5                             |
| Origin LS [LS]      | 6                             |
| Origin return end   | 22                            |
| Origin LS detection | 40                            |

Related items

(1) Parameter setting

Origin return action depends on basic para. setting.

Basic parameter 72 to 78

| Para. | Name                            | Setting range                                    | Initial value | Change |
|-------|---------------------------------|--|---------------|--------|
| 72    | Origin return direction         | 0 : Positive direction<br>1 : Negative direction | 0             | Power  |
| 73    | Z-phase detection valid/invalid | 0 : Valid<br>1 : Invalid                         | 0             | Power  |
| 74    | Origin LS logic                 | 0 : NO contact<br>1 : NC contact                 | 0             | Always |
| 75    | Origin return speed             | 0.01 to max. speed [r/min]<br>(in 0.01 step)     | 500.00        | Always |
| 76    | Origin detection creep speed    | 0.01 to max. speed [r/min]<br>(in 0.01 step)     | 50.00         | Always |
| 77    | Origin shift quantity           | 1 to 2000000 (in 1 step)<br>[x unit q'ty]        | 5000          | Always |
| 78    | 2nd origin                      | 2 to max. number of division (in 1 step)         | 2             | Power  |

After the setting change of the basic para. 71, 72, and 78, power supply need be turned on again.

(2) Origin return action

At the ON edge of [ORG] signal, the following operations are automatically carried out.

- (a) At the ON edge of [ORG] signal, motor rotation start at the origin return speed (basic para. 75) in the origin return direction (basic para. 72).
- (b) When the [LS] signal turns from off to on, speed is reduced to the origin detection creep speed (basic para. 76). While [LS] on, motor runs at constant speed.
- (c) The first Z-phase signal is detected, following the transfer point of [LS] signal from OFF edge to ON edge.
- (d) The motor stops after rotating by the origin shift quantity (basic para. 77) from the detection of Z-phase signal.
- (e) The indexing end [WPSET] signal turns on, with the stopped position as the No.1 station number. The origin return end signal as the control output signal turns on.

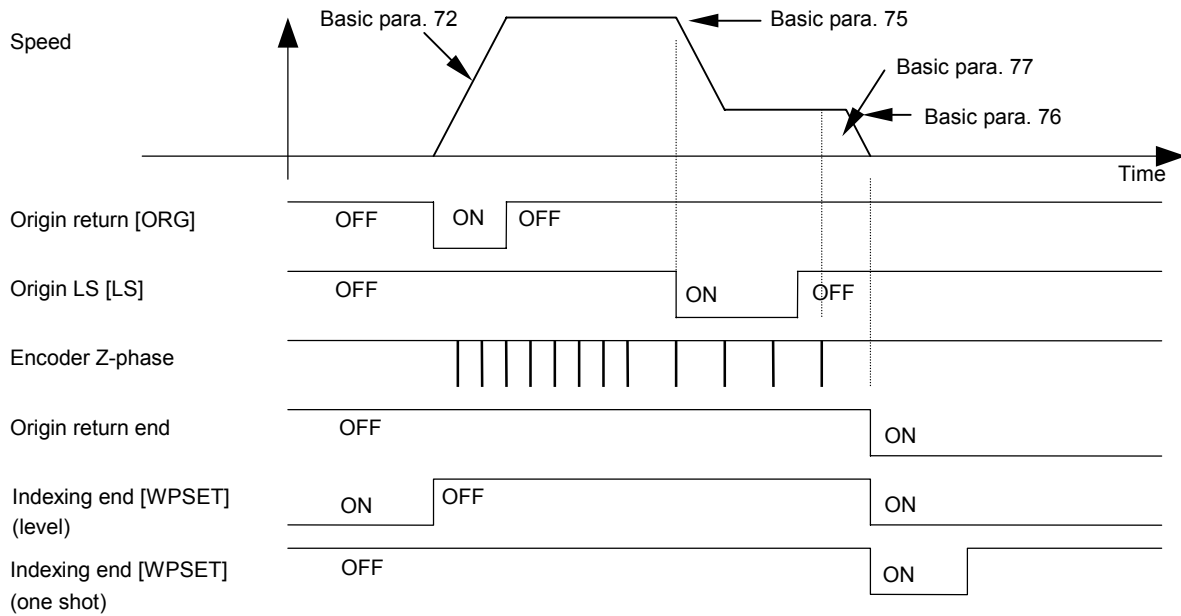
With the Z-phase input invalid selected in the Z-phase valid/invalid (basic para. 73), motor can be stopped after running by the origin shift quantity from the ON edge to OFF edge of [LS] signal.

The on/off status of [LS] signal can be inverted using the origin LS logic (basic para. 74).

Origin return

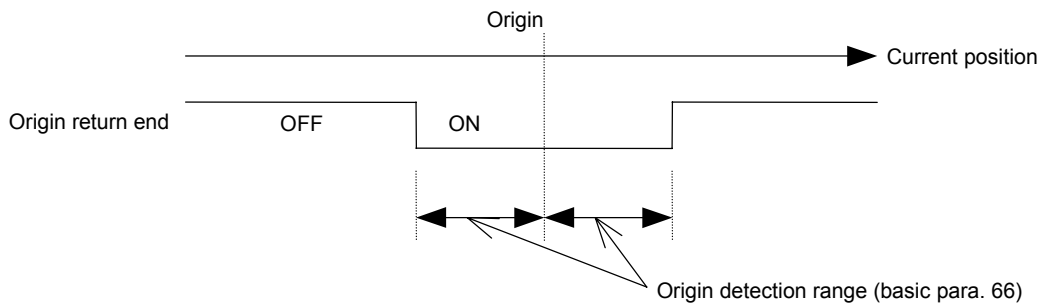
At the ON edge of [ORG] signal, the aforementioned operations (a) through (e) are carried out.

The origin return action can be carried out again, regardless of the on/off status of the origin return end signal.



### (3) Origin return end (22)

This signal is turned on, when the origin return action has been normally ended. After this, this signal is held on, when the current feedback position is within the origin detection range (basic para. 66) viewed from the origin return end position (basic para. 76). If the origin detection range is zero, this signal is always on after the origin return end.

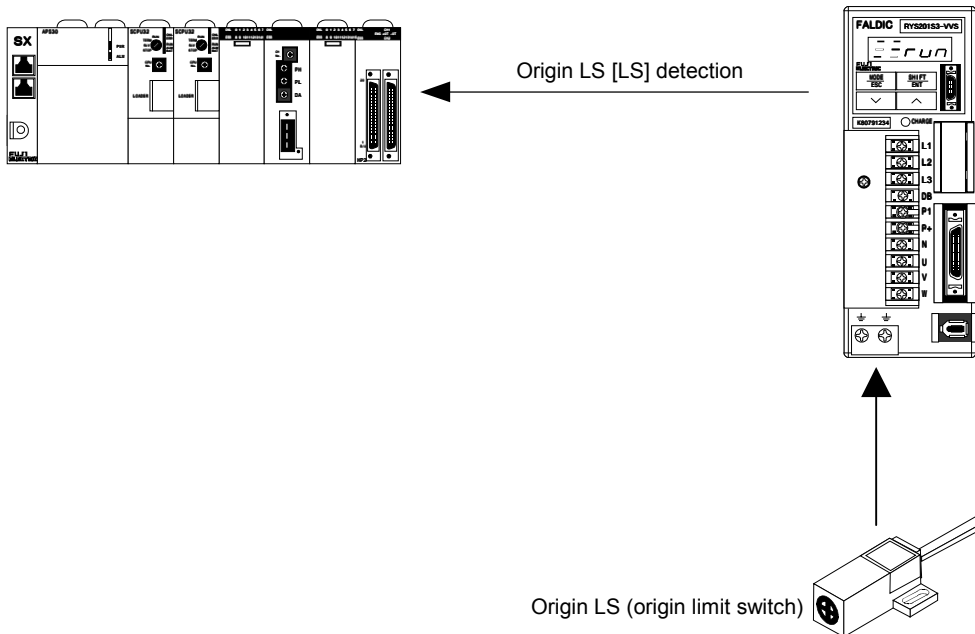


Note : The origin is the position where the machine has stopped after ended the origin return action, or has executed the position preset. It is not necessary the position of the No.1 station number.

(4) Origin LS detection (40)

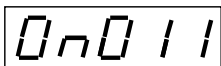
Because the [LS] signal requires quick response, this should be directly input to the amplifier in general. When the host controller needs the origin signal, the origin LS detection signal can be output.

While the [LS] signal is on, the origin LS detection signal (40) is on.



(5) LS-Z pulse

The encoder pulse count can be monitored, from the time when the [LS] signal goes to OFF level, until Z-phase signal is detected.



If this count is small, Z-phase signal of one rotation later may have been detected, depending on the origin LS response. In this case, move the mechanical position of the origin LS.

5.4.2 Position preset

When this signal turns on, the current station number can be rewritten.

---

Position preset (Control input signal)

---

Function

At the ON edge(\*) of this signal input, the current position can be rewritten to the value of the station number [PD14 to PD0]. Position preset is executable while speed zero [NZERO] signal is on. When the position preset is executed, the origin return end is on.

This signal can reset the following alarm detection:

- 1) ABS (absolute) data lost

Parameter setting

To allocate the position preset signal to the control input terminal, set (16) to the system para.. If this signal is not allocated to the control input terminal, this signal is deemed "always off".

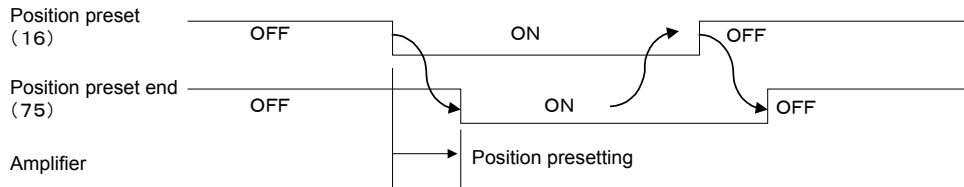
Note : (\*) ON edge means the control input signal's transfer point from off to on.

#### Related item

This signal can turn on the position preset end (75) signal.

When the position preset (16) turns on, the position preset end (75) is on, and when the position preset off, the position preset end off.

When the position presetting is not end, for example, if the speed zero is off, the position preset is not turned on.



### 5.5 Auto start

The section explains signals relating to rotation indexing positioning action.

- Control input signal :
- Auto start [START] (4)
  - Station number D0 (60) to D14 (74)
  - Rotation speed selection VEL0 (12), VEL1 (13)
  - Shorted route valid [DIR] (7)
  - Rotational direction [SIGN] (8)
  - ABS/INC (9)
- Control output signal :
- Indexing end (2)
  - Current position output PD0 (60) to PD14 (74)

**Remark** : For SX bus type (SX bus direct connection), addresses, M codes, and current positions can be obtained from IQ area.

For T-link type (T-link direct connection), addresses, M codes, and current positions can be obtained from WB area.

The auto start [START] (4) signal needs to be commanded by on/off of bit.

#### 5.5.1 Auto start [START]

The signal starts a positioning action.

---

Auto start [START] (Control input signal)

---

#### Function

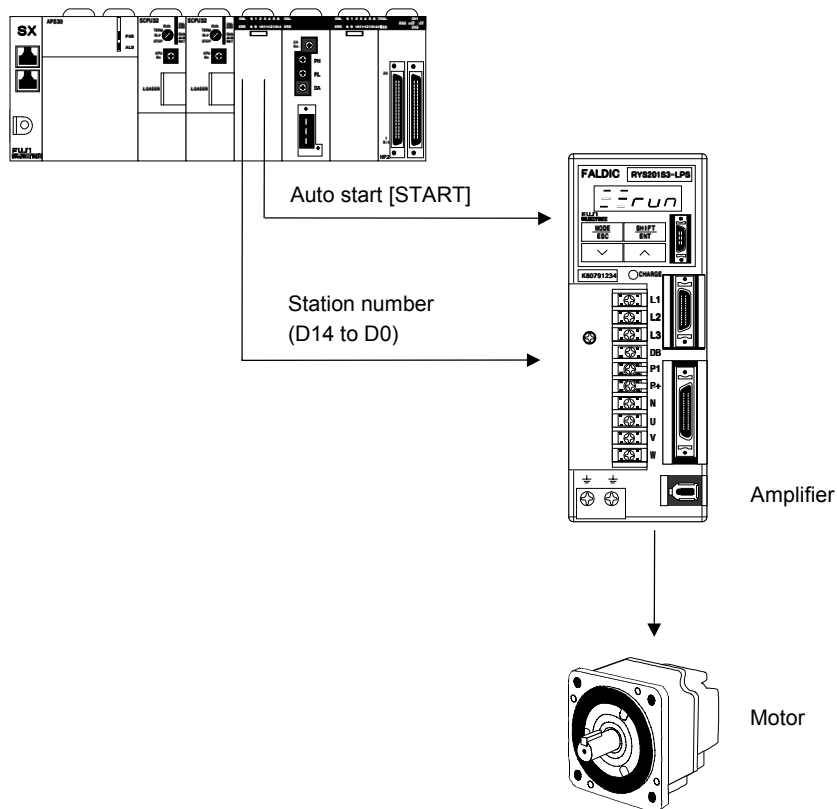
A positioning action starts at the ON edge of [START] (4) signal.

The station numbers are assigned to D14 to D0.

[efesotomasyon.com](http://efesotomasyon.com)

---





#### Parameter setting

To allocate the [START] signal to the control input terminal, set (4) to the system para..  
 If these signals are not allocated to the control input terminal, these signals are deemed “always off”.

#### Related items

##### (1) Station number (D14 to D0)

The station number can be changed over between BCD code and binary by system para. 98 setting. However, for SX bus type, it is fixed to binary.

The station number is settled by the ON edge of the [START] signal.

| Station number                         |   |
|--|---|
| Amplifier                              | Station number                          |
| Basic type (DI/DO position)            | BCD code or binary can be changed over. |
| SX bus type (SX bus direct connection) | Only binary can be specified.           |
| T-link type (T-link direct connection) | BCD code or binary can be changed over. |

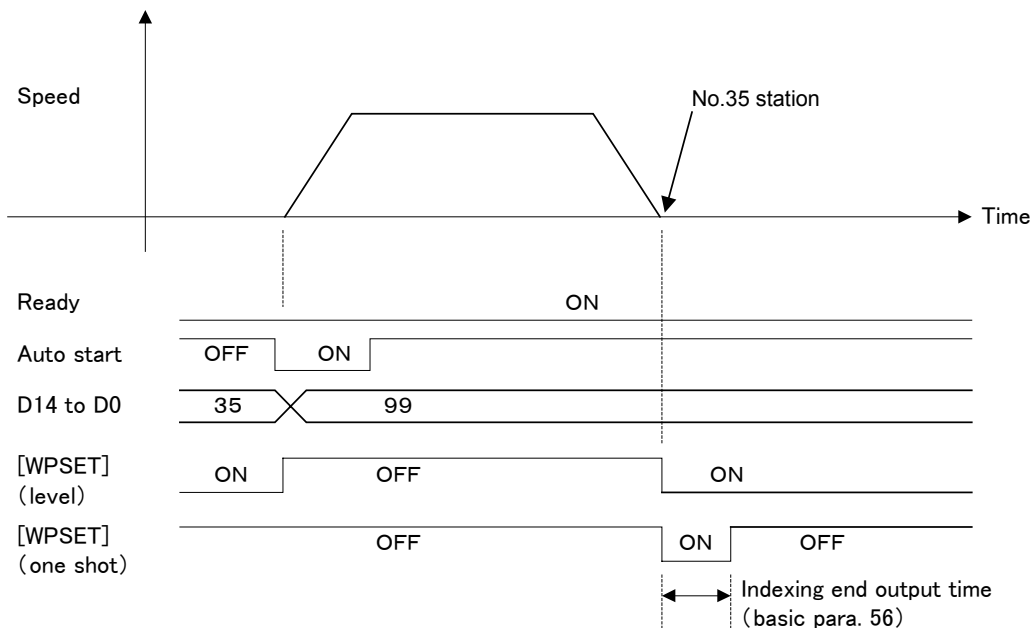
In case of BCD code, D14 to D12 specify the value at thousand's digit of station number, D11 to D8 specify the value at hundred's digit of station number, D7 to D4 specify the value at ten's digit of station number, and D3 to D0 specify the value at unit's digit of station number.

| Station No. (1000's digit of BCD) |     |     |              | Station No. (100's digit of BCD) |     |     |     |             | Station No. (10's digit of BCD) |     |     |     |            | Station No. (Unit's digit of BCD) |     |     |     |              |
|-----------------------------------|-----|-----|--------------|----------------------------------|-----|-----|-----|-------------|---------------------------------|-----|-----|-----|------------|-----------------------------------|-----|-----|-----|--------------|
| D14                               | D13 | D12 | 1000's digit | D11                              | D10 | D9  | D8  | 100's digit | D7                              | D6  | D5  | D4  | 10's digit | D3                                | D2  | D1  | D0  | Unit's digit |
| OFF                               | OFF | OFF | 0            | OFF                              | OFF | OFF | OFF | 0           | OFF                             | OFF | OFF | OFF | 0          | OFF                               | OFF | OFF | OFF | 0            |
| OFF                               | OFF | ON  | 1            | OFF                              | OFF | OFF | ON  | 1           | OFF                             | OFF | OFF | ON  | 1          | OFF                               | OFF | OFF | ON  | 1            |
| OFF                               | ON  | OFF | 2            | OFF                              | OFF | ON  | OFF | 2           | OFF                             | OFF | ON  | OFF | 2          | OFF                               | OFF | ON  | OFF | 2            |
| OFF                               | ON  | ON  | 3            | OFF                              | OFF | ON  | ON  | 3           | OFF                             | OFF | ON  | ON  | 3          | OFF                               | OFF | ON  | ON  | 3            |
| ON                                | OFF | OFF | 4            | OFF                              | ON  | OFF | OFF | 4           | OFF                             | ON  | OFF | OFF | 4          | OFF                               | ON  | OFF | OFF | 4            |
| ON                                | OFF | ON  | 5            | OFF                              | ON  | OFF | ON  | 5           | OFF                             | ON  | OFF | ON  | 5          | OFF                               | ON  | OFF | ON  | 5            |
| ON                                | ON  | OFF | 6            | OFF                              | ON  | ON  | OFF | 6           | OFF                             | ON  | ON  | OFF | 6          | OFF                               | ON  | ON  | OFF | 6            |
| ON                                | ON  | ON  | 7            | OFF                              | ON  | ON  | ON  | 7           | OFF                             | ON  | ON  | ON  | 7          | OFF                               | ON  | ON  | ON  | 7            |
|                                   |     |     |              | ON                               | OFF | OFF | OFF | 8           | ON                              | OFF | OFF | OFF | 8          | ON                                | OFF | OFF | OFF | 8            |
|                                   |     |     |              | ON                               | OFF | OFF | ON  | 9           | ON                              | OFF | OFF | ON  | 9          | ON                                | OFF | OFF | ON  | 9            |

In case of binary code, 12 bit of D14 to D0 specify 1 to 30000.

| Station number (binary) |     |     |     |     |     |     |     |     |     |     |     |     |     |     | Station number |       |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------------|-------|
| D14                     | D13 | D12 | D11 | D10 | D9  | D8  | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  |                |       |
| OFF                     | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | 1              |       |
| OFF                     | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | OFF            | 2     |
| OFF                     | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | ON             | 3     |
| OFF                     | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | OFF | OFF            | 4     |
| OFF                     | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | OFF | ON             | 5     |
| OFF                     | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | ON  | OFF            | 6     |
| OFF                     | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | ON  | ON             | 7     |
| OFF                     | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | OFF | OFF | OFF            | 8     |
| OFF                     | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | OFF | OFF | ON             | 9     |
| OFF                     | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | OFF | ON  | OFF            | 10    |
|                         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |                |       |
|                         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |                |       |
| ON                      | ON  | ON  | OFF | ON  | OFF | ON  | OFF | OFF | ON  | OFF | ON  | ON  | ON  | ON  |                | 29999 |
| ON                      | ON  | ON  | OFF | ON  | OFF | ON  | OFF | OFF | ON  | ON  | OFF | OFF | OFF | OFF |                | 30000 |

**Time chart for auto start signal**



The station number [D14] to [D0] may be changed when the indexing end [WPSET] signal has turned off.  
 The station number is settled at the ON edge of [START] signal.  
 The output form of [WPSET] signal is selected by basic para. 55.

(2) Number of division and speed reduction ratio

The amplifier does not have programming function.

The speed reduction ratio with which a rotating object rotates by one rotation, and the number of division per one rotation, are specified to the parameters.

Basic parameter 91, 92

| Para. | Name                         | Setting range         | Initial value | Change |
|-------|------------------------------|-----------------------|---------------|--------|
| 91    | Speed reduction gear ratio A | 1 to 9999 (in 1 step) | 1             | Power  |
| 92    | Speed reduction gear ratio B | 1 to 9999 (in 1 step) | 1             | Power  |

The inverse number of the motor rotational quantity per one rotation of mechanical equipment system (total of speed reduction ratio) can be specified as follows:

$$\frac{1}{9999} \leq \frac{\text{Speed reduction gear ratio A}}{\text{Speed reduction gear ratio B}} \leq \frac{1}{1}$$

This formula cannot be applied to mechanical equipment system that rotates by one rotation with less than one rotation of the motor output shaft.

This formula cannot be applied to mechanical equipment system that only rotates by less than one rotation even when the motor output shaft rotates more than 9999 rotations.

If the speed reduction ratio is aliquant, the error will not accumulate (example: 1/3).

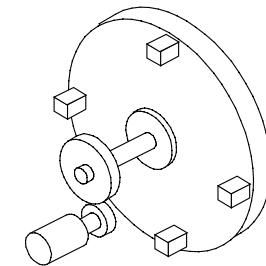
If the speed reduction ratio is expressed by 4 digit numbers, the error will not accumulate. (example: 1777/3333).

Example 1. Rotating object

When the motor is connected to a speed reduction gear with 1/30 (speed reduction ratio), the motor rotates by 30 rotates per one rotation of mechanical equipment system.

Set the speed reduction gear ratio A to 1, the speed reduction gear ratio B to 30.

Speed reduction ratio 1/30



Motor

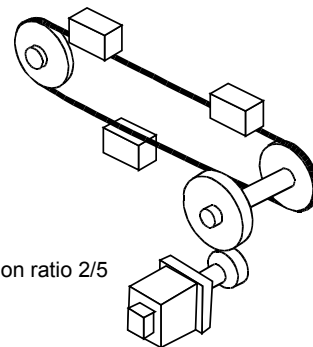
Example 2. Chain drive

Suppose that the drive sprocket rotates by 15 rotations per one rotation of mechanical equipment system.

If the speed reduction gear ratio is 2/5, mechanical equipment system rotates by one rotation when the motor shaft (2/5) rotates by 15 rotations.

Set the speed reduction gear ratio A to 2, the speed reduction gear ratio B to 75.

Speed reduction ratio 2/5



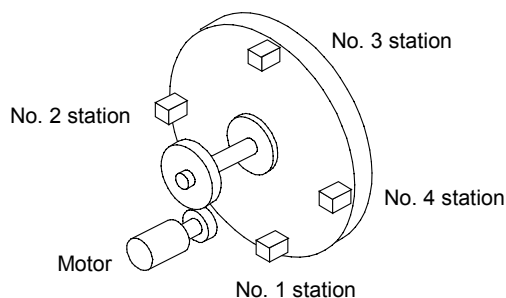
Motor

(3) Rotational direction

The position where the origin return action is complete is the No. 1 station. At factory setting, the station numbers are allocated in the increment direction of rotational direction. When the position preset is executed, the station numbers are allocated from its position in the increment direction of rotational direction.

The station number is allocated from 1 up to the max. number of division of the basic para. 90 sequentially.

Where the max. number of division is four:



(4) Number of division

Basic parameter 90

| Para. | Name                    | Setting range          | Initial value | Change |
|-------|-------------------------|------------------------|---------------|--------|
| 90    | Max. number of division | 2 to 30000 (in 1 step) | 8             | Power  |

This para. specifies the number to divide the rotating object.

If the setting value is set to 2, positioning can be executed at the origin (No. 1 station) and the 180 degree opposite (No. 2 station).

If the [START] signal is used, indexing can be made within the range of less than one rotation.

In order to make a stop at the specified station number after rotating more than one revolution, use the manual indexing function.

See (7) of 5.3.1 Forward command [FWD]/Reverse command [REV].

(5) Backlash correct

The backlash of mechanical equipment system can be corrected by move amount of the motor shaft.

Basic parameter 86

| Para. | Name             | Setting range                  | Initial value | Change |
|-------|------------------|--------------------------------|---------------|--------|
| 86    | Backlash correct | 0 to 10000 [pulse] (in 1 step) | 0             | Always |

After each change of the rotational direction of motor, the motor rotates by the amount added by the setting value.

(6) Specifying the rotational speed

The rotational speed depends on the on/off status of VEL1 and VEL0 signals. The speed can be changed even while motor is running.

Selection of rotational speed

| VEL1 (13) | VEL0 (12) | Rotation speed |
|-----------|-----------|----------------|
| OFF       | OFF       | Basic para. 08 |
| OFF       | ON        | Basic para. 09 |
| ON        | OFF       | Basic para. 10 |
| ON        | ON        | Basic para. 11 |

(7) Shorted route valid [DIR]

When the [START] signal is given while the [DIR] (7) is on, the motor rotates from the current station number to target station toward the direction whose moving distance is shorter.

If the target station is just on the opposite side, the motor rotates in the direction in which the station number increases.

(8) Rotational direction [SIGN]

When the [START] signal is given while the [SIGN] (8) is off, indexing is executed in positive direction.

While the [SIGN] (8) is on, indexing is executed in negative direction.

For RYS S3-RSS and -RTS type, specifying the rotational direction is invalid. Specify the negative sign to the station number.

(9) ABS/INC

When the [START] signal is given while the ABS/INC (9) is off, indexing is executed by specifying the station number as the absolute position. While the ABS/INC (9) is on, indexing is executed as the relative position.

The relationship between the above signals is as follows:

| DIR, SIGN, ABS/INC |           |            |   |
|--------------------|-----------|------------|---|
| DIR(7)             | SIGN(8)   | ABS/INC(9) | Indexing action   |
| ON                 | (ignored) | (ignored)  | Shorted route   |
| OFF                | OFF       | OFF        | Position in the positive direction station number               |
|                    | ON        | OFF        | Position in the negative direction station number               |
|                    | OFF       | ON         | Move for the amount of station number in the positive direction |
|                    | ON        | ON         | Move for the amount of station number in the negative direction |

5.5.2 Indexing end [WPSET]

The positioning action complete can be checked by this signal.

---

Indexing end [WPSET] (Control output signal)

---

Function

This [WPSET] signal turns on when the amplifier completes the positioning action.

This signal is off when the motor starts running. This signal is not turned on, while the motor is stopping by the temporary stop (31).

The output form of the [WPSET] signal can be selected by basic para. 55 setting.

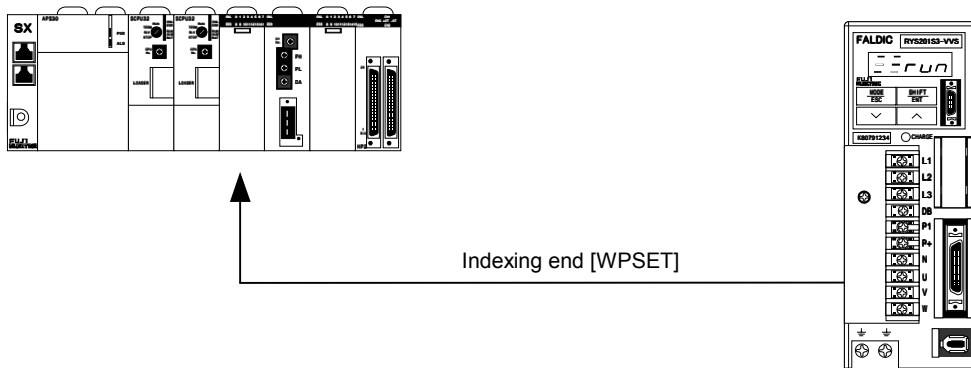
Parameter setting

To allocate the [WPSET] signal to the control output terminal, set (2) to the system para..

Related item

(1) Output form of [WPSET] signal

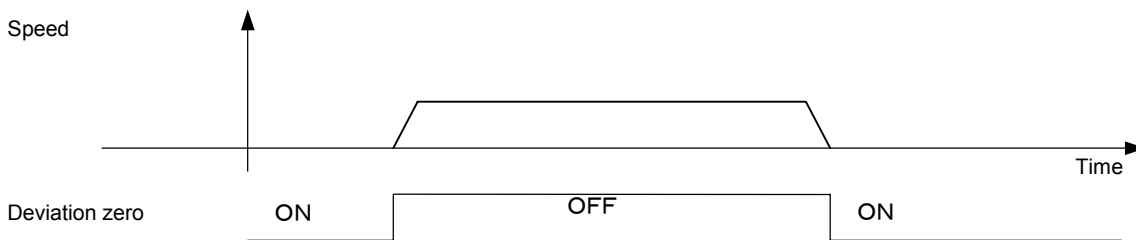
The output form of the [WPSET] signal can be selected by basic para. 55 and 56 setting.



1) When power is turned on  
 Level : OFF  
 One shot : OFF

When the current position is backed up by selecting the ABS system with system para. 99 setting, the motor current position is being stored.  
 When the manual forward command [FWD] transfers to the station position or the indexing is executed by the auto start [START], this output signal is turned on.  
 When the INC system is selected by system para. 99 setting, execute the position preset or the origin return.

2) Pulse train  
 Level : OFF  
 One shot : OFF  
 Motor stopping by the pulse train can be checked by the deviation zero signal.

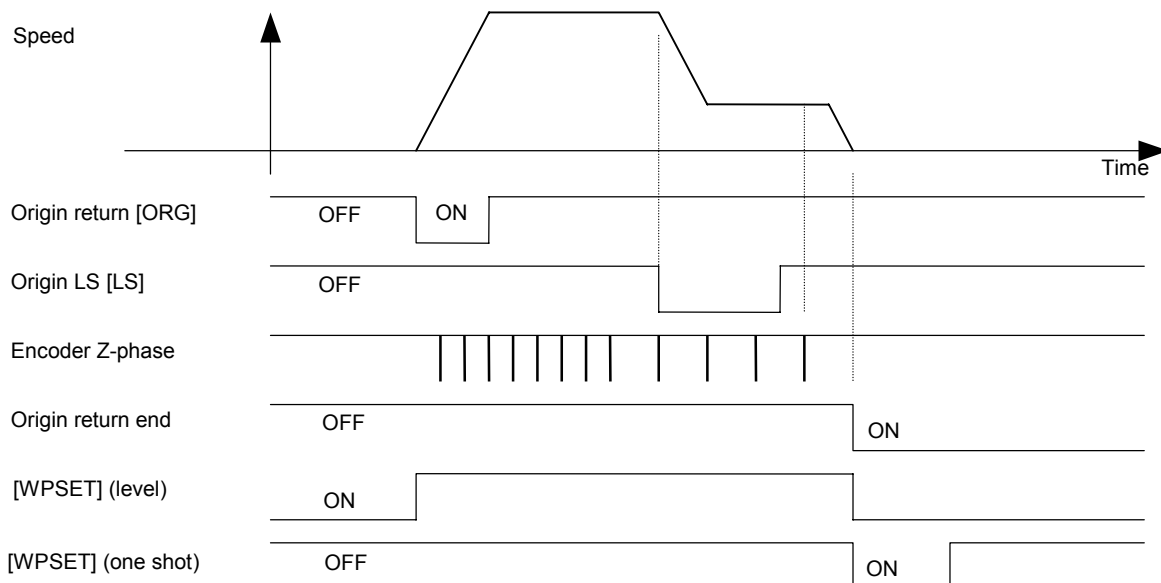


3) Manual feed  
 Level : This signal is off when the motor start running, and on when it reaches a station to stop.  
 One shot : This signal is on for a determined period of time, when it reaches a station to stop.

This signal is not turned on, when basic para. 81 is set to 1 so that the manual indexing is invalid.

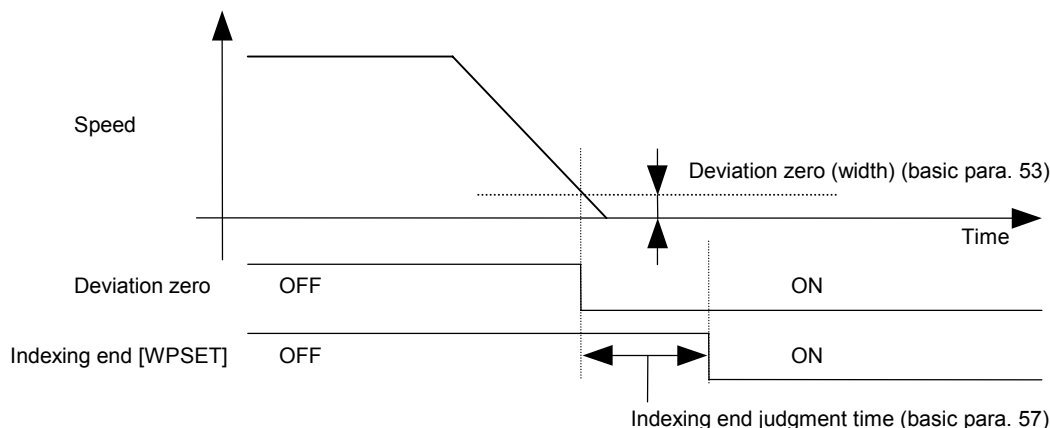
(4) Origin return/Auto start  
 Level : Turns on when the indexing end judgment time (basic para. 57) has elapsed after the difference (deviation) between the command position and feedback position came within the deviation zero zone (width) (basic para. 53).  
 One shot : Turns on for the determined period of time (basic para. 56) on condition that the indexing end output form (level) is on.

With one shot selected, when positioning has started within the time set by basic para. 56, operation is stopped forcibly.



(2) Indexing end judgment time

The output timing of [WPSET] signal is shown below.



- 1) The current command position reaches the target position.
- 2) The motor's current feedback position follows the current command position to reach the target position.
- 3) When the difference (deviation) between the current feedback position and the current command position is less than the deviation zero width (basic para. 53), the deviation zero signal is turned on.
- 4) When the deviation zero signal is continuously held on during the indexing end judgment time (basic para. 57), the [WPSET] signal is turned on.

Basic parameter 57

| Para. | Name                       | Setting range                      | Initial value | Change |
|-------|----------------------------|------------------------------------|---------------|--------|
| 57    | Indexing end judgment time | 0.000 to 1.000 [s] (in 0.001 step) | 0.050         | Always |

• Output form of [WPSET] signal is as follows:

| Cause  | Deceleration method (*)                       | Indexing end [WPSET] signal | Remark   |
|--|---|-----------------------------|--|
| Forward command [FWD]<br>Auto start [START]<br>Origin return [ORG] | "Preset deceleration time"<br>to "servo lock" | On at stopping              | Not turned on when manual indexing is invalid.         |
| Pulse train ratio 1<br>Pulse train ratio 2                         | Pulse train input                             | Always off                  | -  |
| Position preset end  | -   | On at preset end            | -  |
| Deviation clear  | -   | Always off                  | -  |
| Free-run [BX]  | Load torque                                   | Retained at preceded status | -  |
| Temporary stop   | "Preset deceleration time"<br>to "servo lock" | Off                         | At temporary stop off, executes indexing action again. |
| Positioning cancel   | "Preset deceleration time"<br>to "servo lock" | On at stopping              | Not turned on when manual indexing is invalid.         |
| Run command [RUN] off  | "Forced zero speed" to<br>"base off"          | Off                         | Ready [RDY] off  |
| Forced stop [EMG] off  | Forced zero speed                             | Off                         | -  |
| Alarm detection [ALM]<br>(minor fault) (*)                         | "Forced zero speed" to<br>"base off"          | Off                         | -  |
| Alarm detection [ALM]<br>(major fault) (*)                         | Base off                                      | Retained at preceded status | -  |

(\*) : Minor fault ... Deviation excessive [OF], braking resistor overheat [rH], amplifier overheat [AH], encoder overheat [EH] and bus communication error [tE]

Major fault ... Alarm detection other than minor fault

Forced zero speed ... Decelerates to a stop rapidly.

Base off ... Motor has no driving force (free-run).

### 5.5.3 Current position output

The station number is outputted, that the amplifier is receives.

---

#### Current position output (Control output signal)

---

##### Function

The code to be outputted depends on the system para. 98 setting.

The station number is updated at the intermediate point of each station.

The station number can be updated when moved by manual operation or pulse train command.

This signal becomes an output based on the 2nd origin, when the 2nd origin (42) valid of control assignment is used.

The station number output is valid, even if the forced stop [EMG] (10) is off.

The current station number is stored when power is off. The current station number is restored at power recovery.

##### (1) Incremental system (system para. 99 setting: 0)

The motor rotational quantity is not counted at power off. The indexing action starts that the station position at power recovery is the station position at power off. If necessary, execute the origin return action or position preset.

##### (2) Absolute system (system para. 99 setting: 1)

The motor rotational quantity is counted at power off. When the auto start [START] signal or manual indexing is executed, indexing is performed by correcting the rotational quantity during power off.

**Remark :** Do not rotate the motor output shaft more than 32768 [revolution] during power off. Otherwise, the station number will not be recognized at power recovery.

##### • Basic type (DI/DO position)

The current position can be outputted by allocating PD14 to PD0 to the control output terminal.

##### • SX bus type (SX bus direct connection)

The current position can be outputted to the 0, 1 word position of IQ area. The current position can be outputted on condition that bit of SEL2, SEL1, and SEL0 are all off.

The current position can be obtained with the refresh cycle of IQ area.

##### • T-link (T-link direct connection)

The current position can be outputted to the +0, +1 word position of WB area.

The current position can be outputted on condition that 5 bits of data selection are all off.

The current position can be obtained with the refresh cycle of T-link.

#### Current position output

| Amplifier                              | Current position output                       |
|--|---|
| Basic type (DI/DO position)            | Current position can be outputted.            |
| SX bus type (SX bus direct connection) | Current position can be outputted to IQ area. |
| T-link (T-link direct connection)      | Current position can be outputted to WB area. |

##### Parameter setting

To allocate PD14 to PD0 to the control output terminal, set (74) to (60) to the system para..

Not all terminals need not be allocated.



### 5.5.4 2nd origin

The station number is shifted to execute rotation indexing.

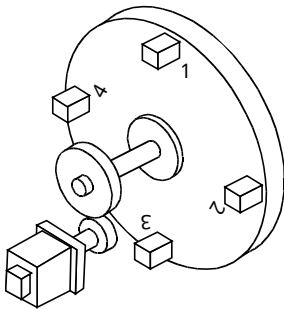
---

#### 2nd origin (Control input signal)

---

##### Function

The rotation indexing is executed based on basic para. 78 setting, while the 2nd origin (42) signal is on. For basic para. 78, the station number is specified, when the origin return is end or position preset is made.



When 2nd origin is off and invalid:  
When the figure on the left is shown at origin return end, position is indexed at No. 1 station position.

When 2nd origin is on and valid:  
When the basic para. setting is 4, position is indexed at the position No. 4 on the left figure.  
When 2nd origin is turned off, position is indexed at No. 1 station position.

The position where indexed at normal operation and the position where indexed temporary (in case of replacement work, example) can be changed.

##### Parameter setting

To allocate 2nd origin to the control input terminal, set (42) to the system para.. If this signal is not allocated to the control input terminal, this signal is deemed "always off".

##### Related item

##### (1) Output of station number

The following signals are outputted based on the 2nd origin.

- Station number of keypad panel and loader
- Current position output of PD14 to PD0

The following signals are outputted with the 2nd origin invalid.

- Fixed point 1 (17) detection
- Fixed point 2 (18) detection
- Origin return end (22)

##### (2) 2nd origin

##### Basic parameter 78

| Para. | Name       | Setting range                            | Initial value | Change |
|-------|------------|--|---------------|--------|
| 78    | 2nd origin | 2 to max. number of division (in 1 step) | 2             | Power  |

This para. specifies the station number that is indexed by the 2nd origin function.

The position of station number is based on the station, when the origin return end or position preset signal is inputted.

### 5.5.5 Positioning cancel

The signal cancels a positioning action being executed to stop.

---

#### Positioning cancel (Control input signal)

---

##### Function

At the ON edge, the positioning cancel (32) signal cancels the positioning action and starts deceleration.  
During the ON period, auto start [START] and origin return [ORG] commands are ignored.  
The signal is invalid for pulse train ratio 1, 2, or manual running [FWD/REV].  
The deceleration is made in a specified decel. time.

The stop position during the positioning cancel depends on the basic para. 81 setting.  
When the manual indexing selection 1 (49) or manual indexing selection 0 (48) is allocated to the control input terminal, the operation follows it.  
See (7) of 5.3.1 Forward command [FWD]/Reverse command [REV].

##### Parameter setting

To allocate the positioning cancel to the control input terminal, set (32) to a system para..  
If this signal is not allocated to the control input terminal, this signal is deemed "always off".

##### Related item

The forced stop [EMG] (10) signal, external fault input (34), and free-run [BX] (54), etc. that are signals for stopping take a precedence.  
The motor decelerates quickly until it stops.

### 5.5.6 Temporary stop

The signal temporarily stops a positioning action being executed.

---

#### Temporary stop (Control input signal)

---

##### Function

At the ON edge, the temporary stop (31) starts deceleration.  
During the on period, auto start [START] and origin return [ORG] command is suspended to stop its movement.  
Turning it off resumes the remainder of action.  
The signal is invalid for pulse train ratio 1, 2, or manual running [FWD/REV].  
The accel./decel. is made in a specified accel./decel. time.

The motor decelerates to a stop from when this signal is on. However, the motor will not stop at a station number.

If, while in temporary stop, the positioning cancel has been validated, the relevant positioning is canceled.  
The temporary stop signal is valid for a positioning action being executed.

##### Parameter setting

To allocate the temporary stop to a control input terminal, set (31) to a system para..

## 5.6 Signal for safety

This section explains the functions and input/output signals for safety operation contained in amplifier.

|   |  |
|---|--|
| Control input signal : Forced stop [EMG] (10) | Control output signal : Forced stop detection (41) |
| Edit permit command (55)                      | Edit permit ON (29)                                |
| Torque limit [TLMT] (30)                      | Torque limit detection (26)                        |
| External fault input (34)                     | Overload early warning (27)                        |

### 5.6.1 Forced stop [EMG]/Forced stop detection

Stops the motor forcibly using the signal to control input terminal.

---

#### Forced stop [EMG]/Forced stop detection (Control input / output signal)

---

##### Function

##### (1) Forced stop [EMG]

While the [EMG] (10) signal is off, the motor is forced stopped.

This input signal is always valid in any control made, and has the highest priority (all other commands are ignored.).

Connect the [EMG] (10) signal directly to the control input terminal of amplifier because the safe operation and speed detecting are important.

Normally, connect this terminal to a push-lock type (NC contact) pushbutton switch (Fuji's command switch is recommended).

##### (2) Forced stop detection

When the [EMG] (10) signal is turned off, the forced stop detection (41) signal is turned on, to be informed the current status externally.

However, the forced stop detection (41) signal is turned off, while external fault input (34) is off.

##### · Basic type (D/DO position)

At factory setting, the forced stop signal is allocated to CONT13 terminal (Pin 20 of CN3).

##### · SX bus type (SX bus direct connection)

At factory setting, the [EMG] signal is not allocated to the control input terminal of CN1. Allocate this signal to use it.

When allocated to IQ area, bit ON executes the forced stop.

##### · T-link type (T-link direct connection)

At factory setting, the [EMG] signal is not allocated to the control input terminal of CN1. Allocate this signal to use it.

When allocated to WB area (at bit 5 in word +4 position), bit on executes the forced stop.

##### Parameter setting

To allocate the [EMG] signal to the control input terminal, set (10) to the system para.. If this signal is not allocated to the control input terminal, this signal is deemed "always on".

To allocate the forced stop detection signal, set (41).

The [EMG] signal can be allocated to multiple terminals, and when any of those input signals is on, the motor stops forcibly.

##### Related item

##### (1) Ready [RDY]

After the [EMG] (10) signal is allocated to the control terminal, when the ready [RDY] signal is turned on with both the run command [RUN] (3) and the [EMG] signals on, the motor can rotate.

##### (2) Forced stop status

While the [EMG] (10) signal is off and the [RUN] is on, the motor makes a stop in the speed zero status making the speed command is zero. Current position cannot be retained in the speed zero status. As the current position has been stored, the origin return action is not necessary again when the [EMG] signal is off. Turning on the [EMG] signal allows the motor to rotate.

If the [RUN] signal is off while the [EMG] is off, the motor is in free-run status.

##### (3) Rotation command

While the [EMG] signal is off, all of the rotation commands are ignored.

When the alarm reset signal is on, or condition of the [EMG] signal is not needed.

### 5.6.2 Edit permit command/Edit permit ON/OFF

This function allows external signal to limit editing the parameter etc..

---

#### Edit permit command/Edit permit ON/OFF (Control input/output signal)

---

##### Function

On/off to the control input signal can limit editing or test running using keypad panel, exclusive loader or PC loader.  
Only while edit permit command (55) is on, the following operation is possible.

- 1) Parameter edit mode
- 2) Test running mode

When edit permit command (55) is turned off, only monitor mode is valid.

Unexpected motor rotation or accidental lowering of vertical moving mechanical system can be prevented, occurring from careless operation of keypad panel, exclusive loader or PC loader.

##### Parameter setting

To allocate the edit permit command to the control input terminal, set (55) to the system para.. Set (29) for the edit permit ON/OFF.

##### Related items

When 1 is set at system para. 94, parameter editing with keypad panel, PC loader or exclusive loader is disabled.  
The system para. 94 is always rewritable.

The relation between the edit permit command and system para. 94 is as follows:

#### Edit permit command and system parameter 94

| Edit permit command<br>(55) | System para. 94    | Edit permit ON/OFF<br>(29) | Edit/Initialize |
|-----------------------------|--------------------|----------------------------|-----------------|
| Not assigned                | 0 : Edit permitted | ON                         | Yes             |
| OFF                         | 0 : Edit permitted | OFF                        | No              |
| ON                          | 0 : Edit permitted | ON                         | Yes             |
| Not assigned                | 1 : Edit inhibited | OFF                        | No              |
| OFF                         | 1 : Edit inhibited | OFF                        | No              |
| ON                          | 1 : Edit inhibited | OFF                        | No              |

### 5.6.3 Torque limit [TLMT]/Torque limit detection

This function limits the motor output torque.

---

#### Torque limit [TLMT]/Torque limit detection (Control input / output signal)

---

##### Function

##### (1) Torque limit

Motor output torque can be limited while [TLMT] (30) signal is on.

Torque limit value can be set by basic para. 59, from 0 to max. output torque in 1% step.

Value of the max. output torque depends on motor output rating and model type.

Motor output torque is based on the 100% rated torque.

Torque limit is always valid in any control mode.

If output torque is limited during accel. or decel., accel. or decel. time may not follow the setting value by basic para..

##### (2) Torque limit detection

This signal is turned on, while motor output torque reaches the torque limit value.

This torque limit detection (26) is always valid in any control mode.

#### Parameter setting

To allocate the [TLMT] signal to the control input terminal, set (30) to the system para.. If the [TLMT] (30) signal is not allocated to the control input terminal, the setting of basic para. 59 is always valid.

To allocate the torque limit detection signal to the control output terminal, set (26) to the system para..

### 5.6.4 External fault input

External signal forcibly stops the motor.

---

External fault input (Control input signal)

---

#### Function

While this signal is turned off, the motor is stopped forcibly.

While external fault input is applied (signal off), the operation is the same as forced stop [EMG] (10).

While external fault input is applied (signal off), forced stop detection (41) signal is turned on.

#### Parameter setting

To allocate the external fault input signal to the control input terminal, set (34) to the system para.. If this signal is not allocated to the control input terminal, this signal is deemed "always on".

#### Related item

See 5.6.1 for the forced stop (10).

### 5.6.5 Overload early warning

Motor's load factor can be checked.

---

Overload early warning (Control output signal)

---

#### Function

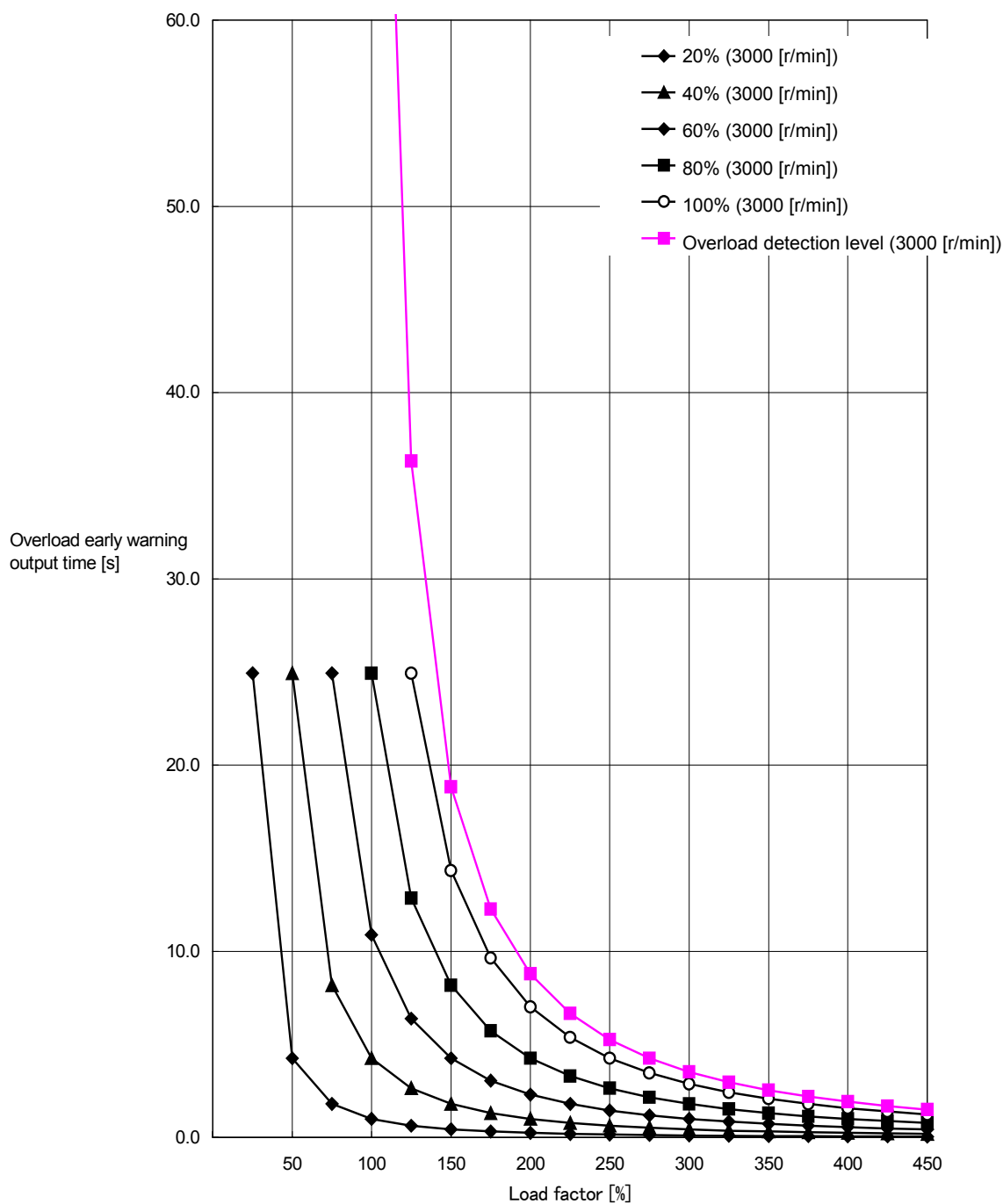
This signal is turned on, when the motor load factor has reached the overload early warning level set at the basic para. 58.. This signal cannot be reset by the control input signal (external signal input).

Early warning signal can be outputted before the amplifier trips due to motor overload alarm.

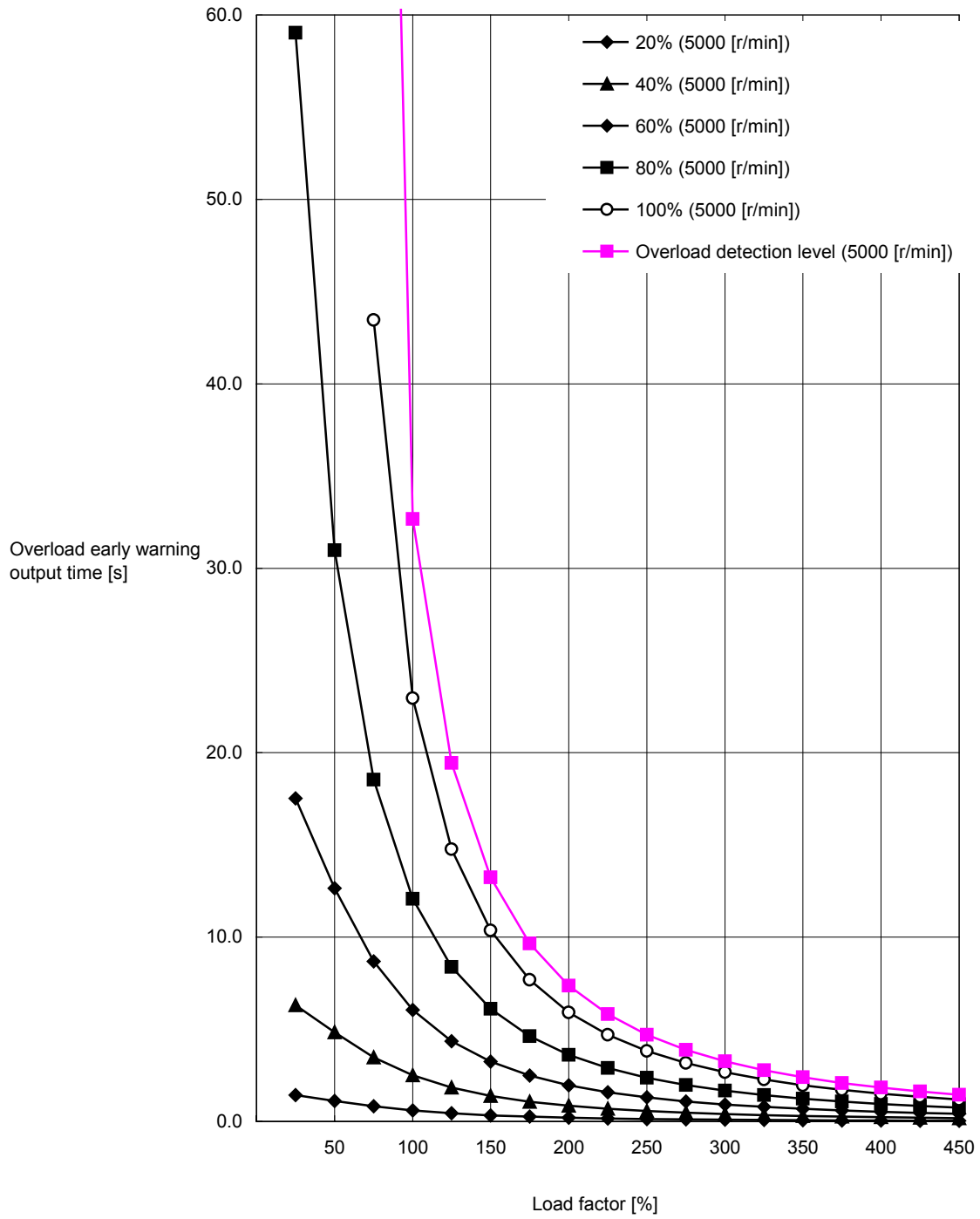
#### Parameter setting

To allocate the overload early warning signal to the control output terminal, set (27) to the system para..

Overload early warning output time (at 3000 [r/min])



Overload early warning output time (at 5000 [r/min])



## 5.7 Incidental functions

This section explains other control functions that the amplifier supports.

Control input signal :

- Clamping end (33)
- Override valid (43)
- Override 1 (44)
- Override 2 (45)
- Override 4 (46)
- Override 8 (47)
- Free-run [BX] (54)
- P-action (29)

Control output signal :

- Fixed point 1 (17)
- Fixed point 2 (18)
- Dynamic braking (15)
- Address error (31)
- Data error (30)
- CPU ready [CPURDY] (28)
- Brake timing (14)

### 5.7.1 Clamping end

This signal lowers the response of motor to lock the rotation object mechanically.

---

#### Clamping end (Control input signal)

---

##### Function

During on of clamping end (33) signal, the control function of motor is limited.

- P-control (proportional band control) is selected for the speed control by the amplifier.
- The rotational command, such as the auto start [START] and manual forward command [FWD], are ignored.

Turn on the clamping end signal after the indexing end [WPSET] signal is on.

##### Parameter setting

To allocate the clamp end signal to the control input terminal, set (33) to the system para.. If this signal is not allocated to the control input terminal, this signal is deemed "always off".

### 5.7.2 Fixed point

This signal is turned on when the motor current position is near a station.

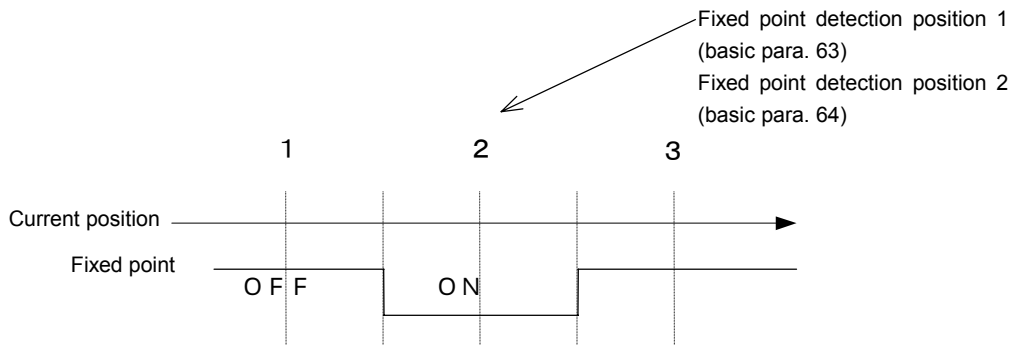
---

#### Fixed point (Control output signal)

---

##### Function

The fixed point signal is updated at intermediate point of each station.





#### Parameter setting

To allocate the fixed point signal 1 to the control output terminal, set (17) to the system para.. Set (18) for the fixed point 2.

#### Related item

The station number is set to basic para. 63 and 64.  
If the 2nd origin function is valid, the output position does not shift.

### 5.7.3 Override

This function changes the current motor speed.

---

|                                 |
|---------------------------------|
| Override (Control input signal) |
|---------------------------------|

---

#### Function

While the override valid (43) signal is turned on, the motor speed is variable by a scale factor specified by the override 1/2/4/8 up to 1.5 times the current speed.

Weighting of scale factor corresponding to override 1/2/4/8 can be changed by basic para.

This function is valid for any rotational command. except for pulse train input (pulse train ratio 1 or 2).

#### Parameter setting

To allocate the override valid signal to the control input terminal, set (43) to the system para.. If this signal is not allocated to the control input terminal, this signal is deemed "always off".

#### System parameter setting

| Signal name    | Setting value |
|----------------|---------------|
| Override valid | 43            |
| Override 1     | 44            |
| Override 2     | 45            |
| Override 4     | 46            |
| Override 8     | 47            |

#### Related items

##### (1) Override scale factor

The scale factors, while the override valid signal is on, are as follows.

If the override valid goes off, the 100% moving speed is obtained.

The signal not allocated to the control input terminal is deemed "always off".

#### Moving speed [%] by override (\*)

| Override 8 | Override 4 | Override 2 | Override 1 | Moving speed [%] |
|------------|------------|------------|------------|------------------|
| OFF        | OFF        | OFF        | OFF        | 0                |
| OFF        | OFF        | OFF        | ON         | 10               |
| OFF        | OFF        | ON         | OFF        | 20               |
| OFF        | OFF        | ON         | ON         | 30               |
| OFF        | ON         | OFF        | OFF        | 40               |
| OFF        | ON         | OFF        | ON         | 50               |
| OFF        | ON         | ON         | OFF        | 60               |
| OFF        | ON         | ON         | ON         | 70               |
| ON         | OFF        | OFF        | OFF        | 80               |
| ON         | OFF        | OFF        | ON         | 90               |
| ON         | OFF        | ON         | OFF        | 100              |
| ON         | OFF        | ON         | ON         | 110              |
| ON         | ON         | OFF        | OFF        | 120              |
| ON         | ON         | OFF        | ON         | 130              |
| ON         | ON         | ON         | OFF        | 140              |
| ON         | ON         | ON         | ON         | 150              |

(\*) Where override weighting is at initial value.

## (2) Override weighting

Override weighting can be changed by using basic para. 17 to 20.

### Basic parameter 17 to 20

| Para. | Name       | Setting range         | Initial value | Change |
|-------|------------|-----------------------|---------------|--------|
| 17    | Override 1 | 0 to 150% (in 1 step) | 10            | Always |
| 18    | Override 2 | 0 to 150% (in 1 step) | 20            | Always |
| 19    | Override 4 | 0 to 150% (in 1 step) | 40            | Always |
| 20    | Override 8 | 0 to 150% (in 1 step) | 80            | Always |

When the override 8, 4, 2 and 1 are all on, adding all initial values gives 150 (= 80 + 40 + 20 + 10). If the initial value has been changed and resultant sum exceeded 150, the preceding value is retained.

## (3) Max. speed

Max. speed of the motor output shaft can be set by basic para.16 setting. However, this setting is invalid while pulse train input exists.

### 5.7.4 Free-run [BX]

This function puts the motor into free-run status forcibly.

---

#### Free-run [BX] (Control input signal)

---

##### Function

While [BX] signal is on, the amplifier output is off, and the motor is in free-run status. Motor decelerates (or accelerates) with the loaded torque.

The [BX] signal is always valid.



#### **CAUTION**

**For safety purpose, do not use this signal to the vertically moving mechanical equipment.**

If this signal is turned on, when using a manual pulse generator with pulse train input (pulse train ratio 1), the handle angle may differ from the motor rotational quantity.

##### Parameter setting

To allocate the [BX] signal to the control input terminal, set (54) to the system para..

##### Related item

The [BX] signal takes the precedence over any other signals in all the control modes.

### 5.7.5 P-action

The speed control is subordinate to proportional band control.

---

#### P-action (Control input signal)

---

##### Function

This signal is turned on while locking the motor shaft mechanically, with the run command [RUN] on. See 5.7.10 Brake timing. Speed control and position control become unstable if P-action signal is on during motor rotating. Never put this signal on during motor rotating.

##### Parameter setting

To allocate the P-action signal to the control input terminal, set (29) to the system para.. If this signal is not allocated to the control input terminal, this signal is deemed "always off".

### 5.7.6 Dynamic braking

This signal is turned on when the amplifier detects major fault.

---

#### Dynamic braking (Control output signal)

---

##### Function

This signal is turned on when a major fault has occurred that the amplifier cannot drive the motor, and is retained until alarm reset signal is input.

Dynamic braking is a braking type to generate power, by short-circuiting the three-phase winding of a synchronous motor. Once the motor is stopped, braking force is not retained.

The output terminal of dynamic braking is +30 [V] DC, 50 [mA]. This cannot directly close a magnetic contactor. Use a general-purpose relay or Fuji's SSC (solid state contactor).

##### Parameter setting

To allocate the dynamic braking signal to the control output terminal, set (15) to the system para.

##### Related items

- Major fault

Fault that cannot drive motor

| Indication | Detection contents          |
|------------|-----------------------------|
| AL SE      | System error                |
| AL OC      | Overcurrent                 |
| AL OS      | Overspeed                   |
| AL LU      | Undervoltage                |
| AL HU      | Overvoltage                 |
| AL ET      | Encoder trouble             |
| AL CT      | Control power trouble       |
| AL dE      | Memory error                |
| AL Fb      | Fuse blown                  |
| AL CE      | Motor combination error     |
| AL rH2     | Resistor overheat 2         |
| AL EC      | Encoder communication error |
| AL CEE     | Control signal error        |
| AL OL      | Motor overload              |

- Minor fault

Protection against overheat etc.

| Indication | Detection contents        |
|------------|---------------------------|
| AL rH      | Braking resistor overheat |
| AL OF      | Deviation excessive       |
| AL rH      | Amplifier overheat        |
| AL EH      | Encoder overheat          |
| AL AL      | ABS (absolute) data lost  |
| AL EE      | Bus communication error   |

### 5.7.7 Address error

Address error of station number can be checked.

---

#### Address error (Control output signal)

---

##### Function

This signal turns on, when a station number at auto start [START] and manual forward command [FWD] address error shown below is detected.

- 1) Data other than specified code (BCD or binary) is input.
- 2) Data other than setting range is input.

This signal turns off, when an auto start is executed at a correct address.

Even if an address error turned on, motor shaft is not stop.

The address can be changed between binary code and BCD code by system para. 98 setting.

- Basic type (DI/DO position)

The address error signal is on, when D0 to D14 setting error specifying station number in CONTn of connector 3 (CN3) is detected. At factory setting, this signal is allocated to OUT4 (No.7 pin of connector 1(CN1)).

- SX bus type (SX bus direct connection)

The address error signal is on, when an error is detected at word 8 and 9 position (specified station) of IQ area. At factory setting, this signal is allocated to OUT8 (word 7, bit 10).

- T-link type (T-link direct connection)

The address error signal is on, when an error is detected at word +6 and 7 (rewrite data) area of WB area. At factory setting, this signal is allocated to OUT9 (word +0, bit 4).

#### Parameter setting

To allocate the address error signal to the control output terminal, set (31) to the system para..

### 5.7.8 Data error

A para. number error and data error at para. editing can be checked.

---

#### Data error (Control output signal)

---

#### Function

This signal turns on, if the following data error is detected at position preset, para. rewrite or manual feed speed selection.

- 1) Data other than specified code (BCD or binary) is input.
- 2) Data other than setting range is input.
- 3) Negative sign specified.

This signal turns off, when rewrite is executed by correct data. Even if a data error is on, the motor shaft is not stop. It turns on or off according to the output timing of the rewrite end (13) signal.

- Basic type (DI/DO position)

The data error signal is on, when D0 to D14 setting error specified station number in CONTn at position preset is detected. At factory setting, this signal is allocated to OUT3 (26 pin of connector 1 (CN1)).

- SX bus type (SX bus direct connection)

The data error signal is on, when an error is detected at word 8 and 9 position and word 14 (low order 8 bit) of IQ area. At factory setting, this signal is allocated to OUT7 (word 7, bit 11).

- T-link type (T-link direct connection)

The data error signal is on, when an error is detected at word +5 (address number ) area and word +6 and 7 (rewrite data) area of WB area. At factory setting, this signal is allocated to OUT14 (word +0, bit 9).

#### Parameter setting

To allocate the data error to the control output terminal, set (30) to the system para..

### 5.7.9 CPU ready [CPURDY]

Normal operation of amplifier and motor can be checked.

---

#### CPU ready [CPURDY] (Control output signal)

---

#### Function

This signal is turned on under the following conditions, after power is turned on.

- CPU in the amplifier is operating normally.

[CPURDY] signal output has no relation with control input signal on/off status.

When the [CPURDY] signal is off, the contents of the control output may be incorrect.

#### Parameter setting

To allocate the [CPURDY] signal to the control output terminal, set (28) to the system para..

### 5.7.10 Brake timing

This signal is automatically turn on or off for the brake operation.

---

#### Brake timing (Control output signal)

---

##### Function

This signal automatically excites or releases the motor brake, in accordance with the rotational command to the amplifier.  
The control condition when the motor is stopped can be set by system para. 81.

##### Parameter setting

To allocate the brake timing output to the control output terminal, set (14) to the system para.. If this signal is not allocated to the control output terminal, this signal is deemed "always off".

##### Related items

###### (1) Brake timing

The step to set the brake timing at the control output terminal is as follows:

###### 1) Setting of control output terminal

Assign the value (14) corresponding to the brake timing to the system para. 31 and above. If value (14) is set at the system para. 31, OUT1 terminal is the output terminal of brake timing.

###### 2) Setting at stoppage

Set "2" or "3" at the system para. 81 to select the status while motor is stopping. When "3" is set at para. 81, the motor comes to free-run status when operating the brake and electromagnetic noise of motor is eliminated.

###### 3) Brake operation time/release time

Assign the operating time and release time of external brake to system para. 82 and 83.

To each time period, add the scan time of PLC, the response time of external relay, magnetic contactor and the brake.

###### (2) Pulse train/manual feed (Forward command [FWD]/Reverse command [REV])

The brake timing output is held off, from when the power is turned on until rotational command is given.

When the following control input signals are given, the brake timing output is turned on.

###### 1) [FWD], [REV]

###### 2) Pulse train ratio 1, pulse train ratio 2

When starting a movement :

###### 1) [FWD]/[REV]

The brake timing is turned on simultaneously, when control input ([FWD] or [REV]) signal is on.

After the brake release time (system para. 83) has elapsed, a rotation starts assuming that brake has actually been released. If [FWD] or [REV] has been turned off during the brake release time, the motor will not start rotation.

###### 2) Pulse train ratio 1/Pulse train ratio 2

The brake timing is turned on simultaneously, when the control input signal is on.

After the brake release time (system para. 83) has elapsed, pulse train input becomes valid assuming that it has been actually released. If the control input signal has been turned off during the brake release time, the pulse train input is invalid.

When terminating the movement :

###### 1) [FWD]/[REV]

When [FWD] or [REV] has turned off, the motor starts deceleration. After the speed zero [NZERO] signal on is confirmed, brake timing turns off, and when brake operation time (system para. 82) has elapsed, the amplifier turns P-action signal on. The same procedure as when starting a movement above, is performed if a rotational command is turned on during the brake operation time.

2) Pulse train ratio 1 / Pulse train ratio 2

After [FWD] or [REV] signal is off, pulse train input becomes invalid with deviation zero signal on.

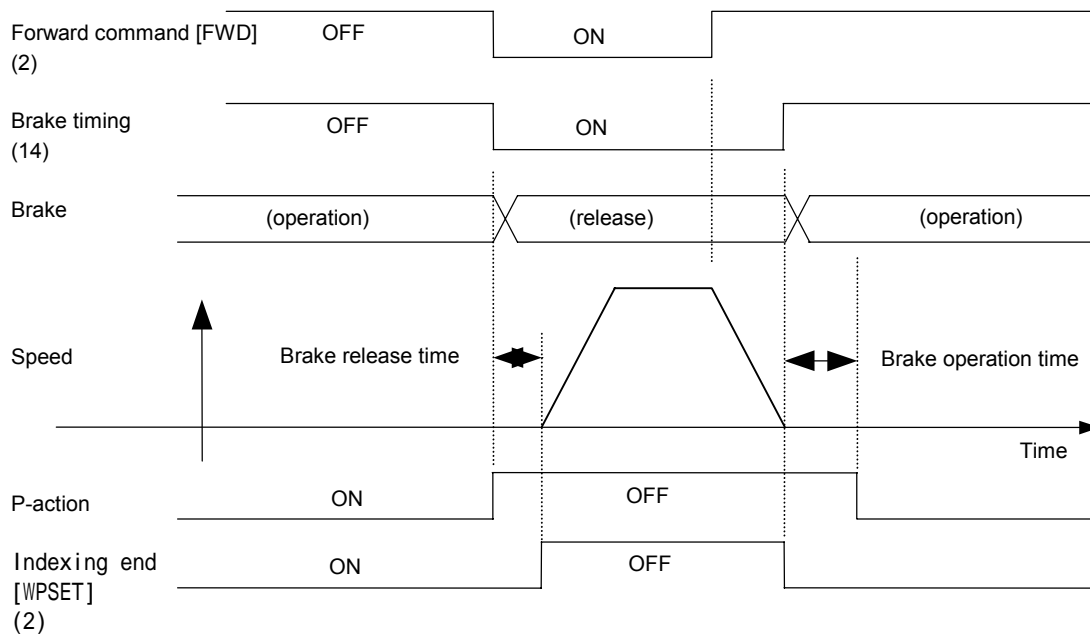
After the deviation zero signal on is confirmed, brake timing turns off, and when brake operation time (system para. 82) has elapsed, the amplifier turns P-action signal on.

The same procedure as when starting a movement above, is performed if a rotational command is turned on during brake operation time.

System parameter 81 to 83

| Para. | Name                  | Setting range  | Initial value | Change |
|-------|-----------------------|--|---------------|--------|
| 81    | Operation at stoppage | 1: Servo lock, 2: Brake (P-action),<br>3: Brake (free-run) | 1             | Power  |
| 82    | Brake operation time  | 0.01 to 9.99 [s] (in 0.01 step)                            | 0.50          | Always |
| 83    | Brake release time    | 0.01 to 9.99 [s] (in 0.01 step)                            | 0.20          | Always |

Brake timing : Validated signal at ON level



• Brake release time

Time period from when the amplifier output is on, until when the external brake release is ended. Just after the brake release time, the brake is operating and the motor is in servo lock status.

The ON level of the rotational command makes the P-action signal off. The P-action signal is on inside the amplifier.

• Brake operation time

Time period from the amplifier output is off, to starts the braking operation.

After positioning is ended, brake timing output is turned off. Just after the brake operation time, the motor is stopping by servo lock only.

During brake operation time, the servo lock and the brake is in operation. After the brake operation time has elapsed, P-action is on and the motor stops with brake.

(3) Origin return [ORG]/Auto start [START]

The brake timing output is held off, from the power is turned on until the rotational command is given.  
 When the following control input (ON edge) signals are given, the brake timing output is turned on.

When starting a movement :

Brake timing turns on at the ON edge of control input signal.

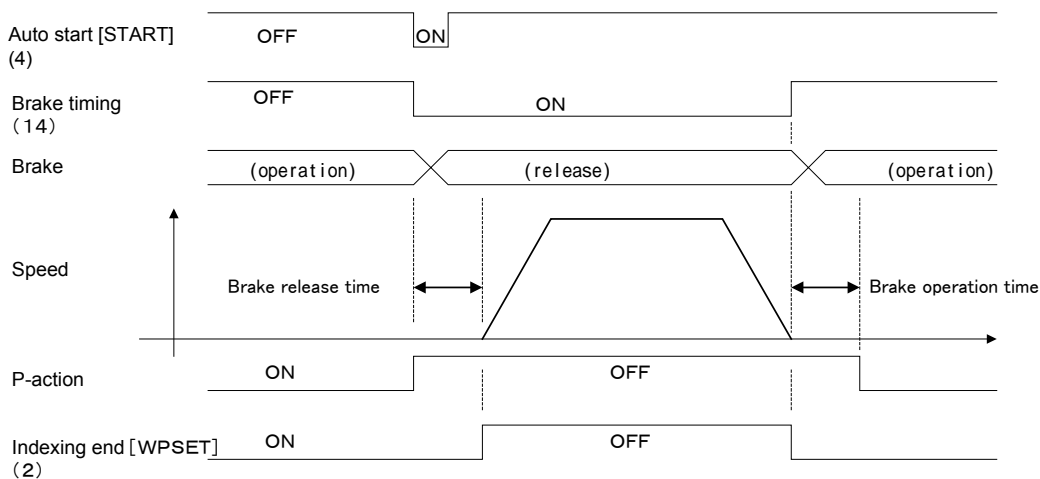
After the brake release time (system para. 83) has elapsed, a rotation starts assuming that the brake has actually been released.

When terminating the movement :

After the amplifier has checked the deviation zero (positioning end), turned off the brake timing, and the brake operation time (system para. 82) has elapsed, the amplifier turns on P-action signal.

The same procedure as when starting a movement above, is performed if a movement restarts at the ON edge of control input signal during the brake operation time.

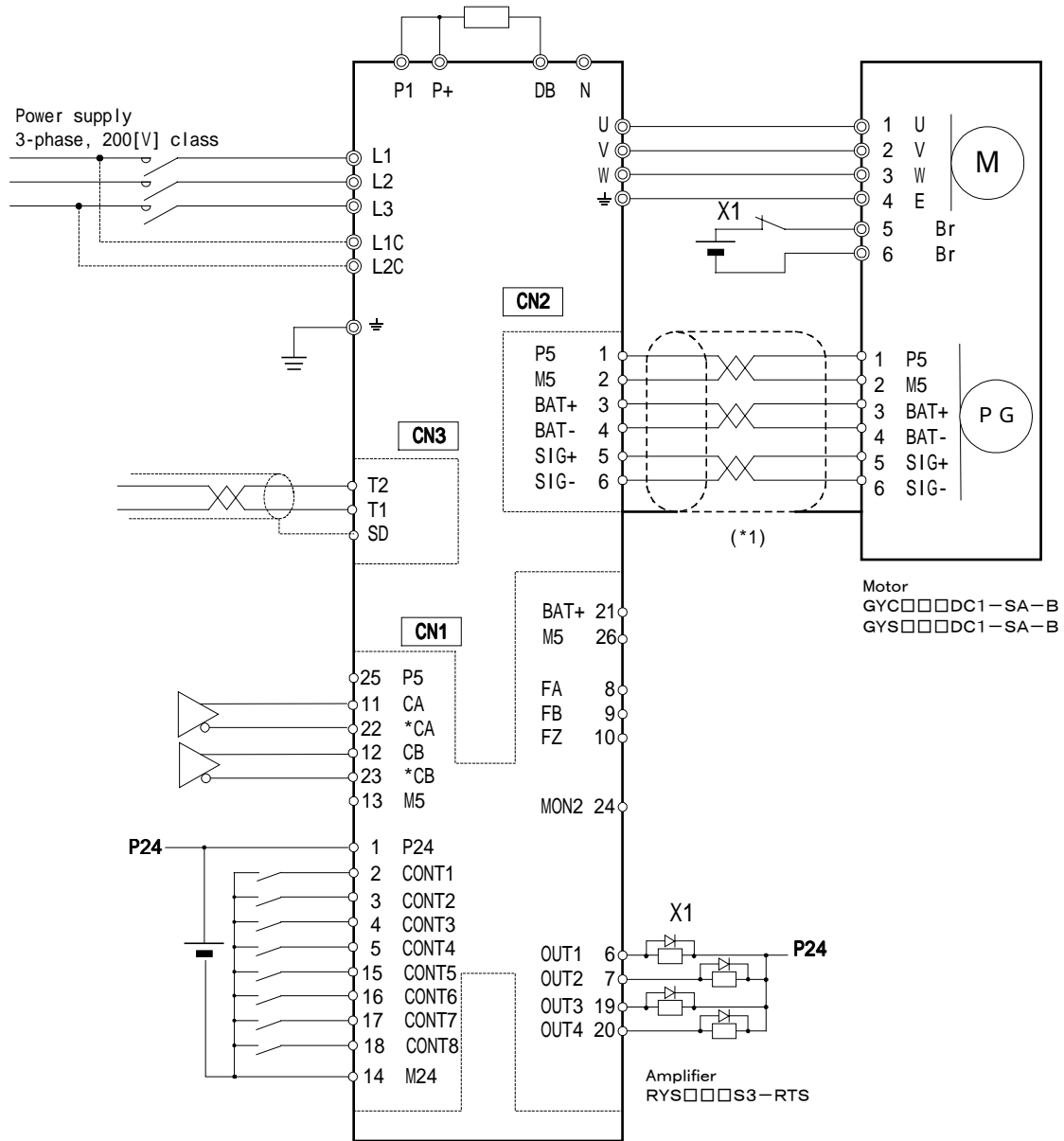
Brake timing : Validated signal at the ON edge



- If an external brake (free-run) is used, the motor comes to free-run status at the timing of P-action as shown on the above figure.
- During brake operation time, mechanical brake and servo lock (before P-action) are executed simultaneously. For vertically moving mechanical equipment, there are no time period of motor free-run during stopping.

External connection diagram (example), 0.4 and 0.75 [kW]

Motor with providing brake



(\*1) Shielded sheath on the shielded cables must be connected with the shell boby and the shell cover.



When the servo lock is released at the alarm detection, run command [RUN] off and forced stop [EMG] off, the brake timing output is off.

- Alarm detection

At alarm detection, the brake timing output goes off immediately to operation the braking.

- [RUN] (1)

At [RUN] off, the motor decelerates quickly and turns off by the [NZERO] (24) signal on.

- Temporary stop (31)

At the ON edge of temporary stop signal, the motor starts deceleration and turns off by the deviation zero (23) signal on.

When the temporary stop is off, the remained action is executed.

The brake timing at signal off is same as “when starting a movement”.

- Positioning cancel (32)

At the ON edge of positioning cancel signal, deceleration starts. The brake timing is same as “when terminating the movement”.

- Deviation clear (50)

The deviation clear is valid during the speed zero (24) signal on. The inputting of deviation clear does not affect the brake timing.

- Free-run [BX] (54)

During [BX] signal on, the motor is in free-run status, and turns off at speed zero (24) signal on.

## 5.8 IQ area (SX bus type)

This section explains the IQ area of RYS S3-RSS type.

RYS S3-RSS type amplifier reserves 16 word in the I/Q area.

### (1) Station number

The station number selects the individual module with amplifier in the system definition of D300win.

The arbitrary number can be specified as the station number.

Set (0) as the station number of the amplifier. Set a different station number if a fail-soft operation for SX bus type is valid.

### (2) Read/rewrite data

The lower order 8 words of IQ area are the read area, and the higher order 8 words are the rewrite area.

The data whether to read or rewrite can be selected by on/off of SEL0, SEL1, SEL2 at bit 8 to 10 in word +14.

When the CSEL0, CSEL1, and CSEL2 of word +5 are simultaneously on or off, the change of the area can be checked.

### (3) CONT/OUT

The bit information at 7 word and bit command at 15 word position are valid in all the read/rewrite data status.

#### • IQ area

| Address | 15   | 14        | 13        | 12         | 11         | 10         | 9          | 8          | 7                       | 6          | 5          | 4          | 3          | 2          | 1                  | 0               |  |
|---------|--|-----------|-----------|------------|------------|------------|------------|------------|-------------------------|------------|------------|------------|------------|------------|--------------------|-----------------|--|
| 0       | Current position, current deviation, basic para. /system para. /LS-Z phase pulse<br>(Low order word PC Amplifier)  |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 1       | Current position, current deviation, basic para. /system para. /LS-Z phase pulse<br>(High order word PC Amplifier) |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 2       | Current speed (Low order word PC ←Amplifier)   |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 3       | Current speed (High order word PC ←Amplifier)  |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 4       | Current torque/current timer data (PC ←Amplifier)  |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 5       | -  |           |           | Alarm code |            |            |            |            |                         | -          |            |            |            |            |                    |                 |  |
| 6       | -  |           |           |            |            | CSEL<br>2  | CSEL<br>1  | CSEL<br>0  | Para. No. current value |            |            |            |            |            |                    |                 |  |
| 7       | OUT<br>3   | OUT<br>4  | OUT<br>5  | OUT<br>6   | OUT<br>7   | OUT<br>8   | OUT<br>9   | OUT<br>10  | OUT<br>11               | OUT<br>12  | OUT<br>13  | OUT<br>14  | OUT<br>15  | OUT<br>16  | Rewrite<br>end     | Read<br>end     |  |
| 8       | Station No./basic para./system para. (Low order word PC →Amplifier)  |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 9       | Station No./basic para./system para. (High order word PC →Amplifier)   |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 10      | Speed command (Low order word PC →Amplifier)   |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 11      | Speed command (High order word PC →Amplifier)  |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 12      | -  |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 13      | -  |           |           |            |            |            |            |            |                         |            |            |            |            |            |                    |                 |  |
| 14      | -  |           |           |            |            | SEL2       | SEL1       | SEL0       | Para. No. setting value |            |            |            |            |            |                    |                 |  |
| 15      | CONT<br>6  | CONT<br>7 | CONT<br>8 | CONT<br>9  | CONT<br>10 | CONT<br>11 | CONT<br>12 | CONT<br>13 | CONT<br>14              | CONT<br>15 | CONT<br>16 | CONT<br>17 | CONT<br>18 | CONT<br>19 | Rewrite<br>command | Read<br>command |  |

## Read/rewrite data (select)

| SEL2 | SEL1 | SEL0 | IQ area (Upper line: 0 to 7W, Lower line: 8 to 15W)  |
|------|------|------|--|
| OFF  | OFF  | OFF  | Current command position, current speed, current torque, alarm code<br>Station No., speed command  |
| OFF  | OFF  | ON   | Current feedback position, current speed, current torque, alarm code<br>Station No., speed command |
| OFF  | ON   | OFF  | Current deviation, current speed, current torque, alarm code<br>Station No., speed command         |
| OFF  | ON   | ON   | –<br>Station No.   |
| ON   | OFF  | OFF  | Basic para. current value<br>Basic para. setting value / Station No.                               |
| ON   | OFF  | ON   | System para. current value<br>System para. setting value / Station No.                             |
| ON   | ON   | OFF  | –<br>Station No.   |
| ON   | ON   | ON   | Current value between LS-Z phase<br>Station No.  |

### (4) Read command / Rewrite command

To read the specified station, basic para. and system para., turn on the read command at bit 0 in word 15 position. The read end at bit 0 in word 7 turns on, when reading is ended.

To perform write, turn on the rewrite command at bit 1 in word +15. The rewrite end at bit 1 in word 7 turns on.

Data such as current command position that always changes, can be read out continuously at the ON edge of read command.

### (5) Auto start

- Sets the station number in the specified station area (see table below).
- Select the rotational speed at VEL0 and VEL1 (see table below).
- The motor starts rotation at the ON edge of auto start [START] signal (see table below).

• IQ area (at factory setting)

| Address | 15  | 14        | 13           | 12         | 11            | 10               | 9         | 8         | 7         | 6                       | 5                  | 4 | 3 | 2 | 1                  | 0               |             |
|---------|---|-----------|--------------|------------|---------------|------------------|-----------|-----------|-----------|-------------------------|--------------------|---|---|---|--------------------|-----------------|-------------|
| 0       | Current position, current deviation, basic para. /system para. /LS-Z phase pulse (Low order word PC Amplifier)  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 1       | Current position, current deviation, basic para. /system para. /LS-Z phase pulse (High order word PC Amplifier) |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 2       | Current speed (Low order word PC ←Amplifier)  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 3       | Current speed (High order word PC ←Amplifier)   |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 4       | Current torque (PC ←Amplifier)  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 5       | -   |           |              | Alarm code |               |                  |           |           |           | -                       |                    |   |   |   |                    |                 |             |
| 6       | -   |           |              |            |               |                  | CSEL<br>2 | CSEL<br>1 | CSEL<br>0 | Para. No. current value |                    |   |   |   |                    |                 |             |
| 7       | RDY   | W<br>PSET | CPU<br>ready | ALM        | Data<br>error | Address<br>error | -         | -         | -         | -                       | -                  | - | - | - | -                  | Rewrite<br>end  | Read<br>end |
| 8       | Station No./basic para./system para. (Low order word PC →Amplifier)   |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 9       | Station No./basic para./system para. (High order word PC →Amplifier)  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 10      | Speed command (Low order word PC →Amplifier)  |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 11      | Speed command (High order word PC →Amplifier)   |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 12      | -   |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 13      | -   |           |              |            |               |                  |           |           |           |                         |                    |   |   |   |                    |                 |             |
| 14      | -   |           |              |            |               |                  | SEL2      | SEL1      | SEL0      | Para. No. setting value |                    |   |   |   |                    |                 |             |
| 15      | RUN   | FWD       | REV          | RST        | START         | ORG              | X1        | VEL0      | VEL1      | DIR                     | Position<br>preset | - | - | - | Rewrite<br>command | Read<br>command |             |

## (6) Manual feed

The rotational speed at forward command [FWD] and reverse command [REV] is specified by the speed command (see table above) while multistep speed selection [X1] is off.

The [X1] is at bit 9 in 15 word (at factory setting) position.

Current command position/current feedback position/current deviation

The current command position etc. can be selected at on/off of SEL0, SEL1, SEL2.

The positions are read out continuously at the ON edge of read command.

## Read/rewrite data (select)

| SEL2 | SEL1 | SEL0 | IQ area (Upper line: 0 to 7W, Lower line: 8 to 15W)   |
|------|------|------|---|
| OFF  | OFF  | OFF  | Current command position, current speed, current torque, alarm code<br>Position data setting value, speed command/speed data setting value  |
| OFF  | OFF  | ON   | Current feedback position, current speed, current torque, alarm code<br>Position data setting value, speed command/speed data setting value |
| OFF  | ON   | OFF  | Current deviation, current speed, current torque, alarm code<br>Position data setting value, speed command/speed data setting value         |

| Address | 15   | 14        | 13           | 12   | 11            | 10               | 9         | 8         | 7    | 6          | 5 | 4 | 3 | 2 | 1                  | 0               |
|---------|--|-----------|--------------|------|---------------|------------------|-----------|-----------|------|------------|---|---|---|---|--------------------|-----------------|
| 0       | Current command position, current feedback position, current deviation<br>(Low order word PC ← Amplifier)  |           |              |      |               |                  |           |           |      |            |   |   |   |   |                    |                 |
| 1       | Current command position, current feedback position, current deviation<br>(High order word PC ← Amplifier) |           |              |      |               |                  |           |           |      |            |   |   |   |   |                    |                 |
| 2       | Current speed (Low order word PC ← Amplifier)  |           |              |      |               |                  |           |           |      |            |   |   |   |   |                    |                 |
| 3       | Current speed (High order word PC ← Amplifier)   |           |              |      |               |                  |           |           |      |            |   |   |   |   |                    |                 |
| 4       | Current torque (PC ← Amplifier)  |           |              |      |               |                  |           |           |      |            |   |   |   |   |                    |                 |
| 5       | -  |           |              | ALM4 | ALM3          | ALM2             | ALM1      | ALM0      | -    |            |   |   |   |   |                    |                 |
| 6       | -  |           |              |      |               | CSEL<br>2        | CSEL<br>1 | CSEL<br>0 | -    |            |   |   |   |   |                    |                 |
| 7       | RDY  | W<br>PSET | CPU<br>ready | ALM  | Data<br>error | Address<br>error | -         | -         | -    | -          | - | - | - | - | Rewrite<br>end     | Read<br>end     |
| 8       | Station No. (Low order word PC → Amplifier)  |           |              |      |               |                  |           |           |      |            |   |   |   |   |                    |                 |
| 9       | Station No. (High order word PC → Amplifier)   |           |              |      |               |                  |           |           |      |            |   |   |   |   |                    |                 |
| 10      | Speed command (Low order word PC → Amplifier)  |           |              |      |               |                  |           |           |      |            |   |   |   |   |                    |                 |
| 11      | Speed command (High order word PC → Amplifier)   |           |              |      |               |                  |           |           |      |            |   |   |   |   |                    |                 |
| 12      | -  |           |              |      |               |                  |           |           |      |            |   |   |   |   |                    |                 |
| 13      | -  | -         | -            | -    | -             | -                | -         | -         | -    |            |   |   |   |   |                    |                 |
| 14      | -  |           |              |      |               | SEL2             | SEL1      | SEL0      | -    |            |   |   |   |   |                    |                 |
| 15      | RUN  | FWD       | REV          | RST  | START         | ORG              | X1        | VEL0      | VEL1 | ABS<br>INC | - | - | - | - | Rewrite<br>command | Read<br>command |

### Current command position/current feedback position/current deviation

| Word position | Setting range   |
|---------------|---|
| Address 0     | Current command position, current feedback position or current deviation (2 word) is stored. Current position is a division number, deviation amount is in 1 pulse unit.  |
| Address 1     |   |
| Address 2     | The current rotational speed is stored in 2 words.<br>The min. value 1 is corresponds to 1 [r/min].   |
| Address 3     |   |
| Address 4     | The current output torque is stored in 1 word.<br>The min. value 1 is corresponds to 1% of rated (100%) torque.   |
| Address 5     | The alarm code is stored.   |
| Address 6     | The status of SEL2, SEL1 and SEL0 are stored..  |
| Address 7     | (Information on each bit is always valid.)  |
| Address 8     | The station number at auto start can be set.  |
| Address 9     |   |
| Address 10    | The rotational speed can be specified at [FWD] / [REV] (X1 to X3 are all off). The speed data at auto start can be set (when VEL1, VEL0 being not specified).<br>The min. value 1 is corresponds to 0.01 [r/min]. |
| Address 11    |   |
| Address 12    | (disabled)  |
| Address 13    |   |
| Address 14    | The data read out using SEL2 to SEL0 can be specified.  |
| Address 15    | (command on each bit is always valid.)  |

### Basic parameter/system parameter

The read or rewrite of parameter can be selected at on/off of SEL0, SEL1, SEL2.

Read/rewrite data (select)

| SEL2 | SEL1 | SEL0 | IQ area (Upper line: 0 to 7W, Lower line: 8 to 15W) |
|------|------|------|---|
| ON   | OFF  | OFF  | Basic para. current value                           |
|      |      |      | Basic para. setting value                           |
| ON   | OFF  | ON   | System para. current value                          |
|      |      |      | System para. setting value                          |

Do not specify the following:

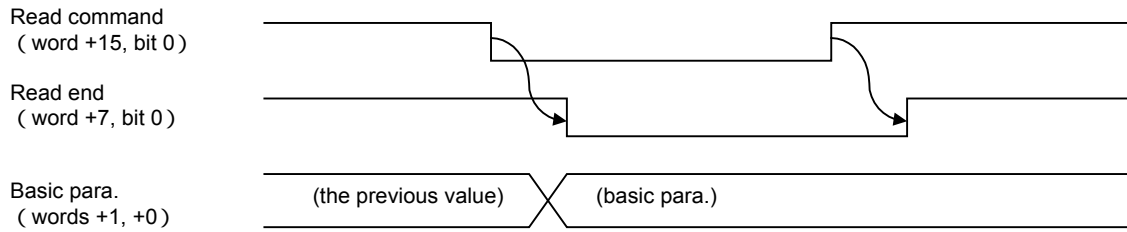
| SEL2 | SEL1 | SEL0 | IQ area (Upper line: 0 to 7W, Lower line: 8 to 15W) |
|------|------|------|---|
| OFF  | ON   | ON   | -   |
|      |      |      | -   |

| Address | 15  | 14     | 13        | 12  | 11         | 10            | 9      | 8      | 7                       | 6   | 5               | 4 | 3 | 2 | 1               | 0            |
|---------|---|--------|-----------|-----|------------|---------------|--------|--------|-------------------------|-----|-----------------|---|---|---|-----------------|--------------|
| 0       | Basic para./system para. current value (Low order word PC ← Amplifier)  |        |           |     |            |               |        |        |                         |     |                 |   |   |   |                 |              |
| 1       | Basic para./system para. current value (High order word PC ← Amplifier) |        |           |     |            |               |        |        |                         |     |                 |   |   |   |                 |              |
| 2       | -   |        |           |     |            |               |        |        |                         |     |                 |   |   |   |                 |              |
| 3       | -   |        |           |     |            |               |        |        |                         |     |                 |   |   |   |                 |              |
| 4       | -   |        |           |     |            |               |        |        |                         |     |                 |   |   |   |                 |              |
| 5       | -   | -      | -         | -   | -          | -             | -      | -      | -                       | -   | -               | - | - | - | -               | -            |
| 6       | -   |        |           |     |            | CSEL 2        | CSEL 1 | CSEL 0 | Para. No. current value |     |                 |   |   |   |                 |              |
| 7       | RDY   | W PSET | CPU ready | ALM | Data error | Address error | -      | -      | -                       | -   | -               | - | - | - | Rewrite end     | Read end     |
| 8       | Basic para./system para. setting value (Low order word PC → Amplifier)  |        |           |     |            |               |        |        |                         |     |                 |   |   |   |                 |              |
| 9       | Basic para./system para. setting value (High order word PC → Amplifier) |        |           |     |            |               |        |        |                         |     |                 |   |   |   |                 |              |
| 10      | -   |        |           |     |            |               |        |        |                         |     |                 |   |   |   |                 |              |
| 11      | -   |        |           |     |            |               |        |        |                         |     |                 |   |   |   |                 |              |
| 12      | -   |        |           |     |            |               |        |        |                         |     |                 |   |   |   |                 |              |
| 13      | -   | -      | -         | -   | -          | -             | -      | -      | -                       | -   | -               | - | - | - | -               | -            |
| 14      | -   |        |           |     |            | SEL2          | SEL1   | SEL0   | Para. No. setting value |     |                 |   |   |   |                 |              |
| 15      | RUN   | FWD    | REV       | RST | START      | ORG           | X1     | VEL0   | VEL1                    | DIR | Position preset | - | - | - | Rewrite command | Read command |

• Basic parameter/system parameter

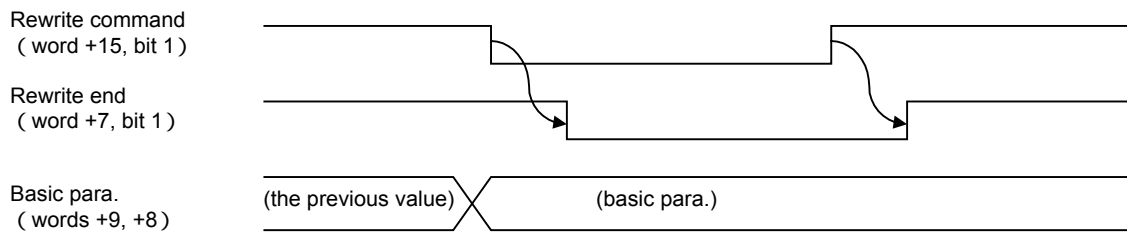
| Word position                  | Setting range  |
|--------------------------------|--|
| Address 0<br>Address 1         | Basic para. or system para. can be read out. There are no decimal point.   |
| Address 2<br>to<br>Address 5   | (disable)  |
| Address 6                      | The status of SEL2, SEL1 and SEL0 are stored (CSEL2 to CSEL0).<br>The written parameter No. is displayed (para. current positioning data).   |
| Address 7                      | (Information on each bit is always valid.)   |
| Address 8<br>Address 9         | The setting value of the para. to be changed will be written.  |
| Address 10<br>to<br>Address 13 | (disable)  |
| Address 14                     | Basic para. or system para. can be selected using SEL2 to SEL0.<br>The para. No. to be changed can be set. Specify 01 to 63H in hexadecimal number (para./positioning data No. setting). |
| Address 15                     | Bit 0 is read command, and bit 1 is rewrite command (ON edge).<br>(command of each bit is always valid.)   |

If a para. No. is specified at low order 8 bits of word +14, it is readed out at the ON edge of read command (word +15, bit 0) to words +1 and +0.



When read end signal turns on, basic para. has been settled.

If a para. No. is specified at low order 8 bits of word +14, it is rewritten at the ON edge of rewrite command (word +15, bit 1) to words +9 and +8.



After rewrite end signal has turned on, data at words +9 and +8 may be changed.

## LS-Z phase pulse

The LS-Z phase pulse can be selected at on/off of SEL0, SEL1, SEL2.

This can be read out at the ON edge of the read command.

Read/rewrite data (select)

| SEL2 | SEL1 | SEL0 | IQ area (Upper line: 0 to 7W, Lower line: 8 to 15W) |
|------|------|------|---|
| ON   | ON   | ON   | LS-Z phase current pulse value                      |
|      |      |      | -   |

| Address | 15   | 14        | 13           | 12  | 11            | 10               | 9         | 8         | 7    | 6   | 5 | 4 | 3 | 2 | 1 | 0                  |                 |
|---------|--|-----------|--------------|-----|---------------|------------------|-----------|-----------|------|-----|---|---|---|---|---|--------------------|-----------------|
| 0       | LS-Z phase pulse<br>(Low order word PC ← Amplifier)  |           |              |     |               |                  |           |           |      |     |   |   |   |   |   |                    |                 |
| 1       | LS-Z phase pulse<br>(High order word PC ← Amplifier) |           |              |     |               |                  |           |           |      |     |   |   |   |   |   |                    |                 |
| 2       | -  |           |              |     |               |                  |           |           |      |     |   |   |   |   |   |                    |                 |
| 3       | -  |           |              |     |               |                  |           |           |      |     |   |   |   |   |   |                    |                 |
| 4       | -  |           |              |     |               |                  |           |           |      |     |   |   |   |   |   |                    |                 |
| 5       | -  | -         | -            | -   | -             | -                | -         | -         | -    | -   | - | - | - | - | - | -                  |                 |
| 6       | -  |           |              |     |               | CSEL<br>2        | CSEL<br>1 | CSEL<br>0 | -    |     |   |   |   |   |   |                    |                 |
| 7       | RDY  | W<br>PSET | CPU<br>ready | ALM | Data<br>error | Address<br>error | -         | -         | -    | -   | - | - | - | - | - | Rewrite<br>end     | Read<br>end     |
| 8       | -  |           |              |     |               |                  |           |           |      |     |   |   |   |   |   |                    |                 |
| 9       | -  |           |              |     |               |                  |           |           |      |     |   |   |   |   |   |                    |                 |
| 10      | -  |           |              |     |               |                  |           |           |      |     |   |   |   |   |   |                    |                 |
| 11      | -  |           |              |     |               |                  |           |           |      |     |   |   |   |   |   |                    |                 |
| 12      | -  |           |              |     |               |                  |           |           |      |     |   |   |   |   |   |                    |                 |
| 13      | -  | -         | -            | -   | -             | -                | -         | -         | -    | -   | - | - | - | - | - | -                  |                 |
| 14      | -  |           |              |     |               | SEL2             | SEL1      | SEL0      | -    |     |   |   |   |   |   |                    |                 |
| 15      | RUN  | FWD       | REV          | RST | START         | ORG              | X1        | VEL0      | VEL1 | DIR | - | - | - | - | - | Rewrite<br>command | Read<br>command |

### • LS-Z phase pulse

| Word position                 | Setting range   |
|-------------------------------|---|
| Address 0                     | LS-Z phase pulse can be stored in 2 word. The positive value only is allowed. |
| Address 1                     | The min. value 1 is corresponds to 1 [pulse].                                 |
| Address 2<br>to<br>Address 5  | (disabled)  |
| Address 6                     | The status of SEL2, SEL1 and SEL0 are stored (CSEL2, CSEL1, CSEL0).           |
| Address 7                     | (information on each bit is always valid.)                                    |
| Address 8<br>to<br>Address 13 | (disabled)  |
| Address 14                    | LS-Z phase pulse is specified using SEL2 to SEL0.                             |
| Address 15                    | Bit 0 is read command (ON edge).<br>(command of each bit is always valid.)    |

The timing of rewrite end and read end is as same as basic para. and sytem para..



## 5.9 WB area (T-link type)

This section explains the WB area of RYS S3-RTS type.  
RYS S3-RTS type amplifier reserves 8 words in the WB area.

### (1) Station number

The station number setting of amplifier (system para. 96) determines the address in WB area. The changed setting of the system parameter is valid only after turning off and on power again.

### (2) Read/rewrite data

The lower order 4 words of WB area are the read out area, and the higher order 4 words are the write area.  
The data whether to read out or rewrite can be selected by on/off of bit 1 to 5 in word +5.

### (3) CONT/OUT

The bit information at +0, +1 word and bit command at word +4, +5 position are valid in all the read/rewrite data status.

### (4) Read command/rewrite command

To read data specified by the read/rewrite data select, turn on the read command at bit 7 in word +5 position. The read end at bit 7 in word +1 turned on, when reading is end.

To write data, turn on the rewrite command at bit 6 in word +5. The rewrite end at bit 6 in word +1 turns on when writing is end.

#### · WB area

| Address | 0  | 1                        | 2          | 3          | 4          | 5          | 6                  | 7               | 8           | 9          | A          | B          | C          | D          | E          | F          |  |
|---------|--|--------------------------|------------|------------|------------|------------|--------------------|-----------------|-------------|------------|------------|------------|------------|------------|------------|------------|--|
| +0      | OUT<br>5   | OUT<br>6                 | OUT<br>7   | OUT<br>8   | OUT<br>9   | OUT<br>10  | OUT<br>11          | OUT<br>12       | OUT<br>13   | OUT<br>14  | OUT<br>15  | OUT<br>16  | OUT<br>17  | OUT<br>18  | OUT<br>19  | OUT<br>20  |  |
| +1      | OUT<br>21  | ALM4                     | ALM3       | ALM2       | ALM1       | ALM0       | Rewrite<br>end     | Read<br>end     | -           |            |            |            |            |            |            |            |  |
| +2      | Read data (High order word    PC ← Amplifier)    |                          |            |            |            |            |                    |                 |             |            |            |            |            |            |            |            |  |
| +3      | Read data (Low order word    PC ← Amplifier)     |                          |            |            |            |            |                    |                 |             |            |            |            |            |            |            |            |  |
| +4      | CONT<br>9  | CONT<br>10               | CONT<br>11 | CONT<br>12 | CONT<br>13 | CONT<br>14 | CONT<br>15         | CONT<br>16      | CONT<br>17  | CONT<br>18 | CONT<br>19 | CONT<br>20 | CONT<br>21 | CONT<br>22 | CONT<br>23 | CONT<br>24 |  |
| +5      | CONT<br>25                                       | Read/rewrite data select |            |            |            |            | Rewrite<br>command | Read<br>command | Address No. |            |            |            |            |            |            |            |  |
| +6      | Rewrite data (High order word    PC → Amplifier) |                          |            |            |            |            |                    |                 |             |            |            |            |            |            |            |            |  |
| +7      | Rewrite data (Low order word    PC → Amplifier)  |                          |            |            |            |            |                    |                 |             |            |            |            |            |            |            |            |  |

#### Read/rewrite data select

| +1  | +2  | +3  | +4  | +5  | WB area (when reading)    | WB area (when rewriting)  |
|-----|-----|-----|-----|-----|---------------------------|---------------------------|
| OFF | OFF | OFF | OFF | OFF | Current feedback position | -                         |
| OFF | OFF | OFF | OFF | ON  | Feedback speed            | -                         |
| OFF | OFF | OFF | ON  | OFF | Torque command            | -                         |
| OFF | OFF | OFF | ON  | ON  | Deviation amount          | -                         |
| OFF | OFF | ON  | OFF | OFF | LS-Z phase pulse          | -                         |
| OFF | OFF | ON  | OFF | ON  | -                         | -                         |
| OFF | OFF | ON  | ON  | OFF | -                         | -                         |
| OFF | OFF | ON  | ON  | ON  | -                         | -                         |
| OFF | ON  | OFF | OFF | OFF | -                         | -                         |
| OFF | ON  | OFF | OFF | ON  | Basic para.               | Basic para.               |
| OFF | ON  | OFF | ON  | OFF | System para.              | System para.              |
| OFF | ON  | OFF | ON  | ON  | -                         | -                         |
| OFF | ON  | ON  | OFF | OFF | -                         | -                         |
| OFF | ON  | ON  | OFF | ON  | -                         | Current feedback position |
| OFF | ON  | ON  | ON  | OFF | Current command position  | -                         |
| OFF | ON  | ON  | ON  | ON  | Command speed             | -                         |
| ON  | OFF | OFF | OFF | OFF | -                         | Speed command [FWD/REV]   |

## (5) Auto start [START]

- Sets the station number in the specified rewrite data area (see ① table below).
- Select the rotational speed at VEL0 and VEL1 (see ② table below).
- The motor starts rotation at the ON edge of [START] signal (at bit 1 in word +4) (see ⑤ table below).

## (6) Manual feed

The rotational speed at forward [FWD] and reverse [REV] command is specified by the speed command (see ① table below) while multistep speed selection [X1] is off.

Turn on the bit 1 only in word +5 position only in the read/rewrite data select area.

After the rewrite command has been turned on, the speed is determined by ① (in 1 [r/min] step).

The [X1] is at bit A in word +4 (at factory setting) position.

- WB area (at factory setting)

| Address | 0                             | 1                        | 2         | 3            | 4             | 5    | 6               | 7            | 8           | 9          | A               | B               | C | D | E | F |  |
|---------|-------------------------------|--------------------------|-----------|--------------|---------------|------|-----------------|--------------|-------------|------------|-----------------|-----------------|---|---|---|---|--|
| +0      | RDY                           | WPSET                    | CPU ready | Alarm detect | Address error | —    | —               | LS detect    | EMG detect  | Data error | —               | —               | — | — | — | — |  |
| +1      | —                             | ALM4                     | ALM3      | ALM2         | ALM1          | ALM0 | Rewrite end     | Read end     | —           |            |                 |                 |   |   |   |   |  |
| +2      | Read data (High order word    |                          |           |              |               |      |                 |              |             |            | PC ← Amplifier) |                 |   |   |   |   |  |
| +3      | Read data (Low order word     |                          |           |              |               |      |                 |              |             |            | PC ← Amplifier) |                 |   |   |   |   |  |
| +4      | RUN                           | START                    | FWD       | REV          | ORG           | EMG  | RST             | VEL0         | VEL1        | DIR        | X1              | Position preset | — | — | — | — |  |
| +5      | —                             | Read/rewrite data select |           |              |               |      | Rewrite command | Read command | Address No. |            |                 |                 |   |   |   |   |  |
| +6      | Rewrite data (High order word |                          |           |              |               |      |                 |              |             |            | PC → Amplifier) |                 |   |   |   |   |  |
| +7      | Rewrite data (Low order word  |                          |           |              |               |      |                 |              |             |            | PC → Amplifier) |                 |   |   |   |   |  |

## ■ Current value

The current value of various data can be selected at on/off of bit 1 to 5 in word +5.

The selected current value can be read out at the ON edge of read command at bit 7 in word +5 position.

Once the read command is turned on, the data can be read out continuously.

## Read/rewrite data select

| +1  | +2  | +3  | +4  | +5  | WB area (when reading)    | WB area (when rewriting) |
|-----|-----|-----|-----|-----|---------------------------|--------------------------|
| OFF | OFF | OFF | OFF | OFF | Current feedback position | -                        |
| OFF | OFF | OFF | OFF | ON  | Feedback speed            | -                        |
| OFF | OFF | OFF | ON  | OFF | Torque command            | -                        |
| OFF | OFF | OFF | ON  | ON  | Deviation amount          | -                        |
| OFF | OFF | ON  | OFF | OFF | LS-Z phase pulse          | -                        |
| OFF | ON  | OFF | ON  | ON  | -                         | -                        |
| OFF | ON  | ON  | OFF | OFF | -                         | -                        |
| OFF | ON  | ON  | OFF | ON  | -                         | -                        |
| OFF | ON  | ON  | ON  | OFF | Current command position  | -                        |
| OFF | ON  | ON  | ON  | ON  | Command speed             | -                        |
| ON  | OFF | OFF | OFF | OFF | -                         | Speed command [FWD/REV]  |

| Address | 0                             | 1                        | 2         | 3            | 4             | 5    | 6               | 7            | 8           | 9          | A               | B               | C | D | E | F |
|---------|-------------------------------|--------------------------|-----------|--------------|---------------|------|-----------------|--------------|-------------|------------|-----------------|-----------------|---|---|---|---|
| +0      | RDY                           | WPSET                    | CPU ready | Alarm detect | Address error | —    | —               | LS detect    | EMG detect  | Data error | —               | —               | — | — | — | — |
| +1      | —                             | ALM4                     | ALM3      | ALM2         | ALM1          | ALM0 | Rewrite end     | Read end     | —           |            |                 |                 |   |   |   |   |
| +2      | Read data (High order word    |                          |           |              |               |      |                 |              |             |            | PC ← Amplifier) |                 |   |   |   |   |
| +3      | Read data (Low order word     |                          |           |              |               |      |                 |              |             |            | PC ← Amplifier) |                 |   |   |   |   |
| +4      | RUN                           | START                    | FWD       | REV          | ORG           | EMG  | RST             | VEL0         | VEL1        | DIR        | X1              | Position preset | — | — | — | — |
| +5      | —                             | Read/rewrite data select |           |              |               |      | Rewrite command | Read command | Address No. |            |                 |                 |   |   |   |   |
| +6      | Rewrite data (High order word |                          |           |              |               |      |                 |              |             |            | PC → Amplifier) |                 |   |   |   |   |
| +7      | Rewrite data (Low order word  |                          |           |              |               |      |                 |              |             |            | PC → Amplifier) |                 |   |   |   |   |

The contents read out in word +2, +3 position are of BCD 8 digits or 32 bits binary (changeable by system para. 98).

• Current value

| Data selection            | Setting range  |
|---------------------------|--|
| Current feedback position | The motor's current position (station) can be stored.  |
| Feedback speed            | The current rotational speed can be stored.<br>The min. value 1 is corresponds to 1 [r/min].   |
| Torque command            | The current output torque can be stored.<br>The min. value 1 is corresponds to 1% of rated (100%) torque.  |
| Deviation amount          | The difference (deviation amount) between the current command position and current feedback position can be stored.<br>The min. value 1 is corresponds to 1 [pulse].                   |
| LS-Z phase pulse          | At origin return, the pulse number can be stored from when the origin LS [LS] signal is off, up to when the motor's Z-phase is detected. The min. value 1 is corresponds to 1 [pulse]. |
| Current command position  | The specified motor's current position (station) can be stored.  |
| Command speed             | The specified motor's current speed can be stored. The min. value 1 is corresponds to 1 [r/min].   |
| Speed command (rewrite)   | The rotational speed can be specified on [FWD]/[REV]. The min. value 1 is corresponds to 0.01 [r/min].   |

■ Parameter

The basic para. and system para. can be edited at on/off status at bit 1 to 5 in word +5 position.

The parameter can be read out at the ON edge of read command at bit 7 in word +5 position.

The parameter can be rewritten at the ON edge of rewrite command at bit 6 in word + 5 position.

Specify the targeted parameter No. in the area of address number.

Read/rewrite data select

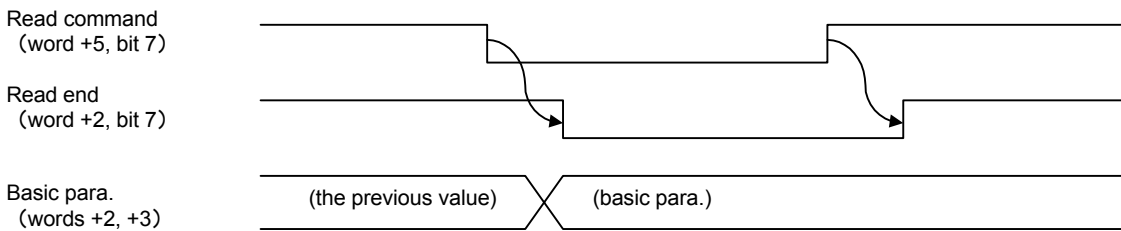
| +1  | +2  | +3  | +4  | +5  | WB area (when reading) | WB area (when rewriting) |
|-----|-----|-----|-----|-----|------------------------|--------------------------|
| OFF | OFF | ON  | OFF | ON  | -                      | -                        |
| OFF | OFF | ON  | ON  | OFF | -                      | -                        |
| OFF | OFF | ON  | ON  | ON  | -                      | -                        |
| OFF | ON  | OFF | OFF | OFF | -                      | -                        |
| OFF | ON  | OFF | OFF | ON  | Basic para.            | Basic para.              |
| OFF | ON  | OFF | ON  | OFF | System para.           | System para.             |

| Address | 0                             | 1                        | 2         | 3            | 4             | 5    | 6               | 7            | 8           | 9               | A  | B | C | D | E | F |  |
|---------|-------------------------------|--------------------------|-----------|--------------|---------------|------|-----------------|--------------|-------------|-----------------|----|---|---|---|---|---|--|
| +0      | RDY                           | WPSET                    | CPU ready | Alarm detect | Address error | —    | —               | LS detect    | EMG detect  | Data error      | —  | — | — | — | — | — |  |
| +1      | —                             | ALM4                     | ALM3      | ALM2         | ALM1          | ALM0 | Rewrite end     | Read end     | —           |                 |    |   |   |   |   |   |  |
| +2      | Read data (High order word    |                          |           |              |               |      |                 |              |             | PC ← Amplifier) |    |   |   |   |   |   |  |
| +3      | Read data (Low order word     |                          |           |              |               |      |                 |              |             | PC ← Amplifier) |    |   |   |   |   |   |  |
| +4      | RUN                           | START                    | FWD       | REV          | ORG           | EMG  | RST             | VEL0         | VEL1        | DIR             | X1 | — | — | — | — | — |  |
| +5      | —                             | Read/rewrite data select |           |              |               |      | Rewrite command | Read command | Address No. |                 |    |   |   |   |   |   |  |
| +6      | Rewrite data (High order word |                          |           |              |               |      |                 |              |             | PC → Amplifier) |    |   |   |   |   |   |  |
| +7      | Rewrite data (Low order word  |                          |           |              |               |      |                 |              |             | PC → Amplifier) |    |   |   |   |   |   |  |

• Parameter/positioning data

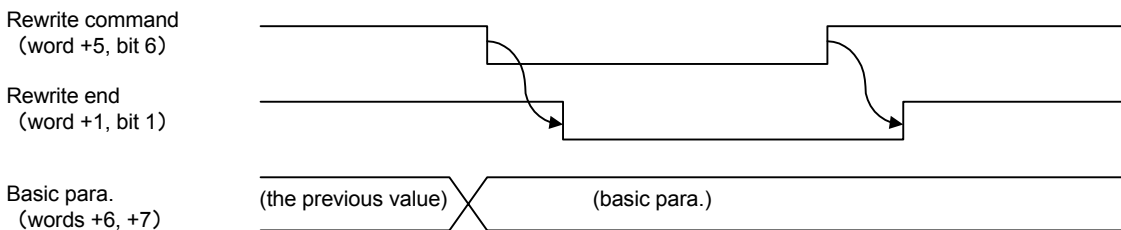
| Data selection | Setting range   |
|----------------|---|
| Basic para.    | The data is read or written with the decimal point ignored. |
| System para.   |   |

If a para. is specified at low order 8 bits of word +5, it is read out at the ON edge of read command (word +5, bit 7) to words +2 and +3.



When read end signal turns on, basic para. has been settled.

If a para. is specified at low order 8 bits of word +5, data set at words +6 and +7 is rewritten at the ON edge of write command (word +5, bit 6).

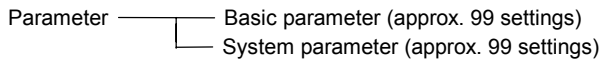


After write end signal has turned on, data at words +6 and +7 may be changed.

## 6. PARAMETER SETTING

### About parameter

There are two types of parameters; basic parameter and system parameter.



Set the parameters according to the motor usage and mechanical equipment system.

#### Basic parameter

The basic parameters are rather frequently adjusted, such as acceleration/deceleration time and manual feed speed.  
Changed setting of most basic parameters immediately affects the amplifier and the motor actions.

#### ■ System parameter

The system parameters are not frequently changed once they are set, such as function allocation to control input/output terminal and offset adjustment.  
Changed setting of most system parameters is valid only after turning off and on power.

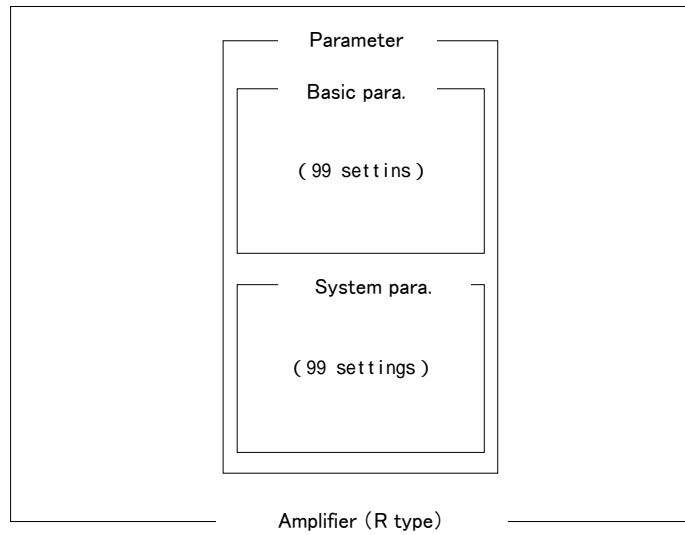
Make sure that the keypad panel indication (7-segment) goes off when power is turned off.

Because the contents of parameter setting are stored in rewritable ROM (EEPROM), they cannot be lost even if power is turned off.  
Specific basic parameters can be stored in RAM and rewritable infinitely.

The parameters can be edited by the keypad panel and personal computer loader, etc.

For SX bus connection type amplifier, all the parameters can be edited from IQ area.

For T-link connection type amplifier, all the parameters can be edited from WB area.



## 6.1 List of parameter

### (1) Basic parameter

The basic parameters are common to all types of the amplifiers.

Basic type (RYS□□□S3-RPS□ type)

SX bus type (RYS□□□S3-RSS□ type)

T-link type (RYS□□□S3-RTS□ type)

The basic parameters are rather frequently adjusted.

| Basic parameter for RYS-R type (1/2) |   | [Basic type / SX bus / T-link]                             |               |        |
|--------------------------------------|---|--|---------------|--------|
| Para.                                | Name                                    | Setting range  | Initial value | Change |
| 01                                   | Manual feed speed 1                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 100.00        | Always |
| 02                                   | Manual feed speed 2                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 500.00        | Always |
| 03                                   | Manual feed speed 3                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 1000.00       | Always |
| 04                                   | Manual feed speed 4                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 100.00        | Always |
| 05                                   | Manual feed speed 5                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 100.00        | Always |
| 06                                   | Manual feed speed 6                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 100.00        | Always |
| 07                                   | Manual feed speed 7                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 100.00        | Always |
| 08                                   | Positioning speed 1                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 10.00         | Always |
| 09                                   | Positioning speed 2                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 50.00         | Always |
| 10                                   | Positioning speed 3                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 100.00        | Always |
| 11                                   | Positioning speed 4                     | 0.01 to max. speed [r/min] (in 0.01 step)                  | 500.00        | Always |
| 12<br>to<br>15                       | Unused                                  | -  | 0             | -      |
| 16                                   | Maximum speed                           | 0.01 to max. speed [r/min] (in 0.01 step)                  | 5000.00       | Always |
| 17                                   | Override 1                              | 0 to 150% (in 1 step)                                      | 10            | Always |
| 18                                   | Override 2                              | 0 to 150% (in 1 step)                                      | 20            | Always |
| 19                                   | Override 4                              | 0 to 150% (in 1 step)                                      | 40            | Always |
| 20                                   | Override 8                              | 0 to 150% (in 1 step)                                      | 80            | Always |
| 21                                   | Acceleration time 1                     | 0.000 to 99.999 [s] (in 0.001 step)                        | 0.100         | Always |
| 22                                   | Deceleration time 1                     | 0.000 to 99.999 [s] (in 0.001 step)                        | 0.100         | Always |
| 23                                   | Acceleration time 2                     | 0.000 to 99.999 [s] (in 0.001 step)                        | 0.500         | Always |
| 24                                   | Deceleration time 2                     | 0.000 to 99.999 [s] (in 0.001 step)                        | 0.500         | Always |
| 25                                   | Non-linear (S-curve) filter coefficient | 0.000 to 1.000 [s] (in 0.001 step)                         | 0.000         | Always |
| 26<br>to<br>30                       | Unused                                  | -  | -             | -      |
| 31                                   | Tuning method                           | 0: Manual 1: Auto (low stiffness) 2: Auto (high stiffness) | 1             | Always |
| 32                                   | Load inertia ratio                      | 0.0 to 100.0 times (in 0.1 step)                           | 0.0           | Always |
| 33                                   | Operation speed response                | 10 to 1000 [Hz] (in 1 step)                                | 100           | Always |
| 34                                   | Speed response at stoppage              | 10 to 1000 [Hz] (in 1 step)                                | 100           | Always |
| 35                                   | Stop detection width                    | 5 to 100 [r/min] (in 1 step)                               | 20            | Always |
| 36                                   | Stop judgment time                      | 0.00 to 1.00 [s] (in 0.01 step)                            | 0.00          | Always |
| 37                                   | Torque filter time constant             | 0.00 to 20.00 [ms] (in 0.01 step)                          | 0.30          | Always |
| 38                                   | Speed regulator integration time        | 1 to 1000 [ms] (in 1 step)                                 | 20            | Always |
| 39                                   | Position regulator gain                 | 1 to 1000 (in 1 step)                                      | 50            | Always |
| 40                                   | Feed forward gain                       | 0.000 to 1.5000 (in 0.001 step)                            | 0.000         | Always |
| 41                                   | Speed setting filter                    | 0.0 to 20.0 [ms] (in 0.1 step)                             | 0.0           | Always |
| 42                                   | Speed feedback filter                   | 0: OFF 1: ON   | 0             | Always |
| 43                                   | Unused                                  | -  | -             | -      |
| 44                                   | Vibration suppression time constant     | 10 to 1000 [ms] (in 1 step)                                | 100           | Always |
| 45                                   | Vibration suppression gain              | 0.00 to 1.00 (in 0.01 step)                                | 0.00          | Always |
| 46<br>to<br>50                       | Unused                                  | -  | -             | -      |

## Basic parameter for RYS-R type (2/2)

[Basic type / SX bus / T-link]

| Para.          | Name                             | Setting range                                    | Initial value | Change |
|----------------|----------------------------------|--|---------------|--------|
| 51             | Speed matching zone (width)      | 10 to max. speed [r/min] (in 1 step)             | 50            | Always |
| 52             | Speed zero width                 | 10 to max. speed [r/min] (in 1 step)             | 20            | Always |
| 53             | Deviation zero width             | 10 to 10000 [pulse] (in 1 step)                  | 200           | Always |
| 54             | Deviation excessive width        | 10 to 65535 (in 1 step) [x 100 pulse]            | 10000         | Always |
| 55             | Indexing end output form         | 0: Level      1: One shot                        | 0             | Power  |
| 56             | Indexing end output time         | 0.01 to 1.00 [s] (in 0.01 step)                  | 0.10          | Always |
| 57             | Indexing end judgment time       | 0.000 to 1.000 [s] (in 0.001 step)               | 0.050         | Always |
| 58             | Overload early warning level     | 10 to 100% (in 1 step)                           | 50            | Always |
| 59             | Max. torque limit level          | 0 to max. torque [%] (in 1 step)                 | 300           | Always |
| 60<br>to<br>62 | Unused                           | -  | -             | -      |
| 63             | Fixed point detection position 1 | 1 to max. division number (in 1 step)            | 1             | Always |
| 64             | Fixed point detection position 2 | 1 to max. division number (in 1 step)            | 1             | Always |
| 65             | Unused                           | -  | 0             | Always |
| 66             | Origin detection range           | 0 to 10000 [pulse] (in 1 step)                   | 0             | Always |
| 67<br>to<br>71 | Unused                           | -  | 0             | -      |
| 72             | Origin return direction          | 0: Positive direction    1: Negative direction   | 0             | Power  |
| 73             | Z-phase detection valid/invalid  | 0: Valid    1: Invalid                           | 0             | Power  |
| 74             | Origin LS logic                  | 0: NO contact    1: NC contact                   | 0             | Always |
| 75             | Origin return speed              | 0.01 to max. speed [r/min] (in 0.01 step)        | 500.00        | Always |
| 76             | Origin detection creep speed     | 0.01 to max. speed [r/min] (in 0.01 step)        | 50.00         | Always |
| 77             | Origin shift quantity            | 1 to 2000000 [pulse] (in 1 step)                 | 50000         | Always |
| 78             | 2nd origin                       | 2 to max. division number (in 1 step)            | 2             | Always |
| 79             | Unused                           | -  | 0             | -      |
| 80             | Unused                           | -  | 0             | -      |
| 81             | Manual indexing                  | 0 : Shortest    1 : Invalid    2: Station number | 0             | Always |
| 82<br>to<br>85 | Unused                           | -  | 0             | -      |
| 86             | Backlash correction              | 0 to 10000 [pulse] (in 1 step)                   | 0             | Always |
| 87<br>to<br>89 | Unused                           | -  | 0             | -      |
| 90             | Max. division number             | 2 to 30000 (in 1 step)                           | 8             | Power  |
| 91             | Reduction ratio A                | 1 to 9999 (in 1 step)                            | 1             | Always |
| 92             | Reduction ratio B                | 1 to 9999 (in 1 step)                            | 1             | Always |
| 93             | Pulse train ratio 1              | 0.01 to 100.00 (in 0.01 step)                    | 1.00          | Always |
| 94             | Pulse train ratio 2              | 0.01 to 100.00 (in 0.01 step)                    | 10.00         | Always |
| 95<br>to<br>99 | Unused                           | -  | 0             | -      |



## (2) System parameter

### (a) Basic type

Basic type  
(DI/DO)

In the system parameter, such contents as function setting to control input/output terminal of amplifier are stored. Changed setting of most parameters is effective only after turning off and on power.

Function (input signal) number assigned to system para. 1 to 21 (CONT1 to CONT21)

|                          |                           |
|--------------------------|---------------------------|
| 0: Not assigned          | 45: Override 2            |
| 1: Run command [RUN]     | 46: Override 4            |
| 2: Forward command [FWD] | 47: Override 8            |
| 3: Reverse command [REV] | 48: Manual index select 0 |
| 4: Auto start [START]    | 49: Manual index select 1 |
| 5: Origin return [ORG]   | 50: Deviation clear       |
| 6: Origin LS [LS]        | 51: X1                    |
| 7: DIR                   | 52: X2                    |
| 8: SIGN                  | 53: X3                    |
| 9: ABS/INC               | 54: Free-run [BX]         |
| 10: Forced stop [EMG]    | 55: Edit permit command   |
| 11: Alarm reset [RST]    | 60: D0                    |
| 12: VELO                 | 61: D1                    |
| 13: VEL1                 | 62: D2                    |
| 14: ACC0                 | 63: D3                    |
| 16: Position preset      | 64: D4                    |
| 27: Pulse train ratio 1  | 65: D5                    |
| 28: Pulse train ratio 2  | 66: D6                    |
| 29: P-action             | 67: D7                    |
| 30: Torque limit         | 68: D8                    |
| 31: Temporary stop       | 69: D9                    |
| 32: Positioning cancel   | 70: D10                   |
| 33: Clamping end         | 71: D11                   |
| 34: External fault input | 72: D12                   |
| 42: 2nd origin           | 73: D13                   |
| 43: Override valid       | 74: D14                   |
| 44: Override 1           |                           |

Function (output signal) assigned to system para. 31 to 40 (OUT1 to OUT10)

|                            |                         |
|----------------------------|-------------------------|
| 0: Not assigned            | 61: PD1                 |
| 1: Ready [RDY]             | 62: PD2                 |
| 2: Indexing end [WPSET]    | 63: PD3                 |
| 13: Rewrite end            | 64: PD4                 |
| 14: Brake timing           | 65: PD5                 |
| 15: Dynamic braking        | 66: PD6                 |
| 16: Alarm detection        | 67: PD7                 |
| 17: Fixed point 1          | 68: PD8                 |
| 18: Fixed point 2          | 69: PD9                 |
| 22: Origin return end      | 70: PD10                |
| 23: Deviation zero         | 71: PD11                |
| 24: Speed zero             | 72: PD12                |
| 25: Speed arrive           | 73: PD13                |
| 26: Torque limit detection | 74: PD14                |
| 27: Overload early warning | 75: Position preset end |
| 28: CPU ready              |                         |
| 29: Edit permit ON/OFF     |                         |
| 30: Data error             |                         |
| 31: Address error          |                         |
| 32: Alarm code 0           |                         |
| 33: Alarm code 1           |                         |
| 34: Alarm code 2           |                         |
| 35: Alarm code 3           |                         |
| 36: Alarm code 4           |                         |
| 40: Origin LS detection    |                         |
| 41: Forced stop detection  |                         |
| 60: PD0                    |                         |

Basic type  
(DI/DO)

| System parameter for RYS-R type (1/2) |                          |  |               | [Basic type] |
|---------------------------------------|--------------------------|--|---------------|--------------|
| No.                                   | Name                     | Setting range                                | Initial value | Change       |
| 01                                    | CONT1 signal assignment  | 0 to 74 (in 1 step)                          | 1             | Power        |
| 02                                    | CONT2 signal assignment  | 0 to 74 (in 1 step)                          | 2             | Power        |
| 03                                    | CONT3 signal assignment  | 0 to 74 (in 1 step)                          | 3             | Power        |
| 04                                    | CONT4 signal assignment  | 0 to 74 (in 1 step)                          | 11            | Power        |
| 05                                    | CONT5 signal assignment  | 0 to 74 (in 1 step)                          | 4             | Power        |
| 06                                    | CONT6 signal assignment  | 0 to 74 (in 1 step)                          | 16            | Power        |
| 07                                    | CONT7 signal assignment  | 0 to 74 (in 1 step)                          | 51            | Power        |
| 08                                    | CONT8 signal assignment  | 0 to 74 (in 1 step)                          | 0             | Power        |
| 09                                    | CONT9 signal assignment  | 0 to 74 (in 1 step)                          | 0             | Power        |
| 10                                    | CONT10 signal assignment | 0 to 74 (in 1 step)                          | 12            | Power        |
| 11                                    | CONT11 signal assignment | 0 to 74 (in 1 step)                          | 7             | Power        |
| 12                                    | CONT12 signal assignment | 0 to 74 (in 1 step)                          | 8             | Power        |
| 13                                    | CONT13 signal assignment | 0 to 74 (in 1 step)                          | 10            | Power        |
| 14                                    | CONT14 signal assignment | 0 to 74 (in 1 step)                          | 60            | Power        |
| 15                                    | CONT15 signal assignment | 0 to 74 (in 1 step)                          | 61            | Power        |
| 16                                    | CONT16 signal assignment | 0 to 74 (in 1 step)                          | 62            | Power        |
| 17                                    | CONT17 signal assignment | 0 to 74 (in 1 step)                          | 63            | Power        |
| 18                                    | CONT18 signal assignment | 0 to 74 (in 1 step)                          | 64            | Power        |
| 19                                    | CONT19 signal assignment | 0 to 74 (in 1 step)                          | 65            | Power        |
| 20                                    | CONT20 signal assignment | 0 to 74 (in 1 step)                          | 0             | Power        |
| 21                                    | CONT21 signal assignment | 0 to 74 (in 1 step)                          | 0             | Power        |
| 22                                    | Parameter RAM storage 1  | 0: Not assigned 1 to 99: Basic parameter No. | 0             | Power        |
| 23                                    | Parameter RAM storage 2  | 0: Not assigned 1 to 99: Basic parameter No. | 0             | Power        |
| 24                                    | Parameter RAM storage 3  | 0: Not assigned 1 to 99: Basic parameter No. | 0             | Power        |
| 25                                    | Parameter RAM storage 4  | 0: Not assigned 1 to 99: Basic parameter No. | 0             | Power        |
| 26                                    | Parameter RAM storage 5  | 0: Not assigned 1 to 99: Basic parameter No. | 0             | Power        |
| 27                                    | Parameter RAM storage 6  | 0: Not assigned 1 to 99: Basic parameter No. | 0             | Power        |
| 28<br>to<br>30                        | Unused                   | -  | 0             | -            |
| 31                                    | OUT1 signal assignment   | 0 to 75 (in 1 step)                          | 1             | Power        |
| 32                                    | OUT2 signal assignment   | 0 to 75 (in 1 step)                          | 2             | Power        |
| 33                                    | OUT3 signal assignment   | 0 to 75 (in 1 step)                          | 30            | Power        |
| 34                                    | OUT4 signal assignment   | 0 to 75 (in 1 step)                          | 31            | Power        |
| 35                                    | OUT5 signal assignment   | 0 to 75 (in 1 step)                          | 60            | Power        |
| 36                                    | OUT6 signal assignment   | 0 to 75 (in 1 step)                          | 61            | Power        |
| 37                                    | OUT7 signal assignment   | 0 to 75 (in 1 step)                          | 62            | Power        |
| 38                                    | OUT8 signal assignment   | 0 to 75 (in 1 step)                          | 63            | Power        |
| 39                                    | OUT9 signal assignment   | 0 to 75 (in 1 step)                          | 64            | Power        |
| 40                                    | OUT10 signal assignment  | 0 to 75 (in 1 step)                          | 65            | Power        |
| 41<br>to<br>62                        | Unused                   | -  | 0             | -            |

Basic type  
(DI/DO)

System parameter for RYS-R type (2/2)

[Basic type]

| No.            | Name                            | Setting range  | Initial value | Change |
|----------------|---------------------------------|--|---------------|--------|
| 63             | Speed command gain              | ± 0.10 to ± 1.50 times (in 0.01 step)  | 1.00          | Always |
| 64             | Speed command offset            | -2000 to 2000 (in 1 step)  | (Individual)  | Always |
| 65             | Unused                          | -  | 0             | -      |
| 66             | Unused                          | -  | 0             | -      |
| 67             | Monitor 1 signal assignment     | 1: Speed command    2: Speed feedback<br>3: Torque command    4: Position deviation  | 2             | Always |
| 68             | Monitor 2 signal assignment     | 1: Speed command    2: Speed feedback<br>3: Torque command    4: Position deviation  | 3             | Always |
| 69             | Monitor 1 scale                 | ± 2.0 to ± 10.0 [V] (in 0.1 step)  | 7.0           | Always |
| 70             | Monitor 1 offset                | -50 to 50 (in 1 step)  | 0             | Always |
| 71             | Monitor 2 scale                 | ± 2.0 to ± 10.0 [V] (in 0.1 step)  | 6.0           | Always |
| 72             | Monitor 2 offset                | -50 to 50 (in 1 step)  | 0             | Always |
| 73             | Monitor 1, 2 output form        | 0: Monitor 1(two-way deflection) / Monitor 2 (two-way deflection)<br>1: Monitor 1(one-way deflection) / Monitor 2 (two-way deflection)<br>2: Monitor 1(two-way deflection) / Monitor 2 (one-way deflection)<br>3: Monitor 1(one-way deflection) / Monitor 2 (one-way deflection) | 0             | Power  |
| 74<br>to<br>77 | Unused                          | -  | 0             | -      |
| 78             | Pulse train input form          | 0: Command code/pulse    1: Forward/reverse pulse<br>2: Two 90 ° phase-different signal  | 1             | Power  |
| 79             | Output pulse count              | 16 to 16384 [pulse/rev] (in 1 step)  | 2048          | Power  |
| 80             | Rotational direction changeover | 0: Positive direction/forward    1: Positive direction/reverse   | 0             | Power  |
| 81             | Operation at stoppage           | 1: Servo lock    2: Brake (P-action)    3: Brake (free-run)  | 1             | Power  |
| 82             | Brake operation time            | 0.01 to 9.99 [s] (in 0.01 step)  | 0.50          | Always |
| 83             | Brake releasing time            | 0.01 to 9.99 [s] (in 0.01 step)  | 0.20          | Always |
| 84             | Operation at undervoltage       | 0: Rapidly decelerates to stop    1: Free-run  | 0             | Power  |
| 85             | Alarm detection at undervoltage | 0: No detection    1: Detects  | 1             | Power  |
| 86             | Braking resistor thermal relay  | 0: Electronic thermal relay    1: External thermal relay   | 0             | Power  |
| 87             | CONT always valid 1             | 0 to 74 (in 1 step)  | 0             | Power  |
| 88             | CONT always valid 2             | 0 to 74 (in 1 step)  | 0             | Power  |
| 89             | Initial indication              | 0 to 20 (in 1 step)  | 0             | Power  |
| 90<br>to<br>93 | Unused                          | -  | 0             | -      |
| 94             | Parameter rewriting inhibit     | 0: Rewriting enable    1: Rewriting disable  | 0             | Always |
| 95             | Unused                          | -  | 0             | -      |
| 96             | Station number                  | 1 to 31 (in 1 step)  | 1             | Power  |
| 97             | Baud rate                       | 0: 9600    1: 19200    2: 38400 [bps]  | 0             | Power  |
| 98             | Binary/BCD                      | 0: Binary    1: BCD  | 0             | Power  |
| 99             | INC/ABS system                  | 0: INC (Incremental)    1: ABS (Absolute)  | 0             | Power  |

(b) SX bus

SX bus  
(SX bus direct  
connection)

In the system parameter, such contents as function setting to control input/output terminal of amplifier are stored. Changed setting of most system parameters is valid only after turning off and on power.

Function (input signal) number assigned to  
system para. 1 to 19 (CONT1 to CONT19)

|                          |                           |
|--------------------------|---------------------------|
| 0: Not assigned          | 33: Clamping end          |
| 1: Run command [RUN]     | 34: External fault input  |
| 2: Forward command [FWD] | 42: 2nd origin            |
| 3: Reverse command [REV] | 43: Override valid        |
| 4: Auto start [START]    | 44: Override 1            |
| 5: Origin return [ORG]   | 45: Override 2            |
| 6: Origin LS [LS]        | 46: Override 4            |
| 7: DIR                   | 47: Override 8            |
| 9: ABS/INC               | 48: Manual index select 0 |
| 10: Forced stop [EMG]    | 49: Manual index select 1 |
| 11: Alarm reset [RST]    | 50: Deviation clear       |
| 12: VEL0                 | 51: X1                    |
| 13: VEL1                 | 52: X2                    |
| 14: ACC0                 | 53: X3                    |
| 16: Position preset      | 54: Free-run [BX]         |
| 27: Pulse train ratio 1  | 55: Edit permit command   |
| 28: Pulse train ratio 2  |                           |
| 29: P-action             |                           |
| 30: Torque limit         |                           |
| 31: Temporary stop       |                           |
| 32: Positioning cancel   |                           |

Function (output signal) assigned to  
system para. 31 to 46 (OUT1 to OUT16)

|                            |                           |
|----------------------------|---------------------------|
| 0: Not assigned            | 34: Alarm code 2          |
| 1: Ready [RDY]             | 35: Alarm code 3          |
| 2: Indexing end [WPSET]    | 36: Alarm code 4          |
| 13: Rewrite end            | 40: Origin LS detection   |
| 14: Brake timing           | 41: Forced stop detection |
| 15: Dynamic braking        | 60: PD0                   |
| 16: Alarm detection        | 61: PD1                   |
| 17: Fixed point 1          | 62: PD2                   |
| 18: Fixed point 2          | 63: PD3                   |
| 22: Origin return end      | 64: PD4                   |
| 23: Deviation zero         | 65: PD5                   |
| 24: Speed zero             | 66: PD6                   |
| 25: Speed arrive           | 67: PD7                   |
| 26: Torque limit detection | 68: PD8                   |
| 27: Overload early warning | 69: PD9                   |
| 28: CPU ready              | 70: PD10                  |
| 29: Edit permit ON/OFF     | 71: PD11                  |
| 30: Data error             | 72: PD12                  |
| 31: Address error          | 73: PD13                  |
| 32: Alarm code 0           | 74: PD14                  |
| 33: Alarm code 1           | 75: Position preset end   |

SX bus  
(SX bus direct  
connection)

System parameter for RYS-R type (1/2)

[SX bus]

| No.            | Name                     | Setting range                                   | Initial value | Change |
|----------------|--------------------------|---|---------------|--------|
| 01             | CONT1 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 02             | CONT2 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 03             | CONT3 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 04             | CONT4 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 05             | CONT5 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 06             | CONT6 signal assignment  | 0 to 55 (in 1 step)                             | 1             | Power  |
| 07             | CONT7 signal assignment  | 0 to 55 (in 1 step)                             | 2             | Power  |
| 08             | CONT8 signal assignment  | 0 to 55 (in 1 step)                             | 3             | Power  |
| 09             | CONT9 signal assignment  | 0 to 55 (in 1 step)                             | 11            | Power  |
| 10             | CONT10 signal assignment | 0 to 55 (in 1 step)                             | 4             | Power  |
| 11             | CONT11 signal assignment | 0 to 55 (in 1 step)                             | 5             | Power  |
| 12             | CONT12 signal assignment | 0 to 55 (in 1 step)                             | 51            | Power  |
| 13             | CONT13 signal assignment | 0 to 55 (in 1 step)                             | 12            | Power  |
| 14             | CONT14 signal assignment | 0 to 55 (in 1 step)                             | 13            | Power  |
| 15             | CONT15 signal assignment | 0 to 55 (in 1 step)                             | 7             | Power  |
| 16             | CONT16 signal assignment | 0 to 55 (in 1 step)                             | 16            | Power  |
| 17             | CONT17 signal assignment | 0 to 55 (in 1 step)                             | 0             | Power  |
| 18             | CONT18 signal assignment | 0 to 55 (in 1 step)                             | 0             | Power  |
| 19             | CONT19 signal assignment | 0 to 55 (in 1 step)                             | 0             | Power  |
| 20<br>to<br>21 | Unused                   | -   | 0             | -      |
| 22             | Parameter RAM storage 1  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 23             | Parameter RAM storage 2  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 24             | Parameter RAM storage 3  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 25             | Parameter RAM storage 4  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 26             | Parameter RAM storage 5  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 27             | Parameter RAM storage 6  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 28<br>to<br>30 | Unused                   | -   | 0             | -      |
| 31             | OUT1 signal assignment   | 0 to 75 (in 1 step)                             | 0             | Power  |
| 32             | OUT2 signal assignment   | 0 to 75 (in 1 step)                             | 0             | Power  |
| 33             | OUT3 signal assignment   | 0 to 75 (in 1 step)                             | 1             | Power  |
| 34             | OUT4 signal assignment   | 0 to 75 (in 1 step)                             | 2             | Power  |
| 35             | OUT5 signal assignment   | 0 to 75 (in 1 step)                             | 28            | Power  |
| 36             | OUT6 signal assignment   | 0 to 75 (in 1 step)                             | 16            | Power  |
| 37             | OUT7 signal assignment   | 0 to 75 (in 1 step)                             | 30            | Power  |
| 38             | OUT8 signal assignment   | 0 to 75 (in 1 step)                             | 31            | Power  |
| 39             | OUT9 signal assignment   | 0 to 75 (in 1 step)                             | 0             | Power  |
| 40             | OUT10 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |
| 41             | OUT11 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |
| 42             | OUT12 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |
| 43             | OUT13 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |
| 44             | OUT14 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |
| 45             | OUT15 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |
| 46             | OUT16 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |

SX bus  
(SX bus direct  
connection)

System parameter for RYS-R type (2/2)

[SX bus]

| No.            | Name                            | Setting range  | Initial value | Change |
|----------------|---------------------------------|--|---------------|--------|
| 47<br>to<br>66 | Unused                          | -  | 0             | -      |
| 67             | Monitor 1 signal assignment     | 1: Speed command    2: Speed feedback<br>3: Torque command    4: Position deviation  | 2             | Always |
| 68             | Monitor 2 signal assignment     | 1: Speed command    2: Speed feedback<br>3: Torque command    4: Position deviation  | 3             | Always |
| 69             | Monitor 1 scale                 | ± 2.0 to ± 10.0 [V] (in 0.1 step)  | 7.0           | Always |
| 70             | Monitor 1 offset                | -50 to +50 (in 1 step)   | 0             | Always |
| 71             | Monitor 2 scale                 | ± 2.0 to ± 10.0 [V] (in 0.1 step)  | 6.0           | Always |
| 72             | Monitor 2 offset                | -50 to 50 (in 1 step)  | 0             | Always |
| 73             | Monitor 1, 2 output form        | 0: Monitor 1(two-way deflection) / Monitor 2 (two-way deflection)<br>1: Monitor 1(one-way deflection) / Monitor 2 (two-way deflection)<br>2: Monitor 1(two-way deflection) / Monitor 2 (one-way deflection)<br>3: Monitor 1(one-way deflection) / Monitor 2 (one-way deflection) | 0             | Power  |
| 74<br>to<br>77 | Unused                          | -  | 0             | -      |
| 78             | Pulse train input form          | 0: Command code/pulse    1: Forward/reverse pulse<br>2: Two 90 ° phase-different signal  | 1             | Power  |
| 79             | Output pulse count              | 16 to 16384 [pulse/rev] (in 1 step)  | 2048          | Power  |
| 80             | Rotational direction changeover | 0: Positive direction/forward    1: Positive direction/reverse   | 0             | Power  |
| 81             | Operation at stoppage           | 1: Servo lock    2: Brake (P-action)    3: Brake (free-run)  | 1             | Power  |
| 82             | Brake operation time            | 0.01 to 9.99 [s] (in 0.01 step)  | 0.50          | Always |
| 83             | Brake releasing time            | 0.01 to 9.99 [s] (in 0.01 step)  | 0.20          | Always |
| 84             | Operation at undervoltage       | 0: Rapidly decelerates to stop    1: Free-run  | 0             | Power  |
| 85             | Alarm detection at undervoltage | 0: No detection    1: Detects  | 1             | Power  |
| 86             | Braking resistor thermal relay  | 0: Electronic thermal relay    1: External thermal relay   | 0             | Power  |
| 87             | CONT always valid 1             | 0 to 55 (in 1 step)  | 0             | Power  |
| 88             | CONT always valid 2             | 0 to 55 (in 1 step)  | 0             | Power  |
| 89             | Initial indication              | 0 to 20 (in 1 step)  | 0             | Power  |
| 90<br>to<br>93 | Unused                          | -  | 0             | -      |
| 94             | Parameter rewriting inhibit     | 0: Rewriting enable    1: Rewriting disable  | 0             | Always |
| 95             | Unused                          | -  | 0             | -      |
| 96             | Station number                  | 0 to 238 (in 1 step)   | 0             | Power  |
| 97             | Baud rate                       | 0: 9600    1: 19200    2: 38400 [bps]  | 0             | Power  |
| 98             | Unused                          | -  | 0             | -      |
| 99             | INC/ABS system                  | 0: INC (Incremental)    1: ABS (Absolute)  | 0             | Power  |

(c) T-link

T-link  
(T-link direct  
connection)

In the system parameter, such contents as function setting to control input/output terminal of amplifier are stored. Changed setting of most system parameters is effective only after turning off and on power.

Function (input signal) number assigned to  
system para. 1 to 21 (CONT1 to CONT21)  
system para. 56 to 59 (CONT22 to CONT25)

|                          |                           |
|--------------------------|---------------------------|
| 0: Not assigned          | 33: Clamping end          |
| 1: Run command [RUN]     | 34: External fault input  |
| 2: Forward command [FWD] | 42: 2nd origin            |
| 3: Reverse command [REV] | 43: Override valid        |
| 4: Auto start [START]    | 44: Override 1            |
| 5: Origin return [ORG]   | 45: Override 2            |
| 6: Origin LS [LS]        | 46: Override 4            |
| 7: DIR                   | 47: Override 8            |
| 9: ABS/INC               | 48: Manual index select 0 |
| 10: Forced stop [EMG]    | 49: Manual index select 1 |
| 11: Alarm reset [RST]    | 50: Deviation clear       |
| 12: VELO                 | 51: X1                    |
| 13: VEL1                 | 52: X2                    |
| 14: ACC0                 | 53: X3                    |
| 16: Position preset      | 54: Free-run [BX]         |
| 27: Pulse train ratio 1  | 55: Edit permit command   |
| 28: Pulse train ratio 2  |                           |
| 29: P-action             |                           |
| 30: Torque limit         |                           |
| 31: Temporary stop       |                           |
| 32: Positioning cancel   |                           |

Function (output signal) assigned to  
system para. 31 to 51 (OUT1 to OUT21)

|                            |                           |
|----------------------------|---------------------------|
| 0: Not assigned            | 34: Alarm code 2          |
| 1: Ready [RDY]             | 35: Alarm code 3          |
| 2: Indexing end [WPSET]    | 36: Alarm code 4          |
| 13: Rewrite end            | 40: Origin LS detection   |
| 14: Brake timing           | 41: Forced stop detection |
| 15: Dynamic braking        | 60: PD0                   |
| 16: Alarm detection        | 61: PD1                   |
| 17: Fixed point 1          | 62: PD2                   |
| 18: Fixed point 2          | 63: PD3                   |
| 22: Origin return end      | 64: PD4                   |
| 23: Deviation zero         | 65: PD5                   |
| 24: Speed zero             | 66: PD6                   |
| 25: Speed arrive           | 67: PD7                   |
| 26: Torque limit detection | 68: PD8                   |
| 27: Overload early warning | 69: PD9                   |
| 28: CPU ready              | 70: PD10                  |
| 29: Edit permit ON/OFF     | 71: PD11                  |
| 30: Data error             | 72: PD12                  |
| 31: Address error          | 73: PD13                  |
| 32: Alarm code 0           | 74: PD14                  |
| 33: Alarm code 1           | 75: Position preset end   |

T-link  
(T-link direct  
connection)

System parameter for RYS-R type (1/2)

[T-link]

| No.            | Name                     | Setting range                                   | Initial value | Change |
|----------------|--------------------------|---|---------------|--------|
| 01             | CONT1 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 02             | CONT2 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 03             | CONT3 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 04             | CONT4 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 05             | CONT5 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 06             | CONT6 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 07             | CONT7 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 08             | CONT8 signal assignment  | 0 to 55 (in 1 step)                             | 0             | Power  |
| 09             | CONT9 signal assignment  | 0 to 55 (in 1 step)                             | 1             | Power  |
| 10             | CONT10 signal assignment | 0 to 55 (in 1 step)                             | 4             | Power  |
| 11             | CONT11 signal assignment | 0 to 55 (in 1 step)                             | 2             | Power  |
| 12             | CONT12 signal assignment | 0 to 55 (in 1 step)                             | 3             | Power  |
| 13             | CONT13 signal assignment | 0 to 55 (in 1 step)                             | 5             | Power  |
| 14             | CONT14 signal assignment | 0 to 55 (in 1 step)                             | 10            | Power  |
| 15             | CONT15 signal assignment | 0 to 55 (in 1 step)                             | 11            | Power  |
| 16             | CONT16 signal assignment | 0 to 55 (in 1 step)                             | 12            | Power  |
| 17             | CONT17 signal assignment | 0 to 55 (in 1 step)                             | 13            | Power  |
| 18             | CONT18 signal assignment | 0 to 55 (in 1 step)                             | 7             | Power  |
| 19             | CONT19 signal assignment | 0 to 55 (in 1 step)                             | 51            | Power  |
| 20             | CONT20 signal assignment | 0 to 55 (in 1 step)                             | 16            | Power  |
| 21             | CONT21 signal assignment | 0 to 55 (in 1 step)                             | 0             | Power  |
| 22             | Parameter RAM storage 1  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 23             | Parameter RAM storage 2  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 24             | Parameter RAM storage 3  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 25             | Parameter RAM storage 4  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 26             | Parameter RAM storage 5  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 27             | Parameter RAM storage 6  | 0: Not assigned    1 to 99: Basic parameter No. | 0             | Power  |
| 28<br>to<br>30 | Unused                   | -   | 0             | -      |
| 31             | OUT1 signal assignment   | 0 to 75 (in 1 step)                             | 0             | Power  |
| 32             | OUT2 signal assignment   | 0 to 75 (in 1 step)                             | 0             | Power  |
| 33             | OUT3 signal assignment   | 0 to 75 (in 1 step)                             | 0             | Power  |
| 34             | OUT4 signal assignment   | 0 to 75 (in 1 step)                             | 0             | Power  |
| 35             | OUT5 signal assignment   | 0 to 75 (in 1 step)                             | 1             | Power  |
| 36             | OUT6 signal assignment   | 0 to 75 (in 1 step)                             | 2             | Power  |
| 37             | OUT7 signal assignment   | 0 to 75 (in 1 step)                             | 28            | Power  |
| 38             | OUT8 signal assignment   | 0 to 75 (in 1 step)                             | 16            | Power  |
| 39             | OUT9 signal assignment   | 0 to 75 (in 1 step)                             | 31            | Power  |
| 40             | OUT10 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |
| 41             | OUT11 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |
| 42             | OUT12 signal assignment  | 0 to 75 (in 1 step)                             | 40            | Power  |
| 43             | OUT13 signal assignment  | 0 to 75 (in 1 step)                             | 41            | Power  |
| 44             | OUT14 signal assignment  | 0 to 75 (in 1 step)                             | 30            | Power  |
| 45             | OUT15 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |
| 46             | OUT16 signal assignment  | 0 to 75 (in 1 step)                             | 0             | Power  |



T-link  
(T-link direct  
connection)

System parameter for RYS-R type (2/2)

[T-link]

| No.            | Name                            | Setting range  | Initial value | Change |
|----------------|---------------------------------|--|---------------|--------|
| 47             | OUT17 signal assignment         | 0 to 75 (in 1 step)  | 0             | Power  |
| 48             | OUT18 signal assignment         | 0 to 75 (in 1 step)  | 0             | Power  |
| 49             | OUT19 signal assignment         | 0 to 75 (in 1 step)  | 0             | Power  |
| 50             | OUT20 signal assignment         | 0 to 75 (in 1 step)  | 0             | Power  |
| 51             | OUT21 signal assignment         | 0 to 75 (in 1 step)  | 0             | Power  |
| 52<br>to<br>55 | Unused                          | -  | 0             | -      |
| 56             | CONT22 signal assignment        | 0 to 55 (in 1 step)  | 0             | Power  |
| 57             | CONT23 signal assignment        | 0 to 55 (in 1 step)  | 0             | Power  |
| 58             | CONT24 signal assignment        | 0 to 55 (in 1 step)  | 0             | Power  |
| 59             | CONT25 signal assignment        | 0 to 55 (in 1 step)  | 0             | Power  |
| 60<br>to<br>67 | Unused                          | -  | 0             | -      |
| 68             | Monitor 2 signal assignment     | 1: Speed command    2: Speed feedback<br>3: Torque command    4: Position deviation  | 3             | Always |
| 69             | Unused                          | -  | 0             | -      |
| 70             | Unused                          | -  | 0             | -      |
| 71             | Monitor 2 scale                 | ± 2.0 to ± 10.0 [V] (in 0.1 step)  | 6.0           | Always |
| 72             | Monitor 2 offset                | -50 to 50 (in 1 step)  | 0             | Always |
| 73             | Monitor 2 output form           | 0: Monitor 2 (two-way deflection)<br>1: Monitor 2 (two-way deflection)<br>2: Monitor 2 (one-way deflection)<br>3: Monitor 2 (one-way deflection) | 0             | Power  |
| 74<br>to<br>77 | Unused                          | -  | 0             | -      |
| 78             | Pulse train input form          | 0: Command code/pulse    1: Forward/reverse pulse<br>2: Two 90 ° phase-different signal  | 1             | Power  |
| 79             | Output pulse count              | 16 to 16384 [pulse/rev] (in 1 step)  | 2048          | Power  |
| 80             | Rotational direction changeover | 0: Positive direction/forward    1: Positive direction/reverse   | 0             | Power  |
| 81             | Operation at stoppage           | 1: Servo lock    2: Brake (P-action)    3: Brake (free-run)  | 1             | Power  |
| 82             | Brake operation time            | 0.01 to 9.99 [s] (in 0.01 step)  | 0.50          | Always |
| 83             | Brake releasing time            | 0.01 to 9.99 [s] (in 0.01 step)  | 0.20          | Always |
| 84             | Operation at undervoltage       | 0: Rapidly decelerates to stop    1: Free-run  | 0             | Power  |
| 85             | Alarm detection at undervoltage | 0: No detection    1: Detects  | 1             | Power  |
| 86             | Braking resistor thermal relay  | 0: Electronic thermal relay    1: External thermal relay   | 0             | Power  |
| 87             | CONT always valid 1             | 0 to 55 (in 1 step)  | 0             | Power  |
| 88             | CONT always valid 2             | 0 to 55 (in 1 step)  | 0             | Power  |
| 89             | Initial indication              | 0 to 20 (in 1 step)  | 6             | Power  |
| 90<br>to<br>93 | Unused                          | -  | 0             | -      |
| 94             | Parameter rewriting inhibit     | 0: Rewriting enable    1: Rewriting disable  | 0             | Always |
| 95             | Unused                          | -  | 0             | -      |
| 96             | Station number                  | 0 to 99 (in 1 step)  | 1             | Power  |
| 97             | Baud rate                       | 0: 9600    1: 19200    2: 38400 [bps]  | 0             | Power  |
| 98             | Binary/BCD                      | 0: Binary    1: BCD  | 1             | Power  |
| 99             | INC/ABS system                  | 0: INC (Incremental)    1: ABS (Absolute)  | 0             | Power  |

## 6.2 Basic parameter

The contents of the basic parameter setting are described in the order of numbers. The settings are common to all amplifiers.

(1) Basic parameter 1 to 7

**Pn001** / **PP001** – **PP007**

| Para. | Name                | Setting range                             | Initial value | Change |
|-------|---------------------|---|---------------|--------|
| 01    | Manual feed speed 1 | 0.01 to max. speed [r/min] (in 0.01 step) | 100.00        | Always |
| 02    | Manual feed speed 2 | 0.01 to max. speed [r/min] (in 0.01 step) | 500.00        | Always |
| 03    | Manual feed speed 3 | 0.01 to max. speed [r/min] (in 0.01 step) | 1000.00       | Always |
| 04    | Manual feed speed 4 | 0.01 to max. speed [r/min] (in 0.01 step) | 100.00        | Always |
| 05    | Manual feed speed 5 | 0.01 to max. speed [r/min] (in 0.01 step) | 100.00        | Always |
| 06    | Manual feed speed 6 | 0.01 to max. speed [r/min] (in 0.01 step) | 100.00        | Always |
| 07    | Manual feed speed 7 | 0.01 to max. speed [r/min] (in 0.01 step) | 100.00        | Always |

The rotational speed can be specified at forward command [FWD] (reverse command [REV]) on.

Selecting the on/off combination of X1, X2, and X3 terminal can change the rotational speed.

The rotational speed can be changed even while motor is running. There is no relation between the order of the basic para. and the setting value size.

For the rotational speed when X1, X2, and X3 terminals are all off, see Section 5.3.1.

### Multistep speed selection

| [X3] | [X2] | [X1] | Speed                      |
|------|------|------|----------------------------|
| OFF  | OFF  | OFF  | See Section 5.3.1          |
| OFF  | OFF  | ON   | Speed set by basic para. 1 |
| OFF  | ON   | OFF  | Speed set by basic para. 2 |
| OFF  | ON   | ON   | Speed set by basic para. 3 |
| ON   | OFF  | OFF  | Speed set by basic para. 4 |
| ON   | OFF  | ON   | Speed set by basic para. 5 |
| ON   | ON   | OFF  | Speed set by basic para. 6 |
| ON   | ON   | ON   | Speed set by basic para. 7 |

(2) Basic parameter 8 to 11

**Pn001** / **PP008** – **PP011**

| Para. | Name                | Setting range                             | Initial value | Change |
|-------|---------------------|---|---------------|--------|
| 08    | Positioning speed 1 | 0.01 to max. speed [r/min] (in 0.01 step) | 10.00         | Always |
| 09    | Positioning speed 2 | 0.01 to max. speed [r/min] (in 0.01 step) | 50.00         | Always |
| 10    | Positioning speed 3 | 0.01 to max. speed [r/min] (in 0.01 step) | 100.00        | Always |
| 11    | Positioning speed 4 | 0.01 to max. speed [r/min] (in 0.01 step) | 500.00        | Always |

The motor speed at auto start can be set.

Selecting the on/off combination of VEL1 and VEL0 at the auto start signal on can change the rotational speed.

(3) Basic parameter 16

**Pn001** / **PP016**

| Para. | Name          | Setting range                             | Initial value | Change |
|-------|---------------|---|---------------|--------|
| 16    | Maximum speed | 0.01 to max. speed [r/min] (in 0.01 step) | 5000.00       | Always |

The upper limit of the motor rotational speed can be specified by the parameter.

If the speed specified by the override exceeds the max. speed, the motor rotates at the specified value.

The max. speed setting is invalid when the position control by pulse train input is being made.

(4) Basic parameter 17 to 20

`Pn001` / `PP017` - `PP020`

| Para. | Name       | Setting range         | Initial value | Change |
|-------|------------|-----------------------|---------------|--------|
| 17    | Override 1 | 0 to 150% (in 1 step) | 10            | Always |
| 18    | Override 2 | 0 to 150% (in 1 step) | 20            | Always |
| 19    | Override 4 | 0 to 150% (in 1 step) | 40            | Always |
| 20    | Override 8 | 0 to 150% (in 1 step) | 80            | Always |

Override weighting can be changed.

When the override 8, 4, 2 and 1 are all on, adding all initial values gives 150 (= 80 + 40 + 20 + 10). If the initial value has been changed and resultant sum exceeded 150, the preceding value is retained.

Moving speed [%] by override

| Override 8 | Override 4 | Override 2 | Override 1 | Moving speed [%] |
|------------|------------|------------|------------|------------------|
| OFF        | OFF        | OFF        | OFF        | 0                |
| OFF        | OFF        | OFF        | ON         | 10               |
| OFF        | OFF        | ON         | OFF        | 20               |
| OFF        | OFF        | ON         | ON         | 30               |
| OFF        | ON         | OFF        | OFF        | 40               |
| OFF        | ON         | OFF        | ON         | 50               |
| OFF        | ON         | ON         | OFF        | 60               |
| OFF        | ON         | ON         | ON         | 70               |
| ON         | OFF        | OFF        | OFF        | 80               |
| ON         | OFF        | OFF        | ON         | 90               |
| ON         | OFF        | ON         | OFF        | 100              |
| ON         | OFF        | ON         | ON         | 110              |
| ON         | ON         | OFF        | OFF        | 120              |
| ON         | ON         | OFF        | ON         | 130              |
| ON         | ON         | ON         | OFF        | 140              |
| ON         | ON         | ON         | ON         | 150              |

\* Where override weighting is at initial value.

The override is valid for all of the rotational speed except for the interrupt input and later at interrupt positioning and pulse train ratio 1, 2.

(5) Basic parameter 21 to 24

**Pn001 / PP021 - PP024**

| Para. | Name                | Setting range                       | Initial value | Change |
|-------|---------------------|-------------------------------------|---------------|--------|
| 21    | Acceleration time 1 | 0.000 to 99.999 [s] (in 0.001 step) | 0.100         | Always |
| 22    | Deceleration time 1 | 0.000 to 99.999 [s] (in 0.001 step) | 0.100         | Always |
| 23    | Acceleration time 2 | 0.000 to 99.999 [s] (in 0.001 step) | 0.500         | Always |
| 24    | Deceleration time 2 | 0.000 to 99.999 [s] (in 0.001 step) | 0.500         | Always |

The motor acceleration/deceleration time can be set.

This function is valid for all of the accel./decel. operation except for pulse train ratio 1, 2.

The time setting is for the speed range of 0 to 2000 [r/min].

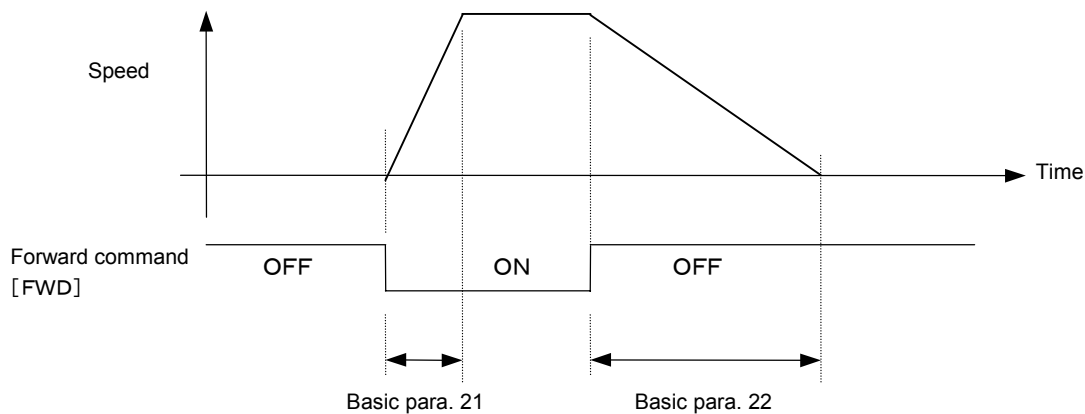
Accel. time 2 and decel. time 2 are valid while ACC0 signal is on.

The on/off input of ACC0 is always valid and accel. time/decel. time can also be changed over. The ACC0 is a signal allocated to CONTROL of system parameters.

External selection of acceleration and deceleration

| ACC0 (14) | Acceleration time | Deceleration time |
|-----------|-------------------|-------------------|
| OFF       | Basic para. 21    | Basic para. 22    |
| ON        | Basic para. 23    | Basic para. 24    |

Accel. time 1 and decel. time 1 can be set separately. For example, only deceleration time can be lengthened. Most suitable deceleration time can be selected depending on the load volume in driving a carrier machine.



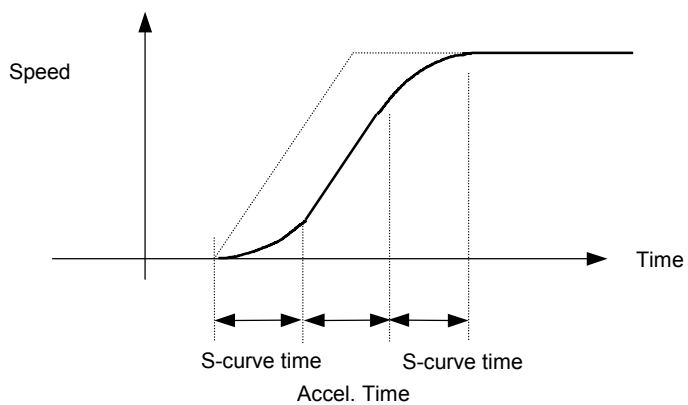
(6) Basic parameter 25

`Pn001` / `PP025`

| Para. | Name                                    | Setting range                      | Initial value | Change |
|-------|---|------------------------------------|---------------|--------|
| 25    | Non-linear (S-curve) filter coefficient | 0.000 to 1.000 [s] (in 0.001 step) | 0.000         | Always |

The motor can be accelerated/decelerated by drawing an S-curve.

S-shaped curve is drawn at the beginning and at the end of acceleration with the setting time. During deceleration this is the same way.



Accel./decel. can be adjusted by using the time constant of the setting time when the pulse train input is given by constant frequency. Even if the host controller cannot perform linear acceleration, smooth acceleration can be realized.

(7) Basic parameter 31 to 45

Pr001 / PP031 - PP045

| Para. | Name                                | Setting range  | Initial value | Change |
|-------|-------------------------------------|--|---------------|--------|
| 31    | Tuning method                       | 0: Manual 1: Auto (low stiffness) 2: Auto (high stiffness) | 1             | Always |
| 32    | Load inertia ratio                  | 0.0 to 100.0 times (in 0.1 step)                           | 0.0           | Always |
| 33    | Operation speed response            | 10 to 1000 [Hz] (in 1 step)                                | 100           | Always |
| 34    | Speed response at stoppage          | 10 to 1000 [Hz] (in 1 step)                                | 100           | Always |
| 35    | Stop detection width                | 5 to 100 [r/min] (in 1 step)                               | 20            | Always |
| 36    | Stop judgment time                  | 0.00 to 1.00 [s] (in 0.01 step)                            | 0.00          | Always |
| 37    | Torque filter time constant         | 0.00 to 20.00 [ms] (in 0.01 step)                          | 0.30          | Always |
| 38    | Speed regulator integration time    | 1 to 1000 [ms] (in 1 step)                                 | 20            | Always |
| 39    | Position controller gain            | 1 to 1000 (in 1 step)                                      | 50            | Always |
| 40    | Feed forward gain                   | 0.000 to 1.5000 ( in 0.001 step)                           | 0.000         | Always |
| 41    | Speed setting filter                | 0.0 to 20.0 [ms] (in 0.1 step)                             | 0.0           | Always |
| 42    | Speed feedback filter               | 0: OFF 1: ON   | 0             | Always |
| 43    | Unused                              | -  | -             | -      |
| 44    | Vibration suppression time constant | 10 to 1000 [ms] (in 1 step)                                | 100           | Always |
| 45    | Vibration suppression gain          | 0.00 to 1.00 (in 0.01 step)                                | 0.00          | Always |

The motor response performance can be adjusted according to mechanical equipment system.

The auto-tuning presumes the load moment of inertia of mechanical equipment system and automatically adjusts various control gains of the motor to drive the inertia optimally.

The auto-tuning is valid for general mechanical equipment system, but this may not be valid for the application like vertically moving transfer equipment whose load torque frequently changes.

In this case, select "0 : Manual" for basic para. 31.

In order to activate the auto-tuning, set the following 2 parameters.

Tuning method (basic para. 31)

Operation speed response (basic para. 33)

Selection of tuning method (basic para. 31)

Basic parameter 31

| Para. | Name          | Setting range  | Initial value | Change |
|-------|---------------|--|---------------|--------|
| 31    | Tuning method | 0: Manual 1: Auto (low stiffness) 2: Auto (high stiffness) | 1             | Always |

Basic parameter 31

| Set value                | Target machine   |
|--------------------------|--|
| 1: Auto (low stiffness)  | Ball-screw (with speed reducer)<br>Spindle drive (with speed reducer)<br>Rack and pinion<br>Timing belt<br>Conveyor<br>Chain drive<br>Feed roll<br>Table indexing (dividing) |
| 2: Auto (high stiffness) | Ball-screw (direct coupling of motor and screw)<br>Spindle drive (direct coupling)   |
| 0: Manual                | All of the para. must be set individually.   |

Set this para. according to mechanical equipment system. In general, the auto (low stiffness) is selected for most of mechanical equipment system.

When the manual is set, automatic regulation regarding the response is not made, and the setting value of each parameter is used.

When the auto (low stiffness) or auto (high stiffness) is selected, the load inertia is assumed and automatic regulation regarding the response is made according to the basic para. 33 setting.

Operating speed response (basic para. 33)

Basic parameter 33

| Para. | Name                     | Setting range               | Initial value | Change |
|-------|--------------------------|-----------------------------|---------------|--------|
| 33    | Operating speed response | 10 to 1000 [Hz] (in 1 step) | 100           | Always |

Use the motor with the initial value of 100 [Hz] in ordinary mechanical equipment system. The higher is the set value, the quicker is the motor's response rate. Mechanical equipment system having direct-coupled ball-screw can have a higher set value (higher response rate as well).

The following 3 basic para. can be automatically adjusted according to the setting value of the operating speed response (basic para. 33).

Basic parameter 37 to 39

| Para. | Name                             | Setting range                     | Initial value | Change |
|-------|----------------------------------|-----------------------------------|---------------|--------|
| 37    | Torque filter time constant      | 0.00 to 20.00 [ms] (in 0.01 step) | 0.30          | Always |
| 38    | Speed regulator integration time | 1 to 1000 [ms] (in 1 step)        | 20            | Always |
| 39    | Position regulator gain          | 1 to 1000 (in 1 step)             | 50            | Always |

Basic para. 37 to 39 can be adjusted when the auto has been selected in the tuning method (basic para. 31) and when the basic para. 33 setting changed.

Remark : Basic para. 37 to 39 can also be set manually after these have been changed by the amplifier. Usually the amplifier set value is used.

Load inertia ratio (basic para. 32)

Basic parameter 32

| Para. | Name               | Setting range                    | Initial value | Change |
|-------|--------------------|----------------------------------|---------------|--------|
| 32    | Load inertia ratio | 0.0 to 100.0 times (in 0.1 step) | 0.0           | Always |

When the auto (low stiffness) or auto (high stiffness) is selected in tuning method (basic para. 31), the load inertia is assumed and the parameters described before can be automatically adjusted.

The load inertia that the amplifier recognizes does not affect the basic para. 32 setting.

The load inertia can be monitored in the monitor mode [  $\square$   $\square$  14 ] by the keypad panel.

If the load inertia ratio (basic para. 32) setting is 0.0, the assumed load inertia value is applied to the actual servo system. In this case, the assumed load inertia value changes always.

If the setting value is other than 0.0, the control is made assuming that the load inertia ratio has been set. (If the setting value is 3.0, control is made assuming that the load inertia is 3.0 times of the servo motor moment of inertia.

Remark: If the basic para. 31 setting is "0: Manual", the gain of control system is determined as the load inertia of the load inertia ratio (basic para.32)

If the setting is 0.0, the load assumption is not made, and the gain is set assuming that no load is applied.

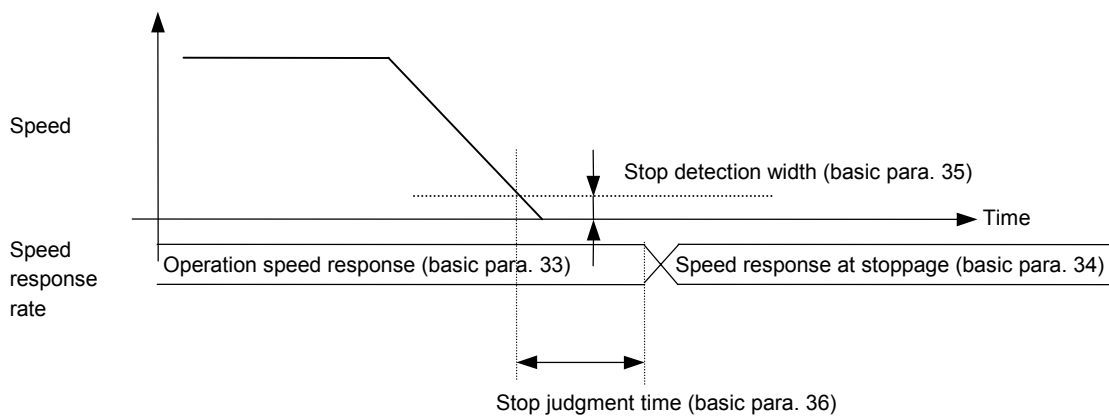


Speed response at stoppage (basic para. 34)

Basic parameter 34 to 36

| Para. | Name                       | Setting range                  | Initial value | Change |
|-------|----------------------------|--------------------------------|---------------|--------|
| 34    | Speed response at stoppage | 10 to 1000 [Hz] (in 1 step)    | 100           | Always |
| 35    | Stop detection width       | 5 to 100 [r/min] (in 1 step)   | 20            | Always |
| 36    | Stop judgment time         | 0.0 to 1.00 [s] (in 0.01 step) | 0.0           | Always |

The motor response rate can be changed over between when the motor is rotating and when the motor is stopping. This is valid to reduce the noise when stopping and suppress the resonance with the mechanical equipment system.



The operation speed response and speed response at stoppage should be changed after the speed has been lower than the stop detection width (basic para. 35) and the stop judgment time (basic para. 36) has elapsed.

This can prevent the motor shaft from starting rotating after the motor has stopped if the setting of speed response at stoppage is low. Set an appropriate time for the stop judgment time as its initial value is 0.0 [s].

Speed feedback filter (basic para. 42)

Basic parameter. 42

| Para. | Name                  | Setting range | Initial value | Change |
|-------|-----------------------|---------------|---------------|--------|
| 42    | Speed feedback filter | 0: OFF 1: ON  | 0             | Always |

When you use 16 bit serial encoder in GYC or GYS series, do not change the setting of the speed feedback filter.

Speed setting filter (basic para. 41)

Basic parameter 41

| Para. | Name                 | Setting range                  | Initial value | Change |
|-------|----------------------|--------------------------------|---------------|--------|
| 41    | Speed setting filter | 0.0 to 20.0 [ms] (in 0.1 step) | 0.0           | Always |

The speed command [NREF] input in the basic type, or the speed setting in the SX bus type, T-link type can be adjusted by the speed setting filter. This is useful when the motor speed is influenced by the turbulence to the analog speed command input terminal. The maximum value of the filter time is 20.0 [ms].

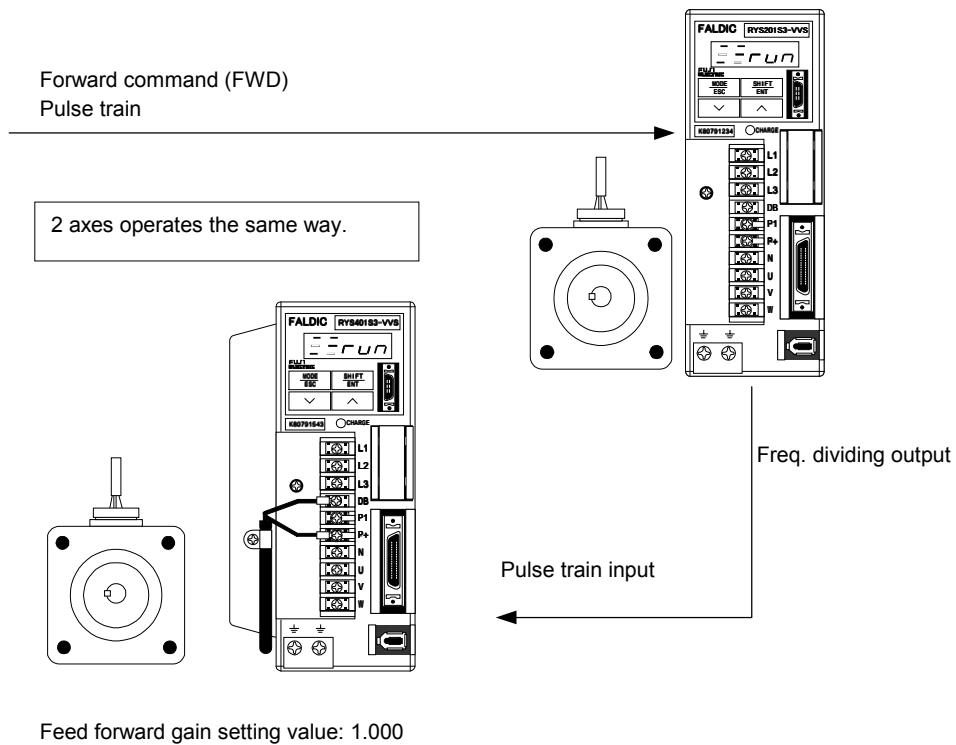
The mutistep speed command (X1, X2, X3) can also be adjusted by the speed setting filter.

Feed forward gain (basic para. 40)

Basic parameter 40

| Para. | Name              | Setting range                  | Initial value | Change |
|-------|-------------------|--------------------------------|---------------|--------|
| 40    | Feed forward gain | 0.000 to 1.500 (in 0.001 step) | 0.000         | Always |

If the feed forward gain is set at 1.0, a smaller deviation (difference between command position and feedback position) can be expected. Set the gain at 1.000 to carry out a synchronous operation between 2 axes using the pulse train input.



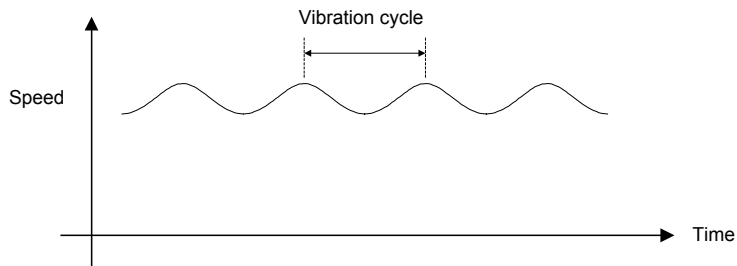
Vibration suppression parameter (basic para. 44, 45)

Basic parameters 44, 45

| Para. | Name                                | Setting range               | Initial value | Change |
|-------|-------------------------------------|-----------------------------|---------------|--------|
| 44    | Vibration suppression time constant | 10 to 1000 [ms] (in 1 step) | 100           | Always |
| 45    | Vibration suppression gain          | 0.00 to 1.00 (in 0.01 step) | 0.00          | Always |

A periodical vibration in motor rotation speed may occur due to the moment of inertia of mechanical equipment system and the motor's response rate. This parameter is always valid regardless of tuning method (basic para. 31).

The vibration suppression time constant (basic para. 44) sets the vibration cycle of rotational speed. Larger effect can be obtained with the higher setting for the vibration suppression gain.



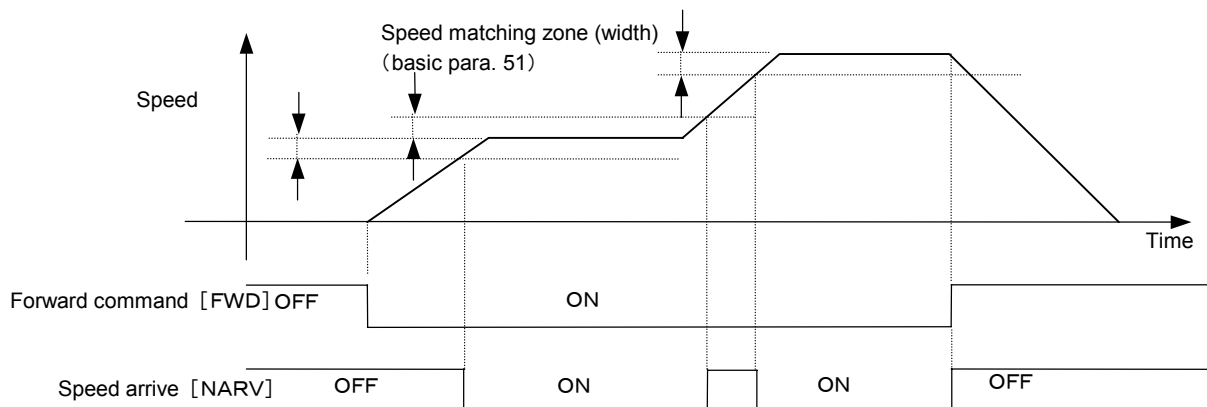
(8) Basic parameter 51

**Pn001 / PP051**

| Para. | Name                        | Setting range                        | Initial value | Change |
|-------|-----------------------------|--------------------------------------|---------------|--------|
| 51    | Speed matching zone (width) | 10 to Max. speed [r/min] (in 1 step) | 50            | Always |

The speed arrive signal is turned on when the motor speed is near the reference speed (set by para.) As the initial value is 50 [r/min], the speed arrive signal is on when the motor speed reaches the reference speed  $\pm 50$  [r/min].

When the motor speed does not reach the reference speed due to the max. speed setting (basic. para. 16) or override setting, this signal turns off. When [FWD] or [REV] signal is off, the speed arrive signal does not turn on.



(9) Basic parameter 52

**Pn001 / PP052**

| Para. | Name             | Setting range                        | Initial value | Change |
|-------|------------------|--------------------------------------|---------------|--------|
| 52    | Speed zero width | 10 to max. speed [r/min] (in 1 step) | 20            | Always |

The output range of the speed zero [NZERO] signal can be set. The minimum unit is 1 [r/min].

(10) Basic parameter 53

**Pn001 / PP053**

| Para. | Name                 | Setting range                   | Initial value | Change |
|-------|----------------------|---------------------------------|---------------|--------|
| 53    | Deviation zero width | 10 to 10000 [pulse] (in 1 step) | 200           | Always |

The range while the deviation zero signal is on can be set. The setting value is the encoder pulse count.

(11) Basic parameter 54

Pn001 / PP054

| Para. | Name                      | Setting range                         | Initial value | Change |
|-------|---------------------------|---------------------------------------|---------------|--------|
| 54    | Deviation excessive width | 10 to 65535 (in 1 step) [x 100 pulse] | 10000         | Always |

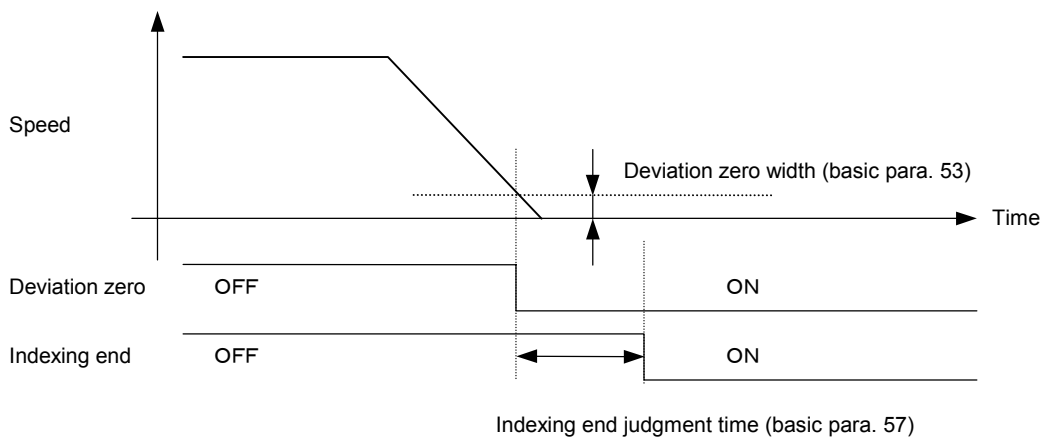
Sets the pulse count for alarm detection about deviation excessive. Initial value at factory setting is 10000 and detects the deviation amount with 1000000 pulses. At factory setting, deviation excessive is detected when the difference (deviation) between command position and feedback position becomes approximately 15.2 revolution when converted to motor rotation. The deviation excessive width is set for use with alarm detection.

(12) Basic parameter 55 to 57

Pn001 / PP055 - PP057

| Para. | Name                       | Setting range                      | Initial value | Change |
|-------|----------------------------|------------------------------------|---------------|--------|
| 55    | Indexing end output form   | 0: Level 1: One shot               | 0             | Power  |
| 56    | Indexing end output time   | 0.01 to 1.00 [s] (in 0.01 step)    | 0.10          | Always |
| 57    | Indexing end judgment time | 0.000 to 1.000 [s] (in 0.001 step) | 0.050         | Always |

The output form, output time, and judgment time of indexing end signal [WPSET] can be set. For details, see 5.5.2 Indexing end [WPSET].



(13) Basic parameter 58

Pn001 / PP058

| Para. | Name                         | Setting range          | Initial value | Change |
|-------|------------------------------|------------------------|---------------|--------|
| 58    | Overload early warning level | 10 to 100% (in 1 step) | 50            | Always |

\* The trip level of amplifier is 100%.

The output level of overload early warning signal in control output signal can be set.

The overload (alarm detection) level of amplifier is 100%.

For details, see 5.6.6 Overload early warning.

(14) Basic parameter 59

Pn001 / PP059

| Para. | Name                    | Setting range                    | Initial value | Change |
|-------|-------------------------|----------------------------------|---------------|--------|
| 59    | Max. torque limit value | 0 to max. torque [%] (in 1 step) | 300           | Always |

\* The rated torque is 100%.

The motor output torque can be limited by the para. setting value.

•Where the torque limit (30) is not allocated.

The basic para. 59 is always effective.

•Where the torque limit (30) is allocated.

Data can be changed between the max. torque and the basic para. 59 setting.

(15) Basic parameter 63, 64

Pn001 / PP063 - PP064

| Para. | Name                    | Setting range                         | Initial value | Change |
|-------|-------------------------|---------------------------------------|---------------|--------|
| 63    | Fixed point detection 1 | 1 to max. division number (in 1 step) | 1             | Always |
| 64    | Fixed point detection 2 | 1 to max. division number (in 1 step) | 1             | Always |

The station number of fixed point 1 and fixed point 2 in control output signal can be set.

(16) Basic parameter 66

`Pn001` / `PP066`

| Para. | Name                   | Setting range                     | Initial value | Change |
|-------|------------------------|-----------------------------------|---------------|--------|
| 66    | Origin detection range | 0, 1 to 10000 [pulse] (in 1 step) | 0             | Always |

The origin return end signal ON width can be set.

The signal is on within the range of the basic para. 66 setting, based on the position at origin return end or at the position preset signal position.

(17) Basic parameter 72 to 78

`Pn001` / `PP072` - `PP078`

| Para. | Name                            | Setting range                               | Initial value | Change |
|-------|---------------------------------|---|---------------|--------|
| 72    | Origin return direction         | 0: Positive direction 1: Negative direction | 0             | Power  |
| 73    | Z-phase detection valid/invalid | 0: Valid 1: Invalid                         | 0             | Power  |
| 74    | Origin LS logic                 | 0: NO contact 1: NC contact                 | 0             | Always |
| 75    | Origin return speed             | 0.01 to max. speed [r/min] (in 0.01 step)   | 500.00        | Always |
| 76    | Origin detection creep speed    | 0.01 to max. speed [r/min] (in 0.01 step)   | 50.00         | Always |
| 77    | Origin shift                    | 1 to 2000000 [pulse] (in 1 step)            | 50000         | Always |
| 78    | 2nd origin                      | 2 to max. division number (in 1 step)       | 2             | Power  |

These parameters are related to the origin return action.

For details, see 5.4.1 Origin return.

(18) Basic parameter 81

`Pn001` / `PP081`

| Para. | Name            | Setting range                            | Initial value | Change |
|-------|-----------------|--|---------------|--------|
| 81    | Manual indexing | 0: Shortest 1: Invalid 2: Station number | 0             | Power  |

During manual operation, the stopping position when the signal [FWD/REV] is off can be set.

For details, see 5.3.1 Forward command/Reverse command.

(19) Basic parameter 86

`Pn001` / `PP086`

| Para. | Name                | Setting range                  | Initial value | Change |
|-------|---------------------|--------------------------------|---------------|--------|
| 86    | Backlash correction | 0 to 10000 [pulse] (in 1 step) | 0             | Always |

The backlash of mechanical equipment system can be corrected by the motor rotational quantity.

Every time when the motor rotational direction changes, the motor runs, adding by the setting value.

While the moving corresponding to backlash correction is being made, the current position indication does not change.

(20) Basic parameter 90

`Pn001` / `PP090`

| Para. | Name                 | Setting range          | Initial value | Change |
|-------|----------------------|------------------------|---------------|--------|
| 90    | Max. division number | 2 to 30000 (in 1 step) | 8             | Power  |

The number to divide the rotating object can be set.

For details, see 5.5.1 Auto start.

(21) Basic parameter 91, 92

`Pn001` / `PP091` - `PP092`

| Para. | Name              | Setting range         | Initial value | Change |
|-------|-------------------|-----------------------|---------------|--------|
| 91    | Reduction ratio A | 1 to 9999 (in 1 step) | 1             | Power  |
| 92    | Reduction ratio B | 1 to 9999 (in 1 step) | 1             | Power  |

The inverse number (total reduction ratio) of motor rotational quantity when the rotating object rotates by one revolution can be set.

For details, see 5.5.1 Auto start.

(22) Basic parameter 93, 94

`Pn001` / `PP093` - `PP094`

| Para. | Name                | Setting range                 | Initial value | Change |
|-------|---------------------|-------------------------------|---------------|--------|
| 93    | Pulse train ratio 1 | 0.01 to 100.00 (in 0.01 step) | 1.00          | Always |
| 94    | Pulse train ratio 2 | 0.01 to 100.00 (in 0.01 step) | 10.00         | Always |

The scale factor of travel distance can be changed by the pulse train ratio 1 (27) and 2 (28) in the control input signal.

For details, see 5.3.2 Pulse train ratio 1, 2.



### 6.3 System parameter

The system parameters can set the functional allocation, the station number, etc.

#### (1) Basic type

(a) System parameter 1 to 21

$Pn002 / PP001 - PP021$

| Para. | Name                     | Setting range       | Initial value | Change |
|-------|--------------------------|---------------------|---------------|--------|
| 01    | CONT1 signal assignment  | 0 to 74 (in 1 step) | 1             | Power  |
| 02    | CONT2 signal assignment  | 0 to 74 (in 1 step) | 2             | Power  |
| 03    | CONT3 signal assignment  | 0 to 74 (in 1 step) | 3             | Power  |
| 04    | CONT4 signal assignment  | 0 to 74 (in 1 step) | 11            | Power  |
| 05    | CONT5 signal assignment  | 0 to 74 (in 1 step) | 4             | Power  |
| 06    | CONT6 signal assignment  | 0 to 74 (in 1 step) | 16            | Power  |
| 07    | CONT7 signal assignment  | 0 to 74 (in 1 step) | 51            | Power  |
| 08    | CONT8 signal assignment  | 0 to 74 (in 1 step) | 0             | Power  |
| 09    | CONT9 signal assignment  | 0 to 74 (in 1 step) | 0             | Power  |
| 10    | CONT10 signal assignment | 0 to 74 (in 1 step) | 12            | Power  |
| 11    | CONT11 signal assignment | 0 to 74 (in 1 step) | 7             | Power  |
| 12    | CONT12 signal assignment | 0 to 74 (in 1 step) | 8             | Power  |
| 13    | CONT13 signal assignment | 0 to 74 (in 1 step) | 10            | Power  |
| 14    | CONT14 signal assignment | 0 to 74 (in 1 step) | 60            | Power  |
| 15    | CONT15 signal assignment | 0 to 74 (in 1 step) | 61            | Power  |
| 16    | CONT16 signal assignment | 0 to 74 (in 1 step) | 62            | Power  |
| 17    | CONT17 signal assignment | 0 to 74 (in 1 step) | 63            | Power  |
| 18    | CONT18 signal assignment | 0 to 74 (in 1 step) | 64            | Power  |
| 19    | CONT19 signal assignment | 0 to 74 (in 1 step) | 65            | Power  |
| 20    | CONT20 signal assignment | 0 to 74 (in 1 step) | 0             | Power  |
| 21    | CONT21 signal assignment | 0 to 74 (in 1 step) | 0             | Power  |

(b) System parameter 31 to 40

$Pn002 / PP031 - PP040$

| Para. | Name                    | Setting range       | Initial value | Change |
|-------|-------------------------|---------------------|---------------|--------|
| 31    | OUT1 signal assignment  | 0 to 75 (in 1 step) | 1             | Power  |
| 32    | OUT2 signal assignment  | 0 to 75 (in 1 step) | 2             | Power  |
| 33    | OUT3 signal assignment  | 0 to 75 (in 1 step) | 30            | Power  |
| 34    | OUT4 signal assignment  | 0 to 75 (in 1 step) | 31            | Power  |
| 35    | OUT5 signal assignment  | 0 to 75 (in 1 step) | 60            | Power  |
| 36    | OUT6 signal assignment  | 0 to 75 (in 1 step) | 61            | Power  |
| 37    | OUT7 signal assignment  | 0 to 75 (in 1 step) | 62            | Power  |
| 38    | OUT8 signal assignment  | 0 to 75 (in 1 step) | 63            | Power  |
| 39    | OUT9 signal assignment  | 0 to 75 (in 1 step) | 64            | Power  |
| 40    | OUT10 signal assignment | 0 to 75 (in 1 step) | 65            | Power  |

Basic type  
(DI/DO)

Function (input signal) number assigned to system para. 1 to 21 (CONT1 to CONT21)

|                          |                           |
|--------------------------|---------------------------|
| 0: Not assigned          | 45: Override 2            |
| 1: Run command [RUN]     | 46: Override 4            |
| 2: Forward command [FWD] | 47: Override 8            |
| 3: Reverse command [REV] | 48: Manual index select 0 |
| 4: Auto start [START]    | 49: Manual index select 1 |
| 5: Origin return [ORG]   | 50: Deviation clear       |
| 6: Origin LS [LS]        | 51: X1                    |
| 7: DIR                   | 52: X2                    |
| 8: SIGN                  | 53: X3                    |
| 9: ABS/INC               | 54: Free-run [BX]         |
| 10: Forced stop [EMG]    | 55: Edit permit command   |
| 11: Alarm reset [RST]    | 60: D0                    |
| 12: VELO                 | 61: D1                    |
| 13: VEL1                 | 62: D2                    |
| 14: ACC0                 | 63: D3                    |
| 16: Position preset      | 64: D4                    |
| 27: Pulse train ratio 1  | 65: D5                    |
| 28: Pulse train ratio 2  | 66: D6                    |
| 29: P-action             | 67: D7                    |
| 30: Torque limit         | 68: D8                    |
| 31: Temporary stop       | 69: D9                    |
| 32: Positioning cancel   | 70: D10                   |
| 33: Clamping end         | 71: D11                   |
| 34: External fault input | 72: D12                   |
| 42: 2nd origin           | 73: D13                   |
| 43: Override valid       | 74: D14                   |
| 44: Override 1           |                           |

Function (output signal) assigned to system para. 31 to 40 (OUT1 to OUT10)

|                            |                         |
|----------------------------|-------------------------|
| 0: Not assigned            | 61: PD1                 |
| 1: Ready [RDY]             | 62: PD2                 |
| 2: Indexing end [WPSET]    | 63: PD3                 |
| 13: Rewrite end            | 64: PD4                 |
| 14: Brake timing           | 65: PD5                 |
| 15: Dynamic braking        | 66: PD6                 |
| 16: Alarm detection        | 67: PD7                 |
| 17: Fixed point 1          | 68: PD8                 |
| 18: Fixed point 2          | 69: PD9                 |
| 22: Origin return end      | 70: PD10                |
| 23: Deviation zero         | 71: PD11                |
| 24: Speed zero             | 72: PD12                |
| 25: Speed arrive           | 73: PD13                |
| 26: Torque limit detection | 74: PD14                |
| 27: Overload early warning | 75: Position preset end |
| 28: CPU ready              |                         |
| 29: Edit permit ON/OFF     |                         |
| 30: Data error             |                         |
| 31: Address error          |                         |
| 32: Alarm code 0           |                         |
| 33: Alarm code 1           |                         |
| 34: Alarm code 2           |                         |
| 35: Alarm code 3           |                         |
| 36: Alarm code 4           |                         |
| 40: Origin LS detection    |                         |
| 41: Forced stop detection  |                         |
| 60: PDO                    |                         |

Connector pin layout

The pin layout concerning the control input/output signal can be changed.

• CN3 (upper side)

|    |        |   |        |    |        |    |        |
|----|--------|---|--------|----|--------|----|--------|
| 2  | P 2 4  | 1 | M 2 4  | 12 | OUT 6  | 11 | OUT 7  |
| 4  | CONT14 | 3 | CONT15 | 14 | OUT 8  | 13 | OUT 9  |
| 6  | CONT16 | 5 | CONT17 | 16 | CONT 9 | 15 | OUT 10 |
| 8  | CONT18 | 7 | CONT19 | 18 | CONT11 | 17 | CONT10 |
| 10 | CONT20 | 9 | CONT21 | 20 | CONT13 | 19 | CONT12 |

• CN1 (lower side)

|    |        |    |        |    |        |    |        |
|----|--------|----|--------|----|--------|----|--------|
| 35 | CA     | 36 | *CA    | 17 | NREF   | 18 | M5     |
| 33 | CB     | 34 | *CB    | 15 | -      | 16 | MON 1  |
| 31 | FA     | 32 | *FA    | 13 | M5     | 14 | MON 2  |
| 29 | FB     | 30 | *FB    | 11 | P 1 0  | 12 | BAT -  |
| 27 | FZ     | 28 | *FZ    | 9  | M5     | 10 | BAT +  |
| 25 | M5     | 26 | OUT 3  | 7  | OUT 4  | 8  | OUT 5  |
| 23 | CONT 7 | 24 | CONT 8 | 5  | OUT 1  | 6  | OUT 2  |
| 21 | CONT 1 | 22 | CONT 2 | 3  | CONT 5 | 4  | CONT 6 |
| 19 | M 2 4  | 20 | P 2 4  | 1  | CONT 3 | 2  | CONT 4 |

## (2) SX bus

(a) System parameter 1 to 19

SX bus  
(SX bus direct  
connection)

**Pn002** / **PP001** - **PP019**

| Para. | Name                    | Setting range       | Initial value | Change |
|-------|-------------------------|---------------------|---------------|--------|
| 01    | OUT1 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 02    | OUT2 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 03    | OUT3 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 04    | OUT4 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 05    | OUT5 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 06    | OUT6 signal assignment  | 0 to 55 (in 1 step) | 1             | Power  |
| 07    | OUT7 signal assignment  | 0 to 55 (in 1 step) | 2             | Power  |
| 08    | OUT8 signal assignment  | 0 to 55 (in 1 step) | 3             | Power  |
| 09    | OUT9 signal assignment  | 0 to 55 (in 1 step) | 11            | Power  |
| 10    | OUT10 signal assignment | 0 to 55 (in 1 step) | 4             | Power  |
| 11    | OUT11 signal assignment | 0 to 55 (in 1 step) | 5             | Power  |
| 12    | OUT12 signal assignment | 0 to 55 (in 1 step) | 51            | Power  |
| 13    | OUT13 signal assignment | 0 to 55 (in 1 step) | 12            | Power  |
| 14    | OUT14 signal assignment | 0 to 55 (in 1 step) | 13            | Power  |
| 15    | OUT15 signal assignment | 0 to 55 (in 1 step) | 7             | Power  |
| 16    | OUT16 signal assignment | 0 to 55 (in 1 step) | 16            | Power  |
| 17    | OUT17 signal assignment | 0 to 55 (in 1 step) | 0             | Power  |
| 18    | OUT18 signal assignment | 0 to 55 (in 1 step) | 0             | Power  |
| 19    | OUT19 signal assignment | 0 to 55 (in 1 step) | 0             | Power  |

(b) System parameter 31 to 46

**Pn002** / **PP031** - **PP046**

| Para. | Name                    | Setting range       | Initial value | Change |
|-------|-------------------------|---------------------|---------------|--------|
| 31    | OUT1 signal assignment  | 0 to 75 (in 1 step) | 0             | Power  |
| 32    | OUT2 signal assignment  | 0 to 75 (in 1 step) | 0             | Power  |
| 33    | OUT3 signal assignment  | 0 to 75 (in 1 step) | 1             | Power  |
| 34    | OUT4 signal assignment  | 0 to 75 (in 1 step) | 2             | Power  |
| 35    | OUT5 signal assignment  | 0 to 75 (in 1 step) | 28            | Power  |
| 36    | OUT6 signal assignment  | 0 to 75 (in 1 step) | 16            | Power  |
| 37    | OUT7 signal assignment  | 0 to 75 (in 1 step) | 30            | Power  |
| 38    | OUT8 signal assignment  | 0 to 75 (in 1 step) | 31            | Power  |
| 39    | OUT9 signal assignment  | 0 to 75 (in 1 step) | 0             | Power  |
| 40    | OUT10 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 41    | OUT11 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 42    | OUT12 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 43    | OUT13 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 44    | OUT14 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 45    | OUT15 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 46    | OUT16 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |

Connector pin layout

• CN1 (lower side)

SX bus  
(SX bus direct connection)

|    |         |    |         |    |        |    |        |
|----|---------|----|---------|----|--------|----|--------|
| 26 | M 5     | 25 | * C B   | 13 | P 5    | 12 | M 5    |
| 24 | C B     | 23 | * C A   | 11 | MON 1  | 10 | MON 2  |
| 22 | C A     | 21 | * F Z   | 9  | M 2 4  | 8  | P 2 4  |
| 20 | F Z     | 19 | * F B   | 7  | OUT 2  | 6  | OUT 1  |
| 18 | F B     | 17 | * F A   | 5  | CONT 5 | 4  | CONT 4 |
| 16 | F A     | 15 | B A T - | 3  | CONT 3 | 2  | CONT 2 |
| 14 | B A T + |    |         | 1  | CONT 1 |    |        |

IQ area

| Address | 15  | 14     | 13     | 12     | 11      | 10      | 9       | 8       | 7       | 6       | 5       | 4       | 3       | 2       | 1               | 0            |
|---------|---|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----------------|--------------|
| 0       | Current position, current deviation, basic para./ system para./ LS-Z phase pulse (Low order word PC Amplifier)  |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 1       | Current position, current deviation, basic para./ system para./ LS-Z phase pulse (High order word PC Amplifier) |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 2       | Current speed (Low order word PC Amplifier)   |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 3       | Current speed (High order word PC Amplifier)  |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 4       | Current torque (PC Amplifier)   |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 5       | Alarm code  |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 6       | Current para. No.   |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 7       | OUT 3   | OUT 4  | OUT 5  | OUT 6  | OUT 7   | OUT 8   | OUT 9   | OUT 10  | OUT 11  | OUT 12  | OUT 13  | OUT 14  | OUT 15  | OUT 16  | Rewrite end     | Read end     |
| 8       | Station No. /basic para./system para. (Low order word PC Amplifier)   |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 9       | Station No. /basic para./system para. (High order word PC Amplifier)  |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 10      | Speed command (Low order word PC Amplifier)   |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 11      | Speed command (High order word PC Amplifier)  |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 12, 13  | -   |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 14      | Para. No. setting   |        |        |        |         |         |         |         |         |         |         |         |         |         |                 |              |
| 15      | CONT 6  | CONT 7 | CONT 8 | CONT 9 | CONT 10 | CONT 11 | CONT 12 | CONT 13 | CONT 14 | CONT 15 | CONT 16 | CONT 17 | CONT 18 | CONT 19 | Rewrite command | Read command |

Function (input signal) number assigned to system para. 1 to 19 (CONT1 to CONT19)

Function (output signal) assigned to system para. 31 to 46 (OUT1 to OUT16)

- |                          |                           |                            |                           |
|--------------------------|---------------------------|----------------------------|---------------------------|
| 0: Not assigned          | 33: Clamping end          | 0: Not assigned            | 34: Alarm code 2          |
| 1: Run command [RUN]     | 34: External fault input  | 1: Ready [RDY]             | 35: Alarm code 3          |
| 2: Forward command [FWD] | 42: 2nd origin            | 2: Indexing end [WPSET]    | 36: Alarm code 4          |
| 3: Reverse command [REV] | 43: Override valid        | 13: Rewrite end            | 40: Origin LS detection   |
| 4: Auto start [START]    | 44: Override 1            | 14: Brake timing           | 41: Forced stop detection |
| 5: Origin return [ORG]   | 45: Override 2            | 15: Dynamic braking        | 60: PD0                   |
| 6: Origin LS [LS]        | 46: Override 4            | 16: Alarm detection        | 61: PD1                   |
| 7: DIR                   | 47: Override 8            | 17: Fixed point 1          | 62: PD2                   |
| 9: ABS/INC               | 48: Manual index select 0 | 18: Fixed point 2          | 63: PD3                   |
| 10: Forced stop [EMG]    | 49: Manual index select 1 | 22: Origin return end      | 64: PD4                   |
| 11: Alarm reset [RST]    | 50: Deviation clear       | 23: Deviation zero         | 65: PD5                   |
| 12: VEL0                 | 51: X1                    | 24: Speed zero             | 66: PD6                   |
| 13: VEL1                 | 52: X2                    | 25: Speed arrive           | 67: PD7                   |
| 14: ACC0                 | 53: X3                    | 26: Torque limit detection | 68: PD8                   |
| 16: Position preset      | 54: Free-run [BX]         | 27: Overload early warning | 69: PD9                   |
| 27: Pulse train ratio 1  | 55: Edit permit command   | 28: CPU ready              | 70: PD10                  |
| 28: Pulse train ratio 2  |                           | 29: Edit permit ON/OFF     | 71: PD11                  |
| 29: P-action             |                           | 30: Data error             | 72: PD12                  |
| 30: Torque limit         |                           | 31: Address error          | 73: PD13                  |
| 31: Temporary stop       |                           | 32: Alarm code 0           | 74: PD14                  |
| 32: Positioning cancel   |                           | 33: Alarm code 1           | 75: Position preset end   |

### (3) T-link

(a) System parameter 1 to 21, 56 to 59

T-link  
(T-link direct  
connection)

Pn002 / PP001 - PP021  
PP056 - PP059

| Para. | Name                     | Setting range       | Initial value | Change |
|-------|--------------------------|---------------------|---------------|--------|
| 01    | CONT1 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 02    | CONT2 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 03    | CONT3 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 04    | CONT4 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 05    | CONT5 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 06    | CONT6 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 07    | CONT7 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 08    | CONT8 signal assignment  | 0 to 55 (in 1 step) | 0             | Power  |
| 09    | CONT9 signal assignment  | 0 to 55 (in 1 step) | 1             | Power  |
| 10    | CONT10 signal assignment | 0 to 55 (in 1 step) | 4             | Power  |
| 11    | CONT11 signal assignment | 0 to 55 (in 1 step) | 2             | Power  |
| 12    | CONT12 signal assignment | 0 to 55 (in 1 step) | 3             | Power  |
| 13    | CONT13 signal assignment | 0 to 55 (in 1 step) | 5             | Power  |
| 14    | CONT14 signal assignment | 0 to 55 (in 1 step) | 10            | Power  |
| 15    | CONT15 signal assignment | 0 to 55 (in 1 step) | 11            | Power  |
| 16    | CONT16 signal assignment | 0 to 55 (in 1 step) | 12            | Power  |
| 17    | CONT17 signal assignment | 0 to 55 (in 1 step) | 13            | Power  |
| 18    | CONT18 signal assignment | 0 to 55 (in 1 step) | 7             | Power  |
| 19    | CONT19 signal assignment | 0 to 55 (in 1 step) | 51            | Power  |
| 20    | CONT20 signal assignment | 0 to 55 (in 1 step) | 16            | Power  |
| 21    | CONT21 signal assignment | 0 to 55 (in 1 step) | 0             | Power  |
| 56    | CONT22 signal assignment | 0 to 55 (in 1 step) | 0             | Power  |
| 57    | CONT23 signal assignment | 0 to 55 (in 1 step) | 0             | Power  |
| 58    | CONT24 signal assignment | 0 to 55 (in 1 step) | 0             | Power  |
| 59    | CONT25 signal assignment | 0 to 55 (in 1 step) | 0             | Power  |

Function (input signal) number assigned to  
system para. 1 to 21 (CONT1 to CONT21)  
system pwa. 56 to 59 (CONT22 to CONT25)

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>0: Not assigned</li> <li>1: Run command [RUN]</li> <li>2: Forward command [FWD]</li> <li>3: Reverse command [REV]</li> <li>4: Auto start [START]</li> <li>5: Origin return [ORG]</li> <li>6: Origin LS [LS]</li> <li>7: DIR</li> <li>9: ABS/INC</li> <li>10: Forced stop [EMG]</li> <li>11: Alarm reset [RST]</li> <li>12: VEL0</li> <li>13: VEL1</li> <li>14: ACC0</li> <li>16: Position preset</li> <li>27: Pulse train ratio 1</li> <li>28: Pulse train ratio 2</li> <li>29: P-action</li> <li>30: Torque limit</li> <li>31: Temporary stop</li> <li>32: Positioning cancel</li> </ul> | <ul style="list-style-type: none"> <li>33: Clamping end</li> <li>34: External fault input</li> <li>42: 2nd origin</li> <li>43: Override valid</li> <li>44: Override 1</li> <li>45: Override 2</li> <li>46: Override 4</li> <li>47: Override 8</li> <li>48: Manual index select 0</li> <li>49: Manual index select 1</li> <li>50: Deviation clear</li> <li>51: X1</li> <li>52: X2</li> <li>53: X3</li> <li>54: Free-run [BX]</li> <li>55: Edit permit command</li> </ul> |
|--|---|

Function (output signal) assigned to  
system para. 31 to 51 (OUT1 to OUT21)

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>0: Not assigned</li> <li>1: Ready [RDY]</li> <li>2: Indexing end [WPSET]</li> <li>13: Rewrite end</li> <li>14: Brake timing</li> <li>15: Dynamic braking</li> <li>16: Alarm detection</li> <li>17: Fixed point 1</li> <li>18: Fixed point 2</li> <li>22: Origin return end</li> <li>23: Deviation zero</li> <li>24: Speed zero</li> <li>25: Speed arrive</li> <li>26: Torque limit detection</li> <li>27: Overload early warning</li> <li>28: CPU ready</li> <li>29: Edit permit ON/OFF</li> <li>30: Data error</li> <li>31: Address error</li> <li>32: Alarm code 0</li> <li>33: Alarm code 1</li> </ul> | <ul style="list-style-type: none"> <li>34: Alarm code 2</li> <li>35: Alarm code 3</li> <li>36: Alarm code 4</li> <li>40: Origin LS detection</li> <li>41: Forced stop detection</li> <li>60: PD0</li> <li>61: PD1</li> <li>62: PD2</li> <li>63: PD3</li> <li>64: PD4</li> <li>65: PD5</li> <li>66: PD6</li> <li>67: PD7</li> <li>68: PD8</li> <li>69: PD9</li> <li>70: PD10</li> <li>71: PD11</li> <li>72: PD12</li> <li>73: PD13</li> <li>74: PD14</li> <li>75: Position preset end</li> </ul> |
|--|---|

(b) System parameter 31 to 51

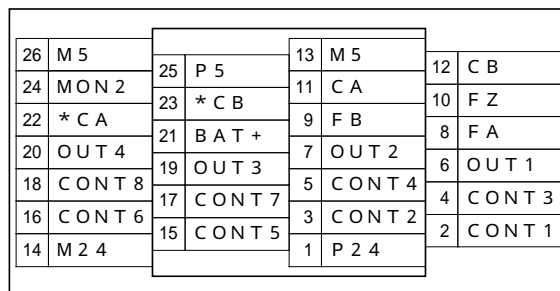
Pn002 / PP031 - PP051

T-link  
(T-link direct connection)

| Para. | Name                    | Setting range       | Initial value | Change |
|-------|-------------------------|---------------------|---------------|--------|
| 31    | OUT1 signal assignment  | 0 to 75 (in 1 step) | 0             | Power  |
| 32    | OUT2 signal assignment  | 0 to 75 (in 1 step) | 0             | Power  |
| 33    | OUT3 signal assignment  | 0 to 75 (in 1 step) | 0             | Power  |
| 34    | OUT4 signal assignment  | 0 to 75 (in 1 step) | 0             | Power  |
| 35    | OUT5 signal assignment  | 0 to 75 (in 1 step) | 1             | Power  |
| 36    | OUT6 signal assignment  | 0 to 75 (in 1 step) | 2             | Power  |
| 37    | OUT7 signal assignment  | 0 to 75 (in 1 step) | 28            | Power  |
| 38    | OUT8 signal assignment  | 0 to 75 (in 1 step) | 16            | Power  |
| 39    | OUT9 signal assignment  | 0 to 75 (in 1 step) | 31            | Power  |
| 40    | OUT10 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 41    | OUT11 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 42    | OUT12 signal assignment | 0 to 75 (in 1 step) | 40            | Power  |
| 43    | OUT13 signal assignment | 0 to 75 (in 1 step) | 41            | Power  |
| 44    | OUT14 signal assignment | 0 to 75 (in 1 step) | 30            | Power  |
| 45    | OUT15 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 46    | OUT16 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 47    | OUT17 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 48    | OUT18 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 49    | OUT19 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 50    | OUT20 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |
| 51    | OUT21 signal assignment | 0 to 75 (in 1 step) | 0             | Power  |

Connector pin layout

· CN1 (lower side)



WB area

| Address | 0   | 1                           | 2       | 3       | 4       | 5       | 6               | 7            | 8               | 9       | A       | B       | C       | D       | E       | F       |  |
|---------|---|-----------------------------|---------|---------|---------|---------|-----------------|--------------|-----------------|---------|---------|---------|---------|---------|---------|---------|--|
| + 0     | OUT 5                                       | OUT 6                       | OUT 7   | OUT 8   | OUT 9   | OUT 10  | OUT 11          | OUT 12       | OUT 13          | OUT 14  | OUT 15  | OUT 16  | OUT 17  | OUT 18  | OUT 19  | OUT 20  |  |
| + 1     | OUT 21                                      | ALM 4                       | ALM 3   | ALM 2   | ALM 1   | ALM 0   | Rewrite end     | Read end     | -               |         |         |         |         |         |         |         |  |
| + 2     | Read data (High order word PC Amplifier)    |                             |         |         |         |         |                 |              |                 |         |         |         |         |         |         |         |  |
| + 3     | Read data (Low order word PC Amplifier)     |                             |         |         |         |         |                 |              |                 |         |         |         |         |         |         |         |  |
| + 4     | CONT 9                                      | CONT 10                     | CONT 11 | CONT 12 | CONT 13 | CONT 14 | CONT 15         | CONT 16      | CONT 17         | CONT 18 | CONT 19 | CONT 20 | CONT 21 | CONT 22 | CONT 23 | CONT 24 |  |
| + 5     | CONT 25                                     | Rewrite/read data selection |         |         |         |         | Rewrite command | Read command | Command address |         |         |         |         |         |         |         |  |
| + 6     | Rewrite data (High order word PC Amplifier) |                             |         |         |         |         |                 |              |                 |         |         |         |         |         |         |         |  |
| + 7     | Rewrite data (Low order word PC Amplifier)  |                             |         |         |         |         |                 |              |                 |         |         |         |         |         |         |         |  |

#### (4) Terminal function assignment

Set a number corresponding to signal name at desired system para., so that the function can be assigned to the terminal.

##### Setting example

Set "1" at the system para. 1 so that the terminal [CONT1] of the control input connector [CN1] functions as the input terminal for the run command [RUN] signal.

##### Duplicated allocation

For the control input terminals, a signal cannot be assigned to more than one terminal simultaneously.

However, only the following signals can be assigned to more than one terminal:

- Forced stop (10)
- Free-run (54)
- External fault input (34)

In case of the forced stop and the external fault input, the motor will stop forcibly if an input terminal is off.

In case of the free-run, the motor will be in free-run status if an input terminal is turned on.

If the signals other than the above have been assigned to more than one terminal, a control signal error [CtE] will be detected when turning on power supply again.

For the control output terminals, a signal can be assigned to more than one terminal simultaneously.

Each terminal goes on or off at the same timing.

##### Always valid

The functions can be always effective by setting a numerical value at the system para. 87 or 88.

Remark : If a number has been assigned to system para. for CONT signal assignment and system para. 87, 88 simultaneously, a control signal error [CtE] will not be detected.

The assigned signal is always valid.

#### (5) System parameter 22 to 27 [ Basic type, SX bus, T-link ]

$Pn002$  /  $PP022$  -  $PP027$

| Para. | Name                    | Setting range                             | Initial value | Change |
|-------|-------------------------|---|---------------|--------|
| 22    | Parameter RAM storage 1 | 0: Not specified 1 to 99: Basic para. No. | 0             | Power  |
| 23    | Parameter RAM storage 2 | 0: Not specified 1 to 99: Basic para. No. | 0             | Power  |
| 24    | Parameter RAM storage 3 | 0: Not specified 1 to 99: Basic para. No. | 0             | Power  |
| 25    | Parameter RAM storage 4 | 0: Not specified 1 to 99: Basic para. No. | 0             | Power  |
| 26    | Parameter RAM storage 5 | 0: Not specified 1 to 99: Basic para. No. | 0             | Power  |
| 27    | Parameter RAM storage 6 | 0: Not specified 1 to 99: Basic para. No. | 0             | Power  |

The contents of basic parameter is stored in the EEPROM (electrically erasable program read only memory) for retaining purpose at power shut down. By specifying RAM, infinite rewriting is enable.

Specify a desired basic para. No. whose contents shall be stored in RAM storage to a system para. 22 to 27.

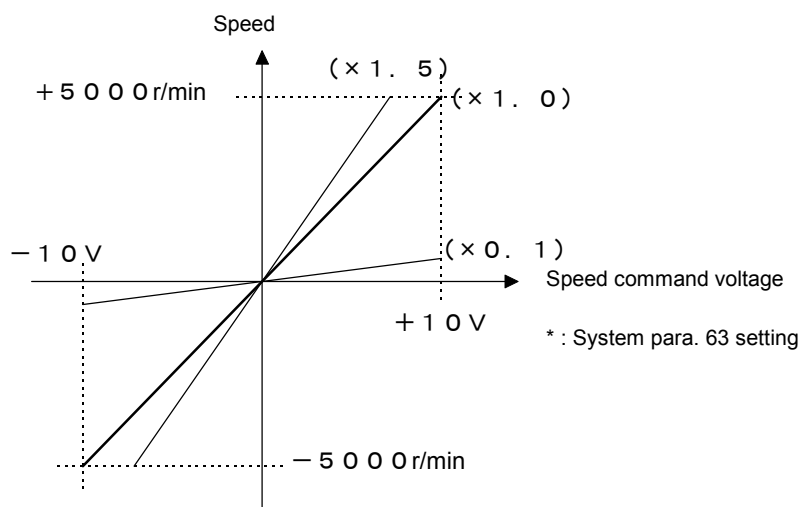
The contents of RAM stored basic para. is initialized at power on.

(6) System parameter 63, 64. [Basic type]

`Pn002` / `PP063` - `PP064`

| Para. | Name                 | Setting range                                 | Initial value | Change |
|-------|----------------------|---|---------------|--------|
| 63    | Speed command gain   | $\pm 0.10$ to $\pm 1.50$ times (in 0.01 step) | 1.00          | Always |
| 64    | Speed command offset | -2000 to 2000 (in 1 step)                     | (Individual)  | Always |

The gain or offset of speed command [NREF] terminal can be adjusted.



■ Speed command gain

These gains can be set from  $\pm 0.10$  to  $\pm 1.50$  times in 0.01 step. Specifying the negative sign can invert the rotational direction.

■ Speed command offset

This can be set from -2000 to 2000 in 1 step. The setting value has no unit. The initial value has been set at factory shipment individually. Automatic offset adjustment is enable in the trial operation mode by the keypad panel (`Fn008`). The value after adjustment will be saved in the system para. 64

(7) System parameter 67 to 73 [Basic type, SX bus, monitor 2 of T-link]

`Pn002` / `PP067` - `PP073`

| Para. | Name                        | Setting range  | Initial value | Change |
|-------|-----------------------------|--|---------------|--------|
| 67    | Monitor 1 signal assignment | 1: Speed command    2: Speed feedback<br>3: Torque command    4: Position deviation  | 2             | Always |
| 68    | Monitor 2 signal assignment | 1: Speed command    2: Speed feedback<br>3: Torque command    4: Position deviation  | 3             | Always |
| 69    | Monitor 1 scale             | $\pm 2.0$ to $\pm 10$ [V] (in 0.1 step)  | 7.0           | Always |
| 70    | Monitor 1 offset            | -50 to 50 (in 1 step)  | 0             | Always |
| 71    | Monitor 2 scale             | $\pm 2.0$ to $\pm 10$ [V] (in 0.1 step)  | 6.0           | Always |
| 72    | Monitor 2 offset            | -50 to 50 (in 1 step)  | 0             | Always |
| 73    | Monitor 1, 2 output form    | 0: Monitor 1 (two-way deflection) / Monitor 2 (two-way deflection)<br>1: Monitor 1 (one-way deflection) / Monitor 2 (two-way deflection)<br>2: Monitor 1 (two-way deflection) / Monitor 2 (one-way deflection)<br>3: Monitor 1 (one-way deflection) / Monitor 2 (one-way deflection) | 0             | Power  |



The output signal form of the monitor 1 [MON1] and monitor 2 [MON2] terminals can be selected. Output form is common to position control, speed control and torque control.

**Monitor 1/ Monitor 2 signal assignment**

Sets the output signal from monitor 1 [MON1] and monitor 2 [MON2] terminal.

| Setting range         | Output signal   |
|-----------------------|---|
| 1: Speed command      | Speed command to the motor recognized by the amplifier                |
| 2: Speed feedback     | Motor's actual rotational speed                                       |
| 3: Torque command     | Torque command value to the motor recognized by the amplifier         |
| 4: Position deviation | Difference (deviation) between position command and position feedback |

**Monitor 1/ Monitor 2 scale**

Sets the full scale of signal of monitor 1 [MON1] and monitor 2 [MON2] terminals. If the negative sign is specified, the polarity of output voltage can be inverted.

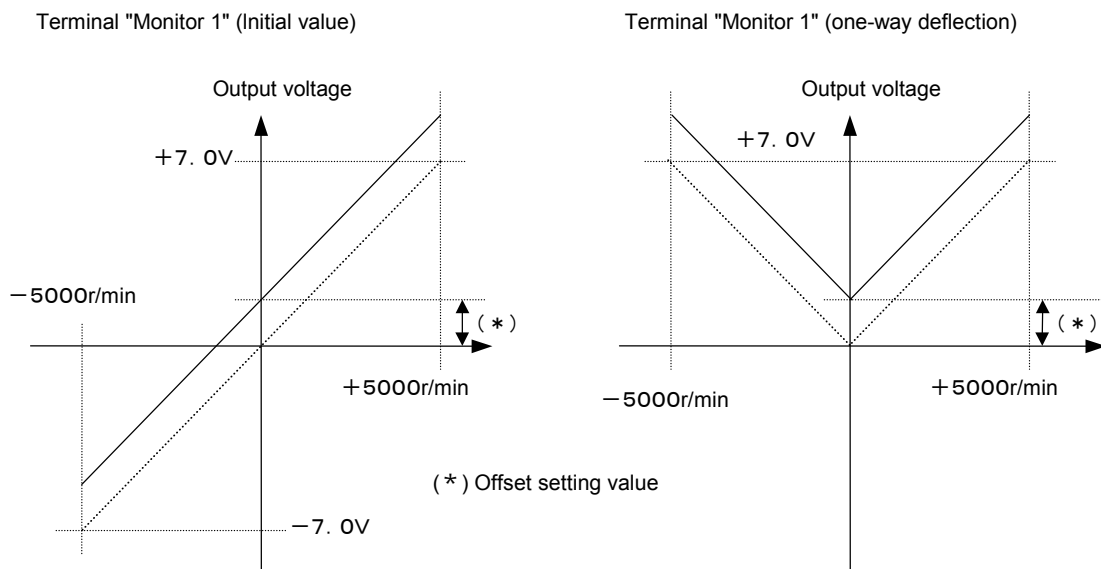
| Setting range         | Output signal                                 |
|-----------------------|---|
| 1: Speed command      | Output voltage in response to max. speed.     |
| 2: Speed feedback     | Output voltage in response to max. speed.     |
| 3: Torque command     | Output voltage in response to max. torque.    |
| 4: Position deviation | Output voltage in response to 1048576 pulses. |

**Monitor 1/ Monitor 2 offset**

The offset voltage of monitor 1 [MON1] and monitor 2 [MON2] terminals can be adjusted. The setting range is from -50 to 0 to 50 in 1 step. The setting value has no unit.

**Monitor 1/ Monitor 2 output form**

Two-way deflection or one-way deflection can be selected for the signal assignment, scale and offset of the monitor 1 [MON1] and monitor 2 [MON2] terminals.



In monitor 1/monitor 2 scale, if the negative sign is specified, the polarity of output voltage can be inverted.

(8) System parameter 78 [ Basic type, SX bus, T-link ]

**Pn002** / **PP078**

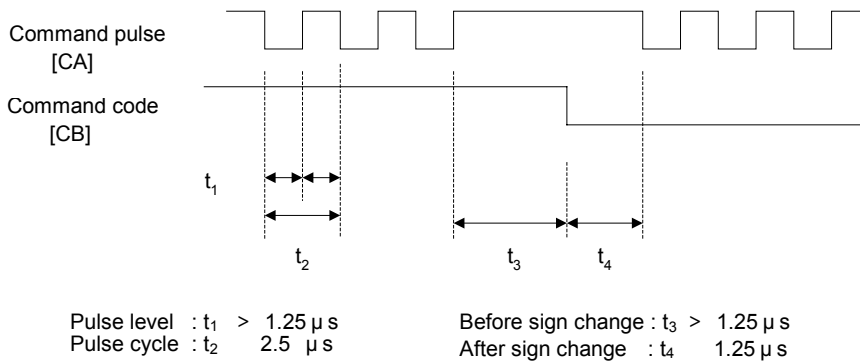
| Para. | Name                   | Setting range   | Initial value | Change |
|-------|------------------------|---|---------------|--------|
| 78    | Pulse train input form | 0 : Command code, command pulse<br>1 : Forward pulse, reverse pulse<br>2 : Two 90° phase-different signal | 1             | Power  |

The pulse form of pulse train input terminal can be selected.

The pulse form of pulse train input terminal [CA], [\*CA], [CB], [\*CB] can be selected. The maximum input frequency is 500 [kHz].

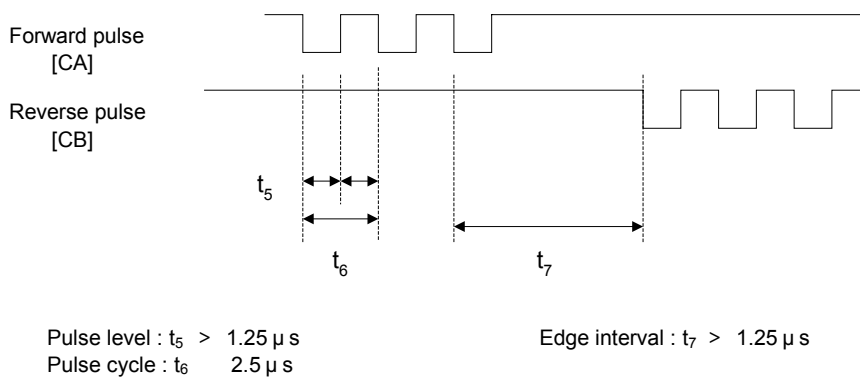
Command code, command pulse (system para. 78 setting : 0)

The command pulse indicates rotational quantity and the command code indicates rotational direction.



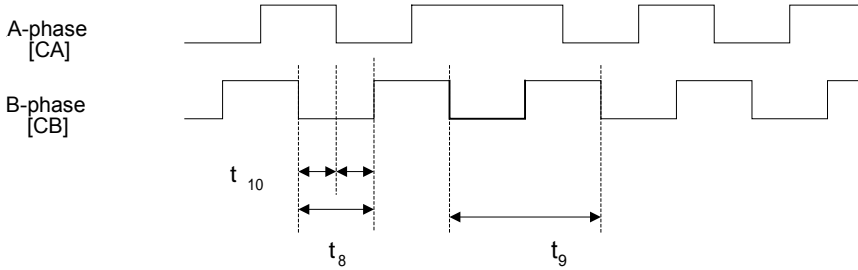
Forward pulse, reverse pulse (system para. 78 setting : 1)

Forward pulse indicates forward direction, reverse pulse indicates the reverse direction.



Two 90° phase-different signal (system para. 78 setting : 2)

A-phase and B-phase signal indicate rotational direction and rotational quantity, respectively. Each edge of A-phase and B-phase signals corresponds to one pulse.



Pulse width :  $t_8 > 1.25 \mu s$   
 Pulse cycle :  $t_9 = 2.5 \mu s$

Edge interval :  $t_{10} > 1.25 \mu s$

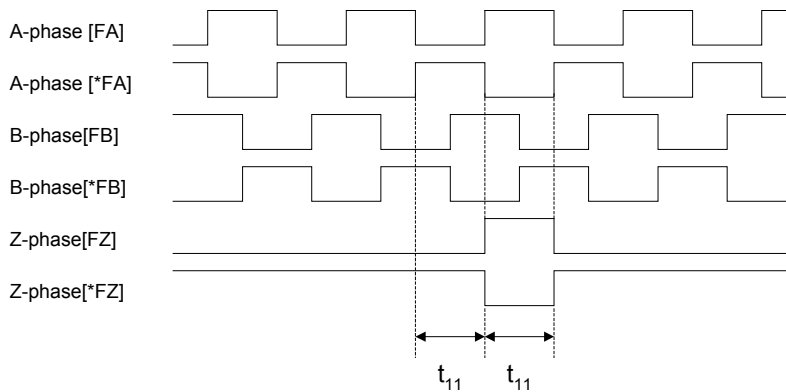
(9) System para. 79. [ Basic type, SX bus (line driver output), T-link (open collector output) ]

`Pn002` / `PP079`

| Para. | Name               | Setting range                       | Initial value | Change |
|-------|--------------------|-------------------------------------|---------------|--------|
| 79    | Output pulse count | 16 to 16384 [pulse/rev] (in 1 step) | 2048          | Power  |

The pulse count in proportion to motor rotational quantity will be output.

The output pulse count can be set for the freq. dividing output terminals [FA], [\*FA], [FB], [\*FB], [FZ], and [\*FZ].



Pulse width :  $t_{11} = 1 [\mu s]$  (equivalent to 500 [kHz])

A-phase and B-phase signals are 50% duty.

The output pulse counts of A-phase and B-phase signal are determined by system para. 79 setting.

Z-phase signal is output one pulse per revolution. The pulse width depends on the A-phase output pulse count.

A-phase signal and Z-phase signal are synchronized. Recommended output frequency is approx. 500 [kHz]. The output frequency is not restricted by the amplifier.

The position of the motor output shaft has no relation with Z-phase.

The system para. 79 sets the freq. dividing output pulse count per one rotation of motor. The output form is two 90° phase-different signal. When the motor rotates forward, a B-phase advanced pulse is output. This does not depend on the rotational direction changeover setting (system para. 80)

Two 90° phase-different signal is output based on the level at the time of power on.

Max. output frequency depends on the performance of IC (differential driver: AM26LS31 or equivalent) for output terminal.

(10) System parameter 80 [ Basic type, SX bus, T-link ]

Pn002 / PP080

| Para. | Name                            | Setting range  | Initial value | Change |
|-------|---------------------------------|--|---------------|--------|
| 80    | Rotational direction changeover | 0 : Positive direction / forward<br>1 : Positive direction / reverse | 0             | Power  |

This para. makes the motor rotational direction match the machine moving direction.

**Speed command voltage [NREF] (multistep speed)**

The positive direction means the rotational direction when a positive (+) voltage is applied to speed command voltage terminal [NREF] (multistep speed), and forward command [FWD] is given. The motor output shaft rotates forward. The voltage input of -10 to 0 to +10 [V] can be applied.

**Pulse train input**

The positive direction means the rotational direction when a forward pulse or command code at H level, or a pulse train of two 90° phase-different (B-phase advance) signal is applied. The motor output shaft rotates forward.

**Forward rotation, reverse rotation**

Forward rotation is counterclockwise (CCW) rotation when viewed from a point facing the drive-end of motor. Clockwise rotation is reverse rotation.

**Resolution of speed command [NREF]**

The resolution is 14 bit at full scale. When a speed reference voltage of 5000 [r/min] / 10 [V] is given,  $(-5000 \text{ to } +5000) \text{ [r/min]} / 2^{14} = 0.6 \text{ [r/min]}$  is obtained.

(11) System parameter 81 [ Basic type, SX bus, T-link ]

Pn002 / PP081

The status when the motor is stopping can be selected.

| Para. | Name                  | Setting range  | Initial value | Change |
|-------|-----------------------|--|---------------|--------|
| 81    | Operation at stoppage | 1 : Servo lock<br>2 : Brake (P-action)<br>3 : Brake (free-run) | 1             | Power  |

**Servo lock**

The motor can be stopped retaining the current position (current position of motor's encoder).

**Brake (P-action)**

The motor can be stopped by the motor's brake, by using the brake timing outputted from amplifier. The motor output shaft is mechanically locked and the control system gain on the amplifier side is lowered.

**Brake (free-run)**

The motor can be stopped by the motor's brake, by using the brake timing outputted from amplifier. Noise or vibration will not be generated because the no motor control is made.

For details, see 5.7.10.

(12) System parameter 82, 83 [ Basic type, SX bus, T-link ]

**Pn002** / **PP082** – **PP083**

| Para. | Name                 | Setting range                   | Initial value | Change |
|-------|----------------------|---------------------------------|---------------|--------|
| 82    | Brake operation time | 0.01 to 9.99 [s] (in 0.01 step) | 0.50          | Always |
| 83    | Brake releasing time | 0.01 to 9.99 [s] (in 0.01 step) | 0.20          | Always |

System para. 82 and 83 are the time setting of brake timing output.

If the external brake is used, setting change of system para. 81 is needed.

Brake operation time : Time period from when the motor shaft has been stopped, to when the P-action signal is on.

Brake releasing time : Time period from when manual forward or origin return command is on, to when the motor begins running.

(13) System parameter 84, 85 [ Basic type, SX bus, T-link ]

**Pn002** / **PP084** – **PP085**

Selects the operation when undervoltage at main circuit input is detected.

| Para. | Name                            | Setting range                                  | Initial value | Change |
|-------|---------------------------------|--|---------------|--------|
| 84    | Operation at undervoltage       | 0: Rapid deceleration to a stop<br>1: Free-run | 0             | Power  |
| 85    | Alarm detection at undervoltage | 0: No detection<br>1: Detects                  | 1             | Power  |

Operation at undervoltage (system para. 84)

Specifies the motor operation when undervoltage has been detected while the run command [RUN] is on.

| Setting range             | Operation  |
|---------------------------|--|
| 0: Rapid decel. to a stop | The motor rapidly decelerates to a stop (within amplifier's highest capacity).               |
| 1: Free-run               | The motor decelerates (or accelerates) with free-run condition according to the load torque. |

Alarm detection at undervoltage (system para. 85)

Specifies the alarm detection operation when undervoltage has been detected while the run command [RUN] is on.

| Setting range   | Operation                       |
|-----------------|---------------------------------|
| 0: No detection | Alarm is not detected.          |
| 1: Detects      | Undervoltage alarm is detected. |

If "0" has been set, the motor stops according to the preset operation to be made at undervoltage, and alarm detection will not be output.

Remark: If the power voltage decrease (undervoltage) due to momentary power failure is detected, the motor decelerates by system para. 84 setting. Due to regenerative power generated by the motor during deceleration, voltage level may exceed undervoltage level. In this case, the motor starts deceleration at the undervoltage level. After that, the motor will accelerate again after alarm detection of undervoltage is released.

(14) System parameter 86 [ Basic type, SX bus, T-link ]

**Pn002** / **PP086**

Connects the NTC thermistor of braking resistor to the control input terminal to protect the resistor.

| Para. | Name                           | Setting  | Initial value | Change |
|-------|--------------------------------|--|---------------|--------|
| 86    | Braking resistor thermal relay | 0: Electronic thermal relay<br>1: External thermal relay | 0             | Power  |

| Setting                     | Overheat detection of braking resistor   |
|-----------------------------|--|
| 0: Electronic thermal relay | Calculates the regenerated power by amplifier to protect the resistor.         |
| 1: External thermal relay   | Directly detects resistor overheat using NTC thermistor built-in the resistor. |

To use external thermal relay, assign the external fault input (34) at the control allocation terminal, connect NTC thermistor for the external resistor.

Protective function by electronic thermal relay built-in the amplifier will be disabled.

(15) System parameter 87, 88 [ Basic type, SX-bus, T-link ]

**Pn002** / **PP087** - **PP088**

(a) Basic type

| Para. | Name                | Setting range       | Initial value | Change |
|-------|---------------------|---------------------|---------------|--------|
| 87    | CONT always valid 1 | 0 to 74 (in 1 step) | 0             | Power  |
| 88    | CONT always valid 2 | 0 to 74 (in 1 step) | 0             | Power  |

(b) SX bus, T-link

| Para. | Name                | Setting range       | Initial value | Change |
|-------|---------------------|---------------------|---------------|--------|
| 87    | CONT always valid 1 | 0 to 55 (in 1 step) | 0             | Power  |
| 88    | CONT always valid 2 | 0 to 55 (in 1 step) | 0             | Power  |

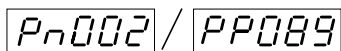
Arbitrary signals among the control input signals can be always valid.

The assignable signals are as follows:

- 1 : Run command [RUN]                    The run command becomes always valid.
- 14 : ACC0                                    Only acceleration time 2 and deceleration time 2 become always valid.
- 27 : Pulse train ratio 1                   Pulse train ratio 1 or 2 become always valid. Do not assign these two signals 1 and 2 at the same time.
- 28 : Pulse train ratio 2
- 29 : P-action                                P-action is always valid. Assignment is not necessary.
- 30 : Torque limit                            Torque limit value becomes always valid. Unless assigned, maximum torque limit value (basic para. 59) setting is valid.
- 43 : Override valid                         Override becomes always valid.
- 44 to 47 : Overeride 1, 2, 4, 8           Only specifically determined magnification becomes valid.
- 48 : Interrupt input valid                   Interrupt input becomes always valid.
- 51 to 53 : [X1], [X2], [X3]              Only specifically determined multistep speed becomes valid.

Remarks: The signals that have been assigned to system para. 87 or 88 are always valid.  
The only two signals can be always valid.

(16) System parameter 89 [Basic type, SX bus, T-link]



(a) Basic type

| Para. | Name               | Setting range       | Initial value | Change |
|-------|--------------------|---------------------|---------------|--------|
| 89    | Initial indication | 0 to 20 (in 1 step) | 0             | Power  |

(b) SX bus, T-link

| Para. | Name               | Setting range       | Initial value | Change |
|-------|--------------------|---------------------|---------------|--------|
| 89    | Initial indication | 0 to 20 (in 1 step) | 6             | Power  |

The contents of indication on the keypad panel at power on can be changed.

The following contents of indication can be selected.

| Setting | Initial indication | Setting | Initial indication |
|---------|--------------------|---------|--------------------|
| 0       |                    | 7       |                    |
| 1       |                    | 8       |                    |
| 2       |                    | 9       |                    |
| 3       |                    | 10      |                    |
| 4       |                    | 11      |                    |
| 5       |                    | 12      |                    |
| 6       |                    | 13      |                    |
|         |                    | 14      |                    |
|         |                    | 15      |                    |
|         |                    | 16      |                    |
|         |                    | 17      |                    |
|         |                    | 18      |                    |
|         |                    | 19      |                    |
|         |                    | 20      |                    |

(17) System parameter 94, 95 [ Basic type, SX bus, T-link ]

/ -

| Para. | Name                        | Setting range                               | Initial value | Change |
|-------|-----------------------------|---|---------------|--------|
| 94    | Parameter rewriting inhibit | 0: Rewriting enable<br>1: Rewriting disable | 0             | Always |

Parameter rewriting on the keypad panel can be prohibited.

Even if "1: Rewriting disable" is selected, only the system para. 94 is rewritable.

Remark : Rewrite operation can be restricted by the control input terminal. See 5.6.2 Edit permit command.

(18) System parameter 96 [ Basic type, SX bus, T-link ]

/

(a) Basic type

| Para. | Name           | Setting range       | Initial value | Change |
|-------|----------------|---------------------|---------------|--------|
| 96    | Station number | 1 to 31 (in 1 step) | 1             | Power  |

(b) SX bus

| Para. | Name           | Setting range        | Initial value | Change |
|-------|----------------|----------------------|---------------|--------|
| 96    | Station number | 0 to 238 (in 1 step) | 0             | Power  |



(c) T-link

| Para. | Name           | Setting range       | Initial value | Change |
|-------|----------------|---------------------|---------------|--------|
| 96    | Station number | 0 to 99 (in 1 step) | 1             | Power  |

Sets the station number about communication.

Specifies the amplifier station number at 1 through 31 in decimal.  
If the station number is hexadecimal, see the following conversion table.

| Station No. setting<br>(decimal) | Station No. setting<br>(hexadecimal) | Station No. setting<br>(decimal) | Station No. setting<br>(hexadecimal) | Station No. setting<br>(decimal) | Station No. setting<br>(hexadecimal) |
|----------------------------------|--------------------------------------|----------------------------------|--------------------------------------|----------------------------------|--------------------------------------|
| 1                                | 01H                                  | 11                               | 0BH                                  | 21                               | 15H                                  |
| 2                                | 02H                                  | 12                               | 0CH                                  | 22                               | 16H                                  |
| 3                                | 03H                                  | 13                               | 0DH                                  | 23                               | 17H                                  |
| 4                                | 04H                                  | 14                               | 0EH                                  | 24                               | 18H                                  |
| 5                                | 05H                                  | 15                               | 0FH                                  | 25                               | 19H                                  |
| 6                                | 06H                                  | 16                               | 10H                                  | 26                               | 1AH                                  |
| 7                                | 07H                                  | 17                               | 11H                                  | 27                               | 1BH                                  |
| 8                                | 08H                                  | 18                               | 12H                                  | 28                               | 1CH                                  |
| 9                                | 09H                                  | 19                               | 13H                                  | 29                               | 1DH                                  |
| 10                               | 0AH                                  | 20                               | 14H                                  | 30                               | 1EH                                  |
|                                  |                                      |                                  |                                      | 31                               | 1FH                                  |

If a fail-soft operation is required for SX bus type, specify the desired station number.  
Use the initial value "0" as it is when the station number will be used in the system definition of D300win.

(19) System parameter 98 [ Basic type, T-link ]

**Pn002** / **PP098**

| Para. | Name       | Setting range    | Initial value                | Change |
|-------|------------|------------------|------------------------------|--------|
| 98    | Binary/BCD | 0: Binary 1: BCD | 0 [Basic type]<br>1 [T-link] | Power  |

The code of values handled by the amplifier can be selected.  
SX-bus type amplifiers handle binary code only.  
The initial value of T-link type amplifier is 1 (BCD).

(20) System parameter 99 [ Basic type, SX bus, T-link ]

Pn002 / PP099

| Para. | Name           | Setting range                             | Initial value | Change |
|-------|----------------|---|---------------|--------|
| 99    | INC/ABS system | 0: INC (Incremental)<br>1: ABS (Absolute) | 0             | Power  |

| Setting              | Current position backup   |
|----------------------|---|
| 0: INC (Incremental) | Current position will be lost if power is shut down.<br>Motor rotational quantity is not limited.     |
| 1: ABS (Absolute)    | Current position will be recovered if power supply recovers.<br>Motor rotational quantity is limited. |

Incremental or absolute system can be selected.

#### Pulse encoder

A 16-bit serial encoder built-in the motor is an INC/ABS common-use encoder.

An ABS system can be established if a battery is installed in the amplifier.

The encoder can output a freq. dividing output pulse of 16 to 16384 [pulse/rev].

The multiple rotation count is -32767 to 32767 in an ABS system.

#### Alarm detection in ABS system

The alarms against absolute data lost (AL) will be detected only in the ABS system. This alarm will be reset by the position preset.

#### Current position backup

When power failure occurs, the absolute data of encoder can be backed up by the battery built-in the amplifier. The backup time is approx. one hour after the motor encoder cable is disconnected from the amplifier.

|   |                  |
|---|------------------|
| Backup time by encoder alone<br>(Super capacitor) | Approx. one hour |
|---|------------------|

Some backup methods are available.

#### 1) Battery built-in amplifier (type : WBS-S)

This is a lithium (primary) battery built in the amplifier and cannot be recharged.

The lifetime is approx. 7 years on condition that it is turned on for 8 hours per day (it backups 16 hours)

|  |                 |
|--|-----------------|
| Lifetime of optional battery<br>(16 hour backup after 8 hour power on per day) | Approx. 7 years |
|--|-----------------|

#### 2) External battery

The connector 1 (CN1) for control input/output is equipped with the input terminals [+BAT], [-BAT] for backup power. Connect 3.6 [V] power to these terminals.

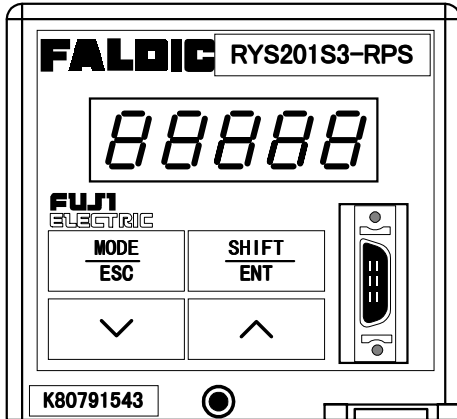
Do not install the backup battery into the amplifier itself if you connect the backup power.

#### 3) Power supply for control circuit

If a UPS is prepared as a peripheral device, connect its power to the control power input terminal so that power can be supplied to the control circuit only (backup is available at the same time)

## 7. KEYPAD PANEL

### 7.1 Display



The amplifier is provided with a keypad panel. It has a display section of five 7-segment LED digits and 4 operation keys. Figures and letters are displayed on the display section.

Remark: The keypad panel cannot be removed.

#### (1) Mode

The keypad panel operation can be classified into 5 modes.

- Sequence mode ..... Indicates the amplifier status.
- Monitor mode ..... Monitors the motor speed and the input/output signal status.
- Parameter edit mode ..... Edits the parameter setting.
- Positioning data edit mode ..... Edits the positioning data.
- Test running mode ..... Operates the motor with the keypad operation.

**For RYS-R type amplifier, the positioning data edit mode is invalid.**

List of 7-segment indication

|   |   |   |   |   |   |   |      |      |   |   |
|---|---|---|---|---|---|---|------|------|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7    | 8    | 9 | - |
|   |   |   |   |   |   |   |      |      |   |   |
| A | b | C | d | E | F | G | H    | I    | J | L |
|   |   |   |   |   |   |   |      |      |   |   |
| n | O | o | P | r | S | t | U, V | u, v | y |   |
|   |   |   |   |   |   |   |      |      |   |   |

**(2) Operation key**



Change the mode (MODE).  
Returns from the mode (ESC).



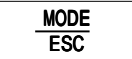
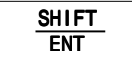
Moves the cursor to the right at data change (SHIFT).  
Stores the mode and figure (ENT). Press more than 1 [s] to store the data.



Selects the sub-mode.  
Decreases the figure (-1).  
When a figure decreases from 0 to 9, the figure on the one higher digit decreases by one.

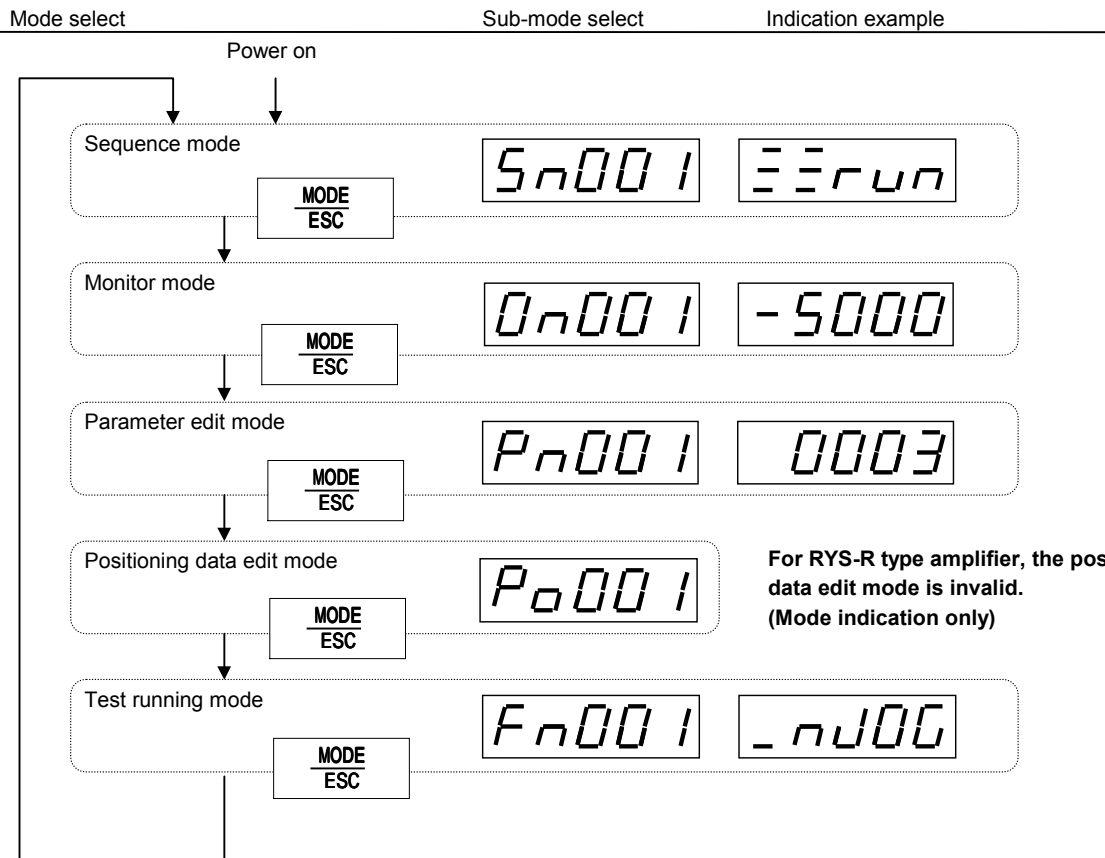


Selects the sub-mode.  
Increases the figure (+1).  
When a figure increases from 9 to 0, the figure on the one higher digit increases by one.

Pressing the  key while pressing the  key changes over the indication between the higher 4 digits and lower 4 digits.

**(3) Mode select**

Each mode can be selected by the MODE key.



## 7.2 Function list

The setting value can be changed in parameter edit mode and positioning data edit mode.

| Mode          | Sub-mode               | Sub-mode select    | Indication example |
|---------------|------------------------|--------------------|--------------------|
| Sequence mode | Sequence               | S <sub>n</sub> 001 | ≡≡run              |
|               | Sub-mode               | S <sub>n</sub> 002 | Stby               |
|               | Alarm detection        | S <sub>n</sub> 003 | AL---              |
|               | Alarm history          | S <sub>n</sub> 004 | A1-OL              |
|               | Amplifier setting      | S <sub>n</sub> 005 | Ud00               |
|               | Motor setting          | S <sub>n</sub> 006 | CO.10              |
|               | Station No. indication | S <sub>n</sub> 007 | A5009              |
| Monitor mode  | Feedback speed         | 0 <sub>n</sub> 001 | -5000              |
|               | Command speed          | 0 <sub>n</sub> 002 | -5000              |
|               | Average torque         | 0 <sub>n</sub> 003 | 123                |
|               | Feedback position      | 0 <sub>n</sub> 004 | 30000              |
|               | Command position       | 0 <sub>n</sub> 005 | 30000              |
|               | Deviation amount       | 0 <sub>n</sub> 006 | H 1234             |
|               | Cumulated pulse        | 0 <sub>n</sub> 007 | H 1234             |
|               | Peak torque            | 0 <sub>n</sub> 008 | 123                |
|               | Input voltage 1        | 0 <sub>n</sub> 009 | - 10.0             |
|               | Input voltage 2        | 0 <sub>n</sub> 010 | - 10.0             |
|               | LS-Z pulse             | 0 <sub>n</sub> 011 | H 1234             |
|               | Input signal           | 0 <sub>n</sub> 012 | H 00000000         |
|               | Output signal          | 0 <sub>n</sub> 013 | H 00000000         |
|               | Load inertia ratio     | 0 <sub>n</sub> 014 | 100.0              |

| Mode                | Sub-mode     | Sub-mode select | Indication example |
|---------------------|--------------|-----------------|--------------------|
| Parameter edit mode | Basic para.  | Pn001           | H 01               |
|                     | System para. | Pn002           | 01                 |

|                            |               |       |  |
|----------------------------|---------------|-------|--|
| Positioning data edit mode | Position data | Po001 |  |
|                            | Speed data    | Po002 |  |
|                            | Timer data    | Po003 |  |
|                            | Status        | Po004 |  |
|                            | M code        | Po005 |  |

**For RYS-R type amplifier, the positioning data edit mode is invalid.**

|                   |                                 |       |      |
|-------------------|---------------------------------|-------|------|
| Test running mode | Manual feed                     | Fn001 | JOG  |
|                   | Origin return                   | Fn002 | ORC  |
|                   | Position preset                 | Fn003 | Prt  |
|                   | Alarm reset                     | Fn004 | rt   |
|                   | History initialization          | Fn005 | ALrt |
|                   | Parameter initialization        | Fn006 | PARt |
|                   | Positioning data initialization | Fn007 | Port |
|                   | Automatic offset adjust         | Fn008 | OFFt |

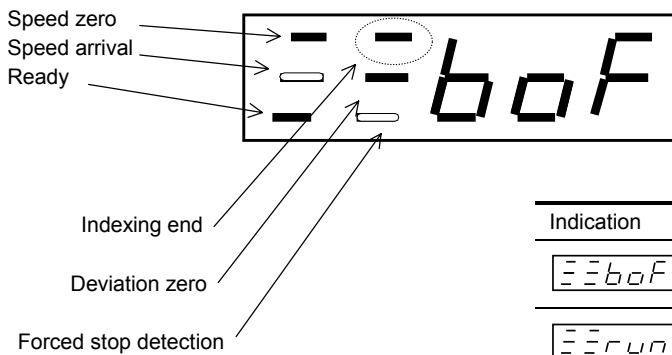
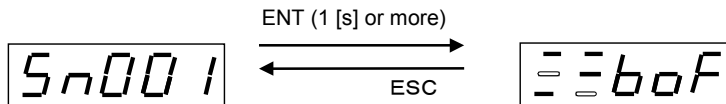
### 7.3 Sequence mode

In the sequence mode, the amplifier current status and the alarm detection history can be displayed. Press the MODE key to display [ *S<sub>n</sub>00<sub>n</sub>* ] and then press the ENT key for more than 1 [s].

- S<sub>n</sub>001* : Sequence
- S<sub>n</sub>002* : Sub-mode
- S<sub>n</sub>003* : Alarm detection
- S<sub>n</sub>004* : Alarm history
- S<sub>n</sub>005* : Amplifier setting
- S<sub>n</sub>006* : Motor setting
- S<sub>n</sub>007* : Station No. indication

#### (1) Sequence

Indicates the amplifier output signal status and operation status.



\* The corresponding LED goes on when the above each output signal is on.

| Indication | Description  |
|------------|--|
|            | In base-off condition, the motor has no driving force and in free-run status. (Figure above) |
|            | The motor can rotate.  |
|            | The amplifier has received a forced stop signal and stops with the speed zero signal.        |

Remark : When power is applied to the amplifier, the sequence of the sequence mode is displayed. The type of indication at power on can be changed by system para. 89 setting.

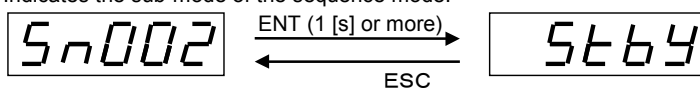
System para. 89 setting

| Setting     | Initial indication      |                        |
|-------------|-------------------------|------------------------|
| 0 (Initial) | <i>S<sub>n</sub>001</i> | Sequence               |
| 1           | <i>S<sub>n</sub>002</i> | Sub-mode               |
| 2           | <i>S<sub>n</sub>003</i> | Alarm detection        |
| 3           | <i>S<sub>n</sub>004</i> | Alarm history          |
| 4           | <i>S<sub>n</sub>005</i> | Amplifier setting      |
| 5           | <i>S<sub>n</sub>006</i> | Motor setting          |
| 6           | <i>S<sub>n</sub>007</i> | Station No. indication |

| Setting | Initial indication      |                    |
|---------|-------------------------|--------------------|
| 7       | <i>0<sub>n</sub>001</i> | Feedback speed     |
| 8       | <i>0<sub>n</sub>002</i> | Command speed      |
| 9       | <i>0<sub>n</sub>003</i> | Average torque     |
| 10      | <i>0<sub>n</sub>004</i> | Feedback position  |
| 11      | <i>0<sub>n</sub>005</i> | Command position   |
| 12      | <i>0<sub>n</sub>006</i> | Deviation amount   |
| 13      | <i>0<sub>n</sub>007</i> | Cumulated pulse    |
| 14      | <i>0<sub>n</sub>008</i> | Peak torque        |
| 15      | <i>0<sub>n</sub>009</i> | Input voltage 1    |
| 16      | <i>0<sub>n</sub>010</i> | Input voltage 2    |
| 17      | <i>0<sub>n</sub>011</i> | LS-Z pulse         |
| 18      | <i>0<sub>n</sub>012</i> | Input signal       |
| 19      | <i>0<sub>n</sub>013</i> | Output signal      |
| 20      | <i>0<sub>n</sub>014</i> | Load inertia ratio |

(2) Sub-mode

Indicates the sub-mode of the sequence mode.



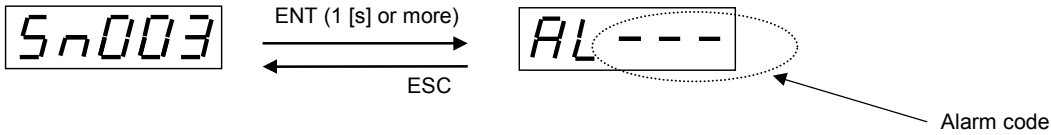
The on/off status of control input signal is indicated.

| Indication  | Description  |
|-------------|--|
| <i>boF</i>  | In base-off condition, the motor does not have driving force and in free-run status. |
| <i>Stby</i> | The motor can rotate and is waiting the run command.                                 |
| <i>JOG</i>  | The motor can rotate and is executing manual feed.                                   |
| <i>P In</i> | The motor can rotate and the pulse train input is valid.                             |
| <i>Auto</i> | The motor can rotate and is executing positioning operation.                         |
| <i>ORC</i>  | The motor can rotate and is executing origin return.                                 |
| <i>PCLP</i> | The amplifier is executing deviation clear.  |
| <i>brEA</i> | The motor can rotate and is measuring the brake timing.                              |
| <i>stop</i> | The motor is stopping with the positioning cancel signal.                            |



### (3) Alarm detection

The contents of current alarm can be displayed with codes. When [Sn004] is displayed, the alarm history can be displayed. When an alarm is detected, the following indication will appear.



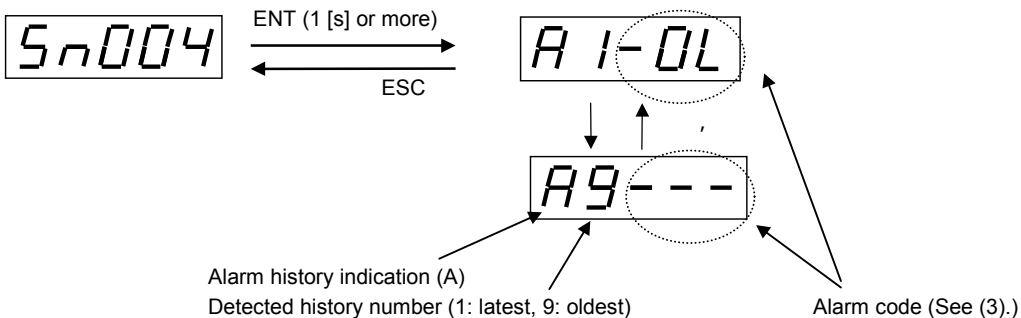
| Major fault |                                   |
|-------------|-----------------------------------|
| Indication  | Description                       |
| AL SE       | System error (SE)                 |
| AL OC       | Overcurrent (OC)                  |
| AL OS       | Overspeed (OS)                    |
| AL Lv       | Undervoltage (Lv)                 |
| AL Hv       | Overvoltage (Hv)                  |
| AL Et       | Encoder trouble (Et)              |
| AL Ct       | Circuit trouble (Ct)              |
| AL dE       | Memory error (dE)                 |
| AL Fb       | Fuse blown (Fb)                   |
| AL CE       | Combination error (CE)            |
| AL rH2      | Resistor heat 2 (rH2)             |
| AL EC       | Encoder communication error (EC)  |
| AL CtE      | Cont (Control signal) error (CtE) |
| AL OL       | Overload (OL)                     |

| Minor fault |                             |
|-------------|-----------------------------|
| Indication  | Description                 |
| AL rH       | Resistor heat (rH)          |
| AL OF       | Deviation excessive (OF)    |
| AL AH       | Amplifier overheat (AH)     |
| AL EH       | Encoder overheat (EH)       |
| AL AL       | Absolute data lost (AL)     |
| AL AF       | Absolute data overflow (AF) |
| AL tE       | Terminal error (tE)         |

Remarks : The alarm codes are indicated automatically.  
 On this indication, if the alarm detection is reset by the control input signal, the initial screen (system para. 89 setting) is displayed.  
 Resetting of alarm detection can also be executed in the test running mode.

### (4) Alarm history

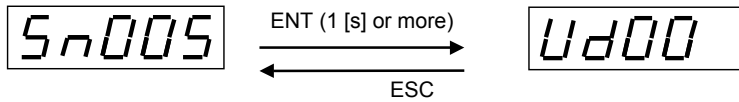
The last 9 times of alarm detection history can be indicated. The indication can be scrolled by the key and key.



Remark : The alarm history can be deleted by the test running mode [Fn005].  
 Press the key and key simultaneously for 1 [s] or more while alarm detection is indicated to reset the alarm detection.

**(5) Amplifier setting**

The amplifier control function and connecting form are indicated.



| Control function (1st digit, left end digit) |                              |
|--|------------------------------|
| Indication                                   | Function                     |
| U  | Speed control                |
| r  | Rotation indexing (dividing) |
| L  | Linear positioning           |

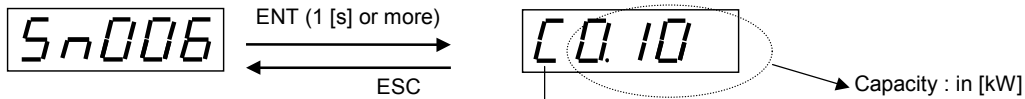
| Main control connector (2nd digit) |             |
|------------------------------------|-------------|
| Indication                         | Function    |
| d                                  | DI/DO basic |
| S                                  | SX bus      |

| Extension connector 1 (3rd digit) |                 |
|-----------------------------------|-----------------|
| Indication                        | Function        |
| □                                 | Not mounted     |
| P                                 | DI/DO extension |
| r                                 | RS485           |

| Extension connector 2 (4th digit) |             |
|-----------------------------------|-------------|
| Indication                        | Function    |
| □                                 | Not mounted |
| t                                 | T-link      |
| P                                 | Parallel    |
| A                                 | ANY bus     |
| F                                 | Multi bus   |

**(6) Motor setting**

The motor type and capacity being connected to the amplifier are indicated.

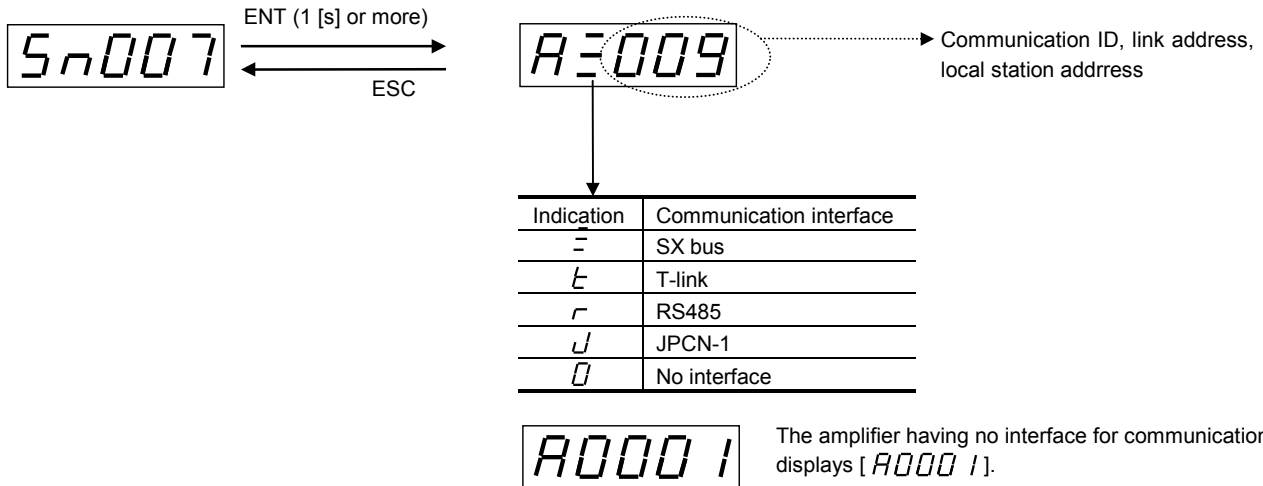


| Indication | Motor type     |
|------------|----------------|
| C          | Cubic type     |
| S          | Slim type      |
| A          | High stiffness |
| F          | Flat           |
| U          | Large capacity |

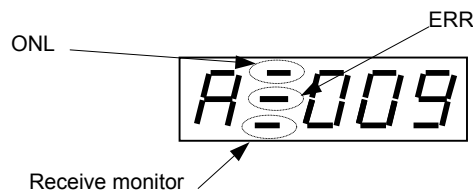
The sample indication above means a cubic type motor of 0.1 [kW].

### (7) Station number indication

The communication ID of the amplifier being connected to various network and link is indicated. For the setting of communication ID, see system para. 96.



For SX bus type, the 2nd digit indication is as follows.



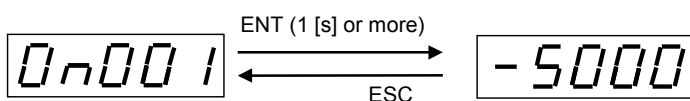
### 7.4 Monitor mode

In the monitor mode, the motor speed or the cumulative value of input pulse can be displayed. Display [ 0n00n ] by the MODE key and hold down the ENT key for at least 1 [s] to indicate the contents.

- |       |                     |       |                      |
|-------|---------------------|-------|----------------------|
| 0n001 | : Feedback speed    | 0n008 | : Peak torque        |
| 0n002 | : Command speed     | 0n009 | : Input voltage 1    |
| 0n003 | : Average torque    | 0n010 | : Input voltage 2    |
| 0n004 | : Feedback position | 0n011 | : LS-Z pulse         |
| 0n005 | : Command position  | 0n012 | : Input signal       |
| 0n006 | : Deviation amount  | 0n013 | : Output signal      |
| 0n007 | : Cumulated pulse   | 0n014 | : Load inertia ratio |

#### (1) Feedback speed

The motor's current speed. Even if the motor is driven by the load (mechanical equipment system), the correct speed will be indicated. The indication is in 1 [r/min] unit. The negative sign is added when the motor rotates in reverse (\*).



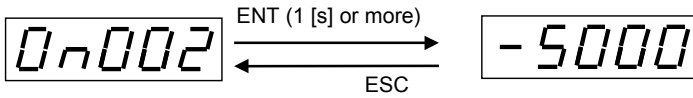
Note : (\*)

Direction of motor shaft rotation (when viewed from a point facing the drive-end of motor) is designed according to Japanese standards :

- Forward direction : Counterclockwise (CCW) rotation
- Reverse direction : Clockwise (CW) rotation

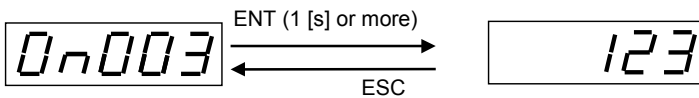
**(2) Command speed**

The speed given to the motor. The speed command voltage, multistep speed and pulse train are the command speed. The indication is in 1 [r/min] unit. The negative sign is added when the motor rotates in reverse (clockwise viewed from shaft extension).



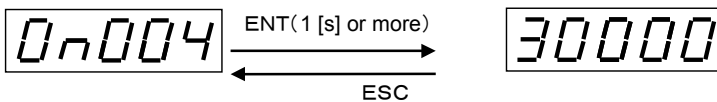
**(3) Average torque**

The motor's current load factor. The average value per second, assuming the rated torque as 100%, is indicated. The indication is from 0% through the max. torque in 1 step. The negative sign is not added.



**(4) Feedback position**

The motor current position is indicated, ranging from 1 to max. division number.

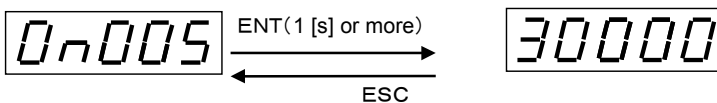


Pressing the MODE key holding down the SHIFT key interchanges the high order 4 digits and low order 4 digits.

Remarks : If the rotating direction has been altered by system para. 80, an increase from the current position raises the reading. The indication is correct even when rotated by the load (mechanical equipment system). 4 digits preceded by "H" are high order 4 digits, and those by "L" are low order 4 digits.

**(5) Command position**

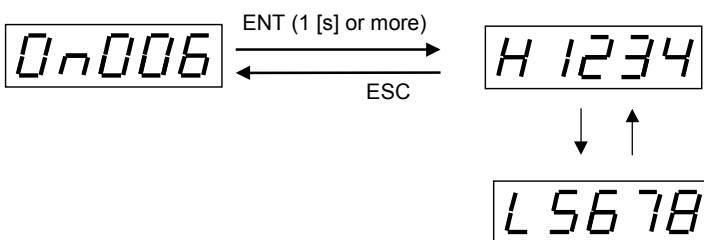
The position of motor directed by the amplifier is displayed, ranging from 1 to max. division number. After a target position is attained, if the run command is turned off and the motor is rotated by the load (mechanical equipment system), a correct position is not displayed.



Pressing the MODE key holding down the SHIFT key interchanges the high order 4 digits and low order 4 digits.

**(6) Deviation amount**

Displays the difference between command position and feedback position. The deviation is displayed in terms of encoder pulse count.

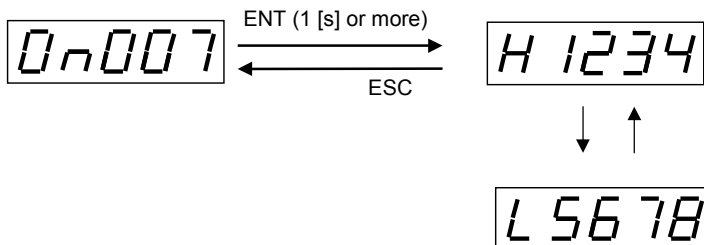


Pressing the MODE key holding down the SHIFT key interchanges the high order 4 digits and low order 4 digits.

**(7) Cumulated pulse**

Displays the number of pulse trains inputted to the pulse train input terminal. Inputting the forward pulses increases the integrated value and inputting the reverse pulses decreases the integrated value.

In case of two 90° phase-different signals, each edge is counted (quadrupling). The count increases if B phase is in lead.



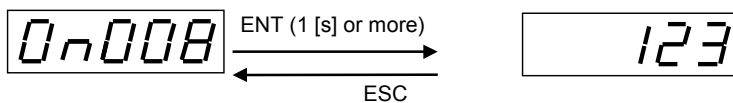
Pressing the MODE key holding down the SHIFT key interchanges the high order 4 digits and low order 4 digits.

Remarks : The maximum positive count of 99,999,999 is followed by 0. The maximum negative count of -99,999,999 is followed by 0. Hence, the count becomes 0 every ±100,000,000.

4 digits preceded by "H" are high order 4 digits, and those by "L" are low order 4 digits. In case of a negative value, H (or L) and - (minus sign) blink alternately.

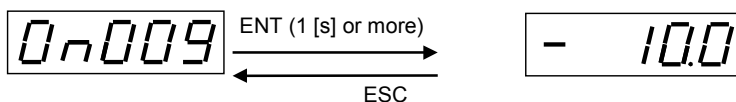
**(8) Peak torque**

Current load factor of motor. The peak value is displayed every other second in percentage assuming the rated torque as 100%. The indication is from 0% to maximum torque without minus sign.



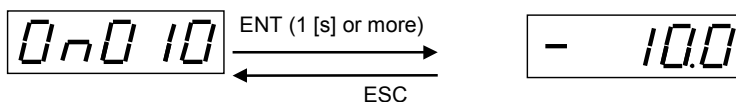
**(9) Input voltage 1**

Indicates the input voltage at the control input terminal [NREF] in 0.1 [V] steps. "-" denotes a negative voltage.



**(10) Input voltage 2**

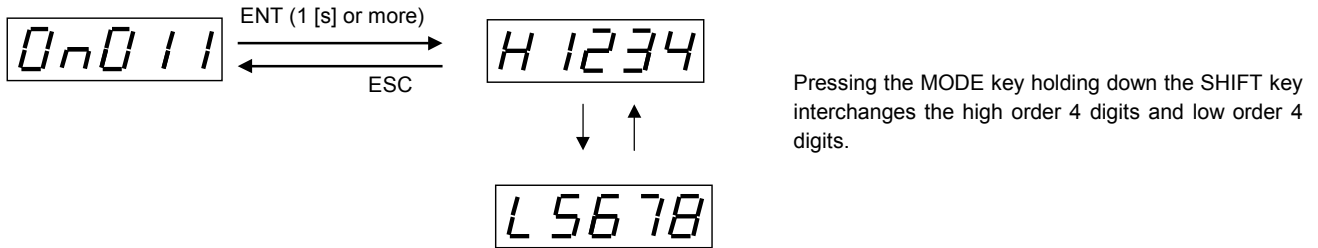
Indicates the input voltage at the control input terminal [TREF] in 0.1 [V] steps. "-" denotes a negative voltage.



\* Some amplifiers do not have the control input [TREF] terminal.

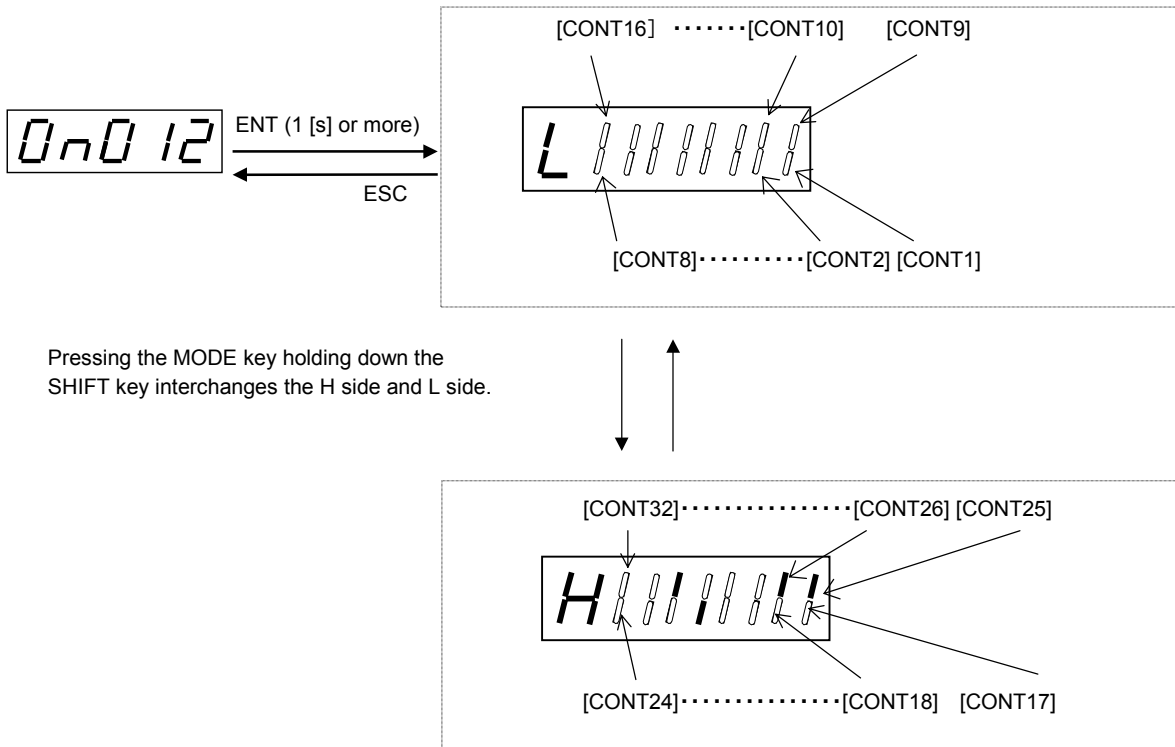
**(11) LS-Z pulse**

Displays a pulse count from when the origin LS signal has turned off at origin return until when Z-phase of motor encoder has been detected. The indication is updated at every origin return action. Since the value is in the origin return direction, there is no -(minus sign).



**(12) Input signal**

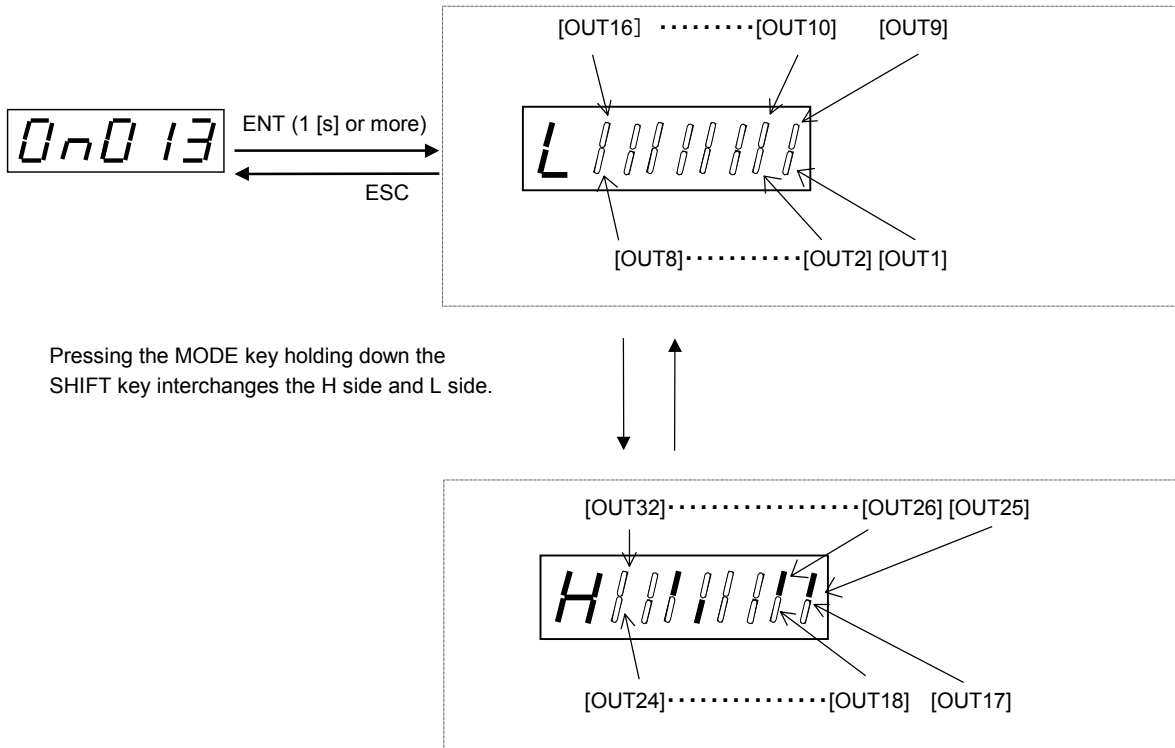
Displays whether the control input signals to the amplifier are turned on or off. If signals are turned on, corresponding LEDs are lit.



**Note :** The number of control input signals depends on the amplifier type.

**(13) Output signal**

Displays whether the control output signals from the amplifier are turned on or off. If signals are turned on, corresponding LEDs are lit.



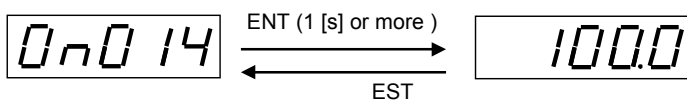
Pressing the MODE key holding down the SHIFT key interchanges the H side and L side.

**Note :** Depending on the amplifier type, the number of control output signals changes.

**(14) Load inertia ratio**

Displays the load inertia ratio recognized by the amplifier regardless of the tuning method (basic para. 31).

$$(\text{Load inertia ratio}) = \frac{(\text{Moment of inertia recognized by amplifier})}{(\text{Moment of inertia of motor})}$$



Displays the magnification (in 0.1 step) of the moment of inertia of the motor.

### 7.5 Parameter edit mode

In the parameter edit mode, basic paras. and system paras. can be edited.

Display [ *Pn000n* ] by the MODE key and hold down the ENT key for at least 1 [s] to select the basic para. or system para.

*Pn001* : Basic para.

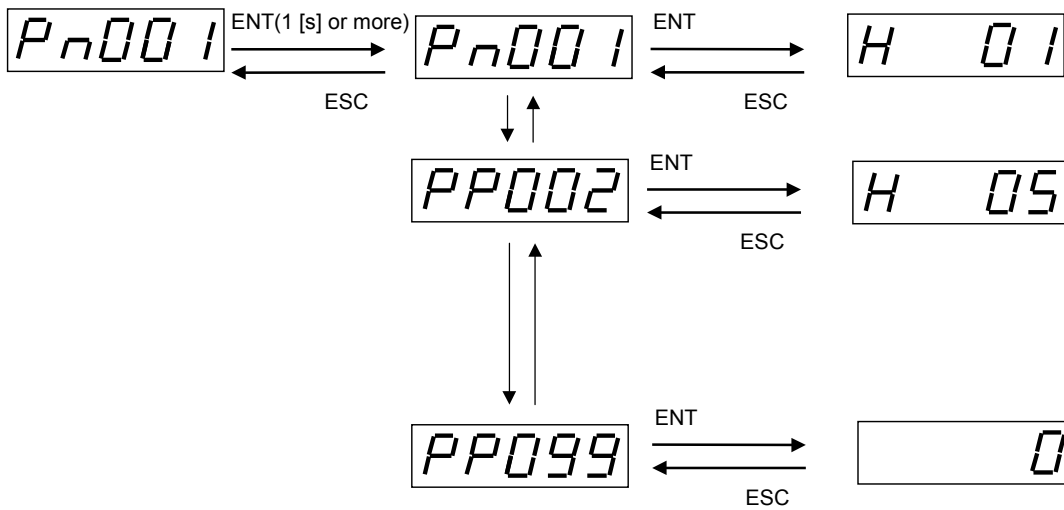
*Pn002* : System para.

By the key or key, select a number of para. By pressing the ENT key, its contents can be edited.

*PP0nn* : Basic or system para. number

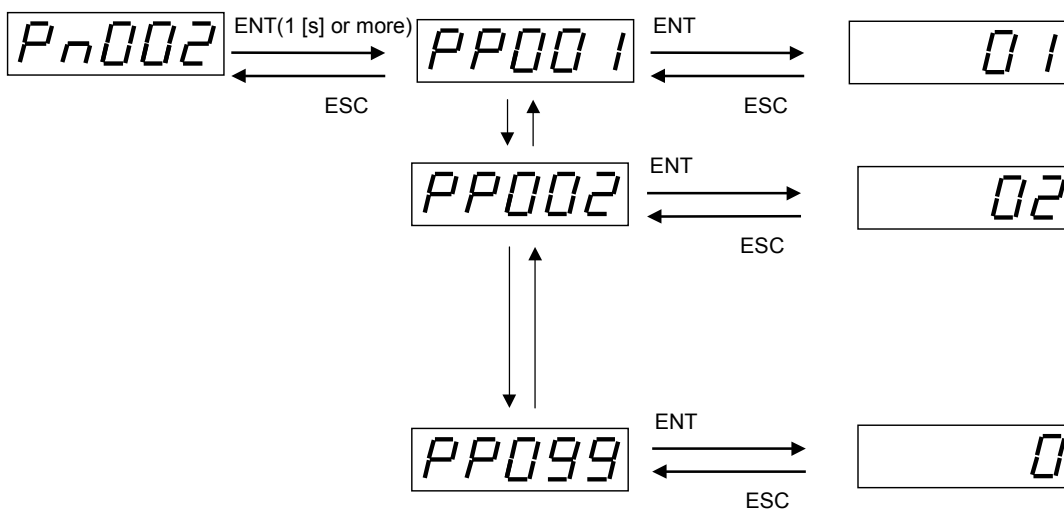
#### (1) Basic parameter

In basic para., rather frequently used contents are registered. Changed setting of most basic para. immediately affects the amplifier and motor actions.



#### (2) System parameter

System para. register the functions of input/output terminals and other contents related to system setting. Changed setting of most system para. is valid only after turning off and on power.





### (3) Indication and editing

The indication and editing methods for para. are as follows.

#### Value indication

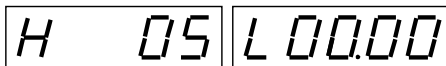
A value of unsigned 5 digits or signed 4 digits or less is displayed as it is.



Left example shows a value of 2 digits is selected.

For clearly indicating the number of digits of a selectable value, zeroes of other columns are suppressed.

A signed value of 5 digits or more is preceded by "H" or "L".

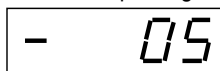


The above example shows a value has 6 digits. (The value will be 500.00.) For interchanging the H side and L side, press the MODE key holding down the SHIFT key.

#### Sign indication

In case of data with minus sign, "H" (or "L") and "-" blink alternately.

In case of data with plus sign, "H" (or "L") indication blinks.



Alternately lights

Example : Data with minus sign  
(H side)

#### Editing a value

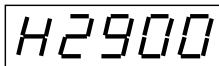
After reading a para., 1 digit or sign blinks at about 1 [s] intervals, prompting you to change that part.

Pressing the key or key changes the value. As for the sign, pressing the key or key while the cursor is located at "H" selects a plus sign (H and blank) or a minus sign (H and -).

If 9 is followed up by 0, the value at the immediately upper place increases by 1. If 0 is followed down by 9, the value at the immediately upper place decreases by 1.

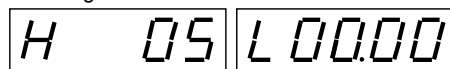


Example : 9 is followed up by 0 to give 2900.



Note that there is no borrow nor carry from H side to L side or reversely.

The shifting order is as follows.



(2) (3) (1) (4) (5)

- (1) Reading a para. allows to change the LSD(\*) of H side.
- (2) Shifting allows to change the sign.
- (3) Shifting locates the cursor to the MSD(\*) of H side. Shifting repeatedly goes to the right and then sequentially circulates within the display range of H side.
- (4) To jump from the H side to the L side, press the MODE key holding down the SHIFT key. On the L side, the MSD can be changed first.
- (5) Each press of the SHIFT key moves the cursor to the right. The LSD is followed by the MSD within the L side.

#### Storing the value

Holding down the ENT key for at least 1 [s] stores the value, blinking all digits simultaneously 3 times. The stored value remains displayed. Pressing the ESC key resumes the para. selecting screen.

#### Value beyond specified range






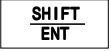



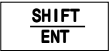
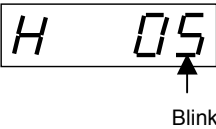


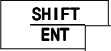
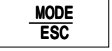
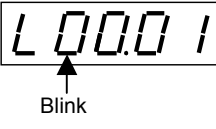
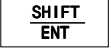
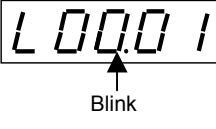

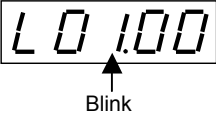
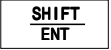

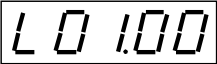
A value can be inputted within the range from minimum to maximum specified for each para.

A value beyond the specified range cannot be inputted.

(\*) LSD : Least significant digit MSD : Most significant digit

Example of editing

Let us change the setting of basic para. 2 "Manual feed speed 2" to 1.0.

| Key operation   | Indication  | Remarks   |
|---|---|---|
|   |    | The feedback speed monitor is displayed.  |
|    |    | Resumes the mode selection.   |
|    |    | Press the MODE key for selecting the parameter. edit mode.  |
|  1 [s] or more   |    | Hold down the ENT key for at least 1 [s] for display the para. 01.  |
|    |    | Select the basic para. 2.   |
|   |   | Pressing the ENT key reads the setting contents.<br>The LSD blinks. (Two MSDs of initial value 500.00 are displayed.) |
|    |  | Decrease the value to 0.  |
|   |  | Press the MODE key holding down the SHIFT key to display the L side (low order 4 digits).                             |
|    |  | Press the SHIFT key to shift the cursor to the adjacent digit on the right.   |
|    |  | Set the value to 1. Likewise, change the LSD to 0.  |
|  1 [s] or more   |  | Hold down the ENT key for at least 1 [s] to store the new value.  |
|   |  | Storing the value keeps it displayed. Pressing the ESC key resumes the para. number selecting screen.                 |

## 7.6 Positioning data edit mode

**CAUTION** : For RYS-R type amplifier, the positioning data edit mode is invalid.

The positioning data edit mode allows to edit the position data, speed data, timer data, status and M code. These 5 data compose 1 point of positioning data.

Press the MODE key to display [  $P_{000n}$  ], and hold down the ENT key for at least 1 [s] to select the data to edit.

$P_{0001}$  : Position data  
 $P_{0002}$  : Speed data  
 $P_{0003}$  : Timer data  
 $P_{0004}$  : Status  
 $P_{0005}$  : M code

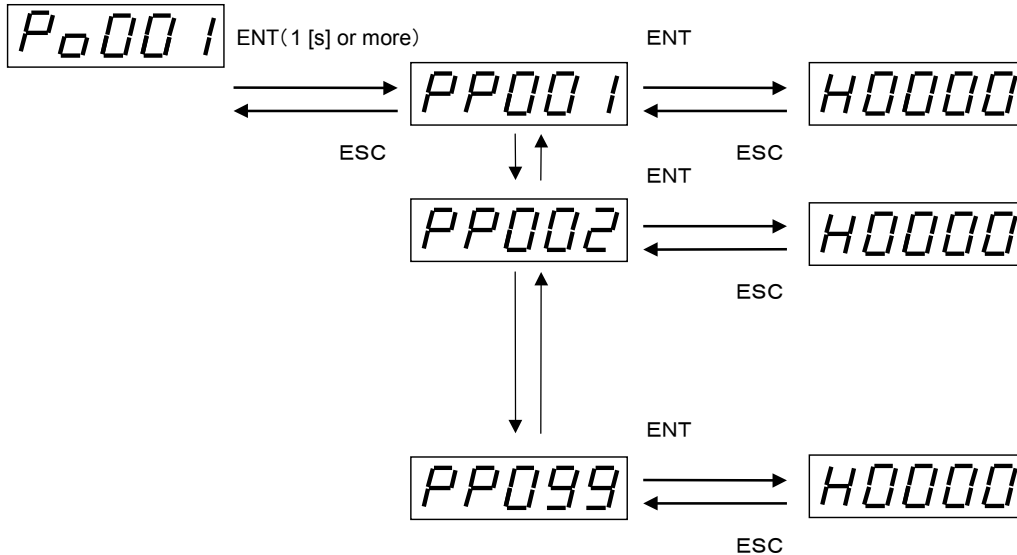
Then, press the  $\leftarrow$  key or  $\rightarrow$  key to select the number of positioning data to edit first.

Pressing the ENT key allows to edit its contents.

$PP0nn$  : Positioning data number

### (1) Position data ( $P_{0001}$ )

As the position data, set the motor stop position. The setting range is -79,999,999 to 79,999,999 in 1 step.



**(2) Speed data ( P<sub>0002</sub> )**

As the speed data, set the moving speed up to the stop position data in speed of motor shaft. The setting range is up to the maximum speed of motor in 0.01 [r/min] step.

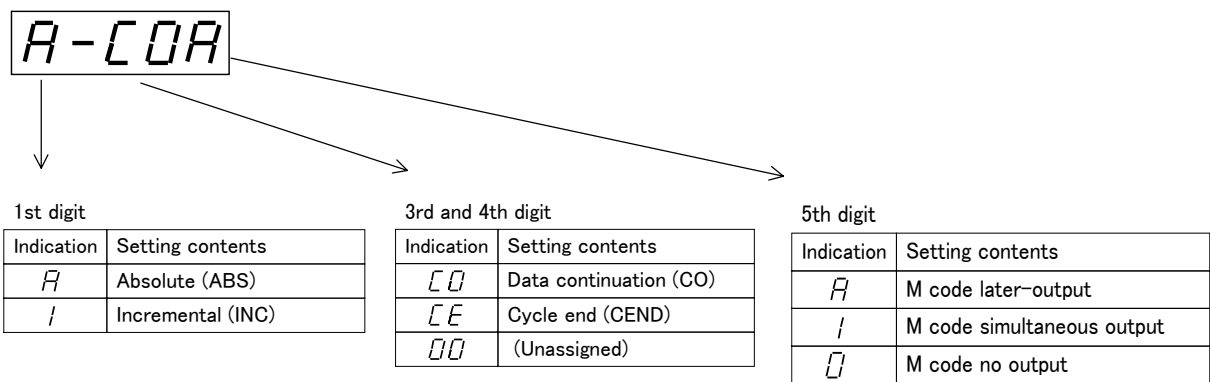
(0.00 [r/min] cannot be selected.)

**(3) Timer data ( P<sub>0003</sub> )**

As the timer data, set the timer value after arriving a stop position. The setting range is 0.00 to 999.99 [s] in 0.01 step.

**(4) Status ( P<sub>0004</sub> )**

Set various information incidental to positioning data. It can be changed by the key or key.



**(5) M code ( P<sub>0005</sub> )**

An M code to output by executing the positioning data can be edited. The setting range is 00 to FF in hexadecimal notation. (An arbitrary value is specified in 1 step.) Each digit is changeable by the key or key.



### 7.7 Test running mode

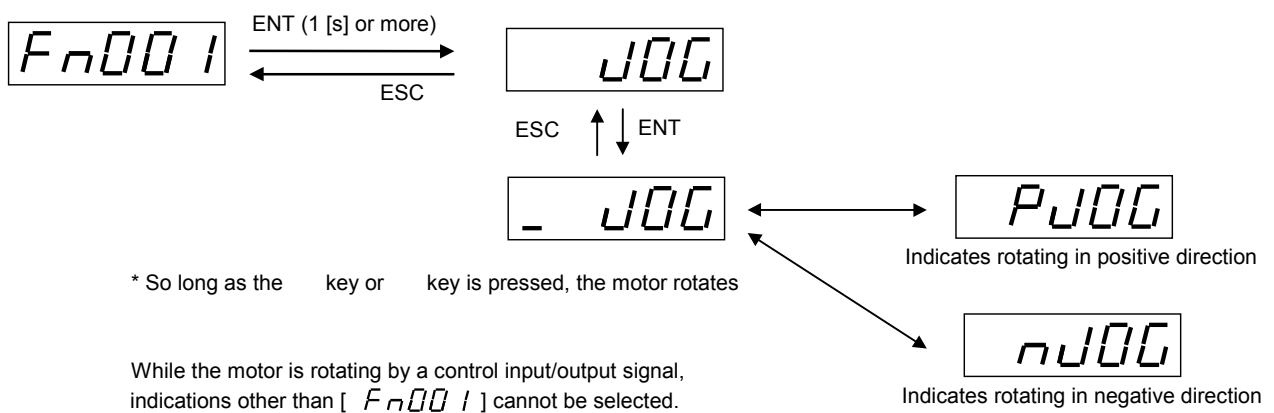
In the test running mode, keying on the keypad panel can rotate the motor or reset the different items.

Upon displaying [ *F<sub>n</sub>00n* ] by the MODE key, holding down the ENT key for at least 1 [s] executes a test running.

|                         |                   |                         |                                   |
|-------------------------|-------------------|-------------------------|-----------------------------------|
| <i>F<sub>n</sub>001</i> | : Manual feed     | <i>F<sub>n</sub>005</i> | : History initialization          |
| <i>F<sub>n</sub>002</i> | : Origin return   | <i>F<sub>n</sub>006</i> | : Parameter initialization.       |
| <i>F<sub>n</sub>003</i> | : Position preset | <i>F<sub>n</sub>007</i> | : Positioning data initialization |
| <i>F<sub>n</sub>004</i> | : Alarm reset     | <i>F<sub>n</sub>008</i> | : Automatic offset adjust         |

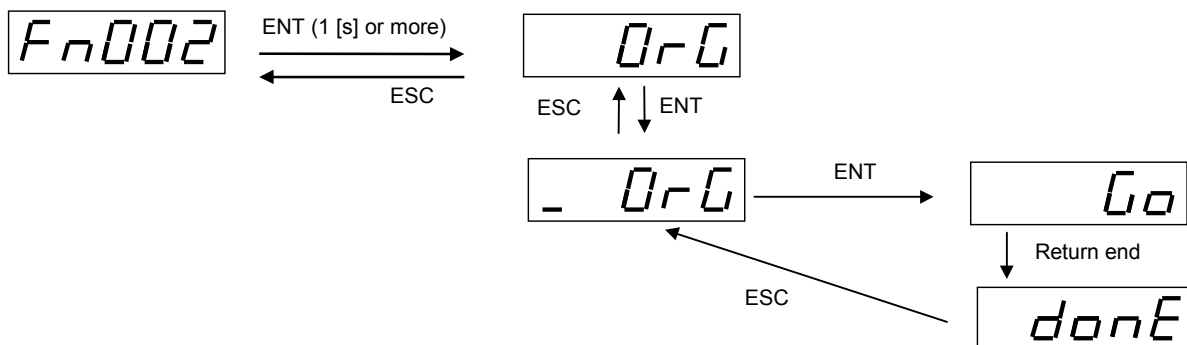
#### (1) Manual feed ( *F<sub>n</sub>001* )

So long as a key on the keypad panel is pressed, the motor rotates. The motor speed is as set by basic para. 1.



#### (2) Origin return ( *F<sub>n</sub>002* )

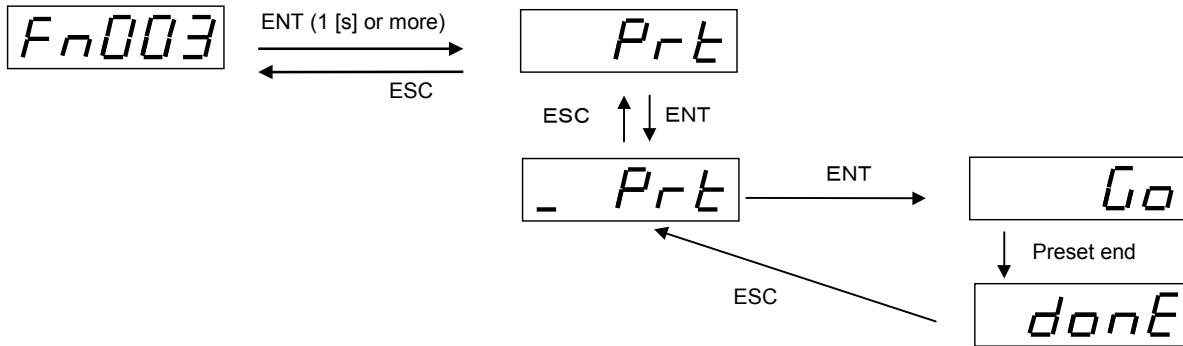
Keying on the keypad panel performs an origin return. The origin return is made according to basic para. 72 to 77. Change of basic para. 72 and 73 settings is valid only after turning off and on power.



After the end of origin return, the indication remains [ *donE* ]. Pressing the ESC key resumes a sub-mode selection.

**(3) Position preset (Fn003)**

The current position of motor can be preset. The following alarm detection can be reset.  
 · ABS data loss



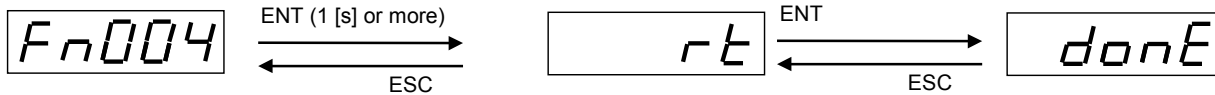
Current position is the followings :

- (a) [D14] to [D0] input value for RYS      S3-RPS type
- (b) Station No. of 8, 9 word position for RYS      -RSS type
- (c) Station No. of +6, +7 word position for RYS      S3-RTS type

Position preset cannot be made while the motor is rotating and while on status of the clamping end signal.

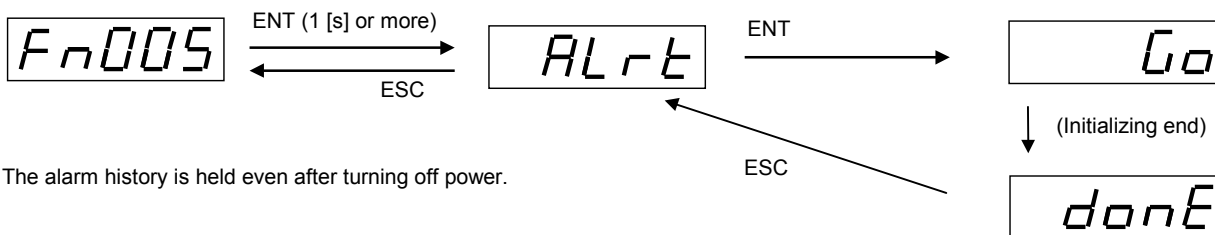
**(4) Alarm reset (Fn004)**

Resets the alarm detected by the amplifier.



**(5) History initialization (Fn005)**

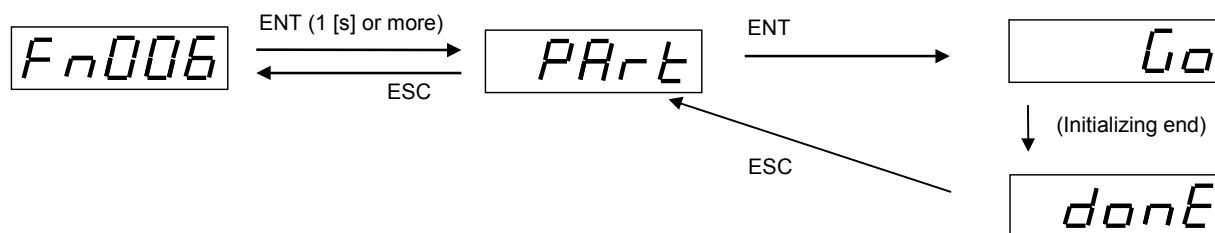
Deletes the history of alarms detected held by the amplifier.  
 This history can be monitored by a sequence mode of [Sn004].



The alarm history is held even after turning off power.

**(6) Parameter initialization (Fn006)**

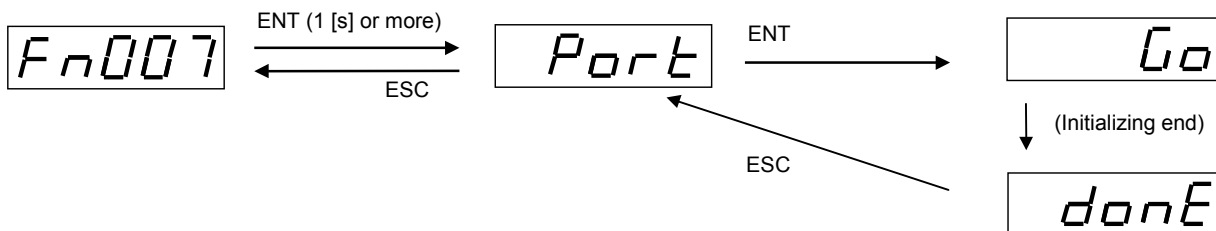
Initializes the basic para. and system para.  
 \* After initializing, be sure to turn off and on power.



### (7) Positioning data initialization (Fn007)

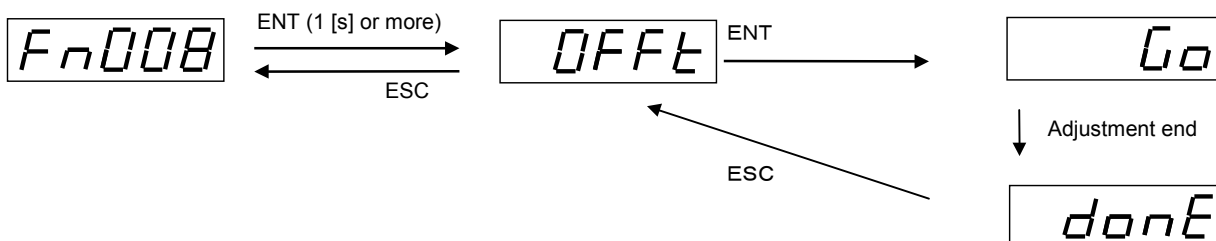
Initializes all positioning data.

\* After initializing, be sure to turn off and on power.



### (8) Automatic offset adjust (Fn008)

Sets the input voltage to the control input terminals [NREF] at 0 [V].



**Automatic offset adjust is only valid for RYS-R basic type. SX bus and T-link types do not have the analog voltage input terminal.** Motor can be rotated with the analog speed command voltage, when FWD (or REV) signal command turns off all of X1, X2 and X3 of multispeed selections.

When the speed command voltage is placed as nearly 0 [V], motor may be rotates slowly.

Adjusting procedure of offset voltage is as follows :

- (1) Sets 0 [V] at the terminal [NREF].  
Whether the run command is given or not has no influence.
- (2) Select [Fn008] on the keypad panel and press the ENT key, then the offset can be adjusted automatically.
- (3) Make sure that the motor will not rotate even if the run command is on.

Remarks:

The adjustment result will be stored in system para. 64.

Along with the change of ambient environment, the offset adjust may be required again.

With the setting of system para. 81, the operation at stoppage can be selected. When the servo lock is selected, the motor can be stopped by the servo lock even in speed control mode. However, when the host controller is controlling the amplifier using the speed command voltage and freq. dividing output pulse (feedback), do not select the servo lock.

## 8. TEST (TRIAL) RUNNING OPERATION

### 8.1 Preparation

#### (1) Preparation

A test running is carried out upon connecting the amplifier and motor. For the wiring method, see 4. TERMINAL DIAGRAMS AND WIRING. For the test running, the motor is not connected to the mechanical equipment system and, when the operation is normal, it is connected to the mechanical equipment system.

##### (a) Main circuit power input

The amplifier power supply includes main circuit power input (L1, L2, L3) and control power input (L1C, L2C). The amplifier can be operated even if the control power input terminal is not connected to the power supply.

##### (b) Main circuit power supply

Connect the motor power line to the (U, V, W,  $\pm$ ) terminals on the amplifier terminal block (board). Changing the phase sequence cannot change the motor rotational direction.

##### (c) Encoder wiring

Connect the encoder for the motor to CN2 on the amplifier using a specified cable.

##### (d) Control input/output wiring

Do not connect CN1 and CN3 of the amplifier, when the test running temporary.

#### (2) Power supply

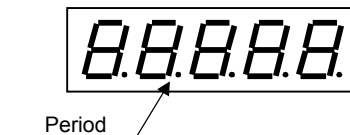
Supply the main circuit power to the amplifier. If the status is as follows, the amplifier is operating properly.

##### ■ LED indication

When power is supplied, the "CHARGE" LED under the keypad panel of amplifier is lit red.

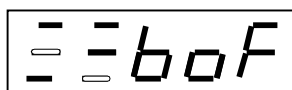
##### ■ 7-segment indication

Periods for all of five 7-segment digits light once simultaneously.



##### • Basic type (DI/DO position)

If the para.(\*) are as set at factory, the sequence of sequence mode appears.



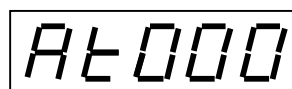
##### • SX bus (SX bus direct connection)

If the para. are as set at factory, the station number of sequence mode appears.



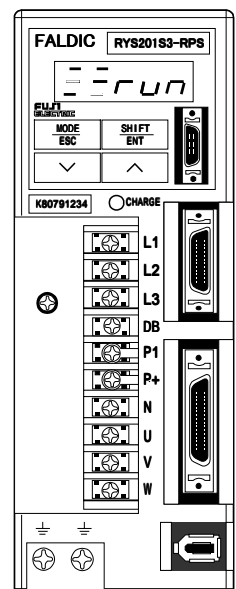
##### • T-link (T-link direct connection)

If the para. are as set at factory, the station number of sequence mode appears.



Remark : The "CHARGE" LED lights with either the main circuit power supply or control power supply on. Depending on the system para. setting, ABS data lost [AL] or other alarms may occur but it is not abnormal.

(\*) Para. : Parameter(s)





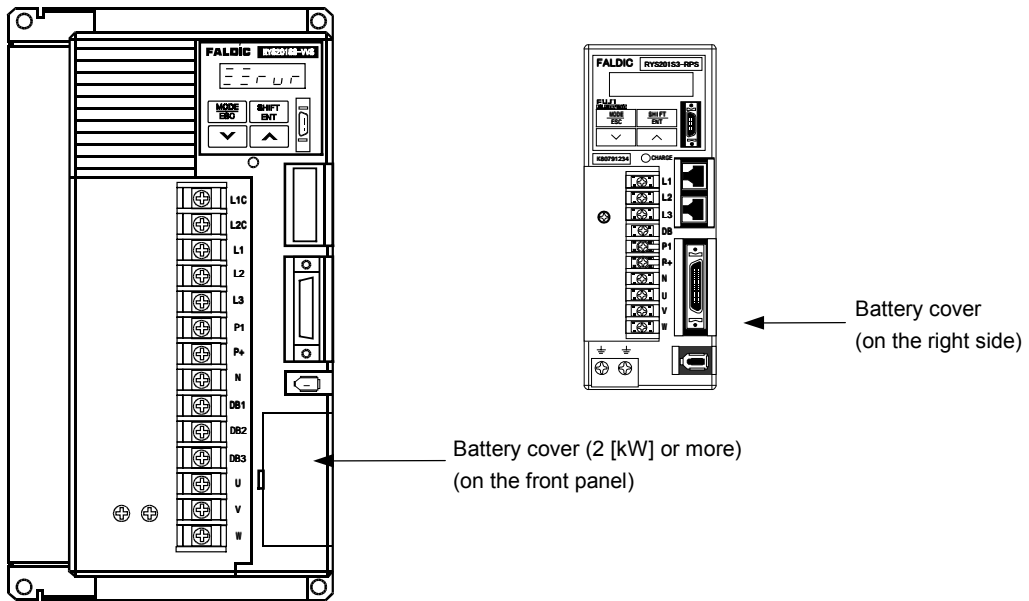
**(3) Absolute system [ABS]**

If an absolute system is used, carry out a start up in the following procedure.

**(a) Battery**

Install a battery (WSB-S type) on the amplifier as follows.

- (i) Pull open downward the cover for the battery holder located on the right side of amplifier. (For the amplifier of 2 [kW] or more, pull open the cover toward this side.)
  - (ii) In the battery holder, there is a connector which is to be engaged with the connector provided for the battery.
  - (iii) Engage the connectors and close the cover in place.
- (Be sure to connect while power is off.)



**(b) System para.**

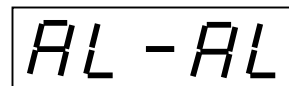
Turn on the power supply, and set system para. 99 to “1”.

**(c) Turning off power**

To validate the set value of system para. 99, turn off and on power. Make sure the 7-segment on the keypad panel is extinguished (goes out) before turning on again.

**(d) Power supply**

Supplying power produces an alarm “Absolute data lost”. This is because the current position data of encoder has been lost.



**(e) Resetting the detected alarm**

Execute the position preset [ F n 0 0 3 ] in the test running mode to reset the alarm detection of "Absolute data lost."

This alarm detection cannot be reset by [RST].

Thereafter, the ABS system is validated.

Either execute the origin return action or input the position preset signal at the normal position.

#### (4) Station No. setting

- Basic type (DI/DO position)

Station No. setting is not necessary.

- SX bus type (SX bus direct connection)

Specifies the station No. in the system definition of D300win. Use the amplifier as it is with the station No. "0". (Use it as the system para. 96 setting at "0" as it is.)

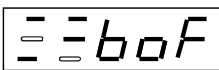


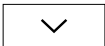


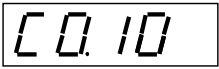
Set just the same station No. to system para. 96 to make the fail-soft function of SX bus valid.

- T-link (T-link direct connection)

Set the T-link address to system para. 96.

#### 8.2 Motor

Check the motor model type and rated output [kW].

| Key operation   | Indication (example)  | Remark   |
|---|---|--|
|   |    | The sequence is displayed.   |
|    |    | By the ESC key, select the sub-mode.   |
|   |   | By the key or key, select [ Sn006 ].   |
|  |  | Pressing the ENT key for at least 1 [s] displays the motor model type. GYC type ("C" of cubic) motor of 0.1 [kW] is displayed on the left example. |

#### 8.3 Basic type (DI/DO position)




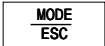


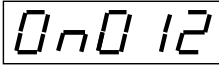
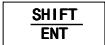

The basic type amplifier operates according to the control input signals.

##### (1) Control input signals

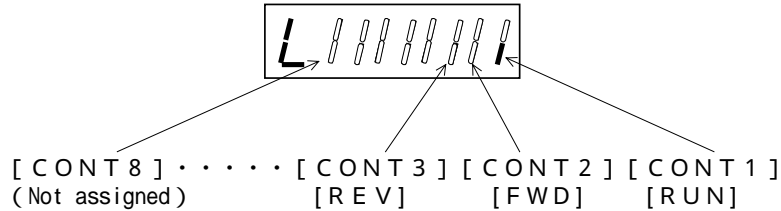
In the monitor mode of the keypad panel, the control input signal on/off status can be checked.

The main circuit power input and control input/output power supply (+24 [V] DC) can be supplied.

CONT13 (forced stop) is an NC contact input.

| Key operation   | Indication (example)  | Remark   |
|---|---|--|
|   |  | Example of test running mode display   |
|  |  | The MODE key selects a mode.   |
|  |  | Select the monitor mode.   |
|  |  | By the key or key, select [ On012 ].   |
|  |  | Holding down the ENT key for at least 1 [s] allows to check the input signal on/off. |

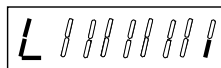
If a control input signal on CN1 turns on, the corresponding LED lights.  
 The input signal display [ 0n0 12 ] in the monitor mode is updated in real-time.



**(2) Manual operation**

By turning on the CONT1 [RUN] of amplifier (as factory set), the motor can be rotated.  
 If output signals (PLC, etc.) to the amplifier are not inputted to the amplifier, check the +24 [V] DC power supply to CN1.

- (a) Supply power to the amplifier.
  - (b) Make sure a voltage is outputted from the +24 [V] DC power supply.
  - (c) Check the connection of forced stop signal (Beware of NC contact input.)
  - (d) Turn on the run command [RUN] signal.
- By the keypad panel of amplifier, make sure the LEDs light according to the run command.



(e) On the keypad panel, the sequence mode recognized by the amplifier can be checked.

| Key operation | Indication (example) | Remark   |
|---------------|----------------------|--|
|               |                      | Example of monitor mode display  |
|               |                      | The MODE key selects a mode.   |
|               |                      | Change the mode.   |
|               |                      | Change the mode.   |
|               |                      | Change the mode.   |
|               |                      | Change the mode.   |
|               |                      | By the  key or  key, select [ Sn00 1 ].                                |
|               |                      | Holding down the ENT key for at least 1 [s] causes a sequence display. |
|               |                      | Turning on [RUN] signal displays [  ].                                 |

- (f) The motor starts running by turning on the CONT2 [FWD] signal after turning on CONT12 [X1].  
 At factory setting, the motor speed is 100 [r/min] (basic para. 1 setting).  
 (g) Turning off the CONT2 [FWD] stops the motor whether CONT7 [X1] is on or not.

#### 8.4 SX bus (SX bus direct connection)









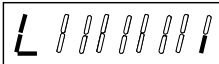
The SX bus direct connection type amplifier operates according to the on/off status of IQ area.

##### (1) Control input signal

At factory setting, no signals are allocated to CN1.  
 Test running can be made without connecting to CN1.

For safety purpose, allocate the following signals before usage. The forced stop (10) is an NC contact input, and requires the control power +24 [V] DC.

- Forced stop (10)
- Origin LS (6)

| Key operation   | Indication display (example)  | Remark   |
|---|---|--|
|   |   | Example of test running mode display   |
|  |  | The MODE key selects a mode.   |
|  |  | Select the monitor mode.   |
|  |  | By the    key or    key, select [ On012 ]  |
|  |  | Holding down the ENT key for at least 1 [s] allows to check the input signal ON/OFF. |

If a control input signal on CN1 turns on, the corresponding LED lights.  
 The input signal display [ On012 ] in the monitor mode is updated in real-time.

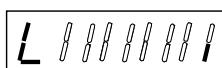
## (2) Manual operation

By turning on the CONT6 [RUN] of IQ area (as factory set), the motor can be rotated.

For the station No., see 5.8 IQ area (SX bus). If the station number setting is 50, specify "%QX50. 15. 15" to CONT6. If a signal is allocated to CN1, check the +24 [V] DC power supply to CN1.

- (a) Supply power to the amplifier.
- (b) Make sure a voltage is outputted from the +24 [V] DC power supply.
- (c) Check the connection of forced stop signal (Beware of NC contact input.)
- (d) Turn on the run command [RUN] signal.

By the keypad panel of amplifier, make sure the LEDs light according to the run command.



- (e) On the keypad panel, the sequence mode recognized by the amplifier can be checked.
- (f) The motor starts running by turning on the CONT7 [FWD] signal after turning on CONT12 [X1].  
At factory setting, the motor speed is 100 [r/min] (basic para. 1 setting).
- (g) Turning off the CONT7 [FWD] stops the motor whether CONT12 [X1] is on or not.

| Key operation | Indication display (example) | Remark   |
|---------------|------------------------------|--|
|               |                              | Example of monitor mode display  |
|               |                              | The MODE key selects a mode.   |
|               |                              | Change the mode.   |
|               |                              | Change the mode.   |
|               |                              | Change the mode.   |
|               |                              | Change the mode.   |
|               |                              | By the  key or  key, select [  ].                                      |
|               |                              | Holding down the ENT key for at least 1 [s] causes a sequence display. |
|               |                              | Turning on [RUN] signal displays [  ].                                 |

• IQ area (at factory setting)

| Address | 15   | 14        | 13           | 12            | 11               | 10        | 9         | 8         | 7                 | 6   | 5                  | 4 | 3 | 2 | 1                  | 0               |  |
|---------|--|-----------|--------------|---------------|------------------|-----------|-----------|-----------|-------------------|-----|--------------------|---|---|---|--------------------|-----------------|--|
| 0       | Current position, current deviation, basic para., system para., LS-Z phase pulse<br>(Low order word PC Amplifier)  |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 1       | Current position, current deviation, basic para., system para., LS-Z phase pulse<br>(High order word PC Amplifier) |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 2       | Current speed (Low order word PC ←Amplifier)   |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 3       | Current speed (High order word PC ←Amplifier)  |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 4       | Current torque (PC ←Amplifier)   |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 5       | -  |           |              | Alarm code    |                  |           |           |           |                   | -   |                    |   |   |   |                    |                 |  |
| 6       | -  |           |              |               |                  | CSEL<br>2 | CSEL<br>1 | CSEL<br>0 | Para. current No. |     |                    |   |   |   |                    |                 |  |
| 7       | RDY  | W<br>PSET | CPU<br>ready | Data<br>error | Address<br>error | -         | -         | -         | -                 | -   | -                  | - | - | - | Rewrite<br>end     | Read<br>end     |  |
| 8       | Specified station/basic para./system para. (Low order word PC →Amplifier)  |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 9       | Specified station/basic para./system para. (High order word PC →Amplifier)   |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 10      | Speed command (Low order word PC →Amplifier)   |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 11      | Speed command (High order word PC →Amplifier)  |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 12      | -  |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 13      | -  |           |              |               |                  |           |           |           |                   |     |                    |   |   |   |                    |                 |  |
| 14      | -  |           |              |               |                  | SEL2      | SEL1      | SEL0      | Para. No. setting |     |                    |   |   |   |                    |                 |  |
| 15      | RUN  | FWD       | REV          | RST           | START            | ORG       | X1        | VEL0      | VEL1              | DIR | Position<br>preset | - | - | - | Rewrite<br>command | Read<br>command |  |

### 8.5 T-link (T-link direct connection)

The T-link direct connection type amplifier operates according to the on/off status of WB area.









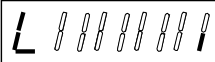
#### (1) Control input signal

At factory setting, no signals are allocated to CN1.

Test running can be made without connecting to CN1.

For safety purpose, allocate the following signals before usage. The forced stop (10) is an NC contact input, and requires the control power +24 [V] DC.

- Forced stop (10)
- Origin LS (6)

| Key operation   | Indication (example)  | Remark   |
|---|---|--|
|   |    | Example of test running mode display   |
|    |    | The MODE key selects a mode.   |
|    |   | Select the monitor mode.   |
|  |  | By the    key or    key, select [ On012 ].   |
|  |  | Holding down the ENT key for at least 1 [s] allows to check the input signal on/off. |

If a control input signal on CN1 turns on, the corresponding LED lights.

The input signal display [ On012 ] in the monitor mode is updated in real-time.

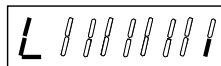
**(2) Manual operation**

By turning on the bit 0 in word +4 [RUN] of WB area (as factory set), the motor can be rotated.

For the WB area, see 5.9 WB area. If the top address setting is 50, specify "B540" at bit 0 in word +4. If a signal is allocated to CN1, check the +24 [V] DC power supply to CN1.

- (a) Supply power to the amplifier.
- (b) Make sure a voltage is outputted from the +24 [V] DC power supply.
- (c) Check the connection of forced stop signal (Beware of NC contact input.)
- (d) Turn on the run command [RUN] signal.

By the keypad panel of amplifier, make sure the LEDs light according to the run command.



- (e) On the keypad panel, the sequence mode recognized by the amplifier can be checked.
- (f) The motor starts running by turning on the bit 2 in word +4 [FWD] signal after turning on bit A in word +4 [X1]. At factory setting, the motor speed is 100 [r/min] (basic para. 1 setting). Make sure that the current position indication changes in words +2, +3.
- (g) Turning off the CONT7 [FWD] stops the motor whether CONT12 [X1] is on or not.

| Key operation | Indication display (example) | Remark   |
|---------------|------------------------------|--|
|               |                              | Example of monitor mode display  |
|               |                              | The MODE key selects a mode.   |
|               |                              | Change the mode.   |
|               |                              | Change the mode.   |
|               |                              | Change the mode.   |
|               |                              | Change the mode.   |
|               |                              | By the  key or  key, select [  ].  |
|               |                              | Holding down the ENT key for at least 1 [s] causes the sequence display. |
|               |                              | Turning on [RUN] signal displays [  ].                                   |



· WB area (at factory setting)

| Address | 0                             | 1                        | 2         | 3            | 4             | 5    | 6               | 7            | 8           | 9          | A               | B               | C | D | E | F |  |
|---------|-------------------------------|--------------------------|-----------|--------------|---------------|------|-----------------|--------------|-------------|------------|-----------------|-----------------|---|---|---|---|--|
| +0      | RDY                           | WPSET                    | CPU ready | Alarm detect | Address error | —    | —               | LS detect    | EMG detect  | Data error | —               | —               | — | — | — | — |  |
| +1      | —                             | ALM4                     | ALM3      | ALM2         | ALM1          | ALM0 | Rewrite end     | Read end     | —           |            |                 |                 |   |   |   |   |  |
| +2      | Read data (High order word    |                          |           |              |               |      |                 |              |             |            | PC ← Amplifier) |                 |   |   |   |   |  |
| +3      | Read data (Low order word     |                          |           |              |               |      |                 |              |             |            | PC ← Amplifier) |                 |   |   |   |   |  |
| +4      | RUN                           | START                    | FWD       | REV          | ORG           | EMG  | RST             | VEL0         | VEL1        | DIR        | X1              | Position preset | — | — | — | — |  |
| +5      | —                             | Read/Rewrite data select |           |              |               |      | Rewrite command | Read command | Address No. |            |                 |                 |   |   |   |   |  |
| +6      | Rewrite data (High order word |                          |           |              |               |      |                 |              |             |            | PC → Amplifier) |                 |   |   |   |   |  |
| +7      | Rewrite data (Low order word  |                          |           |              |               |      |                 |              |             |            | PC → Amplifier) |                 |   |   |   |   |  |

## 9. INSPECTION AND MAINTENANCE

### 9.1 Inspection

#### (1) Before inspection

Because the amplifier is composed of electronic components, normally inspection is not necessary.

Because the motor is a synchronous type (brushless) motor, the motor does not have the part to inspect usually.

Both the amplifier and motor are maintenance-free. However, perform periodic inspection to prevent accidents beforehand and ensure the reliability of equipment.



#### DANGER

- Prior to inspection, turn off power and wait for at least five minutes. Otherwise, there is a risk of electric shock.
- Do not touch the amplifier when the commercial power is supplied. Otherwise, there is a risk of electric shock.

#### (2) Inspection items

| Device    | Inapplicable item   |
|-----------|---|
| Motor     | Abnormal vibration (on motor-shaft and bearing-housings, etc.)<br>Direct exposure to water, steam or oil<br>Misalignment of mechanical coupling at shaft extension                      |
| Amplifier | Loose screws of terminal block (board) and fastening parts<br>Excessive accumulation of dust<br>Nasty smell, damage due to heat, external deformation, cable-wire discontinuation, etc. |

Ensure that the "CHARGE" LED is extinguished (goes out) on keypad panel, before the checking of electrical wirings.



#### CAUTION

Withstand voltage and insulation test with megger and connection test of PC-board and terminals of amplifier must not be conducted. Otherwise, there is a risk of damage to amplifier or encoder built in the motor.

### 9.2 Memory backup

#### (1) Memory backup

An electrically rewritable EEPROM is used for retaining the following items after turning off power supply.

- (i) Basic para. and system para.
- (ii) Positioning data (RYS-L type amplifier only)
- (iii) Alarm detection history

Each area can be initialized by turning off the run command [RUN] of the amplifier (while motor is de-energized).

- (a) Initialization of parameter

To initialize, select the para. initialization [ *F n006* ] in the test running mode and press the ENT key.

Notice : After the initialization, be sure to turn on power again.

*F n006*

The initialization is not allowed if rewrite is inhibited by system para. 94.

*PARt*

The initialization is impossible while the motor is energized with the [RUN] signal on.

- (b) Initialization of positioning data (RYS-L type amplifier only)

To initialize, select the positioning data initialization [ *F n007* ] in the test running mode and press the ENT key.

Notice : After the initialization, be sure to turn on power again.

*F n007*

The initialization is not allowed if rewrite is inhibited by system para. 95.

*PARt*

The initialization is impossible while the motor is energized with the [RUN] signal on.

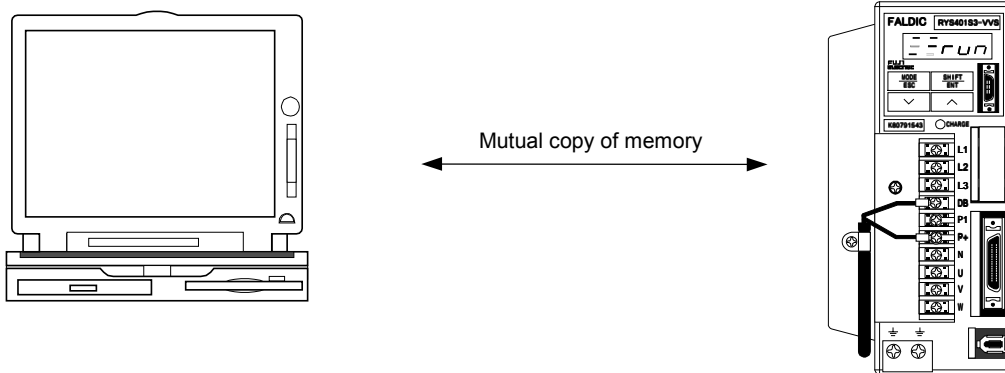
(c) Initialization of alarm detection history

The alarm detection history is held at all times. It can be initialized by the history initialization [ *F n 005* ] in the test running mode of the keypad panel.

**(2) Copying the memory**

Use of a handy-loader or PC-loader can copy the setting contents of amplifier to the loader or, reverse, the loader contents can be transferred to the amplifier.

If you have no technical documents for operation of handy-loader or PC-loader, contact us.



**(3) Saving the setting contents into RAM**

The EEPROM reaches its end of expected-service life after approx. 100,000 operations.

If basic para. and positioning data are saved in RAM, rewriting is available any number of times.

For saving in RAM, refer to 6.3 (5).

Para. and positioning data saved in RAM can be rewritten any number of times.

Turning on power selects default values.

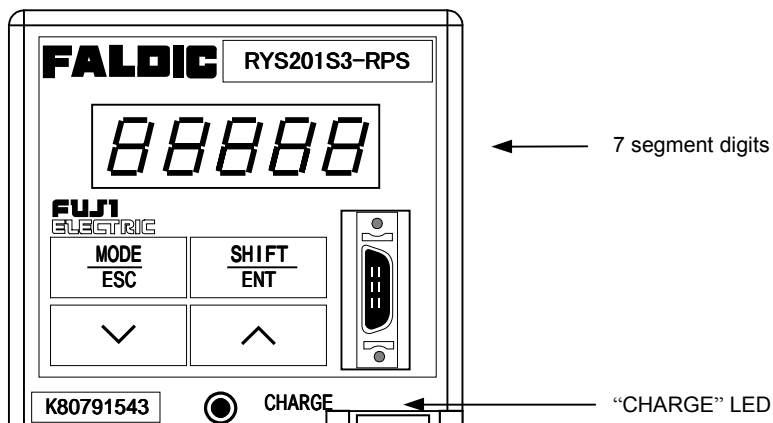
**9.3 Fault display**

The fault diagnosis is explained in three sections below.

- (1) Initial status
- (2) When error (failure) is not displayed
- (3) Faults with alarm indication

**(1) Initial status**

After turning on commercial power for the amplifier, some of 7 segments on the keypad panel lit (light up). The "CHARGE" LED lights on the keypad panel.



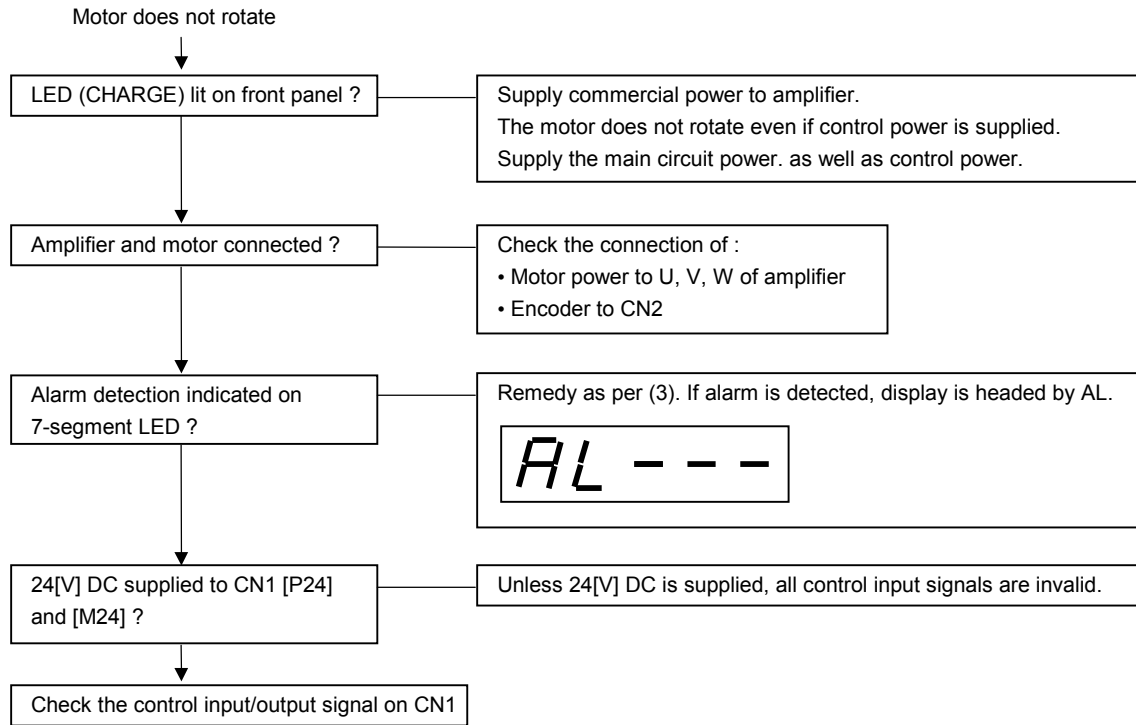
If turning on power displays nothing, contact us.

Supplying only the control power lights the display.

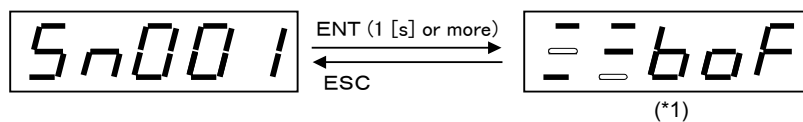
**(2) When error (failure) is not displayed**

The following exemplifies checkup procedure. As required, contact us.

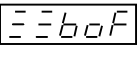
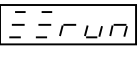
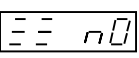
**(a) Motor does not rotate**



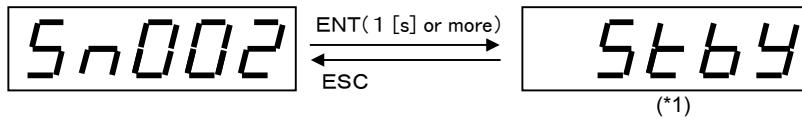
(i) Sequence display



(\*1) Displays current (present) status

| Indication  | Description  | Check and remedy  |
|---|--|---|
|  | In base-off condition, the motor has no driving force and in free-run status.                  | <ul style="list-style-type: none"> <li>• Turn on the run command [RUN].</li> <li>• Turn off the free-run command [BX].</li> </ul> |
|  | The motor can rotate.  | Proceed to (ii).  |
|  | The amplifier has received a forced stop [EMG] signal and stops with the speed zero signal on. | Reset [EMG] by on.  |

(ii) Sub-mode display



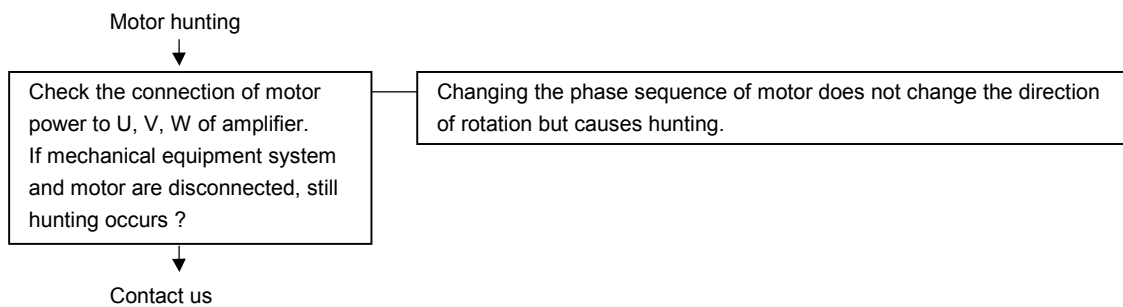
(\*1) Displays the current present status

| Indication | Description   | Check and remedy  |
|------------|---|---|
| boF        | In base-off condition, the motor has no driving force and in free-run status. | Turn on the run command [RUN].<br>Turn off the free-run command [BX].                           |
| StbY       | The motor can rotate and is waiting the run command.                          | Manual forward [FWD] may not be valid.  |
| JDG        | The motor can rotate and is executing manual feed.                            | The motor is already rotating.<br>Increase the analog input voltage or multistep speed setting. |
| PIn        | The motor can rotate and the pulse train input is valid.                      | The pulse train may not be input or the pulse train signal form may be different.               |
| Auto       | The motor can rotate and is executing positioning operation.                  | Increase the speed data.  |
| OrG        | The motor can rotate and is executing origin return.                          | Increase the origin creep speed.  |
| IntP       | The motor can rotate and is executing interrupt positioning.                  | -   |
| PCLP       | The amplifier is executing deviation clear.                                   | Invalidate the deviation clear signal.  |
| brEA       | The motor can rotate and is measuring the brake timing.                       | -   |
| StoP       | The motor is stopping with positioning cancel signal.                         | Invalidate the positioning cancel signal.   |

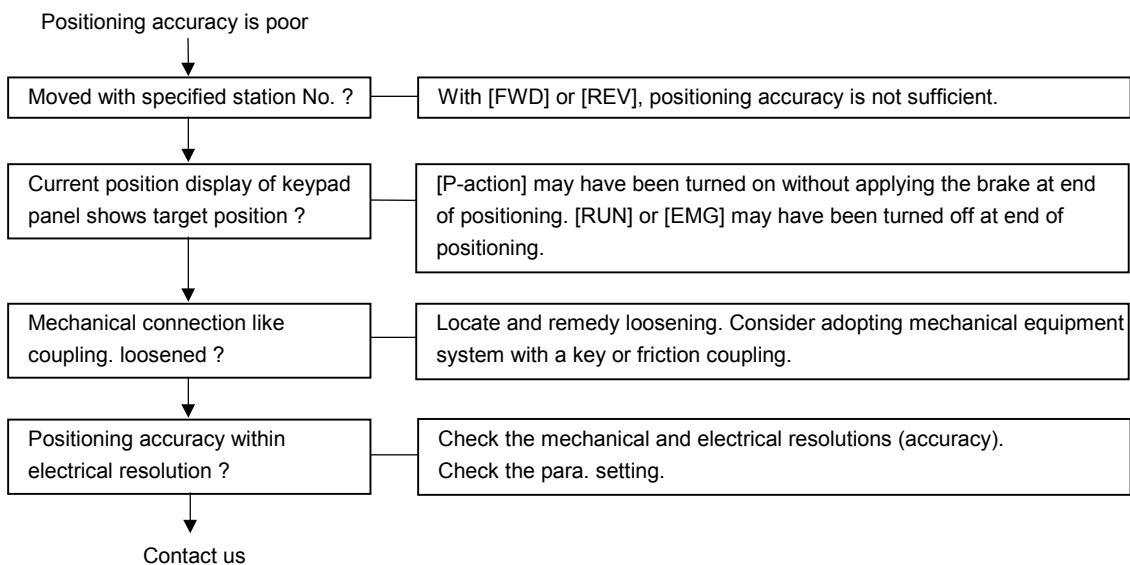
**(b) Motor hunting rotation (motor shaft rotates forward/reverse repeatedly)**

The amplifier which incorporates a real-time turning function estimates the mechanical equipment system at all times. For the amplifier, the real-time turning function is factory validated.

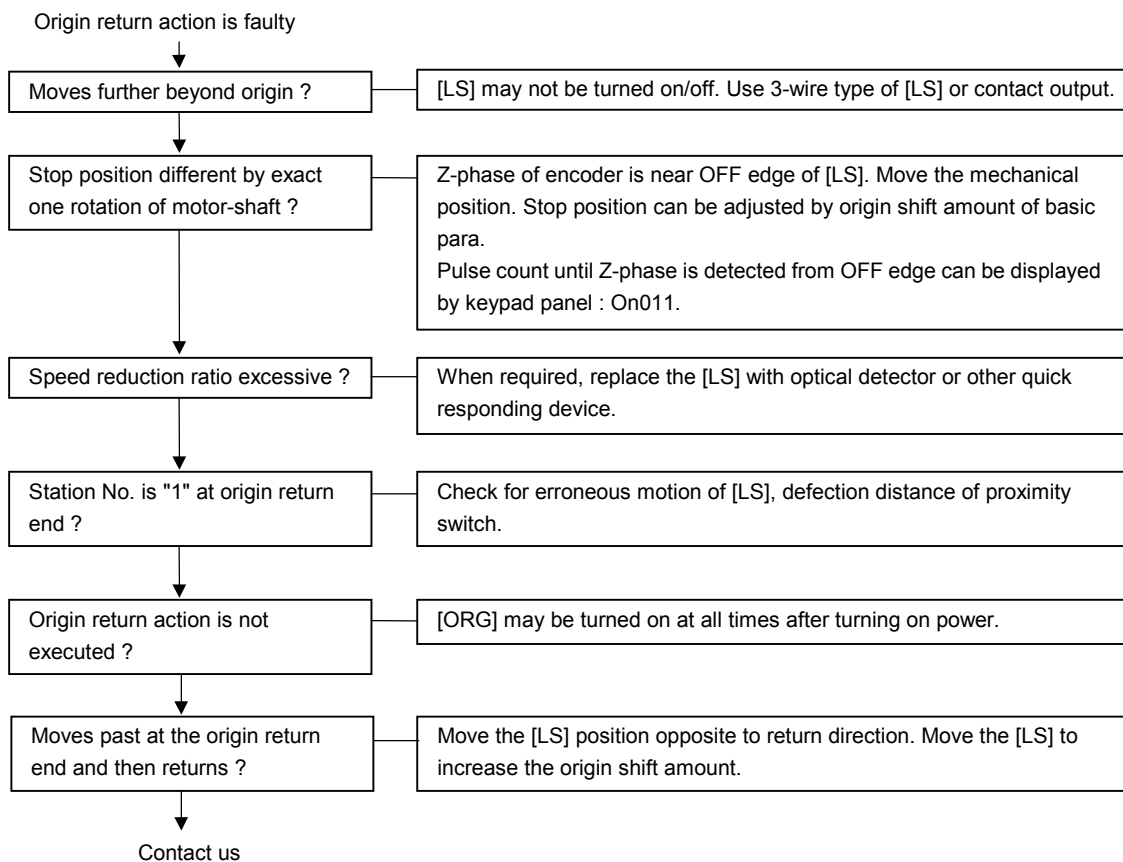
The real-time turning function is valid for most mechanical equipment systems except some examples. If it does not work, contact us.



**(c) Positioning accuracy is poor**



**(d) Origin return action is faulty**

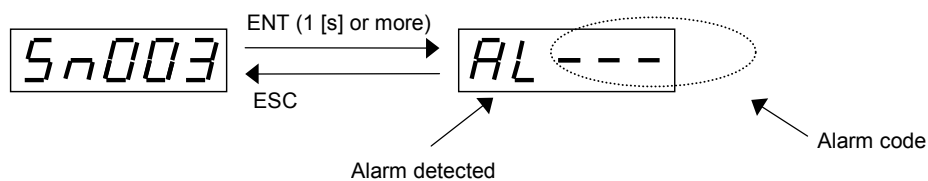


### (3) Faults with alarm indication

If an alarm is detected, the detected contents are displayed on the keypad panel of amplifier.

If multiple alarms are detected simultaneously, alarm indication is made in accordance with the priority order given below.

| Priority order | Display | Description                                   |
|----------------|---------|---|
| 1              | AL SE   | System error                                  |
| 2              | AL OC   | Overcurrent, output overcurrent               |
| 3              | AL OS   | Overspeed                                     |
| 4              | AL LU   | Low voltage, undervoltage                     |
| 5              | AL HU   | High voltage, overvoltage                     |
| 6              | AL EE   | Encoder trouble                               |
| 7              | AL CE   | Circuit trouble, amplifier trouble            |
| 8              | AL dE   | Data error, memory error                      |
| 9              | AL Fb   | Fuse brown                                    |
| 10             | AL CE   | Combination error                             |
| 11             | AL rH2  | Resistor heat 2                               |
| 12             | AL EC   | Encoder communication error                   |
| 13             | AL CEE  | Cont (control signal) error                   |
| 14             | AL OL   | Over load, motor overheat                     |
| 15             | AL rH   | Resistor heat, braking (DB) resistor overheat |
| 16             | AL OF   | Overflow, deviation excessive                 |
| 17             | AL AH   | Amp heat, amplifier overheat                  |
| 18             | AL EH   | Encoder heat, encoder overheat                |
| 19             | AL AL   | Absolute data lost                            |
| 20             | AL AF   | Absolute data overflow                        |
| 21             | AL tE   | Terminal error                                |
| 22             | AL ---  | (non)   |



Remark : An alarm is automatically displayed if detected.

If, at a displayed status, the alarm detection is reset by a control input signal, the initial screen (system para. 89 setting) appears.

The alarm detection can be reset in the test running mode [Fn004] also.

Holding down the  key and  key simultaneously for at least 1 [s] at a status where an alarm detection is displayed resets the alarm detection.

**(a) Overload, motor overheat**

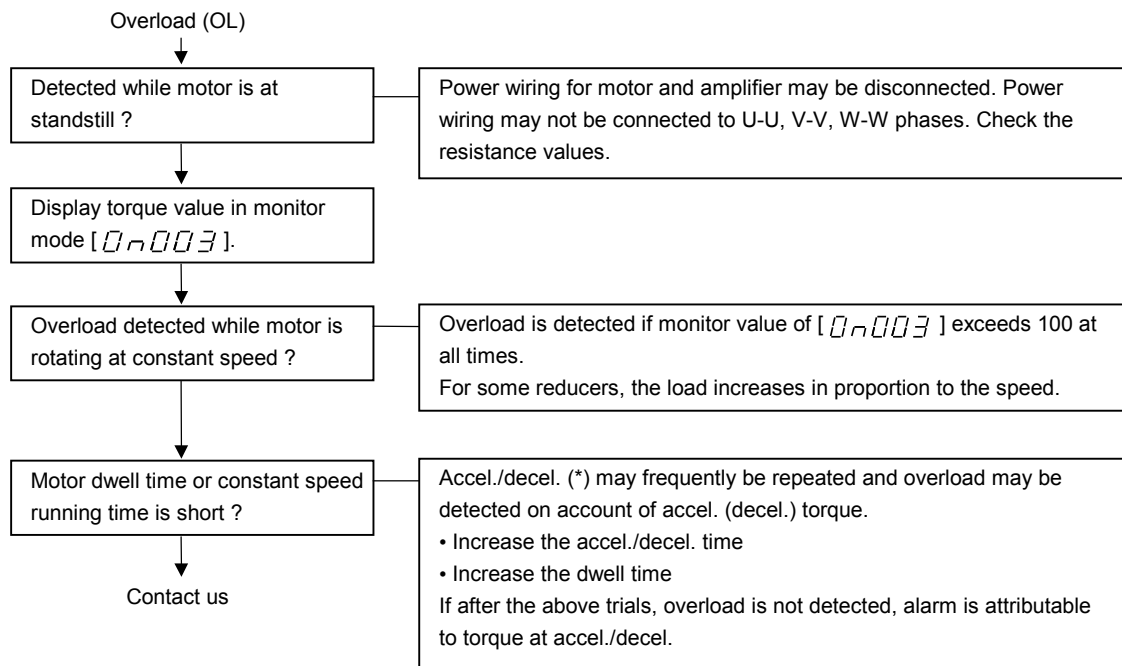
- Keypad panel display



- Contents of alarm

The rms (root-mean-square) value of torque (command value) of motor exceeded the value allowed to the motor (detected by electronic thermal relay built-in amplifier).

- Cause, check and remedy



**(b) Absolute data lost**

- Keypad panel display



- Contents of alarm

Absolute value data of the 16-bit serial encoder built in GYC/GYS type motor are lost.

- Cause, check and remedy

This alarm is detected only when ABS (absolute system) is selected by setting of system para. 99.

Use an absolute system upon presetting the current position. This alarm detection cannot be reset by alarm reset [RST] signal.

(i) Mount a battery (WSB-S type) on the amplifier or supply power to the control input/output terminal on CN1.

(ii) Connect the encoder wiring from CN2 to the encoder wires of motor.

The current position information is destroyed if approx. 1 [h] elapses at a status where the encoder wiring is not connected.

(iii) Preset the current position in the test running mode [Fn003].

Executing the position preset simultaneously resets the alarm detection.

- (\*) Accel. : Acceleration, accelerating  
Decel. : Deceleration, decelerating



**(c) Combination error**

- Keypad panel display

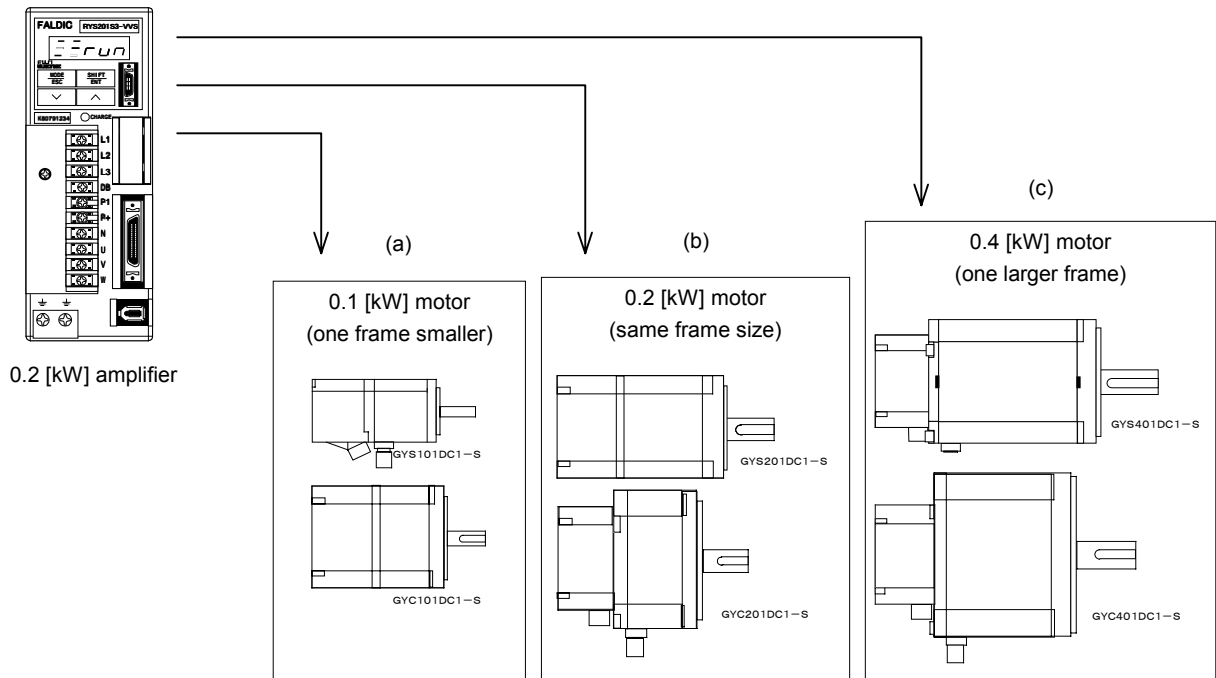


- Contents of alarm  
The combination of connected amplifier and motor is not correct.

- Cause, check and remedy  
Upon turning on power, the amplifier automatically recognizes the motor.  
Use amplifier and motor as a specified pair of model types

For 200[V] class input voltage of amplifier :

If the 0.2[kW] type amplifier and 0.1[kW] motor (which is a step smaller than the optimum combination) is combined as a pair, rated torque of 0.1[kW] motor can be obtained.



- (a) : The rated torque is the one for one frame smaller motor.
- (b) : The rated torque is the one for the same frame size motor.
- (c) : The rated torque is the same as where the same frame size motor is used.

**(d) Cont (control signal) error**

- Keypad panel display



- Contents of alarm

One and the same signal is allocated to several control input signal (CONTn) terminals on CN1 of amplifier.

- Cause, check and remedy

Since the same signal cannot be allocated to several terminals, any one setting should be selected. Forced stop (10), free-run (54), external fault input (34) and "not assigned" (0) may be present on several terminals. The same signal can be allocated to several control output terminals.

Remark : The cont error does not occur in case of overlap setting of the CONT always valid 1, 2 (system para. 87, 88) and the system para. A signal set at the CONT always valid is valid at all times.

**(e) Low voltage, undervoltage**

- Keypad panel display



- Contents of alarm

The voltage supplied to the amplifier is below the minimum specified level.

- Cause, check and remedy

The supply voltage may have dropped on account of momentary failure, etc. or the power supply capacity may be poor.

Remark : The detection of undervoltage can be invalidated by setting of system para. 85 if the power supply condition is not good. In this case, if free-run is selected by setting of system para. 84, the running can be continued at momentary failure.

**(f) High voltage, overvoltage**

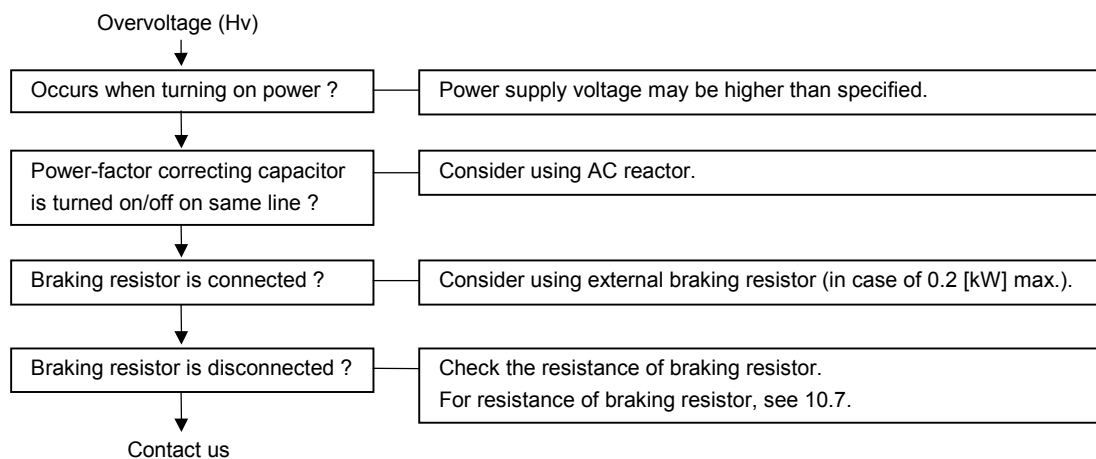
- Keypad panel display



- Contents of alarm

The DC intermediate voltage in the amplifier is higher than the upper limit.

- Cause, check and remedy



**(g) Amp heat, amplifier overheat**

- Keypad panel display



- Contents of alarm

The temperature of cooling-fins of the amplifier is above 100°C.

- Cause, check and remedy

The ambient temperature for the amplifier should be below +55°C. The lifetime of large-capacity capacitor in the amplifier greatly varies depending on the ambient temperature.

**In case the alarm was detected below 55°C, contact us.**

**(h) Encoder communication error**

- Keypad panel display



- Contents of alarm

The communication is not made between 16-bit serial encoder and amplifier.

- Cause, check and remedy

The encoder wiring may be detached or disconnected.

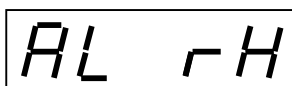
The serial communication is performed at 4 [Mbps] of data rate. Do not extend the wiring by connecting several short cables.

Connect the encoder by optional cable or specified cables.

The encoder wiring has about 5 [V] of voltage amplitude. Do not install it in a location where a strong electric or magnetic field exists.

**(i) Resistor heat, braking (DB) resistor overheat**

- Keypad panel display



- Contents of alarm

The heating power of the braking resistor of amplifier exceeded a specified value.

- Cause, check and remedy

If an alarm is detected immediately after turning on power, the power supply voltage may be higher than specified.

If detected while running, the frequency of braking operation may be high, and the braking resistor may overheat. In such a case,

- use an external braking resistor,
- prolong the accel./decel. time. or
- raise the reduction speed ratio, if possible.

**(j) Overflow, deviation excessive**

- Keypad panel display

A rectangular keypad panel display showing the characters 'AL' followed by a space and 'OF' in a stylized, segmented font.

- Contents of alarm

Deviation quantity (difference between the current command position and current feedback position) exceeded the set value of basic para. 54.

- Cause, check and remedy

The initial set value of basic para. 54 is 10000 (x 100) [pulse].

If the difference between the current command position and current feedback position exceeds 1000000 [pulse], an alarm is detected.

Under normal operating conditions, the deviation quantity increases in proportion to the motor speed.

If an alarm is detected when rotating the motor by turning on the [RUN], the motor power wiring phases U, V, W may not be connected to the corresponding terminals (U, V, W) of the amplifier.

The set value of basic para. 54 need not be decreased.

The deviation quantity can be reduced by setting the feed forward gain of basic para. 40 to near 1.000.

**(k) Other protection functions**

Under normal operating conditions, alarms other than the above mentioned are seldom detected.

If the following alarms appeared, contact us.

**(i) Encoder heat, encoder overheat**

- Keypad panel display

A rectangular keypad panel display showing the characters 'AL' followed by a space and 'EH' in a stylized, segmented font.

- Contents of alarm

The temperature of 16-bit serial encoder exceeded a specified value.

- Cause, check and remedy

The ambient temperature for the motor should be 40°C max.

If an alarm appeared before running such as immediately after turning on power, contact us.

**(ii) Resistor heat 2**

- Keypad panel display

A rectangular keypad panel display showing the characters 'AL', a space, a small 'r', another space, and 'H2' in a stylized, segmented font.

- Contents of alarm

The regenerative power processing transistor mounted on the amplifier overheats.

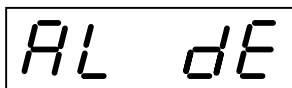
- Cause, check and remedy

The ambient temperature of amplifier should be 55°C max.

If an alarm appeared before running such as immediately after turning on power, contact us.

**(iii) Data error, memory error**

- Keypad panel display

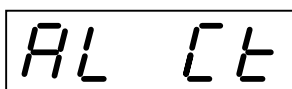


- Contents of alarm  
Contents of the non-volatile storage memory mounted on the amplifier are destroyed.

- Cause, check and remedy  
If an alarm appeared immediately after turning on power, contact us.

**(iv) Circuit trouble, amplifier trouble**

- Keypad panel display

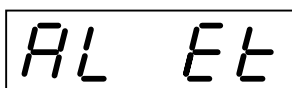


- Contents of alarm  
The control power supply circuit mounted on the amplifier is abnormal.

- Cause, check and remedy  
If an alarm appeared immediately after turning on power, contact us.

**(v) Encoder trouble**

- Keypad panel display

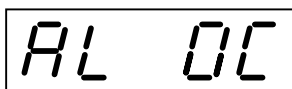


- Contents of alarm  
The 16-bit serial encoder attached to the motor may be broken.

- Cause, check and remedy  
If an alarm appeared immediately after turning on power, contact us.

**(vi) Overcurrent, output overcurrent**

- Keypad panel display



- Contents of alarm  
The output current from the amplifier to the motor exceeded a specified value.

- Cause, check and remedy  
The power wiring to the motor may be short-circuited or grounded.  
As a general rule, minimum insulation resistance between motor terminals and grounding (earth) terminal (symbol "E" or " $\perp$ ") is about 1 [M $\Omega$ ].  
The motor winding resistance value between each phase is as same.

**(vii) Overspeed**

- Keypad panel display



- Contents of alarm  
The motor speed has exceeded 1.1 times of the max. speed.
- Cause, check and remedy  
At acceleration, overshooting may have occurred.  
Check the speed wave form at acceleration with a pc loader.

**(viii) Fuse brown**

- Keypad panel display



- Contents of alarm  
Voltage was generated at both ends of the fuse in the amplifier main circuit (2 [kW] and above).
- Cause, check and remedy  
The main circuit fuse is for preventing the secondary accident such as fire. The fuse cannot be replaced. Do not turn on power again, and contact us.

**9.4 Items to inquire when faulty**

If an alarm appeared, remedy it referring to 9.3.

When contacting us, specify the following items.

- (a) Data on nameplate : Type, serial equipment No.
- (b) Device configuration : Example, type of external braking resistor etc.
- (c) Outline of mechanical equipment system driven by motor : Example, ball-screw feed, vertical drive, reduction speed ratio 1/2
- (d) Fault contents
  - (i) Running duration (years)
  - (ii) Alarm occurrence frequency, conditions : Example : when a certain device operates, the motor stops
  - (iii) Alarm display contents
  - (iv) Whether reproducible ?
  - (v) While accelerating, rotating at constant speed or decelerating ?
  - (vi) Whether different between forward and reverse rotation of motor ?
  - (vii) Whether at particular conditions ? : Example : when [RUN] signal has been turned on ?  
when advancing mechanical-table has come to a particular position ?
  - (viii) Whether trouble persists even after replacing the machine or amplifier with one having the same specification ?

## 9.5 Other information

### (1) Operating conditions : Refer to 3. INSTALLATION.

#### (a) Power-on

The amplifier can be energized continuously.



#### **DANGER**

**Do not touch the amplifier when the commercial power is supplied. Otherwise, there is a risk of electric shock.**

#### (b) Specifications : Refer to 2. SPECIFICATIONS.

GYC and GYS type motors are of continuous rating.

#### (c) Operation

Do not repeatedly turn on and off the power supply to start and stop the motor.

It may affect the devices inside the amplifier.

#### (d) Radio noise : Refer to 3.2 (1) (b) (iv) and 10.4.

Radio noise preventive measures are not implemented to the amplifier and motor as general industrial equipment. Therefore, following devices may receive noises:

- AM radios near the amplifier or motor
- Wired broadcast, etc. near the wiring
- Measuring instruments or household appliances

### (2) Expected-service-life

#### (a) Motor

The motor bearings should be replaced with new ones, when required. If the bearings produce unusual noise, replace bearings.

The motor incorporates (built-in) encoder, etc. Therefore, inquire us for how to replace the bearings.

#### (b) Cooling fan motor built in the amplifier

The expected-service-life of the fan will be approx. 20,000 [h].

Contact us when a replacement with new one is required.

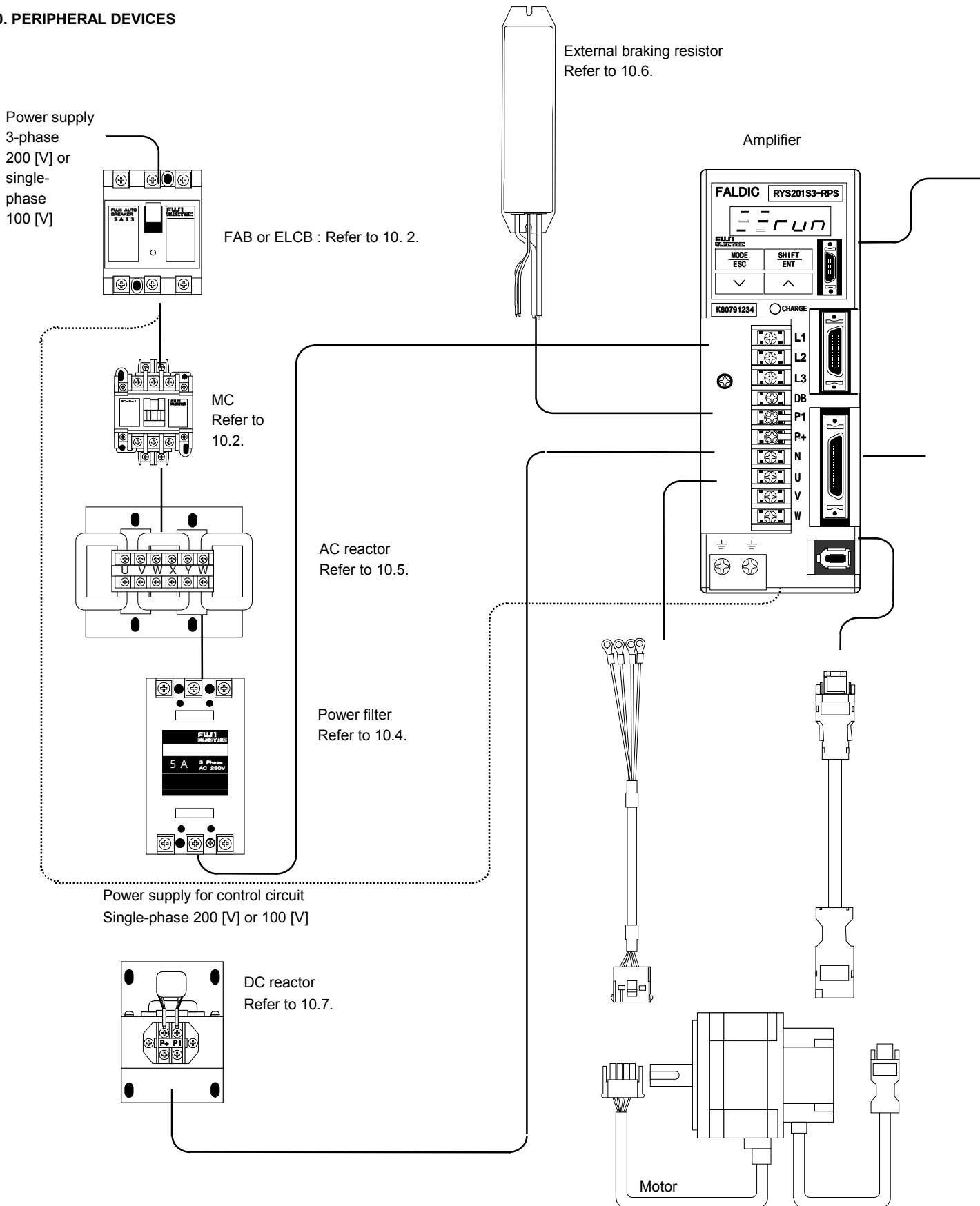
#### (c) Brake built in the motor

The expected-service-life will be approx. 20,000 operations at rated torque.

#### (d) Capacitor built in the amplifier

The amplifier incorporates large capacitors. Contact us when a replacement with new one is required.

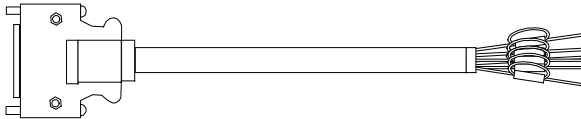
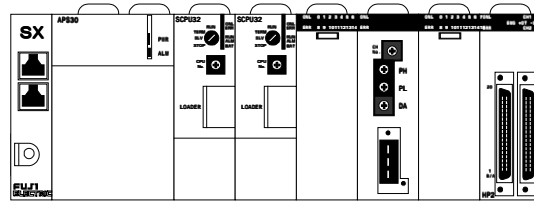
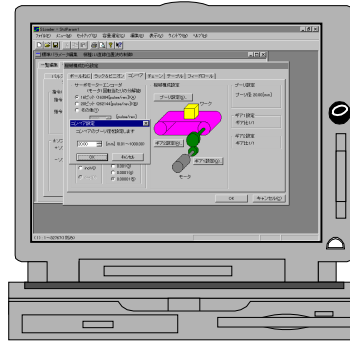
## 10. PERIPHERAL DEVICES



Example : Actual machines may differ in details.



Personal computer loader



Optional cables  
Refer to 10.8.

Programmable logic controller (PLC)  
MICREX-SX  
MICREX-F  
FREX-PC

## 10.1 Cables

Power supply and control circuit cables in the internal of the control panels are as follows :

### (1) Power supply and motor input cables

(a) Cable size

| Input voltage class                                  |   | [V]     | 100         | 200         |             |                    |
|--|---|---------|-------------|-------------|-------------|--------------------|
| Amplifier output                                     |   | [kW]    | 0.05 to 0.2 | 0.03 to 0.4 | 0.75 to 1.5 | 2, 3, 4, 5         |
| Amplifier type                                       |   | RYS S3- | 6           |             |             |                    |
|  |   |         | 500 to 201  | 300 to 401  | 751 to 152  | 202, 302, 402, 502 |
| Conductor sectional area of cable [mm <sup>2</sup> ] | Power supply, motor input, ground (earth) |         | 1.25        |             | 2           | 3.5, 5.5           |
|  | Brake                                     |         | 1.25        |             |             |                    |
|  | Power supply for control                  |         | 0.75        |             |             |                    |

(b) Cable type

- (i) 600 [V] class, poly-vinyl insulated cable (JIS C 3307) or
- (ii) Poly-vinyl insulated cable "KIV" (JIS C 3316) or
- (iii) 600 [V] class, cross-link polyethylene insulated cable "FSCL" (JCS 360) or equivalent

### (2) Control input/output cables for CN1 : + 24 [V], 50 [mA] max.

(a) Size of twisted-pair shielded cable, AWG No.26

| Amplifier type | CN1 for VVS, LPS, RPS | CN3 for LPS, RPS | CN1 for others |
|----------------|-----------------------|------------------|----------------|
| Cable          | 18-core               | 10-core          | 13-core        |

(b) Cable type

"XEBV" or "XEWV" (The Furukawa Electric Co. , Ltd.) or equivalent

### (3) Host interface for CN3

- (a) Digital input/output and analog signal cable : Same as (2) above.
- (b) T-link, JPCN-1 and SX bus : Specified cables should be applied.

### (4) Encoder cables for CN2 (4 [Mbps] serial communication)

Cross-link polyethylene insulated, poly-vinyl sheath cables RMCV-SV type :

| Wiring length within | Cable size and pair, core quantities ( * ) |
|----------------------|--|
| 10 [m]               | AWG No.25 / 4-pair and AWG No.23 / 2-core  |
| 50 [m]               | AWG No.25 / 4-pair and AWG No.17 / 2-core  |

or optional cable : See 10.8.

( \* ) AWG : Refer to Remark of 4.3 (2) (d).

### 10.2 Auto circuit breaker (FAB, MCCB), earth leakage circuit breaker (ELCB) and magnetic contactor (MC) : Recommended Fuji's type

FAB or ELCB is installed on the power supply side for turning power supply and promptly cutting off a fault current such as short-circuit current. MC is used when amplifiers are disconnected from the power supply with an external signal or in the case of power ON/OFF from remote operation panels.

The types are applicable to the power supply capacity is up to 500 [kVA], specified cable diameter size with the wiring length within 20 [m] is used, and ON/OFF of the primary side of one amplifier is performed. Connect an AC reactor if the power supply capacity exceeds 500 [kVA].

(i) For 200 [V] class input voltage of amplifier

| Amplifier output        |                    | [kW] |         | 0.03 to 0.1 | 0.2    | 0.4    | 0.75 to 1.5 | 2      | 3        | 4, 5     |
|-------------------------|--------------------|------|---------|-------------|--------|--------|-------------|--------|----------|----------|
| Amplifier type          |                    | RYS  | S3-     | 300 to 101  | 201    | 401    | 751 to 152  | 202    | 302      | 402, 502 |
| Fuji's Recommended type | For each amplifier | FAB  | type SA | 33B/3       | 33B/5  | 33B/10 | 53B/15      | 33B/30 | 33B/40   | 33B/50   |
|                         |                    |      |         | current [A] | 3      | 5      | 10          | 15     | 30       | 40       |
|                         | ELCB type          | EG   | 33B/3   | 33B/5       | 33B/10 | 53B/15 | 33B/30      | 33B/40 | 33B/50   |          |
| MC type                 |                    | SC-  |         | 5-1(19A)    |        |        |             |        | 1N (26A) | 2N (35A) |

(ii) For 100 [V] class input voltage of amplifier

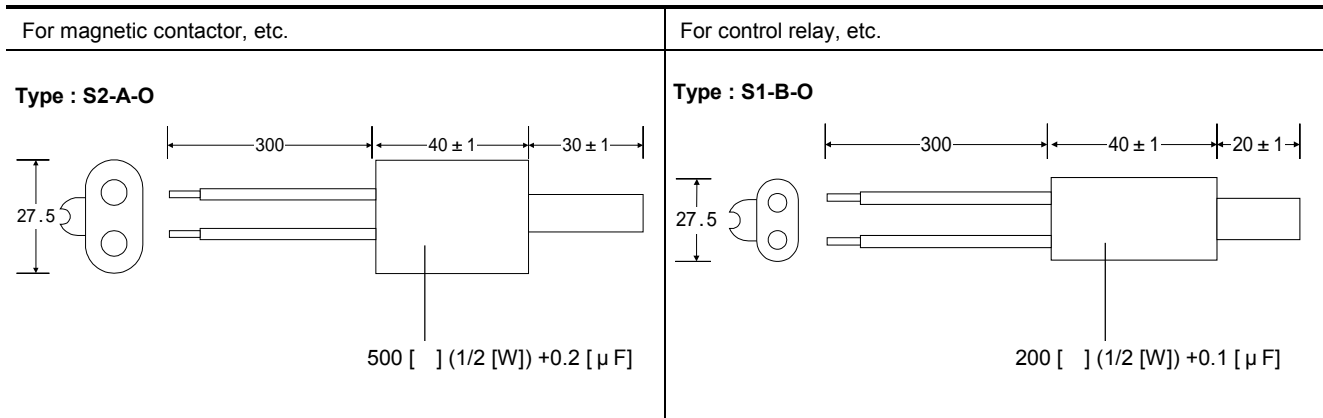
| Amplifier output        |                    | [kW] |         | 0.05        | 0.1    | 0.2    |
|-------------------------|--------------------|------|---------|-------------|--------|--------|
| Amplifier type          |                    | RYS  | S3- 6   | 500         | 101    | 201    |
| Fuji's Recommended type | For each amplifier | FAB  | type SA | 33B/3       | 33B/5  | 33B/10 |
|                         |                    |      |         | current [A] | 3      | 5      |
|                         | ELCB type          | EG   | 33B/3   | 33B/5       | 33B/10 |        |
| MC type                 |                    | SC-  |         | 5-1(19A)    |        |        |

### 10.3 Surge suppressor (surge killer)

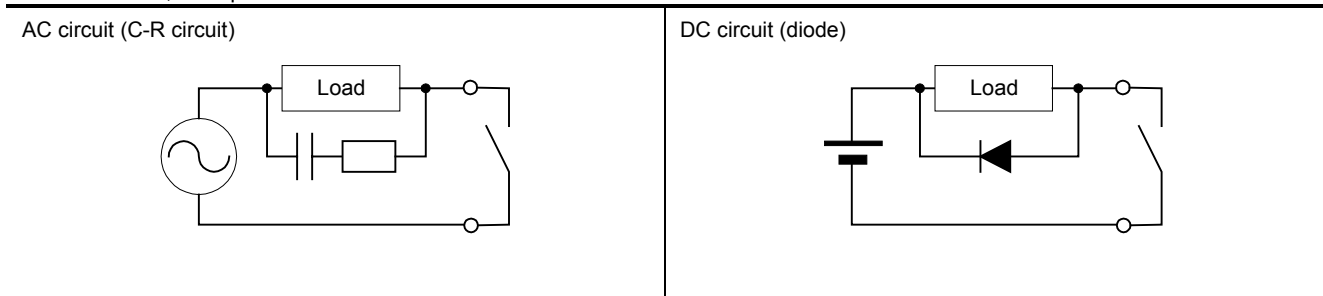
Shown below are recommended surge suppressors (for 250 [V] AC or less ) to be installed on peripheral devices (magnetic contactor, solenoid, brake, etc. ) of amplifier.

DC equipment should be equipped with a diode for surge voltage suppression.

[unit : mm]



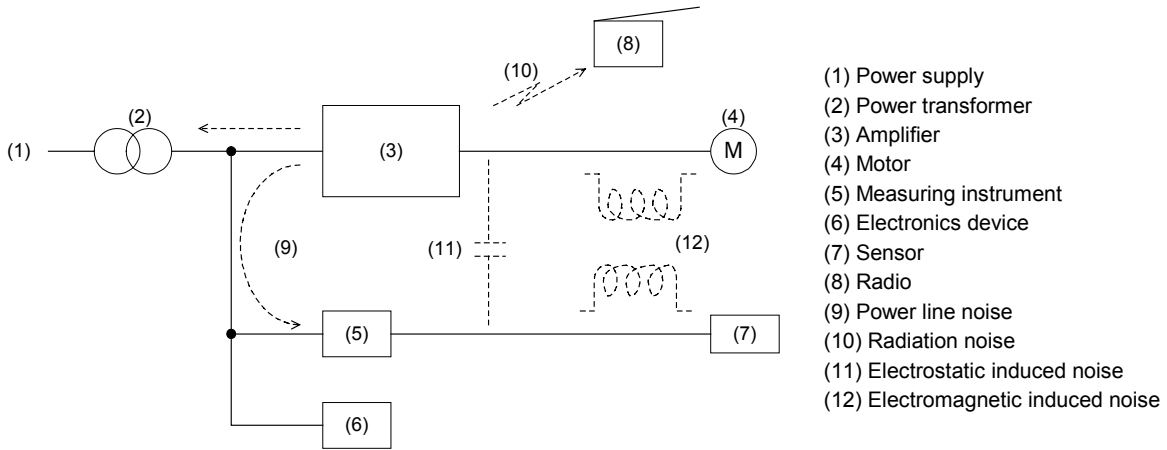
### Protection circuit, example



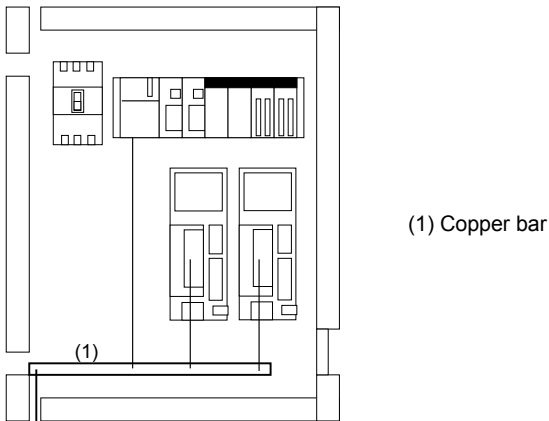
### 10.4 Power filter

Power filter is installed to prevent the PWM circuit in amplifier from exerting influence over the power supply side.

In the amplifier, the PWM circuit performs high frequency switching. This causes power line noise, radiation noise from the amplifier and noise from the motor power cable, and these noises may have an adverse influence over external equipment. To prevent such an influence, the following methods are available. Refer to figure below.



- (a) Installation of amplifier in a grounded steel container. Avoid close installation with personal computer and measuring instrument.
- (b) Installation of power filter at primary side of amplifier to prevent PWM from exerting influence over power source.
- (c) Install the cable from each amplifier to motor in a grounded metal conduit.
- (d) Minimize the distance of ground connection by using a larger size copper bar. Ground connection should be wired to each equipment separately. See figure below.



- (e) Avoid mutual connection of the following cables.
  - (i) Ground : Power system and frame (enclosure)
  - (ii) + 24 [V] DC for control input/output and 0 [V] of power supply
  - (iii) 0 [V] power supply : Speed command and encoder
- (f) Avoid binding together the 200 [V] power supply and amplifier output cable, + 24/+ 15 [V] DC control signal cable and encoder cable or laying them in parallel.
- (g) Separate 200 [V] power source with that of 100 [V]-system device by use of an insulating transformer : Fuji "TRAFY", etc. .

| Input voltage class | [V]     | 100       |        | 200         |        |            |        |          |
|---------------------|---------|-----------|--------|-------------|--------|------------|--------|----------|
| Amplifier output    | [kW]    | 0.05, 0.1 | 0.2    | 0.03 to 0.2 | 0.4    | 0.75 to 2  | 3      | 4, 5     |
| Amplifier type      | RYS S3- | 6         |        | 300 to 201  | 401    | 751 to 202 | 302    | 402, 502 |
| Power filter type   | FHF-TA/ | 5/250     | 10/250 | 5/250       | 10/250 | 20/250     | 30/250 | 50/250   |

### 10.5 AC reactor (reactor for impedance matching)

#### (1) AC reactor application

Provide and connect an AC reactor in any of the following cases.

(a) Power supply capacity is large

When the power supply capacity exceeds 500 [kVA] (\*), the input current of the amplifier becomes large at the time of power on, and there is a possibility where the rectifying diodes of the amplifier are damaged.

Note : (\*) Cable length of 20 [m] with specified cable diameter size.

(b) Power supply voltage is unbalanced

Connect an AC reactor if the power supply voltage unbalance rate is 3% or higher.

$$\text{Unbalance rate of power supply voltage [\%]} = \frac{\text{Max. voltage [V]} - \text{Min. voltage [V]}}{\text{3-phase average voltage [V]}} \times 100$$

(c) Suppression of higher harmonics

Higher harmonics current is generated because an amplifier is of capacitor input type.

AC reactor suppresses voltage distortion in the power supply system.

#### (2) Connection

Connect an AC reactor to the primary (power supply) side of the amplifier.

| Input voltage class |           | [V]   | 100         | 200         |       |       |          |       |       |       |       |
|---------------------|-----------|-------|-------------|-------------|-------|-------|----------|-------|-------|-------|-------|
| Amplifier output    |           | [kW]  | 0.05 to 0.2 | 0.03 to 0.2 | 0.4   | 0.75  | 1, 1.5   | 2     | 3     | 4     | 5     |
| Amplifier type      | RYS       | S3-   | 6           |             |       |       |          |       |       |       |       |
|                     |           |       | 500 to 201  | 300 to 201  | 401   | 751   | 102, 152 | 202   | 302   | 402   | 502   |
| AC reactor          | type      | ACR2- | 0.4A        | 0.4A        | 0.75A | 1.5A  | 2.2A     | 3.7A  | 5.5A  | 7.5A  | 11A   |
|                     | reactance | [mH]  | 2.92        |             | 1.57  | 0.939 | 0.679    | 0.406 | 0.279 | 0.207 | 0.145 |

### 10.6 External braking resistor : External dimension : Refer to 10.8 (3)

A braking resistor is provided (built-in) with the amplifier for 0.2 [kW] over.

However, if load variation is wide, elevation (hoisting) load, or higher frequent operation, the following external braking resistor should be installed. In such a case, built-in resistor should be disconnected.

#### (1) Data of external braking resistor

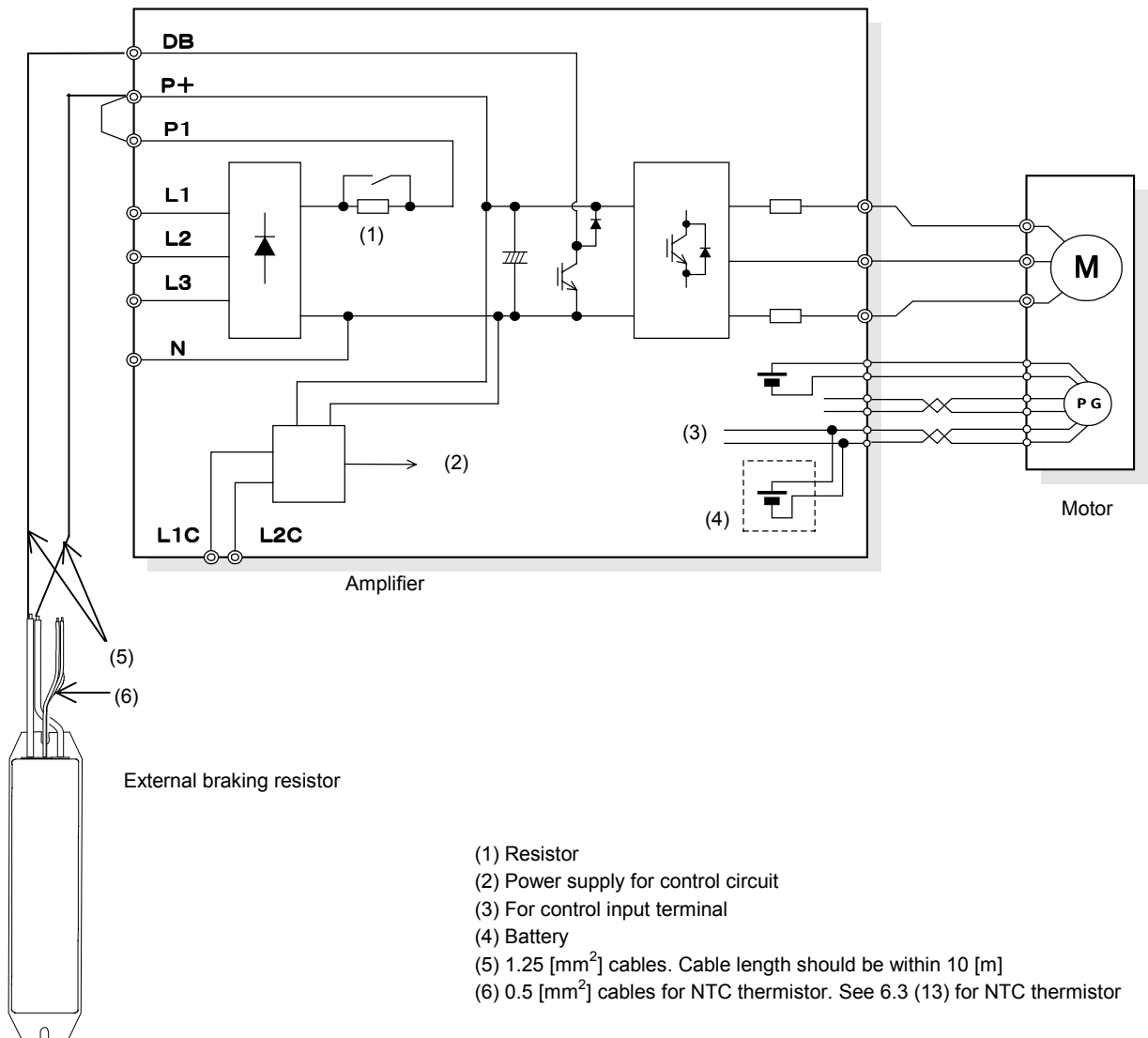
| Input voltage class |          | [V]  | 100            |     | 200            |     |         |          |          |          |  |
|---------------------|----------|------|----------------|-----|----------------|-----|---------|----------|----------|----------|--|
| Amplifier output    |          | [kW] | 0.05, 0.1      | 0.2 | 0.03 to 0.2    | 0.4 | 0.75    | 1, 1.5   | 2, 3     | 4, 5     |  |
| Amplifier type      | RYS      | S3-  | 6              |     |                |     |         |          |          |          |  |
|                     |          |      | 500, 101       | 201 | 300 to 201     | 401 | 751     | 102, 152 | 202, 302 | 402, 502 |  |
| Resistor            | type     |      | WSR-401        |     |                |     | WSR-751 | WSR-152  | DB11-2   | DB22-2   |  |
|                     | (**) [W] |      | 17             |     |                |     | 25      | 75       | 115      |          |  |
| Resistance          |          | [ ]  | 68             |     |                |     | 15      |          | 10       | 5.8      |  |
| Built-in resistor   | (**) [W] |      | Not applicable | 12  | Not applicable | 12  | 20      | 30       | 60       |          |  |
|                     | [ ]      |      | applicable     | 68  | applicable     | 68  | 33      | 18       | 9        | 5.5      |  |

Note : (\*\*) Cont. : Continuous operation duty at 25 , allowable

#### (2) Data of NTC thermistor embedded in the external braking resistor

| Resistor type | Open circuited the thermistor at the following temperature [ ] | Withstand AC voltage tested for one minute [kV] | Contact capacity   |
|---------------|--|---|--------------------|
| WSR- 401      | 135 ± 5  | 1.5   | 30 [V] DC, 0.1 [A] |
|               |  | 2.5   |                    |
|               | 152  | 150 ± 10  |                    |
| DB 11-2       |  |   |                    |
| 22-2          |  |   |                    |

### (3) External braking resistor connection



## 10.7 DC reactor

### (1) DC reactor application

Provide and connect an DC reactor in any of the following cases.

(a) Power supply capacity is large

When the power supply capacity exceeds 500 [kVA] (\*), the input current of the amplifier becomes large at the time of power on, and there is a possibility where the rectifying diodes of the amplifier are damaged.

Note : (\*) Cable length of 20 [m] with specified cable diameter size.

(b) Power supply voltage is unbalanced

Connect an DC reactor if the power supply voltage unbalance rate is 3% or higher.

$$\text{Unbalance rate of power supply voltage [\%]} = \frac{\text{Max. voltage [V]} - \text{Min. voltage [V]}}{3\text{-phase average voltage [V]}} \times 100$$

(c) Suppression of higher harmonics

Higher harmonics current is generated in the amplifier.

DC reactor suppresses voltage distortion in the power supply system.

### (2) Connection

Connect an DC reactor to the primary (power supply) side of the amplifier.

|                     |         |      |     |      |             |     |      |      |          |     |     |     |     |  |
|---------------------|---------|------|-----|------|-------------|-----|------|------|----------|-----|-----|-----|-----|--|
| Input voltage class | [V]     | 100  |     |      | 200         |     |      |      |          |     |     |     |     |  |
| Amplifier output    | [kW]    | 0.05 | 0.1 | 0.2  | 0.03 to 0.1 | 0.2 | 0.4  | 0.75 | 1, 1.5   | 2   | 3   | 4   | 5   |  |
| Amplifier type      | RYS S3- | 6    |     |      |             |     |      |      |          |     |     |     |     |  |
|                     |         | 500  | 101 | 201  | 300 to 101  | 201 | 401  | 751  | 102, 152 | 202 | 302 | 402 | 502 |  |
| DC reactor type     | DCR2-   | 0.2  | 0.4 | 0.75 | 0.2         | 0.4 | 0.75 | 1.5  | 2.2      | 3.7 | 5.5 | 7.5 | 11  |  |
| Inductance          | [mH]    | 20   | 12  | 7    | 20          | 12  | 7    | 4    | 3        | 1.7 | 1.2 | 0.8 | 0.6 |  |

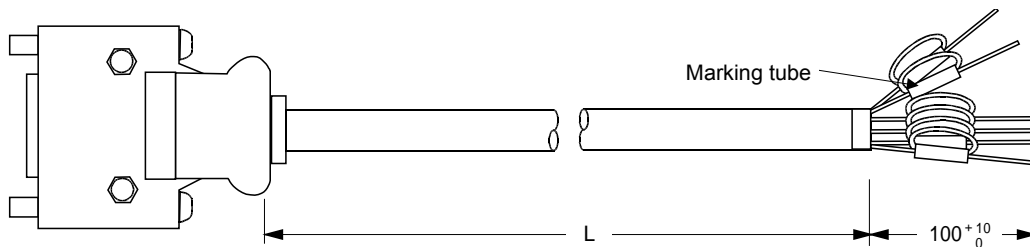
### 10.8 Optional cables, connector kits, battery and external braking resistors

#### (1) Connecting cables [unit : mm]

(a) Control input/output (expanded I/O of L and R types)

Cable type : WSC-D20P03 (20-pin)

Application : CN3 of RYS S3-LPS, RPS amplifier



(i) Connector : CN1

|       |                |
|-------|----------------|
| Plug  | 10120-3000V    |
| Shell | 10320-52A0-008 |

(ii) Wire color

|                 |        |         |       |         |       |         |        |         |       |         |        |         |       |         |       |         |        |         |       |         |
|-----------------|--------|---------|-------|---------|-------|---------|--------|---------|-------|---------|--------|---------|-------|---------|-------|---------|--------|---------|-------|---------|
| Pin No. for CN1 | 1      | 2       | 3     | 4       | 5     | 6       | 7      | 8       | 9     | 10      | 11     | 12      | 13    | 14      | 15    | 16      | 17     | 18      | 19    | 20      |
| Marking tube    | 1      | 2       | 3     | 4       | 5     | 6       | 7      | 8       | 9     | 10      | 11     | 12      | 13    | 14      | 15    | 16      | 17     | 18      | 19    | 20      |
| Wire color      | Orange |         | Gray  |         | White |         | Yellow |         | Pink  |         | Orange |         | Gray  |         | White |         | Yellow |         | Pink  |         |
| Marking         | Red 1  | Black 1 | Red 1 | Black 1 | Red 1 | Black 1 | Red 1  | Black 1 | Red 1 | Black 1 | Red 2  | Black 2 | Red 2 | Black 2 | Red 2 | Black 2 | Red 2  | Black 2 | Red 2 | Black 2 |

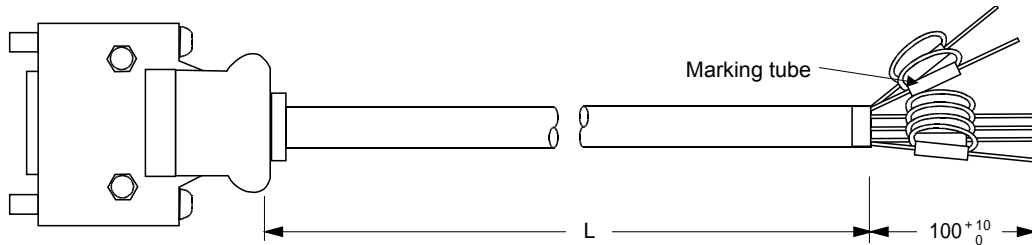
(iii) Cable length (L) and mass

|            |                 |          |
|------------|-----------------|----------|
| Cable type | L [mm]          | Mass [g] |
| WSC-D20P03 | $3000^{+300}_0$ | 400      |

(b) Control input/output (SX bus, T-link, RS-485)

Cable type : WSC-D26P03 (26-pin)

Application : CN1, other than the RYS S3-VVS, LPS, RPS amplifier



(i) Connector : CN1

|       |                |
|-------|----------------|
| Plug  | 10126-3000V    |
| Shell | 10326-52A0-008 |

(ii) Wire color

|                 |        |         |       |         |       |         |        |         |       |         |        |         |       |         |       |         |        |         |       |         |
|-----------------|--------|---------|-------|---------|-------|---------|--------|---------|-------|---------|--------|---------|-------|---------|-------|---------|--------|---------|-------|---------|
| Pin No. for CN1 | 1      | 2       | 3     | 4       | 5     | 6       | 7      | 8       | 9     | 10      | 11     | 12      | 13    | 14      | 15    | 16      | 17     | 18      | 19    | 20      |
| Marking tube    | 1      | 2       | 3     | 4       | 5     | 6       | 7      | 8       | 9     | 10      | 11     | 12      | 13    | 14      | 15    | 16      | 17     | 18      | 19    | 20      |
| Wire color      | Orange |         | Gray  |         | White |         | Yellow |         | Pink  |         | Orange |         | Gray  |         | White |         | Yellow |         | Pink  |         |
| Marking         | Red 1  | Black 1 | Red 1 | Black 1 | Red 1 | Black 1 | Red 1  | Black 1 | Red 1 | Black 1 | Red 2  | Black 2 | Red 2 | Black 2 | Red 2 | Black 2 | Red 2  | Black 2 | Red 2 | Black 2 |

|                 |        |         |       |         |       |         |
|-----------------|--------|---------|-------|---------|-------|---------|
| Pin No. for CN1 | 21     | 22      | 23    | 24      | 25    | 26      |
| Marking tube    | 21     | 22      | 23    | 24      | 25    | 26      |
| Wire color      | Orange |         | Gray  |         | White |         |
| Marking         | Red 3  | Black 3 | Red 3 | Black 3 | Red 3 | Black 3 |

(iii) Cable length (L) and mass

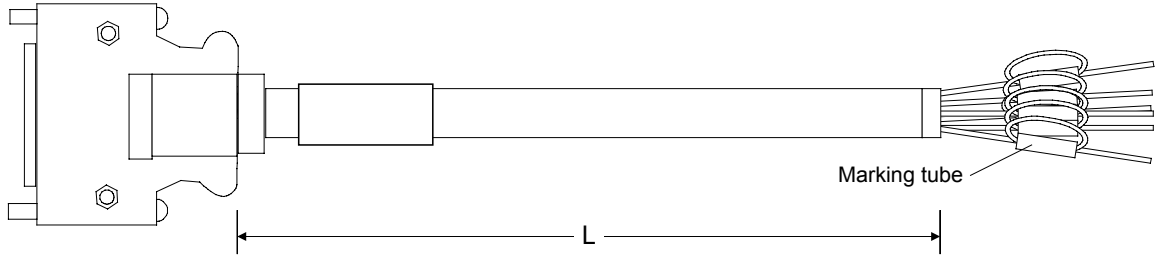
|            |                                   |          |
|------------|-----------------------------------|----------|
| Cable type | L [mm]                            | Mass [g] |
| WSC-D26P03 | 3000 <sup>+300</sup> <sub>0</sub> | 450      |



(c) Control input/output

Cable type : WSC-D36P03 (36-pin)

Application : CN1 of RYS S3-VVS, LPS, RPS amplifier



(i) Connector : CN1

|       |                |
|-------|----------------|
| Plug  | 10136-3000V    |
| Shell | 10336-52A0-008 |

(ii) Wire color

|                 |        |         |       |         |       |         |        |         |       |         |        |         |       |         |       |         |        |         |       |         |
|-----------------|--------|---------|-------|---------|-------|---------|--------|---------|-------|---------|--------|---------|-------|---------|-------|---------|--------|---------|-------|---------|
| Pin No. for CN1 | 1      | 2       | 3     | 4       | 5     | 6       | 7      | 8       | 9     | 10      | 11     | 12      | 13    | 14      | 15    | 16      | 17     | 18      | 19    | 20      |
| Marking tube    | 1      | 2       | 3     | 4       | 5     | 6       | 7      | 8       | 9     | 10      | 11     | 12      | 13    | 14      | 15    | 16      | 17     | 18      | 19    | 20      |
| Wire color      | Orange |         | Gray  |         | White |         | Yellow |         | Pink  |         | Orange |         | Gray  |         | White |         | Yellow |         | Pink  |         |
| Marking         | Red 1  | Black 1 | Red 1 | Black 1 | Red 1 | Black 1 | Red 1  | Black 1 | Red 1 | Black 1 | Red 2  | Black 2 | Red 2 | Black 2 | Red 2 | Black 2 | Red 2  | Black 2 | Red 2 | Black 2 |

|                 |        |         |       |         |       |         |        |         |       |         |        |         |       |         |       |         |
|-----------------|--------|---------|-------|---------|-------|---------|--------|---------|-------|---------|--------|---------|-------|---------|-------|---------|
| Pin No. for CN1 | 21     | 22      | 23    | 24      | 25    | 26      | 27     | 28      | 29    | 30      | 31     | 32      | 33    | 34      | 35    | 36      |
| Marking tube    | 21     | 22      | 23    | 24      | 25    | 26      | 27     | 28      | 29    | 30      | 31     | 32      | 33    | 34      | 35    | 36      |
| Wire color      | Orange |         | Gray  |         | White |         | Yellow |         | Pink  |         | Orange |         | Gray  |         | White |         |
| Marking         | Red 3  | Black 3 | Red 3 | Black 3 | Red 3 | Black 3 | Red 3  | Black 3 | Red 3 | Black 3 | Red 4  | Black 4 | Red 4 | Black 4 | Red 4 | Black 4 |

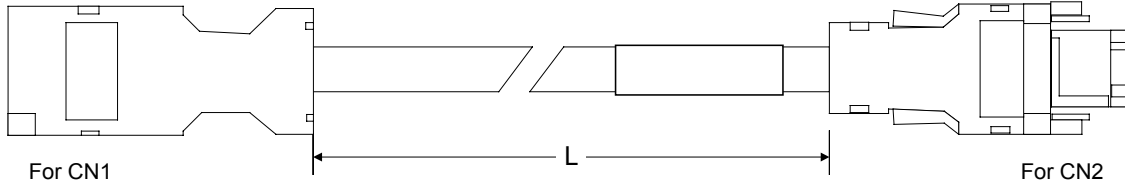
(iii) Cable length (L) and mass

|            |                                   |          |
|------------|-----------------------------------|----------|
| Cable type | L [mm]                            | Mass [g] |
| WSC-D36P03 | 3000 <sup>+300</sup> <sub>0</sub> | 550      |

(d) Encoder cable

Cable type : WSC-P06P05, P06P10 and P6P20

Application : 0.75 [kW] and below



(i) Connector

1) CN1

|             |             |              |
|-------------|-------------|--------------|
| Housing     |             | 53988 - 0611 |
| Socket      | shell cover | 58300 - 0600 |
|             | mold cover  | 53989 - 0605 |
|             |             | 53990 - 0605 |
| Cable clamp |             | 53303 - 0000 |
| Clamp screw |             | 59832 - 0009 |

2) CN2 (5 or 10 [m] cable length)

|             |       |              |
|-------------|-------|--------------|
| Housing     |       | 51145 - 0601 |
| Terminal    |       | 50639 - 8091 |
| Plug shell  | cover | 58098 - 0600 |
|             | body  | 58099 - 0600 |
| Cable clamp |       | 54017 - 0615 |
| Clamp screw |       | 54018 - 0605 |

3) CN2 (20 [m] cable length)

|              |             |              |
|--------------|-------------|--------------|
| Plug         | housing     | 54180 - 0611 |
|              | shell cover | 58299 - 0600 |
|              | shell body  | 58300 - 0600 |
|              | mold cover  | 54181 - 0615 |
| 54182 - 0605 |             |              |
| Cable clamp  |             | 58303 - 0000 |
| Clamp screw  |             | 59832 - 0009 |

(ii) Wire color

|             |     |       |       |        |                |          |                  |
|-------------|-----|-------|-------|--------|----------------|----------|------------------|
| Pin No. for | CN1 | 1     | 2     | 3      | 4              | 5        | 6                |
|             | CN2 | 1     | 2     | 3      | 4              | 5        | 6                |
| Wire color  |     | Red   | Black | Orange | Orange / White | Sky blue | Sky blue / White |
|             | or  | White | Black | Yellow | Brown          | Red      | Blue             |

(iii) Cable length (L) and mass

| Cable type  | L [mm]                              | Mass [g] |
|-------------|-------------------------------------|----------|
| WSC-P06 P05 | 5000 <sup>+500</sup> <sub>0</sub>   | 300      |
|             | 10000 <sup>+1000</sup> <sub>0</sub> | 500      |
| P20         | 20000 <sup>+2000</sup> <sub>0</sub> | 1200     |



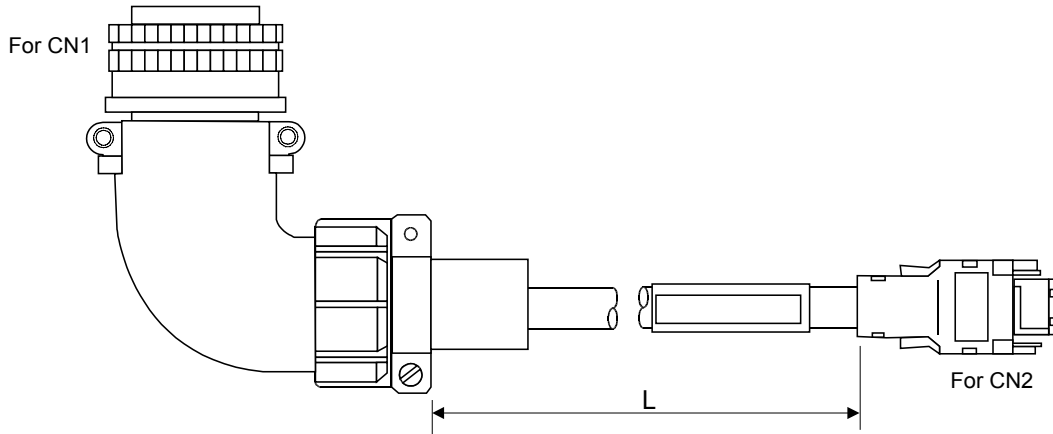
**CAUTION**

**Do not extend the wiring distance by connecting two or more encoder wiring cables.  
A voltage drop by contact resistance of connector may stop the operation abruptly.**

(e) Encoder cable

Cable type : WSC-P06P05-C, P06P10-C and P06P20-C

Application : 1 [kW] and above



(i) Connector

1) CN1

|             |                 |
|-------------|-----------------|
| Connector   | MS3108B20 - 29S |
| Cable clamp | MS3057 - 12A    |

2) CN2

|              |             |              |
|--------------|-------------|--------------|
| Plug         | housing     | 54180 - 0611 |
|              | shell cover | 58299 - 0600 |
|              | shell body  | 58300 - 0600 |
|              | mold cover  | 54181 - 0615 |
| 54182 - 0605 |             |              |
| Cable clamp  |             | 58303 - 0000 |
| Clamp screw  |             | 59832 - 0009 |

(ii) Wire color

| Pin No. for | CN1   | H     | G      | T              | S        | C                | D |
|-------------|-------|-------|--------|----------------|----------|------------------|---|
|             | CN2   | 1     | 2      | 3              | 4        | 5                | 6 |
| Wire color  | Red   | Black | Orange | Orange / White | Sky blue | Sky blue / White |   |
| or          | White | Black | Yellow | Brown          | Red      | Blue             |   |

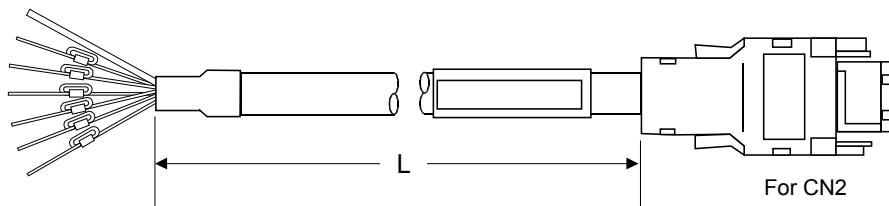
(iii) Cable length (L) and mass

| Cable type | L [mm] | Mass [g]                            |      |
|------------|--------|-------------------------------------|------|
| WSC-P06    | P05-C  | 5000 <sup>+500</sup> <sub>0</sub>   | 450  |
|            | P10-C  | 10000 <sup>+1000</sup> <sub>0</sub> | 650  |
|            | P20-C  | 20000 <sup>+2000</sup> <sub>0</sub> | 1400 |

(f) Encoder cable

Cable type : WSC-P06P05-W, P06P10-W and P06P20-W

Application : 1.5 [kW] and above



(i) Connector

|             |              |              |
|-------------|--------------|--------------|
| Housing     | 54180 - 0611 |              |
| Plug shell  | cover        | 58299 - 0600 |
|             | body         | 58300 - 0600 |
| Cable clamp | 54181 - 0615 |              |
| Clamp screw | 54182 - 0605 |              |

(ii) Wire color

| Marking tube    | P5    | M5    | BAT+   | BAT -          | SIG+     | SIG -            |
|-----------------|-------|-------|--------|----------------|----------|------------------|
| Pin No. for CN2 | 1     | 2     | 3      | 4              | 5        | 6                |
| Wire color      | Red   | Black | Orange | Orange / White | Sky blue | Sky blue / White |
| or              | White | Black | Yellow | Brown          | Red      | Blue             |

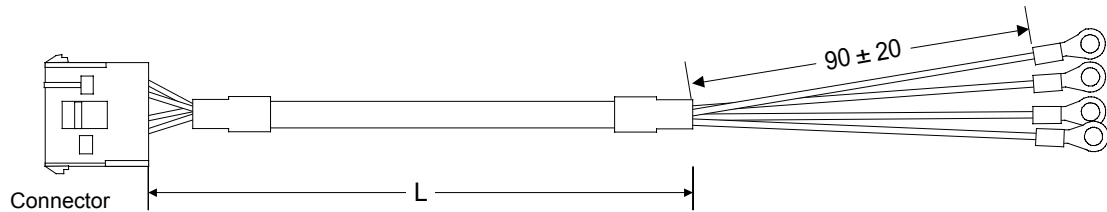
(iii) Cable length (L)

| Cable type | L [mm] | Mass [g]          |      |
|------------|--------|-------------------|------|
| WSC-P06    | P05-W  | $5000^{+500}_0$   | 300  |
|            | P10-W  | $10000^{+1000}_0$ | 500  |
|            | P20-W  | $20000^{+2000}_0$ | 1200 |

(g) Motor power cable for motor without providing brake

Cable type : WSC-M04P05, M04P10 and M04P20

Application : 0.75 [kW] and below



(i) Connector

|             |            |
|-------------|------------|
| Cap housing | 350780 - 1 |
| Socket      | 350570 - 1 |

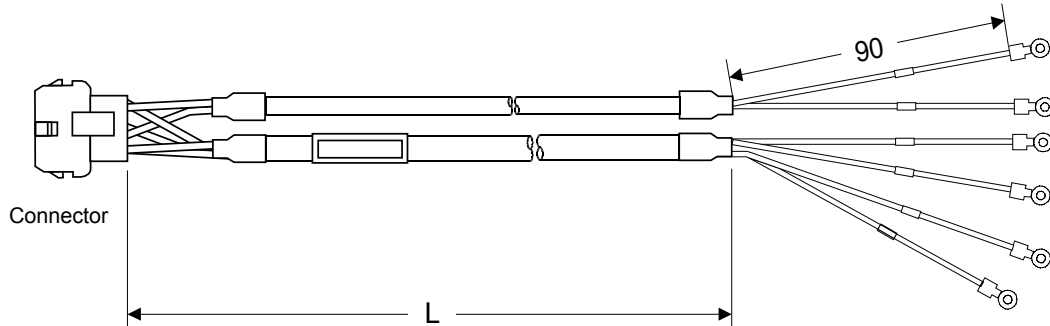
(ii) Wire color

| Pin No. for CN1 | 1   | 2     | 3     | 4              |
|-----------------|-----|-------|-------|----------------|
| Marking         | U   | V     | W     | E              |
| Cable color     | Red | White | Black | Green / Yellow |

(iii) Cable length (L) and mass

| Cable type | L [mm] | Mass [g]          |      |
|------------|--------|-------------------|------|
| WSC-M04    | P05    | $5000^{+500}_0$   | 700  |
|            | P10    | $10000^{+1000}_0$ | 1400 |
|            | P20    | $20000^{+2000}_0$ | 2700 |

(h) Motor power cable for motor with providing brake  
 Cable type : WSC-M06P05, M06P10 and M06P20  
 Application : 0.75 [kW] and below



(i) Connector

|             |            |
|-------------|------------|
| Cap housing | 350781 - 1 |
| Socket      | 350570 - 1 |

(ii) Wire color

| Pin No. for CN1 | 1   | 2     | 3     | 4              | 5   | 6     |
|-----------------|-----|-------|-------|----------------|-----|-------|
| Marking         | U   | V     | W     | E              |     |       |
| Wire color      | Red | White | Black | Green / Yellow | Red | Black |

(iii) Cable length (L) and mass

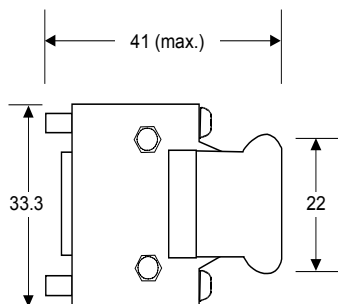
| Cable type  | L [mm]                              | Mass [g] |
|-------------|-------------------------------------|----------|
| WSC-M06 P05 | 5000 <sup>+500</sup> <sub>0</sub>   | 900      |
|             | 10000 <sup>+1000</sup> <sub>0</sub> | 1750     |
|             | 20000 <sup>+2000</sup> <sub>0</sub> | 3400     |

**(2) Connector kits [unit : mm]**

(a) Control input/output (expanded I/O for L, R types)

Connector kit type : WSK-D20P (20-pin)

Application : CN3 of RYS S3-LPS, RPS amplifier



|           |                    |
|-----------|--------------------|
| Plug      | 10120 - 3000VE     |
| Shell kit | 10320 - 52A0 - 008 |

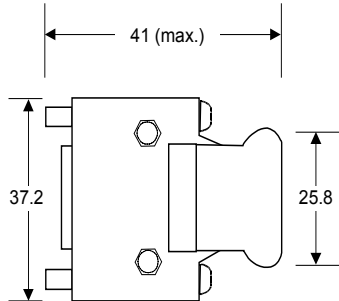
Mass : 20 [g]

(b) Control input/output (SX bus, T-link, RS-485)

Connector kit type : WSK-D26P (26-pin)

Application : CN1 of other than the RYS

S3-VVS, LPS, RPS amplifier



|           |                    |
|-----------|--------------------|
| Plug      | 10126 - 3000VE     |
| Shell kit | 10326 - 52A0 - 008 |

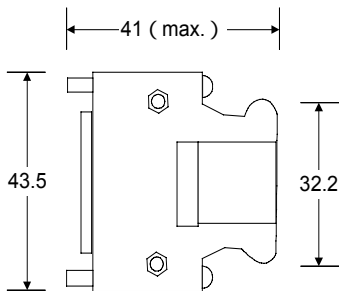
Mass : 20 [g]

(c) Control input/output

Connector kit type : WSK-D36P (36-pin)

Application : CN1 of RYS

S3-VVS, LPS, RPS amplifier



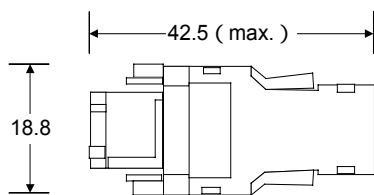
|           |                    |
|-----------|--------------------|
| Plug      | 10136 - 3000V      |
| Shell kit | 10336 - 52A0 - 008 |

Mass : 20 [g]

(d) Encoder

Connector kit type for amplifier side (CN2) : WSK-P06-M

Application : 0.75 [kW] and below



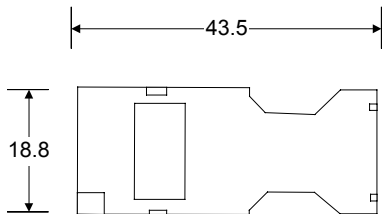
|             |              |
|-------------|--------------|
| Housing     | 54180 - 0611 |
| Shell cover | 58299 - 0600 |
|             | 58300 - 0600 |
| Mold cover  | 54181 - 0615 |
|             | 54182 - 0605 |
| Cable clamp | 58303 - 0000 |
| Clamp screw | 59832 - 0009 |

Mass : 10 [g]

(e) Encoder

Connector kit type for motor side (CN2) : WSK-P06P-F

Application : 0.75 [kW] and below



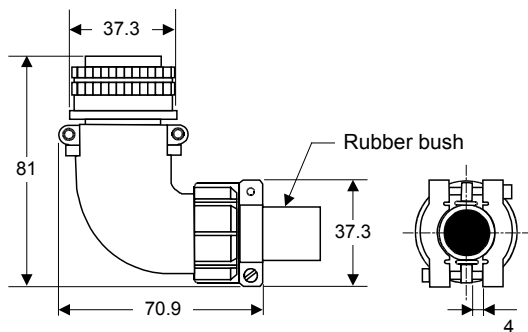
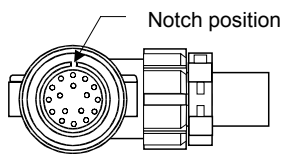
Mass : 10 [g]

|                        |              |
|------------------------|--------------|
| Housing                | 53988 - 0611 |
| Shell baby, clamp side | 58302 - 0600 |
| Mold cover, latch side | 53989 - 0605 |
| Mold cover             | 53990 - 0605 |
| Cable clamp            | 58303 - 0000 |
| Clamp screw            | 59832 - 0009 |

(f) Encoder

Connector kit type for motor side (CN2) : WSK-P06P-C

Application : 1 [kW] and above



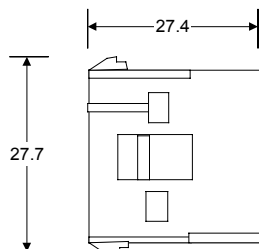
|             |                 |
|-------------|-----------------|
| Connector   | MS3108B20 - 29S |
| Cable clamp | MS3057 - 12A    |

Mass : 150 [g]

(g) Motor power for motor without providing brake

Connector kit type : WSK-M04P (4-pin)

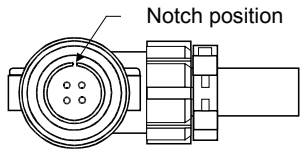
Application : 0.75 [kW] and below



|                        |                             |
|------------------------|-----------------------------|
| Cap                    | 350780 - 1                  |
| Shell body, clamp side | 350570 - 1 or<br>350689 - 3 |

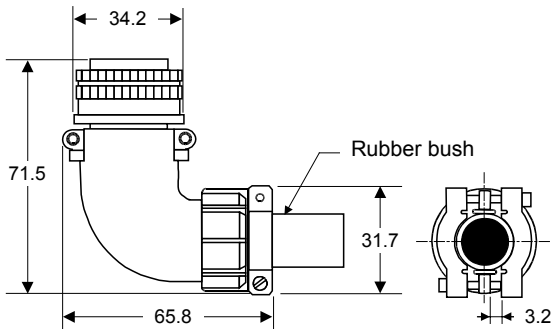
Mass : 10 [g]

(h) Motor power for motor without providing brake  
 Connector kit type : WSK-M04P-CA (4-pin)  
 Application : GYS type motor 1 to 2 [kW]

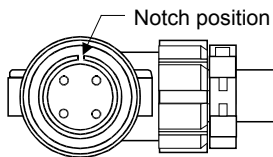


|             |                 |
|-------------|-----------------|
| Connector   | MS3108B18 - 10S |
| Cable clamp | MS3057 - 10A    |

Mass : 100 [g]

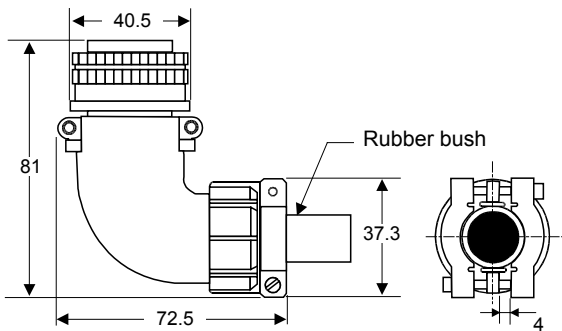


(i) Motor power for motor without providing brake  
 Connector kit type : WSK-M04P-CB (4-pin)  
 Application : GYC type motor 1 [kW] and above, GYS type motor 3 [kW] and above

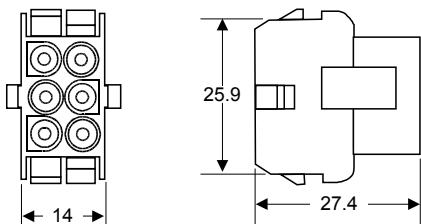


|             |                 |
|-------------|-----------------|
| Connector   | MS3108B22 - 22S |
| Cable clamp | MS3057 - 12A    |

Mass : 150 [g]



(j) Motor power for motor with providing brake  
 Connector kit type : WSK-M06P (6-pin)  
 Application : 0.75 [kW] and below

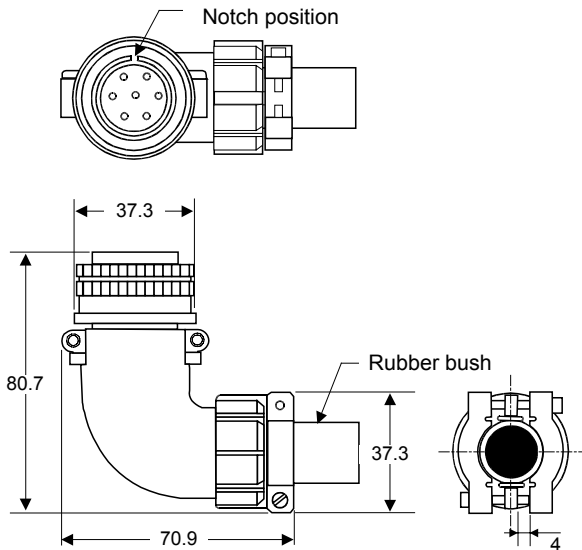


|             |            |
|-------------|------------|
| Cap housing | 350781 - 1 |
| Socket      | 350570 - 1 |

Mass : 10 [g]



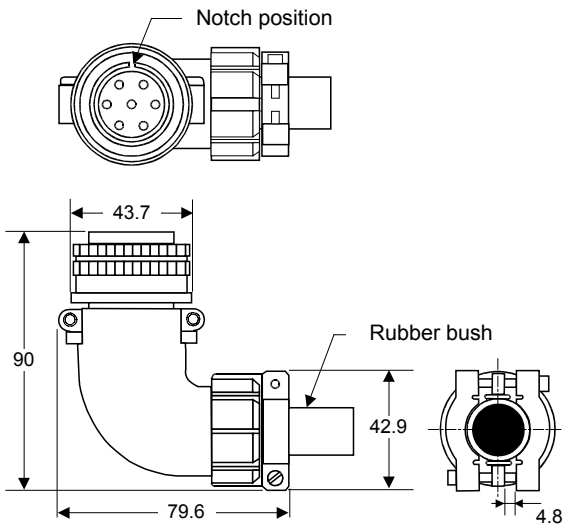
(k) Motor power for motor with providing brake  
 Connector kit type : WSK-M06P-CA (6-pin)  
 Application : GYS type motor 1 to 2 [kW]



|             |                 |
|-------------|-----------------|
| Connector   | MS3108B20 - 15S |
| Cable clamp | MS3057 - 12A    |

Mass : 150 [g]

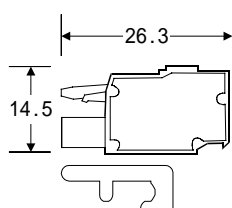
(l) Motor power for motor with providing brake  
 Connector kit type : WSK-M06P-CB (6-pin)  
 Application : GYC type motor 1 [kW] and above, GYS type motor 3 [kW] and above



|             |                 |
|-------------|-----------------|
| Connector   | MS3108B24 - 10S |
| Cable clamp | MS3057 - 16A    |

Mass : 200 [g]

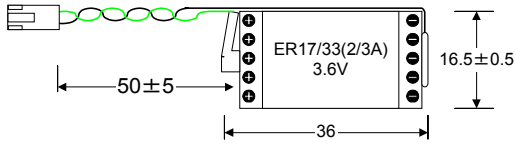
(m) Control power input  
 Connector kit type : WSK-L02P  
 Application : 1.5 [kW] and below



|              |                  |
|--------------|------------------|
| Connector    | 231702/026 - 000 |
| Manual lever | 231 - 131        |

Mass : 5 [g]

(n) Battery  
 Connector kit type : WSB - S



|   |                |
|---|----------------|
| Battery   | ER1733WK41 1PP |
| <ul style="list-style-type: none"> <li>• Nominal voltage : 3.6 [V]</li> <li>• Capacity : 1500 [mAh]</li> <li>• Mass : 15 [g]</li> </ul> |                |

**Storage of battery**

If a battery has been out of service for long-term, the following procedures should be followed.

Battery should be stored in the storeroom. The storeroom should be well ventilated, and selected for possible protection against temperature and moisture.

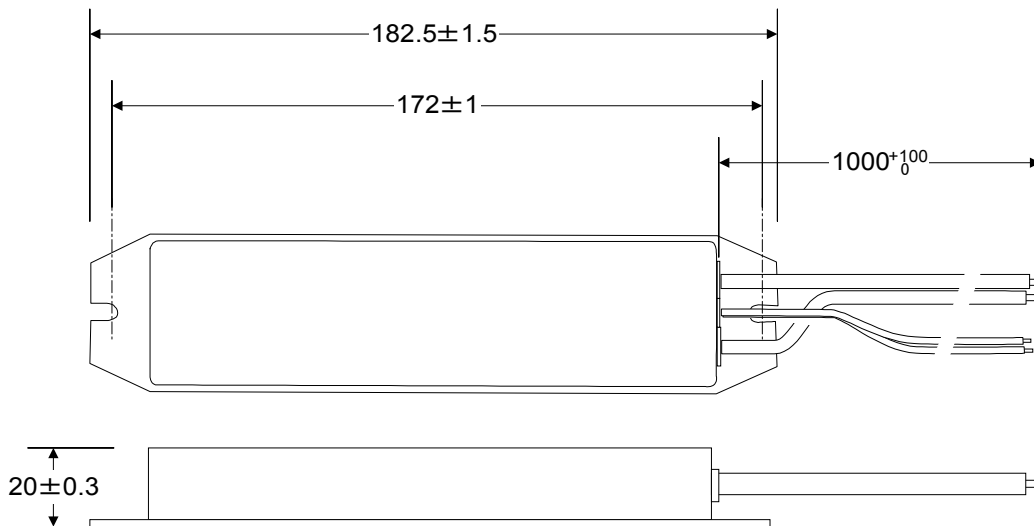
Surrounding condition should be kept within -10 to +75°C temperature and 10 to 90% RH humidity.

Storage term should be within two years.

**(3) External braking resistor [unit : mm]**

(a) Resistor type : WSR-401

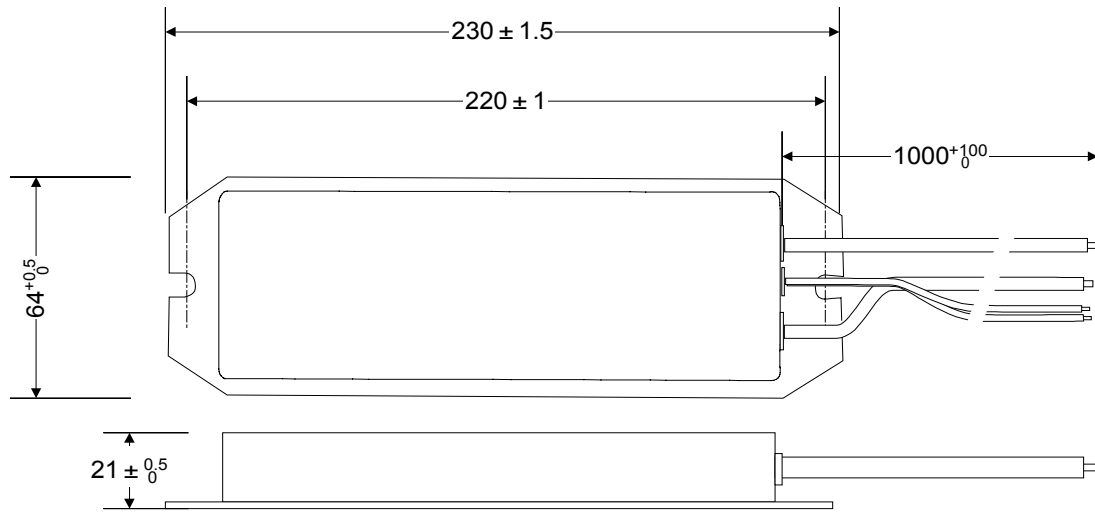
Application : RYS type amplifier 0.4 [kW] and below



Thickness of mounting plate is 1.2 [mm], mass : 235 [g]

(b) Resistor type : WSR-751

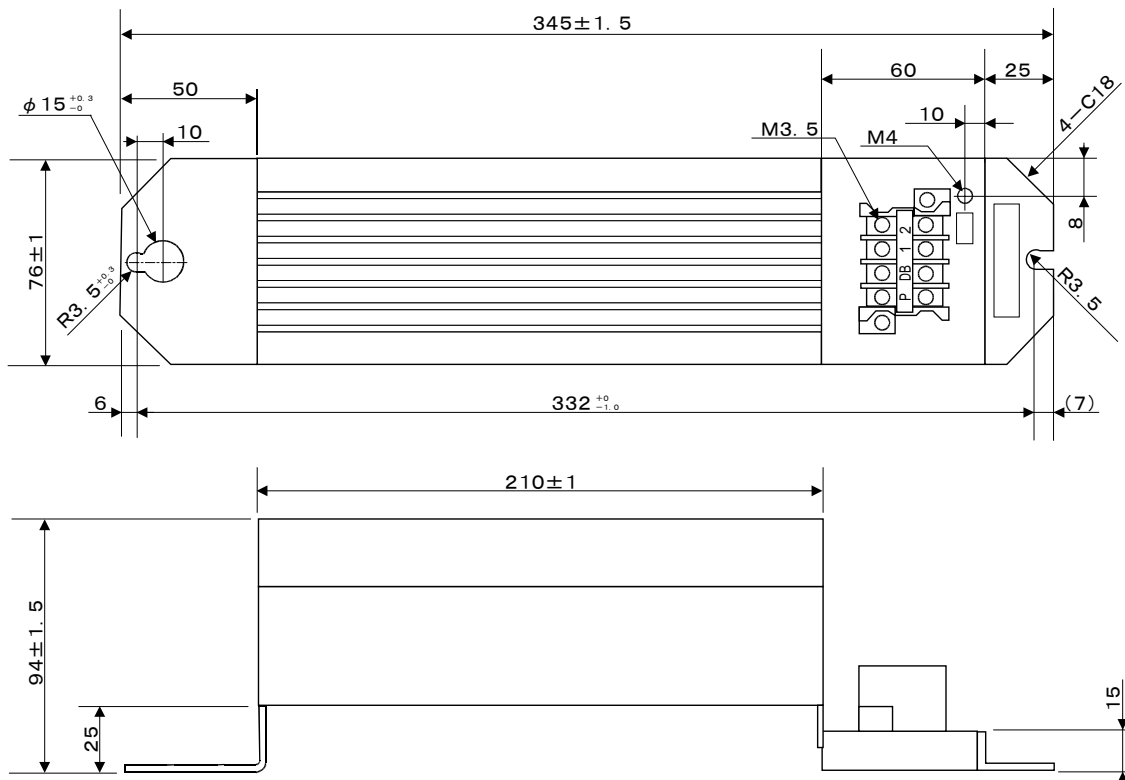
Application : RYS type amplifier 0.75 [kW]



Thickness of mounting plate is 1.5 [mm], mass : 520 [g]

(c) Resistor type : WSR-152

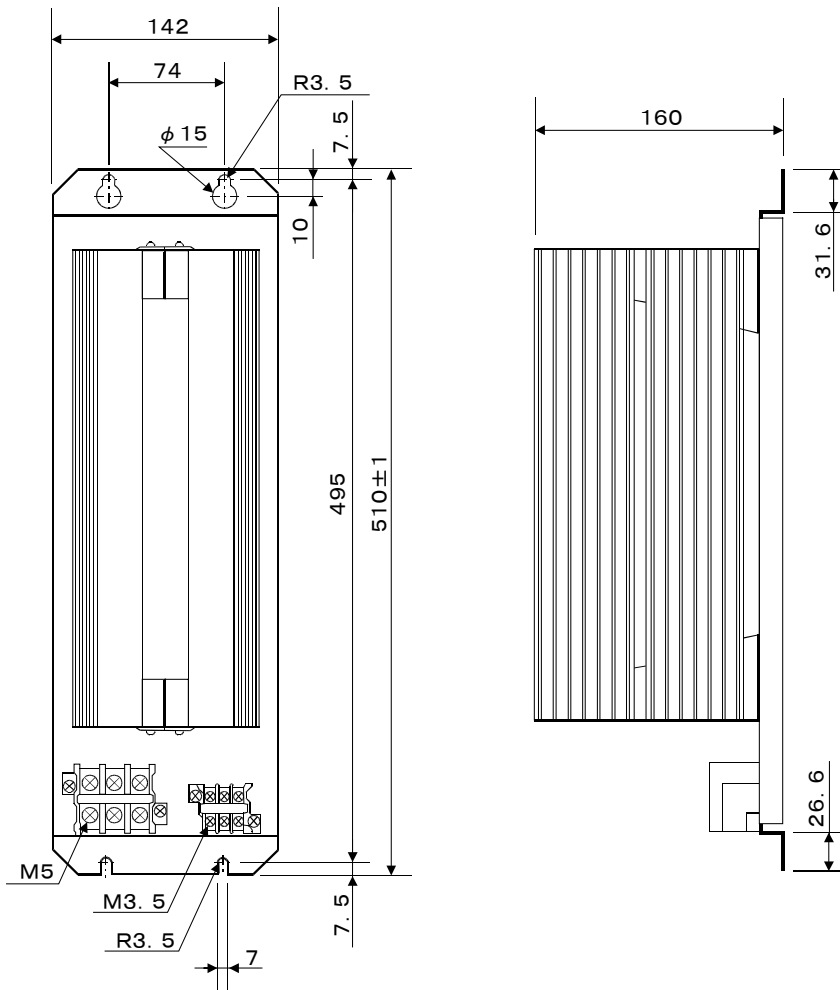
Application : RYS type amplifier 1 and 1.5 [kW]



Thickness of mounting plate is 2 [mm], mass : 2000 [g]



(e) Resistor type : DB22-2  
 Application : RYS type amplifier 4 and 5 [kW]



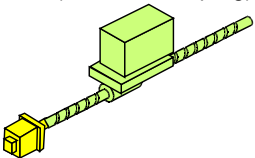
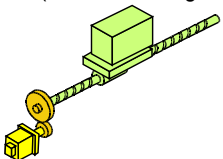
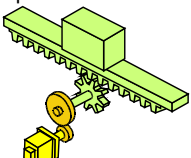
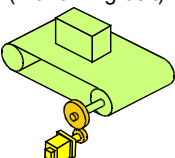
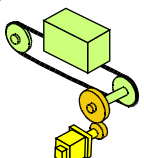
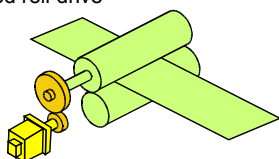
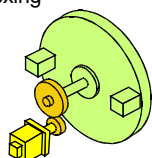
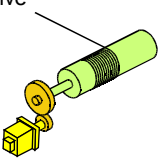
Thickness of mounting plate is 1.6 [mm], mass : 8700 [g]

## 11. APPENDIXES

### 11.1 Model type selection

#### (1) Load machine system

Load machine systems driven by adjustable (variable) speed motor are generally as follows.

| Mechanical system  | Description  |
|--|--|
| Ball-screw (with direct coupling)<br> | Used for high-accuracy positioning in a short distance.  |
| Ball-screw (with reduction gear)<br>  | Load torque is increased through deceleration. Compensation is required for gear backlash.   |
| Rack and pinion<br>                  | Used for positioning in a long distance.<br>Movement per revolution of pinion involves a value. compensation is required.  |
| Conveyor (with timing belt)<br>     | Used for light loads. compensation is required.  |
| Chain drive<br>                     | Mostly used for transfer line, etc.<br>For positioning, countermeasures for chain elongation is needed.<br>Reduction ratio is large. Moving speed of load machine system is low.   |
| Feed roll drive<br>                 | A material having a plate shape is emitted and sandwiched between rolls.<br>An error appears over a large length due to a difference in roll diameter.<br>compensation is required. Feed amount becomes inadequate due to slip at rapid accel./decel.. |
| Table indexing<br>                  | A large reduction speed ratio is required for a large inertia moment of the machine table.<br>Rotational speed of the table is low and a worm-gear is often used.  |
| Spindle drive<br>                   | In winding of wire material, etc., inertia moment becomes larger. Larger reduction speed is necessary.<br>For constant peripheral velocity control, a control system should be checked.  |

In designing the mechanical equipment system, the following should be examined as required.

(a) Reduction gear ratio

Use near the rated speed of motor is recommended where possible.

(b) Pre-load torque

When applying a pre-load to screw, load torque increases.

(c) Holding torque at vertical drive.

At stop of a vertical-feed load machine, energized-motor has a holding torque unless an external-braking device is used.

(d) Mechanical efficiency

(e) Rough estimated mechanical-coefficients

(i) Friction coefficient  $\mu$

| Application  | $\mu$       |
|--|-------------|
| Rail and iron wheel (crane traveling, traverse motion, traveling carriage) | 0.05        |
| Linear way   | 0.05 to 0.2 |
| Linear pole slide unit   |             |
| Roller system  |             |

(ii) Mechanical efficiency

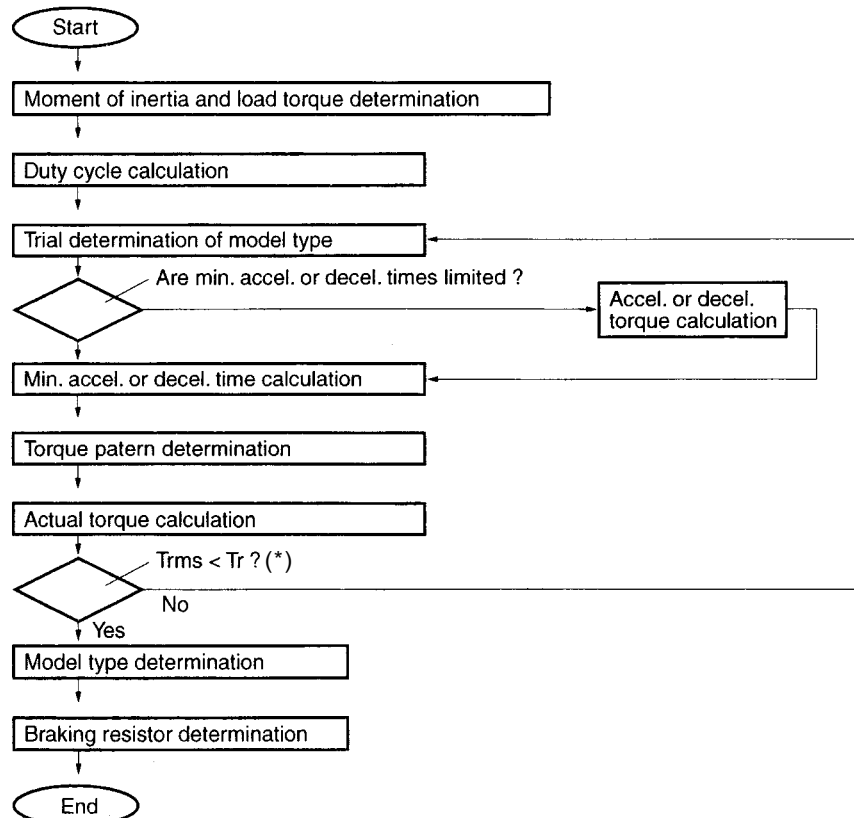
| Application         |                  |             |
|---------------------|------------------|-------------|
| Screw               |                  | 0.5 to 0.8  |
| Ball-screw          |                  | 0.9         |
| Rack and pinion     |                  | 0.8         |
| Spur gear reduction |                  | 0.8 to 0.95 |
| Worm reduction gear | At start         | 0.5 to 0.7  |
|                     | During operation | 0.6 to 0.8  |
| Belt drive          |                  | 0.95        |
| Chain drive         |                  | 0.9         |

(iii) Densities of major materials [kg/m<sup>3</sup>]

|                 |      |
|-----------------|------|
| Steel           | 7850 |
| Stainless steel | 7910 |
| Copper          | 8960 |
| Aluminum        | 2700 |
| Brass           | 8540 |
| Poly-acetal     | 1430 |

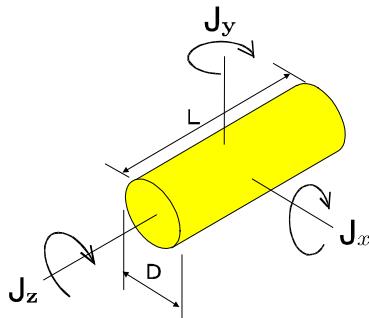
## (2) Model type selection determination

(a) Flow chart for selecting a model type



(\*) : Trms : Actual torque  
Tr : Rated torque

(b) Moment of inertia, basic form

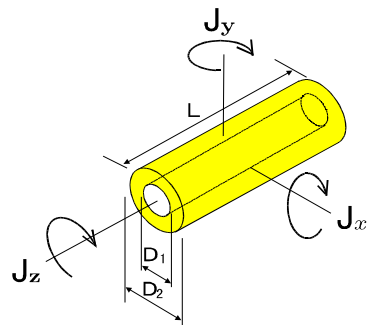


$$J_z = \frac{W}{8} \left( \frac{D}{10^3} \right)^2$$

$$= \frac{W}{32} \left( \frac{L}{10^3} \right) \left( \frac{D}{10^3} \right)^4$$

$$J_x = J_y = \frac{W}{16} \left( \frac{D}{10^3} \right)^2 + \frac{W}{12} \left( \frac{L}{10^3} \right)^2$$

$$W = \frac{4}{L} \left( \frac{L}{10^3} \right) \left( \frac{D}{10^3} \right)^2$$

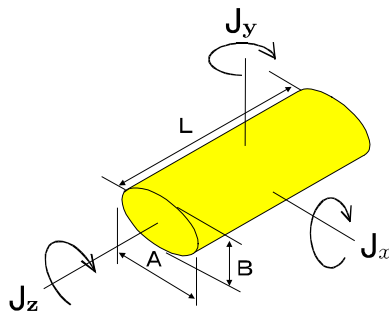


$$J_z = \frac{W}{8} \left( \left( \frac{D_2}{10^3} \right)^2 - \left( \frac{D_1}{10^3} \right)^2 \right)$$

$$= \frac{W}{32} \left( \frac{L}{10^3} \right) \left( \left( \frac{D_2}{10^3} \right)^2 - \left( \frac{D_1}{10^3} \right)^2 \right)$$

$$J_x = J_y = \frac{W}{16} \left( \left( \frac{D_2}{10^3} \right)^2 - \left( \frac{D_1}{10^3} \right)^2 \right) + \frac{W}{12} \left( \frac{L}{10^3} \right)^2$$

$$W = \frac{4}{L} \left( \frac{L}{10^3} \right) \left( \left( \frac{D_2}{10^3} \right)^2 - \left( \frac{D_1}{10^3} \right)^2 \right)$$

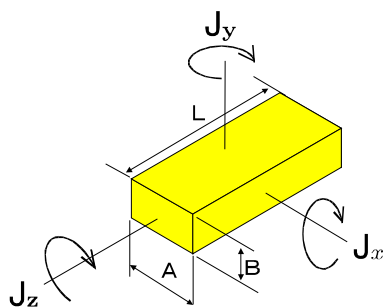


$$J_z = \frac{W}{16} \left( \left( \frac{A}{10^3} \right)^2 + \left( \frac{B}{10^3} \right)^2 \right)$$

$$J_x = \frac{W}{16} \left( \frac{B}{10^3} \right)^2 + \frac{W}{12} \left( \frac{L}{10^3} \right)^2$$

$$J_y = \frac{W}{16} \left( \frac{A}{10^3} \right)^2 + \frac{W}{12} \left( \frac{L}{10^3} \right)^2$$

$$W = \frac{4}{L} \left( \frac{A}{10^3} \right) \left( \frac{B}{10^3} \right) \left( \frac{L}{10^3} \right)$$

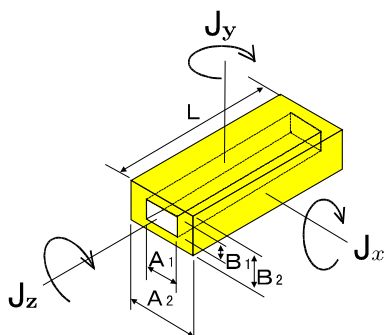


$$J_z = \frac{W}{12} \left( \left( \frac{B}{10^3} \right)^2 + \left( \frac{L}{10^3} \right)^2 \right)$$

$$J_x = \frac{W}{12} \left( \left( \frac{L}{10^3} \right)^2 + \left( \frac{A}{10^3} \right)^2 \right)$$

$$J_y = \frac{W}{12} \left( \left( \frac{A}{10^3} \right)^2 + \left( \frac{B}{10^3} \right)^2 \right)$$

$$W = \left( \frac{A}{10^3} \right) \left( \frac{B}{10^3} \right) \left( \frac{L}{10^3} \right)$$



$$J_x = \frac{W_2}{12} \left( \left( \frac{B_2}{10^3} \right)^2 + \left( \frac{L}{10^3} \right)^2 \right) - \frac{W_1}{12} \left( \left( \frac{B_1}{10^3} \right)^2 + \left( \frac{L}{10^3} \right)^2 \right)$$

$$J_y = \frac{W_2}{12} \left( \left( \frac{A_2}{10^3} \right)^2 + \left( \frac{L}{10^3} \right)^2 \right) - \frac{W_1}{12} \left( \left( \frac{A_1}{10^3} \right)^2 + \left( \frac{L}{10^3} \right)^2 \right)$$

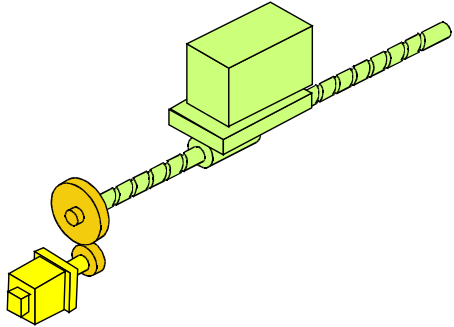
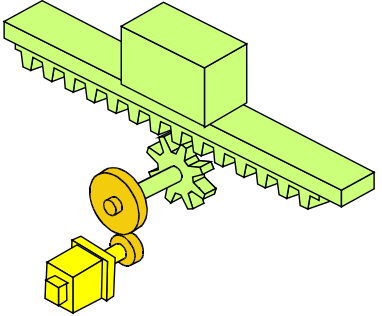
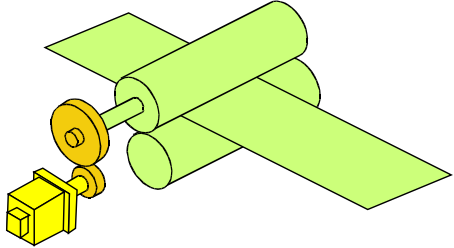
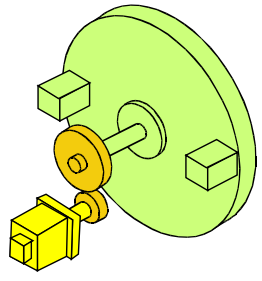
$$J_z = \frac{W_2}{12} \left( \left( \frac{A_2}{10^3} \right)^2 + \left( \frac{B_2}{10^3} \right)^2 \right) - \frac{W_1}{12} \left( \left( \frac{A_1}{10^3} \right)^2 + \left( \frac{B_1}{10^3} \right)^2 \right)$$

$$W = \left( \left( \frac{A_2}{10^3} \right) \left( \frac{B_2}{10^3} \right) - \left( \frac{A_1}{10^3} \right) \left( \frac{B_1}{10^3} \right) \right) \left( \frac{L}{10^3} \right)$$

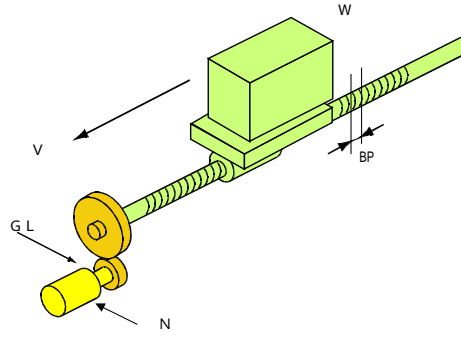
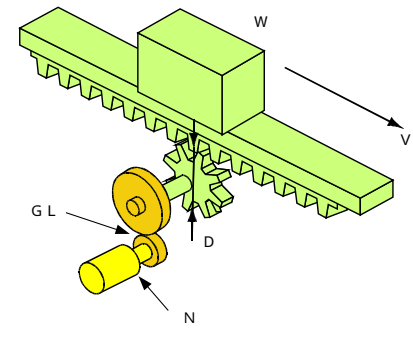
$$W_2 = \left( \frac{A_2}{10^3} \right) \left( \frac{B_2}{10^3} \right) \left( \frac{L}{10^3} \right) \quad W_1 = \left( \frac{A_1}{10^3} \right) \left( \frac{B_1}{10^3} \right) \left( \frac{L}{10^3} \right)$$



(c) Moment of inertia, typical application

|  |   |
|--|---|
| <p>Ball-screw</p>                                 | $J_1 = W \left( \frac{1}{2} \times \frac{B P}{10^3} \right)^2 \times G L^2$ |
| <p>Rack and pinion, conveyor or chain drive</p>  | $J_2 = \frac{W}{4} \left( \frac{D}{10^3} \right)^2 \times G L^2$            |
| <p>Feed roll drive</p>                          | $J_3 = \frac{W}{4} \left( \frac{D}{10^3} \right)^2 \times G L^2$            |
| <p>Table indexing</p>                           | $J_4 = \left( J + W \left( \frac{L}{10^3} \right)^2 \right) \times G L^2$   |

(d) Torque determination

|   |   |
|---|---|
| <p>Ball-screw</p>                  | $T_L = \frac{(\mu W + F) \times 9.81 \left( \frac{BP}{10^3} \right)}{2\pi\eta} \times GL$ <ul style="list-style-type: none"> <li>• <math>T_L</math> at load lifting :</li> </ul> $T_L = \frac{((\mu + 1)W_1 \cdot W_2) \times 9.81 \left( \frac{BP}{10^3} \right)}{2\pi\eta} \times GL$ <ul style="list-style-type: none"> <li>• <math>T_L</math> at lowering :</li> </ul> $T_L = \frac{((\mu - 1)W_1 \cdot W_2) \times 9.81 \left( \frac{BP}{10^3} \right)}{2\pi\eta} \times GL$ <ul style="list-style-type: none"> <li>• <math>T_L</math> at stop (servo lock) :</li> </ul> $T_L = \frac{(W_1 \cdot W_2) \times 9.81 \left( \frac{BP}{10^3} \right)}{2\pi\eta} \times GL$   |
| <p>Rack and pinion, conveyor</p>  | $T_L = \frac{(\mu W + F) \times 9.81 \left( \frac{D}{2} \times \frac{1}{10^3} \right)}{\eta} \times GL$ <ul style="list-style-type: none"> <li>• <math>T_L</math> at load lifting :</li> </ul> $T_L = \frac{((\mu + 1)W_1 - W_2) \times 9.81 \left( \frac{D}{2} \times \frac{1}{10^3} \right)}{\eta} \times GL$ <ul style="list-style-type: none"> <li>• <math>T_L</math> at lowering :</li> </ul> $T_L = \frac{((\mu - 1)W_1 - W_2) \times 9.81 \left( \frac{D}{2} \times \frac{1}{10^3} \right)}{\eta} \times GL$ <ul style="list-style-type: none"> <li>• <math>T_L</math> at stop (servo lock) :</li> </ul> $T_L = \frac{(W_1 - W_2) \times 9.81 \left( \frac{D}{2} \times \frac{1}{10^3} \right)}{\eta} \times GL$ |

Where

- BP : Screw-pitch
- D : Pulley, pinion or roll diameter
- F : Thrust (axial) force (opposes feed on is + direction)
- GL : Reduction speed ratio
- J : Moment of inertia, total
- $J_L$  : Ditto, load parts
- $J_M$  : Ditto, motor rotor
- where,
- $J_L = J_M \times 100$  : Load of low moving velocity
- $J_L = J_M \times 50$  : Load of positioning
- $J_L = J_M \times 10$  : Load of high frequent positioning

- L : Length or distance of parts
- N : Motor speed
- $T_L$  : Load torque, total
- v : Moving velocity
- W : Mass (weight)
- $W_1$  : Ditto, movable part
- $W_2$  : Ditto, counter movable part
- $\eta$  : Mechanical efficiency
- $\mu$  : Friction coefficient

(e) Calculation of accel./decel. torque and accel./decel. time (shortest)

(i) Accel./decel. torque

For application to soft start/stop operation, etc, accel./decel. torque should be calculated according to the formula below.

• Accel./decel. torque ( $T_{AC}$ )

$$T_{AC} = \frac{(J_M + J_L) \times 2 \times (N_1 - N_0)}{60 \times (t_{AC})} \pm T_L \text{ [N} \cdot \text{m]}$$

Where,

$J_L$  : Moment of load inertia after conversion into motor shaft [ $\text{kg} \cdot \text{m}^2$ ]

$J_M$  : Moment of inertia motor rotor [ $\text{kg} \cdot \text{m}^2$ ]

$N_0$  : Motor speed before the speed change [r/min]

$N_1$  : Speed after the speed change [r/min]

$t_{AC}$  : Accel./decel. time [s]

$T_{AC}$  : Max. accel./decel. (breakdown (max.)) motor torque [ $\text{N} \cdot \text{m}$ ]

$T_L$  : Load torque after conversion into motor shaft [ $\text{N} \cdot \text{m}$ ]

The result of the above calculation should be within the allowable maximum accel. /decel. torque of motor.

(ii) Shortest accel./decel. time

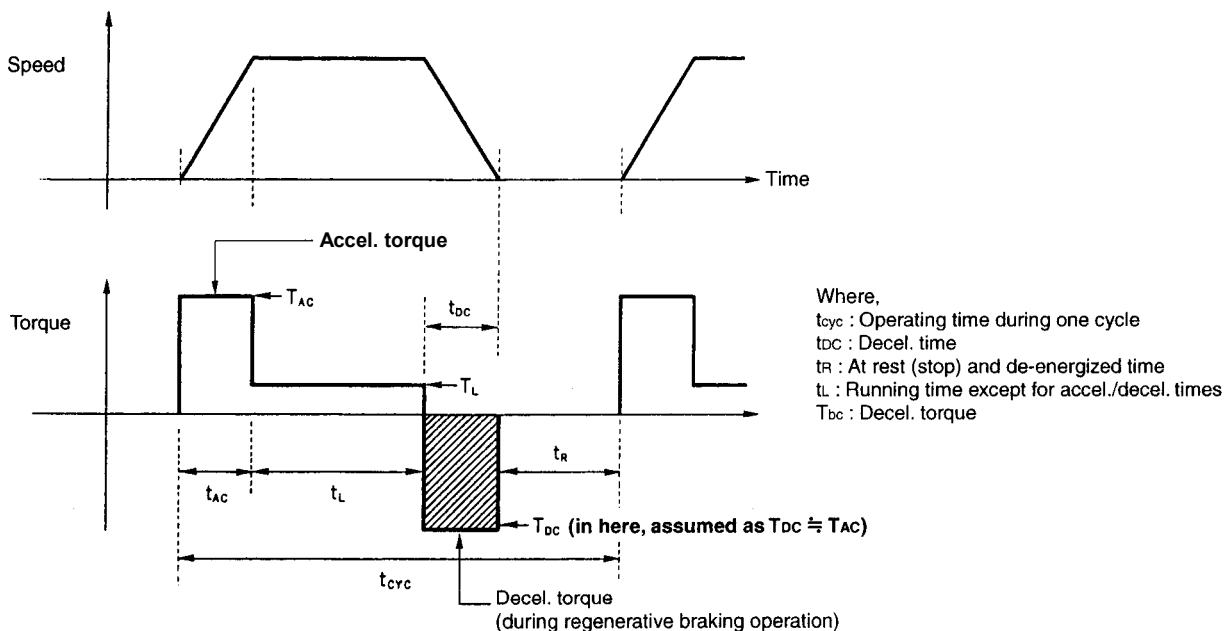
For obtaining the target speed in the shortest time, calculation is required by the formula below.

$$t_{AC} = \frac{(J_L + J_M) \times 2 \times (N_1 - N_0)}{60 \times (T_{AC} \pm T_L)} \text{ [s]}$$

When  $T_{AC} + T_L$  :  $t_{AC}$  : (shortest decel. time)

$T_{AC} - T_L$  :  $t_{AC}$  : (shortest accel. time)

(iii) Operation pattern, basic



(f) Actual torque ( $T_{rms}$ ) determination

In application to a machine which performs rapid feed frequency, the motor may overheat due to the energy required for accel. and decel.. To prevent this, calculate the actual torque in the following procedure depending on the given repetitive operation pattern and ensure that the value is not larger than motor rated torque.

Shown below are the formula for actual torque in the typical operation pattern.

$$T_{rms} = \sqrt{\frac{(T_{AC}^2 \times t_{AC}) + (T_L^2 \times t_L) + (T_{DC}^2 \times t_{DC})}{t_{cyc}}}$$

If the actual torque surpasses the rated torque, the following items should be reviewed.

- Slightly reduce the frequency of acceleration and deceleration.
- Review decel. method or decel. ratio, etc. and set feed speed appropriately.
- If motor torque is generated even during stop, a mechanical equipment system should be selected so as to minimize the necessity for torque at stop.
- To maintain motor response at a satisfactory level, it is recommended to restrict the moment of load inertia within the twofold value of moment of inertia of motor rotor. If higher frequent operation is absolutely required, the moment of load inertia should be further reduced.

(g) Regenerative braking power

(i) Horizontally moving, deceleration

$$P_1 = 0.105 \times T_{DC} \times N_{10} \times (1/2) [W]$$

Where,

$T_{DC}$  = Decel. torque [ N · m ]

$N_{10}$  = Speed at decel. duration [ r/min ]

(ii) Vertically, lowering

$$P_2 = 0.105 \times T_{L0} \times N_{20} [W]$$

Where,

$T_{L0}$  = Load torque at lowering [ N · m ]

$N_{20}$  = Speed at lowering [ r/min ]

(iii) Mean braking power per cycle

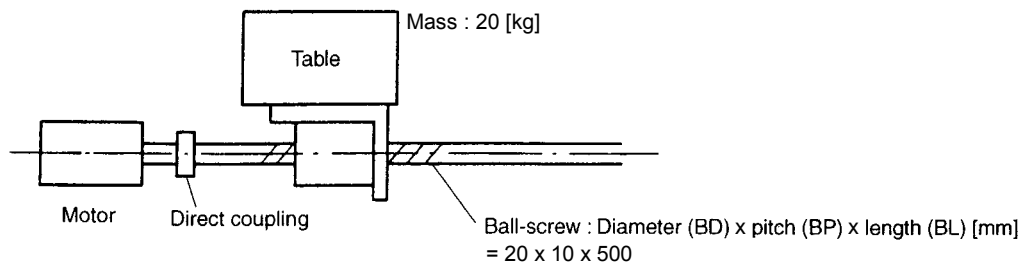
$$P = \frac{P_1 \times t_1 + P_2 \times t_2}{t_{CYC}} [W]$$

Where,

$t_1, t_2$  : Decel. time during  $P_1/P_2$  operation

### (3) Examples of calculation for model type selection

Selection of the output of the motor used for driving the table (horizontally moving body) shown below is exemplified here.



For capacity selection, calculation is required in the following selection procedure.

(i) Moment of inertia of load via conversion into motor shaft

a) Movable part (table) ( $J_{L1}$ )

$$J_{L1} = W \left\{ \frac{1}{2} \times \frac{BP}{10^3} \right\}^2 \times GL^2 = 20 \left\{ \frac{1}{2} \times \frac{10}{10^3} \right\}^2 \times (1/1)^2 = 0.05 \times 10^{-3} [kg \cdot m^2]$$

Where,  $W$  : Mass (weight) of table

b) Ball-screw ( $J_{L2}$ )

$$J_{L2} = \frac{\rho}{32} \times \frac{BL}{10^3} \times \left\{ \frac{BD}{10^3} \right\}^4 \times GL^2 = \frac{7.85 \times 10^3}{32} \times \frac{500}{10^3} \times \left\{ \frac{20}{10^3} \right\}^4 \times (1/1)^2 = 0.06 \times 10^{-3} [kg \cdot m^2]$$

Where,  $\rho$  : Density of ball-screw (assumed as 7850 [kg/m<sup>3</sup>])

thus,  $J_L = J_{L1} + J_{L2} = 0.11 \times 10^{-3} [kg \cdot m^2]$

(ii) Load torque via conversion into motor shaft ( $T_L$ )

$$T_L = \frac{\mu W \times 9.81}{2 \eta} \times \frac{BP}{10^3} \times GL = \frac{0.1 \times 20 \times 9.81}{2 \times 0.9} \times \frac{10}{10^3} \times (1/1) = 0.03 \text{ [N} \cdot \text{m]}$$

Where,  $\mu$  : Friction coefficient = 0.1,  $\eta$  : Mechanical efficiency = 0.9

(iii) Shortest accel./decel. time ( $t_{ac}/t_{dc}$ )

Of the motor which meets the following conditions ;  $J_L \leq 5 \times J_M$  and  $T_L \leq T_R$  (rated torque)  $\times 0.9$   
0.2 [kW] motor is temporarily selected. :

Where,

$T_L = 0.03 \text{ [N} \cdot \text{m]}$ ,  $J_L = 0.11 \times 10^{-3} \text{ [kg} \cdot \text{m}^2]$ , from motor data according to 2.1 : rated torque = 0.637 [N · m], breakdown (max.) torque = 1.91 [N · m], moment of motor rotor inertia =  $0.0216 \times 10^{-3} \text{ [kg} \cdot \text{m}^2]$  for 0.2 [kW], GYC 201DC1-S motor.

a) Shortest accel./decel. time

$$t_{AC} = \frac{(J_M + J_L) \times 2 \times N}{60(T_{AC} - T_L)} = \frac{(0.0216 \times 10^{-3} + 0.11 \times 10^{-3}) \times 2 \times 3000}{60(1.91 - 0.03)} = 0.022 \text{ [s]}$$

b) Accel./decel. torque for application to soft operation (0.05 [s] accel. time) from 0 to 3000 [r/min] speed

$$T_{AC} = \frac{(J_M + J_L) \times 2 \times N}{60 \times t_{ac}} + T_L = \frac{(0.0216 \times 10^{-3} + 0.11 \times 10^{-3}) \times 2 \times 3000}{60 \times 0.05} + 0.03 = 0.86 \text{ [N} \cdot \text{m]}$$

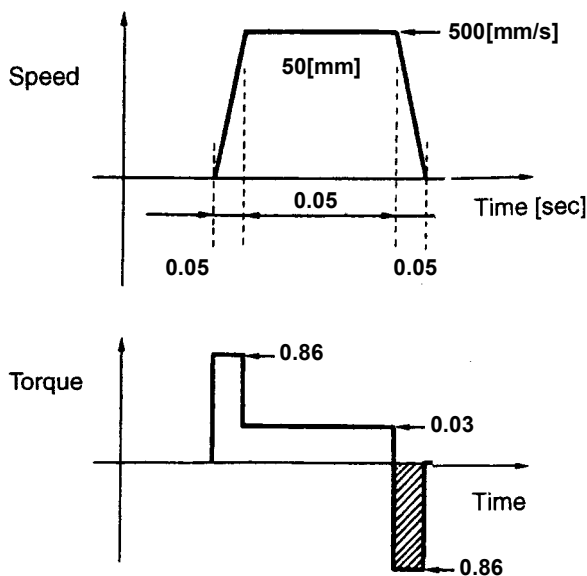
Where,

$J_M$  : Moment of inertia of motor [kg · m<sup>2</sup>]

$N$  : Motor speed [r/min]

$T_{AC}$  : Max. torque which can be output within an increase from 0 to 3000 [r/min]

(iv) Operation pattern



(v) Moving length of ball-screw

Moving velocity ( $v$ ) of mechanical equipment system at 3000 [r/min] motor speed ( $N$ )

$$v = \frac{N}{60} \times BP \times GL = \frac{3000}{60} \times 10 \times (1/1) = 500 \text{ [mm/s]}$$

(vi) Calculation of actual torque ( $T_{rms}$ )

Actual torque can be calculated by the following formula.

$$T_{rms} = \sqrt{\frac{((0.86^2 \times 0.05 \times 2) + (0.03^2 \times 0.05)) \times 1}{0.5}} = 0.38 \text{ [N} \cdot \text{m]}$$

Since the rated torque of 0.2 [kW] motor is 0.637 [N · m], a relation of “actual torque < rated torque “ is satisfied. Therefore, the temporarily selected motor is actually applicable.

(vii) Examination of braking resistor

In the above torque pattern, the hatched area corresponds to the regenerative braking mode. Braking power is as follow.

$$P_1 = 0.105 \times T_{AC} \times N \times (1/2) = 0.105 \times 0.86 \times 3000 \times (1/2) = 135 \text{ [W]}$$

From the above result, mean braking power per cycle is :

$$P = \frac{135 \times 0.05}{0.5} = 14 \text{ [W]}$$

#### (4) Determination of external braking resistor

Because of the braking resistor is not built-in the 0.2 [kW] motor, requiring of external braking resistor provision is reviewed as follows :

(a) Energy ( $E_G$ ) on the mechanical equipment system during deceleration

$$E_G = \frac{1}{2}(J_M + J_L) \cdot (2 \text{ N} / 60)^2$$

$$= \frac{1}{2}(0.0216 \times 10^{-3} + 0.11 \times 10^{-3}) \times \left[ \frac{2 \times 3000}{60} \right]^2 = 6.5 \text{ [J]}$$

(b) Consumption energy ( $E_L$ ) due to load torque

$$E_L = (2 / 60) \times T_L \times N \times t_{DC} \times (1/2)$$

$$= (2 / 60) \times 0.03 \times 3000 \times 0.05 \times (1/2) = 0.24 \text{ [J]}$$

(c) Consumption energy ( $E_M$ ) in motor winding

$$E_M = 3 \times (R \times I^2) \times t_{DC} = 3 \times R \times ((T_{DC} / T_R \times I_R)^2) \times t_{DC}$$

$$= 3 \times 2 \times ((0.86 / 0.637 \times 1.5)^2) \times 0.05 = 1.2 \text{ [J]}$$

(d) Absorbing energy ( $E_S$ ) of motor

$$E_S = \frac{1}{2} CV^2 = \frac{1}{2} (660 \times 10^{-6}) \times (370^2 - (200 \times 2^2)^2) = 18.7 \text{ [J]}$$

Where,

R : Phase resistance of stator winding of GYC201 type motor is 2 [ Ω ], at room temperature

V : Power supply voltage 200 [ V ]

C : DC intermediate capacity of RYS201 amplifier 660 [ μ F ]

(e) Consumption and absorbing energies ( $E_L + E_M + E_S$ ) is 20 [ J ], which is larger than the energy on the mechanical equipment system ( $E_G = 6.5$  [ J ]). Therefore, external braking resistor provision is not required in this example.

## 11.2 Control block diagram

The control block diagram for RYS-R type amplifier is shown on the next page.

### (1) Override

Validated by allocating the control assign terminals [CONTn] to signals.

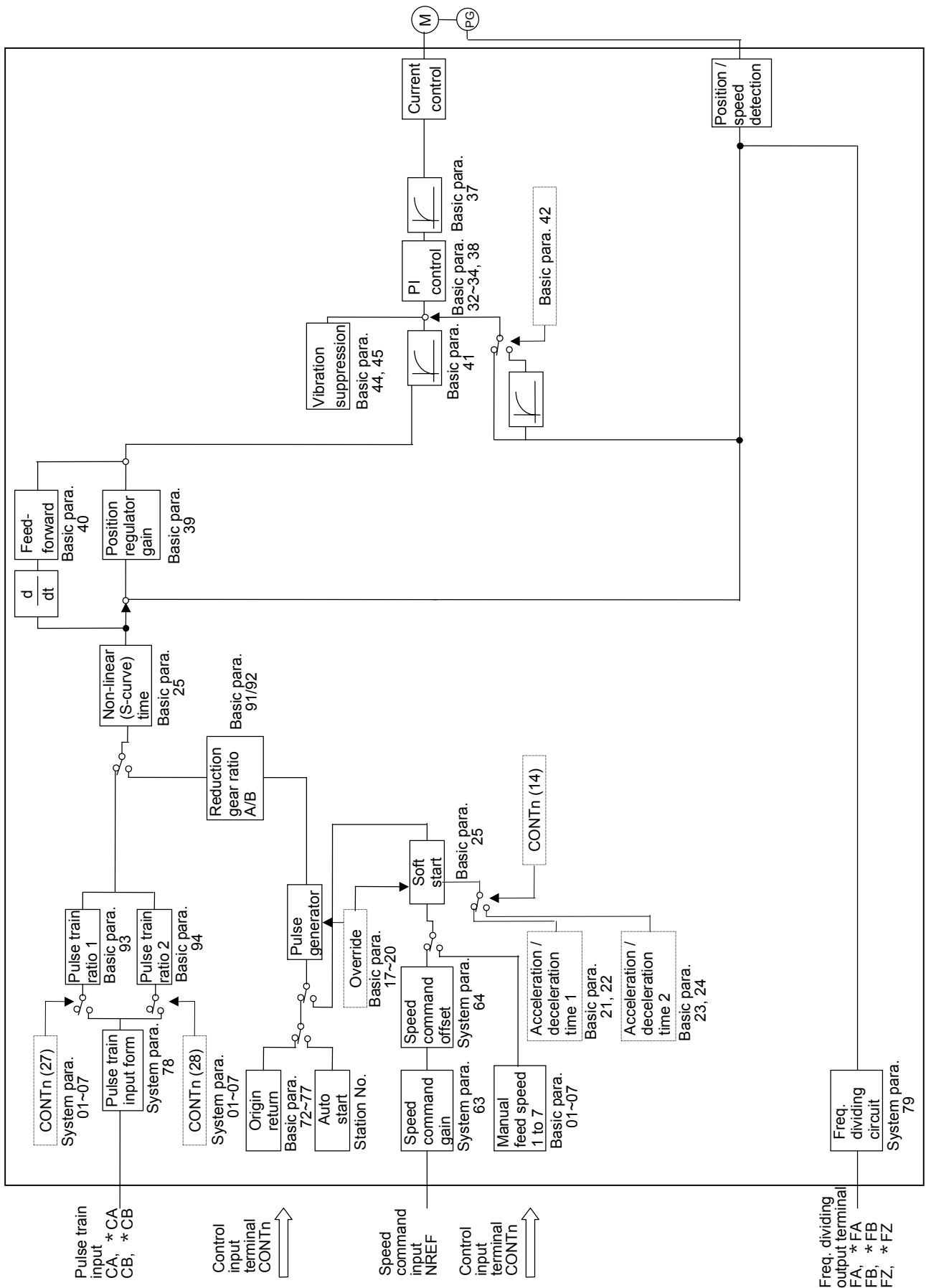
| Setting value | Signal name    |
|---------------|----------------|
| 43            | Override valid |
| 44            | Override 1     |
| 45            | Override 2     |
| 46            | Override 4     |
| 47            | Override 8     |

### (2) Manual feed

The speed of manual forward or reverse rotation can be selected by multistep speed selection [X1], [X2] and [X3].

| X3  | X2  | X1  | Speed                                      |
|-----|-----|-----|--|
| OFF | OFF | OFF | Speed set by speed command [NREF] terminal |
| OFF | OFF | ON  | Speed set by basic para. 1                 |
| OFF | ON  | OFF | Speed set by basic para. 2                 |
| OFF | ON  | ON  | Speed set by basic para. 3                 |
| ON  | OFF | OFF | Speed set by basic para. 4                 |
| ON  | OFF | ON  | Speed set by basic para. 5                 |
| ON  | ON  | OFF | Speed set by basic para. 6                 |
| ON  | ON  | ON  | Speed set by basic para. 7                 |

See 5.3.1 Forward command [FWD]/Reverse command [REV], and 5.7.3 Override.





### 11.3 Letter symbols and abbreviated words

|          |  |          |  |
|----------|--|----------|--|
| <b>A</b> | ABS : Absolute position specified<br>Accel. : Acceleration<br>ACCO : Acceleration/deceleration time selection<br>AD : Address<br>AF : Absolute data overflow, Multiple rotation data overflow<br>AH : Amplifier overheat, Amp. heat<br>AI/AO : Analog input/output<br>ALM : Alarm detection<br>Amplifier : Servo-amplifier   | <b>F</b> | FAB : Fuji's auto circuit breaker, MCCB<br>Fb : Fuse blown<br>FG : Frame (enclosure) ground terminal<br>FLEX : Fuji's PLC<br>FLTH, FLTL : Fault-high or -low level<br>Forward direction : (*)<br>FWD : Forward command   |
| <b>B</b> | BROUT : Dynamic braking fault output<br>BX : Free run  | <b>H</b> | Hv : Overvoltage, High voltage   |
| <b>C</b> | C : Cleaning key<br>CA : Command pulse, A-phase<br>*CA : * is a logic inverted signal of CA<br>CALL : Read key<br>CB : Command pulse, B-phase<br>*CB : * is a logic inverted signal of CB<br>CCW : Counter-clockwise (*)<br>CE : Motor combination error<br>CEND : Cycle end<br>CH : Controller overheat<br>CM : Speed monitor, check pin<br>CMD : Command<br>CN1 : Control input/output signal connector<br>CN2 : Encoder (detector) connector<br>CO : Data continuation<br>CONT : Control signal<br>COPY : Copy mode<br>CPURDY : CPU ready<br>Ct : Control power trouble (error), Circuit trouble, Amplifier trouble<br>CtE : Control signal error<br>CW : Clockwise (*) | <b>I</b> | I/F : Interface<br>INC : Relative (increment) position specified<br>INF : Infinite-length feed   |
| <b>D</b> | DB : Internal braking resistor unit<br>dE : Memory error, Data error<br>Decel. : Deceleration<br>DI/DO : Digital input/output<br>DIR : Shorted route valid<br>DMON : Data monitor<br>D No. : Station number  | <b>J</b> | J <sub>L</sub> : Moment of load inertia after conversion into motor shaft<br>J <sub>M</sub> : Moment of inertia of motor rotor   |
| <b>E</b> | E : Ground (earth) terminal<br>EC : Encoder (detector) communication error<br>EEPROM : Electrically erasable program read only memory<br>EH : Encoder (detector) overheat, Encoder (detector) heat<br>ELCB : Earth leakage circuit breaker<br>EMG : Forced stop<br>ENQ : Enquiry, control code<br>EP : Encoder (detector) power error<br>ERROR : CPU error<br>Et : Encoder (detector) trouble (error)  | <b>L</b> | LC display : Liquid crystal display<br>LED : Light emitted diode<br>LS : Origin LS, Origin limit switch<br>LSD : Least significant digit<br>Lv : Undervoltage, Low voltage   |
|          |  | <b>M</b> | MAN : Test (trial, manual) mode operation (run)<br>MC : Magnetic contactor<br>ME : Memory error<br>MH : Motor overheat<br>MICREX : Fuji's PLC<br>MODE : Transition key<br>MON1 : Speed monitor<br>MON2 : Torque monitor<br>Motor : Servo-motor<br>MSD : Most significant digit               |
|          |  | <b>N</b> | NARV : Speed arrive<br>NEXT : Display key of data after (next) one screen (or No.) display<br>NREF : Speed command<br>NZERO : Speed zero   |
|          |  | <b>O</b> | OC : Overcurrent, Output overcurrent<br>OF : Deviation excessive, Overflow<br>OFF L : Offline key<br>OL : Motor overload, Overload<br>ON L : Online key<br>ORG : Origin return<br>OS : Overspeed<br>OT : Overtravel<br>± OT : ± direction overtravel<br>OUT : Out signal<br>OV : Overvoltage |

- P** PA : Parameter editing mode  
 Para. : Parameter  
 PC : Personal computer  
 PC-board : Printed-circuit board  
 P-control : Proportional band control  
 PD : Current (present) position output  
 PE : Main circuit trouble, Power error  
 PG : Encoder detector, Pulse encoder, Pulse generator  
 PLC : Programmable logic controller  
 PMON : Position monitor  
 PO : Positioning data editing mode  
 POWER : Power on  
 PRE : Display key of data before (previous) one screen  
 (or No.) display  
 PSET : Positioning end, Indexing (dividing) end  
 PWRT : Parameter (re)write
- R** RDY : Ready  
 RES : Reset mode  
 REV : Reverse direction  
 Reverse direction : (\*)  
 rH : Braking (DB) resistor overheat, Resistor heat  
 rH2 : Resistor overheat 2, Resistor heat 2  
 RST : Alarm reset  
 RUN : Run command
- S** S-curve : Non-linear  
 SE : System error  
 SEQ : Sequence mode  
 SIGN : Rotational direction  
 SSC : Solid state contactor  
 START : Auto start  
 STOP : Forced stop key  
 STORE : Write-in of numerical setting key  
 SW : Setting switch
- T** tE : Bus communication error, Terminal error  
 TLMT : Torque limit
- U** UV : Undervoltage
- V** VEL : Rotation speed selection
- W** WPSET : Indexing (dividing) end  
 WRT : Position preset, Position data (re)write  
 WRTE : (Re)write end
- X** X1 : Multistep speed selection X1
- 0** 0V : Common monitor, check pin

Note (\*)

Direction of motor shaft rotation (when viewed from a point facing the drive-end of motor) is designed according to Japanese standard :

- Forward direction : Counter-clockwise (CCW) rotation
- Reverse direction : Clockwise (CW) rotation

# Worldwide Operations

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### America

#### ● USA Service Center, Fuji Electric

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### EC, Middle East and Africa

#### ● EC Service Center, Fuji Electric

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### South East Asia

#### ● South East Asia Service Center, Fuji Electric

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## Contracted Service Companies

### Asia and Oceania

#### ● CNC and Robotic Automated Services

20 Hackett Terrace Marryatville, S.A. 5068 AUSTRALIA  
Phone : 08-8378-6081  
Facsimile : 08-8364-4021

#### ● Fuji-Electric Technology and Service (Shenzhen) Co., Ltd.

Room 209 Liming Bldg. No.144, Zhongxing Rd., Luohu Ku.  
Shenzhen City, CHINA  
Phone : 0755-220-2745  
Facsimile : 0755-218-5812

#### ● Fuji Electric (Asia) Co., Ltd.

Room 1001, 10th Fl., Tsimshatsui Center 66 Mody Rd., Tsimshatsui  
East Kowloon, HONG KONG  
Phone : 2311-8282  
Facsimile : 2312-0566

#### ● Autonom Controls Pvt. Ltd.

17, Adukia Apartment, S. Mody Rd., Kandivli (West),  
Mumbai-400 067, INDIA  
Phone : 022-8658136  
Facsimile : 022-8073246

#### ● Donghai Corporation

Donghai Bldg., 1056-28, Namhyun-dong, Kwanak-ku, Seoul, R.O.  
KOREA  
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Facsimile : 02-586-0057

#### ● Gaius Industries Co., Ltd.

2nd Fl., Young Shin Bldg., 954-4, Dogok-dong, Kangnam-gu, Seoul,  
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Facsimile : 02-554-1118

#### ● Taiwan Optical Measuring Instrument Co., Ltd.

6th Fl.-3, No.190, Sec. 2, Chung Hsing Rd., Hsin Tien City, Taipei  
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### America

#### ● OESS Corporation

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#### ● A. Royal Pte. Ltd.

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