M0008558D

SANMOTION

AC SERVO SYSTEMS

R

TYPE S

Serial Interface Built-in Positioning Function Model

For Rotary Motor

Instruction Manual

SANYO DENKI

The fourth edition (D)

- 1-8,1-9,

  3-1 to 3-4, 3-21, 3-22

  Materials-58
  - Changes as follows: Sumitomo 3M Ltd. --> 3M Japan Limited

- 3-7, -8
  - Adds the notes for general output diode.

- 3-27
  - Adds the notes for selection of RJ-45 modular connector.

- 3-80
  - Encoder clearing procedure
    - Changes the values in the table of turning on an encoder clearing, as follows:
      0x17 --> 0x10, 0x3C --> 0x8D, 0x3E --> 0xFF
    - Changes the values in the table of turning off an encoder clearing, as follows:
      0x17 --> 0x10, 0x7D --> 0xCC, 0xCE --> 0x0F

- 4-8
  - Translates again to the sentence following "*2".

- 4-10
  - Changes the notes for "*2".

- 4-38
  - Changes a part of procedure of the home position setting.

- 8-30
  - Changes the title as follows: Corrective Actions for Problems During Operation --> Inspection

- 8-30, Materials-63
  - Changes as follows: ER3V --> ER3VLY
  - Changes the company name as follows:
    TOSHIBA LIFESTYLE PRODUCTS & SERVICES CORPORATION

- 9-1
  - Changes the mass of RS1*30*F, as follows: 9.8 --> 10.5

- Materials -17
  - Changes the mass as follows: 4.1kg --> 3.0kg

【Safety Precautions】

This chapter is a summary of the safety precautions regarding the use of the R-series type-S, Serial interface built-in positioning type amplifier.
Please read this entire manual carefully prior to installing, operating, performing maintenance or inspecting this device to ensure proper use.
Use this device only after learning about its operation, safety information, and the precautions related to its use. After reading the User Manual, etc., keep it in a location where it is always available to the user for easy reference.

The R-series servo amplifiers and servo motors were designed for use with general industrial equipment. The following instructions should be followed:

- ■ Read the User Manual carefully before any installation or assembly work to ensure proper use.
- ■ Do not perform any retrofitting or modification of the product.
- ■ Consult with your sale representatives or a trained professional technician regarding the installation and maintenance of these devices.
- ■ Special consideration, such as redundant services or an emergency generator, is required when operating, maintaining and controlling devices in certain applications related to human safety or public functions. Contact your distributor or sales office if you intend to use these devices in applications such as;
  - ※ In medical instruments or systems used for life support;
  - ※ With control systems for trains or elevators, the failure of which could cause bodily injury;
  - ※ In computer systems of social or public importance;
  - ※ In other equipment or systems related to human safety or public infrastructure.

■ Additionally, please contact your distributor or sales office if the device is to be used in an environment where vibration is present, such as in-vehicle or transport applications.

Safety Precautions [Make sure to follow.]

This documentation uses the following annotation. Make sure to strictly follow these safety precautions.

■ Safety Precautions and symbols

Safety Precautions		Symbols	
Danger	Denotes immediate hazards that will probably cause severe bodily injury or death as a result of incorrect operation.		Danger /Injury
			Electric shock
Caution	Denotes hazards that could cause bodily injury and product or property damage as a result of incorrect operation. Even those hazards denoted by this symbol could lead to a serious accident.		Caution
			Fire
			Burn
Prohibited	Indicates actions that must be carried out (mandatory actions).		Prohibited
			Disassembly prohibited
Mandatory	Indicates actions that must not be allowed to occur prohibited actions.		Mandatory

Danger

Do not use this device in explosive environment. Injury or fire could otherwise result.	Do not touch the inside of the amplifier. Electric shock could otherwise result.
Do not perform any wiring, maintenance or inspection when the device is hot-wired. After switching the power off, wait at least 5 minutes before performing these tasks. Electric shock could otherwise result.	Only technically qualified personnel should transport, install, wire, operate, or perform maintenance and inspection on this device. Electric shock, injury or fire could otherwise result.
The protective ground terminal (⏚) should always be grounded to the control box or equipment. The ground terminal of the motor should always be connected to the protective ground terminal (⏚) of the amplifier. Electric shock could otherwise result.	Do not damage the cable, do not apply unreasonable stress to it, do not place heavy items on it, and do not insert it in between objects. Electric shock could otherwise result.

Safety Precautions [Make sure to follow.]

Danger

Wiring should be done based on the wiring diagram or the user manual. Electric shock or fire could otherwise result.	Do not touch the rotating part of the motor during operation. Bodily injury could otherwise result.
Do not touch or get close to the terminal and the connector while the device is powered up. Electric shock could otherwise result.	Do not unplug the terminal and the connector while the device is powered up. Electric shock could otherwise result.

Caution

Please read the User Manual carefully before installation, operation, maintenance or inspection, and perform these tasks according to the instructions. Electric shock, injury or fire could otherwise result.	Do not use the amplifier or the motor outside their specifications. Electric shock, injury or damage to the device could otherwise result.
Do not use the defective, damaged and burnt amplifier or the motor. Injury or fire could otherwise result.	Use the amplifier and motor together in the specified combination. Fire or damage to the device could otherwise result.
Be careful of the high temperatures generated by the amplifier/motor and the peripherals. Burn could otherwise result.	Open the box only after checking its top and bottom location. Bodily injury could otherwise result.

Safety Precautions [Make sure to follow.]

⚠ Caution

Verify that the products correspond to the order sheet/packing list. If the wrong product is installed, injury or damage could result. ⚠ Injury or damage could result.	Do not impress static electricity, the high voltage, etc. to the cable for encoders of the servo motor. ⚠ Damage to the device could otherwise result.
Do not measure the insulation resistance and the pressure resistance. ⚠ Damage to the device could otherwise result.	Wiring should follow electric equipment technical standards and indoor wiring regulations. ⚠ An electrical short or fire could otherwise result.
Wiring connections must be secure. ⚠ Motor interruption or bodily injury could otherwise result.	
Do not place heavy objects on top of it or stand on the device. ⚠ Bodily injury could otherwise result.	Do not obstruct the air intake and exhaust vents, and keep them free of debris and foreign matter. ⚠ Fire could otherwise result.
Make sure the mounting orientation is correct. ⚠ Fire or damage to the device could otherwise result.	Put the distance according to the manual in the array in the control board of the servo amplifier. ⚠ Damage to the device could otherwise result.
Do not subject the device to excessive shock or vibration. ⚠ Damage to the device could otherwise result.	Secure the device against falling, overturning, or shifting inadvertently during installation. ⚠ Use the hardware supplied with the motor (if applicable).
Do not expose the device to water, corrosive or flammable gases, or any flammable material. ⚠ Fire or damage to the device could otherwise result.	Install the device on a metal or other non-flammable support. ⚠ Fire could otherwise result.

Caution

There is no safeguard on the motor. Use an over-voltage safeguard, short-circuit breaker, overheating safeguard, and emergency stop to ensure safe operation. Injury or fire could otherwise result.	Do not touch the radiation fin of the amplifier, the regenerative resistor, or the motor while the device is powered up, or immediately after switching the power off, as these parts generate excessive heat. Burn could otherwise result.
In the case of any irregular operation, stop the device immediately. Electric shock, injury or fire could otherwise result.	Do not perform extensive adjustments to the device as they may result in unstable operation. Bodily injury could otherwise result.
Trial runs should be performed with the motor in a fixed position, separated from the mechanism. After verifying successful operation, install the motor on the mechanism. Bodily injury could otherwise result.	The holding brake is not to be used as a safety stop for the mechanism. Install a safety stop device on the mechanism. Bodily injury could otherwise result.
In the case of an alarm, first remove the cause of the alarm, and then verify safety. Next, reset the alarm and restart the device. Bodily injury could otherwise result.	Make sure the input power supply voltage is in or less than the specification range. Damage to the device could otherwise result
Avoid getting close to the device, as a momentary power outage could cause it to suddenly restart (although it is designed to be safe even in the case of a sudden restart). Bodily injury could otherwise result.	Standard specification servo amplifiers have a dynamic brake resistor. Do not rotate the motor continuously from the outside when the amplifier is not powered on, because the dynamic brake resistor will heat up, and can be dangerous. Fire or burn could otherwise result.
Be careful during maintenance and inspection, as the body of the amplifier becomes hot. Burn could otherwise result.	It is recommended to replace the electrolytic capacitors in the amplifier after 5 years, if used at an average temperature of 40°C year round. Damage to the device could otherwise result.

Caution

Please contact your distributor or sales office if repairs are necessary. Disassembly could render the device inoperative. Damage to the device could otherwise result.	Make sure the device does not fall, overturn, or move inadvertently during transportation. Bodily injury could otherwise result.
Do not hold the device by the cables or the shaft while handling it. Damage to the device or bodily injury could otherwise result.	If the amplifier or the motor is no longer in use, it should be discarded as industrial waste.

Prohibited

Do not store the device where it could be exposed to rain, water, toxic gases or other liquids. Damage to the device could otherwise result.	The built-in brake is intended to secure the motor; do not use it for regular control. Damage to the brake could otherwise result. Damage to the device could otherwise result.
Do not overhaul the device. Fire or electric shock could otherwise result.	Do not remove the nameplate cover attached to the device.

Mandatory

Avoid direct sunlight and keep it by temperature and humidity within the range of the specification. { - 20°C to + 65°C, below 90% RH (non-condensing)}.	Please contact our office if the amplifier is to be stored for a period of 3 years or longer. The capacity of the electrolytic capacitors decreases during long-term storage, and could cause damage to the device. Damage to the device could otherwise result.
Install an external emergency stop circuit and enable it to stop the device and cut off the power supply immediately. Install an external protective circuit to the amplifier to cut off the power from the main circuit in the case of an alarm. Motor interruption, bodily injury, burnout, fire and secondary damages could otherwise result.	Operate within the specified temperature and humidity range Amplifier: Temperature 0°C to 55°C, Humidity below 90% RH(non-condensing). Motor: Temperature 0°C to 40°C, Humidity below 90%RH(non-condensing). Burnout or damage to the device could otherwise result.
Follow the directions written on the outside box. Excess stacking could result in collapse. Bodily injury could otherwise result.	The motor angling bolts are used for transporting the motor. Do not use them for transporting the machinery, etc. Damage to the device or bodily injury could otherwise result.

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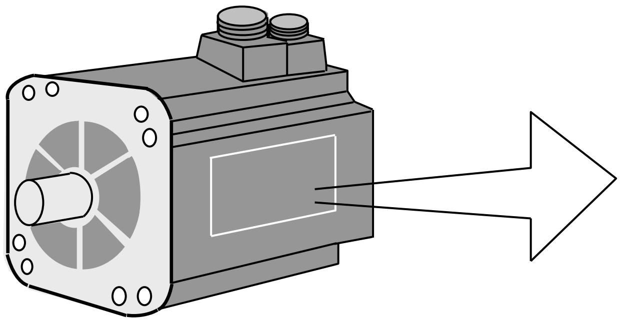
1

[Prior to Use]

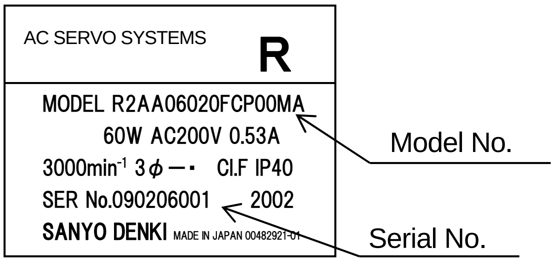
■ Verify the followings when the product arrives. If you find any discrepancy, contact your distributor or sales office.

- Verify that the model number of the servo motor or servo amplifier is the same as ordered. (The model number is located on the main nameplate, following the word “MODEL”.)
- Verify that there are no abnormalities, such as damages to the exterior of the device, or missing accessories.
- Verify that there are no loose screws on the servo motor or servo amplifier.

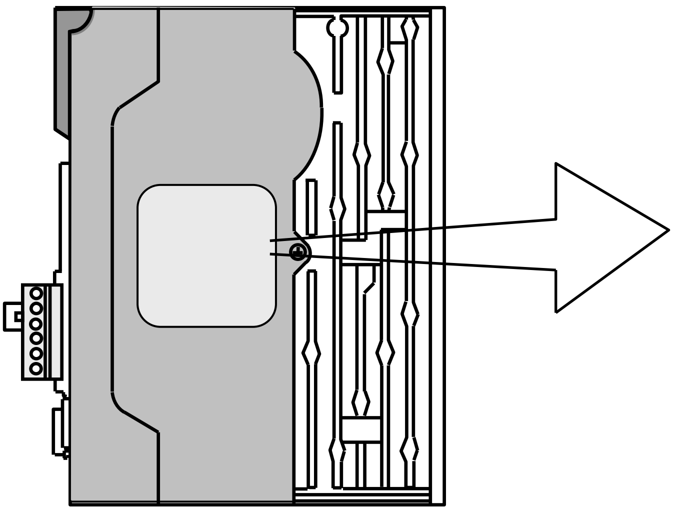
Servo motor



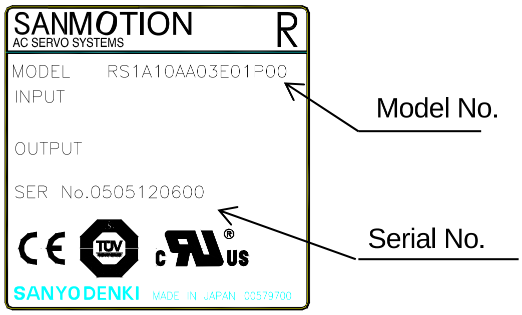
Servo motor main nameplate



Servo amplifier



Servo amplifier main nameplate



Interpretation of the serial number Month (2 digits) + Year (2 digits) + Day (2 digits)+ Serial number (4 digits) + Revision ("A" is abbreviated)

■ Interpretation of servo motor model number

R | 2 | AA | 06 | 020 | F | C | P | 00 | M | A

R-series
R

Motor type
2: Medium inertia

Motor power voltage
AA･･･motor voltage, 200V
EA･･･motor voltage, 100V

Flange angle dimensions
04･･･40, 42mm
06･･･60mm
08･･･80, 86mm

Rated output	
003･･･30W	020･･･200W
005･･･50W	040･･･400W
008･･･80W	075･･･750W
010･･･100W	

Maximum rotation speed
F･･･6000min^{-1}

Holding brake
X･･･No brake
B･･･90 V brake
C･･･24V brake

Encoder type	
P･･･Battery backup method absolute encoder	[PA035C]
H･･･Absolute encoder for incremental system	[PA035S] ⚠

Specification identification
00･･Standard product
01･･With Oil seal

Additional specification identification
M･･CE mark + UL supported
0･･･With decelerator /Without standards
None･･･Without decelerator /Without standards

Gear identification
A･･･Type A 1/3

■ Encoder specifications

Type	Within 1 rotation	Multiple rotation	Notes
PA035C	131072(17bit)	65536 (16bit)	Battery backup method absolute encoder
PA035S	131072(17bit)	–	Absolute encoder for incremental system ⚠

⚠ To the customers using "Absolute encoder for incremental system";
Set parameters values for your servo amplifier indicated below by surely using the setting values in the table below without fail.

General parameter

Group	Page	Symbol	Name	Setting value	Contents
C	00	ABS/INCSYS	Position detection system choice	00:_Absolute	Absolute system
C	08	ECLRFUNC	Absolute Encoder Clear Function Selection	01:_Status	Clear Only Encoder Status
D	41	Sw2	Function switch 2	Bit4 = 1: Available	Return-to-origin function of absolute encoder is necessary to settle coordinate.

1. Prior to Use [Servo motor model number]

■ Interpretation of servo motor model number

Q 1 AA 06 020 D C P 00 E A

Q-series

Motor type
1:Low inertia
2: Medium inertia
3: High inertia

Voltage
AA・・・200V
EA・・・100V

Flange angle dimensions	
04・・・40､42mm	10・・・100mm
05・・・54mm	12・・・120mm
06・・・60mm	13・・・130mm
07・・・76mm	18・・・180mm
08・・・80､86mm	22・・・220mm

Rated output		
003・・・30W	050・・・500W	350・・・3.5kW
005・・・50W	075・・・750W	450・・・4.5kW
006・・・60W	100・・・1.0kW	550・・・5.5kW
010・・・100W	150・・・1.5kW	700・・・7.0kW
020・・・200W	200・・・2.0kW	11K・・・11kW
030・・・300W	250・・・2.5kW	15K・・・15kW
040・・・400W	300・・・3.0kW	20K・・・20kW

Maximum rotation speed	
S・・・1000min^{-1}	H・・・3000/3500min^{-1}
M・・・1500min^{-1}	L・・・3000min^{-1}
B・・・2000min^{-1}	D・・・4500/5000min^{-1}
R・・・2500min^{-1}	F・・・6000min^{-1}

Holding brake
X・・・No brake
B・・・90 V brake
C・・・24V brake

Encoder type ⚠
S・・・Wire-saving incremental encoder [PP031/PP038/PP062]
D・・・Absolute encoder with incremental output [PA035M]
P・・・Battery backup method absolute encoder [PA035C]
W・・・Absolute encoder without battery [RAO62C]

Specification identification
00・・Standard product

Additional specification identification
E・・CE mark supported
U・・UL supported
M・・CE mark + UL supported

Gear identification
A・・・Type A 1/3

■ Encoder specifications

・Incremental encoder

Type	Resolution	Flange angle dimensions	Notes
PP031	8000/8192 P/R	40mm Min	Wire-saving incremental encoder
PP038	4096～25000 P/R	42mm Min	Wire-saving incremental encoder
PP062	8000/8192/20000/32768/40000 P/R	72mm Min	Wire-saving incremental encoder

・Absolute encoder

Type	Within 1 rotation	Multiple rotation	Notes
PA035C	131072(17bit)	65536(16bit)	Battery backup method absolute encoder
PA035M	8192(13bit)	–	Absolute encoder with incremental output ⚠
RA062C	131072(17bit)	8192(13bit)	Absolute encoder without battery

⚠ To the customers using “Battery backup method absolute encoder” with incremental system, See the parameter set values for your servo amplifier in the table below and make sure to use them.

General parameter

Group	Page	Symbol	Name	Setting value	Contents
C	00	ABS/INCSYS	Position detection system choice	01:_Incremental	Absolute system
C	08	ECLRFUNC	Absolute Encoder Clear Function Selection	01:_Status	Clear Only Encoder Status
D	41	Sw2	Function switch 2	Bit4 = 1: Available	Return-to-origin function of absolute encoder is necessary to settle coordinate.

■ Interpretation of servo amplifier model number (Full number)

RS1 | A | 01 | A | F | 0 | 34 | A3 | P | 00

R-series

Amplifier description
- 01･･･15A
- 03･･･30A
- 05･･･50A
- 10･･･100A
- 15･･･150A
- 30･･･300A

Motor type
- A･･･rotary motor

Control Hardware Identification
- F･･･With Serial interface built-in positioning type

Motor combination marking
- 0･･･Q, R series moor standard combination

Code for combined motor type
- Details on next page

Code for encoder combination type
- Details on next page

Interface at control section
- S･･･Speed control type
- T･･･Torque control type
- P･･･Position control type
- X･･･Speed←→torque switch type
- Y･･･Position←→torque switch type
- U･･･Position←→speed switch type
- V･･･Internal speed control type

Individual specification
- 00･･･Standard product
- A1･･single phase specification (AC200V)

Power input, power part details			Model numbers by amplifier capacity		
Input voltage	Regenerative resistor	DB	15A･･･RS1□01 30A･･･RS1□03	50A･･･RS1□05 100A･･･RS1□10 150A･･･RS1□15	300A･･･RS1□**30**
AC200V	Built-in	W	L	A	—
		W/O	M	B	—
	—	W	A	L	A
		W/O	B	M	B
AC100V	Built-in	W	N	—	
		W/O	P	—	
	—	W	E	—	
		W/O	F	—	

The design order is noted by alphabetical characters at the end of the Lot Number on the nameplate.

■ Code for combined motor type

AC200V input

Combined servo amplifier	Servo motor model number	Motor code
RS1L01A RS1A01A RS1M01A RS1B01A	Q1AA04003D	31
	Q1AA04005D	32
	Q1AA04010D	33
	Q1AA06020D	34
	Q2AA04006D	41
	Q2AA04010D	42
	Q2AA05005D	43
	Q2AA05010D	44
	Q2AA05020D	45
	Q2AA07020D	46
	Q2AA07030D	47
	R2AA04003F	D1
	R2AA04005F	D2
	R2AA04010F	D3
	R2AA06010F	D4
	R2AA06020F	D5
	R2AA08020F	DA
RS1L03A RS1A03A RS1M03A RS1B03A	Q1AA06040D	35
	Q1AA07075D	36
	Q2AA07040D	48
	Q2AA07050D	49
	Q2AA08050D	4A
	Q2AA13050H	4F
	R2AA06040F	D6
	R2AA08040F	D8
	R2AA08075F	D7
	R2AA13050D	DC

Combined servo amplifier	Servo motor model number	Motor code
RS1L05A RS1A05A RS1M05A RS1B05A	Q1AA10100D	37
	Q1AA10150D	38
	Q1AA12100D	3B
	Q2AA08075D	4B
	Q2AA08100D	4C
	Q2AA10100H	4D
	Q2AA10150H	4E
	Q2AA13100H	4G
	Q2AA13150H	4H
	R2AA13120D	DD
	R2AAB8100F	DK
RS1L10A RS1A10A RS1M10A RS1B10A	Q1AA10200D	39
	Q1AA10250D	3A
	Q1AA12200D	3C
	Q1AA12300D	3D
	Q1AA13300D	3E
	Q2AA13200H	4J
	Q2AA18200H	4K
	Q2AA22250H	4P
	R2AA13200D	DG

Combined servo amplifier	Servo motor model number	Motor code
RS1L15A RS1A15A RS1M15A RS1B15A	Q1AA13400D	3F
	Q1AA13500D	3G
	Q1AA18450M	3H
	Q2AA18350H	4L
	Q2AA18450H	4M
	Q2AA18550R	4N
	Q2AA22350H	4R
	Q2AA22450R	4S
	Q2AA22550B	4T
	Q2AA22700S	4U
	R2AA22500L	DM
RS1L30A RS1M30A	Q1AA18750H	3J
	Q2AA18550H	7M
	Q2AA18750L	7N
	Q2AA2211KV	7R
	Q2AA2215KV	7S

AC100V input

Combined servo amplifier	Servo motor model number	Motor code
RS1N01A RS1E01A RS1P01A RS1F01A	Q1EA04003D	3S
	Q1EA04005D	3T
	Q1EA04010D	3U
	Q2EA04006D	4V
	Q2EA04010D	4W
	Q2EA05005D	4X
	Q2EA05010D	4Y
	R2EA04003F	DP
	R2EA04005F	DR
	R2EA04008F	DW
	R2EA06010F	DT
RS1N03A RS1E03A RS1P03A RS1F03A	Q1EA06020D	3V
	Q2EA05020D	4Z
	Q2EA07020D	71
	RE2EA6020F	DU

■ Code for combined encoder type

Wire-saving incremental encoder

Encoder code	Measurement	Resolution [P/R]	Hard ID.
01	Optical	2000	A
02	Optical	6000	A
B2	Optical	10000	A

Battery backup method absolute encoder
Absolute encoder without battery

Encoder code	Measurement	Transmission format	Resolution [P/R]	Multiple rotations	Hard. ID.	Remarks
A3	Optical	Half duplex start-stop synchronization 2.5M	17bit	16bit	A	
A4	Optical	Half duplex start-stop synchronization 4.0M	17bit	16bit	A	Applicable to options
A7	Resolver	Half duplex start-stop synchronization 2.5M	15bit	-8192 ～ +8192 rotations	A	
A8	Resolver	Half duplex start-stop synchronization 2.5M	17bit		A	
A9	Resolver	Half duplex start-stop synchronization 4.0M	15bit		A	Applicable to options
AA	Resolver	Half duplex start-stop synchronization 4.0M	17bit		A	Applicable to options

Request method absolute encoder

Encoder code	Measurement	Transmission format	Resolution [P/R]	Multiple rotations	Hard. ID.	Remarks
AB	Resolver	Full duplex Manchester 1.0M	15bit	13bit	H	
AC	Resolver	Full duplex Manchester 2.0M	15bit	13bit	H	

Absolute encoder with incremental output

Encoder code	Measurement	Transmission format	Resolution [P/R]	Multiple rotations	Hard. ID.	Remarks
03	Optical	Full duplex Manchester 1.0M	Incremental:2048P/R Absolute:11bit	13bit	R	

1. Prior to Use [Servo amplifier model number]

■ Interpretation of servo amplifier model number (Abbreviated number)

RS1 A 01 A F

RS1: R-series

F: Control Hardware Identification
F···With Serial interface built-in positioning type

A: Motor type
A···rotary motor

01: Amplifier description

Amplifier description
01···15A
03···30A
05···50A
10···100A
15···150A
30···300A

A:

Power input, power part details			Model numbers by amplifier capacity		
Input voltage	Regenerative resistor	DB	15A···RS1□01 30A···RS1□03	50A···RS1□05 100A···RS1□10 150A···RS1□15	300A···RS1□30
AC200V	Built-in	W	L	A	–
		W/O	M	B	–
	—	W	A	L	A
		W/O	B	M	B
AC100V	Built-in	W	N	–	
		W/O	P	–	
	—	W	E	–	
		W/O	F	–	

Refer to Chapters 5 and 6 for how to set parameters which have been set at the time of shipment, and to page 55 of the attached data for setting contents.

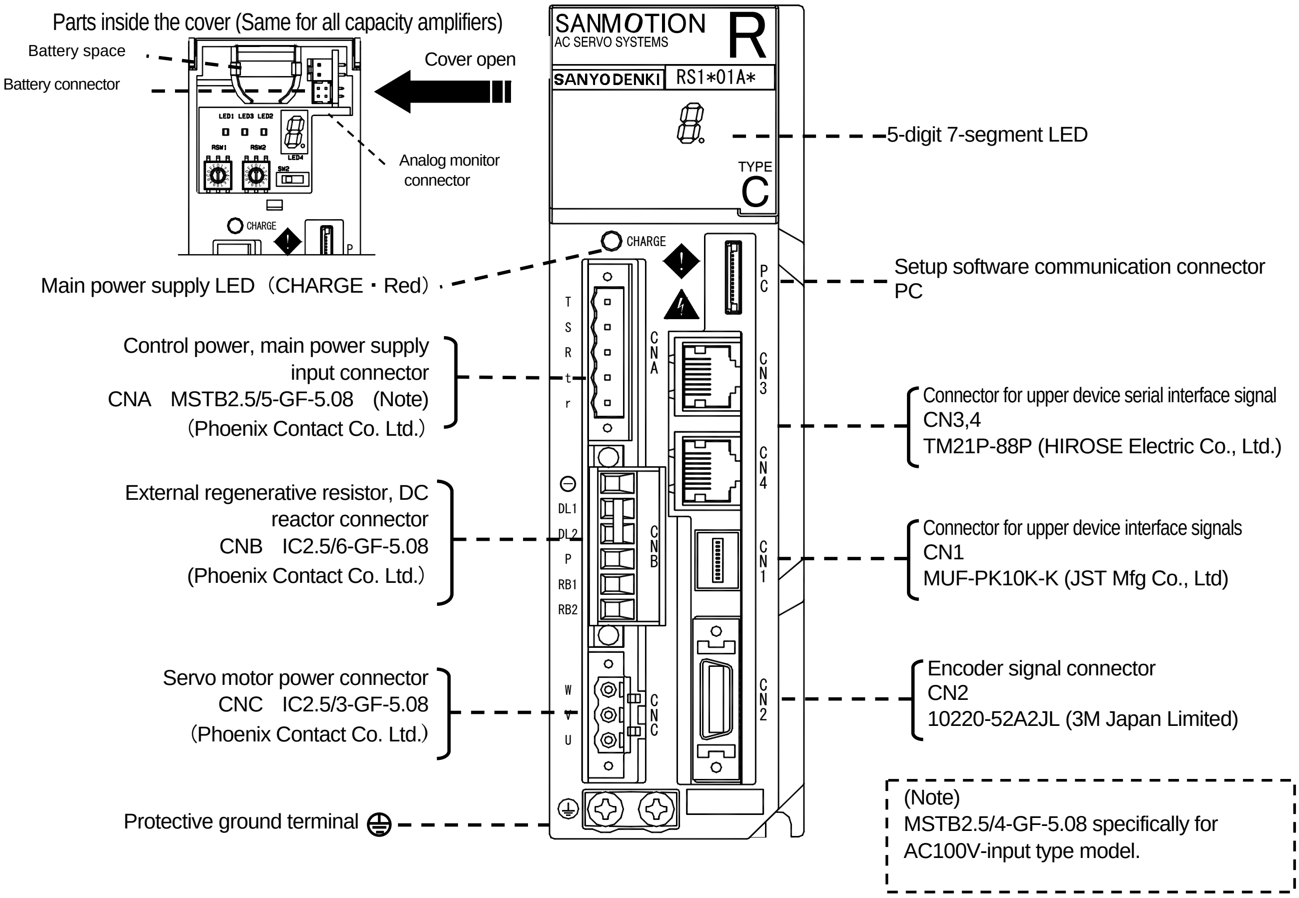
The design order is noted by alphabetical characters at the end of the Lot Number on the nameplate.

■ Motor setting and encoder type of abbreviated model numbers

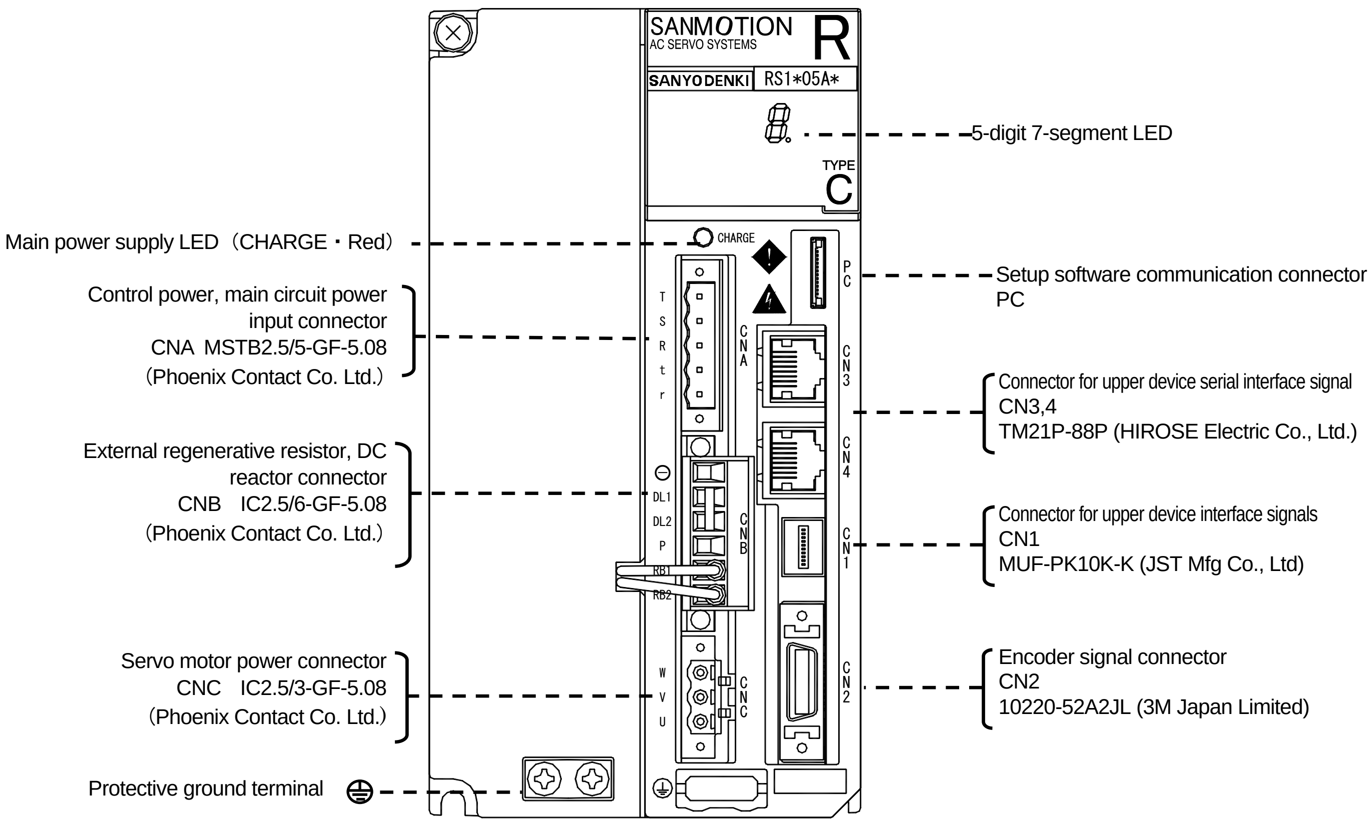
Servo amplifier model number	Servo motor model number	Encoder
RS1△01AF	P50B03003D	Wire-saving incremental encoder 2000P/R
RS1△03AF	P50B07040D	
RS1△05AF	P50B08075D	
RS1△10AF	P60B13200H	
RS1△15AF	P80B22350H	
RS1△30AF	P60B18750R	

△ : Depends on input power voltage, regeneration resistance and dynamic brake resistance.
In case of 200VAC input voltage, A, B, L and M will be filled in.
In case of 100VAC input voltage, E, F, N and P will be filled in.
(However, there are onlyRS1△01 and RS1△03.)

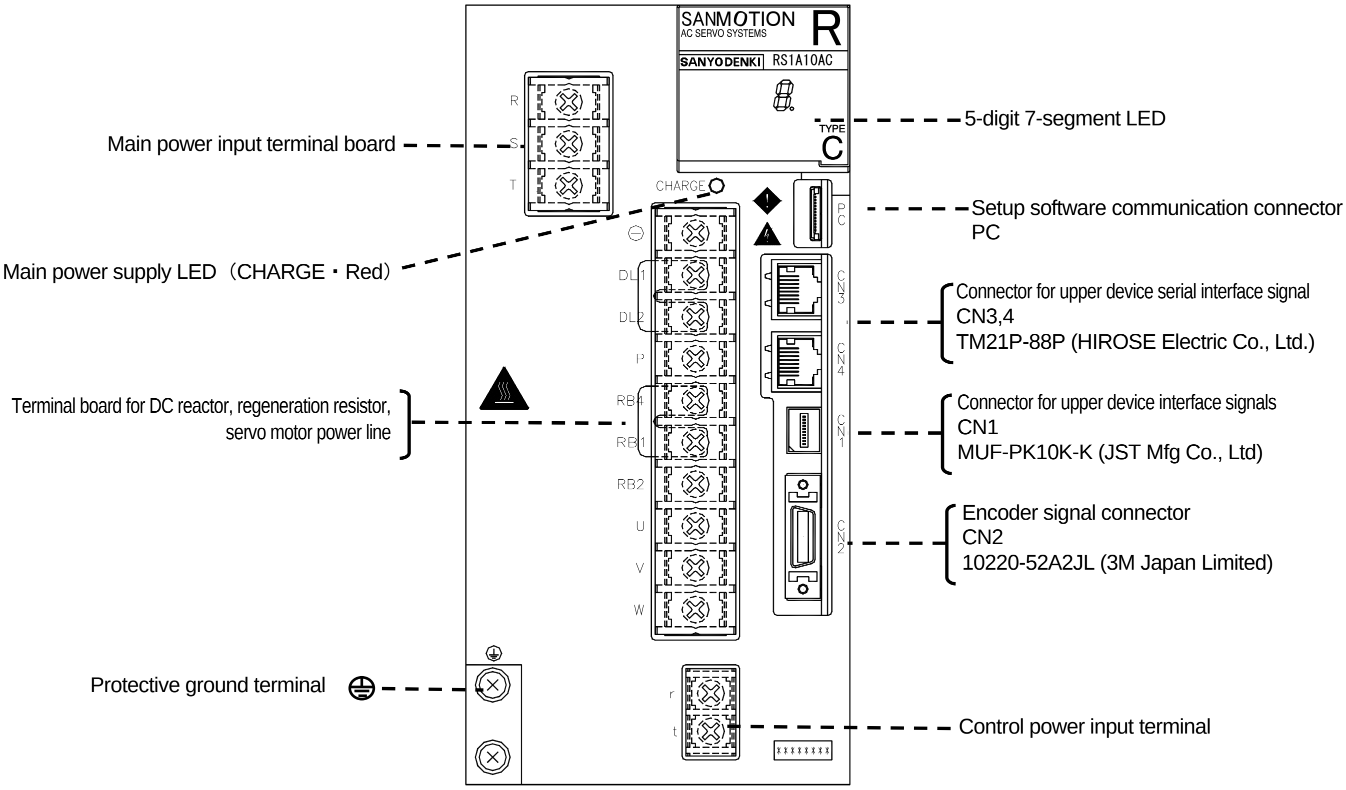
■ RS1□01A□ / RS1□03A□



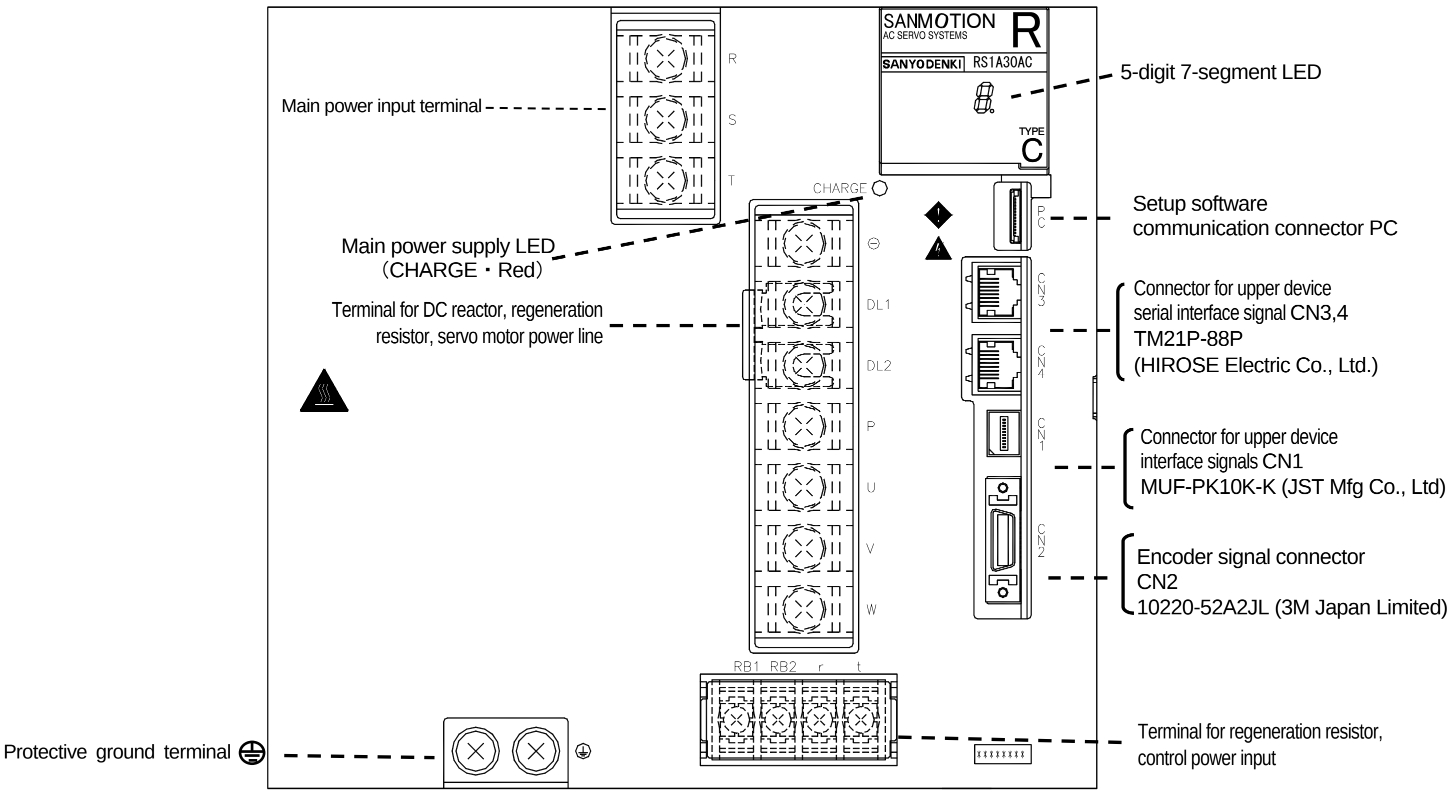
■ RS1□05A□



■ RS1□10A□ / RS1□15A□

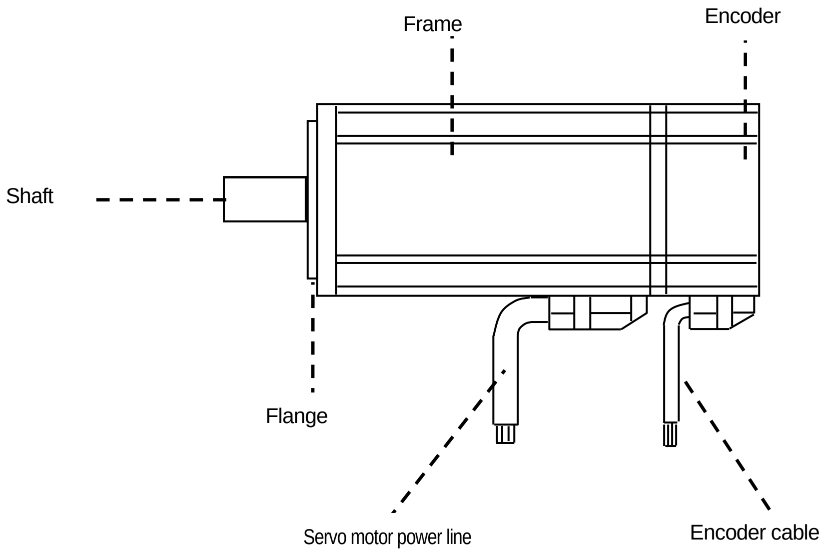


■ RS1□30A□



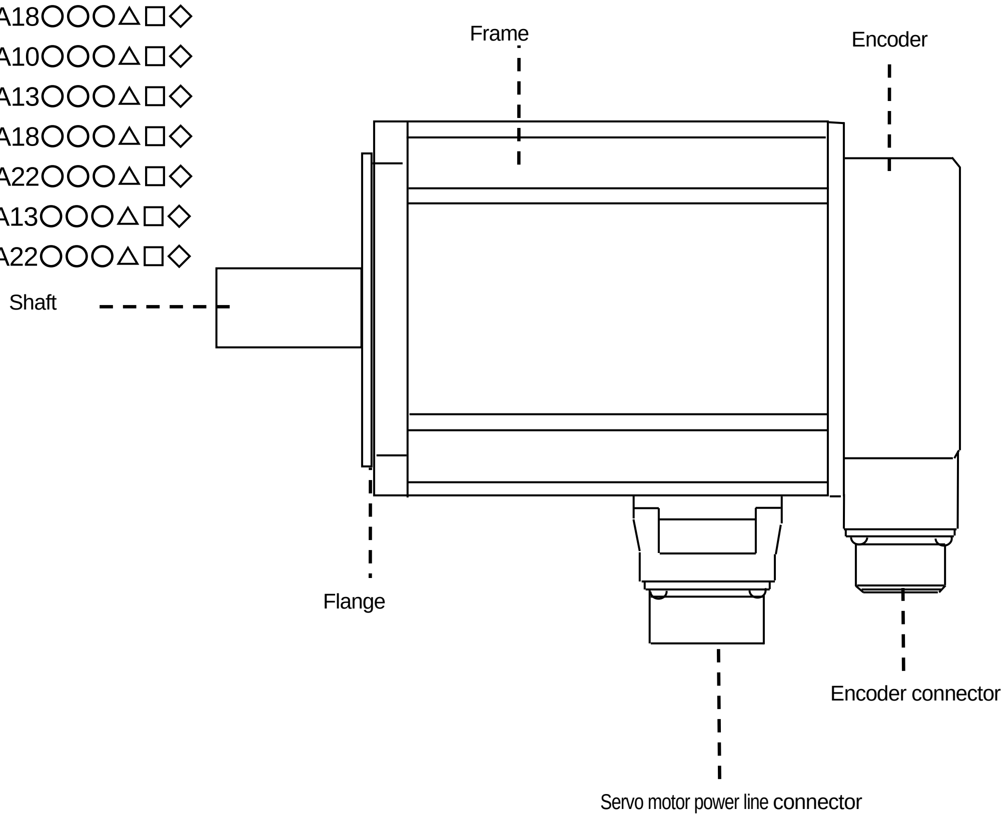
■ Lead wire type

Q1□○○○△□◇
Q1□A06○○○△□◇
Q1AA07○○○△□◇
Q2□A04○○○△□◇
Q2□A05○○○△□◇
Q2□A07○○○△□◇
Q2AA08○○○△□◇
R2□A04○○○△□◇
R2□A06○○○△□◇
R2AA08○○○△□◇



■ Cannon plug type

Q1AA10○○○△□◇
Q1AA12○○○△□◇
Q1AA13○○○△□◇
Q1AA18○○○△□◇
Q2AA10○○○△□◇
Q2AA13○○○△□◇
Q2AA18○○○△□◇
Q2AA22○○○△□◇
R2AA13○○○△□◇
R2AA22○○○△□◇



2

[Installation]

■ Please note the following points regarding the servo amplifier installation location and mounting method.

Various precautions ⚠

The device should be installed on non-flammable surfaces only. Installation on or near flammable materials can cause fire.	Do not stand, put or drop heavy items on the servo amplifier.
Operate the device within the specified environmental conditions.	Do not drop the device or subject it to excessive shock.
Do not install or operate a damaged device or one with damaged parts; return it for repair immediately.	Make sure no screws or other conductive or flammable materials get inside the servo amplifier.
Contact your distributor or sales office if the servo amplifier was stored or out of use for an extended period of time. (three years or more as a standard) The capacity of an electrolytic condenser falls by prolonged storage.	

If enclosed in a cabinet

The temperature inside the cabinet can exceed the external temperature depending on the power consumption of the device and the size of the cabinet. Consider the cabinet size, cooling, and placement, and make sure the temperature around the servo amplifier does not exceed 55°C. For longevity and reliability purposes it is recommended to keep the temperature below 40°C.

If there is a vibration source nearby

Protect the servo amplifier from vibration by installing it on a base with a shock absorber.

If there is a heat generator nearby

If the ambient temperature may increase due to convection or radiation, make sure the temperature near the servo amplifier does not exceed 55°C.

If corrosive gas is present

Long-term use may cause contact failure on the connectors and connecting parts.
Never use the device where it may be exposed to corrosive gas.

If explosive or combustible gas is present

Never use the device where explosive or combustible gas is present. The device's relays and contacts, regenerative resistors and other parts can arc (spark) and can cause fire or explosion.

If dust or oil mist is present

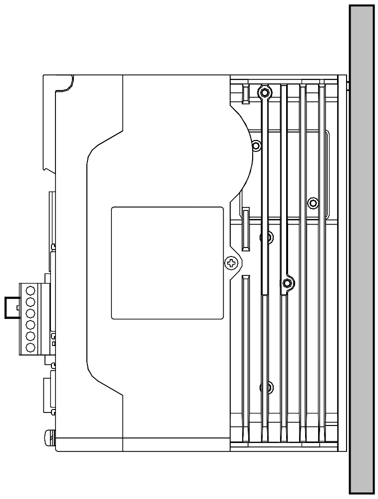
The device cannot be used where dust or oil mist is present. If dust or oil mist accumulates on the device, it can cause insulation deterioration or leakage between the conductive parts, and damage the servo amplifier.

If a large noise source is present

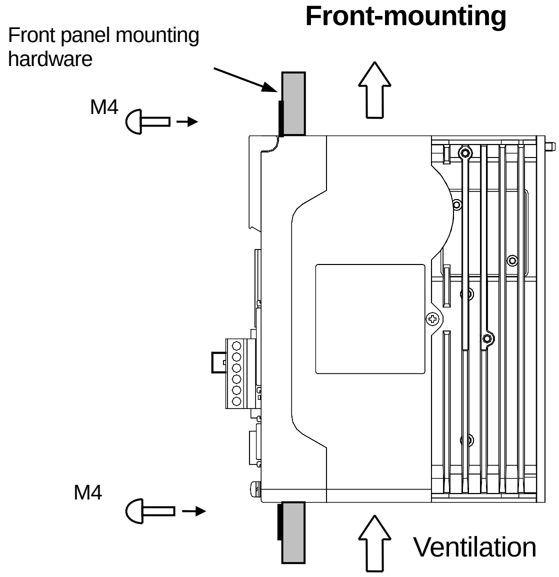
If inductive noise enters the input signals or the power circuit, it can cause a malfunction. If there is a possibility of noise, inspect the line wiring and take appropriate noise prevention measures. A noise filter should be installed to protect the servo amplifier.

■ Mounting direction and location

Rear-mounting



Front-mounting

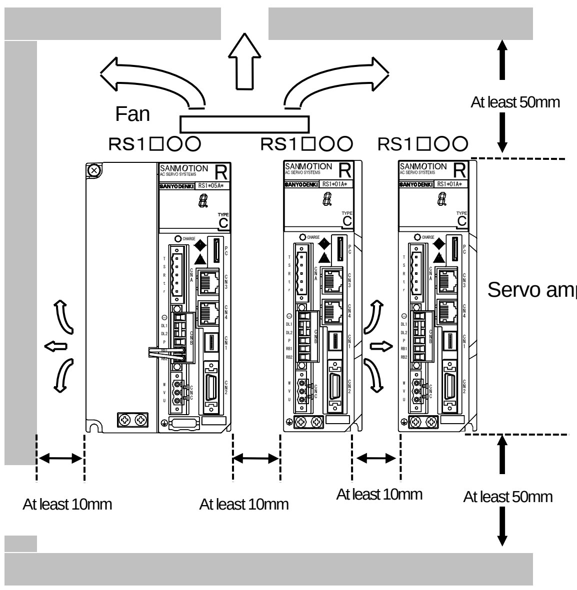


For metal fittings for front/rear mounting, refer to options (compatible with PY2 mounting).

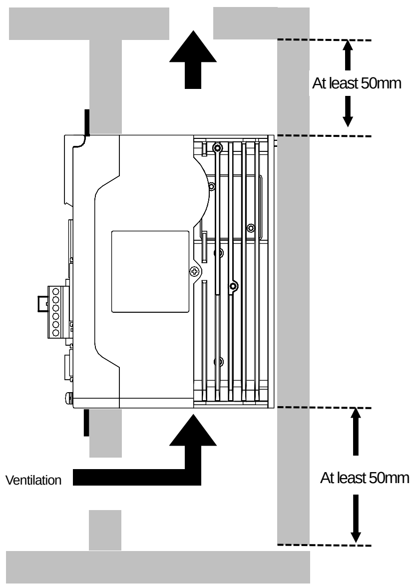
■ Arrangement within the control machine

- ● Leave at least 50 mm space above and below the servo amplifier to ensure unobstructed airflow from the inside of the servo amplifier and the radiator. If heat gets trapped around the servo amplifier, use a cooling fan to create airflow.
- ● The ambient temperature of servo amplifier should always become 55℃ or less. In addition, in order to secure a long-life and high reliability, we recommend you to use temperature below 40℃.
- ● Leave at least 10 mm space on both sides of the servo amplifier to ensure unobstructed airflow from the heat-sinks on the side and from the inside of the servo amplifier.
- ● If the R-series servo amplifier is installed on its side, make sure that the ambient temperature does not exceed 50°C, and mount the back panel to a metal plate.
  RS1□01, RS1□03, RS1□05 : 2mm or more of recommendation metal plate thickness
  RS1□10, RS1□15, RS1□30 : 5mm or more of recommendation metal plate thickness
- ● For RS1□03・RS1□05, a cooling fan is attached at the side. Therefore, it is recommended that the servo amplifier be mounted in an arrangement as shown below.

Front view



Side view



■ Please note the following regarding the installation location and mounting method for the servo motor.

The servo motor is designed for indoor use. Make sure to Install it indoors.	
Do not use the device in locations where the oil seal lip is continuously exposed to oil, or where the device is exposed to large quantities of water, oil drops, or cutting fluid. The motor is designed to withstand only small amounts of moisture spray.	
Ambient temperature: 0 to 40°C Storage temperature: -20 to 65°C Ambient humidity: 20 to 90%	Good ventilation, no corrosive or explosive gases present. No dust or dirt accumulation in the environment. Easy access for inspection and cleaning.

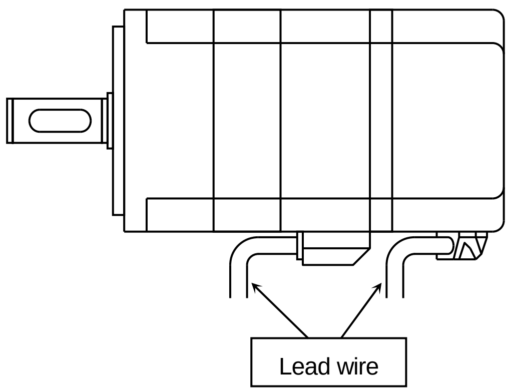
■ Mounting method

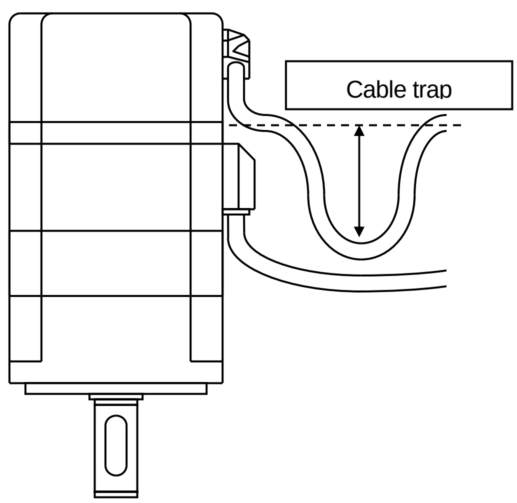
- Mounting in several orientations - horizontal, or with the shaft on top or bottom- is acceptable.

- If the output shaft is used in reduction devices that use grease, oil, or other lubricants, or in mechanisms exposed to liquids, the motor should be installed in a perfectly horizontal or downward position.
  In some models, there is an oil-seal attached to the output shaft. If the shaft is facing upwards and the seal lip is continuously exposed to oil, oil can enter inside the motor and cause damage, as a result of wear and degradation of the oil seal. In such cases an oil-seal should be used on the load-side as well. Contact your distributor or sales office if the device is to be used in such conditions.

- The motor connector and cable outlet should be installed facing downwards, as nearly vertical as possible.

- In vertical installation, create a cable trap to prevent oily water from getting into the motor.





■ Waterproofing and dust proofing

- The protection inside the motor conforms to IEC standards (IEC34-5). However, such protection is suitable only for short-term use. For regular use, additional sealing measures are required.
  Be sure to handle the connector carefully, as damage to the exterior of the connector (painted surface) can reduce its waterproofing capability.

- The motor waterproofing is of IPX 7 class level, but still requires careful handling. If the motor is continuously wet, due to the respiratory effect of the motor, liquid may penetrate inside the motor.

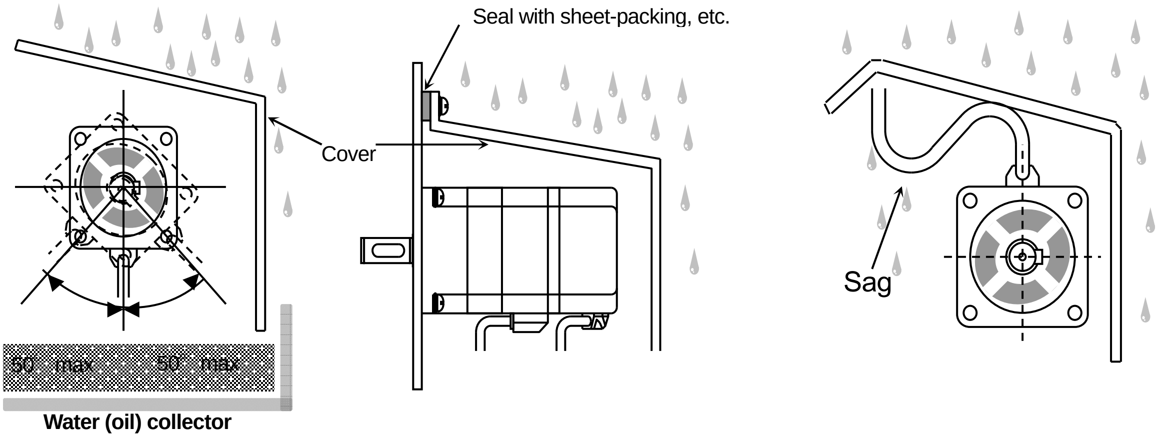
- Install a protective cover to prevent corrosion of the coating and the sealing material, which can be caused by certain types of coolants (especially water soluble types).

- Q1- and Q2-series motors with the canon plugs are only IP67 rated if waterproof connectors and/or conduits are used on the matching canon connectors.

- Q1-series motors (with all flange sizes) and Q2-series motors (with the 42mm flange size) not of the canon plug type are IP40 rated, but IP67 rated waterproofing is also available as an option. Q2-series motors with flange sizes of 54mm, 76mm and 86mm have IP67 rated waterproofing.
  R2-series motors have IP67 rated waterproofing, except for shaft passages and cable ends.

■ Protective cover installation

- Install a protective cover (as described below) for motors continuously subjected to liquids.
- Turn the connectors (lead outlets) downwards within the angle range shown in the picture below.
- Install the cover on the side where the water or oil would drip.
- Install the cover at an angle (for runoff), to prevent water or oil from collecting.
- Make sure that the cable does not get soaked in water or oil.
- Create a sag in the cable outside the cover, to make sure water or oil does not penetrate to the motor.
- If it is not possible to install the connectors (lead outlets) facing downwards, create a sag in the cable to prevent water or oil from entering the motor.

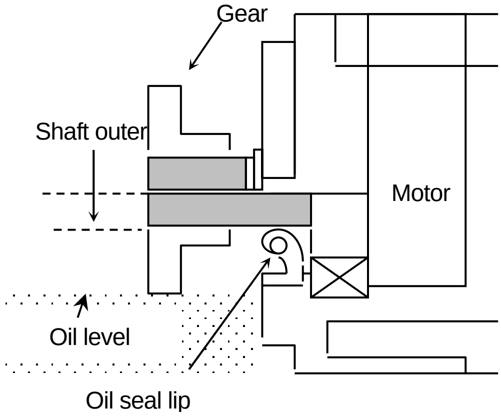


Gear installation

- The oil level of the gear box should be below the oil seal lip, for a slight spraying effect on the lip.

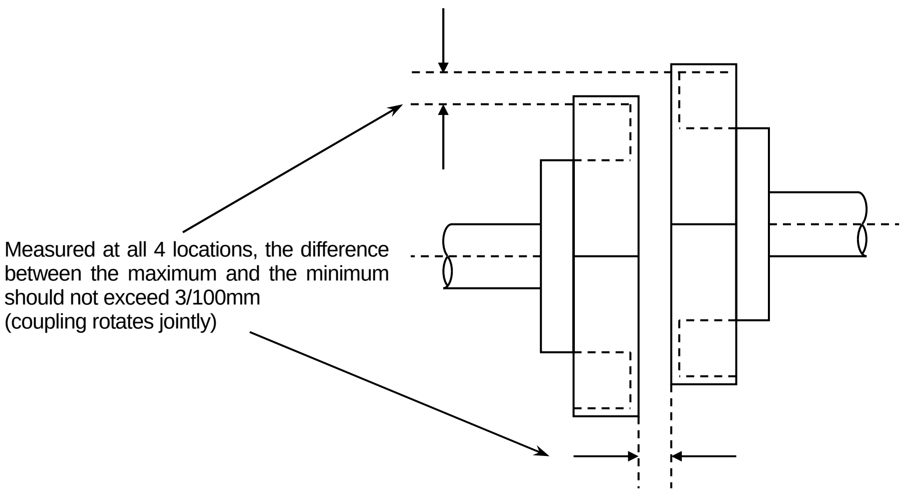
- Create a hole to prevent pressure build-up inside the gear box, as pressure can cause water or oil to penetrate the oil seal and enter inside the motor.

- If the motor is used with the shaft facing upwards, an oil seal should be used on the opposite side of the mechanism as well. In addition, install a drain to expel the water or oil that may penetrate through this oil seal.

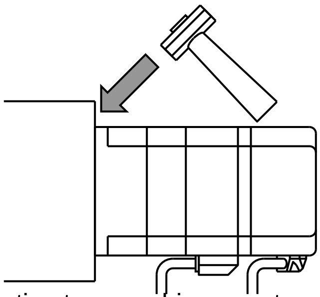


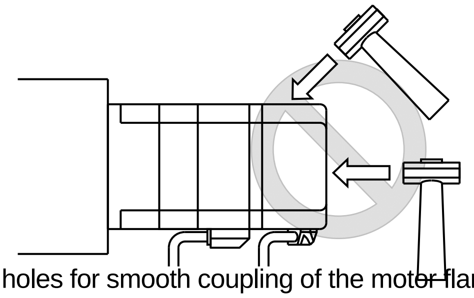
Integration with the target machinery

- Refer to the drawing below for correct centering of the motor shaft and the target machinery. Please note when using a rigid coupling that even a slight mistake in centering can damage the output shaft.



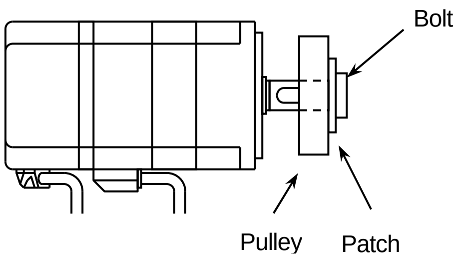
- Do not subject the motor shaft to shock, as the precision encoder is directly connected to it. If it is absolutely necessary to hit the motor for position adjustment or other reasons, use a rubber or plastic hammer and hit the front flange area.

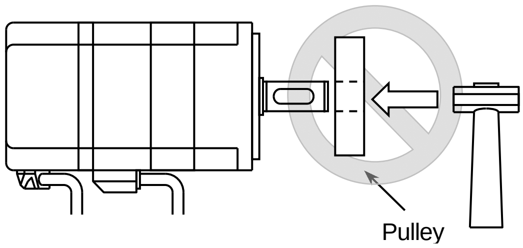




- If mounting to a machine, create enough mounting holes for smooth coupling of the motor flange rabbet.
  The mounting surface should be flat, otherwise damage to the shaft or the load may occur.

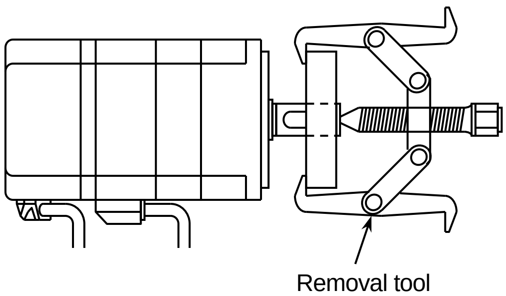
- Use the screw at the end of the shaft for installing parts such as the gear, pulley, or coupling, to avoid shock.

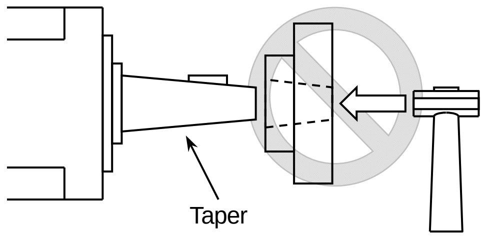




- Tapered motor shafts transmit the torque via the tapered surface. Make sure the key fits without rattling. The tapered surface contact should be no less than 70%.

- Use a special tool for removing the gear, pulley, etc.

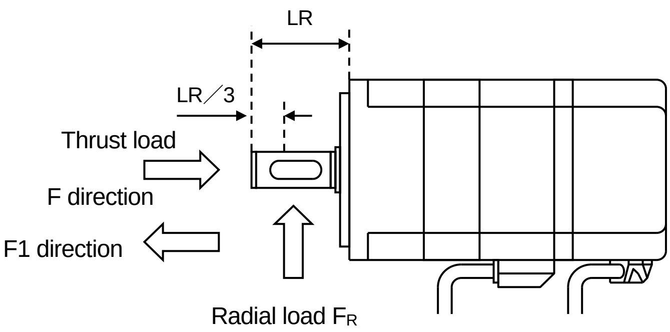




■ Allowable bearing load

- The table below shows the allowable bearing load of the servo motors. Do not apply excessive thrust load or radial load. In case of belt driving, make sure that the shaft converted value of belt tension does not exceed the allowable values shown below. The thrust load and radial load tolerance values assume individual application to the shaft.

The radial load tolerance value is the maximum load that can be applied at the point measured 1/3 of the distance from the tip of the output shaft.



	Model	Assembly			Operation		
		Radial load (N)s	Thrust load (N)		Radial load (N)	Thrust load (N)	
		F_R	F direction	F1 direction	F_R	F direction	F1 direction
Q1	Q1□A04003	98	78	78	49	29	29
	Q1□A04005	150	98	98	98	29	29
	Q1□A04010	150	98	98	98	29	29
	Q1□A06020	390	200	200	200	78	78
	Q1AA06040	390	200	200	250	98	98
	Q1AA07075	590	390	390	340	200	200
	Q1AA10100	980	290	290	690	200	200
	Q1AA10150	980	290	290	690	200	200
	Q1AA10200	980	290	290	690	200	200
	Q1AA10250	980	290	290	690	200	200
	Q1AA12100	980	290	290	690	290	290
	Q1AA12200	980	290	290	690	290	290
	Q1AA12300	980	290	290	690	290	290
	Q1AA13300	2000	390	390	980	390	390
	Q1AA13400	2000	390	390	1200	390	390
	Q1AA13500	2000	390	390	1200	390	390
	Q1AA18450	2300	1900	1900	1500	490	490
	Q1AA18750	3900	2000	2000	1800	590	590
Q2	Q2□A04006	150	98	98	98	29	29
	Q2□A04010	150	98	98	98	29	29
	Q2□A05005	200	200	150	150	78	78
	Q2□A05010	200	200	150	150	78	78
	Q2□A05020	250	200	150	200	78	78
	Q2□A07020	250	490	200	200	98	98
	Q2AA07030	250	490	200	200	98	98
	Q2AA07040	250	490	200	250	98	98
	Q2AA07050	250	490	200	250	98	98
	Q2AA08050	590	780	290	340	200	200
	Q2AA08075	590	780	290	340	200	200
	Q2AA08100	590	780	290	340	200	200
	Q2AA10100	980	290	290	690	200	200
	Q2AA10150	980	290	290	690	200	200
	Q2AA13050	1700	1300	1300	490	290	290
	Q2AA13100	1700	1300	1300	690	290	290
	Q2AA13150	1700	1300	1300	690	290	290
	Q2AA13200	1700	1300	1300	690	290	290
	Q2AA18200	2300	1900	1900	1500	490	490

	Model	Assembly			Operation		
		Radial load (N)s	Thrust load (N)		Radial load (N)	Thrust load (N)	
		F_R	F direction	F1 direction	F_R	F direction	F1 direction
Q2	Q2AA22350	2300	1900	1900	1500	490	490
	Q2AA22450	2300	1900	1900	1500	490	490
	Q2AA22550	3900	2000	2000	1800	590	590
	Q2AA22700	3900	2000	2000	2500	1100	1100
	Q2AA2211K	3900	2000	2000	2700	1500	1500
	Q2AA2215K	3900	2000	2000	2300	1500	1500
R2	R2□A04003F	98	78	78	49	29	29
	R2□A04005F	150	98	98	98	29	29
	R2EA04008F	150	98	98	98	29	29
	R2AA04010F	150	98	98	98	29	29
	R2□A06010F	150	98	98	98	29	29
	R2□A06020F	390	200	200	200	68	68
	R2AA08020F	390	200	200	200	98	98
	R2AA06040F	390	200	200	250	68	68
	R2AA08040F	390	200	200	250	98	98
	R2AA08075F	590	390	390	340	200	200
	R2AAB8100F	590	590	780	290	340	200
	R2AA13050D	590	980	1400	1400	640	490
	R2AA13120D	590	1700	1900	1900	640	490
	R2AA13200D	590	1700	1900	1900	640	490
	R2AA22500L	590	2300	1900	1900	1500	490

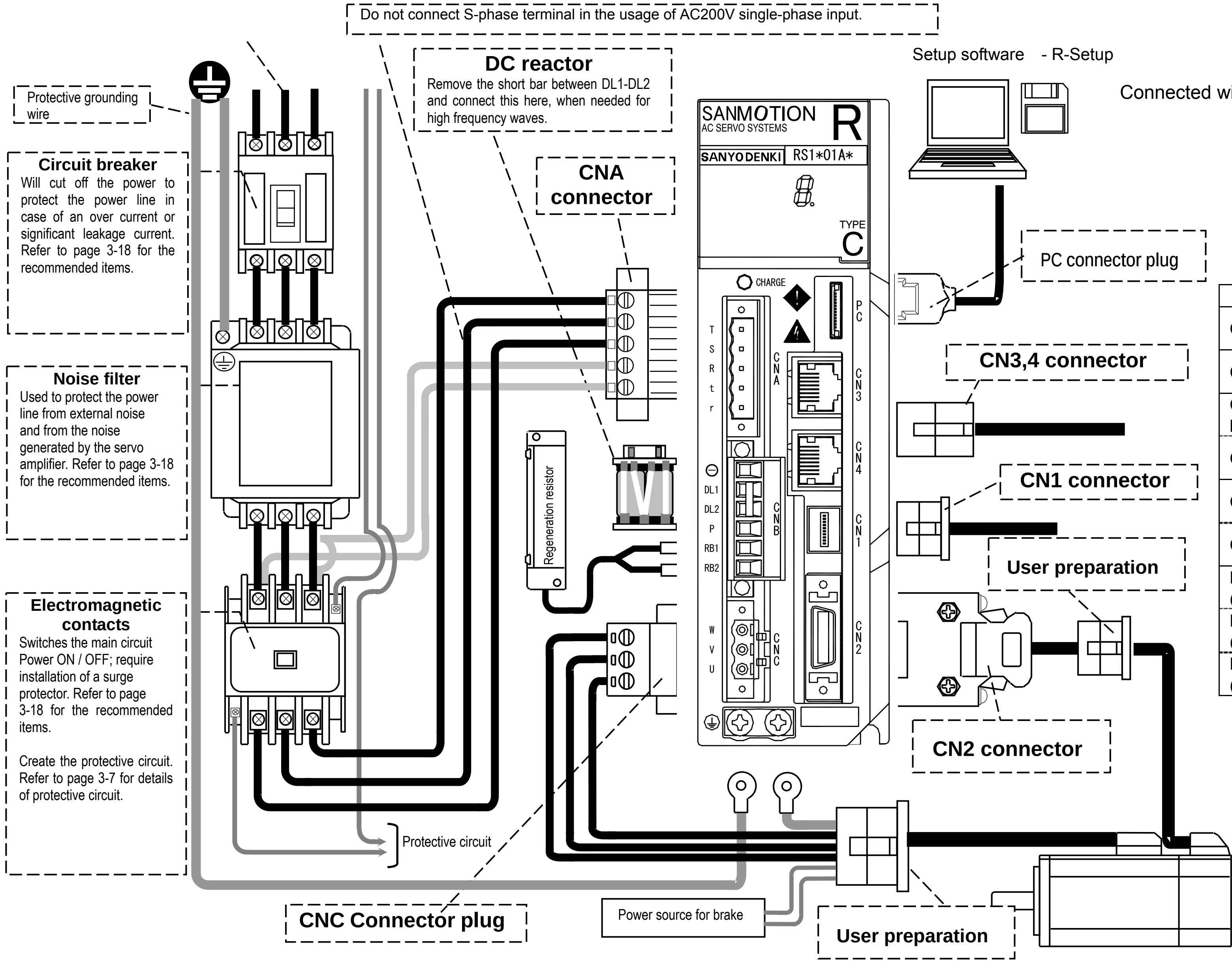
■ Cable installation considerations

- Make sure that no stress is applied to the cable and that it is undamaged.
- If the servo motor is installed in a moving location, make sure that no excessive stress is applied to the cable, by allowing a large bending radius.
- Avoid pulling the cable over sharp objects such as cutting scrap that can damage its exterior. Make sure the cable is not touching any machinery, and that it is out of the path of people and machines.
- Prevent bending or additional weight stress on the cable connection by clamping the cable to the machinery.
  In applications where the motor or the cable is moving using a cable bear, the bending radius should be based on the required cable-life and the type of cable used.
- Install the cables of moving parts in a manner that permits easy regular replacement.
  Consult with your distributor or sales office for recommendations, if you use cables for moving parts.

3

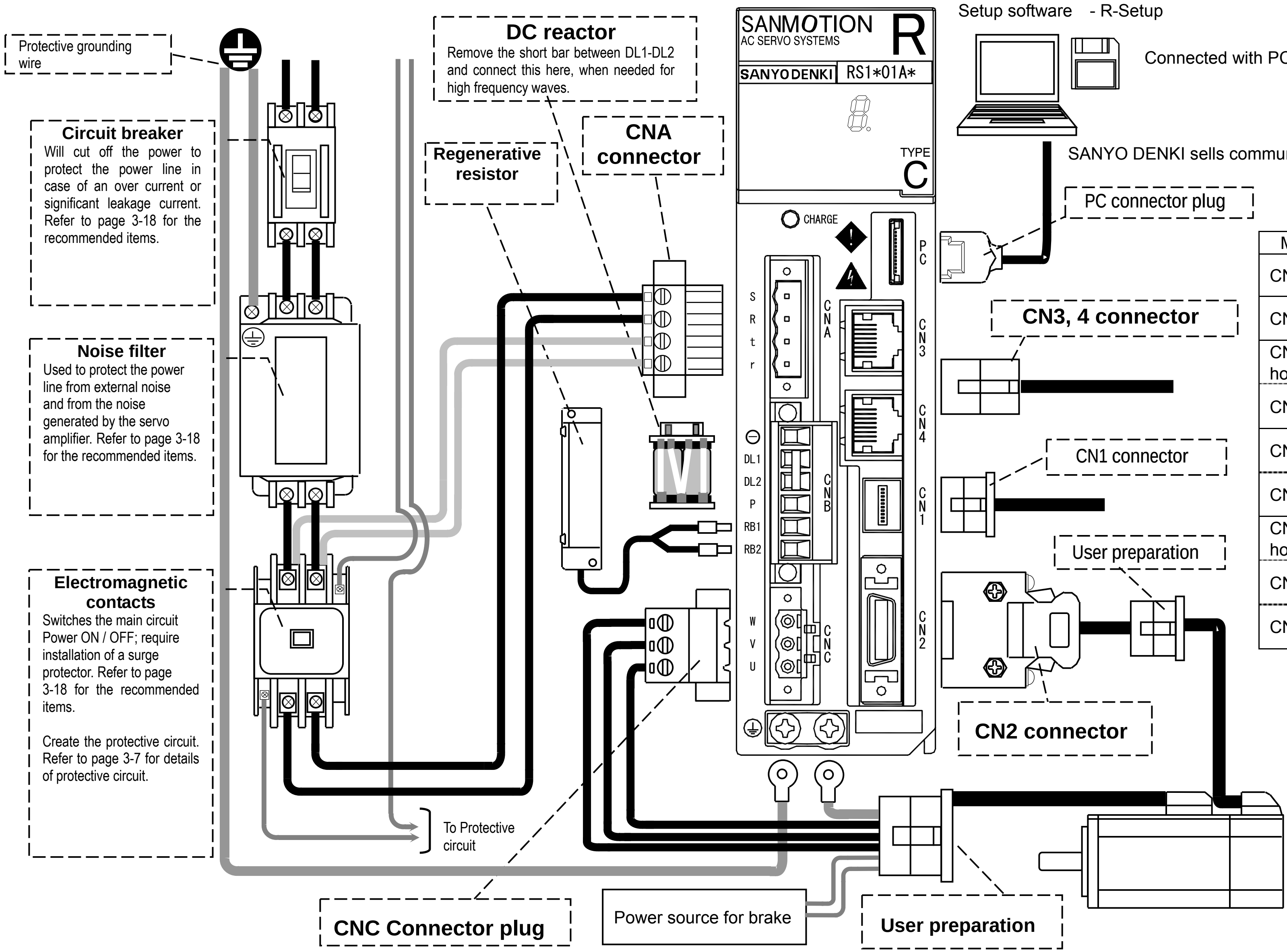
[Wiring]

■ Packaged wiring diagram AC200V-input type RS1☐01A / RS1☐03A / RS1☐05A



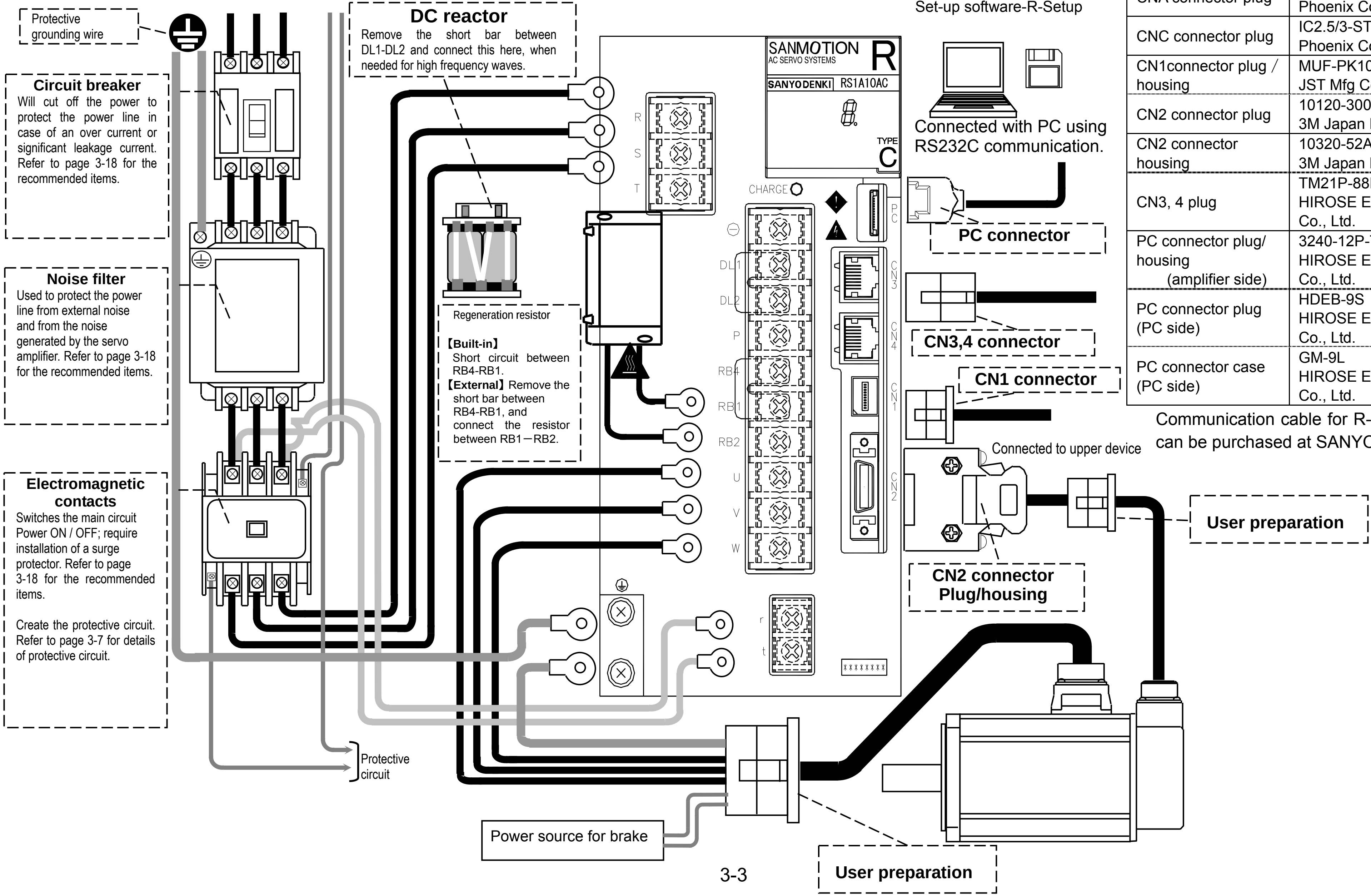
SANYO DENKI sells communication cable for R-SetupRS232C.

Model number of input/output connector plug/housing	
CNA connector plug	MSTB2.5/5-STF-5.08 Phoenix Contact
CNC connector plug	IC2.5/3-STF-5.08 Phoenix Contact
CN1connector plug / housing	MUF-PK10K-K JST Mfg Co.,Ltd
CN2 connector plug	10120-3000PE 3M Japan Limited
CN2 connector housing	10320-52A0-008 3M Japan Limited
CN3, 4 plug	TM21P-88P HIROSE Electric Co., Ltd.
PC connector plug/housing (On Amplifier side)	3240-12P-TO-C HIROSE Electric Co., Ltd.
PC connector plug (On PC side)	HDEB-9S HIROSE Electric Co., Ltd.
PC connector case (On PC side)	GM-9L HIROSE Electric Co., Ltd.



Model number of input/output connector plug/housing	
CNA connector plug	MSTB2.5/4-STF-5.08 Phoenix Contact
CNC connector plug	IC2.5/3-STF-5.08 Phoenix Contact
CN1connector plug / housing	MUF-PK10K-X JST Mfg Co.,Ltd
CN2 connector plug	10120-3000PE 3M Japan Limited
CN2 connector housing	10320-52A0-008 3M Japan Limited
CNC connector plug	TM21P-88P HIROSE Electric Co., Ltd.
CN1connector plug / housing	3240-12P-TO-C HIROSE Electric Co., Ltd.
CN2 connector plug	HDEB-9S HIROSE Electric Co., Ltd.
CNC connector plug	GM-9L HIROSE Electric Co., Ltd.

■ Packaged wiring diagram AC200V input type RS1☐10A / RS1☐15A



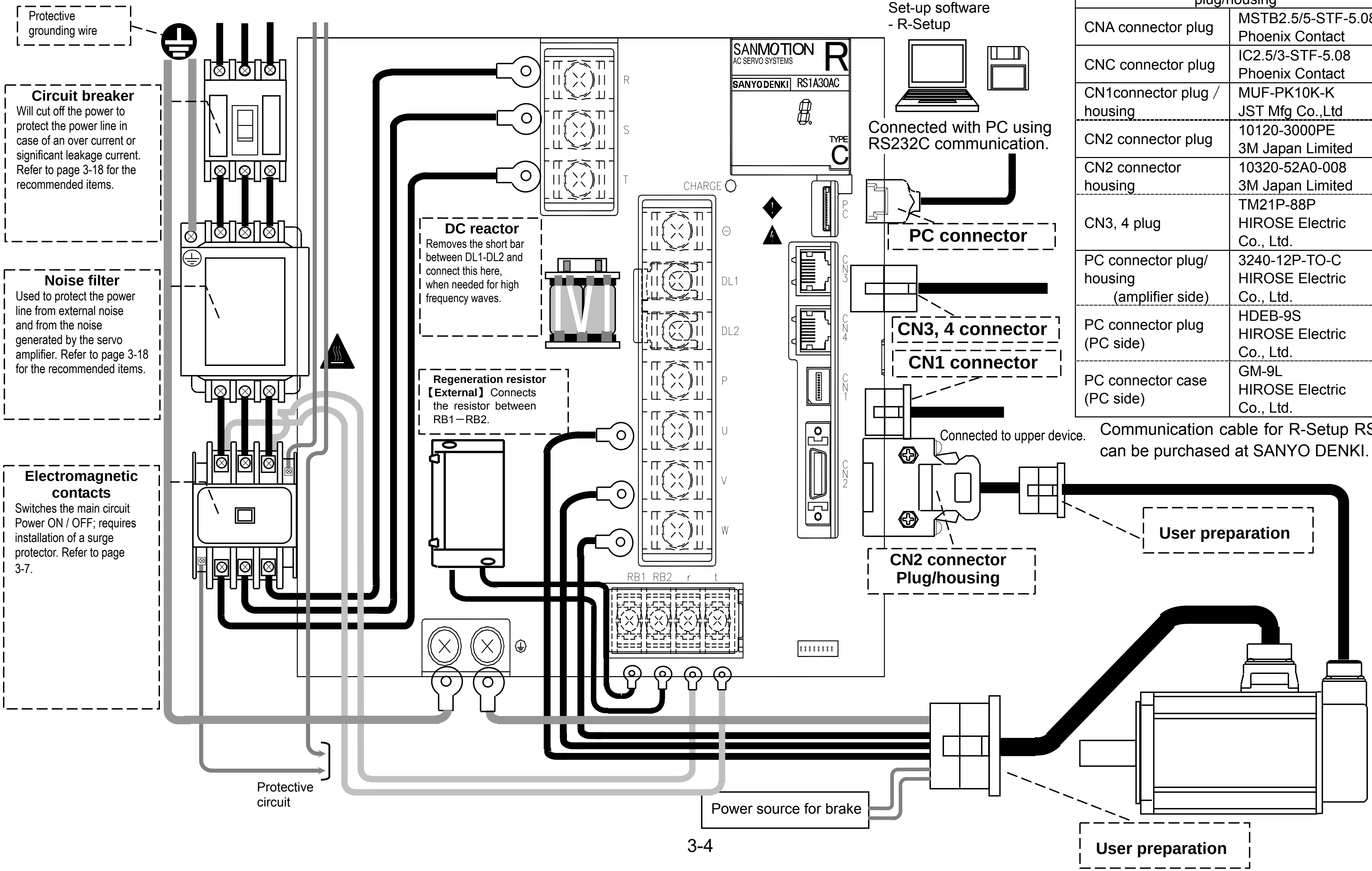
Model number of input/output connector plug/housing	
CNA connector plug	MSTB2.5/5-STF-5.08 Phoenix Contact
CNC connector plug	IC2.5/3-STF-5.08 Phoenix Contact
CN1connector plug / housing	MUF-PK10K-K JST Mfg Co.,Ltd
CN2 connector plug	10120-3000PE 3M Japan Limited
CN2 connector housing	10320-52A0-008 3M Japan Limited
CN3, 4 plug	TM21P-88P HIROSE Electric Co., Ltd.
PC connector plug/ housing (amplifier side)	3240-12P-TO-C HIROSE Electric Co., Ltd.
PC connector plug (PC side)	HDEB-9S HIROSE Electric Co., Ltd.
PC connector case (PC side)	GM-9L HIROSE Electric Co., Ltd.

Communication cable for R-Setup RS232C can be purchased at SANYO DENKI.

■ Packaged wiring diagram AC200V input type /RS1□30A

Model number of input/output connector plug/housing	
CNA connector plug	MSTB2.5/5-STF-5.08 Phoenix Contact
CNC connector plug	IC2.5/3-STF-5.08 Phoenix Contact
CN1connector plug / housing	MUF-PK10K-K JST Mfg Co.,Ltd
CN2 connector plug	10120-3000PE 3M Japan Limited
CN2 connector housing	10320-52A0-008 3M Japan Limited
CN3, 4 plug	TM21P-88P HIROSE Electric Co., Ltd.
PC connector plug/ housing (amplifier side)	3240-12P-TO-C HIROSE Electric Co., Ltd.
PC connector plug (PC side)	HDEB-9S HIROSE Electric Co., Ltd.
PC connector case (PC side)	GM-9L HIROSE Electric Co., Ltd.

Communication cable for R-Setup RS232C can be purchased at SANYO DENKI.

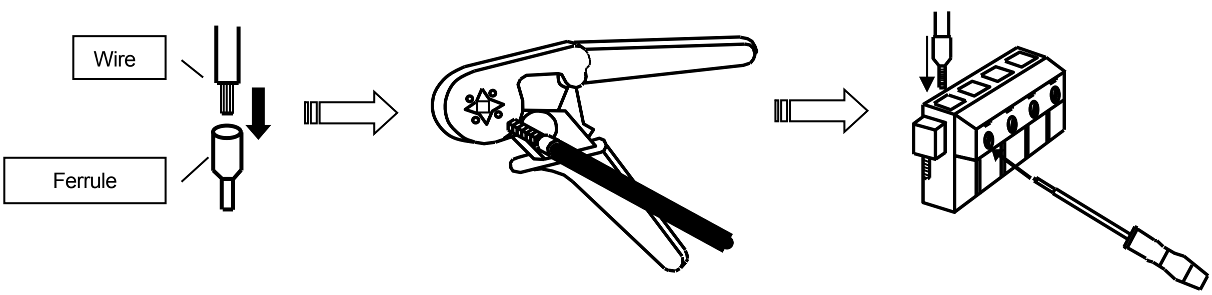


■ High voltage circuit; terminal name and functions

<table>
<tr><th>Terminal name</th><th>Connector marking</th><th colspan="2">Remarks</th></tr>
<tr><td rowspan="3">Main power source</td><td rowspan="3">R･T
or
R･S･T</td><td colspan="2">Single phase AC100to115V ＋10%,-15%　50/60Hz±3%</td></tr>
<tr><td colspan="2">Single phase AC200to230V ＋10%,-15%　50/60Hz±3%</td></tr>
<tr><td colspan="2">Three phase AC200to230V ＋10%,-15%　50/60Hz±3%</td></tr>
<tr><td rowspan="2">Control power source</td><td rowspan="2">r･t</td><td colspan="2">Single phase AC100to115V ＋10%,-15%　50/60Hz±3%</td></tr>
<tr><td colspan="2">Single phase AC200to230V ＋10%,-15%　50/60Hz±3%</td></tr>
<tr><td>Servo motor connector</td><td>U･V･W</td><td colspan="2">Connected with servo motor</td></tr>
<tr><td>Safeguard connector</td><td>⏚</td><td colspan="2">Connected with grounding wire of power source and of servo motor.</td></tr>
<tr><td rowspan="2">Regeneration resistance connector</td><td rowspan="2">RB1・RB2
RB4</td><td>RS1□01AA
RS1□03AA
RS1□05AA
RS1□30AA</td><td>Regeneration resistance will be connected to RB1・RB2. If it is built-in, regeneration resistance has been connected at the time of shipment. In case of short regeneration power, an external regeneration resistance is connected to RB1・RB2. There is no terminal RB4.</td></tr>
<tr><td>RS1□10AA
RS1□15AA</td><td>In case of a built-in regeneration resistance, RB1・RB4 are short circuited by a short bar at the time of shipment. If regeneration power is short, remove the short bar between RB1・RB4 (open) and connect an external regeneration resistance at RB1・RB2.</td></tr>
<tr><td>DC reactor connector</td><td>DL1・DL2</td><td colspan="2">Short circuited at the time of shipment. If high frequency waves need to be controlled, remove the short bar between DL1･DL2 and connect a DC reactor between DL1・DL2.</td></tr>
<tr><td>Maker maintenance</td><td>P・ ⊖</td><td colspan="2">For maker maintenance. Do not connect anything.</td></tr>
</table>

■ How to insert high voltage circuit connector

- Insert the wire into ferrule, and use a special tool to crimp it in.
- Insert the ferrule deep into the connector, and tighten it with a special minus screw driver or something.
  The recommended torque is 0.5to0.6 N・m.



3. Wiring 【High Voltage Circuit; Terminal Name and Function】

● Model number of recommended ferrules and crimping tools for various wire sizes
(Manufactured by Phoenix Contact.)

mm^2	AWG	Model number		
		1Pcs/Pkt	1000Pcs/Pkt	Taped components
0.75 mm^2	18	AI0.75-8GY	AI0.75-8GY-1000	AI0.75-8GY-B (1000Pcs/Pkt)
1.0 mm^2	18	AI1-8RD	AI1-8RD-1000	AI1-8RD-B (1000Pcs/Pkt)
1.5 mm^2	16	AI1.5-8BK	AI1.5-8BK-1000	AI1.5-8BK-B (1000Pcs/Pkt)
2.5 mm^2	14	AI2.5-8BU	AI2.5-8BU-1000	AI2.5-8BU-B (500Pcs/Pkt)

Note) GY: Gray, RD: Red, BK: Black, BU: Blue

Crimping tool model number : 0.25mm^2to6mm^2 : CRIMPFOX UD 6-4, 0.75mm^2to10mm^2: CRIMPFOX UD 10-4

■ High voltage circuit terminal; tightening torque

Amplifier type	Terminal marking			
	CNA	CNB	CNC	⏚
RS1□01	[0.5 to 0.6 N·m]			[1.18 N·m] M4 (screw size)
RS1□03				
RS1□05				

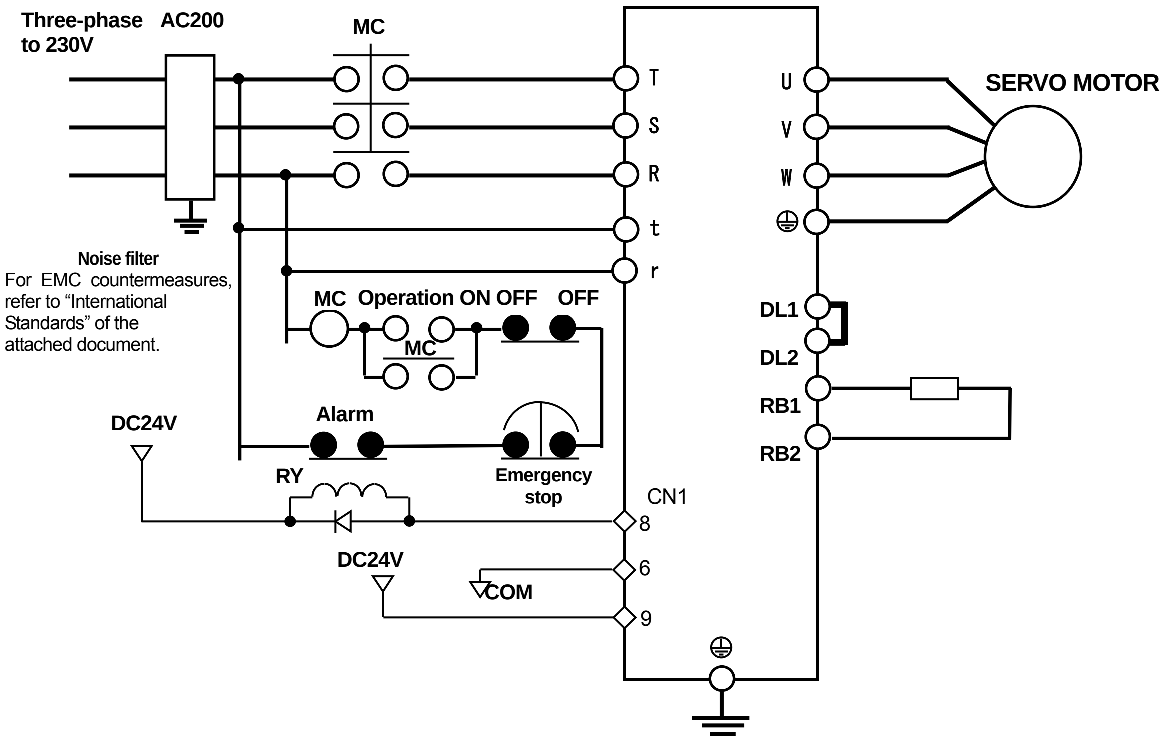
Amplifier type	Terminal marking														
	R	S	T	⊖	DL1	DL2	P	RB4	RB1	RB2	U	V	W	r	t	⏚
RS1□10	[1.18 N·m] M4 (screw size)															
RS1□15																

Amplifier type	Terminal marking													
	R	S	T	⊖	DL1	DL2	P	U	V	W	⏚	RB1	RB2	r	t
RS1□30	[3.73 N·m] M6 (screw size)											[1.18 N·m] M4 (screw size)			

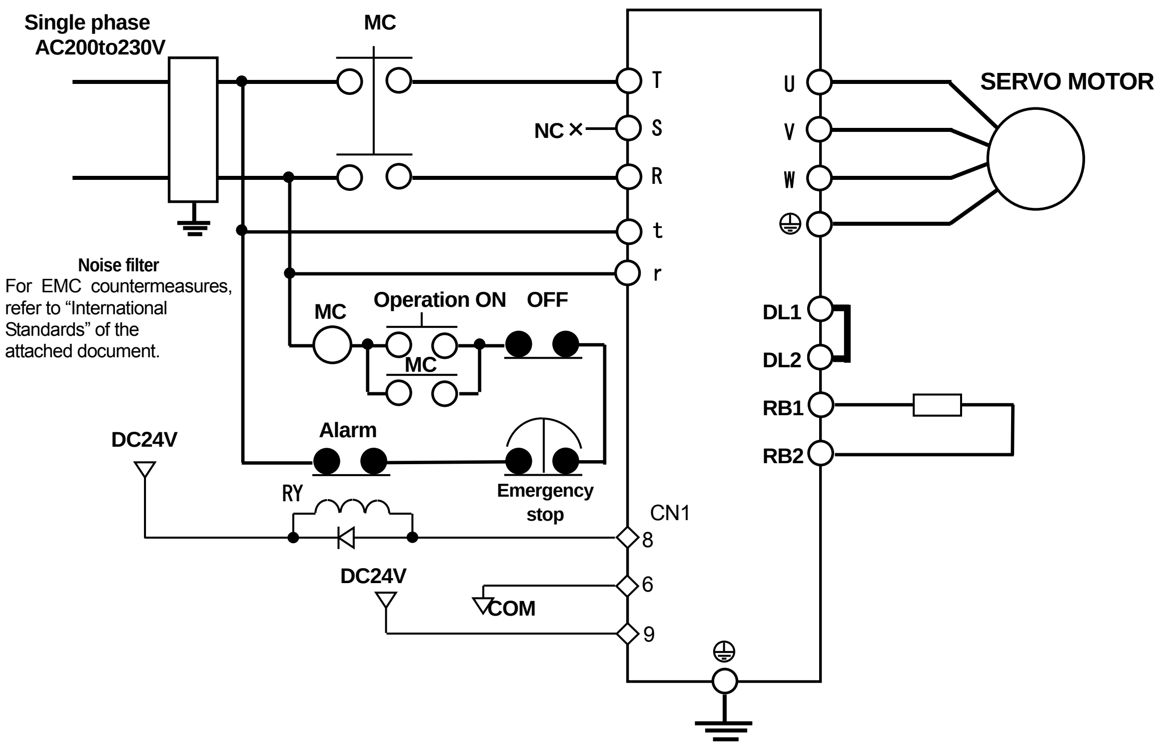
■ Wiring of the power line UVW

	Servo amplifier terminal number	Servo motor canon type terminal number
Q1AA10* Q1AA187* Q2AA10* Q2AA185*, Q2AA187* Q2AA22□□K*	U	A
	V	B
	W	C
	E	D
Q1AA12* Q1AA13* Q1AA184* Q2AA13* Q2AA182*to184* Q2AA22□□0*	U	D
	V	E
	W	F
	E	G, H

■ Three phase 200V RS1□01A・RS1□03A・RS1□05A・RS1□30A

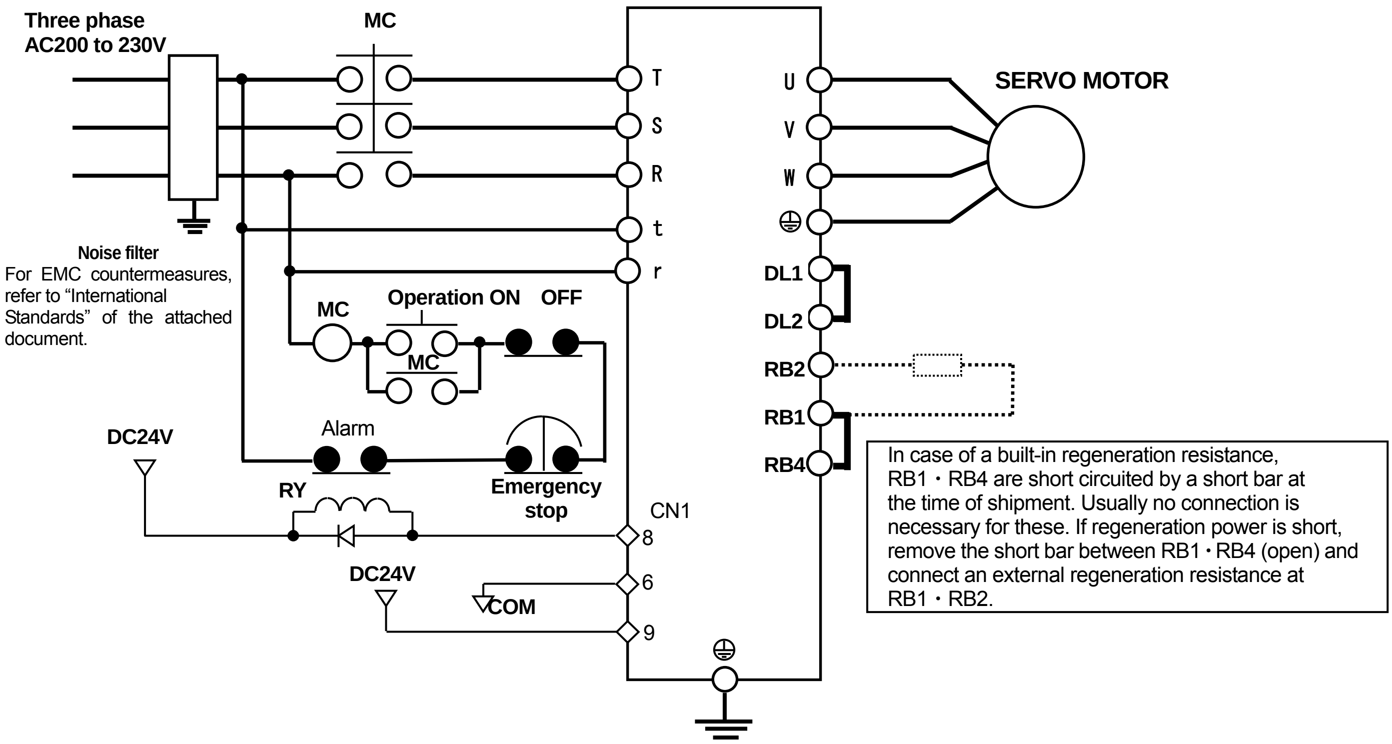


■ Single phase 200V RS1□01A・RS1□03A・RS1□05A

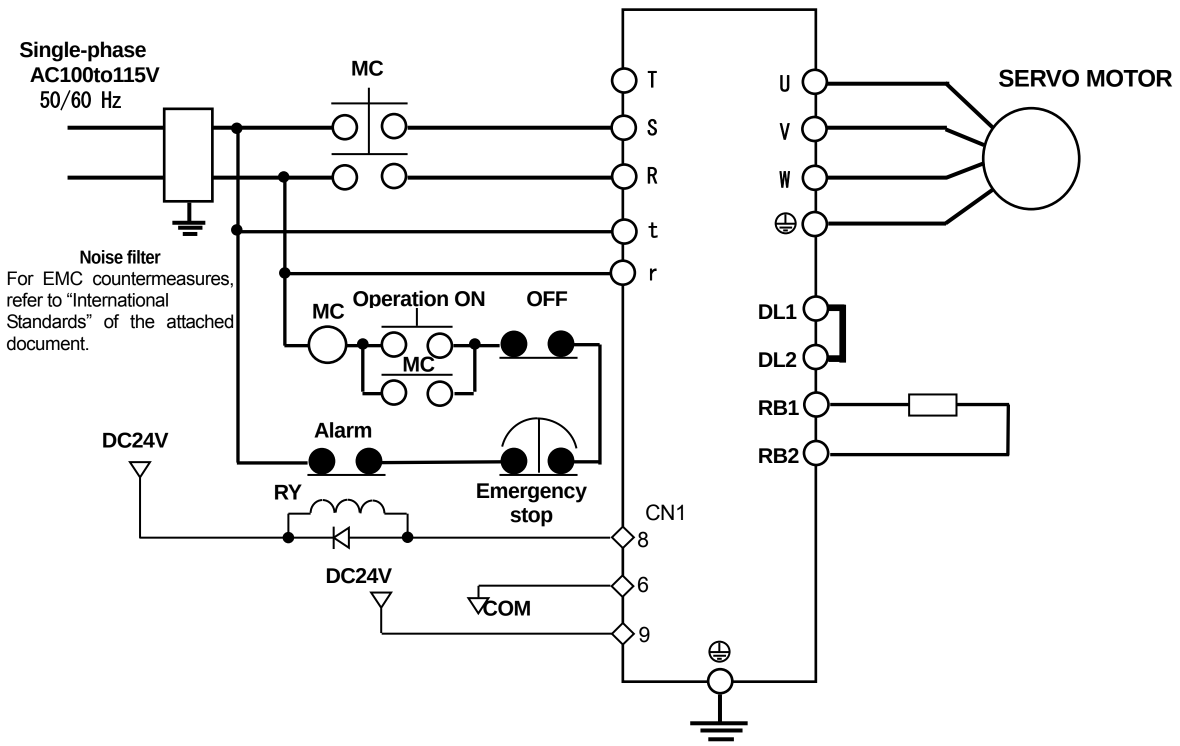


* Make sure to install diode as a surge absorber when connecting induction load, such as relay, to output 8 on CN1.
Please carefully install diode so as not to connect polarity of diode. Failure to do this causes servo amplifier malfunction.

■ Three phase 200V RS1□10A・RS1□15A



■ Single phase 100V RS1□01A・RS1□03A



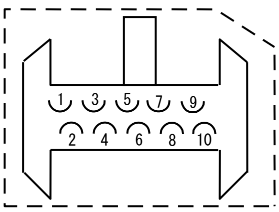
* Make sure to install diode as a surge absorber when connecting induction load, such as relay, to output 8 on CN1.
Please carefully install diode so as not to connect polarity of diode. Failure to do this causes servo amplifier malfunction.

■ Low voltage circuit; terminal name and functions

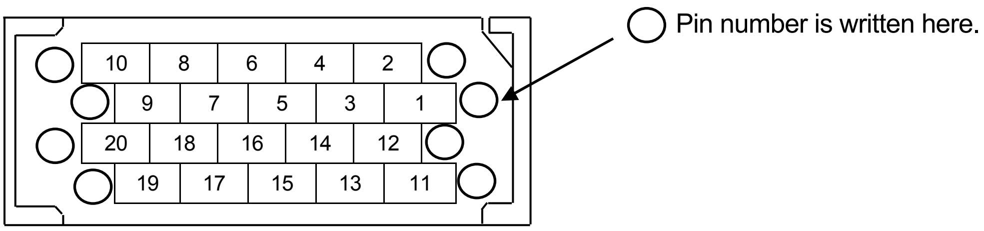
Terminal name	Terminal symbol	Description
Upper device input/output signal connector	CN1	Connects the input/output circuit between upper device (upper controller) and the Servo amplifier.
Encoder connector	CN2	Connects the encoder circuit of the servo motor.

■ Connector terminal number

● CN1 MUF-PK10K-K (Viewed from soldered side.)



● CN2 10120-3000PE (Soldered side)



■ CN1 connector terminal layout

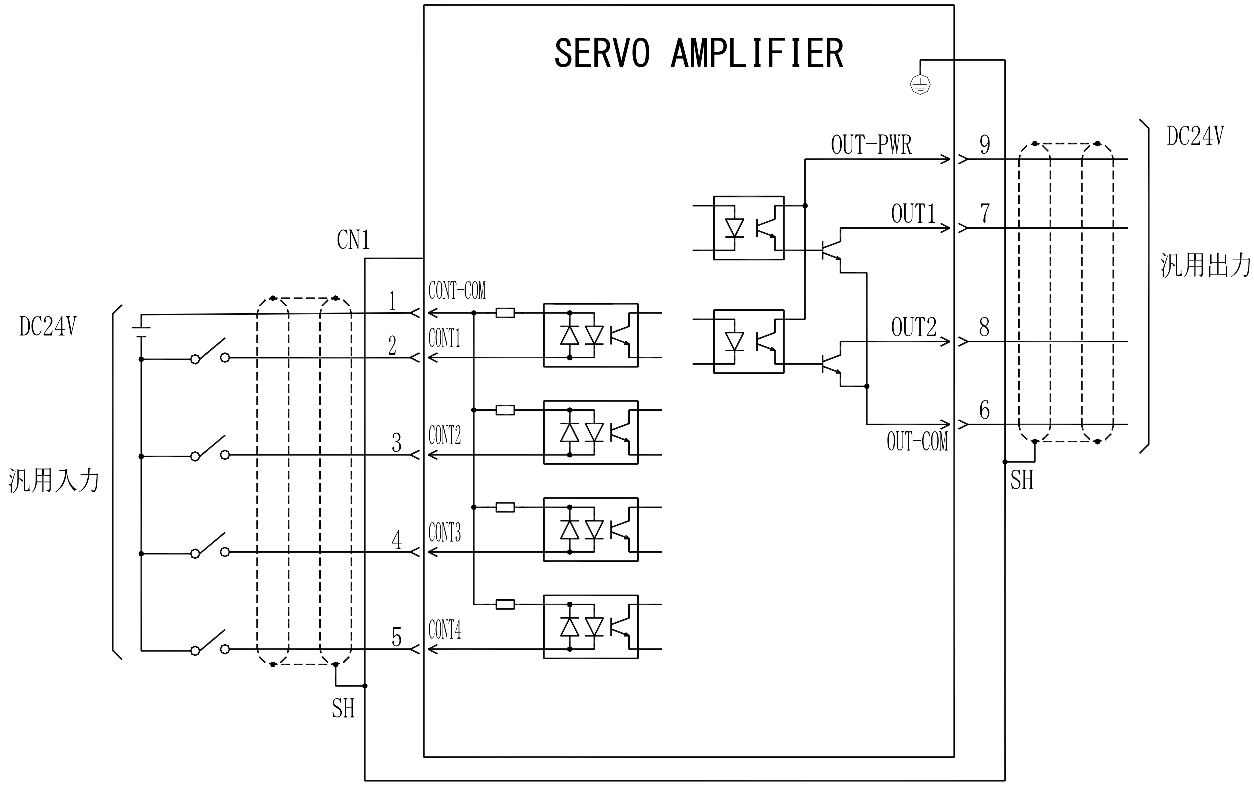
1	3	5	7	9
CONT-COM	CONT2	CONT4	OUT1	OUT-PWR

2	4	6	8	10
CONT1	CONT3	OUT-COM	OUT2	NC

■ CN1 terminal name

Terminal number	Signal code	Signal name	Standard setting brevity code of signal	Standard setting Standard nomenclature of signals
1	CONT-COM	Power supply for General input	—	—
2	CONT1	General input	SON	Servo-on
3	CONT2	General input	+OT	Forward over travel
4	CONT3	General input	-OT	Reverse over travel
5	CONT4	General input	EXT-E	External error
6	OUT-COM	Common for General output	—	—
7	OUT1	General output	HBON	Holding brake excitation timing output
8	OUT2	General output	A-RDY	Power-on permission
9	OUT-PWR	Power supply for general output	—	—
10	NC	—	—	—

■ CN1 Connector terminal layout



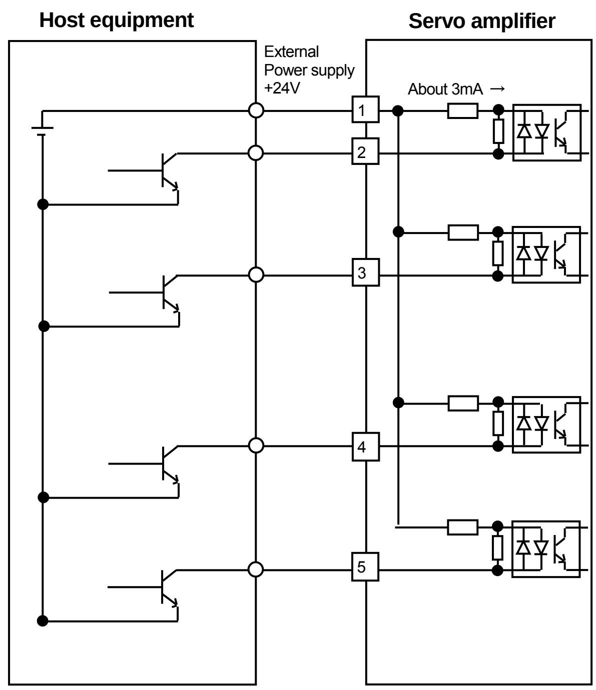
■ Connection example with input circuit

● Composition of input circuit [Input circuit：Bi-directional photo coupler]

・Connected with transistor circuit of relay or open collector.
(Input signal: 2pin to 5pin)

・Voltage range of power supply: DC24V ±10%

・Minimum current:100mA



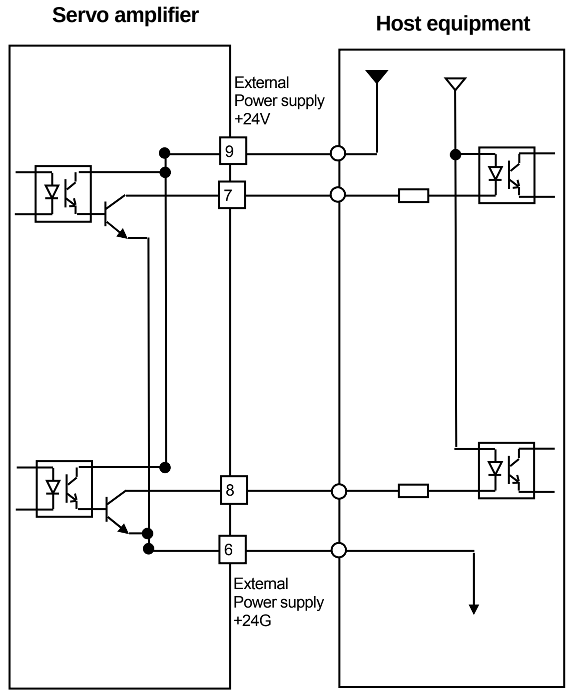
■ Connection example with general output circuit

● Composition of output circuit [output circuit : open collector]

・Connected with photo coupler or relay circuit.
(Output signal : 7pin, 8pin)

・Outer power supply specification
Power supply voltage range: DC24V ±10%
Minimum current: 80mA

・Specification of output circuit power
Power supply voltage range : DC24V ±10%
(Maximum DC30V)
Maximum current : 50mA



■ CN2 terminal layout

10	8	6	4	2
9	7	5	3	1
20	18	16	14	12
19	17	15	13	11

■ Wiring for Wire-saving incremental encoder

Wire-saving incremental encoder				
Terminal No.	Signal name	Description	Servo motor lead type wire color	Servo motor canon type terminal number
1	-	-	-	-
2				
3	A0	A phase position signal output	blue	A
4	$\overline{A0}$		brown	D
5	BO	B phase position signal output	green	B
6	$\overline{BO}$		purple	E
7	ZO	Z phase position signal output	white	F
8	$\overline{ZO}$		yellow	G
9	5V	5V power supply	(red)	(J)
10	SG	5V power supply common	(black)	(N)
11	SG	5V power supply common	(black)	(N)
12	5V	5V power supply	(red)	(J)
13	-	-	-	-
14				
15				
16	SG	5V power supply common	(black)	(N)
17	5V	5V power supply	(red)	(J)
18	SG	5V power source common	(black)	(N)
19	5V	5V power supply	red	J
20	SG	5V power supply common	black	N
G Plate	Shield wire			H

- Refer to page 3-26 for how to process the shield wires.
- The number of power terminals for servo motor encoder connections varies depending on the encoder cable length. Refer to the following table.

	Power connection (CN2) terminal number for servo motor encoder	
Encoder cable length	5V power source terminal number	5V power source common terminal number
Less than 5m	19	20
Less than 10m	19, 17	20, 18
Less than 20m	19, 17, 12	20, 18, 11
Less than 30m	19, 17, 12, 9	20, 18, 11, 16, 10

- Use twisted pair and outer insulated shield cables.
- CN2 plug: 10120-3000PE
- CN2 shell: 10320-52A0-008
- Servo motor encoder: canon plug
  - JL04V-6A20-29S-J1(A72)
  - JL04V-8A20-29S-J1-EB
  - JL04V-6A20-29S-J1-EB
  - MS3108B20-29S
  - MS3106B20-29S

■ CN2 terminal layout

10	8	6	4	2	
	9	7	5	3	1
20	18	16	14	12	
	19	17	15	13	11

■ Wiring for Battery backup method absolute encoder/Absolute encoder without battery/Absolute encoder for incremental system

Battery backup method absolute encoder/Absolute encoder without battery/Absolute encoder for incremental system					
Terminal No.	Signal code	Description	Servo motor lead type wire color	Servo motor canon type terminal number	
1	BAT+	Battery	pink	T	No battery wiring necessary for Absolute encoder without battery/Absolute encoder for incremental system
2	BAT-		purple	S	
3	-	-	-	-	
4					
5					
6					
7					
8					
9	5V	5V power supply	(red)	(H)	
10	SG	5V power supply common	(black)	(G)	
11	SG	5V power supply common	(black)	(G)	
12	5V	5V power supply	(red)	(H)	
13	ES	Position data output	brown	E	
14	$\overline{ES}$		blue	F	
15	-	-			
16	SG	5V power supply common	(black)	(G)	
17	5V	5V supply source	(red)	(H)	
18	SG	5V power supply common	(black)	(G)	
19	5V	5V power supply	red	H	
20	SG	5V power supply common	black	G	
G Plate	Shield wire			J	

・ Refer to page 3-26 for how to process the shield wires.

・ The number of power terminals for servo motor encoder connections varies depending on the encoder cable length. Refer to the following table.

Encoder cable length	Power connection (CN2) terminal number for servo motor encoder	
	5V power supply terminal number	5V power supply common terminal number
Less than 10m	19	20
Less than 25m	19, 17	20, 18
Less than 40m	19, 17, 12	20, 18, 11

Use twisted pair and outer insulated shield cables.

・ CN 2 plug: 10120-3000PE

・ CN 2 shell: 10320-52A0-008

・ Servo motor encoder: canon plug

  ・JL04V-6A20-29S-J1(A72)
  ・JL04V-8A20-29S-J1-EB
  ・JL04V-6A20-29S-J1-EB
  ・MS3108B20-29S
  ・MS3106B20-29S

■ CN2 terminal layout

10	8	6	4	2
9	7	5	3	1
20	18	16	14	12
19	17	15	13	11

■ Absolute encoder with incremental output

Absolute encoder with incremental output				
Terminal No.	Signal Cord	Description	Servo motor lead type wire color	Servo motor canon type terminal number
1	BAT+	Battery	light orange or clear	T
2	BAT-		brown	S
3	A0	A phase position signal output	pink	A
4	$\overline{A0}$		red	B
5	BO	B phase position signal output	blue	C
6	$\overline{BO}$		green	D
7	ZO	Z phase position signal output	yellow	K
8	$\overline{ZO}$		Orange	L
9	5V	5V power supply	(white)	(H)
10	SG	5V power supply common	(black)	(G)
11	SG	5V power supply common	(black)	(G)
12	5V	5V power supply	(white)	(H)
13	PS	Position data output	Pale blue	E
14	$\overline{PS}$		purple	F
15	ECLR	Clear signal	Dark green or light green	R
16	SG	5V power supply common	(black)	(G)
17	5V	5V power supply	(white)	(H)
18	SG	5V power supply common	(black)	(G)
19	5V	5V power supply	white	H
20	SG	5V power supply common	black	G
G Plate	Shield wire			J

・ Refer to page 3-26 for how to process the shield wires.
・ The number of power terminals for servo motor encoder connections varies depending on the encoder cable length. Refer to the following table.

	Power connection (CN2) terminal number for servo motor encoder	
Encoder cable length	5V power supply terminal number	5V power supply common terminal number
Less than 5m	19	20, 16
Less than 10m	19, 17	20, 16, 18
Less than 20m	19, 17, 12	20, 16, 18, 11
Less than 30m	19, 17, 12, 9	20, 16, 18, 11, 10

・ Use twisted pair and outer insulation shield cables.
・ CN2 plug: 10120-3000PE
・ CN2 shell: 10320-52A0-008
・ Servo motor encoder: canon plug
  ・JL04V-6A20-29S-J1(A72)
  ・JL04V-8A20-29S-J1-EB
  ・JL04V-6A20-29S-J1-EB
  ・MS3108B20-29S
  ・MS3106B20-29S

■ CN2 terminal layout

10	8	6	4	2	
	9	7	5	3	1
20	18	16	14	12	
	19	17	15	13	11

■ Request method absolute encoder

Request method absolute encoder				
Terminal No.	Signal code	Description	Servo motor lead type wire color	Servo motor canon type terminal number
1	-	-	-	-
2	-	-	-	-
3	REQ+	Requested Signal	purple or orange	N
4	REQ-		green	P
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	5V	5V power supply	(red)	(H)
10	SG	5V power supply common	(black)	(G)
11	SG	5V power supply common	(black)	(G)
12	5V	5V power supply	(red)	(H)
13	PS	Position data output	brown	E
14	$\overline{PS}$		blue	F
15	ECLR	Clear signal	white	R
16	SG	5V power supply common	yellow	(G)
17	5V	5V power supply	(red)	(H)
18	SG	5V power supply common	(black)	(G)
19	5V	5V power supply	red	H
20	SG	5V power supply common	black	G
G Plate	Shield wire			J

- Refer to page 3-26 for how to process the shield wires.
- The number of power terminals for servo motor encoder connections varies depending on the encoder cable length. Refer to the following table.

	Power connection (CN2) terminal number for servo motor encoder	
Encoder cable length	5V power supply terminal number	5V power supply common terminal number
Less than 5m	19,9	20,16,10
Less than 30m	19,9,17,12	20,16,10,18,11

- Use twisted pair and outer insulated shield cables.
- CN 2 plug: 10120-3000PE
- CN 2 shell: 10320-52A0-008
- Servo motor encoder: canon plug
    - JL04V-6A20-29S-J1(A72)
    - JL04V-8A20-29S-J1-EB
    - JL04V-6A20-29S-J1-EB
    - MS3108B20-29S
    - MS3106B20-29S

■ Power Capacity・Peripherals Examples

Input Voltage	Servo amplifier capacity RS1＊□□A	Servo motor model number	Rated Output(W)	Rated main power supply (KVA)	Power supply control (VA)	Circuit breaker	Noise filter (EMC corresponding time)	Electro magnetic contactor
AC 200V	01	Q1AA04003D	30	0.2	40	**NF30 shape 10A** Manufactured by Mitsubishi Ltd.	**RF3020-DLC** Manufactured by RASMI	**S-N10** Manufactured by Mitsubishi Ltd.
		Q1AA04005D	50	0.2				
		Q1AA04010D	100	0.3				
		Q1AA06020D	200	0.8				
		Q2AA04006D	60	0.3				
		Q2AA04010D	100	0.4				
		Q2AA05005D	50	0.3				
		Q2AA05010D	100	0.4				
		Q2AA05020D	200	0.8				
		Q2AA07020D	200	0.8				
		Q2AA07030D	300	1.0				
		R2AA04003F	30	0.2				
		R2AA04005F	50	0.2				
		R2AA04010F	100	0.4				
		R2AA06010F	100	0.4				
		R2AA06020F	200	0.8				
		R2AA08020F	200	0.8				
	03	Q1AA06040D	400	1.0		**NF30 shape 10A** Manufactured y Mitsubishi Ltd.		
		Q1AA07075D	750	1.7				
		Q2AA07040D	400	1.3				
		Q2AA07050D	500	1.5				
		Q2AA08050D	500	1.5				
		Q2AA13050H	500	1.4				
		R2AA06040F	400	1.0				
		R2AA08040F	400	1.0				
		R2AA08075F	750	1.7				
	05	Q1AA10100D	1000	2.5		**NF30 shape 15A** Manufactured by Mitsubishi Ltd.		
		Q1AA10150D	1500	3.0				
		Q1AA12100D	1000	2.5				
		Q2AA08075D	750	2.0				
		Q2AA08100D	1000	2.5				
		Q2AA10100H	1000	2.5				
		Q2AA10150H	1500	3.0				
		Q2AA13100H	1000	2.5				
		Q2AA13150H	1500	3.0				
		R2AAB8100F	1000	2.5				
		R2AA13120D	1200	2.7				
	10	Q1AA10200D	2000	4.0		**NF50 shape 30A** Manufactured by Mitsubishi Ltd.	**RF3020-DLC** Manufactured by RASMI	**S-N18** Manufactured by Mitsubishi Ltd.
		Q1AA10250D	2500	4.2				
		Q1AA12200D	2000	4.0				
		Q1AA12300D	3000	5.0				
		Q1AA13300D	3000	5.0				
		Q2AA13200H	2000	5.0				
		Q2AA18200H	2000	5.0				
		Q2AA22250H	2500	5.9				
		R2AA13200D	2000	5.0				
	15	Q1AA13400D	4000	6.7		**NF50 shape 50A** Manufactured by Mitsubishi Ltd.	**RF3030-DLC** Manufactured by RASMI **3SUP-HK30-ER-6B** Manufactured by Okaya Ltd.	**S-N35** Manufactured by Mitsubishi Ltd.
		Q1AA13500D	5000	8.3				
		Q1AA18450M	4500	7.4				
		Q2AA18350H	3500	6.9				
		Q2AA18450H	4500	7.4				
		Q2AA18550R	5500	8.4				
		Q2AA22350H	3500	7.4				
		Q2AA22450R	4500	8.4				
		Q2AA22550B	5500	10.1				
		Q2AA22700S	7000	12.2		**NF100 shape 75A** Manufactured by Mitsubishi Ltd.	**3SUP-HK50-ER-6B** Manufactured by Okaya Ltd. **FS5559-35-33** Manufactured by SCHAFFNER	**S-N50** Manufactured by Mitsubishi Ltd.
		R2AA22500L	5000	9.6				
	30	Q1AA18750H	7500	12.6		**NF100 shape 100A** Manufactured by Mitsubishi Ltd.	**RF3070-DLC** Manufactured by RASMI	**S-N65** Manufactured by Mitsubishi Ltd.
		Q2AA18550H	5500	10.1				
		Q2AA18750L	7500	12.6				
		Q2AA2211KV	11000	15.7				
		Q2AA2215KV	15000	21.4				

Input Voltage	Servo amplifier capacity RS1＊□□A	Servo motor model number	Rated Output(W)	Rated main power supply (KVA)	Power supply control (VA)	Circuit breaker	Noise filter (EMC corresponding time)	Electro magnetic contactor
AC 100V	01	Q1EA04003D	30	0.2	40	**NF30 shape 10A** Manufactured by Mitsubishi Ltd.	**RF1010-DLC** Manufactured by RASMI	**S-N10** Manufactured by Mitsubishi
		Q1EA04005D	50	0.3				
		Q1EA04010D	100	0.5				
		Q2EA04006D	60	0.3				
		Q2EA04010D	100	0.5				
		Q2EA05005D	50	0.3				
		Q2EA05010D	100	0.5				
		R2EA04003F	30	0.2				
		R2EA04005F	50	0.2				
		R2EA04008F	80	0.4				
		R2EA06010F	100	0.5				
	03	Q1EA06020D	200	0.5				
		Q2EA05020D	200	0.5				
		Q2EA07020D	200	0.5				
		R2EA06020F	200	0.8				

● Recommended surge protector : R･A･V-781BXZ-2A Manufactured by Okaya Electric Industries Co.,Ltd.

■ Recommended Wire Diameter Examples

Input Voltage	Servo motor model number	Motor power wire diameter (U·V·W·⏚) mm^2	Motor power wire diameter (U·V·W·⏚) AWG No	servo amplifier combination	Main power supply wire diameter (R·S·T·⏚) mm^2	Main power supply wire diameter (R·S·T·⏚) AWG No	Control power wire diameter —	Regeneration resistance wire diameter —	CN1·CN2 Signal wire diameter —
AC200V	Q1AA04003D	0.5	#20	RS1□01	1.25	#16	AWG 16	AWG 16 1.25 mm^2	AWG 24 0.2 mm^2
	Q1AA04005D								
	Q1AA04010D								
	Q1AA06020D	0.75	#18						
	Q1AA06040D	0.75	#18	RS1□03	2.0	#14		AWG 14 2.0 mm^2	
	Q1AA07075D								
	Q1AA10100D	3.5	#12	RS1□05	3.5	#12		AWG 12 3.5 mm^2	
	Q1AA10150D								
	Q1AA12100D								
	Q1AA10200D	3.5	#12	RS1□10	5.5	#10		AWG 10 5.5 mm^2	
	Q1AA10250D								
	Q1AA12200D	5.5	#10	RS1□10	5.5	#10		AWG 10 5.5 mm^2	
	Q1AA12300D								
	Q1AA13300D								
	Q1AA13400D	5.5	#10	RS1□15	8.0	#8		AWG 8 8.0 mm^2	
	Q1AA13500D								
	Q1AA18450M								
	Q1AA18750H	14.0	#6	RS1□30	14.0	#6		AWG 6 14.0 mm^2	
	Q2AA04006D	0.5	#20	RS1□01	1.25	#16		AWG 16 1.25 mm^2	
	Q2AA04010D								
	Q2AA05005D	0.75	#18						
	Q2AA05010D								
	Q2AA05020D								
	Q2AA07020D								
	Q2AA07030D								
	Q2AA07040D	0.75	#18	RS1□03	2.0	#14		AWG 14 2.0 mm^2	
	Q2AA07050D								
	Q2AA08050D								
	Q2AA13050H	2.0	#14						
	Q2AA08075D	0.75	#18	RS1□05	3.5	#12		AWG 12 3.5 mm^2	
	Q2AA08100D								
	Q2AA10100H	3.5	#12						
	Q2AA10150H								
	Q2AA13100H	3.5	#12						
	Q2AA13150H								
	Q2AA13200H	5.5	#10	RS1□10	5.5	#10		AWG 10 5.5 mm^2	
	Q2AA18200H								
	Q2AA22250H								
	Q2AA18350H	5.5	#10	RS1□15	8.0	#8		AWG 8 8.0 mm^2	
	Q2AA18450H								
	Q2AA18550R	8.0	#8	RS1□15					
	Q2AA22350H	5.5	#10						
	Q2AA22450R								
	Q2AA22550B	5.5	#10						
	Q2AA22700S								
	Q2AA18550H	14.0	#6	RS1□30	14.0	#6		AWG 6 14.0 mm^2	
	Q2AA18750L								
	Q2AA2211KV								
	Q2AA2215KV								
	Q4AA1811KB								
	Q4AA1815KB								
	R2AA04003F	0.5	#20	RS1□01	1.25	#16		AWG 16 1.25 mm^2	
	R2AA04005F								
	R2AA04010F								
	R2AA06010F								
	R2AA06020F	0.75	#18						
	R2AA08020F								
	R2AA06040F	0.75	#18	RS1□03	2.0	#14		AWG 14 2.0 mm^2	
	R2AA08040F								
	R2AA08075F								
	R2AA13050D								
	R2AAB8100F	3.5	#12	RS1□05	3.5	#12		AWG 12 3.5 mm^2	
	R2AA13120D								
	R2AA13200D	5.5	#10	RS1□10	5.5	#10		AWG 10 5.5 mm^2	
	R2AA22500L	5.5	#10	RS1□15	8.0	#8		AWG 8 8.0 mm^2	

Input Voltage	Servo motor model number	Motor power wire diameter (U·V·W·⏚) mm²	Motor power wire diameter (U·V·W·⏚) AWG No	servo amplifier combination	Main power supply wire diameter (R·S·T·⏚) mm²	Main power supply wire diameter (R·S·T·⏚) AWG No	Control power wire diameter	Regeneration resistance wire diameter	CN1·CN2 Signal wire diameter
							—	—	—
AC100V	Q1EA04003D	0.5	#20	RS1□01	1.25	#16	AWG 16	AWG 16 1.25 mm²	AWG 24 0.2 mm²
	Q1EA04005D								
	Q1EA04010D								
	Q2EA04006D								
	Q2EA04010D								
	Q2EA05005D	0.75	#18						
	Q2EA05010D								
	Q1EA06020D	0.75	#18	RS1□03	2.0	#14		AWG 14 2.0 mm²	
	Q2EA05020D								
	Q2EA07020D								
	R2EA04003F	0.5	#20	RS1□01	1.25	#16		AWG 16 1.25 mm²	
	R2EA04005F								
	R2EA04008F								
	R2EA06010F								
	R2EA06020F	0.75	#18	RS1□03	2.0	#14		AWG 14 2.0 mm²	

- The information in this table is based on rated current flowing through three bundled lead wires in ambient temperature of 40°C.
- When wires are bundled or put into a wire-duct, take the allowable current reduction ratio into account.
- If ambient temperature is high, service life of the wires becomes shorter due to heat-related deterioration. In this case, use heat-resistant vinyl wires.
- The use of heat-resistant vinyl wires (HIV) is recommended.
- Depending on the servo motor capacity, thinner electric wires than indicated in the above table can be used for the main circuit power input terminal.

■ Connector for Servo Amplifier

	Name	Sanyo Denki Model No.	Model No. of applicable amplifier	Name	Manufacturer's model No.	Manufacturer	Recommended tightening torque
①	CN1	AL-00385594	All	Plug	10150-3000PE	3M Japan Limited	0.196±0.049 N·m (jack-screw)
				Shell kit	10350-52A0-008		
②	CN2	AL-00385596	All	Plug	10120-3000PE		
				Shell kit	10320-52A0-008		
③	CNA	AL-00329461-01	RS1□01toRS1□05 (200V input only)	Plug	MSTB2.5/5-STF-5.08	Phoenix Contact Ltd.	0.5to0.6 N·m
④	CNA	AL-00329461-02	RS1□01toRS1□03 (100V input only)	Plug	MSTB2.5/4-STF-5.08		0.5to0.6 N·m
⑤	CNB	AL-Y0000988-01	RS1□01toRS1□05 (for both 100V·200V)	Plug	IC2.5/6-STF-5.08		0.5to0.6 N·m
⑥	CNC	AL-00329458-01	RS1□01toRS1□05 (for both100V·200V)	Plug	IC2.5/3-STF-5.08		0.5to0.6 N·m
⑦	PC	AL-00490833-01	All	Communication cable for Set-up software -『 R-Setup 』			

Combination	Sanyo Denki Model No.	Model No. of applicable amplifier
Set of ①+②	AL-00292309	All
Set of ③+⑥	AL-00416792	RS1□01toRS1□05(200V input only)
Set of ①+②+③+⑥	AL-00393603	RS1□01toRS1□05(200V input only)
Set of ①+②+④+⑥	AL-00492384	RS1□01toRS1□03(100V input only)

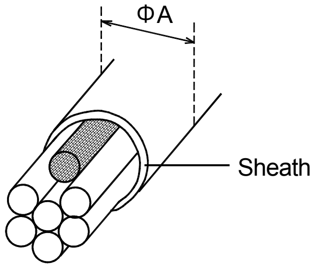
- To have an insulation distance between the main circuit wires and between the main circuit and the signal circuit wires, the use of pole terminals with insulation sleeves is recommended.(If the wire in use is thicker than AWG12, these cannot be used.)

■ How to process CN2 shields.

The drawings below show how to process shields for CN1/CN2 connectors.
There are two ways to process shields; clamping and soldering.

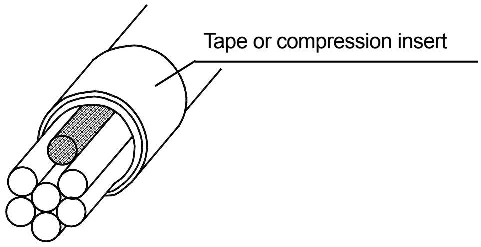
● **Clamping**

1



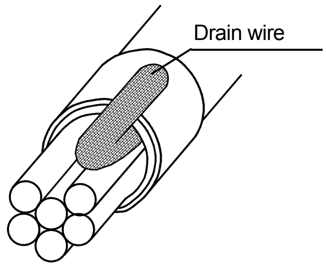
Remove the cable sheath.

2



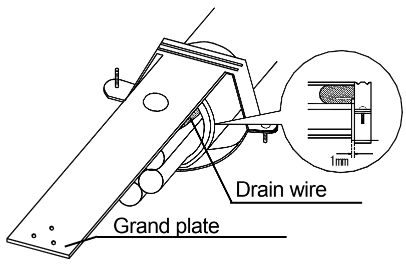
Attach tape or compression insert.
When attached, tape or compression insert must completely be on the sheath of the cable.

3



Bend back the drain wire.

4

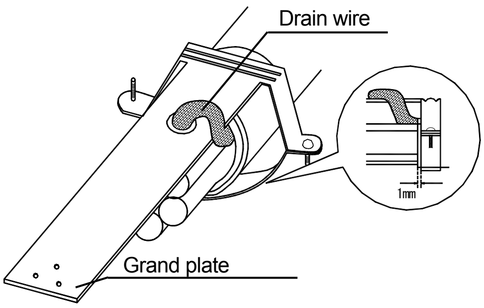


Tighten the cable clamp over the drain wire.
Attach approximately 1mm away from the tape or the compression insert.

∗Compression insert should only be attached before soldering the cable to the connector.

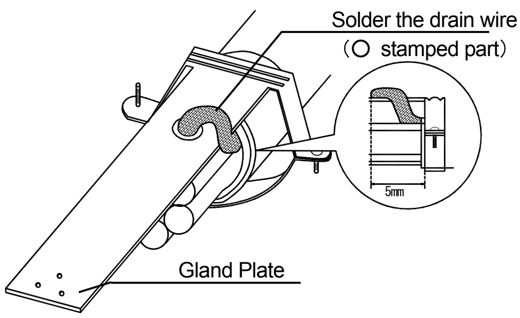
● **Soldering** (Conditions 1 and 2 are the same as for clamping.)

3



Turn the cable and bring the drain wire close to the grand plate.

4



● **Applicable ϕA measurements for CN2.**

Applicable ϕA measurements are shown below. Compression insert is not required if the ϕA measurements are within these.

Connector NO.	ApplicableΦ A measurement	Connector model number	Manufacturer
CN2	10.5 to 12.0mm	10120-3000PE 10320-52A0-008	3M Japan Limited

[Description of CN3・4 Serial Interface (MODBUS communication)]

■ Basic Specifications

Item	Content	Default value	Remark
Protocol	Modbus-RTU	-	Binary mode fixed (No compliant with ASCII mode)
Interface	RS－485(1：N)	-	N＝8 (Note 1)
Baud Rate (bps)	4800,9600,19200, 38400,57600,115200	115200	(Note 2)
Start bit	1	1	Fixed
Data length (bit)	8	8	Fixed
Parity	None, even/odd number	even	(Note 3)
Stop bit	1,2	1	(Note 3)
Electric specification	Based on RS-485 (half duplex communication)	RS-485-compliant (half-duplex communication)	Fixed
Connector	RJ-45	-	

Note 1) From the limitation of general RS-485 physical layer (distance, terminator) specification, connectable amplifier (or other slave units) number is up to 31 per one segment. (Maximum number of devices without repeater.)　Set up a node address with the rotary switch front of amplifier or in the R-Setup (personal computer interface) soft ware.

Note 2) Set up a communication setup (access speed) with the rotary switch on the front surface of amplifier or in R-Setup (personal computer interface).

Note 3) Communication setup (transfer speed, parity, stop bit) is set up by the R-Setup software (interface with PC).

■ Communication Setup of Servo Amplifier

● Servo amplifier communication setting can be changed by rotary switches on the front surface of amplifier and R-setup (interface with PC) software (general parameter Group D).

Page	Name	Standard set value	Unit	Setting range
50	Host communication baud rare	05: _115200bps	—	00 - 06
51	Host communication format	00: _Even_1Stop	—	00 - 02
52	Host communication slave address offset	00: _+0	—	00 - F0
53	Host communication rotary switch 1 mode	00: _Baudrate	—	00 - 01
54	Host communication wait time	0	N*125μS	0 - 8000
55	Host communication time out	0	mS	0 - 10000
56	Host communication specification	00: _MODBUS	—	00 - 01
57	Host communication function	00: _Standard	—	00

● The function of the rotary switch 1 is set up.

When baud rate is chosen, set up slave address offset on the page 52 of Group D.

When slave address offset is chosen, set up baud rate on the page 50 of Group D.

Page	Content
53	MODBUS Rotary switch 1 mode [MODRSWMODE]

Set range	Standard set value
00,01	00:_Baudrate

The function of the rotary switch 1 (RSW1) is set up.
✍Setting becomes effective after control power supply re-input.

Selective value	Content
00:_Baudrate	Communication baud rate is set up with the rotary switch 1.
01:_Address	Slave address offset is set up with the rotary switch 1.

● The host of a slave address is set up.

Page	Content
52	MODBUS Slave address offset [MODADDROFS]

Set range	Standard set value
00toF0	00:_+0

The offset value of the slave address of the servo amplifier that does MODBUS communication is set up.
Setting becomes effective when the rotary switch 1 mode is a setup of 00:_Baudrate.
✍Setting becomes effective after control power supply re-input.

Selective value	Content
00:_+0	0 is added to the value of the rotary switch 2 as an offset value.
10:_+16	16 is added to the value of the rotary switch 2 as an offset value.
20:_+32	32 is added to the value of the rotary switch 2 as an offset value.
30:_+48	48 is added to the value of the rotary switch 2 as an offset value.
40:_+64	64 is added to the value of the rotary switch 2 as an offset value.
50:_+80	80 is added to the value of the rotary switch 2 as an offset value.
60:_+96	96 is added to the value of the rotary switch 2 as an offset value.
70:_+112	112is added to the value of the rotary switch 2 as an offset value.
80:_+128	128 is added to the value of the rotary switch 2 as an offset value.
90:_+144	144 is added to the value of the rotary switch 2 as an offset value.
A0:_+160	160 is added to the value of the rotary switch 2 as an offset value.
B0:_+176	176 is added to the value of the rotary switch 2 as an offset value.
C0:_+192	192 is added to the value of the rotary switch 2 as an offset value.
D0:_+208	208 is added to the value of the rotary switch 2 as an offset value.
E0:_+224	224 is added to the value of the rotary switch 2 as an offset value.
F0:_+240	240 is added to the value of the rotary switch 2 as an offset value.

● Baud rate is set up.

Page	Content
50	MODBUS Communication baud rate [MODBAUD]

Set range	Standard set value
00to05	05:_115200bps

The baud rate that does MODBUS communication with servo amplifier is set up.
Setting becomes effective when the rotary switch 1 mode is a setup of 01:_Address.
✍Setting becomes effective after control power supply re-input.

Selective value
00:_4800bps
01:_9600bps
02:_19200bps

Selective value
03:_38400bps
04:_57600bps
05:_115200bps

● Set latency time to communicate.

Page	Content
51	MODBUS Communication format [MODCOMMFMT]

Set range	Standard set value
08,20,30	20:_Even_1Stop

The format of MODBUS communication is set up.
Start bit (1 bit) and data length (8 bits) are fixation.
All the data bits are 11-bit fixation.
✍ Setting becomes effective after control power supply re-input.

Selective value	Content
00:_Even_1Stop	Even number parity, 1 stop bit
01:_Odd_1Stop	Odd parity, 1 stop bit
02:_None_2Stop	Without parity, 2 stop bit

● Communication waiting time is set up.

Page	Content	
54	MODBUS Communication waiting time [MODWAIT]	
	<table><tr><th>Set range</th><th>Unit</th><th>Standard set value</th></tr><tr><td>0to1000</td><td>ms</td><td>0</td></tr></table>	The response time from servo amplifier is set up. The response time from servo amplifier in case setting is 0 turns into silence interval time (3.5 character time) and totaled time of amplifier internal processing time. Furthermore, when waiting time is required, it is possible to set up a value per 1mS. ✍ Setting becomes effective after control power supply re-input.

● Communication timeout is set up.

Page	Content	
55	MODBUS Communication timeout [MODTIMEOUT]	
	<table><tr><th>Set range</th><th>Unit</th><th>Standard set value</th></tr><tr><td>0to10000</td><td>ms</td><td>0</td></tr></table>	The communication timeout time of servo amplifier is set up. Communication timeout is not detected when setting is 0. When communication timeout time is set up, publish a communication message periodically so that communication timeout is not detected with servo amplifier. ✍ Setting becomes effective after control power supply re-input.

● Set communication specification.

56	Specifications for communication with host controller [HCOMSPEC]	
	<table><tr><th>Setting range</th><th>Standard set value</th></tr><tr><td>00,01</td><td>00:_MODBUS</td></tr></table>	Set specifications for communication with host controller. ✍Set value becomes effective after returning on control power supply.
	<table><tr><th>Value to be selected</th><th>Contents</th></tr><tr><td>00:_MODBUS</td><td>Set specifications for MODBUS-communication.</td></tr></table>	

● Set communication specification.

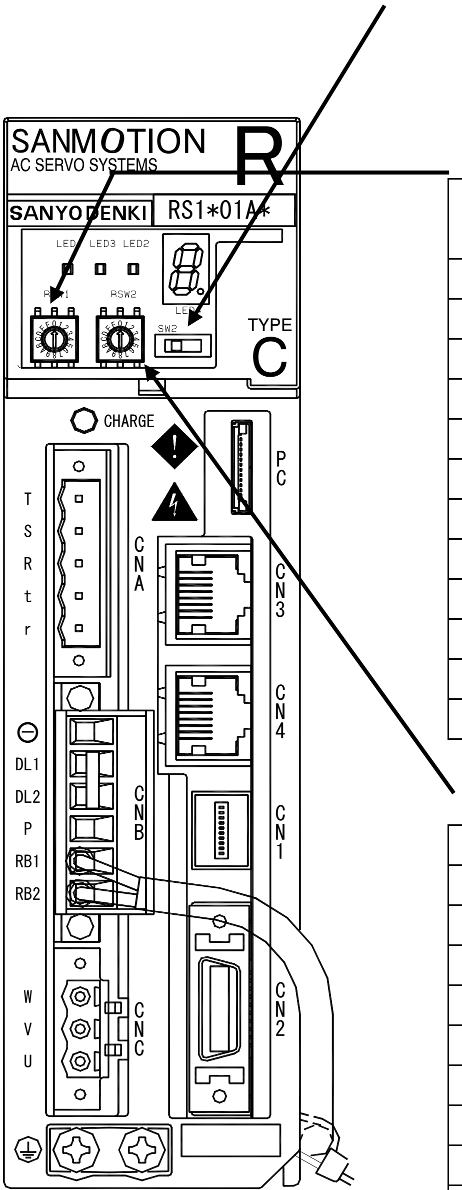
57	Specifications for communication with host controller [HCOMFUNC]	
	<table><tr><th>Setting range</th><th>Standard set value</th></tr><tr><td>00</td><td>00:_Standard</td></tr></table>	Set specifications for communication with host controller. ✍Set value becomes effective after returning on control power supply.
	<table><tr><th>Value to be selected</th><th>Contents</th></tr><tr><td>00:_Standard</td><td>Set standard function.</td></tr></table>	

■ Setup of Slave Address and Communication Baud Rate

- Terminating resistance

  Set up the terminating resistance if needed with the switch in front of amplifier.
  (The factory default setting is "with termination resistor, set to ON.")

Terminating resistor switch



RSW1 Setting

RSW1	RSW1 Mode = 1	RSW1 Mode = 0
	Host slave address	Communication baud rate
0	0	115200bps
1	1	Unused
2	2	Unused
·	·	·
·	·	·
·	·	·
A	A	Unused
B	B	4800bps
C	C	9600bps
D	D	19200bps
E	E	38400bps
F	F	57600bps

RSW2 Setting

RSW2	Low slave address
0	0
1	1
2	2
·	·
·	·
·	·
D	D
E	E
F	F

- Setup of the rotary switches 1 and 2

  By mode select, the rotary switch 1 can change whether the high-order byte of a slave address is set up, or baud rate is set up. (The default at the time of factory shipments is baud rate.)
  Setup of the parameter which was not chosen with the rotary switch 1 can be set up by GroupD, General parameter setup of R-Setup. The rotary switch 2 should set up the low-order byte of a slave address.
  (The default at the time of factory shipments is 1.)

■ Applicable Cables

- RJ-45 Connector

  To secure the reliability in connection, specifications of applicable cables are specified as below.

	Specifications
Common Specification	UL Electrically Verified to ANSI/TIA/EIA 568A Category 5, Straight-through cable for 10BASE-T/100BASE-TX (Commercially available LAN cable)

Recommended LAN Cables

Manufacturer: SANWA SUPPLY INC

Model Number: KB-10T5-01K (1m)

KB-STP-01K (1m shielded cable: Compliant with EMC directives)

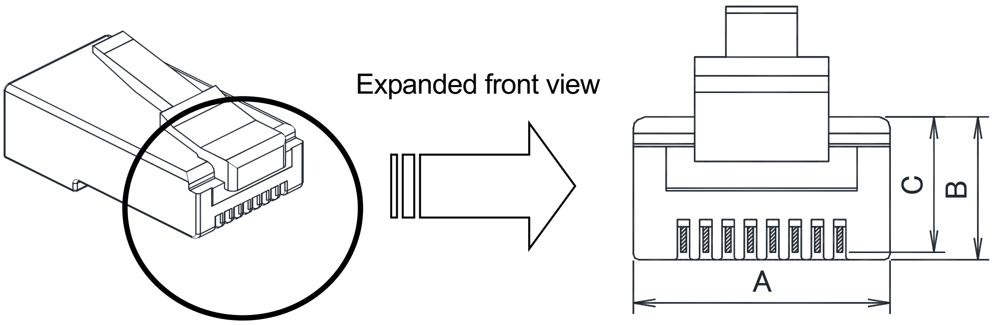
- Specification of connection cable for a host device

  To secure the reliability in connection, use the twisted pair shielded cable for long-distance transmission.

■ Caution for RJ-45 modular connector selection

・ For the modular connector selection and modification, please confirm the standards dimension below (Standards: TIA-968-A).

・ Especially, when the connector (ready-made/ modified product) which has out-of-range dimension at C (from top end of connector housing to lower side of terminal) is used, it gives excessive stress to mating connector and may cause a damage of terminal or connector, and a communication error by contact failure.



Standards dimension:

A: 11.58 to 11.78 mm

B: 6.49 to 6.70 mm

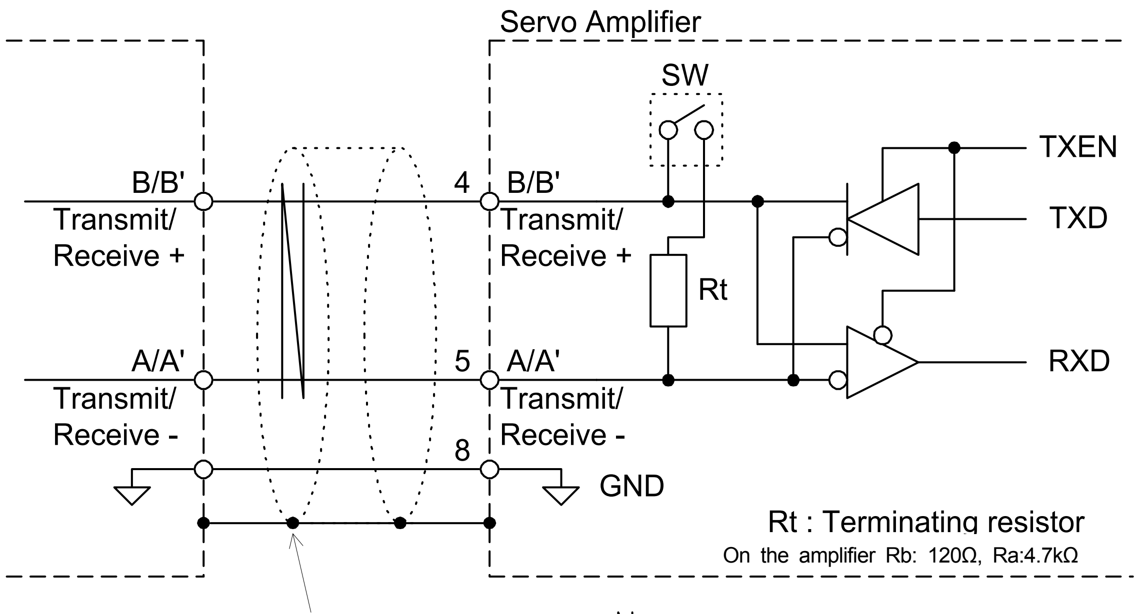
C: 5.89 to 6.15 mm

■ MODBUS Communication Wiring

- Pin disposition of CN3 and CN4

Pin on RJ45	EIA/TIA-485 name	Description
1		
2		
3		
4	B/B’	Transmit/Receive +
5	A/A’	Transmit/Receive -
6		
7		
8	C/C’	Signal Ground (GND)

- Example with pin disposition of CN3 and CN4

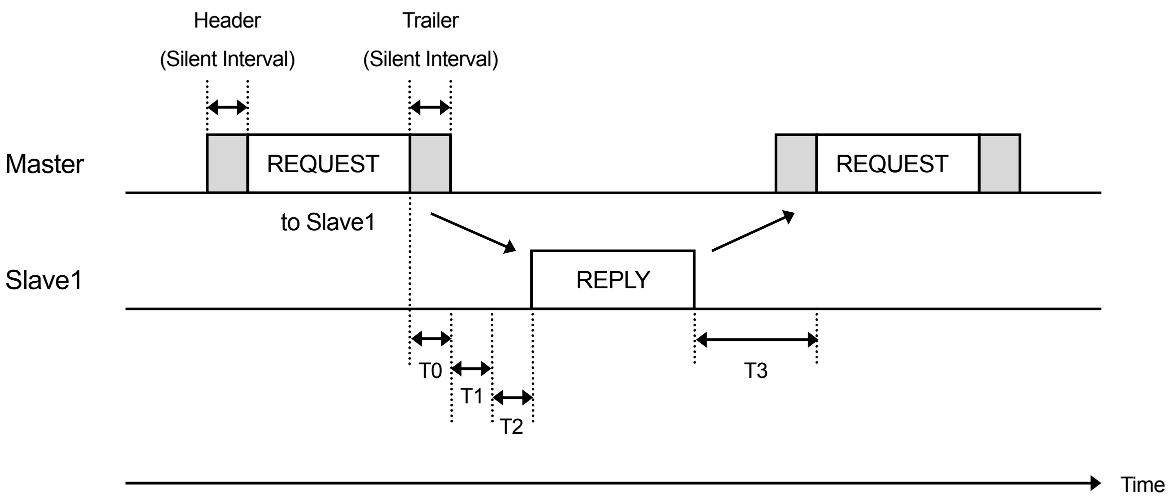


For the parts marked , use a twisted pair shield cable.

■ Master / Slave Communication Time Diagram

- Normal message

In the communication mode of MODBUS-RTU, the message frame judges the beginning of a message and the last by detection of the silence interval time of 3.5 or more characters.
Communication is started by the request from the master.
Communication is not started from the slave. Moreover, there is also no communication between slaves.
(1)Message is sent to the slave (servo amplifier) from the master. (Request)
(2)Message is returned to the master from the slave (servo amplifier). (Response)



T0・・・Indicates silence interval time (for about 3.5 characters)
Calculate silence interval time for every communication baud rate.
e.g.) In the case of 115200bps communication baud rate [1/115200×3.5×11(bit)=about 334(μS)]
T1・・・Indicates servo amplifier incoming message processing time (about 500μS)
T2・・・Indicates communication waiting time (from 0mS to 1000mS)
Setup of the communication waiting time at the time of factory shipments serves as 0mS.
In the system for which reception is not enough with a master with the response time (T0+T1) of amplifier, the response from amplifier is delay able per 1mS setting up this value.
T3・・・Indicates time after servo amplifier sends a response massage until it gives the next request to replying permission
Changes with request messages from the master.
When the write-in request to a register is received, the preservation process to nonvolatile memory (EEPROM) is implemented. Therefore, in sending a write-in request, after T 3 hours or more pass, send the next request.

● Time after Servo Amplifier Receives a Request Message until it Sends to Start of the Response Massage (Response time)

Response time is the sum total time of T0, T1, and T2.

Communication baud rate (bps)	T0 (mS)	T1 (mS)	T2 (mS)	Response time (mS) [When T2=0]
115200	0.334	0.5	0to1000	about 0.834
57600	0.668			about 1.168
38400	1			about 1.5
19200	2			about 2.5
9600	4			about 4.5
4800	8			about 8.5

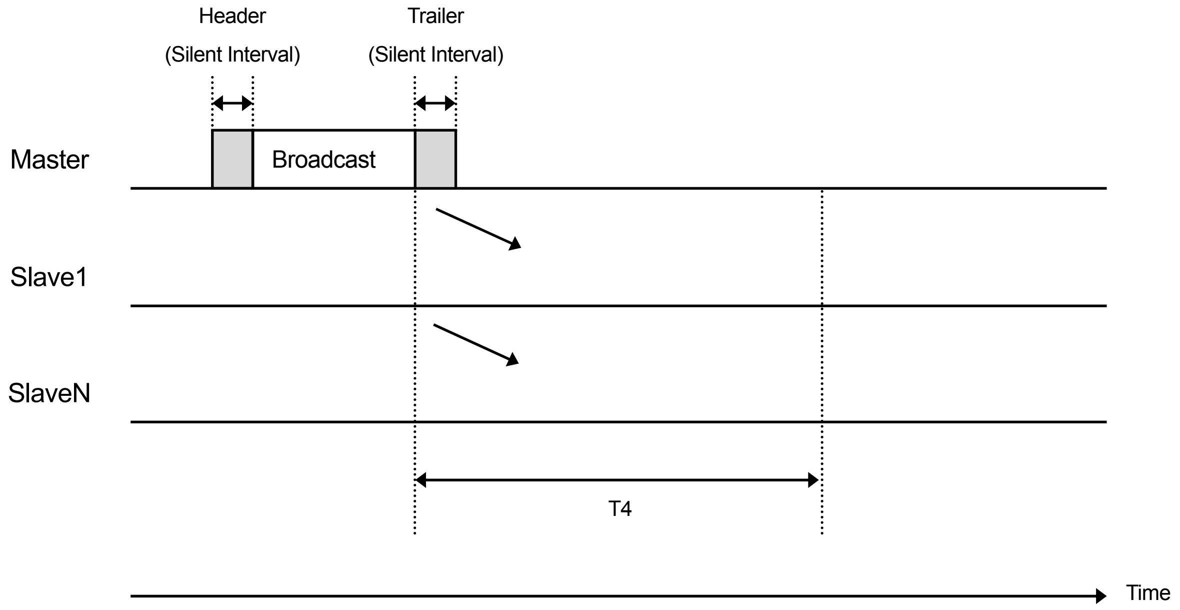
● Time after Servo Amplifier Sends a Response Massage until it Gives the Next Request to Replying Permission

Function code	Function Name	EEPROM save	T3 (mS)
0x01	Read Coils	None	More than T0
0x03	Read Holding Registers		
0x05	Write Single Coil		
0x06	Write Single Register (Coil Input)		
0x08	Diagnostic		
0x10	Write Multiple Registers (Coil Input)		
	Write Multiple Registers (Point Data) [When from the block 0 to the block 9]		
0x06	Write Single Register (Servo Gain)	Exists	More than 22mS
0x10	Write Multiple Registers (Servo Gain)		More than 22mS × n-word
	Write Multiple Registers (Point Data) [When from the block 10 to the block 253]		

✍ In the write-in process to a coil input, the preservation process to nonvolatile memory (EEPROM) is not implemented.
As for the data of blocks 0 to 9, in point data, the preservation process to nonvolatile memory (EEPROM) is not implemented.
In a write-in process of other servo gains, point data, etc., the preservation process to nonvolatile memory (EEPROM) is implemented.
2-word data is contained in point data.
In writing in two or more word data (n-word), please take into consideration the T 3 hours.

- Broadcast message

  Message can be simultaneously sent to two or more slaves.
  There is no response from the slave to the broadcast message.



T4・・・Indicates broadcast message response delay waiting time
The processing time inside communication baud rate, the message which sends, and amplifier etc. is included.
After this time progress, the master can send the following message.

- Description of broadcast message response delay waiting time

  Response delay waiting time changes with communication baud rate and outgoing messages.
  Design the following table to reference with the number of words (n) saved at EEPROM.
  In the case of the outgoing message which is not saved at EEPROM, calculate by n= 0.

Communication baud rate (bps)	T0 (mS)	T1 (mS)	EEPROM save (mS)	T4 (mS)
115200	0.334	0.5	None=0, Exists=22×n-word	More than about 0.834+22n
57600	0.668			More than about 1.168+22n
38400	1			More than about 1.5+22n
19200	2			More than about 2.5+22n
9600	4			More than about 4.5+22n
4800	8			More than about 8.5+22n

- Error detection message

  The driver (slave) will ignore a request and will not return a response under the following conditions:

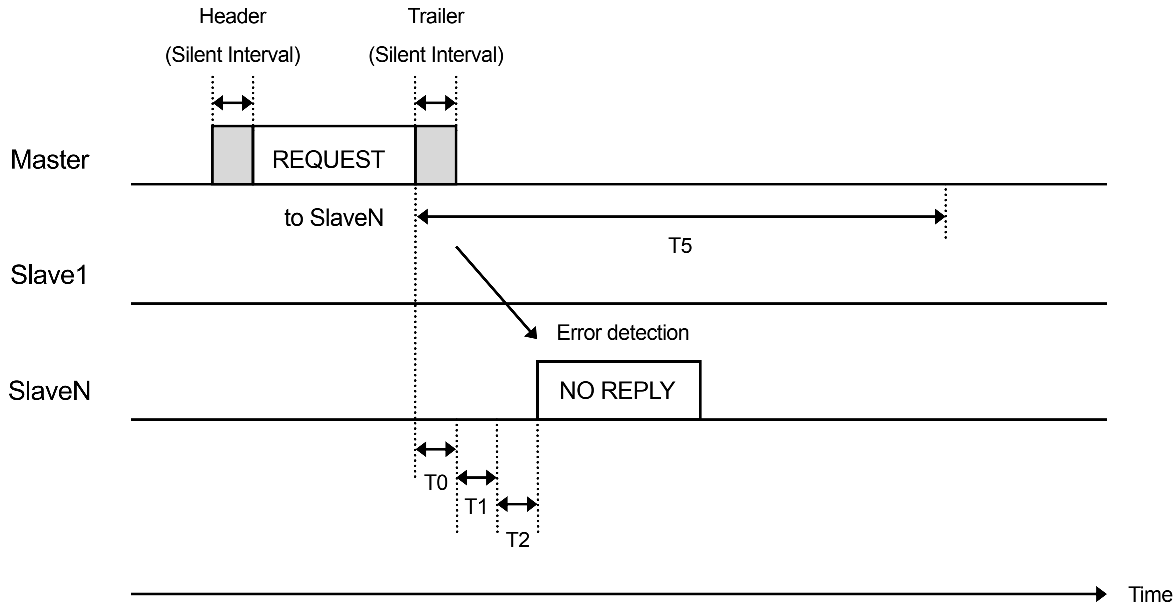
  (1) When the driver detects a communication error during the request receiving process.

  (2) When the slave address of a request and the slave address configured for the driver do not match.

  (3) When the portion of the data comprising the message and time interval is less than or equal to 3.5 characters.

  (4) When the data length of a request is invalid.

✍ When you prepare the timer which supervises a response by a master and the response does not come to within a time on the contrary, send the same request message again. (Resending process)



T5・・・Indicates response timeout time

Set up time to supervise timeout of the response from a slave by a master.

■ Modbus Frame composition

The Modbus application protocol defines a simple Protocol Data Unit (PDU) independent of the underlying communication layers.

Modbus Serial Line PDU

Slave Address (1 byte)	Function code (1byte)	Data (0 up to 252 bytes)	CRC (2bytes)

Modbus PDU

● **Slave address**

Slave Address (1 byte)	Description
0x00	Broadcast address
0x01 to 0xF7	Slave individual address
0xF8 to 0xFF	Reserved

● **Function code**

Use Modbus-RTU communication and specify the function implemented in servo amplifier.
The function code which corresponds with servo amplifier is shown below.

Function code (Hex)	Function Name	Content
0x01	Read Coils	The state of I/O coil is referred to.
0x03	Read Holding Registers	Holding registers, such as parameter, monitor, and point data are referred to.
0x05	Write Single Coil	Writes in output coil.
0x06	Write Single Register	Parameter etc. is written in holding register.
0x08	Diagnostic (Serial Line only)	Communication diagnosis (Loopback test).
0x10	Write Multiple Registers	Parameter, point data, etc. are written in two or more holding register.

Note：Do not use function codes (FC) other than the above.
In writing to two or more coils, please set by using the function of plural register writing or register writing to the register address allocating coils.

● **Data**

As for the data area, the allocation is different accodeing to the function code.
For details, refer to explanation of each function code.

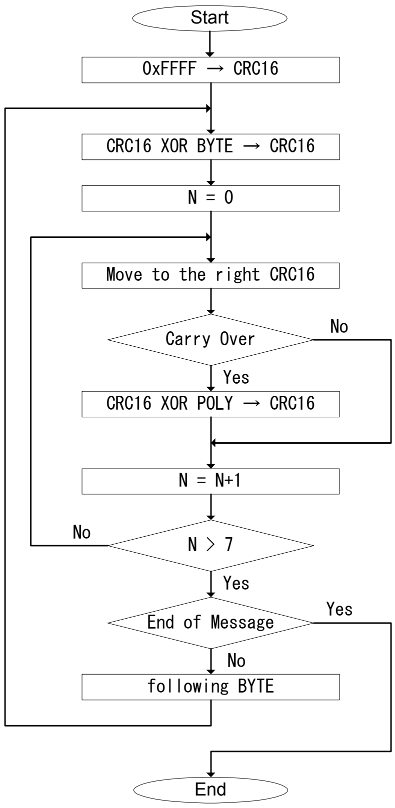
● **CRC**

CRC (Cyclic Redundancy Check) is used for error checking of Modbus-RTU.
The generation polynomial of CRC1-16 (X16+X15+X2+1) is used for generation of the CRC code.

1. A procedure for generating a CRC is:

(1) Load 0xFFFF to CRC16 (register).
(2) Calculate the byte of the beginning of a message, and Exclusive OR of CRC16 (register), and substitute the result for CRC16 (register).
(3) Shift the CRC register one bit to the right, zero-filling the MSB. Extract and examine the LSB.
(4) (If the LSB was 0):
Returns to Step (3) without doing anything.
(If the LSB was 1):
Calculate Exclusive OR of fixed value (0xA001) and CRC16 (register), and substitute a result for CRC16 (register).
Return to Step (3) and check the next bit.
(5) Repeat Steps (3) and (4) until 8 shifts have been performed.
When this is done, a complete 8-bit byte will have been processed.
(6) Repeat Steps (2) through (5) for the next 8-bit byte of the message.
Continue doing this until all bytes have been processed.
(7) The final content of the CRC register is the CRC value.
(8) When the CRC is placed into the message, its higher and lower bytes must be swapped as described below.

Calculation algorithm of the CRC-16



XOR --- exclusive OR
N --- number of information bits
POLY --- 1010 0000 0000 0001
BYTE --- Data(1byte)

2. Placing the CRC into the Message
When the 16-bit CRC (two 8-bit bytes) is sent in the message, the low-order byte will be sent first, followed by the high-order byte.
For example, if the CRC value is 1241 hex (0001 0010 0100 0001).

Slave Address (1 byte)	Function code (1byte)	Data (0 up to 252 bytes)	CRC (2bytes)	
			CRC Lo	CRC Hi
			0x41	0x12

3. CRC error judgment
The sending side which adds CRC to a message calculates the value of CRC.
The reception side compares the result of having re-calculated and calculated CRC with the value received as CRC during reception of a message.
As for servo amplifier, if these two values are not in agreement, an incoming message is canceled as a CRC error.
Then waits for a message in preparation for the next reception. (Will not be in an alarm condition.)

■ Function codes descriptions

- 01 (0x01) Read Coils

  Reads the coil status. (1=ON, 0=OFF)

Request

Slave Address	1byte	0x01 to 0xF7 (Note1)
Function code	1byte	0x01
Coil Starting Address Hi	2byte	0x0000 to 0x003F (Note2)
Coil Starting Address Lo		
Quantity of Outputs Hi (Note3)	2byte	0x0001 to 0x0040
Quantity of Outputs Lo (Note3)		
CRC-16 Lo	2byte	
CRC-16 Hi		

Note1: Broadcasting cannot be performed.
Note2: Coil Starting Address = Coil Number – 1
Coil Number = 1 to 64
Note3: The value exceeding 0 or 64 cannot be set as the number of read-out coils.
When it is set up, an exception code (0x02) is sent back as an error response.

Normal Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x01
Byte Count	1byte	N (Note4)
Coil Status	nbyte	n = N or N+1
CRC-16 Lo	2byte	
CRC-16 Hi		

Note4: The quotient which divided the number of coils by 8 is a number of bytes (N).
When there is remainder, add 1 to a quotient and consider it as a number of bytes.
When there are the remaining bits in the state of a coil, the remaining bits perform zero padding.

Error Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x81
Exception code	1byte	0x01 (Illegal Function) 0x02 (Illgal Data Address) 0x03 (Illgal Data Value) 0x04 (Slave Device Failure)
CRC-16 Lo	2byte	
CRC-16 Hi		

- Coil Number Bit Data – Input allotment1

Refer to the coil input specification for explanation of each bit.

Coil Number (Hex)	Bit Data								Remarks
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
0x0001	CACL	ARST	RAP	-JOG	+JOG	ZRT	RUN	S-ON	
0x0009	M_FIN	IRUN	-1step	+1step	OVRD_3	OVRD_2	OVRD_1	OVRD_0	
0x0011	E_STR	－OT	＋OT	SDN	HOME	BRK_FREE	EXT_E	BAT CLR	
0x0019	IN(128)	IN(64)	IN(32)	IN(16)	IN(8)	IN(4)	IN(2)	IN(1)	

Note : Coil Starting Address = Coil Number – 1
Coil Number = 1 to 32
"-"means reservation. Always set up 0.

- Coil Number Bit Data – Output allotment1

Coil Number (Hex)	Bit Data								Remarks
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
0x0021	WAR (ZFIN)	INPS	PFIN	MOVE	EXT	ERR	HBON	NCRDY	
0x0029	C_RDY	T_LIM_FLG	IN_FEED	IN_STOP	SVACT	SVRDY	A_RDY	ALM	
0x0031	MSTR	-	-	-	MOUT_3	MOUT_2	MOUT_1	MOUT_0	
0x0039	ZOUT_8	ZOUT_7	ZOUT_6	ZOUT_5	ZOUT_4	ZOUT_3	ZOUT_2	ZOUT_1	

Note : Coil Starting Address = Coil Number – 1
Coil Number = 33 to 64
"-"means reservation

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- Coil Number Bit Data – Input allotment2

Refer to the coil input specification for explanation of each bit.

Coil Number (Hex)	Bit Data								Remarks
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
0x0041	–	–	–	–	–	–	–	CSET	
0x0049	–	–	–	–	–	–	–	–	

Note : Coil Starting Address = Coil Number – 1
Coil Number = 65 to 80
"-"means reservation. Always set up 0.

- Coil Number Bit Data – Output allotment3

Coil Number (Hex)	Bit Data								Remarks
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
0x0061	–	–	–	–	–	–	–	–	
0x0069	–	–	–	–	–	–	–	–	

Note : Coil Starting Address = Coil Number – 1
Coil Number = 97 to 112
"-"means reservation

- The example of a coil read-out
  When general purpose input0 to 3 of the driver with Slave Address 1 are read, the status of the general purpose input are as follows;

	INPUT_3	INPUT_2	INPUT_1	INPUT_0
Coil Number	0x002C	0x002B	0x002A	0x0029
Coil Status	OFF	ON	OFF	ON

Request:	Example (Hex)
Slave Address	0x01
Function code	0x01
Coil Starting Address Hi	0x00
Coil Starting Address Lo	0x28
Quantity of Output Hi	0x00
Quantity of Output Lo	0x04
CRC-16 Lo	0xBD
CRC-16 Hi	0xC1

Normal Response:	Example (Hex)
Slave Address	0x01
Function code	0x01
Byte Count	0x01
Coil Status	0x05
CRC-16 Lo	0x91
CRC-16 Hi	0x8B

- Example: State when coil start address =0x0028 and coil number =4
  It is as follows when INPUT_0 (coil number =0x0029) of a coil is set to LSB.
  The bit besides the range of the number of coils (=4) is performed zero padding (=OFF).

	Bit Data							
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Coil Number	0x0030	0x002F	0x002E	0x002D	0x002C	0x002B	0x002A	0x0029
Coil Status	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON

● Coil Number List1 (Input Allocation1)

Coil Number (Hex)	Abbreviation	Description	R/W	Remarks
0x0001	S-ON	Servo ON/OFF direction bit	R/W	
0x0002	RUN	Point startup direction bit	R/W	
0x0003	ZRT	Home position transfer direction bit	R/W	
0x0004	+JOG	Forward rotation manual feed direction bit	R/W	
0x0005	-JOG	Reverse rotation manual feed direction bit	R/W	
0x0006	RAP	Fast/slow feed switching direction bit	R/W	
0x0007	ARST	Alarm/error clearing direction bit	R/W	
0x0008	CACL	Point transfer cancellation bit	R/W	
0x0009	OVRD_0	Override direction bit	R/W	
0x000A	OVRD_1	Override direction bit	R/W	
0x000B	OVRD_2	Override direction bit	R/W	
0x000C	OVRD_3	Override direction bit	R/W	
0x000D	+1step	Forward rotation one-step feed direction bit	R/W	
0x000E	-1step	Reverse rotation one-step feed direction bit	R/W	
0x000F	IRUN	Interrupt startup direction bit	R/W	
0x0010	M_FIN	M output handshake input	R/W	
0x0011	BATCLR	Battery alarm clear direction bit	R/W	
0x0012	EXT_E	External error	R/W	
0x0013	BRK_FREE	Brake release direction bit	R/W	
0x0014	HOME	Home position possible direction bit	R/W	
0x0015	SDN	Return-to-original slowdown direction bit	R/W	
0x0016	+OT	Forward over travel	R/W	
0x0017	-OT	Reverse over travel	R/W	
0x0018	E_STR	External data setting	R/W	
0x0019	IN(1)	Point number direction bit (This is valid for point transfer.)	R/W	0 to 253
0x001A	IN(2)		R/W	
0x001B	IN(4)		R/W	
0x001C	IN(8)		R/W	
0x001D	IN(16)		R/W	
0x001E	IN(32)		R/W	
0x001F	IN(64)		R/W	
0x0020	IN(128)		R/W	

- Coil Number List2 (Output Allocation1)

Coil Number (Hex)	Abbreviation	Description	R/W	Remarks
0x0021	NCRDY	Controller ready output	R	
0x0022	HBON	Holding brake excitation timing output	R	
0x0023	ERR	Error output	R	
0x0024	EXT	External operation mode output	R	
0x0025	MOVE	Point in motion output	R	
0x0026	PFIN	Point positioning completion output	R	
0x0027	INPS	In-position output	R	
0x0028	WAR (ZFIN)	Battery warning output (This is a return to origin completion signal for the incremental sensor.)	R	
0x0029	ALM	Alarm output	R	
0x002A	ARDY	Amp ready output	R	
0x002B	SVRDY	Servo ready output	R	
0x002C	SVACT	Servo ON output	R	
0x002D	IN_STOP	Butting output	R	
0x002E	IN_FEED	During move. output	R	
0x002F	T_LIM_FLG	Torque limit in operation output	R	
0x0030	C_RDY	Fixed excitation signal	R	
0x0031	MOUT_0	M output 0	R	
0x0032	MOUT_1	M output 1	R	
0x0033	MOUT_2	M output 2	R	
0x0034	MOUT_3	M output 3	R	
0x0035	-	(Reserved)	R	
0x0036	-	(Reserved)	R	
0x0037	-	(Reserved)	R	
0x0038	MSTR	M output function handshake output	R	
0x0039	ZOUT_1	Zone output 1	R	
0x003A	ZOUT_2	Zone output 2	R	
0x003B	ZOUT_3	Zone output 3	R	
0x003C	ZOUT_4	Zone output 4	R	
0x003D	ZOUT_5	Zone output 5	R	
0x003E	ZOUT_6	Zone output 6	R	
0x003F	ZOUT_7	Zone output 7	R	
0x0040	ZOUT_8	Zone output 8	R	

- Coil Number List3 (Input Allocation2)

Coil Number (Hex)	Abbreviation	Description	R/W	Remarks
0x0041	CSET	Fixed excitation start signal	R/W	
0x0042 to 0x0050	-	(Reserved)	R/W	

- Coil Number List4 (Output Allocation2)

Coil Number (Hex)	Abbreviation	Description	R/W	Remarks
0x0061 to 0x0070	−	(Reserved)	R	

■ Coil Input/Output Specification

● Coil input specification

Coil No. (Hex)	Signal name	Code	Conditions for input (Restrictions)	Outline of the specifications
0x0001	Servo ON	S-ON	Effective at times other than move operation mode by PC and alarms.	A signal to turn ON the motor excitation. 1) When servo ON signal is turned OFF, servo motor excitation becomes OFF into free status. 2) Motor axis cannot be driven during servo OFF. Servo OFF must be while the motor axis is fixed. 3) When servo ON signal is turned OFF, holding brake excitation timing output (HBON) turns OFF.
0x0002	Start	RUN	1) Not acceptable when other input signals (ZRT, +JOG/-JOG, +1STEP / -1STEP, CACL) are ON. 2) Both MOVE and PFIN outputs must be OFF for points to newly move. (Not acceptable during movement) 3) Acceptable only at servo “ON” status (8-segment LED displays a rotating character of 8) and at external operation (operated from CN1).	A signal to start point move operations. 1) Starts at the edge of 0(OFF) → 1(ON). 2) Moves to specified point by point input ON at start reception. 3) When start signal is turned OFF during operation, it decelerates and stops momentarily. When start signal is turned ON again, continues point move. 4) Start signal is for positioning complete. (Keep ON status until PFIN turns ON.) Note) Point move in this chapter includes continuous point move.
0x0003	Homing start	ZRT	1) Not acceptable when other input signals (RUN, +JOG/-JOG, 1STEP / -1STEP, CACL) are ON. 2) Both MOVE and PFIN outputs must be OFF for points to newly move. (Not acceptable during movement.) 3) Acceptable only at servo “ON” status (8-segment LED displays a rotating character of 8) and at external operation (operated from CN1).	Start signal for home-position start. ・When an incremental encoder is used. 1) Starts return-to-zero operation at the edge of 0(OFF) → 1(ON) 2) Homing start signal must be kept ON until homing operation is complete (PFIN signal turns ON). 3) At homing operation, if homing start signal is turned OFF while high speed movement, it decelerates and stops into a temporary stop status (feed hold). And when homing start signal is turned ON again, resumes the homing operation. When in the low move mode, even if homing start signal is turned OFF, temporary stop status may not occur. ・When an absolute encoder is used. 1) Starts homing operation at the edge of 0 (OFF) → 1(ON). 2) In homing operation, returns to origin-set coordinate.

Coil No. (Hex)	Signal name	Code	Conditions for input (Restrictions)	Outline of the specifications
0x0004	⊕Manual feeding	+JOG	1) Not acceptable when other input signals (RUN, ZRT, +1STEP / -1STEP) are ON. 2) Do not turn ON both +JOG and -JOG signals at the same time. 3) Not acceptable when alarms or others are occurring.	A signal to move forward at communicational operation manual drive. 1) Starts moving at the edge of 0(OFF) → 1(ON), moves while ON and decelerates / stops at OFF. 2) When RAP signal is OFF, the speed set by parameter manual low speed(L_jog) is the feeding speed, and when ON, the speed set by parameter manual high speed (H_jog) is the feeding speed. 3) During JOG feeding, outputs of MOVE and PFIN remain OFF
0x0005	⊖Manual feeding	-JOG	1) Not acceptable when other input signals (RUN, ZRT, +1STEP / -1STEP) are ON. 2) Do not turn ON both +JOG and -JOG signals at the same time. 3) Not acceptable when alarms or others are occurring.	A signal to move backward at communicational operation manual drive. 1) Starts moving at the edge of 0(OFF) → 1(ON), moves while ON and decelerates / stops at OFF. 2) When RAP signal is OFF, the speed set by parameter manual low speed(L_jog) is the feeding speed, and when ON, the speed set by parameter manual high speed (H_jog) is the feeding speed. 3) During JOG feeding, outputs of MOVE and PFIN remain OFF
0x0006	Manual high-velocity/ override	RAP	1) Manual high-velocity: Becomes effective for manual sending and 1-step feed when externally operated （communication with host controller or operation via CN1）. 2) Override: Accepted when point move and return-to-origin operation.	1) Switches high/low velocity when manually operating. Switches amount of move and velocity at 1-step feed. 2) Performs each moving at the velocity with parameter (Ovrid)-set multiplying factor.
0x0007	Alarm reset	ARST	1) Effective at the time alarm / error.	A signal to release alarms/errors at alarm/error status. 1) Reset the alarms/errors after their causes have been eliminated. 2) Some alarms may not be released by this signal depending on the contents.
0x0008	Cancel	CACL	Effective only at move by RUN, ZRT, +1step / -1step.	A signal to cancel the point move, home position return, 1 step feeding, and make other move possible. 1) During point move, home-position return and 1step feeding, turns into CACL positioning status by CACL_ON. 2) When point move, return-to-zero and 1 step feeding signals are turned OFF during CACL positioning status, and when CACL signal is turned OFF, operations are aborted (invalid) and other moves are possible.

Coil No. (Hex)	Signal name	Code	Conditions for input (Restrictions)	Outline of the specifications
0x0009	Over ride	OVRD_0	Over ride: Acceptable at point move and return-to-zero.	Setting of an override 0 to the override 15 is chosen in this 4-bit input. Moves by each multiple rate speed set by parameter (Ovrid).
0x000A		OVRD_1		
0x000B		OVRD_2		
0x000C		OVRD_3		
0x000D	+1 step feeding	+1step	1) Not acceptable when other input signals (RUN, ZRT, +JOG/-JOG, CACL) are ON. 2) Do not input both +1step and -1step signals at the same time.	A signal to move forward at communicational operation fixed amount feeding. 1) Starts moving at the edge of 0(OFF) → 1(ON), and moves by the amount set by parameter. 2) When RAP signal is OFF, moves by the amount of “L_stp” at manual low speed. When RAP signal is ON, moves by the amount of “H_stp” at manual high speed.
0x000E	-1 step feeding	-1step	1) Not acceptable when other input signals (RUN, ZRT, +JOG/-JOG, CACL) are ON. 2) Do not input both +1step and -1step signals at the same time.	A signal to move backward at communicational operation fixed pulse feeding. 1) Starts moving at the edge of Open(OFF) → Close(ON), and moves by the amount set by parameter. 2) When RAP signal is OFF, moves by the amount of “L_stp” at manual low speed. When RAP signal is ON, moves by the amount of “H_stp” at manual high speed.
0x000F	Interruption start	IRUN	1) Effective at external operation mode. 2) Can operate only while point move.	A signal to move to interruption point during point move. 1) During point move, moves to interruption point set in the point data which is being executed at the edge of interruption start 0(OFF) → 1(ON). 2) Interruption move during interruption move is impossible.
0x0010	MFIN	M_FIN	Effective at both PC operation and communication operation.	A signal to shake hands with M output (MSTR). Turn the MFIN input 0 (OFF) → 1 (ON) with the M output signal (MSTR) ON to make a handshake with M output. When M output type (M_typ) is “1”, use this MFIN input for handshake to be performed. If moved by changing speed, even when M output type is “1”, handshake is not performed.

Coil No. (Hex)	Signal name	Code	Conditions for input (Restrictions)	Outline of the specifications
0x0011	Battery Alarm Clear （Absolute encoder clear）	BAT CLR	1) Effective during the battery alarm.	A release signal during battery alarm output status. 1) Clear the battery alarm after removing occurrence causes. 2) It is necessary to reset the alarm separately for return. For details, please refer to Chapter 8 “maintenance”.
0x0012	External error	EXT-E		Normally closed contact input(Sw2:standard setting) When inputting Open (OFF), alarm is issued.
0x0013	Forced Brake Release	BRK_ FREE		Releases holding brake compulsorily during Holding Brake operation.
0x0014	Home Position Set	HOME	The input must have been established at start time.	An input of a starting signal performs a starting point set When this signal is (ON)
0x0015	Slowdown before Home	SDN	1) When incremental encoder is used, this is effective during home-position return operation. 2) Ignored when absolute encoder is used.	1) During home-position return operation with an incremental sensor used, 0(OFF) makes the amplifier decelerate (Home-position return low speed). 2) During low speed movement returning to home, home-position return is completed by 0(OFF) → 1(ON). How to return to zero; ・ Completed while 0(OFF) → 1(ON) of SDN. ・ Completed when searching encoder C phase output signal after Open (OFF) →Close (ON) of SDN. These can be selected by a parameter for home-position return type (Z_typ).
0x0016	+Over travel	+OT	Always acceptable.	Normally closed contact input (Sw2: standard setting) Reverse move is prohibited by Inputting Open (OFF) and stops suddenly. After sudden stop, servo is OFF.
0x0017	-Over travel	-OT	Always acceptable.	Normally closed contact input (Sw2: standard setting) Reverse move is prohibited by Inputting Open (OFF) and stops suddenly. After sudden stop, servo is OFF.
0x0018	External data setting	E_STR		Normally opened contact input By signal selection, it is used for external datasetting.

Coil No. (Hex)	Signal name	Code	Conditions for input (Restrictions)	Outline of the specifications
0x0019	Point specification	IN(1)	Point number specification input must have been established at start time.	A signal to specify the target point number at start signal input (RUN). 1) Specify the number by binary code. 2) Numbers to be specified are from 0 to 253.
0x001A		IN(2)		
0x001B		IN(4)		
0x001C		IN(8)		
0x001D		IN(16)		
0x001E		IN(32)		
0x001F		IN(64)		
0x0020		IN(128)		

● Coil output specification

Coil No. (Hex)	Signal name	Code	Conditions for output (Restrictions)	Outline of the specifications
0x0021	NC ready	NC RDY	1) 1(ON) approx. 0.5 sec after power ON. 2) 0(OFF) when main power is OFF and at alarms.	1) 1(ON) when control and main power is established, with no alarms, and position loop is formed. 2) During 1(ON), operations of point positioning move, home-position return, manual feeding and 1 step feeding are possible. NC ready is also 1(ON) when servo ON input signal is 0(OFF).
0x0022	Holding brake excitation timing output	HBON	(TR_ON) while motor is exciting.	Outputs the holding brake excitation (release) timing. At TR_ON, holding brake is excited (released).
00x0023	Error	ERR	Outputs at the following errors. ＋Soft limit －Soft limit Unregistered point specification starting	1(ON) at error state.
0x0024	External operation mode output	EXT	1) 1(On) when external operation is effective. 2) 0(OFF) at PC operation.	1) 1(ON) when external operation input signal can be used. 2) 0(OFF) when operated by PC (in the PC mode). Do not operate externally this time.
0x0025	While operation	MOVE	1) 0(OFF) when power turns ON. 2) 0(OFF) at alarms. 3) 1(ON) during point move (from the time of move completed until turning OFF the start signal (RUN)). 4) 1(ON) during home-position return (until turning OFF the homing signal (ZRT)). 5) 1(ON) during 1 step feeding (from the time of move completed until turning OFF ±1STEP signal). 6) 0(OFF) during manual feeding	1) 1(ON) when receiving start input (RUN) at the time of point positioning move. When move has been complete, 1(ON) is maintained until start signal is turned OFF. The same for home-position return and 1 step feeding; When move has been complete, 1(ON) is maintained until homing signal or ±1STEP signal is turned OFF. 2) When signals of MOVE and PFIN are 1(ON), operation input singnals (start, homing, manual feeding and 1 step feeding) are not accepted.
0x0026	Positioning complete	PFIN	1) 0(OFF) when power turns ON. 2) 0(OFF) at alarms. 3) 1(ON) from the time of move completed until turning OFF the start signal (RUN) at point move. 4) 1(ON) from the time of move completed until turning OFF the homing signal (ZRT) at home-position return operation. 5) 1(ON) from the time of move completed until turning OFF ±1STEP signal at 1 step feeding operation. 6) 0(OFF) at manual feeding.	1) 1(ON) when positioning is complete at point positioning move. When positioning is complete, 1(ON) is maintained until start signal is turned OFF. 2) 1(ON) when home-position return is complete at homing operation. When home-position return is complete, 1(ON) is maintained until homing signal is turned OFF. 3) 1(ON) when move is complete at 1 step feeding. When move is complete, 1(ON) is maintained until ±1STEP signal is turned OFF. 4) When signals of PFIN and MOVE are 1(ON), input signals for other operations are not accepted.

Coil No. (Hex)	Signal name	Code	Conditions for output (Restrictions)	Outline of the specifications
0x0027	In-position	INPS	1) 1(ON) if within the in-position width when power turns ON. 2) TR_OFF generally during move. 1(ON) when moving at low speed within the in-position width. 3) 0(OFF) during alarms.	1) 1(ON) when current position is an ideal position within ± in-position width. 2) 0(OFF) once if moved outside the in-position width by an external means while stopping in the status of in-position output ON. 1(ON) again when entering inside the in-position width by corrective actions. 3) In-position width is set by system in-position width parameter.
0x0028	Warning output (When absolute encoder is used.)	WAR	<u>When ABS encoder is used.</u> 1(ON) in the status of battery warning.	<u>When ABS-E encoder is used.</u> This warning output is 1(ON) when the voltage of absolute encoder battery lowers and warning is output from the sensor. Note: There may be cases encoder cannot detect due to battery voltage drop characteristic.
	Homing complete (When incremental encoder is used.)	ZFIN	<u>When incremental encoder is used.</u> 1) 0(OFF) is maintained when power turns ON and at alarms. 2) 1(ON) when home-position return is complete.	<u>When incremental encoder is used.</u> 1) After power turned ON or alarms were released, this is 1(ON) when home-position return operation, which matches the machine coordinate and unit coordinate, is complete. After that 1(ON) is maintained until another alarm or power shut off. 2) When power turns ON again or alarm is released, 0(OFF) is maintained unless home-position return operation is performed again.

Coil No. (Hex)	Signal name	Code	Conditions for output (Restrictions)	Outline of the specifications
0x0029	Alarm	ALM	Outputs at alarm.	1(ON) at alarm state.
0x002A	Power ON ready output	A_RDY	1(ON) within 2 sec after control power ON.	TR_ON when amplifier becomes the state that can be turned ON the main power supply, after control power is established.
0x002B	Servo ready output	SVRDY		The output is ON during Servo Ready complete.
0x002C	Servo on output	SVACT	Outputs at servo on.	1(ON) at servo on state.
0x002D	Output in strike	IN_STOP	Outputs during strike operation.	On during actual strike operation when strike and move mode.
0x002E	During move. output	IN_FEED		The output is ON During move.
0x002F	Torque limit in operation output	T_LIM_FLG		The output is ON during torque limiting
0x0030	Fixed excitation signal	C_RDY		After completion of fixed excitation, the fixed excitation completion signal (CRDY) is output.

Coil No. (Hex)	Signal name	Code	Conditions for output (Restrictions)	Outline of the specifications
0x0031	M Output	MOUT_0	Three parameters of Code, Type and Delay opt functions.	4-bit outputs from “0000” to “1111”. For details, please refer to explanation of M output of Chapter 4 “Positioning Functions”.
0x0032		MOUT_1		
0x0033		MOUT_2		
0x0034		MOUT_3		
0x0035	(Reserved)	-		
0x0036	(Reserved)	-		
0x0037	(Reserved)	-		
0x0038	M Output Function Hand Shake Output	MSTR	MSTR	Output is in M-output handshake mode. (For details on “M output”, see chapter 4 “Positioning Function”)
0x0039	Zone output	ZOUT_1	Read out the zone that falls within the range of setting coordinate area on the forward side and the negative side.	1(ON) when in the range of the coordinates on the forward side and negative side set in area 1.
0x003A		ZOUT_2		1(ON) when in the range of the coordinates on the forward side and negative side set in area 2.
0x003B		ZOUT_3		1(ON) when in the range of the coordinates on the forward side and negative side set in area 3.
0x003C		ZOUT_4		1(ON) when in the range of the coordinates on the forward side and negative side set in area 4.
0x003D		ZOUT_5		1(ON) when in the range of the coordinates on the forward side and negative side set in area 5.
0x003E		ZOUT_6		1(ON) when in the range of the coordinates on the forward side and negative side set in area 6.
0x003F		ZOUT_7		1(ON) when in the range of the coordinates on the forward side and negative side set in area 7.
0x0040		ZOUT_8		1(ON) when in the range of the coordinates on the forward side and negative side set in area 8.

- 03 (0x03) Read Holding Registers

  This function code is used to read the contents of a contiguous block of holding registers.

Request

Slave Address	1byte	0x01 to 0xF7 (Note1)
Function code	1byte	0x03
Register Starting Address Hi	2byte	0x0000 to 0xFFFF (Note2)
Register Starting Address Lo		
Quantity of Registers Hi	2byte	0x0001 to 0x007D
Quantity of Registers Lo		
CRC-16 Lo	2byte	
CRC-16 Hi		

Note1: Broadcasting cannot be performed.
Note2: Set the address of registers to read, such as a parameter, a monitor, and point data, to a register start address.

Normal Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x03
Byte Count	1byte	2 * N (Note3)
Register Value	N * 2byte	
CRC-16 Lo	2byte	
CRC-16 Hi		

Note3: Quantity of Registers.

Error Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x83
Exception code	1byte	0x01 (Illegal Function) 0x02 (Illegal Data Address) 0x03 (Illegal Data Value) 0x04 (Slave Device Failure)
CRC-16 Lo	2byte	
CRC-16 Hi		

- The example of read-out of holding registers: Register start address= 0x4012, quantity of registers= 2

When actual position of the driver with Slave Address 1 are read, the value of the actual position are as follows;

Register Number (Hex)	Name	Value
0x4012	Actual Position (User Coordinate Hi)	0x1234
0x4013	Actual Position (User Coordinate Lo)	0x5678

Request:	Example (Hex)
Slave Address	0x01
Function code	0x03
Register Starting Address Hi	0x40
Register Starting Address Lo	0x12
Quantity of Registers Hi	0x00
Quantity of Registers Lo	0x02
CRC-16 Lo	0x71
CRC-16 Hi	0xCE

Normal Response:	Example (Hex)
Slave Address	0x01
Function code	0x03
Byte Count	0x04
Register Value Highest	0x12
Register Value Middle-Hi	0x34
Register Value Middle-Lo	0x56
Register Value Lowest	0x78
CRC-16 Lo	0x81
CRC-16 Hi	0x07

- 05 (0x05) Write Single Coil
  Writes into single coil.

Request

Slave Address	1byte	0x01 to 0xF7 (Note1)
Function code	1byte	0x05
Coil Output Address Hi	2byte	Area 1 = 0x0000 - 0x001F (Note 2) Area 2 = 0x0040 - 0x004F (Note 2)
Coil Output Address Lo		
Output value Hi	2byte	0x0000 (OFF) or 0xFF00 (ON)
Output value Lo		
CRC-16 Lo	2byte	
CRC-16 Hi		

Note1: When broadcasting is performed, no response is returned.
Note2: Coil Output Address = Coil Number – 1
Coil Number = 1 - 32 (Area1), 65 - 80 (Area 2)

Normal Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x05
Coil Output Address Hi	2byte	Area 1 = 0x0000 - 0x001F Area 2= 0x0040 - 0x004F
Coil Output Address Lo		
Output value Hi	2byte	0x0000 (OFF) or 0xFF00 (ON)
Output value Lo		
CRC-16 Lo	2byte	
CRC-16 Hi		

Error Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x85
Exception code	1byte	0x01 (Illegal Function) 0x02 (Illegal Data Address) 0x03 (Illegal Data Value) 0x04 (Slave Device Failure)
CRC-16 Lo	2byte	
CRC-16 Hi		

● 06 (0x06) Write Single Register
Data is written in the holding register, which parameters specified. (Servo Gain, Coil Input)
Cannot write into holding registers, such as point data.

Request

Slave Address	1byte	0x01 to 0xF7 (Note1)
Function code	1byte	0x06
Register Starting Address Hi Register Starting Address Lo	2byte	0x0008 to 0x0020 (Servo Gain) 0x0080 to 0x0081 (Coil Input) (Note2)
Register Value Hi Register Value Lo	2byte	0x0000 to 0xFFFF (Note3)
CRC-16 Lo CRC-16 Hi	2byte	

Note1: When broadcasting is performed, no response is returned.
Note2: Set an effective address to the register start address.
When invalid address is set up, an exception code (0x02) is sent back as an abnormal response.
Note3: Set the maximum and minimum value of each parameter within the limits to register value.
When the value besides the range is set up, an exception code (0x03) is sent back as an abnormal response.

Normal Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x06
Register Starting Address Hi Register Starting Address Lo	2byte	0x0008 to 0x0020 (Servo Gain) 0x0080 to 0x0081 (Coil Input)
Register Value Hi Register Value Lo	2byte	0x0000 to 0xFFFF
CRC-16 Lo CRC-16 Hi	2byte	

Error Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x86
Exception code	1byte	0x01 (Illegal Function) 0x02 (Illegal Data Address) 0x03 (Illegal Data Value) 0x04 (Slave Device Failure)
CRC-16 Lo CRC-16 Hi	2byte	

- 08 (0x08) Diagnostic (Serial Line only)
  Used for a communication check between master and slaves.

Request

Slave Address	1byte	0x01 to 0xF7 (Note1)
Function code	1byte	0x08
Sub-function Hi	2byte	0x0000 (Note2)
Sub-function Lo		
Data Hi	2byte	Any (Note3)
Data Lo		
CRC-16 Lo	2byte	
CRC-16 Hi		

Note1: Broadcasting cannot be performed.
Note2: Set 0x0000 (Return Query Data) to the sub-function of diagnosis.
It does not support any other sub-function.
Note3: Any value can be used as the test data.

Normal Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x08
Sub-function Hi	2byte	0x0000
Sub-function Lo		
Data Hi	2byte	Any (Echo Request Data)
Data Lo		
CRC-16 Lo	2byte	
CRC-16 Hi		

Error Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x88
Exception code	1byte	0x01 (Illegal Function) 0x03 (Illegal Data Value) 0x04 (Slave Device Failure)
CRC-16 Lo	2byte	
CRC-16 Hi		

- 16 (0x10) Write Multiple Registers
  Writes data to multiple contiguous holding registers. (Servo Gain, Coil Input, JOG-related Data, Point Data)

Request

Slave Address	1byte	0x01 to 0xF7 (Note1)
Function code	1byte	0x10
Register Starting Address Hi Register Starting Address Lo	2byte	0x0008 to 0x0020 (Servo gain) 0x0080 to 0x0082 (Coil-input) 0x1000 to 0x1003 (JOG-related Data) 0x8000 to 0x9FBF (Point data) (Note2)
Quantity of Registers Hi Quantity of Registers Lo	2byte	0x0001 to 0x0018 (Servo gain) 0x0001 to 0x0003 (Coil-input) 0x0001 to 0x0004 (JOG-related Data) 0x0001 to 0x0010 (Point data)
Byte Count	1byte	2 * N (Note3)
Registers Value	N * 2byte	(Note4)
CRC-16 Lo CRC-16 Hi	2byte	

Note1: When broadcasting is performed, no response is returned.
Note2: Set an effective address to the register start address.
When invalid address is set up, an exception code (0x02) is sent back as an abnormal response.
Note3: N = Quantity of Registers.
Note4: Set the maximum and minimum value of each parameter within the limits to register value.
When the value besides the range is set up, an exception code (0x03) is sent back as an abnormal response.

Normal Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x10
Register Starting Address Hi Register Starting Address Lo	2byte	0x0008 to 0x0020 (Servo gain) 0x0080 to 0x0082 (Coil-input) 0x1000 to 0x1003 (JOG-related Data) 0x8000 to 0x9FBF (Point data)
Quantity of Registers Hi Quantity of Registers Lo	2byte	0x0001 to 0x0018 (Servo gain) 0x0001 to 0x0003 (Coil-input) 0x0001 to 0x0004 (JOG-related Data) 0x0001 to 0x0010 (Point data)
CRC-16 Lo CRC-16 Hi	2byte	

Error Response

Slave Address	1byte	0x01 to 0xF7
Function code	1byte	0x90
Exception code	1byte	0x01 (Illegal Function) 0x02 (Illegal Data Address) 0x03 (Illegal Data Value) 0x04 (Slave Device Failure)
CRC-16 Lo	2byte	
CRC-16 Hi		

■ Parameter

- **Parameter address range (0x0001 to 0x3FFF)**

  The parameter edit accesses this domain of a register number.

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	BIt 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	Parameter Setting Register Address selection													

- **Register address list – Parameter 1 (Servo Gain)**

Register Address (Hex)	Name	Standard value	Unit	Setting range	R/W
0x0000 to 0x0007	(Reserved)	-	-	-	R
0x0008	Position Loop Proportional Gain 1	30	1/s	1 to 3000	R/W
0x0009	Position Loop Proportional Gain 2	30	1/s	1 to 3000	R/W
0x000A	Position Loop Proportional Gain 3	30	1/s	1 to 3000	R/W
0x000B	Position Loop Proportional Gain 4	30	1/s	1 to 3000	R/W
0x000C	Position Loop Integral Time Constant 1	10000	0.1ms	5 to 10000	R/W
0x000D	Position Loop Integral Time Constant 2	10000	0.1ms	5 to 10000	R/W
0x000E	Position Loop Integral Time Constant 3	10000	0.1ms	5 to 10000	R/W
0x000F	Position Loop Integral Time Constant 4	10000	0.1ms	5 to 10000	R/W
0x0010	Velocity Loop Proportional Gain 1	50	Hz	1 to 2000	R/W
0x0011	Velocity Loop Proportional Gain 2	50	Hz	1 to 2000	R/W
0x0012	Velocity Loop Proportional Gain 3	50	Hz	1 to 2000	R/W
0x0013	Velocity Loop Proportional Gain 4	50	Hz	1 to 2000	R/W

● **Register Address List – Parameter 2 (Servo Gain)**

Register address (Hex)	Name	Standard value	Unit	Setting range	R/W
0x0014	Velocity Loop Integral Time Constant 1	200	0.1ms	5 to 10000	R/W
0x0015	Velocity Loop Integral Time Constant 2	200	0.1ms	5 to 10000	R/W
0x0016	Velocity Loop Integral Time Constant 3	200	0.1ms	5 to 10000	R/W
0x0017	Velocity Loop Integral Time Constant 4	200	0.1ms	5 to 10000	R/W
0x0018	Load moment-of-inertia ratio 1 (Load bulk density)	100	%	0 to 15000	R/W
0x0019	Load moment-of-inertia ratio 2 (Load bulk density)	100	%	0 to 15000	R/W
0x001A	Load moment-of-inertia ratio 3 (Load bulk density)	100	%	0 to 15000	R/W
0x001B	Load moment-of-inertia ratio 4 (Load bulk density)	100	%	0 to 15000	R/W
0x001C	Torque Command Filter 1	600	Hz	1 to 2000	R/W
0x001D	Torque Command Filter 2	600	Hz	1 to 2000	R/W
0x001E	Torque Command Filter 3	600	Hz	1 to 2000	R/W
0x001F	Torque Command Filter 4	600	Hz	1 to 2000	R/W
0x0020	Time constant of position command smoothing	0	1ms	0 to 1000	R/W

【Caution】 Write in this area involves storing in non-volatile memory (EEPROM).
Do not use for rewriting each moving frequently.

● **Register Address List – Parameter 3 (Coil Input)**

Register Address (Hex)	Name	Standard value	Unit	Setting range	R/W
0x0080	Coil Input Group 1	-	Bit	0 to 0xFFFF	R/W
0x0081	Coil Input Group 2	-	Bit	0 to 0xFFFF	R/W
0x0082	Coil Input Group 3	-	Bit	0 to 0xFFFF	R/W

Register Address = 0x0080 (Write/Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
M_FIN	IRUN	-1step	+1step	OVRD_3	OVRD_2	OVRD_1	OVRD_0
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CACL	ARST	RAP	-JOG	+JOG	ZRT	RUN	S-ON

Register Address = 0x0081 (Write/Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
IN (128)	IN (64)	IN (32)	IN (16)	IN (8)	IN (4)	IN (2)	IN (1)
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
E_STR	－OT	＋OT	SDN	HOME	BRK_ FREE	EXT_E	BAT CLR

Register Address = 0x0082 (Write/Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-	-	-	-	-	-	-	-
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	-	-	-	-	CSET

Register address list – parameter 4 (positioning function)

<table>
<tr><th>Register address (Hex)</th><th>Name</th><th>Unit</th><th>Setting range</th><th>R/W</th></tr>
<tr><td rowspan="2">0x0C00</td><td>System velocity limit (higher order byte)</td><td rowspan="2">Uv</td><td rowspan="2">1 to
2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>System velocity limit (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C02</td><td>PC operation speed limit (higher order byte)</td><td rowspan="2">Uv</td><td rowspan="2">1 to
2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>PC operation speed limit (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C04</td><td>Software limit in positive direction (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">-2147483648
to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Software limit in positive direction (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C06</td><td>Software limit in negative direction (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">-2147483648
to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Software limit in negative direction (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C08</td><td>Depth of end (higher order byte) *1</td><td rowspan="2">Pulse</td><td rowspan="2">1 to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Depth of end (lower order byte) *1</td></tr>
<tr><td>0x0C0A</td><td>(Reserved)</td><td>-</td><td>0</td><td>R/W</td></tr>
<tr><td>0x0C0B</td><td>System in-position width *1</td><td>Pulse</td><td>1 to 65535</td><td>R/W</td></tr>
<tr><td rowspan="2">0x0C0C</td><td>System overflow (higher order byte) *1</td><td rowspan="2">U</td><td rowspan="2">1 to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>System overflow (lower order byte) *1</td></tr>
<tr><td rowspan="2">0x0C0E</td><td>Overflow when current limited (higher order byte) *1</td><td rowspan="2">U</td><td rowspan="2">1 to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Overflow when current limited (lower order byte) *1</td></tr>
<tr><td>0x0C10</td><td>Amount of backlash</td><td>U</td><td>0 to 32767</td><td>R/W</td></tr>
<tr><td>0x0C11</td><td>Software limit detection and operation direction
<table><tr><td>Bit15 Bit8</td><td>Bit7 Bit0</td></tr><tr><td>Operation direction *1</td><td>Software limit detection</td></tr></table></td><td>-</td><td>Bit7 to Bit0
= 0, 1
Bit15 to Bit8
= 0, 1</td><td>R/W</td></tr>
<tr><td>0x0C12</td><td>Acceleration and deceleration constant</td><td>Uv/ms</td><td>1 to 65535</td><td>R/W</td></tr>
<tr><td>0x0C13</td><td>S-shaped curve acceleration and deceleration time</td><td>ms</td><td>0 to 32767</td><td>R/W</td></tr>
<tr><td>0x0C14</td><td>Jog-current limit in PC operation</td><td>%</td><td>0 to 510</td><td>R/W</td></tr>
<tr><td>0x0C15</td><td>Return-to-origin type and direction
<table><tr><td>Bit15 Bit8</td><td>Bit7 Bit0</td></tr><tr><td>Return-to-origin direction</td><td>Return-to-origin type</td></tr></table></td><td>-</td><td>Bit7 to Bit0
= 0, 1
Bit15 to Bit8
= 0, 1</td><td>R/W</td></tr>
</table>

● **Register address list – parameter 5 (positioning function)**

Register address (Hex)	Name	Unit	Setting range	R/W
0x0C16	Return-to –origin at high speed (higher order byte) Return-to –origin at high speed (lower order byte)	Uv	1 to 2147483647	R/W
0x0C18	Return-to –origin at low speed (higher order byte) Return-to –origin at low speed (lower order byte)	Uv	1 to 2147483647	R/W
0x0C1A	Origin position coordinate (higher order byte) Origin position coordinate (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C1C	Origin-offset value (higher order byte) Origin-offset value (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C1E	(Reserved)	-	0	R/W
0x0C1F	Origin in-position width *1	Pulse	1 to 65535	R/W
0x0C20	+STROKE (used only for infinite coordinate) (higher order byte) +STROKE (used only for infinite coordinate) (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C22	Effective stroke length of absolute encoder (higher order byte)*2 Effective stroke length of absolute encoder (lower order byte)*2	U	-2147483648 to 2147483647	R/W
0x0C24	Range (1) in negative direction (higher order byte) Range (1) in negative direction (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C26	Range (1) in positive direction (higher order byte) Range (1) in positive direction (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C28	Range (2) in negative direction (higher order byte) Range (2) in negative direction (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C2A	Range (2) in positive direction (higher order byte) Range (2) in positive direction (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C2C	Range (3) in negative direction (higher order byte) Range (3) in negative direction (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C2E	Range (3) in positive direction (higher order byte) Range (3) in positive direction (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C30	Range (4) in negative direction (higher order byte) Range (4) in negative direction (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C32	Range (4) in positive direction (higher order byte) Range (4) in positive direction (lower order byte)	U	-2147483648 to 2147483647	R/W
0x0C34	Range (5) in negative direction (higher order byte) Range (5) in negative direction (lower order byte)	U	-2147483648 to 2147483647	R/W

● **Register address list – parameter 6 (positioning function)**

<table>
<tr><th>Register address (Hex)</th><th>Name</th><th>Unit</th><th>Setting range</th><th>R/W</th></tr>
<tr><td rowspan="2">0x0C36</td><td>Range (5) in positive direction (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">-2147483648
to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Range (5) in positive direction (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C38</td><td>Range (5) in negative direction (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">-2147483648
to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Range (5) in negative direction (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C3A</td><td>Range (5) in positive direction (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">-2147483648
to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Range (5) in positive direction (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C3C</td><td>Range (7) in negative direction (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">-2147483648
to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Range (7) in negative direction (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C3E</td><td>Range (7) in positive direction (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">-2147483648
to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Range (7) in positive direction (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C40</td><td>Range (8) in negative direction (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">-2147483648
to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Range (8) in negative direction (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C42</td><td>Range (8) in positive direction (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">-2147483648
to 2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Range (8) in positive direction (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C44</td><td>High speed set for manual operation (higher order byte)</td><td rowspan="2">Uv</td><td rowspan="2">1 to
2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>High speed set for manual operation (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C46</td><td>Low speed set for manual operation (higher order byte)</td><td rowspan="2">Uv</td><td rowspan="2">1 to
2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>Low speed set for manual operation (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C48</td><td>1 step-displacement at high speed (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">1 to
2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>1 step-displacement at high speed (lower order byte)</td></tr>
<tr><td rowspan="2">0x0C4A</td><td>1 step-displacement at low speed (higher order byte)</td><td rowspan="2">U</td><td rowspan="2">1 to
2147483647</td><td rowspan="2">R/W</td></tr>
<tr><td>1 step-displacement at low speed (lower order byte)</td></tr>
<tr><td>0x0C4C</td><td>Override 0 and override 1<table><tr><td>Bit15 Bit8</td><td>Bit7 Bit0</td></tr><tr><td>Override 1</td><td>Override 0</td></tr></table></td><td>%</td><td>Bit7 to Bit0
= 1 to 255
Bit15 to Bit8
= 1 to 255</td><td>R/W</td></tr>
<tr><td>0x0C4D</td><td>Override 2 and override 3<table><tr><td>Bit15 Bit8</td><td>Bit7 Bit0</td></tr><tr><td>Override 3</td><td>Override 2</td></tr></table></td><td>%</td><td>Bit7 to Bit0
= 1 to 255
Bit15 to Bit8
= 1 to 255</td><td>R/W</td></tr>
</table>

● **Register address list – parameter 7 (positioning function)**

<table>
<tr><th>Register address (Hex)</th><th>Name</th><th>Unit</th><th>Setting range</th><th>R/W</th></tr>
<tr><td>0x0C4E</td><td>Override 4 and override 5<table><tr><td>Bit15 Bit8</td><td>Bit7 Bit0</td></tr><tr><td>Override5</td><td>Override4</td></tr></table></td><td>%</td><td>Bit7 to Bit0
= 1 to 255
Bit15 to Bit8
= 1 to 255</td><td>R/W</td></tr>
<tr><td>0x0C4F</td><td>Override 6 and override7<table><tr><td>Bit15 Bit8</td><td>Bit7 Bit0</td></tr><tr><td>Override7</td><td>Override6</td></tr></table></td><td>%</td><td>Bit7 to Bit0
= 1 to 255
Bit15 to Bit8
= 1 to 255</td><td>R/W</td></tr>
<tr><td>0x0C50</td><td>Override 8 and override 9<table><tr><td>Bit15 Bit8</td><td>Bit7 Bit0</td></tr><tr><td>Override9</td><td>Override8</td></tr></table></td><td>%</td><td>Bit7 to Bit0
= 1 to 255
Bit15 to Bit8
= 1 to 255</td><td>R/W</td></tr>
<tr><td>0x0C51</td><td>Override 10 and override 11<table><tr><td>Bit15 Bit8</td><td>Bit7 Bit0</td></tr><tr><td>Override11</td><td>Override10</td></tr></table></td><td>%</td><td>Bit7 to Bit0
= 1 to 255
Bit15 to Bit8
= 1 to 255</td><td>R/W</td></tr>
<tr><td>0x0C52</td><td>Override 12 and override 13<table><tr><td>Bit15 Bit8</td><td>Bit7 Bit0</td></tr><tr><td>Override13</td><td>Override12</td></tr></table></td><td>%</td><td>Bit7 to Bit0
= 1 to 255
Bit15 to Bit8
= 1 to 255</td><td>R/W</td></tr>
<tr><td>0x0C53</td><td>Override 14 and override 15<table><tr><td>Bit15 Bit8</td><td>Bit7 Bit0</td></tr><tr><td>Override15</td><td>Override14</td></tr></table></td><td>%</td><td>Bit7 to Bit0
= 1 to 255
Bit15 to Bit8
= 1 to 255</td><td>R/W</td></tr>
<tr><td rowspan="2">0x0C54</td><td>System division number (higher order byte) *1</td><td rowspan="2">(Pulse)</td><td rowspan="2">1 to 131072</td><td rowspan="2">R/W</td></tr>
<tr><td>System division number (lower order byte) *1</td></tr>
<tr><td rowspan="2">0x0C56</td><td>User- division number (higher order byte) *1</td><td rowspan="2">(mm)</td><td rowspan="2">1 to 131072</td><td rowspan="2">R/W</td></tr>
<tr><td>User- division number (lower order byte) *1</td></tr>
</table>

● Register address list – parameter 8 (positioning function)

Register address (Hex)	Name	Unit	Setting range	R/W
0x0C58	Decimal point of velocity and position data Bit15 – Bit8: Decimal point of velocity and position data Bit7 – Bit0: (Reserved)	–	Bit7 to Bit0 = 0 Bit15 to Bit8 =0 to 5	R/W
0x0C59	Setting unit Bit15 – Bit8: (Reserved) Bit7 – Bit0: Setting unit	–	Bit7 to Bit0 = 0 to 1 Bit15 to Bit8 = 0	R/W
0x0C5A	Function switch 1	–	0x0000 to 0xFFFF	R/W
0x0C5B	Function switch 2	–	0x0000 to 0xFFFF	R/W
0x0C5C	Function switch 3	–	0x0000 to 0xFFFF	R/W
0x0C5D	Function switch 4	–	0x0000 to 0xFFFF	R/W

*1：When setting value is changed, control power needs to be re-turned on.

*2：When setting value is changed, make sure to perform home position setting. If not performed, position displacement can occur.

*3：Unit of velocity system "U_v" and position system "U" are determined by setting parameters (S_pls, U_pls, D_dpo, Unit) by user. Refer to page 4-40, "Please read this instruction to use positioning function for the first time."" for unit determination.

*4：Refer to "Chapter4, positioning function, parameter group D," for the details of positioning function.

● Demand write dedicated area (From 0x1000)

The values re-written by using register in this area are effective in each updating cycle as needed.

Register address (Hex)	Name	Unit	Setting range	R/W	<Note>
0x1000	JOG-Velocity (higher order byte) JOG-Velocity (lower order byte)	Uv	0 to 2147483647	R/W	1, 2
0x1002	JOG-acceleration	Uv/ms	1 to 65535	R/W	3, 4
0x1003	Position command smoothing time constant	1ms	0 to 1000	R/W	3, 4

Note1: JOG-velocity when power supply turned on is preset to zero.

Note2: When velocity is set to zero, JOG-moving is performed at the velocity set by parameters.

Note3: When velocity is set to zero, the value set by parameter is applied to the acceleration.

Note4: Acceleration value shall be re-written prior to the setting for velocity, as once velocity is re-written, a command to immediately correspond the set velocity is generated.

Note5: The values re-written by using this register are not stored in EEPROM. Position command smoothing time constant when power supply turned on is preset to the same value as the parameters whose name has been stored in EEPROM (register address: 0x0020).

Note6: If you have changed any values of position command smoothing time constant by using this register, do not re-write the position command smoothing time constant via R_Setup Software or register address: 0x0020 without returning on control power supply. Failure to do so results in "EEPROM Checksum error" –state as parameters stored in EEPROM becomes inconsistent.

■ Monitor

● **Monitor Address Range (0x4000 to 0x7FFF)**

Read-out of monitor data accesses this domain of a register number.

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	Monitor data register address selection													

● **Register Address List – Monitor 1**

Register Address (Hex)	Name		Unit	R/W
0x4000	Servo Amplifier Status	(Note1)	-	R
0x4001	Warning Status	(Note2)	-	R
0x4002	Velocity Monitor		min-1	R
0x4003	Velocity Command Monitor		min-1	R
0x4004	Torque Monitor		%	R
0x4005	Torque Command Monitor		%	R
0x4006	Regenerative Resistance Run Rate		%	R
0x4007	Effective Torque Monitor		%	R
0x4008	Effective Torque Monitor (Estimate)		%	R
0x4009	Control Loop Parameter_Load moment-of-inertia ratio monitor		%	R
0x400A	Control Loop Parameter_Position Loop Proportional Gain		s-1	R
0x400B	Control Loop Parameter_Position Loop Integral Time Constant Monitor		ms	R
0x400C	Control Loop Parameter_Speed Loop Proportional Gain Monitor		Hz	R
0x400D	Control Loop Parameter_Speed Loop Integral Time Constant Monitor		ms	R
0x400E	Control Loop Parameter_Torque Command Filter Monitor		Hz	R
0x400F	Load Troque Monitor (Estimate)		%	R
0x4010	Alarm Code		-	R
0x4011	Execution Point Number		-	R
0x4012	Actual Position (User Coordinate Hi)	(Note3)	- (Note1)	R
0x4013	Actual Position (User Coordinate Lo)			
0x4014	Command Position (User Coordinate Hi)	(Note3)	- (Note1)	R
0x4015	Command Position (User Coordinate Lo)			
0x4016	Position Deviation (User Coordinate Hi)	(Note3)	- (Note1)	R
0x4017	Position Deviation (User Coordinate Lo)			

Note1: Refer to page 7-21 for the details of monitor. Servo amplifier state is read out, however, only low-order byte is effective, high-order byte has no meaning.
Note2: Refer to page 7-21 for the details of monitor. The warning state read out becomes as follows: Low-order byte is warning state 1, high-order byte is warning state 2.
Note3: Actual monitor value is indicated in user coordinate, decimal point is not added.

- **Register Address List – Monitor 2**

Register Address (Hex)	Name	Unit	R/W
0x4080	Coil Input Group1 Monitor (Note4)	-	R
0x4081	Coil Input Group2 Monitor (Note4)	-	R
0x4082	Coil Output Group1 Monitor	-	R
0x4083	Coil Output Group2 Monitor	-	R

Register Address = 0x4080 (Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
M_FIN	IRUN	-1step	+1step	OVRD_3	OVRD_2	OVRD_1	OVRD_0
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CACL	ARST	RAP	-JOG	+JOG	ZRT	RUN	S-ON

Register Address = 0x4081 (Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
IN (128)	IN (64)	IN (32)	IN (16)	IN (8)	IN (4)	IN (2)	IN (1)
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
E_STR	−OT	+OT	SDN	HOME	BRK_ FREE	EXT_E	BAT CLR

Register Address = 0x4082 (Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
C_RDY	T_LIM _FLG	IN_ FEED	IN_ STOP	SVACT	SVRDY	A_RDY	ALM
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
WAR (ZFIN)	INPS	PFIN	MOVE	EXT	ERR	HBON	NCRDY

Register Address = 0x4083 (Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
ZOUT_8	ZOUT_7	ZOUT_6	ZOUT_5	ZOUT_4	ZOUT_3	ZOUT_2	ZOUT_1
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
MSTR	-	-	-	MOUT_3	MOUT_2	MOUT_1	MOUT_0

Note4: This monitor is an echo back monitor of “coil input group 1 and 2 (register address: 0x0080, 0x0081),” the values written into register address: 0x0080, 0x0081 can be read out as they are. Readout register address: 0x4090 to confirm hardware I/O-input information.

- **Register Address List – Monitor 3**

Register Address (Hex)	Name	Unit	R/W
0x4084	Alarm History (Now)	-	R
0x4085	Alarm History (Last 1)	-	R
0x4086	Alarm History (Last 2)	-	R
0x4087	Alarm History (Last 3)	-	R
0x4088	Alarm History (Last 4)	-	R
0x4089	Alarm History (Last 5)	-	R
0x408A	Alarm History (Last 6)	-	R
0x408B	Alarm History (Last 7)	-	R

● **Register Address List – Monitor 4**

Register Address List	Name	Unit	R/W
0x408C	Coil Input Group3 Monitor	-	R
0x408D	(Reserved)	-	R
0x408E	Coil Output Group3 Monitor	-	R
0x408F	(Reserved)	-	R
0x4090	General purpose input monitor	-	R

Register Address = 0x408C (Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-	-	-	-	-	-	-	-
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	-	-	-	-	CSET

Register Address = 0x408D (Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-	-	-	-	-	-	-	-
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	-	-	-	-	-

Register Address = 0x408E (Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-	-	-	-	-	-	-	-
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	-	-	-	-	-

Register Address = 0x408F (Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-	-	-	-	-	-	-	-
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	-	-	-	-	-

Register Address = 0x4090 (Read)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-	-	-	-	-	-	-	-
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	-	INPUT_3	INPUT_2	INPUT_1	INPUT_0

■ Alarm Code

When an alarm is issued, verify its contents using the Alarm List (Table 1 to 3).
For remedies at the time of defective operation, please refer to chapter 8 in the attached sheet.
Detection Operations: After alarm, "DB" will slow down and stop the servo motor.
Detection Operations: "SB" shows down and stops the servo motor as per the sequence current limitation value.
After selecting the dynamic brake in forced stop operation selection, the servo motor will slow down and stop by dynamic brake operations irrespective of operations during detecting.
(However, while detecting alarm 0x0053 [DB resistor super heating]), the servo motor will stops via servo brake operation.)
Detection Operations: "－" is an alarm detected only in the initial process after turning ON the control power.
Alarm clear： "V" means it is possible to reset, " " means it is not possible to reset.

● Alarm Code List 1

Alarm Code (Hex)	Name	Description	Operation when detected	Alarm Clear
0x0001	Serial communication error 1	・Time-out error of a host device communication	DB	V
0x0021	Power Element Error (Overcurrent)	・Over current of drive module ・Abnormality in drive power source ・Overheating of drive module	DB	V
0x0022	Current Detection Error 0	・Abnormality of electric current detection value	DB	V
0x0023	Current Detection Error 1	・Abnormality of Electric current detection circuit	DB	V
0x0024	Current Detection Error 2	・Abnormality in communication with Electric current detection circuit	DB	V
0x0031	Forward over travel	・Entering normal over travel	DB	V
0x0032	Reverse over travel	・Entering reverse over travel	DB	V
0x0041	Overload 1	・Excessive effective torque	SB	V
0x0042	Overload 2	・Stall overload	DB	V
0x0043	Regenerative Error	・Regeneration load ratio exorbitance	DB	V
0x0051	Amplifier Overheat	・Overheating detection of amplifier ambient temperature	SB	V
0x0052	Inrush Preventive Register Overheat	・Detection of in-rush prevention resistance overheating	SB	V
0x0053	DB Resistor Overheat	・Overheating detection of DB resistor	SB	V
0x0054	Internal Overheat	・Overheating detection of Internal regeneration resistor	DB	V
0x0055	External Error	・Overheating detection of External regeneration resistor and abnormality detection of higher rank equipment	DB	V
0x0061	Overvoltage	・DC Excess voltage of main circuit	DB	V
0x0062	Main Circuit Undervoltage (Note1)	・DC Main circuit low voltage	DB	V
0x0063	Main Power Supply Open Phase (Note1)	・1 phase of the 3 phase main circuit power supply disconnected	SB	V
0x0071	Control Power Supply Undervoltage (Note3)	・Control power supply low voltage	DB	V (Note2)
0x0072	Under voltage of + 12 V	・Under voltage of + 12 V	SB	V

Note 1:Control power error or servo ready OFF is detected during instantaneous break of 1.5 to 2 cycles.
Note 2:When the main power voltage increases or decreases gradually or is an instantaneous interruption, main circuit low voltage or main power open phase may be detected.
Note 3:When the control panel voltage drops below +5V due to suspension of control power, the alarm cannot be cleared without turning OFF the control power, even if having been restored with only a little drop from +5V resulting in detection of control power supply error. Turn OFF the control power to reset the alarm.

- Alarm Code List 2

Alarm Code (Hex)	Name	Description	Operation when detected	Alarm Clear
0x0081	Encoder Pulse Error 1 (A-phase, B-phase, Z-phase)	・Incremental encoder (A, B, Z) signal line break ・Power supply line break	DB	“ “
0x0082	Absolute Encoder Signal Disconnect	・Absolute Encoder (PS) signal line break	DB	V
0x0083	External Encoder Pulse Error (CN-EXT: A-Phase, B-Phase)	・Breaking of full close Encoder (A, B) signal line	DB	V
0x0084	Communication Error Between Encoder and Amplifier	・Encoder serial signal time out	DB	V (Note5)
0x0085	Encoder Initial Process Error	・Failed to read CS data of incremental encoder ・Abnormality in initial process of absolute encoder ・Cable break	-	“ “
0x0087	CS Disconnection	・CS signal line break	DB	“ “
0x0091	Encoder Command Error	・Mismatch of transmission command and reception command	DB	V
0x0092	Encoder FORM Error	・Start, Stop bit Abnormality ・Insufficient data length	DB	V
0x0093	Encoder SYNC Error	・Data cannot be received during the prescribed time after the command is sent.	DB	V
0x0094	Encoder CRC Error	・CRC generated from the received data and sent CRC do not match	DB	V
0x00A1	Encoder Error 1	・Breakdown of Encoder internal device	DB	(Note 6)
0x00A2	Absolute Encoder Battery Error	・Battery low voltage	DB	(Note 6)
0x00A3	Encoder Overheat	・Motor built-in Encoder Overheating	DB	(Note 6)
0x00A5	Encoder Error 3	・Error generation of multi-rotation data ・Abnormality in operations of temperature encoder	DB	(Note 6)
0x00A6	Encoder Error 4	・Encoder internal EEPROM data is not set ・Overflow of multi-rotation data	DB	(Note 6)
0x00A7	Encoder Error 5	・Resolver Output Abnormality ・Light receiving element abnormality in encoder	DB	(Note 6)
0x00A8	Encoder Error 6	・Resolver disconnection ・Light emitting element abnormality in encoder	DB	(Note 6)
0x00A9	Failure of Encoder	・Encoder failure	DB	(Note 6)
0x00B2	Encoder Error 2	・Position data incorrect	DB	(Note 6)
0x00B3	Absolute Encoder Multi-Turn Counter Error	・Detection of incorrect multiple rotations coefficient	DB	(Note 6)
0x00B4	Absolute Encoder Single-Turn Counter Error	・Detection of incorrect 1 rotation coefficient	DB	(Note 6)
0x00B5	Over-allowable Speed of Absolute Encoder at Turning ON	・Exceeds the permitted speed of motor rotation speed when the power is turned ON	DB	(Note 6)
0x00B6	Encoder Memory Error	・Access error of Encoder internal EEPROM	DB	(Note 6)
0x00B7	Acceleration Error	・Exceeds the permitted speed for motor rotation	DB	(Note 6)

Note 4 : When instantaneous interruption of a control source is long, it is regarded as power supply interception and then turning it on again. The detected abnormalities of control source do not remain in an alarm history.
(The instantaneous interruption more than 1 second will be interpreted as power supply interception.)
Note 5:When the absolute encoder with incremental output is used alarm resetting is prohibited.
Note 6:Due to abnormality in encoder main body, encoder clear may sometimes be needed.

- Alarm Code List 3

Alarm Code (Hex)	Name	Description	Operation when detected	Alarm Clear
0x00C1	Overspeed	・Motor rotation speed is 120 % more than the highest speed limit	DB	V
0x00C2	Speed Control Error	・Torque command and acceleration direction are not matching.	DB	V
0x00C3	Speed Feedback Error	・Motor power line disconnection (Note 8)	DB	V
0x00D1	Excessive Position Deviation	・Position Deviation Counter exceeds setup value	DB	V
0x00D2	Position Command Pulse Frequency Error 1	・Frequency of entered position command pulse is excessive	SB	V
0x00D3	Position Command Pulse Frequency Error 2	・Position command frequency after electronic gear is high.	SB	V
0x00DF	Test Run Close (Note 7)	・Detection in ‘Test mode end’ status	DB	V
0x00E1	EEPROM Error	・Abnormality of amplifier with built-in EEPROM	DB	“ “
0x00E2	EEPROM Check Sum Error	・Error in check sum of EEPROM (entire area)	-	“ “
0x00E3	Internal RAM Error	・Access error in CPU built in RAM	-	“ “
0x00E4	Process Error between CPU and ASIC	・Access abnormality in CPU ~ ASIC	-	“ “
0x00E5	Parameter Error 1	・Detection when non-corresponding or undefined amplifier, motor, encoder code are specified.	-	“ “
0x00E6	Parameter Error 2	・Error in combining code of motor, encoder, and/or amplifier that was set from system parameter.	-	“ “
0x00E7	Parameter Error 3	・Error in address setting or baud rate setting of a host device communication	-	“ “
0x00F1	Task Process Error	・Error in interruption process of CPU	DB	“ “
0x00F2	Initial Time-Out	・Detection when initial process does not end within initial process time	-	“ “
0x00FF	Sub-CPU error	・Failure in procedure of initialization in common RAM ・Error in a processor used for a host device communication	-	“ “

Note 7: Alarm that occurs in ‘Test mode end’ status is not recorded in the alarm history.

Note 8: When there is a rapid motor fall simultaneous with servo ON, there is a possibility that a break in the motor’s power line cannot be detected.

■ Point Data

● **Point Data Address Range (0x8001 to 0xBFFF)**

Edit of point data accesses this domain of a register number.

Since there is 4-byte data in point data, take consistency of the higher rank of data, and a low rank.

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	0	Point Data Block Number Selection									Point Data Selection				

● **Register Address List 1 – Point Data Block 0**

Register Address (Hex)	Block Number	Name	Unit	Setting Range	R/W
0x8000	0	Speed (Hi)	Uv	1 to 2147483647	R/W
		Speed (Lo)			
0x8002		Position Data (Hi)	U	-2147483647 to 2147483647	R/W
		Position Data (Lo)			
0x8004		Move Mode	-	0 to 65535	R/W
0x8005		Acceleration Data	Uv/ms	0 to 65535	R/W
0x8006		S-shaped acceleration/ deceleration time	ms	0 to 32767	R/W
0x8007		Torque limit	%	0 to 799	R/W
0x8008		M output Delay (Hi)	U	-1 to 2147483647	R/W
		M output Delay (Lo)			
0x800A		M output Type	-	0 to 65535	R/W
0x800B		Starting point (Ip) at interruption start	-	0 to 253	R/W
0x800C		Dwell Time	ms	0 to 65535	R/W
0x800D		The number of times of a repeat in 1 point jump and conditional jump is specified.	–	0 to 65535	R/W
0x800E		The point number of a jump place is set up.	–	0 to 253	R/W
0x800F		(Reserved)	-	0	R/W
0x8010 to 0x801F		(Reserved)	-	-	R

● **Register Address List 2 – Point Data Block 1 to Block 253**

Register Address (Hex)	Block Number	Name	Unit	Setting Range	R/W
0x8020	1	Speed (Hi)	Uv	1 to 2147483647	R/W
		Speed (Lo)			
0x8022		Position Data (Hi)	U	-2147483647 to 2147483647	R/W
		Position Data (Lo)			
0x8024		Move Mode	-	0 to 65535	R/W
0x8025		Acceleration Data	Uv/ms	0 to 65535	R/W
0x8026		S-shaped acceleration/ deceleration time	ms	0 to 32767	R/W
0x8027		Torque Limit	%	0 to 799	R/W
0x8028		M output Delay (Hi)	U	-1 to 2147483647	R/W
		M output Delay (Lo)			
0x802A		M output Type	-	0 to 65535	R/W
0x802B		Starting point (Ip) at interruption start	-	0 to 253	R/W
0x802C		Dwell Time	ms	0 to 65535	R/W
0x802D		The number of times of a repeat in 1 point jump and conditional jump is specified.	–	0 to 65535	R/W
0x802E		The point number of a jump place is set up.	–	0 to 253	R/W
0x802F		(Reserved)	-	0	R/W
0x8030 to 0x803F		(Reserved)	-	-	R
0x8040 to 0x805F	2	(Structure is the same as block 0.)			
・ ・ ・	・ ・ ・	・ ・ ・			
0x9F80 to 0x9F9F	252	(Structure is the same as block 0.)			
0x9FA0 to 0x9FBF	253	(Structure is the same as block 0.)			

■ Move Mode

Bit allotment	Explanation of Bit
Bit15 to Bit14	01 : Fixed
Bit13 to Bit12	Move mode 2 01 : Continuous move 00 : Last mode
Bit11	0 : Fixed
Bit10	Move mode ABS / INC 1 : Position data is incremental (relative) command 0 : Position data is absolute command.
BIt9	Move mode with end/ no end 1: Travel on “Bump Stop” 0: Normal Movement (No Bumping)
Bit8	Move mode Variable speed: stop/ continuous 1: Continuous speed change operation 0: Stop and change speed operation
Bit7 to Bit4	Servo Gain change 1111 to 0101 : default (Gain1) 0100 : Gain 4 0011 : Gain 3 0010 : Gain 2 0001 : Gain 1 0000 : default (Gain1)
Bit3 to Bit0	Loop Mode (Reserve) 1111 to 0000 : Reserve

*** Refer to “Chapter 4, positioning function, explanation of point data,” for details of point data and move modes.**

■ M output Type

Bit allotment	Explanation of Bit
Bit15 to Bit8	M output Code Sets the data for M output. M output is 4 bits from “00000000 to 00001111”. Set this to “00000000” for usual.
Bit7 to Bit0	M output Type Sets the function of M output as follows: 11111111 to 00000011 : Reserve 00000010 : Only M output, without handshaking. 00000001 : When the move is complete with handshaking mode, MSTR signal is output and wait until MFIN signal is input, the next move is performed. 00000000 : Without M output operations. No change from the previous M output. Set this to “00000000” for usual.

■ The write-in procedure of point data (EEPROM preservation procedure)

Point data No. 0 through No. 9 can be changed at any time.
Note: Difference between point data No. 0 through No. 9 and No. 10 through No. 253
- Point data No. 0 through No. 9 is written in internal RAM.
- Point data No. 10 through No. 253 is written in internal EEPROM.

* The number of times of writing in EEPROM is limited to about 100,000 times while that of tim es of writing extended-point data No. 0 through No.9 is virtually unlimited, because the data is written in RAM. Thus point data No. 0 through No.9 is rewritten frequently.
RAM data disappears if the servo unit limited power supply shuts down. To prevent this problem, a backup copy of RAM data must be created in a higher controller.

*How to overwrite default value of Point Data No. 0 through No. 9.
Write the values via [Setup software R-Setup] after power supply turned on with point data not written via host controller.
When point data 0 to 9 have been written at the state other than the above via [Setup software R-Setup], Alarm (ALM/EEPROM Checksum error) is activated.

A point data can be read or written on 32-byte block basis.
We recommend that a point data be read, changed, and rewritten if it needs to be changed.
In principle, do not turn off the control power supply during writing operation.
Doing so causes mode abnormalities to output, thus preventing writing.
If communications are interrupted previously, no output may be generated, depending on the communication conditions.

■ Communication example

- Communication example is described on condition of the following.

Baud rate･･･115200bps
Slave address･･･1
Silent interval time(T0)･･･about 334μS
Servo amplifier processing time(T1)･･･about 500μS
Communication wait time(T2)･･･0mS
Outgoing message minimum transmitting time･･･1/1152000×11bit(Per byte)
The conditions by the side of a master are considered as continuation transmission.
Please improve according to the equipment to be used.
Response massage minimum transmitting time･･･125μS(Per byte)

(The example of communication timing is described by setting response time from servo amplifier to about 0.9 ms (s).)

✍ In setting up a communication cycle (scanning cycle), set up a satisfactory value accodeing to composition, a system configuration (the number of axes), etc. of equipment and a communication message to be used.
In changing baud rate, please refer to the example and re-calculate it.

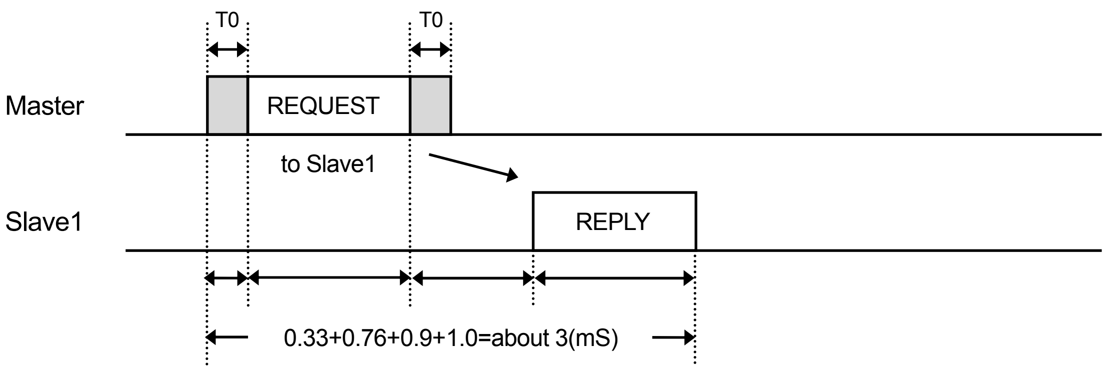
- Use a communication diagnostic message and check communicative establishment.

Request message：8byte (message length=1/1152000×11bit×8byte=about 0.76mS)

Slave Adr	FC	Sub-FuncHi	Sub-FuncLo	Data Hi	Data Lo	CRC16 Lo	CRC16 Hi
0x01	0x08	0x00	0x00	0x12	0x34	0xED	0x7C

Response massage：8byte (message length=0.125×8=about 1mS)

Slave Adr	FC	Sub-FuncHi	Sub-FuncLo	Data Hi	Data Lo	CRC16 Lo	CRC16 Hi
0x01	0x08	0x00	0x00	0x12	0x34	0xED	0x7C



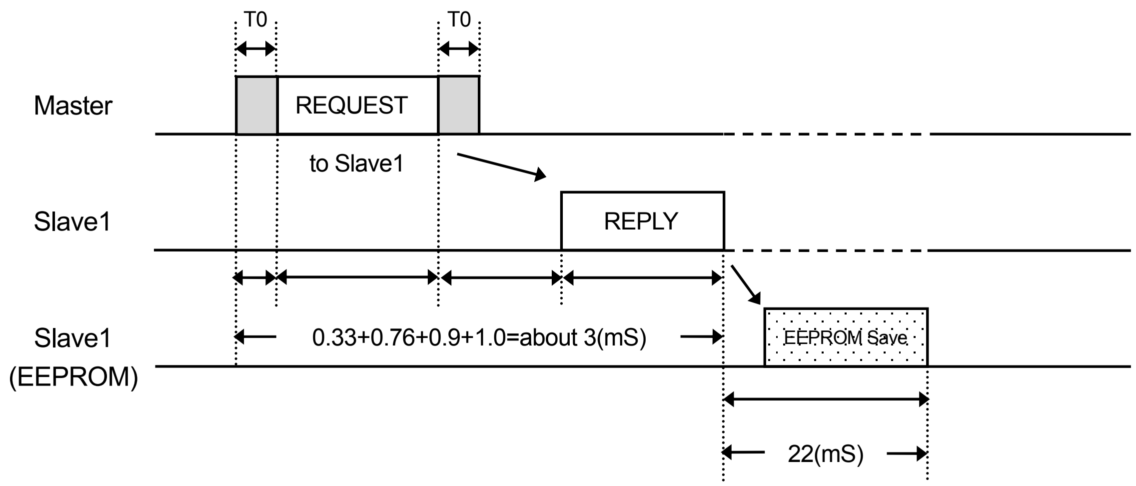
- Servo gain is set.
  The velocity loop proportional gain 1 is set as 100Hz.

Request message：8byte (message length=1/1152000×11bit×8byte=about 0.76mS)

Slave Adr	FC	Reg Adr Hi	Reg Adr Lo	Reg Val Hi	Reg Val Lo	CRC16 Lo	CRC16 Hi
0x01	0x06	0x00	0x10	0x00	0x64	0x89	0xE4

Response massage：8byte (message length=0.125×8=about 1mS)

Slave Adr	FC	Reg Adr Hi	Reg Adr Lo	Reg Val Hi	Reg Val Lo	CRC16 Lo	CRC16 Hi
0x01	0x06	0x00	0x10	0x00	0x64	0x89	0xE4



✍ In the write-in command (a single or multi) of a holding register, since a write-in value is saved at EEPROM, the reserve time of about 22 mS(s) is spent inside amplifier.
Therefore, if the write-in command of a holding register is executed, please publish the next command after waiting for 25mS or more.
It takes about 34ms to reflect the parameter written to actual moving, so when moving work after setting parameter, make sure to issue command to operate after a lapse of 40ms in consideration of margin.

- Alarm history is read.
  The eight-word continuation data of an alarm history zone is read out of monitor data.

Request message：8byte (message length=1/1152000×11bit×8byte=about 0.76mS)

Slave Adr	FC	Reg Adr Hi	Reg Adr Lo	Quantity Hi	Quantity Lo	CRC16 Lo	CRC16 Hi
0x01	0x03	0x40	0x84	0x00	0x08	0x11	0xE5

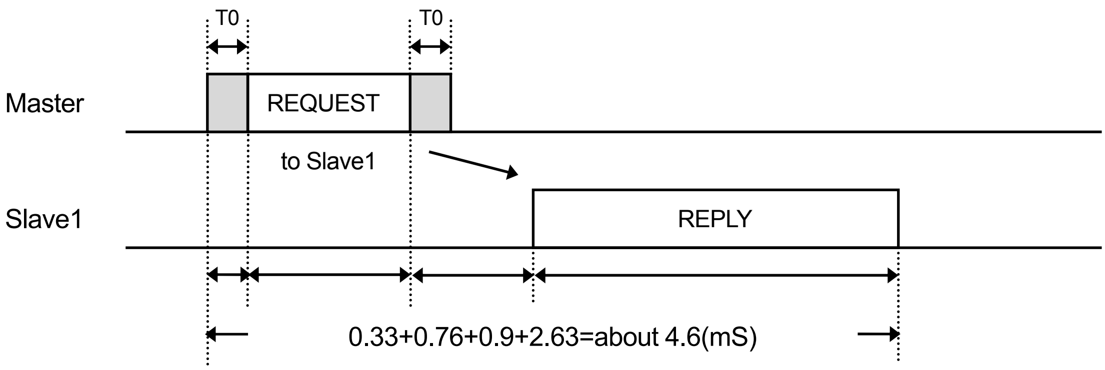
Response massage：21byte (message length=0.125×21=about 2.63mS)

Slave Adr	FC	Byte Count
0x01	0x03	0x10

AlmNow Hi	AlmNow Lo	AlmLast1 Hi	AlmLast1 Lo	AlmLast2 Hi	AlmLast2 Lo	AlmLast3 Hi	AlmLast3 Lo

AlmLast4 Hi	AlmLast4 Lo	AlmLast5 Hi	AlmLast5 Lo	AlmLast6 Hi	AlmLast6 Lo	AlmLast7 Hi	AlmLast7 Lo

CRC16 Lo	CRC16 Hi



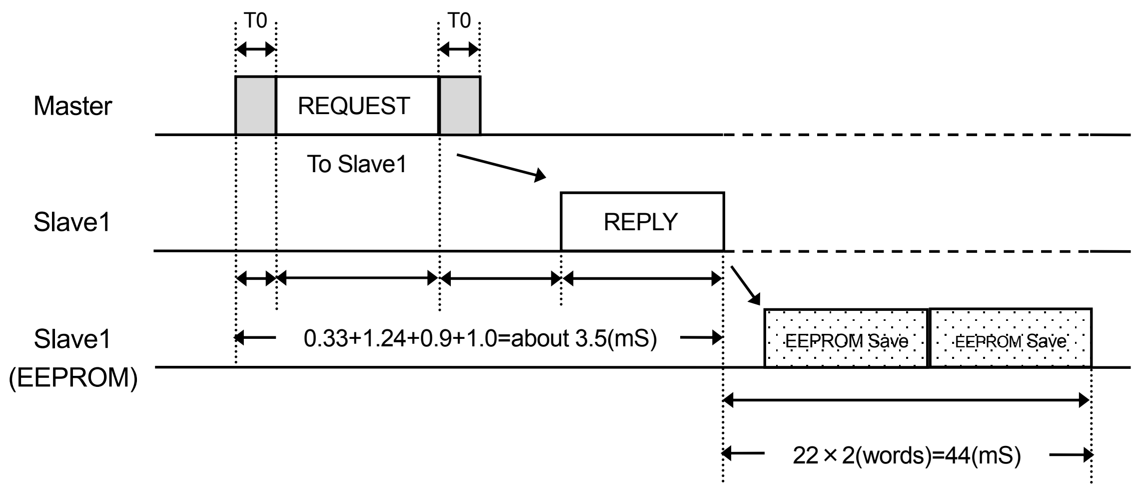
● Point data are set up. (Block 10 to 253)
Set the velocity data (32 bits) of block 10 as 0x12345678 out of point data.

Request message：13byte (message length=1/1152000 × 11bit × 13byte=about 1.24mS)

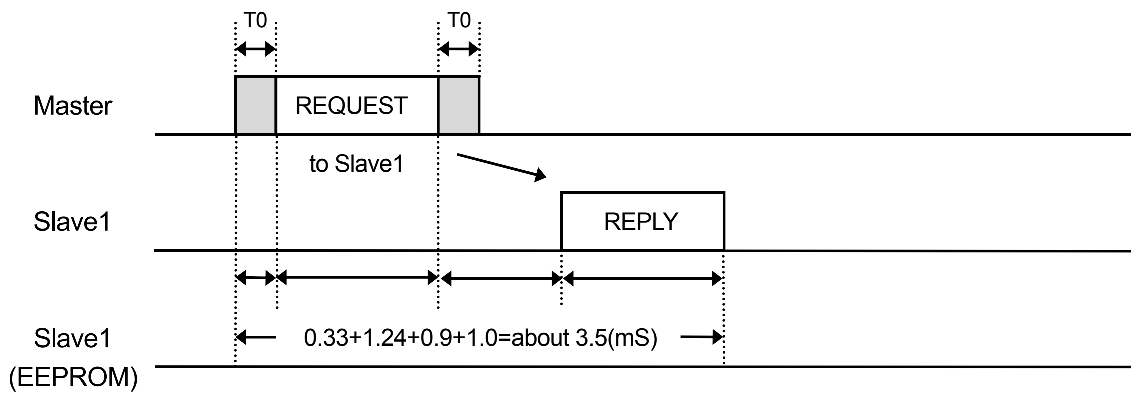
Slave Adr	FC	Reg Adr Hi	Reg Adr Lo	Quantity Hi	Quantity Lo	Byte Count	Speed HH	Speed HL	Speed LH	Speed LL	CRC16 Lo	CRC16 Hi
0x01	0x10	0x81	0x40	0x00	0x02	0x04	0x12	0x34	0x56	0x78	0xE0	0xFD

Response massage：8byte (message length=0.125 × 8= about 1mS)

Slave Adr	FC	Reg Adr Hi	Reg Adr Lo	Quantity Hi	Quantity Lo	CRC16 Lo	CRC16 Hi
0x01	0x10	0x81	0x40	0x00	0x02	0x68	0x20



● Point data are set up. (in the case of blocks 0 to 9)
The point data of blocks 0 to 9 are not saved at EEPROM.
Since it is renewal only of internal RAM, can change during turning on electricity at any time.



✍ Point data differ with the block to set up and in the time which can receive the next command.
Since time to answer with the number of data to set up differs, please design according to the example of usage.

- Point data are set up. (Block 10 to 253)
  Set up all the data of block 10 out of point data.

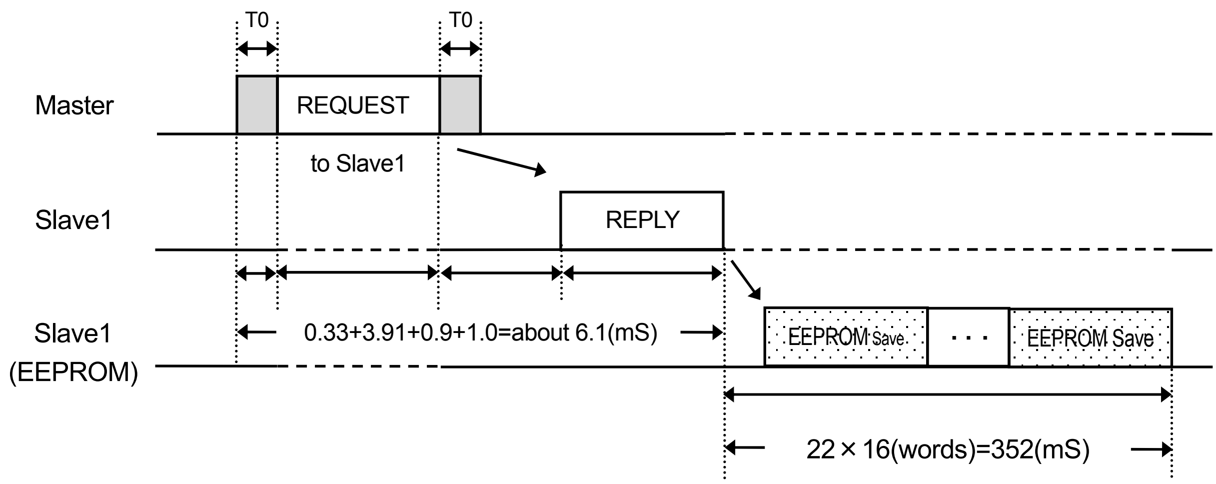
Request message : 41byte (message length=1/1152000×11bit×41byte=about 3.91mS)

Slave Adr	FC	Reg Adr Hi	Reg Adr Lo	Quantity Hi	Quantity Lo	Byte Count
0x01	0x10	0x81	0x40	0x00	0x10	0x20

Speed HH	Speed HL	Speed LH	Speed LL	. . . .	CRC16 Lo	CRC16 Hi

Response massage : 8byte (message length=0.125×8=about 1mS)

Slave Adr	FC	Reg Adr Hi	Reg Adr Lo	Quantity Hi	Quantity Lo	CRC16 Lo	CRC16 Hi
0x01	0x10	0x81	0x40	0x00	0x10	0xE8	0x2D



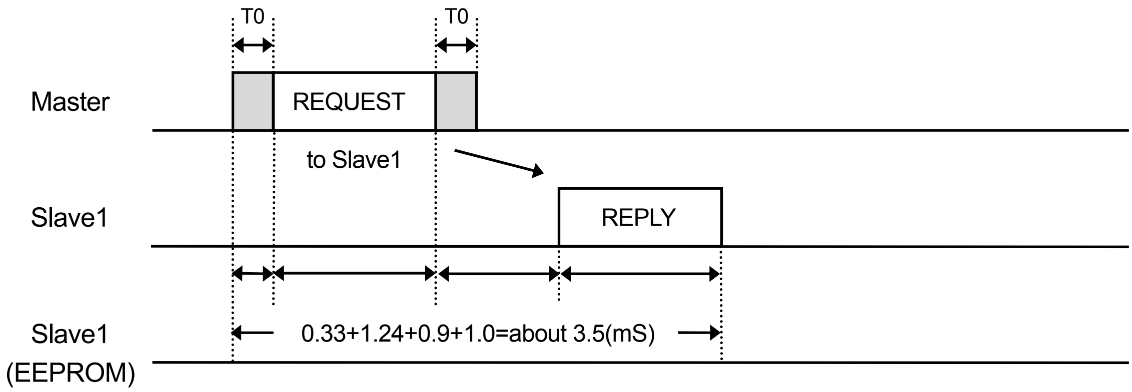
- Coil inputs are set up. (All the 32bits are set up by multi-register setup.)
  When only a servo-on input is turned on and all other bits are set to OFF.

Request message : 13byte (message length=1/1152000 × 11bit × 13byte=about 1.24mS)

Slave Adr	FC	Reg Adr Hi	Reg Adr Lo	Quantity Hi	Quantity Lo	Byte Count	CoilInG1 Hi	CoilInG1 Lo	CoilInG2 Hi	CoilInG2 Lo	CRC16 Lo	CRC16 Hi
0x01	0x10	0x00	0x80	0x00	0x02	0x04	0x00	0x01	0x00	0x00	0xAA	0x0F

Response massage : 8byte (message length=0.125 × 8=about 1mS)

Slave Adr	FC	Reg Adr Hi	Reg Adr Lo	Quantity Hi	Quantity Lo	CRC16 Lo	CRC16 Hi
0x01	0x10	0x00	0x80	0x00	0x02	0x40	0x20



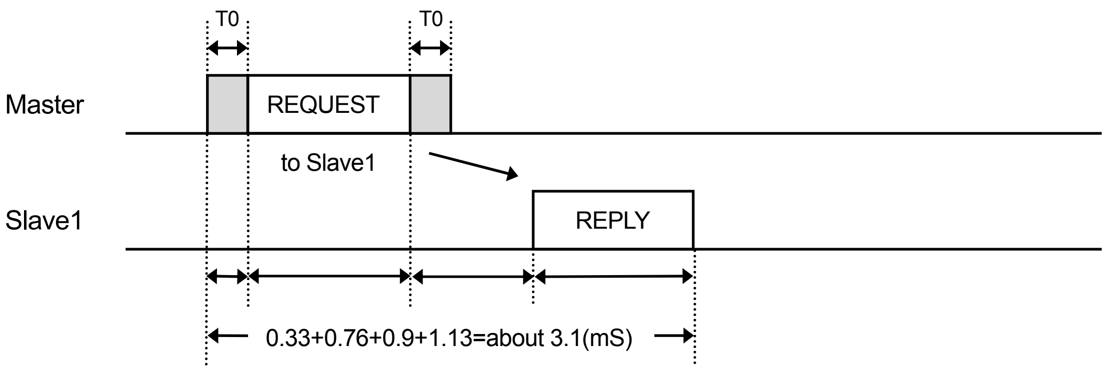
- Coil outputs are read. (All the 32bits are read by holding register read-out.)

Request message : 8byte (message length=1/1152000 × 11bit × 8byte=about 0.76mS)

Slave Adr	FC	Reg Adr Hi	Reg Adr Lo	Quantity Hi	Quantity Lo	CRC16 Lo	CRC16 Hi
0x01	0x03	0x40	0x82	0x00	0x02	0x71	0xE3

Response massage : 9byte (message length=0.125 × 9=about 1.13mS)

Slave Adr	FC	Byte Count	CoilOutG1Hi	CoilOutG1Lo	CoilOutG2Hi	CoilOutG2Lo	CRC16 Lo	CRC16 Hi
0x01	0x03	0x04						



- Alarm clear procedure (only 1 bit is set up by single coil setup.)

① Turn on an alarm clear input.

Request message : 8byte (message length=1/1152000×11bit×8byte=about 0.76mS)

Slave Adr	FC	Coil Adr Hi	Coil Adr Lo	Out Val Hi	Out Val Lo	CRC16 Lo	CRC16 Hi
0x01	0x05	0x00	0x06	0xFF	0x00	0x6C	0x3B

Response massage : 8byte (message length=0.125×8=about 1mS)

Slave Adr	FC	Coil Adr Hi	Coil Adr Lo	Out Val Hi	Out Val Lo	CRC16 Lo	CRC16 Hi
0x01	0x05	0x00	0x06	0xFF	0x00	0x6C	0x3B

② Wait for 20mS or more.

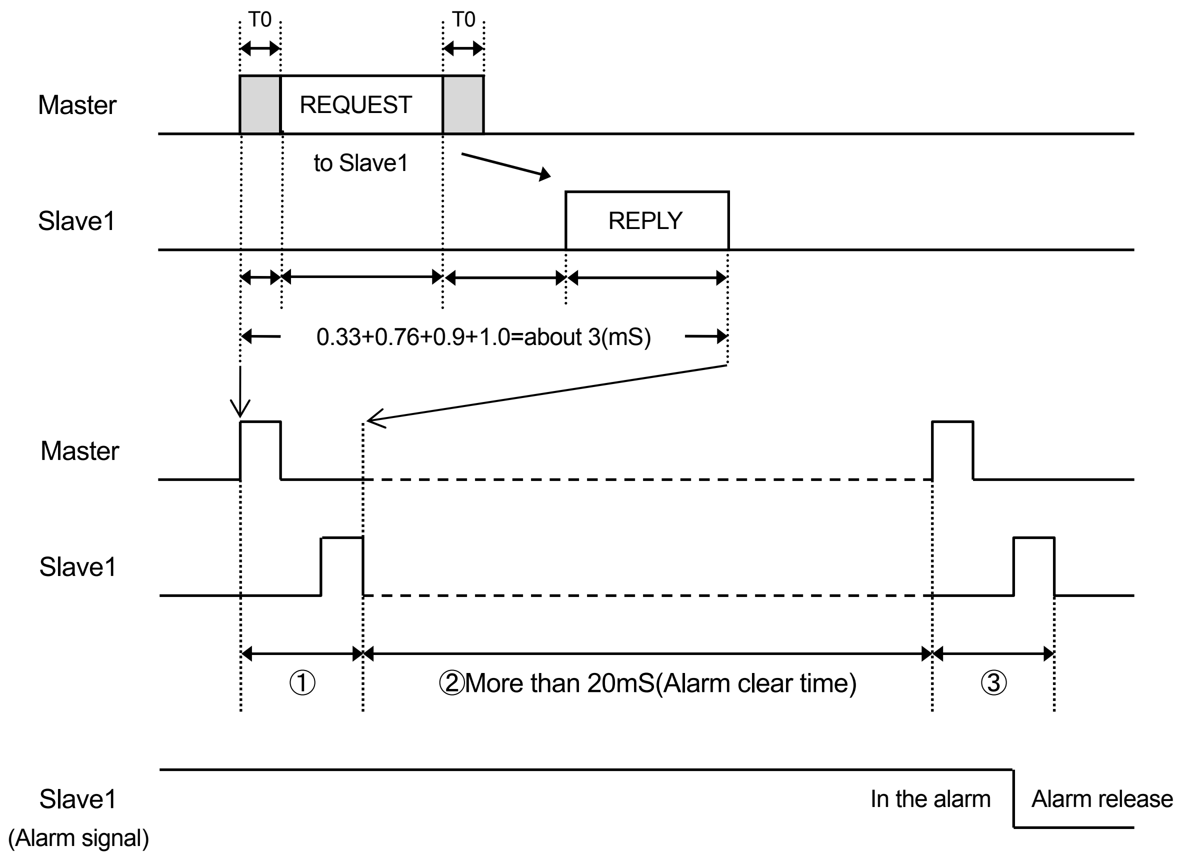
③ Turn off an alarm clear input.

Request message : 8byte (message length=1/1152000×11bit×8byte=about 0.76mS)

Slave Adr	FC	Coil Adr Hi	Coil Adr Lo	Out Val Hi	Out Val Lo	CRC16 Lo	CRC16 Hi
0x01	0x05	0x00	0x06	0x00	0x00	0x2D	0xCB

Response massage : 8byte (message length=0.125×8=about 1mS)

Slave Adr	FC	Coil Adr Hi	Coil Adr Lo	Out Val Hi	Out Val Lo	CRC16 Lo	CRC16 Hi
0x01	0x05	0x00	0x06	0x00	0x00	0x2D	0xCB



✍ By the single or multi-register setup, you may operate it together with other bits.
In order to clear an alarm condition inside amplifier, please continue ON for 20mS or more.
If an alarm clear input is turned off, an alarm condition will be canceled and it will return to a normal state.
However, reset may be impossible unless it resets power supply or (control power source is once intercepted and is switched on again) clears encoder depending on the kind of alarm.
Please refer to the attached sheet [Chapter 8 Maintenance] and [Alarm list].

- Encoder clear procedure (only 1 bit is set up by single coil setup.)
  ① Turn on an encoder clear input.

Request message：8byte (message length=1/1152000×11bit×8byte=about 0.76mS)

Slave Adr	FC	Coil Adr Hi	Coil Adr Lo	Out Val Hi	Out Val Lo	CRC16 Lo	CRC16 Hi
0x01	0x05	0x00	0x10	0xFF	0x00	0x8D	0xFF

Response massage：8byte (message length=0.125×8=about 1mS)

Slave Adr	FC	Coil Adr Hi	Coil Adr Lo	Out Val Hi	Out Val Lo	CRC16 Lo	CRC16 Hi
0x01	0x05	0x00	0x10	0xFF	0x00	0x8D	0xFF

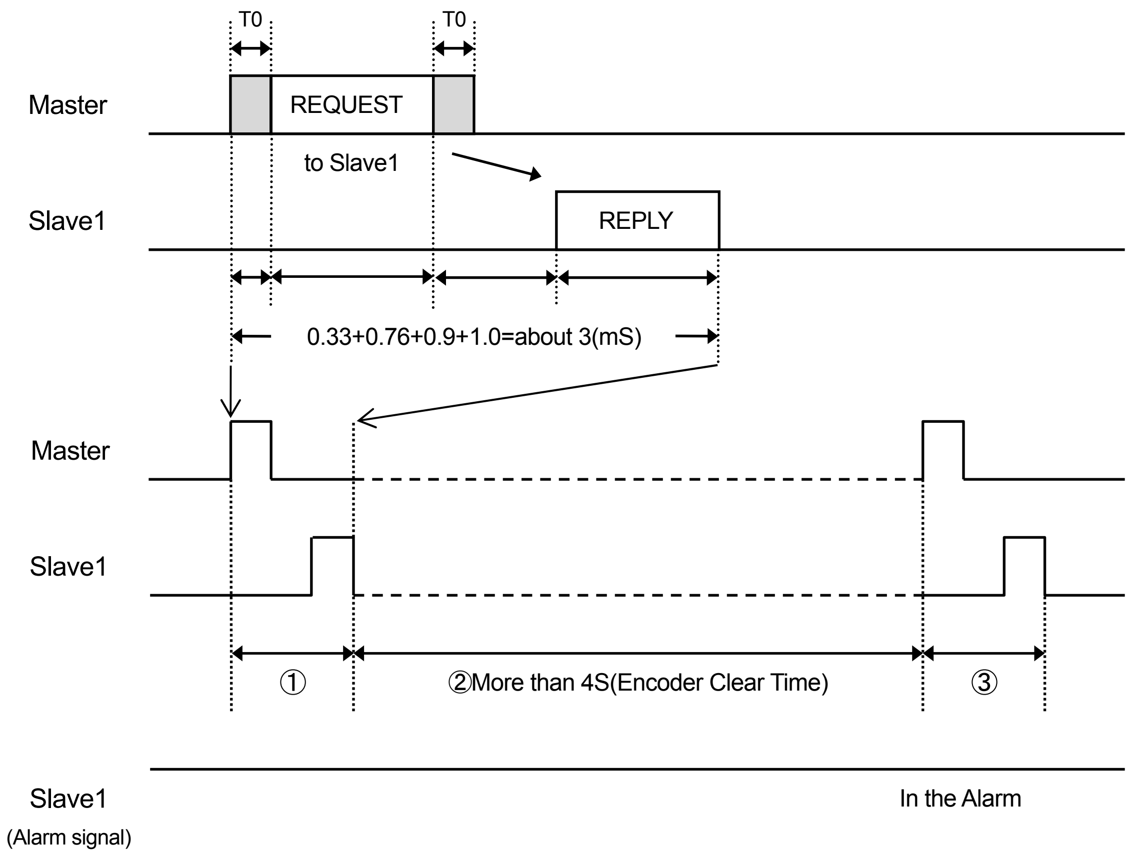
② Wait for 4S or more.
③ Turn off an encoder clear input.

Request message：8byte (message length=1/1152000×11bit×8byte=about 0.76mS)

Slave Adr	FC	Coil Adr Hi	Coil Adr Lo	Out Val Hi	Out Val Lo	CRC16 Lo	CRC16 Hi
0x01	0x05	0x00	0x10	0x00	0x00	0xCC	0x0F

Response massage：8byte (message length=0.125×8=about 1mS)

Slave Adr	FC	Coil Adr Hi	Coil Adr Lo	Out Val Hi	Out Val Lo	CRC16 Lo	CRC16 Hi
0x01	0x05	0x00	0x10	0x00	0x00	0xCC	0x0F



✍ By the single or multi-register setup, you may operate it together with other bits.
In order to clear an encoder clear state inside amplifier, please continue ON for more than 4 ms.
The encoder clear differs from the "alarm reset method" after turning off an encoder clear input in the sensor and encoder to be used.
Please refer to page “Materials-64,” Encoder clear reset method.

4

[Positioning Function]

■ Explanation of Parameter GroupD

● Parameter Group D List

Group	Page / Register address	Symbol	Parameter Level	Name and Description	Standard Setting Value	Unit	Setting Range
D	00 0x0C00	S_vmx	Basic	System velocity limit ･If the velocity exceeds this value through external operation, the velocity is limited at this setting.	750.00	※4	1 to 2147483647
	01 0x0C02	T_vmx	Basic	Velocity limit of PC operation ･If the velocity exceeds this value through PC operation, the velocity is limited at this setting velocity. In case of S_vmx<T_vmx, the velocity is limited at S_vmx.	100.00	※4	1 to 2147483647
	02 0x0C04	S_+OT	Basic	Positive direction software limit ･If the actual coordinate exceeds this valu,e, the software limit gets errors.	999999.99	※5	-214748368 to 2147483647
	03 0x0C06	S_-OT	Basic	Negative direction software limit ･If the actual coordinate gets lower than this valu,e, the software limit gets errors.	-999999.99	※5	-214748368 to 2147483647
	04 0x0C08	Stp_P	Basic	Striking depth *1 ･The amount of soaking pulse is set up upon striking.	100	Pulse	1 to 2147483647
	05 0x0C0B	S_inp	Basic	System in-position width *1 ･If the deviation value is within the set imposition, imposition is output.	100	Pulse	1 to 65535
	06 0x0C0C	S_ovf	Basic	System overflow *1 ･Excessive deviation value is setup at overflow.	999.99	※5	1 to 2147483647
	07 0x0C0E	T_ovf	Basic	Current limit overflow ※1 ･Excessive deviation value is setup at overflow during current limit.	100.00	※5	1 to 2147483647
	08 0x0C10	Bakls	Basic	Backlash ･The amount of backlash of the machine can be setup	0.00	※5	0 to 32767
	09 0x0C11 Bit7_0	SOTde	Basic	Software limit detection ･Whether the software limit isdisabled or enabled is setup. "0"…Software limit is disabled (Disable) "1"…Software limit is enabled (Enable)	01:_Enabled	-	0,1
	0A 0x0C11 Bit15_8	M_dir	Basic	Operation direction *1 ･The operation direction of the motor is setup. "0"…CCW: in case of rotary in the direction of positive coordinate (Positive-Dir) "1"…CW: in case of rotary in the direction of positive coordinate (Negative-Dir)	00:_ Positive-Dir.	-	0,1
	0B 0x0C12	Accel	Basic	Acceleration/deceleration constant ･Acceleration at external operation/PC operation mode is setup.	100	※3	1 to 65535
	0C 0x0C13	S_rat	Basic	S-acceleration/deceleration time ･S-shape time during an s-acceleration is setup. ･When JOG with specific position stop function is enabled, this parameter is not applied. To smooth velocity inclination, set position command smoothing time constant.	0	ms	0 to 32767
	0D 0x0C14	T_jog	Basic	Jog current limit of PC operation ･The current limit value is setup when the current is limited through the Jog operation of PC movement.	100	%	0 to 510
	0E 0x0C15 Bit7_0	Z_typ	Basic	Home-position return type ･The direction of Home-position return is setup. "0"-C phase signal search (C-Signal) "1"-SDN OFF search (SDN-OFF)	00:_C-Signal	-	0,1
	0F 0x0C15 Bit15_8	Z_dir	Basic	Home-position return direction ･The direction of Home-position return is setup. "0"-High speed / Positive direction Low speed/ Negative direction (Positive-Dir) "1"-High speed/ Negative direction Low speed/ Positive direction (Negative-Dir)	01:_ Negative-Dir.	-	0,1

Group	Page / Register address	Symbol	Parameter Level	Name and Description	Standard Setting Value	Unit	Setting Range
D	10 0x0C16	Z_hsp	Basic	Home-position return high speed ･High speed setup upon Home-position return (when using incremental encoder) Velocity setup upon Home-position return (when using the absolute sensor)	16.70	※4	1 to 2147483647
	11 0x0C18	Z_lsp	Basic	Home-position return low speed ･Low speed setup upon Home-position return	0.80	※4	1 to 2147483647
	12 0x0C1A	Z_add	Basic	Home-position coordinate ･This value will be Home-position of the user's coordinate when Home-position returns. (When using incremental encoder) This value will be Home-position of the user's coordinate when 'home-position set' is executed.	0.00	※5	-214748368 to 2147483647
	13 0x0C1C	Z_ofs	Basic	Home-position offset value ･In Home-position return, this value is used as an offset between the vase signal (C-phase or SDN signal) position and the user base position.	0.00	※5	-214748368 to 2147483647
	14 0x0C1F	Z_inp	Basic	Home-position in-position width ※1 ･Reducing this value improves the home-position return precision.	100	Pulse	1 to 65535
	15 0x0C20	+STROKE	Basic	+STROKE (Used for infinite coordinate only) Set maximum value of coordinate towards plus axis	0.00	※5	-214748368 to 2147483647
	16 0x0C22	A_ofs	Basic	Effective stroke length of absolute encoder (Normal coordinate) ※2 ･Sets the valid stroke length from the home-position in the absolute encoder. ･-STROKE (Used for infinite revolving coordinate only) Set minimum value of coordinate towards minus axis	-100.00	※5	-214748368 to 2147483647
	17 0x0C24	Zon1L	Basic	Zone (1) Negative direction side ･Sets the valid negative direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	18 0x0C26	Zon1H	Basic	Zone (1)Positive direction side ･Sets the valid positive direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	19 0x0C28	Zon2L	Basic	Zone (2) Negative direction side ･Sets the valid negative direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	1A 0x0C2A	Zon2H	Basic	Zone (2) Positive direction side ･Sets the valid positive direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	1B 0x0C2C	Zon3L	Basic	Zone (3) Negative direction side ･Sets the valid negative direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	1C 0x0C2E	Zon3H	Basic	Zone (3) Positive direction side ･Sets the valid positive direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	1D 0x0C30	Zon4L	Basic	Zone (4) Negative direction side ･Sets the valid negative direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	1E 0x0C32	Zon4H	Basic	Zone (4) Positive direction side ･Sets the valid positive direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	1F 0x0C34	Zon5L	Basic	Zone (5) Negative direction side ･Sets the valid negative direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	20 0x0C36	Zon5H	Basic	Zone (5) Positive direction side ･Sets the valid positive direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	21 0x0C38	Zon6L	Basic	Zone (6) Negative direction side ･Sets the valid negative direstion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647

Group	Page Register address	Symbol	Parameter Level	Name and Description	Standard Setting Value	Unit	Setting Range
D	22 0x0C3A	Zon6H	Basic	Zone (6)Positive direction side ·Sets the valid positive diresthion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	23 0x0C3C	Zon7L	Basic	Zone (7) Negative direction side ·Sets the valid negative diresthion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	24 0x0C3E	Zon7H	Basic	Zone (7) Positive direction side ·Sets the valid positive diresthion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	25 0x0C40	Zon8L	Basic	Zone (8) Negative direction side ·Sets the valid negative diresthion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	26 0x0C42	Zon8H	Basic	Zone (8) Positive direction side ·Sets the valid positive diresthion coordinates for the zone signal.	0.00	※5	-214748368 to 2147483647
	27 0x0C44	H_jog	Basic	Manual high speed ·High speed setting of in manual feed and 1step feed. High speed or low speed can be switched by entering RAP.	16.70	※4	1 to 2147483647
	28 0x0C46	L_jog	Basic	Manual low speed ·Low speed setting of in manual feed and 1step feed. High speed or low speed can be switched by entering RAP.	0.80	※4	1 to 2147483647
	29 0x0C48	H_stp	Basic	High speed 1step travel distance ·Sets the travel distance in case of +/-1step input. High speed travel distance / low speed travel distance can be switched by entering RAP.	10.00	※5	1 to 2147483647
	2A 0x0C4A	L_stp	Basic	Low speed 1step travel distance ·Sets the travel distance in case of +/-1step input. High speed travel distance / low speed travel distance can be switched by entering RAP.	1.00	※5	1 to 2147483647
	2B 0x0C4C Bit7_0	Ovride 0	Basic	Oveerride 0 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	2C 0x0C4C Bit15_8	Ovride 1	Basic	Oveerride 1 ·This setting ratio is multiplied by travel velocity through this override input	150	%	1to 255
	2D 0x0C4D Bit7_0	Ovride 2	Basic	Oveerride 2 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	2E 0x0C4D Bit15_8	Ovride 3	Basic	Oveerride 3 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	2F 0x0C4E Bit7_0	Ovride 4	Basic	Oveerride 4 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	30 0x0C4E Bit15_8	Ovride 5	Basic	Oveerride 5 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	31 0x0C4F Bit7_0	Ovride 6	Basic	Oveerride 6 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	32 0x0C4F Bit15_8	Ovride 7	Basic	Oveerride 7 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	33 0x0C50 Bit7_0	Ovride 8	Basic	Oveerride 8 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	34 0x0C50 Bit15_8	Ovride 9	Basic	Oveerride 9 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	35 0x0C51 Bit7_0	Ovride 10	Basic	Oveerride 10 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	36 0x0C51 Bit15_8	Ovride 11	Basic	Oveerride 11 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255
	37 0x0C52 Bit7_0	Ovride 12	Basic	Oveerride 12 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1to 255

Group	Page Register address	Symbol	Parameter Level	Name and Description	Standard Setting Value	Unit	Setting Range
A	38 0x0C52 Bit15_8	Ovride13	Basic	Oveerride 13 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1 to 255
	39 0x0C53 Bit7_0	Ovride14	Basic	Oveerride 14 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1 to 255
	3A 0x0C53 Bit15_8	Ovride15	Basic	Oveerride 15 ·This setting ratio is multiplied by travel velocity through this override input	100	%	1 to 255
	3B 0x0C54	S_pls	Basic	Number of system divisions *1 ·Number of divisions for 1 motor rotation.	8000	(Pulse)	1 to 131072
	3C 0x0C56	U_pls	Basic	Number of user divisions *1 ·Travel distance per one motor rotation from the user point of view.	10.00	(mm)	1 to 131072
	3E 0x0C58 Bit15_8	D_dpo	Basic	Velocity, Position data decimal point *1 ·Setup of decimal point position for indication "0"…No decimal point "1"…One place of decimals "2"…Two places of decimals "3"…Three places of decimals "4"…Four places of decimals "5"…Five places of decimals	2	-	0 to 5
	3F 0x0C59 Bit7_0	Unit	Basic	Setting unit *1 ·Setting of the unit "00"……pulse、"01"…… mm	01:_mm	-	00,01
	40 0x0C5A	Sw1	Basic	Function switch1	0000H	-	0000 to FFFF
	41 0x0C5B	Sw2	Basic	Function switch2	0000H	-	0000 to FFFF
	42 0x0C5C	Sw3	Basic	Function switch3	0000H	-	0000 to FFFF
	43 0x0C5D	Sw4	Basic	Function switch4	0000H	-	0000 to FFFF
	50 -	HCOMBAUD	Basic	Host equipment communication baud rate	05:_ 115200bps	—	—
	51 -	HCOMFMT	Basic	Host equipment communication format	00:_ Even_1 Stop	—	—
	52 -	HCOM ADROFS	Basic	Slave address offset in host equipment communication	00:_+0	—	—
	53 -	HCOMSW MODE	Basic	Host equipment communication rotary switch 1 mode	00:_Baud rate	—	—
	54 -	HCOMWAIT	Basic	Latency time to host equipment communication	0	x125uS	0 - 8000
	55 -	HCOMTIM OUT	Basic	Host equipment communication timeout	0	mS	0 - 10000
	56 -	HCOMSPEC	Basic	Host equipment communication specifications	00:_MOD BUS	—	—
	57 -	HCOMFUNC	Basic	Host equipment communication functions	00:_Stand ard	—	—

* If the set values are changed, Please be sure to perform zero set. Otherwise it will cause displacement.

3,4,5:Units are not specified in this instruction manual because user are supposed to setup the parameters (S_pls,U_pls,D_dpo,Unit).

Velocity system is displayed as "U_V" and position system "U" in the explanation from here on.

Refer to page 4-40 Parameters set for the first time use.

- Detail Explanation of Parameters Group D
  Each parameter contained in the parameter group D is explained.
  In addition, the explanation which has given *1, *2, etc. to the head of the sentence; since there are notes, refer to page 4 - 10.

1) 00 S_vmx:System velocity limit (Uu)

The operational velocity data is limited within this value even if it is set larger by external manipulation.

2) 01 T_vmx:Velocity limit of PC operation(Uu)

The velocity is limited by this value like S_vmx when you manipulate through PC.
However, it is limited with the set value of S_vmx in the case of S_vmx < T_vmx.

3) 02 S_+OT:Positive direction software limit(U)

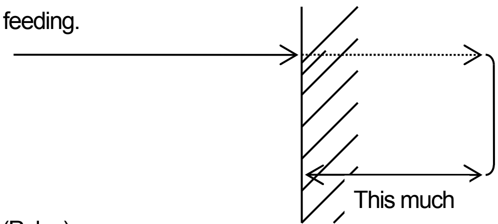
･Software limit is always enabled in the case of an absolute sensor and enabled after zero return in the case of an incremental encoder.
･If the current position exceeds this set value, it decelerates and stops and forward transit is forbidden. (Software limit error will be output.)
･Break-out should be conducted by manual (JOG) to the opposite direction (negative direction).
Error will be released by inputting alarmreset signal where it comes in the limit (operational range).
･SOTde: If you select"0 " = (page 09), it won't work.

4) 03 S_-OT:Negative direction software limit(U)

･When the current position falls below this set value, backward transition is forbidden.
･Break-out should be conducted by manual (JOG) to the opposite direction (positive direction).
Error will be released by inputting alarmreset signal where it comes in the limit (operational range).
･SOTde: If you select"0 " = (page 09), it won't work.

5) 04 Stp_P:Striking depth

This is a virtual entry depth at striking operation. It is a pulse that complete positioning even without reaching the goal position if the striking depth falls in with the difference between command position and present one at the striking operation during positioning feeding.



6) 05 S_inp:System in-position width(Pulse)

･Positioning is completed and in-position is output when the difference between command position and present position (deviation amount) is withinS_inp value(±).
･This value should usually be set with positioning error permissible value.

7) 06 S_ovf : System overflow (U)

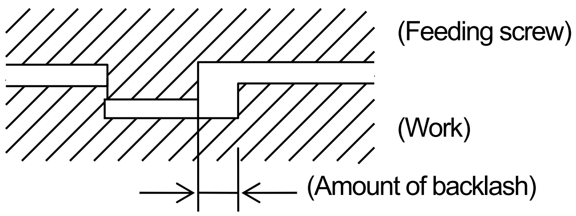
･Values considered as overmuch position deviation (alarm) and defective position loop (defective trailing) including operation are setup.
･Set values are determined in adjusted value and maximum velocity of position loop gain(Kp) and feed forward gain (KFF).
S_ovf > VmaxX (100-Kff) / (100×Kp)

8) 07 T_ovf :Overflow at current limit (U)

･During current limit, position deviation is apt to be bigger than usual operation and overmuch deviation alarm becomes sensitive.
･This is a parameter to avoid this state.
･Therefore usually it is T_ovf > S_ovf.

9) 08 Bakls: Backlash (U)

- Amount of backlash of a machine is set.
- Amount of backlash is carried out being added to travel data every time travel direction changes.
- Perform zero return operation when you use backlash correction or after you alter setting.
- Correction starts when the direction reverses to the direction of zero return operational completion.



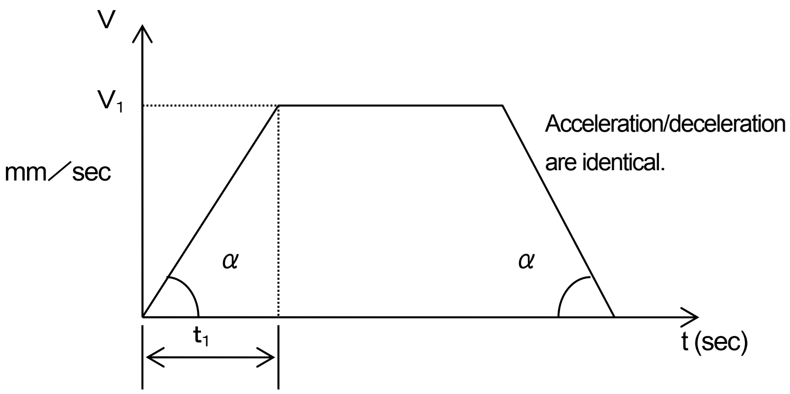
10) 09 SOTde: Software limit detection (-)

- Validity / invalidity of software limit is setup.

"0"…Software limit is invalid.
"1"…Software limit is valid.

11) 0B Accel: Acceleration / deceleration constant (—)

This is used in all the transitions of manual, 1step, home-position return, point transition.



$$\text{Accel} = \frac{V_1 \times 10^{(D\_dpo)}}{t_1 \times 10^3}$$ However V_1 = (mm/s)

When rising at 0.2sec until the velocity of 0→375(mm/sec)

V_1=375 (mm/sec)…(N=4500min^{-1})

t_1=0.2 (sec) , D_dpo=2、U_pls=5.00 (mm)

$$\text{Accel} = \frac{375 \times 10^2}{0.2 \times 10^3} = 187.5 \rightarrow 188$$

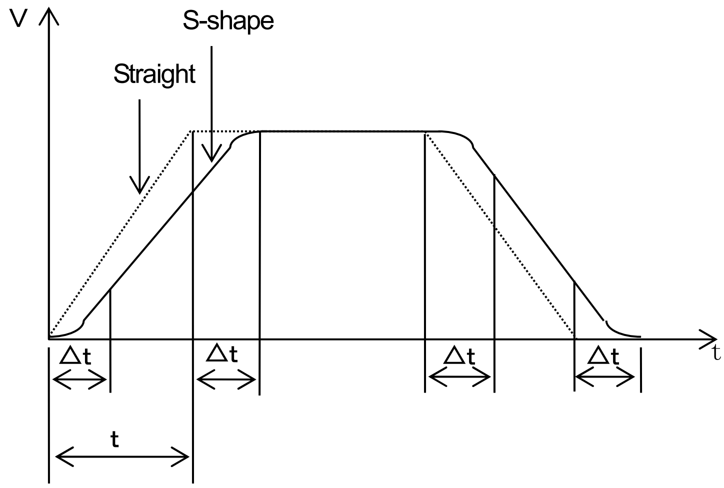
Note) When acceleration constant is too high, overshood or undershoot (vibration) is prone to happen.

12) 0C S_rat : S-acceleration/deceleration time (msec)

・ The curb section (△t)of s-shape in the acceleration and decelaration is set with time.

・ Linear acceleration/deceleration when set value is below 4(msec)
(Set “0” during the straight line.)

・ If acceleration time is short enough and the curb section of s-shape is too long, it can not reach acceleration constant (Accel).



・Rising (downward) time at S-shape is about △t longer (curb section of S-shape) than at straight line.

・ The straight line at S-shape is acceleration constant (Accel).

13) 0D T-jog:Jog current limit of PC operation

This is current limit set value when limiting current at Jog running of PC operation (Test Run function on setup software).

<Explanation of PC operation/Jog operation>

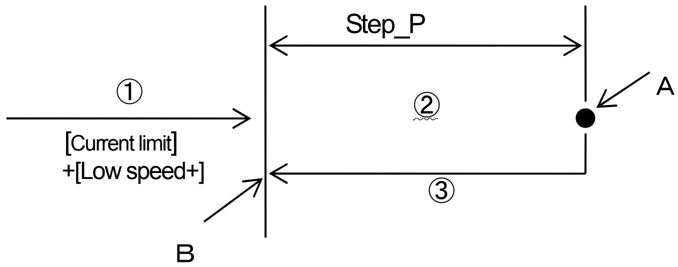
Jog operation by PC is carried out at “test operation” or “Jog operation execution”.

Follow the directions below when you specially want to teach striking stop.

① Strike after Jog-moving at [current limit]+[low speed+] or [low speed-].

② Move the ideal value after striking making only pulses set by parameter“Step_P” as soaking pulses.

③ When ideal value moves “Step_P”, deviation will be cleared and ideal value is completed at position B.



④If you register teaching, position A is automatically registered and you can teach striking stop.
(In advance, set other data for striking stop.)

14) 0E Z_typ:Home-position return type(-)

*2 When incremental encoder or incremental use absolute encoder are used, home-position return operation should be done at first for matiching internal command coordinate and actual machine coordinate.

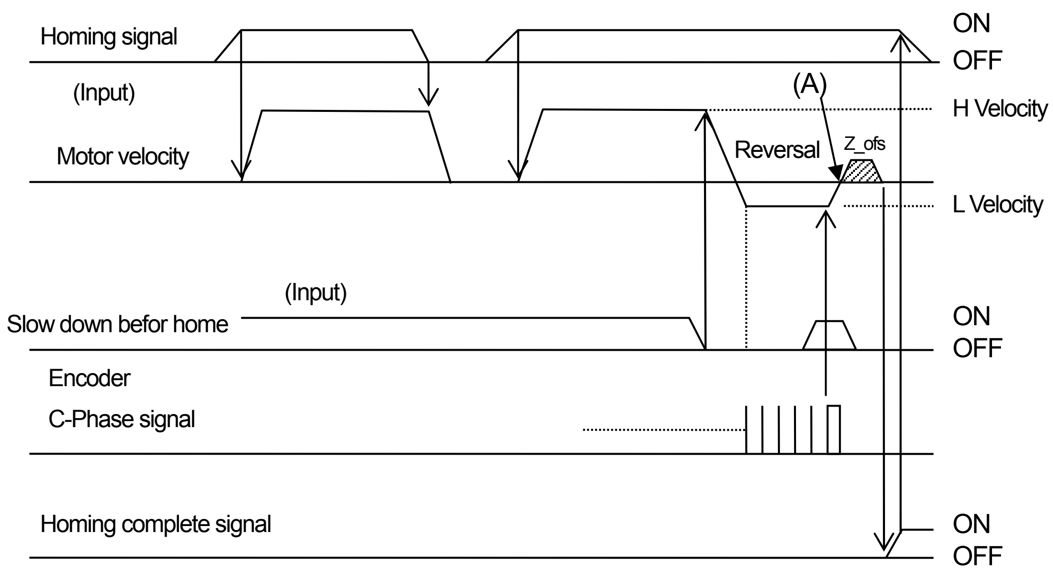
Home-position return method can choose from type below at parameter Z_typ.

a) Home-position return type 0(Set value:0)

(1) ON of a zero return signal (ZRT) will start movement in the direction (Z_dir) of the starting point at the velocity set up at the zero return high speed (Z_hsp).

(2) Once carries out a slowdown stop in OFF of a home position slowdown signal (SDN), and the direction of operation is reversed.
After reversal, moves at the velocity set up at the zero return low speed (Z _lsp).

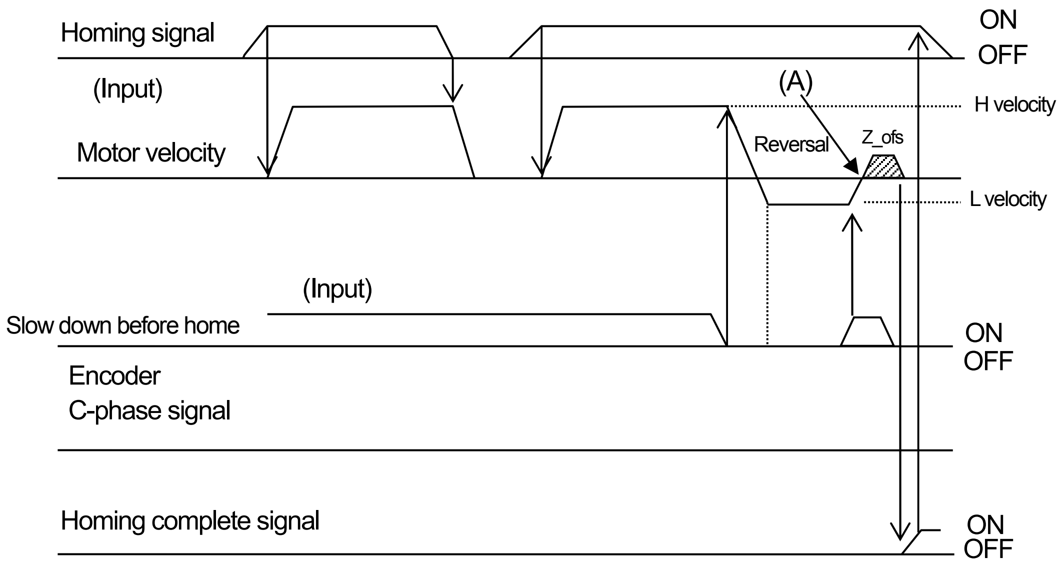
(3) After home position slowdown signal (SDN) is again set to ON, an encoder C phase signal stops for the first time in the position which added the starting point offset value (Z_ofs) to the position set to ON, and the position serves as the starting point. The coordinates of a starting point position serve as a value set as the starting point position coordinate (Z_add).



b) Home-position return type 1(Set value: 1)

(1) and (2) are the same as that of the zero return type 0.

(3) Zero return slowdown signal (SDN) stops in the position which added the starting point offset value (Z_ofs) to the position again set to ON, and the position serves as the starting point. The coordinates of a starting point position serve as a value set as the starting point position coordinate (Z_add).



Note:1 Homing signal is accepted only when other operational signals (RUN , Jog, 1 STEP) are all OFF.

2 In actual movement, since the position of the actually stopped position (A) differs from the position decided by C phase signal (Type 1; signal before home position), it performs movement of the amount of compensation +Z_ofs.

Movement of the amount of compensation is performed also Z_ofs=0.

15) 0F Z_dir: Home-position return direction (-)

*2 ･Seting “0”…Forward rotation at high speed Backward rotation at low speed

･Setting “1”…Backward rotation at high speed Forward rotation at low speed

16) 10 Z_hsp: Home-position return high speed (Uυ)

･With incremental encoder

Velocity at which it moves to the direction set by (Z_dir) without SDN input signal from homing start.

･With absolute encoder

Velocity of home positioning

17) 11 Z_lsp: Home-position return low speed (Uυ)

*2 ･At homing operation, it slows down from (Z_hsp) by slow-down signal and later reverses and get away from the slow-down signal. Reverse velocity at that time.

18) 12 Z_add: Home-position coordinate (U)

*3 ･With incremental sensor

The coordinate set here becomes user coordinate value when home-position return is completed.

･With absolute sensor

The value set here becomes user coordinate value at home-position set.

< Important >

･Home-position return or Home-position set is necessary when this value is changed.

19) 13 Z_ofs: Home-position offset value (U)

･When home-position return, it moves at this value as home reference signal (C-phase or SDN signal) position and correction amount of user reference position. (When using incremental encoder)

20) 16 A_ofs: Effective stroke length of absolute encoder (U)

*1 ･Unnecessary with incremental encoder

･Setup effective stroke length at absolute encoder as absolute value. Set this value adding margin (±α) to mechanical effective stroke. (If it exceeds this effective stroke length, normal positioning is impossible because it exceeds the region of absolute encoder.)

･When the effective stroke of encoder is larger than a mechanism's stroke enough (more than twice), it can be used with A_ofs=0.

(It is preset automatically in the center position of encoder stroke at the time of A_ofs=0.)

Important

Please be sure to set home if you change this value.

If you resore control power without home-position set, it causes displacement of position.

Notes

*1 Those are parameters needed only when encoder is absolute one.

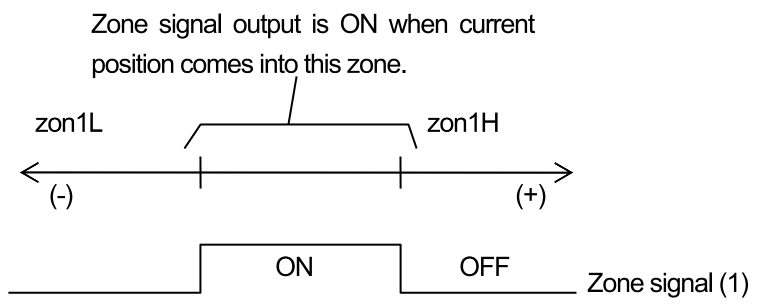
*2 Those are parameters needed when incrermental encoder or incremental use absolute encoder are used. Check the position of zero when zero returns if you change this system parameters.

*3 Those are parameters needed by both absolute and incremental encoder.

*4 15 +STROKE, 16 A_ofs(-STROKE) are described in “Explanation of infinite revolving specification”

21) 17 Zon1L : Zone signal (1)Negative direction side(U)
22) 18 Zon1H : Zone signal (1)Positive direction side (U)

・Set the zone that outputs zone signal (1)with Zon1L and Zon1H.　Note)Zon1L<Zon1H
・It is necessary to select zone signal output for general-purpose output.
(Reference: Output selectionsignal)



・It is not output if the time when it is within the zone is too short. (t≧40msec)
・Zone signal is enabled after zero return completion with incremental encoder and always enabled with absolute encoder.

23) 19 Zon2L : Zone signal (2)Negative direction side(U)
24) 1A Zon2H : Zone signal (2)Positive direction side (U)
25) 1B Zon3L : Zone signal (3)Negative direction side(U)
26) 1C Zon3H : Zone signal (3)Positive direction side (U)
27) 1D Zon4L : Zone signal (4)Negative direction side(U)
28) 1E Zon4H : Zone signal (4)Positive direction side (U)
29) 1F Zon5L : Zone signal (5)Negative direction side(U)
30) 20 Zon5H : Zone signal (5)Positive direction side (U)
31) 21 Zon6L : Zone signal (6)Negative direction side(U)
32) 22 Zon6H : Zone signal (6)Positive direction side (U)
33) 23 Zon7L : Zone signal (7)Negative direction side(U)
34) 24 Zon7H : Zone signal (7)Positive direction side (U)
35) 25 Zon8L : Zone signal (8)Negative direction side(U)
36) 26 Zon8H : Zone signal (8)Positive direction side (U)

37) 27 H_jog : Manual high speed (Uυ)

・Velocity when it moves at high speed when rapid signal (RAP) is input during manual (JOG) operation or 1 step feeding operation

38) 28 L_jog : Manual low speed (Uυ)

・Velocity when rapid signal (RAP) is not input during manual (JOG) operation or 1 step feeding operation

39) 29 H_stp : High speed 1step travel distance (U)

・1 step travel distance when it travels at high speed when rapid signal is input

40) 2A L_stp : Low speed 1 step travel distance (U)

・1 step travel distance when rapid signal (RAP) is not input

41) 2B Ovride0 : Override 0 (%)

・It operates at the velocity multiplied by this rate with the set value as 100% to velocity set value of point data.

Example) If Ovride0=10% to the velocity set 10mm/sec, execution speed will be 1mm/sec.

・The time when override O is enabled is when " Home-position return, point movement" when OVRID input is OFF.

Note) It is disabled for manual (JOG) operation.

・The time override 1 is enabled when "Home-position return, point movement" when OVRID input is ON.

・ Setting of an override No. zero to 15 is selected by 4-bit input OVERID - zero to three - in bainary conversion.

See the table below for detail.

	OVRID_3	OVRD_2	OVRD_1	OVRD_0
OVRID NO.	a = 8	= 4	= 2	= 1
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	¦	¦	¦	¦
4	¦	¦	¦	¦
¦	¦	¦	¦	¦
10	¦	¦	¦	¦
¦	¦	¦	¦	¦
15	ON	ON	ON	ON

42) 2C Ovride1 : Override 1(%)
43) 2D Ovride2 : Override 2(%)
44) 2E Ovride3:Override3 (%)
45) 2F Ovride4:Override4 (%)
46) 30 Ovride5:Override5 (%)
47) 31 Ovride6:Override6 (%)
48) 32 Ovride7:Override7 (%)
49) 33 Ovride8:Override8 (%)
50) 34 Ovride9:Override9 (%)
51) 35 Ovride10:Override10 (%)
52) 36 Ovride11:Override11 (%)
53) 37 Ovride12:Override12 (%)
54) 38 Ovride13:Override13 (%)
55) 39 Ovride14:Override14 (%)
56) 3A Ovride15:Override15 (%)

57) 4D Sw1:Function switch 1

・Set values are given in hexadecimal.

Upper

15	14	13	12	11	10	9	8
0	0	0	0	0	0	0	0

Bit number

Lower

7	6	5	4	3	2	1	0
0/1	0	0/1	0/1	0/1	0	0/1	0/1

Bit 0 – External data setting
0:No external data setting
1:Permitted external data setting

Bit 1 – Coordinate at external data set teaching
0:Ideal position coordinate
1:Current position coordinate

Bit 2 – Fixed 0

Bits 3 to 5 – Used when infinite rotation spec. Refer to the clause of infinite rotation specification for detail

Bit 6 – Fixed 0

Bit 7 – Deviation clear at striking stop
0:Clear deviation
1:Don't clear deviation

Note) Set all that don't have an explanation about bit to 0.

<Setting method> It will be in four-digit hexadecimal because bit numbers are displayed in hxidecimals per 4 bit unit.
(Each of 10 to 15 is displayed A,B,C,D,E,F)
Bit weight for 1st digit bit 3=8 bit 2=4 bit 1=2 bit 0=1
Bit weight for 2nd digit bit 7=8 bit 6=4 bit 5=2 bit 4=1
Bit weight for 3rd digit bit 11=8 bit 10=4 bit 9=2 bit 8=1
Bit weight for 4th digit bit 15=8 bit 14=4 bit 13=2 bit 12=1

Setting example) ・No deviation clearance at striking stop・・・・・・・・・・・・・・・・・・・・・・ ・・・・・・・・・bit7=1
・Coordinate at external data set teaching is current position coordinate・・・・・bit1=1
・External data setting shall be effective. (Permissible)・・・・・・・・・・・・・ ・・・・・・bit0=1
Setting value shall be 0083[H] in the above case.

58) 41 Sw2: Function switch 2

- It is used as function selection, logic reversal, and soft jumper.
- Setting values are given in hexadecimal. (Refer to parameters "Sw1")

High-order

Bit number	15	14	13	12	11	10	9	8
	0	0	0	0/1	0	0	0/1	0

Bit 9: JOG with specific position stop
0: Disabled
1: Enabled

Bit 12: Selection of timer to detect POFF when power supply is turned off
0: Applies Power Failure detectiom delay time.
1: Applies POFF detection delay time

Low-order

Bit number	7	6	5	4	3	2	1	0
	0/1	0/1	0/1	0/1	0	0/1	0/1	0/1

Bits 1 (+0T), 0 (-0T): Hard overtravel
0:external validity
1:internal forcing ON (function disabled)

Bit 2: Hard overtravel logic
0:Normally closed contact (external signal)
1:Normally opened contact (external signal)

Bit 3: Fixed 0

Bit 4: Homing function of absolute encoder
0: None
1: Effective (Note)

∗Make sure to set to "1" to use absolute encoder in incremental system.

Bit 5: External error detection
0:external validity
1:internal forcing ON (function disabled)

Bit 6: Fixed 0

Bit 7: SDN signal switchover
0:Normally closed contact (external signal)
1:Normally opened contact (external signal)

Note) Set all that don't have an explanation about bit to 0.

Setting example)
- SDN signal shall be normally opened contact-input.··················bit7=1
- External error shall not be detected.(Internal forcing shall be ON)·······bit5=1
- Hard overtravel shall be Normally opened contact input.··············bit2=1

Setting value is 00A4 [H] in the above case.

59) 42 Sw3:Function switch 3 ・ 43 Sw4:Function switch 4

It is reserve area. Set “0000”.

- Absolute encoder clear function

Normally, although absolute encoder clear is performed via setup software, absolute encoder clear can be also performed from CN1 input signal by the following method.

- The absolute encoder clear method -

  ○ Sw2: Setup of bit4= "0" (with no absolute encoder homing)

  ○ Sw1: Setup of bit6= "1" (Absolute encoder clear functional external I/O mode: Valid)

  ○ ALM state

With the above-mentioned setup and a state, absolute encoder clear is performed by "turning on" of simultaneously CN1 incoming-signal SDN (19 pins) and ZRT (28 pins).

However, if an absolute encoder clear is performed, multi-turn part of coordinates will also be cleared and a coordinate system will be unfixed.

Be sure to perform home position setting after execution of this function.

■ Explanation of Point Data

・ Each role of point data and function are explained.

Point number	Speed	Position	Servo gain selection	Move mode: Mode 1		Mode 2		Mode3	ABS/INC	Striking W/Wo	Speed change stop/	Acceleration	S-shape acceleration/deceleration time ※1	Currentlimit	Output: Type	Delay	Code	IP	Roop mode select	Dwell time	Repetition count
	*	*										*	ms	%		*				ms	
0	100.0	0.0	0	0	1	0	0	0	0	0	0	250	10	350	0	0.0	0	0	0	0	0000
1	214748364.7	-214748364.7	0	0	0	0	0	0	0	1	0	65535	32767	510	2	214748364.7	15	1	0	32767	0000
to																					
253	10.0	50.0	0	0	1	0	0	0	1	0	0	200	0	150	0	0.0	0	253	0	100	0000

※1 R setup software is used for a setup of point data.
Refer to the separate volume "setup software instructions manual" about the detailed setting direction.

※2 Explanation of Point Data tables described in the following pages may omit the columns of "Servo gain select" and "Loop mode select".

● Point number

・Setting range:0 to 253
・Speicify this point number to perform settings and operations.
・Use 8 bit external input for external specification by binary code.

● Speed (Uv)

・Setting range:0 to 2147483647 ・・・(Without decimal points)
0 to 214748364.7 ・・・(One place for decimals)7
・Set this below motor maximum rotation speed.

● Position data (U)

・Setting range: -2147483648 to +2147483647 ・・・(without decimal points)
-214748364.8 to +214748364.7・・・(One place for decimals)
However, this must be within effective stroke.
・Whether this data is treated as an incremental amount (incremental command) or as a coordinate (absolute command) is determined by operation patterns.

● Acceleration (Uv/ms)

・Setting range:0 to 65535
・Acceleration and deceleration are the same. (Refer to explanation of page 4-6)

● S-shaped acceleration/deceleration time(ms)

・Setting range: 0 to 32767
・Acceleration and deceleration are the same. (Refer to explanation of page 4-7)

● Current limit (%)

・Setting range:0 to 510 (%)・・・At every 1 (%)
・To set this to "0"does not mean 0 (%) but without current limit.
(For rotation type motors, current limit are treated the same as torque limit.)
In other words, operation is possible up until motor peak torque.
Set this to "0" for usual positioning.
・In general, set this current limit only when striking stop operation is performed.
Setting this current limit will cause endless overflowing or operations.
・Larger current than the maximum current determined by motors will be limited by instantaneous maximum current.

● Move mode

・See the move modes as follows:

a) Mode 1

00: Point data is not set   01: Positioning operation effective

10: Reserved   11: Reserved

b) Mode 2

00: Final move   01: Continuous move

10: Reserved   11: Reserved

c) Mode 3

Set this to “0”.

d) ABS / INC

0:Position data is absolute command.

1:Position data is incremental command.

e) Striking: Without/With

0:Normal move (Without striking)

1:Move by “striking stop“

f) Speed change: Stop / Continuous

0:Stop and change speed operation   (This is called the operation pattern 0.)

1:Continuous speed change operation   (This is called the operation pattern 1.)

a) Mode 1

Whether the point data is valid or invalid (not set) is set at “Mode 1”.

When ”Mode 1”is “01”, execution is possible with valid data.

When “Mode 1” is “00”, “10” and “11”, data is invalid and operation becomes unfixed.

<Combination examples of operation patterns>

Data valid	W/Wo continue	Command position data	W/Wo striking	Operation pattern
Mode1	Mode2	ABS/INC	Striking	Speed change
Valid “01”	Complete “00” Continue “01”	Absolute command 「0」	Normal move (Without striking) 「0」	Stop and change speed「0」
		Incremental command「1」		Stop and change speed「0」
		Absolute command 「0」		Continuous speed change「1」
		Incremental command「1」		Continuous speed change「1」
		Absolute command 「0」	Move with striking 「1」	Stop and change speed「0」
		Incremental command「1」		Stop and change speed「0」
		Absolute command 「0」		Continuous speed change「1」
		Incremental command「1」		Continuous speed change「1」

◎Make sure to set a move point of “Mode 2” with a completion code “00” at the end of move pattern.

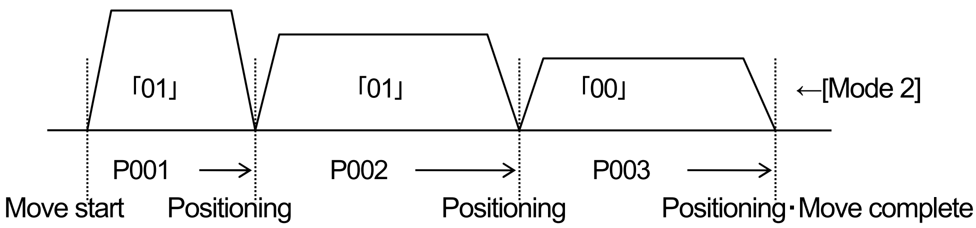
d) Mode 2 and f) speed change (operation)

Operation pattern is according to "Mode 2" (With/Without continue of point execution).
When "Mode 2" is "00", the move is complete.
When "Mode 2" is "01", the move continues.
When "Mode 2"is "10" and "11", there will be "error 18" at execution.

0: Stop and change speed

After moving by a certain points, decelerates and stops, and makes positioning to the next point.
When "Mode 2"is "01", the move continues, and when "Mode 2" is "00", the move is complete at the point.
Example)

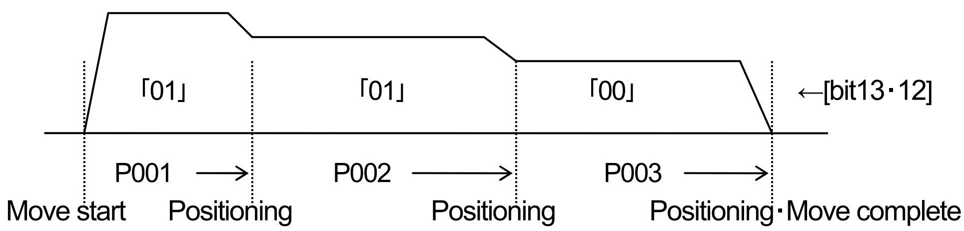
※The last point of move pattern must have "Mode 2" with "00" at the end.



Move starts at P001, then to P001 → P002 → P003 (temporarily stops at each point). Since "Mode 2" at P003 is "00", positioning and move is complete here.
Thus, when "Mode 2" is set to "01" in the point setting, the move continues to the next point (the point with 1 added to the currently moving point) up until "00"of "Mode 2"appears.

1: Continuous speed change operation

Set at a certain point, the move does not stop at the next point, but accelerates or decelerates according to the set speed and then moves. When "Mode 2" is "01", the move continues and when "Mode 2" is "00", the move is complete at the point, which is the same as' stop and change speed operation'.
Example)



Move starts at P001, and then to P001 → P002 → P003 with continuous speed change, and the move is complete at P003.
The point where the speed change is complete point where is a set position as the moving point.

<Notes for continuous speed change operation>

Continuous speed change does not occur in the following cases:

① The direction of move changes in the position data setting.(e.g. Forward → reverse)
② Continuous speed change point is more than 8.
③ Point operation to be executed is stop and change speed operation.
④ The next point operation is stop and change speed operation.
⑤ “Mode 2” includes “00” (feeding complete).
⑥ Striking stop operation is being set.
⑦ Dwell time is being set(to other than 0).

On the other hand, the following functions are restricted when continuous speed change is used:

⑧ S-shaped acceleration/deceleration; At all the point numbers where continuous speed change is set, the move is a straight acceleration/deceleration even if parameters for S-shaped acceleration/deceleration are set.
⑨ Handshaking of Output; At the point where continuous speed change is orated, Output handshaking is not executed even if it is set.

However, in the cases from ① to ⑦ shown above where continuous speed change does not actually occur in spite of the setting, Output handshaking is executed.

Customers are requested, generally, not to set Output handshaking under continuous speed change operation configuration.

c) Mode 3

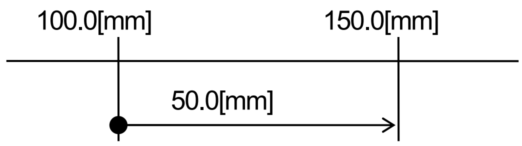
・Set “0” here, as this is a reserved zone.

d) ABS / INC

This determines as what kind of command the value set by position data will be treated.

0: Absolute command: Position data is treated as absolute coordinate system (user coordinate system).

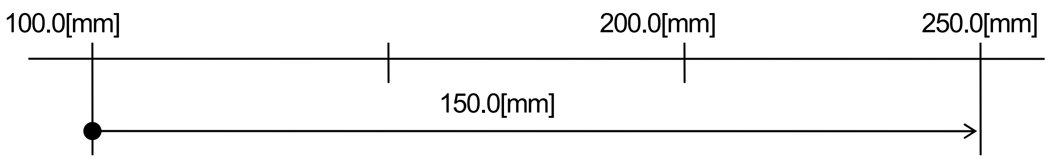
Example) When positioning by absolute command at the position data of 150.0[mm], assuming that the current position is 100.0[mm];



Thus, moves forward by 50.0 [mm] and get positioned at 150.0[mm].
Therefore, the move amount varies depending on the current position.

1: Incremental command: Position data is treated as amount of feeding (user coordinate system).

Example) When positioning by incremental command at the position data of 150.0[mm], assuming that the current position is 100.0[mm];



Thus, moves forward by 150.0[mm] and get positioned at 250.0[mm].
Therefore, the position varies depending on the current position.

e) Striking: Without/With

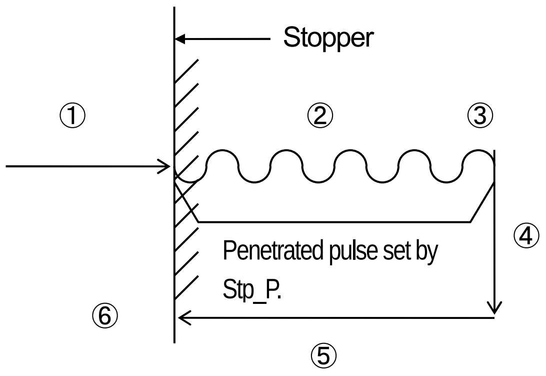
Sets with / without striking stop in the point move.

0: Normal move (without striking) setting

1: Striking stop setting

◎Striking stop

When striking stop is set, see the actual operation of striking stop as follows:



① Positioning move toward the stopper

② Strikes against the stopper, the current value stops, the ideal value keeps moving, and deviation accumulates.

③ Stops moving when penetrated pulse(deviation) ≧ Stp_P(parameter).
(Even if not reaching positioning point.)

④ During dwell time, pushing operation with penetrated pulse (deviation).

⑤ After dwell time, penetrated pulse is cleared.

⑥ Positioning complete or next move.

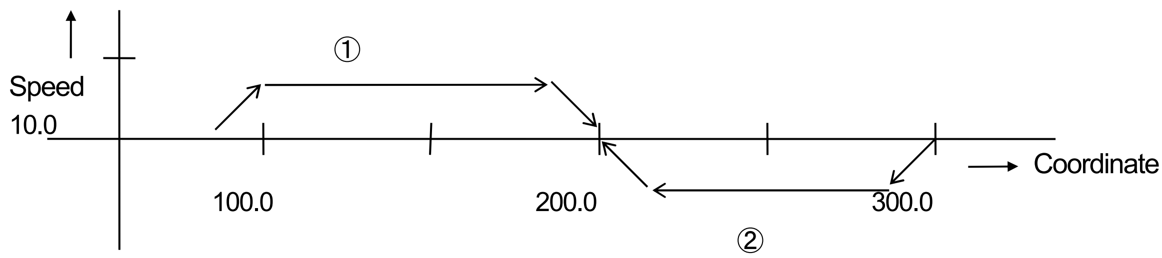
to Notes to

- When striking stop is used, set the current limit (torque limit) as well as this setting. Striking operation without current limit may cause overloading.
- In the normal positioning, make sure to set “the current limit = 0.”
- When Stp_P(parameter)is small, or when deviation is large during move due to high speed/acceleration (deviation ≧ Stp_P), striking stop may occur accidentally during move. Make sure to keep the speed low.

● Move example1 (Action)

a) Absolute command single move

Point number	Speed	Position	Move Mode: Mode1		Mode2		Mode3	ABS/INC	Striking: WoW	Speed change :stop /continuous	Acceleration	S-shaped acceleration/deceleration time	Current limit	Output: Type	Delay	Code	IP	Dwell time	Repetition count
	*	*									*	ms	%		*			ms	
1	10.0	200.0	0	1	0	0	0	0	0	0	250	0	0	0	0.0	0	0	0	0000

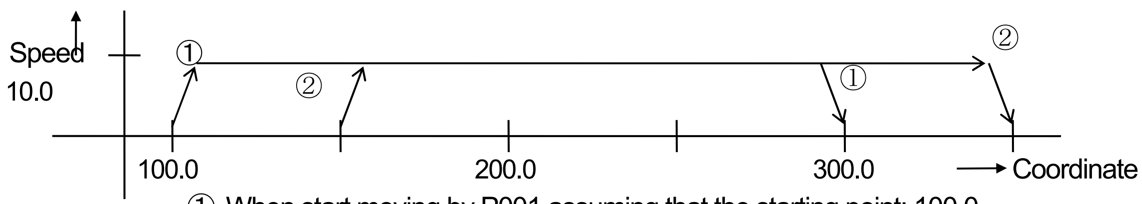


① When start moving by P001assuming that the starting point : 90.0

② When start moving by Poo91 assuming that the starting point : 290.0

b) Incremental command single move

Point number	Speed	Position	Move Mode: Mode1		Mode2		Mode3	ABS/INC	Striking: WoW	Speed change :stop /continuous	Acceleration	S-shaped acceleration/deceleration time	Current limit	Output: Type	Delay	Code	IP	Dwell time	Repetition count
	*	*									*	ms	%		*			ms	
1	10.0	200.0	0	1	0	0	0	1	0	0	250	0	0	0	0.0	0	0	0	0000

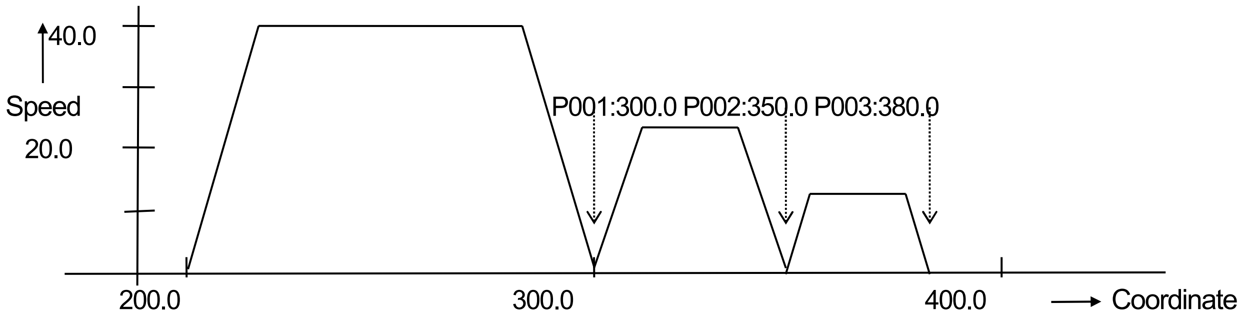


① When start moving by P001 assuming that the starting point: 100.0

② When start moving by P001 assuming that the starting point: 150.0

c) Incremental command stop-and-change-speed

Point number	Speed	Position	Move Mode: Mode1		Mode2		Mode3	ABS/INC	Striking: WoW	Speed change :stop /continuous	Acceleration	S-shaped acceleration/deceleration time	Current limit	Output: Type	Delay	Code	IP	Dwell time	Repetition count
	*	*									*	ms	%		*			ms	
1	40.0	100.0	0	1	0	1	0	1	0	0	250	0	0	0	0.0	0	0	0	0000
2	20.0	50.0	0	1	0	1	0	1	0	0	250	0	0	0	0.0	0	0	0	0000
3	10.0	30.0	0	1	0	0	0	1	0	0	250	0	0	0	0.0	0	0	0	0000



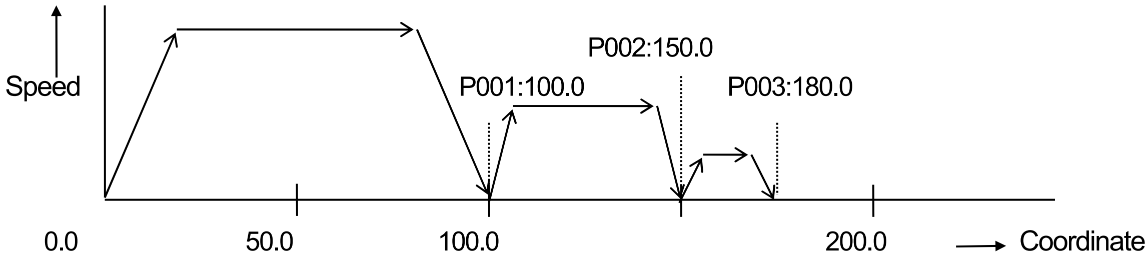
① When start moving by P001 assuming that the starting point : 200.0

※Even if the starting point is changed, move does not change.

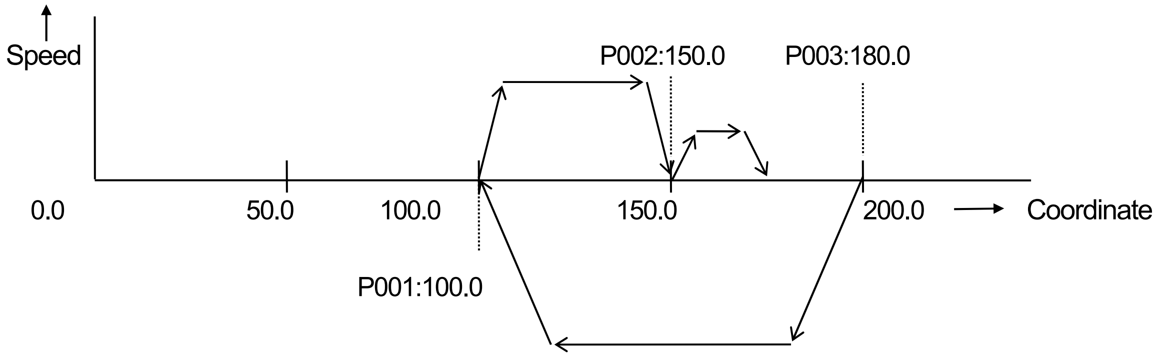
d) Absolute command stop-and-change-speed

Point number	Speed	Position	Move Mode								Acceleration	S-shaped acceleration/deceleration time	Current limit	Output			IP	Dwell time	Repetition count
			Mode1		Mode2		Mode3	ABS/INC	Striking: WoW	Speed change :stop /continuous				Type	Delay	Code			
	*	*									*	ms	%		*			ms	
1	40.0	100.0	0	1	0	1	0	0	0	0	250	0	0	0	0.0	0	0	0	0000
2	20.0	150.0	0	1	0	1	0	0	0	0	250	0	0	0	0.0	0	0	0	0000
3	10.0	180.0	0	1	0	0	0	0	0	0	250	0	0	0	0.0	0	0	0	0000

① When start moving by P001 assuming that the starting point : 0.0

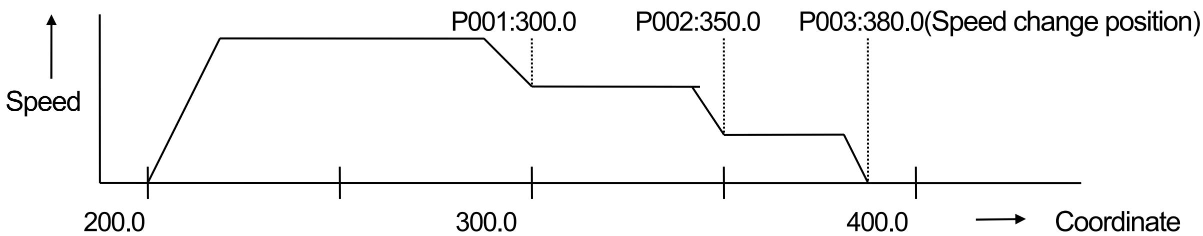


② With the same setting, moves P002→P003 reversely after moving by P001 assuming that the starting point : 200



e) Incremental command continuous speed change

Point number	Speed	Position	Move Mode								Acceleration	S-shaped acceleration/deceleration time	Current limit	Output			IP	Dwell time	Repetition count
			Mode1		Mode2		Mode3	ABS/INC	Striking: WoW	Speed change :stop /continuous				Type	Delay	Code			
	*	*									*	ms	%		*			ms	
1	40.0	100.0	0	1	0	1	0	1	0	1	250	0	0	0	0.0	0	0	0	0000
2	20.0	50.0	0	1	0	1	0	1	0	1	250	0	0	0	0.0	0	0	0	0000
3	10.0	30.0	0	1	0	0	0	1	0	1	250	0	0	0	0.0	0	0	0	0000

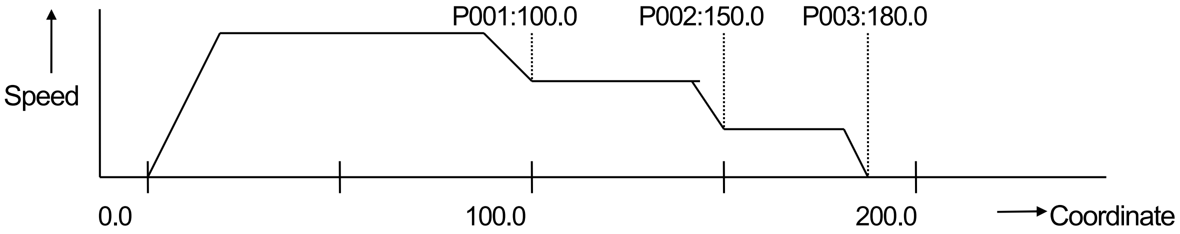


① Startmoving by P001 assuming that the startin point : 200.0
Speed change point of P001 and P002 is a registered position, however, it changes a little due to CPU sampling delay, motor speed or acceleration/deceleration setting. When accuracy for speed change point is desired, use a stop-and-change-speed operation.

f) Absolute command continuous speed change

Point number	Speed	Position	Move Mode								Acceleration	S-shaped acceleration/deceleration time	Current limit	Output			IP	Dwell time	Repetition count
			Mode1		Mode2		Mode3	ABS/INC	Striking: Wo/W	Speed change: stop /continuous				Type	Delay	Code			
	*	*									*	ms	%		*			ms	
1	40.0	100.0	0	1	0	1	0	0	0	1	250	0	0	0	0.0	0	0	0	0000
2	20.0	150.0	0	1	0	1	0	0	0	1	250	0	0	0	0.0	0	0	0	0000
3	10.0	180.0	0	1	0	0	0	0	0	1	250	0	0	0	0.0	0	0	0	0000

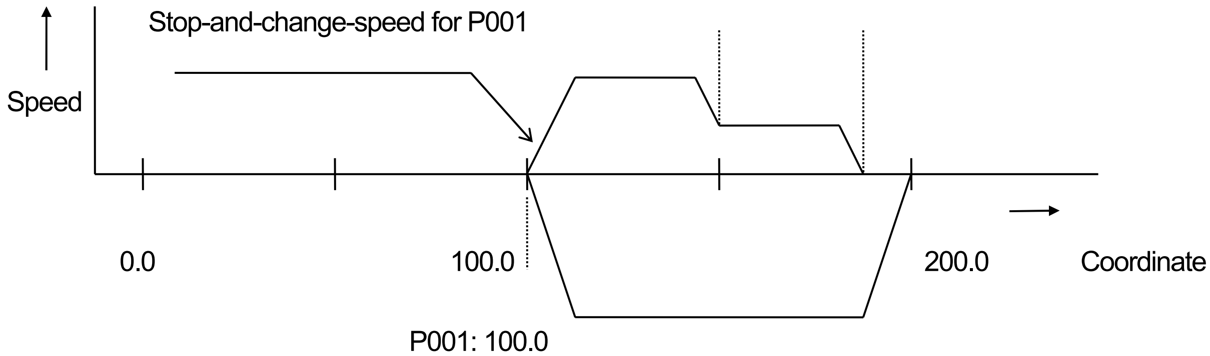
① Start moving by P001 assuming that the starting point : 0.0



② Startmoving by P001assuming that the starting point : 200.0

Stop-and-change-speed operation up to P001: 100.0, continuous speed changeP002→P003.

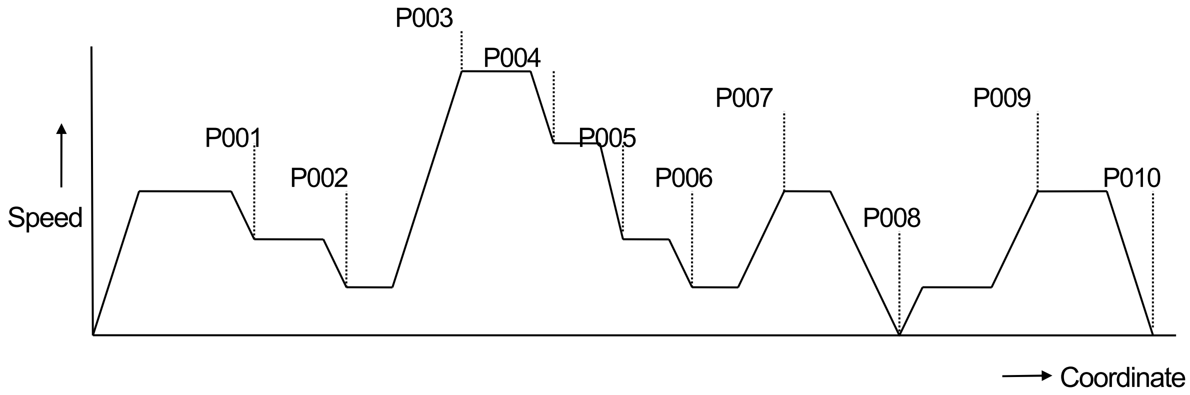
Because rotation is reversed, P002: 150.0 P003: 180.0



g) Continuous speed change for more than 8 points

① When operation is by “continuous speed change” for P001 to P010

※Continuous speed change for P001 to P007, stop-and-change-speed for P008, and again continuous speed change for P009 →P010.



● Starting point “Ip” at interruption start

When an interruption start is input during move, the point set here will be started as an interruption start. In other words, when an interruption start is input, the move being executed is aborted and start moving by the point number “Ip”which is set at the point data.

However, during interruption start, another interruption start cannot be input.

● Dwell time (msec)

Dwelltime function is that when the move is complete and current position is in-position, wait for the time set here and then perform positioning complete or the next move.

◎ Example) In the case of 1 point move: After the point move is complete, wait for dwell time and positioning complete is output. And in the middle of continous move, wait for the dwell time and then to the next move.

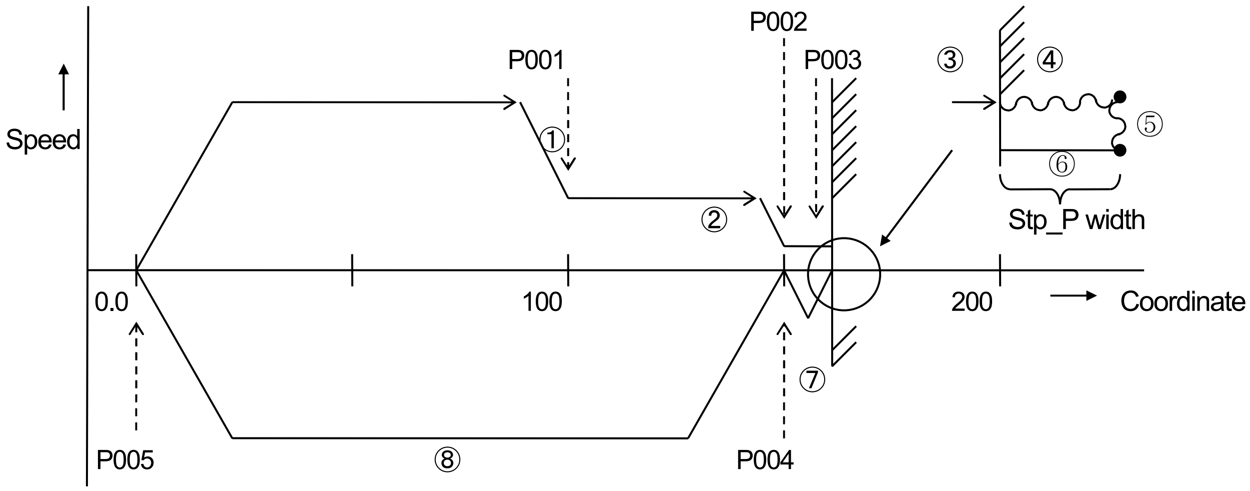
◎ As a special treatment, when “Striking stop” is performed with the dwell time being set, pushing control is performed for the penetrated pulse of the dwell time, and after that deviation is cleared.

◎ If the dwell time oter than 0 is set in the continuous speed change mode, the point is for stop-and-change-speed, not for continuous speed change.

● Move example 2 (Striking･Interruption Move)

The moves below are applications of Striking stop and interruption Move.

Point number	Speed	Position	Move Mode: Mode1		Mode2		Mode3	ABS/INC	Striking: WoW	Speed change stop /continuous	Acceleration	S-shaped acceleration/deceleration time	Current limit	Output: Type	Delay	Code	IP	Dwell time	Repetition count
	*	*									*	ms	%		*			ms	
1	40.0	100.0	0	1	0	1	0	0	0	1	250	0	0	0	0.0	0	11	0	0000
2	20.0	150.0	0	1	0	1	0	0	0	1	250	0	0	0	0.0	0	11	0	0000
3	5.0	180.0	0	1	0	1	0	0	1	1	250	0	40	0	0.0	0	10	10000	0000
4	5.0	-5.0	0	1	0	1	0	1	0	0	250	0	40	0	0.0	0	10	0	0000
5	40.0	0.0	0	1	0	0	0	0	0	0	250	0	0	0	0.0	0	11	0	0000
to																			
10	5.0	-5.0	0	1	0	1	0	1	0	0	250	0	40	0	0.0	0	0	0	0000
11	40.0	0.0	0	1	0	0	0	0	0	0	250	0	0	0	0.0	0	0	0	0000



① From Starting position：0.0, start by P001 and change speed, then to P002.

② Move by P002, change speed, then to P003.

③ During move by P003, strike the stopper and current position is stopped (with 40% current limt hereafter).

④ With the command value being output as is, idial position is allowed to enter and deviation pulse of Stp_P (penetrated pulse) accumulates, then the move is cancelled.

⑤ During the dwell time(10.0 msec), pushing operation for the penetrated pulse.

⑥ After the dwell time, deviation pulse is cleared.

⑦ Return "5.0" by P004 with an incremental command. (with 40% current limit so far.)

⑧ Return to the starting position by P005 high speed move.

This is the end of a series of operations. However, you can return to the starting position during move by interruption start.

When an interruption is started during move by P001, P002 andP005, return to the starting position with high speed by P011.

When an interruption is started during move by P003 andP004, continuous move is performed from P010 → P011, with current limit first and then return with high speed.

● Output

a) Code
b) Type
c) Delay

Functions of Output are determined by the 3 parameters above.
See the descriptions of each parameter.

a) Code

Sets the data for Output. Output is 4 bits from “00 to 15.”

b) Type

Sets the function of Output as follows:

0: Without Output operations. No change from the previous Output.

1: When the move is complete with handshaking mode, MSTR signal is output and wait until MFIN signal is input. When MFIN signal is input, the next move is performed.

2: Only Output, without handshaking.

c) Delay

Sets the timing for outputting in Output as follows:

0: Output along with the start of the point move.

-1: Output when the point move is complete.

Positive value: Output after the move value set here (incremental value).

However, if this is larger than the value of point move, Output after the move is complete.

Notes *1) Output must be selected at general output selection.
(SEL1 and SEL2 are ON, and SEL3 is OFF.)

*2) When Output type is *1*, Output is output at the Output timing. However, Output becomes *0* once after handshaking is complete.

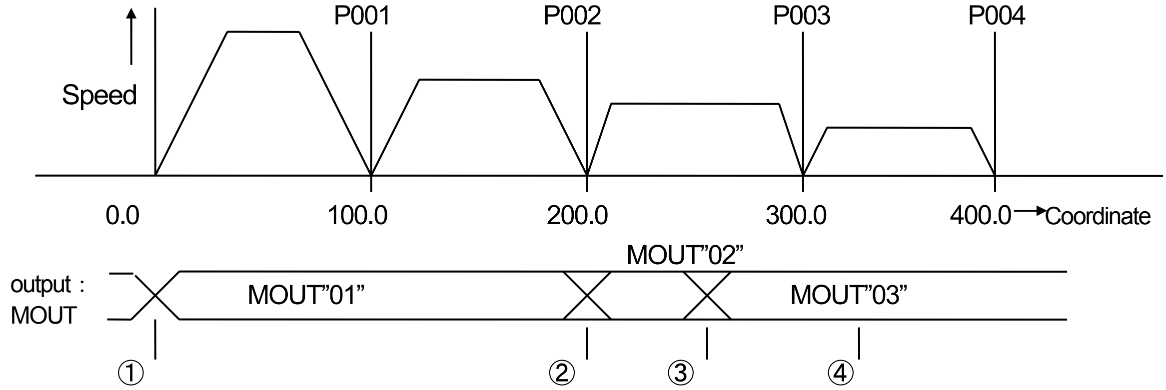
*3) When operation pattern is continuous speed change, do not use Output type *1*, Handshaking type.

*4) Output is not output at the final point move.
When the move is complete with 1 point move, there is no Output. Therefore, set a dummy point (the same position) for output setting.

● Move example 3 (Output function)

a) In the case of OutputType → *2*

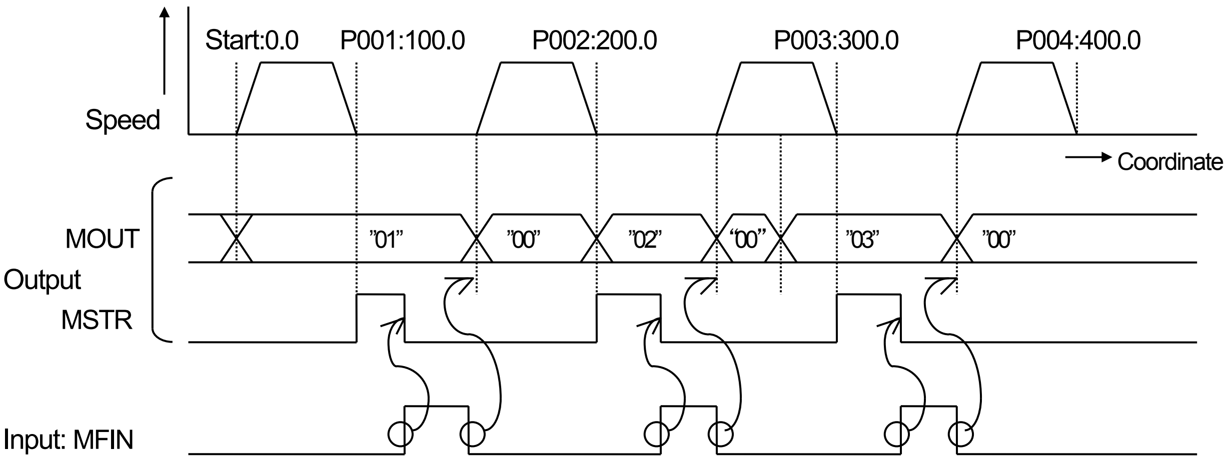
Point number	Speed	Position	Move Mode: Mode1		Mode2		Mode3	ABS/INC	Striking: WoW	Speed change stop /continuous	Acceleration	S-shaped acceleration/deceleration time	Current limit	Output: Type	Delay	Code	IP	Dwell time	Repetition count
	*	*									*	ms	%		*			ms	
1	40.0	100.0	0	1	0	1	0	0	0	0	250	0	0	2	0.0	1	0	0	0000
2	30.0	200.0	0	1	0	1	0	0	0	0	250	0	0	2	- 0.1	2	0	0	0000
3	20.0	300.0	0	1	0	1	0	0	0	0	250	0	0	2	50.0	3	0	0	0000
4	10.0	400.0	0	1	0	0	0	0	0	0	250	0	0	0	0.0	0	0	0	0000



① Since Output timing for P001 is "0", Output along with start.
② Since Output timing for P002 is "-0.1(negative)", Output along with positioning complete.
③ Since Output timing for P003 is "50.0", Output in "50" incremental feeding after move by P003.
④ When OutputType is "0", no change in Output.

b) In the case of OutputType→“1”

Point number	Speed	Position	Move Mode: Mode1		Mode2		Mode3	ABS/INC	Striking: WoW	Speed change :stop /continuous	Acceleration	S-shaped accel / decel time	Current limit	Output: Type	Delay	Code	IP	Dwell time	Repetition count
	*	*									*	ms	%		*			ms	
1	20.0	100.0	0	1	0	1	0	0	0	0	250	0	0	1	0.0	1	0	0	0000
2	20.0	200.0	0	1	0	1	0	0	0	0	250	0	0	1	- 0.1	2	0	0	0000
3	20.0	300.0	0	1	0	1	0	0	0	0	250	0	0	1	50.0	3	0	0	0000
4	20.0	400.0	0	1	0	0	0	0	0	0	250	0	0	0	0.0	0	0	0	0000



In the case of OutputType: *1*, handshaking is performed using input/output of MSTR and MFIN.
For example, in case of P001, Output timing is “0”, therefore, Output is output along with the start.
When the move by P001 is complete, MSTR outputs ON and waits.
When input MFIN turns “OFF→ON”, Output outputs“00”and enters the next move, and then Output is executeed according to the next move setting.

● Servo gain selection

By setting up servo gain selection of point data, four kinds of gains can be changed for every point.

The setting list of gains is as follows.

Servo gain selection	Position loop proportional gain	Position loop integral time constant	Velocity loop proportional gain	Velocity loop integral time constant	Load inertia ratio	Torque command filter
0	*The various functional effective conditions of the usual function become effective.*					
1	*KP1*	*TPI1*	*KVP1*	*TVI1*	*JRAT1*	*TCFIL1*
2	*KP2*	*TPI2*	*KVP2*	*TVI2*	*JRAT2*	*TCFIL2*
3	*KP3*	*TPI3*	*KVP3*	*TVI3*	*JRAT3*	*TCFIL3*
4	*KP4*	*TPI4*	*KVP4*	*TVI4*	*JRAT4*	*TCFIL4*

※Movement is performed by the above-mentioned servo gain setup according to setting up servo gain selection with point data. However, it is continuously used by servo gain selection of the first point performed, at the time of continuation movement in variable speed.

※Servo gain selection cannot be used together with auto tuning. Priority is given to auto tuning when auto tuning is effective.

● A jump / loop function of a point

(1) Overview

A jump/loop of a point are possible by setting each up by the following point-data setup.

(A) Loop mode select: The kind of a jump/loop

(B) JP: The point number of a jump place

(C) Repeat times: The number of times which does a loop

A jump / loop setup of the point

Point Data

Point No. Search | Search | Copy | Teaching | Data Write

No	Feed Rate	Position	gain_selection	Operation Pattern								Accel	Time_of_S_Shaped	Current_Limit	M Output			IP	Dwell_Time	loop mode	Jump_No	Repetition
				MODE1		MODE2		MODE3	ABS/INC	Norm./Striking	Stop/Continue				Type	Delay	Code					
	Pulse/s	Pulse										Uv/ms	ms	%		Pulse			ms			
0	40960	8192	0	0	1	0	0	0	0	0	0	4096	0	0	0	0	0	0	0	1	253	0
1	100	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0
2	409600	1000	0	0	1	0	1	0	1	0	0	4096	0	0	0	0	0	0	0	0	0	0
3	40960	100	0	0	1	0	0	0	1	0	0	4096	0	0	0	0	0	0	0	2	0	100
4	100	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0
5	100	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0
6	409600	0	0	0	1	0	1	0	0	0	0	4096	0	0	0	0	0	0	0	0	0	0
7	409600	-100	0	0	1	0	1	0	1	0	0	4096	0	0	0	0	0	0	0	0	0	0
8	409600	110	0	0	1	0	1	0	1	0	0	4096	0	0	0	0	0	0	0	3	7	3
9	409600	1000	0	0	1	0	0	0	1	0	0	4096	0	0	0	0	0	0	0	3	7	3

(2) Data setting guideline of a jump / loop function

(A) Kinds of loop (loop mode select)

(a) Normal mode (Seting value:0)

No jump. No loop.

(b) Unconditional jump (Seting value: 1)

Unconditional jump is done to other points. Only FEED_END(Mode 2:00) of move mode is effective, it does not jump when other.

(c) 1 point jump (Seting value: 2)

This point is repeatedly performed by the number of times of repetition.

Only stop operation (operation pattern: 0) of move mode in variable speed is effective, it does not perform except it.

(d) Condition jump (Seting value: 3)

Only the number of times of specification is jumped on other points. Only stop operation (operation pattern: 0) in variable speed is effective, and move mode does not jump it other than it.

The nest to a maximum of 15 is possible for a condition jump. However, when other jumps are in a loop, it becomes to a maximum of 15 including the jump.

When the jump place which does not become a nest in a condition jump is specified: It is set to ERR 1A.

Moreover, when the number of nested (other jumps are included) is 15 or more: It is set to ERR19.

(B) JP

The point number of a jump place is set up.

(C) Repeat times

The number of times of a repeat in 1 point jump and conditional jump is specified.

About the relation of each data of point data

	Loop mode selection	JP	Repetition	Operation conditions
Normal mode	0	—	—	—
Unconditional jump	1	○	—	Mode2:0 (When the last moving)
1 point jump	2	—	○	Speed change:0 (When changing speed and stopping)
Conditional jump	3	○	○	Speed change:0 (When changing speed and stopping)

○: data to be set up.

—:data which does not need a setup, and it is ignored even if it puts in data.

Loop command is not executed when loop command is inputted except a condition of operation.

(3) Example of operation

Functional explanation of each jump/loop is given for a point-data setup of the front page for an example.

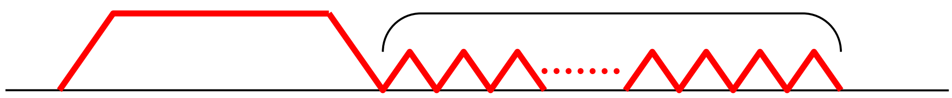
(A) Conditional jump

Execution of the point [0] will perform the point [253] after point [0] execution.

※That makes it Infinite loop operation. Commands such as a cancel command need to be input to stop it.

(B) 1 point jump

If the point [2] is performed, after point [2] execution, the point [3] will be repeated and performed 100 times.



※Execution by one point is also possible, and when the point [3] is performed, P3 is repeated and performed 100 times, then it ends.

(C) Conditional jump

No	Feed Rate	Position	gain_selection	Operation Pattern MODE1		MODE2		MODE3	ABS/INC	Norm./Striking	Stop/Continue	Accel	Time_of_S_Shaped	Current_Limit	M Output Type	Delay	Code	IP	Dwell_Time	loop_mode	Jump_No	Repetition
	Pulse/s	Pulse										Uv/ms	ms	%		Pulse			ms			
5	100	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0
6	409600	0	0	0	1	0	1	0	0	0	0	4096	0	0	0	0	0	0	0	0	0	0
7	409600	-100	0	0	1	0	1	0	1	0	0	4096	0	0	0	0	0	0	0	0	0	0
8	409600	110	0	0	1	0	1	0	1	0	0	4096	0	0	0	0	0	0	0	3	7	3
9	409600	1000	0	0	1	0	0	0	1	0	0	4096	0	0	0	0	0	0	0	3	7	3

Each 3 times

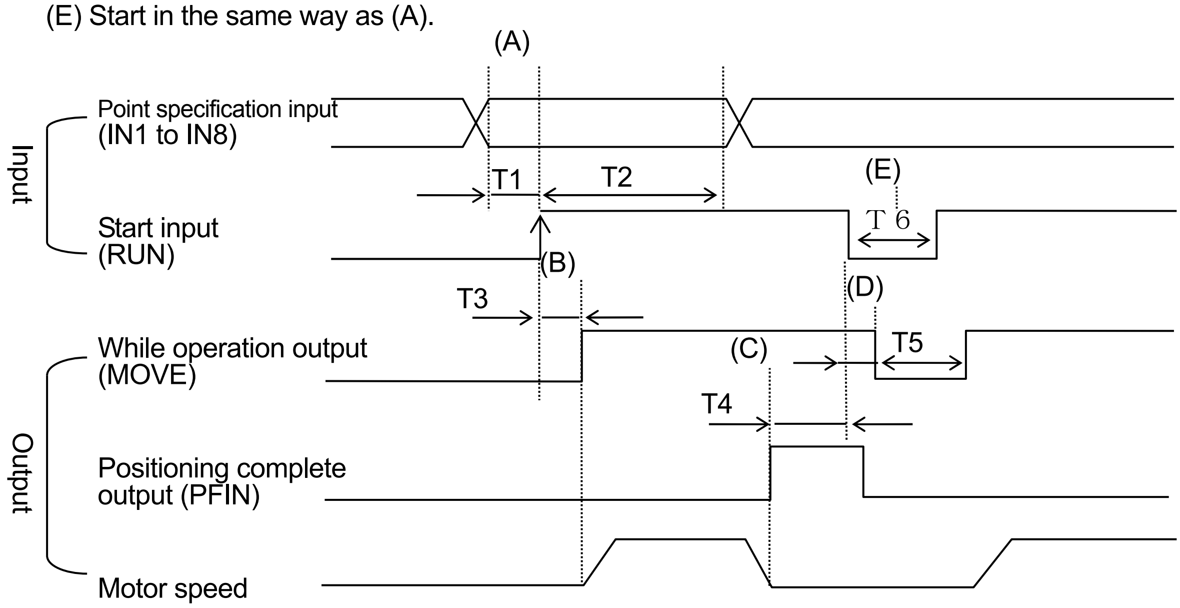
Execution of the point [6] will perform the point [7 to 8] 3 times after point [6] execution, and the point [7 to 9] is performed 3 times. Since it is in the nest state, finally, the point [7 and 8] is performed 9 times and the point [9] is performed 3 times.

■ Operations by external input

See the descriptions of operations by external input. This is mainly operated by outputs such as sequencer.

● Point specification move 1

(A) Input a point number at the external point specification input (IN1 to 8), and after data set up, the start input (RUN) turns OFF→ON.
(B) MOVE (while operation output) becomes ON , and the move starts. (Start input remains ON.)
(C) After the move completes and the positioning complete output (PFIN) turns ON, turn OFF the start input (RUN).
(D) Start input (RUN) turns OFF, therefore, MOVE (while operation output) and PFIN (positioning complete output) turn OFF.
(E) Start in the same way as (A).



T1≧0ms (data set up time)
T2≧40ms (Data hold time)
T3,T5≧20ms (Start acceptance delay time)
T4≧0ms (Start signal holding time)
T6≧40ms (Start signal OFF time)

- Point specification move 2

This section describes the feeding stop and move cancellation.

(A) Input a point number at the external point specification input (IN1 to 8), and after data set up, the start input (RUN) turns OFF→ON. MOVE (while operation output) turns ON and the move starts.

(B) Turning OFF the start input (RUN) during operation decelerates the motor. (This status is called feeding stop.)

(C) Turning on the start input (RUN) again in the feeding stop status resumes the point move set at (A) and positioning is performed (continues).

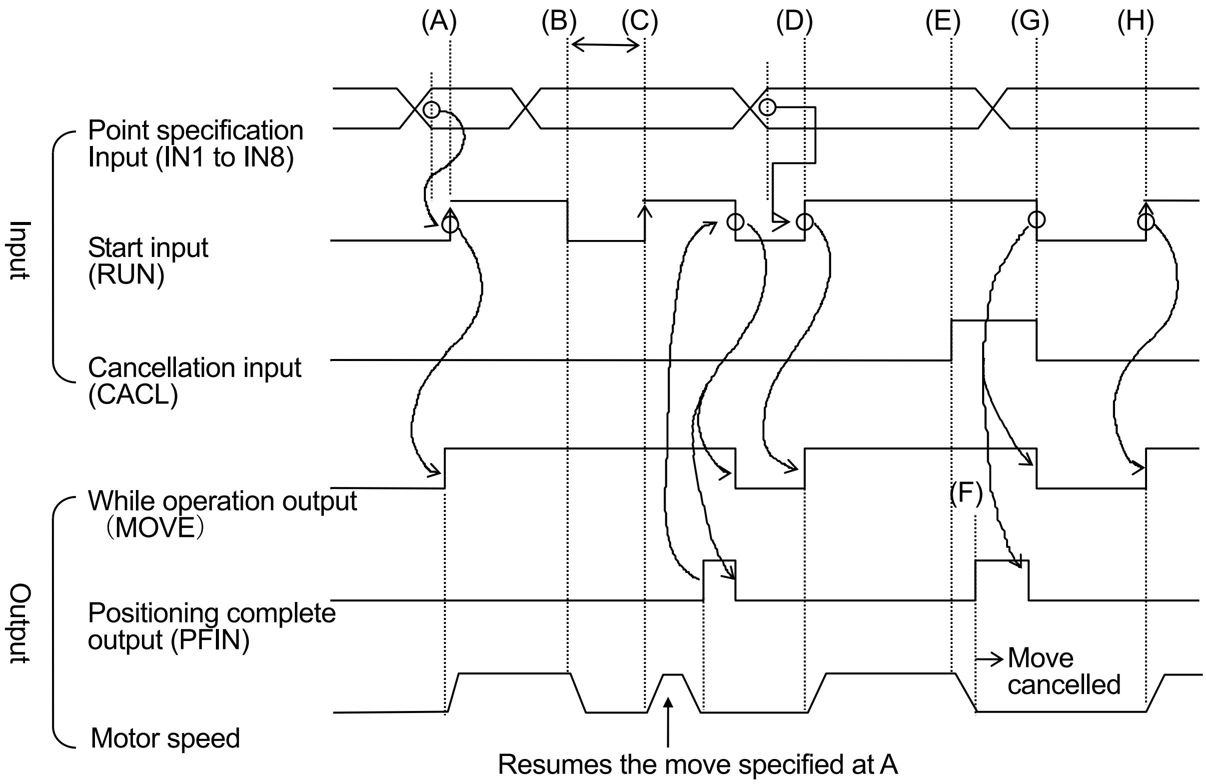
(D) Start in the same way as (A).

(E) Turn ON the cancellation input (CACL) during move, move cancellation mode makes the motor decelerate.

(F) When the move cancellation is complete with the motor decelerating and stopping, positioning complete output (PFIN) turns ON, which means the completion of cancellation.

(G) When positioning complete output (PFIN) turns ON, turn OFF the start input (RUN).
If MOVE (during operation input) and PFIN (positioning complete) are OFF, cancellation is complete.

(H) Then, input a desired point number at the point specification input to start.



- Point specification move 3

This section describes interruption, which is very useful for forced return operation.

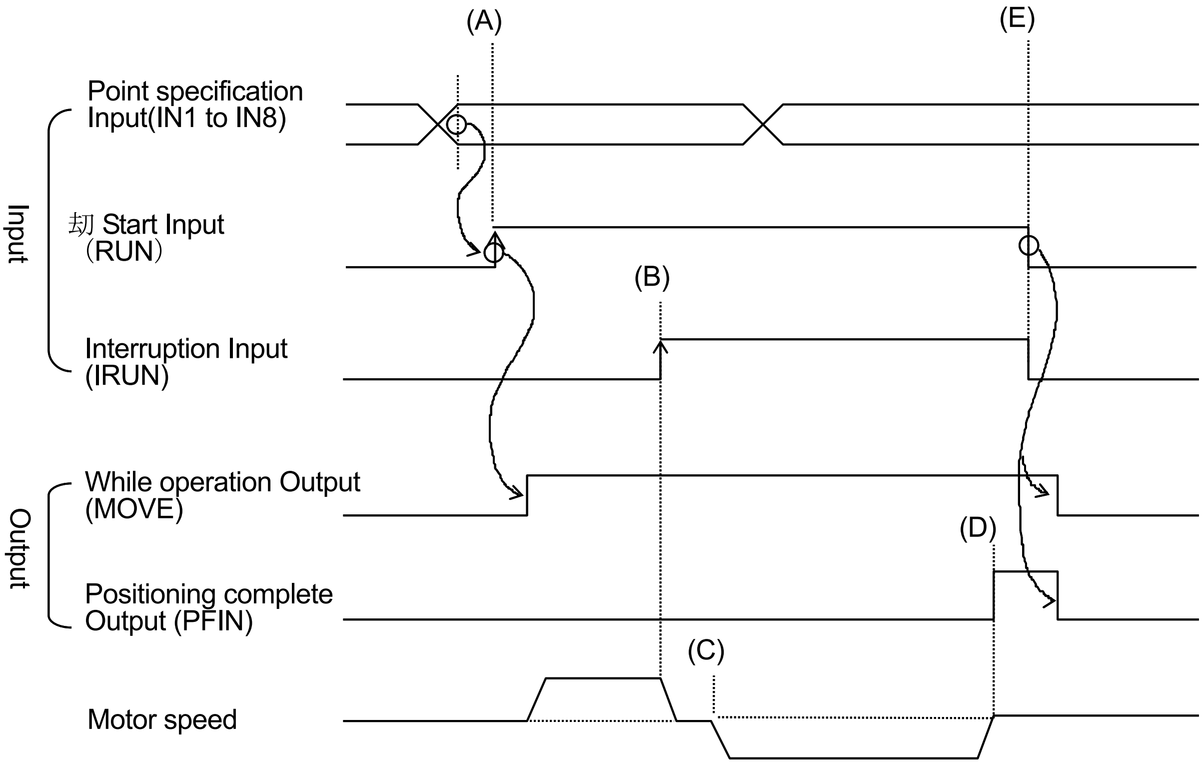
(A) Input a point number at the external point specification input (IN1 to 8), and after data set up, the start input (RUN) turns OFF→ON. MOVE (while operation output) turns ON and the move starts.

(B) If it interrupts during operation and a starting input (IRUN) is turned on, it will become interruption move mode and a motor will be a slowdown stop.

(C) A motor interrupts from the point data of the specified point after a slowdown stop, reads the point (IP), and starts movement on an interruption point.
*Beforehand, interruption point (IP) must be set up in point data.

(D) The completion output (PFIN) of positioning is turned on in the place which completed point movement of an interruption point.

(E) After the completion output (PFIN) of positioning turns on, interruption movement will be completed if a starting input (RUN) and an interruption starting input (IRUN) are turned off.



- Home-position return

1) For incremental encoder

(A) Turning homing input (ZRT) OFF→ON makes the home-position return operation start.

(B) When home-position return operation starts, while operation output (MOVE) turns ON.

(C) Upon completion of the home-position return, positioning complete output (PFIN) and homing complete output (ZFIN) turn ON.

(D) When homing input (ZRT) turns OFF, while operation output (MOVE) and positioning complete output (PFIN) turn OFF.

(E) Homing output (ZFIN) remains ON, however, it is OFF in the following cases:

(In other words, home-position return operation is necessary for the following cases.)

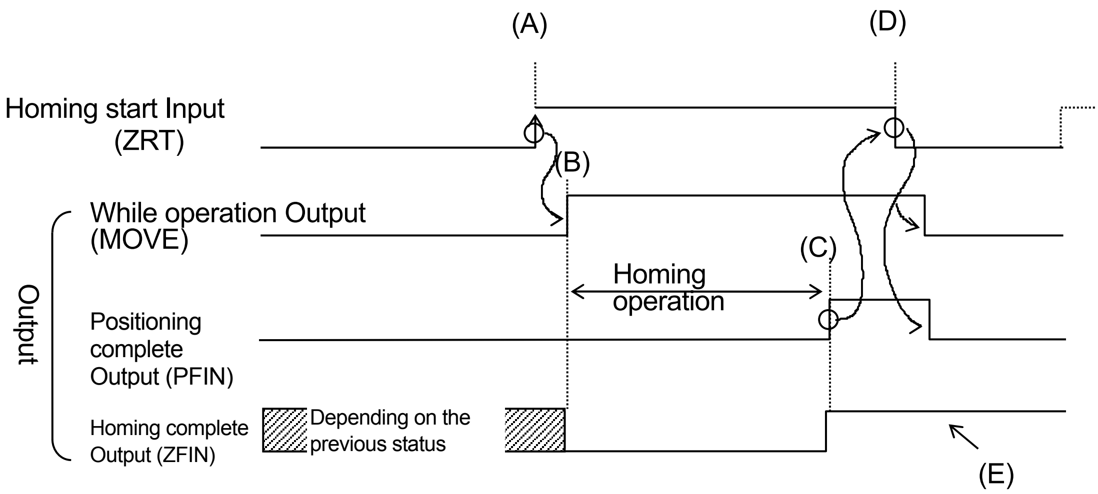
･When homing is started again.

･When alarms are issued.

･When the main power source turns OFF. (The same for turning it ON again.)

･When control power turns OFF. (The same for turning it ON again.)

Note) Do not apply cancellation, feed hold and servo OFF during homing from low speed feeding until operation complete (the point (D)).



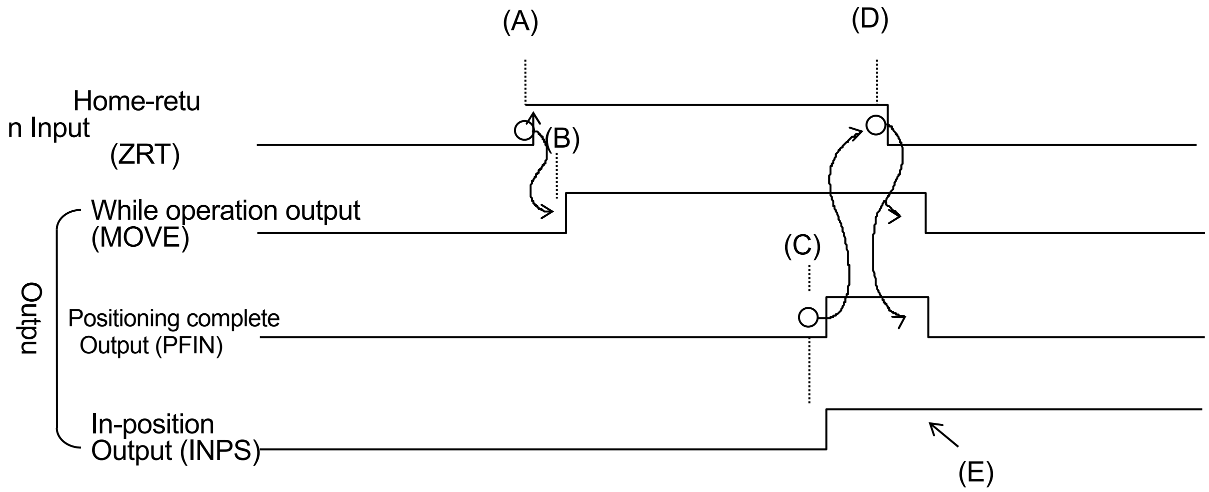
2) For absolute encoder

When an absolute encoder is used, Home-position return operation is not necessary. Therefore homing related Inputs/Outputs are changed as follows. Therefore homing related outputs are different form when an incremental encoder is used.

When incremental encoder is used.	When absolute encoder is used.
Homing Input (ZRT)	Home-return Input (ZRT)

And functions are;

(A) Turning the home-return Input (ZRT) OFF→ON starts the home-return operation.
Home-return operation makes the move to the position (coordinate) whose origin has been set.
(B) While operation output (MOVE) turns ON, which is the same as usual point move.
(C) Positioning complete (PFIN) and in-position output (INPS) turn ON when the positioning is complete to the pre-set coordinate.
(D) Turn OFF the home-return (ZRT), and while operation output (MOVE) and positioning complete output (PFIN) turn OFF.
(E) In-position output (INPS) remains ON. However, it turns OFF when the position deviation becomes larger than in-position width in the next move, because conditions for this output are that current position coordinate should match the one with its origin set and also be within in-position.



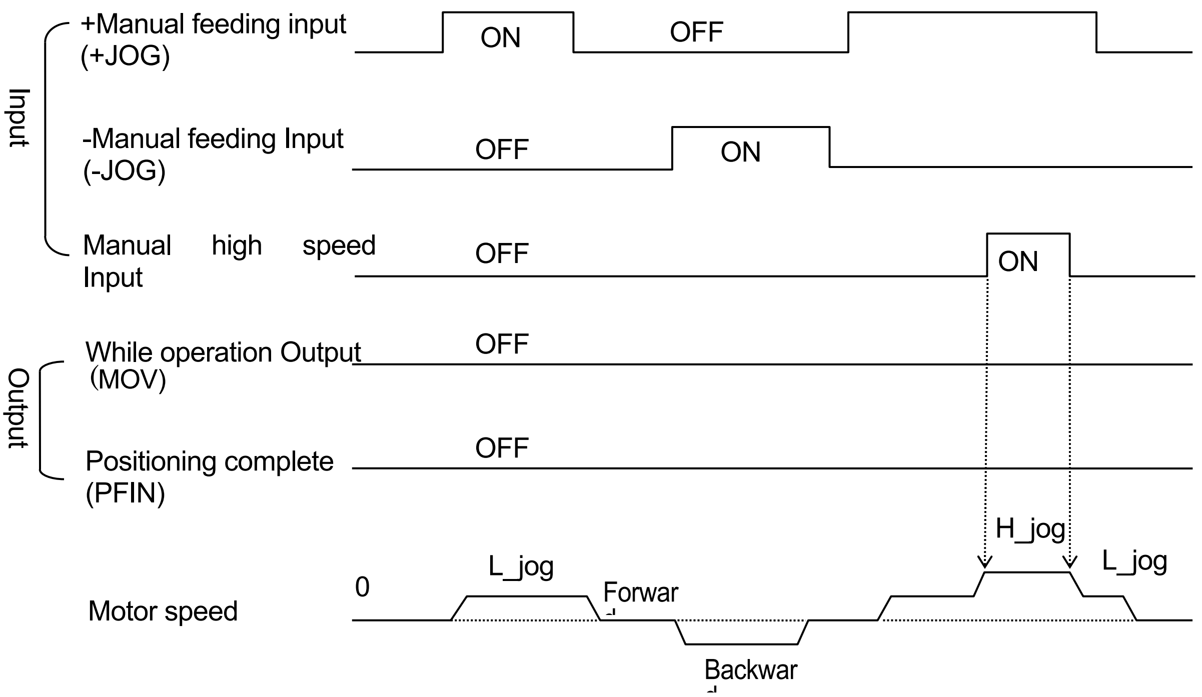
※When absolute encoder home-return function is effective, the movement and the method become the same as the case of incremental encoder combination.

Please refer to [1 For incremental encoder], in that case.

● JOG feeding (Manual feeding)

1) For incremental encoder

- While forward manual feeding (+JOG) Input is ON, the move is toward positive direction of the coordinate at the speed of (L_jog) set by a parameter.
- While backward manual feeding (-JOG) Input is ON, the move is toward negative direction of the coordinate.
- When manual high speed (RAP) is input during +JOG (or -JOG) is being input, the move is at the speed of parameter (H_jog).



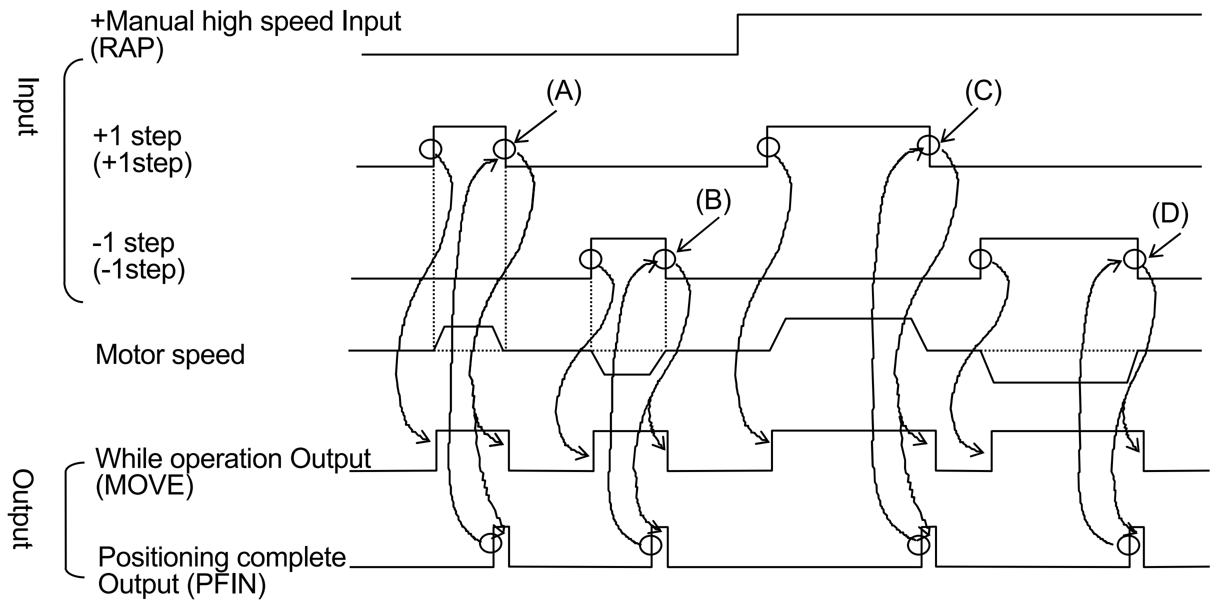
- 1-step feeding

Turning OFF to ON the +1step(+1step) or the -1 step (-1step) makes the move by a certain pulse numbers set by a parameter.

(A) Turning OFF to ON the +1 step input (+1step) while manual high speed input (RAP) if OFF makes the move toward positive direction by the “L_stp” set amount at the“L_jog”set speed.
(B) In the same way, turning OFF to ON the -1 step (-1step) makes the move toward negative direction.
(C) Turning OFF to ON the +1 step input (+1step) while manual high speed input (RAP) if ON makes the move toward positive direction by the “H_stp” set amount at the“H_jog”set speed.
(D) In the same way, turning OFF to ON the -1 step (-1step) makes the move toward negative direction.

・Keep the 1-step input ON during move . If it is OFF during move, the motor decelerates and stops into feed hold status. And when the input is turned ON again, the move continues.

・Cancellation input (CACL) is also effective.



- Home position setting when battery error occurred (home position setting)

  Perform home position setting under the state battery error occurred by refeering the following procedure:

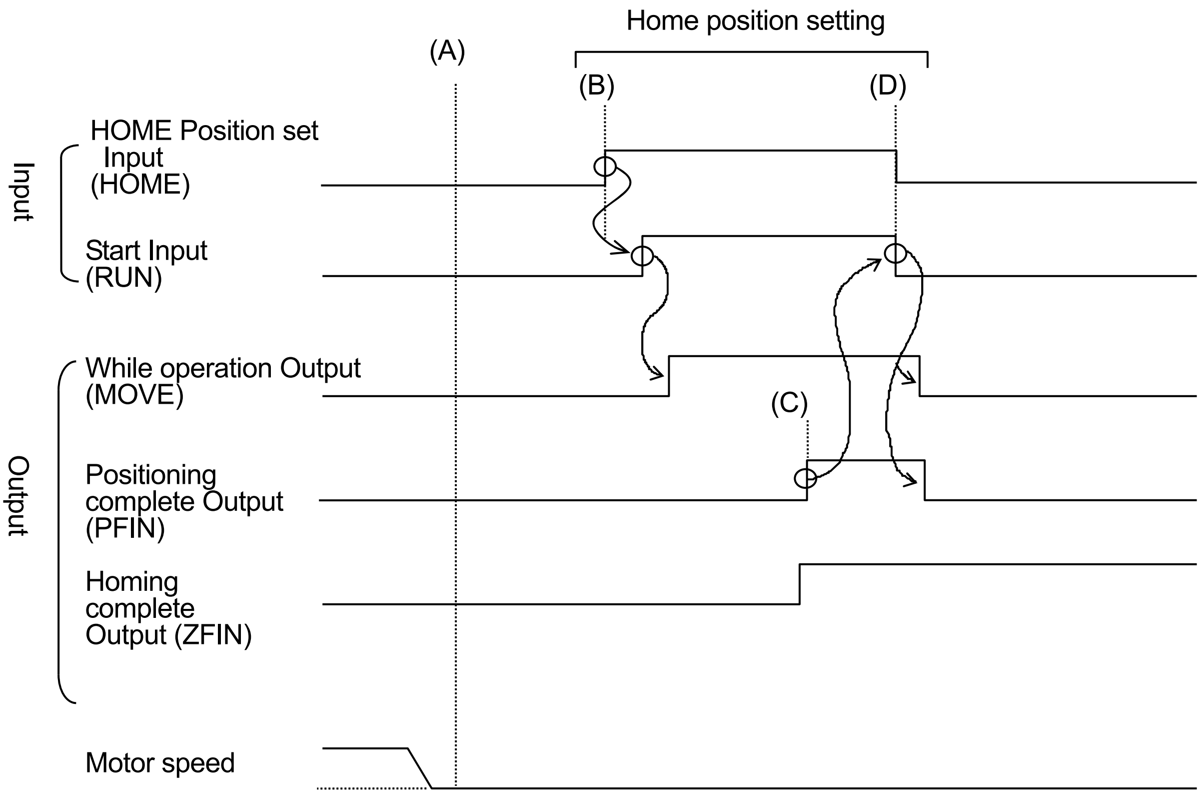
  ① Disable software limit detecting function.
  ② Turn on battery alarm clear (BATCLR), and then turn off it after lapse of more than 4 seconds.
  ③ Turn on alarm clear (ARST), and then turn off it after lapse of more than 40 seconds.
  ④ Perform home position setting procesure (A) to (D).
  ⑤ Enable software limit detecting function.

  Note: Setting of software limit detection is stored in EEPROM. Make sure to return the setting "enabled" to use software limit detecting function.

- Home position setting (Origin setting)

  Home position setting is the way to set the current position as an origin, and used for both incremental and absolute encoder.
  Move to the position where you want to set as an origin by JOG feeding or others, turn on the start input (RUN) with setting of (HOME) input, and the current position is set as an origin without any move.

(A) Move to where you want to set as an origin by JOG feeding or others.
(B) Set input (HOME) to ON first, then turn the start input (RUN) OFF→ON.
(C) When origin setting is complete, the positioning complete output (PFIN) and homing complete (ZFIN) turn ON.
(D) Turning OFF the start input makes the during operation output (MOVE) and positioning complete output (PFIN) OFF, and home position setting is complete.



* Do not apply cancellation or servo OFF during home position setting.

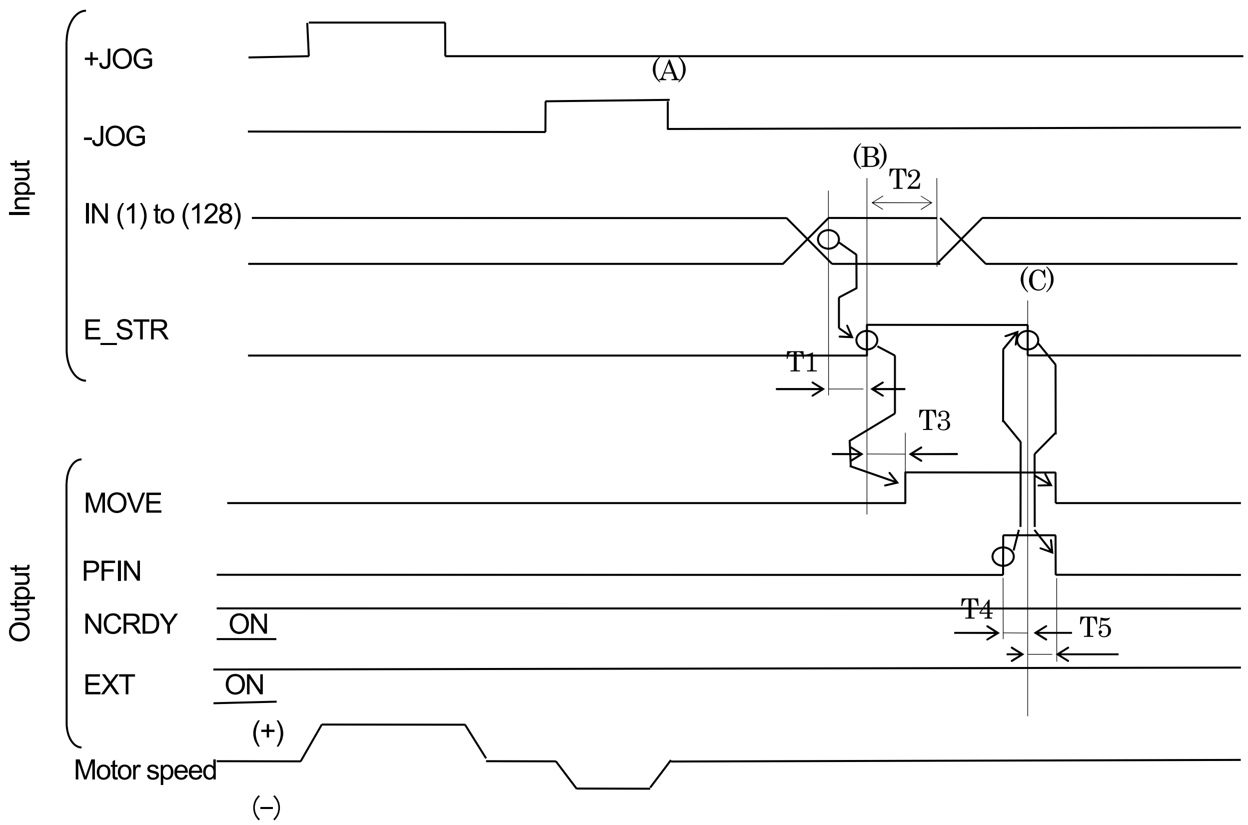
■ External data setting

Using "Point teaching " function (External data setting), the amplifier allows to set position points by external data.

- External data acceptance: To accept external data, set bit "0" of [SW1] to bit "1" and also bit "3" of [SW2] to bit "0" in the parameter group D.
- Before "Point teaching", conditions of speed, positioning operation active and absolute command need to be set up previously.

Input a specified point number and then turn ON the external input signal E_STR 8 (CN1-22pin), a position where the motor is currently stopped (Ideal position) can be registered as the coordinate value with that specified point number.

Position points setting by external data can be registered in External operation input mode except a status of a motor is in motion or alarms.



T1 >= 0 msec (data/command set up time)
T2 >= 40 msec (data/command holding time)
T3, T5 >= 20 msec (data/start-up acceptance delay time)
T4 >= 0 msec (data/start-up holding time)

(A) In External operation input mode, using JOG feeding or others,
move to a desired position to register as a coordinate value (Point teaching).
(B) Input a specified point number for that posit ion (Point teaching)
and then, input signal (E_STR) OFF → turns ON.
(C) Turn OFF input signal (E_STR) when output signal (PFIN) turns ON.
Then, output signal (PFIN, MOVE) ON → start turning OFF
(Complete External teaching data setting.)

■ Read this instruction to use positioning functions for the first time.

-Important!! The following parameters are references for positioning. -

● Parameters for positioning functions (NC parameters) are a group to set positioning system. When input data values do not conform to mechanical configuration, make sure to verify the status, as this causes unintended erroneous operation.

After changing parameter 0A "M_dir", 3B "S_pls", 3C "U_pls", 3E "D_dpo", 3F "Unit," turn off the power supply and then turn on the power again. Refer to "R-Setup-Setup Software Instruction Manual" for the details.

● Parameters set for the first time use

0A "M_dir" Operation direction
3B "S_pls" Number of system divisions
3C "U_pls" Number of user divisions
3E "D_dpo" Velocity, Position data decimal point
3F "Unit" Setting unit
· "————" Encoder function
· "————" Encoder resolution
· "————" Motor model number

} Refer to System parameter.

1) Encoder function, resolution, and motor model number are determined when they are purchased (shipped setting values).

2) 3E "D_dpo": Decimal point for velocity and position data setting are designated.

"0"・・・without decimal points
"1"・・・one place of decimals
"2"・・・two places of decimals
"3"・・・three places of decimals
"4"・・・four places of decimals
"5"・・・five places of decimals

Important
Re-turn on the power supply after setting parameters 1), 4), 5), and 6).

3) 3F "Unit":Setting unit

"0"・・・Pulse
"1"・・・mm

4) 0A "M_dir":Motor operation direction is adjusted.

"0": Positive direction coordinate/Rotary motor is CCW turn seen from shaft side.
"1": Positive direction coordinate/Rotary motor is CW turn seen from shaft side.

5) 3B "S_pls": Division number per one turn of motor

"S_pls" ="Encoder resolution " (in case of absolute encoder)
"S_pls" ="Encoder resolution " × 4 (in case of incremental encoder)
(Detection multiplication)

<Sensor resolving power example>
① ABS-E (131072 P/R)・・・"S_pls" =131072
② Incremental (2000 P/R)・・・"S_pls" =8000

6) 3C "U_pls" :Travel distance per turn of a motor seen from user.
Input setting unit of position data is determined at the above "D_dpo", "S_pls", and "U_pls". (※5 of parameters list in 4. Group D)

e.g.1) System moving 5mm per single turn of motor with incremental encoder (8000-division).

Setting unit of position data: 0.001 mm

Unit = 1

D_dpo = 3

After writing the above values, close parameter setting for setting-up, and then open it again.
(With the above process, setting of "Unit, D_dpo" is reflected as a parameter.)

S_pls= 8000

U_pls= 5.000 (Internal value: 5000)

If you set travel distance at 7.354mm, set it to "7.354"in this step.
If you set velocity at 8mm/s, set it to "8.000mm/s."

* The internal value means the value without decimal point.
  Expression "5.000" means internal value "5000."
* Perform setting so as to be S_pls>=U_pls (internal value).

e.g.2) System moving 5mm per single turn of motor with absolute encoder (131072-division).

Setting of unit system is as follows:

Unit = 1

D_dpo = 4

After writing the above values, close parameter setting for setting-up, and then open it again.
(With the above process, setting of "Unit, D_dpo" is reflected as a parameter.)

S_pls= 131072

U_pls= 10.0000 (Internal value：10000)

If you set travel distance at 1.235mm, set it to "1.2350" in this step.
If you set velocity at 4mm/s, set it to "4.000mm/s."

* Zero after decimal point can be omitted by setting-up.
* Positioning point varies depending on resolution levels of motor encoder, so make sure to set gear ratio of S_pls/U_pls so as to be 20 times or less.

Important information
・ Perform setting so as to be "S_pls>=U_pls (internal value)." ・ Set gear ratio S_pls/U_pls so as to be 20 times or less.

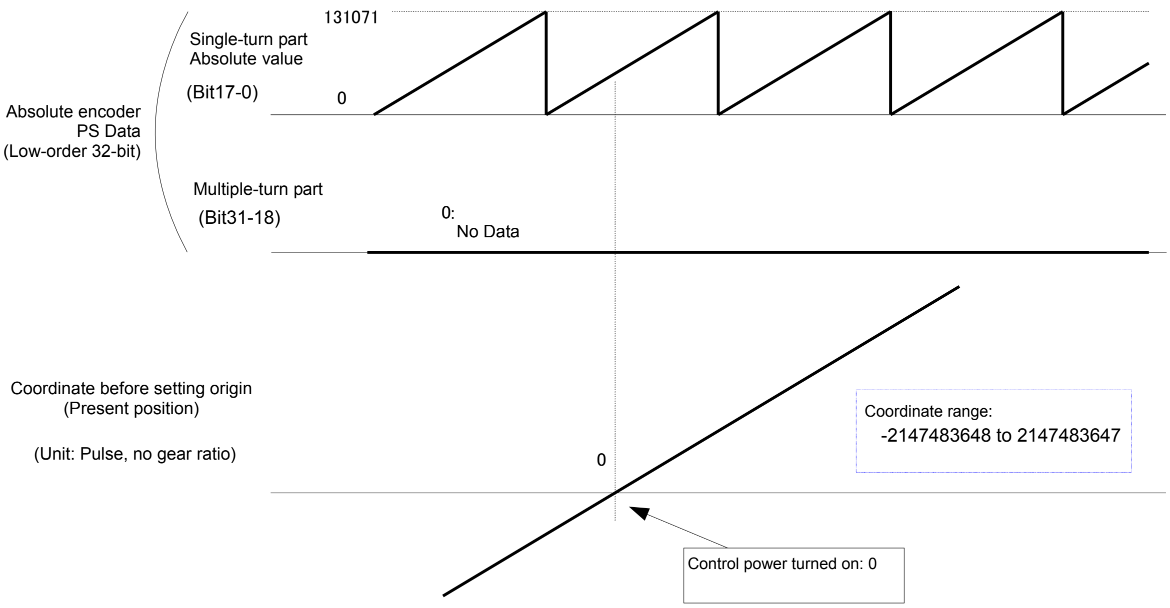
Re-turn on power supply after setting the above parameters.
After that, set "S_ovf" and "T_ovf."
Set "S_vmx," "T_vmx," "Accel," "S_rat," "S_inp," "Z_inp," "H_jog," "L_jog," "H_stp," "L_stp," "S_+OT," and "S_-OT" by referring the decided "U_pls" to perform Chapter 6, trial operation verification.

● Home position setting of absolute encoder

(A) Absolute encoder (PA035)

(A-1) Position creation for PA035S (Absolute encoder for incremental system)

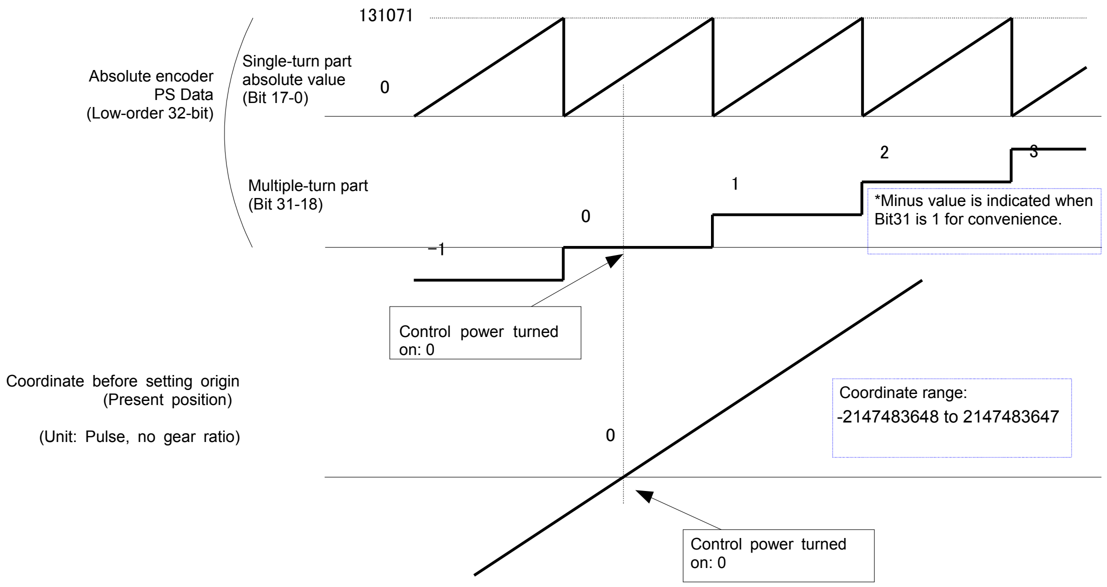
- Division number per single-turn:131072 divisions/single-turn ・・・17-bit
- Multiple-turn: No data



(A-2) Position creation for PA035C being used by incremental system (No battery backup)

- Division number per single-turn:131072 divisions/single-turn ・・・17-bit
- Number of multiple-turn: 32678 turns ・・・15-bit Total 32-bit

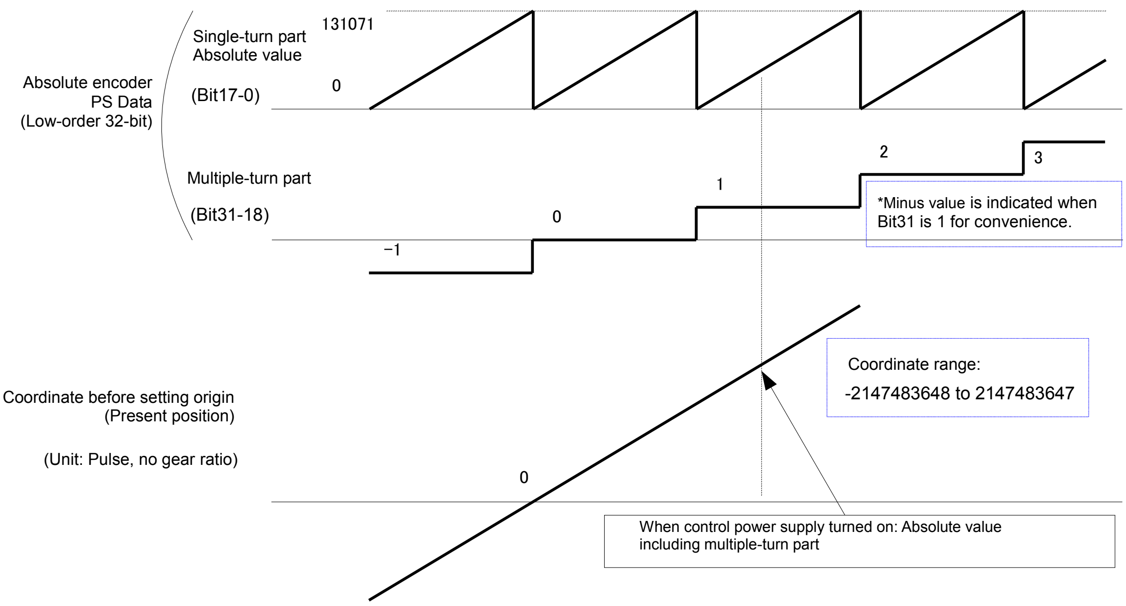
＊ There are 33 bits for output signal from encoder, however, this servo amplifier uses only 32 bits.



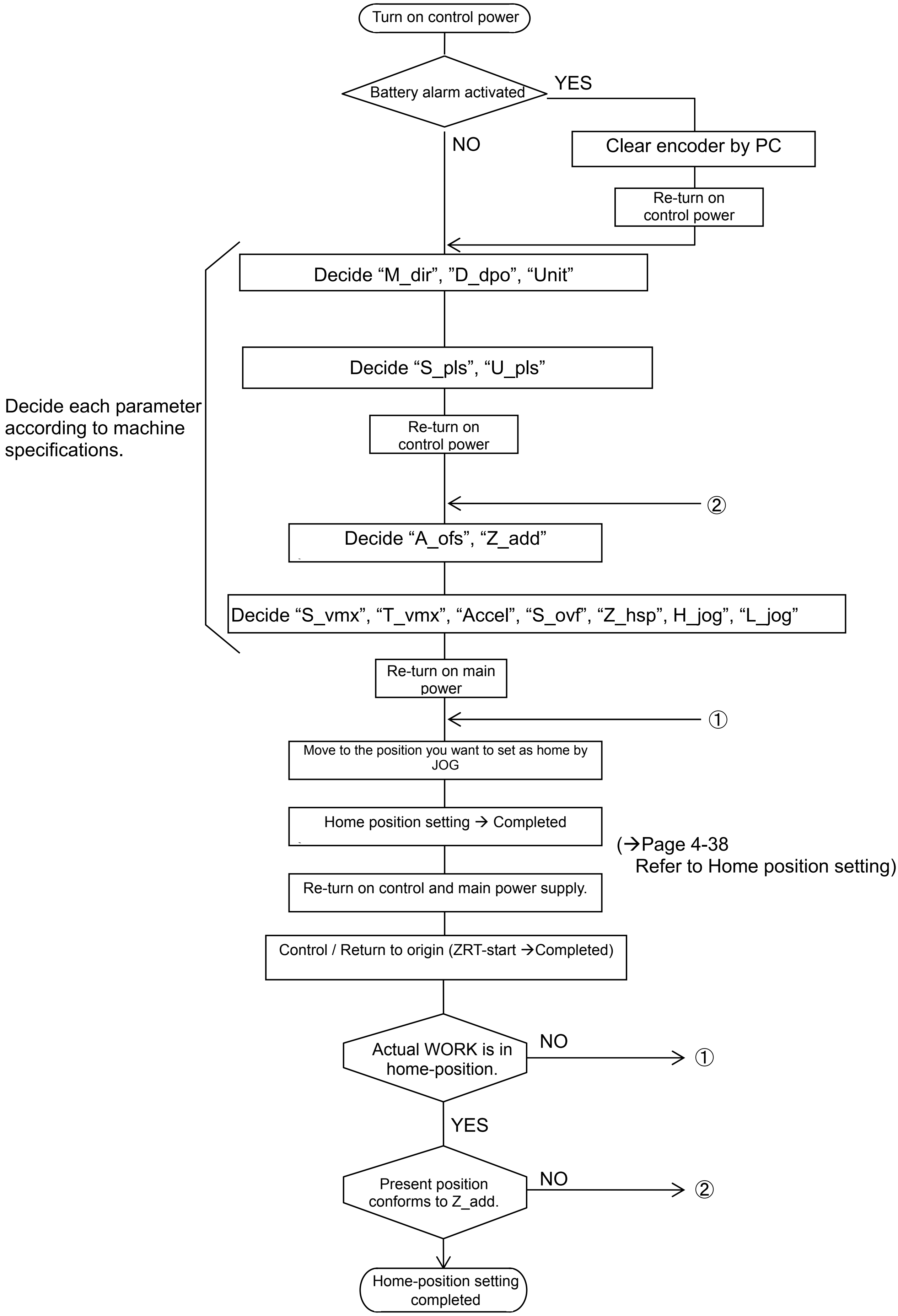
(A-3) Position creation for PA035C being used by absolute system (With battery backup)

- Division number per single-turn:131072 divisions/single-turn ・・・17-bit
- Number of multiple-turn: 32678 turns ・・・15-bit Total 32-bit

＊ There are 33 bits for output signal from encoder, however, this servo amplifier uses only 32 bits.



(B) Flowchart of home position setting of absolute encoder



(C) Example of home position determination

Ball screw drive: Direct-coupled P=10mm.l=800mm

Travel distance set unit: 0.001mm Velocity unit: 0.0001mm/sec

① Set as follows:

M_dir="0"･･････････Encoder and user coordinates increase in the same direction.

D_dpo="2" (two places of decimals) ･ 0.01mm, 0.01mm/sec

Unit ="1" (mm)

②S_pls=131072･･By referring division number.

U_pls=10.0000･･･････Specify 10mm-move per single turn of motor.

S_ovf=40.0000

After setting the above parameter, turn on the control power again.

③S_vmx=750.0000 (mm/sec) ･ By referring Nmax=4500min^{-1}

T_vmx=200.0000 (mm/sec)･･By referring T_vmx<S_vmx

H_jog=20.0000 (mm/sec)･･･Start trial operation at slow velocity.

L_jog=1.0000 (mm/sec)････Start trial operation at slow velocity

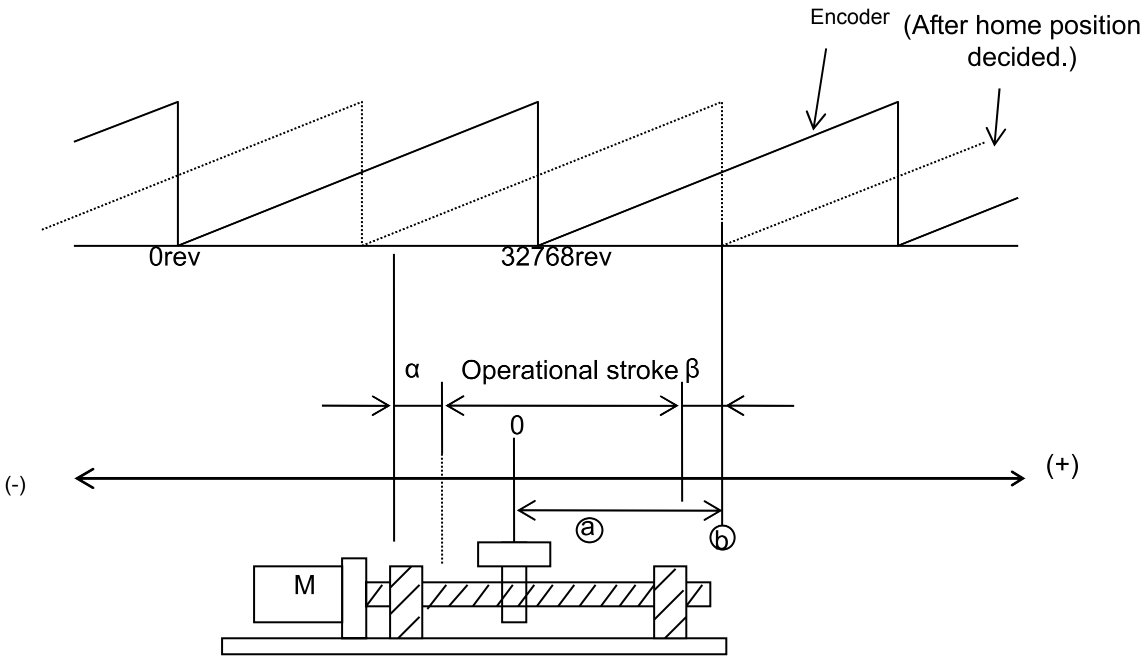
Z_hsp=20.0000 (mm/sec)･･･Start trial operation at slow velocity.

Accel=250.0000 (mm/sec)･･Setting to perform "0 at rising edge → 4500min^{-1}" for 300m sec.

A_ofs=2000.0000 (mm)･･Specify the amount of a =2000.0000mm (β : margin >0)

Note: This example shows "A_ofs" is set to explain the functions, however, if encoder effective stroke is longer than the one of machine (2 times or more), you can use as "A_ofs=0" is set.

This is preset at the center of encoder stroke, when A_ofs=0.



Z_add=0.0000(mm)・・・・・User coordinates shall be 0 at home position setting.

④Feed to the position you set as home position by JOG.
⑤Home position setting → completed･･･Encoder coordinates system becomes dotted line.
(→ Refer to home-position setting on 4-38 page)
⑥Home position setting completed with the above steps.
⑦Check (α + operational stroke + β) < 32768rev
If the value exceeds encoder stroke, encoder cannot be used.
(In this case, the encoder operates the next encoder range and causes damages to machine.)

Note

Make sure to perform home position setting after you change M_dir, D_dpo, Unit, S_pls, U_pls, A_ofs, Z_add, perform motor conversion, and release battery alarm.

- Home position setting of incremental encoder

Incremental encoder needs to perform homing to conform electrical home position to mechanical home position at power-on.
If homing is required, ZFIN-output of “I / O” is turned off. In that case, perform homing.
When homing is completed normally, ZFIN-output is turned on.

The parameters need to perform a minimum setting for homing are as follows:

10 Z_hsp: High speed on zero-return (U υ)
This is the velocity set at “Z_dir,” having no deceleration signal (contact point closed), as this is start after homing.

11 Z_lsp: Slow speed on zero-return (U υ)
This is the reversed velocity when escaping from deceleration signal by rotating in negative direction, after decelerating in response of deceleration signal (Z_hsp) in homing operation.

0E Z_typ: Zero-return type (-)
Set type of homing. Two types, type 0 and 1, are available.

0F Z_dir: Zero-return direction (-)
Set rotational direction for homing.

12 Z_add: Zero-position coordinates (-)
Set user coordinates value when homing completed.
Set the above parameters to perform homing.

1 .1 .1 Normal

・Only after setting of parameters for reference of positioning and home position, point setting and external point move become available.
・ If any changes to parameters for reference of positioning and home position occurred, perform resetting of the parts after the affected changes from the first.

■ Description of infinite motor rotation specification

・**Outline**

Specification for infinite rotation is a mode used for rotating solids such as rotating table.
Specifically, if coordinates rotating in positive direction exceeds the values of "+ stroke," the coordinates changes to the value of "- stroke."
Permanent rotation in positive direction is available by processing coordinate system in the above way. (This can be applied equally to reversed rotation.)

For example, if in the condition that + stroke=1000, - stroke = -1000," rotation is in positive direction, and coordinates exceeds 999, the coordinates changes to –1000.
Function of rotation in the shortest way is also supported, if "+" travel distance exceed 1/2 of whole coordinates (figures after the decimal point rounded up), the move is in the shortest way.
(When in "-" travel distance exceeds 1/2 of whole coordinates (figures after the decimal point rounded down), the move is in the shortest way.)
For example above, When 1000- (-1000)/2 = 1000, rotation is in the shortest way.

For example, if present position is - 500 and target value is 999, rotation is in the shortest way. (Rotation is in negative direction instead of positive direction.)
If present position is 500, and target value is 501, rotation is in the shortest way.
Functions for range signal is also extended to support infinite coordinate system.

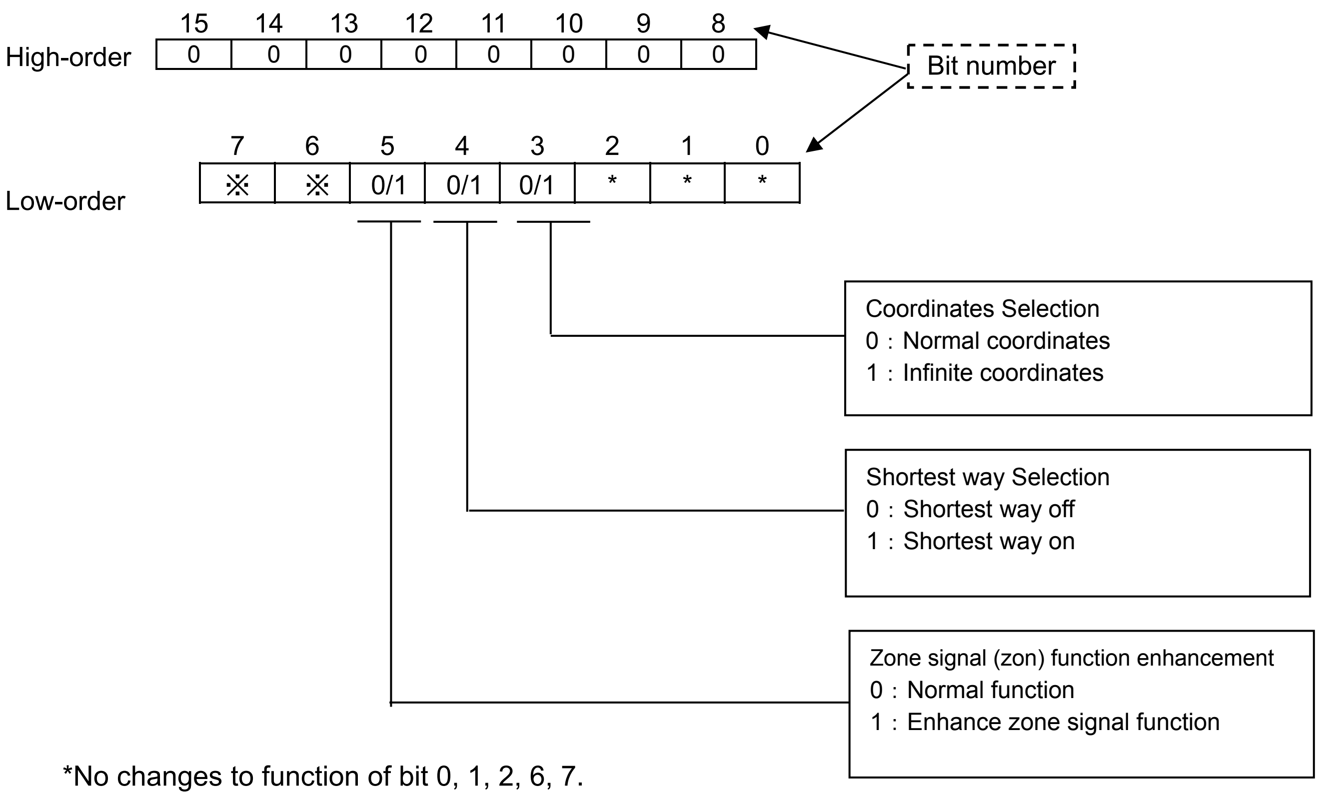
You can set range signals including unique points in the range "- 900 to 900" that could not be set normally.
In this case, if present position is within the range either "- 900 to - 1000 or "900 to 999," range signal is turned on.

・**Parameter to be added or changed**

15: +STROKE [+Stroke]
Set the maximum values of coordinates in + direction.
(The value under this value shall exactly be the maximum coordinates value.)

16:A_ofs [Absolute encoder effective stroke length → - stroke]
Set the minimum values of coordinates in - direction. (The connotation changed.)

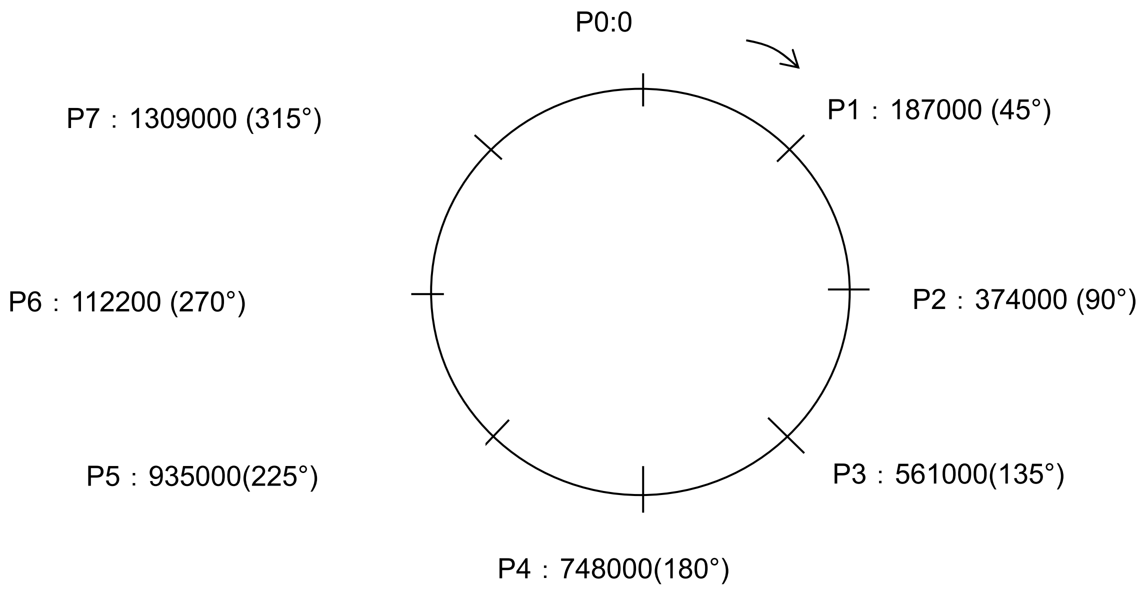
40:Sw1 [Function switch1]
Perform setting of switching between "infinite coordinates system" and "rotation in the shortest way."



*No changes to function of bit 0, 1, 2, 6, 7.

● Explanation of operation in usage example

Condition: Motor resolution: 8000P/R
Mechanical gear ratio: 187:1
3B:S_pls=8000
3C:U_pls=8000
Since motor rotates 187 times per 1 mechanical rotation, the traveling range is 187*8000=1496000P/R
0 – 1496000 (When 1496000=0, it is 0 - 1495999 accurately)
15:+stroke =1496000
16:-stroke =0
Speed in mechanism conversion 10min-1: 10*187*8000/60=249333
27:H_jog=249333
28:L_jog=249
Travel by 1 step is 360/8=45°1496000/8=187000
29:H_stp=187000
2A:L_stp=1
"4D: Sw1=0018" by rotating in the shortest way in infinite coordinates system.
The above are system parameters, the following are point data.



Operational modes that can rotate in the shortest way are as follows only:

Mode2: 00 (completed)

Positioning command data: 0 (absolute command)

Operating pattern:0 (Stop and change speed operation)

Position setting within coordinates (0 to 1495999).

So point data are as follows:

N	Speed	Position	Mode1	Mode 2	ABS/INC	Accelerated speed	S curve acceleration	Current control	M output	IP	Dowel
0	249333	0	1	0	0	510	0	0	0	0	0
1	249333	187000	1	0	0	510	0	0	0	0	0
2	249333	374000	1	0	0	510	0	0	0	0	0
3	249333	561000	1	0	0	510	0	0	0	0	0
4	249333	748000	1	0	0	510	0	0	0	0	0
5	249333	935000	1	0	0	510	0	0	0	0	0
6	249333	1122000	1	0	0	510	0	0	0	0	0
7	249333	1309000	1	0	0	510	0	0	0	0	0

Judgment of shortest way:

When rotating in negative direction and **"travel distance > whole coordinate/2 (the figures after the decimal fractions rounded down),"** motor rotates in the shortest way.
When rotating in positive direction and "**travel distance ≧ whole coordinate – (1/2 of whole coordinate (the figures after the decimal fractions rounded down),"** in actual operation, when moving in positive direction and travel distance ≧ 1531904 - (1531904/2), motor also rotates in the shortest way.
Specifically, rotations by moving from P0 to P4 and from P4 to P0 are in positive direction, if position is in P4 with the state 1-pulse moved at L_stp in negative direction, and in that condition if you want to rotate to P0, motor rotates in negative direction to the point.
If you want to rotate moving parts more than single turn, set with incremental command. For example, if the position is designated as 1914880 in incremental mode, the moving part stops in the same coordinate after rotating 10 times in positive direction.

Extended function of range signal

When setting "bit5 = 1 of sw1," extended function of range signal activated.

Operational condition: sw1 (bit5=1)

Range signal: zon☐L > zon☐H (☐:1 to 8)

"zon☐L≦present position" or "present position < zon☐H"

In the above condition, the set range signal is turned on.

Set area signal of "0-position±100" in setting of usage example.

Set as follows:
sw1 (bit5=1)
zon1L: 1531804
zon1H: 100
(zon1L > zon1H)
After setting, range signal 1 is turned on at "1531804≦present position" or "present position <100."

■ Explanation of JOG with specific position stop

· Outline of operation

The stop position after JOG-feeding operation can be "specific" position designated by point data by enabling JOG with specific position stop function, instead of "unspecified" decelerating stop position.

(1) Turning on the signal +/-JOG starts JOG-feeding operation.
During the operation, switching high-velocity JOG/ low-velocity JOG is enabled by turning on or off signal RAP. For the servo amplifiers which can communicate, the JOG-velocity can be changed on a real-time basis by re-writing JOG velocity register.

(2) Turning on signal RUN during JOG-operation switches the mode from JOG-feeding mode to point-positioning mode with motor being rotated, and then performs positioning by referring to target position and acceleration (deceleration) of applicable point data in the information of IN(1) to IN(128) at the time RUN turned on.

· Parameters used for this function

(1) Performs setting for infinite motor rotation specifications. (→ Refer to "Description of infinite motor rotation specification.")
(2) Sets bit9 of Sw2 [Function switch 2] to "1."

41:Sw2 [Function switch 2]
Performs setting of infinite coordinate system and enable-setting of JOG with specific position stop.

High-order

15	14	13	12	11	10	9	8
0	0	0	0/1	0	0	0/1	0

Bit number

Fixed-position stopping JOG-function
0: Disabled
1: Function enabled

Low-order

7	6	5	4	3	2	1	0
0/1	0	0/1	0/1	0/1	0/1	0/1	0/1

Bit number

· Restrictions on this function

(1) When the function of JOG with specific position stop is enabled, the S-shaped curve acceleration and deceleration time (0C:S_rat) of normal JOG-feeding is not applied.
(2) In specific position stop operation, the velocity setting value set to point data and S-shaped curve acceleration and deceleration time are not used. Set the acceleration value to be set to the point data at 50[Uv/ms] or over. If you need to set the value at 50[Uv/ms] or less, please contact us.
(3) To smooth velocity change incline, set position command smoothing time constant (parameter Group1, page00).
(4) Use point data designated by this function in the following moving mode:

Mode 2=00 : Final move
ABS/INC=0 : ABS
With travel to fixed position =0 : No travel to fixed position
Speed change=0 : stop

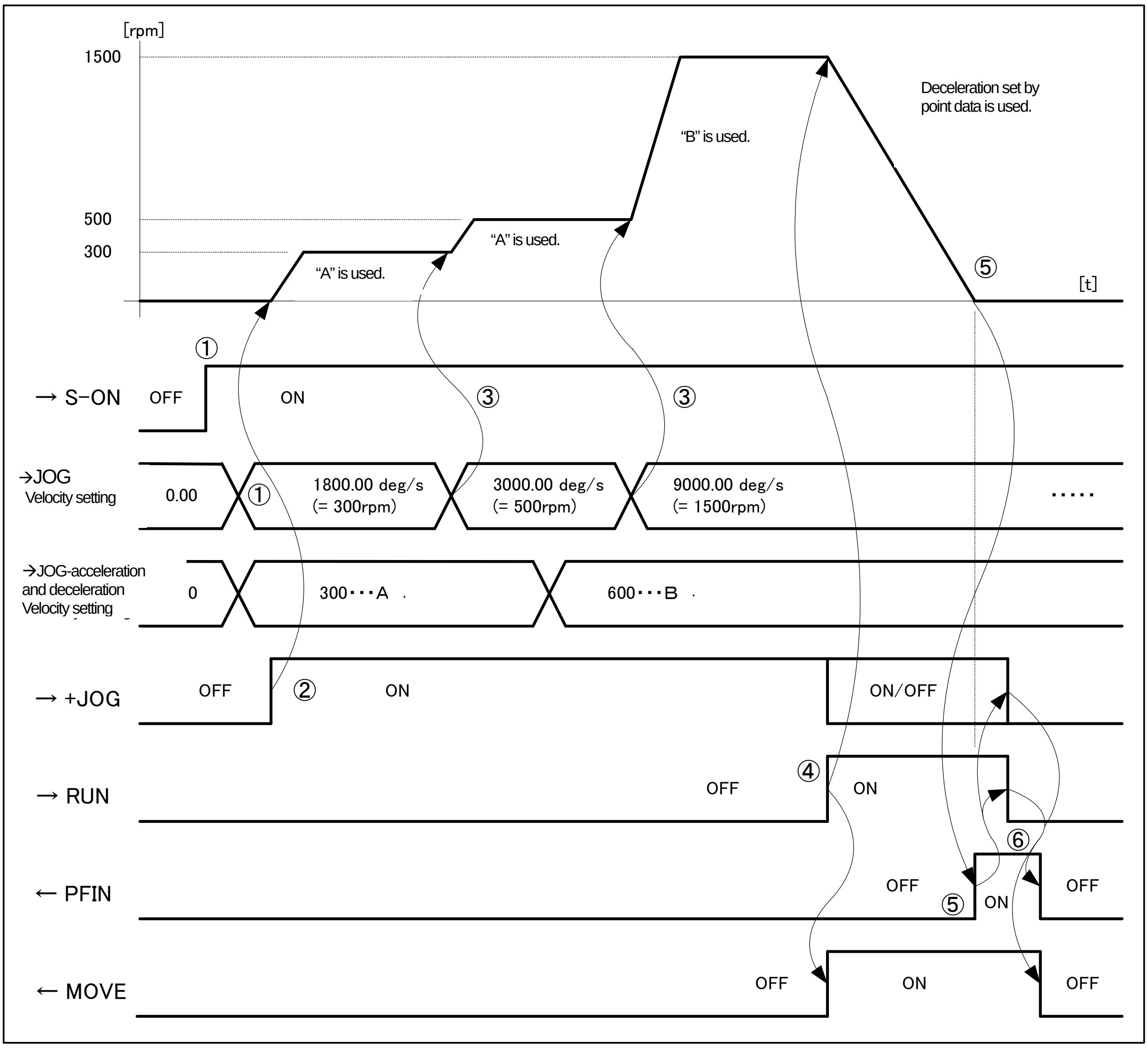
- Operation explanations of by usage examples

Condition: motor resolution: 131072P/R
Setting of parameter GroupD without gearing system
(1) Setting of base units
3B:s_pls =131072
3C:u_pls =360.00 (Positioning accuracy: 0.01°)
3E:D_pls =2
(After the decimal point of velocity and position data: two places of decimals)
3F:Unit =01
(*The unit indicated in instruction manual and setup software is "mm," however interpret the unit as "deg" for rotary system.)
(2) Setting of stroke and functions
15:+STROKE =360.00
16:A_ofs =0
40:Sw1 =0008h (Infinite coordinate enabled)
41:Sw2 =0203h (This function enabled, no detection of ±OT)
(3) Setting of JOG-velocity and acceleration
27: H_jog =6000.00deg/s (Equivalent to 1000rpm)
28: L_jog =600.00deg/s (Equivalent to 100rpm)
0B: Accel =300deg/s / ms (Velocity increases in increments of 2s up to 1000rpm.)

Setting example of point data

N	Velocity	Position	Mode1	Mode2	ABS/INC	Acceleration	S-shaped curve acceleration appearing in chart	current limit	M-output	IP	Dwell time
0	6000.00	0.00	1	0	0	300	0	0	0	0	0
1	6000.00	45.00	1	0	0	300	0	0	0	0	0
2	6000.00	90.00	1	0	0	300	0	0	0	0	0
3	6000.00	135.00	1	0	0	300	0	0	0	0	0
4	6000.00	180.00	1	0	0	300	0	0	0	0	0
5	6000.00	225.00	1	0	0	300	0	0	0	0	0
6	6000.00	270.00	1	0	0	300	0	0	0	0	0
7	6000.00	315.00	1	0	0	300	0	0	0	0	0

Example of operational sequence (When changing JOG-velocity on a real-time basis)



(The allows "→" in the figure above mean input signal and input information into servo amplifier.)
(The allows "←" in the figure above mean output signal from servo amplifier.)

- Explanation of sequence -

(1) Servo on to set real time acceleration and deceleration (register address: 0x1002) and real time JOG-velocity (register address: 0x1000) at the values as desired.

(2) Turning on signal +/-JOG starts and accelerates the motor up to the set JOG-velocity.

(3) Rewriting real time JOG-velocity value changes JOG-velocity on a real-time basis. (When changing JOG-velocity, the JOG acceleration set at the time is used.)

(4) Turning on signal RUN during JOG operation reads out point data set to IN (1) to IN (128) at the time, and starts deceleration at the acceleration (deceleration) parameters set to point data. Signal MOVE is turned on at the same time of specific position stop operation start. At this point, no differences would be made on specific position stop function whether +/-JOG signal turned on in the above (2) is ON or OFF.

(5) PFIN is turned on after positioning to the target point designated by point data is competed.

(6) Controller turns off signal RUN and +/-JOG, after confirming that PFIN is ON. Servo amplifier turns off signal PFIN and MOVE, after detecting that signal RUN and +/-JOG are turned off.

<Register change on a real-time basis>

- **Write storage as needed (0x1000 and the subsequent)**

The values rewritten by using registers in this range become enable in each updating cycle as needed.

Register address (Hex)	Description	Unit	Setting range	R/W
0x1000	JOG-velocity (high order) JOG-velocity (low order)	Uv	0 to 2147483647	R/W
0x1002	JOG acceleration	Uv/ms	1 to 65535	R/W

- JOG-velocity and acceleration at powering-on are preset at "0."
- When setting velocity at "0," motor performs JOG-feeding at the velocity set by general parameters.
- When setting velocity at "0," the value set by general parameters is applied to the acceleration also.
- Acceleration value shall be re-written prior to the setting for velocity, as once velocity is re-written, a command to immediately correspond the set velocity is generated.

5

[Parameters]

■ General Parameter Group 0 [Auto-tuning setting]

Page	Symbol	Name	Standard Value	Unit	Display Range	Reference page
00	TUNMODE	Tuning mode	00: _AutoTun	—	00 to 02	5-6
01	ATCHA	Automatic Tuning Characteristic	00: _Positioning1	—	00 to 04	5-6
02	ATRES	Automatic Tuning Response	5	—	1 to 30	5-6
03	ATSAVE	Automatic Tuning, Automatic Parameter Saving	00: _Auto_Saving	—	00 to 01	5-6
10	ANFILTC	Automatic Notch Filter Tuning, Torque Command	50	%	10 to 100	5-6
20	ASUPTC	Automatic Vibration Suppressor Frequency Tuning, Torque Command	25	%	10 to 100	5-6
21	ASUPFC	Automatic Vibration Suppressor Frequency Tuning, Friction Compensation Value	5	%	0 to 50	5-6

■ General Parameter Group 1 [Basic controlling parameter setting]

Page	Symbol	Name	Standard Value	Unit	Display Range	Reference page
00	PCSMT	Position command smoothing time constant	0	ms	0 to 1000	5-7
01	PCFIL	Position command filter	0.0	ms	0.0 to 2000.0	5-7
02	KP1	Position Loop Proportional Gain 1	30	1/s	1 to 3000	5-7
03	TPI1	Position Loop Integral Time Constant 1	1000.0	ms	0.5 to 1000.0	5-7
04	TRCPGN	Higher Tracking Control, Position Compensation Gain	0	%	0 to 100	5-8
05	FFGN	Feed Forward Gain	0	%	0 to 100	5-8
08	FFFIL	Feed Forward Filter	2000	Hz	1 to 2000	5-8
10	VCFIL	Velocity Command Filter	2000	Hz	1 to 2000	5-8
12	VDFIL	Velocity Feedback Filter	1500	Hz	1 to 2000	5-8
13	KVP1	Velocity Loop Proportional Gain 1	50	Hz	1 to 2000	5-8
14	TVI1	Velocity Loop Integral Time Constant 1	20.0	ms	0.5 to 1000.0	5-8
15	JRAT1	Load Inertia Ratio (Load Mass Ratio) 1	100	%	0 to 15000	5-8
16	TRCVGN	Higher Tracking Control, Velocity Compensation Gain	0	%	0 to 100	5-8
17	AFBK	Acceleration Feedback Gain	0.0	%	-100.0 to 100.0	5-8
18	AFBFIL	Acceleration Feedback Filter	500	Hz	1 to 2000	5-8
20	TCFIL1	Torque Command Filter 1	600	Hz	1 to 2000	5-8
21	TCFILOR	Torque Command Filter Order	2	Order	1 to 3	5-8

∗When you manually tune, set the [Page 16: Higher Tracking Control, Velocity Compensation Gain] at 100 % to bring conditions in line with Q-Series standard characteristics.

■ General Parameter Group 2 [Vibration suppressing control/Notch filter/Disturbance observer setting]

Page	Symbol	Name	Standard Value	Unit	Display Range	Reference page
00	SUPFRQ1	Vibration Suppressor Frequency 1	500	Hz	5 to 500	5-9
01	SUPLV	Vibration Suppressor Level Selection	00	—	00 to 03	5-9
10	VCNFIL	Velocity Command,Notch Filter	500	Hz	50 to 500	5-9
20	TCNFILA	Torque Command,Notch Filter A	2000	Hz	100 to 2000	5-9
21	TCNFPA	TCNFILA, Low Frequency Phase Delay Improvement	00	—	00 to 02	5-9
22	TCNFILB	Torque Command,Notch Filter B	2000	Hz	100 to 2000	5-9
23	TCNFDB	TCNFILB, Depth Selection	00	—	00 to 03	5-9
24	TCNFILC	Torque Command, Notch Filter C	2000	Hz	100 to 2000	5-9
25	TCNFDC	TCNFILC, Depth Selection	00	—	00 to 03	5-9
26	TCNFILD	Torque Command,Notch Filter D	2000	Hz	100 to 2000	5-9
27	TCNFDD	TCNFILD, Depth Selection	00	—	00 to 03	5-10
30	OBCHA	Observer characteristic	00: _Low	—	00 to 01	5-10
31	OBG	Observer Compensation Gain	0	%	0 to 100	5-10
32	OBLPF	Observer Output, Low Pass Filter	50	Hz	1 to 2000	5-10
33	OBNFIL	Observer Output, Notch Filter	2000	Hz	100 to 2000	5-10

■ General Parameter Group 3

[Setting for gain switching control / vibration suppressing frequency switching]

Page	Symbol	Name	Standard Value	Unit	Display Range	Reference page
00	KP2	Position Loop Proportional Gain 2	30	1/s	1 to 3000	5-10
01	TPI2	Position Loop Integral Time Constant 2	1000.0	ms	0.5 to 1000.0	5-10
02	KVP2	Velocity Loop Proportional Gain 2	50	Hz	1 to 2000	5-10
03	TVI2	Velocity Loop Integral Time Constant 2	20.0	ms	0.5 to 1000.0	5-10
04	JRAT2	Load Inertia Ratio (Load Mass Ratio) 2	100	%	0 to 15000	5-10
05	TCFIL2	Torque Command Filter 2	600	Hz	1 to 2000	5-10
10	KP3	Position Loop Proportional Gain 3	30	1/s	1 to 3000	5-11
11	TPI3	Position Loop Integral Time Constant 3	1000.0	ms	0.5 to 1000.0	5-11
12	KVP3	Velocity Loop Proportional Gain 3	50	Hz	1 to 2000	5-11
13	TVI3	Velocity Loop Integral Time Constant 3	20.0	ms	0.5 to 1000.0	5-11
14	JRAT3	Load Inertia Ratio (Load Mass Ratio) 3	100	%	0 to 15000	5-11
15	TCFIL3	Torque Command Filter 3	600	Hz	1 to 2000	5-11
20	KP4	Position Loop Proportional Gain 4	30	1/s	1 to 3000	5-11
21	TPI4	Position Loop Integral Time Constant 4	1000.0	ms	0.5 to 1000.0	5-11
22	KVP4	Velocity Loop Proportional Gain 4	50	Hz	1 to 2000	5-11
23	TVI4	Velocity Loop Integral Time Constant 4	20.0	ms	0.5 to 1000.0	5-11
24	JRAT4	Load Inertia Ratio (Load Mass Ratio) 4	100	%	0 to 15000	5-11
25	TCFIL4	Torque Command Filter 4	600	Hz	1 to 2000	5-11
30	GCFIL	Low Pass Filter of Gain Switching	0	ms	0 to 100	5-11
40	SUPFRQ2	Vibration Suppressor Frequency 2	500	Hz	5 to 500	5-12
41	SUPFRQ3	Vibration Suppressor Frequency 3	500	Hz	5 to 500	5-12
42	SUPFRQ4	Vibration Suppressor Frequency 4	500	Hz	5 to 500	5-12

■ General Parameter Group 4 [To set high setting control]

Page	Symbol	Name	Standard Value	Unit	Display Range	Reference page
00	CVFIL	Command Velocity, Low Pass Filter	1000	Hz	1 to 2000	5-12
01	CVTH	Command Velocity Threshold	20	min^{-1}	0 to 65535	5-12
02	ACCC0	Acceleration Compensation	0	x 50 Pulse	-9999 to +9999	5-12
03	DECC0	Deceleration Compensation	0	x 50 Pulse	-9999 to +9999	5-12

■ General Parameter Group 8 [Control system setting]

Page	Symbol	Name	Standard Value	Unit	Display Range	Reference page
17	EDGEPOS	Positioning method	00: _Pulse_Interval	—	00 to 01	5-13
18	PDEVMON	Inposition / Position Deviation Monitor	00: _After_Filter	—	00 to 01	5-13
19	CLR	Deviation Clear Selection	00_Type1	—	00 to 01	5-13
24	VCOMP	Preset Velocity Compensation Command	0	min^{-1}	-9999 to +9999	5-13
28	VCLM	Velocity Limit	65535	min^{-1}	1 to 65535	5-13
31	TCOMP1	Preset Torque Compensation Command 1	0	%	-500 to 500	5-13
32	TCOMP2	Preset Torque Compensation Command 2	0	%	-500 to 500	5-13
37	SQTCLM	Torque Limit at Sequence Operation	120	%	10 to 500	5-13
40	NEAR	In-Position Near Range	500	Pulse	1 to 65535	5-14
42	ZV	Speed Zero Range	50	min^{-1}	50 to 500	5-14
43	LOWV	Low Speed Range	50	min^{-1}	0 to 65535	5-14
44	VCOMP	Speed Matching Width	50	min^{-1}	0 to 65535	5-14
45	VA	High Speed Range	1000	min^{-1}	0 to 65535	5-14

The parameter of “02 VCZDAT” cannot be set from a digital operator.

As for the parameter, setting becomes effective after control power supply re-input.

■ General Parameter Group 9 [Function enabling condition setting]

Page	Symbol	Name	Standard Value	Display Range	Reference page
13	GC1	Gain Switching Function, Select Input 1	00: _Always_ Disable	00 to 27	5-15,16
14	GC2	Gain Switching Function, Select Input 2	00: _Always_ Disable	00 to 27	5-15,16
15	SUPFSEL1	Vibration Suppressor Frequency, Select Input 1	00: _Always_ Disable	00 to 27	5-15,16
16	SUPFSEL2	Vibration Suppressor Frequency, Select Input 2	00: _Always_ Disable	00 to 27	5-15,16
17	PLPCON	Position Loop Proportional Control, Switching Function	01: _Always_ Enable	00 to 27	5-15,16
26	VLPCON	Velocity Loop Proportional Control, Switching Function	04: _CONT2_ON	00 to 27	5-15,16
27	VCOMPS	Velocity Compensation Function, Select Input	00: _Always_ Disable	00 to 27	5-15,16
30	TCOMPS1	Torque Compensation Function, Select Input 1	00: _Always_ Disable	00 to 27	5-15,16
31	TCOMPS2	Torque Compensation Function, Select Input 2	00: _Always_ Disable	00 to 27	5-15,16
33	OBS	Disturbance Observer	00: Always_ Disable	00 to 27	5-15,16
41	DISCHARG	Main Power Discharge Function	01: _Always_ Enable	00 to 27	5-15,16

■ General Parameter Group A

[Settings of General purpose input-output/Monitor output selection/Configuration of R-Setup]

Page	Symbol	Name	Standard Value	Display Range	Reference page
00	CONT1	General Purpose Input 1	01: _S-ON	00 to 30	5-17
01	CONT2	General Purpose Input 2	16: _+OT	00 to 30	5-17
02	CONT3	General Purpose Input 3	17: _-OT	00 to 30	5-17
03	CONT4	General Purpose Input 4	12: _EXT-E	00 to 30	5-17
04	OUT1	General output 1 output setting	03: _HBON	00 to 31	5-18
05	OUT2	General output 2 output setting	0B: _A-RDY	00 to 31	5-18
10	DMON	Digital Monitor, Output Signal Selection	00: Always_OFF	00 to 5B	5-19 to 21
11	MON1	Analog Monitor 1, Output Signal Selection	05: VMON_2mV/ min^{-1}	00 to 15	5-19 to 21
12	MON2	Analog Monitor 2, Output Signal Selection	02: TCMON_2V/TR	00 to 15	5-19 to 21
13	MONPOL	Analog monitor output polarity	00: _MON1+_MON2+	00 to 08	5-22
20	COMAXIS	Setup Software, Communication Axis Number	01: _#1	01 to 0F	5-22
21	COMBAUD	Setup Software, Communication Baud Rate	05: _38400bps	00 to 05	5-22

As for the parameter, setting becomes effective after control power supply re-input.

■ General Parameter Group B [Setting related to sequence/alarms]

Page	Symbol	Name	Standard Value	Unit	Display Range	Reference page
00	JOGVC	JOG Velocity Command	50	min^{-1}	0 to 32767	5-23
12	ACTEMR	Emergency Stop Operation	00: _SERVO-BRAKE	—	00 to 01	5-23
13	BONDLY	Delay Time of Engaging Holding Brake (Holding brake holding delay time)	300	ms	0 to 1000	5-23
14	BOFFDLY	Delay Time of Releasing Holding Brake (Holding brake release delay time)	300	ms	0 to 1000	5-23
15	BONBGN	Brake Operation Beginning Time	0	ms	0 to 65535	5-23
16	PFDDLY	Power Failure Detection Delay Time	32	ms	20 to 1000	5-24
20	OFWLV	Following Error Warning Level	65535	x 1024 pulse	1 to 65535	5-24
22	OLWLV	Overload Warning Level	90	%	20 to 100	5-24
23	VFBALM	Speed Feedback Error (ALM_C3) Detection	01: _Enabled	—	00 to 01	5-24
24	VCALM	Speed Control Error (ALM_C2) Detection	00: _Disabled	—	00 to 01	5-24
25	POFDLY	POFF detection delay time	32	ms	20 to 1000	5-25

As for the parameter, setting becomes effective after control power supply re-input.

■ General Parameter Group C [Encoder related setting]

Page	Symbol	Name	Standard Value	Unit	Display Range	Reference page
00	ABS/INCSYS	Position detection system choice	00: _Absolute	--	00 to 01	5-25
01	ENFIL	Motor Incremental Encoder, Digital Filter	01: _220nsec	—	00 to 07	5-25
02	EX-ENFIL	External Incremental Encoder, Digital Filter	01: _220nsec	—	00 to 07	5-26
03	EX-ENPOL	External Encoder Polarity Invert	00: _Type1	—	00 to 07	5-26
08	ECLRFUNC	Absolute Encoder Clear Function Selection	00: _Status_MultiTurn	—	00 to 01	5-26

As for the parameter, setting becomes effective after control power supply re-input.

To the customers using “Absolute encoder for incremental system” with R motor;

Please set the setting of the parameter of the table below value to the servo amplifier.

Group	Page	Symbol	Name	Setting value	Contents
C	00	ABS/INCSYS	Position detection system choice	00: _Absolute	Absolute system
C	08	ECLRFUNC	Absolute Encoder Clear Function Selection	01: _Status	Clear Only Encoder Status
D	41	Sw2	Funciton switch 2	Bit4 = 1: Available	Return-to-origin function of absolute encoder is necessary to settle coordinate.

As for the parameter, setting becomes effective after control power supply re-input.

To the customers using “Battery backup method absolute encoder” with incremental system with Q motor:

Please set the setting of the parameter of the table below value to the servo amplifier.

Group	Page	Symbol	Name	Setting value	Contents
C	00	ABS/INCSYS	Position detection system choice	01: _Incremental	Absolute system
C	08	ECLRFUNC	Absolute Encoder Clear Function Selection	01: _Status	Clear Only Encoder Status
D	41	Sw2	Funciton switch 2	Bit4 = 1: Available	Return-to-origin function of absolute encoder is necessary to settle coordinate.

As for the parameter, setting becomes effective after control power supply re-input.

■ Encoder specifications

Type	Within 1 rotation	Multiple rotation	Notes
PA035C	131072(17bit)	65536(16bit)	Battery backup method absolute encoder
PA035S	131072(17bit)	—	Absolute encoder for incremental system

To the customers using “Battery backup method absolute encoder” with incremental system:

See the parameter set values for your servo amplifier in the table below and make sure to use them.

General parameter

Group	Page	Symbol	Name	Setting value	Contents
C	00	ABS/INCSYS	Position detection system choice	01: _Incremental	Absolute system
C	08	ECLRFUNC	Absolute Encoder Clear Function Selection	01: _Status	Clear Encoder Status only
D	41	Sw2	Funciton switch 2	Bit4 = 1: Available	Return-to-origin function of absolute encoder is necessary to settle coordinate.

■ System parameter [for Setup software - R-Setup]

Page	Name	Display Range	Reference page
00	Main Power, Input Type	2 ways (depending on the hardware type)	5-27
01	Motor Encoder Type	2 ways (depending on the hardware type)	5-27
02	Incremental Encoder, Function Setting	2 ways (depending on the hardware type)	5-27
03	Incremental Encoder, Resolution Setting	500P/R to 65535P/R	5-27
04	Absolute Encoder, Function Setting	4 ways (depending on the hardware type)	5-27
05	Absolute Encoder, Resolution Setting	11ways	5-27
06	Motor Type	—	5-28
08	Control Mode	6 ways	5-28
09	Position Loop Control and Position Loop Encoder Selection	2ways (depending on the hardware type)	5-28
0A	External Encoder, Resolution Setting	500P/R to 65535P/R	5-28
0B	Regenerative Resistor Selection	3ways	5-28

■ General parameter Group 0 [Auto-tuning settings]

Page	Contents
00	**Tuning mode [TUNMODE]** Setting range: 00 to 02 / Unit: — / Standard value: 00: _AutoTun Selection / Contents: 00: _AutoTun — Automatic Tuning 01:_AutoTun_JRAT-Fix — Automatic Tuning (JRAT Fixed) 02: _ManualTun — Manual Tuning
01	**Automatic Tuning Characteristic [ATCHA]** Setting range: 00 to 04 / Unit: — / Standard value: 00: _Positioning1 Selection / Contents: 00: _Positioning1 — Positioning Control 1 01: _Positioning2 — Positioning Control 2 02: _Positioning3 — Positioning Control 3 03: _Trajectory1 — Trajectory Control 04: _Trajectory2 — Trajectory Control (KP Fixed)
02	**Automatic Tuning Response [ATRES]** Setting range: 1 to 30 / Unit: — / Standard value: 5 Sets the auto-tuning response. The larger the set value, the higher the response. Make the setting suitable for rigidity of the device.
03	**Automatic Tuning, Automatic Parameter Saving [ATSAVE]** Setting range: 00 to 01 / Unit: — / Standard value: 00: _Auto_Saving The parameter (JRAT) obtained from auto-tuning result is automatically saved. Selection / Contents: 00:_Auto_Saving — Saves Parameter Automatically in JRAT1. 01: _No_Saving — Automatic Saving is Invalidity
10	**Automatic Notch Filter Tuning, Torque Command [ANFILTC]** Setting range: 10 to 100 / Unit: % / Standard value: 50 Sets the torque command value applied to the motor at the time of auto-notch filter tuning. Larger value makes the tuning more accurate; however, note that it also makes the move of the machine larger.
20	**Automatic Vibration Suppressor Frequency Tuning, Torque Command [ASUPTC]** Setting range: 10 to 100 / Unit: % / Standard value: 25 Sets the torque command value applied to the motor at the time of auto-vibration suppressing frequency tuning. Larger value makes the tuning more accurate; however, note that it also makes the move of the machine larger.
21	**Automatic Vibration Suppressor Frequency Tuning, Friction Compensation Value [ASUPFC]** Setting range: 0 to 50 / Unit: % / Standard value: 5 Sets the friction torque compensation added to the motor torque at the time of auto-vibration suppressing frequency tuning. Set this value close to actual friction torque, and vibration suppressing frequency tuning will be more accurate.

■ General parameter Group 1 [Basic control parameter setting]

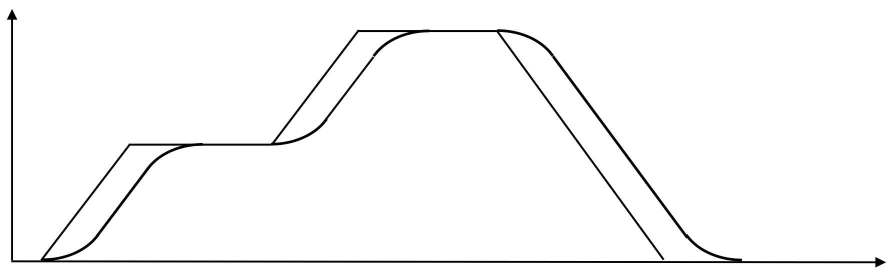
<table>
<tr><th>Page</th><th colspan="2">Contents</th></tr>
<tr><td rowspan="3">00</td><td colspan="2">Time constant of position command smoothing [PCSMT]</td></tr>
<tr><td>

Setting range	Unit	Standard setting value
0 to 1000	ms	0

</td><td>This moving average filter makes position command pulse smooth.</td></tr>
<tr><td colspan="2">

- Sets time constant.
- This gives S-shaped curve acceleration and deceleration to all the moves such as point moving (including continuous variable velocity moving) and JOG-move.
- When smoothing point moving command with accompanying continuous variable velocity moving, use this paramenter instead of S-shaped acceleration/deceleration time in point table.
- When set value is “0,” filter becomes invalid.
- Acceleration and deceleration of “S_rat” in Parameter GroupD, page 0C and and point data are doubly-S-shaped curved in this function, so set the S-shaped curve acceleration and deceleration time to “0” to use this function. To use this parameter, set general parameter Group8 page18 to “01:_Before_Filter.”

  - Continuous variable velocity moving case



</td></tr>
<tr><td rowspan="2">01</td><td colspan="2">Position command filter [PCFIL]</td></tr>
<tr><td>

Setting range	Unit	Standard value
0.0 to 2000.0	ms	0.0

</td><td>Parameter to put primary low pass filter to the position command. Time constant of the filter is set. Filter is disabled with the set value of 0.0ms.</td></tr>
<tr><td rowspan="2">02</td><td colspan="2">Position Loop Proportional Gain 1 [KP1]</td></tr>
<tr><td>

Setting range	Unit	Standard value
1 to 3000	1/s	30

</td><td>Proportional gain for position controller.
When auto-tuning result saving is executed, the tuning result is automatically saved in this parameter.</td></tr>
<tr><td rowspan="2">03</td><td colspan="2">Position Loop Integral Time Constant 1 [TPI1]</td></tr>
<tr><td>

Setting range	Unit	Standard value
0.5 to 1000.0	ms	1000.0

</td><td>Integral time constant for position controller. When position loop proportional control switching function is disabled, this setting becomes enabled.
Integral term is disabled (proportional control) with the set value of 1000.0ms.</td></tr>
</table>

Page	Contents	
04	Higher Tracking Control, Position Compensation Gain [TRCPGN] Setting range: 0 to 100; Unit: %; Standard value: 0	Parameter to enhance following-up performance. The larger value can make the following-up performance higher. When the value other than 0% is set, position command filter and feed forward gain are automatically set.
05	Feed Forward Gain [FFGN] Setting range: 0 to 100; Unit: %; Standard value: 0	Feed forward compensation gain at the time of position control.
08	Feed Forward Filter [FFFIL] Setting range: 1 to 2000; Unit: Hz; Standard value: 2000	Parameter to put primary low pass filter to feed forward command. Sets the cut-off frequency. Filter is disabled with the set value of 2000Hz.
10	Velocity Command Filter [VCFIL] Setting range: 1 to 2000; Unit: Hz; Standard value: 2000	Parameter to put primary low pass filter to velocity command. Sets the cut-off frequency. Filter is disabled with the set value of 2000Hz.
12	Velocity Feedback Filter [VDFIL] Setting range: 1 to 2000; Unit: Hz; Standard value: 1500	Parameter to put primary low pass filter to velocity feedback. Sets the cut-off frequency. Filter is disabled with the set value of 2000Hz.
13	Velocity Loop Proportional Gain 1 [KVP1] Setting range: 1 to 2000; Unit: Hz; Standard value: 50	Proportional gain of velocity controller. When auto-tuning result saving is executed, the tuning result is automatically saved in this parameter.
14	Velocity Loop Integral Time Constant 1 [TVI1] Setting range: 0.5 to 1000.0; Unit: ms; Standard value: 20.0	Integral time constant of velocity controller. When velocity loop proportional control switching function is disabled, this set value is enabled. Integral term (proportional control) is disabled with the set value of 1000.0ms. When auto-tuning result saving is executed, the tuning result is automatically saved in this parameter.
15	Load Inertia Ratio (Load Mass Ratio) 1 [JRAT1] Setting range: 0 to 15000; Unit: %; Standard value: 100	Sets inertia moment of the loading device to the motor inertia moment. Set value＝JL/JM×100% JL: Load inertia moment JM: Motor inertia moment When auto-tuning result saving is executed, the tuning result is automatically saved in this parameter.
16	Higher Tracking Control, Velocity Compensation Gain [TRCVGN] Setting range: 0 to 100; Unit: %; Standard value: 0	Parameter to enhance following-up performance. The larger value can make the following-up performance higher. When velocity loop proportional control switching function is used, set this to 0%.
17	Acceleration Feedback Gain [AFBK] Setting range: -100.0 to 100.0; Unit: %; Standard value: 0.0	Compensation function to make the velocity loop stable. Multiply this gain with the detected acceleration to compensate torque command. Setting unit is 0.1%.
18	Acceleration Feedback Filter [AFBFIL] Setting range: 1 to 2000; Unit: Hz; Standard value: 500	Parameter to put primary low pass filter to acceleration feedback compensation. Sets the cut-off frequency. Filter is disabled with the set value of 2000Hz.
20	Torque Command Filter 1 [TCFIL1] Setting range: 1 to 2000; Unit: Hz; Standard value: 600	Parameter to put low pass filter to torque command. Sets the cut-off frequency. When auto-tuning result saving is executed, the tuning result is automatically saved in this parameter.
21	Torque Command Filter Order [TCFILOR] Setting range: 1 to 3; Unit: Order; Standard value: 2	Parameter to set ordinal number of torque command filter.

■ General parameter

Group 2 [vibration suppressing control / notch filter / disturbance observer settings]

Page	Contents			
00	Vibration Suppressor Frequency 1 [SUPFRQ1]			
	Setting range	Unit	Standard value	Parameter to set the frequency of restricting vibration. Inside the servo amplifier, vibration-suppressing frequency from 5 to 99Hz is treated by 1HzUnit, and that from 100 to 500Hz is by 10HzUnit. Even when parameters set by the unit lower than these units, no changes will be made to the operation. Vibration suppressing control is disabled with the set value of 500Hz. When auto-frequency tuning is executed, the tuning result is automatically saved in this parameter. Change this while the motor stops.
	5 to 500	Hz	500	
01	Vibration Suppressor Level Selection [SUPLV]			
	Setting range	Unit	Standard value	Parameter to set the size of vibration suppressing control effect. The smaller the value is, the greater the effect will be. Change this while the motor stops.
	00 to 03	—	00	
10	Velocity Command,Notch Filter [VCNFIL]			
	Setting range	Unit	Standard value	Parameter to set notch filter to velocity command. Sets the center frequency. Inside the servo amplifier, the center frequency from 50 to 99Hz is treated by 1HzUnit and that from 100 to 500Hz is by 10HzUnit. Even when parameters set by the unit lower than these units, no changes will be made to the operation. Filter is disabled with the set value of 500Hz.
	50 to 500	Hz	500	
20	Torque Command,Notch Filter A [TCNFILA]			
	Setting range	Unit	Standard value	Parameter to set notch filter to torque command. Sets the center frequency. Inside the servo amplifier, the center frequency is treated by 10HzUnit. Even when parameters set by the unit of 1Hz, no changes will be made to the operation. Filter is disabled with the set value of 2000Hz. When auto-notch filter tuning is executed, the tuning result is automatically saved in this parameter.
	100 to 2000	Hz	2000	
21	TCNFILA, Low Frequency Phase Delay Improvement [TCNFPA]			
	Setting range	Unit	Standard value	Parameter to improve phase delay at lower frequency than center frequency of torque command notch filter A. The larger the value is, the greater the effect is. Same characteristics as the standard notch filter with the set value of 0.
	00 to 02	—	00	
22	Torque Command,Notch Filter B [TCNFILB]			
	Setting range	Unit	Standard value	Parameter to set notch filter to torque command. Sets the center frequency. Inside the servo amplifier, the center frequency is treated by 10HzUnit. Even when parameters set by the unit of 1Hz, no changes will be made to the operation. Filter is disabled with the set value of 2000Hz.
	100 to 2000	Hz	2000	
23	TCNFILB, Depth Selection [TCNFDB]			
	Setting range	Unit	Standard value	Parameter to set the depth of torque command notch filter B. The larger the value is, the shallower.
	00 to 03	—	00	
24	Torque Command, Notch Filter C [TCNFILC]			
	Setting range	Unit	Standard value	Parameter to set notch filter to torque command. Sets the center frequency. Inside the servo amplifier, the center frequency is treated by the unit of 10Hz. Even when parameters set by the unit of 1Hz, no changes will be made to the operation. Filter is disabled with the set value of 2000Hz.
	100 to 2000	Hz	2000	
25	TCNFILC, Depth Selection [TCNFDC]			
	Setting range	Unit	Standard value	Parameter to set the depth of torque command notch filter C. The larger the value is, the shallower.
	00 to 03	—	00	
26	Torque Command,Notch Filter D [TCNFILD]			
	Setting range	Unit	Standard value	Parameter to set notch filter to torque command. Sets the center frequency. Inside the servo amplifier, the center frequency is treated by the unit of 10Hz. Even when parameters set by the unit of 1Hz, no changes will be made to the operation. Filter is disabled with the set value of 2000Hz.
	100 to 2000	Hz	2000	

Page	Contents
27	TCNFILD, Depth Selection [TCNFDD]

Setting range	Unit	Standard value
00 to 03	—	00

Parameter to set the depth of torque command notch filter D. The greater the value is, the shallower the depth will be.

Page	Contents
30	Observer characteristic [OBCHA]

Setting range	Unit	Standard value
00 to 01	—	00: _Low

Selects the observer characteristics.

Selection	Contents
00: _Low	For Low Cycle
01: _Middle	For Middle Cycle

Page	Contents
31	Observer Compensation Gain [OBG]

Setting range	Unit	Standard value
0 to 100	%	0

Observer compensation gain. The larger the value is, the higher the suppression characteristics will be. However, if this is too large, oscillation may sometimes occur.

Page	Contents
32	Observer Output, Low Pass Filter [OBLPF]

Setting range	Unit	Standard value
1 to 2000	Hz	50

Sets the cut off frequency of observer output low pass filter. Filter is disabled with the set value of 2000Hz.
When the observer characteristics are “01: Middle (For Middle Cycle),” the function is disabled.

Page	Contents
33	Observer Output, Notch Filter [OBNFIL]

Setting range	Unit	Standard value
100 to 2000	Hz	2000

Sets the center frequency of observer output notch filter. Inside the servo amplifier, the center frequency is treated by 10HzUnit. Even when parameters set by the unit of 1Hz, no changes will be made to the operation.
Filter is disabled with the set value of 2000Hz.

■ General parameter

Group 3 [Gain switching control / vibration suppressing frequency switching settings]

Page	Contents
00	Position Loop Proportional Gain 2 [KP2]

Setting range	Unit	Standard value
1 to 3000	1/s	30

Proportional gain for position controller.

Page	Contents
01	Position Loop Integral Time Constant 2 [TPI2]

Setting range	Unit	Standard value
0.5 to 1000.0	ms	1000.0

Integral time constant for position controller.
Integral term is disabled (proportional control) with the set value of 1000.0ms.

Cannot be used when the position loop proportional control switching function is enabled.

Page	Contents
02	Velocity Loop Proportional Gain 2 [KVP2]

Setting range	Unit	Standard value
1 to 2000	Hz	50

Proportional gain for velocity controller.
When load inertia is the one set by load inertia moment ratio (load mass ratio) 2, the response is this set value.

Page	Contents
03	Velocity Loop Integral Time Constant 2 [TVI2]

Setting range	Unit	Standard value
0.5 to 1000.0	ms	20.0

Integral time constant for velocity controller.
Enabled when velocity loop proportional control switching function is disabled.
Integral term is disabled (proportional control) with the set value of 1000.0ms.

Page	Contents
04	Load Inertia Ratio (Load Mass Ratio) 2 [JRAT2]

Setting range	Unit	Standard value
0 to 15000	%	100

Sets the inertia moment of load device to the motor inertia moment. Set value＝JL/JM x 100%
JL: Load inertia moment
JM: Motor inertia moment

Page	Contents
05	Torque Command Filter 2 [TCFIL2]

Setting range	Unit	Standard value
1 to 2000	Hz	600

Parameter to set low pass filter to torque command. Sets the cut off frequency.

Page	Contents	Setting range	Unit	Standard value	Description
10	Position Loop Proportional Gain 3 [KP3]	1 to 3000	1/s	30	Proportional gain for position controller.
11	Position Loop Integral Time Constant 3 [TPI3]	0.5 to 1000.0	ms	1000.0	Integral time constant for position controller. Integral term is disabled (proportional control) with the set value of 1000.0ms. Cannot be used when position loop proportional control switching function is enabled.
12	Velocity Loop Proportional Gain 3 [KVP3]	1 to 2000	Hz	50	Proportional gain for velocity controller. When load inertia is the one set by load inertia moment ratio (load mass ratio) 2, the response is this set value.
13	Velocity Loop Integral Time Constant 3 [TVI3]	0.5 to 1000.0	ms	20.0	Integral time constant for velocity controller. This setting is enabled when velocity loop proportional control switching function is disabled. Integral term is disabled (proportional control) with the set value of 1000.0ms.
14	Load Inertia Ratio (Load Mass Ratio) 3 [JRAT3]	0 to 15000	%	100	Sets the inertia moment of load device to the motor inertia moment. Set value＝JL/JM x 100% JL: Load inertia moment JM: Motor inertia moment
15	Torque Command Filter 3 [TCFIL3]	1 to 2000	Hz	600	Parameter to set low pass filter to torque command. Sets the cut off frequency.
20	Position Loop Proportional Gain 4 [KP4]	1 to 3000	1/s	30	Proportional gain for position controller.
21	Position Loop Integral Time Constant 4 [TPI4]	0.5 to 1000.0	ms	1000.0	Integral time constant for position controller. Integral term is disabled (proportional control) with the set value of 1000.0ms. Cannot be used when position loop proportional control switching function is enabled.
22	Velocity Loop Proportional Gain 4 [KVP4]	1 to 2000	Hz	50	Proportional gain for velocity controller. When load inertia is the one set by load inertia moment ratio (load mass ratio) 2, the response is this set value.
23	Velocity Loop Integral Time Constant 4 [TVI4]	0.5 to 1000.0	ms	20.0	Integral time constant for velocity controller. This setting is enabled when velocity loop proportional control switching function is disabled. Integral term is disabled (proportional control) with the set value of 1000.0ms.
24	Load Inertia Ratio (Load Mass Ratio) 4 [JRAT4]	0 to 15000	%	100	Sets the inertia moment of load device to the motor inertia moment. Set value = JL/JM x 100% JL: Load inertia moment JM: Motor inertia moment
25	Torque Command Filter 4 [TCFIL4]	1 to 2000	Hz	600	Parameter to set low pass filter to torque command. Sets the cut off frequency.
30	Low Pass Filter of Gain Switching [GCFIL]	0 to 100	ms	0	Parameter to set time constant for gain switching. The larger the value is, the gentler the switching is.

Page	Contents

Page 40

Vibration Suppressor Frequency 2 [SUPFRQ2]

Setting range	Unit	Standard value
5 to 500	Hz	500

Parameter to set the frequency of vibration suppressing vibration.
In the servo amplifier, the vibration suppressing frequency from 5 to 99Hz is treated by 1Hz unit, and from 100 to 500Hz is by 10Hz unit. Operations do not change even if parameters set by the unit lower than these units.
Vibration suppressing control is disabled when the set value is 500Hz.

Change this while the motor stops.

Page 41

Vibration Suppressor Frequency 3 [SUPFRQ3]

Setting range	Unit	Standard value
5 to 500	Hz	500

Parameter to set the frequency of vibration suppressing vibration.
In the servo amplifier, the vibration suppressing frequency from 5 to 99Hz is treated by 1H unit, and from 100 to 500Hz is by 10Hz unit. Operations do not change even if parameters set by the unit lower than these units.
Vibration suppressing control is disabled when the set value is 500Hz.

Change this while the motor stops.

Page 42

Vibration Suppressor Frequency 4 [SUPFRQ4]

Setting range	Unit	Standard value
5 to 500	Hz	500

Parameter to set the frequency of vibration suppressing vibration.
In the servo amplifier, the vibration suppressing frequency from 5 to 99Hz is treated by 1H unit, and from 100 to 500Hz is by 10Hz unit. Operations do not change even if parameters set by the unit lower than these units.
Vibration suppressing control is disabled when the set value is 500Hz.

Change this while the motor stops.

■ General parameter Group 4 [High setting control settings]

Page	Contents

Page 00

Command Velocity, Low Pass Filter [CVFIL]

Setting range	Unit	Standard value
1 to 2000	Hz	1000

Sets the cut off frequency of low pass filter, when command velocity is calculated. When the position command resolution is low, lower the cut off frequency.
Filter is disabled when the set value is 2000Hz.

Page 01

Command Velocity Threshold [CVTH]

Setting range	Unit	Standard value
0 to 65535	min^{-1}	20

When the command velocity calculated from position command is larger than this threshold, acceleration or deceleration compensation will be performed.

Page 02

Acceleration Compensation [ACCCO]

Setting range	Unit	Standard value
-9999 to +9999	x 50 Pulse	0

Compensation at acceleration.

Page 03

Deceleration Compensation [DECCO]

Setting range	Unit	Standard value
-9999 to +9999	x 50 Pulse	0

Compensation at deceleration.

■ General parameter Group 8 [Control system settings]

Page	Contents

Page 17 — Positioning method [EDGEPOS]

Setting range	Unit	Standard value
00 to 01	—	00: _Pulse _Interval

Select the encoder pulse positioning from the contents below.

Selection	Contents
00: _Pulse_Interval	Specify Pulse Interval
01: _Pulse_Edge	Specify Pulse Edge

The set value is enabled after control power is turned ON again.

Page 18 — Inposition / Position Deviation Monitor [PDEVMON]

Setting range	Unit	Standard value
00 to 01	—	00: _After_Filter

Select the positioning complete signal (IPN) and position deviation monitor from the contents below.

Selection	Contents
00: _After_Filter	Compare "Position Command Value After Filter Passes by" with "Feedback Value"
01: _Before_Filter	Compare "Position Command Value Before Filter Passes by" with "Feedback Value"

Page 19 — Deviation Clear Selection [CLR]

Setting range	Unit	Standard value
00 to 01	—	00: _Type1

Select the position deviation clearing method from the contents below.

Selection	Contents	
00: _Type1	When SERVO-OFF/ Clear Deviation : Deviation Clear Input/ Level Detection	During servo OFF, deviation clear is always executed. While deviation clear input is ON, deviation clear is always executed.
01: _Type2	When SERVO-OFF/ Clear Deviation : Deviation Clear Input/ Edge Detection	At the edge of OFF →ON of deviation clear input, deviation clear is executed.

Page 24 — Preset Velocity Compensation Command [VCOMP]

Setting range	Unit	Standard value
-9999 to +9999	min^{-1}	0

Parameter for using velocity addition command in a fixed value when velocity addition function is used.

Page 28 — Velocity Limit [VCLM]

Setting range	Unit	Standard value
1 to 65535	min^{-1}	65535

Parameter for restricting the velocity command.
Sets the maximum value of velocity command. Velocity command is restricted by this value at operations of position control and velocity control.
When the set value is larger than 50000, velocity command is restricted at (maximum speed × 1.1). Set this parameter when it is to be restricted at lower than (motor rotation speed x 1.1).
(Use the standard value usually.)

Selection	Contents
01: _Analog_Input	When torque addition function is valid, analog torque addition command value is used.
02: _TCOMP	When torque addition function is valid, internal torque addition command value is used.

Page 31 — Preset Torque Compensation Command 1 [TCOMP1]

Setting range	Unit	Standard value
-500 to +500	%	0

Parameter for using torque addition command in a fixed value, when torque addition function is used.

Page 32 — Preset Torque Compensation Command 2 [TCOMP2]

Setting range	Unit	Standard value
-500 to +500	%	0

Parameter for using torque addition command in a fixed value, when torque addition function is used.

Page 37 — Torque Limit at Sequence Operation [SQTCLM]

Setting range	Unit	Standard value
10 to 500	%	120

Parameter for setting sequence operation torque limit value (JOG operation, holding brake operation waiting, and OT status, etc.) Torque limit value is determined by comparing it with the rated output torque. (100%=rated torque)
During sequence operation, output torque is restricted by this set value.
Output torque is restricted by TP if a value exceeding the peak output torque TP is selected.

Page	Contents	
40	In-Position Near Range [NEAR]	
	Setting range: 1 to 65535 / Unit: Pulse / Standard value: 500	Parameter for setting the output range of near range signal (near in-position complete). Near range signal is output when the deviation counter is lower than this set value. Encoder pulse is standard irrespective of electronic gear and command multiplication functions.
42	Speed Zero Range [ZV]	
	Setting range: 50 to 500 / Unit: min^{-1} / Standard value: 50	Set value for detecting zero-speed status (motor stop). When the motor speed becomes lower than this value, zero-speed status is detected.
43	Low Speed Range [LOWV]	
	Setting range: 0 to 65535 / Unit: min^{-1} / Standard value: 50	Parameter for setting low-speed output range. When the speed is lower than this value, low-speed range is output.
44	Speed Matching Width [VCMP]	
	Setting range: 0 to 65535 / Unit: min^{-1} / Standard value: 50	Parameter for setting the range of velocity matching output. Velocity matching is output when the speed deviation (difference between speed command and actual speed) is within the setting range.
45	High Speed Range [VA]	
	Setting range: 0 to 65535 / Unit: min^{-1} / Standard value: 1000	Parameter for setting the value for speed attainment output. When the speed exceeds this set value, velocity attainment is output. If the motor speed exceeds the selected value during torque control operations, and when the control switching function is enabled, the torque command is always set to 0. Fixed speed cannot be controlled. Avoid continuous usage in this manner.

■ General parameter Group 9 [Condition settings for enabling functions]

Input signals and conditions to enable the functions of each page are set.

✍ Selection contents to be set are on the next page.

Page	Contents	Setting range	Standard value
13	Gain Switching Function, Select Input 1 [GC1]	00 to 27	00: _Always_Disable
14	Gain Switching Function, Select Input 2 [GC2]	00 to 27	00: _Always_Disable
15	Vibration Suppressor Frequency, Select Input 1 [SUPFSEL1]	00 to 27	00: _Always_Disable
16	Vibration Suppressor Frequency, Select Input 2 [SUPFSEL2]	00 to 27	00: _Always_Disable
17	Position Loop Proportional Control, Switching Function [PLPCON]	00 to 27	01: _Always_Enable
26	Velocity Loop Proportional Control, Switching Function [VLPCON]	00 to 27	00: _CONT2_ON
27	Velocity Compensation Function, Select Input [VCOMPS]	00 to 27	00: _Always_Disable
30	Torque Compensation Function, Select Input 1 [TCOMPS1]	00 to 27	00: _Always_Disable
31	Torque Compensation Function,Select Input 2 TCOMPS2]	00 to 27	00: _Always_Disable
33	Disturbance Observer [OBS]	00 to 27	00: _Always_Disable
41	Main Power Discharge Function [DISCHARG]	00 to 27	01: _Always_Enable

■ General parameter Group 9 List of selection contents

When functions are to be always enabled or disabled.

Selection	Contents
00: _Always_ Disable	Always disable the function.
01: _Always_ Enable	Always enable the function.

When functions are to be set with the conditions of servo motor rotation speed.

Selection	Contents
12: _LOWV_IN	Enable the function during low speed status (speed is less than LOWV).
13: _LOWV_OUT	Enable the function while low speed status is not kept.
14: _VA_IN	Enable the function during high speed status (speed is more than VA).
15: _VA_OUT	Enable the function while high speed status is not kept.
16: _VCMP_IN	Enable the function during speed matching status (velocity deviation < VCMP).
17: _VCMP_OUT	Enable the function while speed matching status is not kept.
18: _ZV_IN	Enable the function during zero speed status (speed is less than ZV).
19: _ZV_OUT	Enable the function while zero speed status is not kept.

When functions are to be set with the conditions of positioning signals.

Selection	Contents
20: _NEAR_IN	Enable the function during NEAR status (position deviation < NEAR).
21: _NEAR_OUT	Enable the function while NEAR status is not kept.
1A: _INP_IN	Enable the function during In-Position status (position deviation < INP).
1B: _INP_OUT	Enable the function while In-Position status is not kept.
26: _INPZ_IN	Enable the function during PCMD=0 and In-position Status.
27: _INPZ_OUT	Disable the function during PCMD=0 or In-position Status.

When functions are to be set with the conditions of torque / speed limit

Selection	Contents
1C: _TLC_IN	Enable the function during torque limiting.
1D: _TLC_OUT	Enable the function while torque limiting is not performed.
1E: _VLC_IN	Enable the function during velocity limiting.
1F: _VLC_OUT	Enable the function while velocity limiting is not performed.

When functions are to be set with the servo motor rotation direction and stop status.

Selection	Contents
22: _VMON_>_+LV	Enable the function when Moving Direction is Positive (VMON > LOWV).
23: _VMON_<=_+LV	Enable the function when Moving Direction is not Positive (VMON <= LOWV).
24: _VMON_<_-LV	Enable the function when Moving Direction is Negative (VMON < LOWV).
25: _VMON_>=_-LV	Enable the function when Moving Direction is not Negative (VMON >= LOWV).

■ General parameter Group A

[Settings of General purpose input-output/Monitor output selection/Configuration of R-Setup]

Page	Name	Setting range	Standard value	Description
00	General Purpose input 1 [IN1]	00 to 30	01: _S-ON	Select Input signals from General Purpose Input IN1 – IN4 Turn on Input signals that selected from these parameters whitle General Purpose input IN1-IN4 is turn-on. **【Caution】** ・Specify one inputting (incoming) route to avoid inputting signals doubly (signals selected in general input and input information via communication) as much as possible. ・When input signals doubly, internal amplifier interpretes the signals as logic OR simply. Specifying input source in advance is recommended.
01	General Purpose input 2 [IN2]	00 to 30	16: _+OT	
02	General Purpose input 3 [IN3]	00 to 30	17: _-OT	
03	General Purpose input 3 [IN4]	00 to 30	12: _EXT-E	

00: _No_SELECT	Always disable the function
01: _S-ON	Input signal S-ON is selected
02: _RUN	Input signal RUN is selected
03: _ZRT	Input signal ZRT is selected
04: _+JOG	Input signal +JOG is selected
05: _-JOG	Input signal –JOG is selected
06: _RAP	Input signal RAP is selected
07: _ARST	Input signal ARST is selected
08: _CACL	Input signal CACL is selected
09: _OVRD_0	Input signal CVRD_0 is selected
0A: _OVRD_1	Input signal OVRD_1 is selected
0B: _OVRD_2	Input signal OVRD_2 is selected
0C: _OVRD_3	Input signal OVRD_3 is selected
0D: _+1Step	Input signal +1 Step is selected
0E: _-1Step	Input signal –1 Step is selected
0F: _IRUN	Input signal IRUN is selected
10: _MFIN	Input signal MFIN is selected
11: _BATCLR	Input signal BATCLR is selected
12: _EXT-E	Input signal EXT-E is selected
13: _BRK-FREE	Input signal BRK-FREE is selected
14: _HOME	Input signal HOME is selected
15: _SDN	Input signal SDN is selected
16: _+OT	Input signal +OT is selected
17: _-OT	Input signal –OT is selected
18: _E-STR	Input signal E-STR is selected
19: _IN(1)	Input signal IN (1) is selected
1A: _IN(2)	Input signal IN (2) is selected
1B: _IN(4)	Input signal IN (4) is selected
1C: _IN(8)	Input signal IN (8) is selected
1D: _IN(16)	Input signal IN (16) is selected
1E: _IN(32)	Input signal IN (32) is selected
1F: _IN(64)	Input signal IN (64) is selected
20: _IN(128)	Input signal IN (128) is selected
21: _CSET	Input signal CSET is selected
22: _IN_C42	Input signal IN_C42 is selected
23: _IN_C43	Input signal IN_C43 is selected
24: _IN_C44	Input signal IN_C44 is selected
25: _IN_C45	Input signal IN_C45 is selected
26: _IN_C46	Input signal IN_C46 is selected
27: _IN_C47	Input signal IN_C47 is selected
28: _IN_C48	Input signal IN_C48 is selected
29: _IN_C49	Input signal IN_C49 is selected
2A: _IN_C4A	Input signal IN_C4A is selected
2B: _IN_C4B	Input signal IN_C4B is selected
2C: _IN_C4C	Input signal IN_C4C is selected
2D: _IN_C4D	Input signal IN_C4D is selected
2E: _IN_C4E	Input signal IN_C4E is selected
2F: _IN_C4F	Input signal IN_C4F is selected
30: _IN_C50	Input signal IN_C50 is selected

Page	Name and Description	
04	General Purpose Output 1 [OUT1] Setting range: 00 to 31 / Standard value: 03: _HBON	Select Output signals from General Purpose Output Out1 – Out4.
05	General Purpose Output 1 [OUT2] Setting range: 00 to 31 / Standard value: 0B: _A-RDY	

00: _Aiways_OFF	The Output is always OFF.
01: _Aiways_ON	The Output is always ON
02: _NCRDY	Output signal NCRDY is selected
03: _HBON	Output signal HBON is selected
04: _ERR	Output signal ERR is selected
05: _EXT	Output signal EXT is selected
06: _MOVE	Output signal MOVE is selected
07: _PFIN	Output signal PFIN is selected
08: _INPS	Output signal INPS is selected
09: _WARN/ZFIN	Output signal WARN/ZFIN is selected
0A: _ALM	Output signal ALM is selected
0B: _A-RDY	Output signal A-RDY is selected
0C: _SVRDY	Output signal SVRDY is selected
0D: _SVACT	Output signal SVACT is selected
0E: _IN-STOP	Output signal IN-STOP is selected
0F: _IN-FEED	Output signal IN-FEED is selected
10: _T-LIM-FLG	Output signal T-LIN-FLG is selected
11: _CRDY	Output signal CRDY is selected
12: _MOUT_0	Output signal MOUT_0 is selected
13: _MOUT_1	Output signal MOUT_1 is selected
14: _MOUT_2	Output signal MOUT_2 is selected
15: _MOUT_3	Output signal MOUT_3 is selected
16: _ OUT_C35	Output signal OUT_C35 is selected
17: _ OUT_C36	Output signal OUT_C36 is selected
18: _ OUT_C37	Output signal OUT_C37 is selected
19: _MSTR	Output signal MSTR is selected
1A: _ZOUT_1	Output signal ZOUT_1 is selected
1B: _ZOUT_2	Output signal ZOUT_2 is selected
1C: _ZOUT_3	Output signal ZOUT_3 is selected
1D: _ZOUT_4	Output signal ZOUT_4 is selected
1E: _ZOUT_5	Output signal ZOUT_5 is selected
1F: _ZOUT_6	Output signal ZOUT_6 is selected
20: _ZOUT_7	Output signal ZOUT_7 is selected
21: _ZOUT_8	Output signal ZOUT_8 is selected
22: _ OUT_C61	Output signal OUT_C61 is selected
23: _ OUT_C62	Output signal OUT_C62 is selected
24: _OUT_C63	Output signal OUT_C63 is selected
25: _OUT_C64	Output signal OUT_C64 is selected
26: _OUT_C65	Output signal OUT_C65 is selected
27: _OUT_C66	Output signal OUT_C66 is selected
28: _OUT_C67	Output signal OUT_C67 is selected
29: _OUT_C68	Output signal OUT_C68 is selected
2A: _OUT_C69	Output signal OUT_C69 is selected
2B: _OUT_C6A	Output signal OUT_C6A is selected
2C: _OUT_C6B	Output signal OUT_C6B is selected
2D: _OUT_C6C	Output signal OUT_C6C is selected
2E: _OUT_C6D	Output signal OUT_C6D is selected
2F: _OUT_C6E	Output signal OUT_C6E is selected
30: _OUT_C6F	Output signal OUT_C6F is selected
31: _OUT_C70	Output signal OUT_C70 is selected

Page	Name and Contents	
10	Digital Monitor, Output Signal Selection [DMON] Setting range: 00 to 5B / Standard value: 00: _Always_OFF	Output signals for digital monitor output are selected. ✍Selection values to be set are incidcated in the next page.
11	Analog Monitor 1, Output Signal Selection [MON1] Setting range: 00 to 15 / Standard value: 05: _VMON_2mV/min^{-1}	Output signals for analog monitor output 1, 2 are selected from the followings.
12	Analog Monitor 2, Output Signal Selection [MON2] Setting range: 00 to 15 / Standard value: 02: _TCMON_2V/TR	

00	Reserved
01: _TMON_2V/TR	Torque (thrust) monitor 2V/ rated torque (thrust)
02: _TCMON_2V/TR	Torque (thrust) command monitor 2V/ rated torque (thrust)
03: _VMON_0.2mV/ min^{-1}	Velocity monitor 0.2mV/ min^{-1}
04: _VMON_1mV/ min^{-1}	Velocity monitor 1mV/ min^{-1}
05: _VMON_2mV/ min^{-1}	Velocity monitor 2mV/ min^{-1}
06: _VMON_3mV/ min^{-1}	Velocity monitor 3mV/ min^{-1}
07: _VCMON_0.2mV/ min^{-1}	Velocity command monitor 0.2mV/ min^{-1}
08: _VCMON_1mV/ min^{-1}	Velocity command monitor 1mV/ min^{-1}
09: _VCMON_2mV/ min^{-1}	Velocity command monitor 2mV/ min^{-1}
0A: _VCMON_3mV/ min^{-1}	Velocity command monitor 3mV/ min^{-1}
0B: _PMON_0.1mV/P	Position deviation counter monitor 0.1mV/ Pulse
0C: _PMON_1mV/P	Position deviation counter monitor 1mV/ Pulse
0D: _PMON_10mV/P	Position deviation counter monitor 10mV/ Pulse
0E: _PMON_20mV/P	Position deviation counter monitor 20mV/ Pulse
0F: _PMON_50mV/P	Position deviation counter monitor 50mV/Pulse
10: _FMON_2mV/kP/s	Position command pulse monitor (position command pulse input frequency)2mV/kPulse/s
11: _FMON_10mV/kP/s	Position command pulse monitor (position command pulse input frequency)10mV/kPulse/s
12: _TLMON_EST_2V/TR	Load torque (thrust) monitor (estimated value)2V/ rated torque (thrust)
13: _Sine-U	U phase electric angle Sin 8V-peak
14: _VBUS_1V/DC100V	Main circuit DC voltage 1V / DC100V
15: _VBUS_1V/DC10V	Main circuit DC voltage 1V / DC10V

● List of selection contents for digital monitor output

Selection		Contents
00H	Always_OFF	The output is always OFF
01H	Always_ON	The output is always ON
02H	S-RDY_ON	The output is ON during Servo Ready complete.
03H	S-RDY_OFF	The output is OFF during Servo Ready complete.
04H	P-ON_ON	The output is ON while the main power supply is turned on.
05H	P-ON_OFF	The output is OFF while the main power supply is turned on.
06H	A-RDY_ON	The output is ON during the main power supply ON permission.
07H	A-RDY_OFF	The output is OFF during the main power supply ON permission.
08H	S-ON_ON	The output is ON during motor excitation.
09H	S-ON_OFF	The output is OFF during motor excitation.
0AH	MBR-ON_ON	The output is ON while holding brake excitation signal outputs.
0BH	MBR-ON_OFF	The output is OFF while holding brake excitation signal outputs.
0CH	TLC_ON	The output is ON during torque limiting.
0DH	TLC_OFF	The output is OFF during torque limiting.
0EH	VLC_ON	The output is ON during velocity limiting.
0FH	VLC_OFF	The output is OFF during velocity limiting.
10H	LOWV_ON	The output is ON during low speed status (speed is less than LOWV).
11H	LOWV_OFF	The output is OFF during low speed status (speed is less than LOWV).
12H	VA_ON	The output is ON during high speed status (speed is more than VA).
13H	VA_OFF	The output is OFF during high speed status (speed is more than VA).
14H	VCMP_ON	The output is ON during speed matching status (velocity deviation < VCMP).
15H	VCMP_OFF	The output is OFF during speed matching status (velocity deviation < VCMP).
16H	ZV_ON	The output is ON during zero speed status (speed is less than ZV).
17H	ZV_OFF	The output is OFF during zero speed status (speed is less than ZV).
18H	INP_ON	The output is ON during In-Position status (position deviation < INP).
19H	INP_OFF	The output is OFF during In-Position status (position deviation < INP).
1AH	NEAR_ON	The output is ON during In-Position Near status (position deviation < NEAR).
1BH	NEAR_OFF	The output is OFF during In-Position Near status (position deviation < NEAR).
1CH	CMD-ACK_ON	The output is ON while command can be accepted.
1DH	CMD-ACK_OFF	The output is OFF while command can be accepted.
1EH	GC-ACK_ON	The output is ON during gain switching.
1FH	GC-ACK_OFF	The output is OFF during gain switching.
20H	PCON-ACK_ON	The output is ON during velocity loop proportional control switching.
21H	PCON-ACK_OFF	The output is OFF during velocity loop proportional control switching.
26H	F-OT_ON	The output is ON during positive over-travel status.
27H	F-OT_OFF	The output is OFF during positive over-travel status.
28H	R-OT_ON	The output is ON during negative over-travel status
29H	R-OT_OFF	The output is OFF during negative over-travel status
2AH	WNG-OFW_ON	The output is ON during following warning status (position deviation > OFWLV).
2BH	WNG-OFW_OFF	The output is OFF during following warning status (position deviation > OFWLV).
2CH	WNG-OLW_ON	The output is ON during over-load warning status
2DH	WNG-OLW_OFF	The output is OFF during over-load warning status
2EH	WNG-ROLW_ON	The output is ON during regenerative over-load warning status.
2FH	WNG-ROLW_OFF	The output is OFF during regenerative over-load warning status.
30H	WNG-BAT_ON	The output is ON during battery warning.
31H	WNG-BAT_OFF	The output is OFF during battery warning.
38H	ALM_ON	The output is ON during alarm status.
39H	ALM_OFF	The output is OFF during alarm status.
4AH	CHARGE_ON	The output is ON while main power supply (smooth capacitor) is charging.
4BH	CHARGE_OFF	The output is OFF while main power supply (smooth capacitor) is charging.
4CH	DB_OFF	The output is OFF during dynamic braking.
4DH	DB_ON	The output is ON during dynamic braking.

Continued on the following page.

Selection		Contents
58H	S-RDY2_ON	The output terminal is ON during Servo Ready complete.
59H	S-RDY2_OFF	The output terminal is OFF during Servo Ready complete.
60H	NCRDY_ON	The output is ON while motor can be excited in S-ON input state.
61H	HBON_ON	The output is ON while holding brake excitation signal outputs.
62H	ERR_ON	The output is ON during error status.
63H	EXT_ON	The output is ON while external operation input is effective.
64H	MOVE_ON	The output is ON while operation signal is inputted.
65H	PFIN_ON	The output is ON while positioning is completed and operation signal is ON.
66H	INPS_ON	The output is ON during the inside of allowable deviation (inside of In-position).
67H	ZFIN_ON	The output is ON after homing is completed, without alarm status.
68H	OUT1_ON	The output is ON while output OUT (1) is ON.
69H	OUT2_ON	The output is ON while output OUT (2) is ON.
6AH	OUT3_ON	The output is ON while output OUT (3) is ON.
6BH	OUT4_ON	The output is ON while output OUT (4) is ON.
6CH	OUT5_ON	The output is ON while output OUT (5) is ON.
6DH	OUT6_ON	The output is ON while output OUT (6) is ON.
6EH	OUT7_ON	The output is ON while output OUT (7) is ON.
6FH	OUT8_ON	The output is ON while output OUT (8) is ON.
70H	EXT-E_ON	The output is ON while EXT-E input is ON.
71H	RUN_ON	The output is ON while RUN input is ON.
72H	ZRT_ON	The output is ON whle ZRT input is ON.
73H	+JOG_ON	The output is ON while +JOG input is ON.
74H	-JOG_ON	The output is ON while -JOG input is ON.
75H	RAP/OVRD_ON	The output is ON while RAP/OVRID input is ON.
76H	ARST_ON	The output is ON while ARST input is ON.
77H	CACL_ON	The output is ON while CACL input is ON.
78H	S-ON_ON	The output is ON while S-ON input is ON.
79H	SEL1_ON	The output is ON while SEL1 input is ON.
7AH	SEL2_ON	The output is ON while SEL2 input is ON.
7BH	SEL3_ON	The output is ON while SEL3 input is ON.
7CH	+1STEP_ON	The output is ON while +1STEP input is ON.
7DH	-1STEP_ON	The output is ON while -1STEP input is ON.
7EH	I_RUN_ON	The output is ON while I_RUN input is ON.
7FH	MFIN_ON	The output is ON while MFIN input is ON.
80H	RESERVE1_ON	（Reserved）
81H	RESERVE2_ON	（Reserved）
82H	RESERVE3_ON	（Reserved）
83H	RESERVE4_ON	（Reserved）
84H	SDN_ON	The output is ON while SDN input is ON.
85H	+OT_ON	The output is ON while +OT input is ON.
86H	-OT_ON	The output is ON while -OT input is ON.
87H	E_STR_ON	The output is ON while E_STR input is ON.

*Selections include internal status output.

Page	Contents
13	Analog monitor output polarity [MONPOL]

Setting range	Standard value
00 to 08	00: _MON1+_MON2+

The output polarity of analog monitor output MON1 and MON2 is selected from the contents below.

Selection	Contents
00: _MON1+_MON2+	MON1: Output the positive voltage at forward rotation (positive direction). Output the positive/negative voltage. MON2: Output the positive voltage at forward rotation (positive direction). Output the positive/negative voltage.
01: _MON1-_MON2+	MON1: Output the negative voltage at forward rotation (positive direction). Output the positive/negative voltage. MON2: Output the positive voltage at forward rotation (positive direction). Output the positive/negative voltage.
02: _MON1+_MON2-	MON1: Output the positive voltage at forward rotation (positive direction). Output the positive/negative voltage. MON2: Output the negative voltage at forward rotation (positive direction). Output the positive/negative voltage.
03: _MON1-_MON2-	MON1: Output the negative voltage at forward rotation (positive direction). Output the positive/negative voltage. MON2: Output the negative voltage at forward rotation (positive direction). Output the positive/negative voltage.
04: _MON1ABS_MON2+	MON1: Output the positive voltage at both forward rotation (positive direction) and reverse rotation (reverse direction). MON2: Output the positive voltage at forward rotation (positive direction). Output the positive/negative voltage.
05: _MON1ABS_MON2-	MON1: Output the positive voltage at both forward rotation (positive direction) and reverse rotation (reverse direction). MON2: Output the negative voltage at forward rotation (positive direction). Output the positive/negative voltage.
06: _MON1+_MON2ABS	MON1: Output the positive voltage at forward rotation (positive direction). Output the positive/negative voltage. MON2: Output the positive voltage at both forward rotation (positive direction) and reverse rotation (reverse direction).
07: _MON1-_MON2ABS	MON1: Output the negative voltage at forward rotation (positive direction). Output the positive/negative voltage. MON2: Output the positive voltage at both forward rotation (positive direction) and reverser rotation (reverse direction).
08: _MON1ABS_MON2ABS	MON1: Output the positive voltage at both forward rotation (positive direction) and reverse rotation (reverse direction). MON2: Output the positive voltage at both forward rotation (positive direction) and reverse rotation (reverse direction).

Page	Contents
20	Setup Software, Communication Axis Number [COMAXIS]

Setting range	Standard value
01 to 0F	01: _#1

The axis number for communication with PC is selected from the contents below.
✍The selected value is enabled after turning ON the control power again.

Selection	Selection
01: _#1	09: _#9
02: _#2	0A: _#A
03: _#3	0B: _#B
04: _#4	0C: _#C
05: _#5	0D: _#D
06: _#6	0E: _#E
07: _#7	0F: _#F
08: _#8	

Page	Contents
21	Setup Software, Communication Baud Rate [COMBAUD]

Setting range	Standard value
00 to 05	05: _38400bps

The baud rate for communication with PC is selected from the contents below.
✍The selected value is enabled after turning ON the control power again.

Selection
00: _1200bps
01: _2400bps
02: _4800bps
03: _9600bps
04: _19200bps
05: _38400bps

■ General parameter Group B [sequence/alarm related settings]

Page	Contents
10	Dynamic Brake Action Selection [DBOPE]

Setting range	Unit	Standard value
00 to 05	—	04: _SB__Free

Dynamic brake operation when shifted from servo ON → servo OFF, and during servo OFF is selected from the contents below.

When the main circuit power is shut OFF, the dynamic brake will operate irrespective of this setting.

Selection	
00: _Free_Free	When Servo-OFF, Free-Run is operated. After stops, Motor-Free is operated.
01: _Free_DB	When Servo-OFF, Free-Run is operated. After stops, Dynamic-Braking is performed.
02: _DB__Free	When S-OFF, Dynamic-Braking is performed. After stops, Motor-Free is operated.
03: _DB__DB	When S-OFF, Dynamic-Braking is performed. After stops, Dynamic-Braking.
04: _SB__Free	When Servo-OFF, Servo-Braking is performed. After stops, Motor-Free is operated.
05: _SB__DB	When Servo-OFF, Servo-Braking is performed. After stops, Dynamic-Braking.

Page	Contents
12	Emergency Stop Operation [ACTEMR]

Setting range	Unit	Standard value
00 to 01	—	00: _SERVO-BRAKE

From the following contents, select operation at the time of emergency stop (EMR, main power OFF).
Besides, in usage by a vertical axis, please use it with standard setting (00: _SERVO-BRAKE).
When Emergency stop operation is needed (A main power supply shuts off), select the way of motion in stop from the table below.
Also, when the brake is used in a vertical axis, set (00: _SERVO-BRAKE) standard value only.

Selection	Contents
00: _SERVO-BRAKE	When EMR is input, motor is stopped by servo brake operations. Servo brake motion stops a motor when a main power supply shut off.
01: _DINAMIC-BRAKE	When EMR is input, motor is stopped by dynamic brake operations. Dynamic brake motion stops a motor when a main power supply shut off.

Page	Contents
13	Delay Time of Engaging Holding Brake (holding brake holding delay time) [BONDLY]

Setting range	Unit	Standard value
0 to 1000	ms	300

Holding brake operation delay time when shifted from servo ON to servo OFF is set.
When shifted from servo ON to servo OFF, motor excitation is kept during this time.
(Velocity command is Zero.)

Page	Contents
14	Delay Time of Releasing Holding Brake (holding brake release delay time) [BOFFDLY]

Setting range	Unit	Standard value
0 to 1000	ms	300

Holding brake operation release delay time when shifted from servo OFF to servo ON is set.
When shifted from servo OFF to servo ON, motor is excited during this time. (Velocity Command is Zero.)

Page	Contents
15	Brake Operation Beginning Time [BONBGN]

Setting range	Unit	Standard value
0 to 65535	ms	0

Parameter for setting motor free operation time, dynamic brake operation time and servo brake operation time.
When shifted from servo ON to Servo OFF, holding brake and dynamic brake start to operate after this set time.
When motor does not stop even after servo OFF at gravity axis or else, motor is stopped by holding brake and dynamic brake. In the system where motor speed becomes lower than Speed Zero Range (ZV) within the set time, this setting does not function.
If set to 0msec, brake operation start time is disabled (= infinite).

<table>
<tr><th>Page</th><th colspan="2">Contents</th></tr>
<tr><td rowspan="2">16</td><td colspan="2">Power Failure Detection Delay Time [PFDDLY]</td></tr>
<tr><td>
<table>
<tr><th>Setting range</th><th>Unit</th><th>Standard value</th></tr>
<tr><td>20 to 1000</td><td>ms</td><td>32</td></tr>
</table>
</td><td>The delay time from control power OFF to control power error detection is set. The larger value makes the detection of instantaneous stop slower.
(Larger set value will only result in slower detection of error. In case of power failure of internal logic circuit, operation is the same as when control power is turned ON again. In case of energy shortage of main circuit power, other errors, such as main circuit power loss, may be detected.)
In this setting, actual detection delay time varies by 12ms and +6ms.
The selected value is enabled after control power is turned ON again.</td></tr>
<tr><td rowspan="2">20</td><td colspan="2">Following Error Warning Level [OFWLV]</td></tr>
<tr><td>
<table>
<tr><th>Setting range</th><th>Unit</th><th>Standard value</th></tr>
<tr><td>1 to 65535</td><td>×1024 Pulse</td><td>65535</td></tr>
</table>
</td><td>Parameter to output warning before excessive position deviation alarm (following error) is output.</td></tr>
<tr><td rowspan="2">22</td><td colspan="2">Overload Warning Level [OLWLV]</td></tr>
<tr><td>
<table>
<tr><th>Setting range</th><th>Unit</th><th>Standard value</th></tr>
<tr><td>20 to 100</td><td>%</td><td>90</td></tr>
</table>
</td><td>Parameter for outputting warnings before overload alarm is output. The possible level to be set is ranged from 20% to 99%, assuming that the overload alarm level is 100%. When set to 100%, overload warning and overload alarm are output at one time.
Overload detection is assumed and set as 75% of a rated load when control power is turned ON (hot start). Therefore, if this is set to below 75%, overload warning may be output when control power is turned ON.
The set value is enabled after control power is turned ON again.</td></tr>
<tr><td rowspan="2">23</td><td colspan="2">Speed Feedback Error (ALM_C3) Detection [VFBALM]</td></tr>
<tr><td>
<table>
<tr><th>Setting range</th><th>Unit</th><th>Standard value</th></tr>
<tr><td>00 to 01</td><td>—</td><td>01: _Enabled</td></tr>
</table>
<table>
<tr><th>Selection</th><th>Contents</th></tr>
<tr><td>00: _Disabled</td><td>Disabled</td></tr>
<tr><td>01: _Enabled</td><td>Enabled</td></tr>
</table>
</td><td>Select either one from enabled or disabled of velocity feedback error alarm detection.</td></tr>
<tr><td rowspan="2">24</td><td colspan="2">Speed Control Error (ALM_C2) Detection [VCALM]</td></tr>
<tr><td>
<table>
<tr><th>Setting range</th><th>Unit</th><th>Standard value</th></tr>
<tr><td>00 to 01</td><td>—</td><td>00: _Disabled</td></tr>
</table>
<table>
<tr><th>Selection</th><th>Contents</th></tr>
<tr><td>00: _Disabled</td><td>Disabled</td></tr>
<tr><td>01: _Enabled</td><td>Enabled</td></tr>
</table>
</td><td>Select either one from enabled or disabled of velocity control error alarm detection.
In such an operation pattern as causing a motor overshoot to the command, velocity control error may be detected by mistake. For this, set this parameter to “disabled”.</td></tr>
</table>

Page	Contents
25	POFF detection delay time [POFDLY]

Setting range	Unit	Standard value
20 to 1000	ms	32

This is for setting a delay time to detect main circuit power supply power off (POFF) from turning off of the main circuit power supply.
Note that there are two ways to set power off detection delay time, and the setting value selected by function switch is effective.
This parameter is not effective when selecting the setting to use the conventional parameter (power failure detection delay time). This parameter is effective when you want to set two types of delay time respectively:
1) The setting to delay the time to detect instantaneous interruption of service of control power supply such as the following:
when braking distance needs to be instantaneously suppressed in those instances when main circuit power supply is turned due to safeguard circuit actvation
2) The setting to delay the time to detect power-off.

This setting value becomes effective after control power supply is re-turned on.

To make this parameter effective, the following setting is necessary also.

Function switch 2 (General parameter GroupD-page41)
Bit12: Selects timer to detect POFF when main circuit power supply is turned off.
= 0: Operates simultaneously with the setting of power failure detection delay time (GroupB-page16) (convertible with conventional function)
= 1: Applies setting of APOFF detection delay time (this parameter).

■ General parameter Group C [Encoder related settings]

Page	Contents
00	Position detection system choice [ABS/INCSYS]

Setting range	Unit	Standard value
00 to 01	—	00: _Absolute

Position detection system is selected from the contents below.

Selection	Contents
00: _Absolute	Absolute System
01: _Incremental	Incremental System

Selecting "incremental system" enables the use similar to incremental encoder without installing backup battery in absolute encoder.

Please set it to "00: _Absolute" when you use absolute encoder for incremental system.

Page	Contents
01	Motor Incremental Encoder, Digital Filter [ENFIL]

Setting range	Unit	Standard value
00 to 07	—	01_220nsec

Settings for motor incremental encoder digital filter are selected from the contents below.

Selection	Contents
00: _110nsec	Minimum Pulse Width = 110nsec (Minimum Pulse Phase Difference = 37.5nsec)
01: _220nsec	Minimum Pulse Width = 220nsec
02: _440nsec	Minimum Pulse Width = 440nsec
03: _880nsec	Minimum Pulse Width = 880nsec
04: _75nsec	Minimum Pulse Width = 75nsec (Minimum Pulse Phase Difference = 37.5nsec)
05: _150nsec	Minimum Pulse Width = 150nsec
06: _300nsec	Minimum Pulse Width = 300nsec
07: _600nsec	Minimum Pulse Width = 600nsec

Page	Contents

Page 02

External encoder filter [EX-ENFIL]

Setting range	Unit	Standard value
00 to 07	—	01_220nsec

Selects the setting for ecternal encoder digital filter from the following contents.

Selection	Contents
00:_110nsec	Minimum pulse width = 110nsec (Minimum phase difference = 37.5nsec)
01:_220nsec	Minimum pulse width = 220nsec
02:_440nsec	Minimum pulse width = 440nsec
03:_880nsec	Minimum pulse width = 880nsec
04:_75nsec	Minimum pulse width = 75nsec (Minimum phase difference = 37.5nsec)
05:_150nsec	Minimum pulse width = 150nsec
06:_300nsec	Minimum pulse width = 300nsec
07:_600nsec	Minimum pulse width = 600nsec

Page 03

External encoder polarity reversed [EX-ENPOL]

Setting range	Unit	Standard value
00 to 07	—	00:_Type1

Selects external encoder signal polarity from the fllowing contents.

✍ This setting value becomes effective after control power supply is re-turned on. This setting is not effective when motor encoder is absolute encoder in fully-closed control. (The setting shall be Type1.)

Selection	Contents		
00:_Type1	EX-Z/ not reversed	EX-B/ not reversed	EX-A/ not reversed
01:_Type2	EX-Z/ not reversed	EX-B/ not reversed	EX-A/ reversed
02:_Type3	EX-Z/ not reversed	EX-B/ reversed	EX-A/ not reversed
03:_Type4	EX-Z/ not reversed	EX-B/ reversed	EX-A/ reversed
04:_Type5	EX-Z/ reversed	EX-B/ not reversed	EX-A/ not reversed
05:_Type6	EX-Z/ reversed	EX-B/ not reversed	EX-A/ reversed
06:_Type7	EX-Z/ reversed	EX-B/ reversed	EX-A/ not reversed
07:_Type8	EX-Z/ reversed	EX-B/ reversed	EX-A/ reversed

Page 08

Absolute Encoder Clear Function Selection [ECLRFUNC]

Setting range	Unit	Standard value
00 to 01	—	00: _Status_MultiTurn

Used for clearing some absolute encoder warnings which are not automatically restored.

✍ Valid when battery backup method absolute encoder and absolute encoder without battery is used.

✍ Please set it to "01: _Status" when you use absolute encoder for incremental system.

Selection	Contents
00: _Status_MultiTurn	Clear Encoder Status (Alarm and Warning) and Multi Turn Data
01: _Status	Clear Only Encoder Status

■ General parameter Group D

Please refer to Chapter 4 positioning function for GroupD.
For details on “Communication setup of Servo Amplifier”, see Chapter 3-23 to 25 (“Page” 50 through 57)

■ System parameter

Page	Description	
00	Main Power, Input Type	Selects the input mode for power supplied to the main circuit power supply. Setting range varies depending on the hardware type.

Setting value	Description
00: _AC_3-phase	3-phase AC power is supplied to the main circuit.
01: _AC_Single-phase	Single phase AC power is supplied to the main circuit.

Page	Description	
01	Motor Encoder Type	Motor encoder type in use is selected. Setting range varies depending on the hardware type.

Setting value	Description
00: _Inclemental_ENC	Incremental Encoder
01: _Absolute_ENC	Absolute Encoder

Page	Description	
02	Incremental Encoder, Function Setting	Incremental encoder type is selected when an incremental encoder is used for the motor encoder. Setting range varies depending on the hardware type.

Setting value	Description
00: _Stanndard	Wiring-Save Incremental Encoder [Standard (4-Pairs)]
01: _7Pairs_INC-E	Incremental Encoder with CS Signal. [7-Pairs]

Page	Description	
03	Incremental Encoder, Resolution Setting	Pulse number per motor shaft rotation is set when an incremental encoder is used for the motor encoder.

Setting range	Unit	Standard value
500 to 65535	P/R	—

Page	Description	
04	Absolute Encoder, Function Setting	Absolute encoder type is selected when an absolute encoder is used for the motor encoder. Setting range varies depending on the hardware type. Can only be selected when 01: _Absolute_ENC is selected at Page01 (motor encoder type).

Setting	Description
04: _PA035C-2.5MH_Manu	PA035, Asynchronous, 2.5Mbps, Half Duplex (Manual Setting)
05: _PA035C-4MH_Manu	PA035, Asynchronous, 4Mbps, Half Duplex (Manual Setting)
06: _RA062C-2.5MH_Manu	RA062, Asynchronous, 2.5Mbps, Half Duplex (Manual Setting)
07: _RA062C-4MH_Manu	RA062, Asynchronous, 4Mbps, Half Duplex (Manual Setting)
80: _RA062M-1MF	RA062, Manchester, 1Mbps, Full Duplex
81: _RA062M-2MF	RA062, Manchester, 2Mbps, Full Duplex
84: _ABS-E	ABS-E, 1Mbps (Absolute Encoder with Incremental Signal)

Page	Description	
05	Absolute Encoder, Resolution Setting	Divisions per motor shaft rotation are set when absolute encoder is used for the motor encoder. Can only be selected when 01: _Absolute_ENC is selected at Page01 (motor encoder type).

Setting	Description
00: _2048_FMT	2048 divisions
01: _4096_FMT	4096 divisions
02: _8192_FMT	8192 divisions
03: _16384_FMT	16384 divisions
04: _32768_FMT	32768 divisions
05: _65536_FMT	65536 divisions
06: _131072_FMT	131072 divisions
07: _262144_FMT	262144 divisions
08: _524288_FMT	524288 divisions
09: _1048576_FMT	1048576 divisions
0A: _2097152_FMT	2097152 divisions

Page	Description	
06	Combined motor model number Note 1)	In "The set up software", model numbers of combined motor and their codes are shown. When combined motor is to be changed, change the motor parameter setting of "The set up software". Page contents are different for digital operator. Refer to Note 1).
08	Control Mode	
	02: _Position; fixation at position control type.	
09	Position Loop Control and Position Loop Encoder Selection	Position loop encoder is selected used for position loop control method and position loop control. Setting range varies depending on the hardware type.

Setting	Description
00: _Motor_encoder	Semi-Closed Control / Motor Encoder
01: _Ext－ENC	Fully Closed Control / Extenal Encoder

Page	Description	
0A	External Encoder, Resolution Seting	Sets the resolution of the external encoder under full closed control. Sets the number of converted pulses for each rotation of the motor shaft.

Setting range	Unit	Standard value
500 to 65535	P/R	—

Page	Description	
0B	Regenerative Resistor Selection	Selects the type of regenerative resistance to be connected.

Setting	Description
00: _Not_connect	Regenerative Resistor is not Connected
01: _Built-in_R	Use Built-In Regenerative Resistor
02: _External_R	Use External Regenerative Resistor

The set value is enabled after control power is turned ON again.

Note) In case of digital operator

Page	Description	
06	Servo amplifier information	This is for maker maintenance.
07	Combined motor code	In the digital operator, motor codes of the selected servo motor are displayed. To change the combined motor, change the motor parameter setting at "The set up software." Combined motor cannot be changed by the digital operator.

6

[Operations]

6. Operations [Procedure prior to operation]

■ After wiring, test run will begin. Please do not connect the shaft of the servo motor with the machine.

● Confirm installation and wiring of the servo amplifier and servo motor.

[Confirmation of installation and wiring]

Procedure	Item	Contents
1	Installation	Referring to [Chapter 2. Installation], install the servo amplifier and the servo motor. Do not connect the shaft of the servo motor into the machine to keep the status of no load.
2	Wiring and connection	Referring to [Chapter 3. Wiring], perform wirings for the power supply, the servo motor, and the upper device. However, please do not connect CN1 with the servo amplifier after wiring has been done.
3	Power supply turning on	Turn on the power supply. R-SETUP can be connected; regardless of an alarm that caused by setting conditions.

● Confirm the specifications and the combination of the servo amplifier servo motor encoders.

[Confirmation and Change of specification]

Procedure	Item	Contents
4	Confirmation of servo amplifier specification	Use the AC servo system supporting tool R-Setup to confirm and set the specifications of the servo amplifier. ・Amplifier Capacity ・Control power supply input voltage ・Control power supply input type ・Main circuit power supply input voltage ・Main Power, Input Type ・Control mode ・Encoder selection for full close control ・Regenerative Resistor Selection
5	Confirmation of servo motor encoder specification	Use the AC servo system supporting tool R-Setup to confirm and set the specifications of the servo motor encoder. ・Motor Encoder Type ・Incremental encoder function selection ・Incremental Encoder, Resolution Setting ・Absolute encoder function selection ・Absolute Encoder, Resolution Setting ・Confirmation of external encoder specification
6	Confirmation of combined servo motor	At the time of shipment, the smallest servo motor is combined with the servo amplifier of each capacity. Confirm the servo motor model number and change the parameter for the one in use.
7	Power supply re-turning on	Turn off the power once and turn it on again. Parameter will have been changed by turning off the power supply. Without turning off the power, even if a parameter is changed here, the parameter change will not complete.
8	Reconfirmation	Please check again the specification changes of servo amplifier and servo encoder, and combination with servo motor. Many of the troubles at test run, such as servo motor not operating, are caused by mistakes in parameter setting.

● The movement of the servo amplifier servo motor is confirmed by driving JOG.

[I/O signal confirmation]

Procedure	Item	Contents
9	Confirmation of input signal	Confirm the I/O signal status using the monitoring function inside the servo amplifier. Please confirm that there are protecting functions such as emergency stop, over travel, and alarm reset.
10	The servo on signal is input.	Please confirm the digital operator on the servo amplifier front is displaying a shape of “8".
11	JOG driving	Do not connect the shaft of the servo motor into the machine to keep the status of no load, and perform JOG operation. Confirm that the servo motor rotates forwards and backwards.
12	Power supply shut off	After the servo on signal is turned off, turn the power supply off.

● Connect the servo motor shaft with the machine and confirm the operation.

[Confirmation of machine’s operation function]

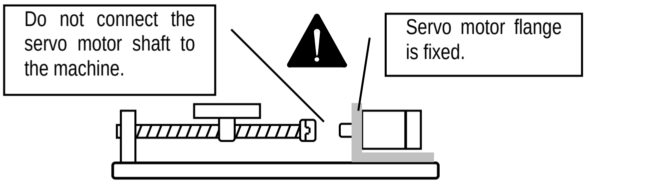
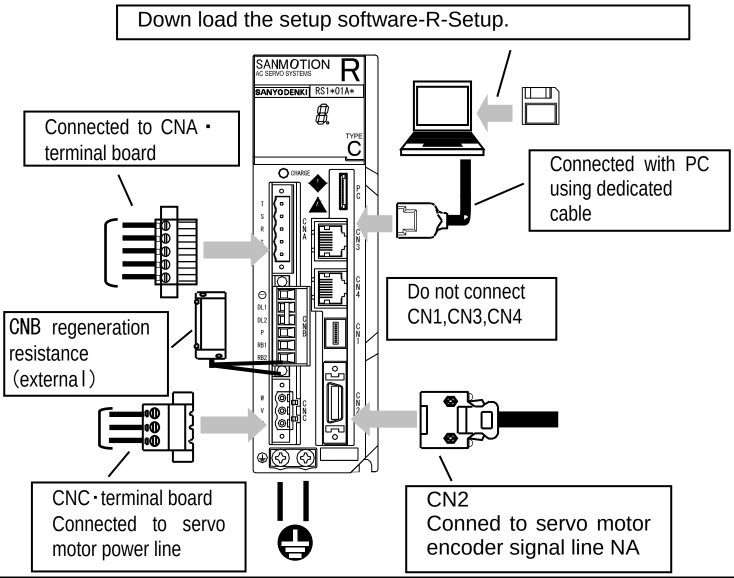
Procedure	Item	Contents
13	Parameter set	The parameter of [Group D] calculated in Chapter 4 is set in R-SETUP.
14	Test operation	Please use ± manual operation (JOG) and ±1 step sending, and confirm the move direction and a travel. Confirm that external abnormalities, ± software limit, and the ± over travel operate normally.

● Input the command of the operation pattern to be used and operate a machine. [Operation]

Procedure	Item	Contents
15	Operation	At the time of shipment, real time auto-tuning (automatic adjustment for servo gain and filter) has been set. There is no need for manual tuning unless operations and characteristics are appropriate.

More detailed procedure is described in the following pages.

■ [Procedure 1 to Procedure 3] Confirmation of installation and wiring

Procedure	Item	Contents
1	<u>Installation</u> Install the servo amplifier and servo motor referring to [Chapter 2, Installation]. Do not connect the servo motor shaft to the machine to keep the status of no load.	
2	<u>Wiring ・Connecting</u> Wire the power supply, servo motor and upper device referring to [Chapter 3, Wiring]. Confirm the correct wiring. If the servo motor does not rotate or is in a state of runaway / overload in test run, wrong wiring may be the cause of it. Do not connect CN1 to servo amplifier after wiring.	
3	<u>Turning on the power supply</u> Turn on the power supply. R-SETUP can be connected; regardless of an alarm that caused by setting conditions.	

■ [Procedure 4 to Procedure 8] Confirming specifications and combination of servo amplifier ・ servo motor ・encoder

<table>
<tr><th>Procedure</th><th colspan="2">Item and Contents</th></tr>
<tr><td rowspan="11">4</td><td colspan="2">Confirming servo amplifier specifications System parameter settings
Use the AC servo system supporting tool R-Setup to confirm and set the specifications of the servo amplifier.
For how to use [the setup software R-Setup], refer to [R-SETUP Instruction Manual].</td></tr>
<tr><td>Item</td><td></td></tr>
<tr><td>Amplifier Capacity
Capacity of the servo amplifier.</td><td rowspan="6">Setting cannot be changed.

Make sure that the contents being displayed are suitable for the machine specifications.</td></tr>
<tr><td>Motor Motion
Structure of the motor that can be combined.</td></tr>
<tr><td>Control power input voltage
Voltage to be supplied to the control power.</td></tr>
<tr><td>Input type of control power supply
Input type of the control power supply.</td></tr>
<tr><td>Main Power, Input Voltage
Power voltage to be supplied to main circuit.</td></tr>
<tr><td style="display:none"></td></tr>
<tr><td>Main Power, Input Type
Selects the input type supplied to main circuit power. Change the set value to 01：_AC_Single-phase for single phase use.</td><td><table><tr><th>Set value</th><th>Contents</th></tr><tr><td>00：_AC_3-phase</td><td>Provide 3-phase AC Power Supply to the Main Power Supply</td></tr><tr><td>01：_AC_Single-phase</td><td>Provide Single-Phase AC Power Supply to the Main Power Supply</td></tr></table></td></tr>
<tr><td>Control Mode
Control mode is 02 fixation.</td><td><table><tr><th>Seting</th><th>Contents</th></tr><tr><td>02：_Position</td><td>Position Control Mode</td></tr></table></td></tr>
<tr><td>Full flossed control encoder selection
No change is necessary for other than full closed system. Confirm that this is set to standard value, at the time of shipment, of 00：_Motor_encoder.</td><td>This is to be set when the system is full closed control.<table><tr><th>Setting</th><th>Contents</th></tr><tr><td>00：_Motor_encoder</td><td>Semi-Closed Control / Motor Encoder</td></tr><tr><td>01：_Ext－ENC</td><td>Fully Closed Control / Extenal Encoder</td></tr></table></td></tr>
<tr><td></td><td>Regenerative Resistor Selection
Selects the regeneration resistance to be connected.</td><td><table><tr><th>Setting</th><th>Contents</th></tr><tr><td>00：_Not_connect</td><td>Regenerative Resistor is not Connected</td></tr><tr><td>01：_Built-in_R</td><td>Use Built-In Regenerative Resistor</td></tr><tr><td>02：_External_R</td><td>Use External Regenerative Resistor</td></tr></table></td></tr>
</table>

6. Operations [Confirmation & Change of servo motor encoder specification]

Procedure	Item and Contents
5	Confirming servo motor encoder specifications — System parameter setting

Confirming servo motor encoder specifications

System parameter setting

Use the AC servo system supporting tool R-Setup to confirm and set the specifications of the encoder.

For how to use [the setup software R-Setup], refer to [R-SETUP Instruction Manual].

Item	
Motor Encoder Type Selects the servo motor encoder type.	See table below

Setting value	Contents
00：_Inclemental_ENC	Incremental Encoder
01：_Absolute_ENC	Absolute Encoder

Item	
Incremental Encoder, Function Setting Selects detailed function of incremental encoder.	This is set when motor encoder type is “incremental encoder”.

Setting value	Contents
00：_Stanndard	Wiring-Save Incremental Encoder [Standard (4-Pairs)]
01：_ 7pairs_INC-E	Incremental Encoder with CS Signal. [7-Pairs]

Item	
Incremental Encoder, Resolution Setting Sets the incremental encoder resolution.	Sets the pulse number of motor shaft one rotation. 500P/R ～ 65535P/R Setting unit＝Pulse/Rev.
Absolute Encoder, Function Setting Selects detailed function of absolute encoder.	This is set when the motor encoder type is “absolute encoder”.

setting	Contents
04:PA035C-2.5MH_Manu	PA035, Asynchronous, 2.5Mbps, Half Duplex (Manual Setting)
05:PA035C-4MH_Manu	PA035, Asynchronous, 4Mbps, Half Duplex (Manual Setting)
06:RA062C-2.5MH_Manu	RA062, Asynchronous, 2.5Mbps, Half Duplex (Manual Setting)
07:RA062C-4MH_Manu	RA062, Asynchronous, 4Mbps, Half Duplex (Manual Setting)
80:RA062M-1MF	RA062, Manchester, 1Mbps, Full Duplex
81:RA062M-2MF	RA062, Manchester, 2Mbps, Full Duplex
84:ABS-E	ABS-E, 1Mbps (Absolute Encoder with Incremental Signal)

Item	
Absolute Encoder, Resolution Setting Sets the absolute encoder resolution. Sets the pulse number of motor shaft one rotation.	This is set when the motor encoder type is “absolute encoder”.

Setting	Contents	Setting	Contents
00:_2048 division	2048 division	06:_131072 division	131072 division
01:_4096 division	4096 division	07:_262144 division	262144 division
02:_8192 division	8192 division	08:_524288 division	524288 division
03:_16384 division	16384 division	09:_1048576 division	1048576 division
04:_32768 division	32768 division	0A:_2097152 division	2097152 division
05:_65536 division	65536 division		

Item	
Sets mandatory parameters for positioning	Set mandatory parameters for positioning Refer to Chapter 4 “Positioning Function”, and follow the instruction of [Read through before performing any of the procedures in Positioning Function] that describes setting of mandatory parameters.

Procedure	Item and Contents	
6	**Confirming the combined servo motor** System parameter setting Use the AC servo system supporting tool R-Setup to confirm and set the model type of combined servo motor. For how to use [the setup software R-Setup], refer to [R-SETUP Instruction Manual].	
	Item	
	Model number of combined motor Shows the combined motor model number.	Ex: Q2AA07030D(0000-0064) ↑ Model number of combined motor is displayed. Combined motor can be changed at Motor parameter setting.

Procedure	Item and Contents
7	**Turning ON the power again** Power shut off→turn ON again Turn OFF the power of servo amplifier and turn it ON again. Turning OFF the power makes the parameter re-written. Without turning OFF the power, the parameter cannot be changed. Make sure to turn OFF→turn ON again.

Procedure	Item and Contents
8	**Reconfirming the specifications** Reconfirmation Reconfirm the specifications and combination of the changed servo amplifier, servo motor encoder and servo motor. Many of the troubles at test run, such as servo motor not operating, etc., are caused by mistakes in parameter setting.

6. Operations [Confirmation of I/O signal and Unit operations]

■ [Procedure 9 to 12] Connection of upper device, CN1, CN3,CN4 and JOG operation.

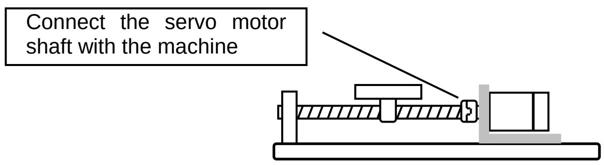
Procedure	Item	Contents
9	Input signal check	Check the status of input signal by the monitor function of R-SETUP. Please check the function of external defect, alarm reset, ±manual operation (JOG),manual high velocity(RAP)and Servo-On signal specifically.

Procedure	Item	Contents
10	Input Servo-On signal	Input Servo-On signal and apply excitation to the servo motor. Please confirm that the digital operation display on the front face of the servo-amplifier shows “8”.

Procedure	Item	Contents
11	JOG Operation J	Input ±manual operation (JOG) and operate JOG with no-load. Please confirm the servo motor rotates in CW/ CCW.

Procedure	Item	Contents
12	Power-Off	Please turn off the power supply after turning off servo signal.

■ [Procedure 13, 14] Confirm the operation connecting servo motor shaft with the machine

Procedure	Item	Contents
13	Parameter setting	Set the parameter of [GroupD] being calculated in chapter 4 by R-SETUP.
14	Trial run	 Please confirm the travel direction and travel distance by ±manual operation (JOG) and ± 1 step travel. Also please check external defect and ±software limitation and ±over travel are operated on normal.

■ [Procedure 15] Input the orders of operation pattern to use and operate the machine.

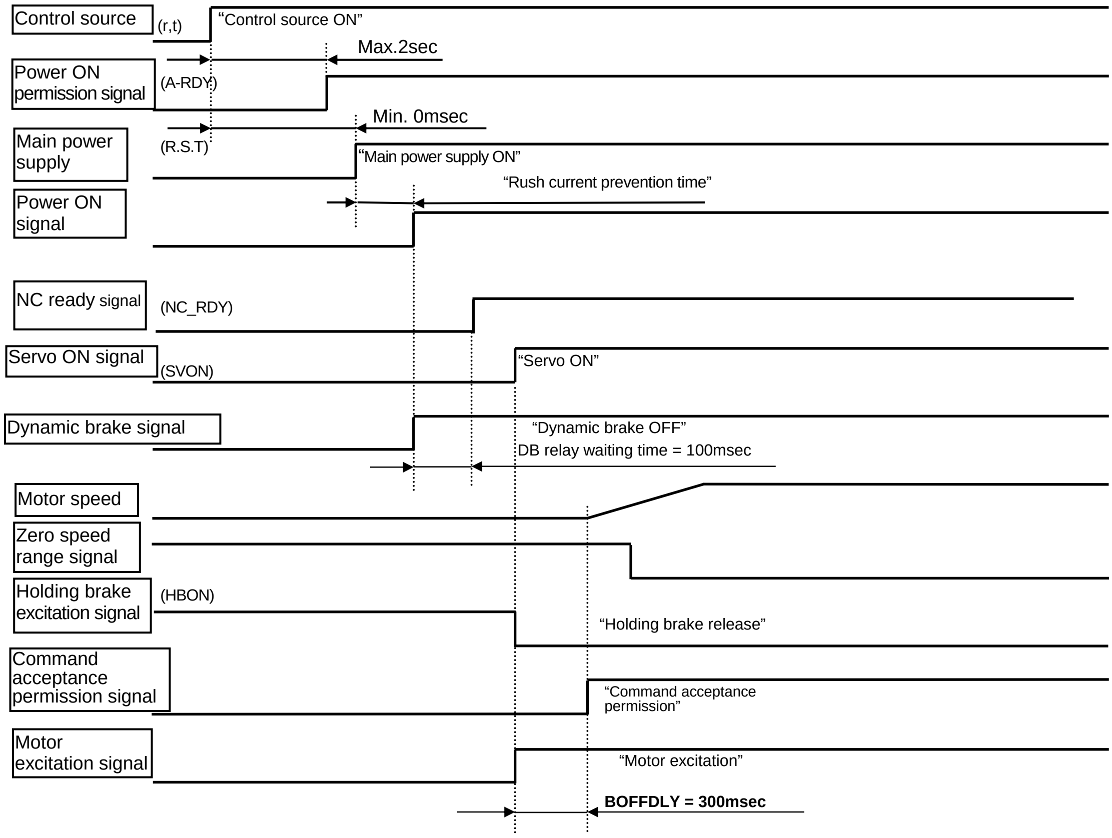
Procedure	Item	Contents
15	Operation	Set the point data and operate in/output signal to move the point. Real-time auto-tuning (auto-tuning of servo-gain and filter) is set on Ex-factory. Manual tuning is unnecessary unless there is any problem on the operation and the property.

■ Operation sequence from power turn ON to power shut OFF at the standard shipment setting

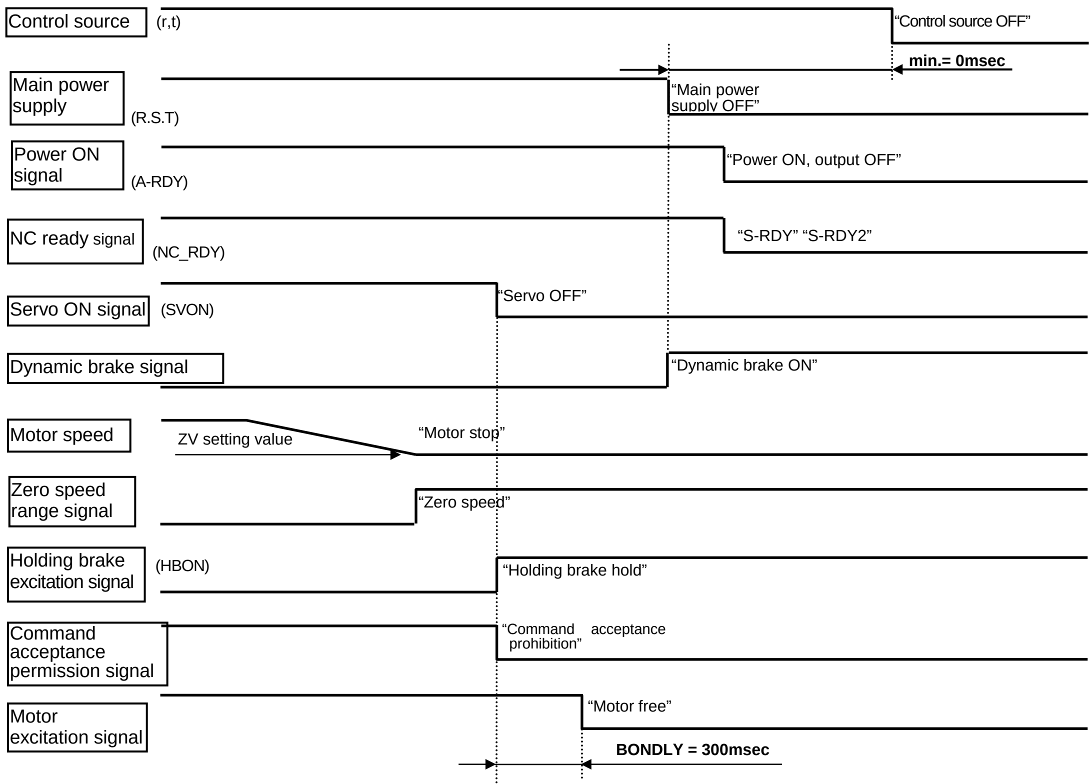
The frequency of the power ON/OFF of the servo amplifier should be less than 5 times/hour and less than 30 times/day.
Please give 10 minutes or more to the interval of power ON/OFF.

● [Power ON → Servo ON]

Notes: What has an abbreviated name in ( ) in the following figures exists as external I/O and an input. The thing without the notation is an internal signal.



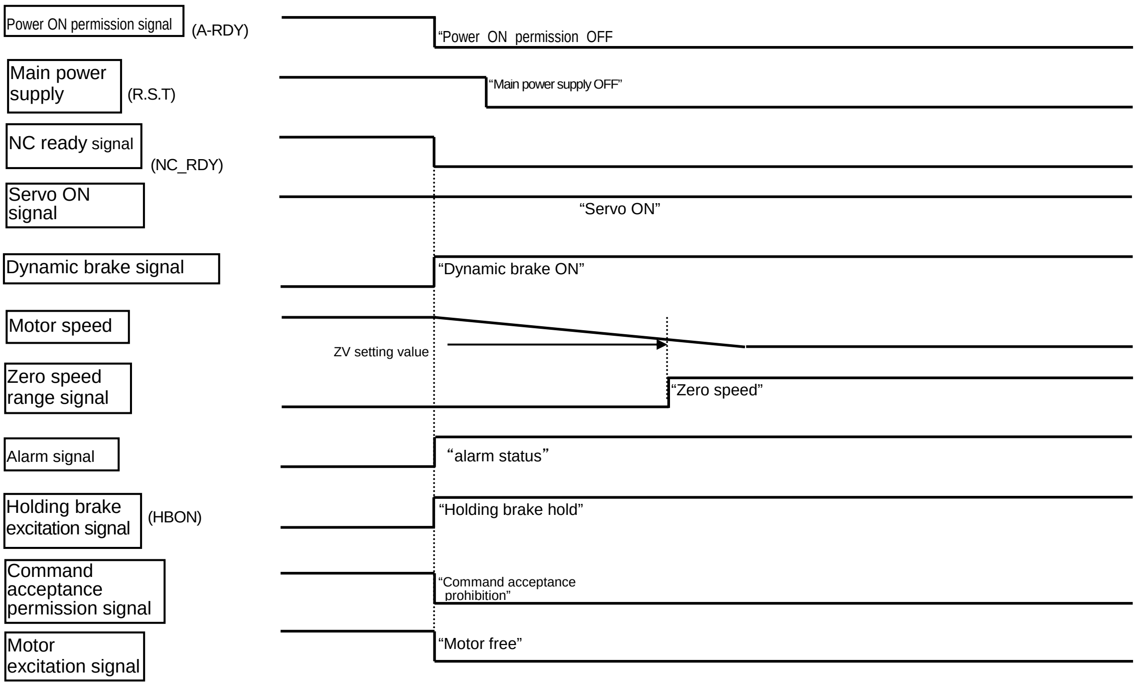
● [Servo OFF → Power OFF]



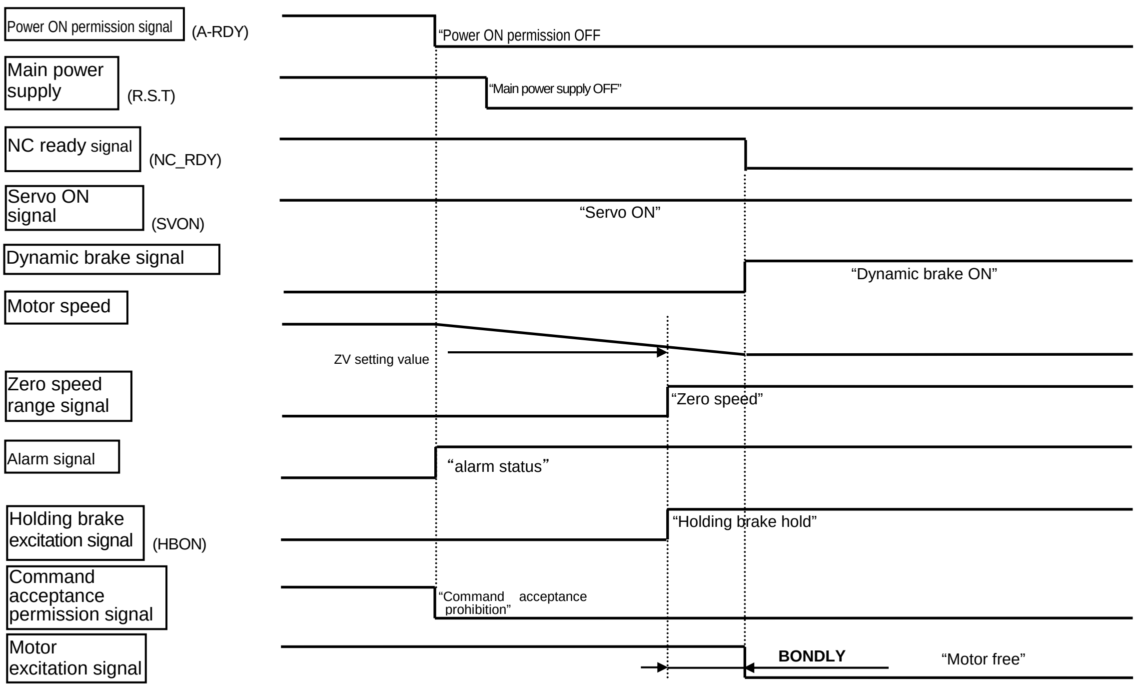
■ Alarm sequence

When an alarm occurs, the servo motor is stopped by dynamic brake or servo brake. The brake to be used is determined depending on alarms. Refer to [Chapter 8, Maintenance] [Alarm list].

● Stop by dynamic brake at alarm



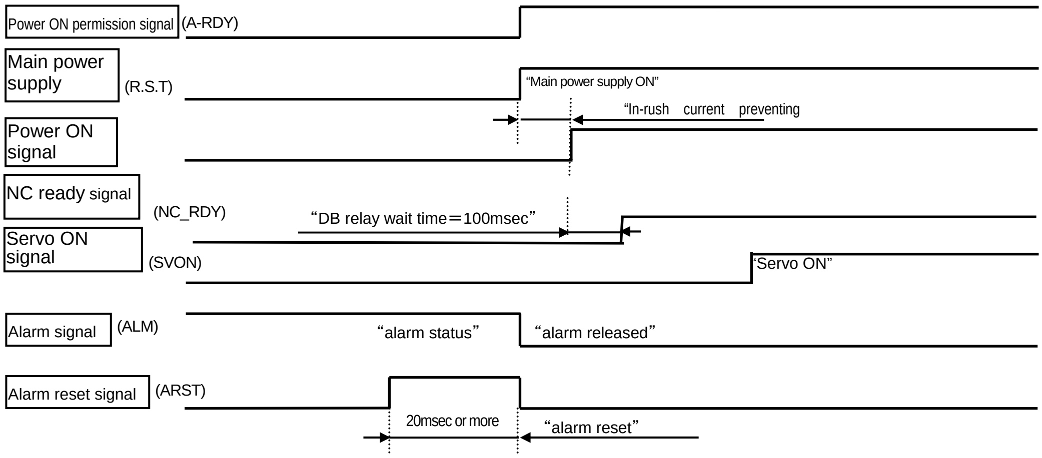
● Stop by servo brake at alarm



⚠ Install a protective circuit referring to [Chapter 3, Wiring] [Wiring example of high voltage circuit, protective circuit]. The above sequence is the one when protective circuit is installed.

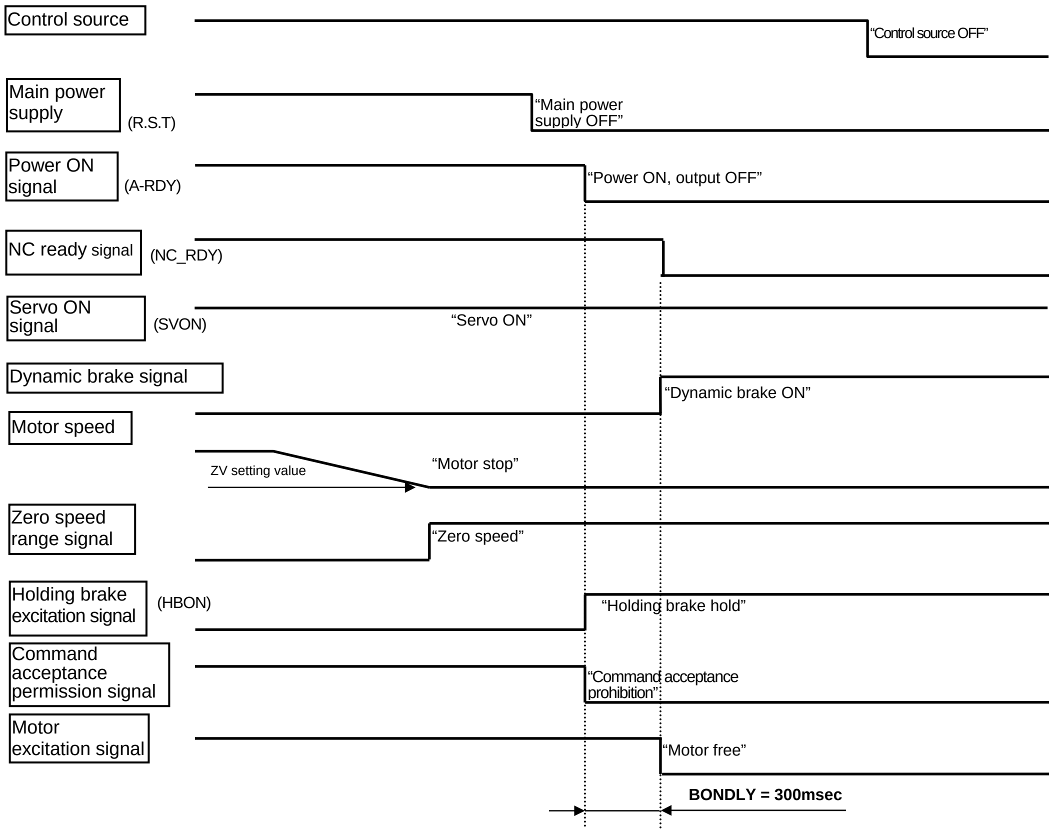
■ Sequence at alarm reset

Inputting alarm-reset signal from general-purpose input can reset alarms.

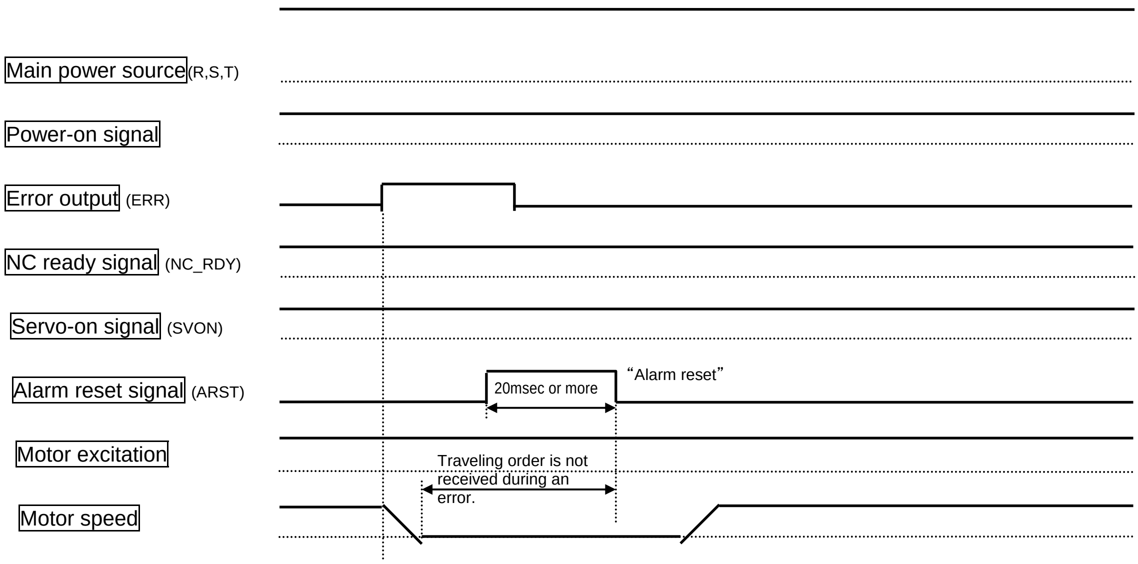


✍ Some alarms cannot be reset unless the power is reset (control power is turned OFF and ON again) or encoder is cleared. Refer to [Chapter 8, Maintenance] [Alarm list].

■ Sequence when power is turned OFF during operation (During servo-on)



■ Error, Sequence

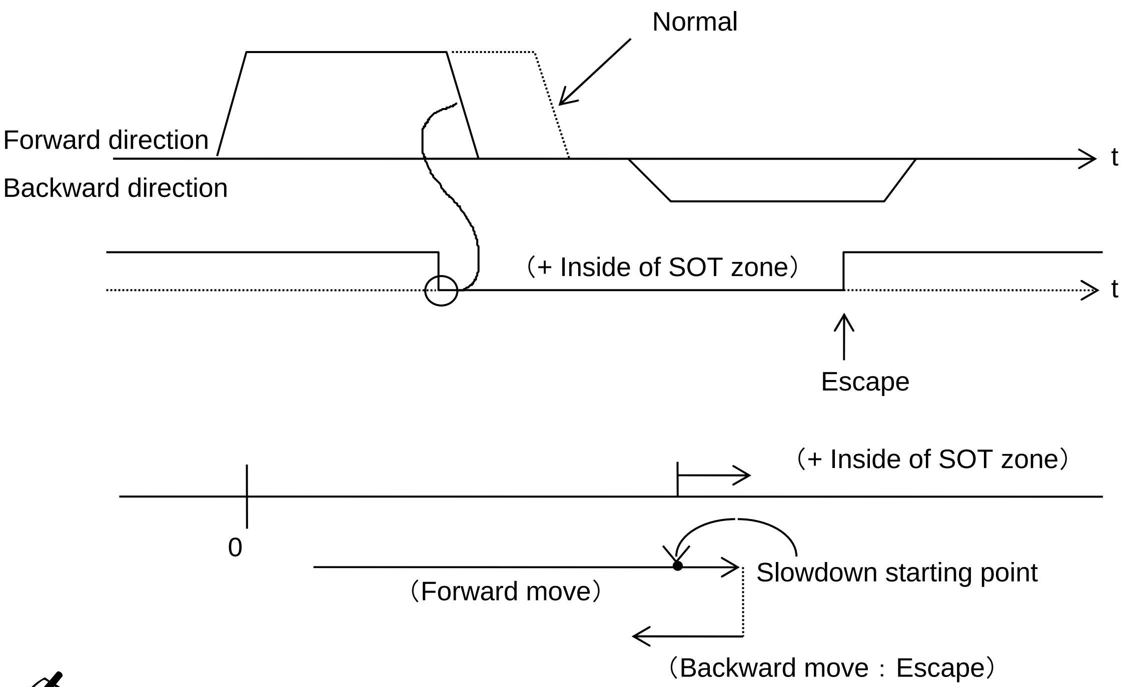


Although motor excitation state is maintained in an error condition, traveling order is not received until error is reset. However, software limit is an exception. (→refer to following.)

An error code output (OUT 8 to 1) outputs from a general-purpose output simultaneously with an error output (Err). (See Chapter 4, when based on an output selection setup)

→Please cope with it by troubleshooting at the time of Chapter 8 error generating.

■ Software limit, Sequence

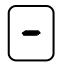
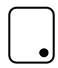


The command for forward move in +SOT zone (and backward move in -SOT zone) are not acceptable.

In addition, movement in the escape direction is based on manual movement (JOG).

■ Explanation in status display mode

● In status display mode, the state of servo amplifier is displayed, as shown in the following table.

State of servo amplifier	Display
Control-power-source establishment state Control power source (r, t) is established and an amplifier lady (RDY) is "ON" state.	
State during main power supply establishment Main power supply (R, S, T) is established, and operation preparation-completion signal is "OFF" state.	
State during main power supply establishment Main power supply (R, S, T) is established, and operation preparation-completion signal is "ON" state.	
Servo-on state "The character of eight" is drawn and it rotates.	
ERR State Shown as a dot flashing.	
Alarm display When alarm activated, 2-digit alarm code of the activated alarm is displayed in time-division method alternately. (e.g.: When amplifier overheat occurred (alarm code:51H), the display is as follows: “5” → “1”→ “not lighted” → “5” ・・・・ Please perform a corrective action according to the contents of "Chapter 8 Maintenance" at the time of alarm generated.	

7

[Adjustment・Functions]

■ Structure of tuning ≪General parameter Group 0≫

At “parameter Group 0 ”, tuning structure of the R series servo amplifier is as follows.

≪General parameter Group 0 ≫

Page	Name
00	Tuning Mode
01	Automatic Tuning Characteristic
02	Automatic Tuning Response
03	Automatic Tuning, Automatic Parameter Saving

00:_AutoTun	Automatic Tuning
01:_AutoTun_JRAT-Fix	Automatic Tuning (JRAT Fixed)
02:_ManualTun	Manual Tuning

00:_Positioning1	Positioning Control 1
01:_Positioning2	Positioning Control 2
02:_Positioning3	Positioning Control 3
03:_Trajectory1	Trajectory Control 1
04:_Trajectory2	Trajectory Control 2 (KP Fixed)

1 to 30	Automatic Tuning Response

00:_Auto_Saving	Saves Parameter Automatically in JRAT1.
01:_No_Saving	Automatic Saving is Invalidity

● **Tuning Mode [page 00]**

00:_AutoTun auto- tuning

The servo amplifier estimates the load inertia moment ratio of the machine and equipment at real time and automatically tunes the servo gain so that it will become the best one. The parameters for the servo amplifier to automatically tune vary depending on the selected auto-tuning characteristics.

※The servo amplifier estimates the load inertia moment ratio at the time of acceleration/deceleration. Therefore, for operations with only excessively low acceleration/deceleration time constant or with only low torque with low velocity, this mode cannot be used. Also, operations with large disturbance torque or with large mechanical clearance, this mode cannot be used, either.

01:_AutoTun_JRAT-Fix Usage at Auto-tuning [JRAT manual setting].

01:_AutoTun_JRAT-Fix Automatic Tuning (JRAT Fixed)

Based on the load inertia moment ratio (JRAT1) which was set, the servo amplifier automatically tunes and makes the servo gain the best one. The parameters for the servo amplifier to automatically tune vary depending on the selected auto-tuning characteristics.

02:_ManualTun Manual Tuning

This is used in order for adjusting the servo gain to the machine and equipment to ensure the maximum response, and when characteristics in auto-tuning are insufficient.

● **Automatic Tuning Characteristic [page 01]**

Characteristics adjusted to machines and equipment are selected when Automatic Tuning and Automatic Tuning (JRAT Fixed) are used.
When Manual Tuning is used, this does not function.

● **Automatic Tuning Response [page 02]**

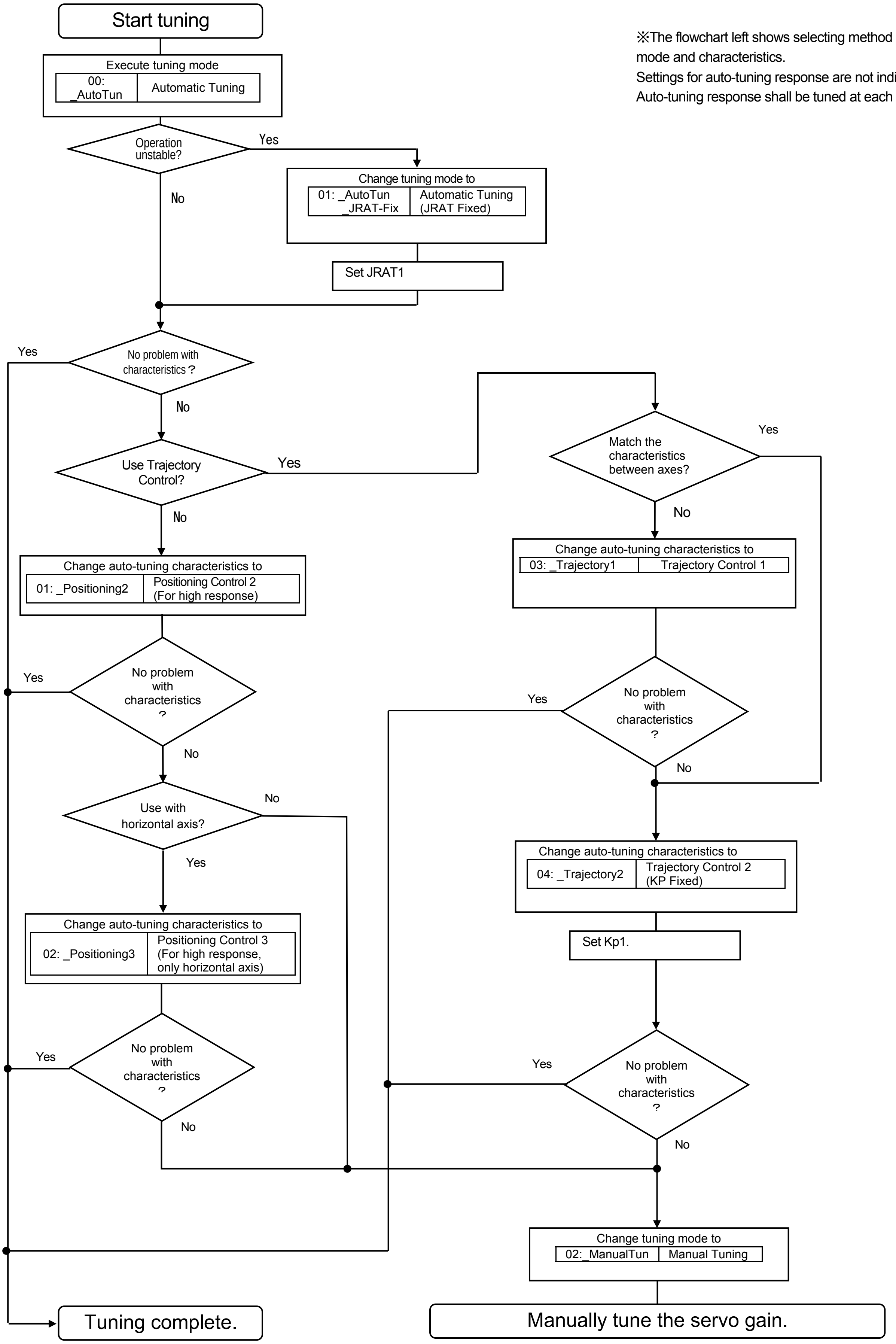
Set this when Automatic Tuning and Automatic Tuning (JRAT Fixed) are used. The larger set value makes the response higher. Set this suitable for the equipment rigidity.
When Manual Tuning is used, this does not function.

● **Automatic Tuning, Automatic Parameter Saving ［load inertia moment ratio］ [page 03]**

The “load inertia moment ratio” obtained from auto-tuning is automatically saved in parameter JRAT1 at every 2 hours. The set value is enabled when Automatic Tuning is used.
When Automatic Tuning (JRAT Fixed) and Manual Tuning are used, this does not function.

■ Tuning method selecting procedure

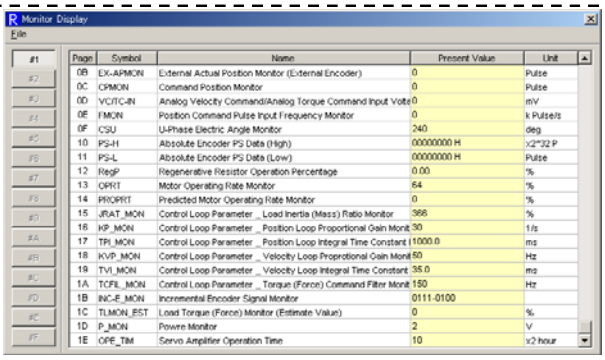
※The flowchart left shows selecting method of tuning mode and characteristics.
Settings for auto-tuning response are not indicated here.
Auto-tuning response shall be tuned at each status.



■ Monitoring servo gain adjustment parameter

The following parameters can be monitored when auto-tuning is used.

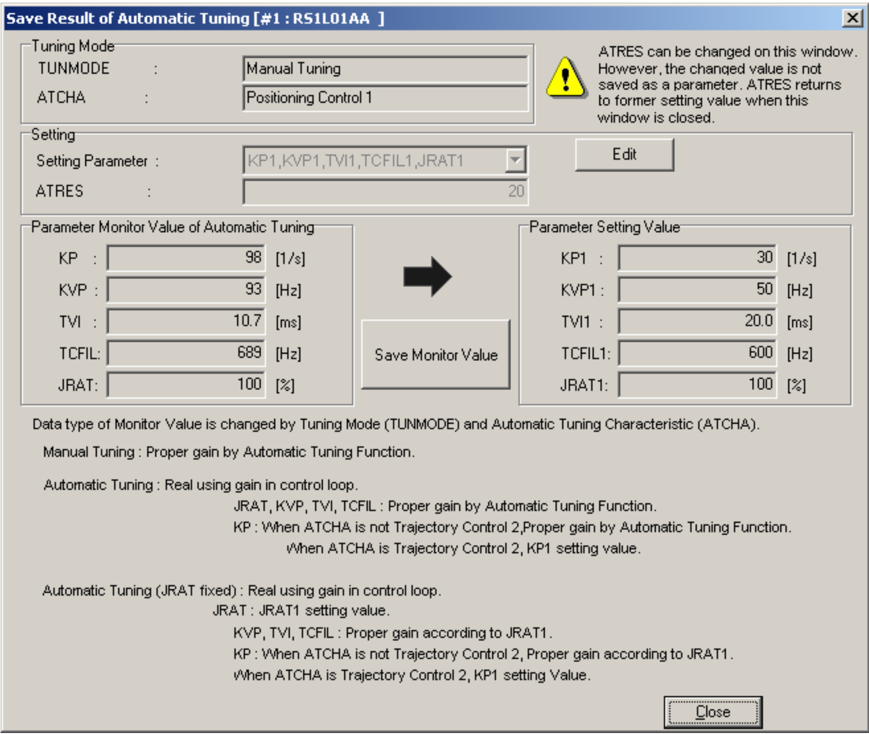
● R-SETUP



Refer to “R-SETUP Instruction Manual” for the operation above.

■ Using auto-tuning result at manual tuning.

At manual tuning, auto-tuning result is saved as a batch or by selection using R-SETUP, and can be used as controlling parameter.

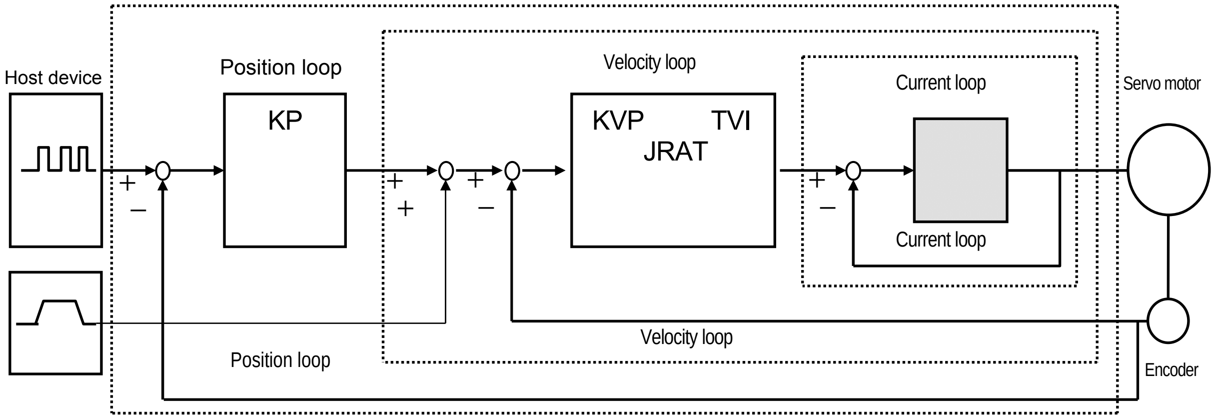


For how to operate these, refer to “ R-SETUP Instruction Manual”.

Note）In the setting of TUNMODE=02:_ManualTun, parameter setting value is used in the control loop. When auto-tuning result saving is executed, the gain parameter being used will change (except during gain switch over). Therefore, the motor operation may change suddenly. Execute auto-tuning result saving while servo OFF or motor stoppage.

■ Servo system structure

Servo system consists of 3 subsystems; the position loop, the velocity loop and the current loop. High response is required for the internal loops. If this structure is compromised, it could result in instability, low response, vibration or oscillation.



The response of the current loop is ensured internally in the servo amplifier, so user is not required to make additional adjustments.

■ Servo adjustment parameters

Position Command Filter [PCFIL]

When the position command resolution is low, set this parameter to suppress the ripples contained in the position command. The larger value of this will make the ripple suppressing effect greater, however, delay will be greater.
※ When high tracking control position compensation gain is set to other than 0%, this parameter is automatically set.

Position Loop Proportional Gain [KP]

Set this equivalent to $KP_{[1/S]} = KVP_{[Hz]}/4 \cdot 2\pi$.

Higher Tracking Control, Position Compensation Gain [TRCPGN]

When tracking effect needs to be improved under high resolution of position command, increase this parameter after adjustment of high tracking control velocity compensation gain.

Feed Forward Gain [FFGN]

Tracking effect of position command can be improved by increasing this gain.
Under positioning control, set this to approximately 30 to 40%.
※When high tracking control position compensation gain is set to other than 0%, this parameter is automatically set.

Feed Forward Filter [FFFIL]

When position command resolution is low, set this parameter to suppress ripples.

Velocity Command Filter [VCFIL]

Under velocity control, when there is a big noise component contained in velocity command, set this parameter to suppress the noise.

Velocity Loop Proportional Gain [KVP]

Set this as high as possible within such a stable operation range as not to cause vibration or oscillation of the machine. If JRAT is accurately set, the set value of KVP becomes the velocity loop response zone.

Velocity Loop Integral Time Constant [TVI]

Set this equivalent to $TVI_{[ms]} = 1000/(KVP_{[Hz]})$.

Load Inertia Ratio [JRAT]

Set the value calculated as shown below.

$$JRAT = \frac{\text{Motor axis converted load inertia moment 【JL】}}{\text{Motor inertia moment 【JM】}} \times 100\%$$

Higher Tracking Control, Velocity Compensation Gain [TRCVGN]
Tracking effect can be improved by increasing compensation gain.
Adjust this so as to shorten the positioning setting time.
※Set the value of JRAT properly to use this function.

Torque Command Filter 1 [TCFIL]

When rigidity of the mechanical device is high, set this value high and the velocity loop proportional gain can be set to high. When rigidity of the mechanical device is low, set this value low and resonance in high frequency zone and abnormal sound can be suppressed. For normal usage, set this below 1200Hz.

■ Adjustment method of vibration suppressing control

Set vibration-suppressing frequency to suppress the low frequency vibration at the tip or the body of the machine. Vibration-suppressing frequency is obtained by executing auto-tuning of vibration-suppressing frequency or by calculating vibration frequency of vibrating point at positioning and its reciprocal. When vibration does not stop with the vibration-suppressing control, there is a possibility that the gain for control system may be too high. In this case, lower the control system gain. Also, when used together with high tracking control velocity compensation gain, vibration-suppressing effect may be greater.
※Vibration suppressing control function can be used together with auto-tuning.

■ Adjustment method of notch filter

Set the torque command notch filter to suppress high frequency resonance resulted from coupling and rigidity of the device mechanism. Notch filter center frequency can be obtained by executing auto-notch filter tuning or by system analysis.
※Torque command notch filter function can be used together with auto-tuning.
※When resonance of the device mechanism does not stop even after this parameter is set, here may be two or more resonance points. In this case, insert notch filters B, C and D to suppress each of them. If not yet suppressed, there is a possibility that auto-tuning response or control gain is too high. If so, lower the auto-tuning response or control gain.

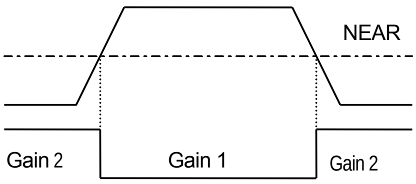
■ Adjustment method of disturbance observer

Set the disturbance observer to suppress the disturbance applied to the motor.
At first, use the low frequency observer characteristics. If not suppressed by that, use that for medium frequency. Gradually increase the observer compensation gain.
The higher the observer compensation gain becomes, the more the disturbance suppressing characteristics will be improved.
However, if it is excessively high, oscillation may result. Use this within the range not causing oscillation.
※Disturbance observer cannot be used with auto-tuning.

■ Adjustment method of gain switch over

When tracking effect is insufficient even if basic parameters of high tracking control position compensation gain and high tracking control velocity compensation gain are set, set the gain switch over so that tracking effect can be improved.

(Example) Gain is increased near positioning compete.



The value of gain 2 shall be set to 1.2 times the value of gain 1.

※ Gain switch over function cannot be used with auto-tuning.

■ Adjustment method of high setting control

When tracking effect is insufficient even after gain switch over, set the high setting control parameter and in-position setting characteristics can be improved. When position command resolution is low, set the value of command velocity calculation low pass filter low. Set the acceleration compensation so that the position deviation near acceleration conclusion becomes small. Set the deceleration compensation so that the position deviation near deceleration conclusion (positioning complete) becomes small.

※ This function cannot be used together with auto-tuning.

■ How to make R series control characteristics equal to Q series standard characteristics

Parameter change as follows can make the status equal to Q series standard characteristics.

Group	Page		Before change	After change
0	00	Tuning Mode	00: _AutoTun	02: ManualTun
1	16	Higher Tracking Control, Velocity Compensation Gain	0%	100%

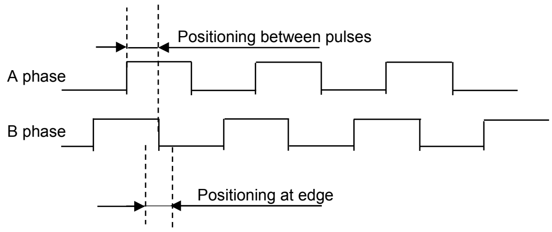
■ Functions of Group 8

[Group 8] 17

Positioning Method [EDGEPOS]

The location of positioning stop is selected; between encoder pulses or at edge.

Selected value	Contents
00:_Pulse_Interval	Specify Pulse Interval
01:_Pulse_Edge	Specify Pulse Edge

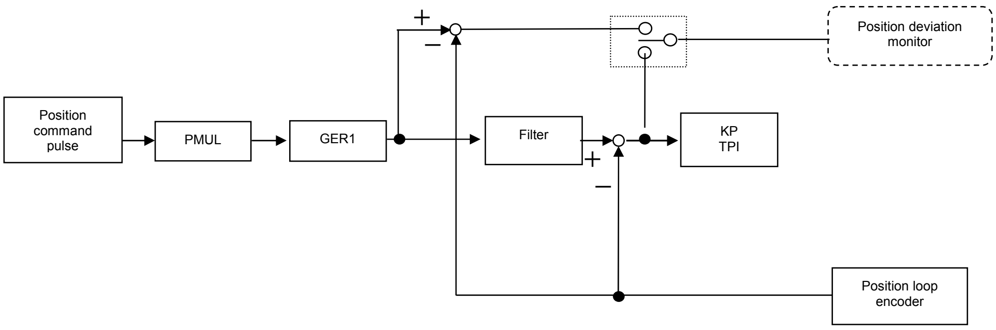


[Group 8] 18

Inposition / Position Deviation Monitor [PDEVMON]

Positioning complete signal when the position control mode is used, and position command used for outputting position deviation monitor can be selected from before or after the position command filter passes.

Selected value	Contents
00:_After_Filter	Compare "Position Command Value After Filter Passes by" with "Feedback Value"
01:_Before_Filter	Compare "Position Command Value Before Filter Passes by" with "Feedback Value"



[Group 8] 19

Deviation Clear Selection [CLR]

This function is used for changing the location deviation counter in the servo amplifier from the host unit to zero.

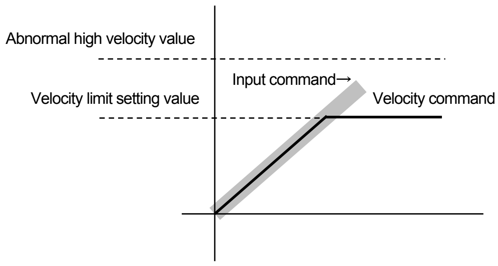
Selection		Description
0H	When SERVO-OFF/ Clear Deviation : Deviation Clear Input/ Level Detection	･Deviation is always cleared when servo is off. Servo ON signal / Servo OFF / Deviation clear / Logic can be changed ･Deviation is always cleared when deviation clear input is ON. CLR signal / CLR ON / Deviation clear / Logic cannot be changed
1H	When SERVO-OFF/ Clear Deviation : Deviation Clear Input/ Edge Detection	･Deviation is always cleared when servo is off. Servo ON signal / Servo OFF / Deviation clear / Logic can be changed ･Deviation is cleared in the edge when deviation clear input becomes OFF/ON. CLR signal / CLR is ON in edge / Logic can be changed

[Group 8] 28

Velocity Limit [VCLM]

A host limit value can be locked in with the velocity limit command.
This value cannot be set to exceed the velocity capabilities of the adjoining motor.

Parameter Group8Page28	VCLM：Velocity Limit	1 - 65535 min^{-1}



[Group 8] 37

Torque Limit at Sequence Operation [SQTCLM]

During the sequence operation the output torque is limited. Limiting the output torque protects the unit mechanism.

The torque limits during sequence operation support the following sequence operations:
- Securing brake standby time
- Servo brake operation

Sequence operation torque limit value setting

Parameter Group 8 Page37	SQTCLM : Torque Limit at Sequence Operation	10 - 500%

If this value is set higher than the maximum output torque (TP) of the servo motor, it will be limited by (TP).

[Group 8] 40

In-Position Near Range [NEAR]

O utputs signal indicating proximity to position completion.

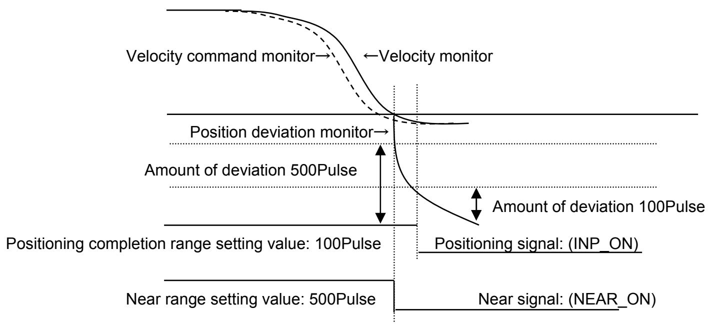
This is used together with positioning complete signal (INP) and near range of positioning complete is output.

Parameter Group8Page40	NEAR：In-Position Near Range	1 to 65535　Pulse

Selection		Description
1A	NEAR_ON	The output is ON during In-Position Near status (position deviation < NEAR).
1B	NEAR_OFF	The output is OFF during In-Position Near status (position deviation < NEAR).

Determine the logical status of the NEAR signal output, and to which output terminal to assign the positioning completion signal output. The assignment of the output terminal is the same location as the positioning completion signals (above).

If set to a value greater than the positioning completion range settings, the host unit receives the NEAR signal before receiving the positioning completion signal (INP), and transition to the positioning completion operations is enabled.



[Gruoup 8] 43 to 45

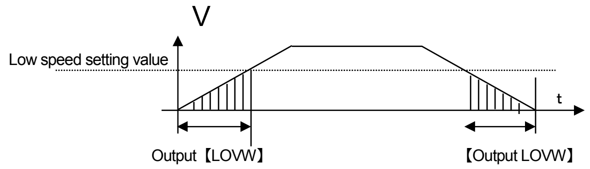
Low Speed Range [LOWV] Speed Matching Width [VCMP] High Speed Range [VA]

This parameter affects settings for the speed output range. The signal can be output from general output (OUT1 to OUT8) and used as a valid condition for all functions.
This parameter affects settings for the speed output range, and can be used as a valid condition for all functions.

Selection		Description
10	LOWV_ON	The output is ON during low speed status (speed is less than LOWV).
11	LOWV_OFF	The output is OFF during low speed status (speed is less than LOWV).
12	VA_ON	The output is ON during high speed status (speed is more than VA).
13	VA_OFF	The output is OFF during high speed status (speed is more than VA).
14	VCMP_ON	The output is ON during speed matching status (speed deviation < VCMP).
15	VCMP_OFF	The output is OFF during speed matching status (speed deviation < VCMP).

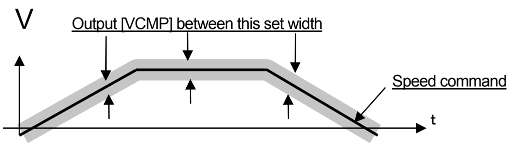
Low speed range: Low speed signal is sent if speed goes below the set value.

Parameter Group8 Page43	LOWV：Low speed range	0 to 65535min^{-1}



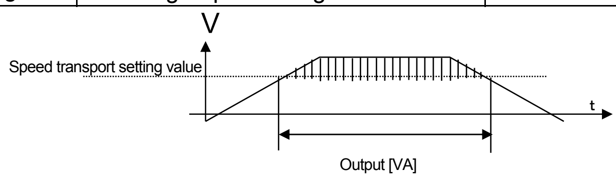
Speed Matching Width: Speed coincidence range signal is given if speed deviation reaches the set range.

Parameter Group8 Page44	VCMP：Speed Matching Width	0 - 65535min^{-1}



Speed transport settings: Speed transport signal is given if speed exceeds the set value.

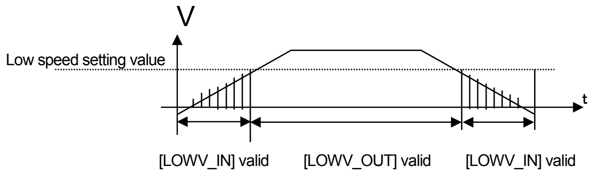
Parameter Group1 Page08	VA：High Speed Range	0 - 65535min^{-1}



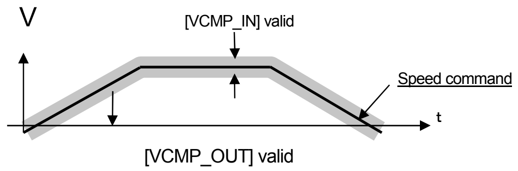
Various functions can be made valid without output signals taken into the host unit when this is used together with Group9 function enabling conditions (input signals).

Selection		Description
12	LOWV_IN	Enable the function during low speed status (speed is less than LOWV).
13	LOWV_OUT	Enable the function while low speed status is not kept.
14	VA_IN	Enable the function during high speed status (speed is more than VA).
15	VA_OUT	Enable the function while high speed status is not kept.
16	VCMP_IN	Enable the function during speed matching status (speed deviation < VCMP).
17	VCMP_OUT	Enable the function while speed matching status is not kept.

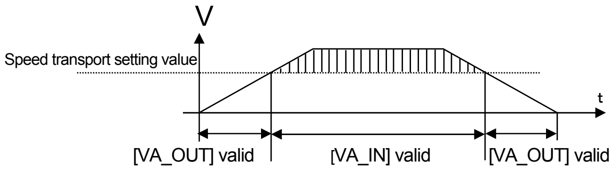
Low speed status [LOWV_IN]: Function is enabled during low speed status (speed below LOWV set value).
Low speed status [LOWV_OUT]: Function is enabled outside of low speed status (speed below LOWV set value).



Speed coincidence status [VCMP_IN]: Function is enabled during speed coincidence status (speed deviation below VCMP set value).
Speed coincidence status [VCMP_OUT]: Function is enabled outside of speed coincidence status (speed deviation below VCMP set value).



Speed transport status [VA_IN]: Function is enabled during speed transport status (speed above VA set value).
Speed transport status [VA_OUT]: Function is enabled outside of speed transport status (speed above VA set value).



■ Functions of Group 9

[Group9] 13,14

Gain Switching Function, Select Input 1 [GC1]　Gain Switching Function, Select Input 2 [GC2]

4 types of gains can be switched and used.

Conditions enabling gain switch over are allocated. When the signal of GC1 and GC2 combination is valid, the set value of corresponding GAIN becomes enabled.

Parameter Group9 Page13	GC1：Gain Switching Function, Select Input 1
Parameter Group9 Page14	GC2：Gain Switching Function, Select Input 2

GC1：Gain Switching Function, Select Input 1	Disabled	Enabled	Disabled	Enabled
GC2：Gain Switching Function, Select Input 2	Disabled	Disabled	Enabled	Enabled
	↓	↓	↓	↓
Gain to be enabled	GAIN 1	GAIN 2	GAIN 3	GAIN4

[Group 9] 15,16

Vibration Suppressor Frequency, Select Input 1 [SUPFSEL1]
Vibration Suppressor Frequency, Select Input 2 [SUPFSEL2]

4 types of vibration suppressing frequency can be switched and used.

Conditions for enabling vibration suppressing frequency selection input are allocated. When the signal of SUPFSEL1 and SUPFSEL2 combination is valid, the set value of corresponding vibration frequency becomes enabled.

Parameter Group9 Page15	SUPFSEL1：Vibration Suppressor Frequency, Select Input 1
Parameter Group9 Page16	SUPFSEL2：Vibration Suppressor Frequency, Select Input 2

SUPFSEL1：Vibration Suppressor Frequency, Select Input 1	Disabled	Enabled	Disabled	Enabled
SUPFSEL2：Vibration Suppressor Frequency, Select Input 2	Disabled	Disabled	Enabled	Enabled
	↓	↓	↓	↓
Vibration suppressing frequency to be enabled	Vibration Suppressor Frequency 1 Group2 Page 00	Vibration Suppressor Frequency 2 Group 3 Page 40	Vibration Suppressor Frequency 3 Group 3 Page 41	Vibration Suppressor Frequency 4 Group 3 Page 42

[Group 9] 17

Position Loop Proportional Control, Switching Function [PLPCON]

Switching between position loop PI control ←→ P control is possible. Switching is possible when position loop proportional control switchover function (PPCON）is enabled.

Conditions for enabling position loop proportional control switchover function are allocated. Switches to proportional control when the signal of PPCON is valid.

Parameter Group9 Page17	PLPCON：Position Loop Proportional Control, Switching Function

PI control(proportional･integral control)････Position loop proportional gain(KP)･Integral time constant(TPI)
P control (Proportional control) ････Position loop proportional gain(KP)

* Position loop integral time constant (TPI)is 1000.0ms at standard setting, therefore, integral function is invalid.

[Group 9] 26

Velocity Loop Proportional Control, Switching Function [VLPCON]

Velocity loop PI control / P control can be used alternatively. Activate switching by enabling the velocity loop comparison control switching function (PCON)

The conditions for enabling the velocity loop comparison control switching function are assigned. Change the comparison control when the PCON signal is valid.

Parameter Group9 Page26	VLPCON：Velocity Loop Proportional Control, Switching Function

PI control (comparison / integral control): Velocity loop comparison gain (KVP) / Velocity loop reset time constant (TVI)
P control (Comparison control): Velocity loop comparison gain (KVP)

* When set to comparison control, servo gain is reduced and the servo system is made stable.
* When the velocity loop reset time constant (TVI) is set to 1000.0ms, it is not necessary to use this function, since the reset time constant in use is invalid (Comparison control)

[Group 9] 41

Main Power Discharge Function [DISCHARG]

This function forcefully discharges voltage charged in the condenser for the main circuit power supply in the servo amplifier when power supply to the main circuit is cut. However, discharge is not possible when the main circuit power supply is ON.

The conditions for enabling forced discharge function are assigned. Forced discharge is possible when the DISCHARGE signal is valid.

Parameter Group9 Page41	DISCHARGE：Main Power Discharge Function

■ Functions of Group B

[GroupB] 10

Dynamic Brake Action Selection [DBOPE]

Conditions for stop at servo OFF can be selected from Servo brake/dynamic brake/free run.
Conditions after servo motor stop can be selected from dynamic brake/free run.

Parameter GroupB Page10	DBOPE: Dynamic Brake Action Selection

Selected value	
00:_Free_Free	When Servo-OFF, Free-Run is operated. After stops, Motor-Free is operated.
01:_Free_DB	When Servo-OFF, Free-Run is operated. After stops, Dynamic-Braking is performed.
02:_DB__Free	When S-OFF, Dynamic-Braking is performed. After stops, Motor-Free is operated.
03:_DB__DB	When S-OFF, Dynamic-Braking is performed. After stops, Dynamic-Braking.
04:_SB__Free	When Servo-OFF, Servo-Braking is performed. After stops, Motor-Free is operated.
05:_SB__DB	When Servo-OFF, Servo-Braking is performed. After stops, Dynamic-Braking.

[GroupB] 12

Forced stop operation [ACTEMR]

When forced stop is executed by power shut off, etc. while servo motor is operating (servo motor is not stopped), conditions for servo motor stop can be selected from servo brake/dynamic brake.

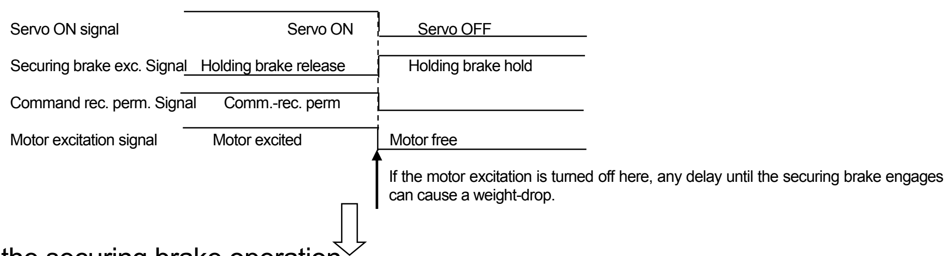
Parameter GroupB Page12	ACTEMR：Emergency Stop Operation

Selected value	Contents
00:_SERVO-BRAKE	When EMR is input, motor is stopped by servo brake operation.
01:_DINAMIC-BRAKE	When EMR is input, motor is stopped by dynamic brake operation.

[GroupB] 13

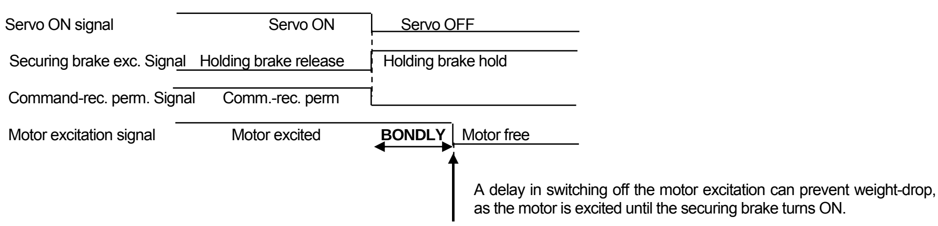
Delay Time of Engaging Holding Brake [BONDLY]

This function is enabled during servo brake operation at servo OFF. It is disabled for dynamic brake and free-run.



Set the delay time for the securing brake operation

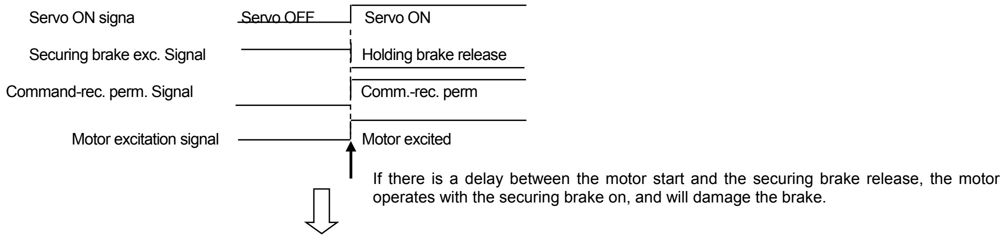
Parameter GroupB Page13	BONDLY：Delay Time of Engaging Holding Brake	0 - 1000ms



・The setting increment is 4 msec. If the setting is 0 msec, the command is disabled (forced zero) for 4 msec after SON.

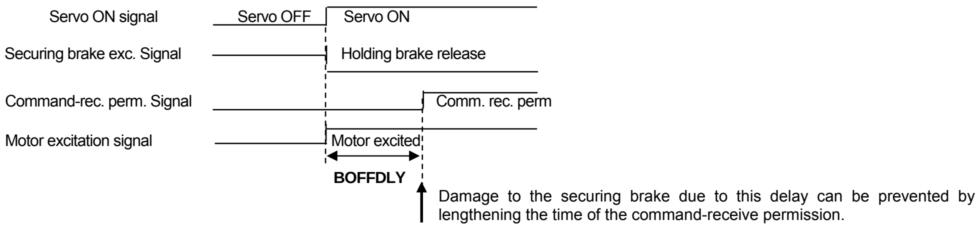
[GroupB] 14

Delay Time of Releasing Holding Brake [BOFFDLY]



･Set the delay time for the securing brake release

Parameter GroupB Page14	BOFFDLY：Delay Time of Releasing Holding Brake	0 to 1000ms



･The setting increment is 4 msec. If the setting is 0 msec, the command is disabled (forced zero) for 4 msec after SON.

[GroupB] 15

Brake Operation Beginning Time [BONBGN]

If the motor does not stop within the time frame set for the brake operation start (BONBGN) when the servo is turned OFF, the securing brake and the dynamic brake force the motor to stop. The function can be disabled by setting the value to “0”ms. The setting increment is 4msec; therefore, set the value to 4 msec or higher.

Parameter GroupB Page15	BONBGN：Brake Operation Beginning Time	0 to 65535ms

* The term “motor does not stop” (above) means that the motor velocity does not fall below the zero velocity (ZV) range.
* The stop sequence is different depending on the condition settings of the emergency stop operation.
* When the brake operation start time (BONBGN) passes, the servo motor will be forced to stop by both the dynamic brake and the securing brake, which can cause damage to the securing brake. Therefore, use this function only after considering the specifications and the sequence of the unit.

[Functions of Group B] [Following Error Warning･Deviation counter overflow･Overload warning]

[GroupB] 16

Power Failure Detection Delay Time [PFDDLY]

This function can set a delay period, after power off of the control power supply, for detecting problems in the control power supply. Detection of unexpected power failure is diminished when this value is increased. However, even if this value is increased and problem detection is delayed, when the power supply to the internal logic circuit is exhausted, routine operations at the time of control power supply cut off / restart will continue.

Parameter GroupB Page16	PFDDLY：Power Failure Detection Delay Time	20 - 1000 ms

* When energy to the main circuit power supply is insufficient, problems like a reduction in main circuit power supply, etc. are also detected.

* The actual anomaly detection delay time compared to the selected value can vary between -12ms and +6ms.

[GroupB] 20

Following Error Warning Level [OFWLV]

This function gives a warning before reaching excessive deviation alarm status.

Set the deviation excessive warning value.

Parameter GroupB Page20	OFWLV：Following Error Warning Level	1 - 65535 × 1024 pulse

[GroupB] 22

Overload Warning Level [OLWLV]

This function will send a warning before reaching overload alarm status. Set the ratio corresponding to the overload alarm value to 100%. When set to 100%, the overload warning and overload alarm are given simultaneously.

Set the overload warning level.

Parameter GroupB Page22	OLWLV：Overload Warning Level	20 - 100 %

* The overload detection process is assumed to be 75% of the rated load at the time of starting the control power supply (hot start). Therefore, if the overload warning level is set below 75%, an overload warning is given after starting the control power supply.

■ Functions of Group C

[GroupC] 01 - 02

Motor Incremental Encoder, Digital Filter [ENFIL]

External Incremental Encoder, Digital Filter [EX-ENFIL]

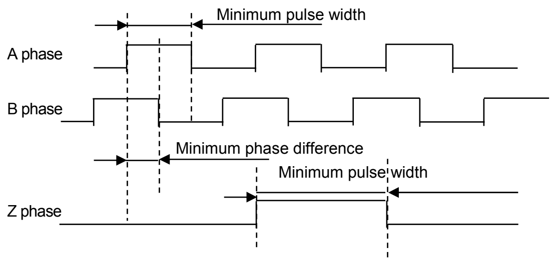
You can set the digital filer value of the incremental pulse for the selected incremental encoder. When noise is superimposed on the incremental encoder, the pulse below the set value is removed as noise. Set this value by considering the frequency of pulses from the selected encoder and the maximum number of rotations of the servo motor. If the input value is greater than the encoder frequency during the peak rotation of the servo motor, the encoder pulse is removed and the servo motor will stop.

The motor encoder and external encoder can be set separately.

Selection for motor incremental encoder digital filter

Parameter GroupC Page01	ENFIL：Motor Incremental Encoder, Digital Filter
Parameter GroupC Page02	EX-ENFIL：External Incremental Encoder, Digital Filter

Selected value	Contents
00:_110nsec	Minimum Pulse Width＝110nsec (Minimum Pulse Phase Difference = 37.5nsec)
01:_220nsec	Minimum Pulse Width＝220nsec
02:_440nsec	Minimum Pulse Width＝440nsec
03:_880nsec	Minimum Pulse Width＝880nsec
04:_75nsec	Minimum Pulse Width＝75nsec (Minimum Pulse Phase Difference = 37.5nsec)
05:_150nsec	Minimum Pulse Width＝150nsec
06:_300nsec	Minimum Pulse Width＝300nsec
07:_600nsec	Minimum Pulse Width＝600nsec



[GroupC] 03

External Encoder Polarity Invert [EX-ENPOL]

You can select external encoder pulse polarity.

Parameter GroupC Page03	EX-ENPOL: External Encoder Polarity Invert

Selected value	Contents		
00:_Type1	EX-Z / Not Reversed	EX-B / Not Reversed	EX-A/ Not Reversed
01:_Type2	EX-Z / Not Reversed	EX-B / Not Reversed	EX-A/ Reversed
02:_Type3	EX-Z / Not Reversed	EX-B/ Reversed	EX-A/ Not Reversed
03:_Type4	EX-Z / Not Reversed	EX-B/ Reversed	EX-A/ Reversed
04:_Type5	EX-Z / Reversed	EX-B / Not Reversed	EX-A/ Not Reversed
05:_Type6	EX-Z / Reversed	EX-B / Not Reversed	EX-A/ Reversed
06:_Type7	EX-Z / Reversed	EX-B/ Reversed	EX-A/ Not Reversed
07:_Type8	EX-Z / Reversed	EX-B/ Reversed	EX-A/ Reversed

This setting is disabled in case of full closed control and when motor encoder is absolute encoder.

(To be set at Type 1.)

[GroupC] 08

Abusolute Encoder Clear Function Selection [ECLRFUNC]

Select the conditions for enabling absolute encoder clear.

Parameter Group9 Page03	ECLR：Abusolute Encoder Clear Function

When using a battery backup method absolute encoder and absolute encoder without battery, you can select the contents to be cleared.

Clear “Warning + multiple rotation data”

Clear only “Warning”

Parameter GroupC Page08	ECLRFUNC：Abusolute Encoder Clear Function Selection

Selected value	Contents
00: _Status_MultiTurn	Clear Encoder Status (Alarm and Warning) and Multi Turn Data
01: _Status	Clear Only Encoder Status

* These conditions are applicable only to the battery backup method absolute encoder and absolute encoder without battery.

* Do not input this while the servo motor is rotating. Confirm that the servo motor stops before inputting this.

■ Description of monitor

All signals and internal status of the servo amplifier can be monitored. There are 3 kinds of monitors.

1. Analog monitor
2. Digital monitor

Monitor box and dedicated monitor cable are needed. Refer to "Materials; Option, Monitor box." Refer to "Chapter 1, Prior to Use, Servo Amplifier Part Names 1-8" for locations for connectors to be connected.

3. Monitor in display (Setup software-R-SETUP, Digital Operator)

● **Analog monitor** (2 channels)

[Group A] 11 to 13

Analog Monitor 1, Output Signal Selection [MON1]
Analog Monitor 2, Output Signal Selection [MON2]
Analog Monitor, Output Polarity [MONPOL]

Analog monitor for use is selected.

Parameter GroupA Page11	MON1：Analog Monitor 1, Output Signal Selection
Parameter GroupA Page12	MON2：Analog Monitor 2, Output Signal Selection

Selected value	Contents
00	Reserved
01: _TMON_2V/TR	Torque Monitor 2V/ rated torque (thrust)
02: _TCMON_2V/TR	Torque Command Monitor 2V/ rated torque (thrust)
03: _VMON_0.2mV/ min^{-1}	Velocity Monitor 0.2mV/ min^{-1}
04: _VMON_1mV/ min^{-1}	Velocity Monitor 1mV/ min^{-1}
05: _VMON_2mV/ min^{-1}	Velocity Monitor 2mV/ min^{-1}
06: _VMON_3mV/ min^{-1}	Velocity Monitor 3mV/ min^{-1}
07: _VCMON_0.2mV/ min^{-1}	Velocity Command Monitor 0.2mV/ min^{-1}
08: _VCMON_1mV/ min^{-1}	Velocity Command Monitor 1mV/ min^{-1}
09: _VCMON_2mV/ min^{-1}	Velocity Command Monitor 2mV/ min^{-1}
0A: _VCMON_3mV/ min^{-1}	Velocity Command Monitor 3mV/ min^{-1}
0B: _PMON_0.1mV/P	Position Deviation Monitor 0.1mV/ Pulse
0C: _PMON_1mV/P	Position Deviation Monitor 1mV/ Pulse
0D: _PMON_10mV/P	Position Deviation Monitor 10mV/ Pulse
0E: _PMON_20mV/P	Position Deviation Monitor 20mV/ Pulse
0F: _PMON_50mV/P	Position Deviation Monitor 50mV/Pulse
10: _FMON_2mV/kP/s	Position Command Pulse Input Frequency Monitor 2mV/kPulse/s
11: _FMON_10mV/kP/s	Position Command Pulse Input Frequency Monitor 10mV/kPulse/s
12: _TLMON_EST_2V/TR	Load Torque Monitor (Estimete Value) 2V/ rated torque (thrust)
13: _Sine-U	U phase electricity angle Sin 8 V peak
14: _VBUS_1V/DC100V	Main Power Circuit D.C. Voltage 1V/DC100V
15: _VBUS_1V/DC10V	Main Power Circuit D.C. Voltage 1V/DC10V

Select this when polarity is to be changed.

Parameter GroupA Page12	MONPOL: Analog Monitor, Output Polarity

Selected value	Contents
00: _MON1+_MON2+	MON1： Positive voltage output in forward rotation; output pos and neg voltage. MON2：Positive voltage output in forward rotation; output pos and neg voltage.
01: _MON1-_MON2+	MON1：Negative voltage output in forward rotation; output pos and neg voltage. MON2：Positive voltage output in forward rotation; output pos and neg voltage.
02: _MON1+_MON2-	MON1：Positive voltage output in forward rotation; output pos and neg voltage. MON2：Negative voltage output in forward rotation; output pos and neg voltage.
03: _MON1-_MON2-	MON1：Negative voltage output in forward rotation; output pos and neg voltage. MON2：Negative voltage output in forward rotation; output pos and neg voltage.
04: _MON1ABS_MON2+	MON1：Positive voltage output together in forward and reverse rotation MON2：Positive voltage output in forward rotation; output pos and neg voltage.
05: _MON1ABS_MON2-	MON1：Positive voltage output together in forward and reverse rotation MON2：Negative voltage output in forward rotation; output pos and neg voltage.
06: _MON1+_MON2ABS	MON1：Positive voltage output in forward rotation; output pos and neg voltage. MON2：Positive voltage output together in forward and reverse rotation
07: _MON1-_MON2ABS	MON1：Negative voltage output in forward rotation; output pos and neg voltage. MON2：Positive voltage output together in forward and reverse rotation
08: _MON1ABS_MON2ABS	MON1：Positive voltage output together in forward and reverse rotation MON2：Positive voltage output together in forward and reverse rotation

● Digital monitor (1 channel)

[Group A] 10

Digital Monitor 1, Output Signal Selection [DMON]

Digital monitor for use is selected.

Parameter GroupA Page10	DMON: Digital Monitor 1, Output Signal Selection

For selected values, refer to "Chapter 5, Parameter [Parameter setting value【GroupA】] general output OUT1-general output OUT8, and setting selection list of digital monitor output.

● List of monitors in display

[Monitor] 00 to 2C

Page	Name	Contents	Unit
00	Servo Amplifier Status	Displays the statuses of main circuit power being supplied, operation ready and servo ON. Note2	---
01	Warning status 1	Displays warning status. Note2	---
02	Warning status 2	Displays warning status. Note2	---
03	General input/output monitor	Displays general input and output (hardware-signal) status Note2	---
05	Velocity Monitor	Displays motor rotation velocity.	min^{-1}
06	Velocity Command Monitor	Displays velocity command value.	min^{-1}
07	Torque Monitor	Displays motor output torque.	%
08	Torque Command Monitor	Displays torque command value.	%
09	Position Deviation Monitor	Displays position deviation values.	Pulse
0A	Actual Position Monitor	Displays current position compared with original position when the control power is turned ON. This is a free run counter. Therefore, when current position exceeds the displayed range, the display is maximum value of reversed polarity.	Pulse
0B	External Actual Position Monitor		
0C	Command Position Monitor		
0E	Position Command Pulse Input Frequency Monitor	Displays command pulse frequency being input.	k Pulse/s
0F	U-Phase Electric Angle Monitor	Displays electric angle of U phase. Except for encoder error, this is always displayed.	deg
10	Absolute Encoder PS Data (High)	Displays absolute encoder position data PS.	x2^32 P
11	Absolute Encoder PS Data (Low)	Displays absolute encoder position data PS.	Pulse
12	Regenerative Resistor Operation Percentage	Displays regeneration resistance operation status.	%
13	Motor Operating Rate Monitor	Displays exact values, however, it may take several hours for the value to become stable depending on the operation pattern.	%
14	Predicted Motor Operating Rate Monitor	Displays estimated value of servo motor usage ratio, which is estimated from a short period of operation. In an application where the same operation pattern repeats in a short period of time, the usage ratio can be confirmed fast.	%
15	Load Inertia (Mass) Ratio Monitor	Values can be confirmed when gain switch over and auto-tuning functions are used.	%
16	Position Loop Proportional Gain Monitor		1/s
17	Position Loop Integral Time Constant Monitor	Values can be confirmed when gain switch over function is used.	ms
18	Velocity Loop Proprotional Gain Monitor	Values can be confirmed when gain switch over and auto-tuning function are used.	Hz
19	Velocity Loop Integral Time Constant Monitor		ms
1A	Torque Command Filter Monitor		Hz
1B	Incremental Encoder Signal Monitor	Incremental signal of CN2 is displayed. Note2	-----
1C	Load Torque Monitor (Estimate Value)	Load torque is displayed.	%
1D	Powre Monitor	Main circuit DC voltage is displayed.	V
1E	Servo Amplifier Operation Time	Counted while control power supply is ON. The time is displayed value×2 hours.	×2 hour
20	Execution Point Number	Displays a point number in execution or a point number that is completed execution	—
21	Actual Location (User Coordinate)	Displays actual position in user coordinate by values with a decimal point. Note 1)	—
22	Command Position (User Coordinate)	Displays command position in user coordinate by values with a decimal point. Note 1)	—
23	Position Deviation (User Coordinate)	Displays position deviation in user coordinate by values with a decimal point. Note 1)	—
24	Input (Group 1) Monitor	Displays status of Input (Group 1) . Note2	—
25	Input (Group 2) Monitor	Displays status of Input (Group 2) . Note2	—
26	Input (Group 3) Monitor	Displays status of Input (Group 3) . Note2	—
27	Input (Point Number) Monitor	Displays status of Input (Point No.) . Note2	—
28	Output (Group 1) Monitor	Displays status of Output (Group 1) . Note2	—
29	Output (Group 2) Monitor	Displays status of Output (Group 2) . Note2	—
2A	Output (Group 3) Monitor	Displays status of Output (Group 3) . Note2	—
2B	Output (Group 4) Monitor	Displays status of Output (Group 4) . Note2	—
2C	Test Monitor	(Manufacturer use only) Note 3)	—

Note 1) Actual monitored values are displayed in user coordinate by values with a decimal point that is previously set by D_dpo.

Note 2) Refer to the following page and after for description of servo amplifier status and each bit allocation.

Note 3) A monitor for the manufacturer use only

For displays of monitor by Setup Software, refer to "Setup Software R-SETUP".

● Description of [Status of Servo Amplifier] Monitor
Contents of status of Servo Amplifier are shown in the table below.

Status Code	Monitor display	Contents of Servo Amplifier status
00 H	Reset	Reset state
01 H	Run	Moving point
02 H	Feed	Moving state
03 H	Feed_Hold	Motion temporary under suspension
04 H	Jog	Move by JOG Feeding
05 H	1step	Step movement - Move at regular interval -
06 H	I_Run	Interrupt Move
07 H	Home	Home position setting
08 H	Z-Return	Homing
09 H	Z-Finish	Homing complete
0A H	Waiting	Servo On:･Waiting command input
0B H	Cancel	Cancel movement
0C H	Normal-End	Movement complete･Wait command input, Servo OFF
0D H	Servo-OFF	Servo OFF state
0E H	M_STR	Wait MFIN
0F H	Dwell	Dwell time - time in a cycle at which no motion occurs -
10 H	Z-Slow_down	Homing SDN in progress
16 H	ERR_Soft+OT	ERR: + Software position limit
17 H	ERR_Soft-OT	ERR: - Software position limit
18 H	ERR_Point_D	ERR: Point data setting error
19 H	ERR_Loop	ERR: Point Loop frequency setting error
1A H	ERR_Nesting	ERR: Point Loop nesting error
1B H	ERR_Z_Return	ERR: Homing motion error

*If display time of amplifer status is too short, the status may not be displayed on the monitor.

● Description of monitor “general input and output”
Displayed contents of general input and ouput signal monitor are as follows:

	Bit allocation							
Name	7	6	5	4	3	2	1	0
General input and output monitor	—	—	General output 2 [OUT2]	General output 1 [OUT1]	General input 4 [IN4]	General input 3 [IN3]	General input 2 [IN2]	General input 1 [IN1]

● Description of [Warning Status 1・2] Monitor
Contents of Status of Warning Status 1・2 are shown in the table below.

	Correspondence table of Bits							
Status	7	6	5	4	3	2	1	0
Warning Status 1	Following Error Warning	—	Speed limit operation running	Torque limit operation running	Regenerative overload Warning	Overload Warning	—	Amplifier Overheating Warning
Warning Status 2	—	Battery voltage reduction Warning	—	—	—	—	—	Main circuit power being charged

● Description of monitor "Incremental encoder signal"
Displayed contents of incremental encoder signal monitor are as follows:

	Bit allocation							
Name	7	6	5	4	3	2	1	0
Incremental encoder signal monitor	—	External encoder Z-phase signal	External encoder B-phase signal	External encoder A-phase signal	—	Servo motor encoder Z-phase signal	Servo motor encoder B-phase signal	Servo motor encoder A-phase signal

● Description of monitor "input/output (for positioning function) signal"
Displayed contents of input/output (for positioning function) signal monitor are as follows:

	Bit allocation							
Name	7	6	5	4	3	2	1	0
Input group 1 Moniotr	CACL	ARST	RAP	-JOG	+JOG	ZRT	RUN	S-ON
Input group 2 Monitor	M_FIN	IRUN	-1step	+1step	OVRD_3	OVRD_2	OVRD_1	OVRD_0
Input group 3 Monitor	E_STR	-OT	+OT	SDN	HOME	BRK_ FREE	EXT_E	BAT CLR
Input point NO. Monitor	IN (128)	IN (64)	IN (32)	IN (16)	IN (8)	IN (4)	IN (2)	IN (1)
Output group 1 Monitor	WAR (ZFIN)	INPS	PFIN	MOVE	EXT	ERR	HBON	NCRDY
Output group 2 Monitor	C_RDY	T_LIM _FLG	IN_ FEED	IN_ STOP	SVACT	SVRDY	A_RDY	ALM
Output group 3 Monitor	MSTR	—	—	—	MOUT_3	MOUT_2	MOUT_1	MOUT_0
Output group 4 Monitor	ZOUT_8	ZOUT_7	ZOUT_6	ZOUT_5	ZOUT_4	ZOUT_3	ZOUT_2	ZOUT_1

* For the details of each information flag (abbreviation), refer to coil input/output specification (after page 3-41).

■ Description of operation tracing function

Various signals and internal status of servo amplifier can be displayed and saved (stored) by analog signals (up to 4 items from the table below are available) and digital signal (up to 4 items from the table below are available).
Refer to the following table for the signals selectable.

- Contents of analog signal selection

Signal name	Data length	Data range	Unit
VMON: Velocity monitor	2 Bytes	-32768 to 32767	min-1
VCMON: Velocity command monitor	2 Bytes	-32768 to 32767	min-1
TMON: Torque monitor	2 Bytes	-32768 to 32767	%
TCMON: Torque command monitor	2 Bytes	-32768 to 32767	%
PMON: Position deviation monitor	4 Bytes	-2147483648 to 2147483647	Pulse
APMON: Actual position monitor (motor encoder)	4 Bytes	-2147483648 to 2147483647	Pulse
CPMON: Command position monitor	4 Bytes	-2147483648 to 2147483647	Pulse
FMON: Position command pulse monitor (position command pulse input frequency)	2 Bytes	-32768 to 32767	Pulse
Sine U	2 Bytes	-32768 to 32767	--
PS-H: Absolute encoder PS (high-order)	4 Bytes	0 to 4294967295	x2^32 P
PS-L: Absolute encoder PS (low-order)	4 Bytes	0 to 4294967295	Pulse
RegR : Regenerative resistance operational rate	2 Bytes	0 to 65535	0.01%
OPRT: Motor usage rate monitor	2 Bytes	0 to 65535	%
JRAT_MON: Control loop parameter_load inertia moment ratio monitor	2 Bytes	0 to 65535	%
TLMON_EST: Load torque (estimate value)	2 Bytes	-32768 to 32767	%
PMON_S: Position deviation monitor (2-Byte)	2 Bytes	-32768 to 32767	Pulse
AD_REAL : Actual position (user coordinate)	4 Bytes	-2147483648 to 2147483647	U
AD_MACH : Command position (user coordinate)	4 Bytes	-2147483648 to 2147483647	U
PAERR : Position deviation (user coordinate)	4 Bytes	-2147483648 to 2147483647	U
IN_POINT : Input (point number) monitor	2 Bytes	0 to 255	--
EXE_POINT : Execution point number	2 Bytes	0 to 255	--

● Contents of digital signal selection

Signal name	Description
RUN : Starting-up	"High" while signal RUN is ON.
+JOG : ＋Manual feeding	"High" while signal +JOG is ON.
-JOG : －Manual feeding	"High" while signal -JOG is ON.
RAP/OVRD : Manual high-velocity/ override	"High" while signal RAP/OVRD is ON.
+1STEP : ＋1 step-feeding	"High" while signal +1STEP is ON.
-1STEP : －1 step-feeding	"High" while signal -1STEP is ON.
I_RUN : Interrupt start-up	"High" while signal I_RUN is ON.
MFIN : Handshake signal	"High" while signal MFIN is ON.
ZRT : Homing signal	"High" while signal ZRT is ON.
SDN : Slow-down signal	"High" while signal SDN is ON.
OVRD_0 : Override-0 signal	"High" while signal OVRD_0 is ON.
OVRD_1 : Override-1 signal	"High" while signal OVRD_1 is ON.
OVRD_2 : Override-2 signal	"High" while signal OVRD_2 is ON.
OVRD_3 : Override-3 signal	"High" while signal OVRD_3 is ON.
OUT1 : General output1	"High" while signal OUT1 is ON.
OUT2 : General output2	"High" while signal OUT2 is ON.
INPS: In-position	"High" while signal INPS is ON.
NEAR: Near-range	"High" while signal NEAR is ON.
VCMP: Actual velocity corresponds to the commanded value.	"High" while signal VCMP is ON.
TLC: Torque (force)-limited operation	"High" while signal TLC is ON.
PFIN : Positioning completed	"High" while signal PFIN is ON.
S-ON: Motor excited	"High" while signal S-ON is ON.
S-RDY: Operation-ready	"High" while signal S-RDY is ON.
MOVE : Operating	"High" while signal MOVE is ON.
PCON-ACK: Proportionally-controlling velocity loop	"High" while signal PCON-ACK is ON.
EGR-ACK: Switching electronic gears	"High" while signal EGR-ACK is ON.
WNG-OFW: Excessive deviation warning activated	"High" while signal WNG-OFW is ON.
WNG-OLW: Excessive load warning activated	"High" while signal WNG-OLW is ON.
ALM: Alarm being activated	"High" while signal ALM is ON.
IN1 : General input 1	"High" while signal IN1 is ON.
IN2 : General input 1	"High" while signal IN2 is ON.
IN3 : General input 3	"High" while signal IN3 is ON.
IN4 : General input 4	"High" while signal IN4 is ON.

8

[Maintenance]

■ Corrective Actions for Problems During Operation

●When troubles occur without any alarm displayed, check and take corrective actions for them referring to the description below. When alarm occurs, perform corrective measures referring to “Trouble Shooting When Alarm Occurs”.

When you do the work for correction processing, be sure to turn off the power supply.

No	Problems	Investigation	Assumed causes and corrective actions
1	“≡” does not light up to 7-segment LED even if main power is ON.	Check the voltage at the power input terminal.	・ If voltage is low, check the power supply. ・ If there is no voltage, check that wires and screws are fastened properly.
		Check if red “CHARGE” LED is lighting off.	・ Internal power circuit of servo amplifier is defective. → Replace the servo amplifier.
2	7-segment LED displays a rotating character “8” (Servo ON status), but motor does not rotate.	Check of command is input by the digital operator’s monitor. page 06 : Velocity Command Monitor page 08 : Torque Command Monitor page 0E : Position Command Monitor The monitor’s value is zero.	・ Input a command.
		Servo is not locked.	・ Confirm that power line of motor is connected.
		Check if torque limit is input.	・ Because torque limit has been input, motor cannot rotate more than load torque.
		Enter deviation clear to check if process is continued.	・ Stop the input of deviation clear.
3	Operation of the servomotor is unstable and velocity is lower than command.	Check if proportional control is entered.	・ Stop the input of proportional control.
		Check if torque limit is input.	・ Stop inputting torque limit.
4	Servo motor rotates only once, and stops.	Check motor power line.	・ The motor power line is not connected.
		Check the setup of encoder resolution. The digital operator’s system parameter page 05 : Absolute Encoder Resolution Setting. page 03 : Incremental Encoder Resolution Setting	・ Change the settings and turn ON the power again.

No	Problems	Investigation	Assumed causes and corrective actions
5	Motor is accelerated.	Check the motor power line.	• Phase order of motor power line does not match.
		Check the wiring of encoder cable.	• Wiring of A phase and B phase of the encoder is incorrect.
6	Motor is vibrating with frequency above 200 Hz.	–	• Reduce the loop gain speed. Set the torque command low-pass filter and torque command notch filter.
7	Excessive over shoot/ under shoot during starting / stopping.	–	• Adjust the servo tuning “response”. • Reduce the loop gain speed. • Increase the integral time constant. • Simplify the acceleration and declaration command. Use position command low-pass filter. •
8	Abnormal sound occurs	Check that there is no defect in mechanical installation.	• Observe by operating one motor. • Pay attention while coupling and confirm that there is no core shift or unbalance.
		Check whether abnormal sound is random or periodic while operating at low speed.	• Confirm that the twisted pair and shield processing of encoder signal line are correct. • Confirm that the wiring for encoder line and power line are installed in the same port. • Confirm that the power supply voltage is sufficient.

■ Alarm List

Operation at detecting: "DB" performs the slowdown stop of the servo motor in dynamic brake operation when the alarm generating.
Operation at detecting: "SB" performs the slowdown stop of the servo motor with sequence current limiting value.
When dynamic brake is selected by forced stop operation selection, the servo motor is decelerating stopped for the dynamic brake operation regardless of the operation when detecting it. (However, it stops in free servo brake operation at the time of alarm 53H (DB resistor overheating) detection.

	Alarm code	Alarm title	Alarm contents	Detection Operations	Alarm Clear
	01H	Serial communication error 1	・Time-out error of a host device communication	DB	V
Abnormality related to drive	21H	Power Module Error (Over-current)	• Over current of drive module • Abnormality in drive power source • Overheating of drive module	DB	V
	22H	Current Detection Error 0	• Abnormality of electric current detection value	DB	V
	23H	Current Detection Error 1	• Abnormality of Electric current detection circuit	DB	V
	24H	Current Detection Error 2	• Abnormality in communication with Electric current detection circuit	DB	V
Abnormality related to load	31H	Positive Over-travel	・Positive Over-travel Status	DB	V
	32H	Negative Over-travel	・Negative Over-travel Status	DB	V
	41H	Overload 1	• Excessive effective torque	SB	V
	42H	Overload 2	・Stall over load	DB	V
	43H	Regenerative Error	• Regeneration load ratio exorbitance	DB	V
	51H	Amplifier Overheat	• Overheating detection of amplifier ambient temperature	SB	V
	52H	RS Overheat	・Detection of in-rush prevention resistance overheating	SB	V
	53H	Dynamic Brake Resistor Overheat	• Overheating detection of DB resistor	SB	V
	54H	Internal Overheat	• Overheating detection of Internal regeneration resistor	DB	V
	55H	External Error	• Overheating detection of External regeneration resistor And Abnormal detection of host equipment	DB	V
Abnormality in power source	61H	Over-voltage	• DC Excess voltage of main circuit	DB	V
	62H	Main Circuit Under-voltage	• DC Main circuit low voltage	DB	V
	63H	Main Power Supply Fail Phase	• 1 phase of the 3 phase main circuit power supply disconnected	SB	V
	71H	Control Power Supply Under-voltage	• Control power supply low voltage	DB	V Note 2)
	72H	Control Power Error	• Under voltage of + 12 V	SB	V
Abnormality related to encoder wiring	81H	Encoder Pulse Error 1 (A-phase, B-phase, Z-phase)	• Incremental encoder (A, B, Z) signal line break • Power supply break	DB	“ ”
	82H	Absolute Encoder Signal Disconnect	• Absolute Encoder (PS) signal line break	DB	V
	83H	External Encoder Pulse Error (CN-EXT: A-Phase, B-Phase, Z-Phase)	• Breaking of full close Encoder (A, B) signal line	DB	V
	84H	Communication Error Between Encoder and Amplifier	• Encoder serial signal time out	DB	V Note 4)
	85H	Encoder Initial Process Error	• Failed to read CS data of incremental encoder • Abnormality in initial process of absolute encoder • Cable break	-	“ ”
	87H	CS Signal Disconnection	• CS signal line break	DB	“ ”
	91H	Encoder Command Error	• Mismatch of transmission command and reception command	DB	V
	92H	Encoder FORM Error	• Start, Stop bit Abnormality • Insufficient data length	DB	V
	93H	Encoder SYNC Error	• Data cannot be received during the prescribed time after the command is sent.	DB	V
	94H	Encoder CRC Error	• CRC generated from the received data and sent CRC does not match	DB	V

Note 1:Control power error or servo ready OFF is detected during instantaneous break of 1.5 to 2 cycles.
Detection of control power error and servo ready OFF can be delayed by setting larger value of PFDDLY（Group B Page 16）.
Note 2:When the main power voltage increases or decreases gradually or is suspended, main circuit low voltage or main power failed phase may be detected.
Note 3:When full-close control/external encoder (CN2 input signal, see System Parameter Page 09) is selected, the alarm can be reset.
Note 4:When the absolute encoder with incremental output is used, alarm resetting is prohibited.
Note 5:”V” means it is possible to reset. “ ”means it is not possible to reset.

	Alarm code	Alarm name	Alarm contents	Operations while detecting	Alarm clear
Abnormality in encoder main body	A1H	Encoder Error 1	・Breakdown of Encoder internal device	DB	Note 3)
	A2H	Absolute Encoder Battery Error	・Battery low voltage	DB	Note 3)
	A3H	Encoder Overheat	・Motor built-in Encoder Overheating	DB	Note 3)
	A5H	Encoder Error 3	・Error generation of multi-rotation data ・ Abnormality in operations of temperature encoder	DB	Note 3)
	A6H	Encoder Error 4	・Encoder internal EEPROM data is not set ・Overflow of multi-rotation data	DB	Note 3)
	A7H	Encoder Error 5	・Resolver Abnormality ・Light receiving abnormality in encoder	DB	Note 3)
	A8H	Encoder Error 6	・Resolver disconnection ・Light receiving abnormality in encoder	DB	Note 3)
	A9H	Failure of Encoder	・Encoder failure	DB	Note 3)
	B2H	Encoder Error 2	・Position data incorrect	DB	Note 3)
	B3H	Absolute Encoder Multi-Turn Counter Error	・Detection of incorrect multiple rotations coefficient	DB	Note 3)
	B4H	Absolute Encoder Single-Turn Counter Error	・Detection of incorrect 1 rotation coefficient	DB	Note 3)
	B5H	Over-allowable Speed of Absolute Encoder at Turning ON	・Exceeds the permitted speed of motor rotation speed when the power is turned ON	DB	Note 3)
	B6H	Encoder Memory Error	・Access error of Encoder internal EEPROM	DB	Note 3)
	B7H	Acceleration Error	・Exceeds the permitted speed for motor rotation	DB	Note 3)
Control system abnormality	C1H	Overvelocity	・Motor rotation speed is 120 % more than the highest speed limit	DB	V
	C2H	Speed Control Error	・Torque command and acceleration direction are not matching.	DB	V
	C3H	Speed Feedback Error	・Motor power disconnection (Note 2)	DB	V
	D1H	Following Error (Excessive Position Deviation)	・Position error exceeds setup value	DB	V
	D2H	Faulty Position Command Pulse Frequency 1	・Frequency of entered position command pulse is excessive	SB	V
	D3H	Faulty Position Command Pulse Frequency 2	・Position command frequency after electronic gear is high.	SB	V
	DFH	Test Run Close	・Detection in ‘Test mode end’ status	DB	V
Control system/Memory system abnormality	E7H	Parameter error 3	・Error in address setting or baud rate setting of a host device communication	DB	“ ”
	F1H	Task Process Error	・Error in interruption process of CPU	DB	“ ”
	F2H	Initial Process Time-Out	・Detection when initial process does not end within initial process time	-	“ ”
	FFH	Sub-CPU error	・Failure in procedure of initialization in common RAM. Error in a processor used for a host device communication	DB	“ ”

Note 1: Alarm that rings in ‘Test mode end’ status is not recorded in the alarm history.
Note 2: When there is a rapid motor slow down simultaneous with servo ON, there is a possibility that a break in the motor’s power line cannot be detected.
Note 3: Due to abnormality in encoder main body, encoder clear may sometimes be needed.
Note 4:”V” means it is possible to reset. “ ”means it is not possible to reset.

■ Warning List

	Warning Title	Warning Contents
Load system	Overload Warning	・When the effective torque exceeds the set torque
	Regenerated Overload Warning	・In case of overload of regenerative resistance
	Amplifier Overheating Warning	・Ambient temperature of the amplifier is out of range of the set temperature
Power supply system	Main circuit is charging	・Voltage of main circuit is above DC 105 V
External input system	Forward over travel	・While entering forward over travel
	Reverse over travel	・While entering reverse over travel
Encoder system	Absolute encoder battery warning	・Battery voltage is below 3.0 V
Control system	Restricting torque command	・While restricting the torque command by torque restriction value
	Restricting speed command	・While restricting the speed command by speed value.
	Excessive position deviation	・When position deviation warning setup value is outside the proscribed limits

Alarm code 01H (Time-out error of a host device communication)

Status at the time of alarm	Cause				
	1	2	3	4	5
Alarm raised after serial communication started	V	V	V	V	V
Issued during operation	V	V	V	V	V

Corrective actions

	Cause	Investigation and corrective actions
1	▪ Cable connection of serial communication loose, or any disconnection part on communication line	▪ Check communication cable connection, or replace cables.
2	▪ Increase or decrease the command pulse frequency of a host device	▪ Setup command pulse frequency within the range of default value
3	▪ Serial communication generates noise.	▪ Inspect or replace/repair the twisted pair cables that have to be used for communication line ▪ Separate and avoid noise source on the periphery of communication line
4	▪ Unequipped terminating resistances at the distal end of serial communication line.	▪ Check both of the distal ends for terminating resistances by Multi drop network
5	▪ A defective control panel of the servo amplifier	▪ Replace the servo amplifier

Alarm code 21H (Power Module Error / Overcurrent)

Status at the time of alarm	Cause			
	1	2	3	4
Issued when control power is turned ON.	(V)		V	(V)
Issued at servo input.	V	V	V	
Issued while starting and stopping the motor.	(V)	(V)	(V)	
Issued after extended operating time.	(V)	(V)	(V)	V

Corrective actions

	Cause	Investigation and corrective actions
1	･U/V/W-phase of amplifier is short circuited due to the wiring in amplifier and motor. Also, U/V/W-phases are grounded in the earth.	･Check the wiring between the amplifier and motor, and confirm that there is no error. If some error is detected, modify or change the wiring.
2	･Short circuit or fault in U/V/W phases on servo motor side.	･Replace the servo motor.
3	･Defect in control print panel ･Defect in power device	･Replace the servo amplifier.
4	･Overheat is detected in Power device (IPM).	･Confirm that the cooling fan motor for the servo amplifier is working. If it is not working, replace the servo amplifier. ･Confirm that the temperature of the control panel (ambient temperature of the servo amplifier) does not exceed 55℃. If in excess of 55(C, check the installation method of the servo amplifier, and confirm that the cooling temperature of the control panel is set to below 55℃

Alarm code 22H (Current Detection Error 0)

Status during alarm	Cause	
	1	2
Issued when the control power is turned ON.	V	(V)
Issued after the power is turned ON.	(V)	V

Corrective actions

	Cause	Investigation and corrective actions
1	･Defect in control print panel ･ Defect in power device	･ Replace the servo amp.
2	･ Servo amplifier and motor are not combined properly	･ Confirm that the proper codes (per the specified Motor Codes) have been used for the servo motor; if not, replace the servo motor.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code 23H (Abnormal current detection1)
Alarm code 24H (Abnormal current detection2)

Status during alarm	Cause	
	1	2
Alarm occurs when control power turns on.	V	
Alarm occurs during operation.	(V)	V

Corrective actions

Cause		Investigation and corrective actions
1	Defect inside the servo-amplifier circuit.	▪ Replace the servo-amplifier.
2	▪ Error by noise	▪ Check the amp-earth wire is installed properly. ▪ Take countermeasure against the noise adding ferrite cores and so on.

Alarm code 31h (Over traveling in CW)
Alarm code 32h (Over traveling in CCW)

Status during alarm	Cause	
	1	2
Alarm occurs when control power turns on.	V	
Alarm occurs during operation.	(V)	V

Corrective actions

Cause		Investigation and corrective actions
1	▪ Defect of power supply (DC+24V) for external input signal. ▪ Error of external wiring. ▪ Wrong ethic of over-traveling signal ・Defect inside servo-amplifier circuit.	▪ Turn the power supply for external input signal to (DC+24V ±10%) ▪ Check the external circuit and correct it if there is any abnormality. ▪ Correct the ethic of over-traveling signal. ・Replace servo-amplifier.
2	▪ Status of Over-traveling. ▪ Error by noise	▪ Travel to the effective operation area. (Escape from over-traveling condition) ▪ Check the amp-earth wire is properly installed. ▪ Take countermeasure against the noise adding ferrite cores, etc.

SW2 : It is possible to travel by negating over-travel with functional switch 2, but please operate it after specifying a cause that it came off from the effective operation area, since over-travel doesn't work in such status.

Alarm code 41H (Overload 1)

Status during alarm	Cause 1	2	3	4	5	6	7	8	9
Issued when power supply control is turned ON.	V								
Issued at input of servo ON.	V	V							V
After command input, issued without rotating the motor.		V			V	V	V		V
After command input, brief motor rotation			V	V	V		(V)	V	

Corrective actions

Cause		Investigation and corrective actions
1	•Defect in servo amplifier control panel or power element peripheral	• Replace the servo amplifier.
2	•Defect in encoder circuit of servomotor	• Replace the servo motor.
3	•Effective torque exceeds the rated torque.	• Monitor the load status using motor usage ratio monitor (OPRT), and check if effective torque exceeds the rated value. • Or, calculate the motor effective torque from load conditions and operation conditions. →If the effective torque is excessive, check the operating or loading, or replace the capacity of the large motor.
4	•Defect in motor-amplifier combination	• Check if the motor in use matches with the recommended type, and replace if it is improper.
5	•Holding brake of servo motor does not release.	• Check that the wiring and voltage of the holding brake are acceptable; if not, repair. → If the above are OK, replace the servomotor.
6	•Wiring of U/V/W –phase between servo amplifier and motor do not match.	• Check the wiring conditions and restore if improper.
7	•One or all connections of U/V/W -phase wiring of servo amplifier / motor is disconnected	• Check the wiring conditions and restore if improper.
8	•Machines collided.	• Check the operating conditions and limit switch.
9	•Encoder pulse number setting does not match with the motor.	• Match the encoder pulse number with the motor.

⚠ During the alarm caused by conditions in #3 (above), if OFF→ON of power supply control is repeated, there is a risk of burning out the servo motor.
Wait for longer than 30 min. for cooling purposes after power shut OFF, and resume operations.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code 42H (Overload 2)

Status during alarm	Cause								
	1	2	3	4	5	6	7	8	9
Issued when power supply control is turned ON.	V								
Issued at input of servo ON.	V	V							V
After command input, issued without rotating the motor.		V			V	V	V		V
After command input, brief motor rotation			V	V	V		(V)	V	

Corrective actions

Cause		Investigation and corrective actions
1	•Defect in servo amplifier control panel or power element peripheral	•Replace the servo amplifier.
2	•Defect in encoder circuit of servomotor	•Replace the servo motor.
3	▪ Rotation is less than 50 min^{-1} and torque command exceeds approx. 2 times of rated torque.	▪ Check if torque command exceeds approx. 2 times of the rated torque by torque command monitor (TCMON). ▪ Or, calculate the motor effective torque from load conditions and operation conditions. →If the effective torque is excessive, check the operating or loading, or replace the capacity of the large motor.
4	•Defect in motor-amplifier combination	▪ Check the motor type setting and the motor in use are matching. If not, correct them.
5	•Holding brake of servo motor does not release.	▪ Check that wirings and voltage for holding brake are correct. If not, repair them. →If they are appropriate, replace the servo motor.
6	•Wiring of U/V/W –phase between servo amplifier and motor do not match.	• Check the wiring conditions and restore if improper.
7	•One or all connections of U/V/W -phase wiring of servo amplifier / motor is disconnected	• Check the wiring conditions and restore if improper.
8	•Machines collided.	•Check the operating conditions and limit switch.
9	•Encoder pulse number setting does not match with the motor.	•Match the encoder pulse number with the motor.

Alarm code 43H (Regenerative Error)

Status during alarm	Cause							
	1	2	3	4	5	6	7	8
Issued when power supply control is turned ON.							V	
Issued when power supply of main circuit is turned ON.						V	V	V
Issued during operation.	V	V	V	V	V		(V)	

Corrective actions

Cause		Investigation and corrective actions
1	• Exceeded permitted value of regenerating power in built-in regenerative resistance specifications. • Excessive load inertia, or tact time is short.	• Check the load inertia and operating pattern. • Use an external regeneration resistor. • Set the load inertia within the specified range. • Increase the deceleration time. • Increase the tact time.
2	• Regenerative resistance wiring conflicts with built-in regenerative resistance specifications.	• Check wiring and replace if incorrect.
3	• Regenerative resistance wiring conflicts with external regeneration resistor specifications.	• Check wiring and replace if incorrect.
4	• Regeneration resistor is disconnected.	• For built-in regeneration resistor specifications, replace the servo amplifier. • For external regeneration resistor specifications, replace the regeneration resistor.
5	• Resistance value of external regeneration resistor is excessive.	• Replace the current resistance value with a value matching the specifications.
6	• Input power supply voltage exceeds the specified range.	• Check the input power supply voltage level.
7	• Defect in control circuit of servo amplifier.	• Replace the servo amplifier.
8	• When external regenerative resistance is selected for system parameter Page OB and external regenerative resistance is not installed.	• Install the external regenerative resistance. • Set to “Do not connect regenerative resistance“.

If the setting of system parameter page 0B regeneration resistance is incorrect, regeneration error is not detected properly, and the amplifier and surrounding circuit may be damaged or burnt.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code 51H (Amplifier Overheat)

Status during alarm	Cause 1	2	3	4	5
Issued when power supply control is turned ON.	(V)		V	(V)	
Issued during operation.	(V)	V	V	V	
Issued after emergency stop.					V

Corrective actions

	Cause	Investigation and corrective actions
1	• Defect in internal circuit of servo amplifier.	• Replace the servo amplifier.
2	•Regenerating power exceeded.	• Check the operating conditions. • Use external regeneration resistor.
3	•Regenerating power is within the specified range but ambient temperature of servo amplifier is out of specified range.	• Confirm that the cooling method maintains the temperature of control panel between 0 ~ 55℃.
4	• Regenerating power is within the specified range but built-in cooling fan of servo amplifier is stopped.	• For an amplifier equipped with a cooling fan motor, check that the cooling fan motor is running; if not, replace the servo amplifier.
5	• Regeneration energy during emergency stop exceeded.	• Change the servo amp. • Check the loading condition.

⚠ Abnormalities are detected in the internal temperature of the amplifier regardless of its ambient temperature. When an amplifier ambient temperature warning is issued, please be sure to check the cooling method of the control panel.

Alarm code 52H (RS Overheat) ［only for RS1☐30］

Status during alarm	Cause 1	2	3
Issued when power supply is turned ON.	V		
Issued when main circuit power supply is turned ON.		V	
Issued during operation.			V

Corrective actions

	Cause	Investigation and corrective actions
1	Defect in internal circuit of servo amplifier.	Replace the servo amplifier
2	▪ Power turning ON is repeated too frequently.	▪ Turn ON/OFF the power less frequently.
3	▪ Ambient temperature is high.	▪ For a servo amplifier equipped with a cooling fan motor, check that the cooling fan motor is running properly. If not, replace the servo amplifier. ▪ Check if the temperature inside the control panel (servo amplifier ambient temperature) exceeds 55℃. If it does, review the servo amplifier installing method and cooling method of control panel to make it below 55℃.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code 53H (Dynamic Brake Resistor Overheat)

Status during alarm	Cause	
	1	2
Issued when power supply is turned ON.	V	
Issued during operation.	(V)	V

Corrective actions

	Cause	Investigation and corrective actions
1	• Defect in internal circuit of servo amplifier.	• Replace the servo amplifier.
2	• DB operation frequency exceeded.	▪ Use the dynamic brake so as not to exceed the permissive frequency.

Alarm code 54H (Internal Overheat)

Status during alarm	Cause		
	1	2	3
Issued when power supply control is turned ON.	(V)		V
Issued during operation.	(V)	V	V

Corrective actions

	Cause	Investigation and corrective actions
1	• Defect in internal circuit of servo amplifier.	• Replace the servo amplifier.
2	• Regenerating power excessive.	• Check the built-in regenerative resistance absorption power. • Check the operating conditions, so that regenerating power is within permitted absorption power. • Use an external regeneration resistor.
3	• Improper wiring of built-in regeneration resistor.	• Confirm improper condition and repair if necessary.

When using a regeneration resistance built in the servo amplifier, make sure to set “built-in regeneration resistance” at system parameter Page ０Ｂ [Regeneration resistance type]. This setting makes the judgment between enabled/disabled of the overheating protection detection treatment of the built-in regeneration resistance. When “No connected regenerative resistance or external regenerative resistance” is selected, overheating of built-in regenerative resistance is not detected. Therefore, there is a danger that built-in regenerative resistance will burn out or be damaged.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code 55H (External Error)

●When external regenerative resistor and output terminal of upper device are not connected

Status during alarm	Cause	
	1	2
Issued when power supply control is turned ON.	V	(V)

Corrective actions

Cause		Investigation and corrective actions
1	· Validity condition for external trip function is set to ‘Valid’.	·When you do not use it, please set GroupD Sw2 bit2 as "1."
2	· Defect in control panel of servo amplifier.	· Replace the servo amplifier.

●When external regenerative resistor is not connected

Status during alarm	Cause		
	1	2	3
Issued when power supply control is turned ON.	V		(V)
Issued after operation.		V	(V)

Corrective actions

Cause		Investigation and corrective actions
1	· Improper wiring of external regenerative resistance.	· Check wiring and replace if necessary.
2	· External regeneration resistor is operating.	· Check the operating conditions. · Increase the capacity of the external regeneration resistor.
3	· Defect in control panel of servo amplifier.	· Replace the servo amplifier.

● When output terminal of host device is connected:
Eliminate the alarm trigger of the upper level device.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code 61H (Overvoltage)

Status during alarm	Cause			
	1	2	3	4
Issued when power supply control is turned ON.	V			
Issued when power supply of main circuit is turned ON.	V	V		
Issued at the time of motor start/stop.		(V)	V	V

Corrective actions

Cause		Investigation and corrective actions
1	· Defect in control panel of servo amplifier.	· Replace the servo amplifier.
2	· The power supply voltage of main circuit exceeds the rated value.	· Reduce the power supply voltage to within the specified range.
3	· Excessive load inertia.	· Reduce the load inertia to within the specified range.
4	▪ Incorrect wiring for regeneration resistance ▪ Built-in regeneration circuit is not functioning.	▪ Wire the regeneration resistance correctly. · While using the external regenerative resistance, check the wiring and resistance value. · Replace the servo amplifier if any abnormality occurs.

Alarm code 62H (Main Circuit Undervoltage)

Status during alarm	Cause				
	1	2	3	4	5
Issued when power supply control is turned ON.				V	(V)
Issued after power supply of main circuit is turned ON.	V	V			
Issued during operation, alarm resetting is possible.		(V)	V		
Issued during operation, alarm resetting is not possible.		V			

Corrective actions

Cause		Investigation and corrective actions
1	· Power supply voltage is below the specified range.	· Check the power supply and set it within the specified range.
2	· Rectifier of main circuit is broken.	· Replace the servo amplifier.
3	· Input voltage is reduced and/or blinking.	· Check the power supply and confirm that there is no blinking or low voltage, etc..
4	· Low voltage outside of the specified range is supplied to the main circuit (R/S/T).	· Check the main circuit voltage. Confirm that there is no external power supply to R/S/T when the main circuit is OFF.
5	· Defect in internal circuit of the servo amplifier.	· Replace the servo amplifier.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code 63H (Main Power Supply Fail Phase)

Status during alarm	Cause		
	1	2	3
Issued when power supply control is turned ON.		V	
Issued when power supply of main circuit is turned ON.	V		V
Issued during motor operations.	(V)		
Alarm issued during single-phase power input selection.			V

Corrective actions

Cause		Investigation and corrective actions
1	• One out of 3 phases (R/S/T) is not inserted.	• Check the wiring and repair if necessary.
2	• Defect in internal circuit of Servo amplifier.	• Replace the servo amplifier.
3	• Servo amplifier is not specified for single phase.	• Check the model number and delivery specifications of the servo amplifier and replace it with a servo amplifier for single-phase power supply. • Edit the parameters and use a single-phase specification amplifier.

Alarm code 71H (Control Power Supply Under voltage)

Status during alarm	Cause		
	1	2	3
Issued at the time of power on.	(V)	V	
Issued during operation.	(V)		V

Corrective actions

Cause		Investigation and corrective actions
1	•Defect in internal circuit of the servo amplifier.	•Replace the servo amplifier.
2	•Power supply voltage is within the specified range.	•Confirm that the power supply is set within the specified range.
3	•Input voltage is fluctuating or stopped.	•Confirm that the power supply is not going to neither stop nor reduce the power, etc..

Alarm code 72H (Control Power Error)

Status during alarm	Cause	
	1	2
Issued when power supply control is turned ON.	(V)	V

Corrective actions

Cause		Investigation and corrective actions
1	•Defect in internal circuit of the servo amplifier.	•Replace the servo amplifier.
2	•Defect in external circuit	• Restart the power supply after removing the connector; if alarm is not issued, check the external circuit. • Restart the power supply after replacing the motor; if alarm is not issued, there is defect in the encoder's internal circuit.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code 81H (Encoder Pulse Error 1 /A-phase, B-phase, Z-phase)
Alarm code 82H (Absolute Encoder Signal Disconnect)
Alarm code 84H (Communication Error Between Encoder and Amplifier)
Alarm code 87H (CS Signal Disconnection)

Status during alarm	Cause					
	1	2	3	4	5	6
Issued when power supply control is turned ON.	V	V	V	V	V	V
Issued after servo is turned ON.				V	V	
Issued during operation.	(V)			V	V	

Corrective actions

	Cause	Investigation and corrective actions
1	For encoder wiring: ·Improper wiring ·Connector is removed ·Loose connection ·Encoder cable is too long ·Encoder cable is too thin	· Check wiring and repair any abnormality. · Confirm that the encoder power supply voltage of the motor is above 4.75 V; increase it if below 4.75 V.
2	· Wrong amplifier encoder type is selected.	·Select the correct encoder type.
3	·Motor encoder that does not match with amplifier encoder type is attached.	·Replace with servo motor equipped with proper encoder.
4	·Defect in servo amplifier control circuit	·Replace the servo amplifier.
5	·Defect in servo motor encoder	· Replace the servo motor.
6	·Parameter set to ‘Full-close/Servo system’.	· Edit the parameter and set to ‘Semi-close/System setup’.

Alarm code 85H (Encoder Initial Process Error)

Status during alarm	Cause				
	1	2	3	4	5
Issued when power supply control is turned ON.	V	V	V	V	(V)

Corrective actions

	Cause	Investigation and corrective actions
1	For encoder wiring: ·Improper wiring ·Connector is removed ·Loose connection ·Encoder cable is too long ·Encoder cable is too thin	· Check wiring and repair any abnormality. · Confirm that the encoder power supply voltage of the motor is above 4.75 V; increase it if below 4.75 V.
2	· Wrong amplifier encoder type is selected.	·Select the correct encoder type.
3	· Defect in servo amplifier control circuit	·Replace the servo amplifier.
4	·Defect in servo motor encoder	·Replace the servo motor.
5	·Initial position data could not be set, as the number of rotations of the motor is more than 250 min^{-1} during power supply.	·Restart the power supply after motor is stopped. (Only when PA035C and PA035S encoder is used.)

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code 91H (Encoder Command Error)
Alarm code 92H (Encoder FORM Error)
Alarm code 93H (Encoder SYNC Error)
Alarm code 94H (Encoder CRC Error)

When abnormalities are detected in the internal part of the absolute position detector for the start-stop synchronization system.

Status during alarm	Cause		
	1	2	3
Issued when control power supply is turned ON.	(V)	V	V

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in encoder	• Replace the servo motor.
2	• Malfunction due to noise	• Confirm proper grounding of the amplifier. • Check the shielding of the encoder cable. • Add ferrite core or similar countermeasures against noise.
3	• Abnormality in encoder wiring.	• Check wiring between the encoder and amplifier.

Alarm code A1H (Encoder Error 1)

When abnormalities are detected in the internal part of the absolute position detector (RA062M) for the Manchester encoding system.

Status during alarm	Cause
	1
Issued when power supply is turned ON.	V
Issued during operation.	V

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in internal circuit of encoder	• Turn ON the power supply again; if not restored, replace the motor.

✍ "Encoder clearing and alarm resetting methods" vary depending on the encoder in use.
Refer to page 53 "Materials; Encoder Clear".

Alarm code A2H (Absolute Encoder Battery Error)

Status during alarm	Cause	
	1	2
Issued when control power is turned ON.	V	V
Issued during operation.		V

Corrective actions

Cause		Investigation and corrective actions
1	• Loose connection of battery cable.	• Confirm the battery connection in the front ON/OFF switch of the amplifier.
2	• Low battery voltage	• Check the battery voltage.

✍ "Encoder clearing and alarm resetting methods" vary depending on the encoder in use.
Refer to page 53 "Materials; Encoder Clear".

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code A3H (Encoder Overheat)

When abnormalities are detected in the internal part of the absolute position detector for the start-stop synchronization system.

Status during alarm	Cause		
	1	2	3
Issued when control power supply is turned ON.	(V)	V	
Issued while stopping the motor.	(V)	V	
Issued during motor operations.		V	V

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in internal circuit of encoder	• Turn ON the power supply again; if not restored, replace the motor.
2	• Motor is not generating heat, but encoder ambient temperature is high.	• Confirm that the cooling method keeps the encoder ambient temperature below 80^{0}C.
3	• Motor is overheated.	• Confirm the cooling procedure of the servo motor.

✍ "Encoder clearing and alarm resetting methods" vary depending on the encoder in use.
Refer to page 53 "Materials; Encoder Clear".

Alarm code A5H (Encoder Error 3)

When abnormalities are detected in the internal part of the absolute position detector for the start-stop synchronization system.

Status during alarm	Cause		
	1	2	3
Issued when power supply is turned ON.	(V)	V	V
Issued during motor operations.	(V)	V	

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in internal circuit of encoder	• Turn ON the power supply again; if not restored, replace the motor.
2	• Malfunction due to noise	• Confirm proper grounding of the amplifier. • Check the shielding of the encoder cable. • Add ferrite core or similar countermeasures against noise.
3	• Number of rotations exceeds the permitted number of rotations.	• Turn ON the power supply again, when motor is stopped.

✍ "Encoder clearing and alarm resetting methods" vary depending on the encoder in use.
Refer to page 53 "Materials; Encoder Clear".

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code A6H (Encoder Error 4)

When abnormalities are detected in the internal part of the absolute position detector for the start-stop synchronization system.

Status when alarm rings.	Cause		
	1	2	3
Issued when power supply is turned ON.	V	V	
Issued during motor operations.		V	V

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in internal circuit of encoder	• Turn ON the power supply again; if not restored, replace the motor.
2	• Malfunction due to noise	• Confirm proper grounding of the amplifier. • Check the shielding of the encoder cable. • Add ferrite core or similar countermeasures against noise.
3	• Multi-rotation counter overflows.	• Correct the operation pattern, and avoid the continuous operation in a fixed direction.

✍ "Encoder clearing and alarm resetting methods" vary depending on the encoder in use.
Refer to page 53 "Materials; Encoder Clear".

Alarm code A7H (Encoder Error 5)
Alarm code A8H (Encoder Error 6)
Alarm code A9H (Failure of Encoder)

When abnormalities are detected in the internal part of the absolute position detector for the start-stop synchronization system.

Status during alarm	Cause	
	1	2
Issued when power supply is turned ON.	V	V
Issued during motor operations.	(V)	V

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in internal circuit of encoder	• Turn ON the power supply again; if not restored, replace the motor.
2	• Malfunction due to noise	• Confirm proper grounding of the amplifier. • Check the shielding of the encoder cable. • Add ferrite core or similar countermeasures against noise.

✍ "Encoder clearing and alarm resetting methods" vary depending on the encoder in use.
Refer to page 53 "Materials; Encoder Clear".

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm Code B2H (Encoder Error 2)

When abnormality is detected in the internal part of the absolute position detector (RAO62M) of the Manchester system.

Status during alarm	Cause 1	Cause 2
Issued during operation.	(V)	V

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in internal circuit of encoder	• Turn ON the power supply again; if not restored, replace the motor.
2	• Malfunction due to noise	• Confirm proper grounding of the amplifier. • Check the shielding of the encoder cable. • Add ferrite core or similar countermeasures against noise.

✍ "Encoder clearing and alarm resetting methods" vary depending on the encoder in use.
Refer to page 53 "Materials; Encoder Clear".

Alarm code B3H (Absolute Encoder Multi-Turn Counter Error)
Alarm code B4H (Absolute Encoder Single-Turn Counter Error)
Alarm code B6H (Encoder Memory Error)

When abnormalities are detected in the internal part of the absolute position detector for the start-stop synchronization system.

Status during alarm	Cause 1	Cause 2
Issued when control power supply is turned ON.	V	
Issued while operation.	(V)	V

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in internal circuit of encoder	• Turn ON the power supply again; if not restored, replace the motor.
2	• Malfunction due to noise	• Confirm proper grounding of the amplifier. • Check the shielding of the encoder cable. • Add ferrite core or similar countermeasures against noise.

✍ "Encoder clearing and alarm resetting methods" vary depending on the encoder in use.
Refer to page 53 "Materials; Encoder Clear".

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code B5H (Over-allowable Speed of Absolute Encoder at Turning ON)

When abnormalities are detected in the internal part of the absolute position detector for the start-stop synchronization system.

Status during alarm	Cause		
	1	2	3
Issued when power supply is turned ON.	V		(V)
Issued while stopping the motor.	V	V	
Issued while rotating the motor.	(V)	V	V

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in internal circuit of encoder	• Turn ON the power supply again; if not restored, replace the motor.
2	• Malfunction due to noise	• Confirm proper grounding of the amplifier. • Check the shielding of the encoder cable. • Add ferrite core or similar countermeasures against noise.
3	• Number of motor rotations exceeds the permitted speed.	• Check the operation pattern and reduce the maximum number of rotations.

✍ "Encoder clearing and alarm resetting methods" vary depending on the encoder in use.
Refer to page 53 "Materials; Encoder Clear".

Alarm code B7H (Acceleration Error)

When abnormalities are detected in the internal part of the absolute position detector for the start-stop synchronization system.

Status during alarm	Cause		
	1	2	3
Issued while stopping the motor.	V	V	
Issued while rotating the motor.	(V)	V	V

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in internal circuit of encoder	• Turn ON the power supply again; if not restored, replace the motor.
2	• Malfunction due to noise	• Confirm proper grounding of the amplifier. • Check the shielding of the encoder cable. • Add ferrite core or similar countermeasures against noise.
3	• The acceleration of motor rotation exceeds the permitted acceleration	• Check the operation pattern, and extend the acceleration and declaration time.

✍ "Encoder clearing and alarm resetting methods" vary depending on the encoder in use.
Refer to page 53 "Materials; Encoder Clear".

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code C1H (Overvelocity)

Status during alarm	Cause			
	1	2	3	4
Issued when control power supply is turned ON.	V	(V)		
Issued if command is entered after Servo ON	(V)	V		
Issued when the motor is started.			V	V
Issued other than operating and starting the motor		V	V	

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in control panel of servo amplifier.	• Replace the servo amplifier.
2	• Defect in the encoder of servo motor	• Replace the servo motor.
3	• Excessive overshoot while starting.	• Monitor speed with the analog monitor. →Adjust the servo parameters if overshoot is excessive. → Simplify the acceleration and declaration command pattern. → Reduce the load inertia.
4	• Wiring of U/V/W -phase between servo amplifier and motor do not match.	• Check the wiring and repair any irregularities.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code C2H (Speed Control Error)

Status during alarm	Cause				
	1	2	3	4	5
Issued when control power supply is turned ON.					V
Issued while due to input of Servo ON	V		V		
Issued if command is entered.	V	V	V		
Issued while starting and stopping the motor.				V	

Corrective actions

Cause		Investigation and corrective actions
1	• Wiring of U/V/W -phase between servo amplifier and motor do not match.	• Check the wiring and repair any irregularities.
2	• The wiring of A, B phase of INC-E and ABS-EI encoder connection is incorrect.	• Check the wiring and repair any irregularities.
3	• The motor is vibrating (oscillating).	• Adjust the servo parameters so that servo motor will not vibrate (oscillate).
4	• Excessive overshoot and undershoot.	• Monitor speed with the analog monitor. • Adjust the servo parameters to reduce overshoot and undershoot. • Increase acceleration and declaration command time. Mask the alarm.
5	• Abnormality in servo amplifier control circuit	• Replace the servo amplifier.

For the speed control error alarm, an alarm may occur while starting and stopping when load inertia is excessive.
For this reason, in the gravitational axis applications, "Do not detect" is selected as the standard setting.
If its detection is needed, consult our representatives.

Alarm code C3H (Speed Feedback Error)

Status during alarm	Cause		
	1	2	3
Issued when command is entered.	V	(V)	V

Corrective actions

Cause		Investigation and corrective actions
1	• Motor is not rotating.	• Confirm that the power line is properly connected. • Replace the servo motor.
2	• Defect in internal circuit of servo amplifier.	• Replace the servo amplifier.
3	• The motor is vibrating (oscillating).	• Adjust the servo parameter so that servo motor will not vibrate (oscillate).

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code D1H (Following Error / Excessive Position Deviation)

Status during alarm	Cause											
	1	2	3	4	5	6	7	8	9	10	11	12
Issued when control power supply is turned ON.										V		
Issued when servo ON is stopped.						V					V	
Issued immediately after entering the command.	V	(V)	V	V	V		V	(V)	V		(V)	
Issued during starting or stopping at high speed.	V	V					V	V	V		(V)	V
Issued during the operations by lengthy command.		V					V	(V)			(V)	

Corrective actions

	Cause	Investigation and corrective actions
1	• Position command frequency is high or acceleration and declaration time is short.	• Correct the position command of the controller
2	• Excessive initial load or low motor capacity.	• Correct the load condition or increase the motor capacity
3	• Holding brake is not released.	• Check the wiring and repair any abnormalities. If specified voltage is applied, replace the servo motor.
4	• Motor is mechanically locked or machine is colliding.	• Check the machinery system.
5	• One or all phases of U/V/W -phase of the servo amplifier and motor has disconnected.	• Check and repair the wiring connections.
6	• Motor is being rotated by an external force (Gravity, etc.) during stopping (positioning completion).	• Check the load, and/or increase the motor capacity.
7	• Valid current limit command is entered by the controller, and the current limit setting is reduced. • Number of encoder pulses does not match with the motor.	• Increase the current limit value or disable the current limit. • Match the number of motor encoder pulses.
8	• Settings of servo parameters (Position loop gain, etc.) are not appropriate.	• Check the servo parameter settings (Raise the position loop gain, etc.)
9	• Excessive deviation setting value is reduced.	• Set a greater value for excessive deviation.
10	• Defect in control panel of servo amplifier.	• Replace the servo amplifier.
11	• Servo motor encoder is defective.	• Replace the servo motor.
12	• Power supply voltage is low.	• Check the power supply voltage.

Alarm code D2H (Faulty Position Command Pulse Frequency 1)

Status during alarm	Cause
	1
Issued after entering position command pulse.	V

Corrective actions

	Cause	Investigation and corrective actions
1	• Command for the digital filter setting of the command pulse input is entered	• Decrease the frequency of the command pulse. • Increase the frequency of the digital filter.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code D3H (Faulty Position Command Pulse Frequency 2)

Status during alarm	Cause	
	1	2
Issued after entering position command pulse.	V	V

Corrective actions

Cause		Investigation and corrective actions
1	• Frequency of command pulse input is excessive.	• Reduce the frequency of command pulse input.
2	• Setting value of electronic gear is excessive.	• Decrease the electronic gear setting value.

Alarm code DFH (Test Run Close)

Status during alarm	Cause
	1
Occurred after execution of test mode.	V

Corrective actions

Cause		Investigation and corrective actions
1	• Normal operation.	• Clear the alarm and restore operation. (After completion of test mode, to confirm any deviation in the controller).

Alarm code E1H (EEPROM Error)

Status during alarm	Cause	
	1	2
Issued when control power supply is turned ON.	V	(V)
Issued during display key operation or set up software operation.		V

Corrective actions

Cause		Investigation and corrective actions
1	• Correct value not read by CPU by nonvolatile memory of built-in servo amplifier.	• Replace the servo amplifier.
2	• Defect in the servo amplifier control panel	• Replace the servo amplifier.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code E2H (EEPROM Internal Data Error)

Status during alarm	Cause	
	1	2
Issued when control power supply is turned ON.	(V)	V

Corrective actions

Cause		Investigation and corrective actions
1	• Correct value not read by CPU by nonvolatile memory of built-in servo amplifier	• Replace the servo amplifier.
2	• Failed to write into the nonvolatile memory during last power supply cutoff.	• Change the optional parameters, turn ON the power supply again, and confirm that alarm has cleared. → If alarm is not cleared, replace the servo amplifier.

Alarm code E3H (Internal RAM Error)
Alarm code E4H (Process Error between CPU and ASIC)

Status during alarm	Cause
	1
Issued when control power supply is turned ON.	V

Corrective actions

Cause		Investigation and corrective actions
1	• Defect in the servo amplifier control panel	• Replace the servo amplifier.

Alarm code E5H (Parameter Error 1)

Status during alarm	Cause	
	1	2
Issued when control power supply is turned ON.	V	V
Issued after changing any of system parameters.	V	

Corrective actions

Cause		Investigation and corrective actions
1	• Selected value is outside the specified range for a system parameter.	• Confirm the model number of the servo amplifier. • Confirm selected values of system parameters and modify if necessary. →Turn ON the power again and confirm that alarm is cleared.
2	• Defect in servo amplifier	• Replace the servo amplifier.

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

Alarm code E6H (Parameter Error 2)

Status during alarm	Cause	
	1	2
Issued when control power supply is turned ON.	V	V
Issued after changing any of system parameters.	V	

Corrective actions

Cause		Investigation and corrective actions
1	• Selected values of system parameters and actual hardware do not match • Improper assembly of system parameter settings.	• Confirm the model number of servo amplifier. • Confirm selected values of system parameters and correct if necessary. →Turn ON the power again and confirm that alarm is cleared.
2	• Defect in servo amplifier	• Replace the servo amplifier.

Alarm code E7H (Parameter Error 3)

Status during alarm	Cause	
	1	2
Issued when power is applied to the control source.	V	V

Corrective actions

Cause		Investigation and corrective actions
1	▪ Undetected setting values of rotary switches.	▪ Check address setting or baud rate setting of rotary switches.
2	▪ Defective control board in the servo amplifier	▪ Replace the servo amplifier

Alarm code F1H (Task Process Error)

Status during alarm	Cause
	1
Issued while operating.	V

Corrective actions

Cause		Investigation and corrective actions
1	• Abnormality in control circuit of servo amplifier	• Replace the servo amplifier

Alarm code F2H (Initial Process Time-Out)

Status during alarm	Cause	
	1	2
Issued when control power supply is turned ON.	V	V

Corrective actions

	Cause	Investigation and corrective actions
1	• Defect in internal circuit of servo amplifier	• Replace the servo amplifier.
2	• Malfunction due to noise	• Confirm proper grounding of the amplifier. • Add ferrite core or similar countermeasures against noise.

Alarm code FFH (Sub-CPU error)

Status during alarm	Cause
	1
Issued when power is applied to the control source.	V
Issued during operation	V

Corrective actions

	Cause	Investigation and corrective actions
1	▪ Disable communication with a Sub-CPU Control circuit error in the servo amplifier	▪ Replace the servo amplifier

Note) V means the cause number with high possibility.
(V) means the cause number with middle possibility.

■ Troubleshooting when error occurs.

●Please take countermeasure and process according to the correction measures on each error display following below procedure.

Error code	Alarm name (Code)	Operation status	Cause	Countermeasure/Process
16H	+Soft limitation (OT_FWD)	Full-time	・It traveled beyond soft limitation coordinates in CW.	・Travel within soft limitation by Jog. ・Change the soft limitation setting of parameter.
17H	－ Soft limitation (OT_RVS)	Full-time	・It traveled lower than soft limitation coordinates in –direction.	
18H	Point data error (POINT_DATA)	When operate point-traveling or while travel.	・The point is not registered for point-traveling. ・Points on the way are not registered for sequence point-traveling.	・Input Alarm-reset for resetting error. ・Register the point.
19H	ERR: Point Loop frequency setting error (Loop)	While processing Point movement or in Moving state	・The number of the nest is over 15 in Point jumpt/Loop function	・Follow the specification of Point Jump/Loop function to set a target point.
1AH	ERR: Point Loop nesting error (Nesting)	While processing Point movement or in moving state	・The Specified target point can't be a nest in Condition jump of Point jump/Loop function	
1BH	Zero-return Operation error (ZRT)	When operate Zero-return.	・Speed reduction time while operating Zero-return is too short.	・・Expand the area of velocity reduction signal to secure the enough time for reducing speed(Traveling amounts).

■ Troubleshooting by history.

There are 2 trace modes of Alarm History and Status History.
It is possible to see up to 7 Alarm Histories and 64 Status Histories.
However, the number of history that can be stored in non-volatile memory is up to 10, so carefully turn off control power supply.
Please see below examples.

	Number	Status	
New	Last01	WAIT_ON	･･･Traveling completion
↑	Last02	Move_point:007	･･･Travel to P007
	Last03	Move_point:006	･･･Travel to P006
	Last04	Move_point:005	･･･Travel to P005
	Last05	WAIT_ON	･･･Traveling completion
	Last06	STEP_ON	･･･1STEP Travel
	Last07	WAIT_ON	･･･Traveling completion
	Last08	JOG_ON	･･･JOG Travel(When stop traveling in JOG travel, the cancellation must be recorded as a history.)
	Last09	CANCEL_ON	
	Last10	WAIT_ON	･･･Cancellation completion
	Last11	CANCEL_ON	･･･Cancel traveling while travel to P004.
	Last12	Move_point:004	･･･Sequence traveling to P004
	Last13	Move_point:003	･･･Travel to P003
	Last14	ALM_None	･･･Reset
	Last15	ALM:55	･･･Heating alarm goes out after completion.
	Last16	WAIT_ON	･･･Traveling completion
	Last17	Move_point:002	･･･Travel to P002
	Last18	WAIT_ON	･･･Traveling completion
	Last19	Move_point:001	･･･Travel to P001
	Last20	WAIT_ON	･･･Servo ON
Old	Last21	SV_OFF	･･･Control Power・Main power ON

As mentioned above, the status before and after alarm occurrences are recorded as a history, it is useful to investigate a cause of alarm.

In addition, Alarm History is as follows for the example.

Code	Status	
Last01	ALM:55	･･････EXT Alarm occurs.
・	・	
・	・	
・	・	
Last07	ALM:43	･･････OL1 Alarm occurs.

However, the status history can be stored only up to 64 histories, therefore, it is recommended to check the history immediately when alarm occurs.

■ About Code of Status History

Code	Contents
Move_Point：DEC[***]	Travel to “***”point code
WAIT_ON	Status of positioning completion. (Waiting for traveling signal on the status of servo-on.)
Cancel_ON	CANCEL(Cancellation)has been input, or, the status of stop JOG traveling
ZRT_ON	Activate Zero-return (ZRT input signal) has been input.
SDN_ON	Short of Home- point speed reduction signal (SDN input signal) has been input.
JOG_ON	Manual traveling (±JOG input signal) has been input.
STP_ON	1 step travel (±1step input signal) has been input.
HOME_ON	Home-Point-Return operation has been completed.
DWEL	Dwell (Intermission) time is in practice.
SV_OFF	The status of servo-off: Servo-on signal (S-ON input signal) is turned OFF.
PRG_STR	External data setting input (E_STR input signal) has been input.
LOOP	Loop control is running.
JMP	“Jump” performed.
NC_Start	Control power established, internal positioning controller is at the ready.
Err_Non	Error has been canceled.
Err_POINT_DATA	Error occurrence. Activate with non-registered point code (RUN input signal).
Alm_Non	Alarm reset(ARST input signal)has been input.
Alm：**	Alarm goes out. Alarm code”**”.

■ Inspection

● For maintenance purposes, a daily inspection is typically sufficient.
Upon inspection, refer to the following description.

Inspection location	Testing conditions			Inspection Items	Inspection Methods	Solution if abnormal
	Time	During operation	While stopping			
Servo motor	Daily	V		Vibration	Check for excessive vibration.	Contact dealer/sales office.
	Daily	V		Sound	Check if there is no abnormal sound as compared to normal sound.	
	Periodic		V	Cleanliness	Check for dirt and dust.	Clean with cloth or air. → ⚠ 1
	Yearly		V	Measure value of insulation resistance	Contact the dealer or sales office.	
	5000 hours → ⚠ 2		V	Replacement of oil seal		
Servo amplifier	Periodic		V	Cleaning	Check for dust accumulated in the accessories.	Clean with air. → ⚠ 1
	Yearly		V	Loose screws	Check for loose connections	Fasten the screws properly.
Absolute encoder back up battery	Regularly → ⚠ 3		V	Battery voltage	Confirm that battery voltage is more than DC3.6V.	Replace the battery.
Temperature	On demand	V		Measure temperature	Ambient temperature Motor frame temperature	Set the ambient temperature within the limit. Check the load condition pattern.

⚠

1. While cleaning with air, confirm that there is no oil content and/or moisture, etc. in the air.
2. This inspection and replacement period is when water- or oil-proof functions are required.
3. The life expectancy of the battery is approximately 2 years, when its power is OFF throughout the year. For replacement, a lithium battery (ER3VLY: 3.6V, 1000mAh) manufactured by TOSHIBA LIFESTYLE PRODUCTS & SERVICES CORPORATION.

■ Parts Overhaul

Parts may deteriorate over time. Perform periodic inspection for preventive maintenance.

No.	Part name	Number of average replacement years	Corrective measures / usage conditions
1	Condenser for smoothing main circuit	5 Years	Replacement with new part is necessary. Load ratio : Less than 50% of rated output current of amplifier Usage condition: Average temp. 40℃ year-round
2	Cooling Fan motor	5 Years	Replacement with new part is necessary. Usage condition: Average temp. 40℃ year-round
3	Lithium battery for absolute encoder [ER3VLY]	3 Years	Replacement with new part is necessary.
4	Electrolysis condenser (other than condenser for smoothing main circuit)	5 Years	Replacement with new part is necessary. Usage condition: Average temp. 40℃ year-round Annual usage period is 4800 hours
5	Fuse	10 Years	Replacement with new part is necessary.

1. Condenser for smoothing the main circuit
   ・If the servo amplifier is in use for more than 3 years, contact the dealer or sales office.
   The capacity of the condenser for smoothing the main circuit is reduces due to the frequency of motor output current and power ON/ OFF during usage, and it may cause damage.

- When the condenser is used with an average 40℃ through out the year, and exceeds more than 50% of the rated output current of servo amplifier, it is necessary to replace the condenser with a new part every 5 years.
- When used in an application where the power turn ON/OFF is repeated more than 30 times a day, consult our representatives.

2. Cooling Fan motor
   - The R-Series Amplifier is set corresponding to the degree of pollution specified in EN50178 or IEC 664-1. As it is not dust proof or oil proof, etc., use it in an environment above Pollution Degree 2 (i.e., Pollution Degree 1,2).
   - R-Series servo amplifiers models RS1□03, RS1□05 RS1□10 RS1□15 and RS1□30 have a built-in cooling fan; therefore be sure to maintain a space of 50mm on the upper and lower side of the amplifier for airflow. Installation in a narrow space may cause damage due to a reduction in the static pressure of the cooling fan and/or degradation of electronic parts. Replacement is necessary if abnormal noise occurs, or oil or dust is observed on the parts. Also, at an average temperature of 40°C year-round, the life expectancy is 5 years.
3. Lithium battery
   - The standard replacement period recommended by our company is the life expectancy of lithium battery based on normal usage conditions. However, if there is high frequency of turning the power ON/OFF, or the motor is not used for a long period, then the life of lithium battery is reduced. If the battery power is less than 3.6 V during inspection, replace it with new one.

● How to replace absolute encoder back-up battery

① Turn ON the servo amplifier control power supply.

② Prepare the replacement lithium battery. [SANYO model number：AL-00494635-01]

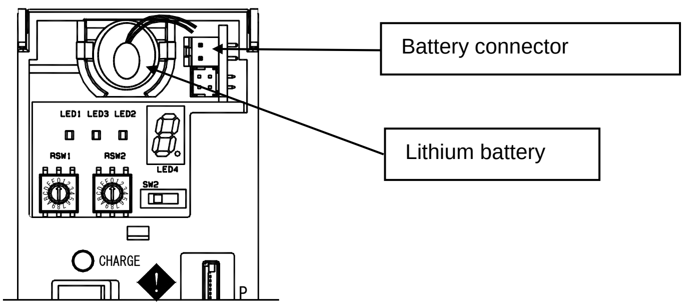
③ Open the servo amplifier front cover.

④ Remove the battery connector.

⑤ Take out the used lithium battery and put in the new replacement one (prepared at ②).

⑥ Attach the connector in the right direction.

⑦ Close the servo amplifier front cover.



✍ If the battery is replaced while the control power is OFF, multiple rotation counter (position data) of the absolute encoder may be instable. When the amplifier control power is turned ON in this status, an alarm (battery error) may be issued. For this, execute encoder clear and alarm reset to release the alarm status. Also, absolute encoder position data may be instable. Check and adjust the relations between position data and machine coordinate system.

✍ At SANYO DENKI, the overhauled servo amplifier is shipped with the same parameters as the ones before overhauling. Be sure to confirm the parameters before use.

9

[Specifications]

■ General specifications

Specifications

	Model number		RS1□01□F	RS1□03□F	RS1□05□F	RS1□10□F	RS1□15□F	RS1□30□F
Basic specifications	Control function		Position control					
	Control system		IGBT PWM control Sinusoidal drive					
	*1 Input power	Main circuit	Three-phase AC200 to 230V+10, -15%, 50/60Hz±3Hz Single phase AC200 to 230V+10, -15%, 50/60Hz±3Hz*2 Single phase AC100 to 115V+10, -15%, 50/60Hz±3Hz*3					
		Controlling circuit	Single phase AC200 to 230V+10, -15%, 50/60Hz±3Hz Single phase AC100 to 115V+10, -15%, 50/60Hz ±3Hz*3					
		For Interface	DC+24V±10%					
	Environment	Ambient temperature*4	0 to 55℃					
		Storage temperature	-20 to +65℃					
		Operating / storage humidity	Below 90%RH (no condensation)					
		Elevation	Below 1000 m from the sea level					
		Vibration	0.5G Frequency range 10 to 55HZ Test for 2H in each direction X.Y.Z					
		Shock	2G					
	Structure		Tray type with built-in power supply					
	Mass kg		0.9	1.0	2.2	5.2	6.5	10.5
Built-in functions	Protection functions		Over current, Current detection error, Overload, Regeneration error, Amplifier overheating, External overheating, Over voltage, Main circuit low voltage, Main circuit open-phase, Control power supply error, Encoder error, Over speed, Speed control error, Speed feedback error, Excessive position error, Position command pulse error, CPU error, Built-in memory error, Battery error, Parameter error					
	LED display		Status display, Monitor display, Alarm display, Parameter settings, Adjustment mode					
	Dynamic brake		Built-in					
	Regeneration process		Built-in					
	Applied load inertia		Within the applied load inertia of combined servo motor					
	Monitor output	Speed monitor (VMON)	2.0V±10% (at 1000min^{-1})					
		Torque monitor (TMON)	2.0V±10% (at 100%)					
Positioning Function	Number of Control Axis		1 pc					
	Number of Registration Points		It is possible to set it up to 254 points (P000 to P253)					
	Maximum Command Amounts		-2,147,483,648 to +2,147,483,647					
	Command Unit		Mm or Pulse					
	Fast-Forwarding Speed		2,147,483.647mm/sec(0.001mm/Pulse selection)					
	Addition & Reduction Speed		Automatic addition & Reduction speed(Straight line/S curve shift)					
	Point Data Setting		Setting by numeric value input with PC or teaching					
	Traveling Point Number Setting		Parallel 8 bit (Binary code)					
	Current Limitation		0 to 510% (Rating =100%), however, less than instant maximum stall current					
	Software Limitation		Yes					
	Traveling Mode		Zero-point return, analog (JOG, 1Step), specified point traveling.					
	Area Signal		8 zones in maximum					

*1 Source Voltage should be within the specified range.

AC200V Power input type Specified power supply range AC170V to AC253V

AC100V Power input type Specified power supply range AC85V to AC127V

Install a step-down transformer, etc. if power supply exceeds the specified power supply.

*2 AC200V single-phase input type corresponds only toRS1☐01/RS1☐03/RS1☐05.

*3 AC100V single-phase input type corresponds only toRS1☐01/RS1☐03.

*4 When stored in the box, be sure that internal temperature does not exceed this range.

*5 Minimum rotational speed is determined as equivalent to the amplifier not stopping for a load with maximum continuous torque.

● Incoming current

Input voltage	Amplifier model name	Control circuit (Maximum value between 1ms after input)*3	Main circuit (Maximum value between 1.2 seconds after input)
AC200V	RS1☐01☐	40A(O-P)	18A(O-P)*1
	RS1☐03☐		
	RS1☐05☐		
	RS1☐10☐		
	RS1☐15☐		
	RS1☐30☐		
AC100V	RS1☐01☐	20A(O-P)	9A(O-P)*2
	RS1☐03☐		

*1 Incoming current value is the maximum value when AC230V is supplied.

*2 Incoming current value is the maximum value when AC115V is supplied.

*3 Use thermistor for incoming current prevention circuit of power supply control.

When power is turned ON again after disconnection, power supply on/disconnection is repeated for short time, ambient temperature and temperature of thermistor is high, the incoming current exceeding the above mentioned table may pass.

● Current leakage

Since “R series” Servo amplifier drives the motor by PWM control of IPM, electric current leakage of high frequency flows through the floating capacity of motor winding, power cable or amplifier. Malfunction in short circuit breaker and protective relay installed in power supply electric circuit may occur. Use the inverter as electricity leakage breaker, which provides countermeasures for wrong operations.

Motor model number	Electric current leakage per motor
RS1☐01☐	0.5 mA
RS1☐03☐	0.5 mA
RS1☐05☐	1.5 mA
RS1☐10☐	3.0 mA
RS1☐15☐	3.0 mA
RS1☐30☐	5.0 mA

- While using 2 or more motors, electric current leakage each motor is added.
- Tough-rubber sheath cable of 2mm is used as power line, in case of short system and long system of cable length, value of above table should be selected as far as possible.
- The machine is grounded (type D(3rd type)) so that the dangerous voltage on the main part of a machine, operation panel, etc. does not arise at the time of an emergency leakage.
- The value of current leaked is the measured value in ordinary leak checkers (Filter 700Hz).

● Calorific value

Input voltage	Amplifier capacity	Motor model number	Total calorific value of Servo amplifier (W)
AC200V	RS1□01A	Q1AA04003D	11
		Q1AA04005D	15
		Q1AA04010D	18
		Q1AA06020D	24
		Q2AA04006D	12
		Q2AA04010D	19
		Q2AA05005D	16
		Q2AA05010D	19
		Q2AA05020D	26
		Q2AA07020D	32
		Q2AA07030D	32
		R2AA04003F	11
		R2AA04005F	13
		R2AA04010F	15
		R2AA06010F	16
		R2AA06020F	24
		R2AA08020F	25
	RS1□03A	Q1AA06040D	44
		Q1AA07075D	66
		Q2AA07040D	45
		Q2AA07050D	62
		Q2AA08050D	55
		Q2AA13050H	65
		R2AA06040F	43
		R2AA08040F	40
		R2AA08075F	67
		R2AA13050D	72
	RS1□05A	Q1AA10100D	47
		Q1AA10150D	61
		Q1AA12100D	47
		Q2AA08075D	43
		Q2AA08100D	45
		Q2AA10100H	50
		Q2AA10150H	62
		Q2AA13100H	58
		Q2AA13150H	63
		R2AAB8100F	45
		R2AA13120D	61
	RS1□10A	Q1AA10200D	111
		Q1AA10250D	116
		Q1AA12200D	101
		Q1AA12300D	123
		Q1AA13300D	125
		Q2AA13200H	93
		Q2AA18200H	101
		Q2AA22250H	137
		R2AA13200D	98

Input voltage	Amplifier capacity	Motor model number	Total calorific value of Servo amplifier (W)
AC200V	RS1□15A	Q1AA13400D	146
		Q1AA13500D	169
		Q1AA18450M	160
		Q2AA18350H	138
		Q2AA18450H	154
		Q2AA18550R	201
		Q2AA22350H	137
		Q2AA22450R	150
		Q2AA22550B	191
		Q2AA22700S	222
		R2AA22500L	141
	RS1□30A	Q1AA18750H	428
		Q2AA18550H	361
		Q2AA18750L	413
		Q2AA2211KV	496
AC100V	RS1□01A	Q1EA04003D	16
		Q1EA04005D	22
		Q1EA04010D	27
		Q2EA04006D	21
		Q2EA04010D	26
		Q2EA05005D	22
		Q2EA05010D	31
		R2EA04003F	16
		R2EA04005F	19
		R2EA04008F	21
		R2EA06010F	25
	RS1□03A	Q1EA06020D	51
		Q2EA05020D	43
		Q2EA07020D	49
		R2EA06020F	41

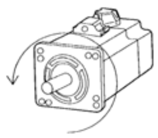
・Generation of heat built-in regeneration resistance is not included in the numerical value given in the table, it is necessary to add it if needed.
・If external regeneration resistance is used, change the additional items of calorific value of external regeneration resistance as per the place where it is installed.
・Follow the installation method of the “clause 2. for installation”.

■ Servo motor general specifications

Series Name	Q1	Q2	R2
Time Rating	Continuous		
Insulation Classification	Type F		
Dielectric Strength Voltage	AC1500V 1 minute		
Insulation Resistance	DC500V, more than 10MΩ		
Protection Method	Fully closed, Auto cooling		
	IP67 (However, Q1□A04,06 and 07 is IP40) It conforms to IP67 by using a waterproof connector, conduit, shell, clamp, etc.	IP67 (However, Q2□A04 is IP40)	IP67 (Excluding shaft passages and cable ends)
Sealing	Sealed(except Q1□A04,06,07)	Sealing(Except Q2□A04)	Not sealed (Optional)
Ambient Temperature	0 to +40℃		
Storage Temperature	-20 to +65℃		
Ambient Humidity	20 to 90% (Without condensation)		
Vibration Classification	V15		
Coating Color	Munsell N1.5 equivalent		
Excitation Method	Permanent-magnet type		
Installation Method	Flange mounting		

■ Rotation Direction Specifications

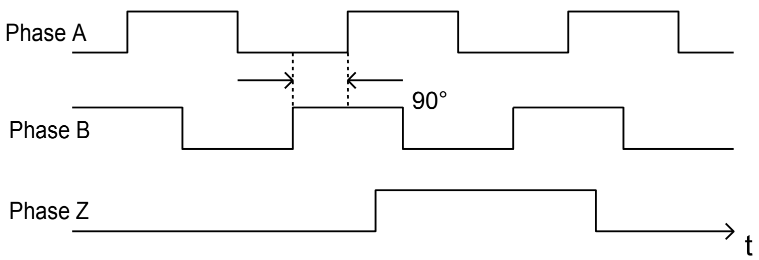
● When a command to increase the position command is entered, the servo motor rotates in a counterclockwise direction from the load side



● **Encoder Signal Phases**

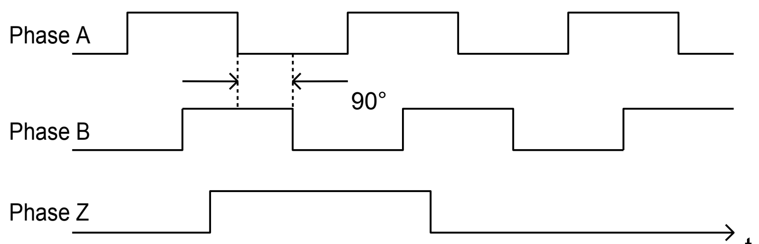
Incremental encoder

<Normal rotation>



Phase B is ahead of Phase A by 90°.

<Reverse rotation>



Phase B is behind Phase A by 90°.

When the Z-Phase is high, both A- and B- Phases cross the low level, once every revolution.

Absolute encoder

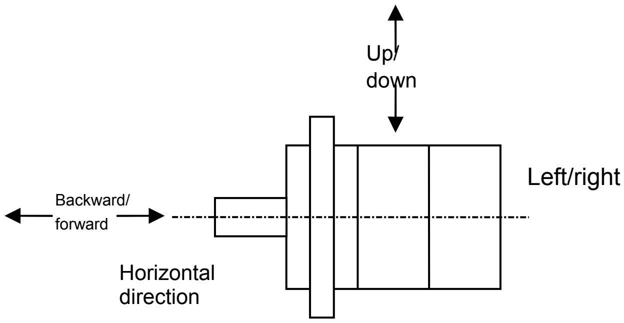
Normal (forward) rotation: Position data increased output

Reverse rotation: Position data decreased output

■ Mechanical specifications

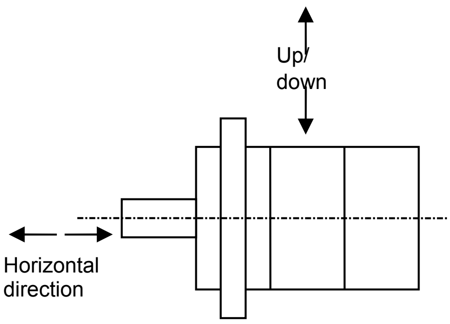
● Vibration Resistance

Install the servo motor in a horizontal direction (as shown in the following figure), so that when vibration is applied in any 3 directions (up/down, back/forward, left/right) it can withstand the vibration acceleration up to 24.5m/s^2.



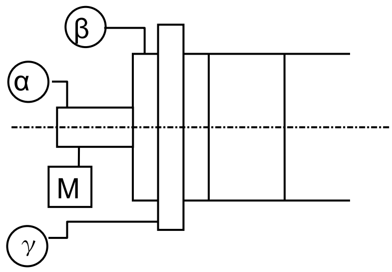
● Shock Resistance

Install the shaft of the servo motor in a horizontal direction (as shown in the following figure). It should withstand shock acceleration up to 98 m/s^2 (when shocks are applied in an Up/down direction) for 2 times. However, since a precision detector is fixed to the counter-load side of the motor, any shock applied to the shaft may cause damage the detector; therefore, do not subject the shaft to shock under any circumstances.



● Working accuracy

The following table shows the accuracy of the servo motor output shaft and precision (Total Indicator Reading) of the parts surrounding the shaft.

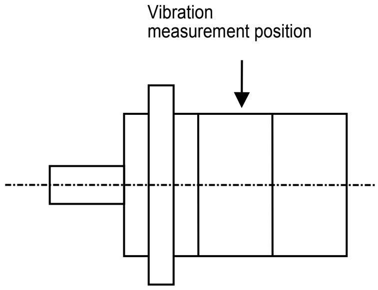
Items	* 1 T.I.R.	Reference Figure
Vibrations of output shaft terminal α	0.02	
Eccentricity of the external diameter of the flange on output shaft M (β)	0.06 (Below□86)	
	0.08 (Above□100)	
Perpendicularity of the flange face to output shaft M (γ)	0.07 (Below□86)	
	0.08 (Above□100)	

*1 T.I.R (Total Indicator Reading)

9. Specifications [Mechanical specifications of servo motor]

● Vibration Classification

The vibration classification of the servo motor is V15 or less, at the maximum rotation speed for a single servo motor unit, and is measured in the manner pictured below.



● Mechanical Strength

The output strength of the servo motor can withstand instantaneous maximum torque.

● Oil seal

A Type S oil seal (as described in the following table) is fixed to the output shaft of the servo motor. This oil seal is produced by NOK Corporation; please contact your dealer or sales representative for replacement of the oil seal.

Servo Motor Model	Oil Seal type (Type S)	Servo Motor Model	Oil Seal type (Type S)
Q1□A04○○○□		Q2AA13○○○□	AC1677E1
Q1□A06○○○□	N/A	Q2AA18○○○□	AC2368E0
Q1AA07○○○□		Q2AA18550□	AC2651A8
Q1AA10○○○□	AC1306E0	Q2AA18750□	
Q1AA12○○○□	AC1677E1	Q2AA22○○○□	AC2368E0
Q1AA13○○○□	AC1677E1	Q2AA22550□	AC3152E0
Q1AA18450□	AC2368E0	Q2AA22700□	
Q1AA18750□	AC2651A8	Q2AA2211K□	AC3152E0
Q2□A04○○○□	N/A	Q2AA2215K□	
Q2□A05○○○□	AC0382A0	R2□A04○○○□	
Q2□A07○○○□	AC0687A0	R2□A06○○○□	N/A (Optional)
Q2AA08○○○□	AC0875A0	R2AA□8○○○□	
Q2AA10○○○□	AC1306E0		

● Degree of decrease rating: R2AA Motor fixed oil seal and brake

About oil seal and brake fixed, considering of a rise in heat, continuous zone should apply the following degree of decrease rating.

Oil seal / Brake	non-fixed oil seal	fixed oil seal
with no brake	No decrease rating	decrease rating 2
with brake	decrease rating 1	decrease rating 2

Decrease rating 1

Servo Motor Model R2AA	04010F	06040F
degree of decrease rating %	90	

Decrease rating 2

Servo Motor Model R2AA	04005F	04010F	06040F	08075F
degree of decrease rating %	90	85	80	90

■ Holding brake specifications

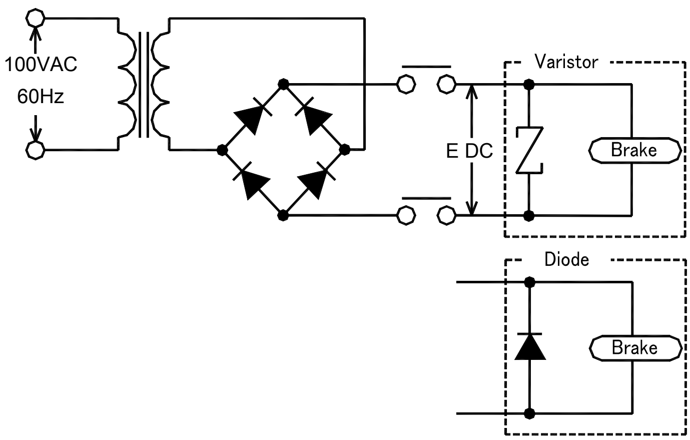
An optional holding brake is available for each motor. Since this brake is used for holding, it cannot be used for braking, except for an emergency. Turn brake excitation ON or OFF by using the holding brake timing signal output. When using this signal, set the command for brake release time to $0min^{-1}$ for the servo amplifier.

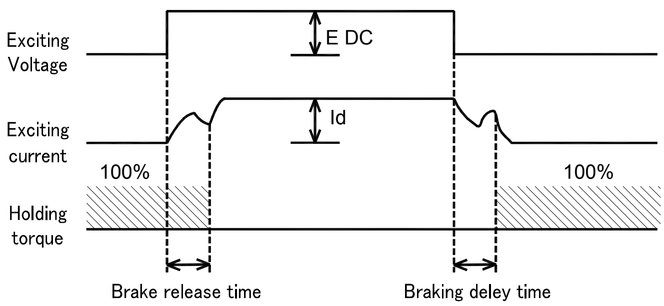
To externally control the holding brake, a response time (as shown in the following table) is required. When using a motor with a brake, determine a time sequence that takes this delay time into account.

Model		Static friction torque N.m	Release time msec	Braking delay time msec	
				Varistor	Diode
Q1	Q1AA04003D	0.098	25	15	100
	Q1AA04005D	0.157			
	Q1AA04010D	0.320			
	Q1AA06020D	0.637	30	20	120
	Q1AA06040D	1.274			
	Q1AA07075D	2.38	40	20	200
	Q1AA10100D	3.92	40	30	120
	Q1AA10150D	7.84	100	30	140
	Q1AA10200D	7.84			
	Q1AA10250D	9.80	100	30	140
	Q1AA12100D	3.92	100	30	140
	Q1AA12200D	7.84	100	30	140
	Q1AA12300D	11.8	100	30	140
	Q1AA13400D	19.6	120	50	150
	Q1AA13500D	19.6			
	Q1AA18450M	32.0	150	40	250
	Q1AA18750H	54.9	300	140	400
Q2	Q2AA04006D	0.191	25	15	100
	Q2AA04010D	0.319			
	Q2AA05005D	0.167	15	10	100
	Q2AA05010D	0.353			
	Q2AA05020D	0.353			
	Q2AA07020D	0.69	25	15	100
	Q2AA07030D	0.98			
	Q2AA07040D	1.372			
	Q2AA07050D	1.85	30	20	200
	Q2AA08050D	1.96	30	20	200
	Q2AA08075D	2.94			
	Q2AA08100D	2.94			
	Q2AA10100H	3.92	40	30	120
	Q2AA10150H	7.84	100	30	140
	Q2AA13050H	3.50	40	30	120
	Q2AA13100H	9.0	70	30	130
	Q2AA13150H	9.0	100	30	140
	Q2AA13200H	12.0			
	Q2AA18200H	12.0	100	30	140
	Q2AA18350H	32.0	120	40	150
	Q2AA18450H	32.0	150	40	250
	Q2AA18550R	54.9	300	140	400
	Q2AA18550H				
	Q2AA18750L				
	Q2AA22250H	32.0	300	140	400
	Q2AA22350H	32.0	300	140	400
	Q2AA22450H	32.0	300	140	400
	Q2AA22550B	90.0	300	140	400
	Q2AA22700S	90.0	300	140	400
	Q2AA2211KV				
	Q2AA2215KV				

Model		Static friction torque N.m	Release time msec	Braking delay time msec	
				Varistor	Diode
Q1	Q1EA04003D	0.098	25	15	100
	Q1EA04005D	0.157			
	Q1EA04010D	0.32			
	Q1EA06020D	0.637	30	20	120
Q2	Q2EA04006D	0.191	25	15	100
	Q2EA04010D	0.319			
	Q2EA05005D	0.167	15	10	100
	Q2EA05010D	0.353			
	Q2EA05020D	0.353			
	Q2EA07020D	0.69	25	15	100
R2	R2AA04003F	0.32	25	15	100
	R2AA04005F	0.32			
	R2AA04010F	0.32			
	R2AA06010F	0.36	30	20	120
	R2AA06020F	1.37			
	R2AA08020F	2.55	40	20	200
	R2AA06040F	1.37	30	20	120
	R2AA08040F	2.55	40	20	200
	R2AA08075F	2.55			
	R2AAB8100F	3.92	40	20	200
	R2AA13050D	3.50	40	30	120
	R2AA13120D	9.0	100	30	130
	R2AA13200D	12.0	100	30	140
	R2AA22500L	42	150	60	250
	R2EA04003F	0.32	25	15	100
	R2EA04005F	0.32			
	R2EA04008F	0.32			
	R2EA06010F	0.36	30	20	120
	R2EA06020F	1.37			

Brake operating time is measured in the following circuit.





The brake release time and braking delay time refer to those mentioned in the above tables. The brake release time is the same for both the varistor and diode.

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Materials

[Selection Details]

[Global Standards]

[Dimension]

[Servo Motor Data Sheet]

[Option]

[Encoder Clear]

Materials: Selection Details

[Time of Acceleration and Deceleration/Allowable Repetition]

■ Time of Acceleration and Deceleration

● The motor's acceleration time (t_a) and deceleration time (t_b) when under a constant load is calculated by following method.

$\boxed{\text{Acceleration time: } t_a = (J_M+J_L) \cdot (2\pi/60) \cdot \{(N_2-N_1)/(T_P-T_L)\}}$ [S]

$\boxed{\text{Deceleration time: } t_b = (J_M+J_L) \cdot (2\pi/60) \cdot \{(N_2-N_1)/(T_P+T_L)\}}$ [S]

✍ These expressions are for the rated speed values, but exclude the viscous torque and friction torque of the motor.

t_a: Acceleration time(S)

t_b: Deceleration time(S)

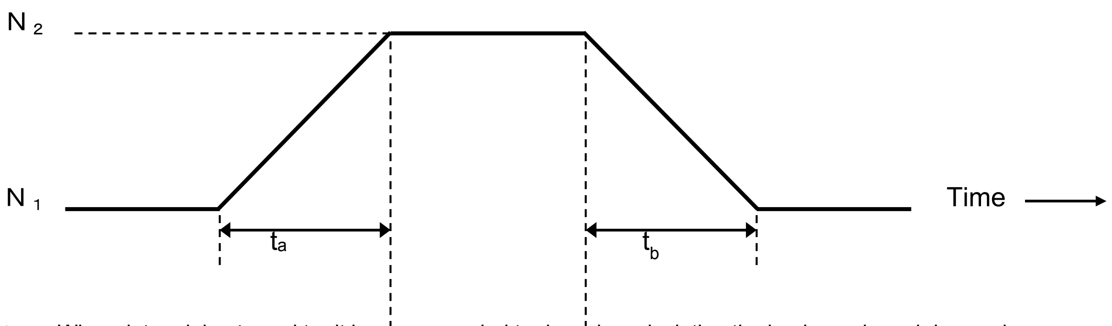
J_M: Motor inertia(kg・m^2)

J_L: Load inertia(kg・m^2)

N_1,N_2: Rotational speed of motor(min^{-1})

T_P: Instantaneous maximum stall torque(N・m)

T_L: Load torque(N・m)



✍ When determining t_a and t_b, it is recommended to do so by calculating the load margin and decreasing the instantaneous maximum instant stall torque value (TP) to 80%.

■ Allowable repetitions

● There are separate limitations on repetitive operations for both the servo motor and servo amplifier, and the conditions of both must be fulfilled simultaneously.

Allowable repetitions for the servo amplifier

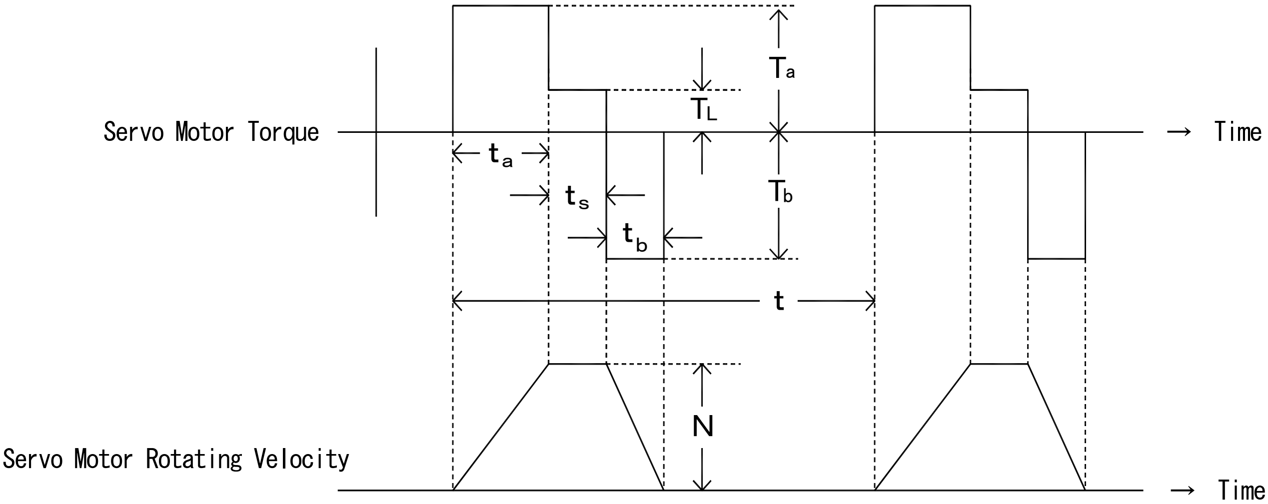
When START / STOP sequences are repeated frequently, confirm in advance that they are within the allowed range. Allowed repetitions differ depending on the type, capacity, load inertia, adjustable-speed current value and motor rotation speed of the motor in use. If the load inertia = motor inertia × m times, and when the permitted START / STOP repetitions (up until the maximum rotation speed) exceed $\frac{20}{m+1}$ times/min, contact your dealer or sales office for assistance, as precise calculation of effective torque and regenerating power is critical.

Permitted repetitions for the motor

Permitted START / STOP repetitions differ according to the motor's usage conditions, such as the load condition and time of operation.

■ When continuous-speed status and motor stop status is repeated

- In operating conditions such as those shown below, and the motor should be used at a frequency in which its effective torque is less than the rated torque (T_R).



If the operating cycle is considered as 't', the usable range can be determined as follows:

$$t \geqq \frac{Ta^2\, ta + T_L^2\, ts + Tb^2\, tb}{T_R^2} \quad [s]$$

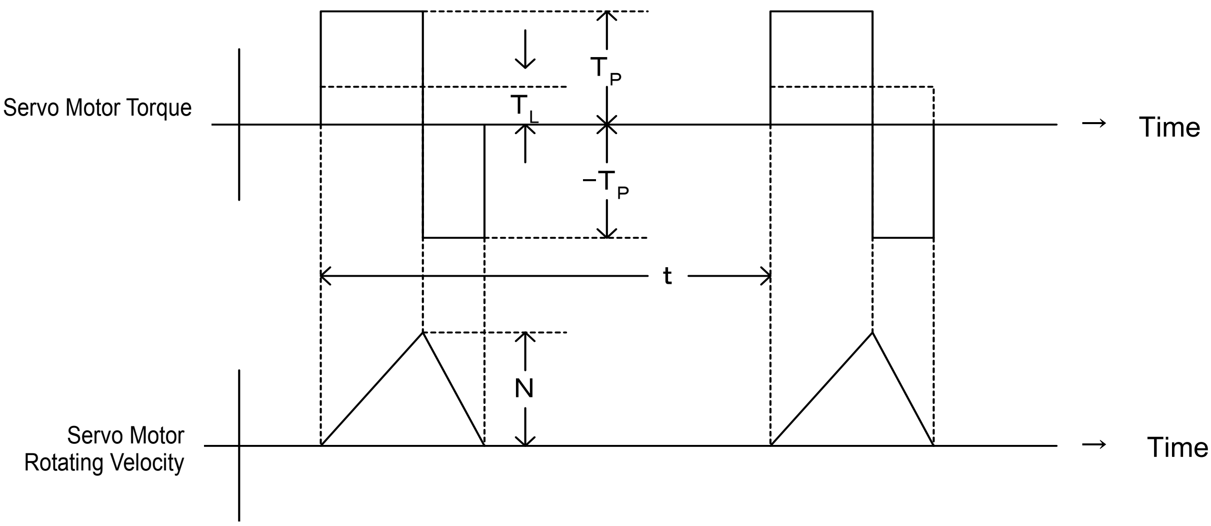
Ta: Acceleration torque
Tb: Deceleration torque
T_L: Load torque
Trms: Efective torque
T_R: Rated torque

When cycle time (t) is predetermined, Ta,Tb, t_a, t_b appropriate in the above formula are required.

✍ When actually determining the system drive mode, it is recommended to calculate the load margin and suppress it to Trms $\leqq$ $0.7T_R$

■ When the motor repeats acceleration, deceleration, and stop status

- For the operating status shown below, the value of permitted repetitions n (times/min) is displayed by following equation.



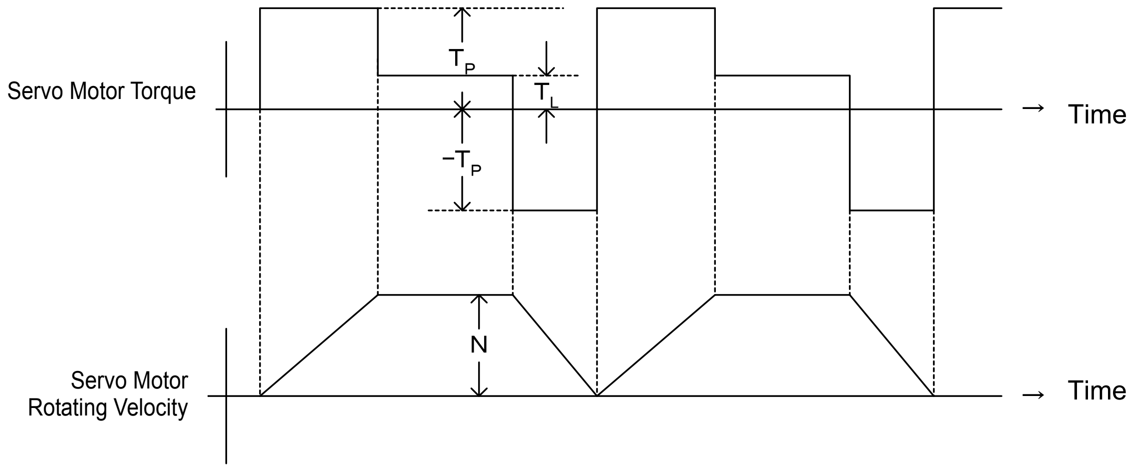
$$n = 2.86 \times 10^2 \times \frac{1}{N(J_M + J_L)} \times \frac{T_P^2 - T_L^2}{T_P^3} \times T_R^2 \quad \text{[times/ min]}$$

T_R : Rated torque

Materials Selection Details [Allowable Repetition/Loading Precaution]

■**When the motor repeats acceleration, constant speed operation, and deceleration status**

- For the operating status shown below, the value of permitted repetitions 'n' (times/min) is displayed by following equation.



$$n = 2.86 \times 10^{2} \times \frac{1}{N(J_M + J_L)} \times \frac{T_R^{2} - T_L^{2}}{T_P} \quad \text{[times/ min]}$$

■ Loading Precautions

- Negative load

  The servo amplifier cannot perform continuous operations by negative load from the servo motor for more than several seconds.

  When using the amplifier with a negative load, contact your dealer or sales representative.

  ・ Downward motor drive (when there is no counter weight.)

  ・ When usinglike a generator, such as the wind-out spindle of a winder.

- Load Inertia (J_L)

  When the servo amplifier is used with a load inertia exceeding the allowable load intertia calculated in terms of the motor shaft, a main circuit power overvoltage detection or regenerative error function may be issued at the time of deceleration.

  The following measures must be taken in this case. For more details, please consult with your dealer or sales representative.

  ・ Reduce the torque limit

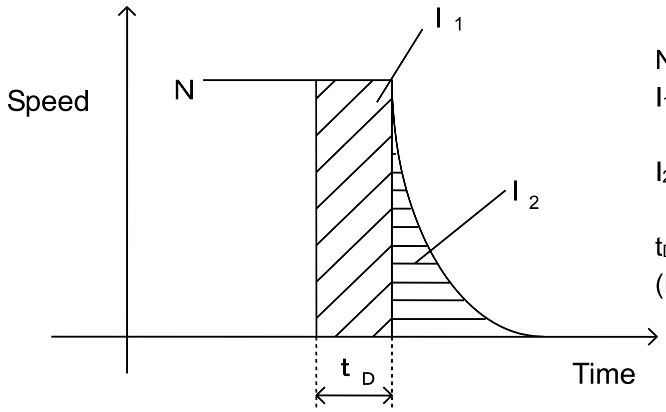
  ・ Extend the acceleration and deceleration time (Slow down)

  ・ Reduce the maximum motor speed

  ・ Install an external regenerative resistor

■ Slowing down the revolution angle by the dynamic brake

- **Slowing down the revolution angle by the dynamic brake is as follows:**



N: Motor speed (min^{-1})
I_1: Slow-down revolution angle (rad) by amplifier internal process time t_D.
I_2: Slow-down revolution angle (rad) by on dynamic brake operation
t_D: Delay time from signal display to operation start (s)
(Depending on amplifier capacity; Refer to following)

Servo Amplifier Model Name	Delay Time t_D (S)
RS1☐01 ☐= L / A / N / E	10×10^{-3}
RS1☐03 ☐= L / A / N / E	10×10^{-3}
RS1☐05 ☐= A / L	10×10^{-3}
RS1☐10 ☐= A / L	24×10^{-3}
RS1☐15 ☐= A / L	24×10^{-3}
RS1A30	42×10^{-3}

[Standard formula] When load torque (T_L) is considered as zero.

$$I = I_1 + I_2$$

$$= \frac{2\pi N \cdot t_D}{60} + (JM + JL) \times (\alpha N + \beta N^3)$$

I: Integrated slow-down rotation angle (rad)

J_m: Motor inertia ($kg\cdot m^2$)

J_L: Load inertia (Motor axis conversion) ($kg\cdot m^2$) ・

$\alpha \cdot \beta$: Refer to the constant table of the dynamic brake

■ Instantaneous tolerance of dynamic brake

● If the load inertia (J_L) substantially exceeds the applicable load inertia, abnormal heat can be generated due to dynamic brake resistance. Take precautions against situations such as an overheat alarm or the failure of dynamic break resistance, and consult your dealer or sales representative if such a situation occurs.

The energy (E_{RD}) consumed by dynamic brake resistance in 1 dynamic brake operation is as follows:

$$E_{RD} = \frac{2.5}{R\phi + 2.5} \times \left\{ \frac{1}{2} (J_M + J_L) \times \left(\frac{2\pi}{60} N \right)^2 - I \times T_L \right\}$$

$R\phi$: Motor phase winding resistance (Ω)

J_M : Motor inertia (kg./m^2)

J_L : Load inertia (Motor shaft conversion) (kg/m^2)

N : Number of motor rotations (min $^{-1}$) in feed rate V

I : Integrated slow-down rotating angle (rad)

TL : Load torque (N/m)

✍ Dynamic brake resistance may fail if the energy E_{RD} consumed by dynamic brake resistance during dynamic brake operation exceeds the energy shown in the following table. Consult with the dealer or sales representative if such a situation is anticipated.

Amplifier Model Name	E_{RD} (J)
RS1☐01 ☐= L / A / N / E	360
RS1☐03 ☐= L / A / N / E	360
RS1☐05 ☐= A / L	1800
RS1☐10 ☐= A / L	2450
RS1☐15 ☐= A / L	2450
RS1A30	9384

■Allowable frequency of dynamic brake

●The allowable frequency (main circuit power ON/OFF) of the dynamic brake is less than 10 rotations per hour and 50 rotations per day under the conditions of maximum speed. However the load inertia is within the applicable one.

✍ In basic terms, operation of the dynamic brake in six-minute intervals between two operations is permissable at maximum speed, but if the brake is to be operated with greater frequency, the motor speed must be reduced.
Use the following ratio to determine allowable frequency:

$$\frac{6\ \text{min}}{(\text{Number of rated rotations/ maximum number of rotations for usage})^2}$$

■ Dynamic brake constant table.

Amplifier capacity	Motor model number	α	β	J_M(kg·m²)
RS1A01 RS1L01	Q1AA04003D	204	92.0×10^{-7}	0.01×10^{-4}
	Q1AA04005D	130	34.3×10^{-7}	0.0134×10^{-4}
	Q1AA04010D	53	35.0×10^{-7}	0.0233×10^{-4}
	Q1AA06020D	13	32×10^{-7}	0.141×10^{-4}
	Q2AA04006D	87.8	25.6×10^{-7}	0.057×10^{-4}
	Q2AA04010D	55.2	8.4×10^{-7}	0.086×10^{-4}
	Q2AA05005D	132	10.7×10^{-7}	0.067×10^{-4}
	Q2AA05010D	45.2	7.93×10^{-7}	0.13×10^{-4}
	Q2AA05020D	19.0	46.9×10^{-7}	0.25×10^{-4}
	Q2AA07020D	25.9	11.7×10^{-7}	0.38×10^{-4}
	Q2AA07030D	11.0	13.9×10^{-7}	0.45×10^{-4}
	R2AA04003F	227	4.29×10^{-6}	0.0247×10^{-4}
	R2AA04005F	119	2.96×10^{-6}	0.0376×10^{-4}
	R2AA04010F	41.2	1.56×10^{-6}	0.0627×10^{-4}
	R2AA06010F	32.6	5.04×10^{-6}	0.117×10^{-4}
	R2AA06020F	14.5	2.46×10^{-6}	0.219×10^{-4}
	R2AA08020F	11.3	1.13×10^{-6}	0.52×10^{-4}
RS1A03 RA1L03	Q1AA06040D	9.13	13.1×10^{-7}	0.247×10^{-4}
	Q1AA07050D	5.24	7.75×10^{-7}	0.636×10^{-4}
	Q2AA07040D	10.2	7.08×10^{-7}	0.75×10^{-4}
	Q2AA07050D	10.6	3.84×10^{-7}	0.85×10^{-4}
	Q2AA08050D	7.71	4.51×10^{-7}	1.30×10^{-4}
	Q2AA13050H	5.34	6.99×10^{-7}	2.80×10^{-4}
	R2AA06040F	8.82	1.00×10^{-6}	0.412×10^{-4}
	R2AA08040F	6.91	4.25×10^{-6}	1.04×10^{-4}
	R2AA08075F	5.84	9.10×10^{-8}	1.82×10^{-4}
	R2AA13050D	6.46	2.14×10^{-6}	3.1×10^{-4}
RS1A05 RS1L05	Q1AA10100D	6.50	6.89×10^{-7}	1.29×10^{-4}
	Q1AA10150D	3.95	3.60×10^{-7}	1.61×10^{-4}
	Q2AA08075D	9.23	1.71×10^{-7}	2.07×10^{-4}
	Q2AA08100D	5.30	1.62×10^{-7}	2.7×10^{-4}
	Q2AA10100H	2.78	1.50×10^{-7}	5.4×10^{-4}
	Q2AA10150H	2.03	0.92×10^{-7}	8.0×10^{-4}
	Q2AA13100H	2.81	3.35×10^{-7}	5.40×10^{-4}
	Q2AA13150H	1.79	2.33×10^{-7}	7.94×10^{-4}
	R2AAB8100F	5.46	2.08×10^{-7}	2.38×10^{-4}
	R2AA13120D	4.06	6.45×10^{-7}	6.0×10^{-4}
RS1A10 RS1L10	Q1AA10200D	4.19	0.47×10^{-7}	2.15×10^{-4}
	Q1AA10250D	2.70	0.46×10^{-7}	2.65×10^{-4}
	Q1AA12200D	2.85	0.33×10^{-7}	4.37×10^{-4}
	Q1AA12300D	1.53	0.27×10^{-7}	6.40×10^{-4}
	Q1AA13300D	1.78	0.53×10^{-7}	4.92×10^{-4}
	Q2AA13200H	1.23	0.48×10^{-7}	12×10^{-4}
	Q2AA18200H	1.49	0.36×10^{-7}	20×10^{-4}
	Q2AA22250H	1.83	0.24×10^{-7}	32.20×10^{-4}
	R2AA13200D	1.69	0.91×10^{-7}	12.2×10^{-4}
RS1A15 RS1L15	Q1AA13400D	2.13	0.25×10^{-7}	6.43×10^{-4}
	Q1AA13500D	1.52	0.20×10^{-7}	8.47×10^{-4}
	Q1AA18450M	0.43	0.35×10^{-7}	27.5×10^{-4}
	Q2AA18350H	1.14	0.09×10^{-7}	38×10^{-4}
	Q2AA18450H	0.74	0.09×10^{-7}	55×10^{-4}
	Q2AA18550R	0.52	0.05×10^{-7}	72.65×10^{-4}
	Q2AA22350H	1.13	0.17×10^{-7}	47.33×10^{-4}
	Q2AA22450R	0.76	0.12×10^{-7}	67.45×10^{-4}
	Q2AA22550B	0.46	0.11×10^{-7}	95×10^{-4}
	Q2AA22700S	0.18	0.10×10^{-7}	185×10^{-4}
	R2AA22500L	0.8	0.41×10^{-7}	55×10^{-4}
RS1A30	Q1AA18750H	0.96	4.77×10^{-9}	52×10^{-4}
	Q2AA18550H	1.15	2.29×10^{-9}	73×10^{-4}
	Q2AA18750L	0.725	2.30×10^{-9}	95×10^{-4}
	Q2AA2211KV	0.475	2.47×10^{-9}	186×10^{-4}
	Q2AA2215KV	0.335	1.96×10^{-9}	255×10^{-4}

Amplifier capacity	Motor model number	α	β	J_M(kg·m²)
RS1E01 RS1N01	Q1EA04003D	276	68.1×10^{-7}	0.01×10^{-4}
	Q1EA04005D	205	39.7×10^{-7}	0.0134×10^{-4}
	Q1EA04010D	82.3	26.1×10^{-7}	0.0233×10^{-4}
	Q2EA04006D	129	7.40×10^{-7}	0.057×10^{-4}
	Q2EA04010D	72.5	4.91×10^{-7}	0.086×10^{-4}
	Q2EA05005D	212	3.48×10^{-7}	0.067×10^{-4}
	Q2EA05010D	71.6	2.55×10^{-7}	0.13×10^{-4}
	R2EA04003F	305	3.19×10^{-6}	0.0247×10^{-4}
	R2EA04005F	171	2.06×10^{-6}	0.0376×10^{-4}
	R2EA04008F	69.7	1.06×10^{-6}	0.0627×10^{-4}
	R2EA06010F	59.1	2.84×10^{-6}	0.117×10^{-4}
RS1E03 RS1N03	Q1EA06020D	56.3	9.57×10^{-7}	0.141×10^{-4}
	Q2EA05020D	46.4	0.99×10^{-7}	0.25×10^{-4}
	Q2EA07020D	57.0	5.22×10^{-7}	0.38×10^{-4}
	R2EA06020F	38.8	9.10×10^{-7}	0.219×10^{-4}

✍ The values for α and β are based on an assumed resistance value of the power line of 0Ω.
If the combination with an amplifier is different than those shown above, consult your dealer or sales office.

■ Regeneration Process

●The regeneration capacity of the servo amplifier depends on the allowable power of the regenerative resistor. When using the servo amplifier with built-in regeneration resistor, be sure to calculate regeneration resistance PM and confirm that PM<PRI (the allowable power for the built-in regeneration resistor) is fulfilled.

When regeneration power PM exceeds the permitted power (PRI) of the built-in regeneration resistor, you can operate by conducting regeneration restance (PM) caluculation, confirming that PM<PRO (the maximum allowable power of the exterior regeneration resistor) is fulfilled, and connecting the opional external regeneration resistor

	Built-in regeneration resistor is available [PRI]	Regeneration resistor connecting number	External regeneration resistor is available [PRO]	Regeneration resistor connecting number	Contact us in case below
RS1☐01	PM= 2W and below	Ⅰ	PM=220Wand below	Refer to “Materials” page 11	PM=220W and up
RS1☐03	PM= 5W and below	Ⅰ	PM=220Wand below		PM=220W and up
RS1☐05	PM= 20W and below	Ⅰ	PM=500Wand below		PM=500Wand up
RS1☐10	PM= 90W and below	Ⅱ	PM=500Wand below		PM=500Wand up
RS1☐15	PM=120W and below	Ⅱ	PM=500Wand below		PM=500Wand up
RS1☐30	———	———	PM=500Wand below		PM=500Wand up

✍ If using the bult-in regeneration resistor, please specify the model number of the servo amplifier with bult-in regeneration resistor in reference to “Section 1: Prior to Use – Servo Amplifier Model Number”

If using the exterior regeneration resistor, please specify the model number of the servo amplifier without bult-in regeneration resistor.

✍ When regeneration power PM exceeds the maximum permitted power (PRO) of the external regeneration resistor, reconsider the acceleration constant, load inertia, etc.

● Resistance Value of Servo Amplifier Built-in Regeneration Resistor

Model Number of Servo Amplifier with Built-in Regeneration Resistor	Resistance Value of Built-in Regeneration Resistor
RS1☐01 ☐= L / M / N / P	100Ω
RS1☐03 ☐= L / M / N / P	50Ω
RS1☐05 ☐= A / B	17Ω
RS1A10 ☐= A / B	10Ω
RS1A15 ☐= A / B	6Ω

Materials Selection Details

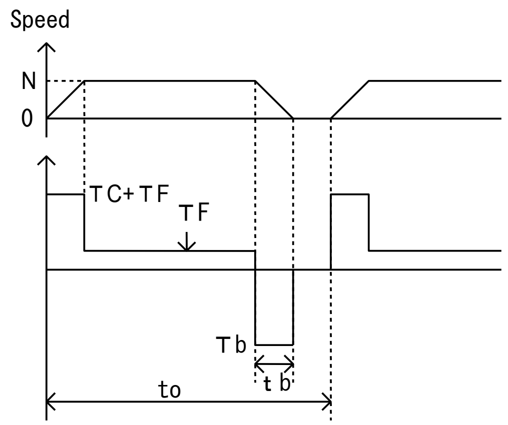
[Calculation Method of Regeneration Power by Operations along Horizontal Axis]

■ Regeneration Power (PM) by Operations along Horizontal Axis

● Regeneration energy is calculated.

$$EM = EHb = \frac{1}{2} \times N \times 3 \cdot KE\phi \times \frac{Tb}{KT} \times tb - \left(\frac{Tb}{KT}\right)^2 \times 3 \cdot R\phi \times tb$$

EM	:	Regeneration energy during operations along horizontal axis	……[J]
EHB	:	Regeneration energy during deceleration	……[J]
KEϕ	:	Induced voltage constant	……[Vrms/min $^{-1}$] (Motor constant)
KT	:	Torque constant	……[N・m/Arms] (Motor constant)
N	:	Motor rotation speed	……[min $^{-1}$]
Rϕ	:	Armature resistance	……[Ω] (Motor constant)
Tb	:	Deceleration time	……[s]
Tb	:	Torque during deceleration	……[N・m] (Tb= Tc - TF)
Tc	:	Adjustable speed torque	……[N・m]
TF	:	Friction torque	……[N・m]



● Effective regeneration power is calculated.

$$PM = \frac{EM}{to}$$

PM	:	Effective regeneration power [W]
EM	:	Regeneration energy during deceleration [J]
To	:	Cycle time [s]

Materials　Selection Details

[Calculation Method of Regeneration Power by Operations along Vertical Axis]

■ Regeneration Power (PM) by Operations along Vertical Axis (With a Gravitational Load)

● Regenerative energy is calculated.

$$EM = EVUb + EVD + EVDb$$

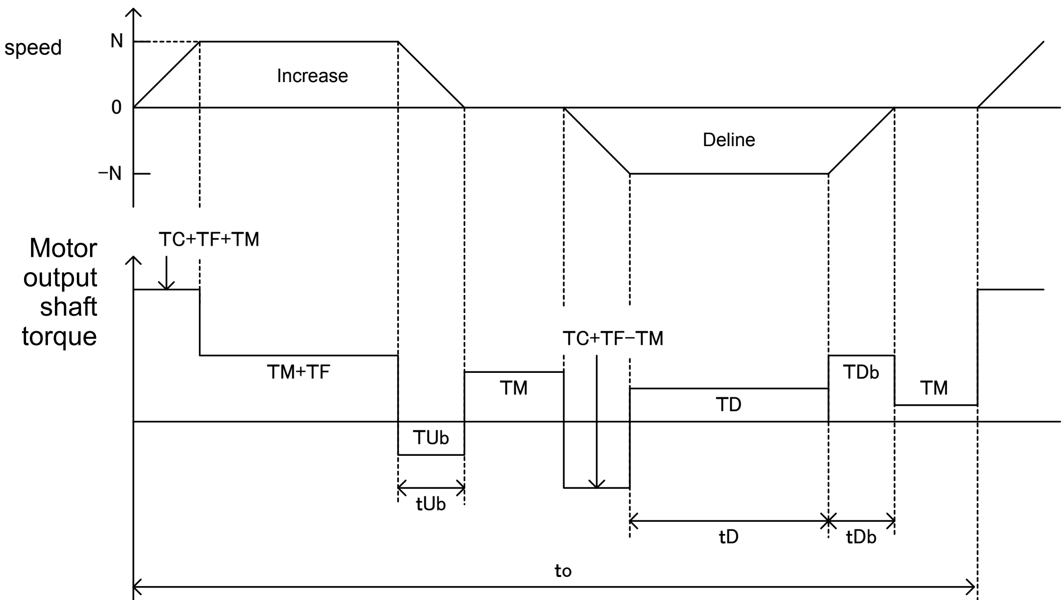
$$= \frac{1}{2} N \times 3 \cdot KE\phi \times \frac{TUb}{KT} \times tUb - \left(\frac{TUb}{KT}\right)^2 \times 3 \cdot R\phi \times tUb$$

$$+ N \times 3 \cdot KE\phi \times \frac{TD}{KT} \times tD - \left(\frac{TD}{KT}\right)^2 \times 3 \cdot R\phi \times tD$$

$$+ \frac{1}{2} N \times 3 \cdot KE\phi \times \frac{TDb}{KT} \times tDb - \left(\frac{TDb}{KT}\right)^2 \times 3 \cdot R\phi \times tDb$$

EM	:	Regeneration energy during operations along vertical axis	……[J]
EVUb	:	Regeneration energy during increased deceleration	……[J]
EVD	:	Regeneration energy during descending run	……[J]
EVDb	:	Regeneration energy during decreased deceleration	……[J]
TUb	:	Torque during increased deceleration	……[N・m]
TUb	:	Increased deceleration time	……[s]
TD	:	Torque during descending run	……[N・m] (TD=TM – TF)
TD	:	Descending run time	……[s]
TDb	:	Torque during decreased deceleration	……[N・m] (TDb=TC – TF+TM)
TDb	:	Decreased deceleration time	……[s]
TM	:	Gravitational load torque	……[N・m]

✍ When the calculation result of either of EVUb, EVD, or EVDb is negative, calculate EM by considering the value of those variabkes as 0.



● Effective regeneration power is calculated.

$$PM = \frac{EM}{to}$$

PM : Effective regeneration power [W]

EM : Regeneration energy during increased deceleration/ descending / decreased deceleration [J]

to : Cycle time [s]

Materials Selection Details

[Confirmation Method of Regeneration Power]

■ Confirmation method of regeneration power PM in actual operation

● Regeneration power PM can be easily confirmed in the setup software.

Setup software…… Monitor display Page 12・ RegP・Regeneration circuit operating rate

✍ The monitor value of the regeneration circuit operating rate shows the operating rate of regeneration circuit. The display range is 0.01%～99.99%.

● The actual regeneration power PM can be calculated from this monitor value by following equation.

Input Supply Voltage：In case of AC200V specification

$$\text{Regeneration power PM (W)} = \frac{400(\text{V}) \times 400(\text{V})}{\text{Regeneration resistance }(\Omega)} \times \frac{\text{regeneration circuit operating rate (\%)}}{100(\%)}$$

Input Supply Voltage：In case of AC100V specification

$$\text{Regeneration power PM (W)} = \frac{200(\text{V}) \times 200(\text{V})}{\text{Regeneration resistance }(\Omega)} \times \frac{\text{regeneration circuit operating rate (\%)}}{100(\%)}$$

● Calculation Example

Servo Amplifier Model Number： RS1L01AA*

[With built-in regeneration resistance/Input Supply Voltage:AC200V Specification]

Regeneration resistance value： 100Ω [Built-in Regeneration Resistance]

Monitor Value： 0.12% [RegP]

$$\text{Regeneration power PM (W)} = \frac{400(\text{V}) \times 400(\text{V})}{100(\Omega)} \times \frac{0.12(\%)}{100(\%)} = \boxed{1.92(\text{W})}$$

✍ The regeneration power calculated from this monitor value continues to be the target until the end of operations. Regeneration power varys with the voltage fluctuation of the input power supply and changes across the ages of the servo amplifier and the loading device.

✍ Select regeneration resistance by calculating regeneration power PM from the operation pattern, as per the calculation method of regeneration power PM.

✍ Install the external regeneration resistor on equipment, and measure the temperature of the external regeneration resistor by the operating condition that the regeneration electric power PM becomes the maximum. Then do sufficient mounting check of alarm not being generated. In addition, it takes 1 to 2 hours until the temperature of the external regeneration resistor is saturated. Since insulated degradation, corrosion, etc. may arise in the place where corrosive gas has occurred, or a place with much dust, be careful of an attachment place.

Materials Selection Details [External Regenerative Resistor]

■ Selection of Optional External Regenerative Resistor

● You can select the combination of external regenerative resistors based on effective regenerative power [PM] sought by the regeneration calculation.

Amplifier Model Number	[PM]	Up to 10W	Up to 30W	Up to 55W	Up to 60W	Up to 110W	Below 220W	220W and over
RS1□01	Resistor Sign	A×1	C×1	E×1	D×2	F×2	E×4	Contact
	Connection Number	Ⅲ	Ⅲ	Ⅲ	Ⅳ	Ⅳ	Ⅵ	
RS1□03	Resistor Sign	B×1	D×1	F×1	C×2	E×2	F×4	Contact
	Connection Number	Ⅲ	Ⅲ	Ⅲ	Ⅴ	Ⅴ	Ⅵ	

Amplifier Model Number	[PM]	Up to 55W	Up to 125W	Up to 250W	Below 500W	500W and over
RS1□05	Resistor Sign	G×1	H×1	I×2	H×4	Contact
	Connection Number	Ⅲ	Ⅲ	Ⅳ	Ⅵ	

Amplifier Model Number	[PM]	Up to 125W	Up to 250W	Below 500W	500W and over
RS1□10	Resistor Sign	I ×1	H×2	I ×4	Contact
	Connection Number	Ⅲ	Ⅴ	Ⅵ	

Amplifier Model Number	[PM]	Up to 125W	Up to 250W	Below 500W	500W and over
RS1□15	Resistor Sign	J×1	K×2	J×4	Contact
	Connection Number	Ⅲ	Ⅴ	Ⅵ	

Amplifier Model Number	[PM]	Up to 250W	Below 500W	500W and over
RS1□30	Resistor Sign	L×1	L×2	Contact
	Connection Number	Ⅲ	Ⅴ	

✍ The above resistor sign of a combination of an external regenerative resistor correspond to the following table.
Please select a resistor model name corresponding to a resistor sign.

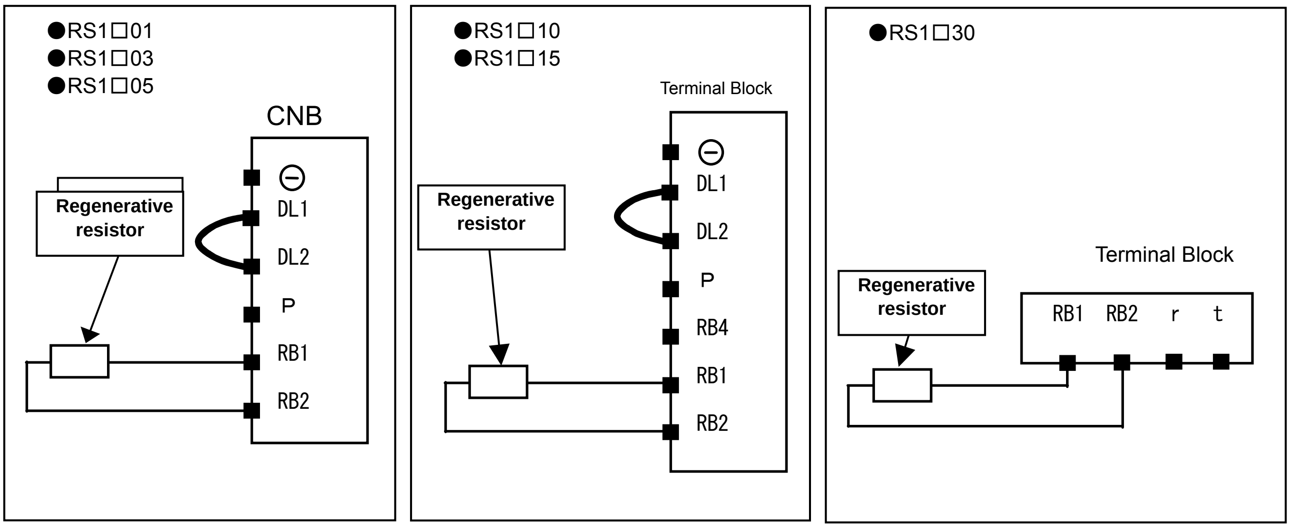
✍ The above connection number of a combination of an external regenerative resistor is on the next page.
Please connect based on the connection number.

✍ The external regeneration resistors are installed with the condition of that regeneration electric power utilization rate can reach maximum 25%.

✍ Forced-cooling by using an air-cooling fan raise rate of regeneration electric power utilization up to around 50%.

Resistor Sign	Resistor Model Number	Resistance Value	Thermostat Detection temperature (Contact specification)	Permissible Effective Power [P M]	Outline Drawing
A	REGIST-080W100B	100Ω	135℃±7℃ (b Contact)	10W	Refer to 'Materials 15'
B	REGIST-080W50B	50Ω		10W	
C	REGIST-120W100B	100Ω		30W	
D	REGIST-120W50B	50Ω		30W	
E	REGIST-220W100B	100Ω		55W	
F	REGIST-220W50B	50Ω		55W	
G	REGIST-220W20B	20Ω		55W	
H	REGIST-500W20B	20Ω	100℃±5℃ (b Contact)	125W	Refer to 'Materials16'
I	REGIST-500W10B	10Ω		125W	
J	REGIST-500W7B	7Ω		125W	
K	REGIST-500W14B	14Ω		125W	
L	REGIST-1000W6R7B	6.7Ω	140℃±5℃ (b Contact)	250W	Refer to 'Materials17'

■ Connection of Regenerative Resistance



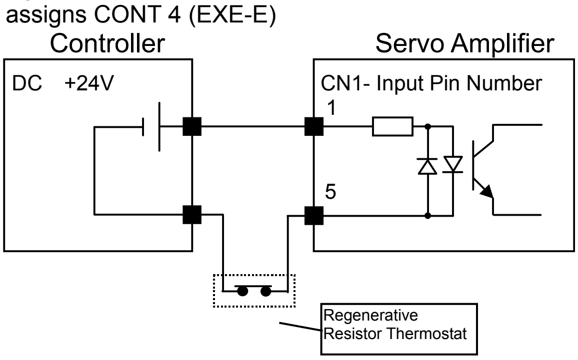
✍ Please make sure to install the external regenerative resistor with twisted wires and use as a short wire which is up to 5 meters long as possible.

✍ Use nonflammable electric wire or perform non-combustible processing (silicon tube, etc.) for connecting cable and wired, and install wiring so as to not come in contact with the built-in unit .

✍ Please make sure to change the set-up of “System Parameter” and “Regenerative Resistance Selection” in line with the kind of regenerative resistor you connect.

■ Connection of the Thermostat of a Regenerative Resistor

- Assign one of the general purpose input [CONT 1 – CONT 4] for connection of the Thermostat Standard setting assigns CONT 4 (EXE-E)

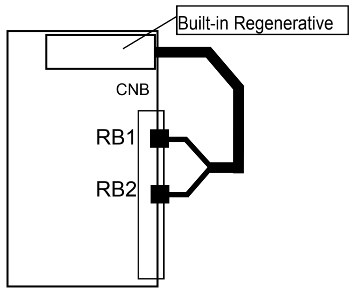
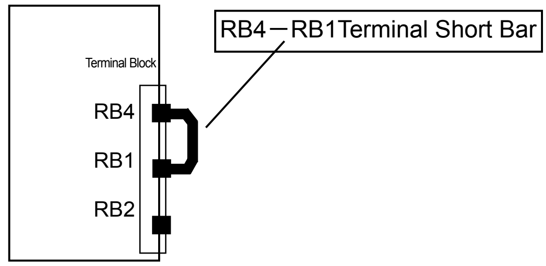
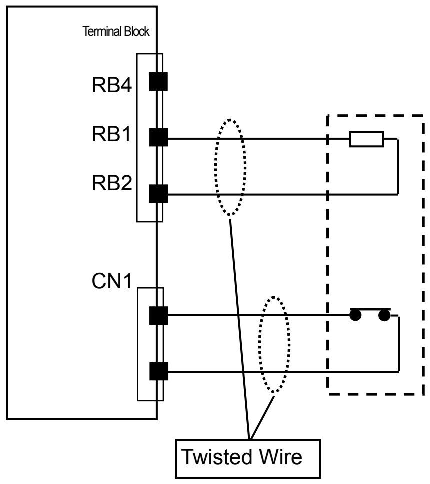
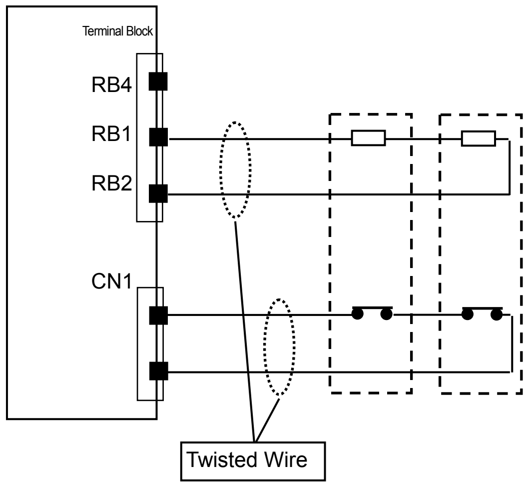
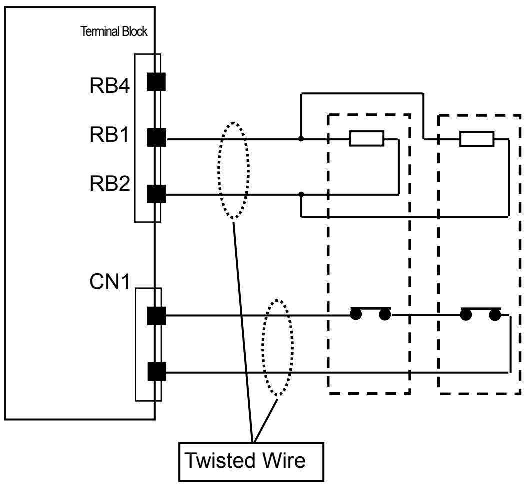
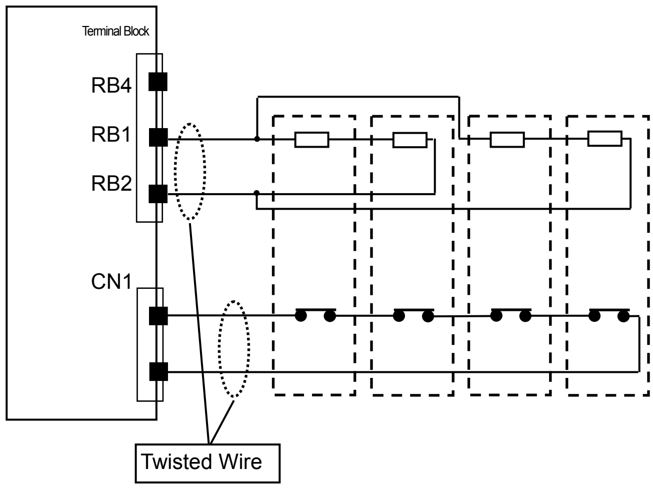


✍ Example of standard setting: Connect the Thermostat of Regenerative Resistor to CONT 4

Set CONT 4 [parameter Group A 03] at standard setting [12H:EXT-E]

Materials Selection Details [External Regenerative Resistor]

■ Connection Number of External Regenerative Resistor combination

Connection Ⅰ	**Connection Ⅱ**
	
Connection Ⅲ	**Connection Ⅳ** [×2] Series Connection
	
Connection Ⅴ [×2] Parallel Connection	**Connection Ⅵ** [×4] Series/Parallel Connection
	

■ Protection Function of Regenerative Resistance

With the R series servo amplifier, the regenerative resistance protection function is specified by parameter selections. Appropriate protection for regenerative resistance is applied by setting parameters according to the type of regenerative resistance to be connected. Set the appropriate parameters by following the instructions given below.

● The protection functions are divided into three main types:

① Protection for a short-time, high load factor (using built-in or external regenerative resistance): An error is detected when the power absorption of regenerative resistance is extremely high over a short time period (100msec to 10 seconds). A 'Regenerative Error' alarm ("ALM_43") is issued when this error is detected.

② Protection when allowable power absorption is exceeded for long time (using built-in regenerative resistance): An error is detected when the power absorption of the built-in regenerative resistance exceeds the allowable power absorption over a long time period (from a few seconds to a few minutes). An 'Internal Overheat' alarm ("ALM_54") is issued when this error is detected.

③ Protection during thermostat operation of the external regenerative resistor: An error is detected when the external trip function is started. An 'External error / external trip' alarm ("ALM_55") is issued when this error is detected.

● The two parameters requiring settings are given below.

①	Regenerative resistance selection	Regenerative resistance built-in type [0B]
②	External trip input function	General parameter [Include 12:_EXT-E into any of GroupA 00 to 03]

● Relationship between parameter settings and protection functions

Regenerative resistance in use		Parameter setting		Protection function operation		
Resistor	Thermostat	Regenerative resistance selection	External trip input function	Regenerative error [ALM_43]	Internal overheat [ALM_54]	External Alarm External Trip [ALM_55]
Not Connecting	–	00:_Not_Connect	–	Invalid	Invalid	–
Built-in Regenerative Resistance	–	01:_Built-in_R	–	Valid	Valid	–
External Regenerative Resistance	–	02:_External_R	–	Valid	Invalid	–
External Regenerative Resistance	Connect to servo amplifier	02:_External_R	Setting	Valid	Invalid	Valid

✍ Make appropriate settings to regenerative resistance [System parameter/Page0B] when using built-in regenerative resistance.
If these parameter settings are incorrect, normally detected errors related to built-in regenerative resistance may not be detected, possible causing the burning/fuming of regenerative resistance.

✍ The built-in/ external regenerative resistance may generate heat even if the overheat alarm etc. has not been generated.
Do not touch the servo amplifier for 30 minutes after power is disconnected in the case of a power failure, as there is a risk of burn, etc.

✍ Incorrect parameter settings may cause irregular operation of the protection functions. Upon an alarm, confirm its cause and adjust the settings appropriately.

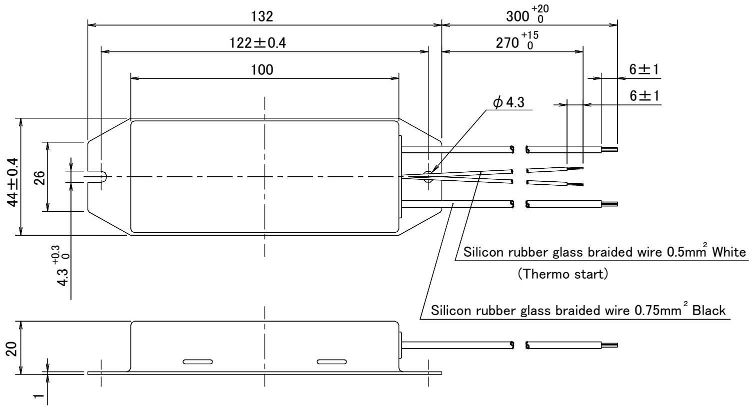
✍ The place where corrosive gas has occurred, and when there is much dust, insulated degradation, corrosion, etc.may arise. There fore be careful of an attachment place.

✍ Arrangement of the external regeneration resistor should open an interval so that it is not influenced by generation of heat from other parts.

[External Regenerative Resistor Dimension]

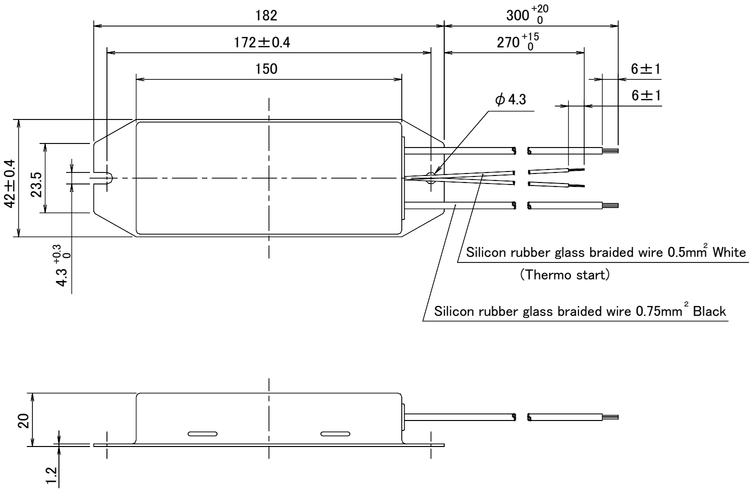
■ External Dimension of Regenerative Resistor

Unit：mm



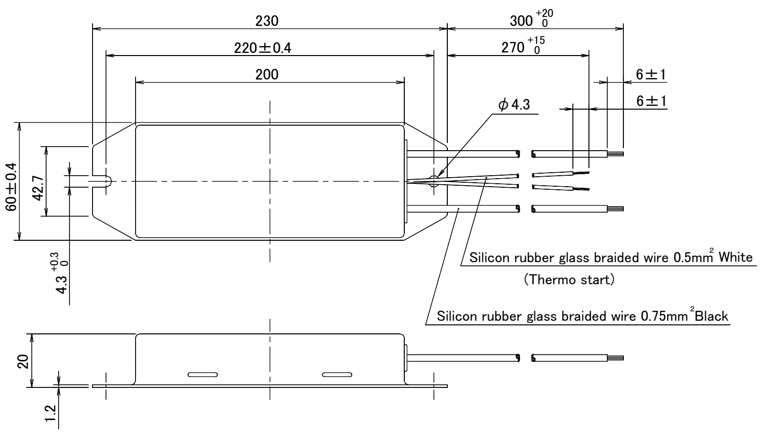
	Model number	Thermostat Detection temperature (Contact specification)
1	REGIST-080W100B	135℃±7℃ (Normal close contact)
2	REGIST-080W50B	135℃±7℃ (Normal close contact)

Mass:0.19kg



	Model number	Thermostat Detection temperature (Contact specification)
1	REGIST-120W100B	135℃±7℃ (Normal close contact)
2	REGIST-120W50B	135℃±7℃ (Normal close contact)

Mass:0.24kg

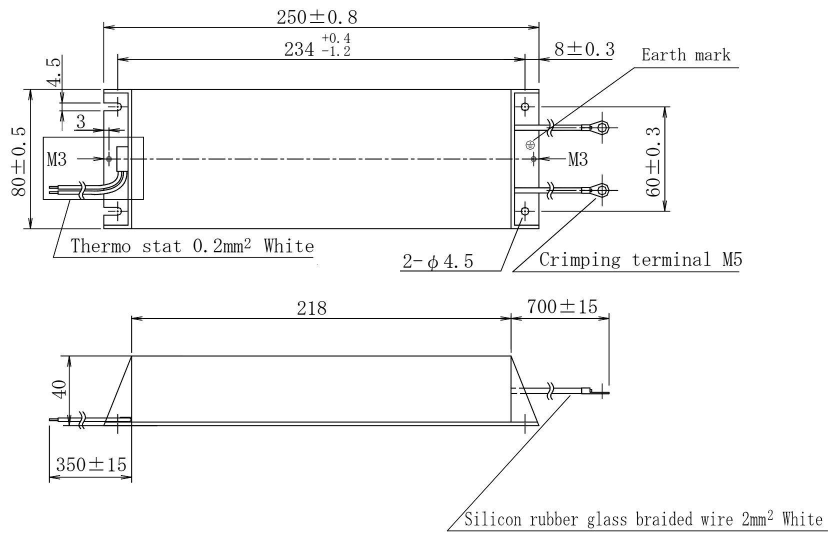


	Model number	Thermostat Detection temperature (Contact specification)
1	REGIST-220W50B	135℃±7℃ (Normal close contact)
2	REGIST-220W20B	135℃±7℃ (Normal close contact)
3	REGIST-220W100B	135℃±7℃ (Normal close contact)

Mass: 0.44kg

Materials Selection Details

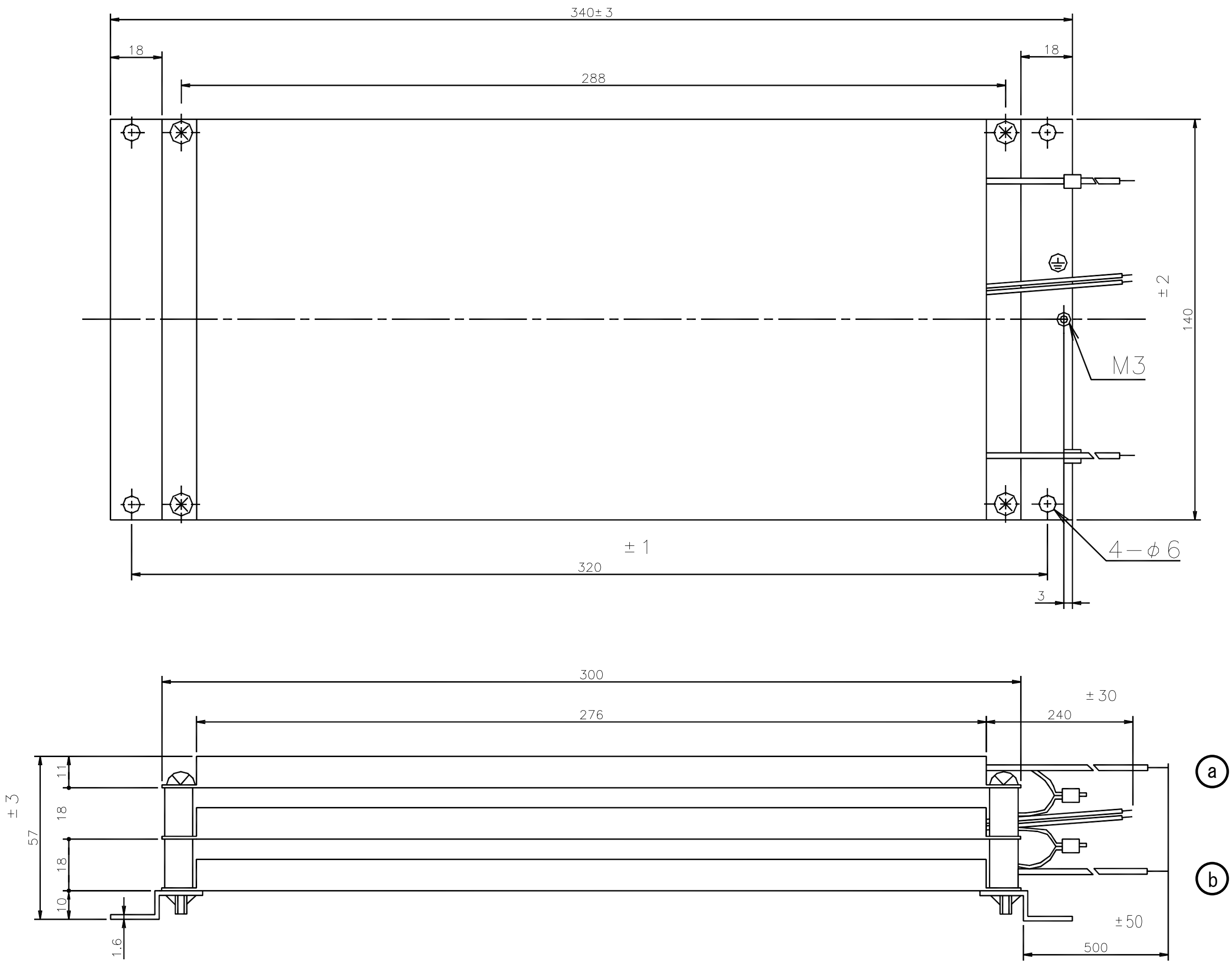
[External Regenerative Resistor Dimension]

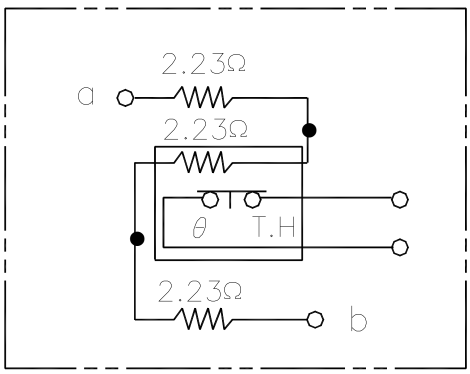


	Model number	Thermostat Detection temperature (Contact specification)
1	REGIST-500W20B	100℃±5℃ (Normal close contact)
2	REGIST-500W20	None
3	REGIST-500W10B	100℃±5℃ (Normal close contact)
4	REGIST-500W10	None
5	REGIST-500W7B	100℃±5℃ (Normal close contact)
6	REGIST-500W7	None
7	REGIST-500W14B	100℃±5℃ (Normal close contact)
8	REGIST-500W14	None

Mass:1.4kg

[External Regenerative Resistor Dimension]





Connection Diagram

	Model number	Thermostat Detection temperature (Contact specification)
1	REGIST-1000W6R7B	140℃±5℃ (Normal close contact)

Mass: 3.0kg

Materials　Global Standards [Global standards conformity]

■ Outline of Global standards conformity

● RS1 servo amplifier conforms to the international standards below.

Mark	International standards	Standard number	Certification Organization
	UL standard	UL508C (File No.E179775)	UL (Underwriters Laboratories inc.)
	CSA standard		
	EN standard	EN50178 EN61000-6-2 EN61800-3	TÜV (TÜV Product Service Japan, Ltd.)

● Q and R servomotor conforms to the international standards below.

Display	International standards	Standard number	Certification Organization
	UL standard	UL1004 UL1446 (File No.E179832)	UL (Underwriters Laboratories inc.)
	EN standards	IEC-34-1 IEC34-5	TÜV (TÜV Product Service Japan, Ltd.)

✍ For products conforming to international standards, some specifications may differ from the standard product due to prerequisites necessary for obtaining approval. Contact the manufacturer for more details.

✍ The file number of UL is available at the UL homepage: http://www.ul.com/database/.

✍ Please contact your dealer or sales representative if you need the above certiification.

● Precautions for conformity standards

① Make sure to use servo amplifier and servo motor in a proper combination. Check “Section 1 : Prior to use --- Servo amplifier type number.

② Make sure to install the servo amplifier in your control panel in an environment where the pollution level specified in EN50178 and IEC664 is no less than 2 (polution level 1, 2). The control panel installation configuration (under IP54) must exclude exposure to water, oil, carbon, dust, etc.

③ The servo amplifiers must be used under the conditions specified in overvoltage categoryⅢ, EN50178. For the interface, use a DC power supply with reinforced and insulated input and outputs.

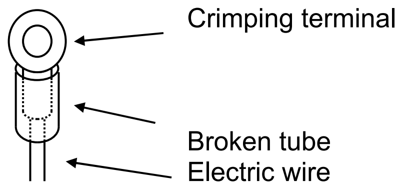
Materials Global Standards [Global standards conformity]

④ Always ground the protective earth terminals of the servo amplifier to the power supply earth. (⏚)

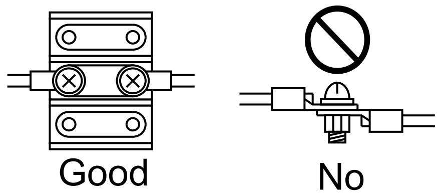
⑤ When connecting grounding wire to the protective earth terminal, always connect one wire in one terminal; never connect jointly with multiple wires or terminals.

⑥ When connecting the leakage stopper, make sure to connect the protective earth terminal to the power supply earth. (⏚)

⑦ Connect earthing wire by using a crimping terminal with insulated tube, so that the connected wire will not touch the neighboring terminals.



⑧ For wire relays, use a fixed terminal block to connect wires; never connect wires directly.



⑨ Connect an EMC filter to the input power supply of the unit.

⑩ Use an EN/ IEC-standard compatible no-fuse circuit breaker and electromagnetic contactor.

Materials　Global Standards [Global standards conformity]

■ Compliance with EC Directives

Our company has performed the requisite low voltage and EMC testing in accordance with EC Directives related to CE marking through a separate, third-party certifying authority.

Directive classification	Classification	Test	Test standard
Low voltage Directive (Servo amplifier)	—	—	EN50178: 1997
EMC Directive (Servo amplifier / servo motor)	Emission	Conducted　emission	EN55011: A1/1999
		Radiated emission	EN55011: A1/1999
	Immunity test	Electrostatic discharge immunity	EN61000-4-2: A2/2001
		Radiated electromagnetic field immunity	EN61000-4-3: A2/2001
		Electrical first transient/ burst immunity	EN61000-4-4: A2/2001
		Conducted disturbance immunity	EN61000-4-6: A1/2001
		Surge immunity	EN61000-4-5: A1/2001
		Voltage Dips & Interruptions immunity	EN61000-4-11: A1/2001
		Adjustable speed electrical power drive system	EN61800-3/1996 :A11/2000
Low voltage Directive (Servo motor)	—	Rotating electrical machines- Part1:　Rating and performance	IEC-34-1
		Rotating electrical machines-Part5:Classification of degrees of protection provided by enclosures of rotating electrical machines(IP code)	IEC34-5
		Rotating electrical machines-Prat9:　Noise limits	IEC34-9

For the EMC Directives, tests are performed by general installation and countermeasure methods, in our company as machines and configurations differ depending on customers' needs.

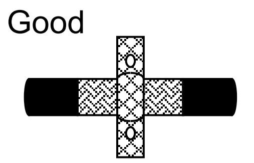
This servo amplifier has been authorized to display CE marking based on the recognition certificate issued by a separate, third-party certifying authority.　Accordingly, customers are instructed to perform the final conformity tests for all instruments and devices in use.

Materials　Global Standards [Global standards conformity]

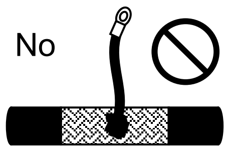
● Precautions for EMC Directives

Use the following guidelines below for the RS1 servo system in order to conform the customer's equipment and devices to the EMC Directives.

① A metallic material must be used for the door and main body of control panel.
② The joints of the top and side panels must be masked and welded.
③ Parts joined with screws must be welded to prevent noise from leaking out from joints.
④ When joining parts with screws or spot welding, the welding space must be within 10cm.
⑤ Use an EMI gasket so that there is zero clearance between the door and control panel.
⑥ Install EMI gasket uniformly to the contact points between door and main body of control panel.
⑦ Perform conductivity processing on the EMI gasket, door and main body of control panel to confirm their conductivty.
⑧ Ground the noise filter frame to the control panel.
⑨ Ground the servo amplifier chassis provided by the customer.
⑩ Use shield cables for the motor power line and encoder cable.
⑪ Ground the shield of motor power wire and encoder cable to the control panel with the clamp.
⑫ Ground and clamp the shield of motor power line and encoder cable to the frame of the servo amplifier.
⑬ Use a conducting metal P clip or U clip to ground and clamp the shield wire, and fix it directly with metal screws. Do not ground by soldering electric wire to the shield wire.

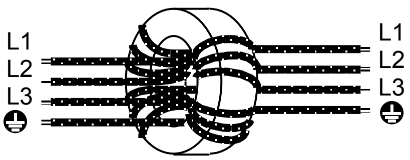


Grounding by U clip or P clip



Grounding by soldering

⑭ Wrap the zero-phase reactor four times around the primary side of the noise filter.

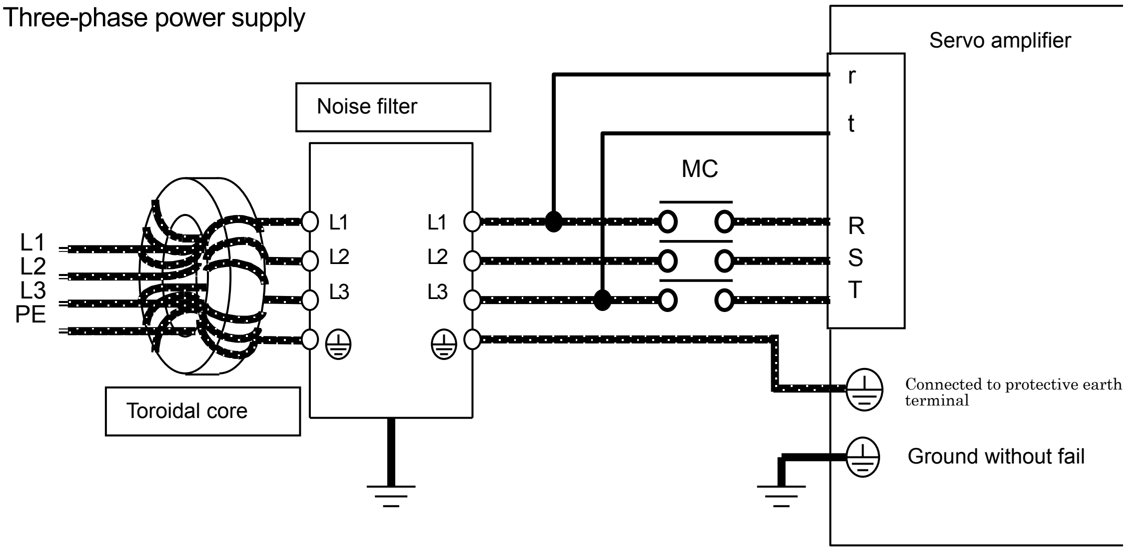


⑮ Wire the servo amplifier at a short distance from the secondary side of noise filter.
⑯ Wire the primary side and secondary side of the noise filter separately.

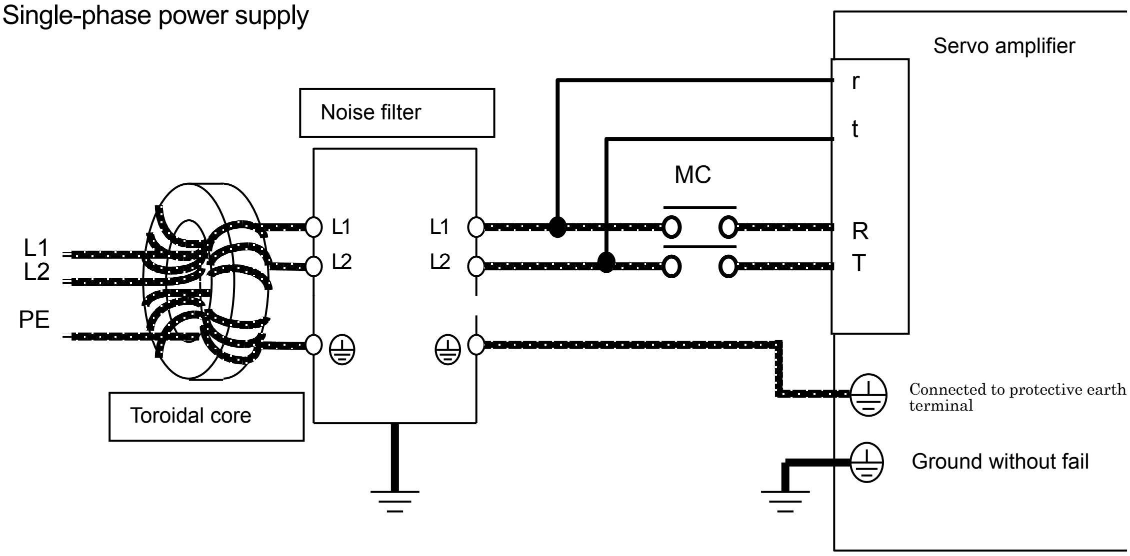
Materials　Global Standards [Global standards conformity]

■ Installation of noise filter and servo amplifier

● Three-phase power supply



● Single-phase power supply



✍ Always ground the frame of the noise filter.

✍ Install wiring by separating the primary and secondary wiring of the noise filter as much as possible.

✍ Keep wiring from the noise filter to servo amplifier as short as possible.

✍ Connect the servo amplifier to the secondary side of noise filter.

Materials　Global Standards [Global standards conformity]

■ Recommended prevention components

● Noise filter

Model Number	Specifications	Manufacturer
3SUP-HK30-ER-6B	Rated voltage : Line-Line 500 V Rated current : 30 A	Okaya Electric Industries Co. Ltd.
3SUP-HK50-ER-6B	Rated voltage : Line-Line 500 V Rated current : 50 A	Okaya Electric Industries Co. Ltd.
RF3020-DLC	Rated voltage : Line-Line 440 to 550 V Rated current : 20 A	RASMI ELECTRONICS LTD.
RF3030-DLC	Rated voltage : Line-Line 440 to 550 V Rated current : 30 A	RASMI ELECTRONICS LTD.
RF3070-DLC	Rated voltage : Line-Line 440 to 550 V Rated current : 70 A	RASMI ELECTRONICS LTD.
RF1010-DLC	Rated voltage : Line-Neutral 250 V Rated current : 10 A	RASMI ELECTRONICS LTD.
FS5559-35-33	Rated voltage : Line-Line 480 V Rated current : 35 A	SCHAFFNER

● Toroidal core

Model Number	External diameter	Internal diameter	Manufacturer
251-211	65 mm	36 mm	SCHAFFNER

Okaya Electric Industries Co. Ltd.: http://www.okayaelec.co.jp/

RASMI ELECTRONICS LTD. : http://www.rasmi.com/

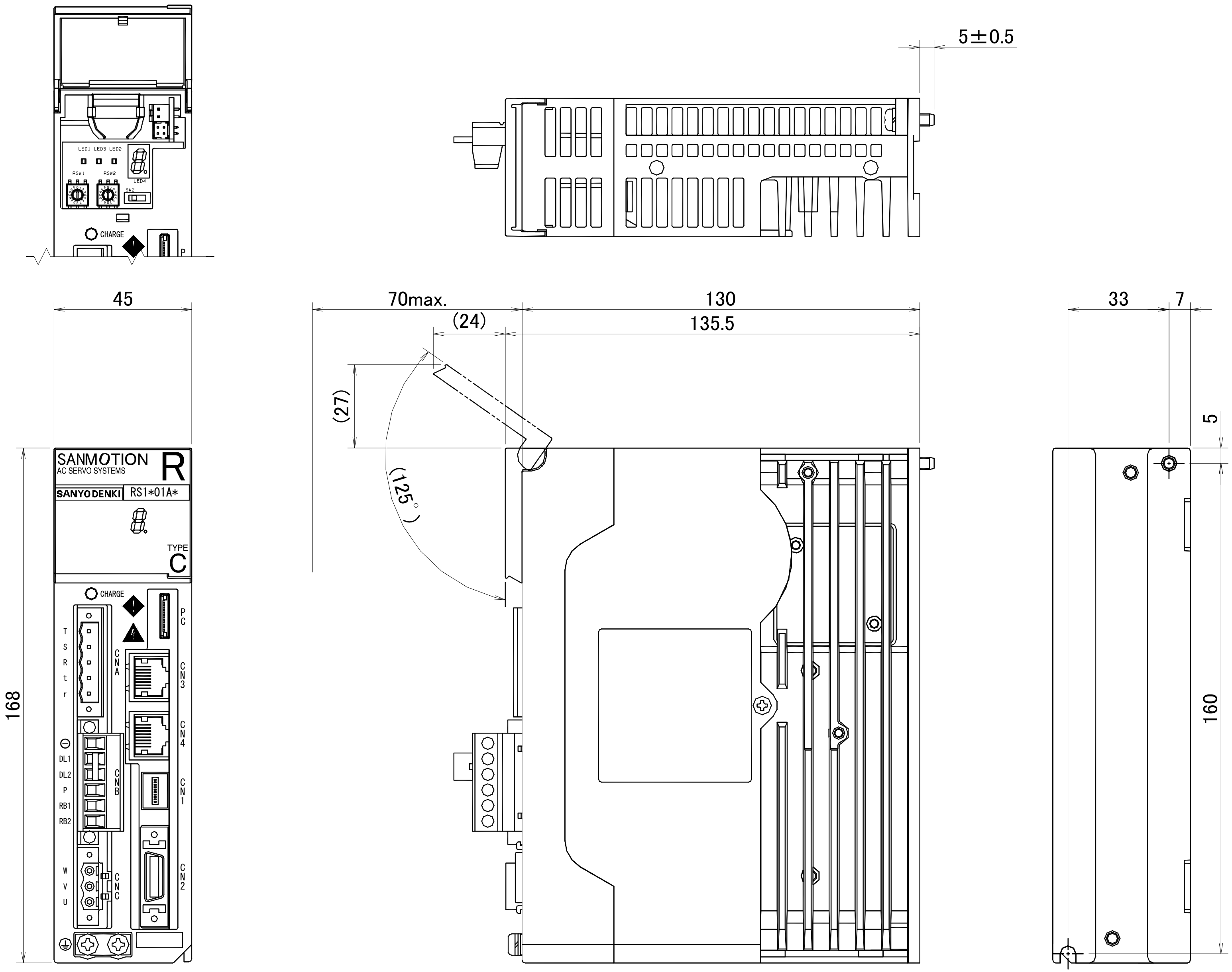
SCHAFFNER : http://www.schaffner.com/

✍ Please inquire the order for the RASMI product of our company.

■ Implementation of check test

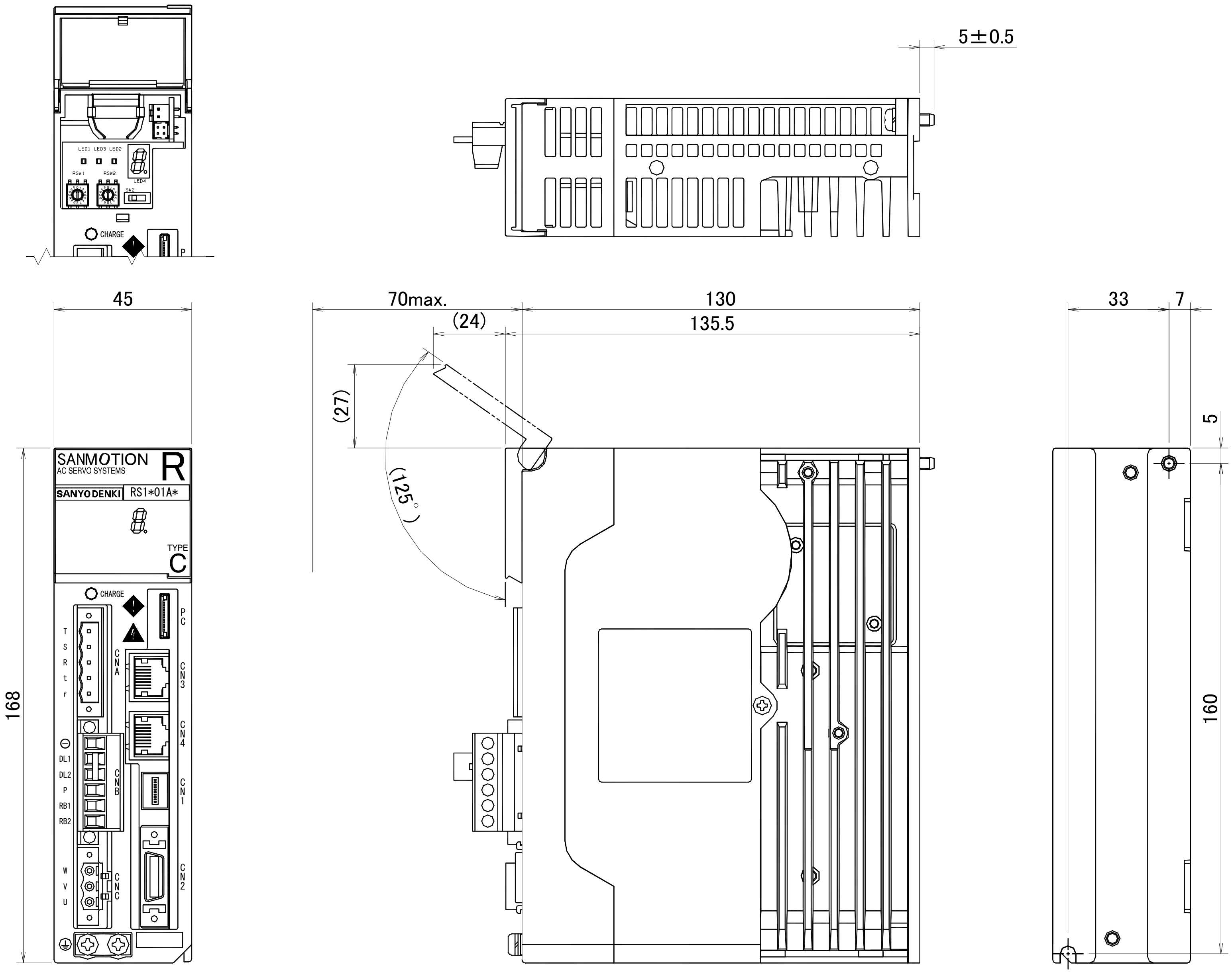
EMC testing of equipment and devices which the RS1 servo system is built–in should meet the emission and immunity (electromagnetic compatibility) standards for the usage environment / and operating conditions.

It is necessary to follow the instructions mentioned above and conduct a final conformity check test after review.



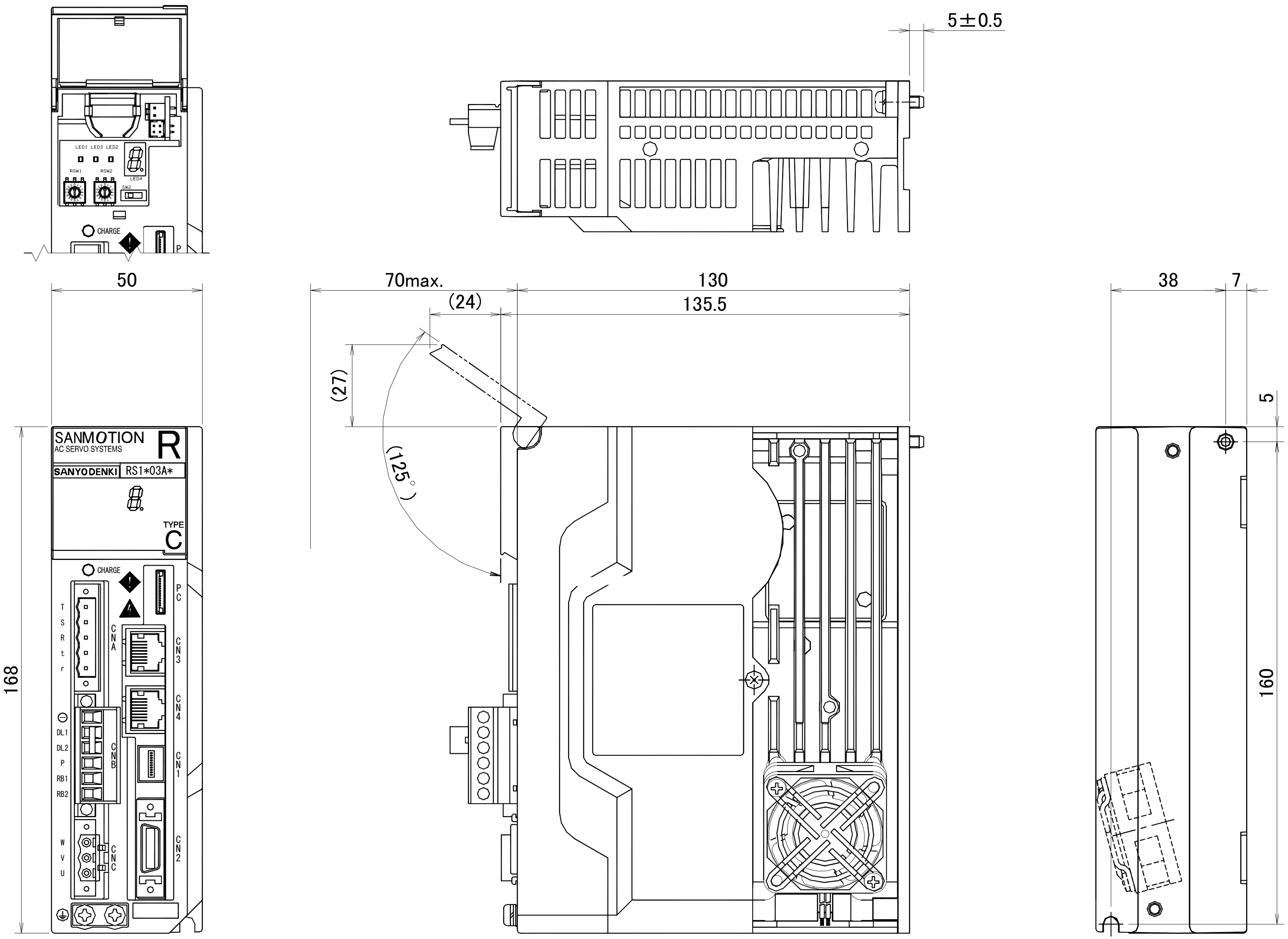
5±0.5
45
70max.
(24)
130
135.5
33
7
5
(27)
(125°)
168
160
SANMOTION
AC SERVO SYSTEMS
R
SANYO DENKI
RS1*01A*
TYPE
C
CHARGE

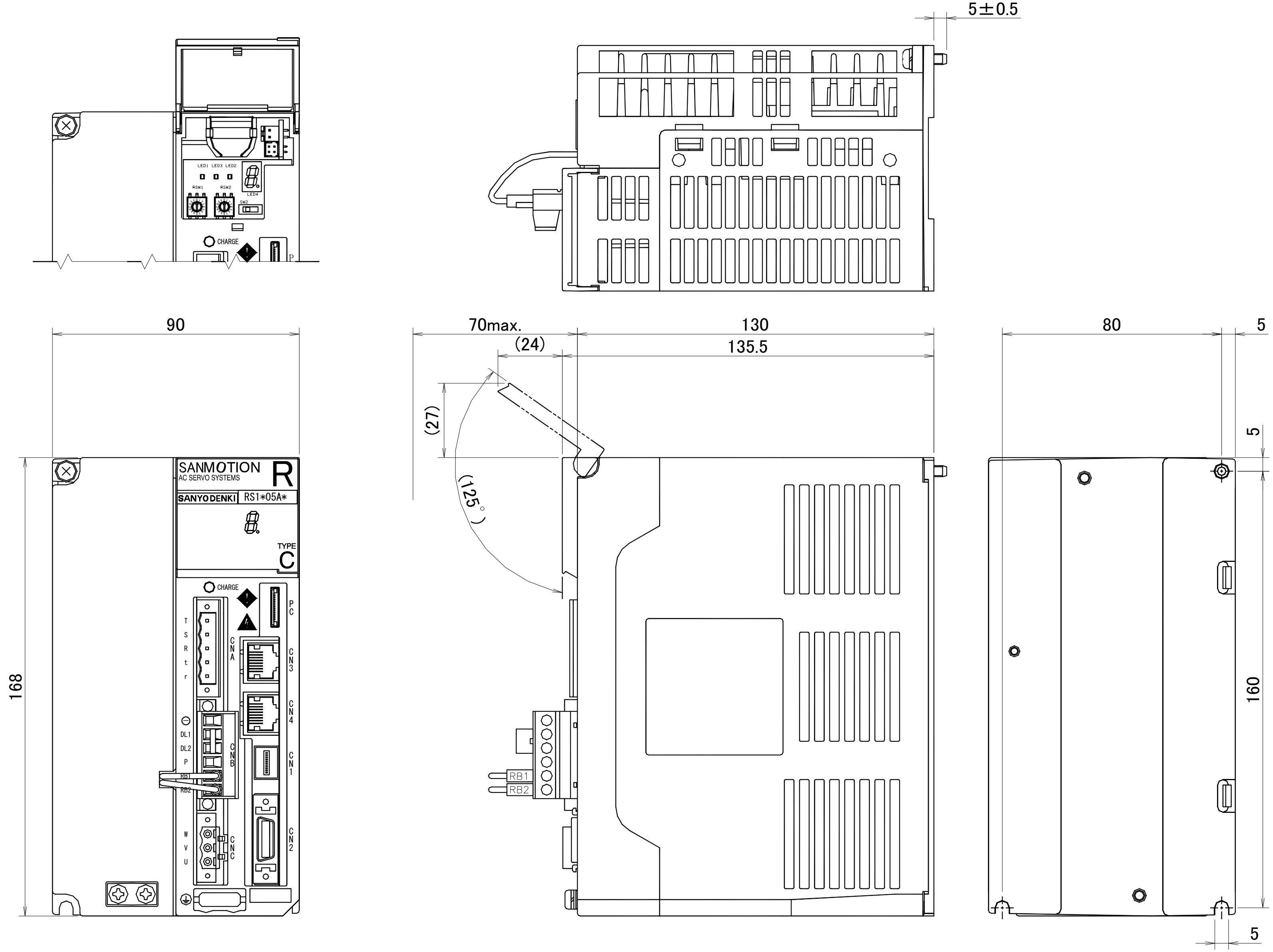
Materials, outline dimensions [RS1□01]



Materials, outline dimensions

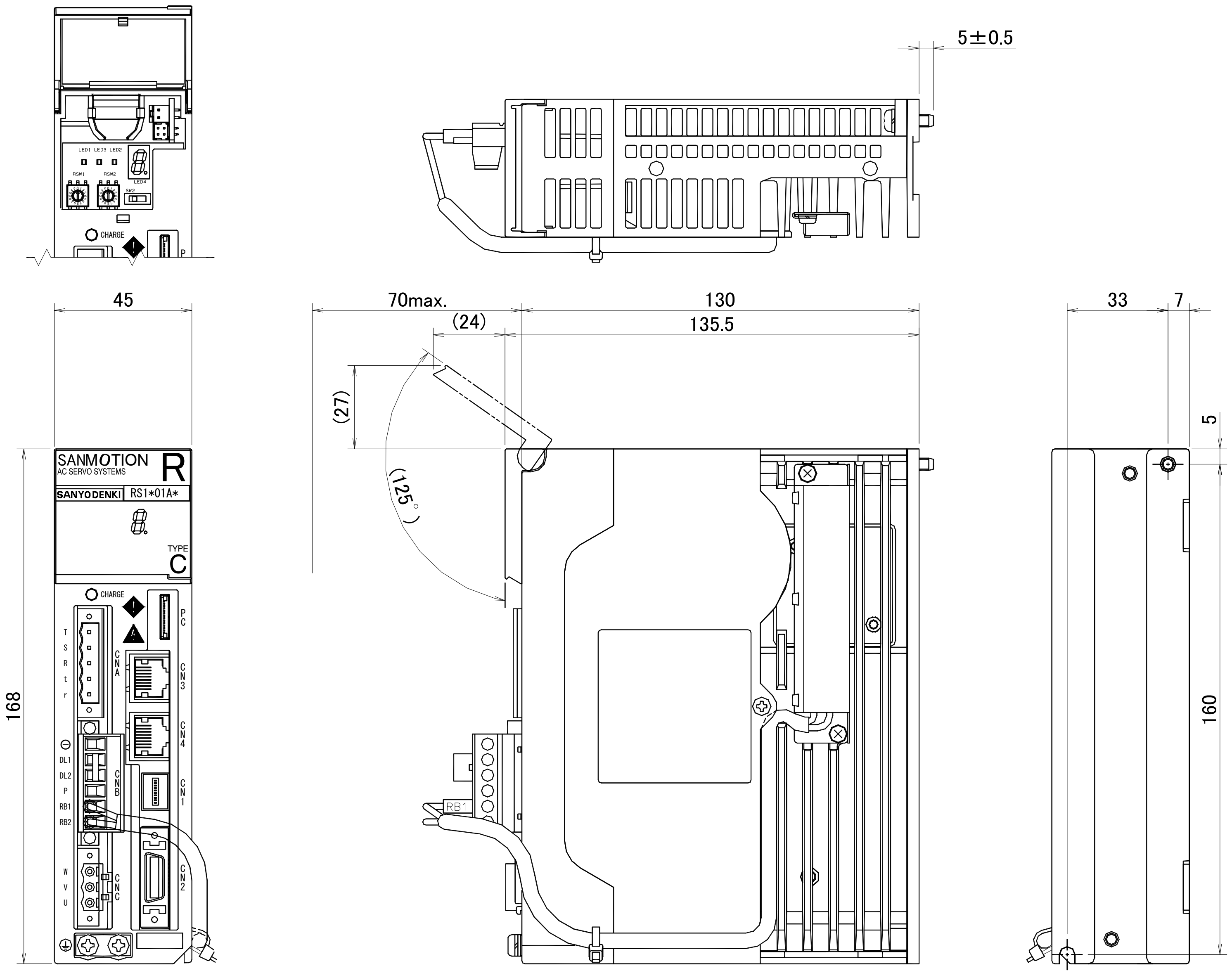
[RS1□03]



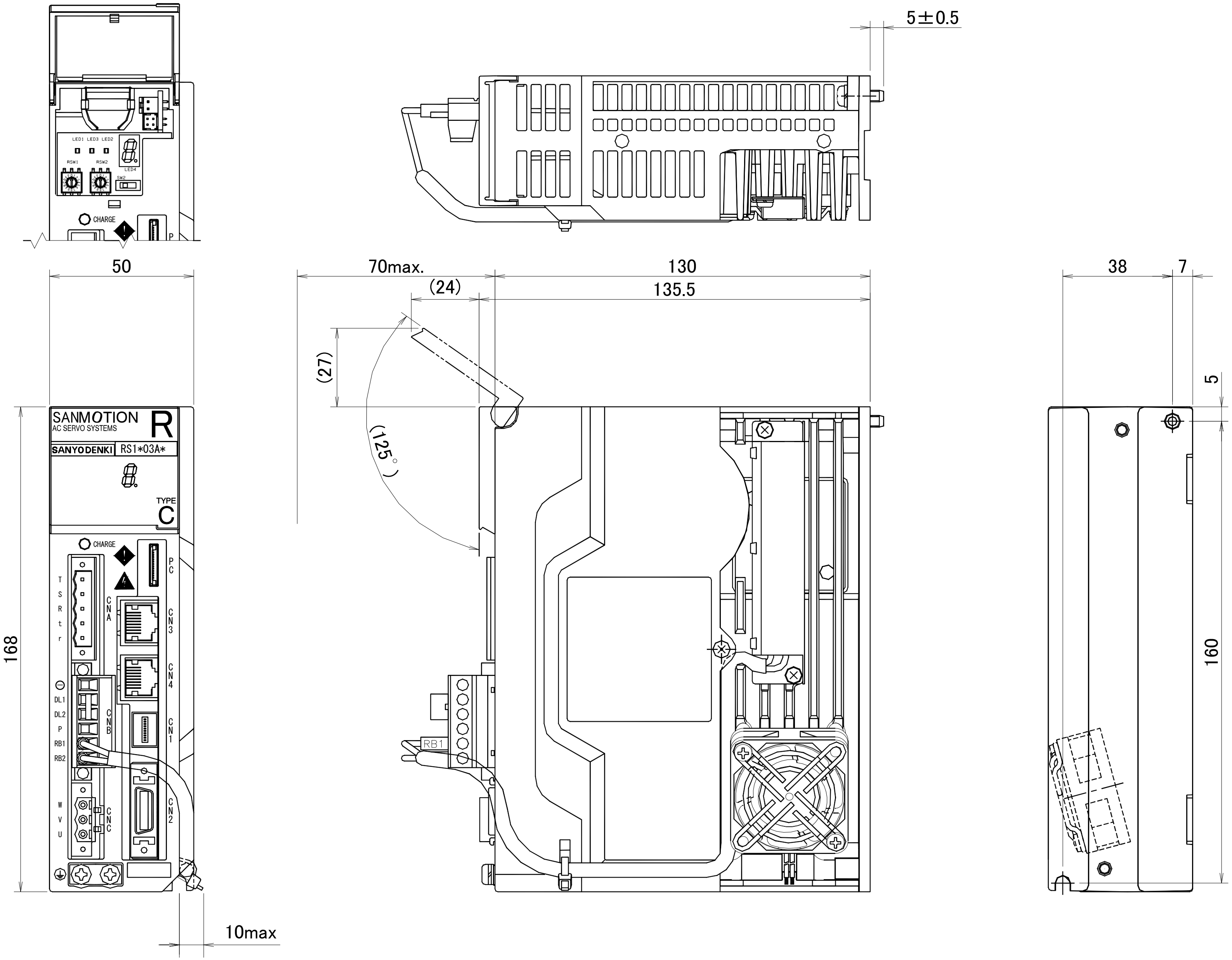


5±0.5
90
70max.
(24)
130
135.5
80
5
(27)
(125°)
168
160
5
5
SANMOTION
AC SERVO SYSTEMS
R
SANYO DENKI
RS1*05A*
TYPE
C
CHARGE
RB1
RB2

Materials, outline dimensions [RS1L/M01]

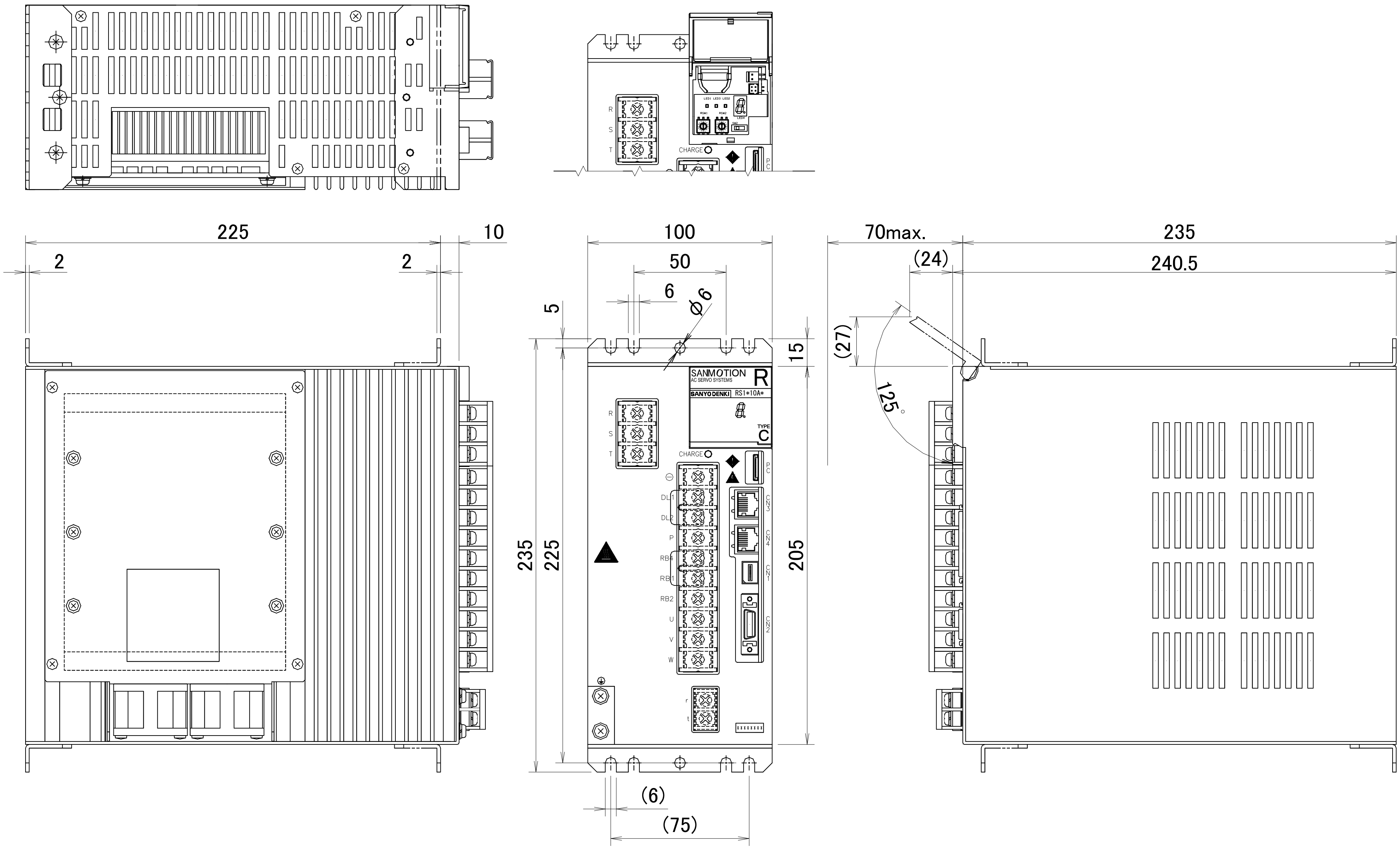


Materials, outline dimensions [RS1L/M03]



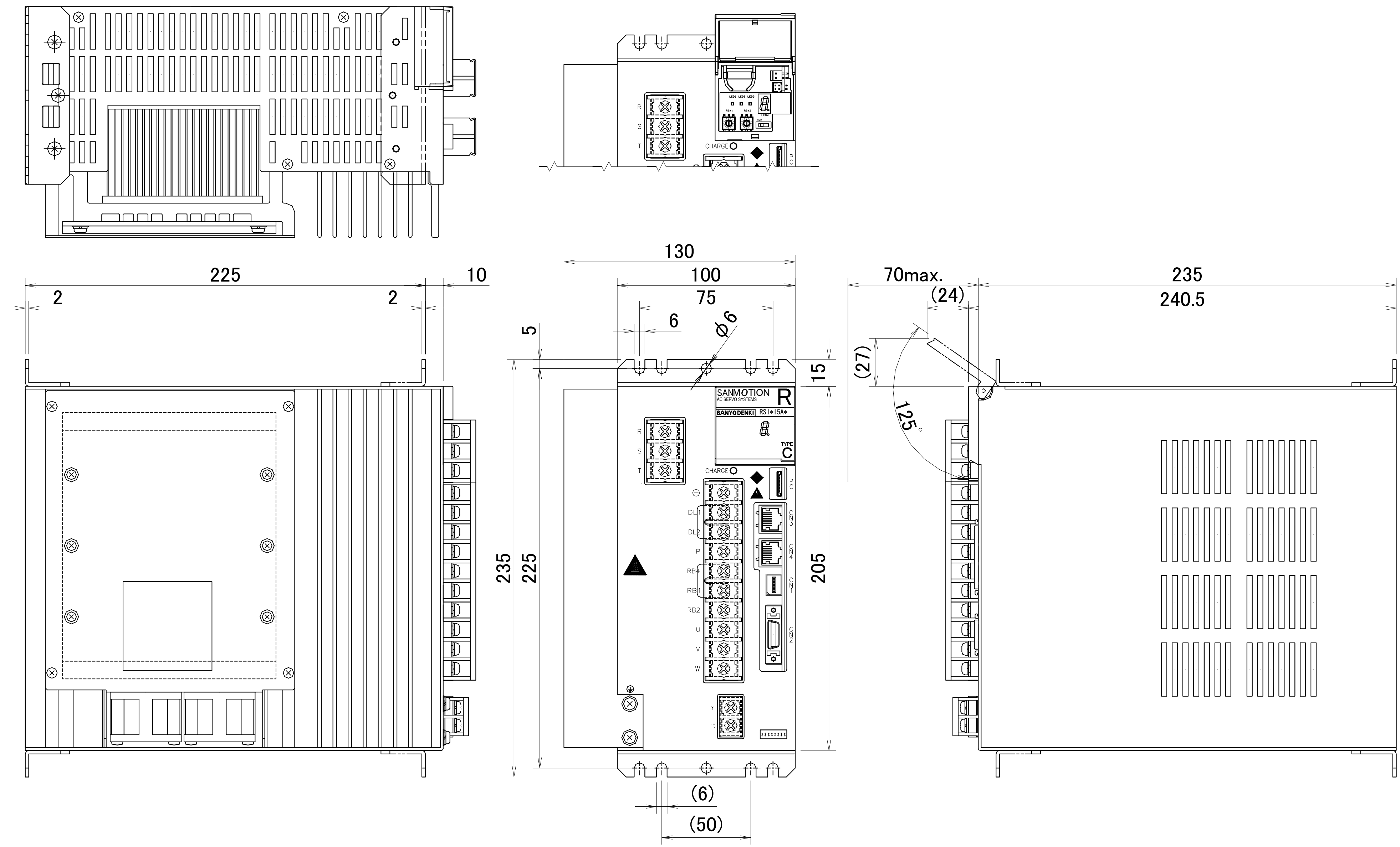
Materials, outline dimensions

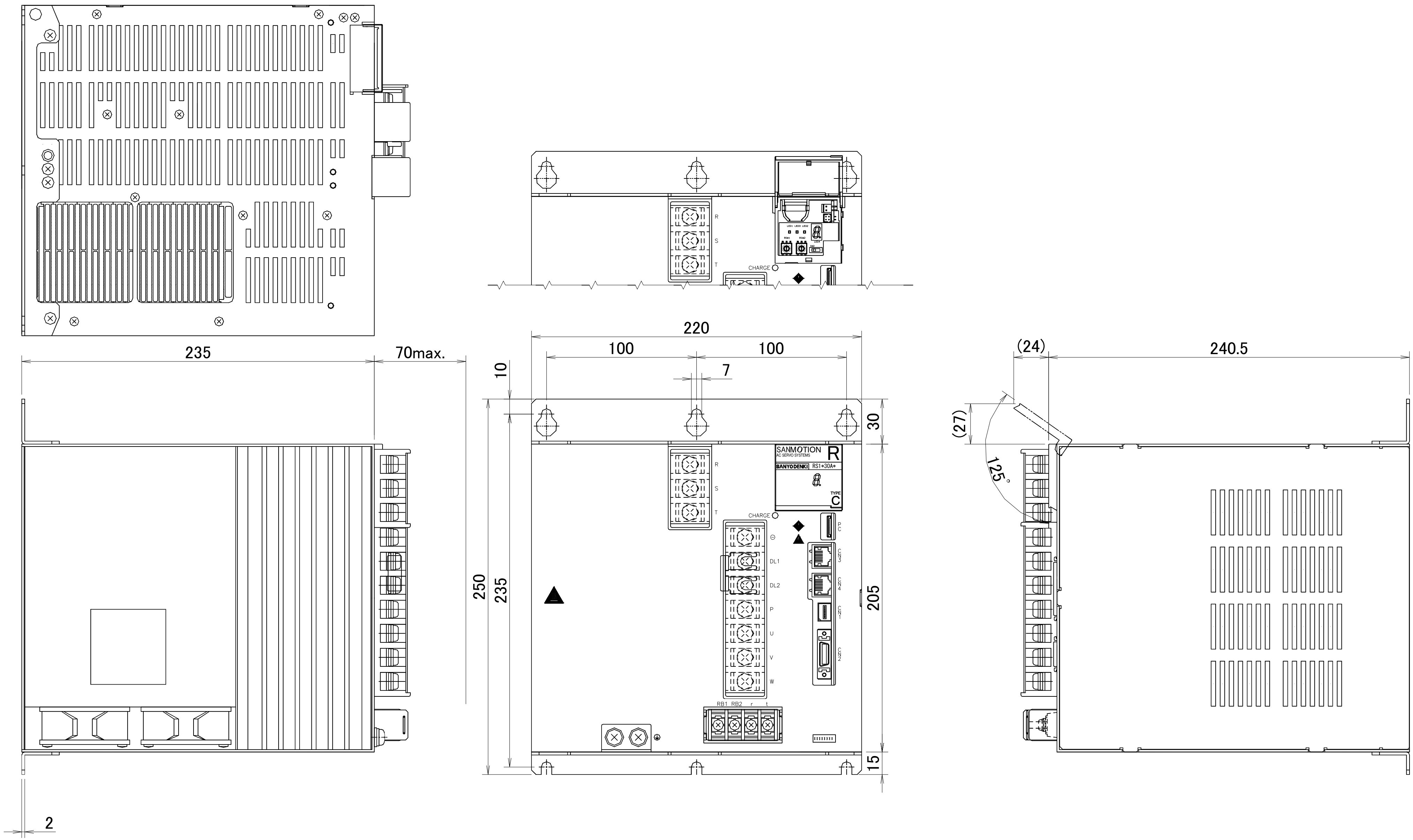
[RS1□10]



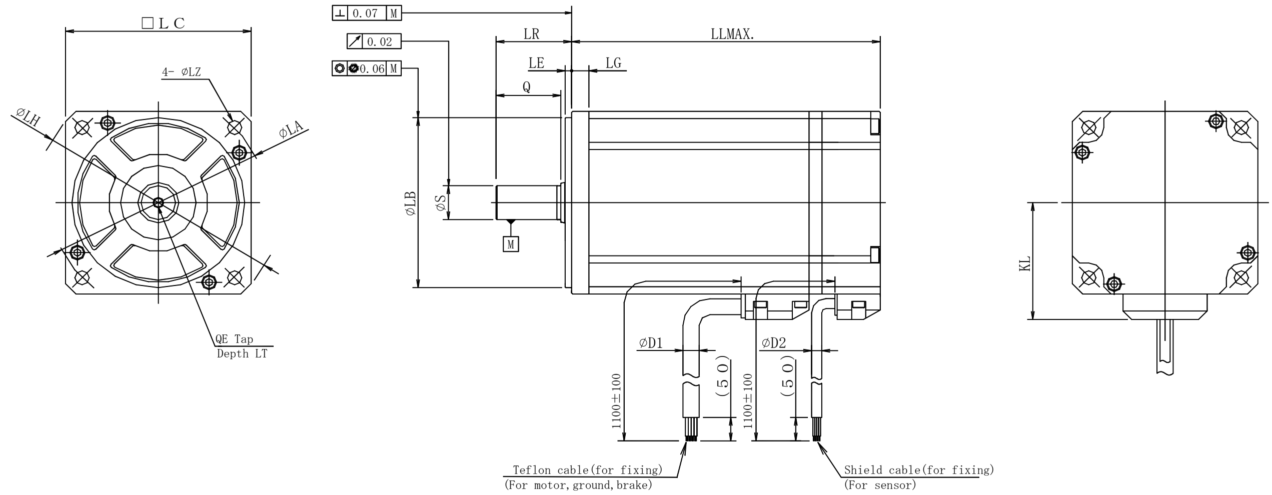
Materials, outline dimensions

[RS1□15]



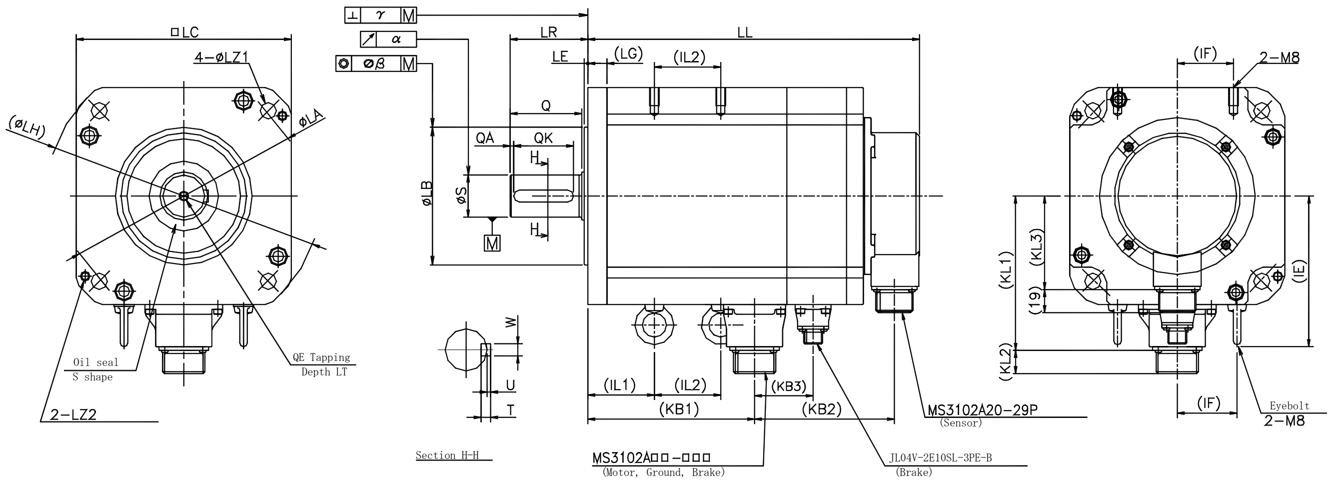

235
70max.
2
220
100
100
7
10
250
235
30
205
15
R
S
T
CHARGE
DL1
DL2
P
U
V
W
RB1 RB2 r t
SANMOTION
R
TYPE
C
(24)
240.5
(27)
125°

Materials, outline dimensions [Q1 □40-□76]



	Wire-saving incremental encoder [PP031]		Battery backup method absolute encoder [PA035C]																[PP 031]	[PA 035C]	
	Without Brake	With Brake	Without Brake	With Brake																	
MODEL	LL	LL	LL	LL	LG	KL	LA	LB	LE	LH	LC	LZ	LR	S	Q	QE	LT	D1	D2	D2	Oil seal
Q1□A04003△□◇	75±2	121.5±2	80.3±2	125.3±2	5	30	46	0 30-0.021	2.5	54	40	4.5	25	0 6-0.008	-	-	-	7	4.7	5	Option
Q1□A04005△□◇	81±2	127.5±2	87.3±2	131.3±2										0 8-0.009		-	-				
Q1□A04010△□◇	100±2	146.5±2	106.3±2	150.3±2																	
Q1□A06020△□◇	111±2	140±2	116±2	145±2	6	41	70	0 50-0.025	3	81	60	5.5	30	0 14-0.011		M5	12	7.5			
Q1AA06040△□◇	140±2	169±2	145±2	174±2																	
Q1AA07075△□◇	154±2	177.5±2	163.6±2	187±2	8	50	90	0 70-0.030	3	100	76	5.5	40	0 16-0.011	35	M5	12	7.5			

Materials Dimension [Q1 □100 - □180]

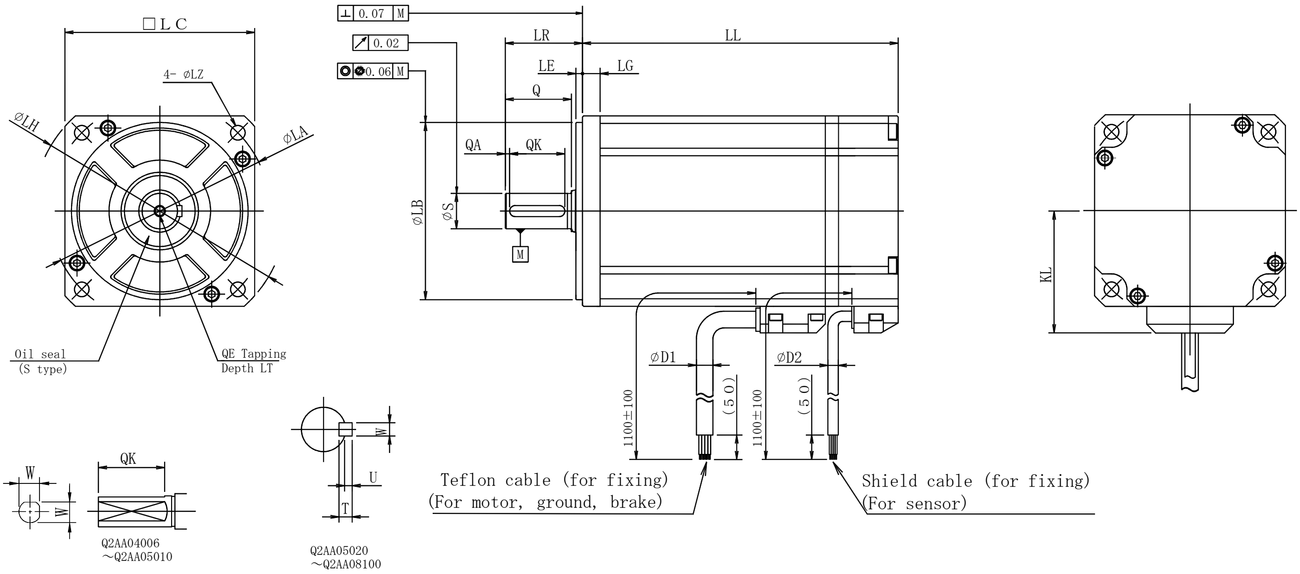


	Wire-saving incremental encoder [PP031]					Battery backup method absolute encoder [PA035C]					Connector Note 1					[PP 031]	[PA 035C]		
	Withou Brake		Without Brake			Withou Brake		Without Brake			Motor, Earth	Brake(only when brake is instalied) Note2							
MODEL	LL	KB2	LL	KB2	KB3	LL	KB2	LL	KB2	KB3	MS3102A	JL04V-2E	LG	KL1	KL2	KL3	KL3	LA	LB
Q1AA10100△□◇	184	80	219	116	51	193	90	229	125	51	20-15P	10SL-3PEB	10	78	19	63	63	115	0 95-0.035
Q1AA10150△□◇	209		244			218		254											
Q1AA10200△□◇	234		269			243		279											
Q1AA10250△□◇	259		294			268		304											
Q1AA12100△□◇	168	72	204	108	45	183	87	219	123	45	24-11P	10SL-3PE-B	12	93	21	67	63	135/ 145	0 110-0.035
Q1AA12200△□◇	205		241			220		256											
Q1AA12300△□◇	242		278			257		293											
Q1AA13300△□◇	205	67	254	117	-	220	84	270	134	-	24-11P		12	98	21	80	63	145	0 110-0.035
Q1AA13400△□◇	232		281			247		297											
Q1AA13500△□◇	269		318			284		334											
Q1AA18450△□◇	288	67	338	117	-	304	84	354	134	-	24-11P		16	123	21	80	63	200	0 114.3-0.035
Q1AA18750△□◇	384	72	434	122	54	400	89	450	139	54	32-17P	10SL-3PE-B	19	144	22				

MODEL	LE	LH	LC	LZ1	LZ2	LR	S	Q	QA	QK	W	T	U	KB1	α	β	γ	QE	LT	IE	IF	IL1	IL2
Q1AA10100△□◇	3	130	100	9	-	45	0 22-0.013	40	3	32	0 6-0.030	6	2.5	84	0.02	0.08	0.08	M6	20	-	-	-	-
Q1AA10150△□◇														109									
Q1AA10200△□◇														134									
Q1AA10250△□◇														159									
Q1AA12100△□◇	3	162	120	9	-	45	0 22-0.013	40	3	32	0 6-0.030	6	2.5	76	0.02	0.08	0.08	M6	20	-	-	-	-
Q1AA12200△□◇														113									
Q1AA12300△□◇						55	0 28-0.013	50	3	42	0 8-0.036	7	3	150				M8	25				
Q1AA13300△□◇	4	165	130	9	M6	55	0 28-0.013	50	3	42	0 8-0.036	7	3	117	0.02	0.08	0.08	M8	25	-	-	-	-
Q1AA13400△□◇														144									
Q1AA13500△□◇														181									
Q1AA18450△□◇	3	230	180	13.5	M8	65	0 35-0.016	60	3	50	0 10-0.036	8	3	200	0.02	0.08	0.08	M8	25	124	50	93	50
Q1AA18750△□◇						79	0 42-0.016	75	3	67	0 12-0.043	8	3	291				M10	25	124	50	85	145

Note 1) Connector becomes a waterproof specification when intuition is combined, and use the connector of the waterproof specification forthe receiving side plug for IP67, please.

Note 2) All the brake connectors become JL04V-2E70SL-3PE-B for CE of the A DC24V brake.



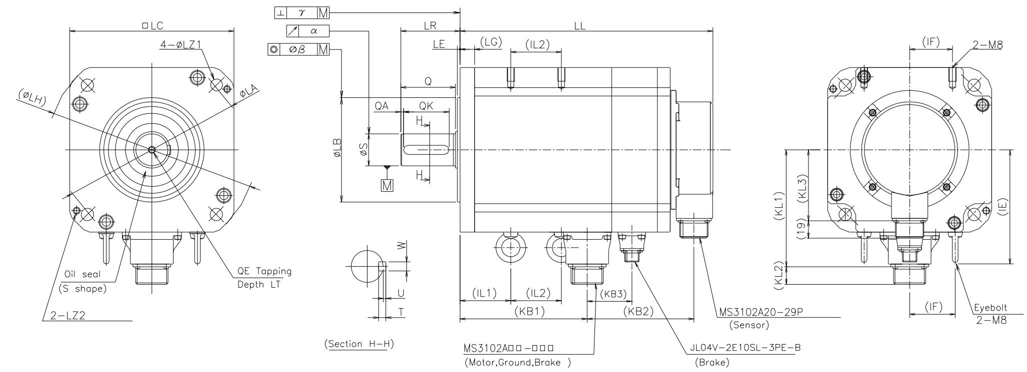
	Wire-saving incremental encoder [PP031]		Battery backup method absolute encoder [PA035C]										
	Without Brake	With Brake	Without Brake	With Brake									
MODEL	LL	LL	LL	LL	LG	KL	LA	LB	LE	LH	LC	LZ	LR
Q2□A04006△□◇	80±2	112±2	88±2	120±2	5	31	48	0 34-0.025	2	57	42	3.5	24
Q2□A04010△□◇	94±2	126±2	102±2	134±2									
Q2□A05005△□◇	79±2	108±2	88±2	110.5±2	5	38	60	0 50-0.025	2.5	71.5	54	4.5	24
Q2□A05010△□◇	87±2	115±2	96±2	118.5±2									
Q2□A05020△□◇	103±2	131±2	112±2	134.5±2									30
Q2□A07020△□◇	96±2	121±2	105±2	131±2	8	50	90	0 70-0.030	3	100	76	5.5	30
Q2AA07030△□◇	103±2	128±2	113±2	138±2									
Q2AA07040△□◇	110±2	135±2	120±2	145±2									
Q2AA07050△□◇	118±2	143±2	128±2	153±2									
Q2AA08050△□◇	128±2	164±2	136.5±2	172.5±2	8	55	100	0 80-0.030	3	115	86	6.6	35
Q2AA08075△□◇	145±2	181±2	153.5±2	189.5±2									
Q2AA08100△□◇	164±2	198±2	170.5±2	206.5±2									

											[PP031]	[PA035C]	
MODEL	S	Q	QA	QK	W	T	U	QE	LT	D1	Oil seal	D2	Oil seal
Q2AA04006△□◇	0 7-0.009	20	-	15	6.5±0.2	-	-	-	-	7	4.7	5	Without Note 1
Q2AA04010△□◇													
Q2AA05005△□◇	0 8-0.009	20	-	15	7.5±0.2	-	-	M3	8	7.5			With
Q2AA05010△□◇													
Q2AA05020△□◇	0 11-0.011	25	2	20	4	4	1.5	M4	10				
Q2AA07020△□◇	0 14-0.011	25	2	20	5	5	2	M5	12				
Q2AA07030△□◇													
Q2AA07040△□◇													
Q2AA07050△□◇													
Q2AA08050△□◇	0 16-0.011	30	2	25	5	5	2	M5	21				
Q2AA08075△□◇													
Q2AA08100△□◇													

(Unit:mm)

Note 1) If an oil seal is needed for Q2AA04*, the overall motor length is different.

Materials Dimension [Q2 □100 - □220]

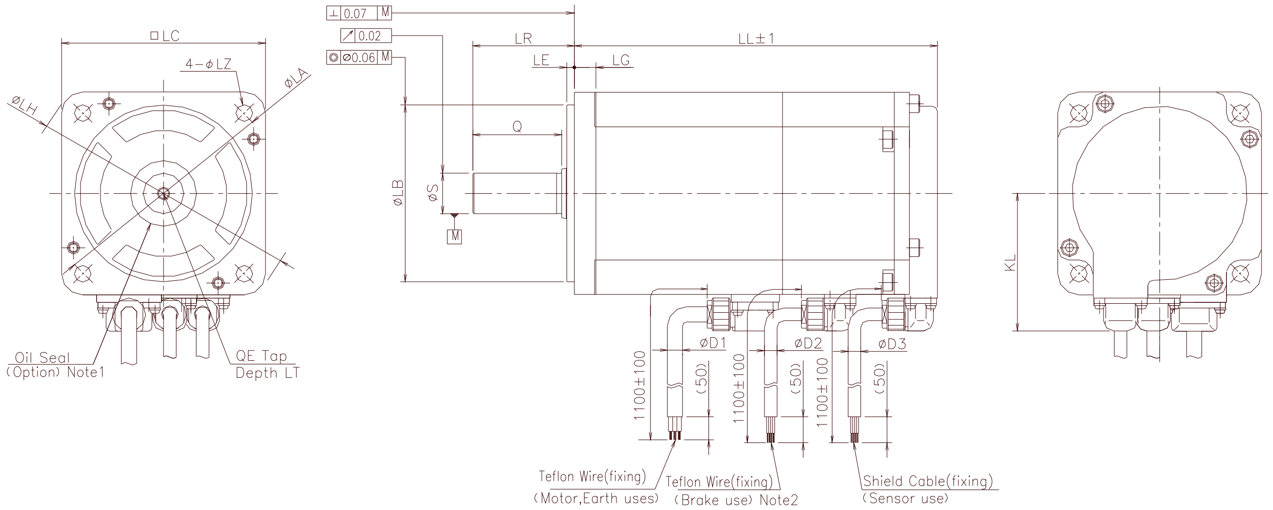


	Wire-saving incremental encoder [PP031]					Battery backup method absolute encoder [PA035C]					Connector Note 1					[PP 031]	[PA 035C]		
	Without Brake		With Brake			Without Brake		With Brake			Motor grounding	Brake(only when brake is instalied) Note2							
MODEL	LL	KB2	LL	KB2	KB3	LL	KB2	LL	KB2	KB3	MS3102A	JL04V-2E	LG	KL1	KL2	KL3	KL3	LA	LB
Q2AA10100△□◇	196	77	231	113	51	207	90	243	125	51	20-15P	10SL-3PE-EB	10	78	19	67	63	115	0 95-0.035
Q2AA10150△□◇	226		261			237		273											
Q2AA13050△□◇	135	67	171	103	-	150	84	186	120	-	24-11P		12	98	21	80	63	145	0 110-0.035
Q2AA13100△□◇	152		188			167		203											
Q2AA13150△□◇	169		205			184		220											
Q2AA13200△□◇	186		226	107	-	201		241	124	-									
Q2AA18200△□◇	171	67	221	117	-	186	84	236	134	-	24-11P		16	123	21	80	63	200	0 114.3-0.035
Q2AA18350△□◇	203		253			218		268											
Q2AA18450△□◇	218		268			234		284											
Q2AA18550△□◇	282	72	332	122	54	298	89	348	139	54	32-17P	10SL-3PE-EB	19	144	22	80	63	200	0 114.3-0.035
Q2AA18750△□◇	332		382			348		398											
Q2AA22250△□◇	158	65	196	104	44	171	80	210	119	44	24-11P	10SL-3PE-EB	16	141	21	80	63	235	0 200-0.046
Q2AA22350△□◇	171		209			184		223											
Q2AA22450△□◇	189		227			202		241											
Q2AA22550△□◇	252	82	309	140	82	265	97	323	155	82			19						
Q2AA22700△□◇	310		368			323		381											
Q2AA2211K△□◇	335	73	393	131	61	355	94	406	145	61	32-17P	10SL-3PE-EB	19	162	22	80	63	235	0 200-0.046
Q2AA2215K△□◇	394		452			414		465											

MODEL	LE	LH	LC	LZ1	LZ2	LR	S	Q	QA	QK	W	T	U	KB1	α	β	γ	QE	LT	IE	IF	IL1	IL2
Q2AA10100△□◇	3	130	100	9	-	45	0 22-0.013	40	3	32	0 6-0.030	6	2.5	98	0.02	0.08	0.08	M6	20	-	-	-	-
Q2AA10150△□◇														128									
Q2AA13050△□◇	4	165	130	9	M6	55	0 22-0.013	50	3	42	0 6-0.030	6	2.5	47	0.02	0.08	0.08	M6	20	-	-	-	-
Q2AA13100△□◇														64									
Q2AA13150△□◇														81									
Q2AA13200△□◇							0 28-0.013				0 8-0.036	7	3	98				M8	25				
Q2AA18200△□◇	3	230	180	13.5	M8	65	0 35-0.016	60	3	50	0 10-0.036	8	3	83	0.02	0.08	0.08	M8	25	-	-	-	-
Q2AA18350△□◇														115						124	50	61	20
Q2AA18450△□◇														130									35
Q2AA18550△□◇	3	230	180	13.5	M8	79	0 42-0.016	75	3	67	0 12-0.043	8	3	189	0.02	0.08	0.08	M10	25	124	50	85	50
Q2AA18750△□◇														239									100
Q2AA22250△□◇	4	270	220	13.5	M10	65	0 35-0.016	60	3	50	0 10-0.036	8	3	71	0.02	0.08	0.08	M8	25	142	60	50	10
Q2AA22350△□◇														84									20
Q2AA22450△□◇														102									40
Q2AA22550△□◇						79	0 55-0.019	75		67	0 16-0.043	10	4	149	0.03	0.08	0.10	M10				55	50
Q2AA22700△□◇														207									110
Q2AA2211K△□◇	4	270	220	13.5	M10	79	0 55-0.019	75	3	67	0 16-0.043	10	4	241	0.03	0.08	0.10	M10	25	142	60	69	120
Q2AA2215K△□◇														300									180

Note 1) Connector becomes a waterproof specification when intuition is combined, and use the connector of the waterproof specification forthe receiving side plug for IP67, please.

Note 2) All the brake connectors become JL04V-2E70SL-3PE-B for CE of the A DC24V brake.

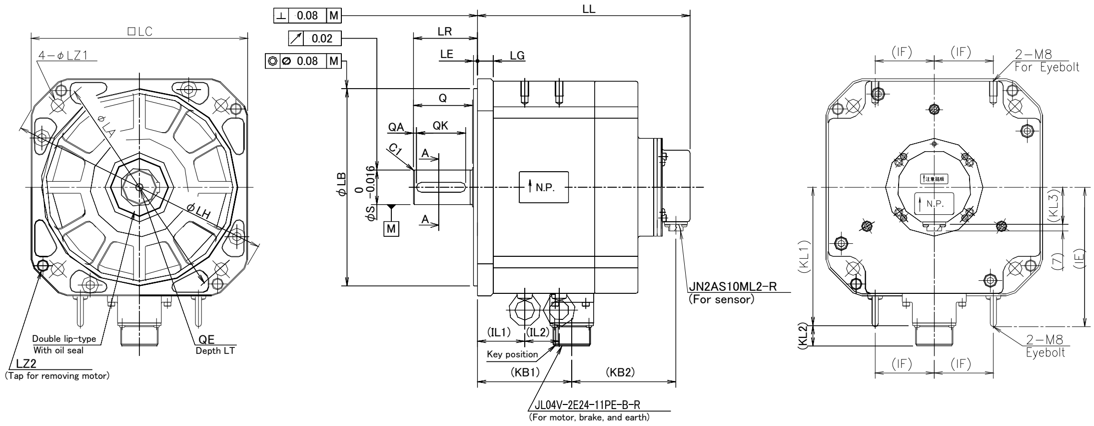


	Without Oil Seal		Without Oil Seal Note1										
	Battery backup method absolute encoder		Battery backup method absolute encoder										
	Without Brake	With Brake	Without Brake	With Brake									
MODEL	LL	LL	LL	LL	LG	KL	LA	LB	LE	LH	LC	LZ	LR
R2□A04003△□◇	51.5	87.5	56.5	92.5	5	35.3	46	0 30-0.021	2.5	56	40	2−φ 4.5	25
R2□A04005△□◇	56.5	92.5	61.5	97.5									
R2EA04008△□◇	72	108	77	113									
R2AA04010△□◇													
R2□A06010△□◇	58.5	82.5	65.5	89.5	6	44.6	70	0 50-0.025	3	82	60	4−φ 5.5	25
R2□A06020△□◇	69.5	97.5	76.5	104.5									30
R2AA08020△□◇	66.3	102	73.3	109	8	54.4	90	0 70-0.030		108	80	4−φ 6.6	
R2AA06040△□◇	95.5	123.5	102.5	130.5	6	44.6	70	0 50-0.025		82	60	4−φ 5.5	
R2AA08040△□◇	78.3	114	85.3	121	8	54.4	90	0 70-0.030	3	108	80	4−φ 6.6	
R2AA08075△□◇	107.3	143	114.3	150									40
R2AAB8100△□◇	137	163	137	163		59.4	100	0 80−0.03		115.5	86		35

							Absolute
MODEL	S	Q	QE	LT	D1	D2	D3
R2AA04003△□◇	0 6 -0.008	20	—	—	6	5	5
R2AA04005△□◇	0 8 –0.009						
R2EA04008△□◇							
R2AA04010△□◇							
R2□A06010△□◇	0 8 –0.009		—	—			
R2□A06020△□◇	0 14 –0.011	25	M5	12			
R2AA08020△□◇							
R2AA06040△□◇							
R2AA08040△□◇							
R2AA08075△□◇	0 16 –0.011	35	M5	12			
R2AAB8100△□◇		30					

Note 1) If an oil seal is needed, the motor whole length differs.
Note 2) For the one without brake, there is no brake connector (or cable) attached.

Materials　Dimension　　　　　　　[Q2　□100 - □220]



	Battery backup method absolute encoder																	
	Without Brake		With Brake															
MODEL	LL	KB2	LL	KB2	KL3	S	W	T	U	KB1	QE	LT	LC	LR	LA	LH	Q	LB
R2AA13050△□◇	103	44	139.5	81	69	0 22-0.013	0 6-0.030	6	0 2.5-0.2	46	M6	20	130	55	145	165	50	110
R2AA13120△□◇	120.5		160	84						64								
R2AA13200△□◇	171	57	216	103	38	0 28-0.013	0 8-0.036	7	0 3-0.4	99	M8	25						
R2AA22500△□◇	163	52			38	0 35-0.016	0 10-0.036	8		96			220	65	235	270	60	200

MODEL	QA	QK	LZ1	LZ2	LE	LG	KL1	KL2	IE	IF	IL1	IL2
R2AA13050△□◇	3	42	9	2-M6	4	12	98	21	-	-	-	-
R2AA13120△□◇												
R2AA13200△□◇												
R2AA22500△□◇		50	13.5	4-M12		16	142		142	60	48	35

Materials Servo motor data sheet [Characteristics table]

Three-phase AC200V-input specification

Servo Motor model Q1AA			04003D	04005D	04010D	06020D	06040D	07075D	10100D
Servo Amplifier model RS1☐			01*	01*	01*	01*	03*	03*	05*
*Rated output	P_R	kW	0.03	0.05	0.1	0.2	0.4	0.75	1
*Rated speed	N_R	min^{-1}	3000	3000	3000	3000	3000	3000	3000
*Maximum speed	N_{max}	min^{-1}	5000	5000	5000	5000	5000	5000	5000
*Rated torque	T_R	N・m	0.098	0.159	0.318	0.637	1.27	2.38	3.19
*Continuous stall torque	T_S	N・m	0.108	0.159	0.318	0.637	1.27	2.38	3.92
*Peak torque	T_P	N・m	0.322	0.477	0.955	1.91	3.82	7.16	10.5
*Rated current	I_R	Arms	0.49	0.80	1	1.5	2.9	4.5	6.5
*Continuous stall current	I_S	Arms	0.53	0.80	1	1.5	2.9	4.5	7.8
*Peak current	I_P	Arms	2.2	2.9	3.6	5.8	10.5	15	24.5
Torque constant	K_T	N・m/Arms	0.220	0.23	0.360	0.49	0.510	0.61	0.55
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	7.68	8.0	12.6	17.2	17.8	21.4	19.3
Phase resistance	R_ϕ	Ω	15	8.1	7.6	2.5	1.3	0.63	0.34
*Rated power rate	Q_R	kW/s	9.60	18.8	43.4	28.7	65.3	89.6	78.9
Inertia (Including Wiring INC)	J_M	$kg\cdot m^2(GD^2/4)$ ×10-4	0.01	0.0134	0.0233	0.141	0.247	0.636	1.29
Aluminium plate		mm	t6×250	t6×250	t6×250	t12×250	t12×250	t12×250	t20×400

Servo Motor model Q1AA			10150D	10200D	10250D	12100D	12200D	12300D	13300D
Servo Amplifier model RS1☐			05*	10*	10*	05*	10*	10*	10*
*Rated output	P_R	kW	1.5	2	2.5	1	2	3	3
*Rated speed	N_R	min^{-1}	3000	3000	3000	3000	3000	3000	3000
*Maximum speed	N_{max}	min^{-1}	4500	5000	5000	5000	5000	5000	4500
*Rated torque	T_R	N・m	4.79	6.37	7.97	3.19	6.37	9.55	9.5
*Continuous stall torque	T_S	N・m	4.9	7.36	8.82	3.92	7.36	11	10.8
*Peak torque	T_P	N・m	14.7	19.6	24.4	11	21	31	28.4
*Rated current	I_R	Arms	8.2	15.9	16.6	6.2	14.3	16.2	16.7
*Continuous stall current	I_S	Arms	8.2	18	17.2	7.5	16.2	17.3	17.6
*Peak current	I_P	Arms	26.5	55	55	24.5	53	55	55
Torque constant	K_T	N・m/Arms	0.705	0.470	0.587	0.578	0.534	0.73	0.693
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	24.6	16.4	20.5	20.2	18.6	25.4	24.2
Phase resistance	R_ϕ	Ω	0.272	0.0860	0.104	0.190	0.07	0.082	0.087
*Rated power rate	Q_R	kW/s	143	189	240	45.2	93	143	184
Inertia (Including Wiring INC)	J_M	$kg\cdot m^2(GD^2/4)$ ×10-4	1.61	2.15	2.65	2.25	4.37	6.4	4.92
Aluminium plate		mm	t20×400	t20×470	t20×470	t20×400	t20×470	t20×470	t20×470

Servo Motor model Q1AA			13400D	13500D	18450M	18750H			
Servo Amplifier model RS1☐			15*	15*	15*	30*			
*Rated output	P_R	kW	4	5	4.5	7.5			
*Rated speed	N_R	min^{-1}	3000	3000	1500	1500			
*Maximum speed	N_{max}	min^{-1}	4500	4500	1500	3000			
*Rated torque	T_R	N・m	12.7	15.7	28.5	48			
*Continuous stall torque	T_S	N・m	14.7	18.1	31.6	55			
*Peak torque	T_P	N・m	39.2	47.6	105	125			
*Rated current	I_R	Arms	23.4	25.8	20	55			
*Continuous stall current	I_S	Arms	26.4	27.5	22.2	60			
*Peak current	I_P	Arms	83	83	83	155			
Torque constant	K_T	N・m/Arms	0.612	0.724	1.71	0.91			
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	21.4	25.3	59.6	31.7			
Phase resistance	R_ϕ	Ω	0.048	0.0461	0.129	0.021			
*Rated power rate	Q_R	kW/s	251	291	295	443			
Inertia (Including Wiring INC)	J_M	$kg\cdot m^2(GD^2/4)$ ×10-4	6.43	8.47	27.5	52			
Aluminium plate		mm	t20×470	t20×540	t20×540	t20×540			

・Constants are values at the time of installing on the aluminum board in the table. They indicate ‘thickness’×’side of square’.

・Items with * and velocity – torque characteristics indicate values after temperature rise saturation. The others indicate values at 20℃. Each value indicates TYP.

Materials Servo motor data sheet [Characteristics table]

AC100V-input specification

Servo Motor model NO. Q1EA			04003D	04005D	04010D	06020D			
Servo Amplifier model NO.RS1☐			01*	01*	01*	03*			
*Rated output	P_R	kW	0.03	0.05	0.1	0.2			
*Rated speed	N_R	min^{-1}	3000	3000	3000	3000			
*Maximum speed	N_{max}	min^{-1}	5000	5000	5000	5000			
*Rated torque	T_R	N･m	0.098	0.159	0.318	0.637			
*Continuous stall torque	T_S	N･m	0.108	0.159	0.318	0.637			
*Peak torque	T_P	N･m	0.322	0.477	0.955	1.91			
*Rated current	I_R	Arms	0.9	1.9	2.2	4.5			
*Continuous stall current	I_S	Arms	0.95	1.9	2.2	4.5			
*Peak current	I_P	Arms	4	7	7.9	15.5			
Torque constant	K_T	N･m/Arms	0.115	0.096	0.176	0.161			
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	4.03	3.3	6.13	5.63			
Phase resistance	R_ϕ	Ω	4.28	1.4	2.2	0.33			
*Rated power rate	Q_R	kW/s	9.6	18.8	43.5	28.7			
Inertia (Including Wiring INC)	J_M	kg･m²(GD²/4) ×10-4	0.01	0.0134	0.0233	0.141			
Aluminium plate		mm	t6×305	t6×305	t6×305	t6×305			

・Constants are values at the time of installing on the aluminum board in the table. They indicate 'thickness'×'side of square'.

・Items with "*" and velocity – torque characteristics indicate values after temperature rise saturation. The others indicate values at 20℃. Each value indicates TYP.

Materials Servo motor data sheet [Characteristics table]

3-phase AC200V-input specification

Servo Motor model NO. Q2AA			04006D	04010D	05005D	05010D	05020D	07020D	07030D
Servo Amplifier model NO. RS1☐			01*	01*	01*	01*	01*	01*	01*
*Rated output	P_R	kW	0.06	0.1	0.05	0.1	0.2	0.2	0.3
*Rated speed	N_R	min^{-1}	3000	3000	3000	3000	3000	3000	3000
*Maximum speed	N_{max}	min^{-1}	5000	5000	5000	5000	5000	5000	5000
*Rated torque	T_R	N・m	0.191	0.318	0.159	0.318	0.637	0.637	0.955
*Continuous stall torque	T_S	N・m	0.216	0.353	0.167	0.353	0.686	0.686	0.98
*Peak torque	T_P	N・m	0.65	1	0.518	1.06	2.05	2.1	3.4
*Rated current	I_R	Arms	0.67	1.1	0.86	1.1	1.6	2.1	2.1
*Continuous stall current	I_S	Arms	0.67	1.2	0.88	1.2	1.7	2.2	2.5
*Peak current	I_P	Arms	2.7	3.6	3.3	4.3	5.9	7.5	7.9
Torque constant	K_T	N・m/Arms	0.314	0.325	0.21	0.33	0.435	0.34	0.519
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	10.97	11.34	7.26	11.4	15.2	11.8	18.1
Phase resistance	R_ϕ	Ω	11.3	6.77	4.72	4.05	3.24	1.88	2.22
*Rated power rate	Q_R	kW／s	6.46	11.8	3.78	7.78	16.2	10.6	20.3
Inertia (Including Wiring INC)	J_M	kg・m^2(GD^2/4)×10^{-4}	0.057	0.086	0.067	0.13	0.25	0.38	0.45
Aluminium plate		mm	t6×250	t6×250	t6×250	t6×305	t6×305	t6×305	t6×305

Servo Motor model NO. Q2AA			07040D	07050D	08050D	08075D	08100D	10100H	10150H
Servo Amplifier model NO. RS1☐			03*	03*	03*	05*	05*	05*	05*
*Rated output	P_R	kW	0.4	0.5	0.5	0.75	1	1	1.5
*Rated speed	N_R	min^{-1}	3000	3000	3000	3000	3000	2000	2000
*Maximum speed	N_{max}	min^{-1}	5000	5000	5000	5000	5000	3500	3000
*Rated torque	T_R	N・m	1.273	1.59	1.589	2.387	3.18	5	7.2
*Continuous stall torque	T_S	N・m	1.372	1.85	1.96	2.941	3.92	6	8
*Peak torque	T_P	N・m	4.1	5.2	6.56	9	12.5	16.6	20.5
*Rated current	I_R	Arms	3.0	4.3	3.7	5.9	6	6.8	8.6
*Continuous stall current	I_S	Arms	3.1	5.0	4.3	7	6.9	8.1	9.4
*Peak current	I_P	Arms	12	15	15	23.7	25	24.5	25.5
Torque constant	K_T	N・m/Arms	0.482	0.442	0.52	0.441	0.59	0.814	0.94
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	16.8	15.4	18.1	15.4	20.5	28.4	32.7
Phase resistance	R_ϕ	Ω	1.26	0.8	0.800	0.358	0.410	0.477	0.34
*Rated power rate	Q_R	kW／s	21.6	27.3	19.4	27.5	37.0	46.0	65
Inertia (Including Wiring INC)	J_M	kg・m2(GD2/4)×10^{-4}	0.75	0.85	1.3	2.07	2.7	5.4	8.0
Aluminium plate		mm	t6×305	t6×305	t6×305	t6×305	t20×305	t20×400	t20×400

Servo Motor model NO. Q2AA			13050H	13100H	13150H	13200H	18200H	18350H	18450H
Servo Amplifier model NO. RS1☐			03*	05*	05*	10*	10*	15*	15*
*Rated output	P_R	kW	0.5	1.0	1.5	2	2	3.5	4.5
*Rated speed	N_R	min^{-1}	2000	2000	2000	2000	2000	2000	2000
*Maximum speed	N_{max}	min^{-1}	3500	3000	3500	3500	3500	3500	3000
*Rated torque	T_R	N・m	2.5	5	7.5	9.55	9.5	16.7	21.5
*Continuous stall torque	T_S	N・m	3	6	9	12	12	21.1	27.1
*Peak torque	T_P	N・m	7.1	15	20.3	30.5	31	55	70
*Rated current	I_R	Arms	4.6	7	8.7	13.1	15	22.6	24
*Continuous stall current	I_S	Arms	5.2	8.3	10.2	16.3	18	28	29
*Peak current	I_P	Arms	15	23.7	26.5	48	55	83	81
Torque constant	K_T	N・m/Arms	0.607	0.803	0.981	0.822	0.75	0.840	1.04
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	21.2	28.0	34.2	29	25.9	29.3	36.4
Phase resistance	R_ϕ	Ω	0.442	0.276	0.266	0.128	0.075	0.048	0.044
*Rated power rate	Q_R	kW／s	22.3	46	64	78	45.7	73	84
Inertia (Including Wiring INC)	J_M	kg・m^2(GD^2/4)×10^{-4}	2.8	5.4	7.94	12	20	38	55
Aluminium plate		mm	t20×305	t20×400	t20×400	t20×470	t20×470	t20×470	t20×470

- Items with *(of the previous page; 39) and velocity – torque characteristics indicate values after temperature rise saturation. The others indicate values at 20℃. Each value indicates TYP.
- The constants shown above are the values when installed in heat releasing alminum plate, and indicate (thickness) x (one side length of squre). Items marked with "*" and velocity-torque characteristic show the values after increase-in-temperature saturated. The other items show the values at 20°C. Each value shows TYP. value.

Materials Servo motor data sheet [Characteristics table]

Servo Motor model Q2AA			18550R	22250H	22350H	22450R	22550B	22700S	
Servo Amplifier model RS1☐			15*	10*	15*	15*	15*	15*	
*Rated output	P_R	kW	5.5	2.5	3.5	4.5	5.5	7	
*Rated speed	N_R	min^{-1}	1500	2000	2000	2000	1500	1000	
*Maximum speed	N_{max}	min^{-1}	2500	3500	3000	2500	2000	1000	
*Rated torque	T_R	N･m	35	12	17	21.5	35	67	
*Continuous stall torque	T_S	N･m	37.3	13.5	22	32	42	70	
*Peak torque	T_P	N･m	88	30	50	70	90	150	
*Rated current	I_R	Arms	32.2	19.6	23.3	23	30	34	
*Continuous stall current	I_S	Arms	33.7	21.8	29.8	33	35.1	34	
*Peak current	I_P	Arms	83	55	78	83	79.7	83	
Torque constant	K_T	N･m/Arms	1.24	0.685	0.814	1.06	1.32	2.13	
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	43.2	23.9	28.4	37.1	46.0	74.5	
Phase resistance	R_ϕ	Ω	0.039	0.0735	0.0559	0.0497	0.0464	0.057	
*Rated power rate	Q_R	kW/s	180	44.7	61.1	68.5	129	243	
Inertia (Including Wiring INC)	J_M	$kg･m^2(GD^2/4) \times 10^{-4}$	69	32.2	47.33	67.45	95	185	
Aluminium plate		mm	t20×540	t20×470	t20×470	t20×470	t20×540	t20×540	

Servo Motor model Q2AA			18550H	18750L	2211KV	2215KV			
Servo Amplifier model RS1☐			30*	30*	30*	30*			
*Rated output	P_R	kW	5.5	7.5	11	15			
*Rated speed	N_R	min^{-1}	1500	1500	1500	1500			
*Maximum speed	N_{max}	min^{-1}	3000	3000	2000	2000			
*Rated torque	T_R	N･m	35	48	70	95.5			
*Continuous stall torque	T_S	N･m	37.3	54.9	80	95.5			
*Peak torque	T_P	N･m	95	137	176	223			
*Rated current	I_R	Arms	47	52	60	66			
*Continuous stall current	I_S	Arms	47	57	66	66			
*Peak current	I_P	Arms	155	160	155	157			
Torque constant	K_T	N･m/Arms	0.830	1.03	1.29	1.54			
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	29.0	36.0	45.1	53.6			
Phase resistance	R_ϕ	Ω	0.018	0.017	0.015	0.016			
*Rated powerrate	Q_R	kW/s	168	240	260	360			
Inertia (Including Wiring INC)	J_M	$kg･m^2(GD^2/4) \times 10^{-4}$	73	95	186	255			
Aluminium plate		mm	t20×540	t20×540	t20×540	t20×540			

AC100V Input specification

Servo Motor model Q2EA			04006D	04010D	05005D	05010D	05020D	07020D	
Servo Amplifier model RS1☐			01*	01*	01*	01*	03*	03*	
*Rated output	P_R	kW	0.06	0.1	0.05	0.1	0.2	0.2	
*Rated speed	N_R	min^{-1}	3000	3000	3000	3000	3000	3000	
*Maximum speed	N_{max}	min^{-1}	5000	5000	5000	5000	5000	5000	
*Rated torque	T_R	N･m	0.191	0.318	0.159	0.318	0.637	0.637	
*Continuous stall torque	T_S	N･m	0.216	0.353	0.167	0.353	0.686	0.686	
*Peak torque	T_P	N･m	0.65	1	0.518	1.03	2.1	2.1	
*Rated current	I_R	Arms	1.9	2.0	1.5	2.1	3.9	4.4	
*Continuous stall current	I_S	Arms	1.9	2.2	1.5	2.3	4.1	4.6	
*Peak current	I_P	Arms	7.9	7	5.6	7.9	15.5	15.5	
Torque constant	K_T	N･m/Arms	0.117	0.188	0.12	0.169	0.184	0.162	
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	4.09	6.55	4.2	5.9	6.41	5.67	
Phase resistance	R_ϕ	Ω	1.5	1.9	1.8	1.22	0.64	0.5	
*Rated powerrate	Q_R	kW/s	6.46	11.8	3.78	7.8	16.2	10.6	
Inertia (Including Wiring INC)	J_M	$kg･m^2(GD^2/4) \times 10^{-4}$	0.057	0.086	0.067	0.13	0.25	0.38	
Aluminium plate		mm	t6×305	t6×305	t6×305	t6×305	t6×305	t6×305	

- Constants are values at the time of installing on the aluminum board in the table. They indicate ‘thickness’×’side of square’.
- Items with * and velocity – torque characteristics indicate values after temperature rise saturation. The others indicate values at 20℃. Each value indicates TYP.

Materials Servo motor data sheet [Characteristics table]

Servo Motor model R2AA			04003F	04005F	04010F	06010F	06020F	08020F
Servo Amplifier model RS1☐			01*	01*	01*	01*	01*	01*
*Rated output	P_R	kW	0.03	0.05	0.1	0.1	0.2	0.2
*Rated speed	N_R	min^{-1}	3000	3000	3000	3000	3000	3000
*Maximum speed	N_{max}	min^{-1}	6000	6000	6000	6000	6000	6000
*Rated torque	T_R	N･m	0.098	0.159	0.318	0.318	0.637	0.637
*Continuous stall torque	T_S	N･m	0.108	0.167	0.318	0.353	0.686	0.686
*Peak torque	T_P	N･m	0.37	0.59	1.18	1.13	2.2	2.2
*Rated current	I_R	Arms	0.51	0.67	0.81	0.86	1.5	1.5
*Continuous stall current	I_S	Arms	0.56	0.69	0.81	0.86	1.6	1.5
*Peak current	I_P	Arms	2.15	2.8	3.3	3.5	5.6	4.8
Torque constant	K_T	N･m/Arms	0.201	0.246	0.424	0.375	0.476	0.516
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	7	8.6	14.8	13.1	16.6	18.0
Phase resistance	R_ϕ	Ω	12	9	9.3	4.8	2.7	2.3
*Rated powerrate	Q_R	kW/s	3.9	6.7	16	8.6	19	8
Inertia (Including Battery backup method absolute encoder)	J_M	$kg\cdot m^2(GD^2/4)\times10^{-4}$	0.028	0.0409	0.066	0.120	0.222	0.523
Aluminium plate		mm	t6×250	t6×250	t6×250	t6×250	t6×250	t6×250

Servo Motor model R2AA			06040F	08040F	08075F	B8100F	13050D	13120D	13200D	22500L
Servo Amplifier model RS1☐			03*	03*	03*	05*	03*	05*	10*	15*
*Rated output	P_R	kW	0.4	0.4	0.75	1.0	0.55	1.2	2.0	5.0
*Rated speed	N_R	min-1	3000	3000	3000	3000	2000	2000	2000	2000
*Maximum speed	N_{max}	min-1	6000	6000	6000	6000	5000	5000	5000	4000
*Rated torque	T_R	N･m	1.27	1.27	2.39	3.18	2.6	5.7	9.5	24
*Continuous stall torque	T_S	N･m	1.37	1.37	2.55	3.92	2.6	6.0	12	32
*Peak torque	T_P	N･m	4.8	4.4	8.5	14.3	7.0	16	30	75
*Rated current	I_R	Arms	2.8	2.6	4.6	6.0	5.2	9.1	14.3	22.0
*Continuous stall current	I_S	Arms	2.8	2.6	4.6	6.8	5.2	9.3	17.5	34.0
*Peak current	I_P	Arms	10.8	8.9	15.5	25.7	15.5	25.4	45.5	83.0
Torque constant	K_T	N･m/Arms	0.524	0.559	0.559	0.582	0.53	0.65	0.7	1.0
Voltage constant for each phase	$K_{E\phi}$	mV/min-1	18.3	19.5	19.5	20.3	18.5	22.7	24.3	34.9
Phase resistance	R_ϕ	Ω	1.36	0.93	0.4	0.44	0.39	0.23	0.11	0.047
*Rated powerrate	Q_R	kW/s	39	16	31	42	22	54	74	105
Inertia (Including Battery backup method absolute encoder)	J_M	kg･m2(GD2/4) ×10-4	0.415	1.043	1.823	2.383	3.103	6.003	12.203	55
Aluminium plate		mm	t6×250	t6×250	t6×250	t12×305	t20×305	t20×400	t20×470	t20×470

AC100V Input specification

Servo Motor model R2EA			04003F	04005F	04008F	06010F	06020F
Servo Amplifier model RS1☐			01*	01*	01*	01*	03*
*Rated output	P_R	kW	0.03	0.05	0.08	0.1	0.2
*Rated speed	N_R	min^{-1}	3000	3000	3000	3000	3000
*Maximum speed	N_{max}	min^{-1}	6000	6000	6000	6000	6000
*Rated torque	T_R	N･m	0.098	0.159	0.255	0.318	0.637
*Continuous stall torque	T_S	N･m	0.108	0.167	0.255	0.318	0.686
*Peak torque	T_P	N･m	0.37	0.59	0.86	1.0	2.2
*Rated current	I_R	Arms	0.94	1.2	1.3	1.7	3.1
*Continuous stall current	I_S	Arms	1.0	1.3	1.3	1.7	3.2
*Peak current	I_P	Arms	3.7	4.9	4.5	5.6	11.9
Torque constant	K_T	N･m/Arms	0.116	0.142	0.22	0.206	0.224
Voltage constant for each phase	$K_{E\phi}$	mV/min^{-1}	4.04	4.97	7.7	7.2	7.82
Phase resistance	R_ϕ	Ω	4.0	3.0	2.9	1.5	0.6
*Rated powerrate	Q_R	kW/s	3.9	6.7	10	8.6	19
Inertia (Including Battery backup method absolute encoder)	J_M	$kg\cdot m^2(GD^2/4)\times10^{-4}$	0.028	0.0409	0.066	0.120	0.222
Aluminium plate		mm	t6×250	t6×250	t6×250	t6×250	t6×250

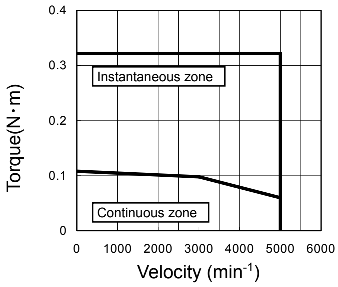
・Constants are values at the time of installing on the aluminum board in the table. They indicate 'thickness'×'side of square'.

・Items with * and velocity – torque characteristics indicate values after temperature rise saturation.
The others indicate values at 20°C. Each value indicates TYP.

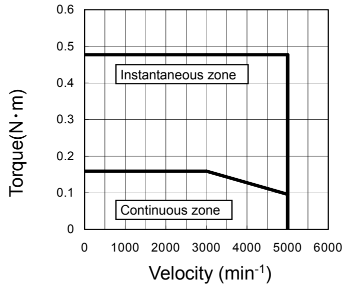
Materials Servo motor data sheet [Velocity-Torque characteristics]

Q1AA motor velocity-torque characteristics charts indicate the values when AC200V 3-phase amplifier connected.
Instantaneous zone decreases when amplifier power supply is 200V or less.
Please contact us if your amplifier power supply is single-phase AC200V.

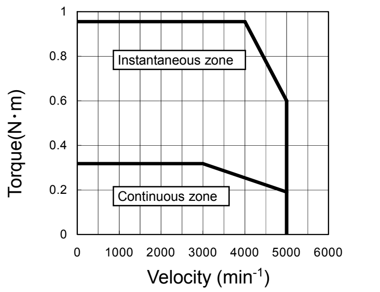
Velocity - torque characteristic
Q1AA04003D (30W)



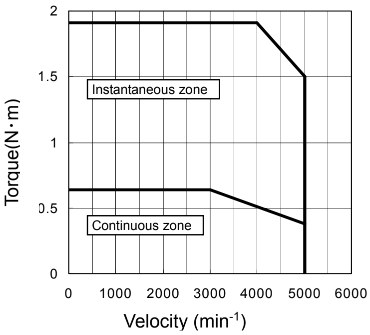
Velocity - torque characteristic
Q1AA04005D (50W)



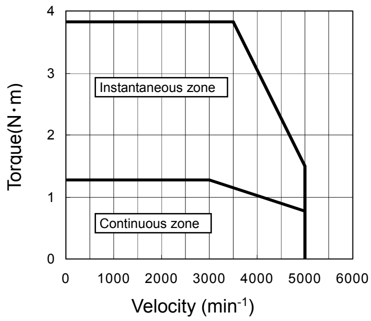
Velocity - torque characteristic
Q1AA04010D (100W)



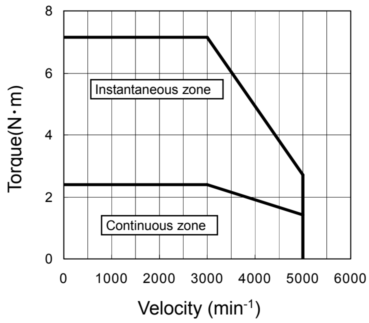
Velocity - torque characteristic
Q1AA06020D（200W）



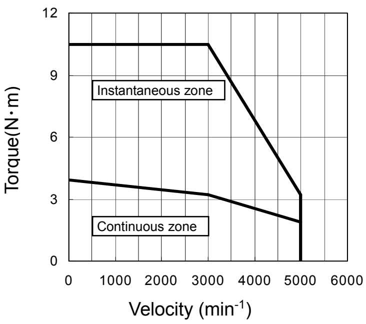
Velocity - torque characteristic
Q1AA06040D（400W）



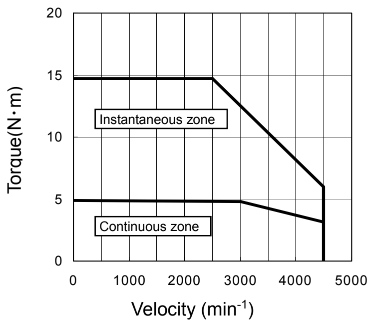
Velocity - torque characteristic
Q1AA07075D（750W）



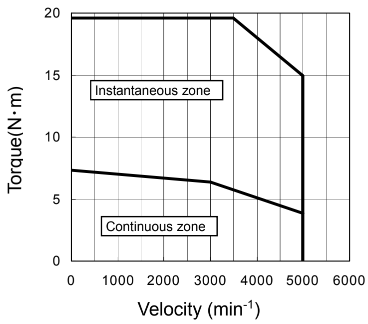
Velocity - torque characteristic
Q1AA10100D（1kW）



Velocity - torque characteristic
Q1AA10150D（1.5kW）

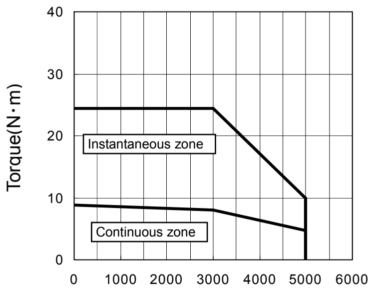


Velocity - torque characteristic
Q1AA10200D（2kW）

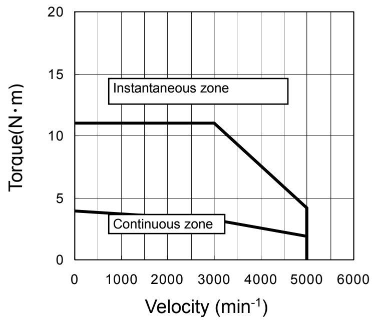


Materials Servo motor data sheet [Velocity-Torque characteristics]

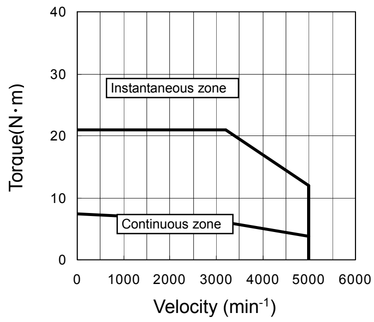
Velocity - torque characteristic
Q1AA10250D（2.5kW）



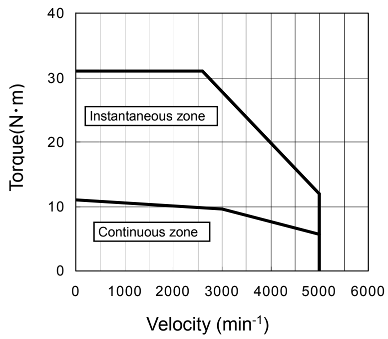
Velocity - torque characteristic
Q1AA12100D（1kW）



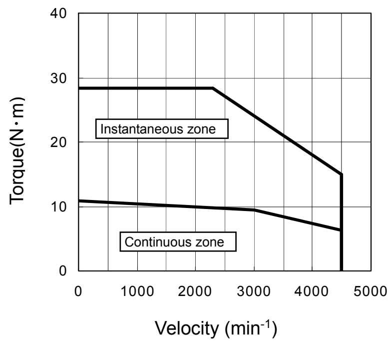
Velocity - torque characteristic
Q1AA12200D（2kW）



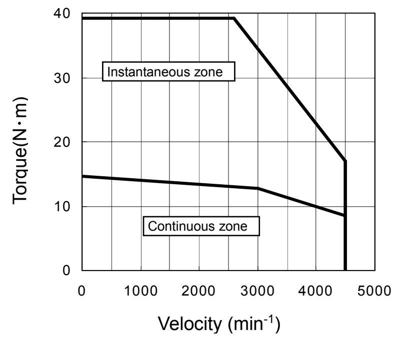
Velocity - torque characteristic
Q1AA12300D（3kW）



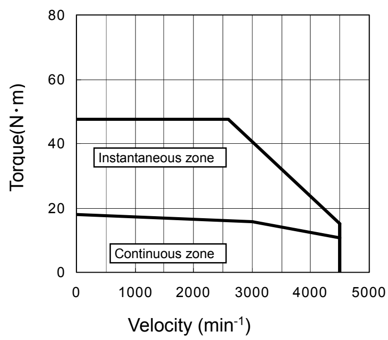
Velocity - torque characteristic
Q1AA13300D（3kW）



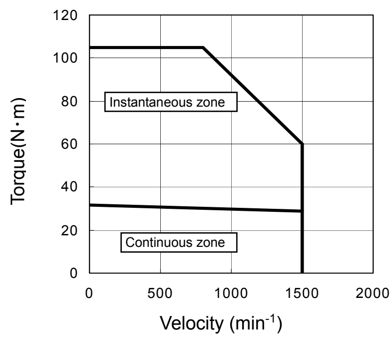
Velocity - torque characteristic
Q1AA13400D（4kW）



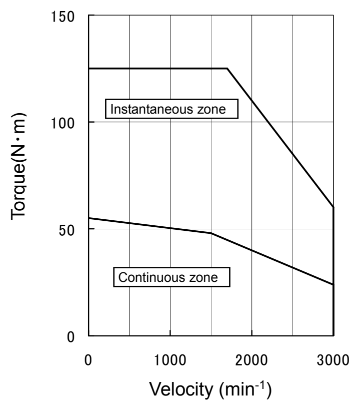
Velocity - torque characteristic
Q1AA13500D（5kW）



Velocity - torque characteristic
Q1AA18450M（4.5kW）



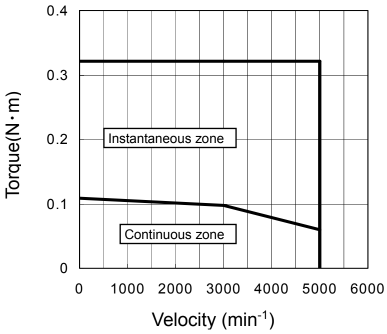
Velocity - torque characteristic
Q1AA18750H (7.5kW)



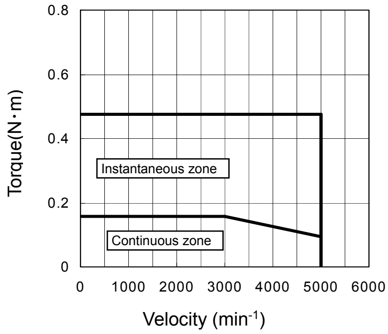
Materials Servo motor data sheet [Velocity-Torque characteristics]

Q1EA motor velocity-torque characteristics charts indicate the values when single-phase AC100V amplifier connected. Instantaneous zone decreases when amplifier power supply is 100V or less.

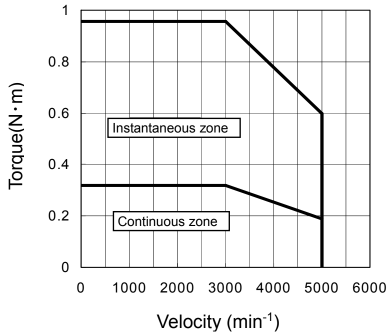
Velocity - torque characteristics
Q1EA04003D（30W）



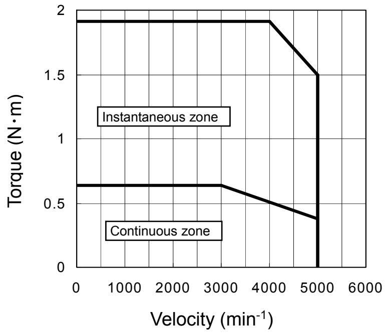
Velocity - torque characteristics
Q1EA04005D（50W）



Velocity - torque characteristics
Q1EA04010D（100W）

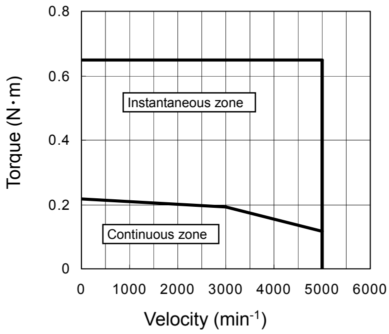


Velocity - torque characteristics
Q1EA06020D（200W）

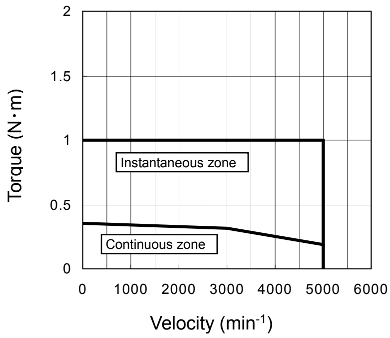


Q2AA motor velocity-torque characteristics charts indicate the values when 3-phase AC 200V amplifier connected. Instant domain decreases when amplifier power supply is 200V or less.
Please contact us if your amplifier power supply is single-phase AC200V.

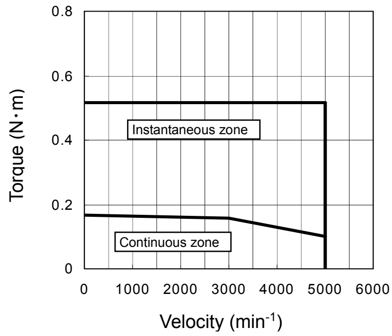
Velocity - torque characteristics
Q2AA04006D（60W）



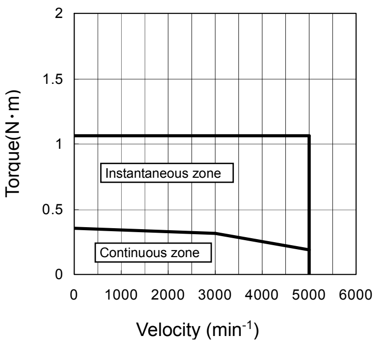
Velocity - torque characteristics
Q2AA04010D（100W）



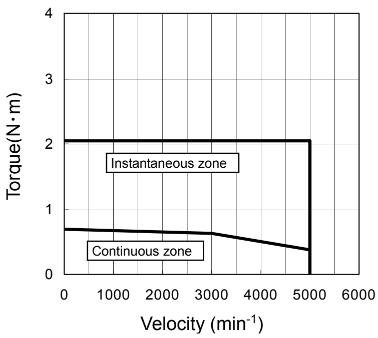
Velocity - torque characteristics
Q2AA05005D（50W）



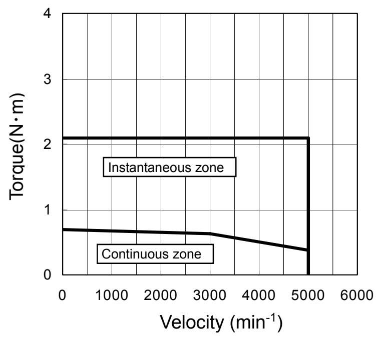
Velocity - torque characteristics
Q2AA05010D（100W）



Velocity - torque characteristics
Q2AA05020D（200W）

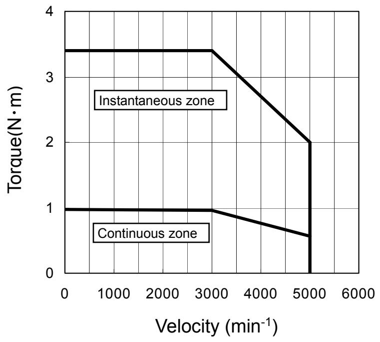


Velocity - torque characteristics
Q2AA07020D（200W）

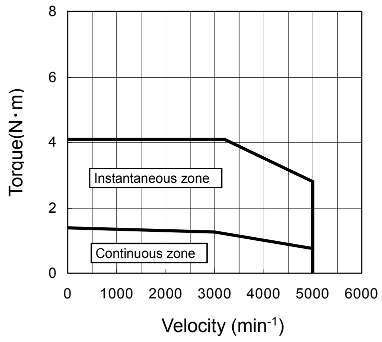


Materials Servo motor data sheet [Velocity-Torque characteristics]

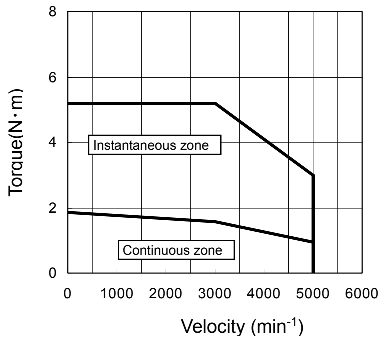
Velocity - torque characteristics
Q2AA07030D（300W）



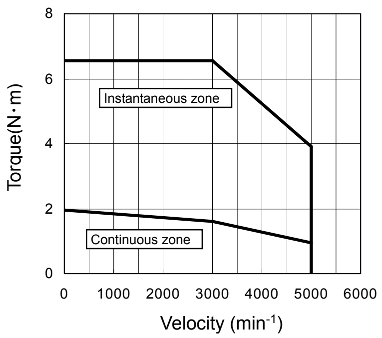
Velocity - torque characteristics
Q2AA07040D（400W）



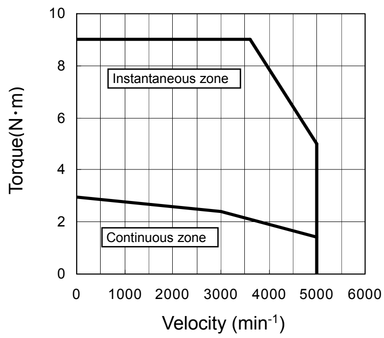
Velocity - torque characteristics
Q2AA07050D（500W）



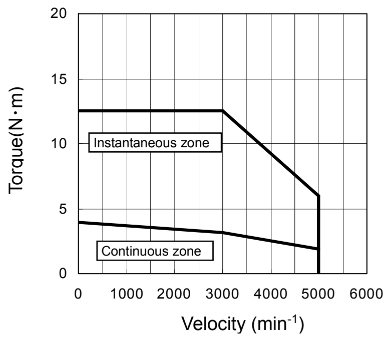
Velocity - torque characteristics
Q2AA08050D（500W）



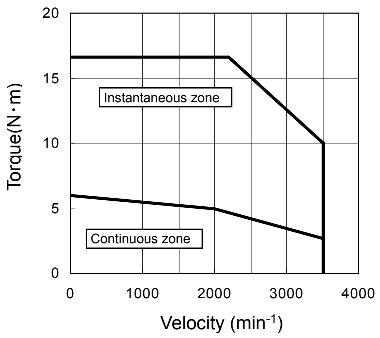
Velocity - torque characteristics
Q2AA08075D（750W）



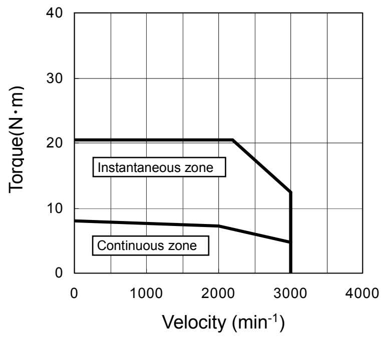
Velocity - torque characteristics
Q2AA08100D（1kW）



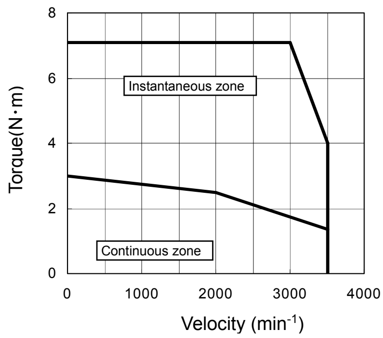
Velocity - torque characteristics
Q2AA10100H（1kW）



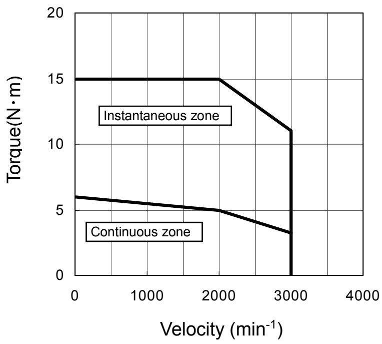
Velocity - torque characteristics
Q2AA10150H（1.5kW）



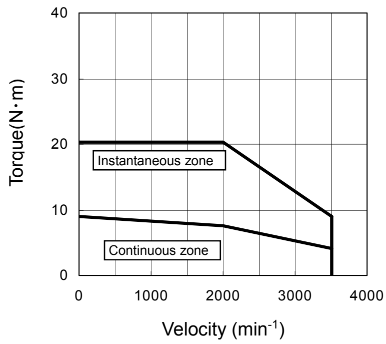
Velocity - torque characteristics
Q2AA13050H（500W）



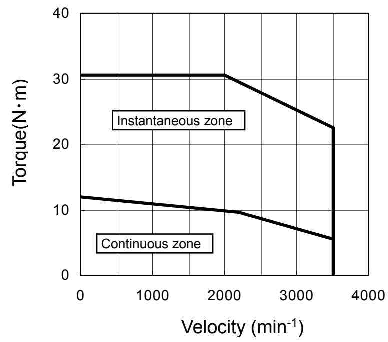
Velocity - torque characteristics
Q2AA13100H（1kW）



Velocity - torque characteristics
Q2AA13150H（1.5kW）

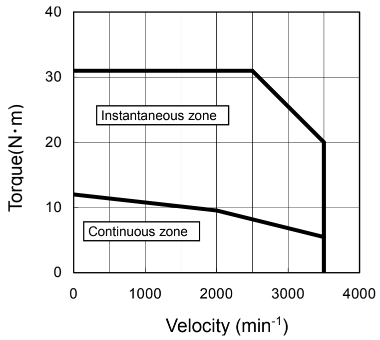


Velocity - torque characteristics
Q2AA13200H（2kW）

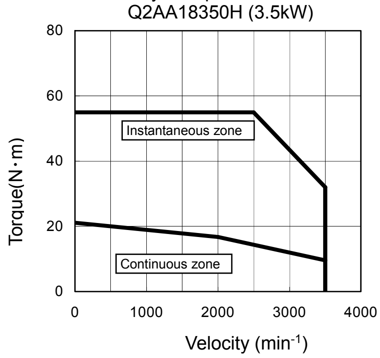


Materials Servo motor data sheet [Velocity-Torque characteristics]

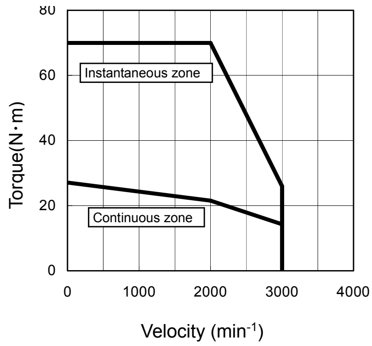
Velocity - torque characteristic
Q2AA18200H (2kW)



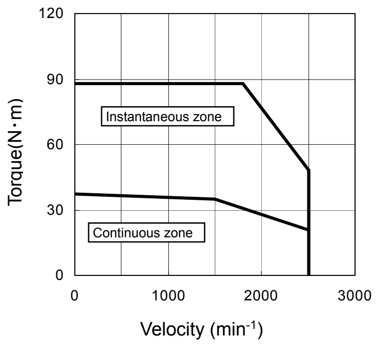
Velocity - torque characteristic
Q2AA18350H (3.5kW)



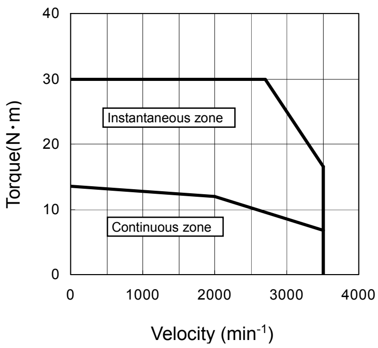
Velocity - torque characteristic
Q2AA18450H (4.5kW)



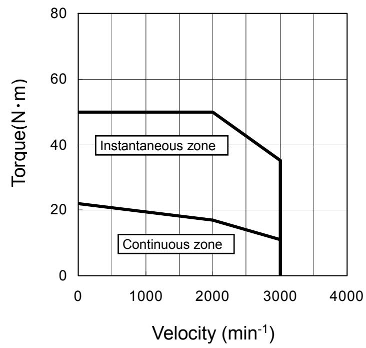
Velocity - torque characteristic
Q2AA18550R（5.5kW）



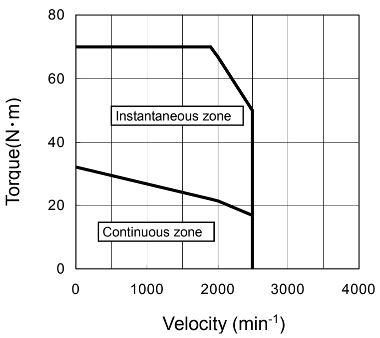
Velocity - torque characteristic
Q2AA22250H（2.5kW）



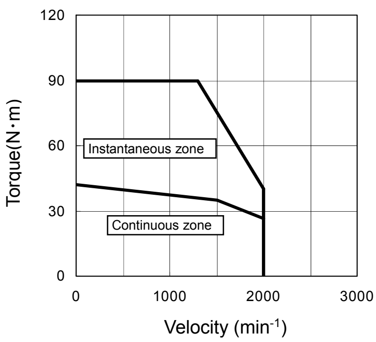
Velocity - torque characteristic
Q2AA22350H（3.5kW）



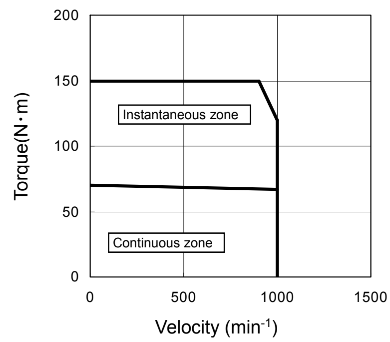
Velocity - torque characteristic
Q2AA22450R（4.5kW）



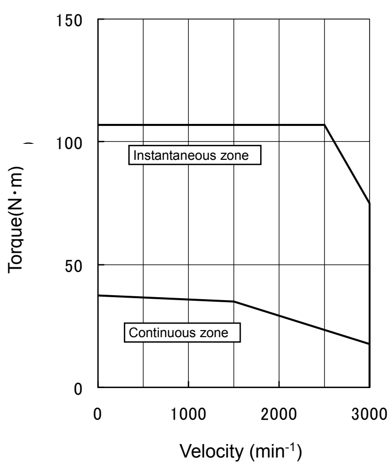
Velocity - torque characteristic
Q2AA22550B（5.5kW）



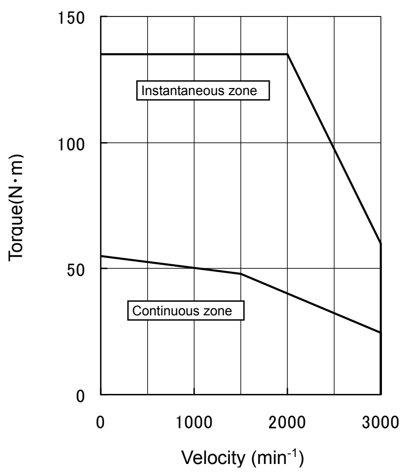
Velocity - torque characteristic
Q2AA22700S（7kW）



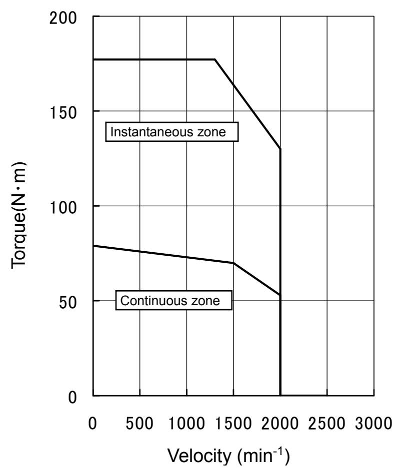
Velocity - torque characteristic
Q2AA18550H(5.5kW)



Velocity - torque characteristic
Q2AA18750L(7.5kW)



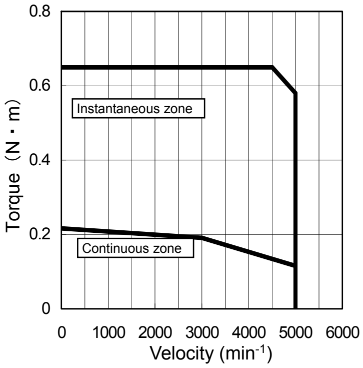
Velocity - torque characteristic
Q2AA2211KV(11kW)



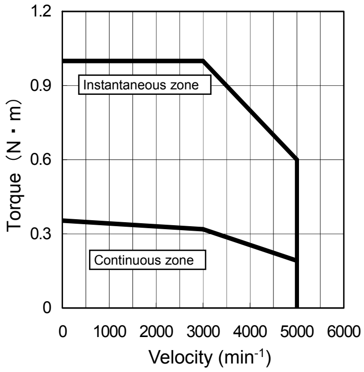
Materials Servo motor data sheet [Velocity-Torque characteristics]

Q2EA Motor speed-torque characteristics indicate the values in combination with operation amplifier for single phase when amplifier power supply is AC100V. Instant domain decreases when amplifier power supply is below 100V.

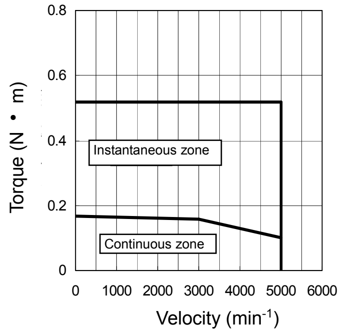
Velocity - torque characteristics
Q2EA04006D (60W)



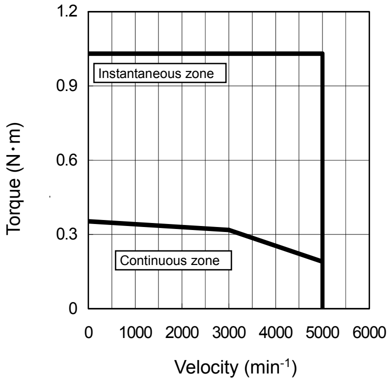
Velocity - torque characteristics
Q2EA04010D (100W)



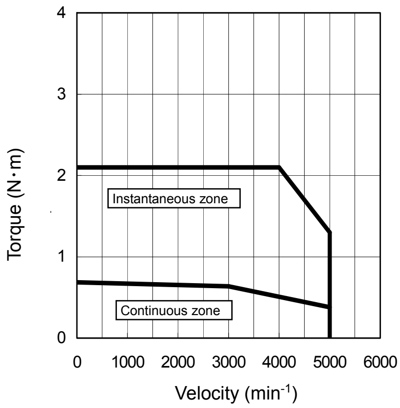
Velocity - torque characteristic
Q2EA05005D (50W)



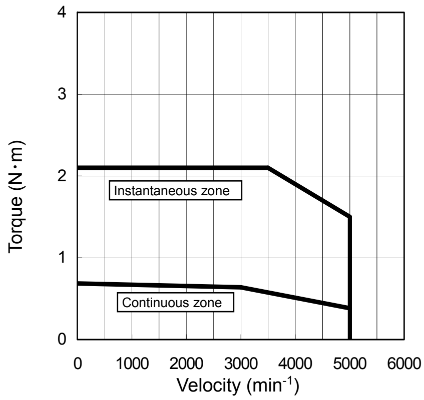
Velocity - torque characteristic
Q2EA05010D (100W)



Velocity - torque characteristics
Q2EA05020D (200W)



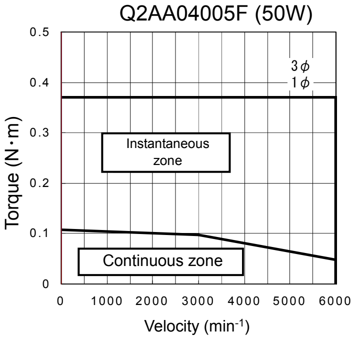
Velocity - torque characteristics
Q2EA07020D (200W)



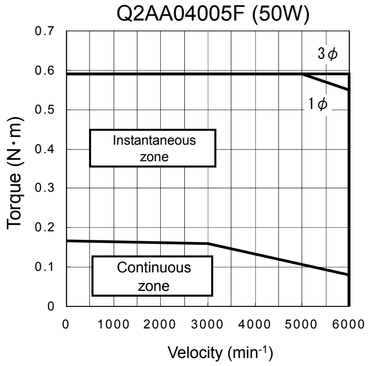
Materials Servo motor data sheet [Velocity-Torque characteristics]

R2AA motor velocity-torque characteristics charts show the values when 3-phase AC200V amplifier connected.
When power supply voltage is 200V or less, the instantaneous zone decreases. If your amplifier power supply is single-phase AC 200V, please contact us.

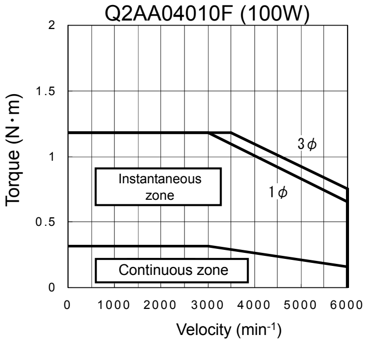
Velocity - torque characteristic
Q2AA04005F (50W)



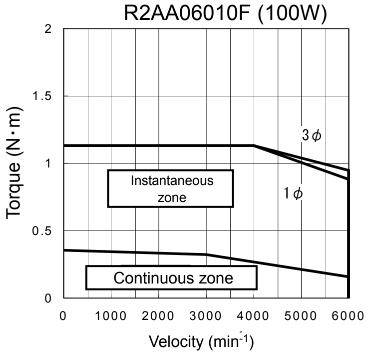
Velocity - torque characteristic
Q2AA04005F (50W)



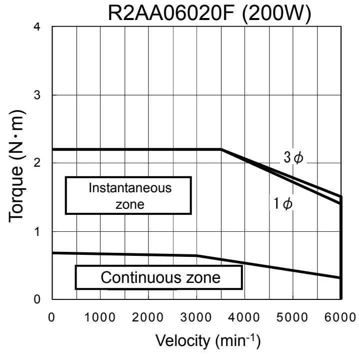
Velocity - torque characteristic
Q2AA04010F (100W)



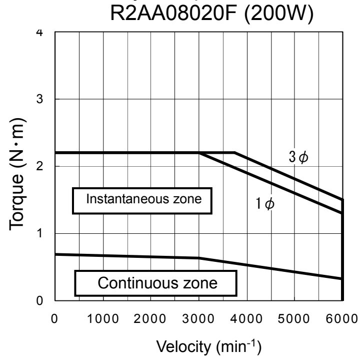
Velocity - torque characteristic
R2AA06010F (100W)



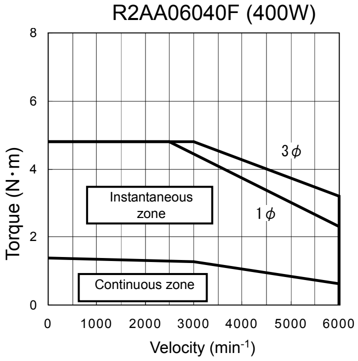
Velocity - torque characteristic
R2AA06020F (200W)



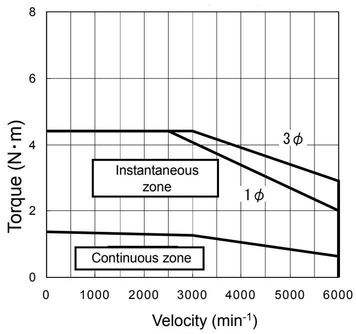
Velocity - torque characteristic
R2AA08020F (200W)



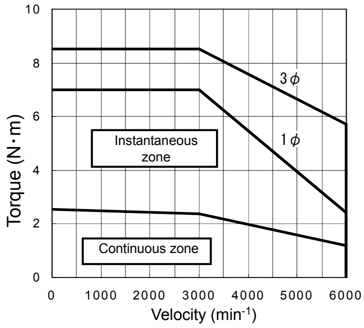
Velocity - torque characteristic
R2AA06040F (400W)



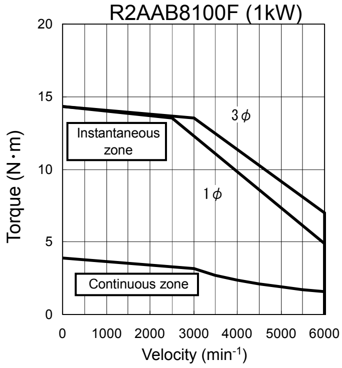
Velocity - torque characteristic
R2AA08040F (400W)



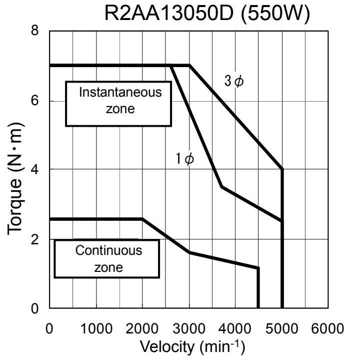
Velocity - torque characteristic
R2AA08075F (750W)



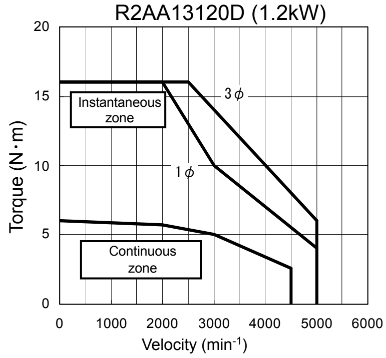
Velocity - torque characteristic
R2AAB8100F (1kW)



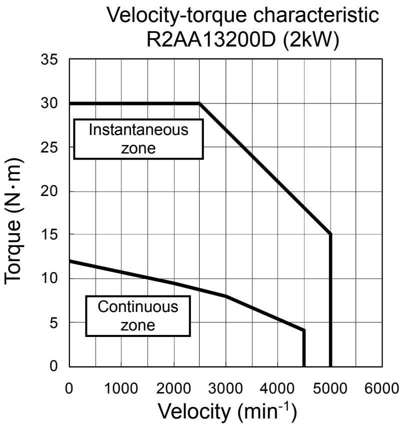
Velocity - torque characteristic
R2AA13050D (550W)

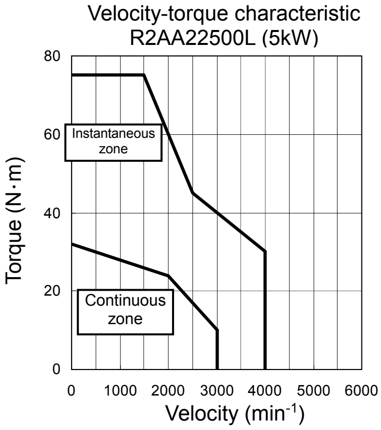


Velocity - torque characteristics
R2AA13120D (1.2kW)

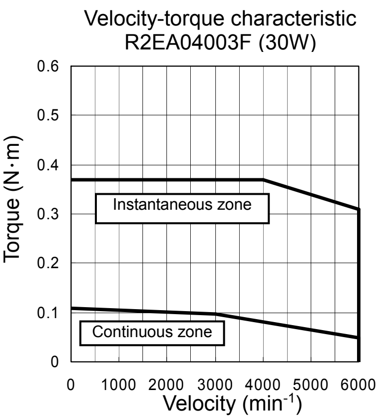


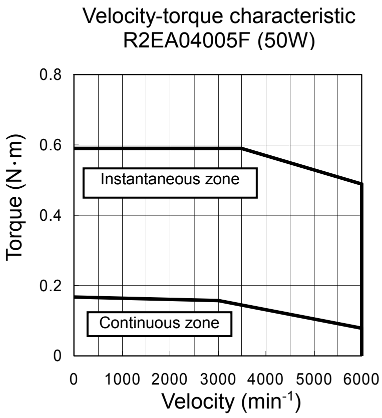
R2AA motor velocity-torque characteristics charts indicate the values when 3-phase 200V amplifier connected. Instantaneous zone decreases when amplifier power supply is 200V or less.

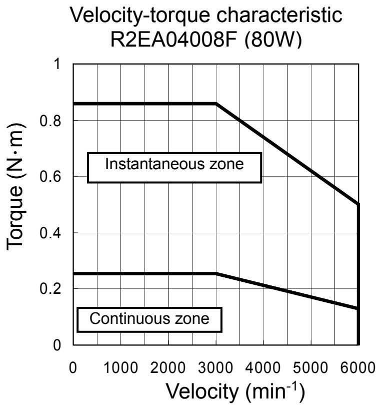


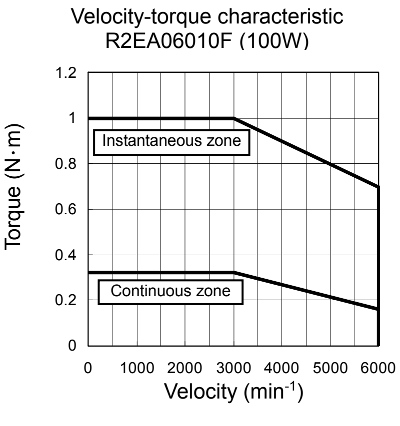


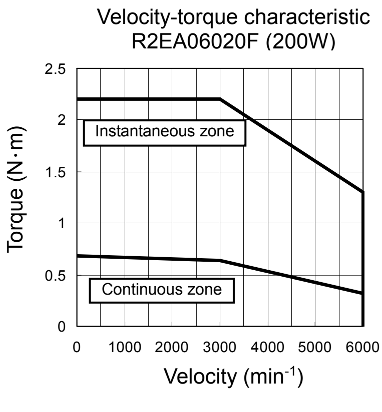
R2EA motor velocity-torque characteristics charts indicate the values when amplifier power supply connected is AC200V, 3-phase.
When power voltage is 200V or less, the instantaneous zone decreases. Please contact us if your amplifier power supply is AC200V single-phase.











- Degree of decrease rating: R2AA motor with oil seal and brake
  For motor with oil seal and brake, apply the following decrease ratings to continuous zone, considering increase in temperature.

Brake \ Oil seal	No oil seal	With oil seal
No brake	No decrease rating	Decrease rating 2
With brake	Decrease rating 1	Decrease rating 2

Decrease rating 1

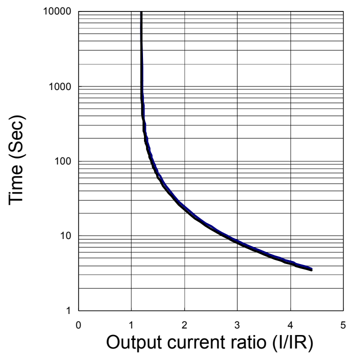
Servo Motor Model NO.	R2AA 04010F	R2AA 06040F
Degree of decrease rating %	90	

Decrease rating 2

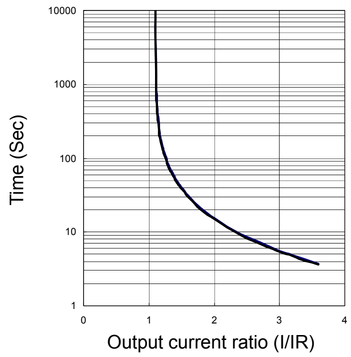
Servo Motor Model NO.	R2AA 04005F	R2AA 04010F	R2AA 06040F	R2AA 08075F	R2EA 04005F
Degree of decrease rating %	90	85	80	90	90

The followings show overload characteristics of Q1AA motor.

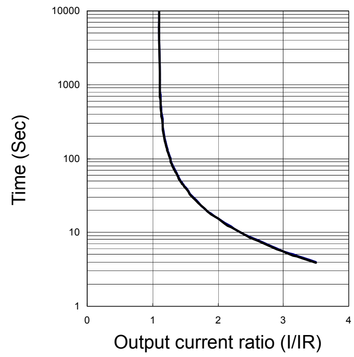
Overload characteristic
Q1AA04003D (30W)



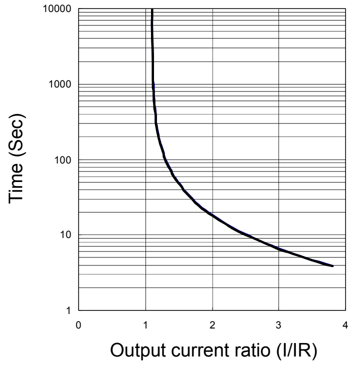
Overload characteristic
Q1AA04005D (50W)



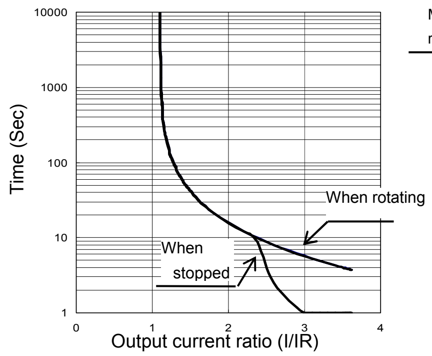
Overload characteristic
Q1AA04010D (100W)



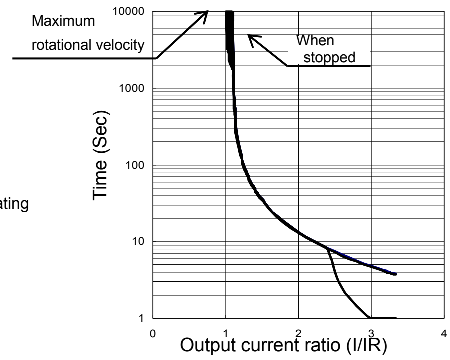
Overload characteristic
Q1AA06020D (200W)



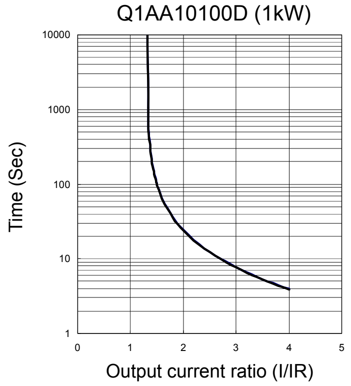
Overload characteristic
Q1AA06040D (400W)



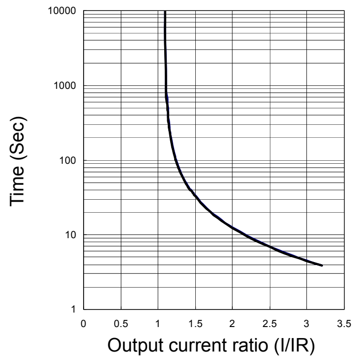
Overload characteristic
Q1AA07075D (750W)



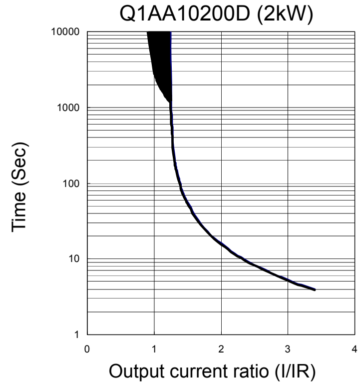
Overload characteristic
Q1AA10100D (1kW)



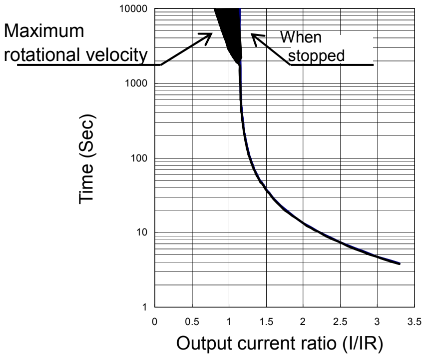
Overload characteristic
Q1AA10150D (1.5kW)



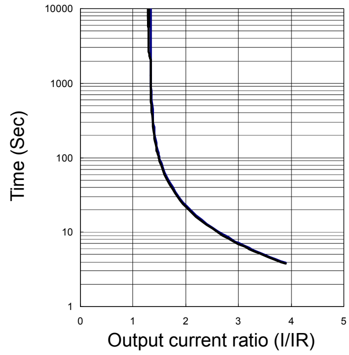
Overload characteristic
Q1AA10200D (2kW)



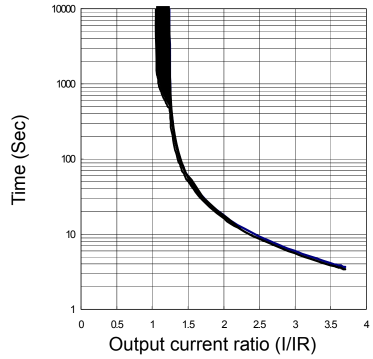
The followings show overload characteristics of Q1AA motor.



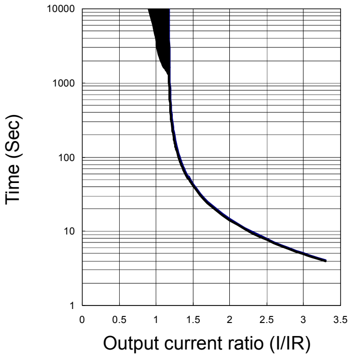
Overload characteristic
Q1AA10250D (2.5kW)



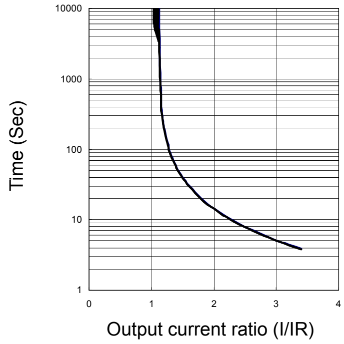
Overload characteristic
Q1AA12100D (1kW)



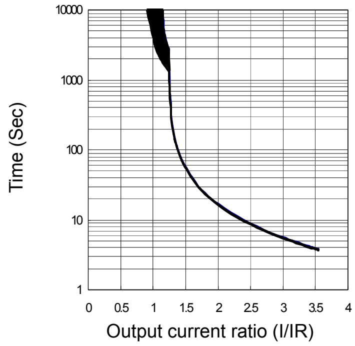
Overload characteristic
Q1AA12200D (2kW)



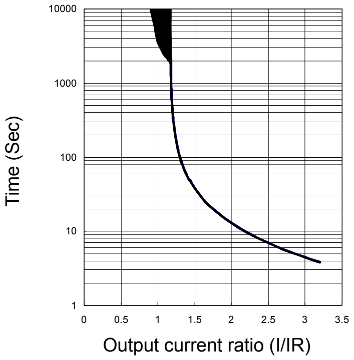
Overload characteristic
Q1AA12300D (3kW)



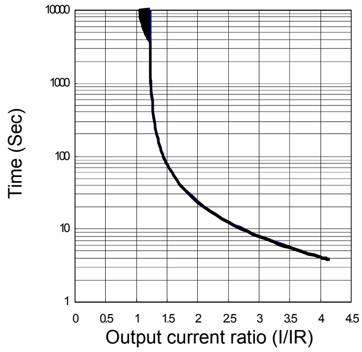
Overload characteristic
Q1AA13300D (3kW)



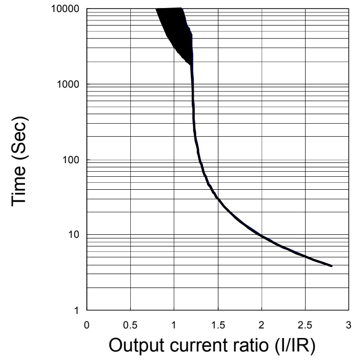
Overload characteristic
Q1AA13400D (4kW)



Overload characteristic
Q1AA13500D (5kW)

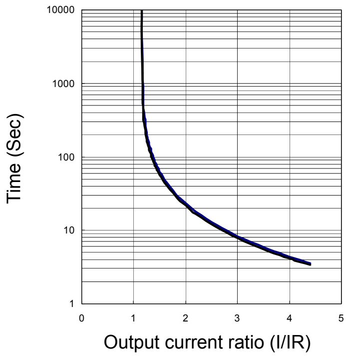


Overload characteristic
Q1AA18450M (4.5kW)

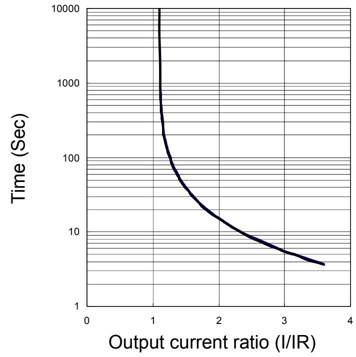


Overload characteristic
Q1AA18750H (7.5kW)

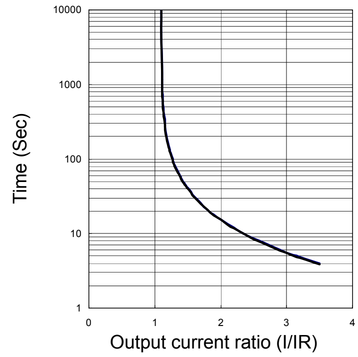
The followings show overload characteristics of Q1EA motor.



Overload characteristic
Q1EA04003D (30W)



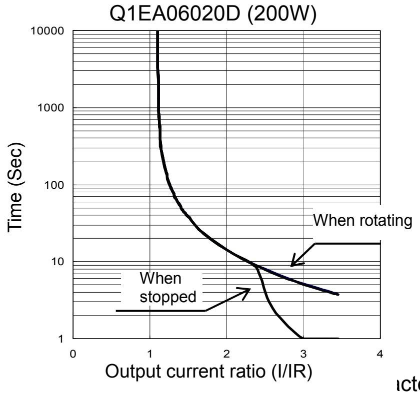
Overload characteristic
Q1EA04005D (50W)



Overload characteristic
Q1EA04010D (100W)

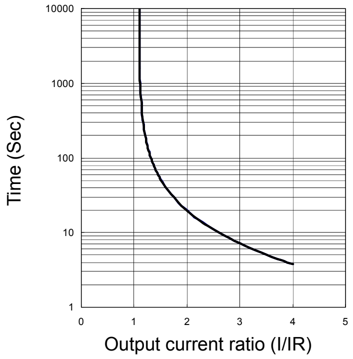
The followings show overload characteristics of Q1EA motor.

Overload characteristic
Q1EA06020D (200W)

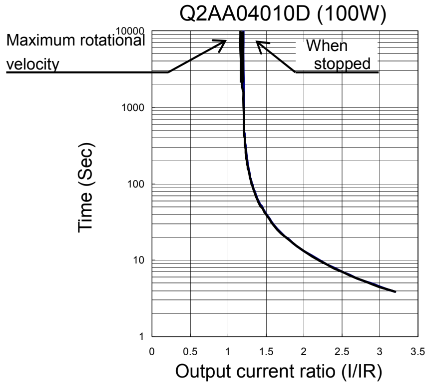


cteristics of Q2AA motor.

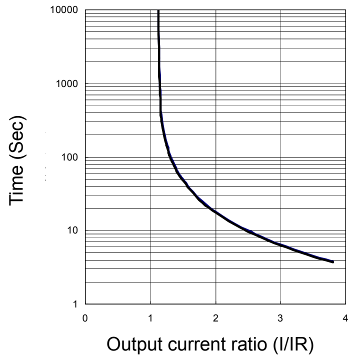
Overload characteristic
Q2AA04006D (60W)



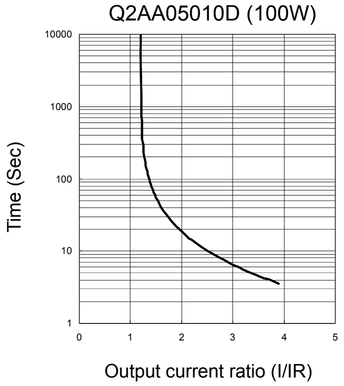
Overload characteristic
Q2AA04010D (100W)



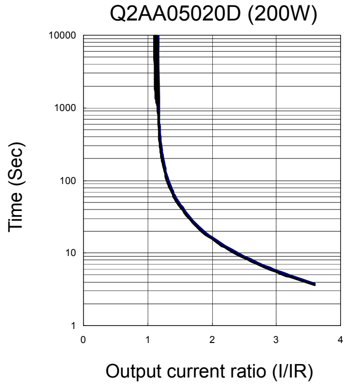
Overload characteristic
Q2AA05005D (50W)



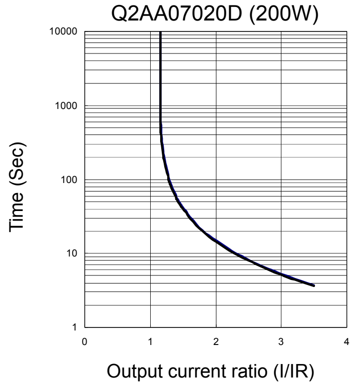
Overload characteristic
Q2AA05010D (100W)



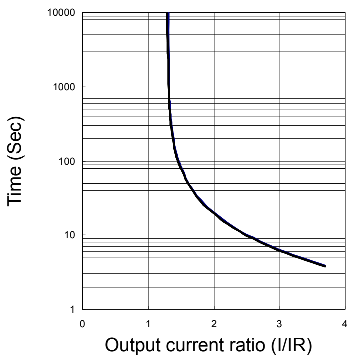
Overload characteristic
Q2AA05020D (200W)



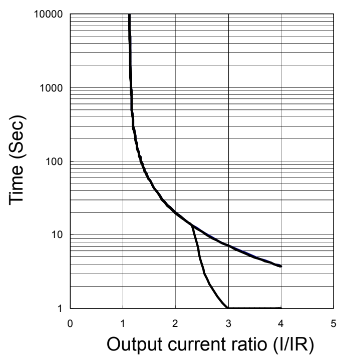
Overload characteristic
Q2AA07020D (200W)



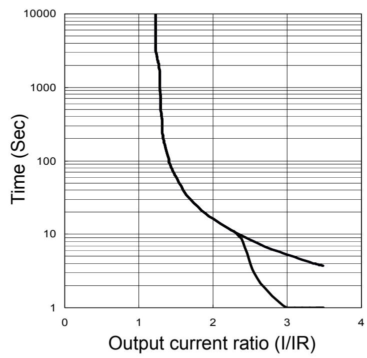
Overload characteristic
Q2AA07030D (300W)



Overload characteristic
Q2AA07040D (400W)



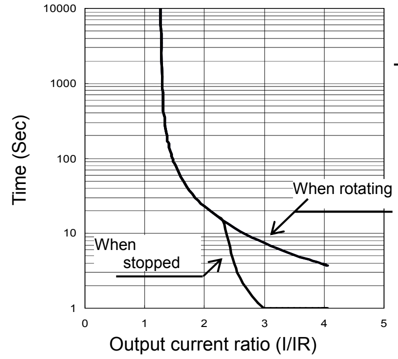
Overload characteristic
Q2AA07050D (500W)



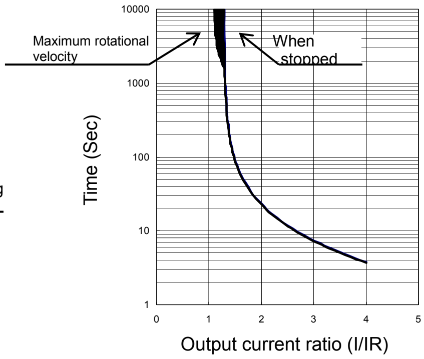
Materials Servo motor data sheet [Overload characteristic]

The followings show overload characteristics of Q2AA motor.

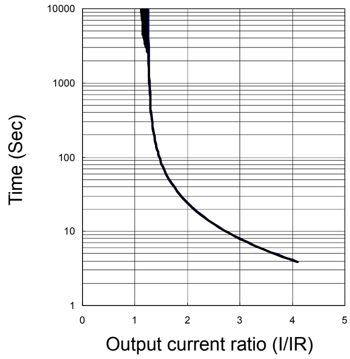
Overload characteristic
Q2AA08050D (500W)



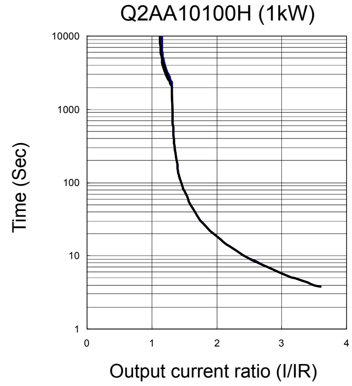
Overload characteristic
Q2AA08075D (750W)



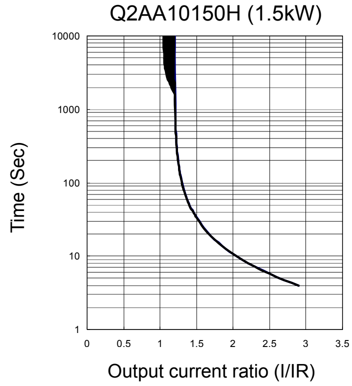
Overload characteristic
Q2AA08100D (1kW)



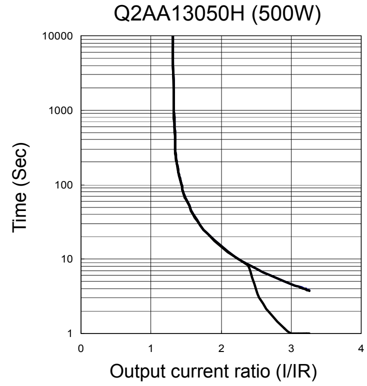
Overload characteristic
Q2AA10100H (1kW)



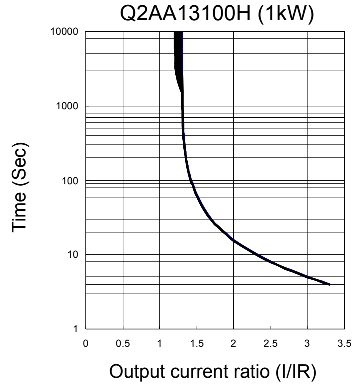
Overload characteristic
Q2AA10150H (1.5kW)



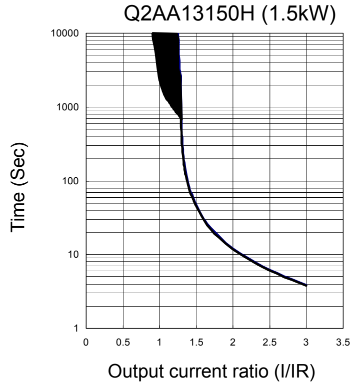
Overload characteristic
Q2AA13050H (500W)



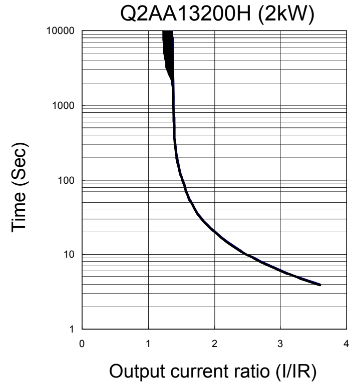
Overload characteristic
Q2AA13100H (1kW)



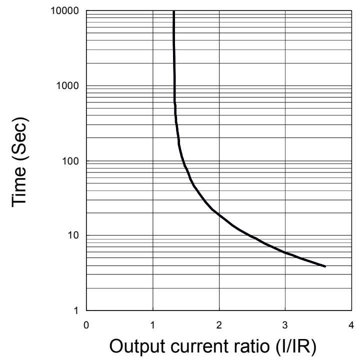
Overload characteristic
Q2AA13150H (1.5kW)



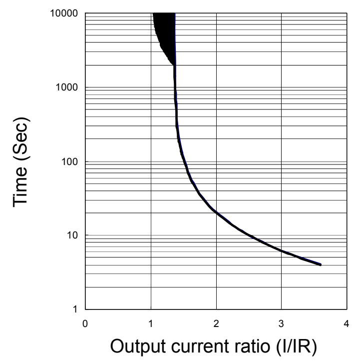
Overload characteristic
Q2AA13200H (2kW)



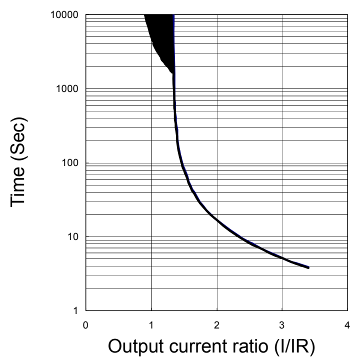
Overload characteristic
Q2AA18200H (2kW)



Overload characteristic
Q2AA18350H (3.5kW)



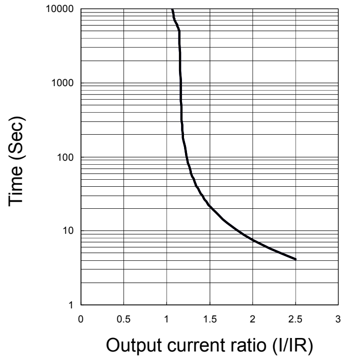
Overload characteristic
Q2AA18450H (4.5kW)



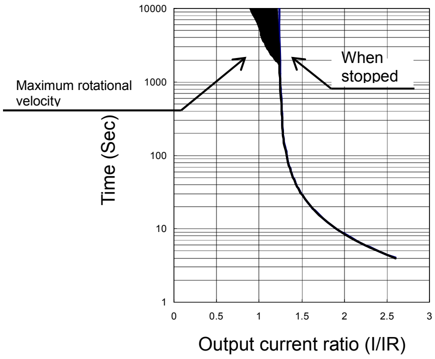
Materials Servo motor data sheet [Overload characteristic]

The followings show overload characteristics of Q2AA motor.

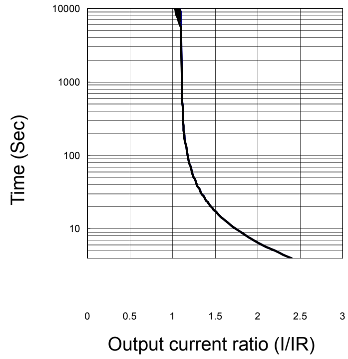
Overload characteristic
Q2AA18550R (5.5kW)



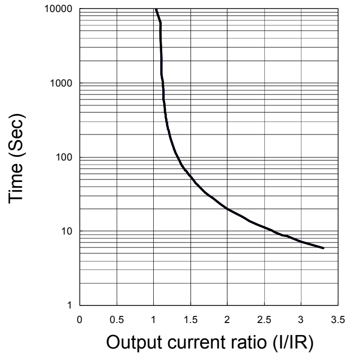
Overload characteristic
Q2AA22550B (5.5kW)



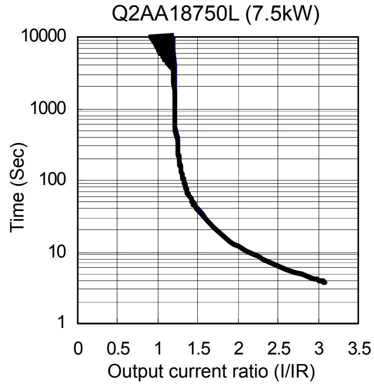
Overload characteristic
Q2AA22700S (7kW)



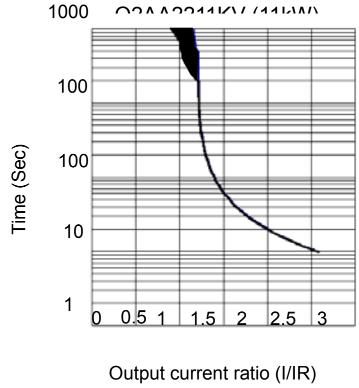
Overload characteristic
Q2AA18550H (5.5kW)



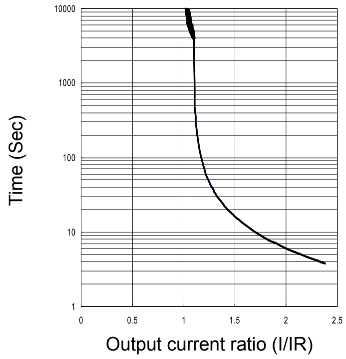
Overload characteristic
Q2AA18750L (7.5kW)



Overload characteristic

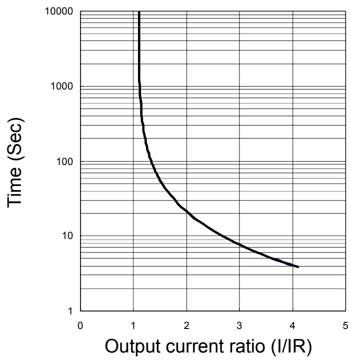


Overload characteristic
Q2AA2215KV (15kW)

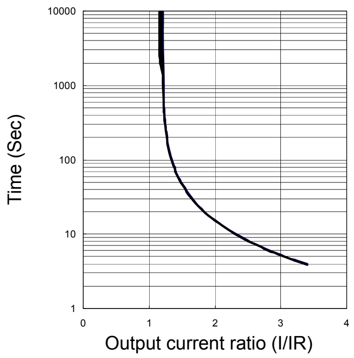


The followings show overload characteristics of Q2EA motor.

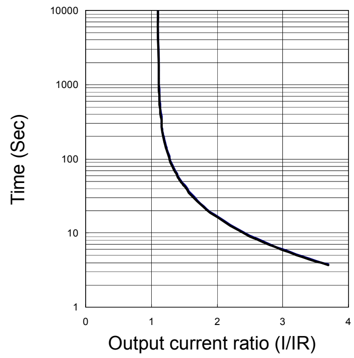
Overload characteristic
Q2EA04006D (60W)



Overload characteristic
Q2EA04010D (100W)

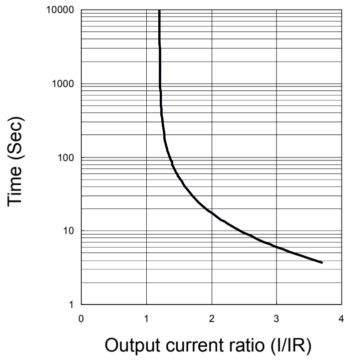


Overload characteristic
Q2EA05005D (50W)

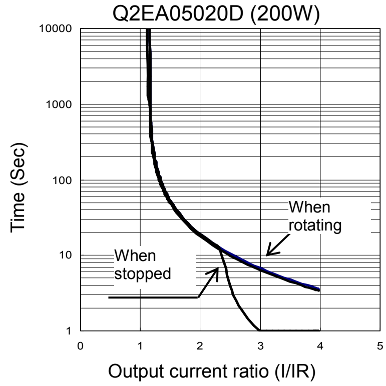


The followings show overload characteristics of Q2EA motor.

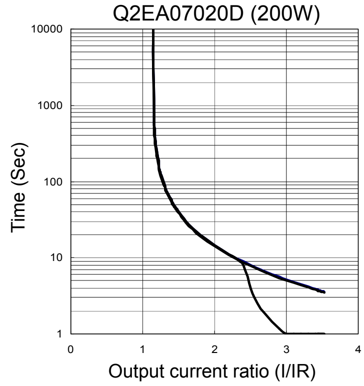
Overload characteristic
Q2EA05010D (100W)



Overload characteristic
Q2EA05020D (200W)

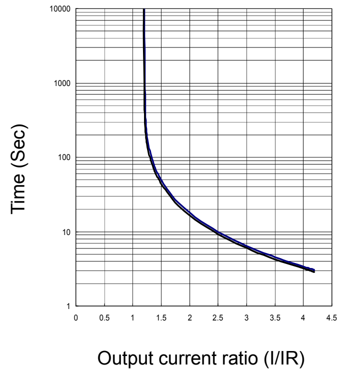


Overload characteristic
Q2EA07020D (200W)

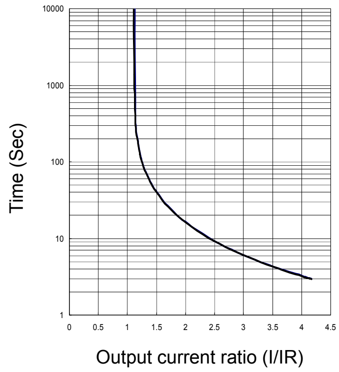


The followings show overload characteristics of R2AA motor.

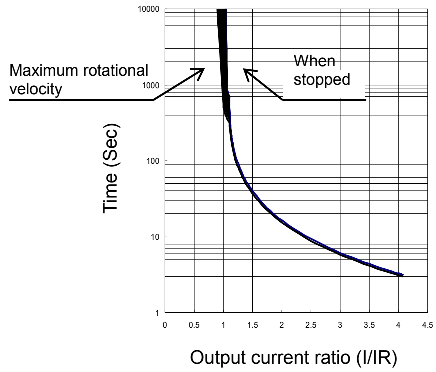
Overload characteristic
R2AA04003F (30W)



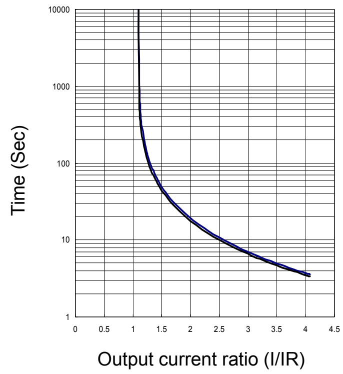
Overload characteristic
R2AA04005F (50W)



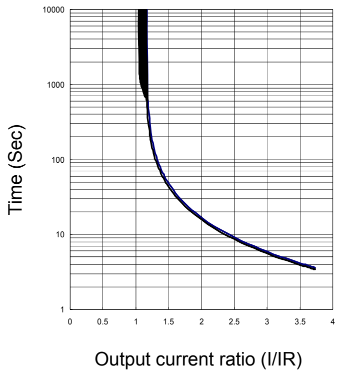
Overload characteristic
R2AA04010F (100W)



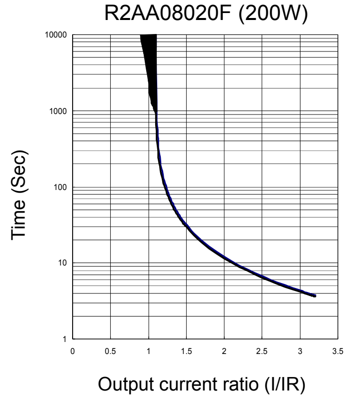
Overload characteristic
R2AA06010F (100W)



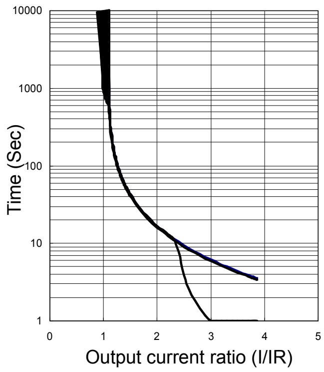
Overload characteristic
R2AA06020F (200W)



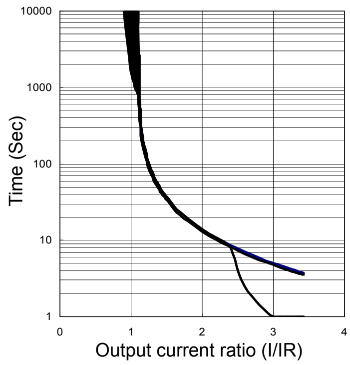
Overload characteristic
R2AA08020F (200W)



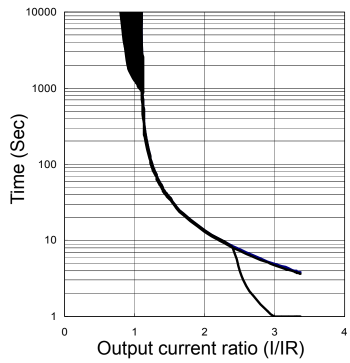
Overload characteristic
R2AA06040F (400W)



Overload characteristic
R2AA08040F (400W)



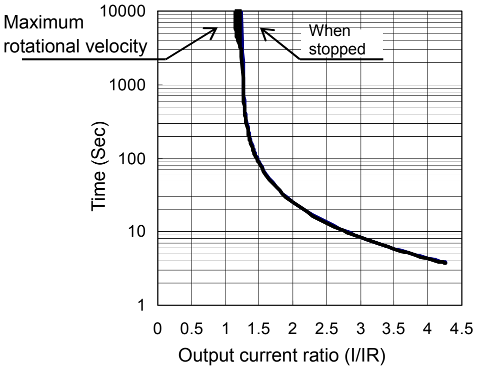
Overload characteristic
R2AA08075F (750W)



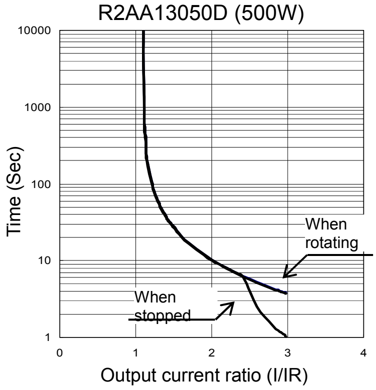
Materials Servo motor data sheet

The followings show overload characteristics of R2AA motor.

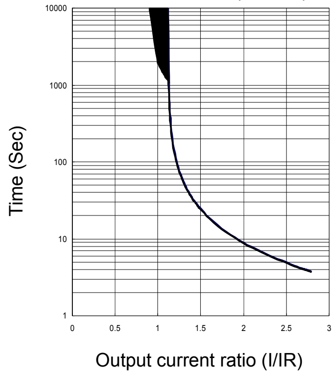
Overload characteristic
R2AAB8100F (1kW)



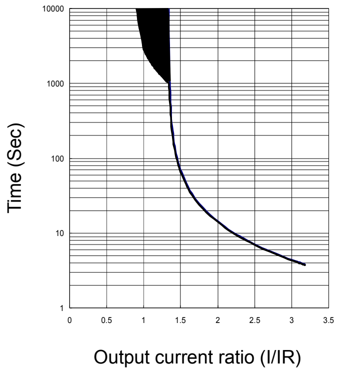
Overload characteristic
R2AA13050D (500W)



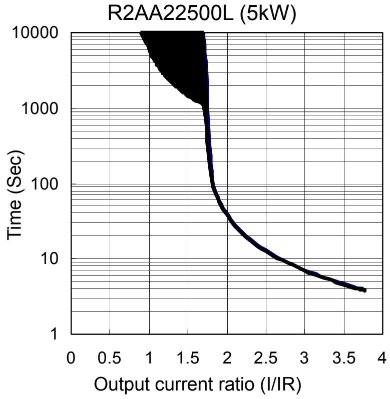
Overload characteristic
R2AA13120D (1.2kW)



Overload characteristic
R2AA13200D (2kW)

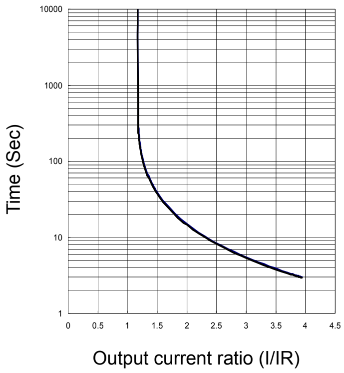


Overload characteristic
R2AA22500L (5kW)

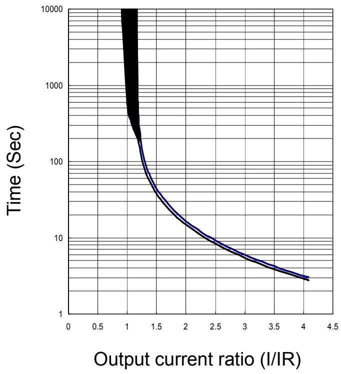


The followings show overload characteristics of R2EA motor.

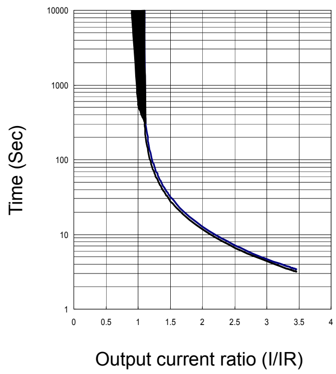
Overload characteristic
R2EA04003F (30W)



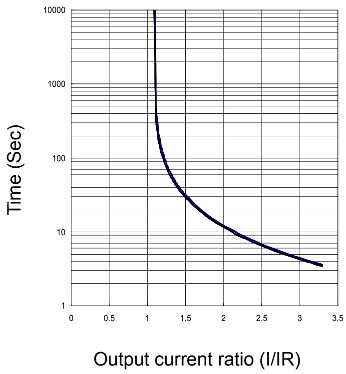
Overload characteristic
R2EA04005F (50W)



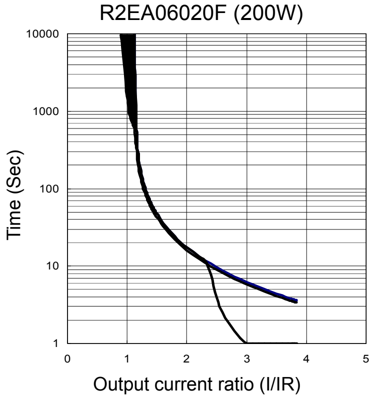
Overload characteristic
R2EA04008F (80W)



Overload characteristic
R2EA06010F (100W)



Overload characteristic
R2EA06020F (200W)



■ Input-output connector

Connector table for AC 200V input type

Application	Model number	Contents	Manufacturer	Manufacturer's model number
Single connector	AL-Y0004290-02	CN1 Plug	JST Mfg Co., Ltd	MUF-PK10K-X
	AL-00385596	CN2 Plug and housing	3M Japan Limited	10120-3000PE
				10320-52A0-008
	AL-00329461-01	CNA plug	Phoenix Contact Co. Ltd.	MSTB2.5/5-STF-5.08
	AL-Y0000988-01	CNB plug	Phoenix Contact Co. Ltd.	IC2.5/6-STF-5.08
	AL-00329458-01	CNC plug	Phoenix Contact Co. Ltd.	IC2.5/3-STF-5.08
High voltage circuit Connector set	AL-00416792	CNA,CNB,CNC plug	Phoenix Contact Co. Ltd.	MSTB2.5/5-STF-5.08
				IC2.5/3-STF-5.08

*CNB is installed in the servo amplifier. It is not included in the high-voltage circuit connector set.

AC100V input type

Application	Model number	Contents	Manufacturer	Manufacturer's model number
Single connector	AL-00329461-02	CNA plug	Phoenix Contact Co. Ltd.	MSTB2.5/4-STF-5.08

Setup softwear computer connecting cable

Model number	Remarks
AL-00490833-01	Dedicated cable

■ Metal mounting fittings

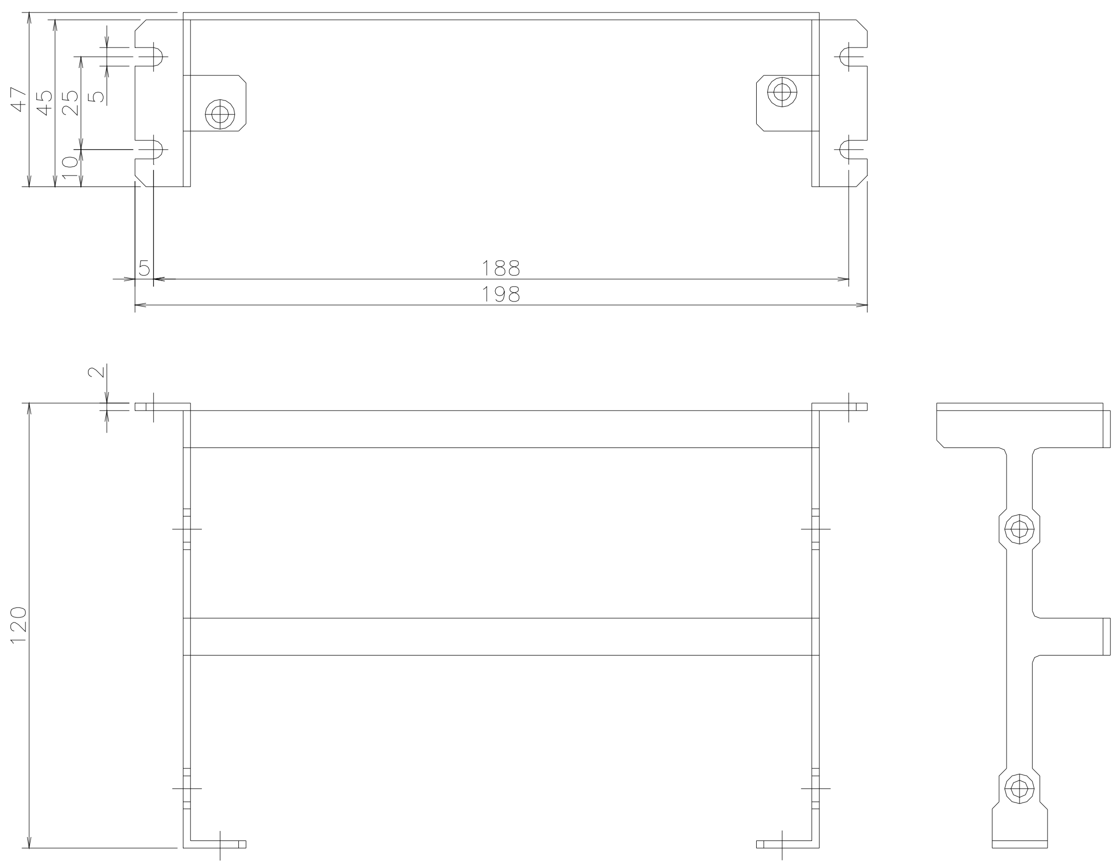
The servo amplifiers of RS□01,RS□03,RS□05 have metal mounting fittings of old compatible (PY2 series) available.

● Metal mounting fittings table for RS□01~05

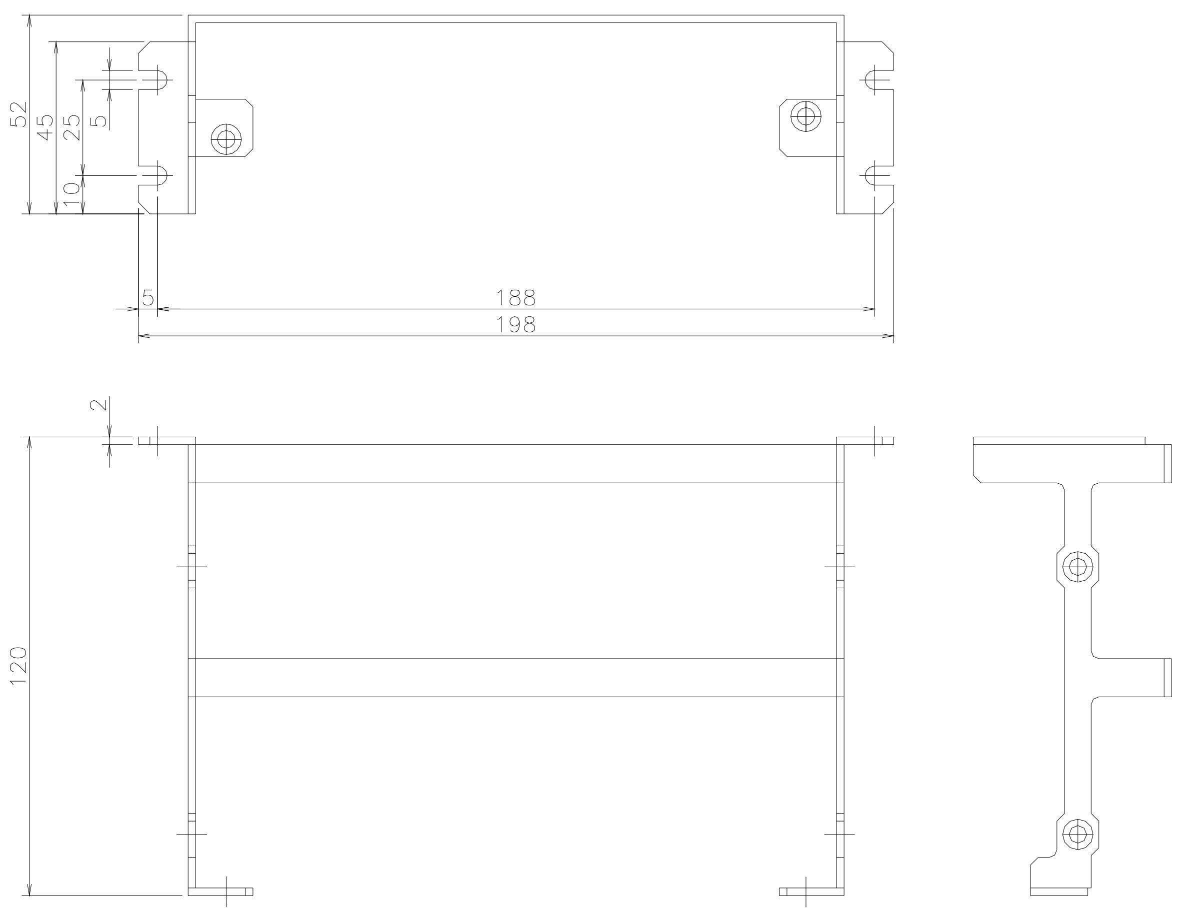
Servo amplifier model number	Mounting Position	Model	Contents
RS1□01	Front	AL-00582788-01	Fitting metals: 1 Tightning screw: 6
RS1□03	Front	AL-00582789-01	Fitting metals: 1 Tightning screw: 2
RS1□01, RS1□03	Back	AL-00582791-01	Fitting metals: 1 Tightning screw: 2
RS1□05	Front	AL-00582790-01	Fitting metals: 1 Tightning screw: 6
	Back	AL-00582792-01	Fitting metals: 1 Tightning screw: 2

Metal mounting fittings of this option employ three-number chromate plating treatment.
(Surface color:It is different from blue-silver/body color.)

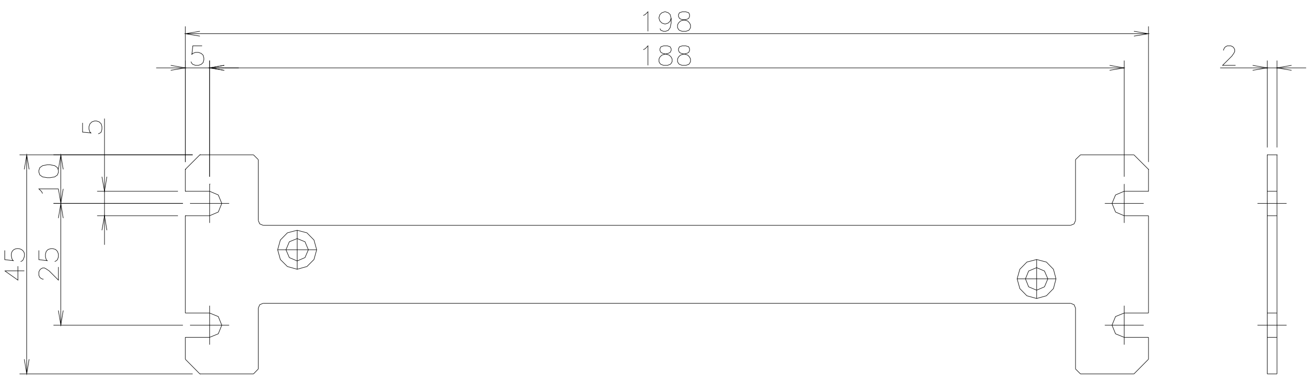
● AL-00582788-01



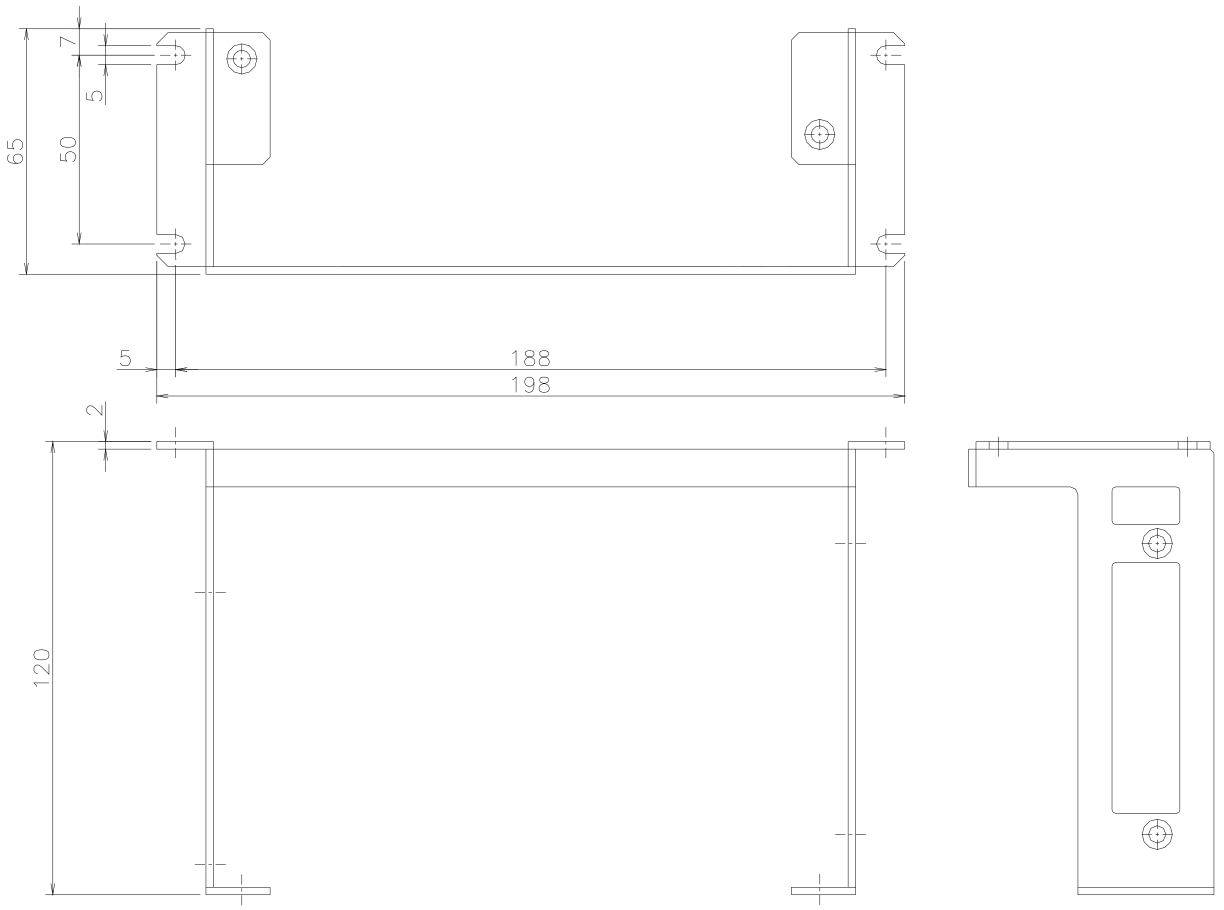
- AL-00582789-01



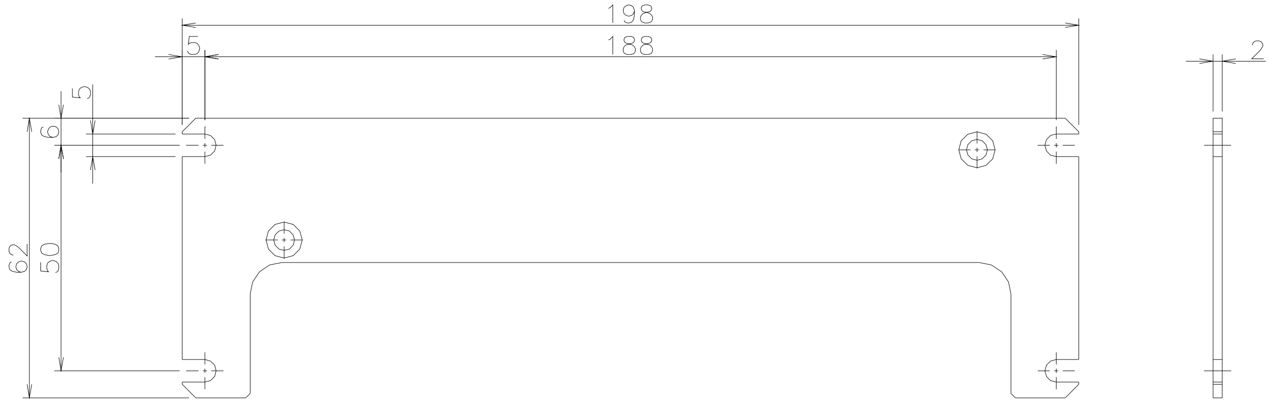
- AL-00582791-01



- AL-00582790-01



- AL-00582792-01

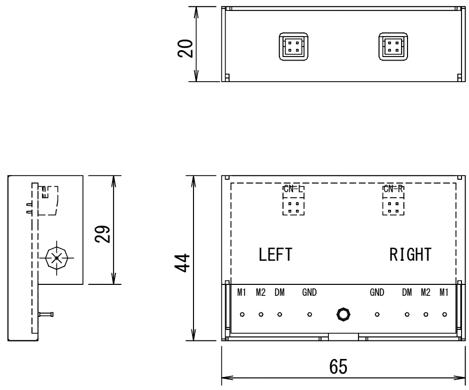


■ Monitor box

● Monitor box and dedicated cable

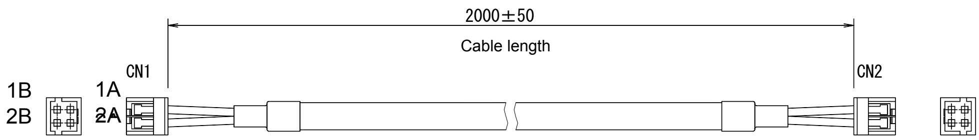
Model number	Remarks
Q-MON-1	Monitor box + Dedicated cables (2 cables)

Two dedicated cables blow come with this monitor box.



● Dedicated cables

Model number	Remarks
AL-00496726-01	Dedicated cable (1 cable)

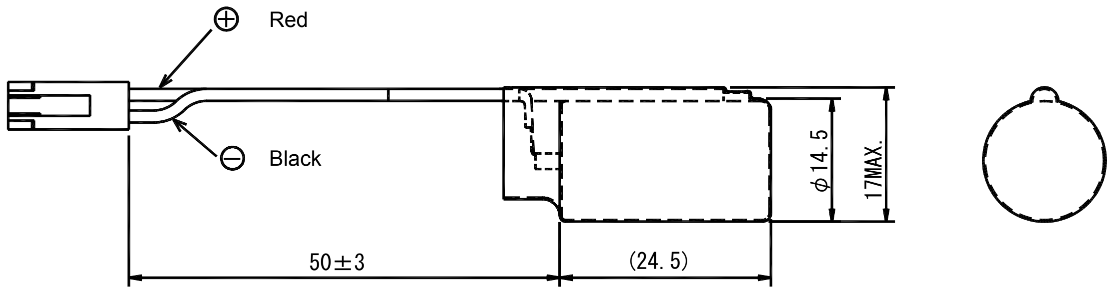


Terminal name	Function
1A	Analog monitor 1
1B	Analog monitor 2
2A	GND
2B	Degital monitor

	Manufacturer mdel number	Manufacturer
Connector	LY10-DC4	Japan Aviation Electronics Industry, Ltd.
Contact	LY10-C1-1-10000	Japan Aviation Electronics Industry, Ltd.

■ Lithium battery

Model number	Remarks
AL-00494635-01	ER3VLY



Mass: 0.02kg

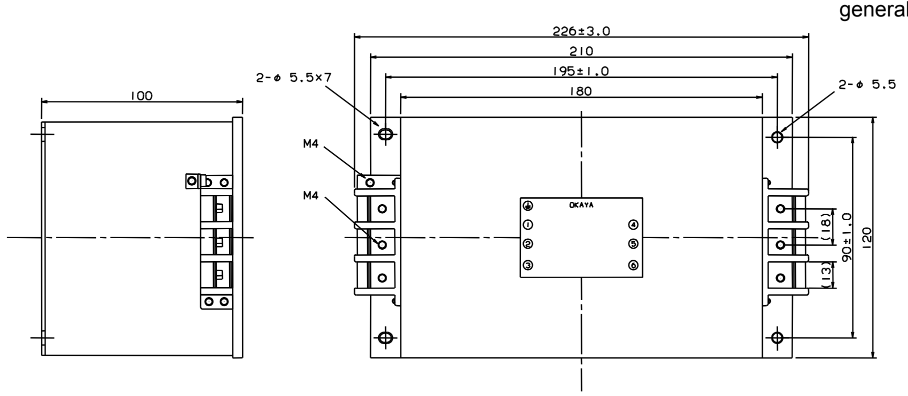
	Manufacturer mdel number	Manufacturer
Connector	IL-2S-S3L-(N)	Japan Aviation Electronics Industry, Ltd.
Contact	IL-C2-1-10000	Japan Aviation Electronics Industry, Ltd.
Battery	ER3VLY	TOSHIBA LIFESTYLE PRODUCTS & SERVICES CORPORATION

■ EMC countermeasure kit

Model number	Remarks
QS-EMC-KIT1	Noise filter: 3SUP-HK30-ER-6B
	Toroidal core: 251-211

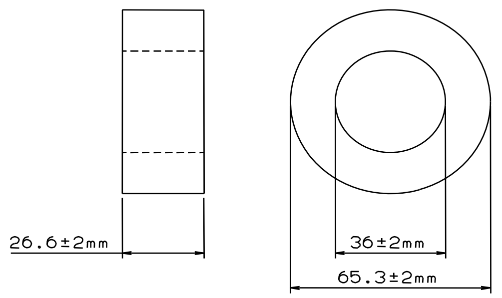
Model number: 3SUP-HK30-ER-6B

unit
general allowance:±1.5mm



Mass:2.5kg

Model number: 251-11



Mass: 0.3kg

■ Encoder clear / Alarm reset method

'Encoder clear / alarm reset method' vary according to the encoder you use. Any alarms will not be reset under the proceure of the list below unless any alarm factors are removed by correction.

● Asynchronous encoder

Alarm code	Name		Encoder type	Encoder clear and alarm reset method
A2	Battery abnormal	→	PA035C	After'Encoder clear input' ⇒ 'Alarm reset input'
			RA062C	—
A3	Encoder overheat	→	PA035C	'Alarm reset input'
			RA062C	
A5	Abnormal encoder3	→	PA035C	—
			RA062C	Power restoration
A6	Abnormal encoder4	→	PA035C	—
			RA062C	Power restoration
A7	Abnormal encoder5	→	PA035C	—
			RA062C	Power restoration
A8	Abnormal encoder6	→	PA035C	—
			RA062C	Power restoration
A9	Encoder failure	→	PA035C	Power restoration
			RA062C	
B3	Numerous rotation abnormal	→	PA035C	Power restoration
			RA062C	
B4	One rotation abnormal	→	PA035C	Power restoration
			RA062C	—
B5	Over speed/ Numerous rotation abnormal	→	PA035C	After'Encoder clear input' ⇒ 'Power restoration' or 'Alarm reset input'
			RA062C	
B6	Memory abnormal	→	PA035C	After'Encoder clear input' ⇒ 'Power restoration' or 'Alarm reset input'
			RA062C	
B7	Acceleration abnormal	→	PA035C	—
			RA062C	After'Encoder clear input' ⇒ 'Power restoration'

● Manchester encoder

Alarm code	Name		Encoder type	Encoder clear and alarm reset method
A1	Encoder abnormal 1	→	RA062M	Power restoration
A2	Battery abnormal	→	ABS-E	After'Encoder clear input' → 'Alarm reset input'
B2	Encoder abnormal 2	→	RA062M	Power restoration

Release	
Revision A	Jul. 2009
Revision B	Jan. 2010
Revision C	Oct. 2011
Revision D	Feb. 2016

■Precautions For Adoption

Failure to follow the precautions on the right may cause moderate injury and property damage, or in some circumstances, could lead to a serious accident.
Always follow all listed precautions.

⚠ Cautions

- Read the accompanying Instruction Manual carefully prior to using the product.
- If applying to medical devices and other equipment affecting people's lives please contact us beforehand and take appropriate safety measures.
- If applying to equipment that can have significant effects on society and the general public, please contact us beforehand.
- Do not use this product in an environment where vibration is present, such as in a moving vehicle or shipping vessel.
- Do not perform any retrofitting, re-engineering, or modification to this equipment.
- The Products presented in this Instruction Manual are meant to be used for general industrial applications. If using for special applications related to aviation and space, nuclear power, electric power, submarine repeaters, etc., please contact us beforehand.

* For any question or inquiry regarding the above, contact our Sales Department.

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Translated version of the original instructions