

FALDIC- α Fuji AC Servo System

RYS-R Type

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
 DANGER	Indicates that death or severe personal injury will result if proper precautions are not taken.
 CAUTION	Indicates that personal injury or property damage alone will result if proper precautions are not taken.

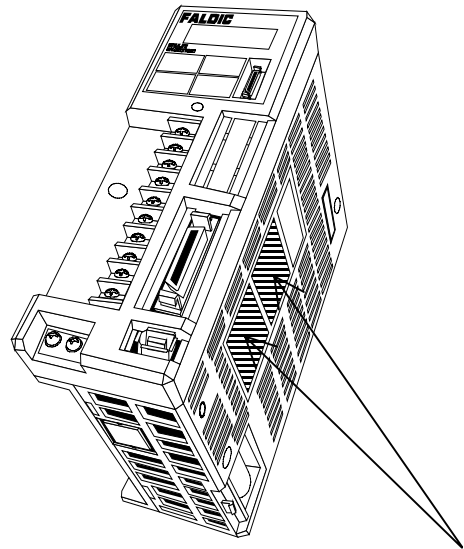
Pictorial symbols are used as necessary.

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



Warning display


Fig. B



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 [Ω] 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

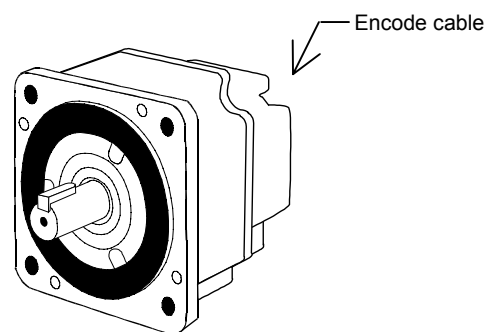
The FALDIC- series which corresponds to a upper level interface is an AC servo system for motion-control necessary for a driven machine.

(1) Model type in this manual

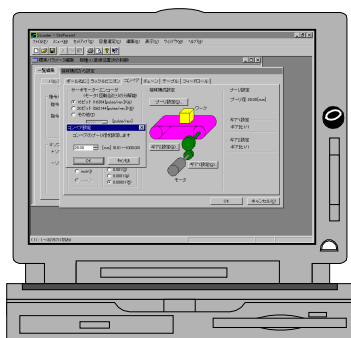
- (a) Amplifier (*) : RYS S3-RPS , RSS and RTS
- (b) Motor (*) : GYC DC1-S * - * * * *
- GYS DC1-S * - * * * *
- (c) Gear head : GYN SAG-G
- GRN SAG-G

(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

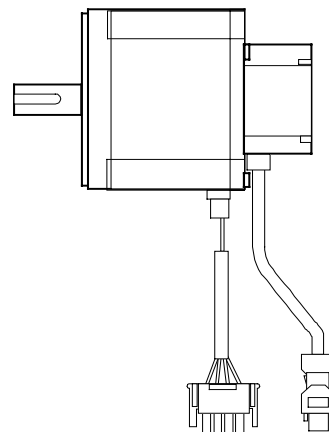
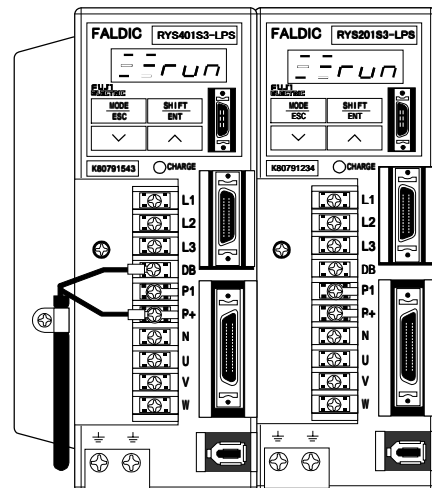
Cubic type of approximately half the depth of our basic type motor and slim type of flange of approximately half size are obtained.

(i) The degree of protection (motor enclosure protection) is IP55.

Optionally, IP67 can be supplied.

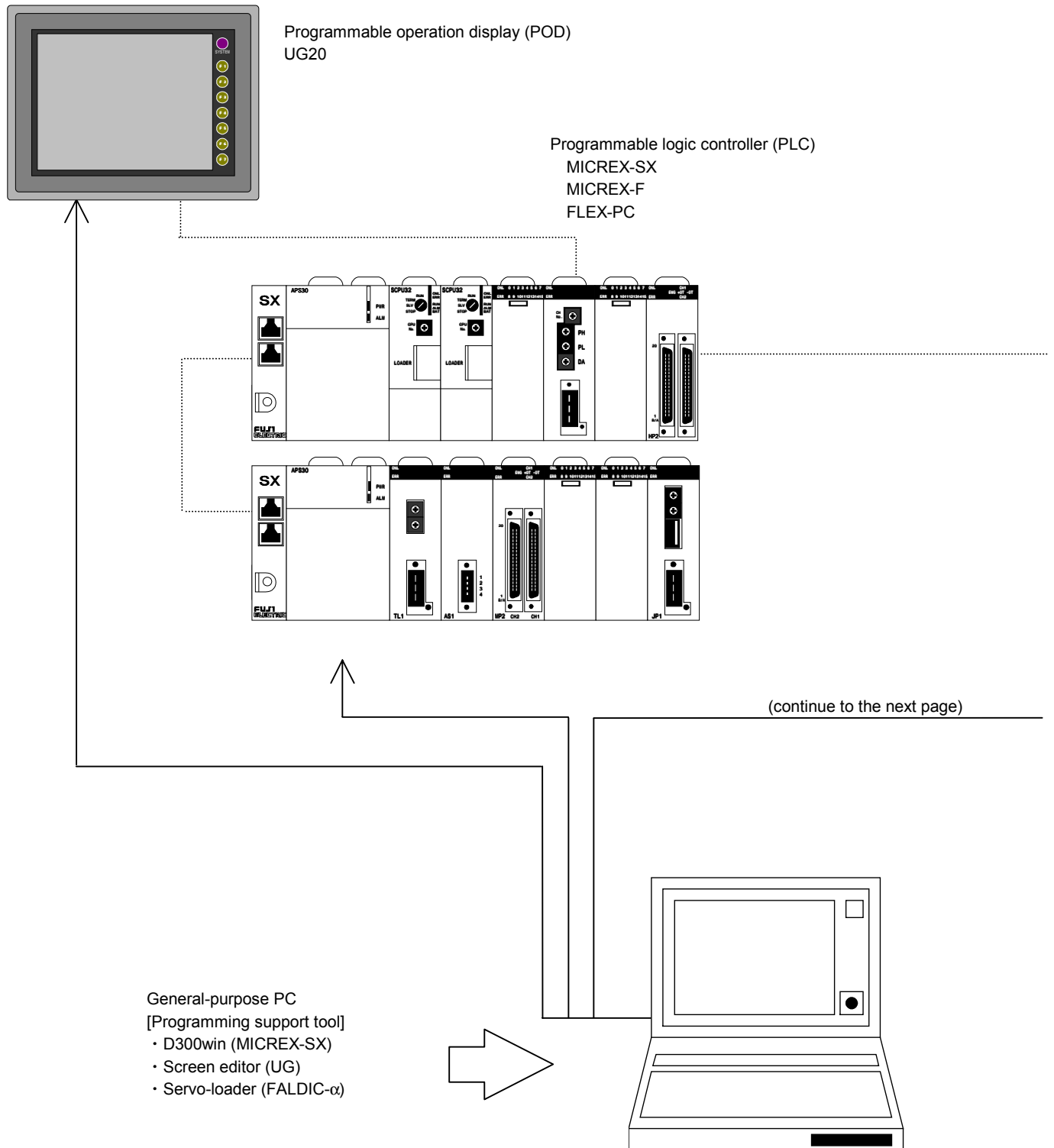
(ii) 0.03 to 5 [kW] are available.

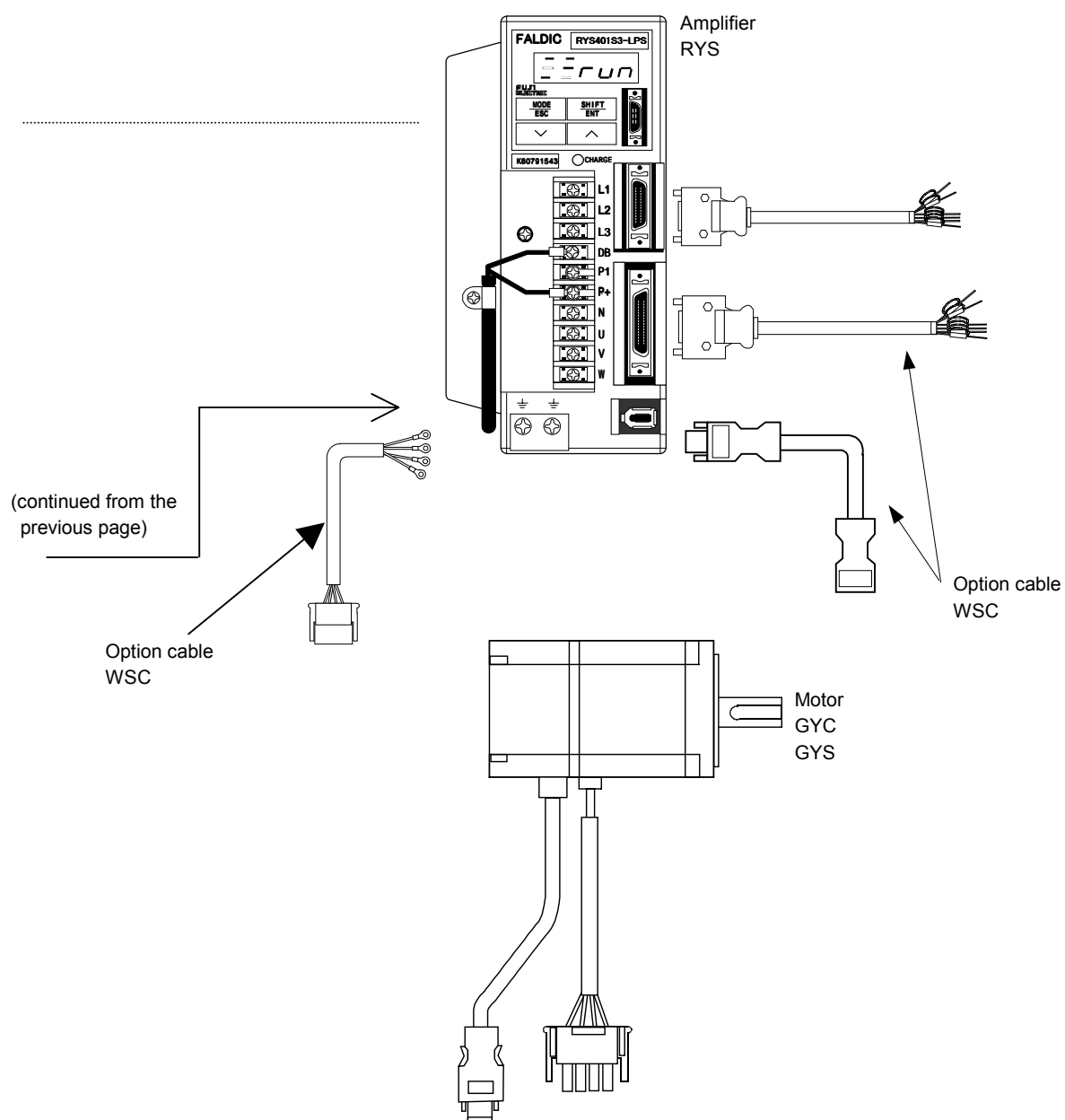
(iii) Acceptable acceleration vibration is $49 [m/s^2]$ and the slit plate material of 16 bit serial encoder is non-glass film.



1.2 System configuration

The following illustrates related devices of FALDIC- α system.





1.3 Functions

The FALDIC- α series has 3 types of control function for particular applications.

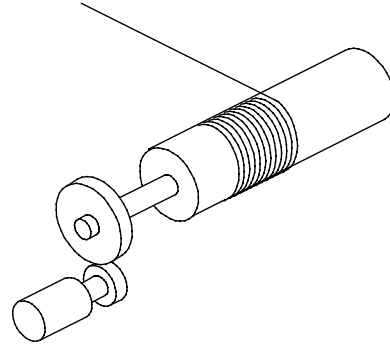
(1) RYS-V type : Pulse train/speed control (velocity)

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)

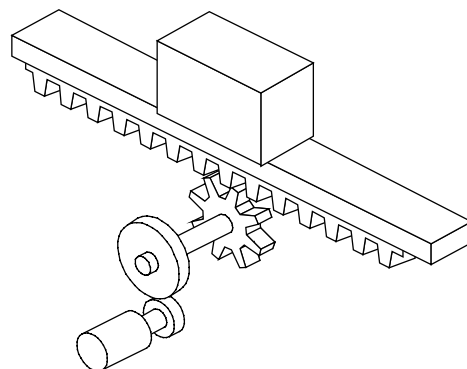
Maximum command value $\pm 79,999,999$

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)

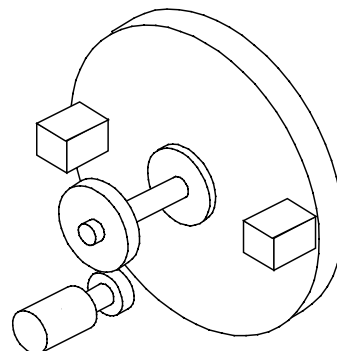
Maximum indexing number 30000

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 :

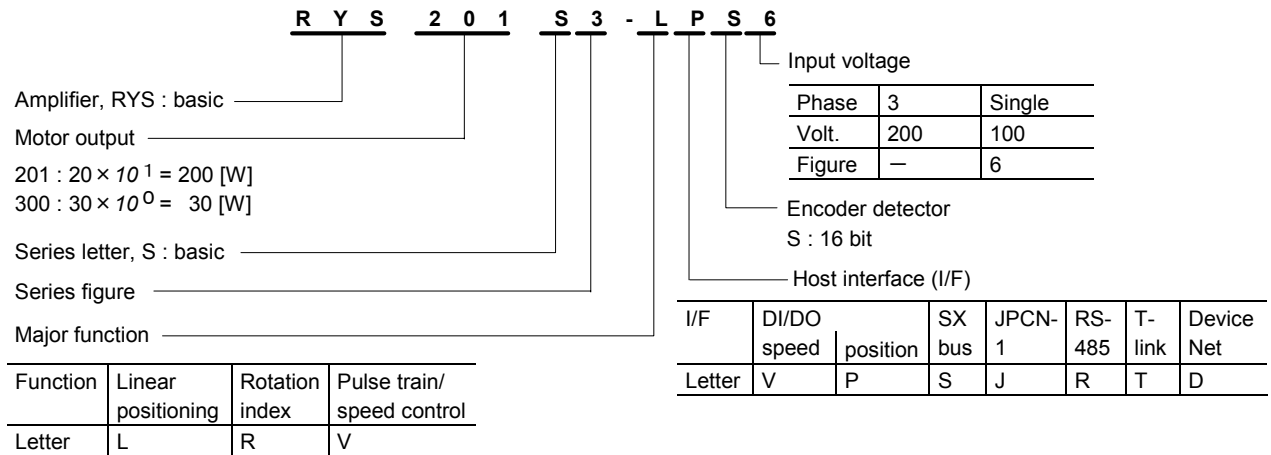
- DI/DO position (expanded DI/DO),
- SX bus,
- T-link,
- RS-485,
- Open network, etc.



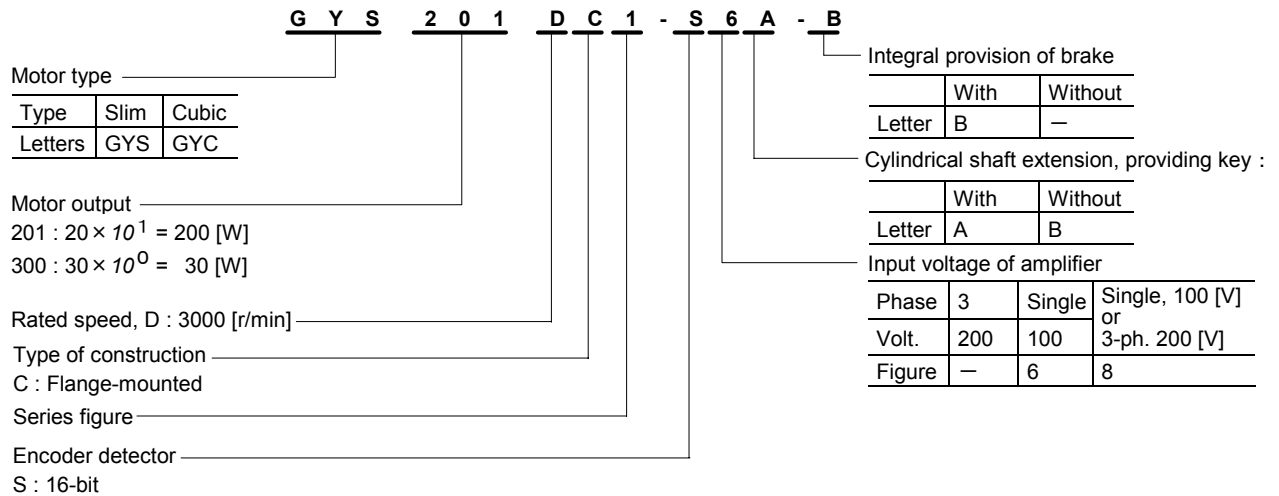
1.4 Explanation of model type

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

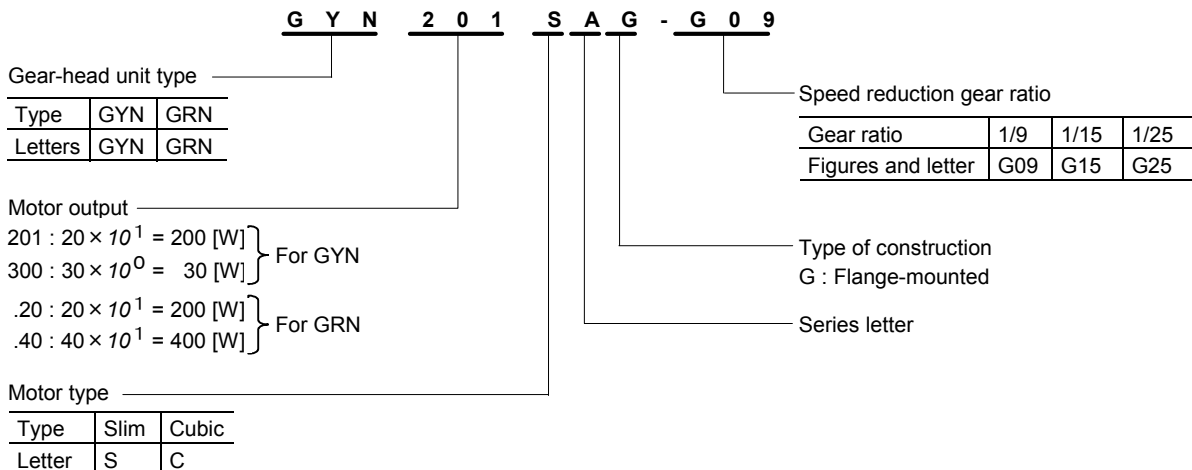
(a) Amplifier



(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 (× 10 ⁻³) J		[kg • m ²]	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 [μm]				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.) [m/s ²]			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 G25	201	401	751	102 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 (× 10 ⁻³) J	[kg • m ²]			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 [μm] (*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 ²]				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 S8B, SB or SA	DC1- S8B	300 S8B	500	101 SB	201 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 (× 10 ⁻³) J[kg • m ²]		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 [μm]						
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 ²]		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 S8B-B, SB-B or SA-B	DC1- S8B-B	300 S8B-B	500	101 SB-B	201 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)			-	CCW				
Backlash (max.) (*4)		[min]	-	40		30		
Mass (weight)		[kg]	-	0.7		2.1		3.8
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)			-	CCW				
Backlash (max.) (*4)		[min]	-	40		30		
Mass (weight)		[kg]	-	0.7		2.1		3.8
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 ⁻³) J[kg • m ²]			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.) [m/s ²]			24.5					
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(× 10 ⁻³) J[kg • m ²]			-	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 [μm]			
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 ²]			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	300	500	101	GRN
			300	500	101	.20
Rated output		[kW]	0.03	0.05	0.1	0.2
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
Max. (breakdown) torque		[N • m]	-	3.68	7.36	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 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)					
	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. In the case of compliance with the European standard : Pollution degree = 2, Over voltage category =					
	Temp., humidity			- 10 to +55°C, 90% RH max. (no condensation)					
	Vibration / shock			4.9 [m/s ²] / 19.6 [m/s ²] acceleration, acceptable (max.)					
Others				DC reactor terminals (P1, P+) for harmonics suppression. 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], 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. In the case of compliance with the European standard : Pollution degree = 2, Over voltage category =					
	Temp., humidity			- 10 to +55°C, 90% RH max. (no condensation)					
	Vibration / shock			4.9 [m/s ²] / 19.6 [m/s ²] acceleration, acceptable (max.)					
Others				DC reactor terminals (P1, P+) for harmonics suppression. 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 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)			
	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. In the case of compliance with the European standard : Pollution degree = 2, Over voltage category =			
	Temp., humidity			- 10 to +55°C, 90% RH max. (no condensation)			
	Vibration / shock			4.9 [m/s ²] / 19.6 [m/s ²] acceleration, acceptable (max.)			
Others				DC reactor terminals (P1, P+) for harmonics suppression. 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)	CA, *CA CB, *CB
	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)	FA, *FA
	Form	Two 90° phase-different signal	FB, *FB
	Pulse	16 to 16384 [pulse/rev] (in 1 step)	FZ, *FZ
Speed command	Power supply	+10 ± 0.4 [V] (output current 30 [mA] max.)	P10, M5
	Input	± 10 [V] (20 k input impedance)	NREF
Monitor output 1/2		For analog-meter (two/one-way deflection), (1) Speed command, (2) Speed feedback, (3) Torque command, (4) Position deviation	MON1 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 Signal assign terminals of control input	CONT1 to CONT21
OUT output		+30 [V] DC, 50 [mA] max. sink output Signal assign terminals of control output	OUT1 to 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) 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)	CA, *CA CB, *CB
	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.)	P5
Freq. dividing output	Output	Freq. 500 [kHz] max. (differential output)	FA, *FA
	Form	Two 90° phase-different signal	FB, *FB
	Pulse	16 to 16384 [pulse/rev] (in 1 step)	FZ, *FZ
Monitor output 1/2		For analog-meter (two/one-way deflection), (1) Speed command, (2) Speed feedback, (3) Torque command, (4) Position deviation	MON1 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 Signal assign terminals of control input	CONT1 to CONT5
OUT output		+30 [V] DC, 50 [mA] max. sink output Signal assign terminals of control output	OUT1 and 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) 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 CB, *CB
	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.)	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 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 Signal assign terminals of control input	CONT1 to CONT8
OUT output		+30 [V] DC, 50 [mA] max. sink output Signal assign terminals of control output	OUT1 to OUT4
External backup		Input terminals of backup power supply from external to pulse encoder	BAT+, BAT-
Control function			
Position control		Auto start (station No. specify) 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.

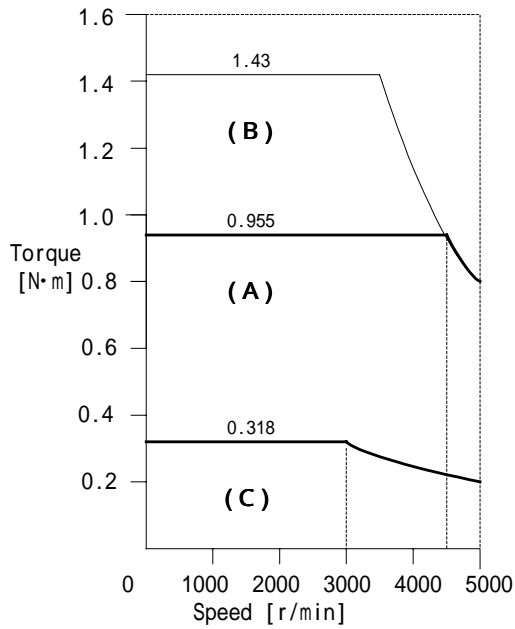
Output torque [%]	100 (rated torque)	125	150	200	300	450
Overload detecting time approx. [s]	Continuous operation is acceptable.	35	18	9	3	1.5

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

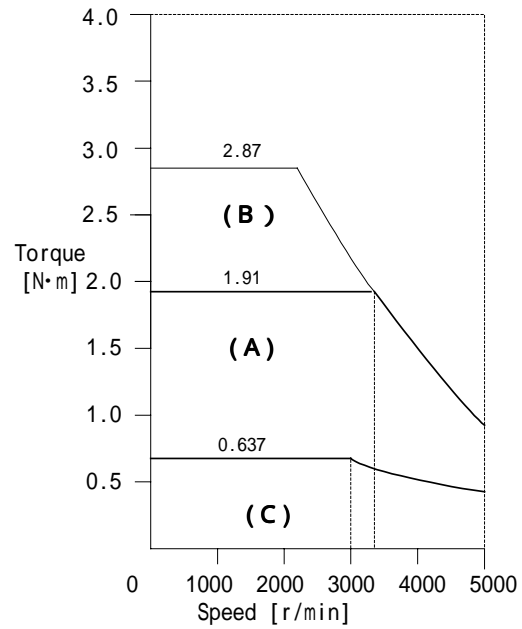
Note: (*) Accel. : Accelerating or acceleration
Decel. : Decelerating or deceleration

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

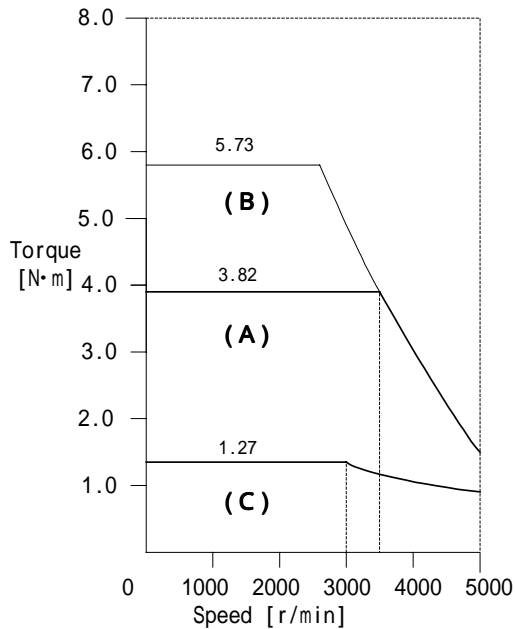
• GYC 1 0 1 DC 1 - SA (0 . 1 [kW])



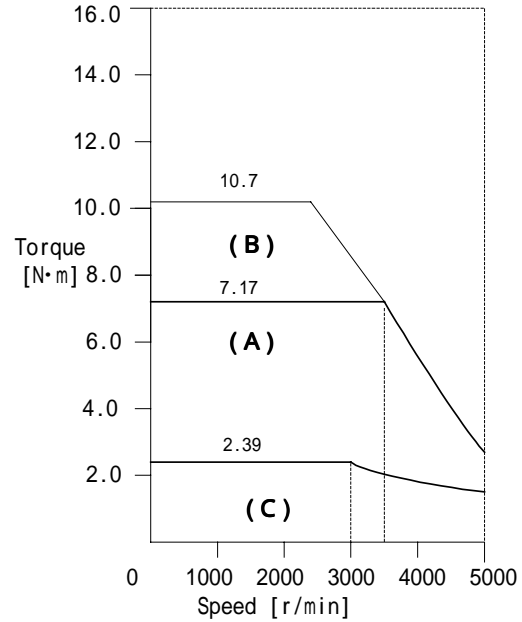
• GYC 2 0 1 DC 1 - SA (0 . 2 [kW])



• GYC 4 0 1 DC 1 - SA (0 . 4 [kW])



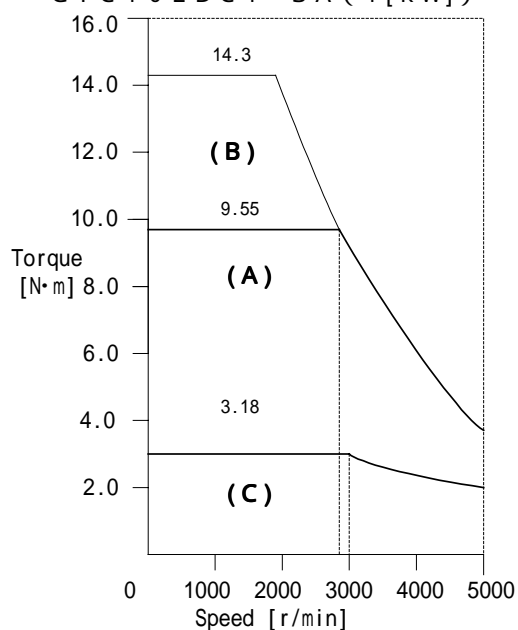
• GYC 7 5 1 DC 1 - SA (0 . 7 5 [kW])



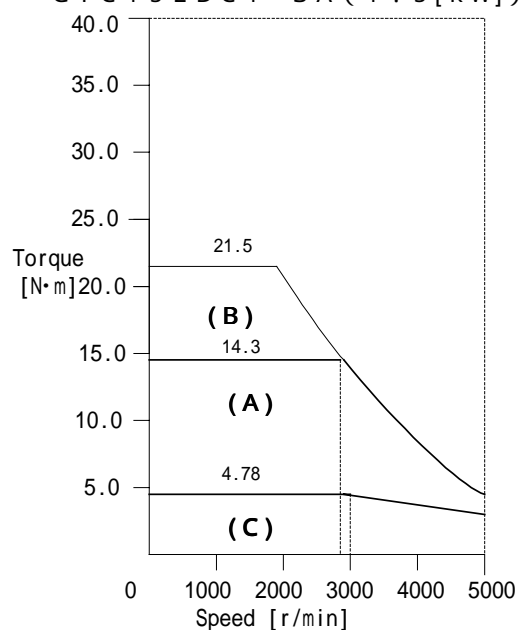
(A) Acceleration/deceleration area 1
 (B) Acceleration/deceleration area 2
 (C) Continuous operation area

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

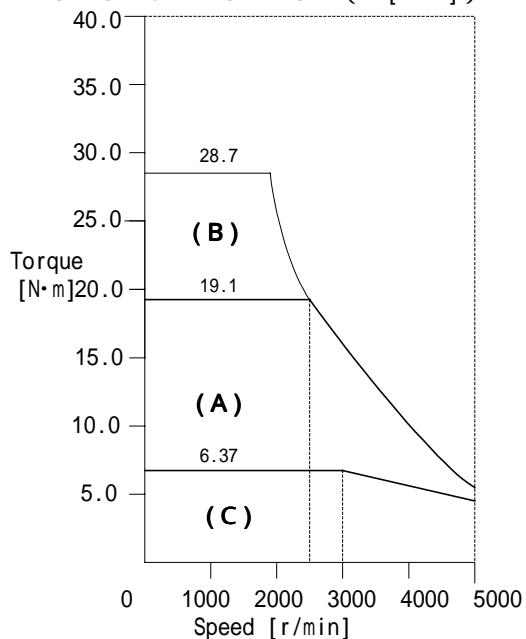
• G Y C 1 0 2 D C 1 - S A (1 [kW])



• G Y C 1 5 2 D C 1 - S A (1 . 5 [kW])



• G Y C 2 0 2 D C 1 - S A (2 [kW])



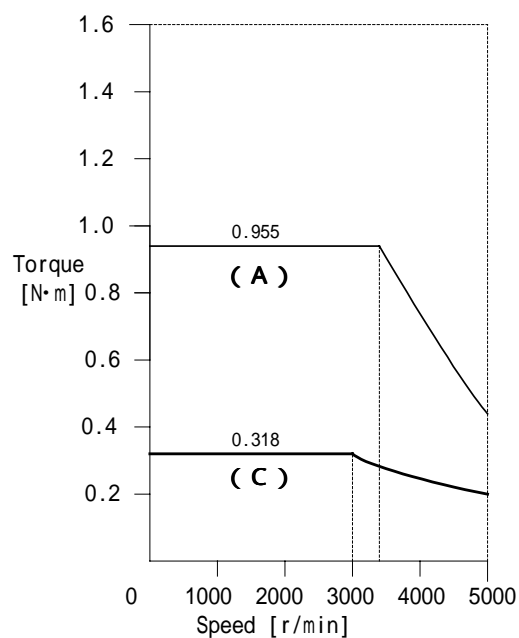
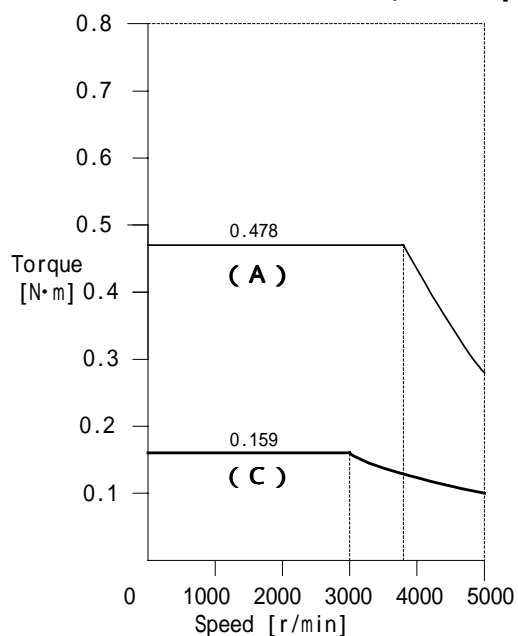
(A) Acceleration/deceleration area 1

(B) Acceleration/deceleration area 2

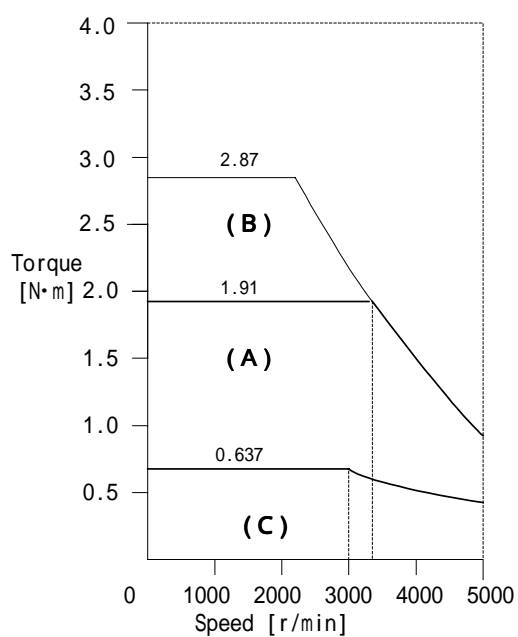
(C) Continuous operation area

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

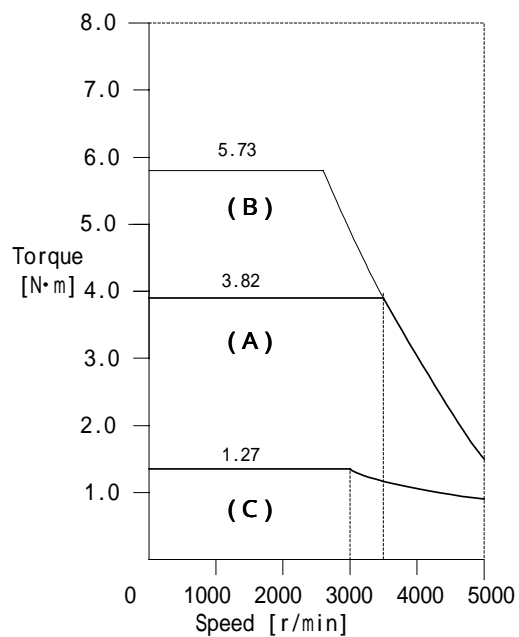
• GYS 500DC1 - S8B (0.05[kW]) • GYS 101DC1 - SB (0.1[kW])



• GYS 201DC1 - SA (0.2[kW])

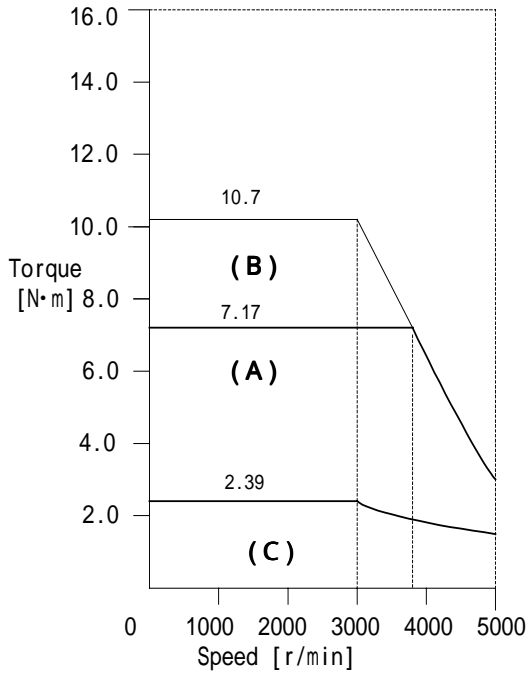


• GYS 401DC1 - SA (0.4[kW])

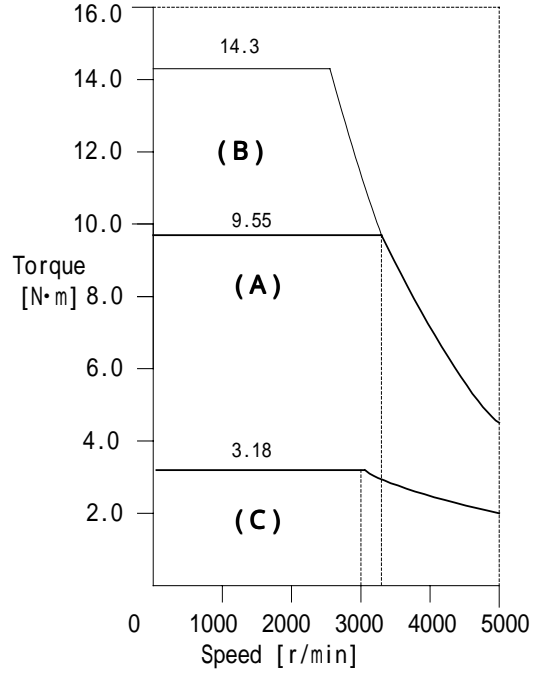


(2) GYS motor, slim type, for 200 [V] class input voltage of amplifier (cont'd)

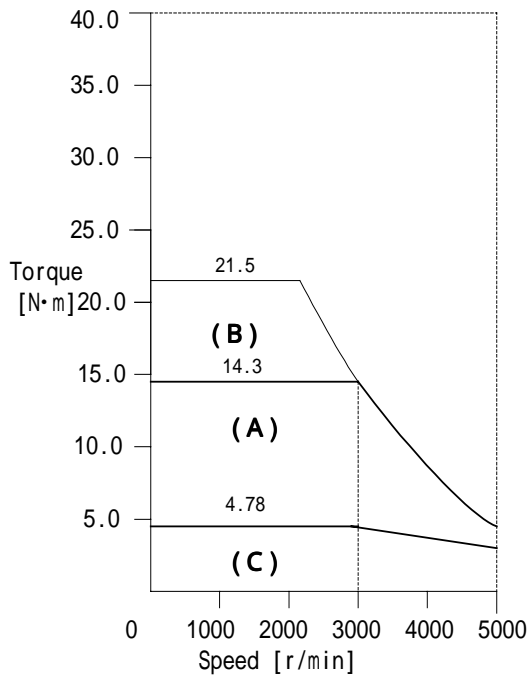
• GYS 751DC1 - SA (0.75 [kW])



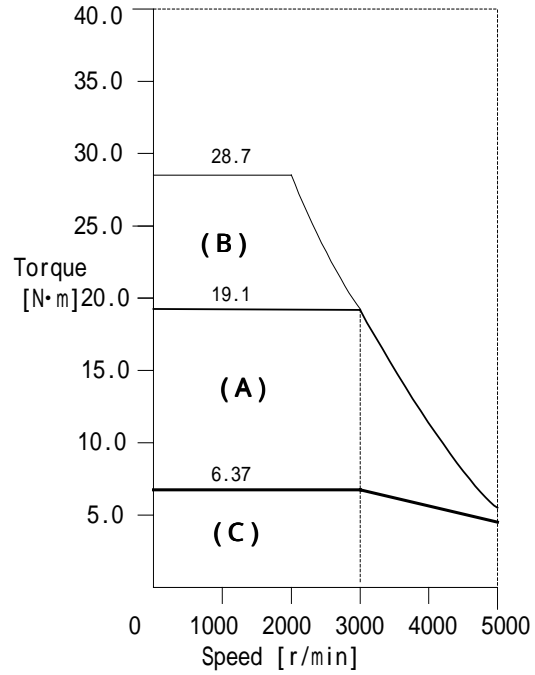
• GYS 102DC1 - SA (1 [kW])



• GYS 152DC1 - SA (1.5 [kW])



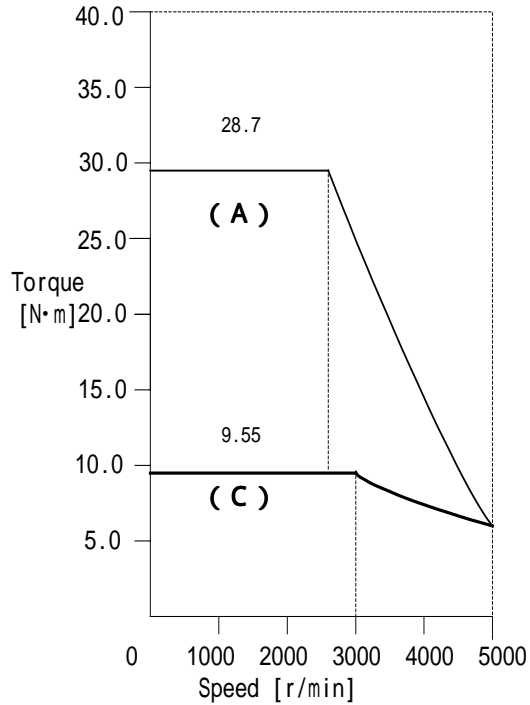
• GYS 202DC1 - SA (2 [kW])



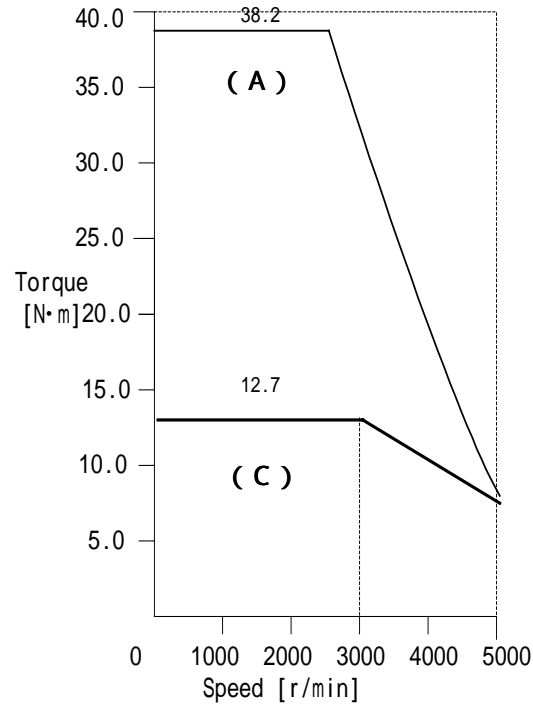
(A) Acceleration/deceleration area 1
 (B) Acceleration/deceleration area 2
 (C) Continuous operation area

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

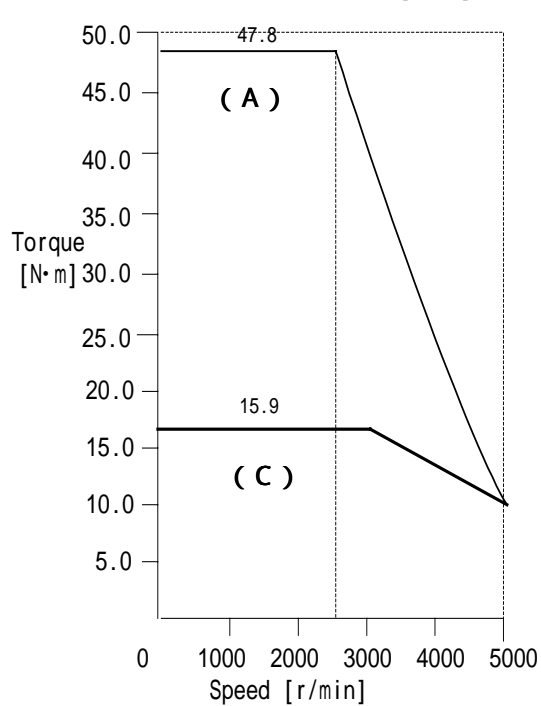
• G Y S 3 0 2 D C 1 - S A (3 [kW])



• G Y S 4 0 2 D C 1 - S A (4 [kW])

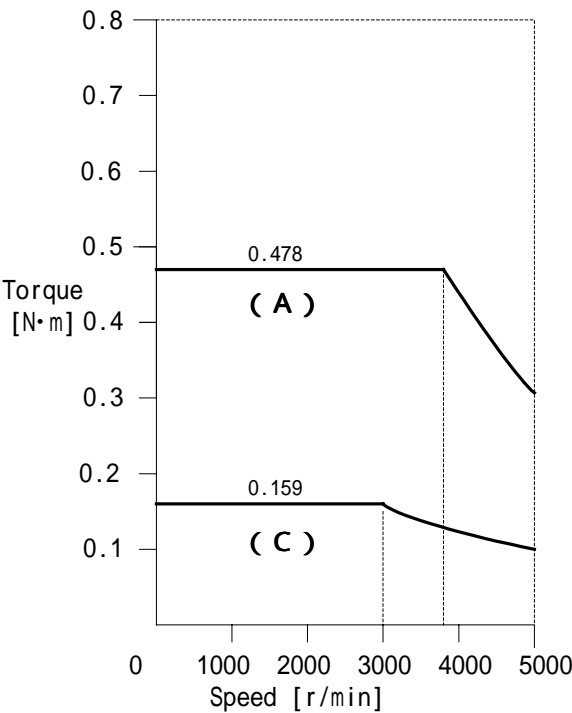


• G Y S 5 0 2 D C 1 - S A (5 [kW])

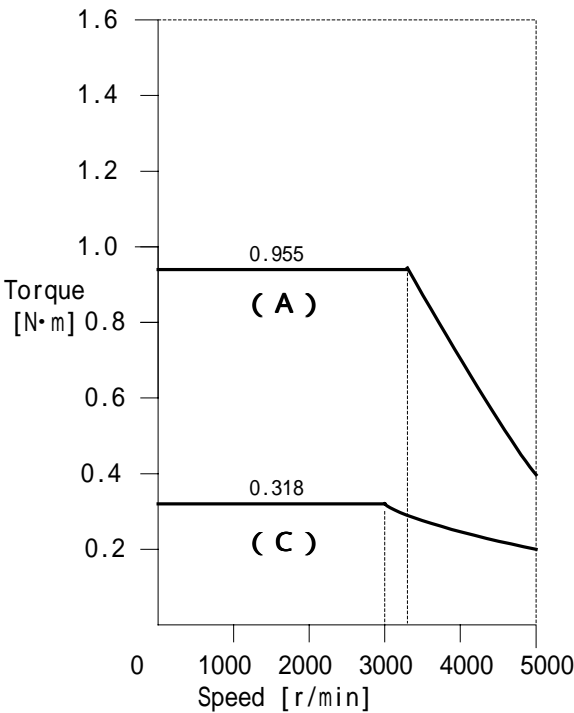


(3) GYS motor, slim type, for 100 [V] class input voltage of amplifier

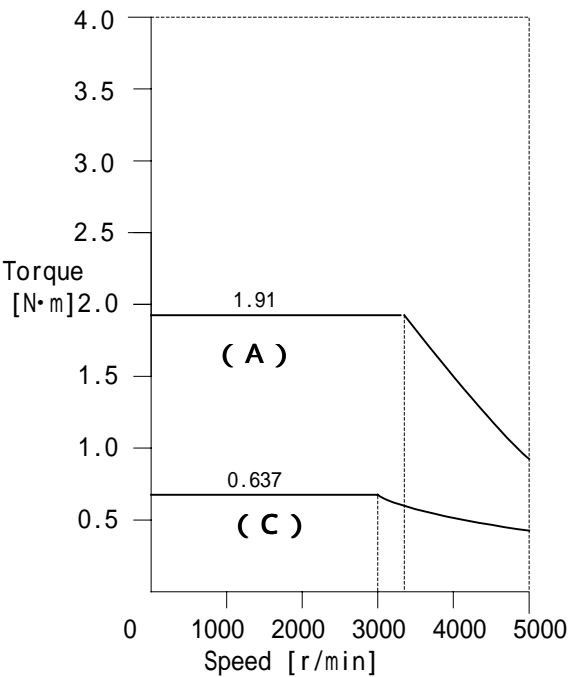
• GYS 5 0 0 DC 1 - S 8 B (0 . 0 5 [kW])



• 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

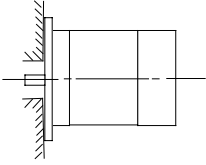
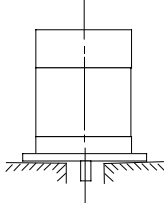
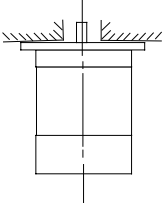
3.1 Motor

(1) Installation environment

See 3.2 (1) (a)

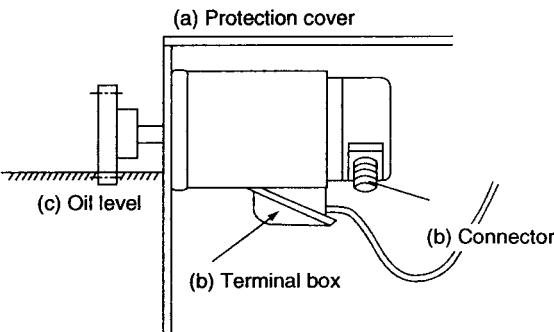
(2) Type of construction (mounting)

Each motor allows the following methods of mounting.

Flange-mounted		
IMB5	IMV1	IMV3
		

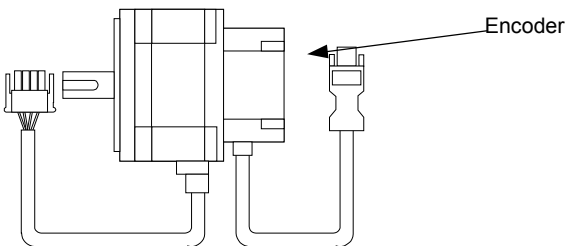
(3) No-oil or no-water-drop protection

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.



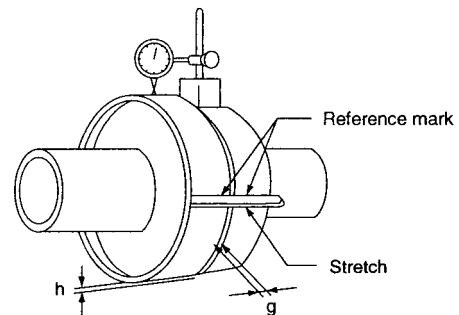
CAUTION

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

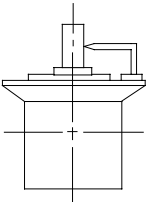
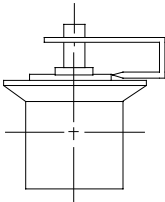
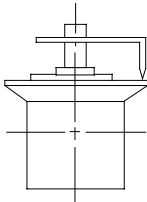
The probe of the indicator is attached to the shaft midway along its length.

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

The indicator is fitted rigidly on the shaft extension.

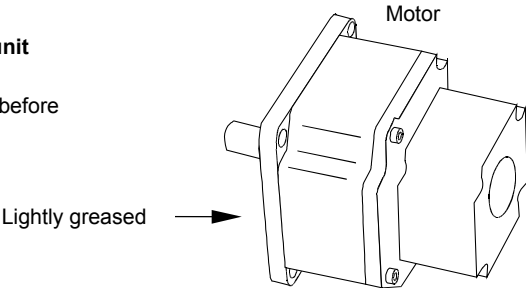
(c) Perpendicularity of mounting face of flange to shaft for flange-mounted motor
 The indicator is fitted rigidly on the shaft extension.

[unit : mm]

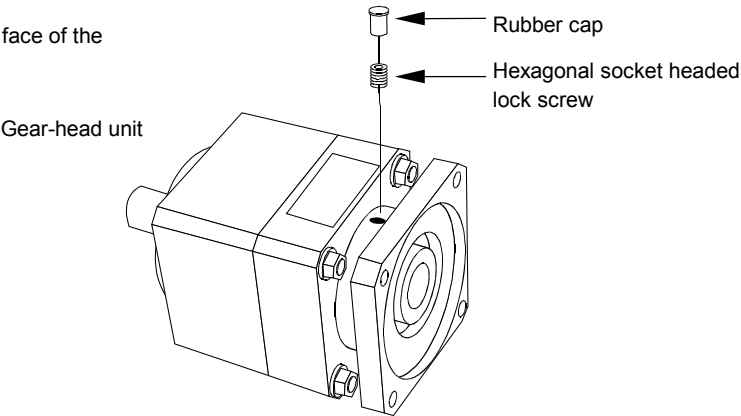
(a)	(b)	(c)
Flange-mounted	Flange-mounted	Flange-mounted
		
0.02	0.06	0.08

(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.



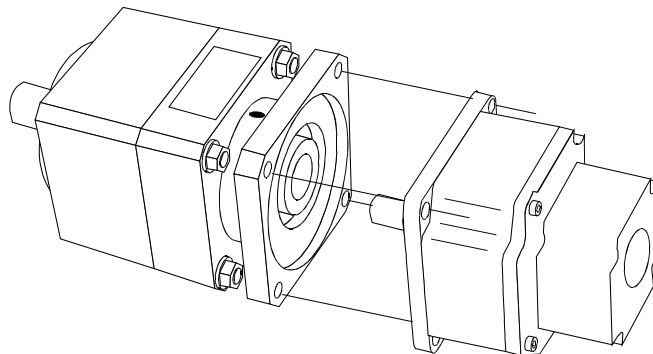
(b) Preparation for mounting
 Remove the rubber cap from a deep point of the flange face of the gear-head unit.



(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 SAG		GYN	SAG	GYN	CAG		
	500	101	.20	.40	751		101	201	401	751

(i) Screws for fastening of flanges

(7) Screws for fastening of ladders				
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.

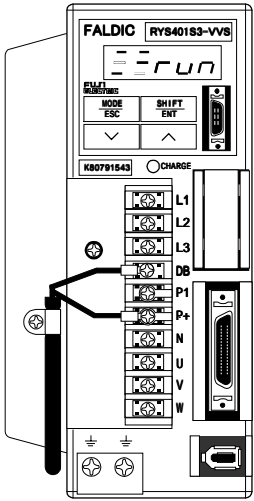
(v) In vacuum

(vi) In explosive atmosphere

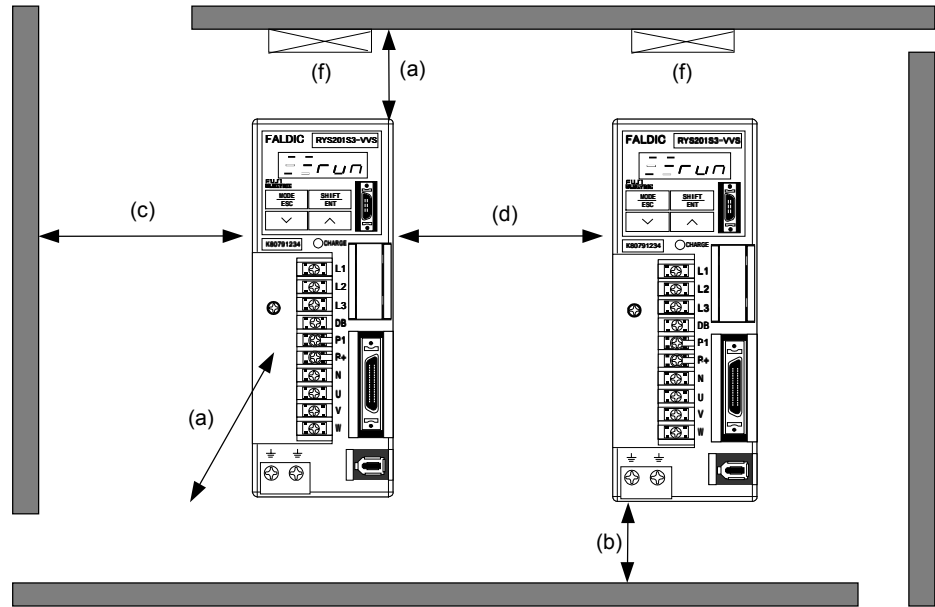
(vii) Under acceleration vibration

(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.



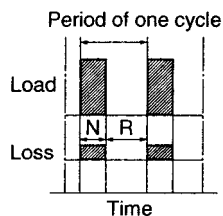
[unit : mm (min.)]

(a) Upper and front	(b) Lower	(c) Left and right	(d) Between amplifiers
50	40	10	(i) 5 (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

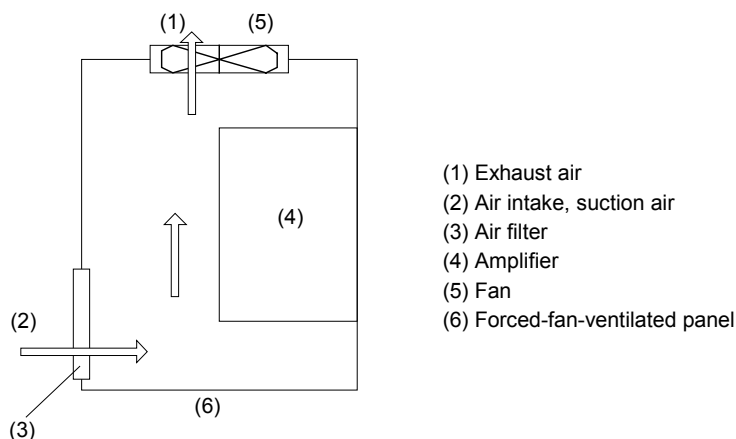
Provide an exhaust port and an air intake (suction) port in the panel, and mount a fan to the exhaust port to forced ventilate the internal air. Also, mount an air filter to the air intake port in order to maintain an environment better than IEC664 pollution degree 2 (*) in the panel. For the air volume 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 ³ /min]	0.06	0.11	0.23	0.43	0.57
Opening size of air intake (suction air) [m ²]	0.0009	0.0019	0.0038	0.0071	0.0095

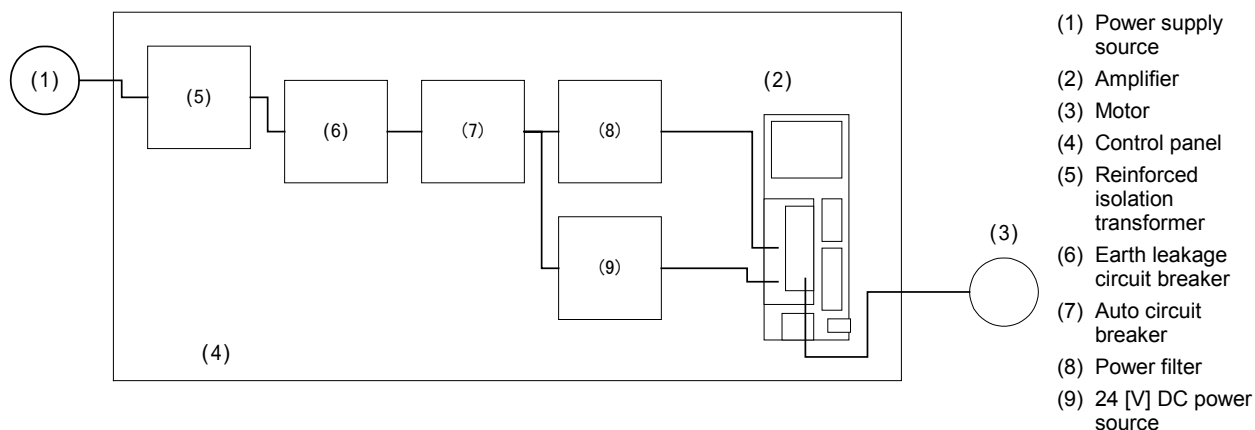
Amplifier output [kW]	1.5	2	3	4	5
Air volume of forced-ventilation-fan [m ³ /min]	0.85	1.14	1.7	2.27	2.84
Opening size of air intake (suction air) [m ²]	0.0142	0.0189	0.0284	0.0378	0.0473



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

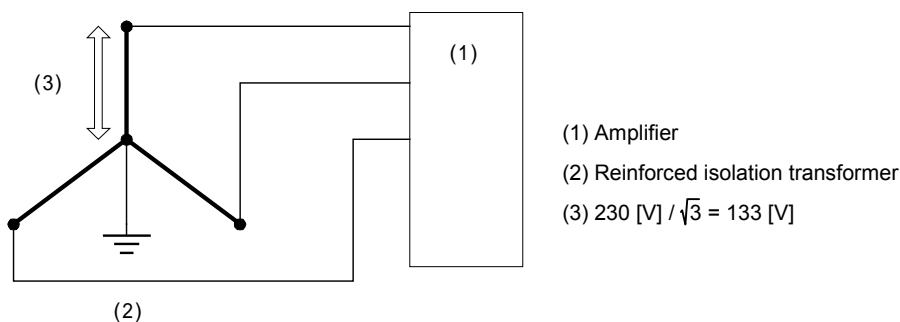


(a) Power supply

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.

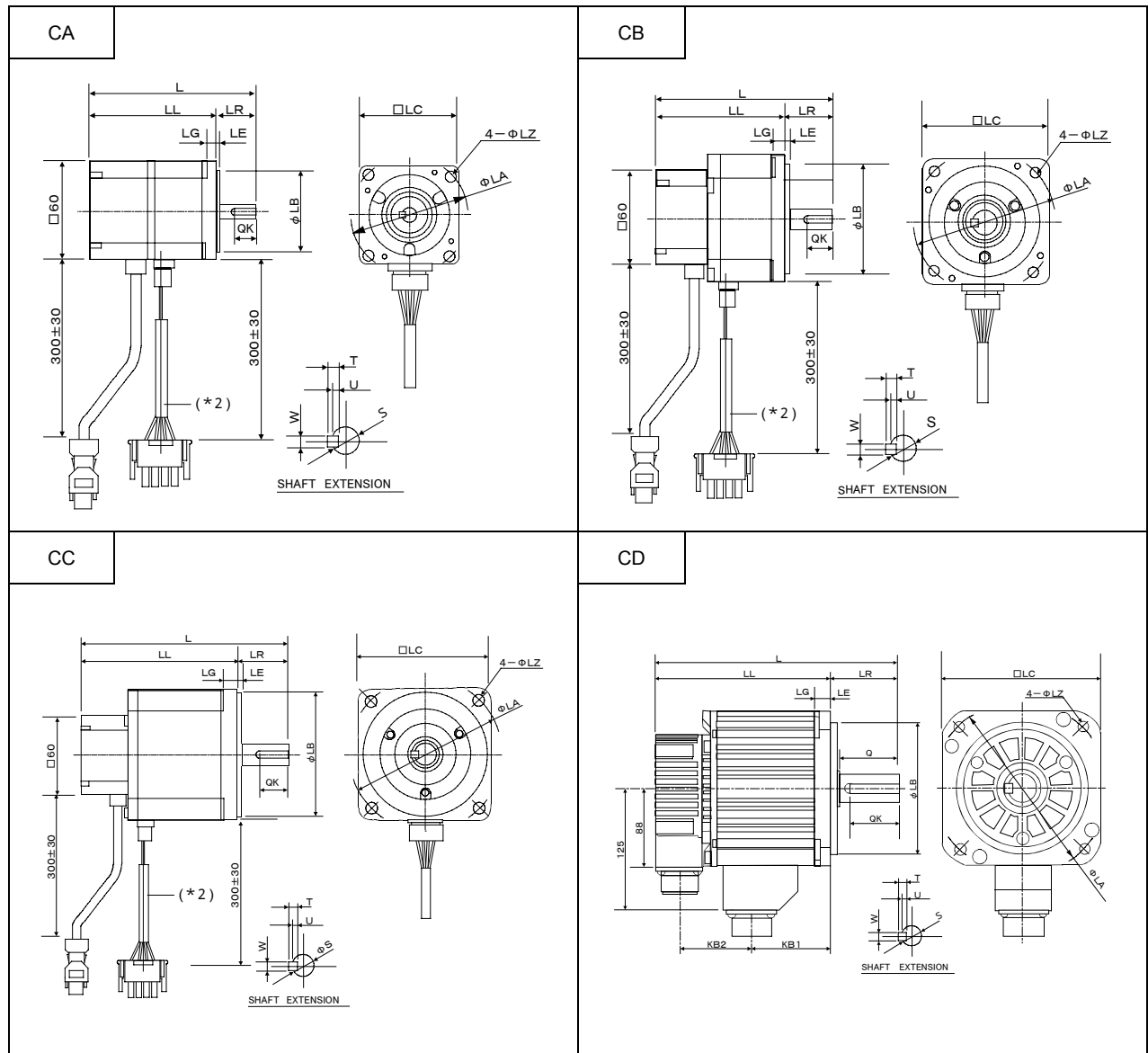
Input voltage class [V]			100		200					
Amplifier output [kW]			0.05, 0.1	0.2	0.03 to 0.2	0.4	0.75, 1	1.5	2, 3	4, 5
Amplifier type	RYS	S3-	6							
			500, 101	201						
					300 to 201	401	751, 102	152	202, 302	402, 502
Auto circuit breaker	type BU-ECA		3005	3010	3005	3010	3015	3020	3030	3050
	current	[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 GYC	Fig	Q	QK	QR	S (*3)	T	U	W	(*1)	L	LL	LR	LG	LE	LA	LB (*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																

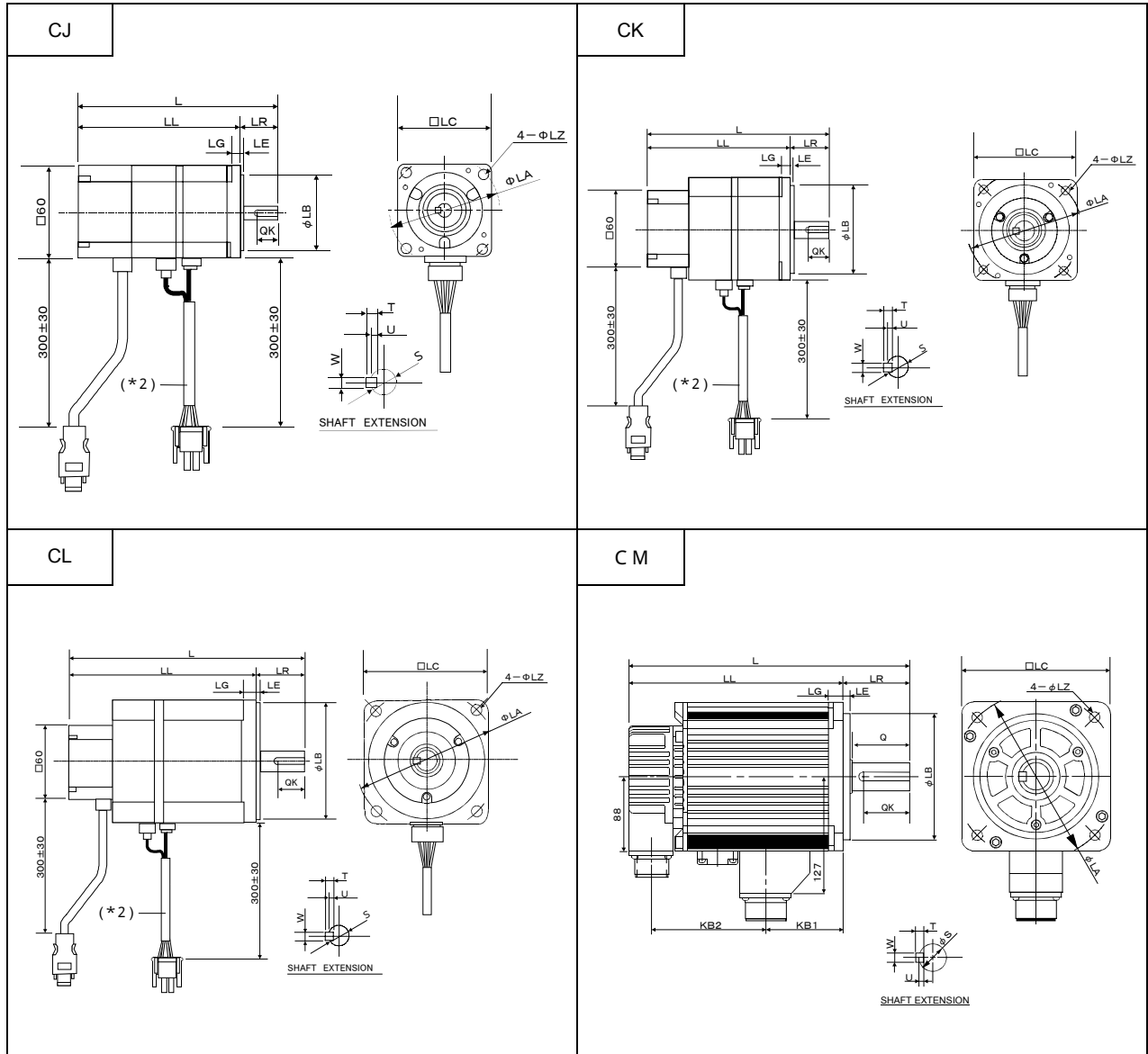
(*1) Screw hole (metric diameter x depth) of shaft extension (*2) Insulating protection tube

(*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 [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 GYC	Fig	Q	QK	QR	S (*3)	T	U	W	(*1)	L	LL	LR	LG	LE	LA	LB (*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																

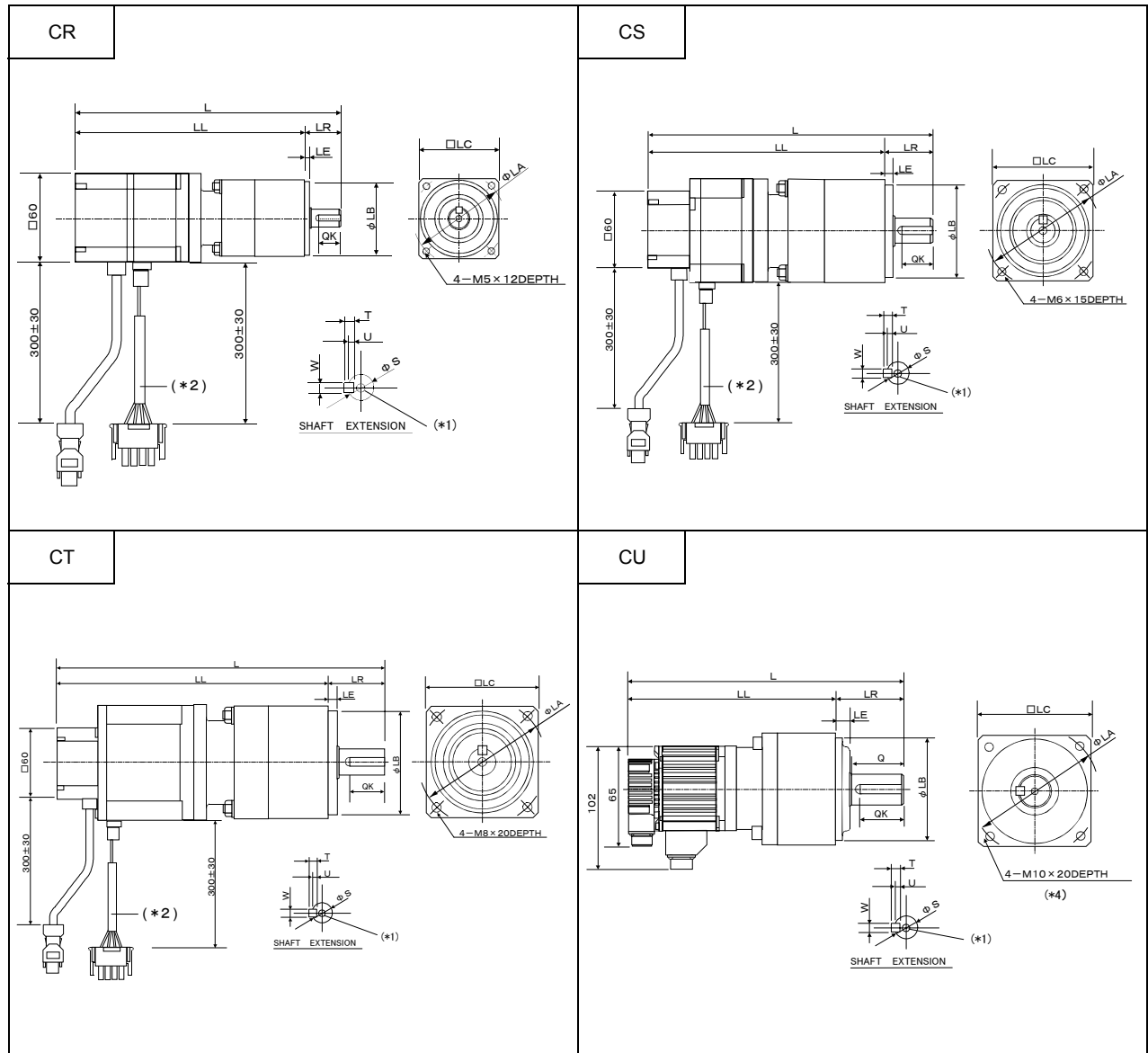
(*1) Screw hole (metric diameter x depth) of shaft extension (*2) Insulating protection tube

(*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 [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]

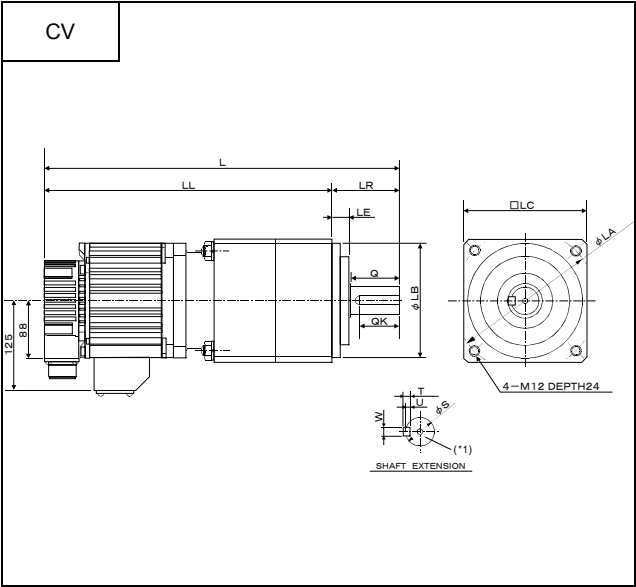


Type GYC	Fig	Q	QK	QR	ϕS	T	U	W	(*1)	L	LL	LR	LG	LE	ϕLA	ϕLB
101DC1-SA	CR	-	15	-	$12^{+0}_{-0.011}$	4	2.5	4	M4x8	178	153	25	-	4	60	$50^{+0}_{-0.025}$
201DC1-SA	CS	-	23	-	$19^{+0}_{-0.013}$	6	3.5	6	M5x13	218	181	37	-	6	90	$70^{+0}_{-0.03}$
401DC1-SA	CS	-	23	-	$19^{+0}_{-0.013}$	6	3.5	6	M5x13	233	196	37	-	6	90	$70^{+0}_{-0.03}$
751DC1-SA	CT	-	30	-	$24^{+0}_{-0.013}$	7	4	8	M6x15	282.5	233.5	49	-	8	115	$90^{+0}_{-0.035}$
102DC1-SA	CU	55	45	-	$32^{+0}_{-0.016}$	8	5	10	M6x15	362.5	298.5	64	-	8	135	$110^{+0}_{-0.035}$
152DC1-SA	CU	55	45	-	$32^{+0}_{-0.016}$	8	5	10	M6x15	377.5	313.5	64	-	8	135	$110^{+0}_{-0.035}$
202DC1-SA	CV	55	45	-	$32^{+0}_{-0.016}$	8	5	10		431.5	354.5	77	-	20	160	$130^{+0}_{-0.04}$
-																
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(*1) Screw hole (metric diameter x depth) of shaft extension (*2) Insulating protection tube

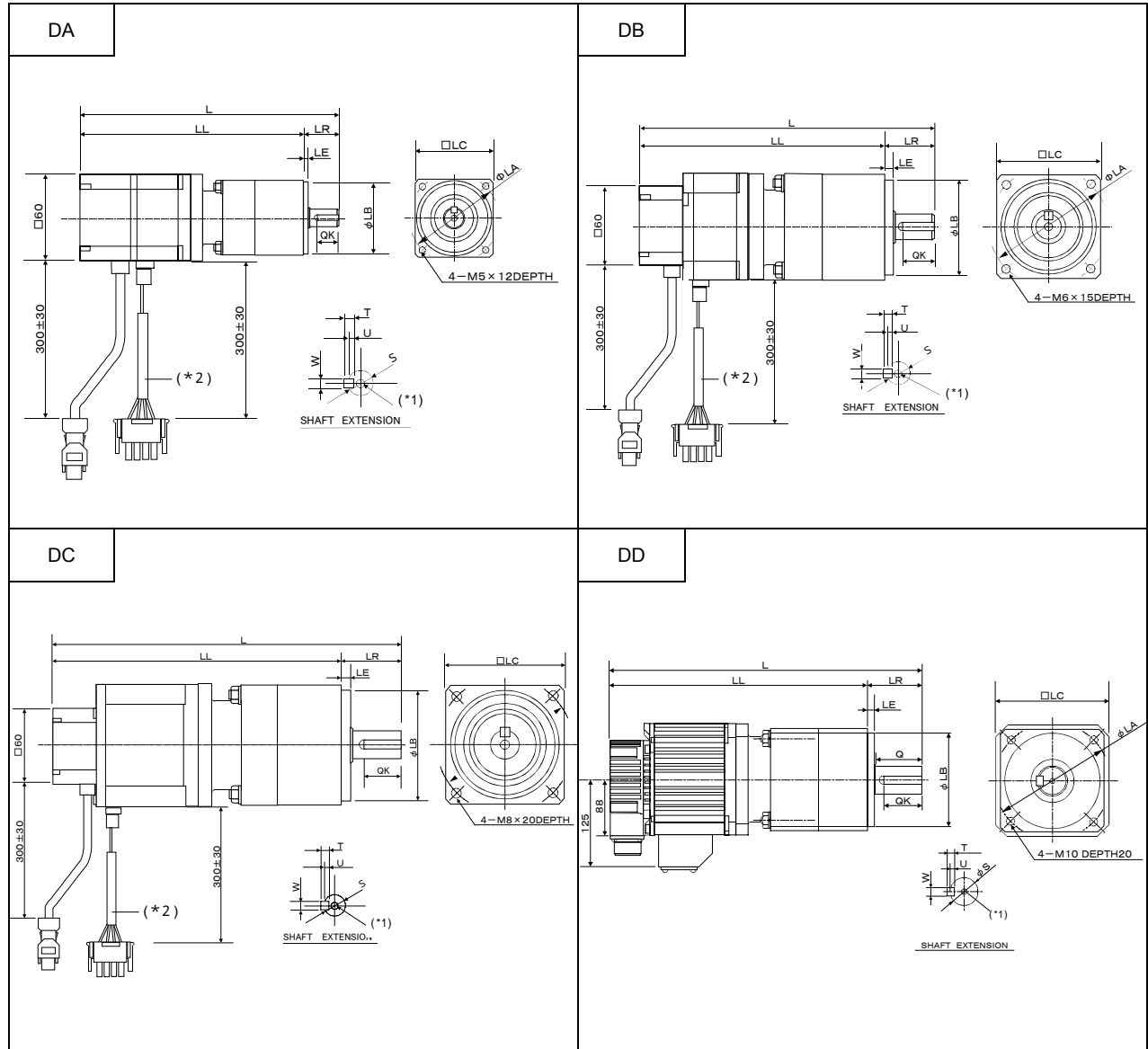
(*4) For 152 type, 1.5 [kW] : 4 - M12 x 24 DEPTH

(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]

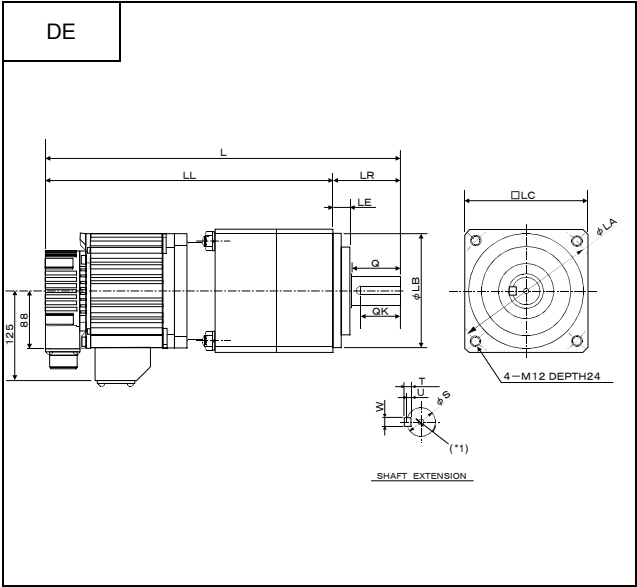


Type GYC	Fig	Q	QK	QR	S	T	U	W	(*1)	L	LL	LR	LG	LE	LA	LB
101DC1-SA	DA	-	15	-	$12^{+0}_{-0.011}$	4	2.5	4	M4x8	178	153	25	-	4	60	$50^{+0}_{-0.025}$
201DC1-SA	DB	-	23	-	$19^{+0}_{-0.013}$	6	3.5	6	M5x13	218	181	37	-	6	90	$70^{+0}_{-0.03}$
401DC1-SA	DB	-	23	-	$19^{+0}_{-0.013}$	6	3.5	6	M5x13	233	196	37	-	6	90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

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

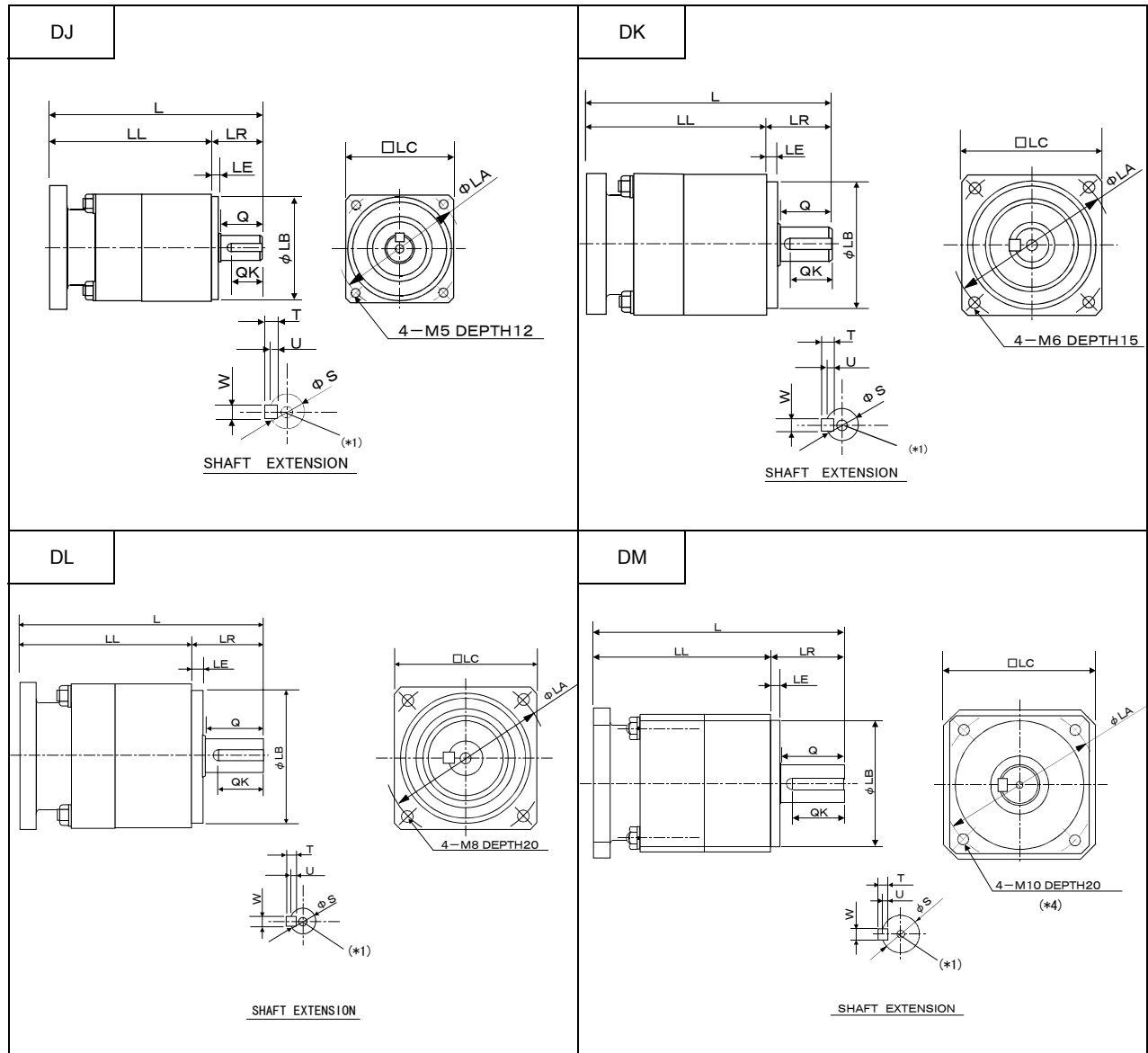
(*2) Insulating protection tube

(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]

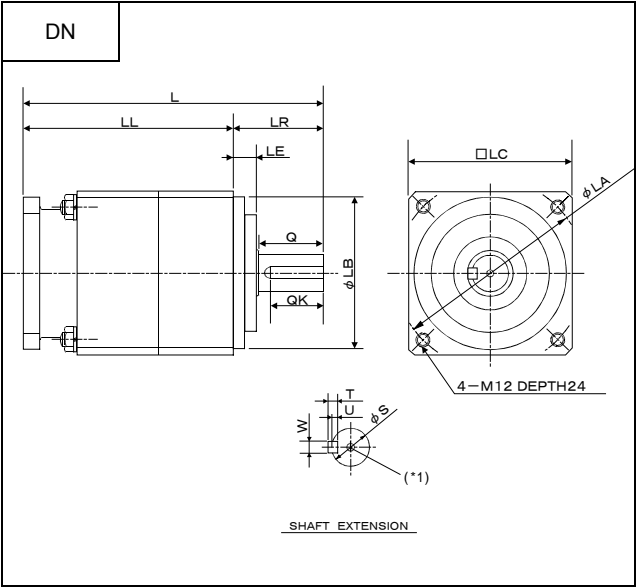


Type GYN	G09	Fig	Q	QK	QR	ϕS	T	U	W	(*1)	L	LL	LR	LG	LE	ϕLA	ϕLB	$\square LC$	Mass [kg]
101CAG-		DJ	20	15	-	$12^{+0}_{-0.011}$	4	2.5	4	M4x8	103	78	25	-	4	60	$50^{+0}_{-0.025}$	52	0.72
201CAG-		DK	30	23	-	$19^{+0}_{-0.013}$	6	3.5	6	M5x13	136	99	37	-	6	90	$70^{+0}_{-0.03}$	78	2.1
401CAG-		DK	30	23	-	$19^{+0}_{-0.013}$	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
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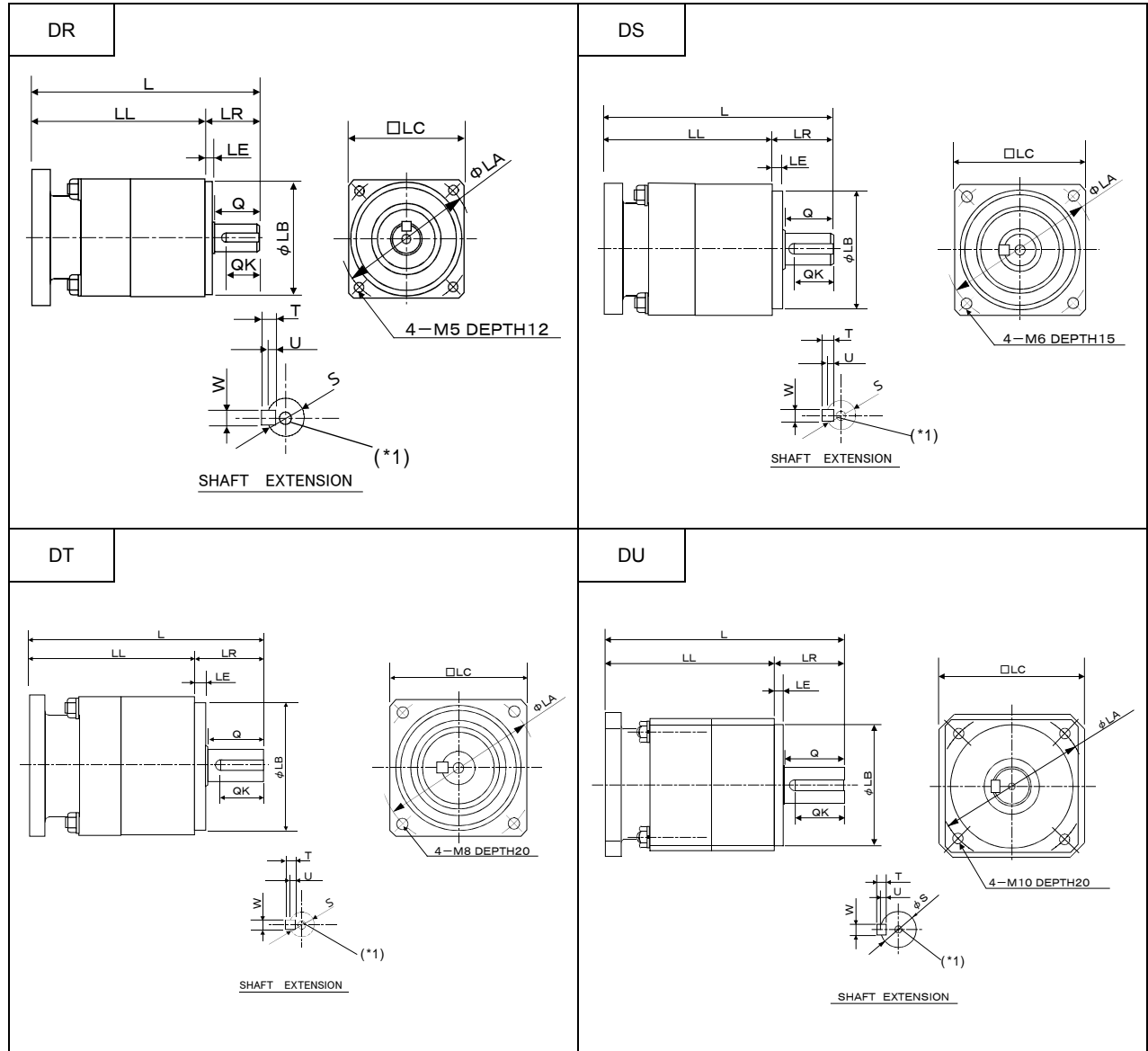
(*1) Screw hole (metric diameter x depth) of shaft extension

(*4) For 152 type, 1.5 [kW] : 4 - M12 × 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]



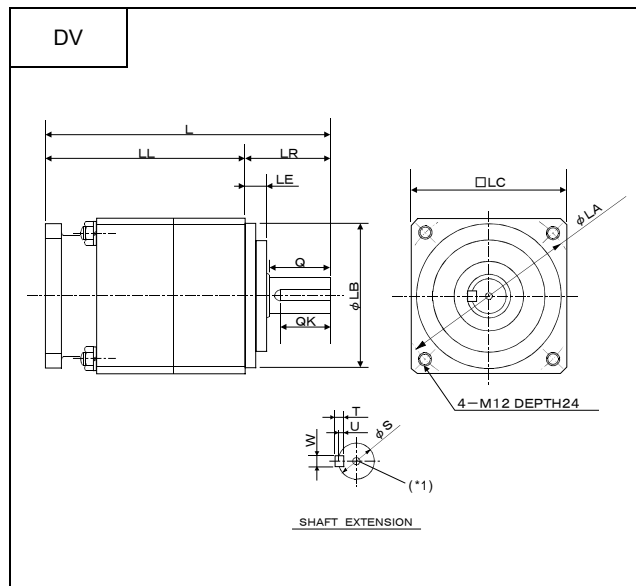
(f) Gear-head unit for GYC cubic type motor, gear ratio 1/25 (for 101 to 751 types) or 1/15 (for 102 to 202 types)
GYN101 to 202CAG - G25 or G15, 0.1 to 2 [kW]



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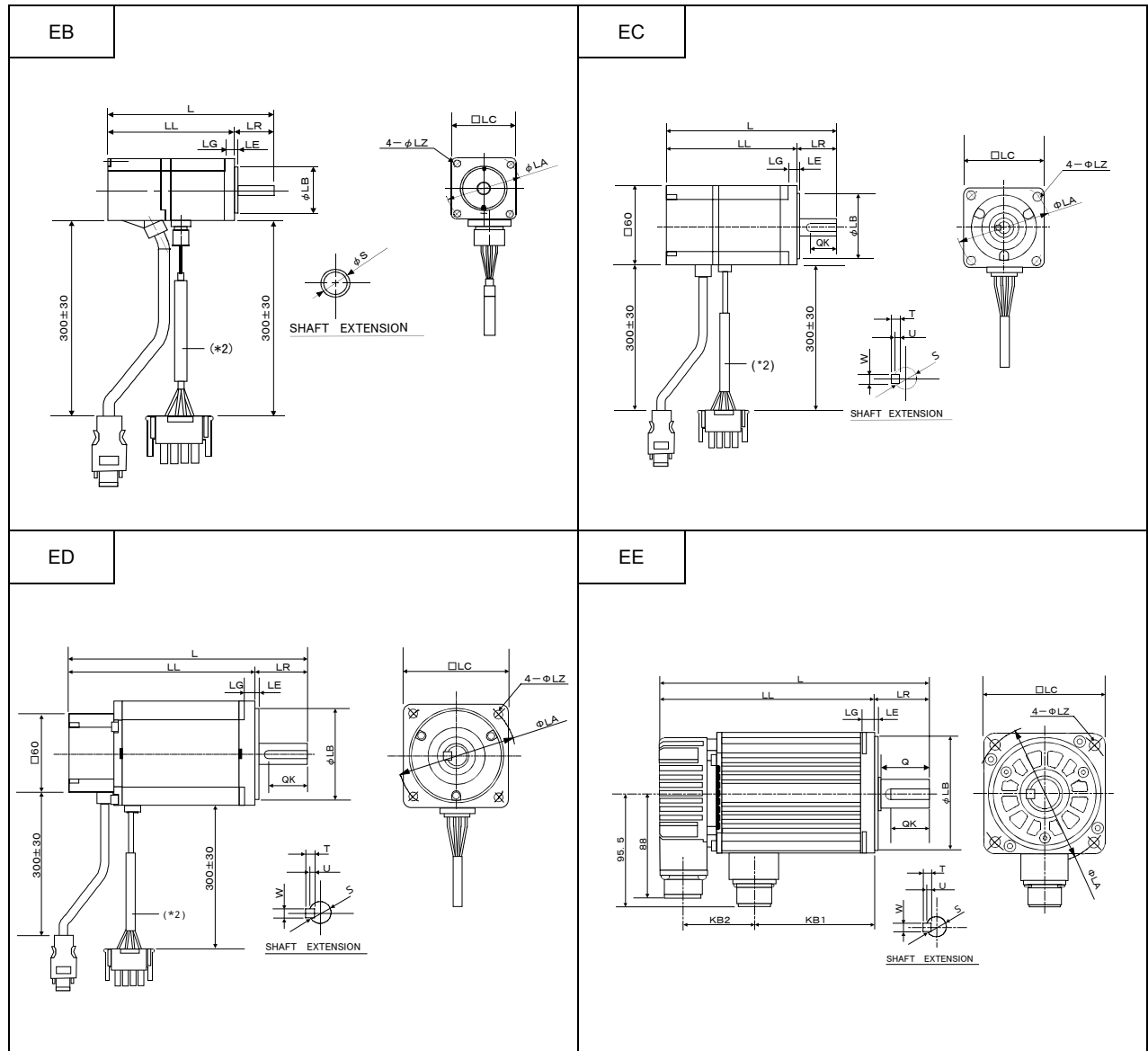
(*1) Screw hole (metric diameter x depth) of shaft extension

(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]

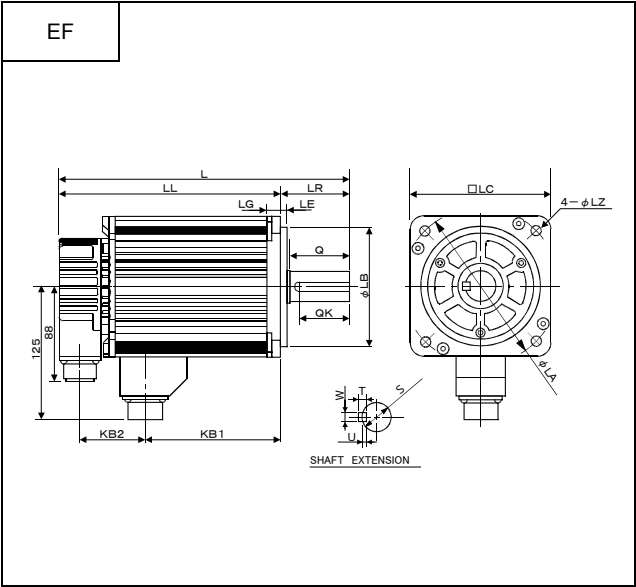


Type GYS	Fig	Q	QK	QR	S (*3)	T	U	W	(*1)	L	LL	LR	LG	LE	LA	LB (*3)
300DC1-S8B		-	-	-	6h6	-	-	-	-	103	78	25	5	2.5	46	30h7
500DC1-S8B	EB	-	-	-	6h6	-	-	-	-	103	78	25	5	2.5	46	30h7
101DC1-SB	EB	-	-	-	8h6	-	-	-	-	121	96	25	5	2.5	46	30h7
201DC1-SA	EC	-	20	-	14h6	5	3	5	-	126.5	96.5	30	6	3	70	50h7
401DC1-SA	EC	-	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

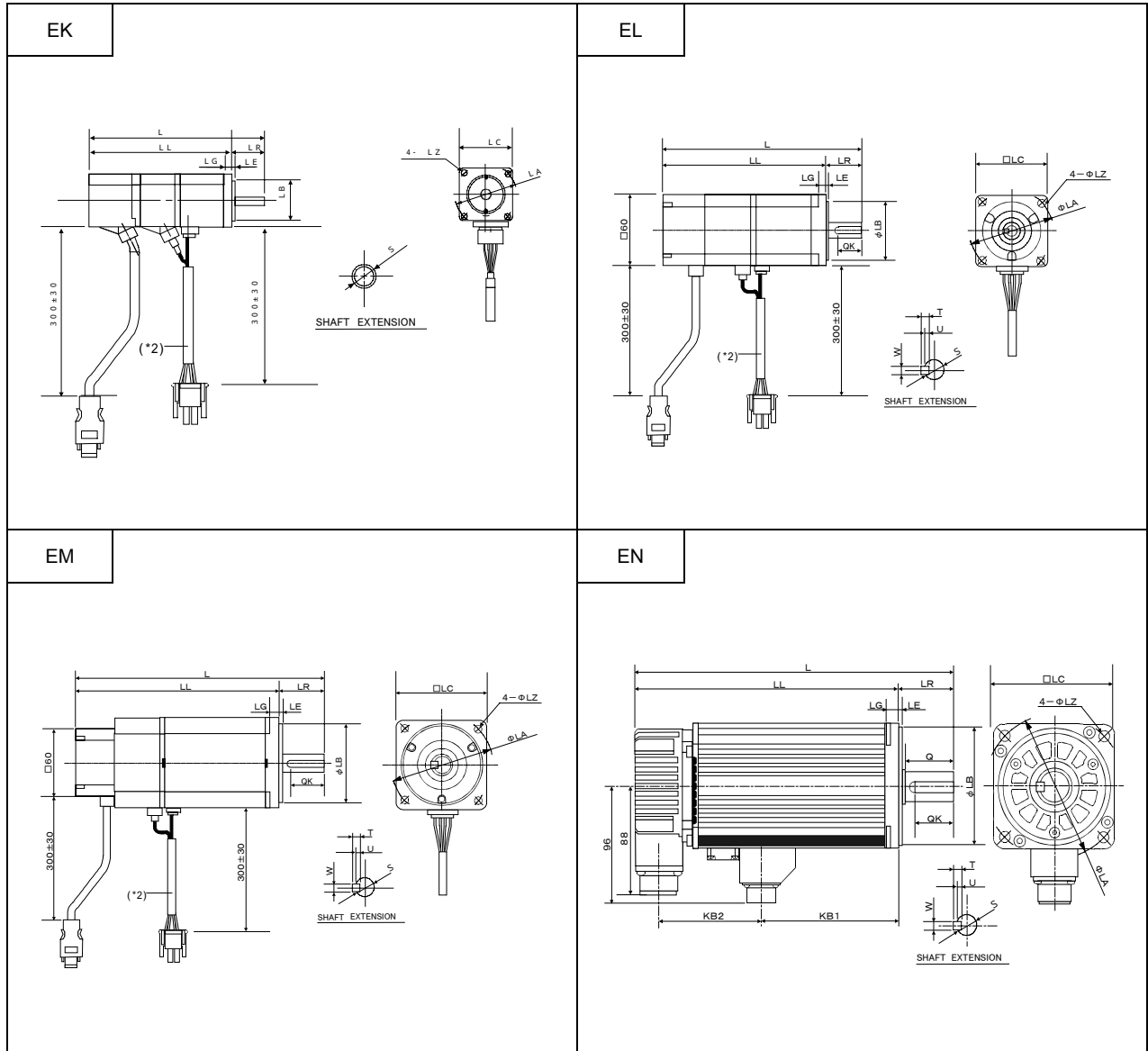
(*3) Shaft extension (S) and flanged spigot (LB) are machining finished with h6 or h7 fits.

(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]

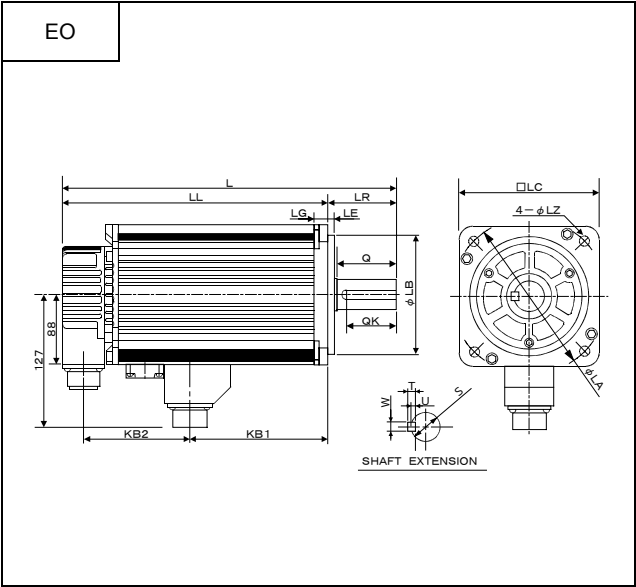


Type GYS	Fig	Q	QK	QR	S (*3)	T	U	W	(*1)	L	LL	LR	LG	LE	LA	LB (*3)
300DC1-S8-B		-	-	-	6h6	-	-	-	-	140	115	25	2.5	2.5	46	30h7
500DC1-S8-B	EK	-	-	-	6h6	-	-	-	-	140	115	25	2.5	2.5	46	30h7
101DC1-SB-B	EK	-	-	-	8h6	-	-	-	-	158	133	25	2.5	2.5	46	30h7
201DC1-SA-B	EL	-	20	-	14h6	5	3	5	-	165	135	30	6	3	70	50h7
401DC1-SA-B	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

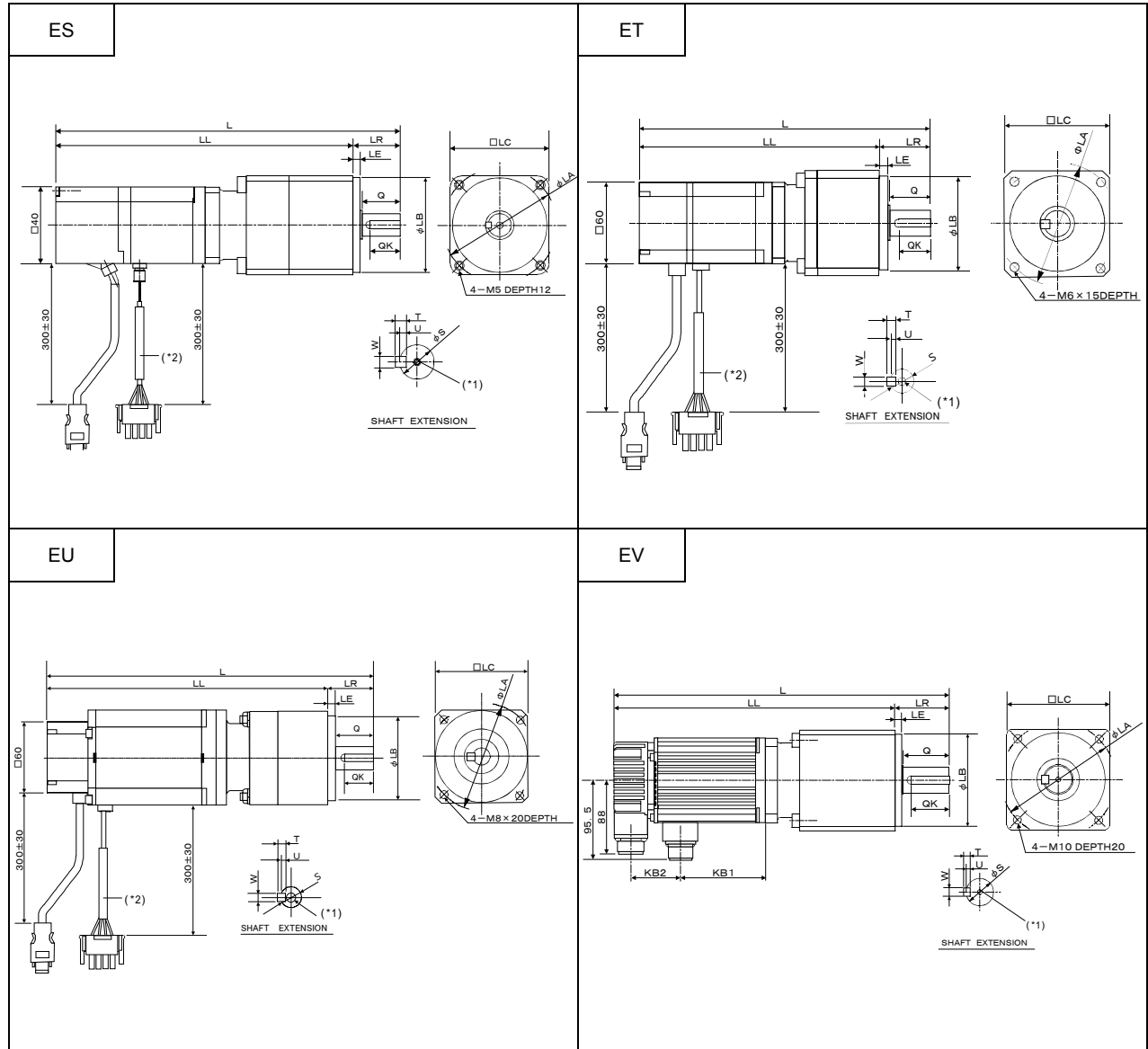
(*3) Shaft extension (S) and flanged spigot (LB) are machining finished with h6 or h7 fits.

(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]

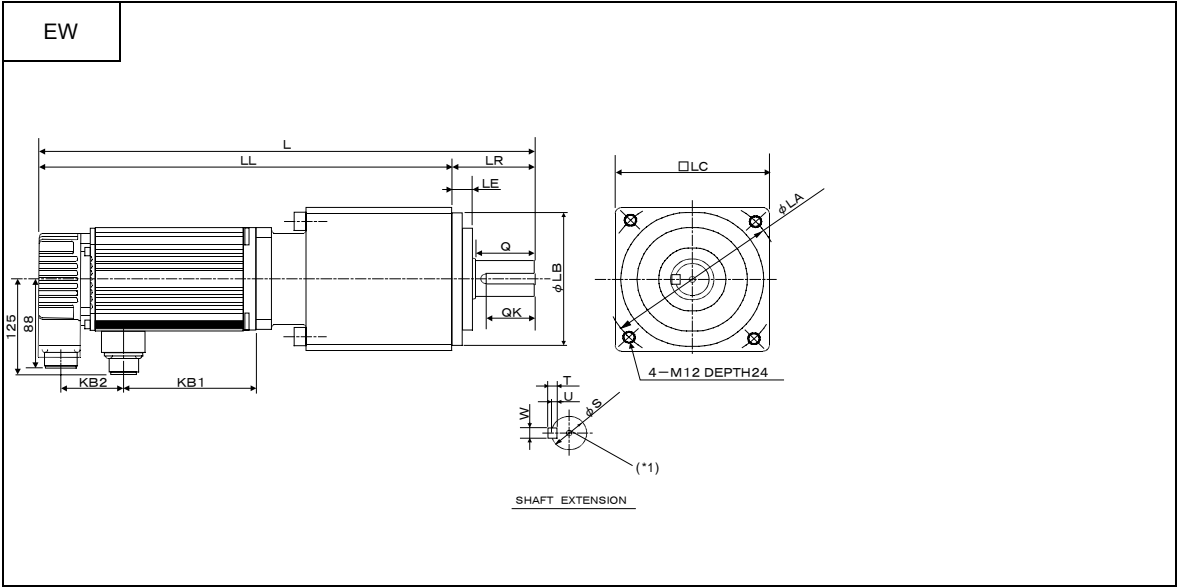


Type GYS	Fig	Q	QK	QR	S (*3)	T	U	W	(*1)	L	LL	LR	LG	LE	LA	LB (*3)
300DC1-S8B																
500DC1-S8B	ES	20	16	-	12h6	4	2.5	4		208	197	21	-	4	60	50h7
101DC1-SB	ES	20	16	-	12h6	4	2.5	4		236	215	21	-	4	60	50h7
201DC1-SA	ET	30	23	-	19h6	6	3.5	6	M4x8	232.5	195.5	37	-	6	90	70h7
401DC1-SA	ET	30	23	-	19h6	6	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

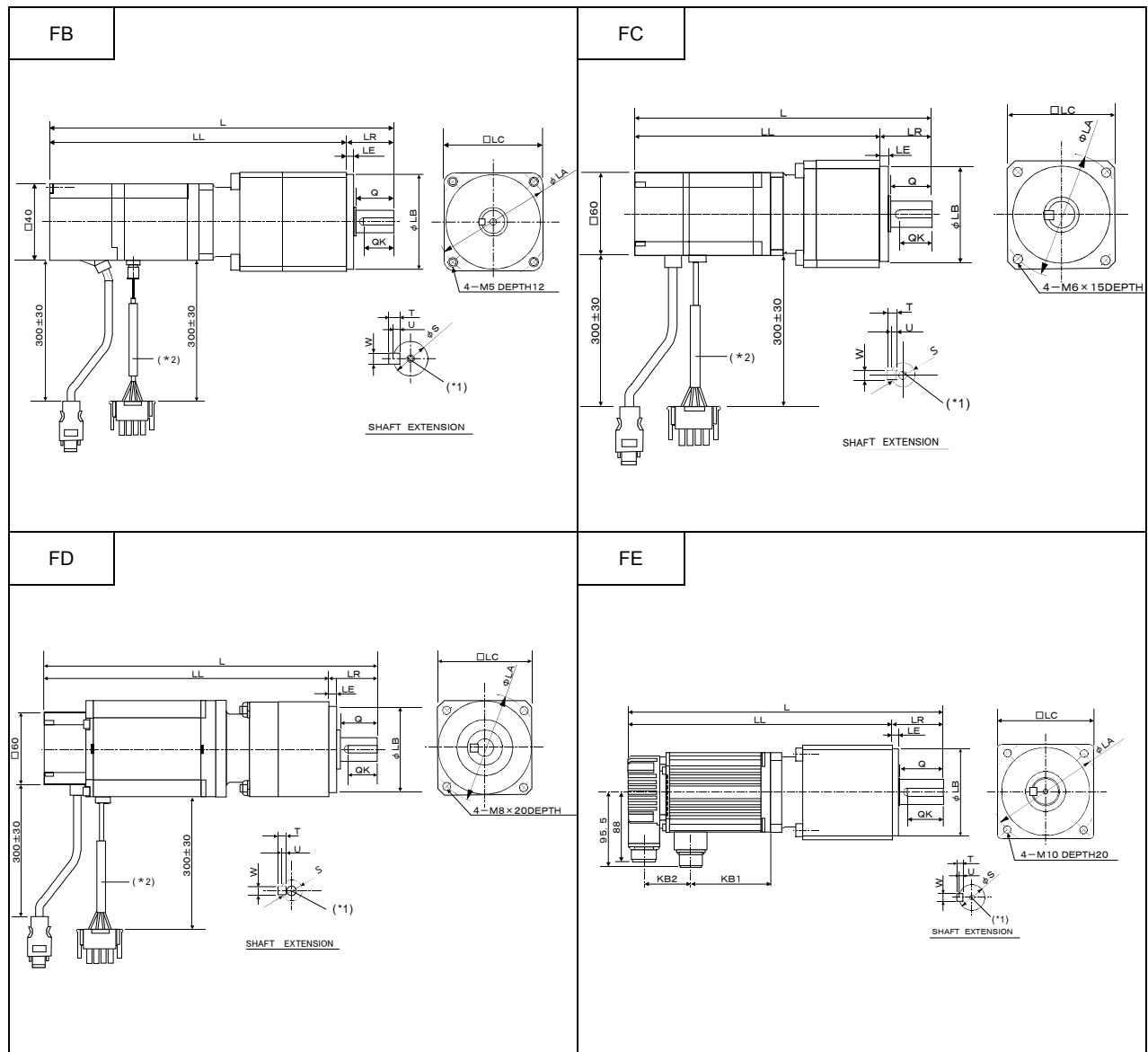
(*3) Shaft extension (S) and flanged spigot (LB) are machining finished with h6 or h7 fits.

(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]



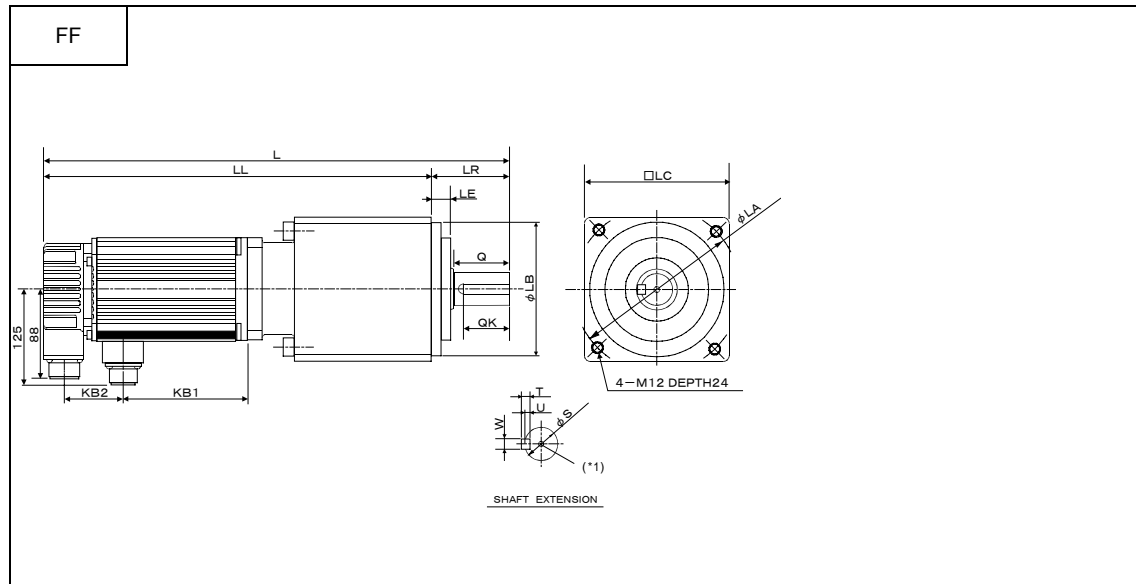
	LC	L1	L2	L3	LZ	IE	IL	C	KB1	KB2	Mass [kg]
- - - - -	52	-	-	-	-	-	-	-	-	-	1.15
- - - - -	52	-	-	-	-	-	-	-	-	-	1.25
- - - - -	78	-	-	-	-	-	-	-	-	-	3.3
- - - - -	78	-	-	-	-	-	-	-	-	-	3.9
- - - - -	98	-	-	-	-	-	-	-	-	-	7.2
- - - - -	120	-	-	-	-	-	-	-	77	57	12.2
- - - - -	120	-	-	-	-	-	-	-	99.5	57	13.0
- -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

[illegible]

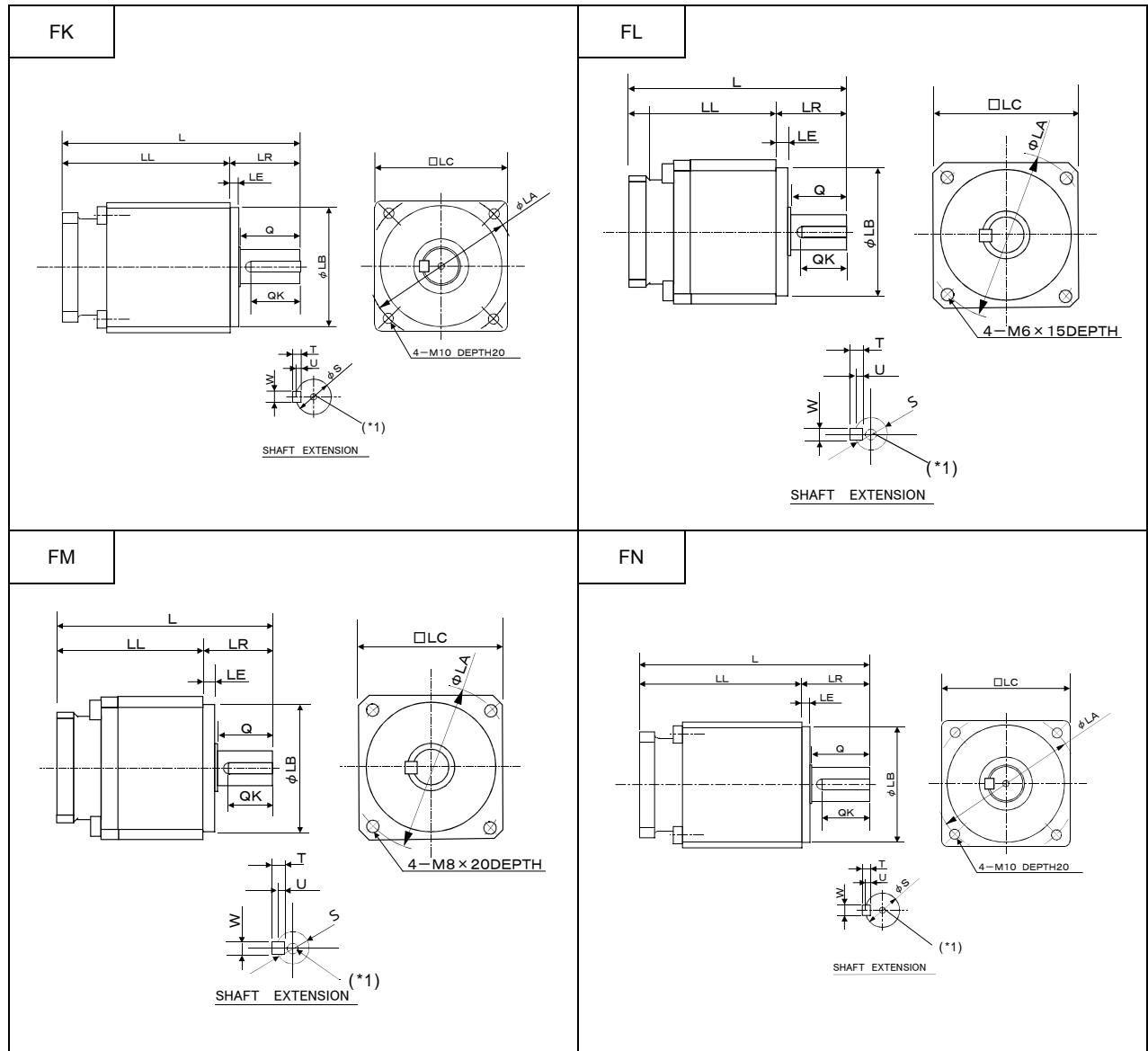
(*1) Screw hole (metric diameter x depth) of shaft extension (*2) Insulating protection tube
(*3) Shaft extension (S) and flanged spigot (LB) are machining finished with h6 or h7 fits.

(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]

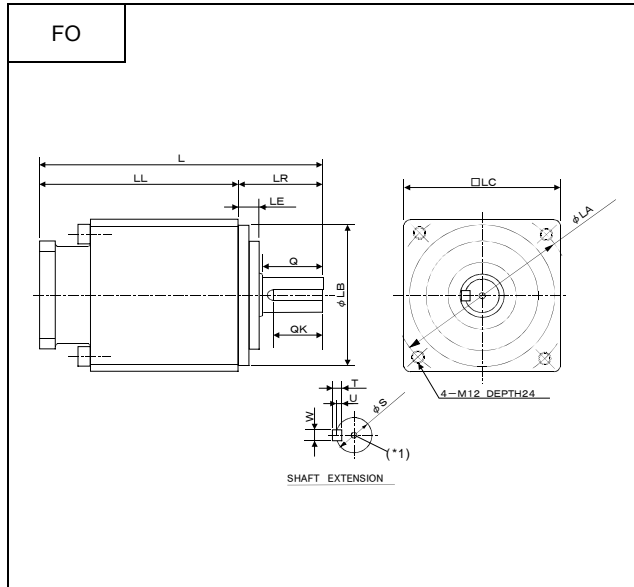


Type	Fig	Q	QK	QR	S (*3)	T	U	W	(*1)	L	LL	LR	LG	LE	LA	LB (*3)	LC	Mass [kg]
G09																		
GYN300SAG-																		
GYN500SAG-	FK	20	16	-	12h6	4	2.5	4		103	78	25	-	4	60	50h7	52	0.7
GYN101SAG-	FK	20	16	-	12h6	4	2.5	4		103	78	25	-	4	60	50h7	52	0.7
GRN.20SAG-	FL	30	23	-	19h6	6	3.5	6	M4x8	136	99	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-																		

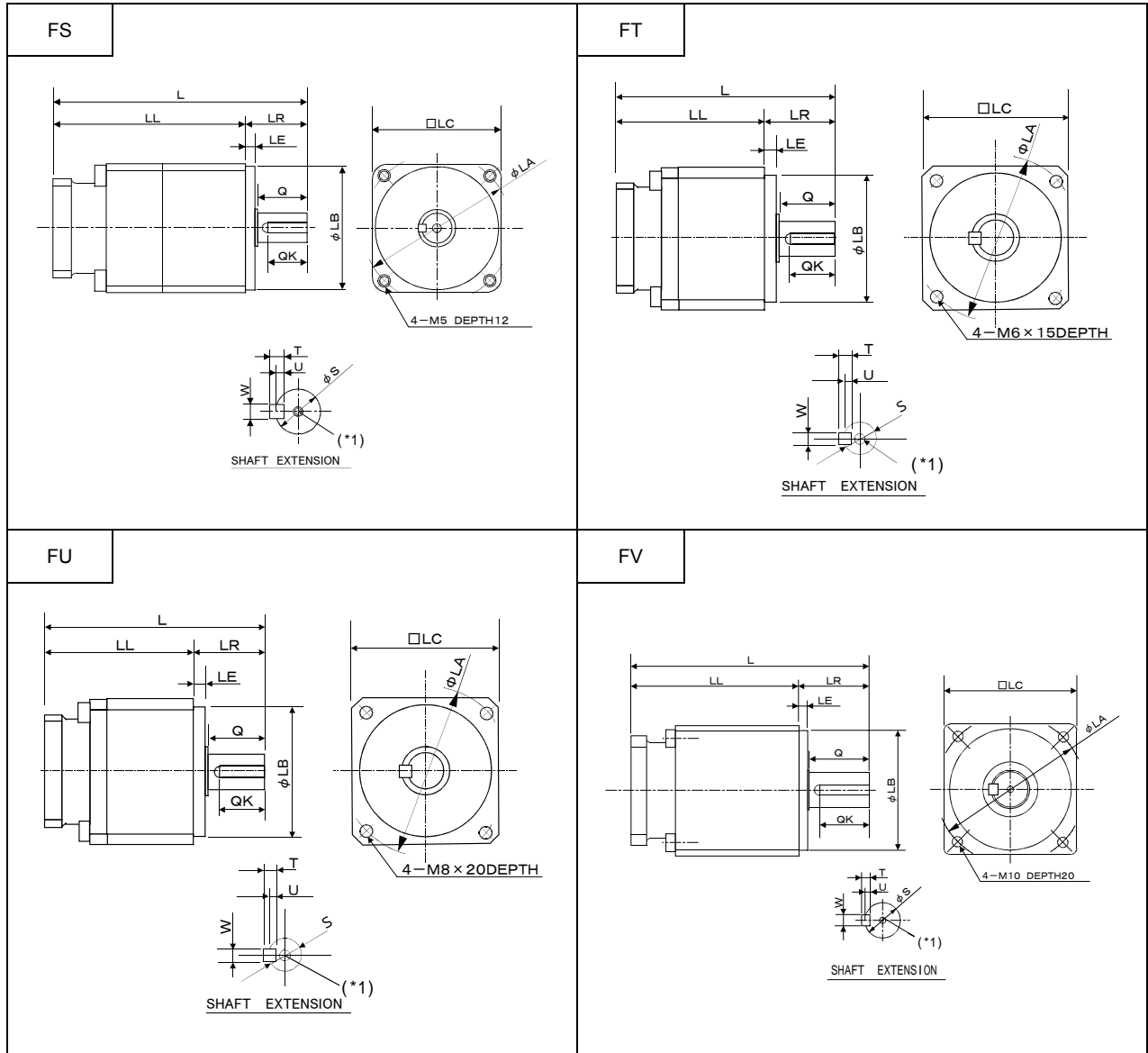
(*1) Screw hole (metric diameter x depth) of shaft extension

(*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]

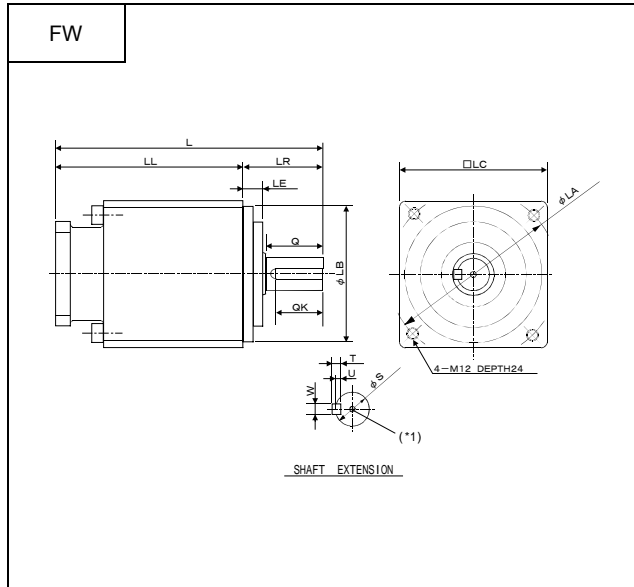


Type	Fig	Q	QK	QR	S (*3)	T	U	W	(*1)	L	LL	LR	LG	LE	LA	LB (*3)	LC	Mass [kg]
GYN300SAG-G25																		
GYN500SAG-G25	FS	20	16	-	12h6	4	2.5	4		103	78	25	-	4	60	50h7	52	0.7
GYN101SAG-G25	FS	20	16	-	12h6	4	2.5	4		103	78	25	-	4	60	50h7	52	0.7
GRN.20SAG-G25	FT	30	23	-	19h6	6	3.5	6	M4x8	136	99	37	-	6	90	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.

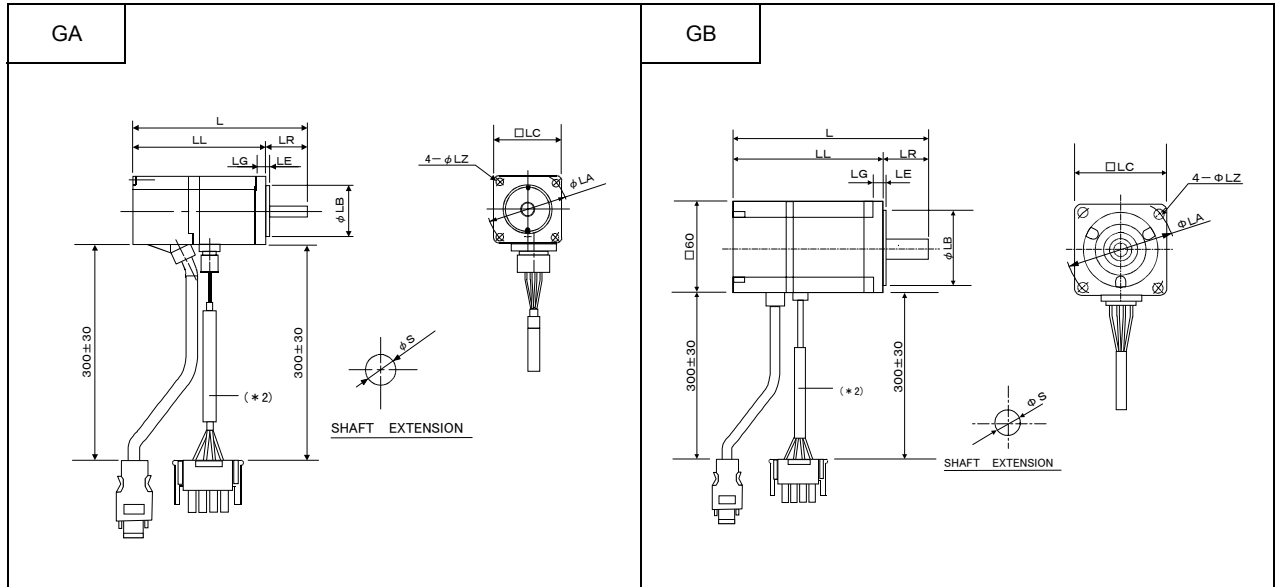
(I) Gear-head unit for GYS slim type motor, gear ratio 1/25 (for 300 to 751 types) or 1/15 (for 102 to 502 types) (cont'd)
 GYN300 to 101 and 751 to 502, GRN.20 to .40SAG-G25 or G15, 0.03 to 5 [kW]



(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]

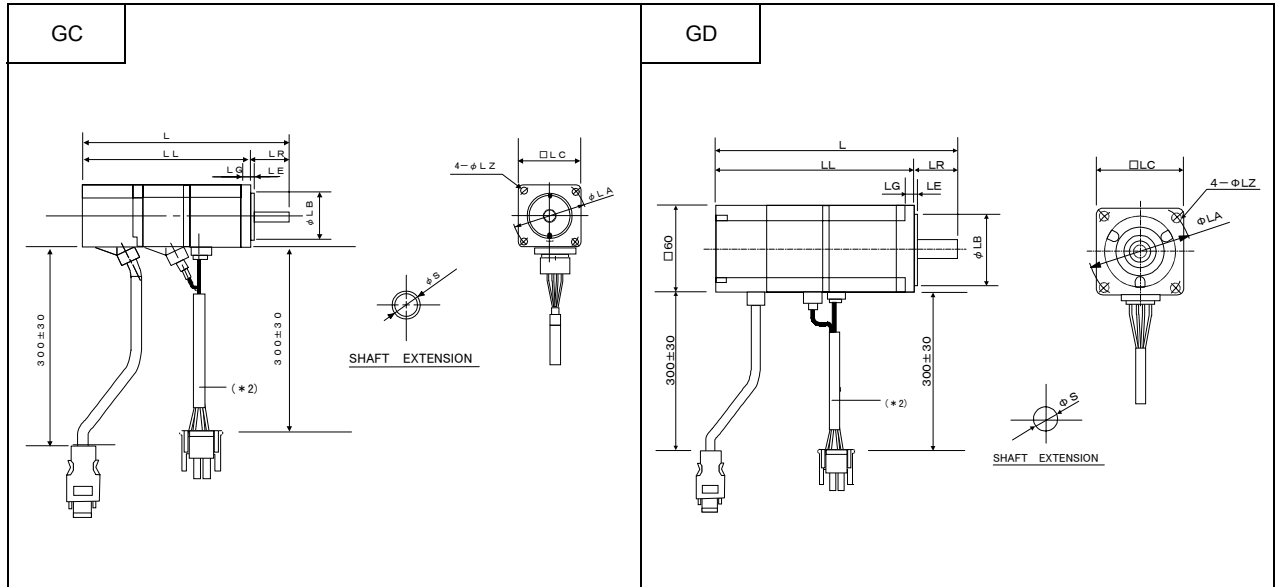


Type GYS	Fig	QK	ϕS (*3)	T	U	W	L	LL	LR	LG	LE	ϕLA	ϕLB (*3)	DLC	ϕLZ	Mass [kg]
300DC1-S8B																
500DC1-S8B	GA	-	6h6	-	-	-	103	78	25	5	2.5	46	30h7	40	4.3	0.45
101DC1-S6B	GB	-	8h6	-	-	-	121	96	25	5	2.5	46	30h7	40	4.3	0.55
201DC1-S6B	GB	-	14h6	-	-	-	126.5	96.5	30	6	3	70	50h7	60	5.5	1.2

(*2) Insulating protection tube

(*3) Shaft extension (ϕS) and flanged spigot (ϕLB) 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	φ S (*3)	T	U	W	L	LL	LR	LG	LE	φ LA	φ LB (*3)	DLC	φ LZ	Mass [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

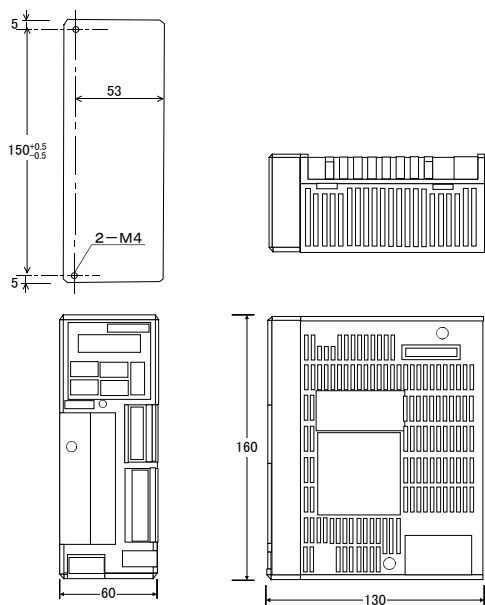
(*2) Insulating protection tube

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

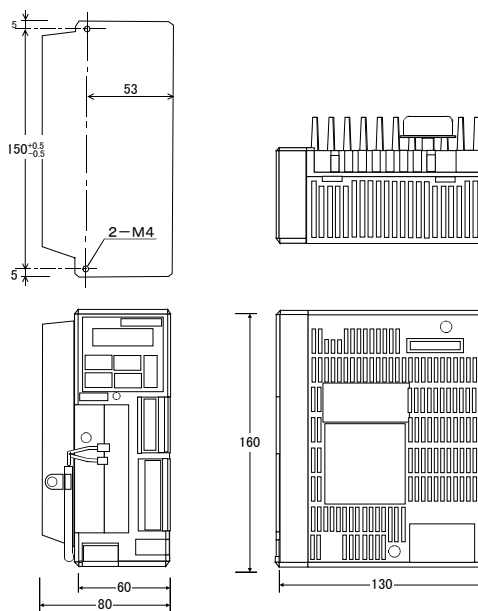
(3) RYS amplifier

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

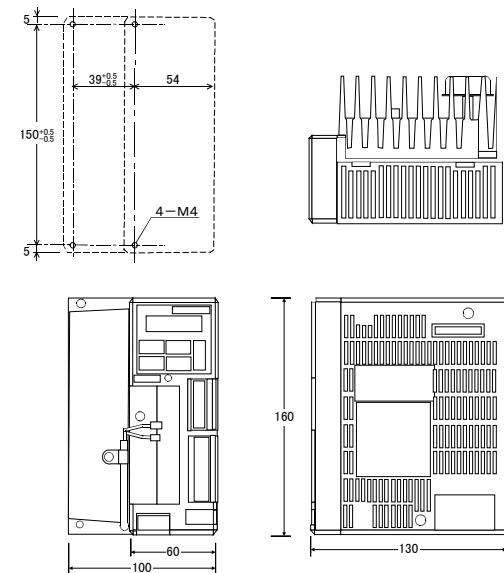
(i) 0.03 to 0.2 [kW]



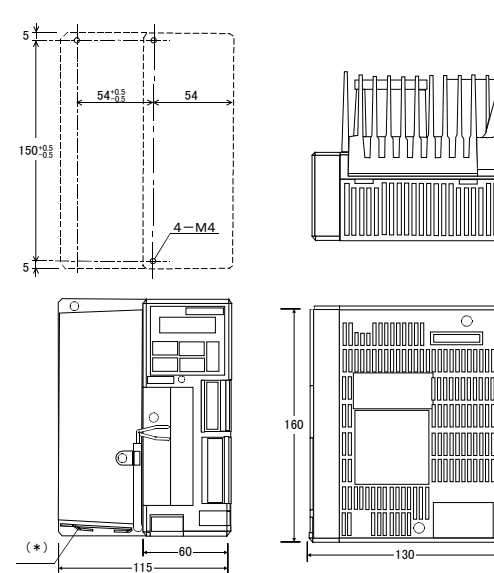
(ii) 0.4 [kW]



(iii) 0.75 [kW]

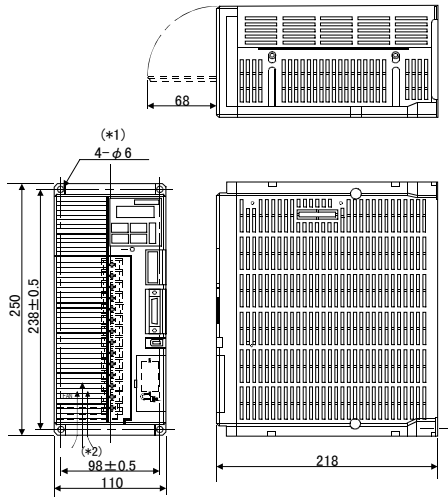


(iv) 1, 1.5 [kW]

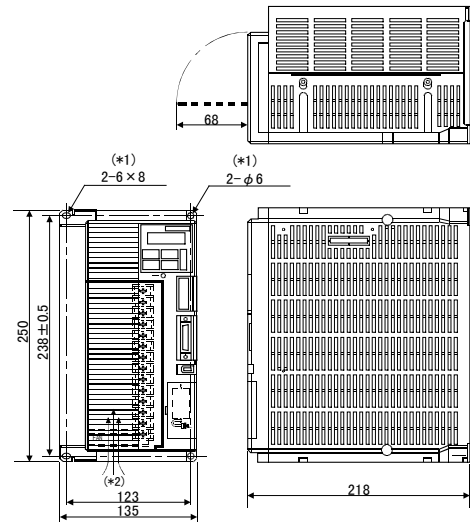


(*) Ventilation cooling fan

(v) 2, 3 [kW]



(vi) 4, 5 [kW]

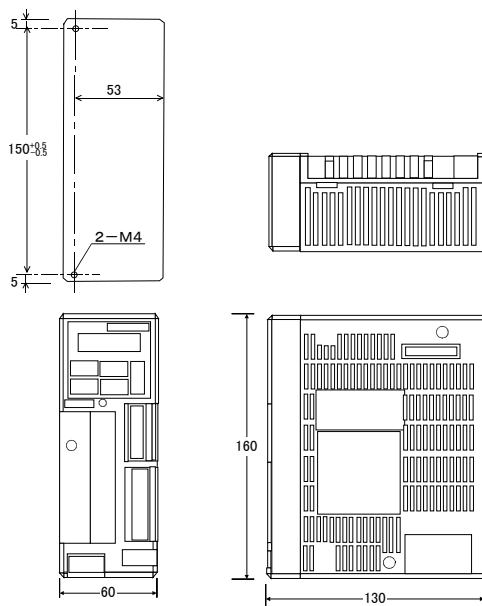


(*1) Panel mounting hole

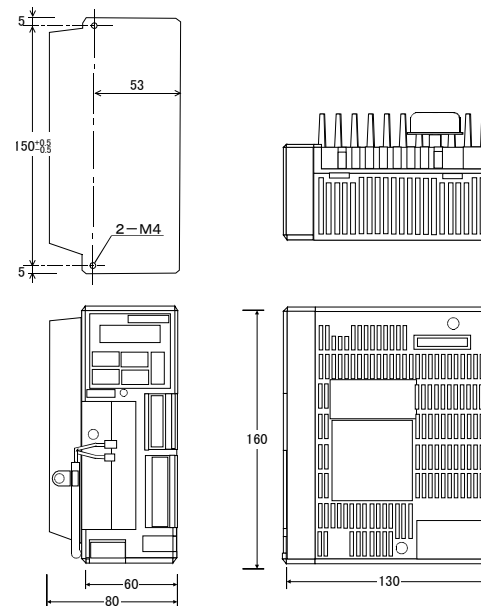
(*2) Ventilation cooling-air inlet

(b) 100 [V] class input voltage of amplifier

(i) 0.05, 0.1 [kW]



(ii) 0.2 [kW]

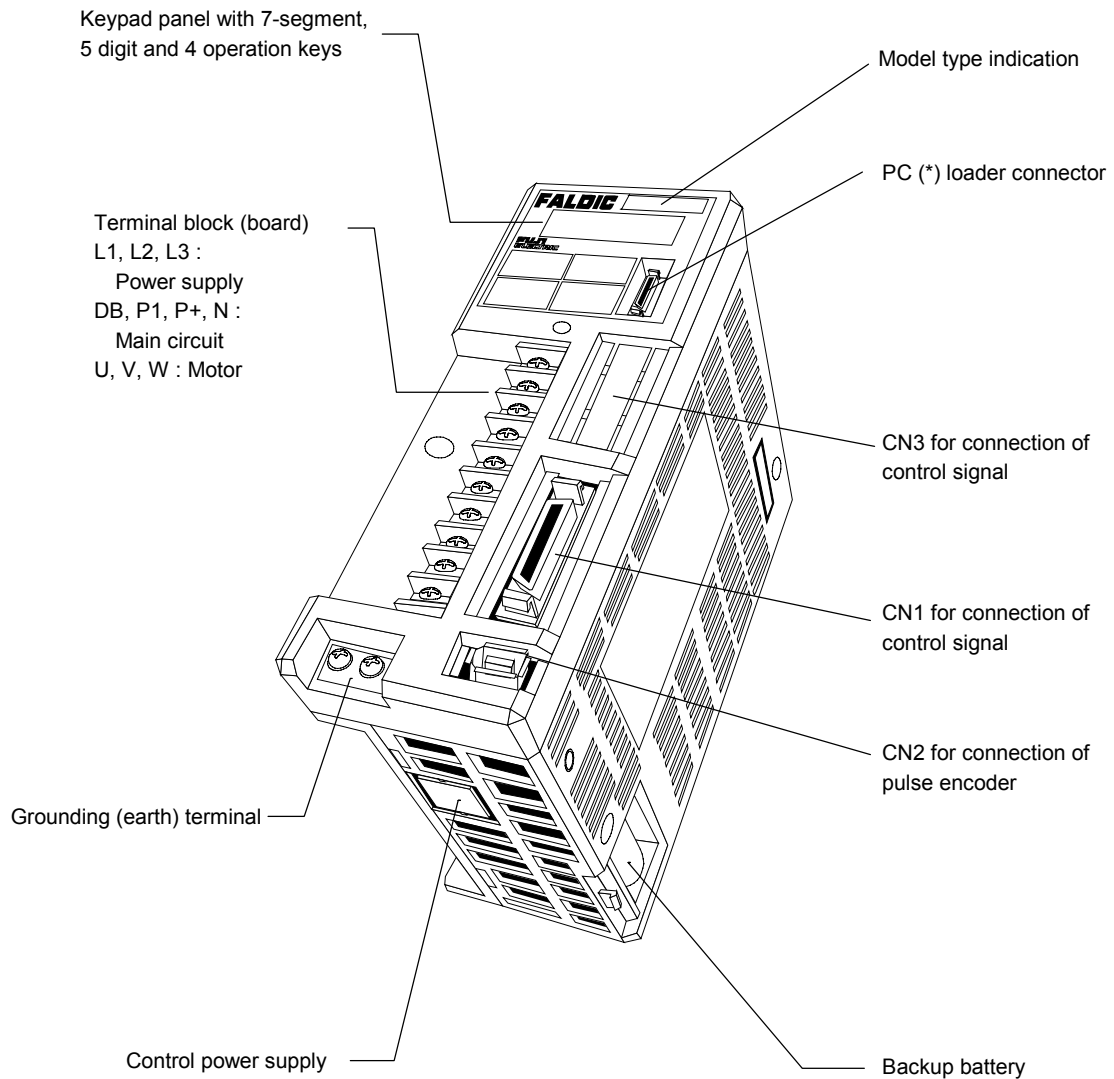


4. TERMINAL DIAGRAMS AND WIRING

4.1 Amplifier, motor and optional devices layout

(1) Amplifier

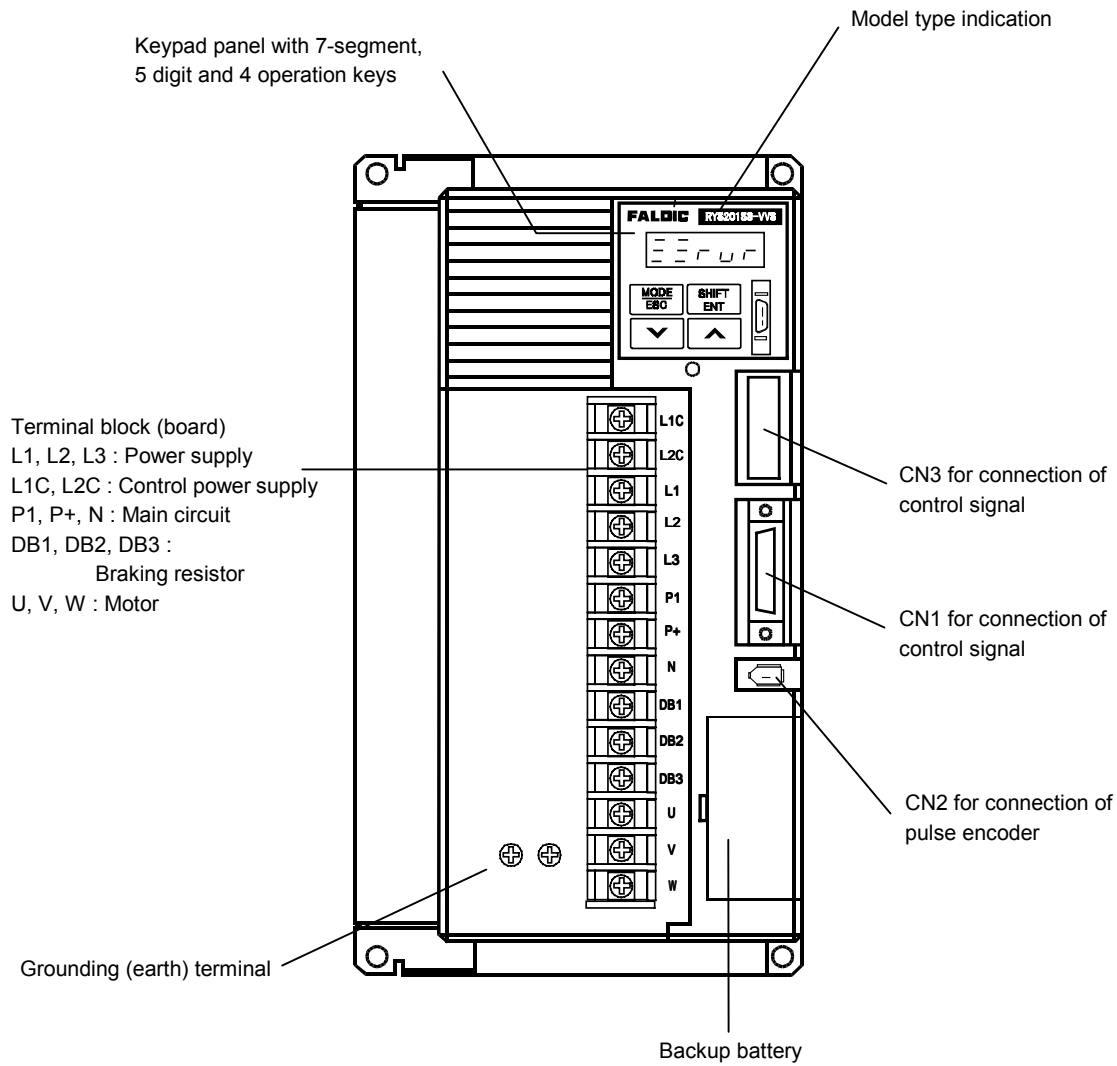
(a) 0.03 to 1.5 [kW]



Remark : Actual amplifier may differ in details.

(*) PC : Personal computer

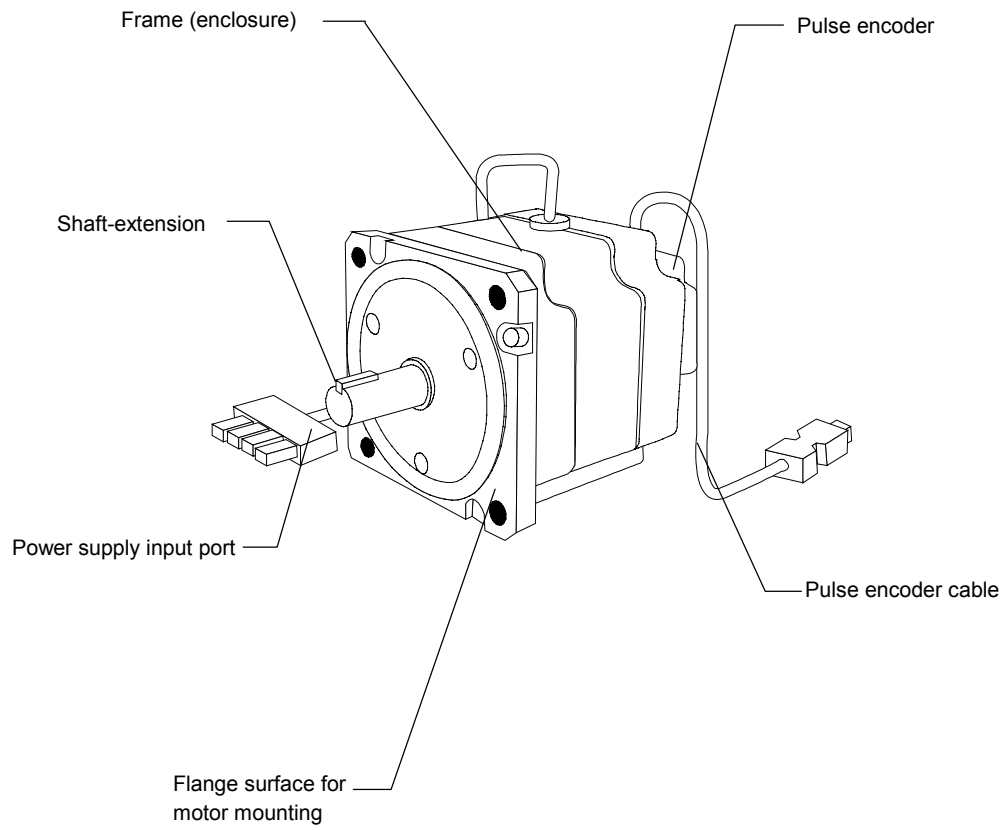
(1) Amplifier (cont'd)
(b) 2 to 5 [kW]



Remarks :

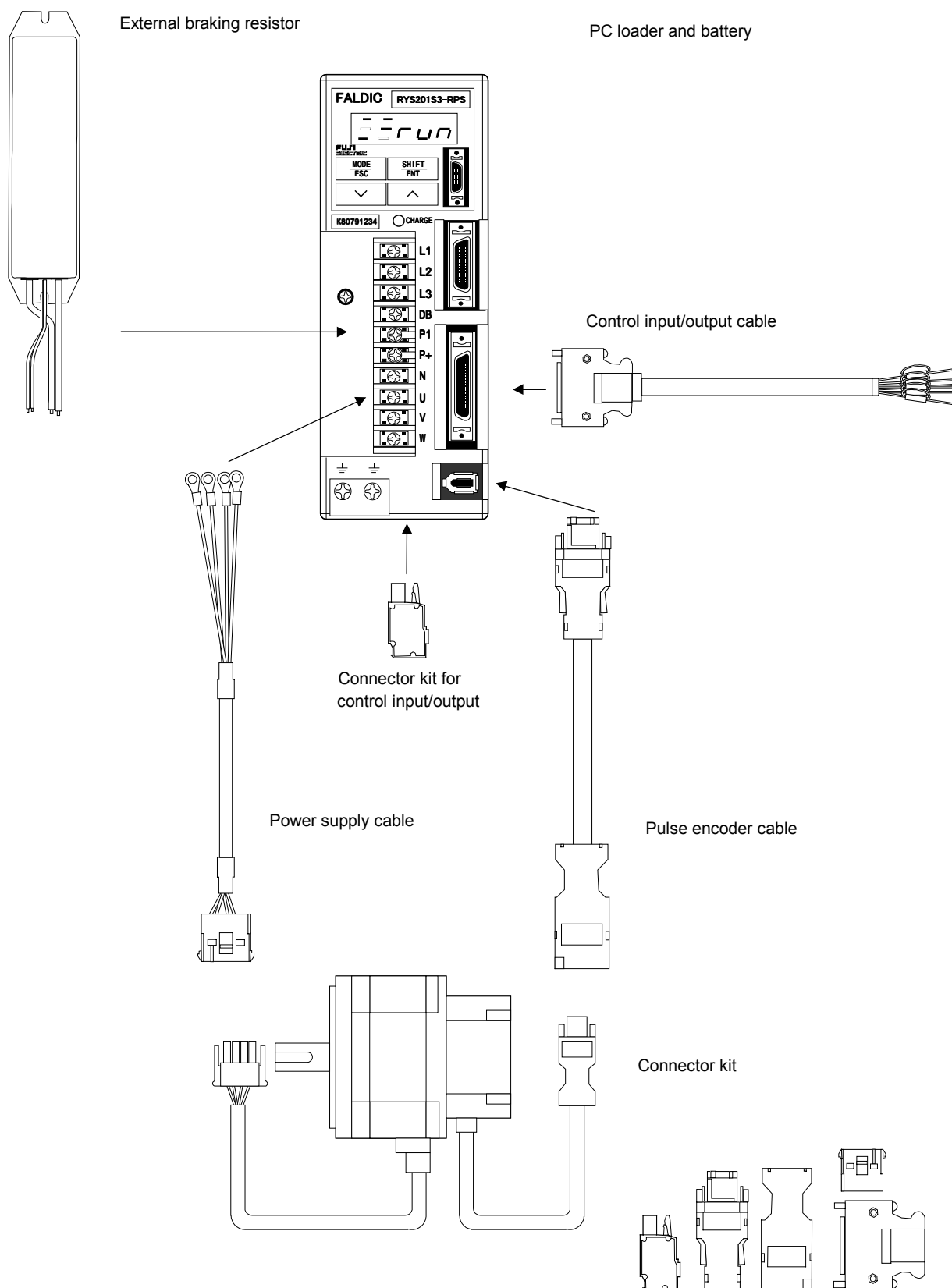
- (1) This figure indicates the state where the cover of terminal block (board) is open. The cover should be closed before power on.
- (2) Actual amplifier may differ in details.

(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	10.8	Description (*)										Type	
	(1)	a	Control cable		Expanded (CN3) for L, R type amplifier			3 [m] lg.			WSC - D20P03 D26P03 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 D26P 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		P06P-M P06P-F P06P-C				
		e			Molex (*) (motor side)								
		f			Canon (*)		1 [kW] and above						
		g		Motor without brake	AMP (*)	0.75 [kW] and below		M04P M04P-CA M04P-CB					
		h			Canon (*)	GYS, 1 to 2 [kW]							
		i				GYS, 1 [kW] } and above GYS, 3 [kW]							
		j		Motor with brake	AMP (*)	0.75 [kW] and below		M06P M06P-CA M06P-CB					
		k			Canon (*)	GYS, 1 to 2 [kW]							
		l				GYS, 1 [kW] } and above GYS, 3 [kW]							
	(3)	a	External braking resistor			0.4 [kW] and below			WSR- 401 751 152				
		b				0.75 [kW]							
		c				1, 1.5 [kW]							
		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-S8B, SB or SA	500 S8B	101 SB	201 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- * * * 6	500	101	201
Motor type (example)	GYS	DC1-S8B, S6B	500 S8B	101 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.

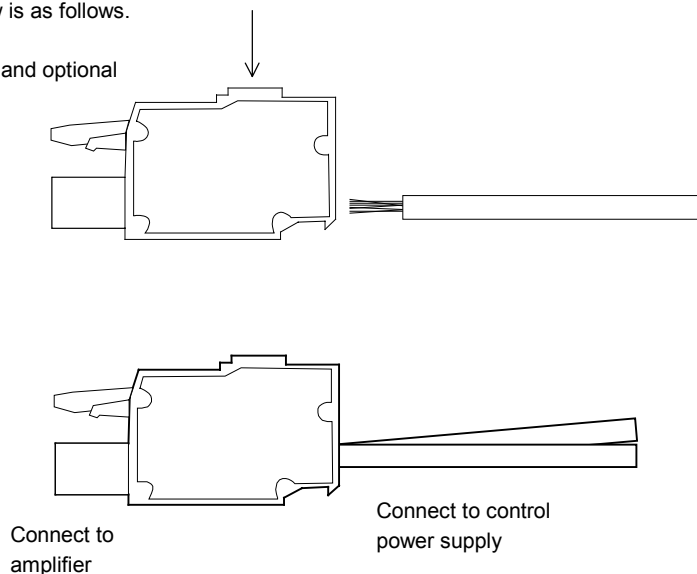
(a) Connector

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.

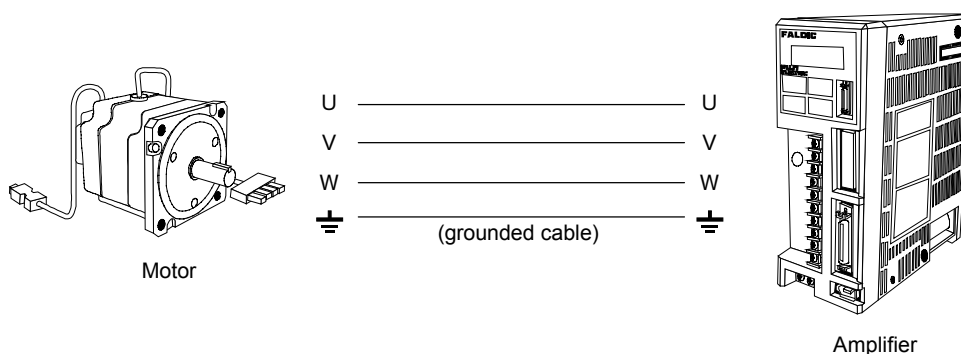
Do not connect commercial power supply to the motor terminals.

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 :

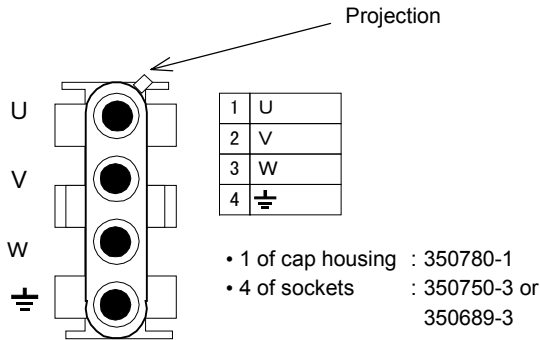
Phase advancing capacitor, reactor, power filter, surge suppressor (surge killer)

Terminal workings of motor power supply cables are as follows :

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

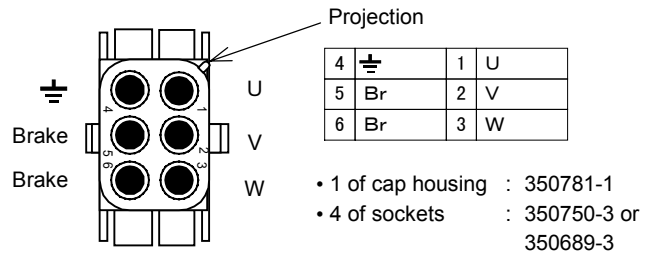
(i) Motor without providing brake

• Viewed from socket inserting side



(ii) Motor with providing brake

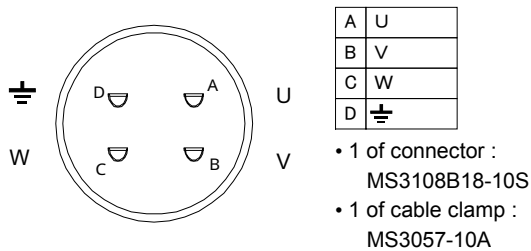
• Viewed from socket inserting side



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

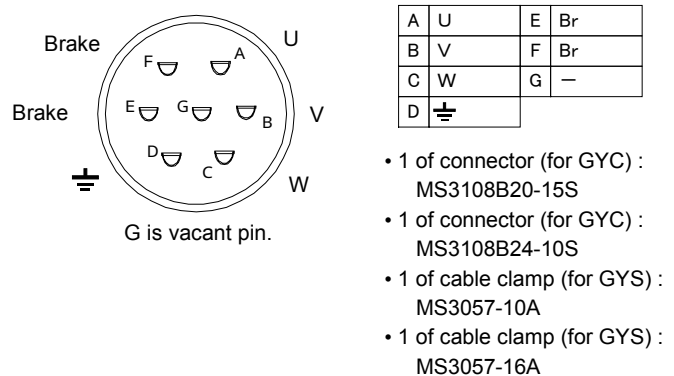
(i) Motor without providing brake

• View of plug wiring side



(ii) Motor with providing brake

• View of plug wiring side



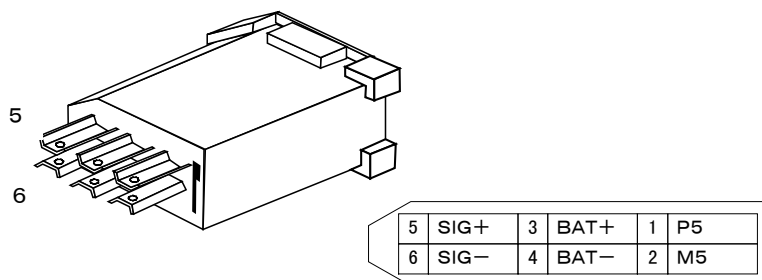
(2) Pulse encoder wiring

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)

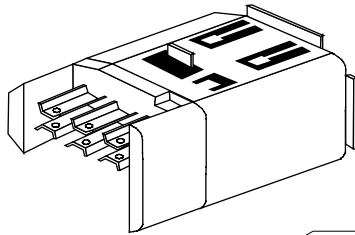
(i) Wiring to amplifier



• 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

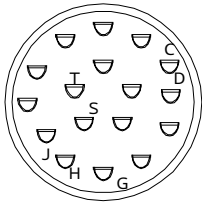


6	SIG-	4	BAT-	2	M5
5	SIG+	3	BAT+	1	P5

• 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 ²
				CM	mm ²
16	1.4	55.12	1.400	3038	1.539
		50.82	1.291	2583	1.309
	1.2	47.24	1.200	2232	1.131
23		22.57	0.5773	509.4	0.2581
24	.55	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
	.45	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

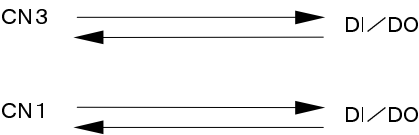
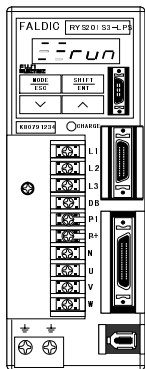
Plug : 10120-3000VE
Shell kit : 10320-52A0-008

(b) CN1 (lower side)

Connect control input/output signals.

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

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



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

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

(ii) CN1(lower side)

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

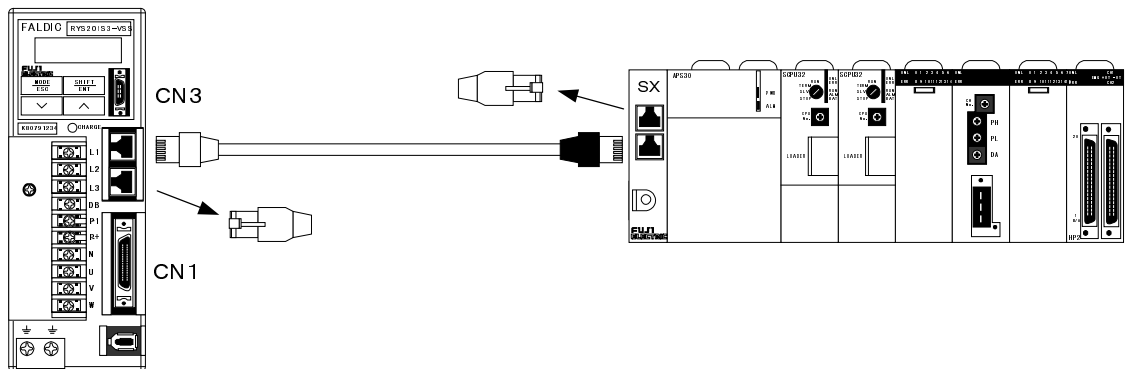
The IQ area of the CPU is of 512 word (at maximum).

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	* C B	13	P 5	12	M 5
24	C B	23	* C A	11	M O N 1	10	M O N 2
22	C A	21	* F Z	9	M 2 4	8	P 2 4
20	F Z	19	* F B	7	O U T 2	6	O U T 1
18	F B	17	* F A	5	C O N T 5	4	C O N T 4
16	F A	15	B A T -	3	C O N T 3	2	C O N T 2
14	B A T +			1	C O N T 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 (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/current timer data (PC ← Amplifier)															
5	—			Alarm code						—						
6	—					CSEL 2	CSEL 1	CSEL 0	Para. No. current value							
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	—					SEL2	SEL1	SEL0	Para. No. setting value							
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

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 Station No., speed command
OFF	OFF	ON	Current feedback position, current speed, current torque, alarm code Station No., speed command
OFF	ON	OFF	Current deviation, current speed, current torque, alarm code Station No., speed command
OFF	ON	ON	— Station No.
ON	OFF	OFF	Basic para. current value Basic para. setting value / Station No.
ON	OFF	ON	System para. current value System para. setting value / Station No.
ON	ON	OFF	— Station No.
ON	ON	ON	Current value between LS-Z phase Station No.

(d) Terminal function
CN1 (lower side)

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

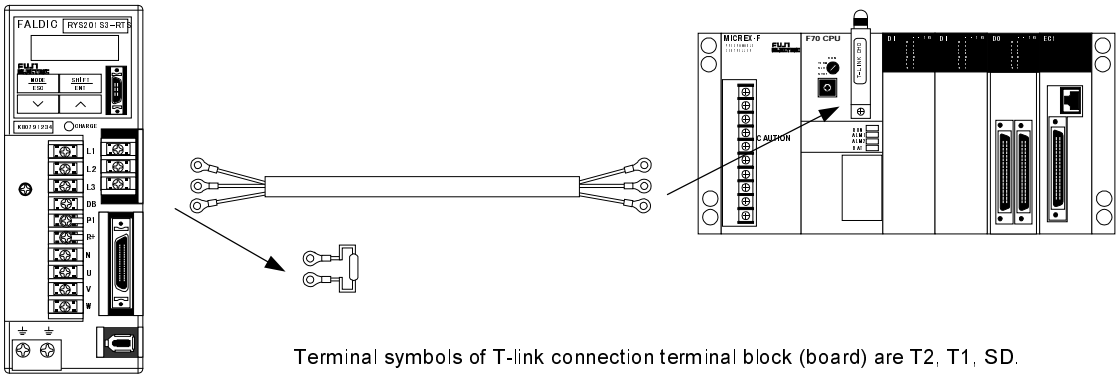
(*) Each of terminal M5 is internally connected. They are not connected with terminal M24.

(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 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	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	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	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 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 M24	1 24	Control power supply	+24 [V] DC, 0.2 [A]
CONT1 CONT2 CONT3 CONT4 CONT5 CONT6 CONT7 CONT8	2 3 4 5 15 16 17 18	Control input	+24 [V] DC, 10 [mA] Initially assigned at factory : CONT1 : — (unassigned) CONT2 : — (unassigned) CONT3 : — (unassigned) CONT4 : — (unassigned) CONT5 : — (unassigned) CONT6 : — (unassigned) CONT7 : — (unassigned) CONT8 : — (unassigned)
OUT1 OUT2 OUT3 OUT4	6 7 19 20	Control output	+30 [V] DC, 50 [mA] max. OUT1 : — (unassigned) OUT2 : — (unassigned) OUT3 : — (unassigned) OUT4 : — (unassigned)
MON2 M5	24 26	Monitor 2 (output)	Analog voltage. Initially assigned at factory : MON2 : Torque monitor
P5 M5	25 13	Power supply for pulse train	+5 [V] DC, 200 [mA]
CA, *CA CB, *CB	11, 22 12, 23	Pulse train input	Input freq. : 500 [kHz] max. (differential input) (*2)
FA FB FZ	8 9 10	Freq. dividing output	Freq. dividing terminal. 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] (each one-point)	
Control output	+30 [V] DC, 50 [mA] (max.)	
Analog input	20 [k Ω] impedance	
Analog output (monitor output)	Voltage output	
Pulse train input	Differential input	
Pulse train output	Differential output	

4.5 External connection diagrams (normal, example)

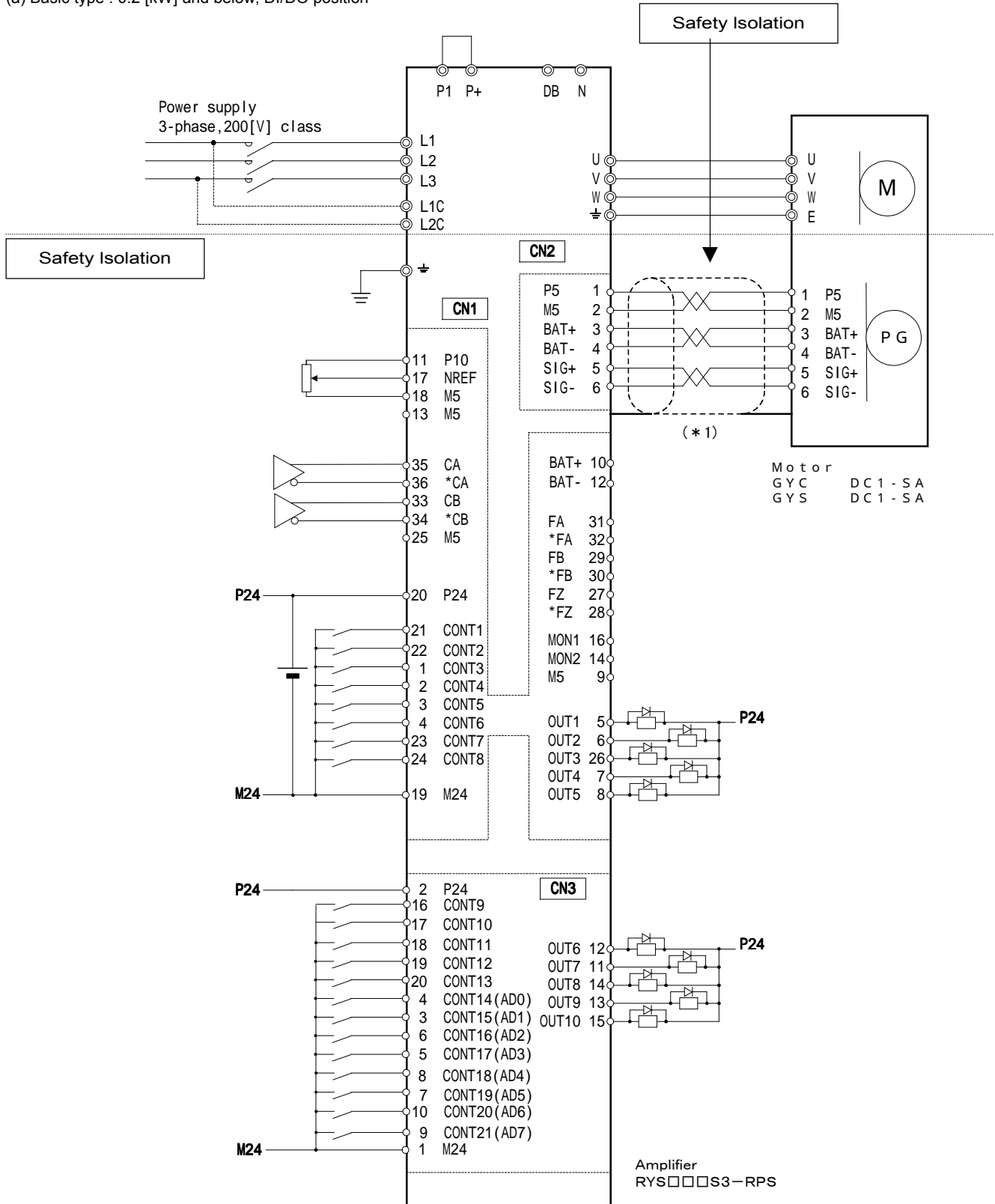
(1) External connection diagrams of RYS-S3-RPS type amplifier and GYC, GYS type motor

	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

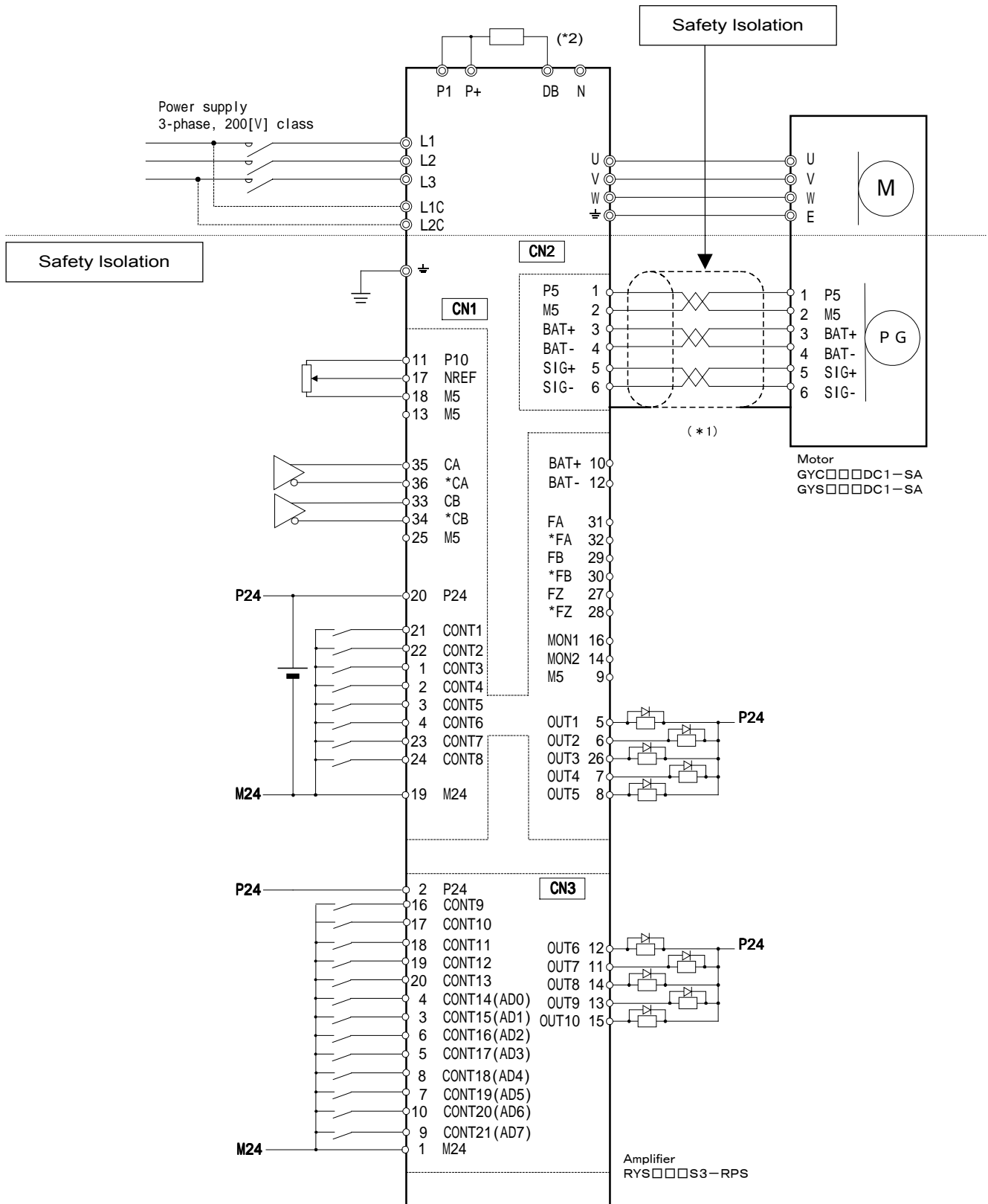
(a) Basic type : 0.2 [kW] and below, DI/DO position



(*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.

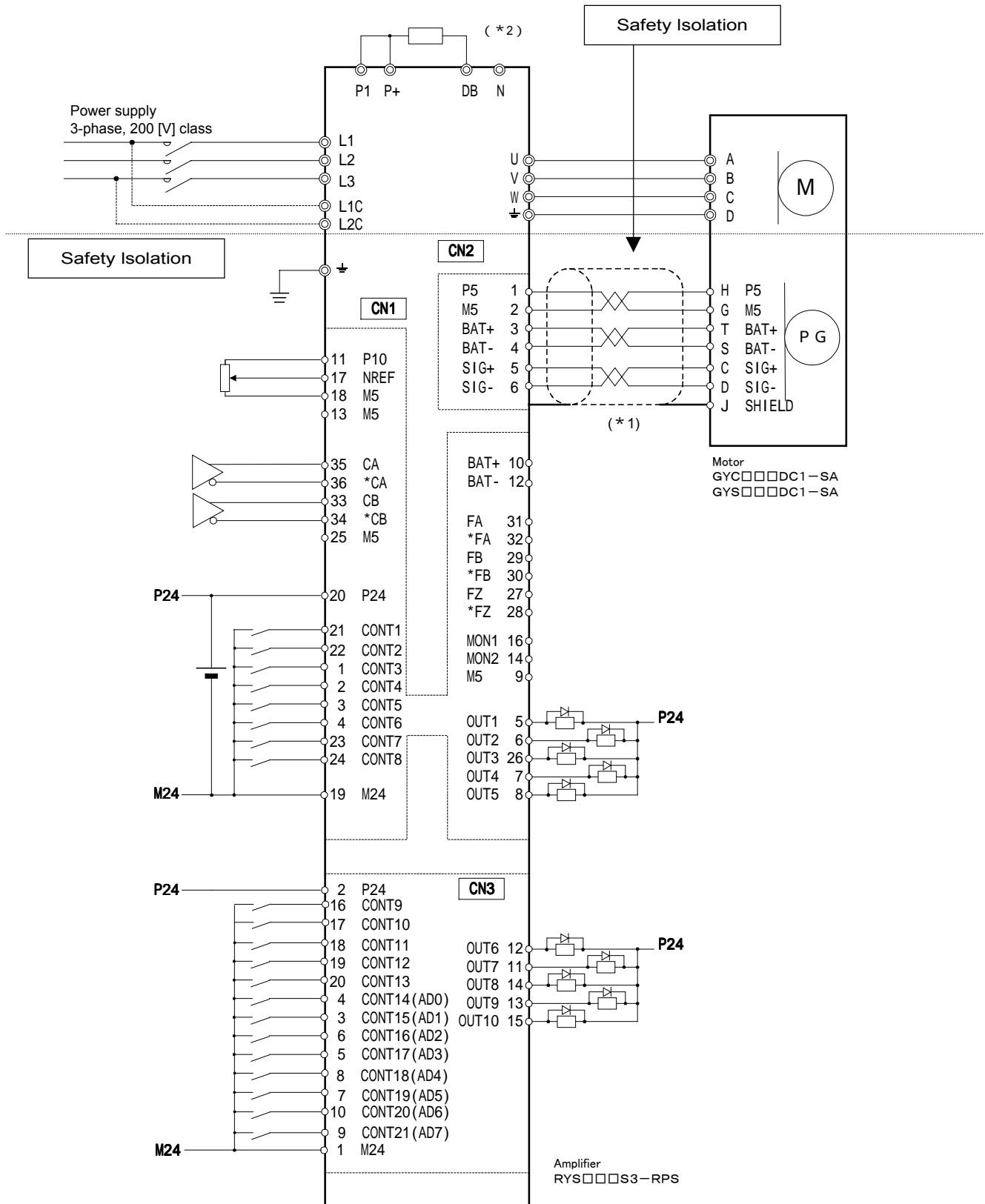
(b) Basic type : 0.4 and 0.75 [kW], DI/DO position



(*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.

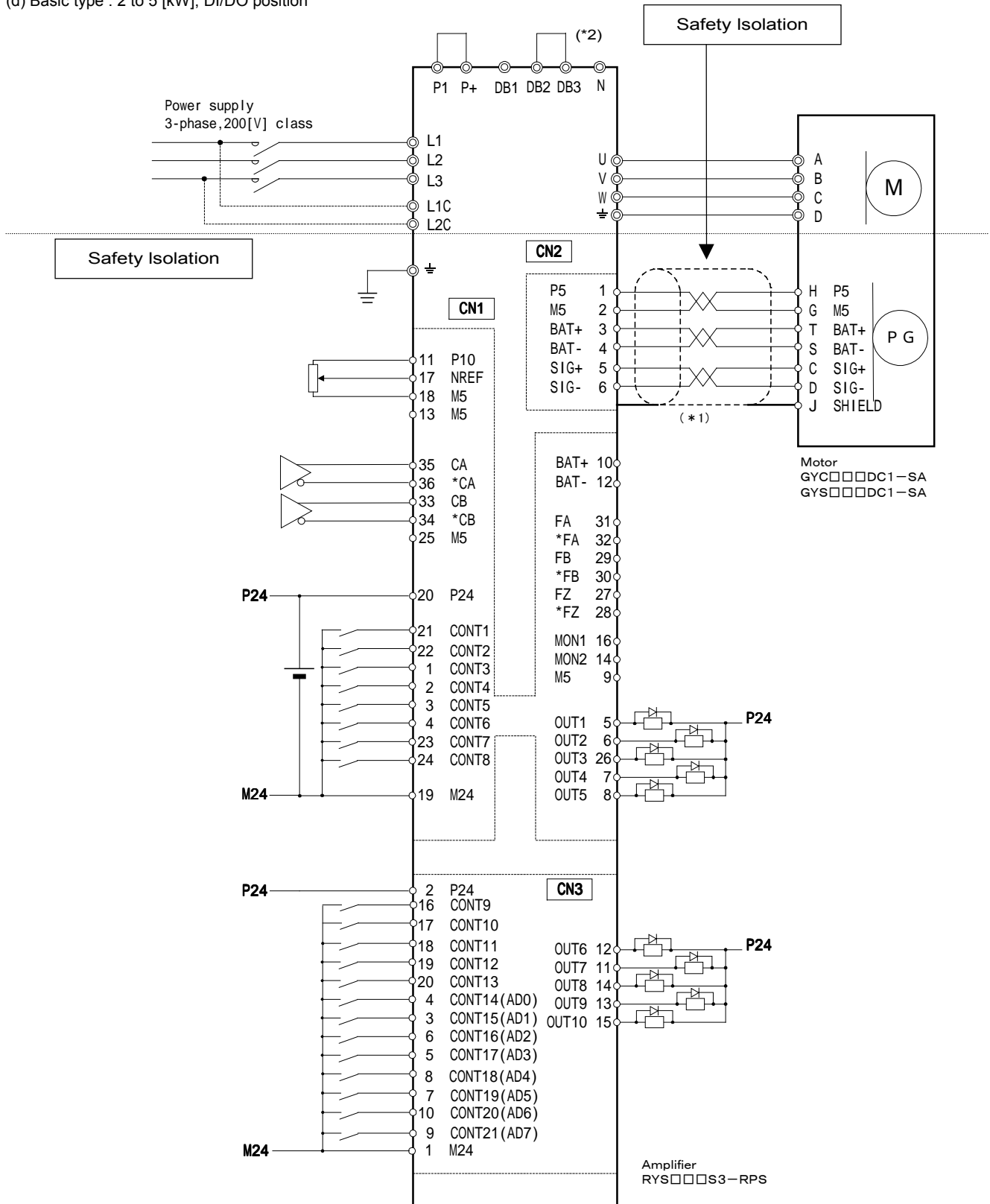
(c) Basic type : 1 and 1.5 [kW], DI/DO position



(*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.

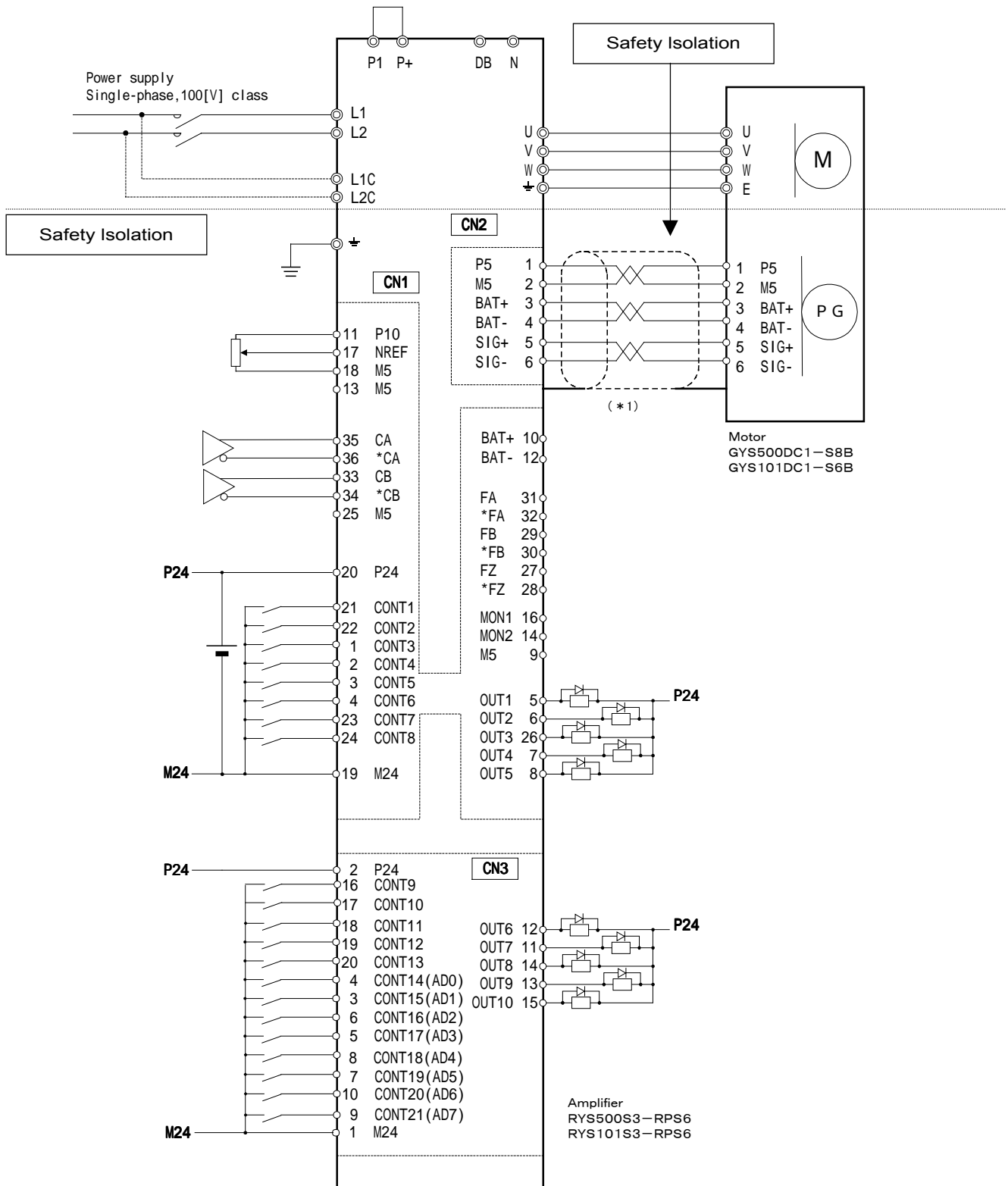
(d) Basic type : 2 to 5 [kW], DI/DO position



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

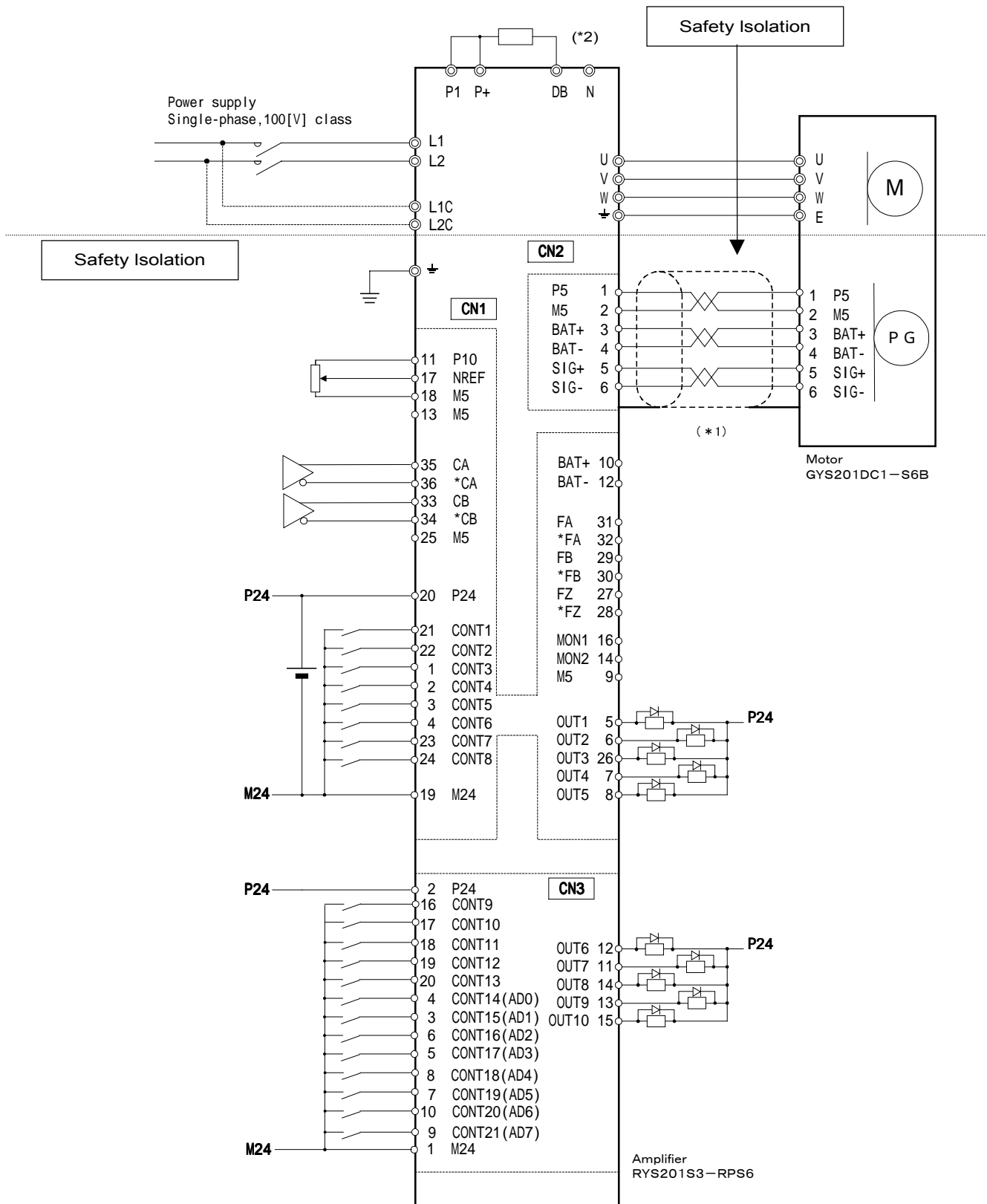
(*2) A braking resistor is provided (built-in) with amplifier.

(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.

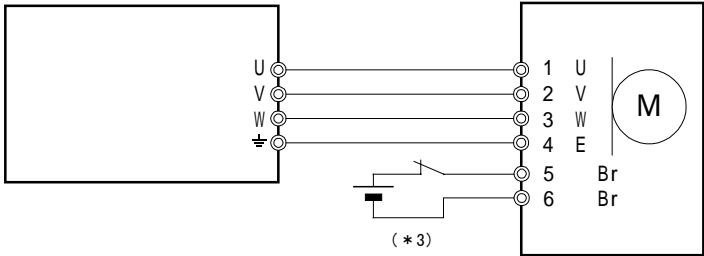
(f) Basic type : 0.2 [kW] for 100 [V] class input voltage of amplifier, DI/DO position



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

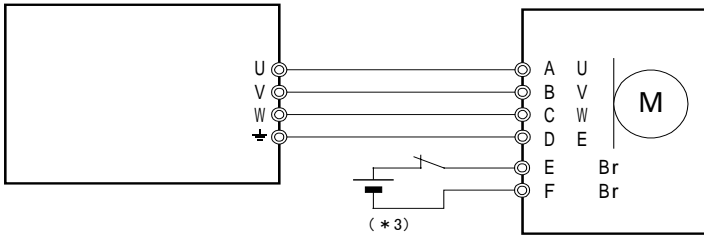
(*2) A braking resistor is provided (built-in) with amplifier.

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



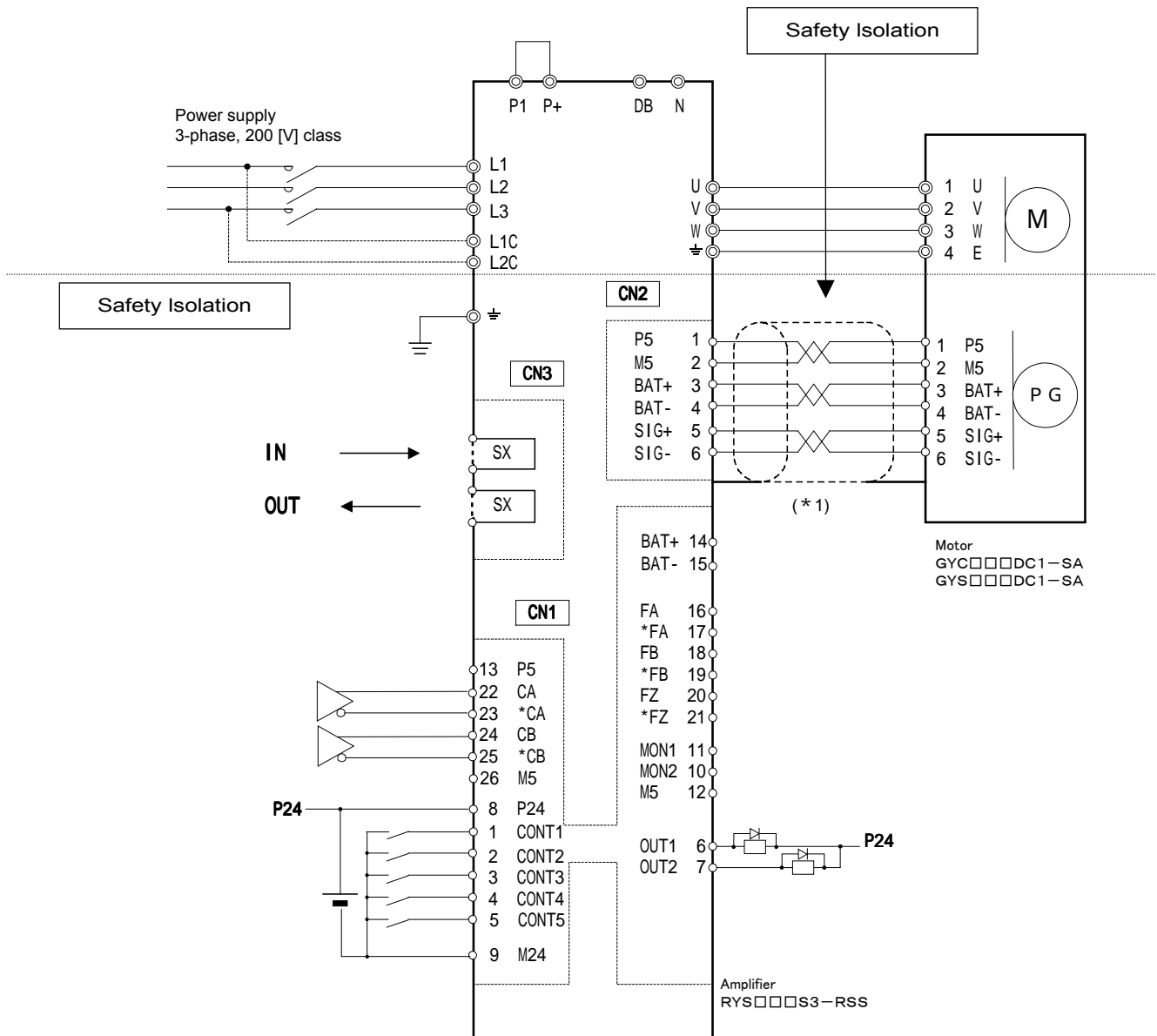
Motor type	GYC		GYS		GYC, GYS	
Rated output [kW]	0.1	0.2	0.1 and below	0.2	0.4	0.75
(*3) Brake power supply	24 [V] DC					
Brake input [W]	6.5	9	6.1	7.3	9	8.5

- (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 :

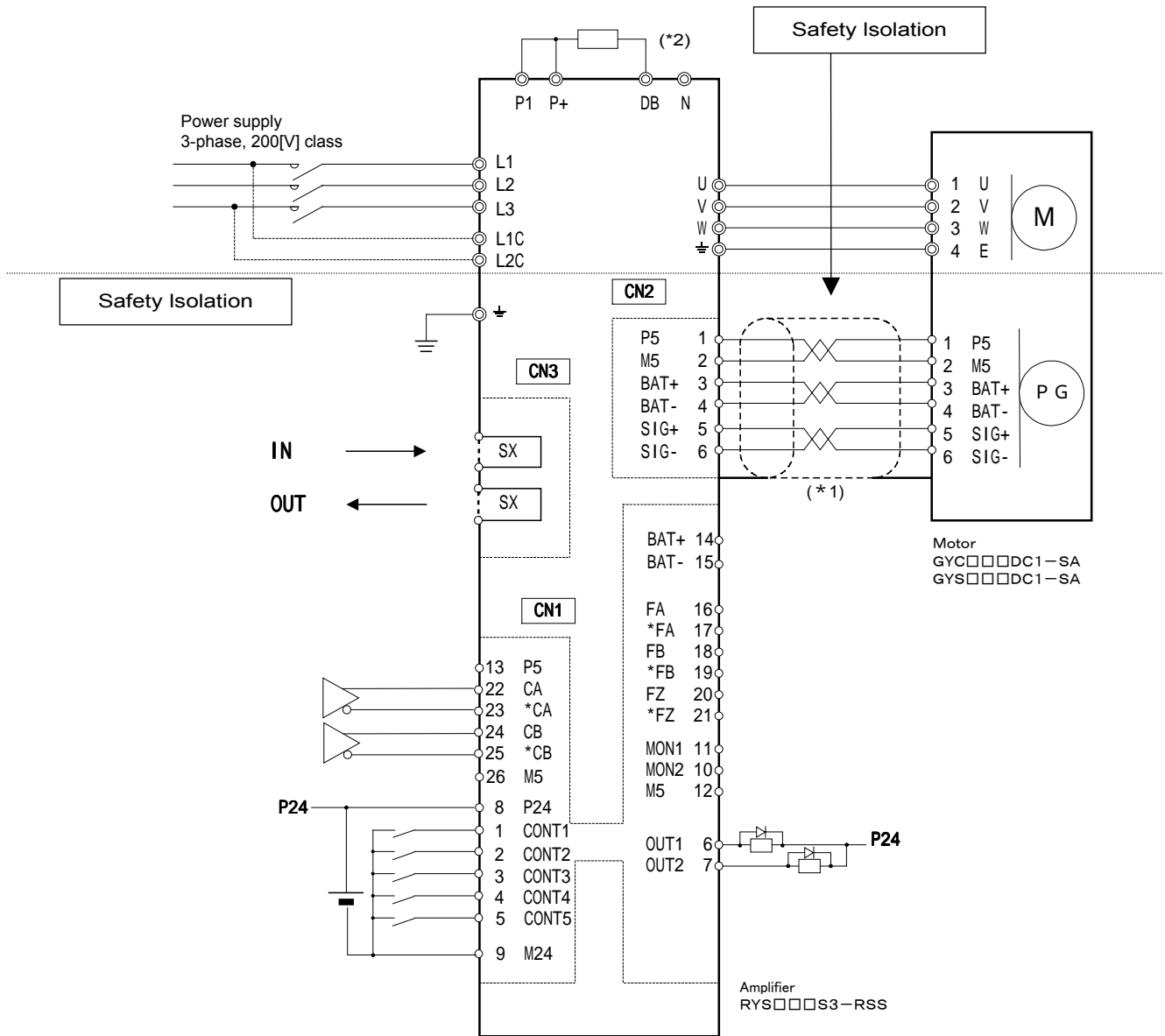
Terminal symbol	CONT1 to CONT5	OUT1 and OUT2
Function	-	-

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 (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 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	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 preset	-	-	-	Rewrite command	Read command

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

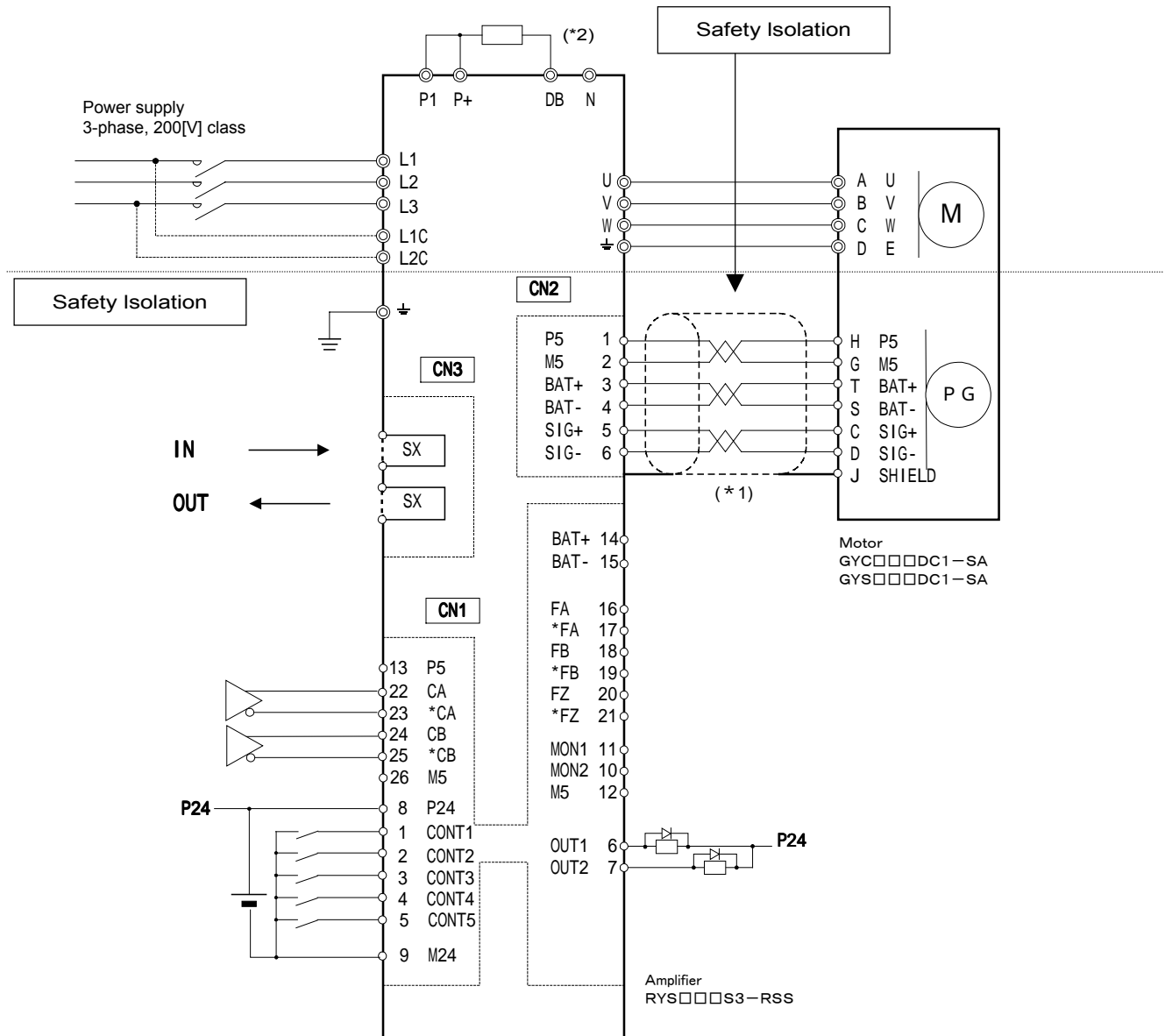
(i) SX bus type : 0.4 and 0.75 [kW]



(*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.

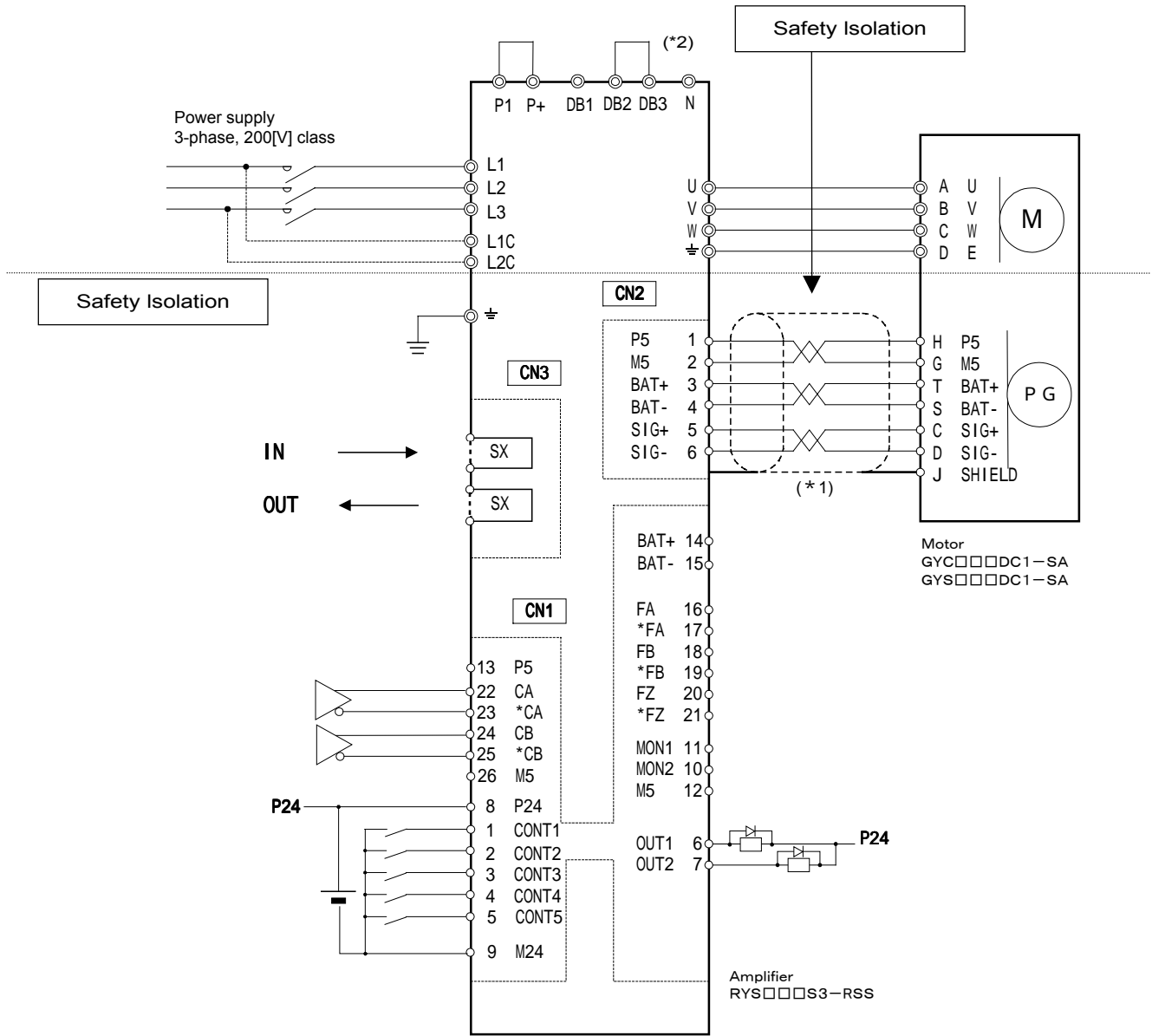
(j) SX bus type : 1 and 1.5 [kW]



(*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.

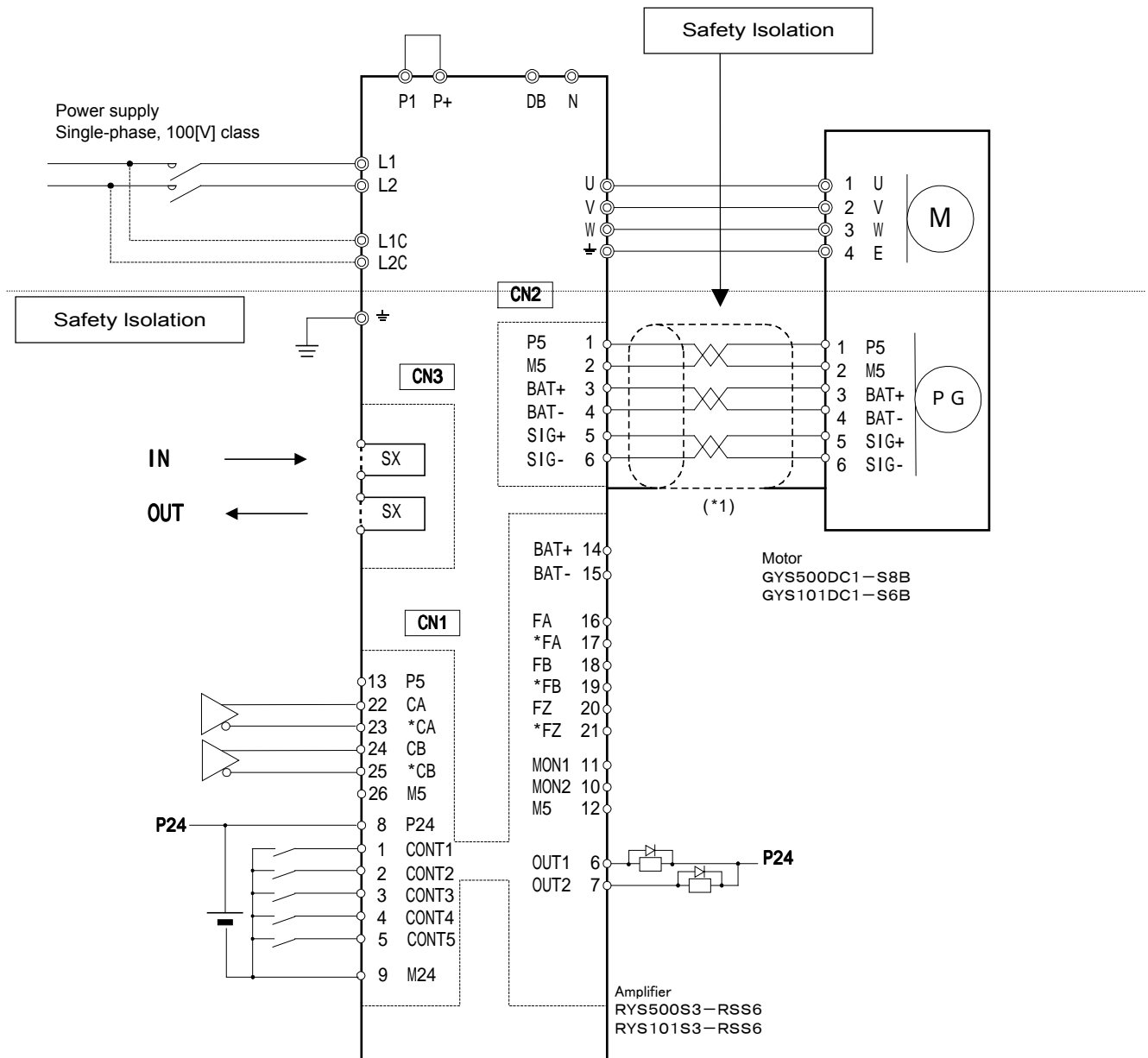
(k) SX bus type : 2 to 5 [kW]



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

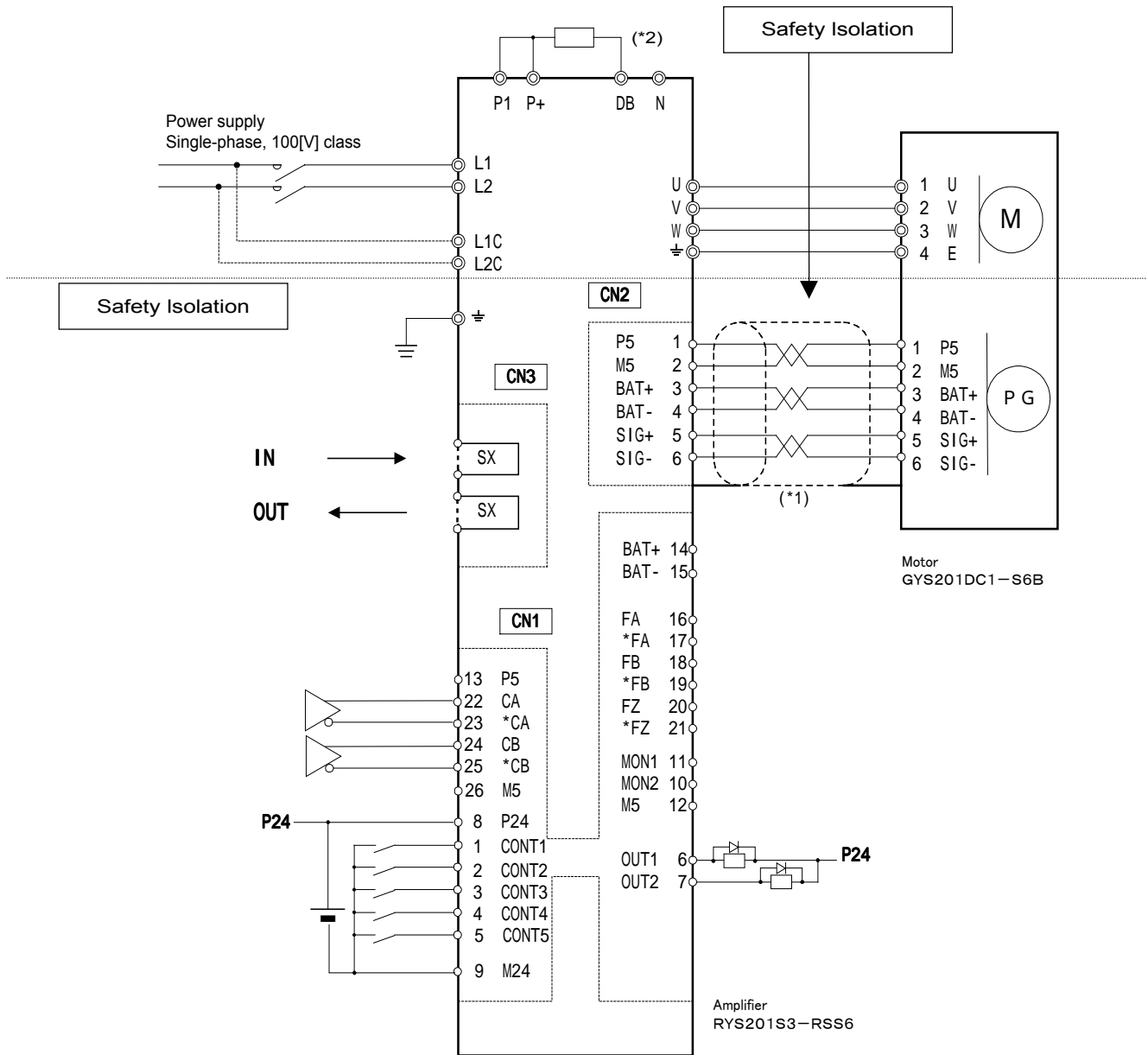
(*2) A braking resistor is provided (built-in) with amplifier.

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



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

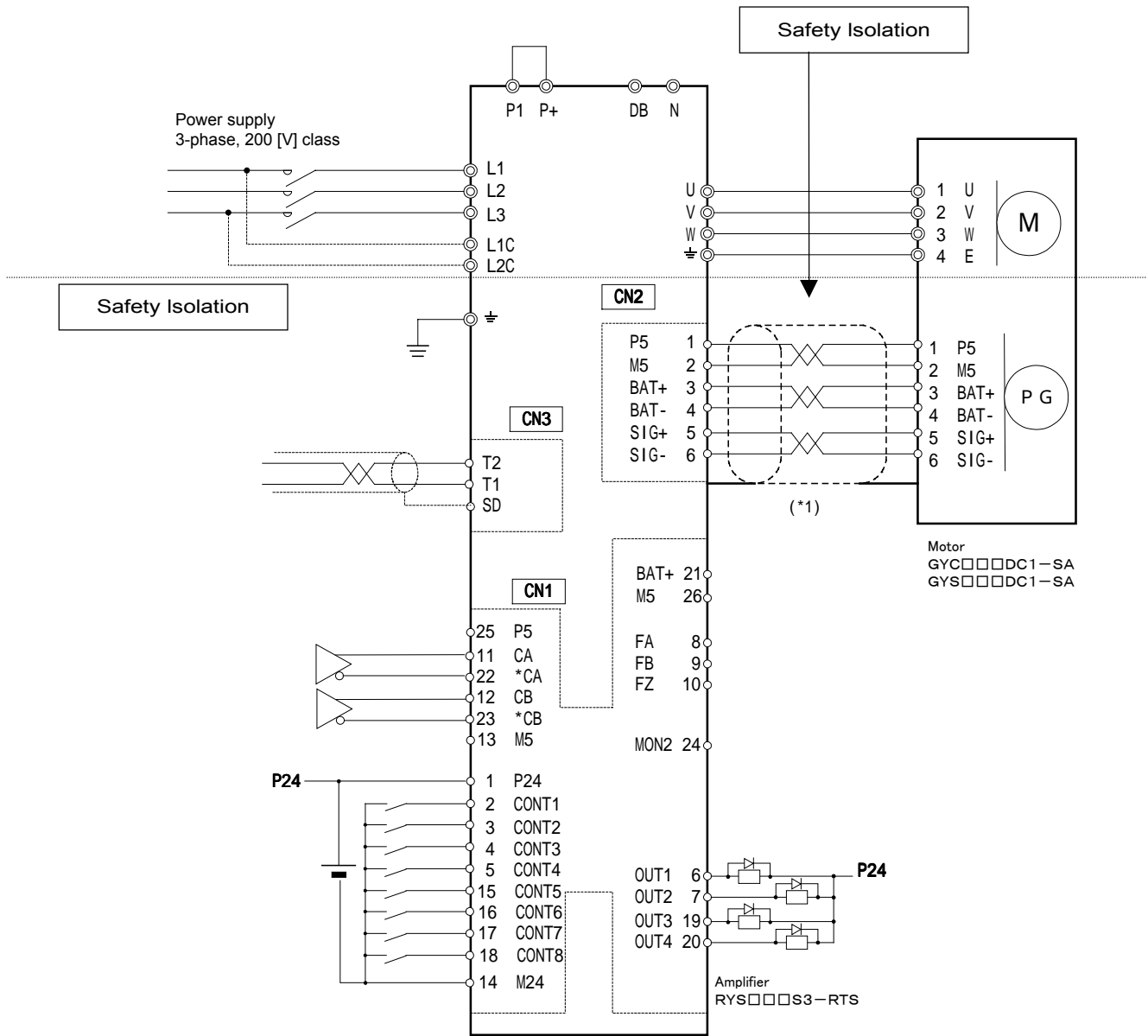
(m) SX bus type : 0.2 [kW] for 100 [V] class input voltage of amplifier



(*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)

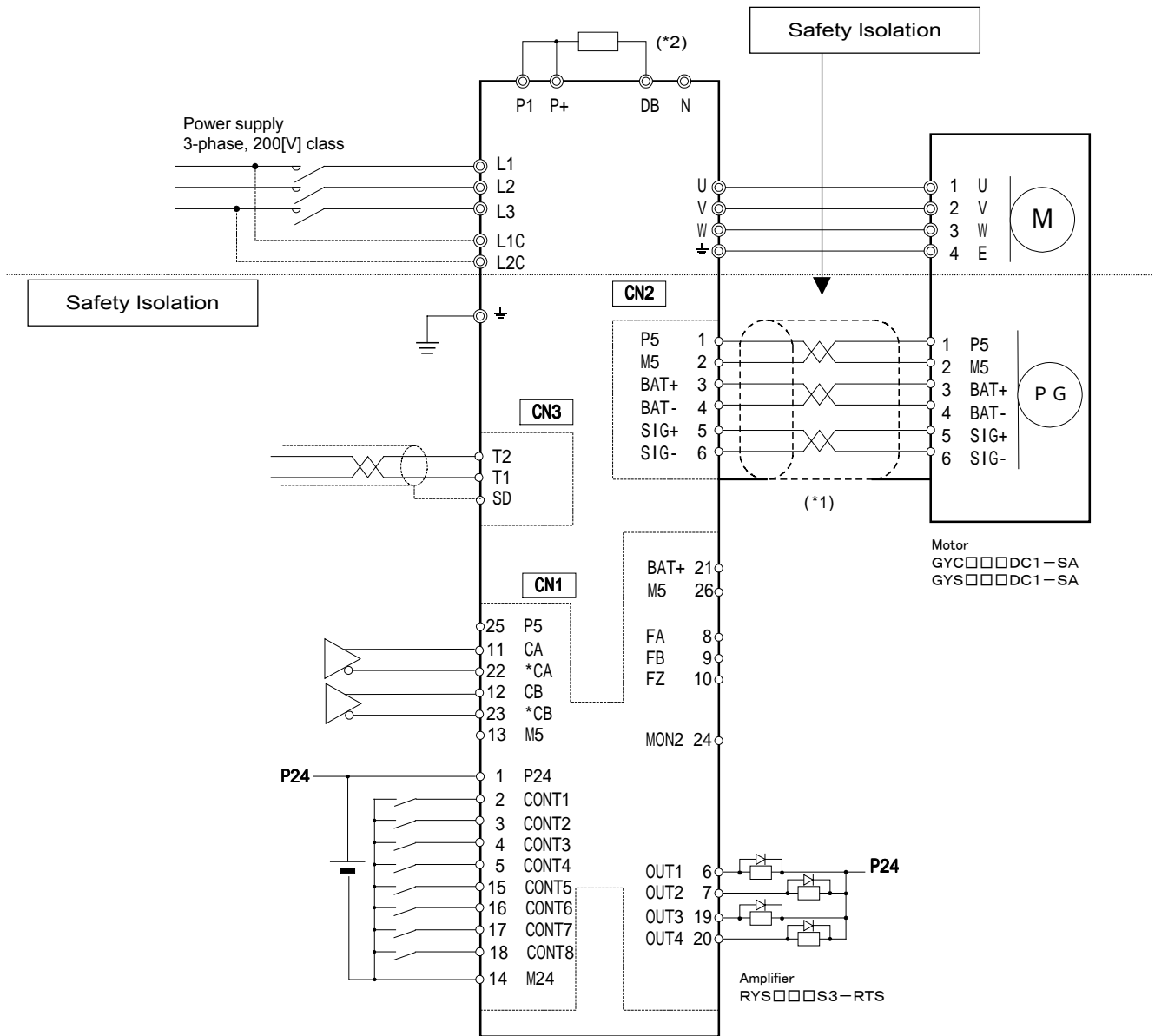
Address	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
+0	RDY	WPSET	CPU ready	Alarm detect	Address error	—	—	LS detect	EMG detect	Data error	—	—	—	—	—	—
+1	—	ALM4	ALM3	ALM2	ALM1	ALM0	Rewrite end	Read end	—							
+2	Read data (High order word PC ← Amplifier)															
+3	Read data (Low order word PC ← Amplifier)															
+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.

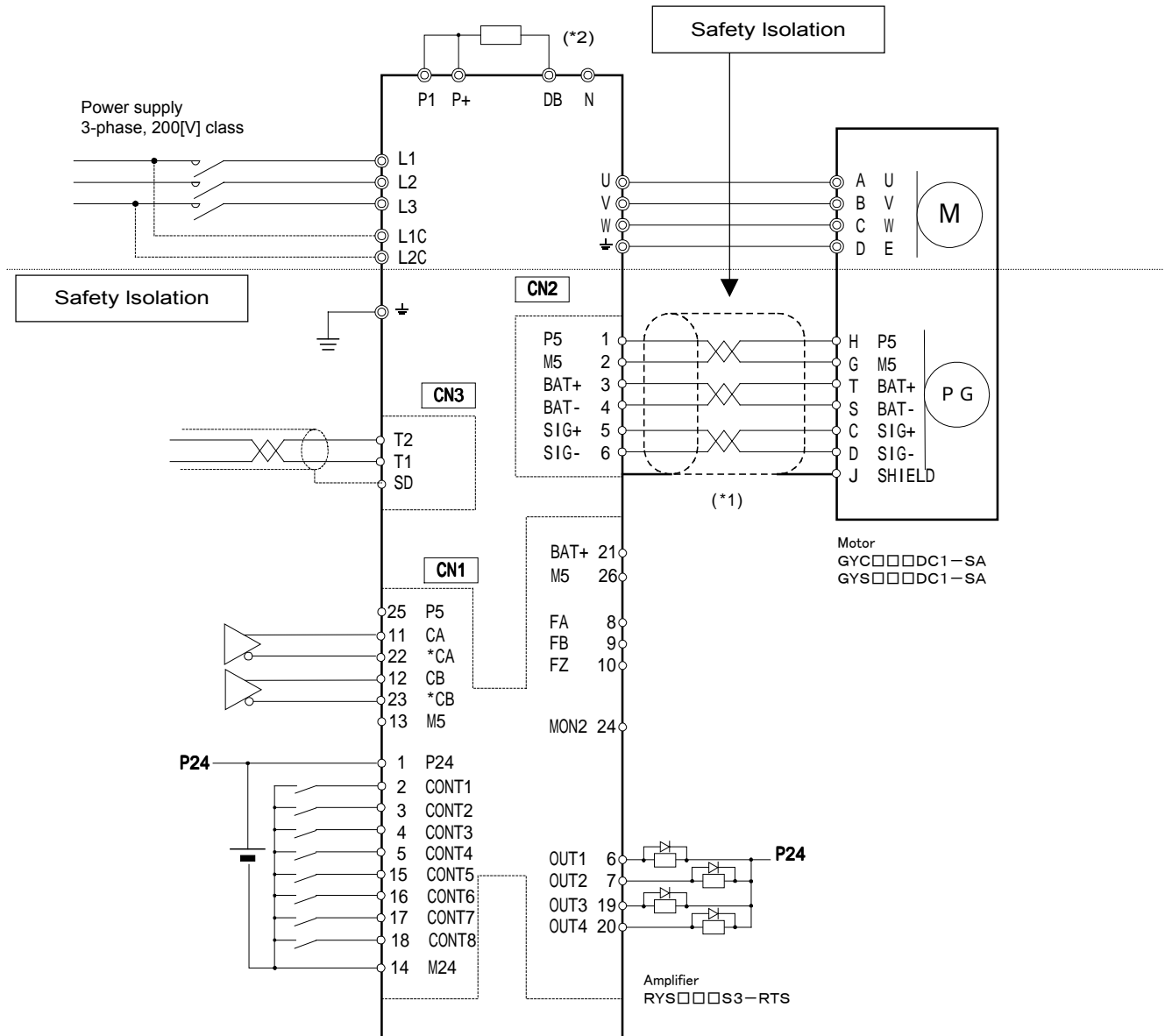
(o) T-link type : 0.4 and 0.75 [kW]



(*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.

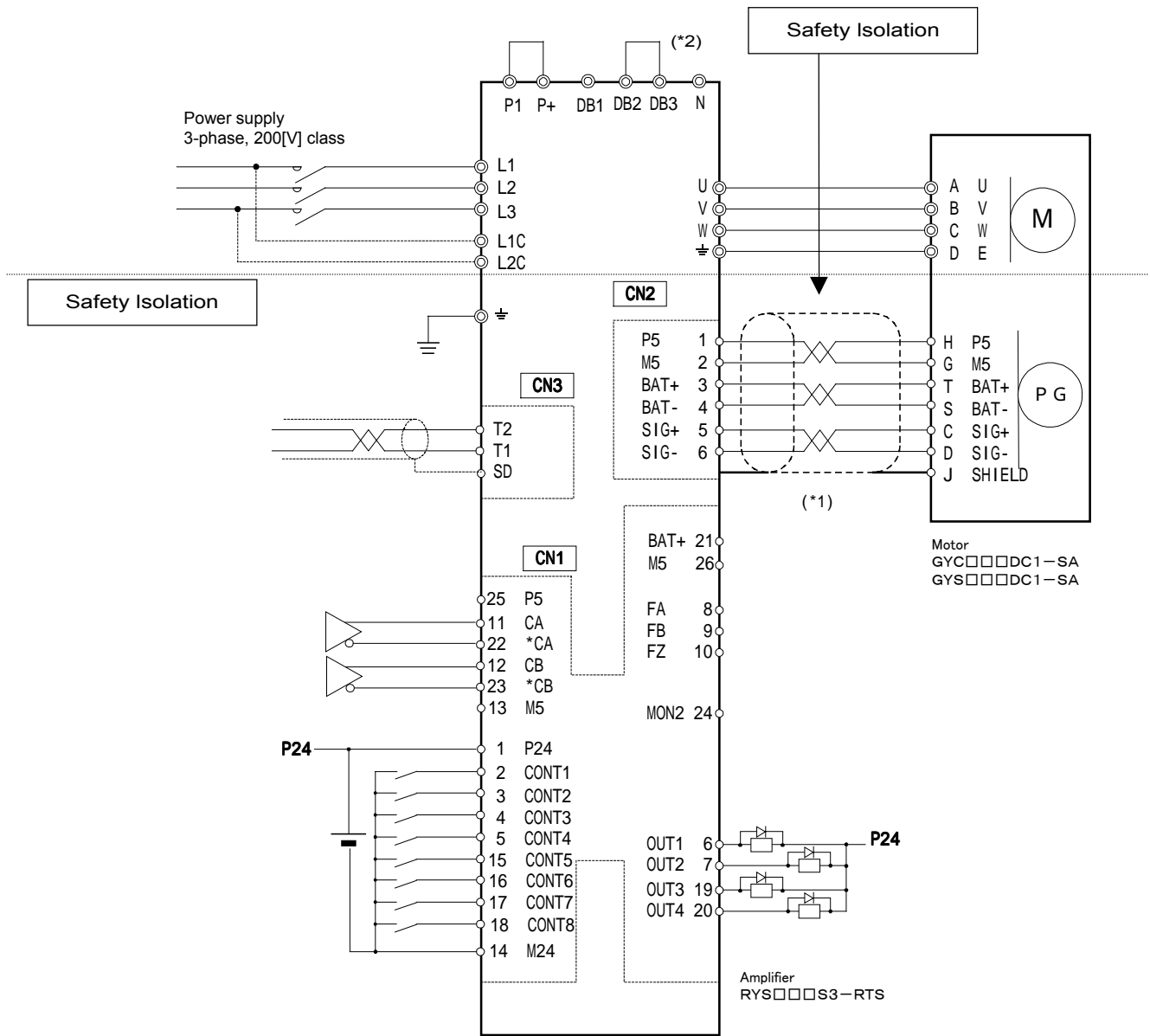
(p) T-link type : 1 and 1.5 [kW]



(*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.

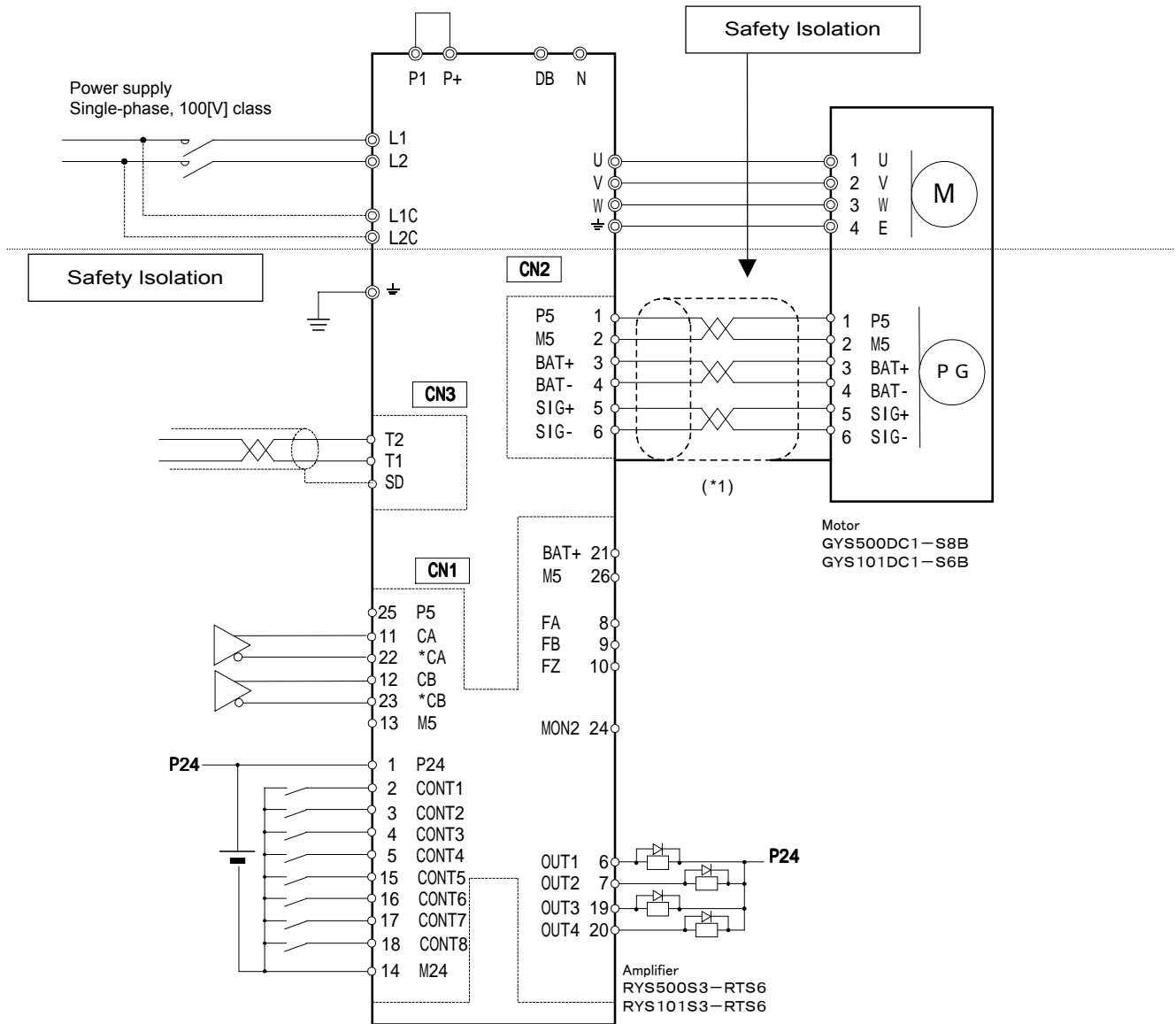
(q) T-link type : 2 to 5 [kW]



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

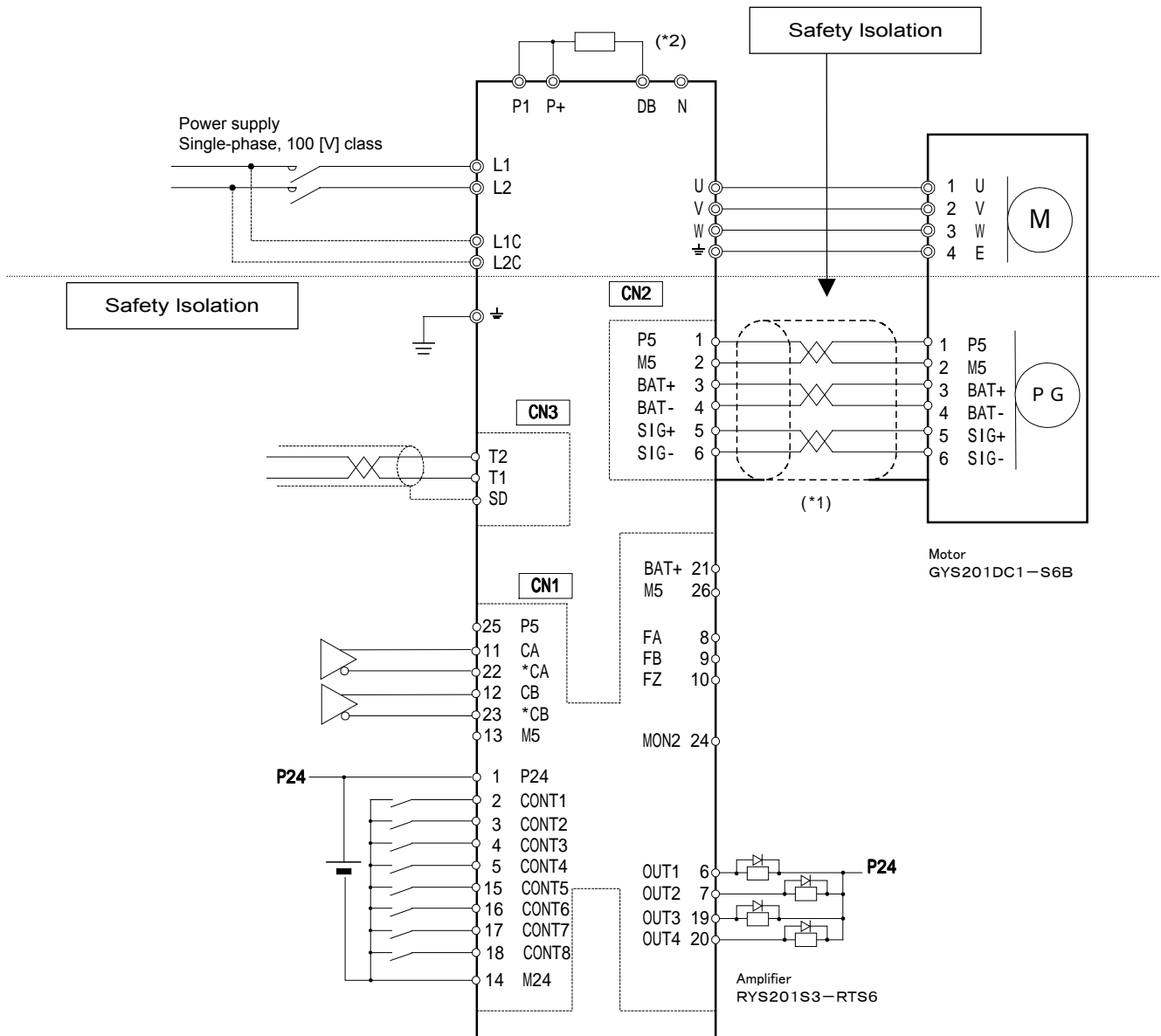
(*2) A braking resistor is provided (built-in) with amplifier.

(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



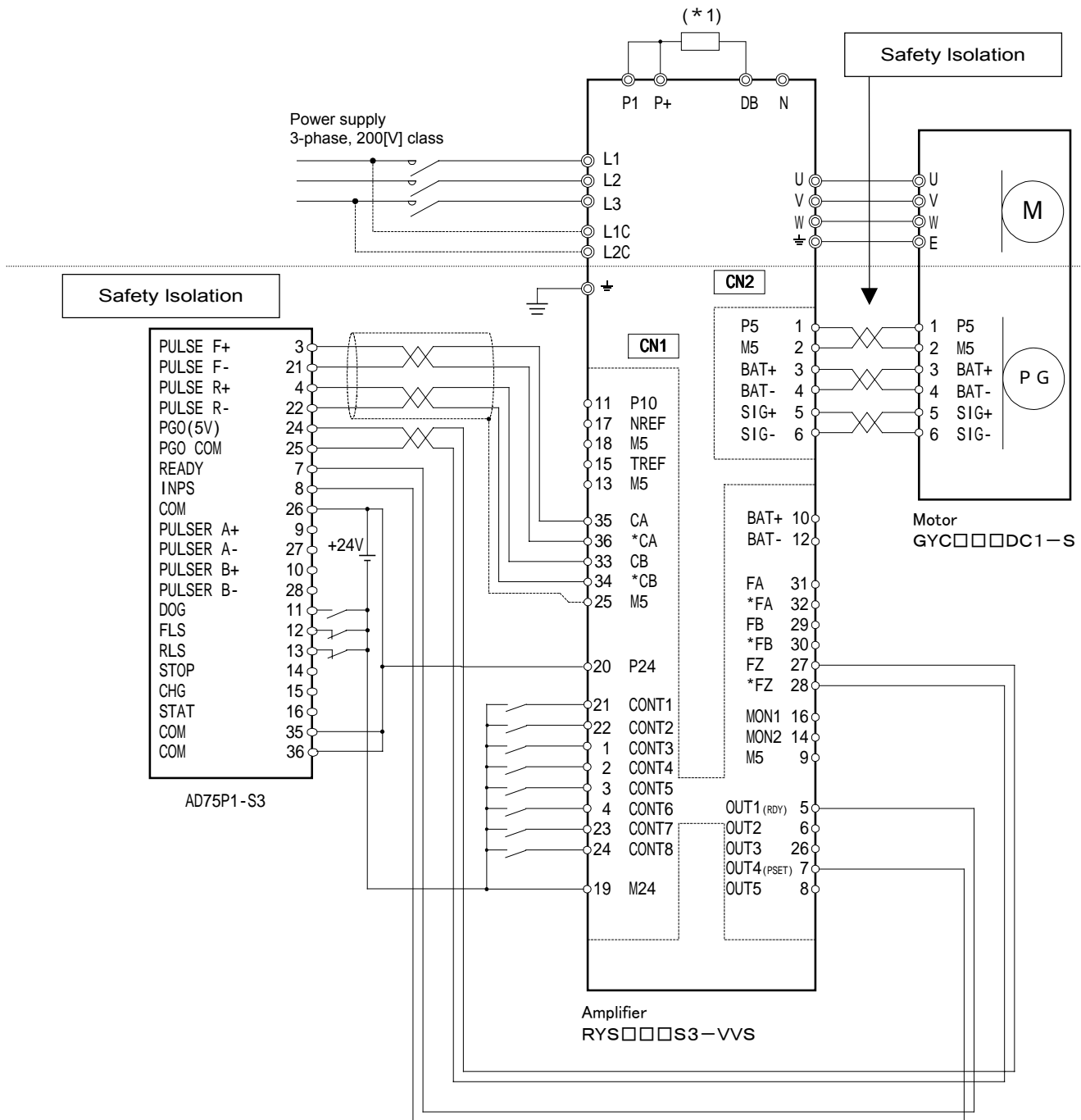
(*1) Shielded sheath on the shielded cables must be connected with the shell body and the shell cover.

(*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 :

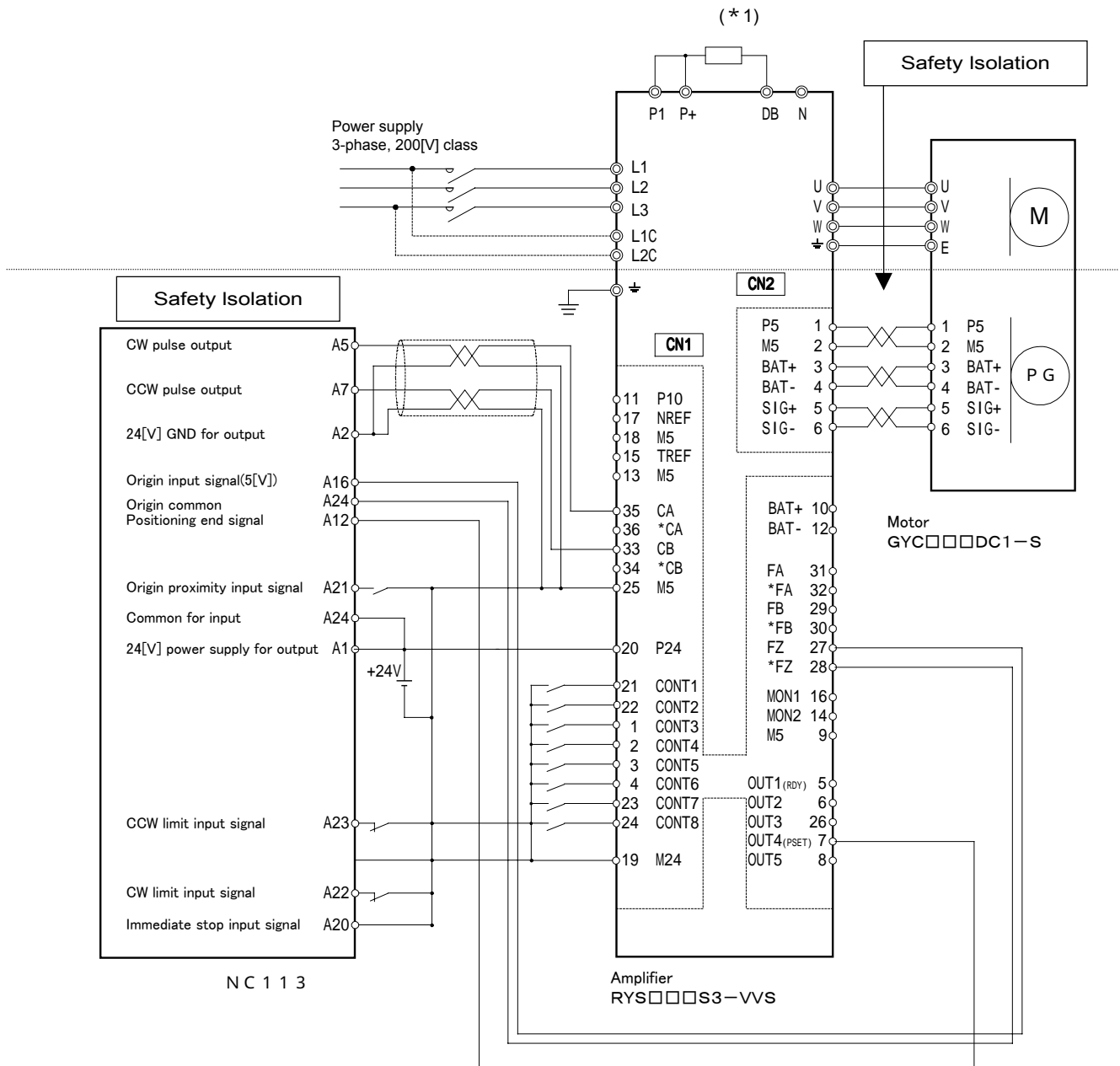
Terminal symbol	CONT1	CONT2	CONT3	CONT4	CONT5	CONT6	CONT7	CONT8
Function (*4)	RUN	FWD	REV	RST	Multispeed selection X1	Multispeed selection X2	Pulse train ratio 1	Positioning control

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 :

(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 X1 X2		Pulse train ratio 1	Positioning 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”.

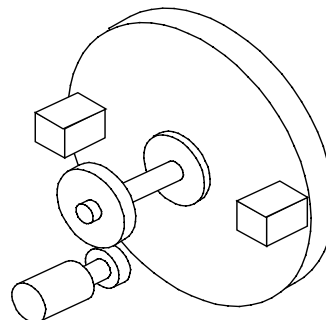
- (*4)
- | | | |
|-----------------------|------------------------|-------------------|
| CPURDY : CPU ready | PSET : Positioning end | RST : Alarm reset |
| FWD : Forward command | RDY : Ready | RUN : Run command |
| NZERO : Speed zero | REV : Reverse command | |

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.

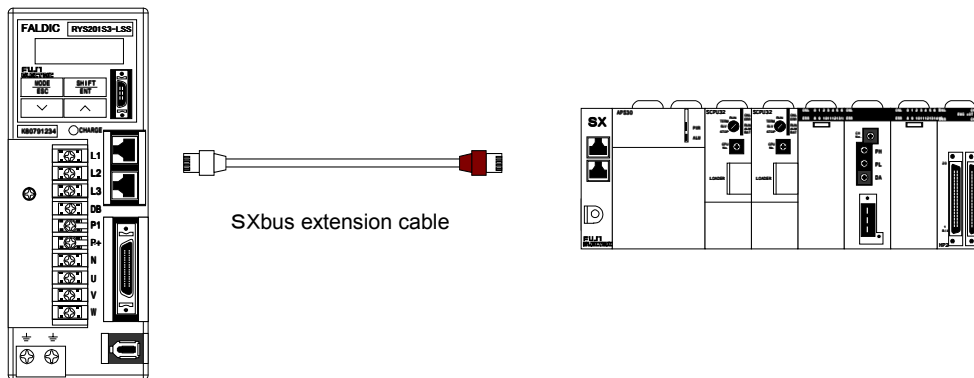
The signal form of the [START] and the current position output varies depending on the upper level interface.

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

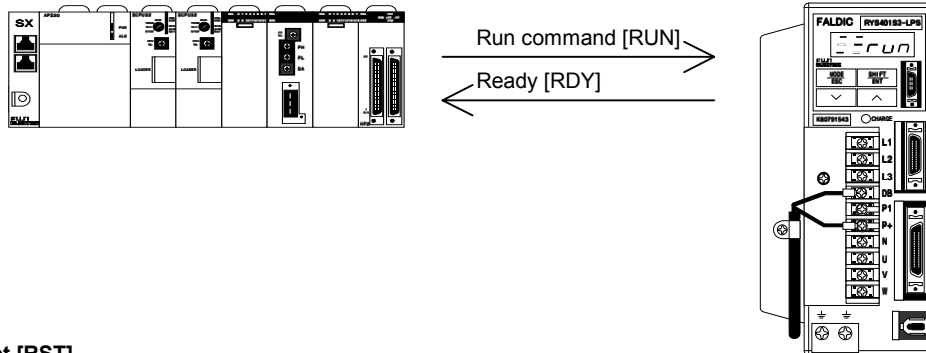
When the host controller receives the on/off status of [RDY] signal, it recognizes that the motor can be rotated.

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 [F₀₀₀₄]
 - 3) Press key and key simultaneously (longer than 1 [s]) at alarm detection [S₀₀₃].
 - 4) Press key and key simultaneously (longer than 1 [s]) at alarm history [S₀₀₄].
 - 5) Turn power off and turn on again
- To initialize the history [F₀₀₅] 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..

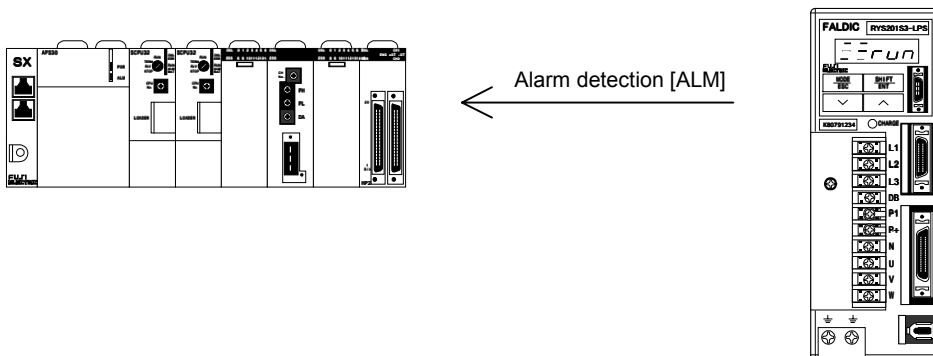
Related item

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 HU	5
OFF	ON	OFF	OFF	ON	Undervoltage	AL LU	4
OFF	ON	OFF	ON	OFF	Encoder trouble (*3)	AL Et	6
OFF	ON	OFF	ON	ON	-	—	-
OFF	ON	ON	OFF	OFF	Control power trouble (*3)	AL Ct	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 rH2	11
ON	OFF	OFF	ON	ON	Control signal error (*3)	AL CEE	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 :

- Forward command [FWD] (2)
- Reverse command [REV] (3)
- Pulse train ratio 1 (27)
- Pulse train ratio 2 (28)
- Deviation clear (50)
- Multistep speed selection X 1 [X1] (51)
- Multistep speed selection X 2 [X2] (52)
- Multistep speed selection X 3 [X3] (53)
- Acceleration/deceleration time selection [ACC0] (14)
- Speed command [NREF] (fixed)

Control output signal :

- Deviation zero (23)
- Deviation excessive [OF] (alarm detection is issued)
- Speed zero [NZERO] (24)
- Speed arrive [NARV] (25)

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

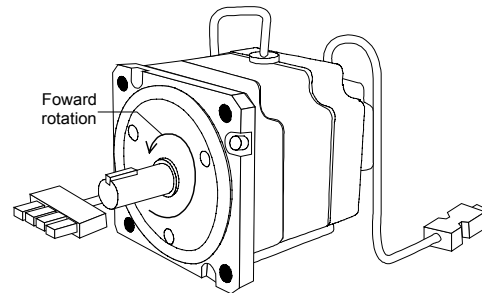
[ACC0] (14)	Accel. time	Decel. time
OFF	Basic para. 21	Basic para. 22
ON	Basic para. 23	Basic para. 24

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

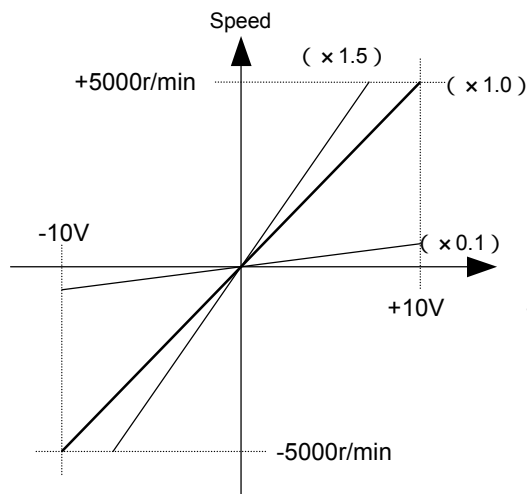
The rotational direction of motor output shaft for the [FWD] can be changed by the system para. 80.

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.



Speed command voltage

The value in () is the setting value of system para. 63.

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.

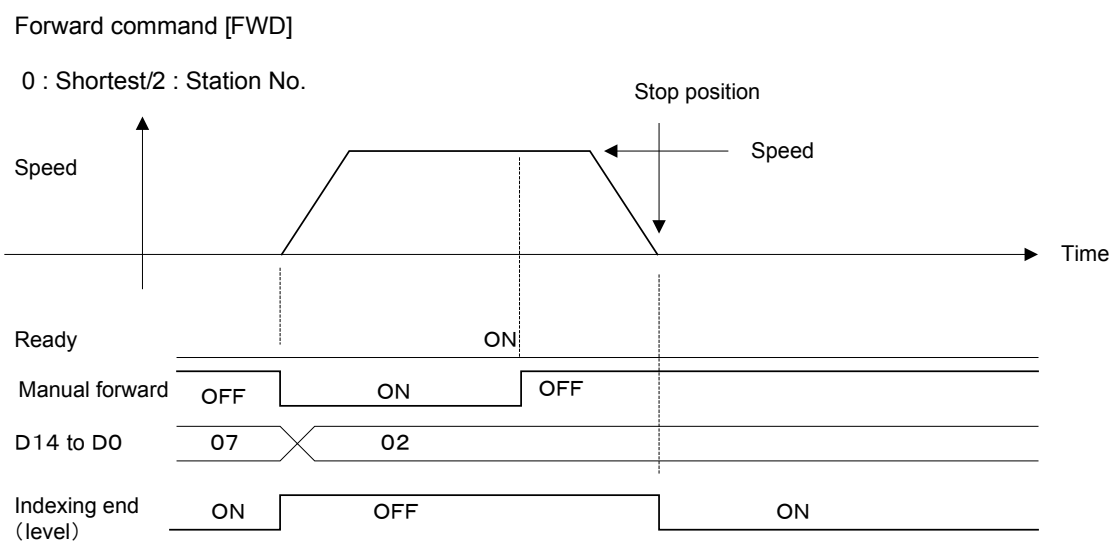
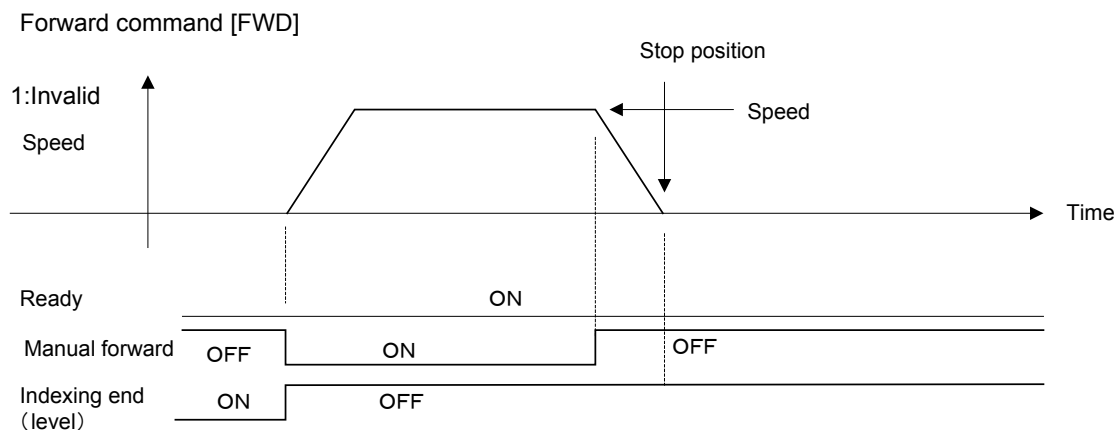
(7) Manual indexing

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

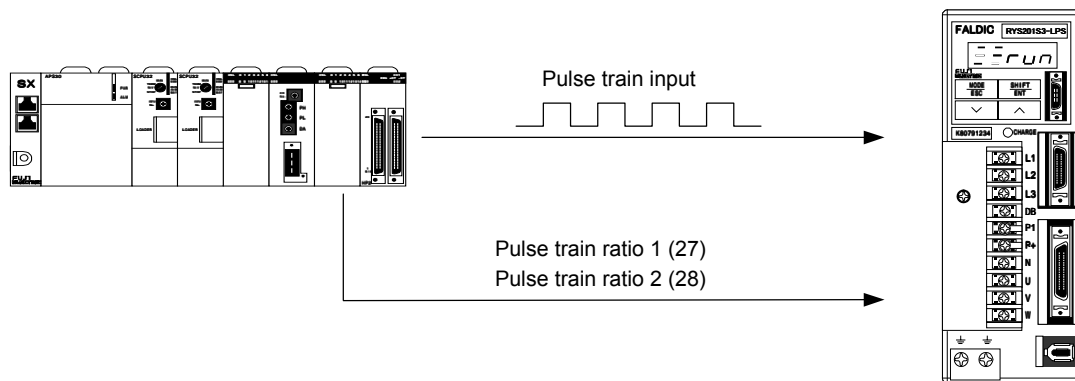
The signal validates a pulse train from the manual pulse generator, etc.

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) [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.

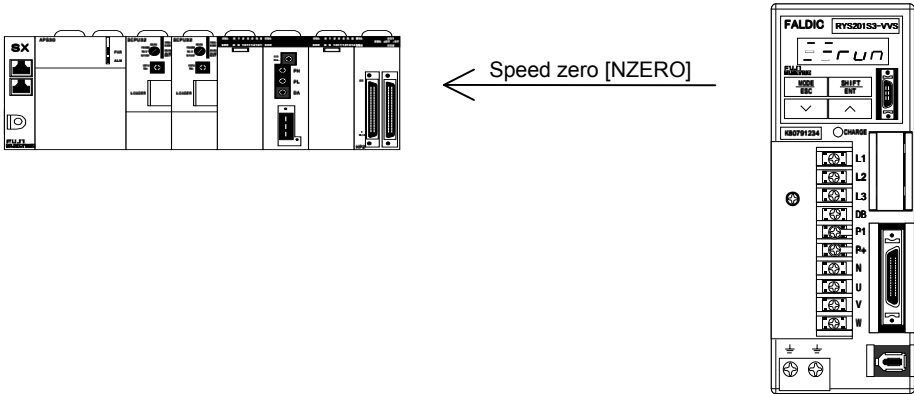
Speed zero [NZERO] (Control output signal)

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 ± 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 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 (in 1 step) [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.

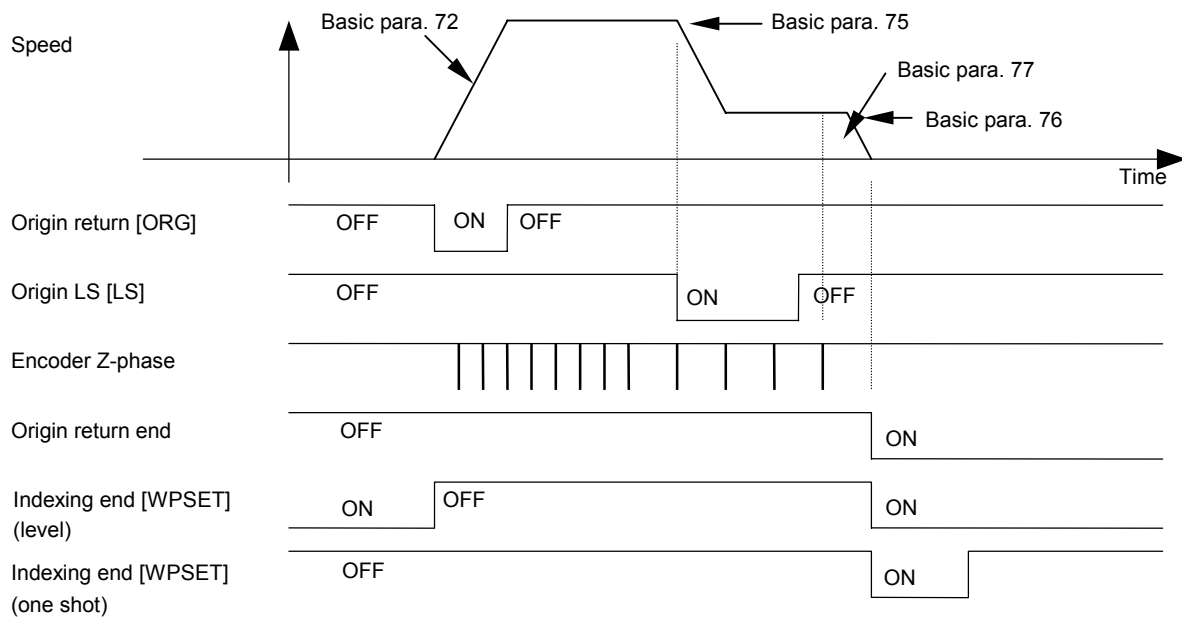
With the Z-phase input invalid selected in the Z-phase valid/invalid (basic para. 73), motor can be stopped after running by the origin shift quantity from the ON edge to OFF edge of [LS] signal.

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

Origin return

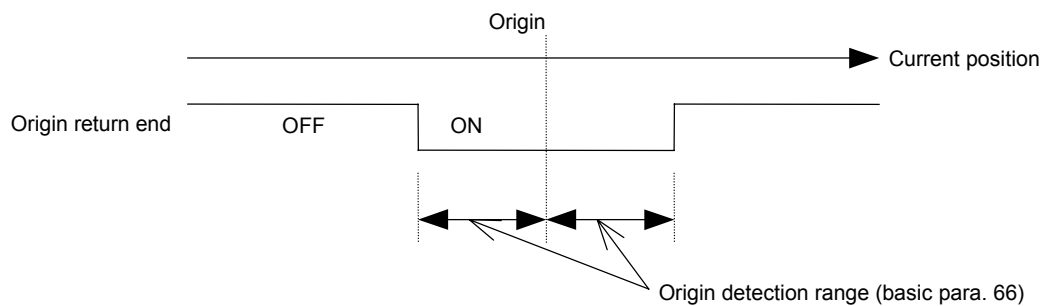
At the ON edge of [ORG] signal, the aforementioned operations (a) through (e) are carried out.

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.

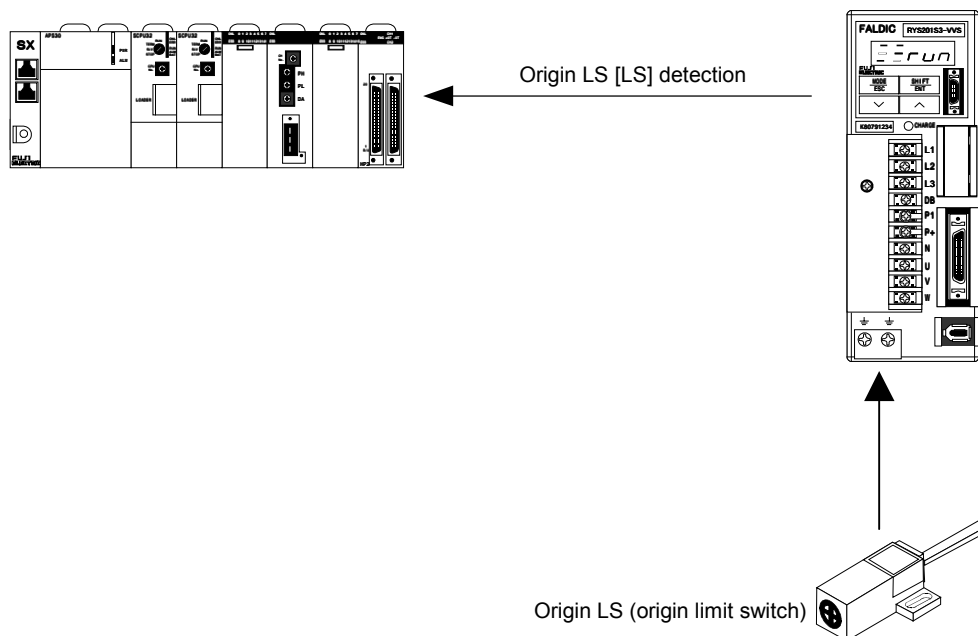


Note : The origin is the position where the machine has stopped after ended the origin return action, or has executed the position preset. It is not necessary the position of the No.1 station number.

(4) Origin LS detection (40)

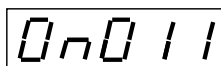
Because the [LS] signal requires quick response, this should be directly input to the amplifier in general. When the host controller needs the origin signal, the origin LS detection signal can be output.

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".

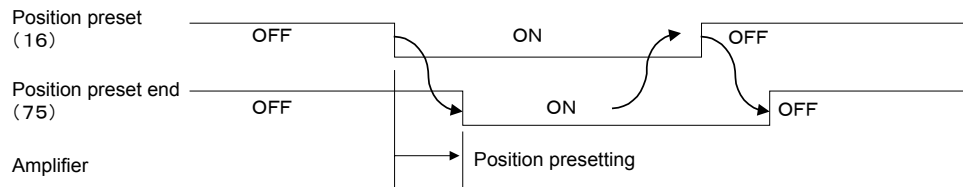
Note : (*) ON edge means the control input signal's transfer point from off to on.

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.

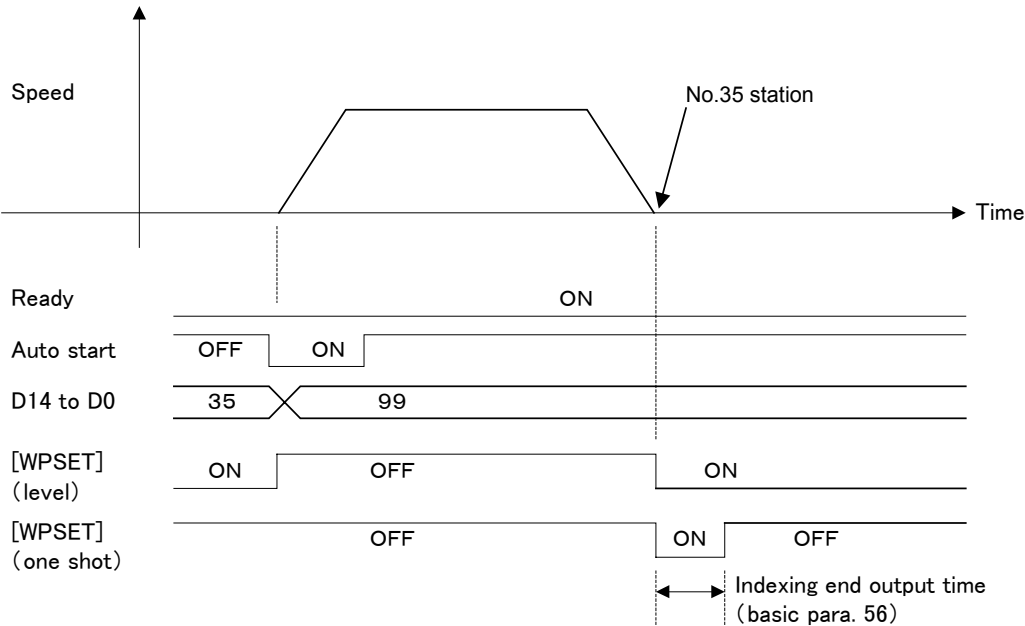
In case of BCD code, D14 to D12 specify the value at thousand's digit of station number, D11 to D8 specify the value at hundred's digit of station number, D7 to D4 specify the value at ten's digit of station number, and D3 to D0 specify the value at unit's digit of station number.

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	2
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	3
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	ON	OFF	ON	5
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	ON	ON	ON	7
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	ON	OFF	OFF	ON	9
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.

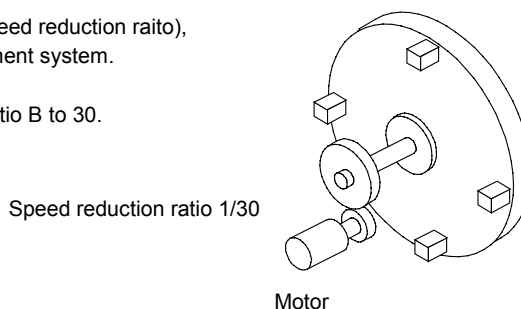
If the speed reduction ratio is aliquant, the error will not accumulate (example: 1/3).

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.

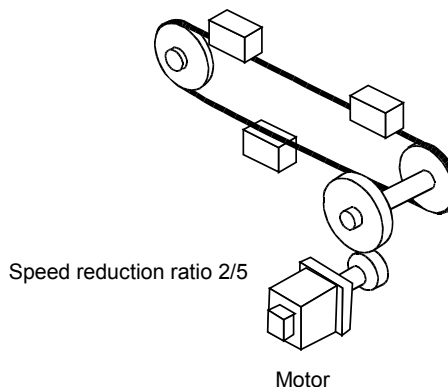


Example 2. Chain drive

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

If the speed reduction 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.

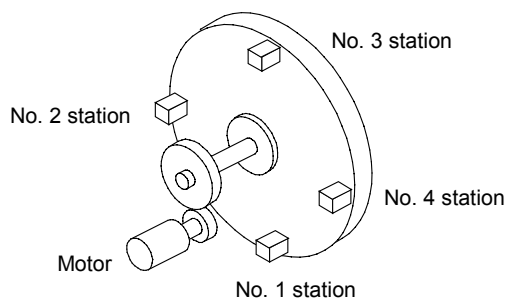


(3) Rotational direction

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.

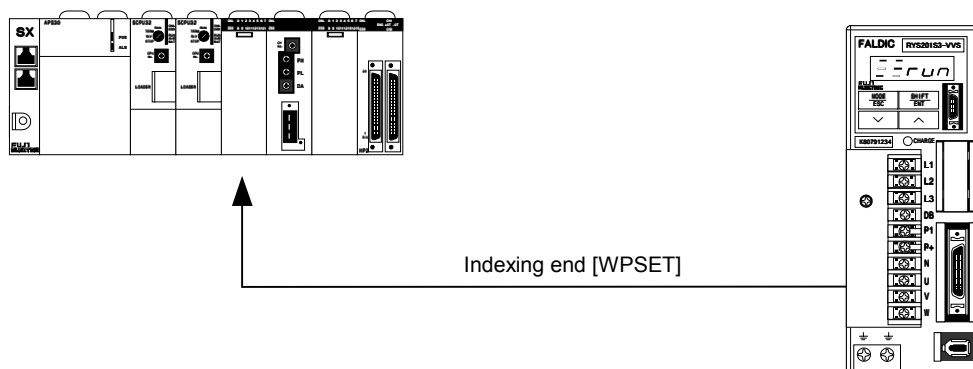
Parameter setting

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

Related item

(1) Output form of [WPSET] signal

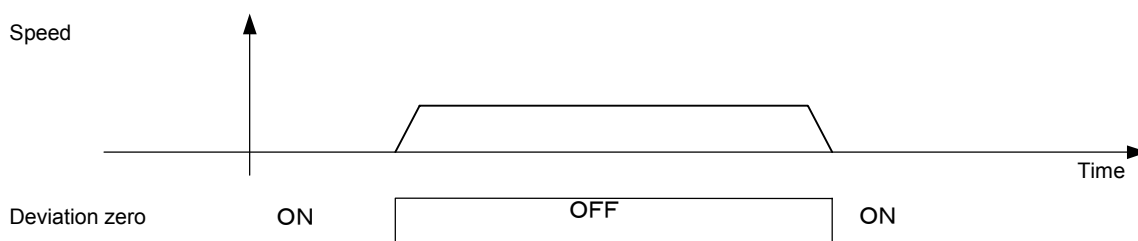
The output form of the [WPSET] signal can be selected by basic para. 55 and 56 setting.



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.

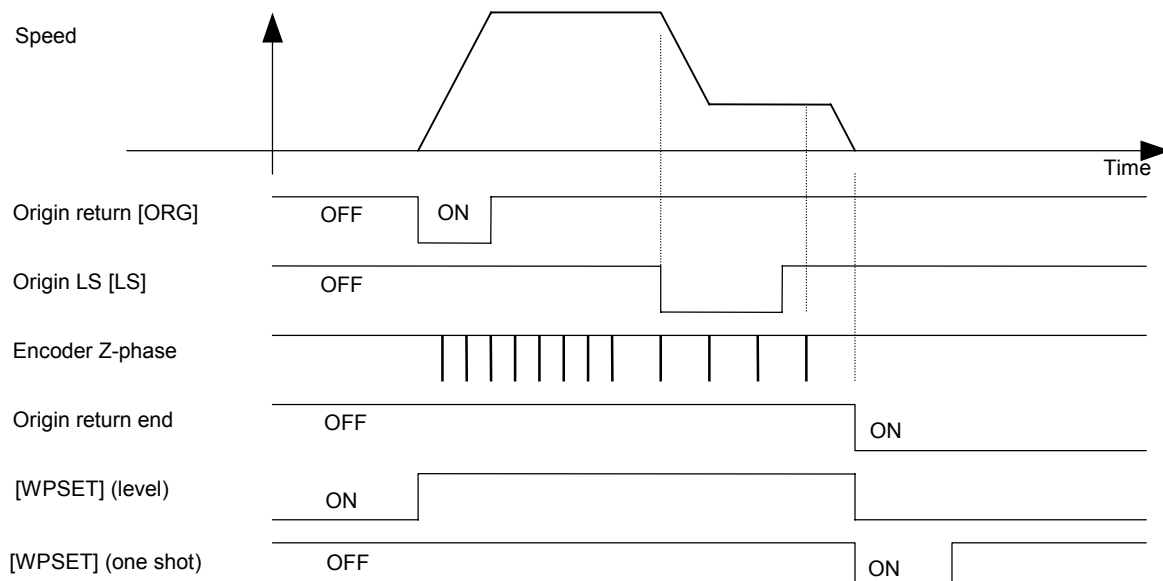


3) Manual feed
 Level : This signal is off when the motor start running, and on when it reaches a station to stop.
 One shot : This signal is on for a determined period of time, when it reaches a station to stop.

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

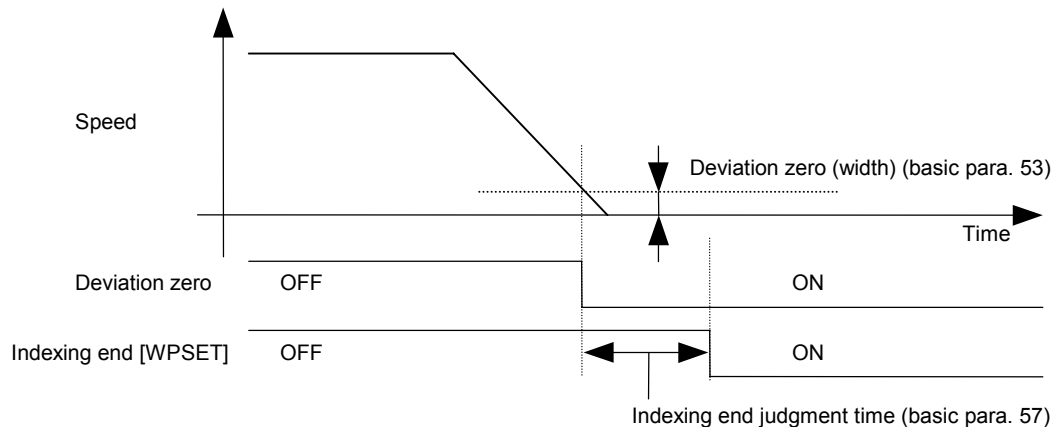
(4) Origin return/Auto start
 Level : Turns on when the indexing end judgment time (basic para. 57) has elapsed after the difference (deviation) between the command position and feedback position came within the deviation zero zone (width) (basic para. 53).
 One shot : Turns on for the determined period 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] Auto start [START] Origin return [ORG]	"Preset deceleration time" to "servo lock"	On at stopping	Not turned on when manual indexing is invalid.
Pulse train ratio 1 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" to "servo lock"	Off	At temporary stop off, executes indexing action again.
Positioning cancel	"Preset deceleration time" to "servo lock"	On at stopping	Not turned on when manual indexing is invalid.
Run command [RUN] off	"Forced zero speed" to "base off"	Off	Ready [RDY] off
Forced stop [EMG] off	Forced zero speed	Off	-
Alarm detection [ALM] (minor fault) (*)	"Forced zero speed" to "base off"	Off	-
Alarm detection [ALM] (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.

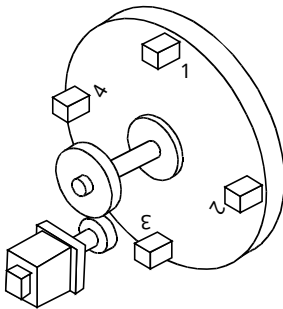
5.5.4 2nd origin

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 temporary 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)
<p>Function</p> <p>(1) Forced stop [EMG]</p> <p>While the [EMG] (10) signal is off, the motor is forced stopped.</p> <p>This input signal is always valid in any control made, and has the highest priority (all other commands are ignored.).</p> <p>Connect the [EMG] (10) signal directly to the control input terminal of amplifier because the safe operation and speed detecting are important.</p> <p>Normally, connect this terminal to a push-lock type (NC contact) pushbutton switch (Fuji's command switch is recommended).</p> <p>(2) Forced stop detection</p> <p>When the [EMG] (10) signal is turned off, the forced stop detection (41) signal is turned on, to be informed the current status externally.</p> <p>However, the forced stop detection (41) signal is turned off, while external fault input (34) is off.</p> <p>• Basic type (D/DO position)</p> <p>At factory setting, the forced stop signal is allocated to CONT13 terminal (Pin 20 of CN3).</p> <p>• SX bus type (SX bus direct connection)</p> <p>At factory setting, the [EMG] signal is not allocated to the control input terminal of CN1. Allocate this signal to use it.</p> <p>When allocated to IQ area, bit ON executes the forced stop.</p> <p>• T-link type (T-link direct connection)</p> <p>At factory setting, the [EMG] signal is not allocated to the control input terminal of CN1. Allocate this signal to use it.</p> <p>When allocated to WB area (at bit 5 in word +4 position), bit on executes the forced stop.</p> <p>Parameter setting</p> <p>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".</p> <p>To allocate the forced stop detection signal, set (41).</p> <p>The [EMG] signal can be allocated to multiple terminals, and when any of those input signals is on, the motor stops forcibly.</p> <p>Related item</p> <p>(1) Ready [RDY]</p> <p>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.</p> <p>(2) Forced stop status</p> <p>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.</p> <p>If the [RUN] signal is off while the [EMG] is off, the motor is in free-run status.</p> <p>(3) Rotation command</p> <p>While the [EMG] signal is off, all of the rotation commands are ignored.</p> <p>When the alarm reset signal is on, or condition of the [EMG] signal is not needed.</p>

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 (55)	System para. 94	Edit permit ON/OFF (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

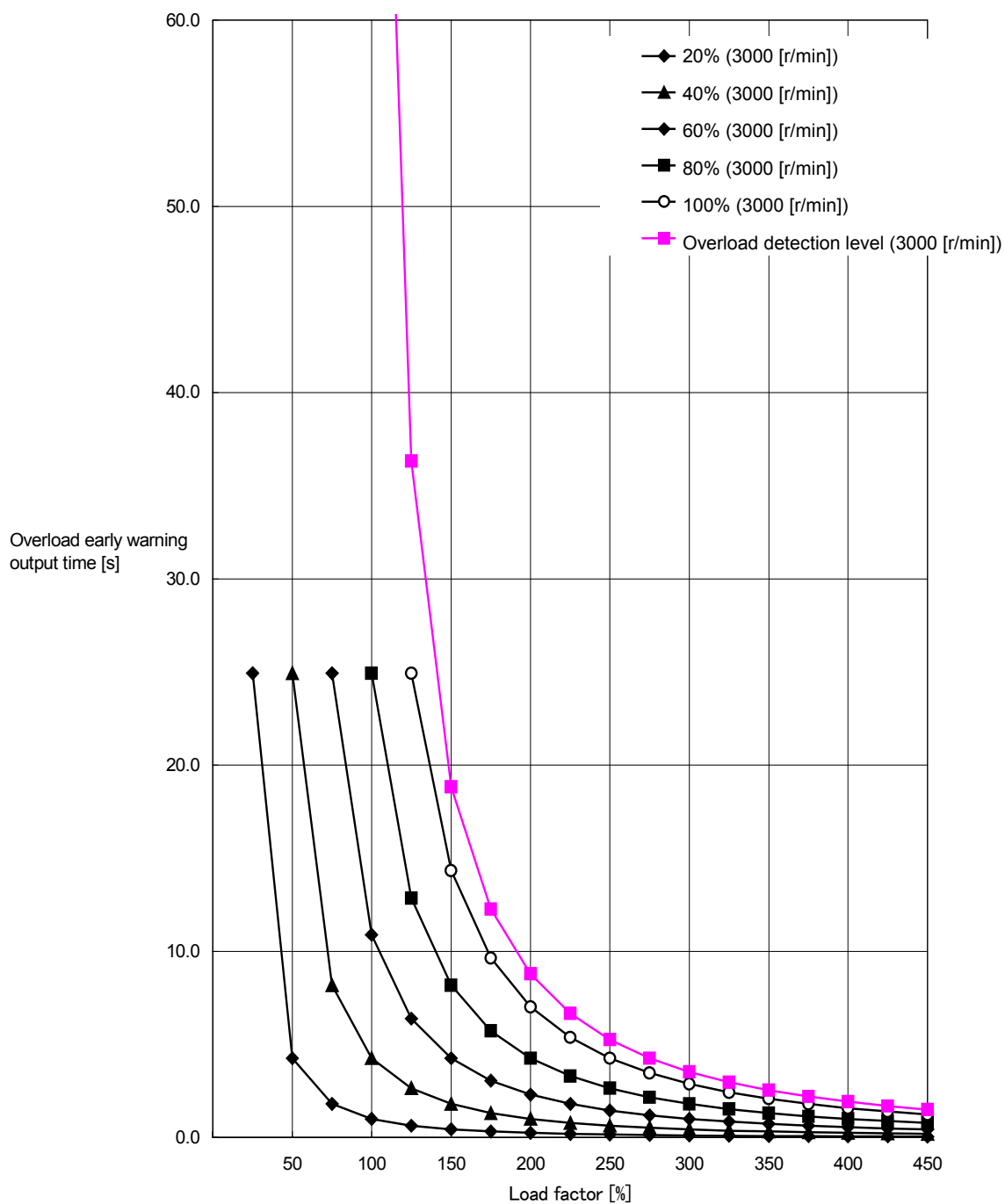
This signal is turned on, when the motor load factor has reached the overload early warning level set at the basic para. 58.. This signal cannot be reset by the control input signal (external signal input).

Early warning signal can be outputted before the amplifier trips due to motor overload alarm.

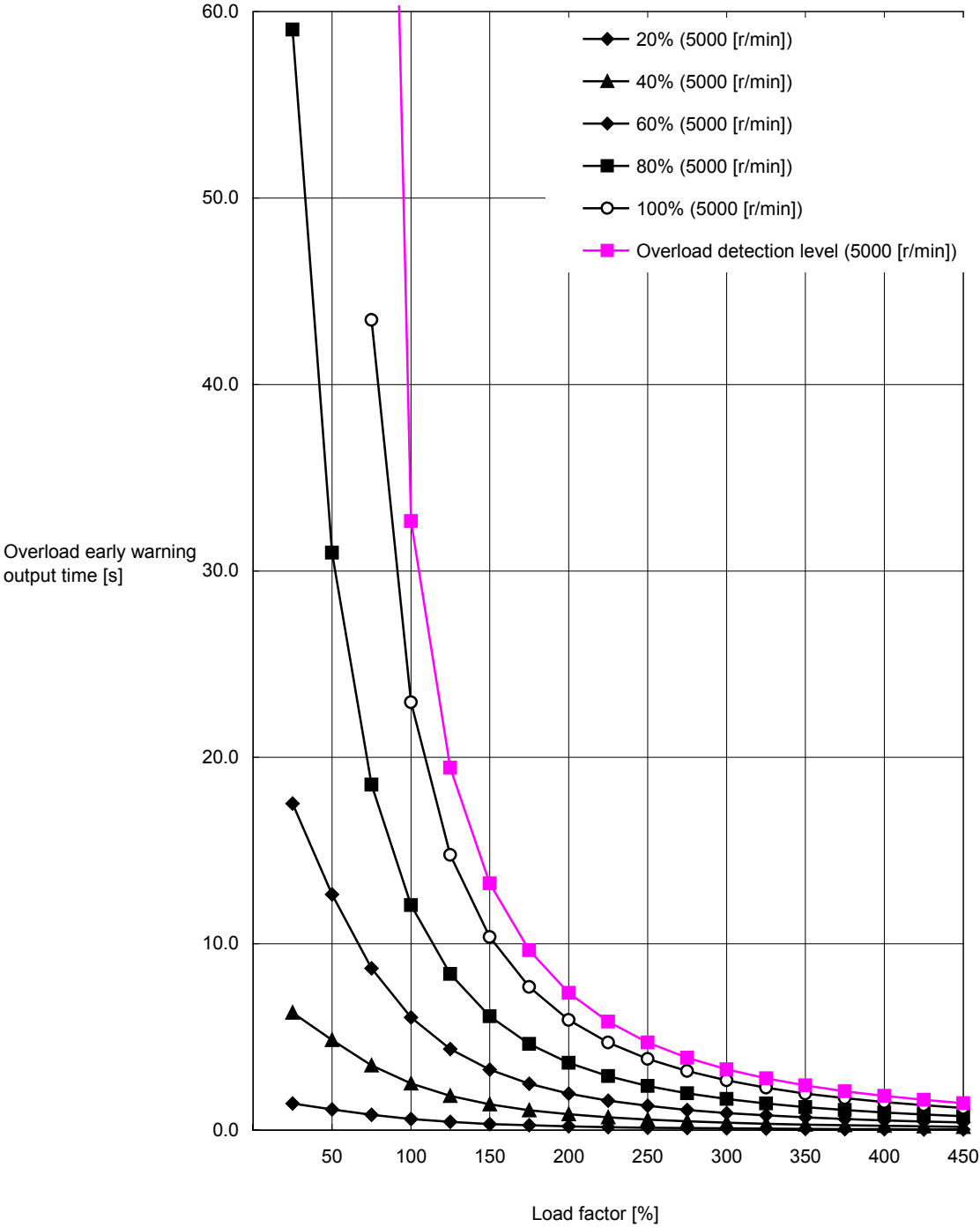
Parameter setting

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)
<div>Function</div> <div>During on of clamping end (33) signal, the control function of motor is limited.</div> <div><div>• P-control (proportional band control) is selected for the speed control by the amplifier.</div><div>• The rotational command, such as the auto start [START] and manual forward command [FWD], are ignored.</div></div> <div>Turn on the clamping end signal after the indexing end [WPSET] signal is on.</div> <div>Parameter setting</div> <div>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”.</div>

5.7.2 Fixed point

This signal is turned on when the motor current position is near a station.

Fixed point (Control output signal)
<div>Function</div> <div>The fixed point signal is updated at intermediate point of each station.</div> <div><div><div><div><div>1</div><div>2</div><div>3</div></div><div><div>Current position</div><div>Fixed point</div></div><div><div><div><div></div><div></div><div></div></div><div><div>O F F</div><div>O N</div><div></div></div></div></div><div><div>Fixed point detection position 1 (basic para. 63)</div><div>Fixed point detection position 2 (basic para. 64)</div></div></div></div></div>

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
<u>AL SE</u>	System error
<u>AL OC</u>	Overcurrent
<u>AL OS</u>	Overspeed
<u>AL LV</u>	Undervoltage
<u>AL HV</u>	Overvoltage
<u>AL ET</u>	Encoder trouble
<u>AL CT</u>	Control power trouble
<u>AL dE</u>	Memory error
<u>AL Fb</u>	Fuse blown
<u>AL CE</u>	Motor combination error
<u>AL RH2</u>	Resistor overheat 2
<u>AL EC</u>	Encoder communication error
<u>AL EE</u>	Control signal error
<u>AL OL</u>	Motor overload

• Minor fault

Protection against overheat etc.

Indication	Detection contents
<u>AL rH</u>	Braking resistor overheat
<u>AL OF</u>	Deviation excessive
<u>AL AH</u>	Amplifier overheat
<u>AL EH</u>	Encoder overheat
<u>AL AL</u>	ABS (absolute) data lost
<u>AL EE</u>	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)
<p>Function</p> <p>This signal turns on, if the following data error is detected at position preset, para. rewrite or manual feed speed selection.</p> <ol style="list-style-type: none"> 1) Data other than specified code (BCD or binary) is input. 2) Data other than setting range is input. 3) Negative sign specified. <p>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.</p> <ul style="list-style-type: none"> • Basic type (DI/DO position) <p>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)).</p> <ul style="list-style-type: none"> • SX bus type (SX bus direct connection) <p>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).</p> <ul style="list-style-type: none"> • T-link type (T-link direct connection) <p>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).</p> <p>Parameter setting</p> <p>To allocate the data error to the control output terminal, set (30) to the system para..</p>

5.7.9 CPU ready [CPURDY]

Normal operation of amplifier and motor can be checked.

CPU ready [CPURDY] (Control output signal)
<p>Function</p> <p>This signal is turned on under the following conditions, after power is turned on.</p> <ul style="list-style-type: none"> • CPU in the amplifier is operating normally. <p>[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.</p> <p>Parameter setting</p> <p>To allocate the [CPURDY] signal to the control output terminal, set (28) to the system para..</p>

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.

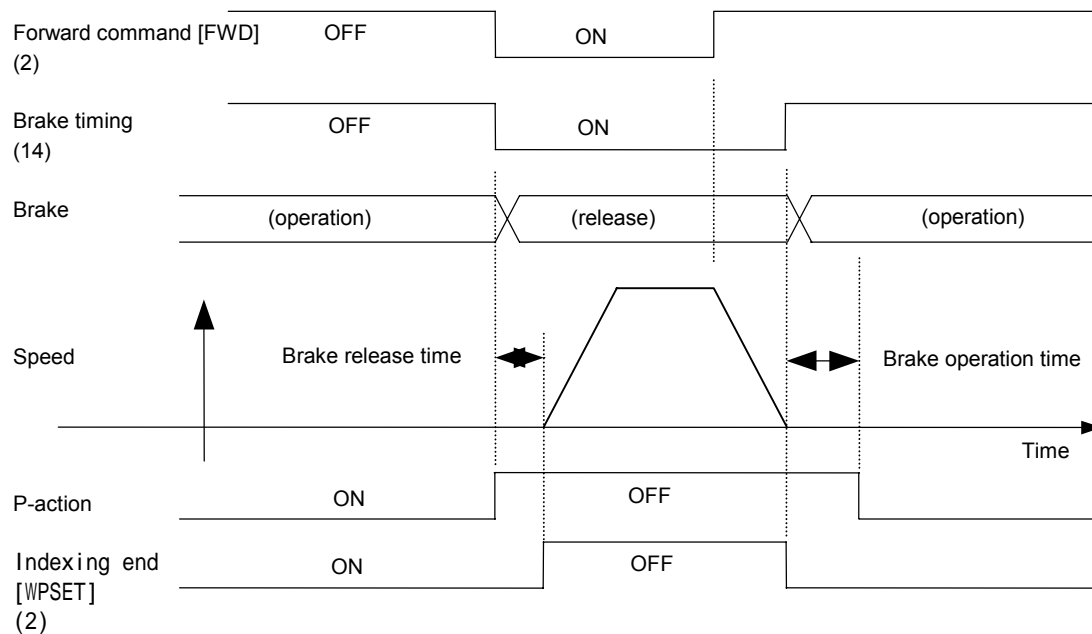
After the deviation zero signal on is confirmed, brake timing turns off, and when brake operation time (system para. 82) has elapsed, the amplifier turns P-action signal on.

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), 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.

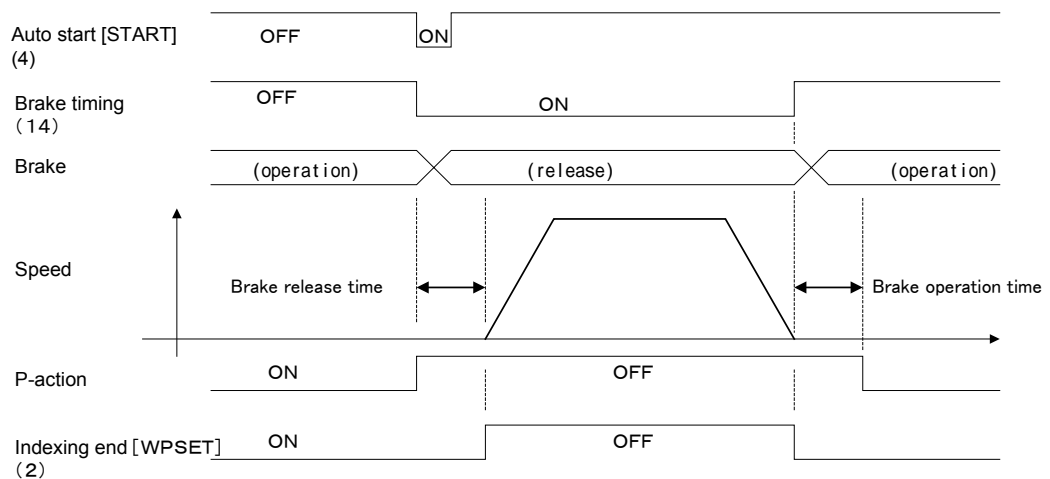
After the brake release time (system para. 83) has elapsed, a rotation starts assuming that the brake has actually been released.

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.

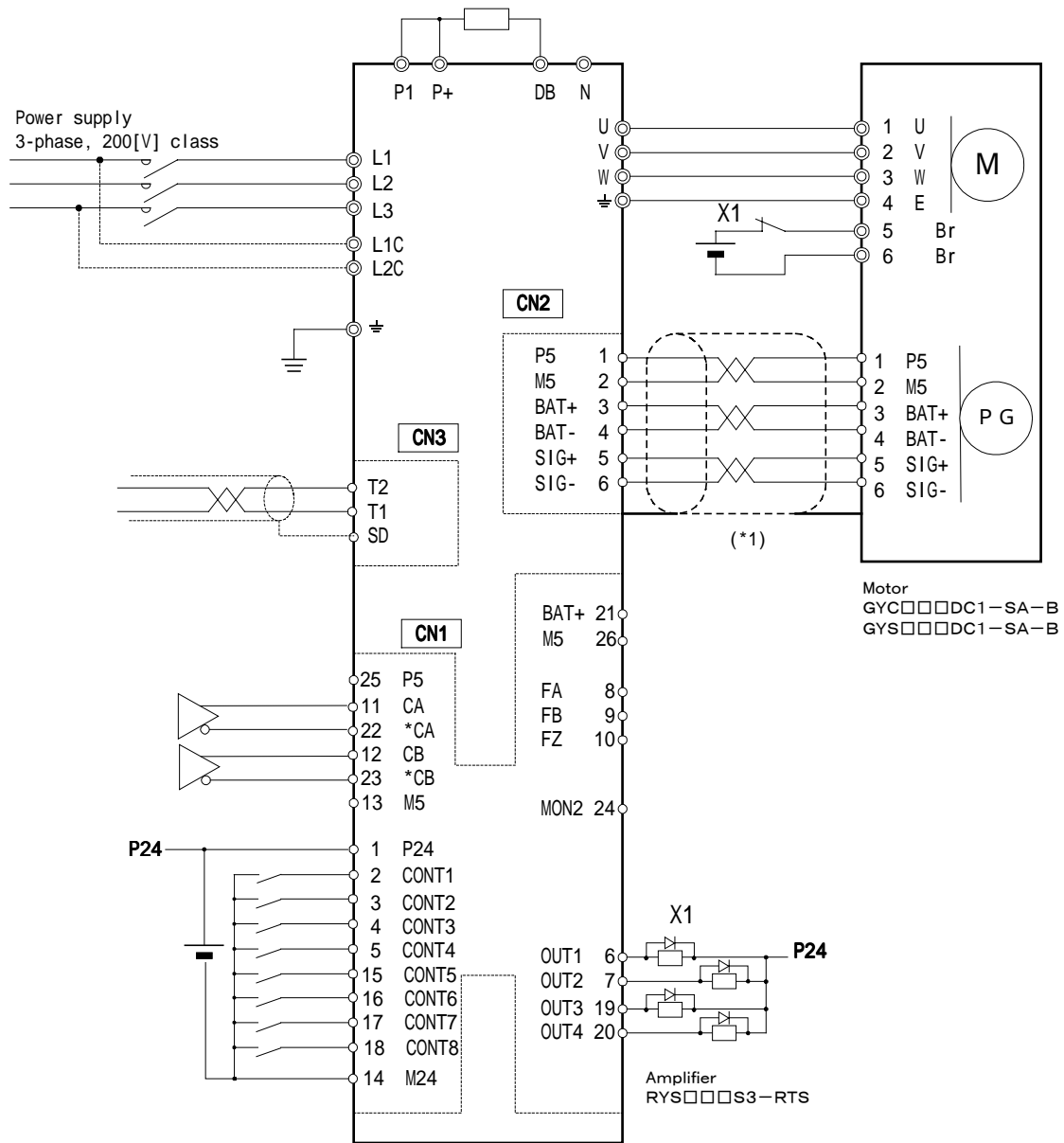
Brake timing : Validated signal at the ON edge



- 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 (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/current timer data (PC ←Amplifier)															
5	-			Alarm code					-							
6	-					CSEL 2	CSEL 1	CSEL 0	Para. No. current value							
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	-					SEL2	SEL1	SEL0	Para. No. setting value							
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

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 Station No., speed command
OFF	OFF	ON	Current feedback position, current speed, current torque, alarm code Station No., speed command
OFF	ON	OFF	Current deviation, current speed, current torque, alarm code Station No., speed command
OFF	ON	ON	– Station No.
ON	OFF	OFF	Basic para. current value Basic para. setting value / Station No.
ON	OFF	ON	System para. current value System para. setting value / Station No.
ON	ON	OFF	– Station No.
ON	ON	ON	Current value between LS-Z phase 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 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	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 preset	-	-	-	Rewrite command	Read 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 Position data setting value, speed command/speed data setting value
OFF	OFF	ON	Current feedback position, current speed, current torque, alarm code Position data setting value, speed command/speed data setting value
OFF	ON	OFF	Current deviation, current speed, current torque, alarm code 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 (Low order word PC ← Amplifier)															
1	Current command position, current feedback position, current deviation (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	-					CSEL2	CSEL1	CSEL0	-							
7	RDY	W PSET	CPU ready	ALM	Data error	Address error	-	-	-	-	-	-	-	-	Rewrite end	Read 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 INC	-	-	-	-	Rewrite command	Read 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. The min. value 1 is corresponds to 1 [r/min].
Address 3	
Address 4	The current output torque is stored in 1 word. The min. value 1 is corresponds to 1% of rated (100%) torque.
Address 5	
Address 6	The status of SEL2, SEL1 and SEL0 are stored.. (Information on each bit is always valid.)
Address 7	
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). 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. (command on each bit is always valid.)
Address 15	

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:

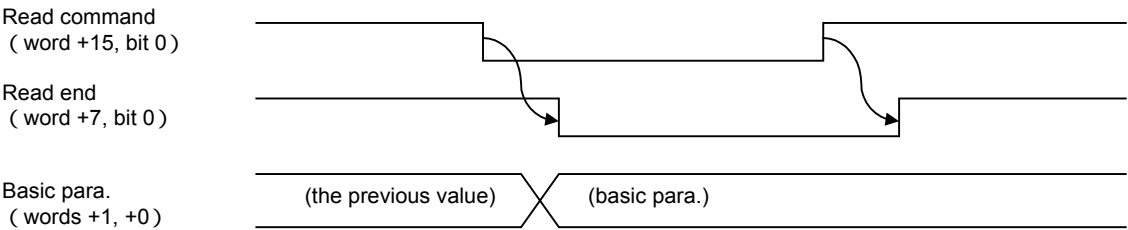
SEL2	SEL1	SEL0	IQ area (Upper line: 0 to 7W, Lower line: 8 to 15W)
OFF	ON	ON	-
			-

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

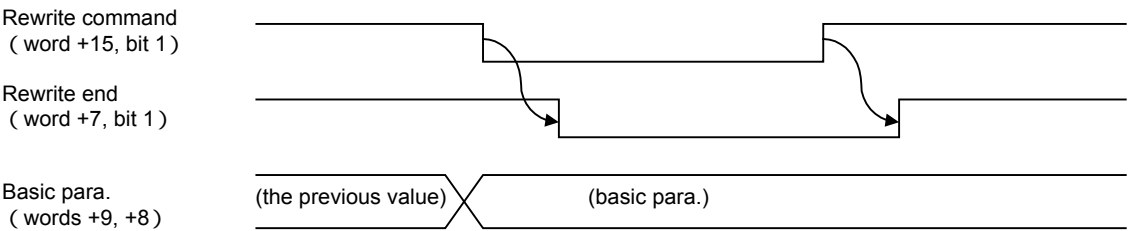
Word position	Setting range
Address 0	Basic para. or system para. can be read out. There are no decimal point.
Address 1	
Address 2 to Address 5	(disable)
Address 6	The status of SEL2, SEL1 and SEL0 are stored (CSEL2 to CSEL0). The written parameter No. is displayed (para. current positioning data).
Address 7	(Information on each bit is always valid.)
Address 8 Address 9	The setting value of the para. to be changed will be written.
Address 10 to Address 13	(disable)
Address 14	Basic para. or system para. can be selected using SEL2 to SEL0. 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). (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 (Low order word PC ← Amplifier)															
1	LS-Z phase pulse (High order word PC ← Amplifier)															
2	-															
3	-															
4	-															
5	-		-	-	-	-	-	-	-							
6	-					CSEL 2	CSEL 1	CSEL 0	-							
7	RDY	W PSET	CPU ready	ALM	Data error	Address error	-	-	-	-	-	-	-	-	Rewrite end	Read end
8	-															
9	-															
10	-															
11	-															
12	-															
13	-		-	-	-	-	-	-	-							
14	-					SEL2	SEL1	SEL0	-							
15	RUN	FWD	REV	RST	START	ORG	X1	VEL0	VEL1	DIR	-	-	-	-	Rewrite command	Read 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 to 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 to Address 13	(disabled)
Address 14	LS-Z phase pulse is specified using SEL2 to SEL0.
Address 15	Bit 0 is read command (ON edge). (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 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	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	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	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 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)															

①

⑤

②

③

④

■ 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. The min. value 1 is corresponds to 1 [r/min].
Torque command	The current output torque can be stored. 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. 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

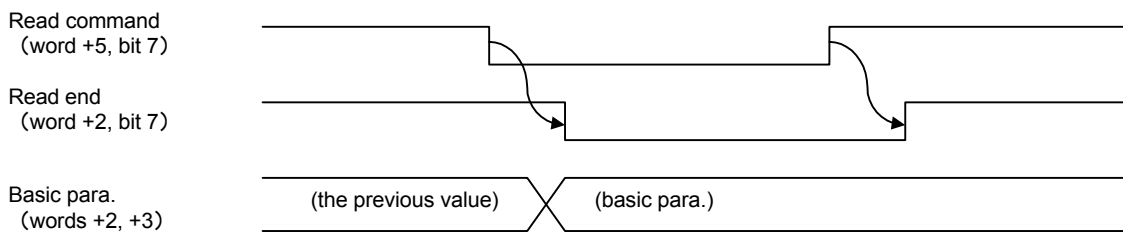
+1	+2	+3	+4	+5	WB area (when reading)	WB area (when rewriting)
OFF	OFF	ON	OFF	ON	-	-
OFF	OFF	ON	ON	OFF	-	-
OFF	OFF	ON	ON	ON	-	-
OFF	ON	OFF	OFF	OFF	-	-
OFF	ON	OFF	OFF	ON	Basic para.	Basic para.
OFF	ON	OFF	ON	OFF	System para.	System para.

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

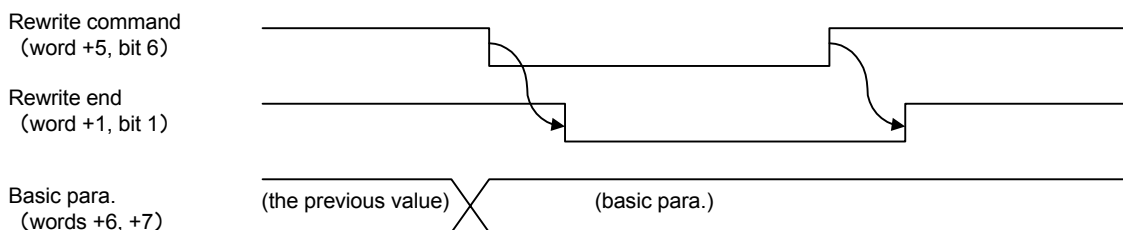
Data selection	Setting range
Basic para.	The data is read or written with the decimal point ignored.
System para.	

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).

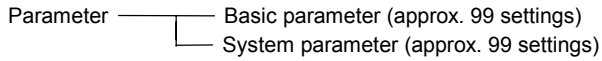


After write end signal has turned on, data at words +6 and +7 may be changed.

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.

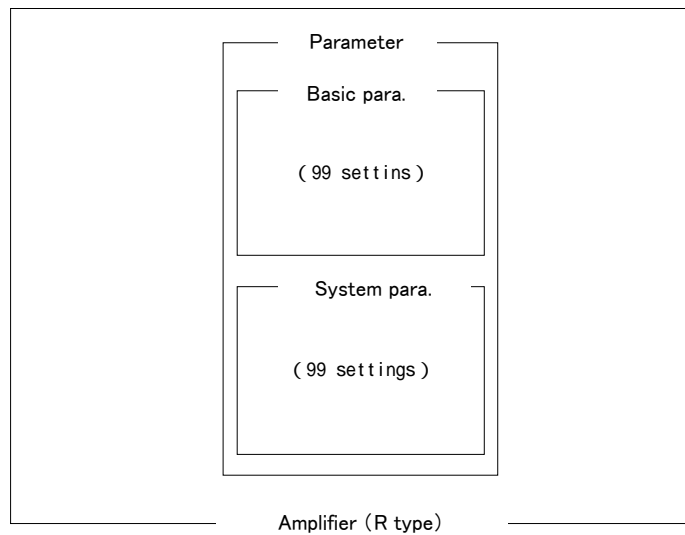
Make sure that the keypad panel indication (7-segment) goes off when power is turned off.

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 to 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 to 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 to 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 to 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 to 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 to 85	Unused	-	0	-
86	Backlash correction	0 to 10000 [pulse] (in 1 step)	0	Always
87 to 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 to 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 to 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 to 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 3: Torque command 4: Position deviation	2	Always
68	Monitor 2 signal assignment	1: Speed command 2: Speed feedback 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) 1: Monitor 1(one-way deflection) / Monitor 2 (two-way deflection) 2: Monitor 1(two-way deflection) / Monitor 2 (one-way deflection) 3: Monitor 1(one-way deflection) / Monitor 2 (one-way deflection)	0	Power
74 to 77	Unused	-	0	-
78	Pulse train input form	0: Command code/pulse 1: Forward/reverse pulse 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 to 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 to 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 to 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

System parameter for RYS-R type (2/2)

[SX bus]

No.	Name	Setting range	Initial value	Change
47 to 66	Unused	-	0	-
67	Monitor 1 signal assignment	1: Speed command 2: Speed feedback 3: Torque command 4: Position deviation	2	Always
68	Monitor 2 signal assignment	1: Speed command 2: Speed feedback 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) 1: Monitor 1(one-way deflection) / Monitor 2 (two-way deflection) 2: Monitor 1(two-way deflection) / Monitor 2 (one-way deflection) 3: Monitor 1(one-way deflection) / Monitor 2 (one-way deflection)	0	Power
74 to 77	Unused	-	0	-
78	Pulse train input form	0: Command code/pulse 1: Forward/reverse pulse 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 to 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: 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 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

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 to 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

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 to 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 to 67	Unused	-	0	-
68	Monitor 2 signal assignment	1: Speed command 2: Speed feedback 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) 1: Monitor 2 (two-way deflection) 2: Monitor 2 (one-way deflection) 3: Monitor 2 (one-way deflection)	0	Power
74 to 77	Unused	-	0	-
78	Pulse train input form	0: Command code/pulse 1: Forward/reverse pulse 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 to 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].

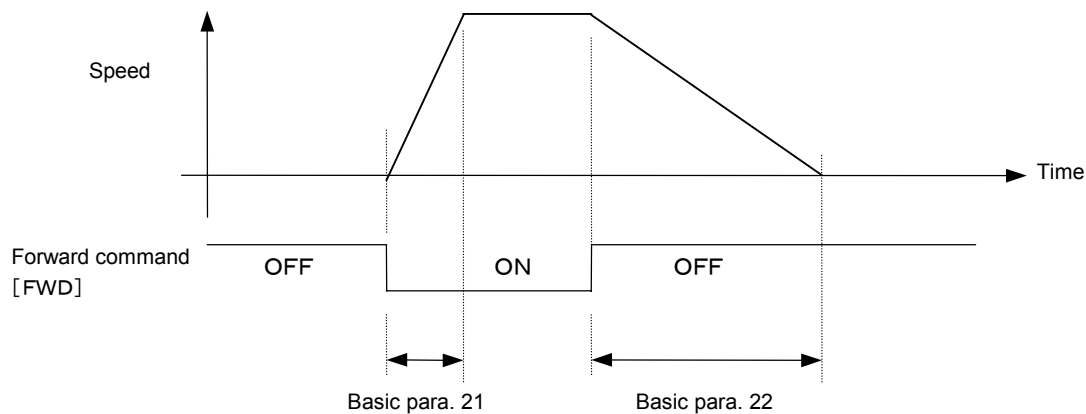
Accel. time 2 and decel. time 2 are valid while ACC0 signal is on.

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.



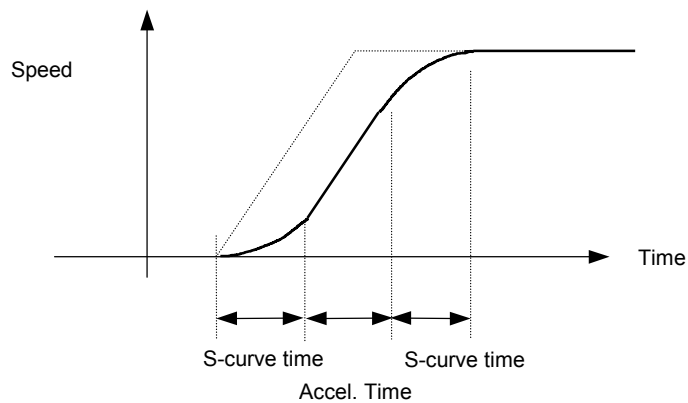
(6) Basic parameter 25

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) Spindle drive (with speed reducer) Rack and pinion Timing belt Conveyor Chain drive Feed roll Table indexing (dividing)
2: Auto (high stiffness)	Ball-screw (direct coupling of motor and screw) 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 [ 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)

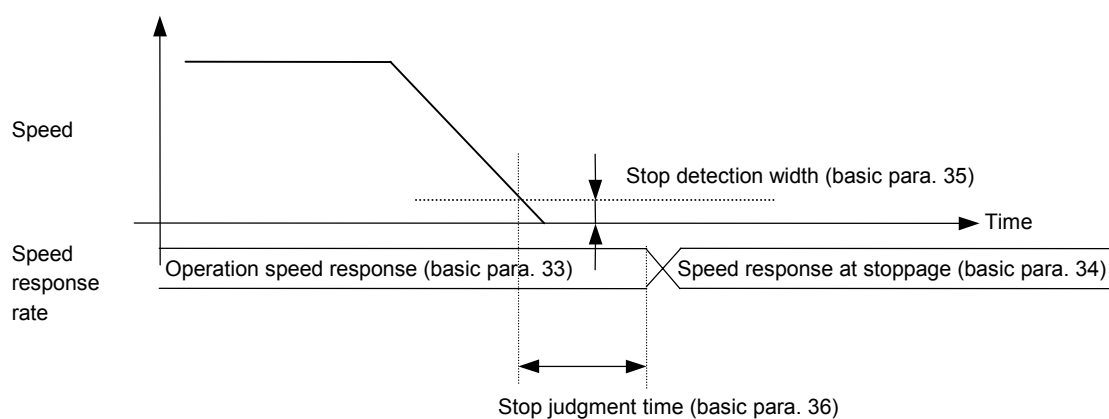
If the setting is 0.0, the load assumption is not made, and the gain is set assuming that no load is applied.

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].

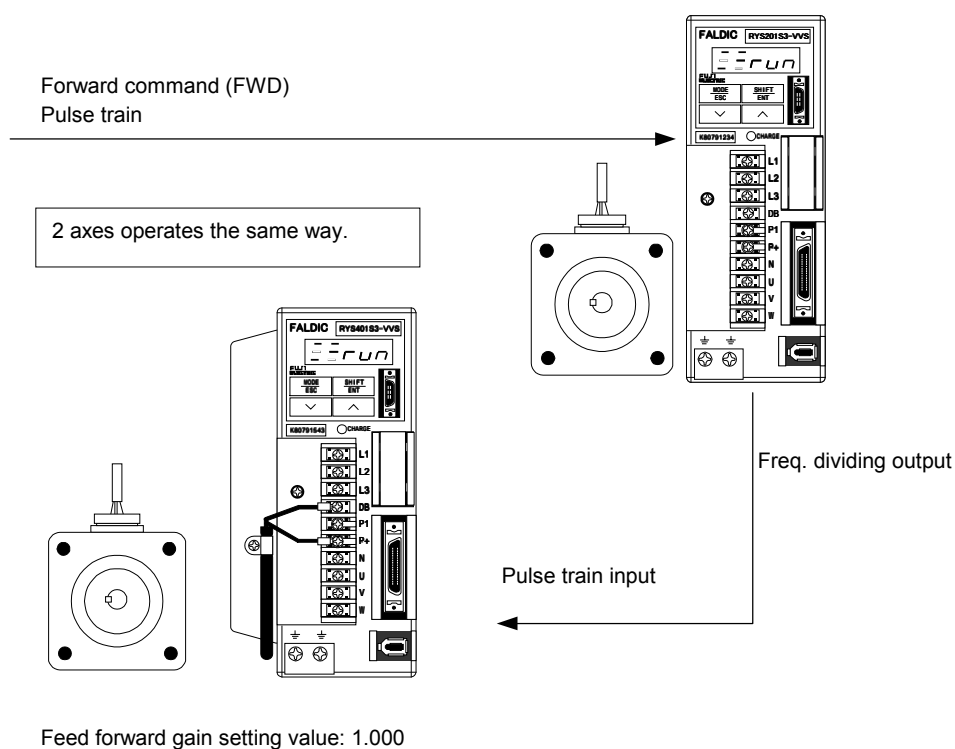
The mutistep speed command (X1, X2, X3) can also be adjusted by the speed setting filter.

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.



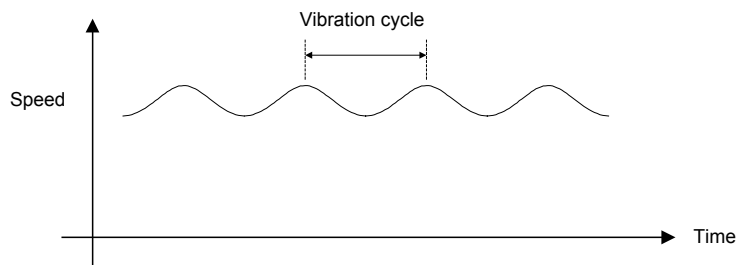
Vibration suppression parameter (basic para. 44, 45)

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.



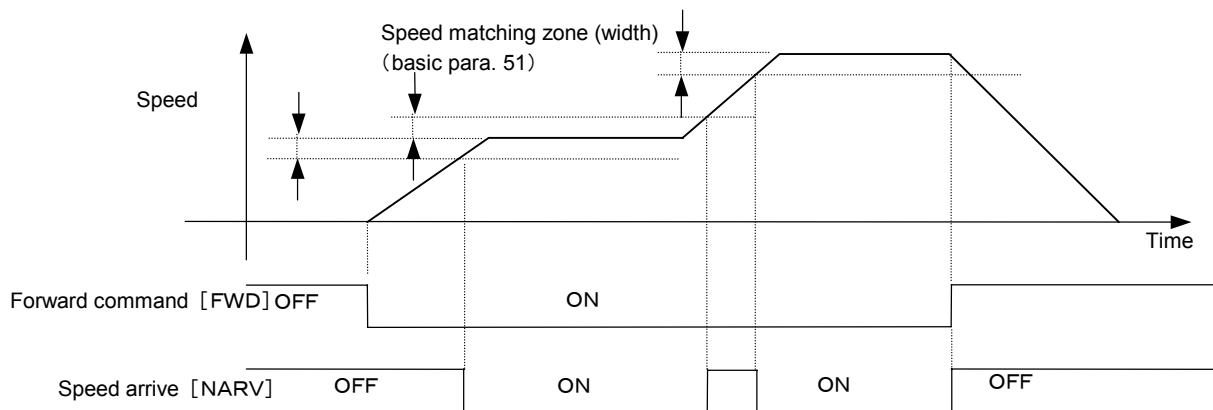
(8) Basic parameter 51

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 ± 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

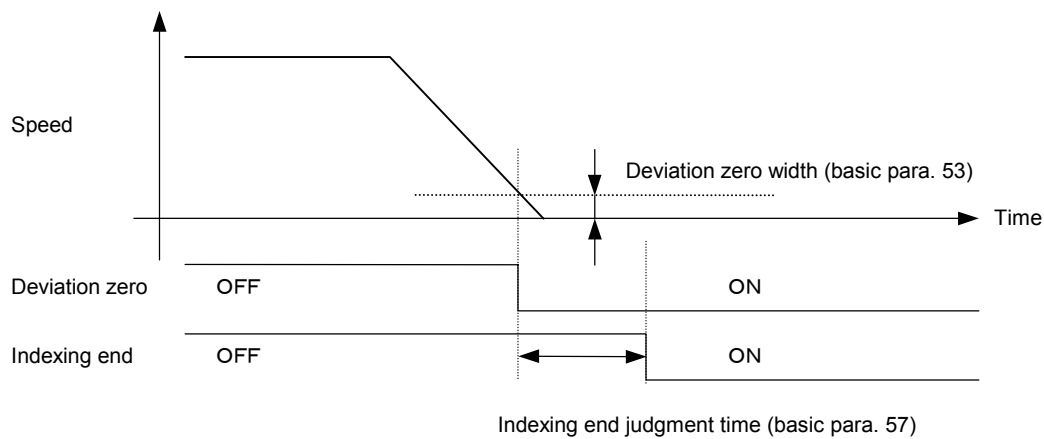
Sets the pulse count for alarm detection about deviation excessive. Initial value at factory setting is 10000 and detects the deviation amount with 1000000 pulses. At factory setting, deviation excessive is detected when the difference (deviation) between command position and feedback position becomes 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: VEL0	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	

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	P10	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	-				CSEL 2				CSEL 1				CSEL 0			
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					SEL2				SEL1				SEL0			
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)

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

(3) T-link

(a) System parameter 1 to 21, 56 to 59

$Pn002$ / $PP001$ - $PP021$
 $PP056$ - $PP059$

T-link
(T-link direct
connection)

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)

Function (output signal) assigned to
system para. 31 to 51 (OUT1 to OUT21)

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

(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)

26	M 5	25	P 5	13	M 5	12	C B
24	MON 2	23	* C B	11	C A	10	F Z
22	* C A	21	B A T +	9	F B	8	F A
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		

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.

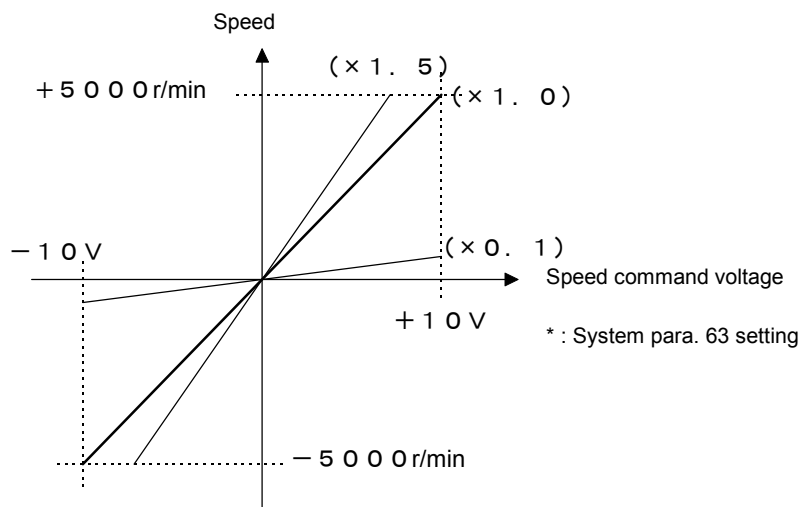
The contents of RAM stored basic para. is initialized at power on.

(6) System parameter 63, 64. [Basic type]

Pn002 / **PP063** – **PP064**

Para.	Name	Setting range	Initial value	Change
63	Speed command gain	± 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

The gain or offset of speed command [NREF] terminal can be adjusted.



■ Speed command gain

These gains can be set from ± 0.10 to ± 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 ([F008]). 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 3: Torque command 4: Position deviation	2	Always
68	Monitor 2 signal assignment	1: Speed command 2: Speed feedback 3: Torque command 4: Position deviation	3	Always
69	Monitor 1 scale	± 2.0 to ± 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	± 2.0 to ± 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) 1: Monitor 1 (one-way deflection) / Monitor 2 (two-way deflection) 2: Monitor 1 (two-way deflection) / Monitor 2 (one-way deflection) 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.

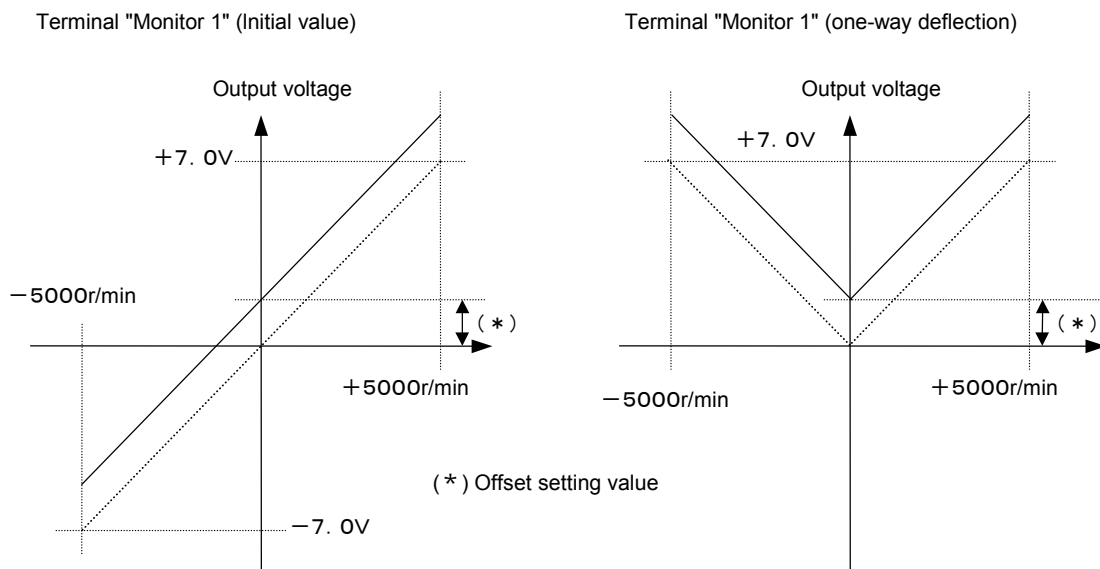
Setting range	Output signal
1: Speed command	Output voltage in response to max. speed.
2: Speed feedback	Output voltage in response to max. speed.
3: Torque command	Output voltage in response to max. torque.
4: Position deviation	Output voltage in response to 1048576 pulses.

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.

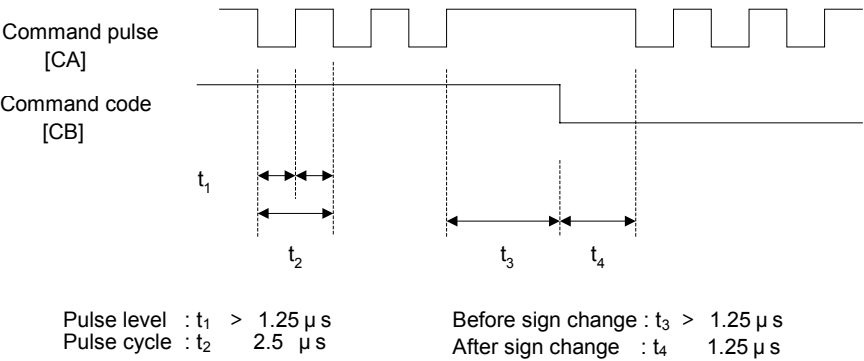
(8) System parameter 78 [Basic type, SX bus, T-link]

Pn002 / PP078

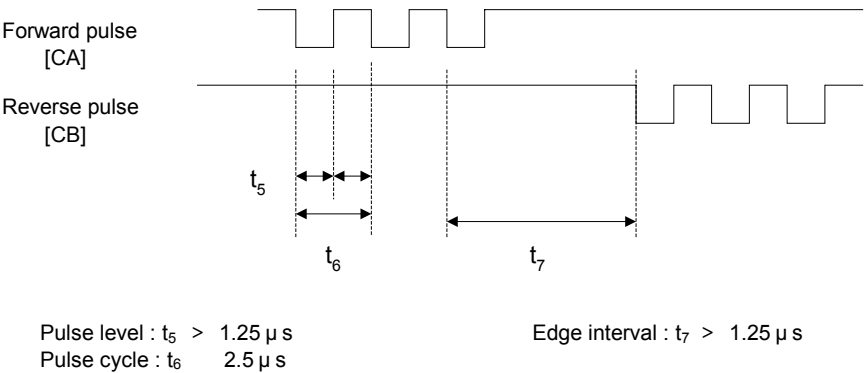
Para.	Name	Setting range	Initial value	Change
78	Pulse train input form	0 : Command code, command pulse 1: Forward pulse, reverse pulse 2: Two 90° phase-different signal	1	Power

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.

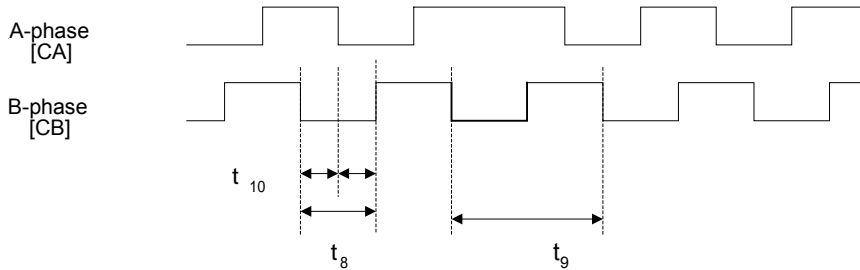


Forward pulse, reverse pulse (system para. 78 setting : 1)
Forward pulse indicates forward direction, reverse pulse indicates the reverse direction.



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 : $t_{10} > 1.25 \mu s$

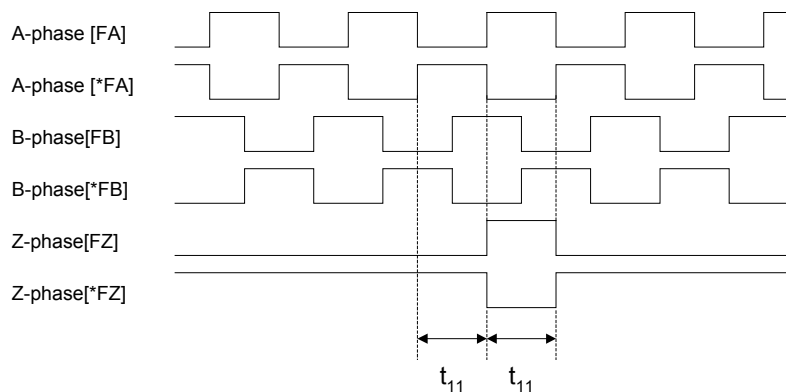
(9) System para. 79. [Basic type, SX bus (line driver output), T-link (open collector output)]

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 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 2 : Brake (P-action) 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 1: Free-run	0	Power
85	Alarm detection at undervoltage	0: No detection 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 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 28 : Pulse train ratio 2	Pulse train ratio 1 or 2 become always valid. Do not assign these two signals 1 and 2 at the same time.
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]

Pn002 / PP089

(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		Sequence	7		Feedback speed
1		Sub mode	8		Command speed
2		Alarm detection	9		Actual torque
3		Alarm history	10		Feedback position
4		Amplifier setting	11		Command position
5		Motor setting	12		Deviation amount
6		Station No. indication	13		Cumulated pulse
			14		Peak torque
			15		Input voltage 1
			16		Input voltage 2
			17		LS-Z pulse
			18		Input signal
			19		Output signal
			20		Load inertia ratio

(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 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 (decimal)	Station No. setting (hexadecimal)	Station No. setting (decimal)	Station No. setting (hexadecimal)	Station No. setting (decimal)	Station No. setting (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] 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) 1: ABS (Absolute)	0	Power

Setting	Current position backup
0: INC (Incremental)	Current position will be lost if power is shut down. Motor rotational quantity is not limited.
1: ABS (Absolute)	Current position will be recovered if power supply recovers. 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 (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 (16 hour backup after 8 hour power on per day)	Approx. 7 years
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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.

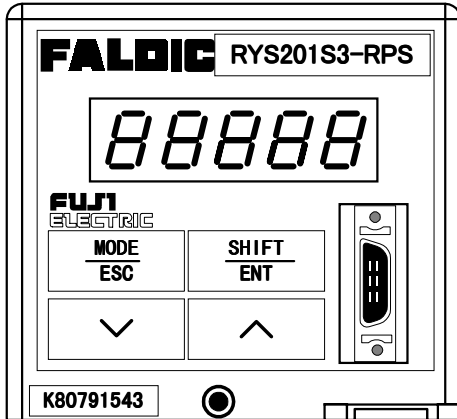
Do not install the backup battery into the amplifier itself if you connect the backup power.

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.

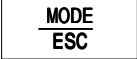



Sequence mode Indicates the amplifier status.
 Monitor mode Monitors the motor speed and the input/output signal status.
 Parameter edit mode Edits the parameter setting.
 Positioning data edit mode Edits the positioning data.
 Test running mode Operates the motor with the keypad operation.

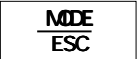

For RYS-R type amplifier, the positioning data edit mode is invalid.

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	

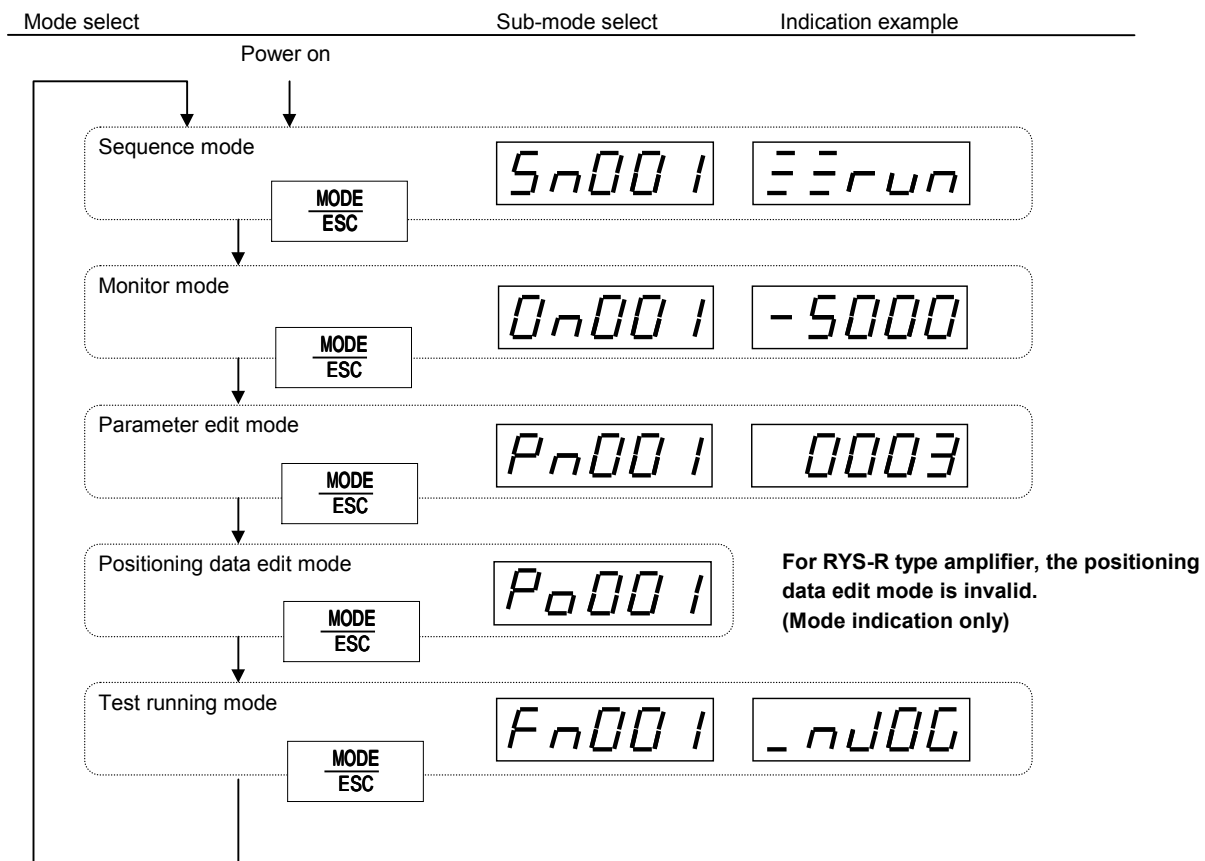
(2) Operation key

	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		
	Sub-mode		
	Alarm detection		
	Alarm history		
	Amplifier setting		
	Motor setting		
	Station No. indication		
Monitor mode	Feedback speed		
	Command speed		
	Average torque		
	Feedback position		
	Command position		
	Deviation amount		
	Cumulated pulse		
	Peak torque		
	Input voltage 1		
	Input voltage 2		
	LS-Z pulse		
	Input signal		
	Output signal		
	Load inertia ratio		

Mode	Sub-mode	Sub-mode select	Indication example
Parameter edit mode	Basic para.	<i>Pn001</i>	<i>H 01</i>
	System para.	<i>Pn002</i>	<i>01</i>

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

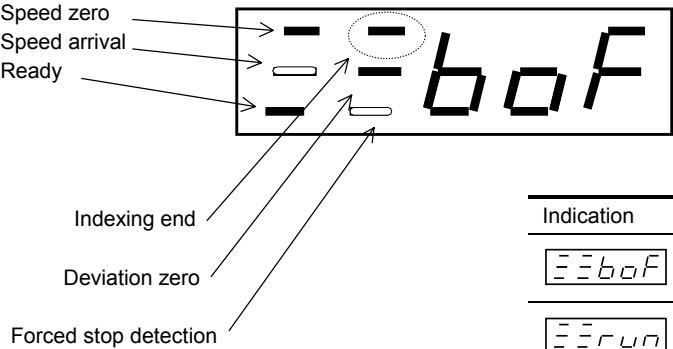
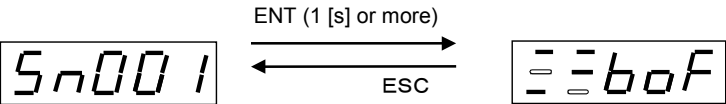
7.3 Sequence mode

In the sequence mode, the amplifier current status and the alarm detection history can be displayed.
Press the MODE key to display [Sn00n] and then press the ENT key for more than 1 [s].

- Sn001 : Sequence
- Sn002 : Sub-mode
- Sn003 : Alarm detection
- Sn004 : Alarm history
- Sn005 : Amplifier setting
- Sn006 : Motor setting
- Sn007 : 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.

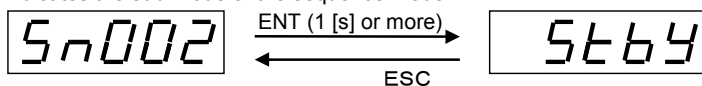
System para. 89 setting

Setting	Initial indication	
0 (Initial)	S_n001	Sequence
1	S_n002	Sub-mode
2	S_n003	Alarm detection
3	S_n004	Alarm history
4	S_n005	Amplifier setting
5	S_n006	Motor setting
6	S_n007	Station No. indication

Setting	Initial indication	
7	0_n001	Feedback speed
8	0_n002	Command speed
9	0_n003	Average torque
10	0_n004	Feedback position
11	0_n005	Command position
12	0_n006	Deviation amount
13	0_n007	Cumulated pulse
14	0_n008	Peak torque
15	0_n009	Input voltage 1
16	0_n010	Input voltage 2
17	0_n011	LS-Z pulse
18	0_n012	Input signal
19	0_n013	Output signal
20	0_n014	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
boF	In base-off condition, the motor does not have driving force and in free-run status.
Stby	The motor can rotate and is waiting the run command.
JOG	The motor can rotate and is executing manual feed.
PIn	The motor can rotate and the pulse train input is valid.
Auto	The motor can rotate and is executing positioning operation.
ORC	The motor can rotate and is executing origin return.
PCLP	The amplifier is executing deviation clear.
brEA	The motor can rotate and is measuring the brake timing.
Stop	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)

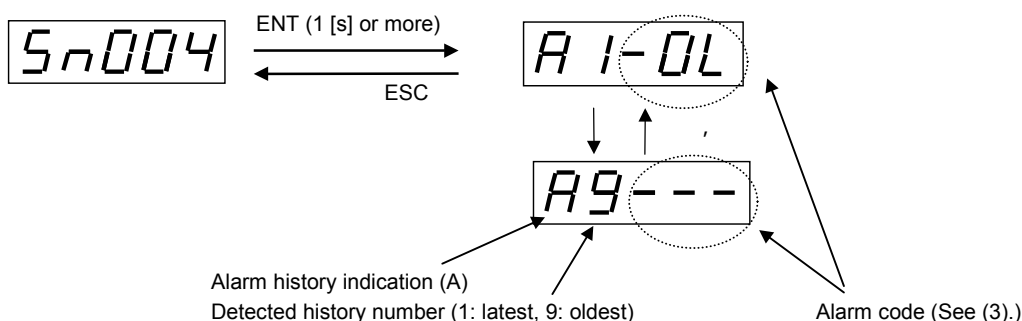
Remarks : The alarm codes are indicated automatically.

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.

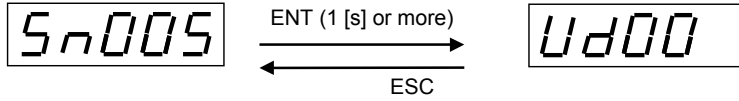


Remark : The alarm history can be deleted by the test running mode [Fn005].

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

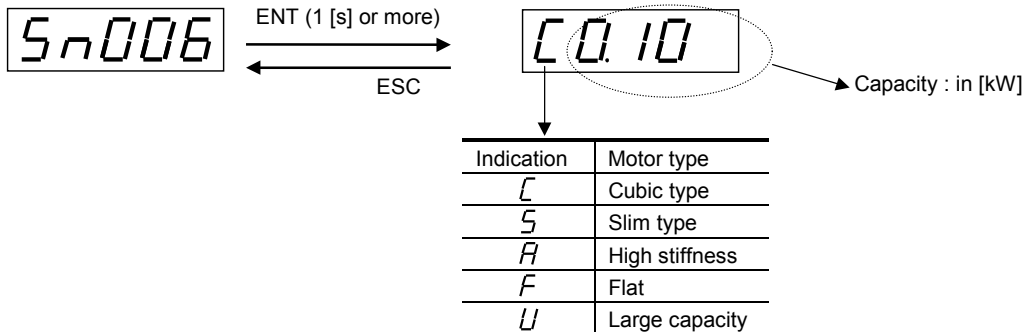
Main control connector (2nd digit)	
Indication	Function
d	DI/DO basic
S	SX bus

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

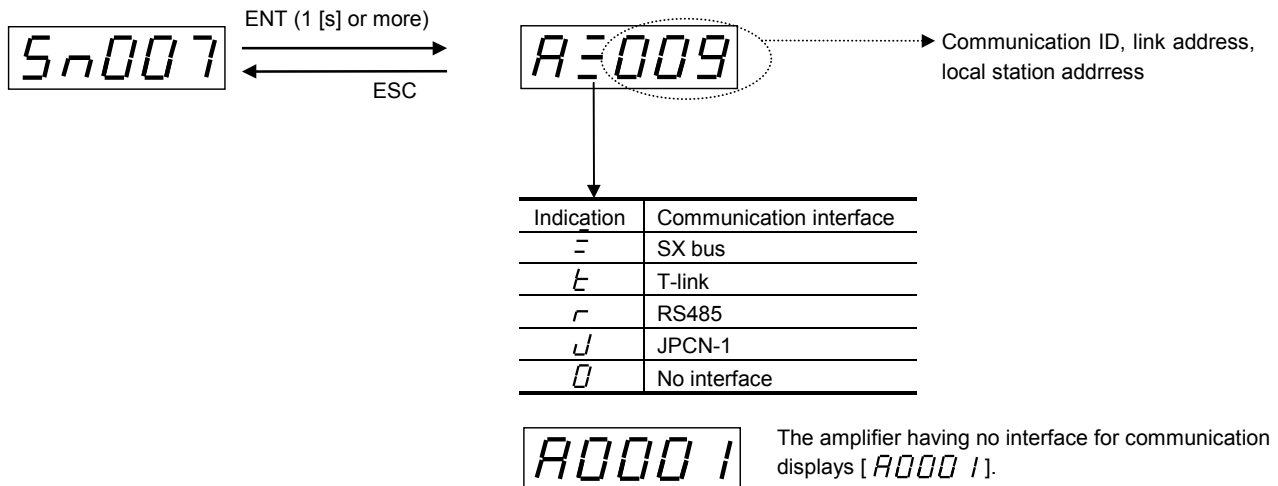
The motor type and capacity being connected to the amplifier are indicated.



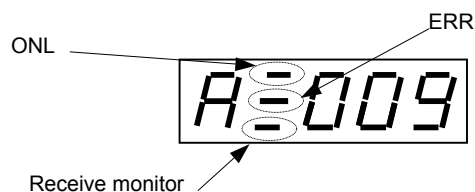
The sample indication above means a cubic type motor of 0.1 [kW].

(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.



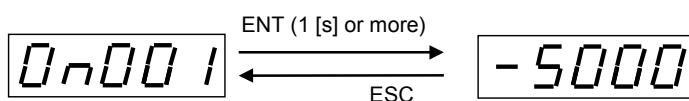
7.4 Monitor mode

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.

0n00 1	: Feedback speed	0n00 8	: Peak torque
0n00 2	: Command speed	0n00 9	: Input voltage 1
0n00 3	: Average torque	0n0 10	: Input voltage 2
0n00 4	: Feedback position	0n0 11	: LS-Z pulse
0n00 5	: Command position	0n0 12	: Input signal
0n00 6	: Deviation amount	0n0 13	: Output signal
0n00 7	: Cumulated pulse	0n0 14	: 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 : (*)

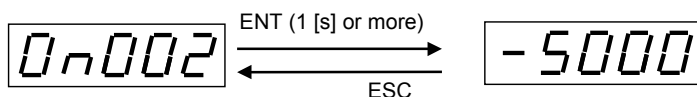
Direction of motor shaft rotation (when viewed from a point facing the drive-end of motor) is designed according to Japanese standards :

- 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.

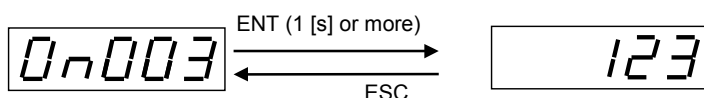
The indication is in 1 [r/min] unit. The negative sign is added when the motor rotates in reverse (clockwise viewed from shaft extension).



(3) Average torque

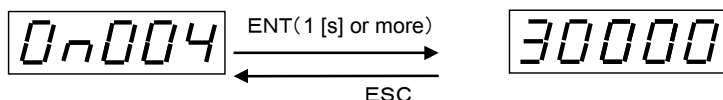
The motor's current load factor. The average value per second, assuming the rated torque as 100%, is indicated.

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.

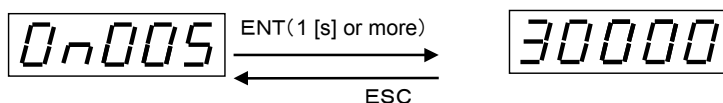
The indication is correct even when rotated by the load (mechanical equipment system).

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.

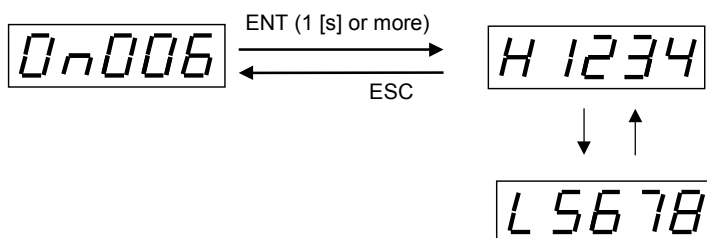
After a target position is attained, if the run command is turned off and the motor is rotated by the load (mechanical equipment system), a correct position is not displayed.



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.

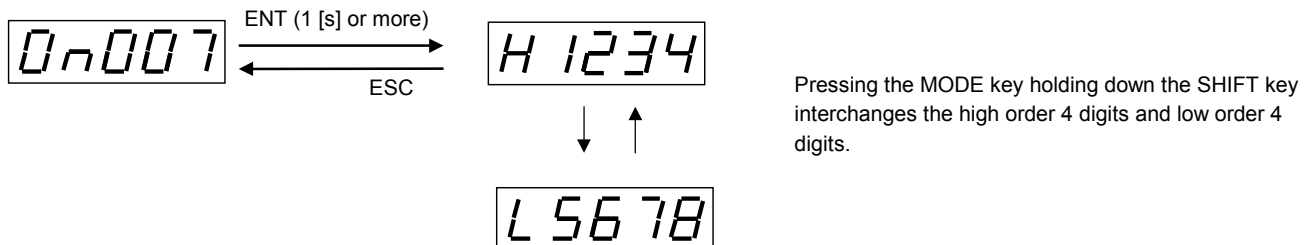


Pressing the MODE key holding down the SHIFT key interchanges the high order 4 digits and low order 4 digits.

(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.

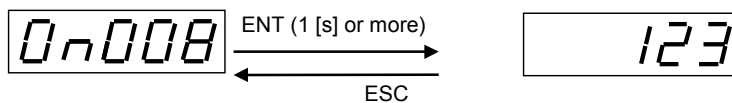


Remarks : The maximum positive count of 99,999,999 is followed by 0. The maximum negative count of -99,999,999 is followed by 0. Hence, the count becomes 0 every $\pm 100,000,000$.

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.

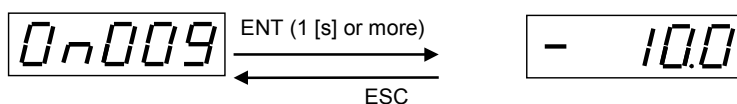
(8) Peak torque

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.



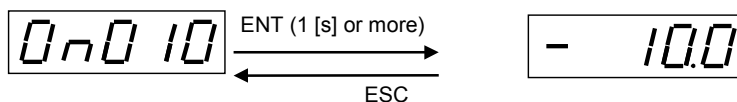
(9) Input voltage 1

Indicates the input voltage at the control input terminal [NREF] in 0.1 [V] steps. "-" denotes a negative voltage.



(10) Input voltage 2

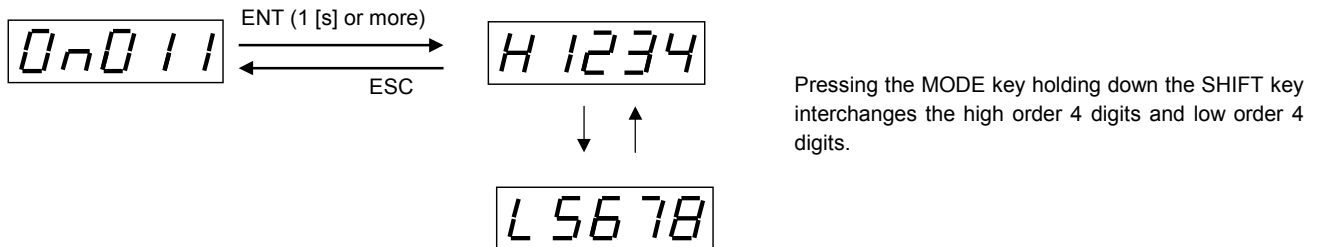
Indicates the input voltage at the control input terminal [TREF] in 0.1 [V] steps. "-" denotes a negative voltage.



* Some amplifiers do not have the control input [TREF] terminal.

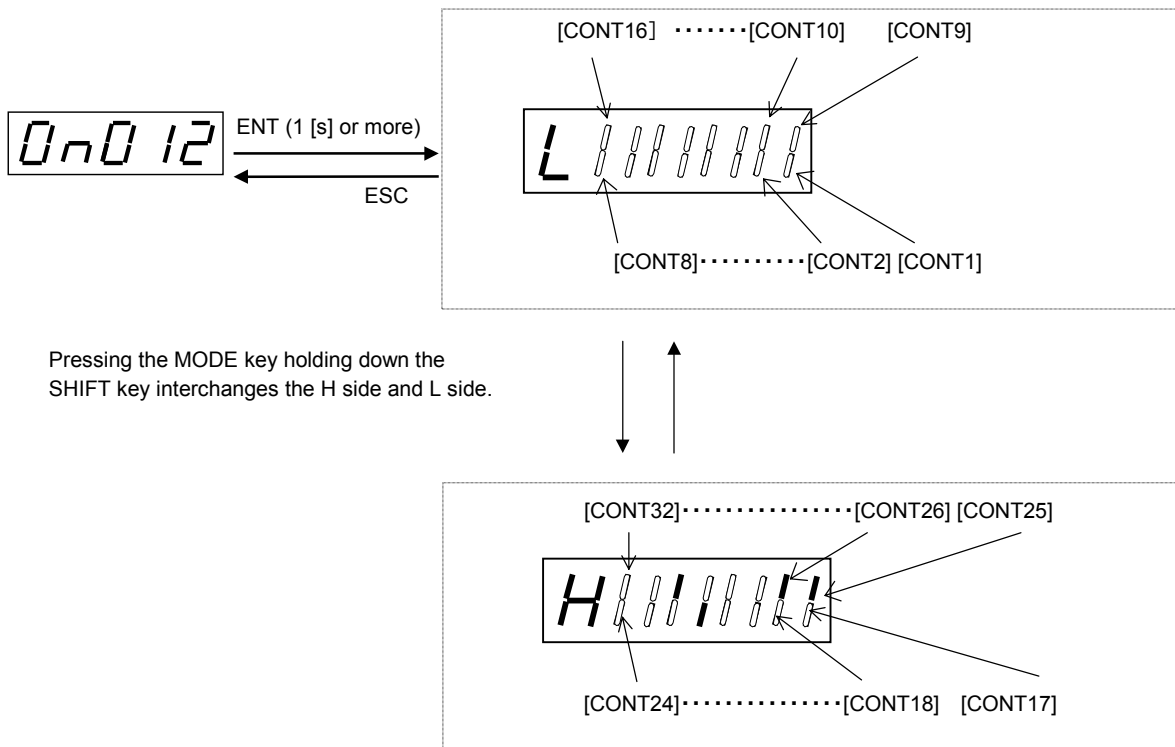
(11) LS-Z pulse

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

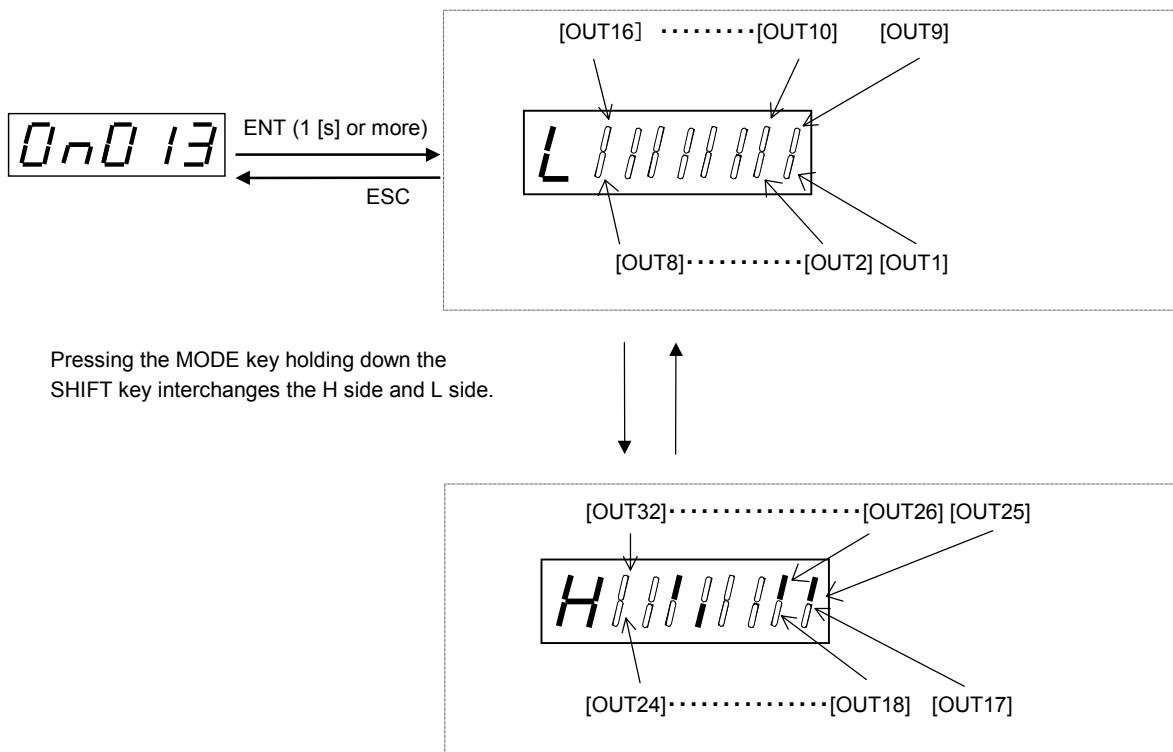
Displays whether the control input signals to the amplifier are turned on or off. If signals are turned on, corresponding LEDs are lit.



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.

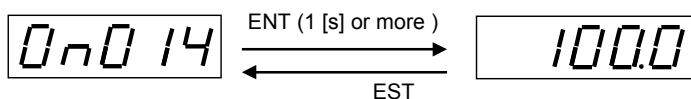


Note : Depending on the amplifier type, the number of control output signals changes.

(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 [*Pn000*] 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.

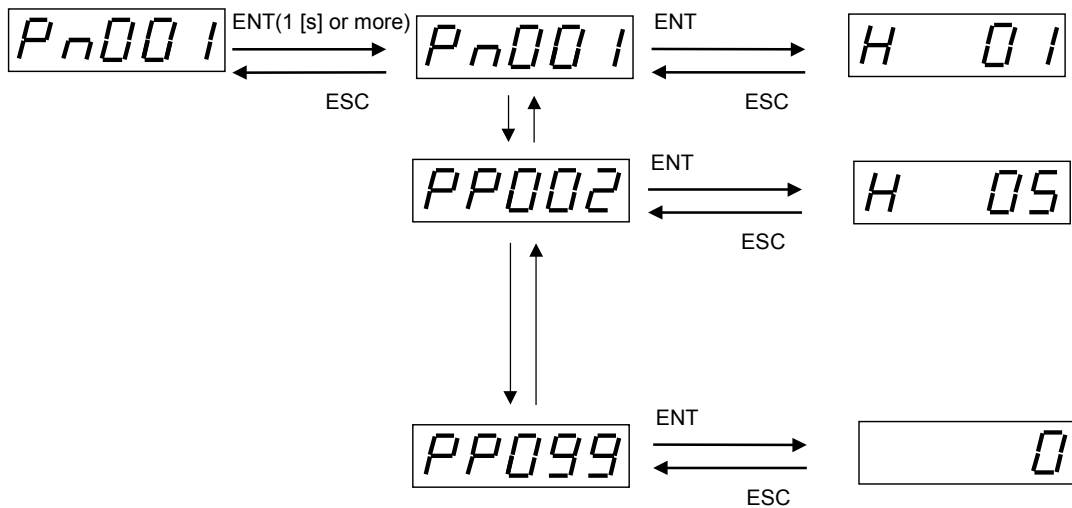
Pn002 : System para.

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

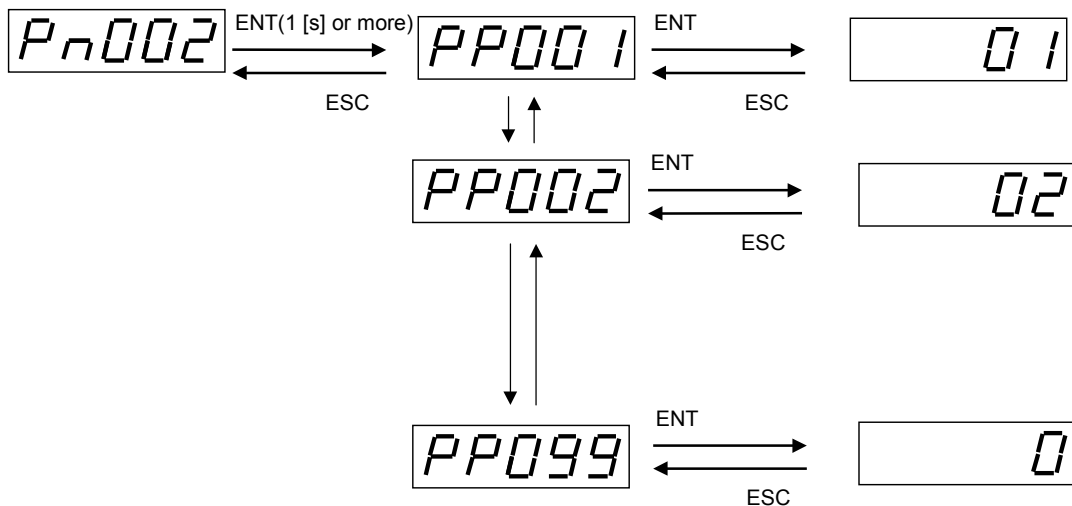
(1) Basic parameter

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

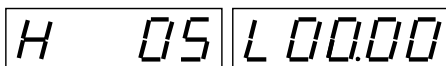
A value of unsigned 5 digits or signed 4 digits or less is displayed as it is.



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".

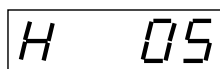
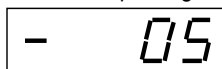


The above example shows a value has 6 digits. (The value will be 500.00.) For interchanging the H side and L side, press the MODE key holding down the SHIFT key.

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.



Example : Data with minus sign
(H side)

Alternately lights

Editing a value

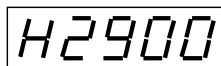
After reading a para., 1 digit or sign blinks at about 1 [s] intervals, prompting you to change that part.

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.

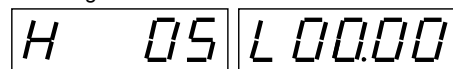


Example : 9 is followed up by 0 to give 2900.



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. 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 [*Po00n*], and hold down the ENT key for at least 1 [s] to select the data to edit.

Po001 : Position data

Po002 : Speed data

Po003 : Timer data

Po004 : Status

Po005 : M code

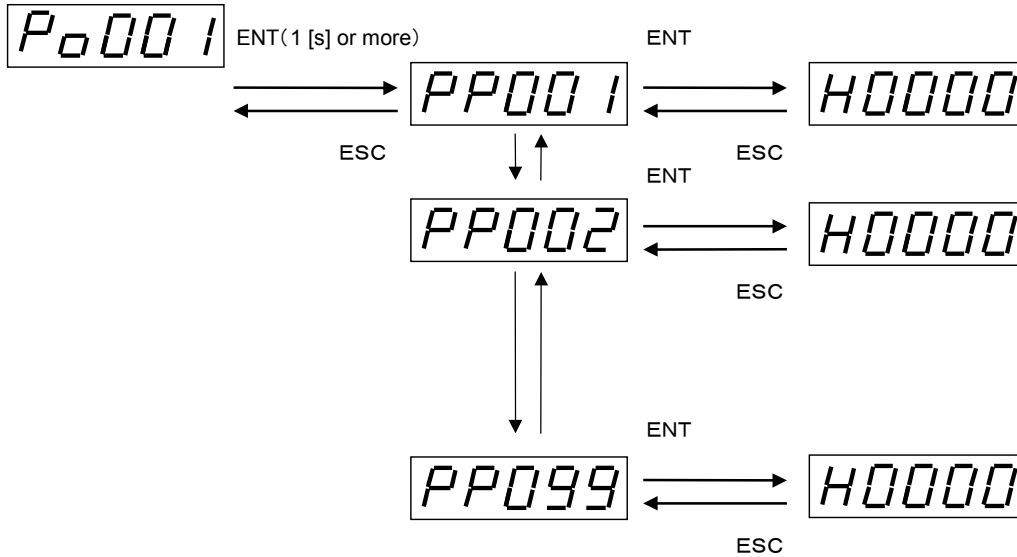
Then, press the key or key to select the number of positioning data to edit first.

Pressing the ENT key allows to edit its contents.

PP0nn : Positioning data number

(1) Position data (*Po001*)

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 (P0002)

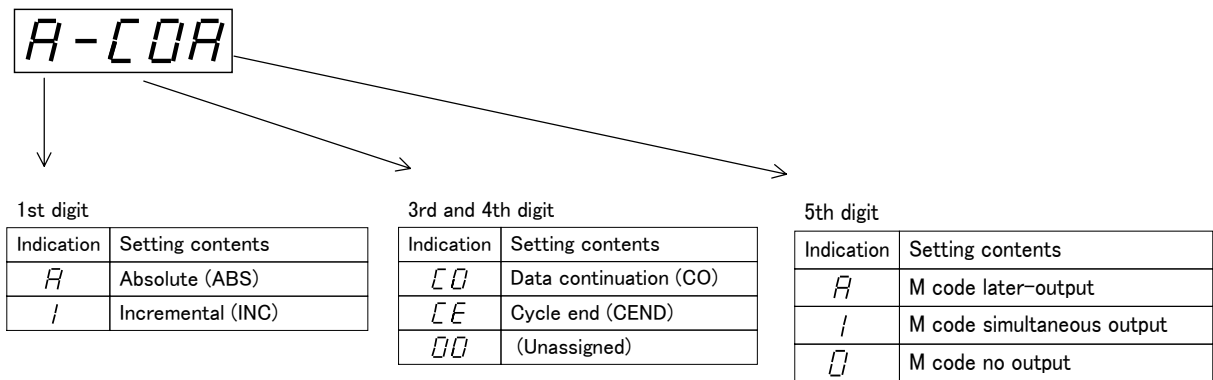
As the speed data, set the moving speed up to the stop position data in speed of motor shaft. The setting range is up to the maximum speed of motor in 0.01 [r/min] step.
(0.00 [r/min] cannot be selected.)

(3) Timer data (P0003)

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 (P0004)

Set various information incidental to positioning data. It can be changed by the key or key.



(5) M code (P0005)

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.

FF

7.7 Test running mode

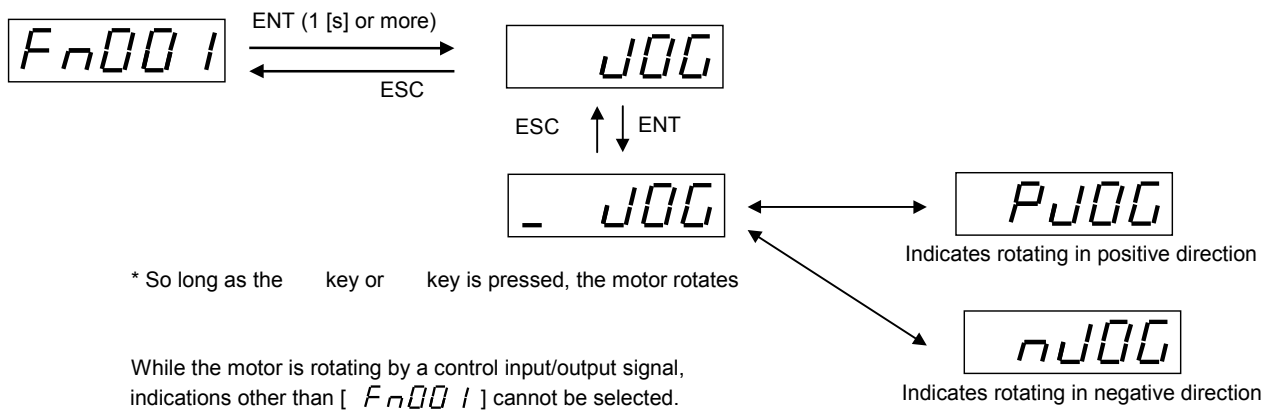
In the test running mode, keying on the keypad panel can rotate the motor or reset the different items.

Upon displaying [*F_n000*] by the MODE key, holding down the ENT key for at least 1 [s] executes a test running.

<i>F_n001</i>	: Manual feed	<i>F_n005</i>	: History initialization
<i>F_n002</i>	: Origin return	<i>F_n006</i>	: Parameter initialization.
<i>F_n003</i>	: Position preset	<i>F_n007</i>	: Positioning data initialization
<i>F_n004</i>	: Alarm reset	<i>F_n008</i>	: Automatic offset adjust

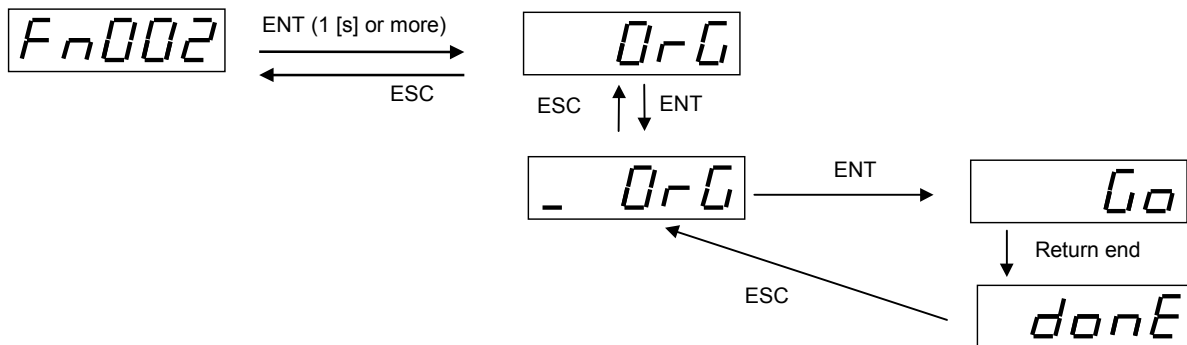
(1) Manual feed (*F_n001*)

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_n002*)

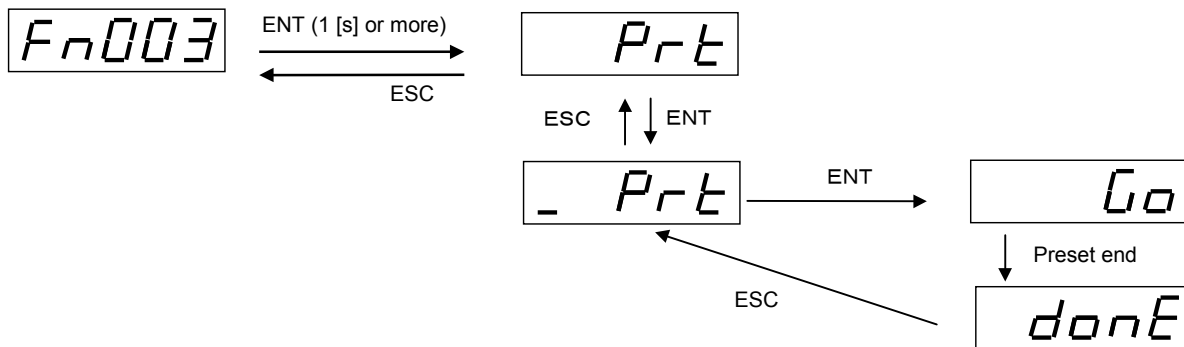
Keying on the keypad panel performs an origin return. The origin return is made according to basic para. 72 to 77. Change of basic para. 72 and 73 settings is valid only after turning off and on power.



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



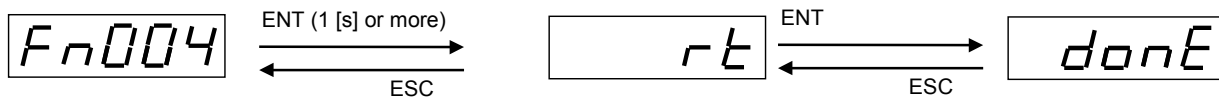
Current position is the followings :

- (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)

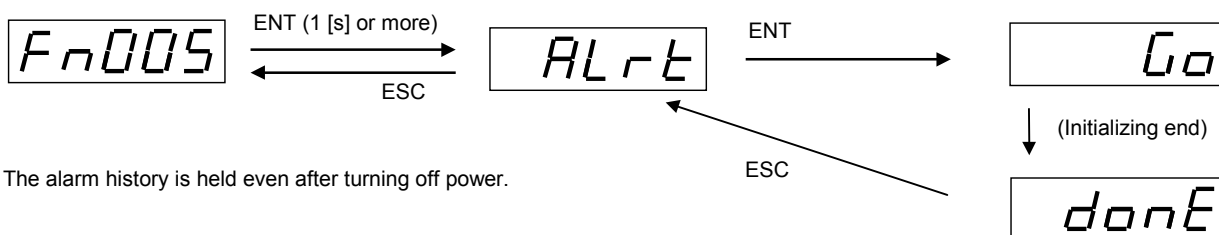
Resets the alarm detected by the amplifier.



(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].

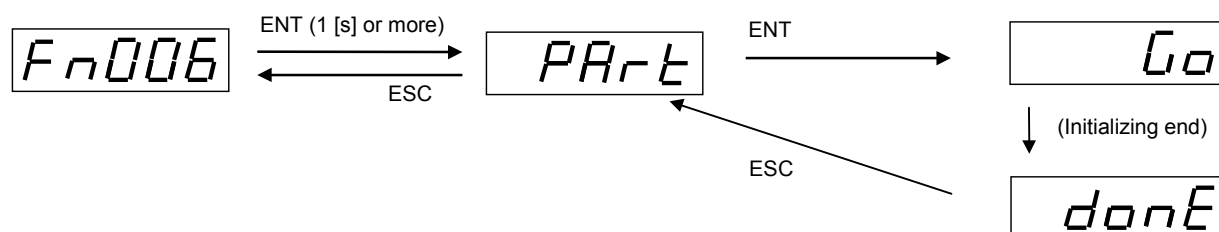


The alarm history is held even after turning off power.

(6) Parameter initialization (Fn006)

Initializes the basic para. and system para.

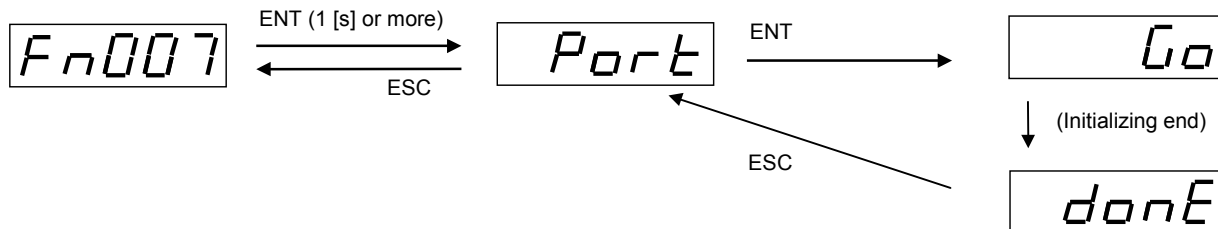
* After initializing, be sure to turn off and on power.



(7) Positioning data initialization (*F_{n007}*)

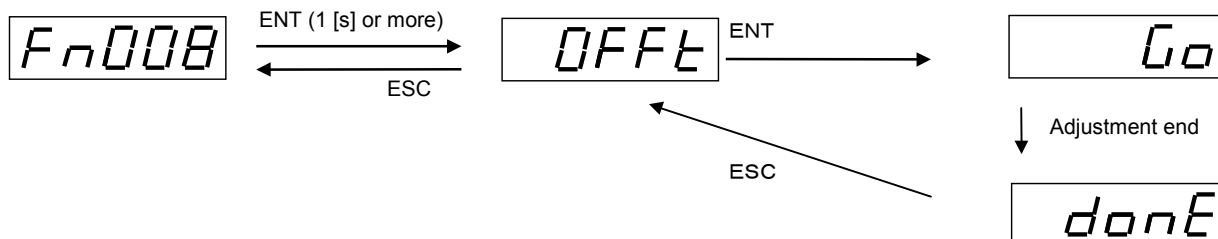
Initializes all positioning data.

* After initializing, be sure to turn off and on power.



(8) Automatic offset adjust (*F_{n008}*)

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 [*F_{n008}*] 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, $\frac{\perp}{\perp}$) 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

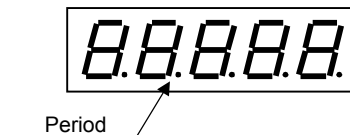
Supply the main circuit power to the amplifier. If the status is as follows, the amplifier is operating properly.

■ LED indication

When power is supplied, the "CHARGE" LED under the keypad panel of amplifier is lit red.

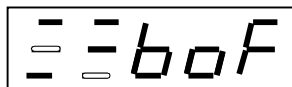
■ 7-segment indication

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.



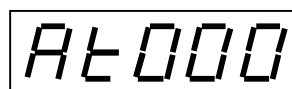
• SX bus (SX bus direct connection)

If the para. are as set at factory, the station number of sequence mode appears.



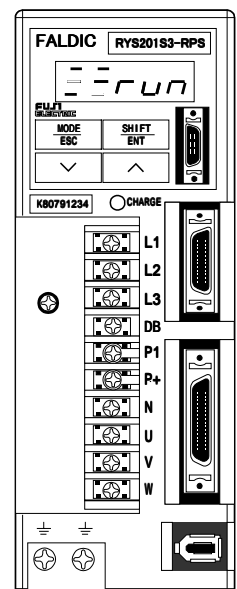
• T-link (T-link direct connection)

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

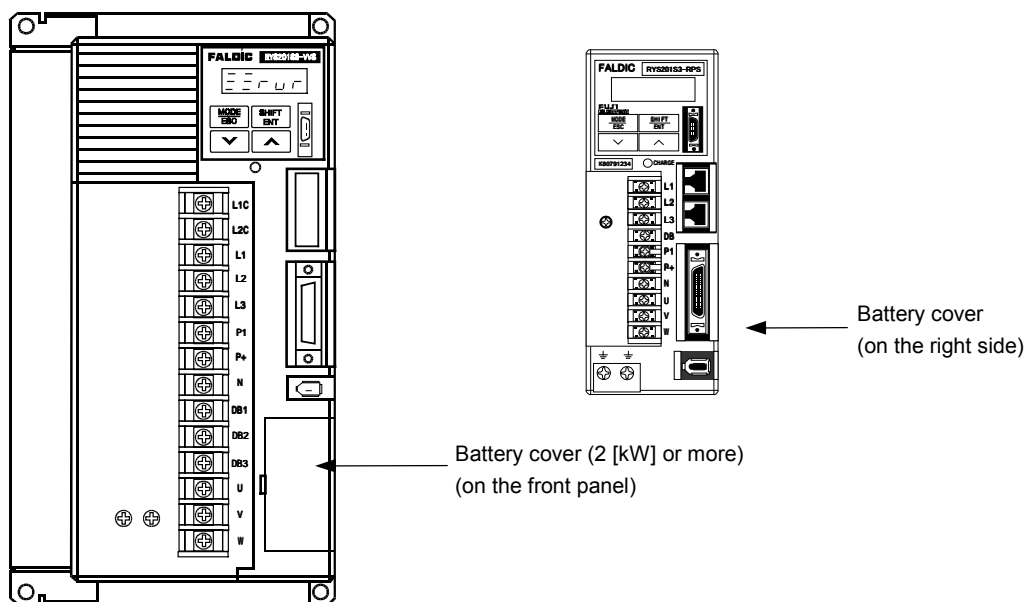
Install a battery (WSB-S type) on the amplifier as follows.

(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".

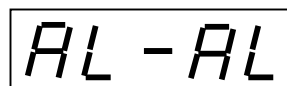
(c) Turning off power

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

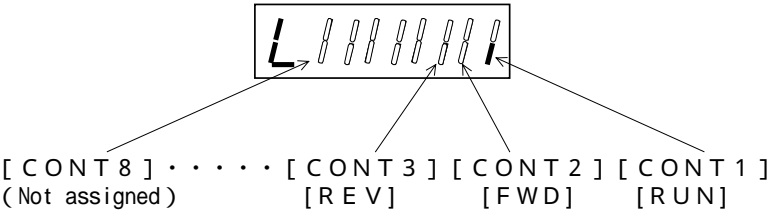
In the monitor mode of the keypad panel, the control input signal on/off status can be checked.

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.

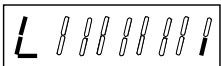
Key operation	Indication (example)	Remark
		Example of test running mode display
		The MODE key selects a mode.
		Select the monitor mode.
		By the key or key, select [On012].
		Holding down the ENT key for at least 1 [s] allows to check the input signal on/off.

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 [==run].

- (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.


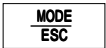






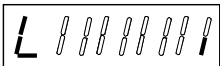
8.4 SX bus (SX bus direct connection)

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)

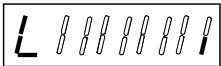
Key operation	Indication display (example)	Remark
		Example of test running mode display
		The MODE key selects a mode.
		Select the monitor mode.
		By the key or key, select [On012]
		Holding down the ENT key for at least 1 [s] allows to check the input signal ON/OFF.

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 (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 2	CSEL 1	CSEL 0	Para. current No.							
7	RDY	W PSET	CPU ready	Data error	Address error	-	-	-	-	-	-	-	-	-	Rewrite end	Read 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 preset	-	-	-	Rewrite command	Read command

8.5 T-link (T-link direct connection)


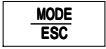







The T-link direct connection type amplifier operates according to the on/off status of WB area.

(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.

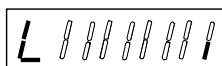
(a) Supply power to the amplifier.

(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.) Direct exposure to water, steam or oil Misalignment of mechanical coupling at shaft extension
Amplifier	Loose screws of terminal block (board) and fastening parts Excessive accumulation of dust 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.

Par t

The initialization is impossible while the motor is energized with the [RUN] signal on.

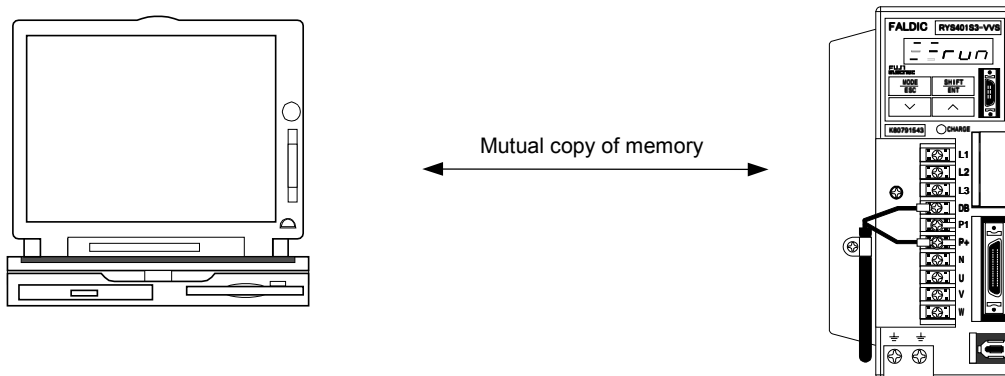
(c) Initialization of alarm detection history

The alarm detection history is held at all times. It can be initialized by the history initialization [*F n005*] 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.

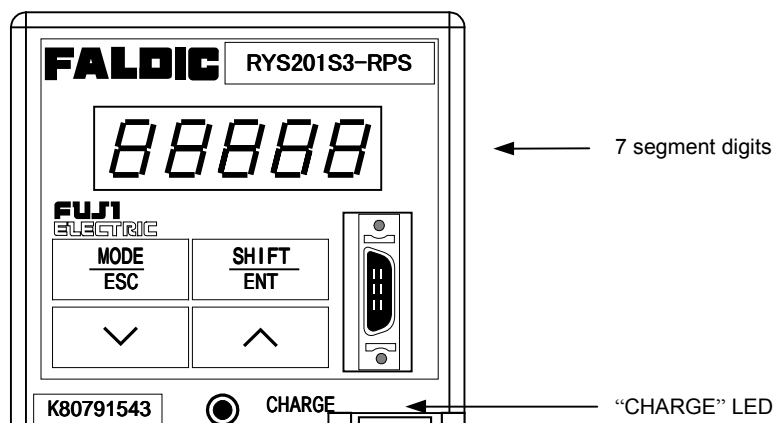
9.3 Fault display

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.



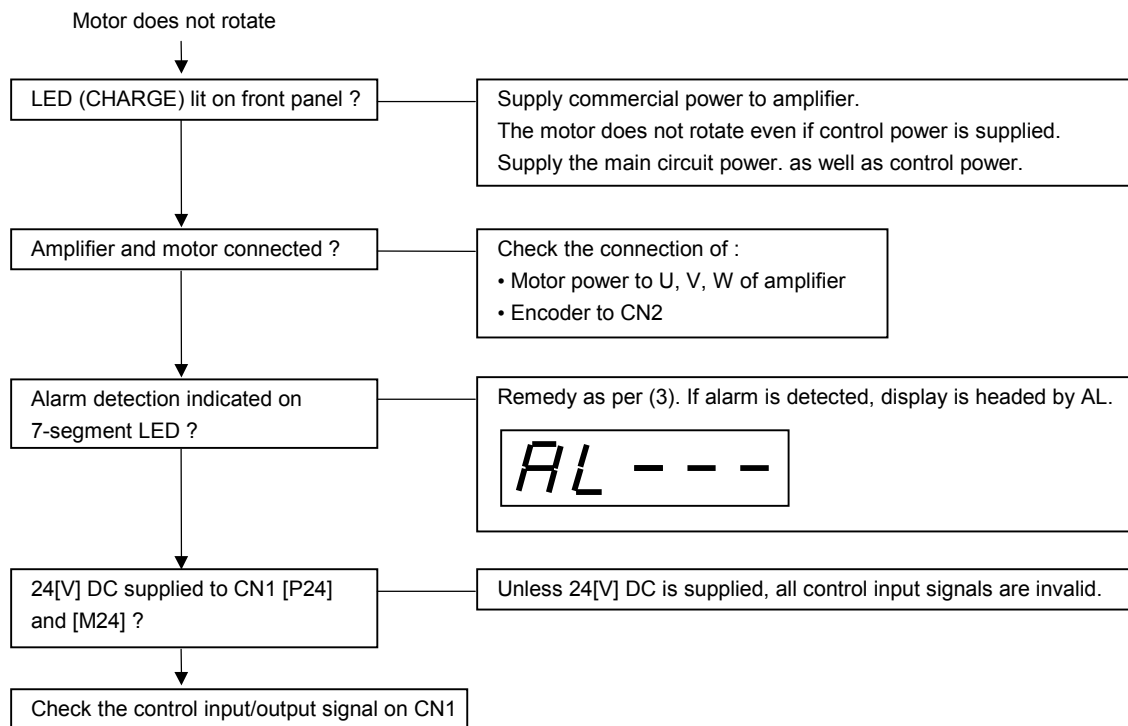
If turning on power displays nothing, contact us.

Supplying only the control power lights the display.

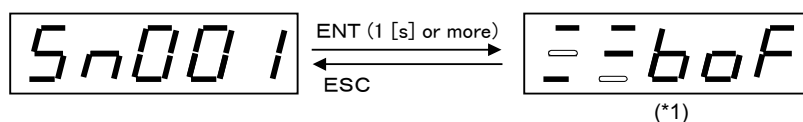
(2) When error (failure) is not displayed

The following exemplifies checkup procedure. As required, contact us.

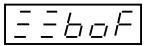
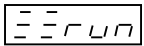
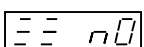
(a) Motor does not rotate



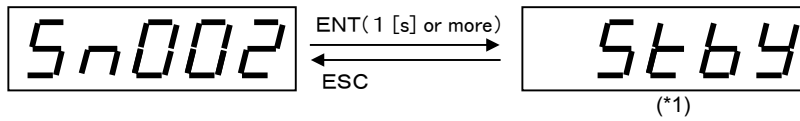
(i) Sequence display



(*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"> • Turn on the run command [RUN]. • Turn off the free-run command [BX].
	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



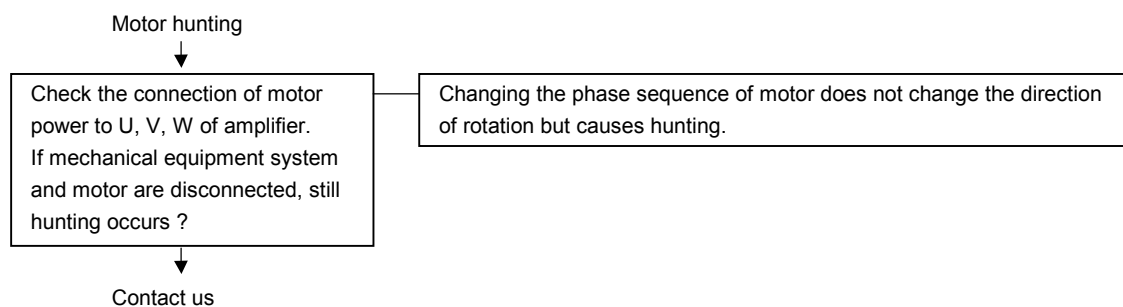
(*1) Displays the current present status

Indication	Description	Check and remedy
	In base-off condition, the motor has no driving force and in free-run status.	Turn on the run command [RUN]. Turn off the free-run command [BX].
	The motor can rotate and is waiting the run command.	Manual forward [FWD] may not be valid.
	The motor can rotate and is executing manual feed.	The motor is already rotating. Increase the analog input voltage or multistep speed setting.
	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.
	The motor can rotate and is executing positioning operation.	Increase the speed data.
	The motor can rotate and is executing origin return.	Increase the origin creep speed.
	The motor can rotate and is executing interrupt positioning.	-
	The amplifier is executing deviation clear.	Invalidate the deviation clear signal.
	The motor can rotate and is measuring the brake timing.	-
	The motor is stopping with positioning cancel signal.	Invalidate the positioning cancel signal.

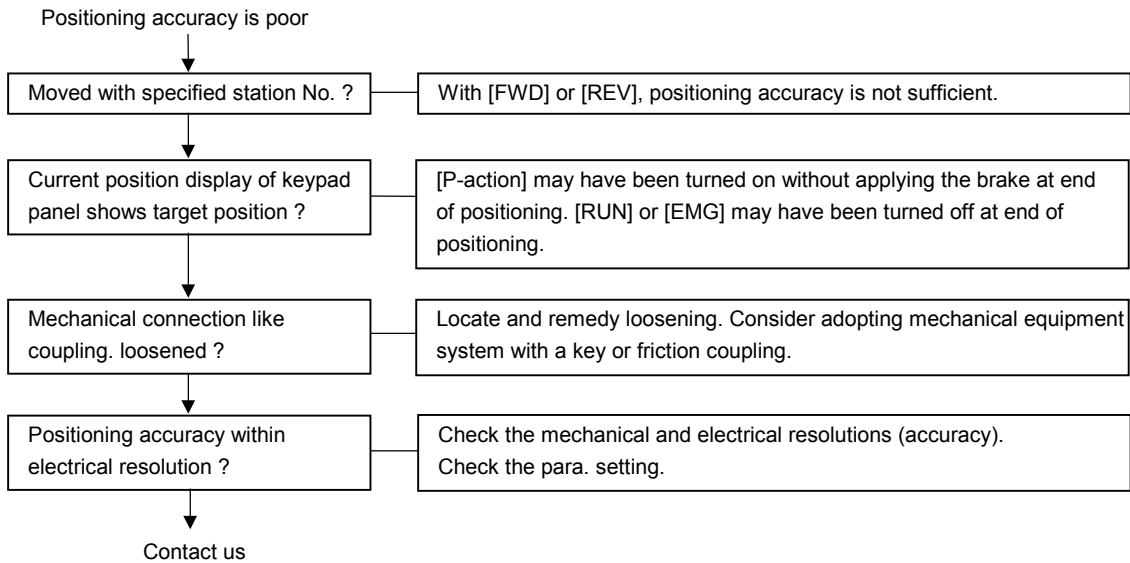
(b) Motor hunting rotation (motor shaft rotates forward/reverse repeatedly)

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.

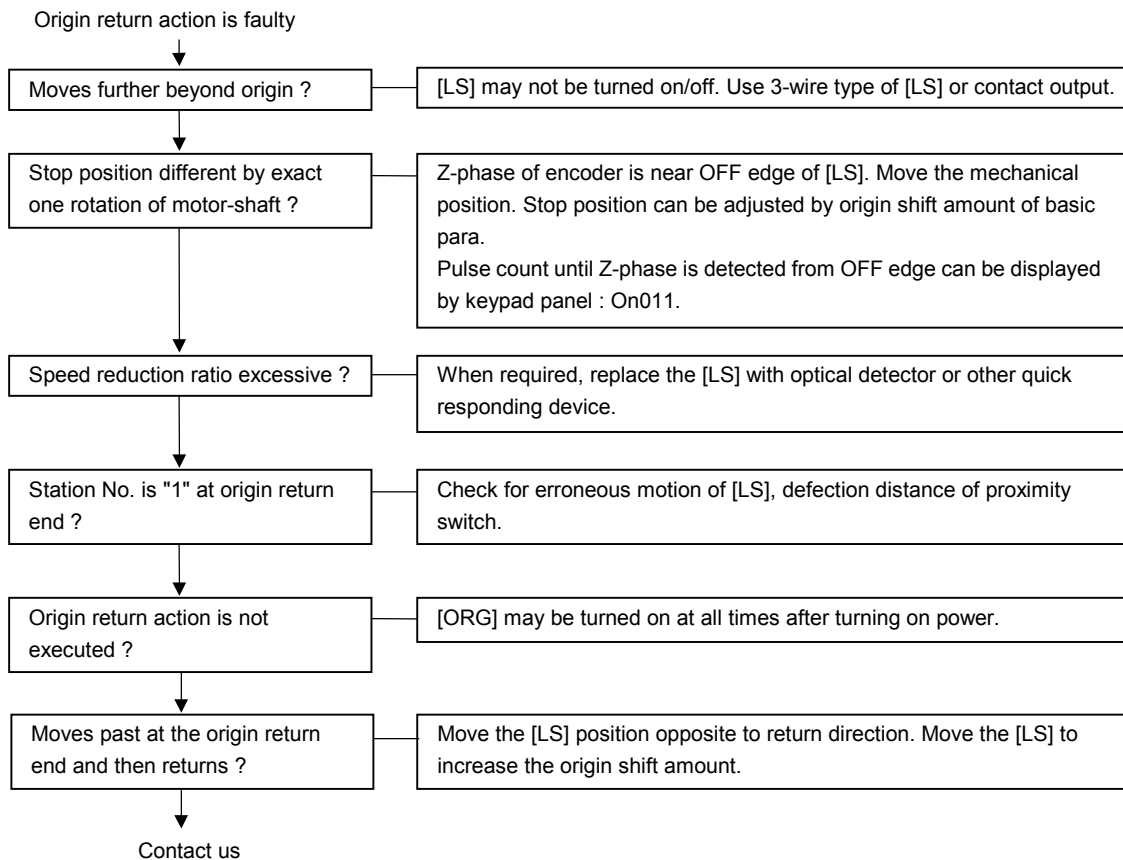
The real-time turning function is valid for most mechanical equipment systems except some examples. If it does not work, contact us.



(c) Positioning accuracy is poor



(d) Origin return action is faulty

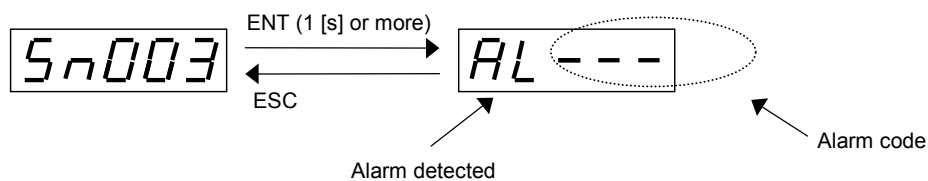


(3) Faults with alarm indication

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 Et	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

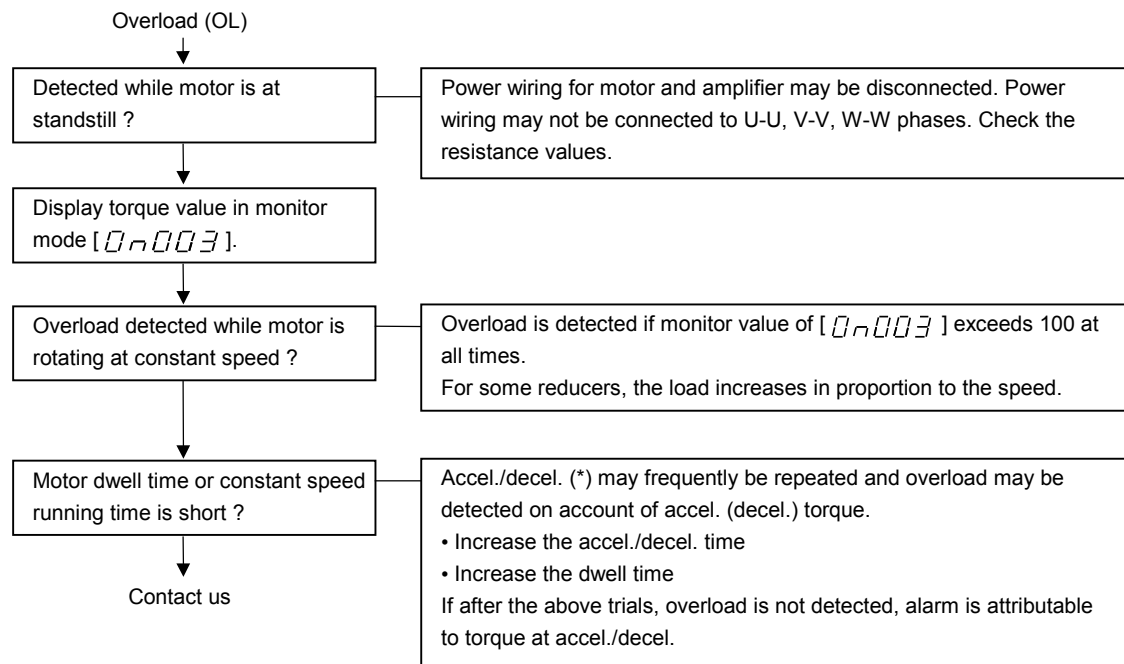
- Keypad panel display



- 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 [F n 0 0 3].

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.

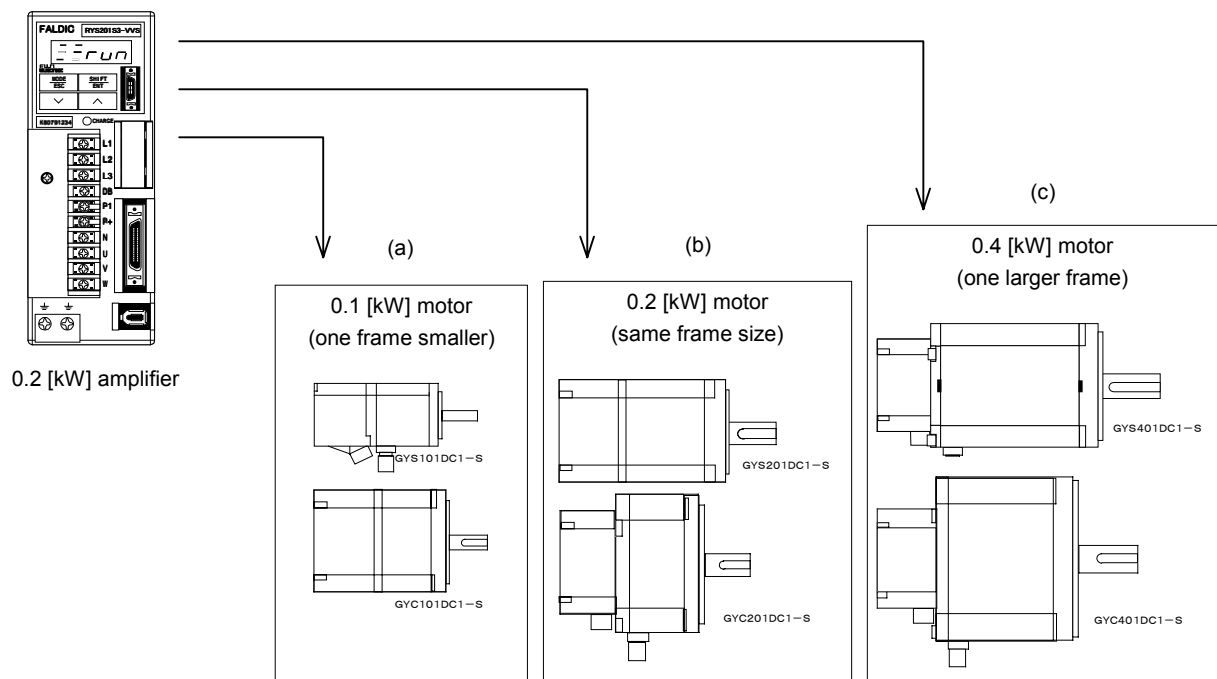
- Cause, check and remedy

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

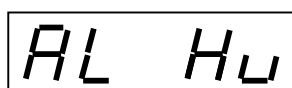
The supply voltage may have dropped on account of momentary failure, etc. or the power supply capacity may be poor.

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

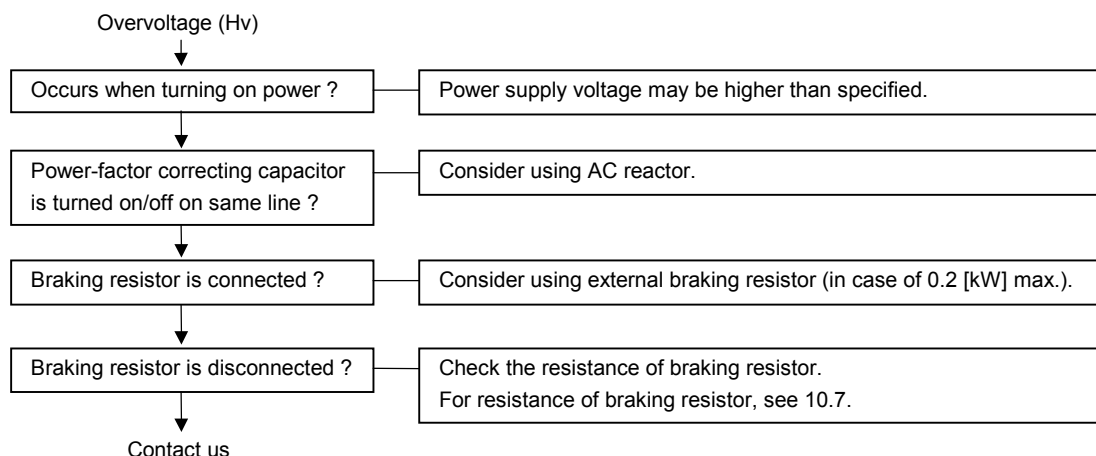
- Keypad panel display



- 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



- 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.

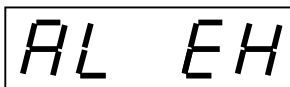
(k) Other protection functions

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



- 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



- 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

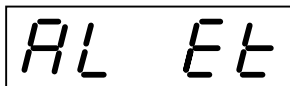
The control power supply circuit mounted on the amplifier is abnormal.

- 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 " $\frac{1}{\equiv}$ ") is about 1 [M Ω].

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.

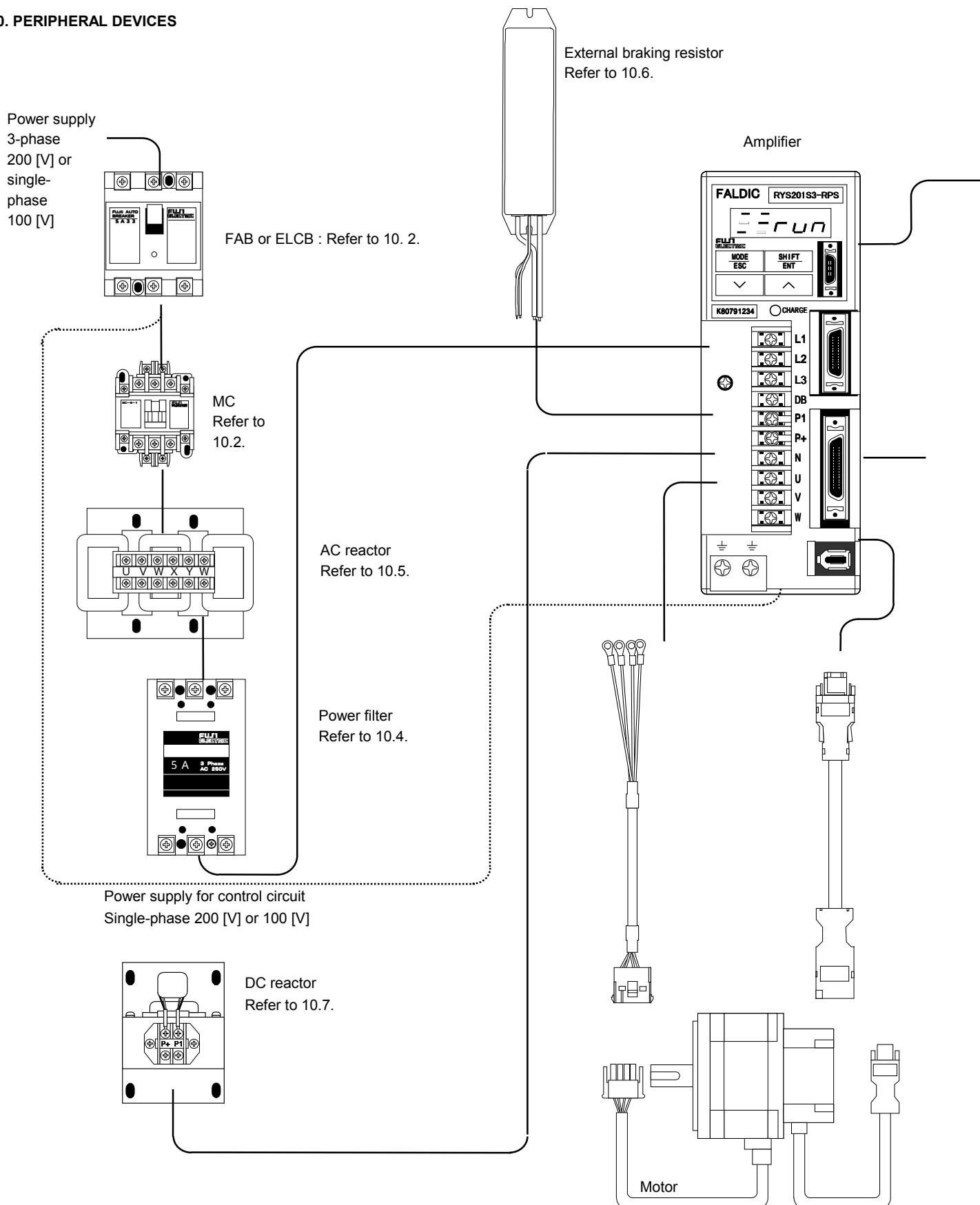
(c) Brake built in the motor

The expected-service-life will be approx. 20,000 operations at rated torque.

(d) Capacitor built in the amplifier

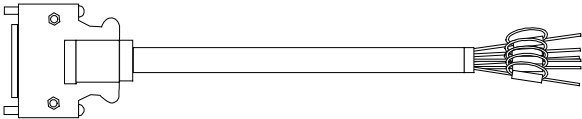
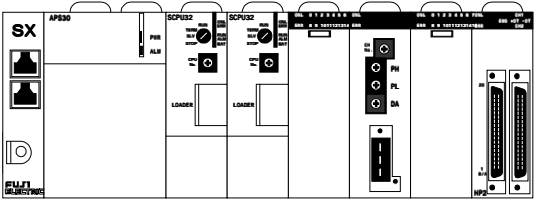
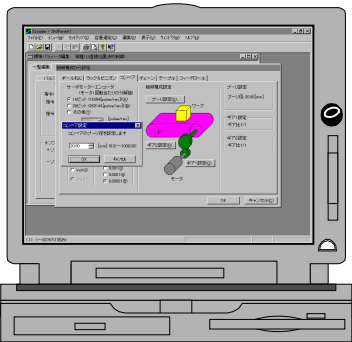
The amplifier incorporates large capacitors. Contact us when a replacement with new one is required.

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 ²]	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	50	
		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

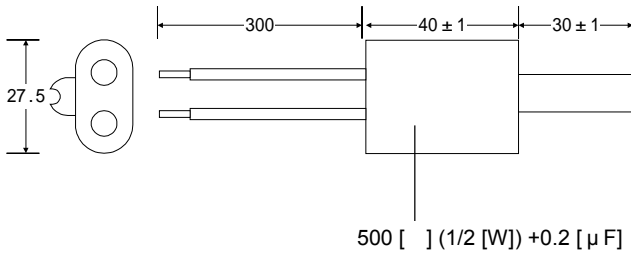
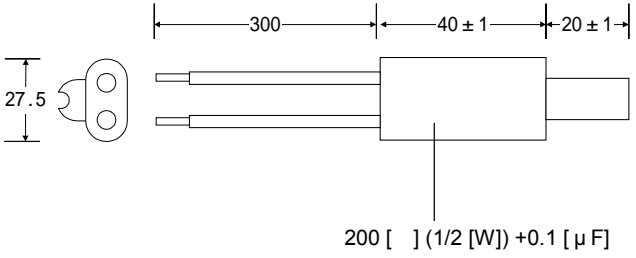
Amplifier output				[kW]	0.05	0.1	0.2
Amplifier type				RYS	S3-	6	
Fuji's Recommended type	For each amplifier	FAB	type	SA	33B/3	33B/5	33B/10
				current [A]	3	5	10
		ELCB type		EG	33B/3	33B/5	33B/10
	MC type			SC-	5-1(19A)		

10.3 Surge suppressor (surge killer)

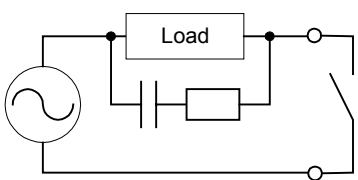
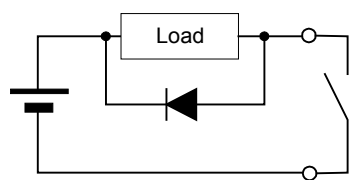
Shown below are recommended surge suppressors (for 250 [V] AC or less) to be installed on peripheral devices (magnetic contactor, solenoid, brake, etc.) of amplifier.

DC equipment should be equipped with a diode for surge voltage suppression.

[unit : mm]

For magnetic contactor, etc.	For control relay, etc.
<p>Type : S2-A-O</p>  <p>500 [V] (1/2 [W]) +0.2 [μF]</p>	<p>Type : S1-B-O</p>  <p>200 [V] (1/2 [W]) +0.1 [μF]</p>

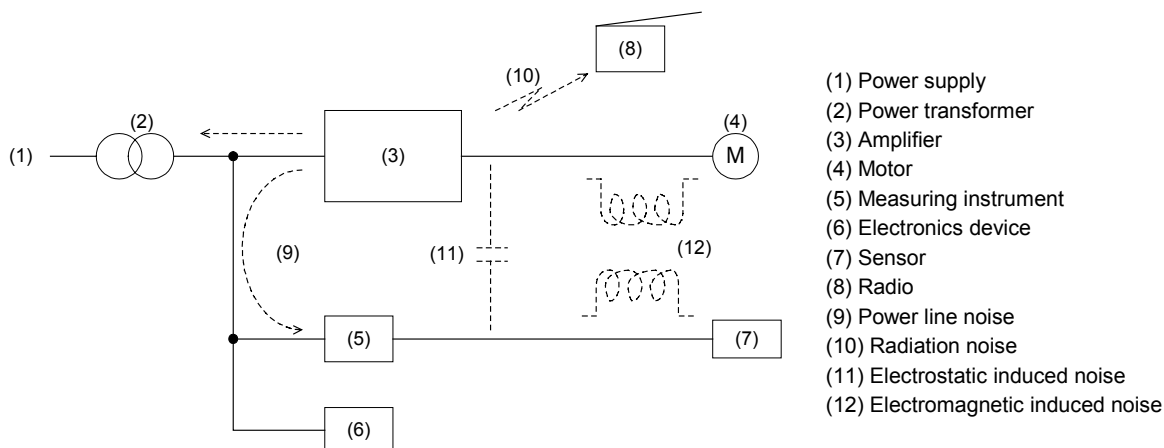
Protection circuit, example

AC circuit (C-R circuit)	DC circuit (diode)
	

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.

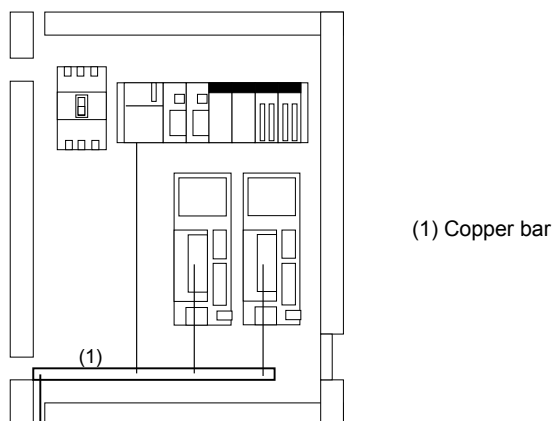


(a) Installation of amplifier in a grounded steel container. Avoid close installation with personal computer and measuring instrument.

(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						
			500, 101	201	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
	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

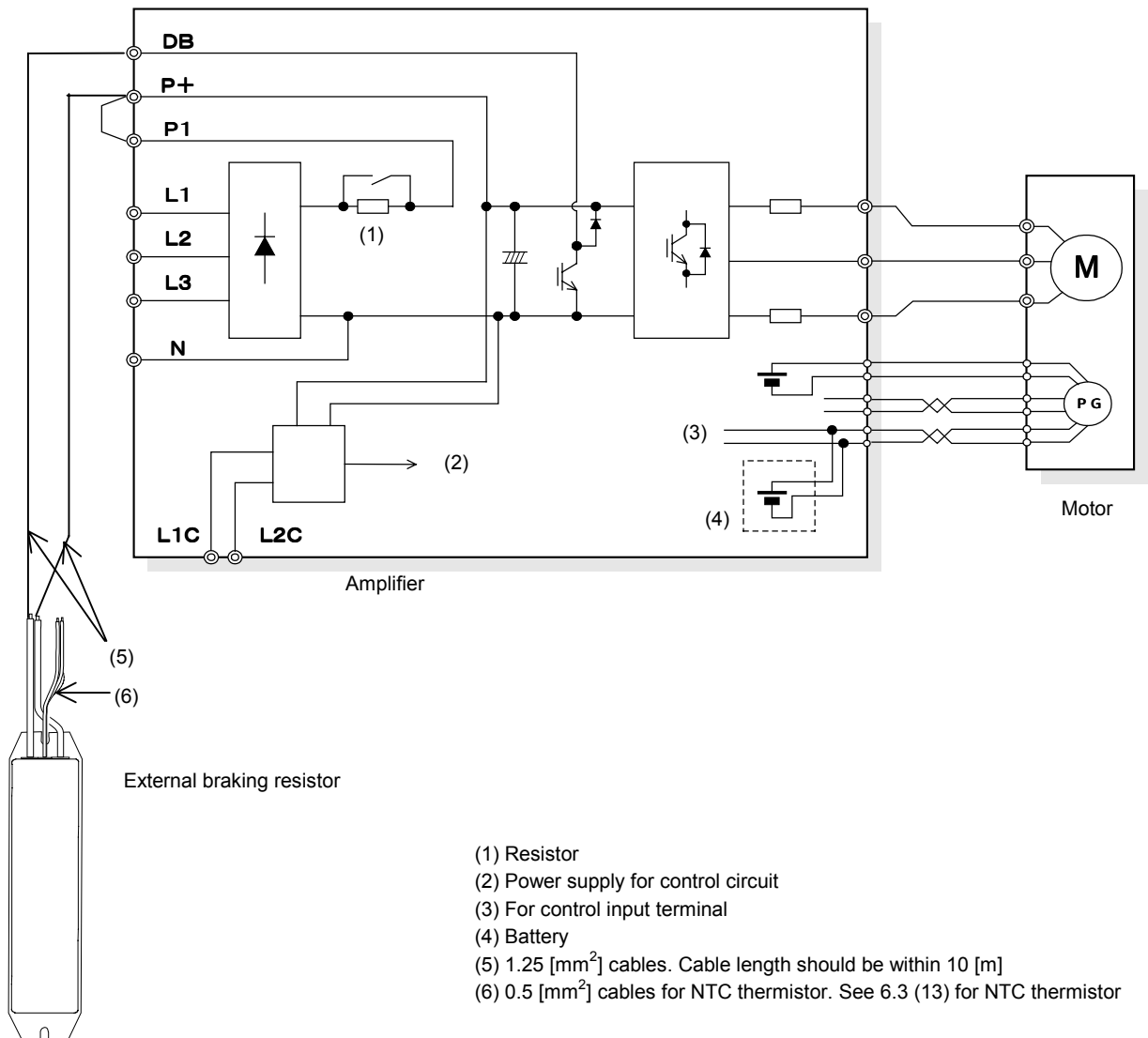
Input voltage class [V]		100		200						
Amplifier output [kW]		0.05, 0.1	0.2	0.03 to 0.2	0.4	0.75	1, 1.5	2, 3	4, 5	
Amplifier type	RYS S3-	6								
		500, 101	201	300 to 201	401	751	102, 152	202, 302	402, 502	
Resistor	type	WSR-401				WSR-751	WSR-152	DB11-2	DB22-2	
	(**) [W]	17				25	75	115		
Resistance [Ω]		68				15		10	5.8	
Built-in resistor	(**) [W]	Not applicable	12	Not applicable	12	20	30	60		
	[Ω]		68		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]
	751		2.5	
	152	150 ± 10		
DB	11-2			120 [V] AC/30 [V] DC, 0.1 [A]
	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.

$$\text{Unbalance rate of power supply voltage [\%]} = \frac{\text{Max. voltage [V]} - \text{Min. voltage [V]}}{\text{3-phase average voltage [V]}} \times 100$$

(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

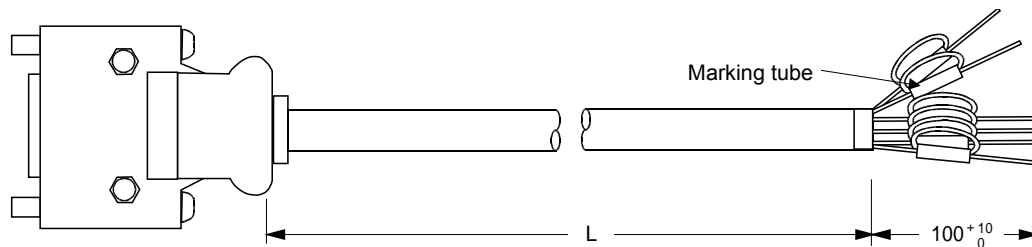
10.8 Optional cables, connector kits, battery and external braking resistors

(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

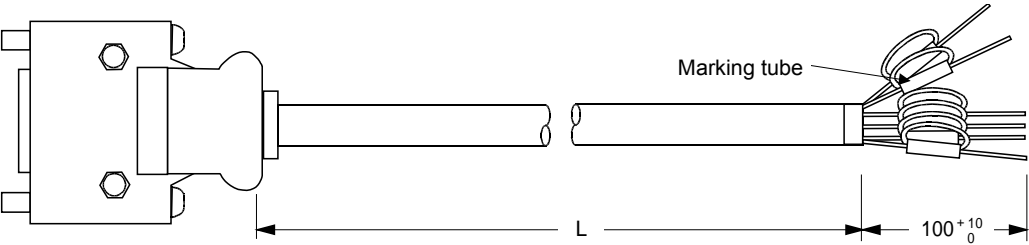
(ii) Wire color

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

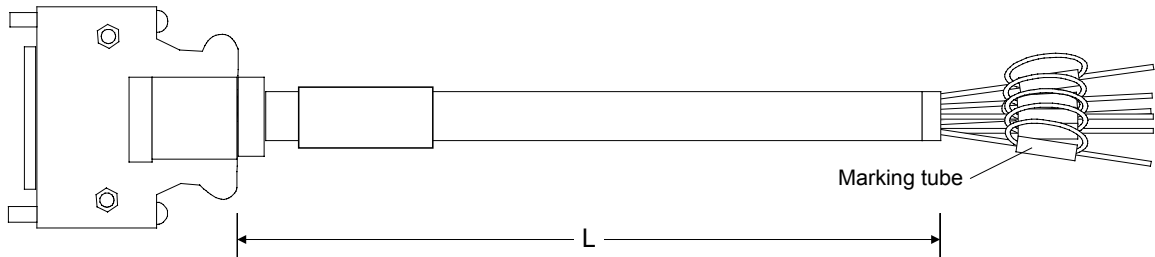
(iii) Cable length (L) and mass

Cable type	L [mm]	Mass [g]
WSC-D26P03	3000 ⁺³⁰⁰ ₀	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

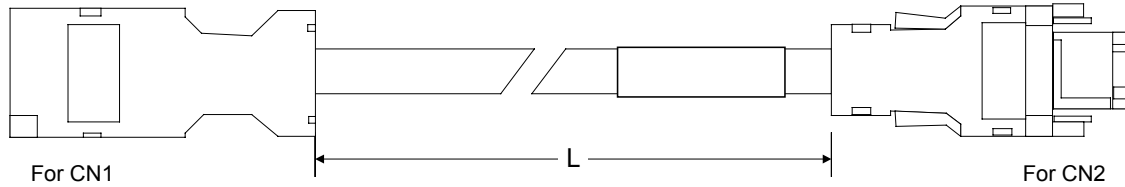
(iii) Cable length (L) and mass

Cable type	L [mm]	Mass [g]
WSC-D36P03	3000 ⁺³⁰⁰ ₀	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

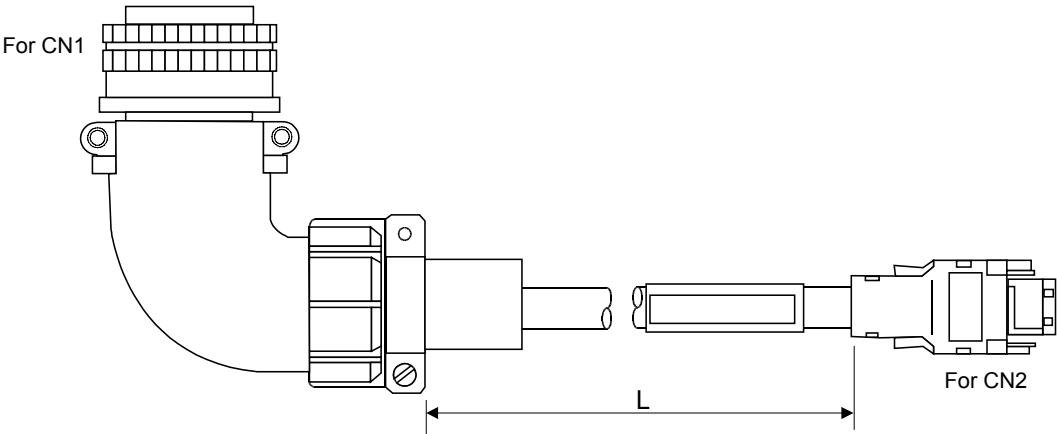
Cable type	L [mm]	Mass [g]
WSC-P06 P05	5000 ⁺⁵⁰⁰ ₀	300
	P10	10000 ⁺¹⁰⁰⁰ ₀
	P20	20000 ⁺²⁰⁰⁰ ₀



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

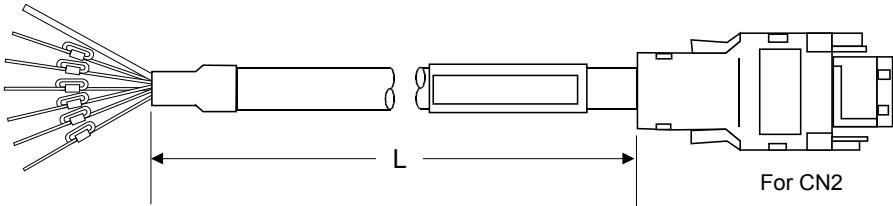
(ii) Wire color

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 ⁺⁵⁰⁰ ₀	450
	P10-C	10000 ⁺¹⁰⁰⁰ ₀	650
	P20-C	20000 ⁺²⁰⁰⁰ ₀	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
					Red	Blue

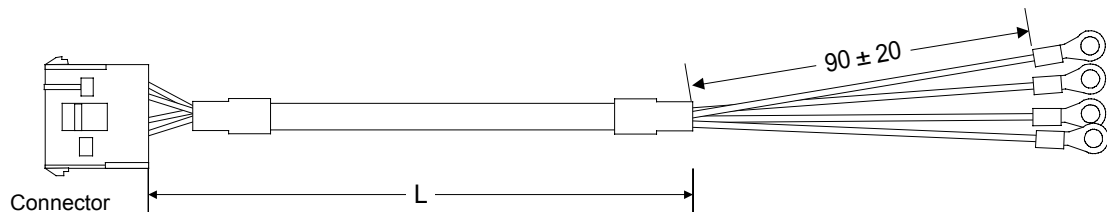
(iii) Cable length (L)

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

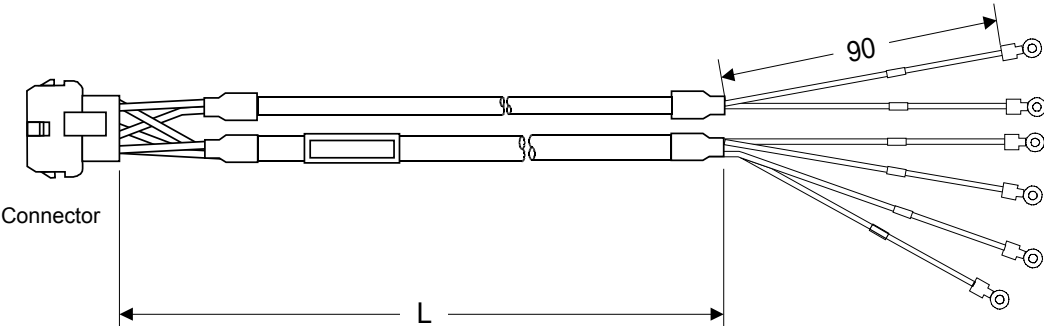
(ii) Wire color

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

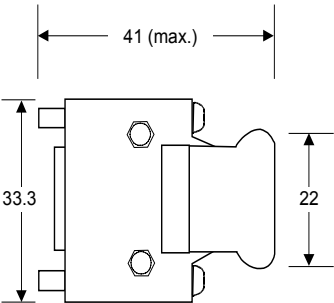
Pin No. for CN1	1	2	3	4	5	6
Marking	U	V	W	E		
Wire color	Red	White	Black	Green / Yellow	Red	Black

(iii) Cable length (L) and mass

Cable type	L [mm]	Mass [g]
WSC-M06 P05	5000 ⁺⁵⁰⁰ ₀	900
	P10	10000 ⁺¹⁰⁰⁰ ₀
	P20	20000 ⁺²⁰⁰⁰ ₀

(2) Connector kits [unit : mm]

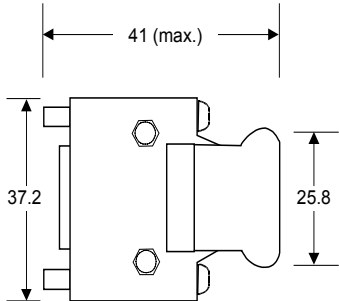
(a) Control input/output (expanded I/O for L, R types)
 Connector kit type : WSK-D20P (20-pin)
 Application : CN3 of RYS S3-LPS, RPS amplifier



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

Mass : 20 [g]

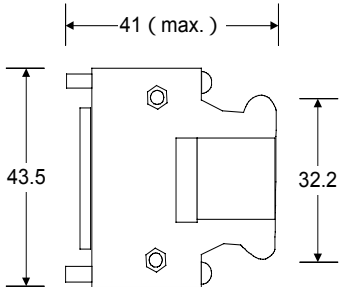
(b) Control input/output (SX bus, T-link, RS-485)
 Connector kit type : WSK-D26P (26-pin)
 Application : CN1 of other than the RYS S3-VVS, LPS, RPS amplifier



Plug	10126 - 3000VE
Shell kit	10326 - 52A0 - 008

Mass : 20 [g]

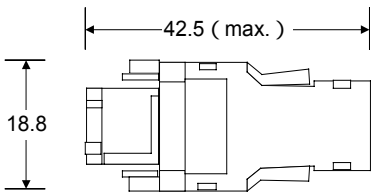
(c) Control input/output
 Connector kit type : WSK-D36P (36-pin)
 Application : CN1 of RYS S3-VVS, LPS, RPS amplifier



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



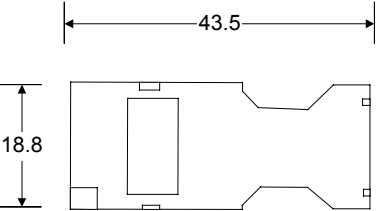
Mass : 10 [g]

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

(e) Encoder

Connector kit type for motor side (CN2) : WSK-P06P-F

Application : 0.75 [kW] and below



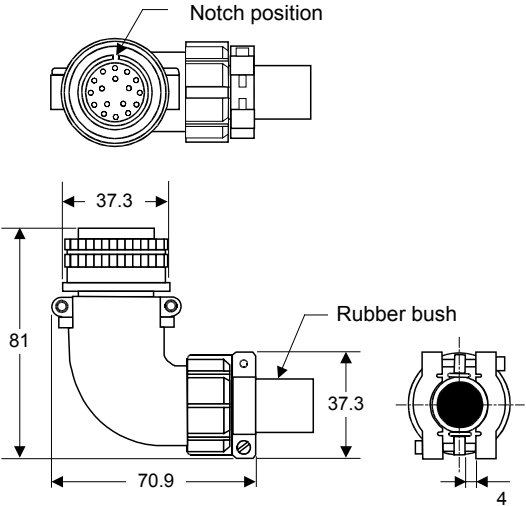
Mass : 10 [g]

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



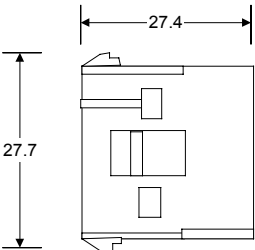
Connector	MS3108B20 - 29S
Cable clamp	MS3057 - 12A

Mass : 150 [g]

(g) Motor power for motor without providing brake

Connector kit type : WSK-M04P (4-pin)

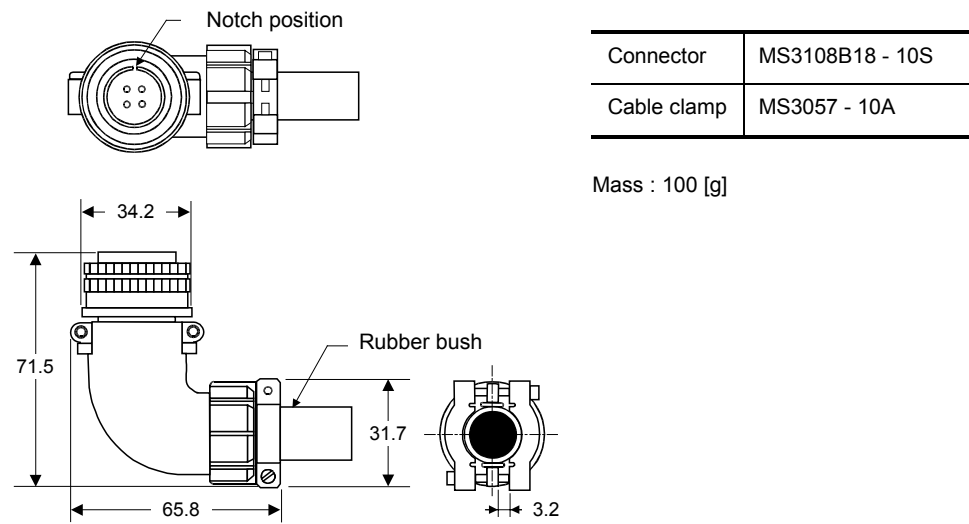
Application : 0.75 [kW] and below



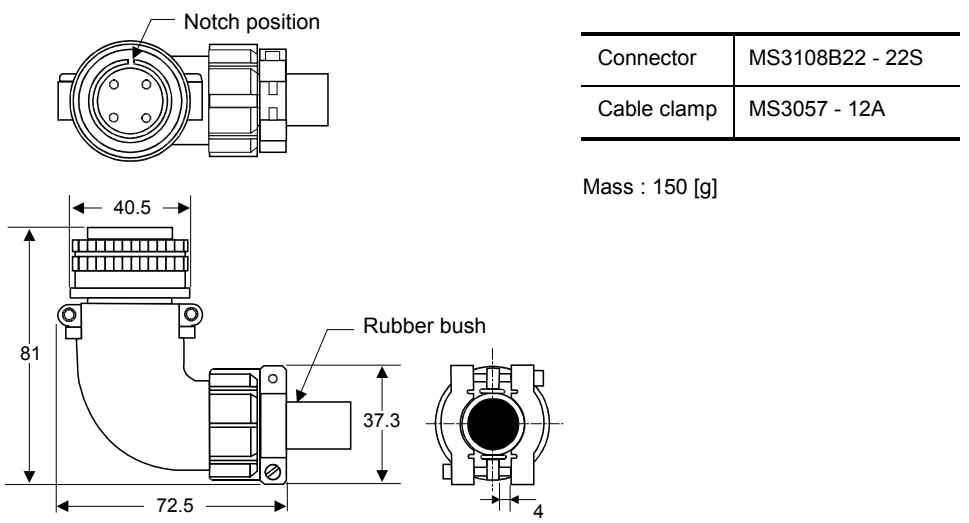
Cap	350780 - 1
Shell body, clamp side	350570 - 1 or 350689 - 3

Mass : 10 [g]

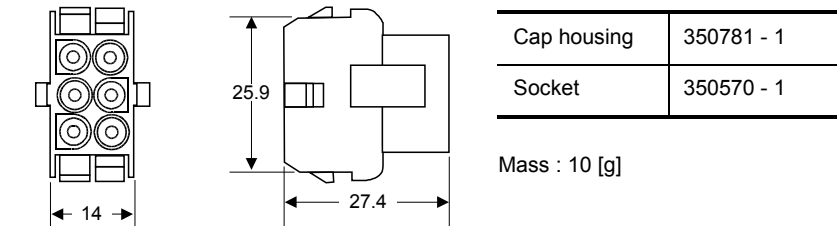
(h) Motor power for motor without providing brake
 Connector kit type : WSK-M04P-CA (4-pin)
 Application : GYS type motor 1 to 2 [kW]



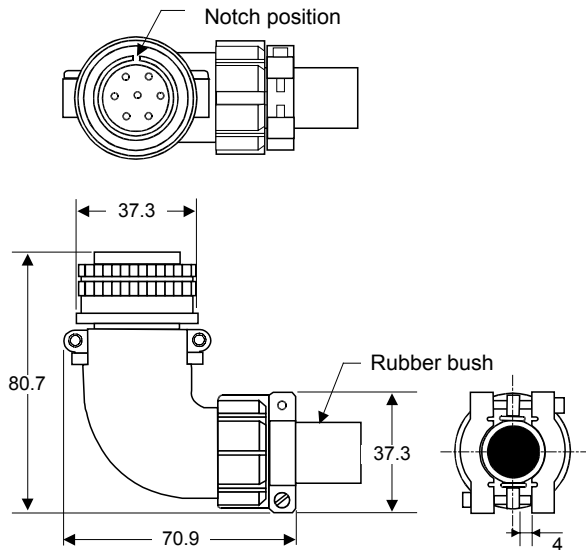
(i) Motor power for motor without providing brake
 Connector kit type : WSK-M04P-CB (4-pin)
 Application : GYC type motor 1 [kW] and above, GYS type motor 3 [kW] and above



(j) Motor power for motor with providing brake
 Connector kit type : WSK-M06P (6-pin)
 Application : 0.75 [kW] and below



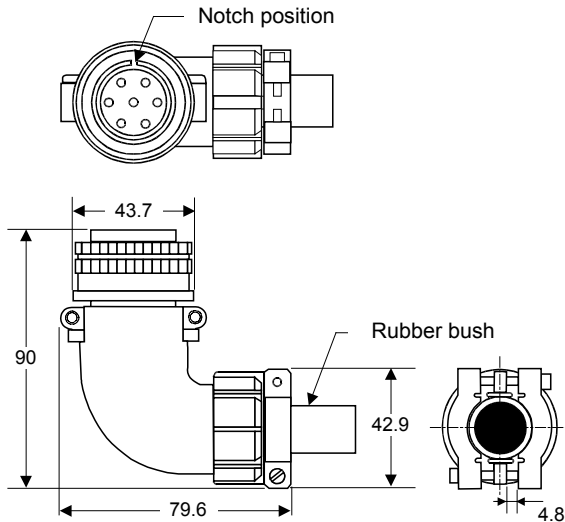
(k) Motor power for motor with providing brake
 Connector kit type : WSK-M06P-CA (6-pin)
 Application : GYS type motor 1 to 2 [kW]



Connector	MS3108B20 - 15S
Cable clamp	MS3057 - 12A

Mass : 150 [g]

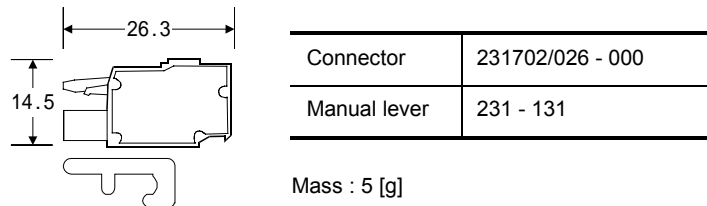
(l) Motor power for motor with providing brake
 Connector kit type : WSK-M06P-CB (6-pin)
 Application : GYC type motor 1 [kW] and above, GYS type motor 3 [kW] and above



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

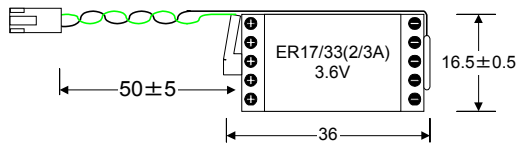


Connector	231702/026 - 000
Manual lever	231 - 131

Mass : 5 [g]

(n) Battery

Connector kit type : WSB - S



Battery	ER1733WK41 1PP
<ul style="list-style-type: none"> • Nominal voltage : 3.6 [V] • Capacity : 1500 [mAh] • Mass : 15 [g] 	

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.

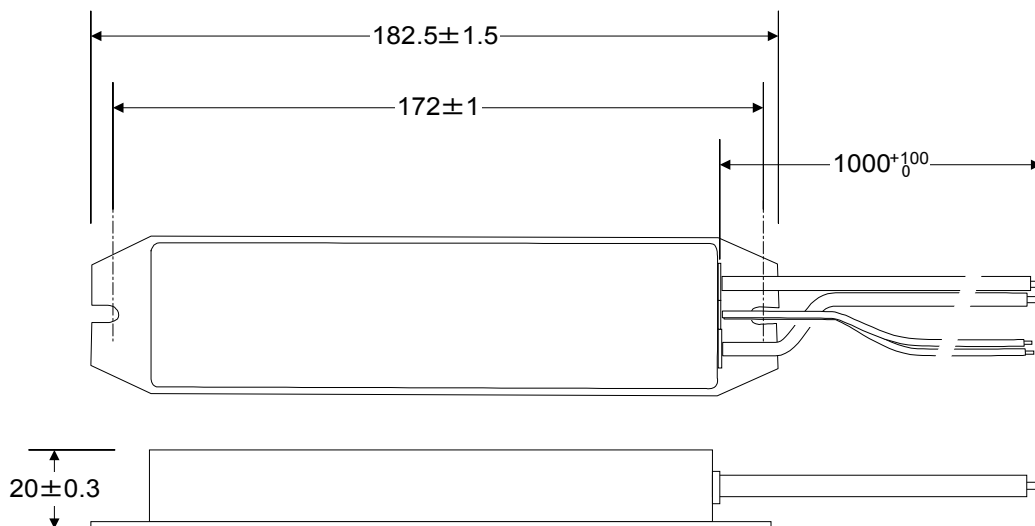
Surrounding condition should be kept within -10 to $+75^{\circ}\text{C}$ temperature and 10 to 90% RH humidity.

Storage term should be within two years.

(3) External braking resistor [unit : mm]

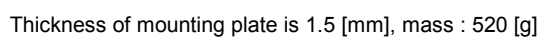
(a) Resistor type : WSR-401

Application : RYS type amplifier 0.4 [kW] and below

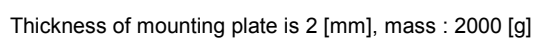


Thickness of mounting plate is 1.2 [mm], mass : 235 [g]

Application : RYS type amplifier 0.75 [kW]

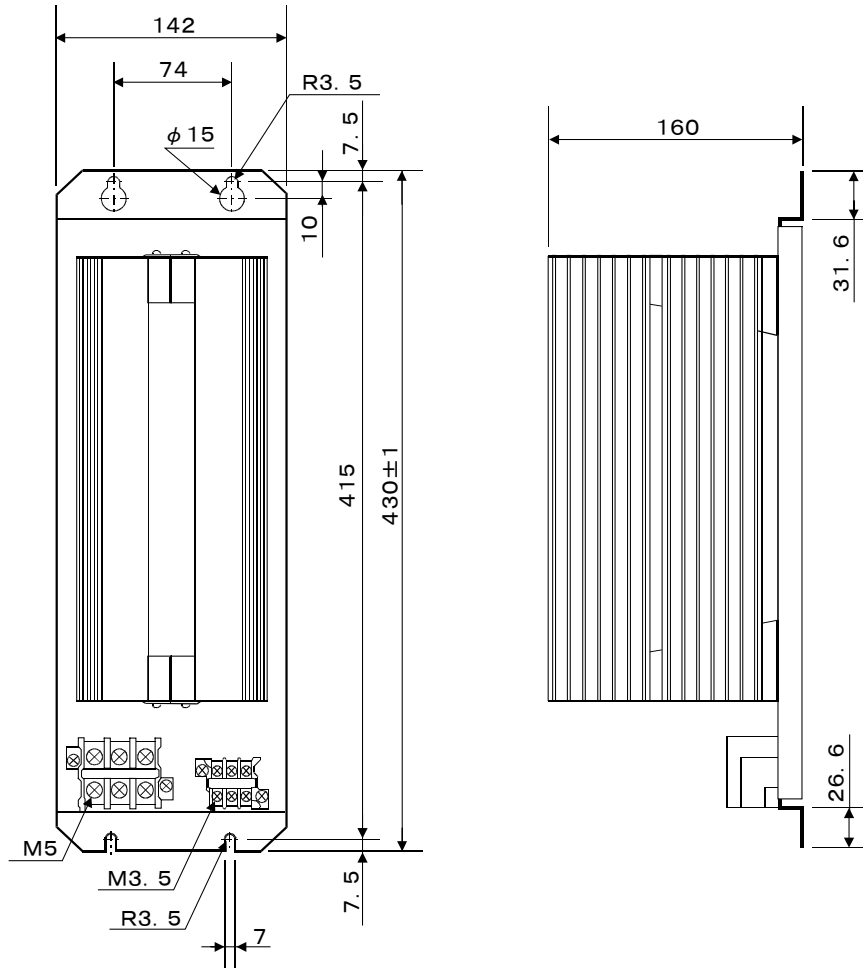


Application : RYS type amplifier 1 and 1.5 [kW]



(d) Resistor type : DB11-2

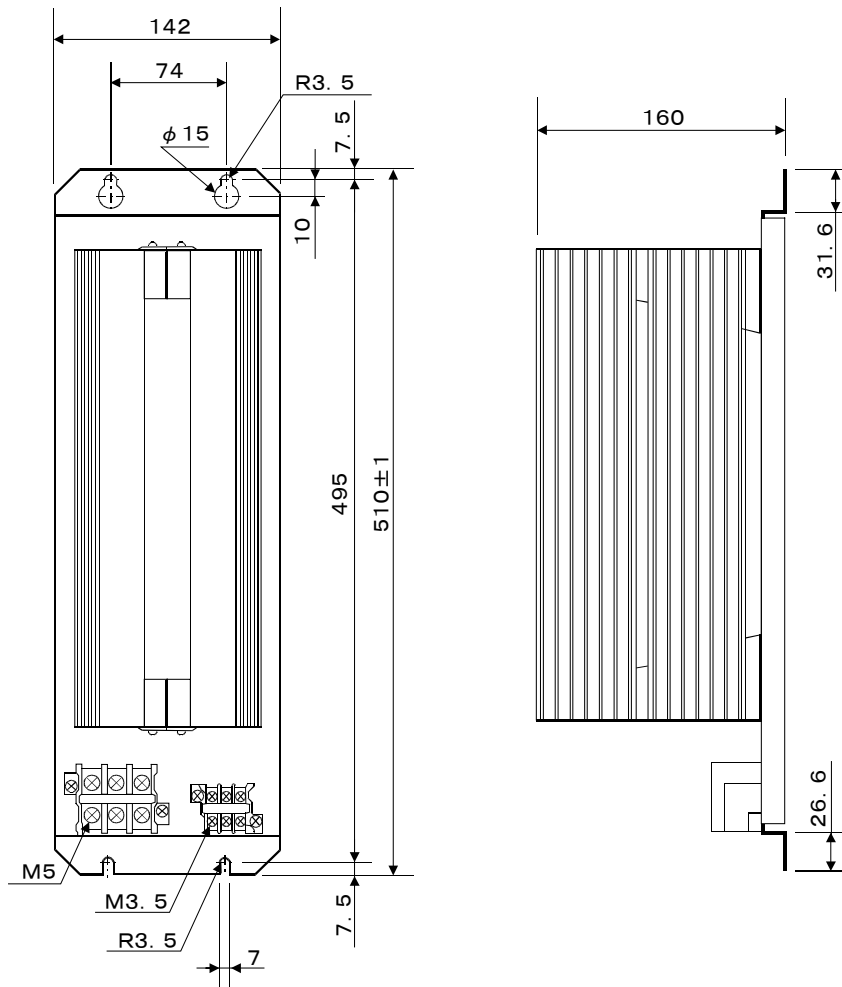
Application : RYS type amplifier 2 and 3 [kW]



Thickness of mounting plate is 1.6 [mm], mass : 6900 [g]

(e) Resistor type : DB22-2

Application : RYS type amplifier 4 and 5 [kW]



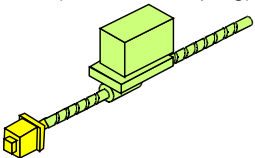
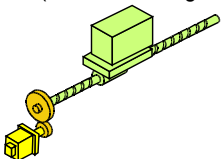
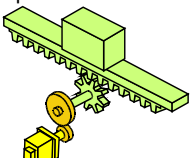
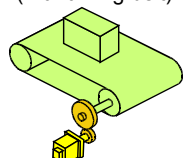
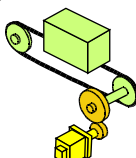
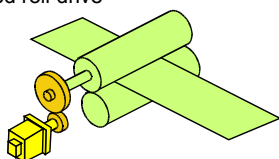
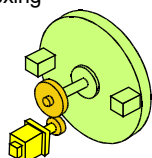
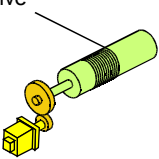
Thickness of mounting plate is 1.6 [mm], mass : 8700 [g]

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) 	Used for high-accuracy positioning in a short distance.
Ball-screw (with reduction gear) 	Load torque is increased through deceleration. Compensation is required for gear backlash.
Rack and pinion 	Used for positioning in a long distance. Movement per revolution of pinion involves a value. compensation is required.
Conveyor (with timing belt) 	Used for light loads. compensation is required.
Chain drive 	Mostly used for transfer line, etc. For positioning, countermeasures for chain elongation is needed. Reduction ratio is large. Moving speed of load machine system is low.
Feed roll drive 	A material having a plate shape is emitted and sandwiched between rolls. An error appears over a large length due to a difference in roll diameter. compensation is required. Feed amount becomes inadequate due to slip at rapid accel./decel..
Table indexing 	A large reduction speed ratio is required for a large inertia moment of the machine table. Rotational speed of the table is low and a worm-gear is often used.
Spindle drive 	In winding of wire material, etc., inertia moment becomes larger. Larger reduction speed is necessary. 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 μ

Application	μ
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

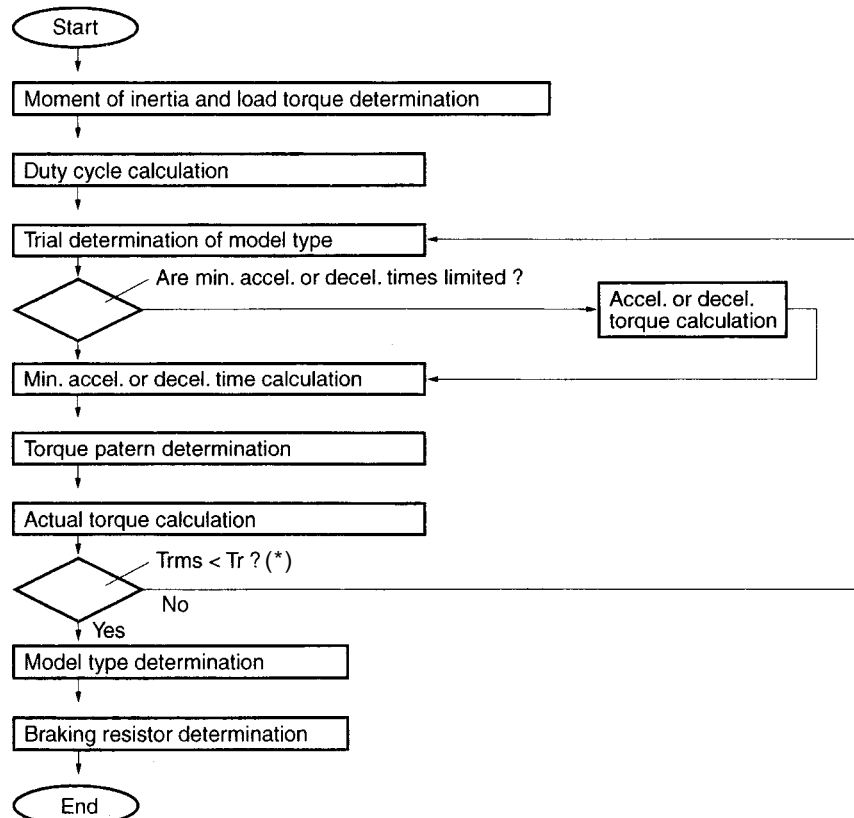
Application		
Screw		0.5 to 0.8
Ball-screw		0.9
Rack and pinion		0.8
Spur gear reduction		0.8 to 0.95
Worm reduction gear	At start	0.5 to 0.7
	During operation	0.6 to 0.8
Belt drive		0.95
Chain drive		0.9

(iii) Densities of major materials $[\text{kg/m}^3]$

Steel	7850
Stainless steel	7910
Copper	8960
Aluminum	2700
Brass	8540
Poly-acetal	1430

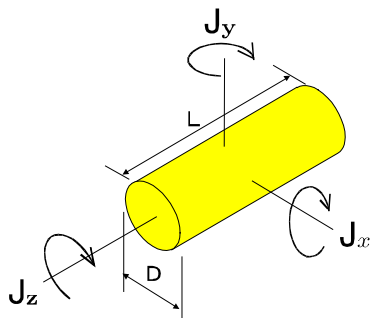
(2) Model type selection determination

(a) Flow chart for selecting a model type



(*) : Trms : Actual torque
Tr : Rated torque

(b) Moment of inertia, basic form

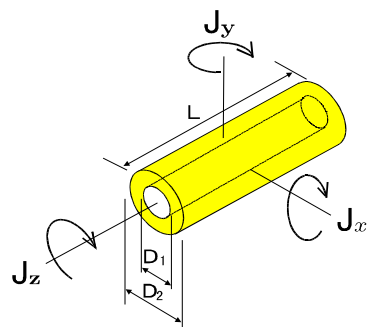


$$J_z = \frac{W}{8} \left(\frac{D}{10^3} \right)^2$$

$$= \frac{1}{32} \left(\frac{L}{10^3} \right) \left(\frac{D}{10^3} \right)^4$$

$$J_x = J_y = \frac{W}{16} \left(\frac{D}{10^3} \right)^2 + \frac{W}{12} \left(\frac{L}{10^3} \right)^2$$

$$W = \frac{1}{4} \left(\frac{L}{10^3} \right) \left(\frac{D}{10^3} \right)^2$$

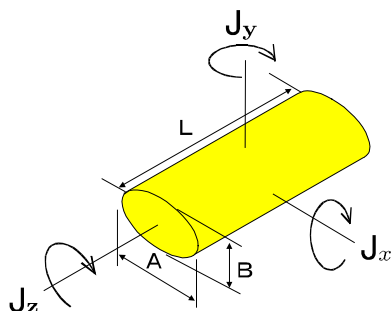


$$J_z = \frac{W}{8} \left[\left(\frac{D_2}{10^3} \right)^2 - \left(\frac{D_1}{10^3} \right)^2 \right]$$

$$= \frac{1}{32} \left(\frac{L}{10^3} \right) \left[\left(\frac{D_2}{10^3} \right)^4 - \left(\frac{D_1}{10^3} \right)^4 \right]$$

$$J_x = J_y = \frac{W}{16} \left[\left(\frac{D_2}{10^3} \right)^2 - \left(\frac{D_1}{10^3} \right)^2 \right] + \frac{W}{12} \left(\frac{L}{10^3} \right)^2$$

$$W = \frac{1}{4} \left(\frac{L}{10^3} \right) \left[\left(\frac{D_2}{10^3} \right)^2 - \left(\frac{D_1}{10^3} \right)^2 \right]$$

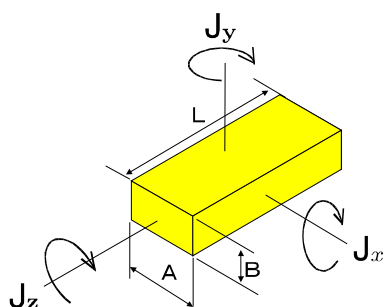


$$J_z = \frac{W}{16} \left[\left(\frac{A}{10^3} \right)^2 + \left(\frac{B}{10^3} \right)^2 \right]$$

$$J_x = \frac{W}{16} \left(\frac{B}{10^3} \right)^2 + \frac{W}{12} \left(\frac{L}{10^3} \right)^2$$

$$J_y = \frac{W}{16} \left(\frac{A}{10^3} \right)^2 + \frac{W}{12} \left(\frac{L}{10^3} \right)^2$$

$$W = \frac{1}{4} \left(\frac{A}{10^3} \right) \left(\frac{B}{10^3} \right) \left(\frac{L}{10^3} \right)$$

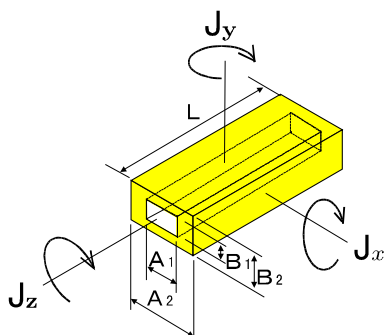


$$J_z = \frac{W}{12} \left[\left(\frac{B}{10^3} \right)^2 + \left(\frac{L}{10^3} \right)^2 \right]$$

$$J_x = \frac{W}{12} \left[\left(\frac{L}{10^3} \right)^2 + \left(\frac{A}{10^3} \right)^2 \right]$$

$$J_y = \frac{W}{12} \left[\left(\frac{A}{10^3} \right)^2 + \left(\frac{B}{10^3} \right)^2 \right]$$

$$W = \left(\frac{A}{10^3} \right) \left(\frac{B}{10^3} \right) \left(\frac{L}{10^3} \right)$$



$$J_x = \frac{W_2}{12} \left[\left(\frac{B_2}{10^3} \right)^2 + \left(\frac{L}{10^3} \right)^2 \right] - \frac{W_1}{12} \left[\left(\frac{B_1}{10^3} \right)^2 + \left(\frac{L}{10^3} \right)^2 \right]$$

$$J_y = \frac{W_2}{12} \left[\left(\frac{A_2}{10^3} \right)^2 + \left(\frac{L}{10^3} \right)^2 \right] - \frac{W_1}{12} \left[\left(\frac{A_1}{10^3} \right)^2 + \left(\frac{L}{10^3} \right)^2 \right]$$

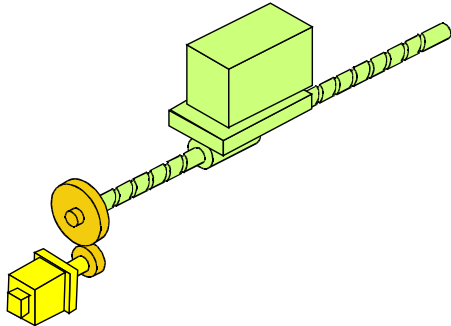
$$J_z = \frac{W_2}{12} \left[\left(\frac{A_2}{10^3} \right)^2 + \left(\frac{B_2}{10^3} \right)^2 \right] - \frac{W_1}{12} \left[\left(\frac{A_1}{10^3} \right)^2 + \left(\frac{B_1}{10^3} \right)^2 \right]$$

$$W = \left[\left(\frac{A_2}{10^3} \right) \left(\frac{B_2}{10^3} \right) - \left(\frac{A_1}{10^3} \right) \left(\frac{B_1}{10^3} \right) \right] \left(\frac{L}{10^3} \right)$$

$$W_2 = \left(\frac{A_2}{10^3} \right) \left(\frac{B_2}{10^3} \right) \left(\frac{L}{10^3} \right) \quad W_1 = \left(\frac{A_1}{10^3} \right) \left(\frac{B_1}{10^3} \right) \left(\frac{L}{10^3} \right)$$

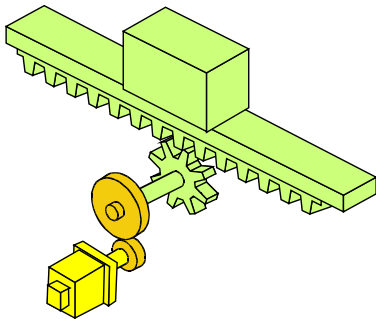
(c) Moment of inertia, typical application

Ball-screw



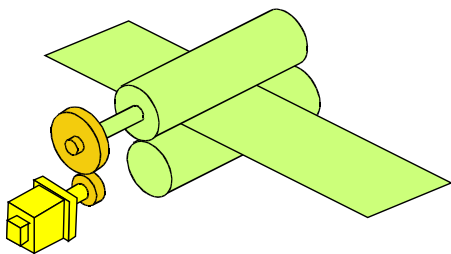
$$J_1 = W \left(\frac{1}{2} \times \frac{B P}{10^3} \right)^2 \times G L^2$$

Rack and pinion, conveyor or chain drive



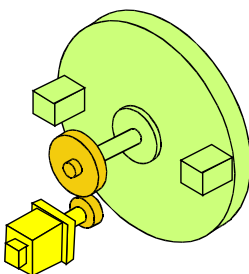
$$J_2 = \frac{W}{4} \left(\frac{D}{10^3} \right)^2 \times G L^2$$

Feed roll drive



$$J_3 = \frac{W}{4} \left(\frac{D}{10^3} \right)^2 \times G L^2$$

Table indexing



$$J_4 = \left(J + W \left(\frac{L}{10^3} \right)^2 \right) \times G L^2$$

(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"> • T_L at load lifting : $T_L = \frac{((\mu + 1)W_1 - W_2) \times 9.81 \left(\frac{BP}{10^3} \right)}{2\pi\eta} \times GL$ <ul style="list-style-type: none"> • T_L at lowering : $T_L = \frac{((\mu - 1)W_1 - W_2) \times 9.81 \left(\frac{BP}{10^3} \right)}{2\pi\eta} \times GL$ <ul style="list-style-type: none"> • T_L at stop (servo lock) : $T_L = \frac{(W_1 - W_2) \times 9.81 \left(\frac{BP}{10^3} \right)}{2\pi\eta} \times GL$
<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"> • T_L at load lifting : $T_L = \frac{((\mu + 1)W_1 - W_2) \times 9.81 \left(\frac{D}{2} \times \frac{1}{10^3} \right)}{\eta} \times GL$ <ul style="list-style-type: none"> • T_L at lowering : $T_L = \frac{((\mu - 1)W_1 - W_2) \times 9.81 \left(\frac{D}{2} \times \frac{1}{10^3} \right)}{\eta} \times GL$ <ul style="list-style-type: none"> • T_L at stop (servo lock) : $T_L = \frac{(W_1 - W_2) \times 9.81 \left(\frac{D}{2} \times \frac{1}{10^3} \right)}{\eta} \times GL$

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
: Mechanical efficiency
 μ : 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

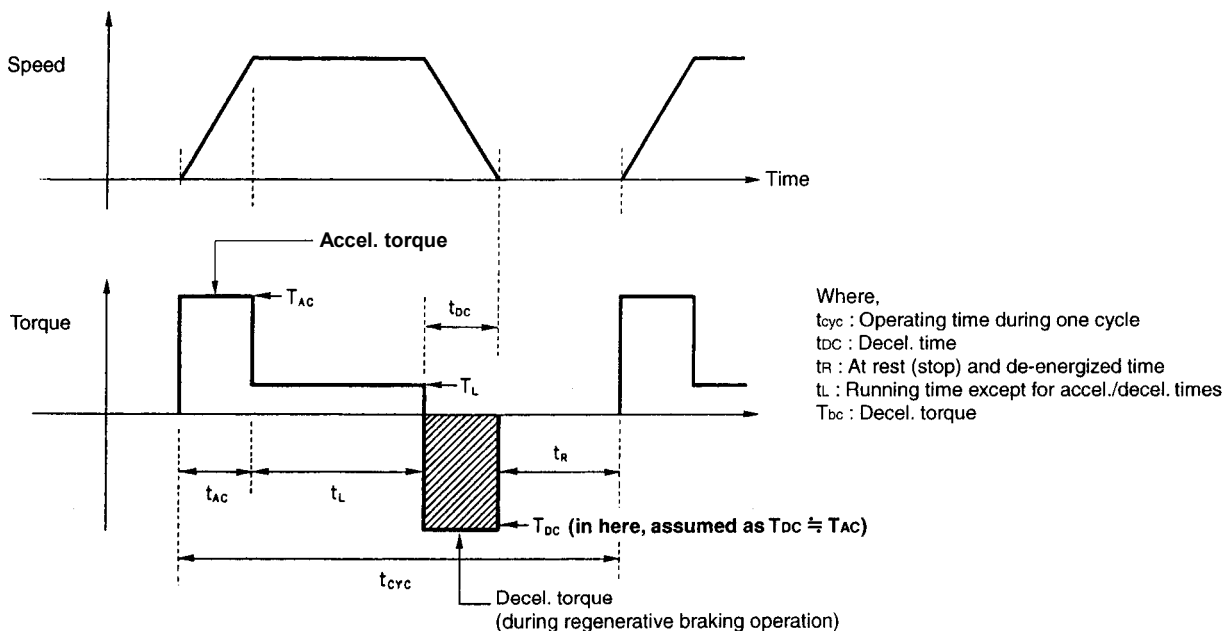
For obtaining the target speed in the shortest time, calculation is required by the formula below.

$$t_{AC} = \frac{(J_L + J_M) \times 2 \times (N_1 - N_0)}{60 \times (T_{AC} \pm T_L)} \text{ [s]}$$

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

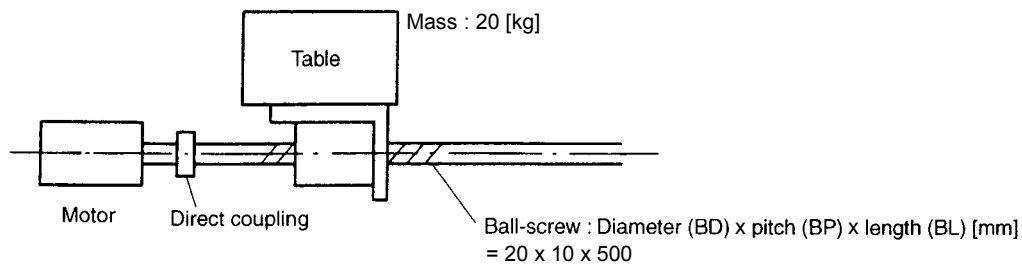
$$P = \frac{P_1 \times t_1 + P_2 \times t_2}{t_{cyc}} [W]$$

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, ρ : Density of ball-screw (assumed as 7850 [kg/m³])

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, μ : Friction coefficient = 0.1, η : 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

$$T_{AC} = \frac{(J_M + J_L) \times 2 \times N}{60 \times t_{ac}} + T_L = \frac{(0.0216 \times 10^{-3} + 0.11 \times 10^{-3}) \times 2 \times 3000}{60 \times 0.05} + 0.03 = 0.86 \text{ [N} \cdot \text{m]}$$

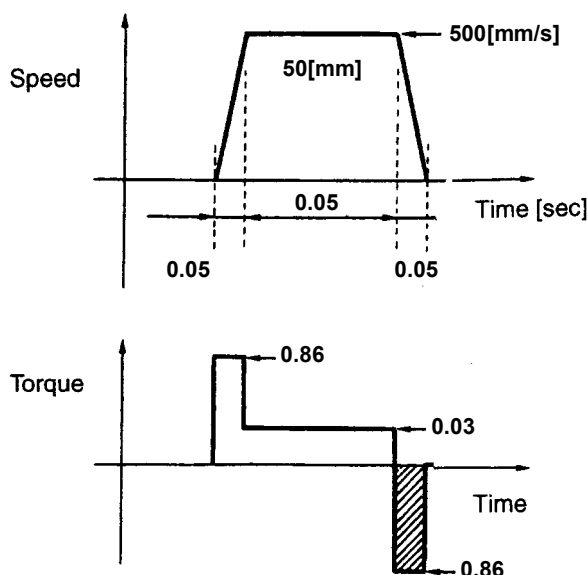
Where,

J_M : Moment of inertia of motor [kg · m²]

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

$$E_S = \frac{1}{2} CV^2 = \frac{1}{2} (660 \times 10^{-6}) \times (370^2 - (200 \times 2^{\frac{1}{2}})^2) = 18.7 \text{ [J]}$$

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 ($E_G = 6.5 \text{ [J]}$). 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.

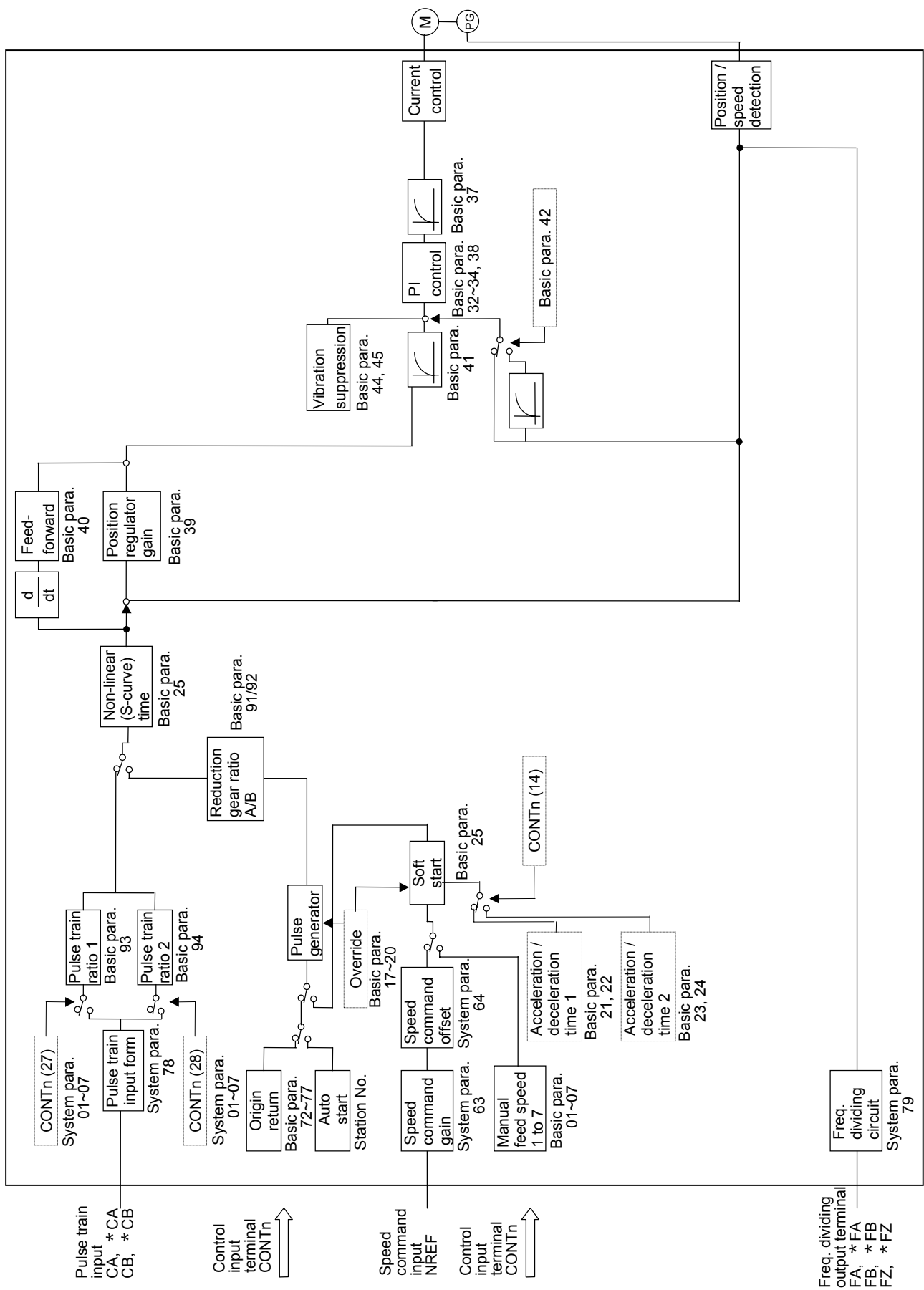
Setting value	Signal name
43	Override valid
44	Override 1
45	Override 2
46	Override 4
47	Override 8

(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

A	ABS : Absolute position specified Accel. : Acceleration ACCO : Acceleration/deceleration time selection AD : Address AF : Absolute data overflow, Multiple rotation data overflow AH : Amplifier overheat, Amp. heat AI/AO : Analog input/output ALM : Alarm detection Amplifier : Servo-amplifier	F	FAB : Fuji's auto circuit breaker, MCCB Fb : Fuse blown FG : Frame (enclosure) ground terminal FLEX : Fuji's PLC FLTH, FLTL : Fault-high or -low level Forward direction : (*) FWD : Forward command
B	BROUT : Dynamic braking fault output BX : Free run	H	Hv : Overvoltage, High voltage
C	C : Cleaning key CA : Command pulse, A-phase *CA : * is a logic inverted signal of CA CALL : Read key CB : Command pulse, B-phase *CB : * is a logic inverted signal of CB CCW : Counter-clockwise (*) CE : Motor combination error CEND : Cycle end CH : Controller overheat CM : Speed monitor, check pin CMD : Command CN1 : Control input/output signal connector CN2 : Encoder (detector) connector CO : Data continuation CONT : Control signal COPY : Copy mode CPURDY : CPU ready Ct : Control power trouble (error), Circuit trouble, Amplifier trouble CtE : Control signal error CW : Clockwise (*)	I	I/F : Interface INC : Relative (increment) position specified INF : Infinite-length feed
D	DB : Internal braking resistor unit dE : Memory error, Data error Decel. : Deceleration DI/DO : Digital input/output DIR : Shorted route valid DMON : Data monitor D No. : Station number	J	J _L : Moment of load inertia after conversion into motor shaft J _M : Moment of inertia of motor rotor
E	E : Ground (earth) terminal EC : Encoder (detector) communication error EEPROM : Electrically erasable program read only memory EH : Encoder (detector) overheat, Encoder (detector) heat ELCB : Earth leakage circuit breaker EMG : Forced stop ENQ : Enquiry, control code EP : Encoder (detector) power error ERROR : CPU error Et : Encoder (detector) trouble (error)	L	LC display : Liquid crystal display LED : Light emitted diode LS : Origin LS, Origin limit switch LSD : Least significant digit Lv : Undervoltage, Low voltage
		M	MAN : Test (trial, manual) mode operation (run) MC : Magnetic contactor ME : Memory error MH : Motor overheat MICREX : Fuji's PLC MODE : Transition key MON1 : Speed monitor MON2 : Torque monitor Motor : Servo-motor MSD : Most significant digit
		N	NARV : Speed arrive NEXT : Display key of data after (next) one screen (or No.) display NREF : Speed command NZERO : Speed zero
		O	OC : Overcurrent, Output overcurrent OF : Deviation excessive, Overflow OFF L : Offline key OL : Motor overload, Overload ON L : Online key ORG : Origin return OS : Overspeed OT : Overtravel ± OT : ± direction overtravel OUT : Out signal 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

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