



General-Purpose AC Servo

MITSUBISHI SERVO AMPLIFIERS & MOTORS  
**MELSERVO**

Functional safety unit

**MODEL**

**MR-D30**

INSTRUCTION MANUAL

## ● Safety Instructions ●

Please read the instructions carefully before using the equipment.


To use the equipment correctly, do not attempt to install, operate, maintain, or inspect the equipment until you have read through this Instruction Manual, Installation guide, and appended documents carefully. Do not use the equipment until you have a full knowledge of the equipment, safety information and instructions. In this Instruction Manual, the safety instruction levels are classified into "WARNING" and "CAUTION".




Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.




Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury to personnel or may cause physical damage.

Note that the  CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety. What must not be done and what must be done are indicated by the following diagrammatic symbols.



Indicates what must not be done. For example, "No Fire" is indicated by .



Indicates what must be done. For example, grounding is indicated by .

In this Instruction Manual, instructions at a lower level than the above, instructions for other functions, and so on are classified into "POINT".

After reading this Instruction Manual, keep it accessible to the operator.

## 1. To prevent electric shock, note the following

### WARNING

- Before wiring or inspection, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier.
- Ground the servo amplifier and servo motor securely.
- Any person who is involved in wiring and inspection should be fully competent to do the work.
- Do not attempt to wire the servo amplifier and servo motor until they have been installed. Otherwise, it may cause an electric shock.
- Do not operate switches with wet hands. Otherwise, it may cause an electric shock.
- The cables should not be damaged, stressed, loaded, or pinched. Otherwise, it may cause an electric shock.
- During power-on or operation, do not open the front cover of the servo amplifier. Otherwise, it may cause an electric shock.
- Do not operate the servo amplifier with the front cover removed. High-voltage terminals and charging area are exposed and you may get an electric shock.
- Except for wiring and periodic inspection, do not remove the front cover of the servo amplifier even if the power is off. The servo amplifier is charged and you may get an electric shock.
- To prevent an electric shock, always connect the protective earth (PE) terminal (marked ⊕) of the servo amplifier to the protective earth (PE) of the cabinet.
- To avoid an electric shock, insulate the connections of the power supply terminals.

## 2. To prevent fire, note the following

### CAUTION

- Install the servo amplifier, servo motor, and regenerative resistor on incombustible material. Installing them directly or close to combustibles will lead to smoke or a fire.
- Always connect a magnetic contactor between the power supply and the main circuit power supply (L1, L2, and L3) of the servo amplifier, in order to configure a circuit that shuts down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor is not connected, continuous flow of a large current may cause smoke or a fire when the converter unit or servo amplifier malfunctions.
- Always connect a molded-case circuit breaker, or a fuse to each servo amplifier between the power supply and the main circuit power supply (L1, L2, and L3) of the servo amplifier, in order to configure a circuit that shuts down the power supply on the side of the servo amplifier's power supply. If a molded-case circuit breaker or fuse is not connected, continuous flow of a large current may cause smoke or a fire when the servo amplifier malfunctions.
- When using the regenerative resistor, switch power off with the alarm signal. Otherwise, a regenerative transistor malfunction or the like may overheat the regenerative resistor, causing smoke or a fire.
- Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier, servo motor, and MR-D30.

### 3. To prevent injury, note the following

#### CAUTION

- Only the voltage specified in the Instruction Manual should be applied to each terminal. Otherwise, a burst, damage, etc. may occur.
- Connect cables to the correct terminals. Otherwise, a burst, damage, etc. may occur.
- Ensure that polarity (+/-) is correct. Otherwise, a burst, damage, etc. may occur.
- The servo amplifier heat sink, regenerative resistor, servo motor, etc. may be hot while power is on or for some time after power-off. Take safety measures, e.g. provide covers, to avoid accidentally touching the parts (cables, etc.) by hand.

### 4. Additional instructions

The following instructions should also be fully noted. Incorrect handling may cause a malfunction, injury, electric shock, fire, etc.

#### (1) Transportation and installation

#### CAUTION

- Transport the products correctly according to their mass.
- Stacking in excess of the specified number of product packages is not allowed.
- Do not hold the front cover when transporting the servo amplifier. Otherwise, it may drop.
- Install the servo amplifier and the servo motor in a load-bearing place in accordance with the Instruction Manual.
- Do not get on or put heavy load on the equipment.
- The equipment must be installed in the specified direction.
- Leave specified clearances between the servo amplifier and the cabinet walls or other equipment.
- Do not install or operate the servo amplifier and MR-D30 which have been damaged or have any parts missing.
- Do not block the intake and exhaust areas of the servo amplifier and MR-D30. Otherwise, it may cause a malfunction.
- Do not drop or strike the servo amplifier, servo motor, and MR-D30. Isolate them from all impact loads.
- When you keep or use the equipment, please fulfill the following environment.

Item		Environment
Ambient temperature	Operation	0 °C to 55 °C (non-freezing)
	Storage	-20 °C to 65 °C (non-freezing)
Ambient humidity	Operation	90 %RH or less (non-condensing)
	Storage	
Ambience		Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, and dirt
Altitude		1000 m or less above sea level
Vibration resistance		5.9 m/s <sup>2</sup> , at 10 Hz to 55 Hz (directions of X, Y and Z axes)

- When the product has been stored for an extended period of time, contact your local sales office.
- When handling the servo amplifier and MR-D30, be careful about the edged parts such as corners of them.

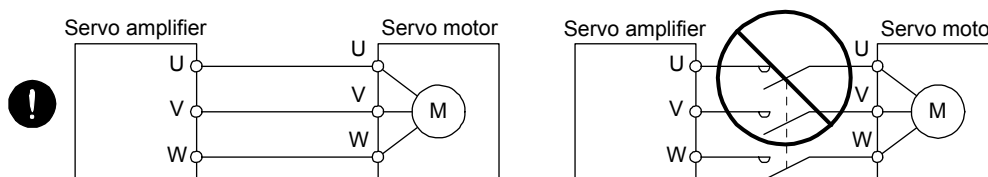
## ⚠ CAUTION

- The servo amplifier and MR-D30 must be installed in a metal cabinet.
- When fumigants that contain halogen materials such as fluorine, chlorine, bromine, and iodine are used for disinfecting and protecting wooden packaging from insects, they cause malfunction when entering our products. Please take necessary precautions to ensure that remaining materials from fumigant do not enter our products, or treat packaging with methods other than fumigation (heat method). Additionally, disinfect and protect wood from insects before packing products.

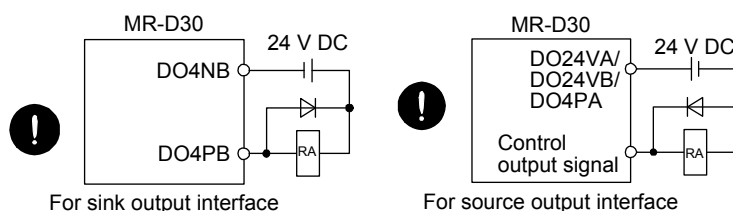
### (2) Wiring

## ⚠ CAUTION

- Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly.
- Do not install a power capacitor, surge killer, or radio noise filter (optional FR-BIF-(H)) on the servo amplifier output side.
- To avoid a malfunction, connect the wires to the correct phase terminals (U, V, and W) of the servo amplifier and servo motor.
- Connect the servo amplifier power output (U, V, and W) to the servo motor power input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.



- The surge absorbing diode installed to the DC relay for control output signals should be fitted in the specified direction. Otherwise, the emergency stop and other protective circuits may not operate.



- When the cable is not tightened enough to the terminal block, the cable or terminal block may generate heat because of the poor contact. Be sure to tighten the cable with specified torque.
- Connecting a servo motor of the wrong axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.

### (3) Test run and adjustment

## ⚠ CAUTION

- Before operation, check the parameter settings. Improper settings may cause some machines to operate unexpectedly.
- Never make a drastic adjustment or change to the parameter values as doing so will make the operation unstable.
- Do not get close to moving parts during the servo-on status.

#### (4) Usage

### ⚠ CAUTION

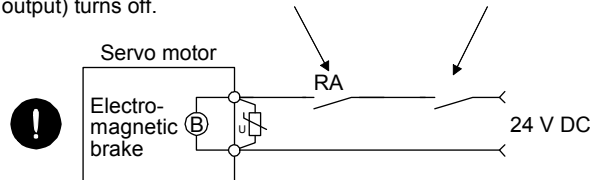
- When it is assumed that a hazardous condition may occur due to a power failure or product malfunction, use a servo motor with an external brake to prevent the condition.
- Do not disassemble, repair, or modify the equipment.
- Before resetting an alarm, make sure that the run signal of the servo amplifier is off in order to prevent a sudden restart. Otherwise, it may cause an accident.
- Use a noise filter, etc. to minimize the influence of electromagnetic interference. Electromagnetic interference may be given to the electronic equipment used near the servo amplifier.
- Burning or breaking a servo amplifier may cause a toxic gas. Do not burn or break it.
- Use the servo amplifier with the specified servo motor.
- The electromagnetic brake on the servo motor is designed to hold the motor shaft and should not be used for ordinary braking.
- For such reasons as service life and mechanical structure (e.g. where a ball screw and the servo motor are coupled via a timing belt), the electromagnetic brake may not hold the motor shaft. To ensure safety, install a stopper on the machine side.

#### (5) Corrective actions

### ⚠ CAUTION

- When it is assumed that a hazardous condition may occur due to a power failure or product malfunction, use a servo motor with an electromagnetic brake or external brake to prevent the condition.
- Configure an electromagnetic brake circuit so that it is activated also by an external EMG stop switch.

Contacts must be opened when ALM (Malfunction) or SBCS (SBC output) turns off.      Contacts must be opened with the EMG stop switch.



- When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.
- Provide an adequate protection to prevent unexpected restart after an instantaneous power failure.

## (6) Maintenance, inspection and parts replacement

### CAUTION

- With age, the electrolytic capacitor of the servo amplifier will deteriorate. To prevent a secondary accident due to a malfunction, it is recommended that the electrolytic capacitor be replaced every 10 years when it is used in general environment. Please contact your local sales office.
- When using a servo amplifier whose power has not been turned on for a long time, contact your local sales office.
- Do not touch the lead sections such as ICs or the connector contacts.
- Do not place the unit on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.
- The parameters of MR-D30 are protected by passwords to prevent incorrect settings. The parameters of MR-D30 which are returned for fixing/investigation will be initialized. The parameters and other settings need to be set again.

## (7) General instruction

- To illustrate details, the equipment in the diagrams of this Instruction Manual may have been drawn without covers and safety guards. When the equipment is operated, the covers and safety guards must be installed as specified. Operation must be performed in accordance with this Instruction Manual.

## (8) Conditions of use for the product

- MR-D30 complies with a safety standard, but this fact does not guarantee that MR-D30 will be free from any malfunction or failure. The user of this product shall comply with any and all applicable safety standard, regulation or law and take appropriate safety measures for the system in which the product is installed or used and shall take the second or third safety measures other than the product. Our company is not liable for damages that could have been prevented by compliance with any applicable safety standard, regulation or law.
- Our company prohibits the use of Products with or in any application involving, and we shall not be liable for a default, a liability for defect warranty, a quality assurance, negligence or other tort and a product liability in these applications.
  - (1) Power plants
  - (2) Trains, railway systems, airplanes, airline operations, and other transportation systems
  - (3) Hospitals, medical care, dialysis and life support facilities or equipment
  - (4) Amusement equipment
  - (5) Incineration and fuel devices
  - (6) Handling of nuclear or hazardous materials or chemicals
  - (7) Mining and drilling
  - (8) Other applications where the level of risk to human life, health or property are elevated.

## ● DISPOSAL OF WASTE ●

Please dispose a servo amplifier, battery (primary battery) and other options according to your local laws and regulations.

### EEPROM life

The number of write times to the EEPROM, which stores parameter settings, etc., is limited to 100,000. If the total number of the following operations exceeds 100,000, MR-D30 may malfunction when the EEPROM reaches the end of its useful life.

- Write to the EEPROM due to parameter setting changes
- Write to the EEPROM due to device changes

### «About the manual»

You must have this Instruction Manual and the following manuals to use this servo. Ensure to prepare them to use the servo safely.

#### Relevant manuals

Manual name	Manual No.
MELSERVO-J4 MR-J4-_B_(-RJ) Servo Amplifier Instruction Manual (Note 5)	SH(NA)030106
MELSERVO-J4 MR-J4-_A_(-RJ) Servo Amplifier Instruction Manual (Note 6)	SH(NA)030107
MR-J4 Servo Amplifier Instruction Manual (Troubleshooting)	SH(NA)030109
MELSERVO Servo Motor Instruction Manual (Vol. 3) (Note 1)	SH(NA)030113
MELSERVO Linear Servo Motor Instruction Manual (Note 2)	SH(NA)030110
MELSERVO Direct Drive Motor Instruction Manual (Note 3)	SH(NA)030112
MELSERVO Linear Encoder Instruction Manual (Note 2, 4)	SH(NA)030111
EMC Installation Guidelines	IB(NA)67310

- Note
1. It is necessary for using a rotary servo motor.
  2. It is necessary for using a linear servo motor.
  3. It is necessary for using a direct drive motor.
  4. It is necessary for using a fully closed loop system.
  5. It is necessary for using an MR-J4-\_B\_(-RJ) servo amplifier.
  6. It is necessary for using an MR-J4-\_A\_(-RJ) servo amplifier.

### «Cables used for wiring»

Wires mentioned in this Instruction Manual are selected based on the ambient temperature of 40 °C.





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# 1. FUNCTIONS AND CONFIGURATION

## 1. FUNCTIONS AND CONFIGURATION

### 1.1 Summary

POINT
<p>● If the combination of MR-D30 and servo amplifier is wrong, "ERROR" will turn on.</p>

This instruction manual only describes the functions of MR-D30. Refer to "MR-J4-\_B\_(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-\_A\_(-RJ) Servo Amplifier Instruction Manual" for functions of the servo amplifier you use.

You can extend the safety observation function by using MR-D30 with the MR-J4-\_B\_-RJ servo amplifier or MR-J4-\_A\_-RJ servo amplifier. However, which extension you can use depends on software version. The safety observation function cannot be used other than the following combinations. "ERROR" on the MR-D30 display will turn on with other combinations.

MR-D30 software version	Servo amplifier software version	Safety observation function (IEC/EN 61800-5-2)	Servo motor with functional safety	Servo amplifier
A0	B3/B4	STO/SS1/SBC/SLS/SSM	Not compatible	MR-J4-_B_-RJ
	B5 or later	STO/SS1/SBC/SLS/SSM	Not compatible	MR-J4-_B_-RJ
A1	B3/B4	STO/SS1/SBC/SLS/SSM	Not compatible	MR-J4-_B_-RJ
	B5 or later	STO/SS1/SBC/SLS/SSM/SOS/SS2	Compatible	MR-J4-_B_-RJ MR-J4-_A_-RJ (Note)

Note. MR-J4-\_A\_-RJ manufactured in November, 2014 or later is supported.

The following shows characteristics of functions.

(1) Use of safety observation function with wiring to MR-D30

By combination of MR-D30 functional safety unit, MR-J4-\_B\_-RJ servo amplifier, and servo motor with functional safety, the safety observation function (STO/SS1/SBC/SLS/SSM/SOS/SS2) which compatible with Category 4, PL e, SIL 3 can be used. When a servo motor with functional safety is not used, the SOS/SS2 functions are not available. The SLS/SSM functions are compatible with Category 3, PL d, SIL 2.

(2) Use of the safety observation function using the drive safety integrated motion controller through SSCNET III/H

By using safety integrated motion controller to control the safety observation function, the amplifier complies with Category 3, PL d, SIL 2 (STO/SS1/SBC/SLS/SSM). (Refer to table 1.1.)

By using parameter of MR-D30 to control the safety observation function, the amplifier complies with Category 3, PL d, SIL 2 (STO/SS1/SBC/SLS/SSM). (Refer to table 1.1.)

# 1. FUNCTIONS AND CONFIGURATION

Table 1.1 Compatibility of safety observation function

	Safety observation function with wiring to MR-D30	Safety observation function through SSCNET III/H
Compatible controller	Servo system controller Q173DSCPU Q172DSCPU Q170MSCPU QD77MS LD77MS General-purpose interface	Drive safety integrated motion controller Q173DSCPU Q172DSCPU + Safety signal module Q173DSXY
STO	Category 4, PL e, SIL 3 (Note 1)	Category 3, PL d, SIL 2
SS1		
SBC		
SLS (Note 2)		
SSM (Note 2)	Category 3, PL d, SIL 2 Category 4, PL e, SIL 3 (Note 3)	
SS2 (Note 4)	Category 4, PL e, SIL 3 (Note 1)	
SOS (Note 4)		

- Note
1. To meet Category 4, PL e, SIL 3, an input diagnosis using test pulses is required.
  2. Linear servo system, direct drive servo system, and fully closed loop system are not compatible with SLS, SSM, SS2, and SOS.
  3. To meet Category 4, PL e, SIL 3, a servo motor with functional safety is required.
  4. To enable SS2 and SOS, a servo motor with functional safety is required.

## 1.2 Outline of safety observation function

The following functions can be used by MR-D30 functional safety unit.

- (1) STO (Safe torque off)  
Shuts off servo motor drive energy electronically with based on an input signal from an external device (secondary-side output shut-off). This corresponds to stop category 0 of IEC 60204-1.
- (2) SS1 (Safe stop 1)  
Starts deceleration based on an input signal from an external device (EM2). After a specified time for the check of stop, the STO function will be activated (SS1). This corresponds to stop category 1 of IEC 60204-1.
- (3) SS2 (Safe stop 2)  
Starts deceleration based on an input signal from an external device (EM2). After a specified time for the check of stop, the SOS function will be activated (SS2). This corresponds to stop category 2 of IEC 60204-1.
- (4) SOS (Safe operating stop)  
This is a function to monitor whether the servo motor stops within the prescribed range for the stop position. The power is supplied to the servo motor.
- (5) SLS (Safely-limited speed)  
This is a function to observe whether the speed is within a regulated speed limit value. When the speed is over a specified speed, energy will be shut off by STO.
- (6) SSM (Safe speed monitor)  
Outputs a signal when the servo motor speed is within a regulated speed.

# 1. FUNCTIONS AND CONFIGURATION

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- (7) SBC (Safe brake control)  
Outputs a signal for an external brake control.
  
- (8) Status monitor (SM: Status monitor)  
Outputs a signal for the safety observation function status. This function is not the one defined in IEC/EN 61800-5-2. The function is an original function of the functional safety unit.



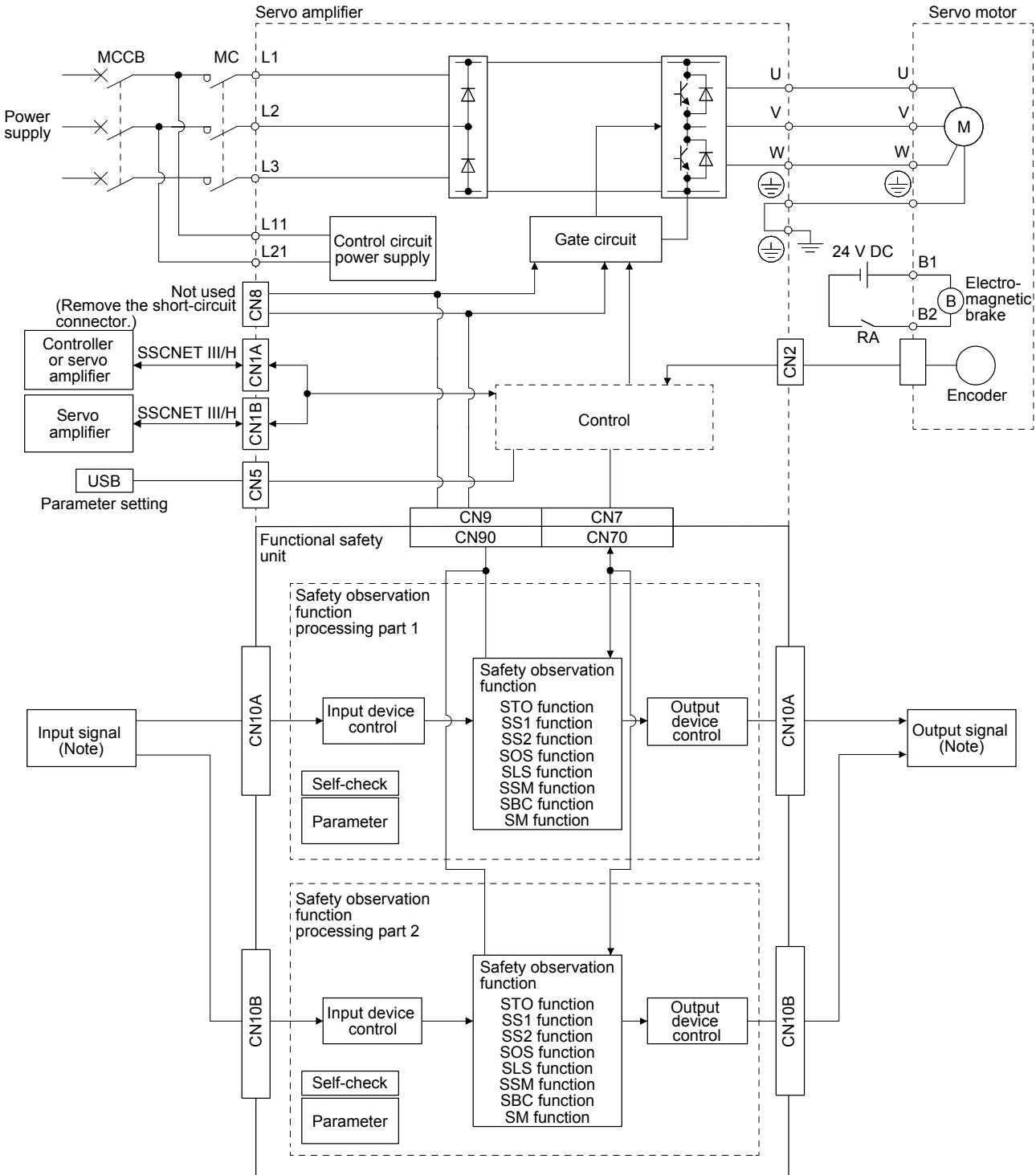
# 1. FUNCTIONS AND CONFIGURATION

## 1.3 Function block diagram

### 1.3.1 MR-J4-\_B\_-RJ

#### (1) When using input signals

The following block diagram shows an operation of the safety observation function using input devices assigned to pins of the CN10A and CN10B connectors. By diagnosis of input signals, the amplifier complies with safety level Category 4, PL e, SIL 3.

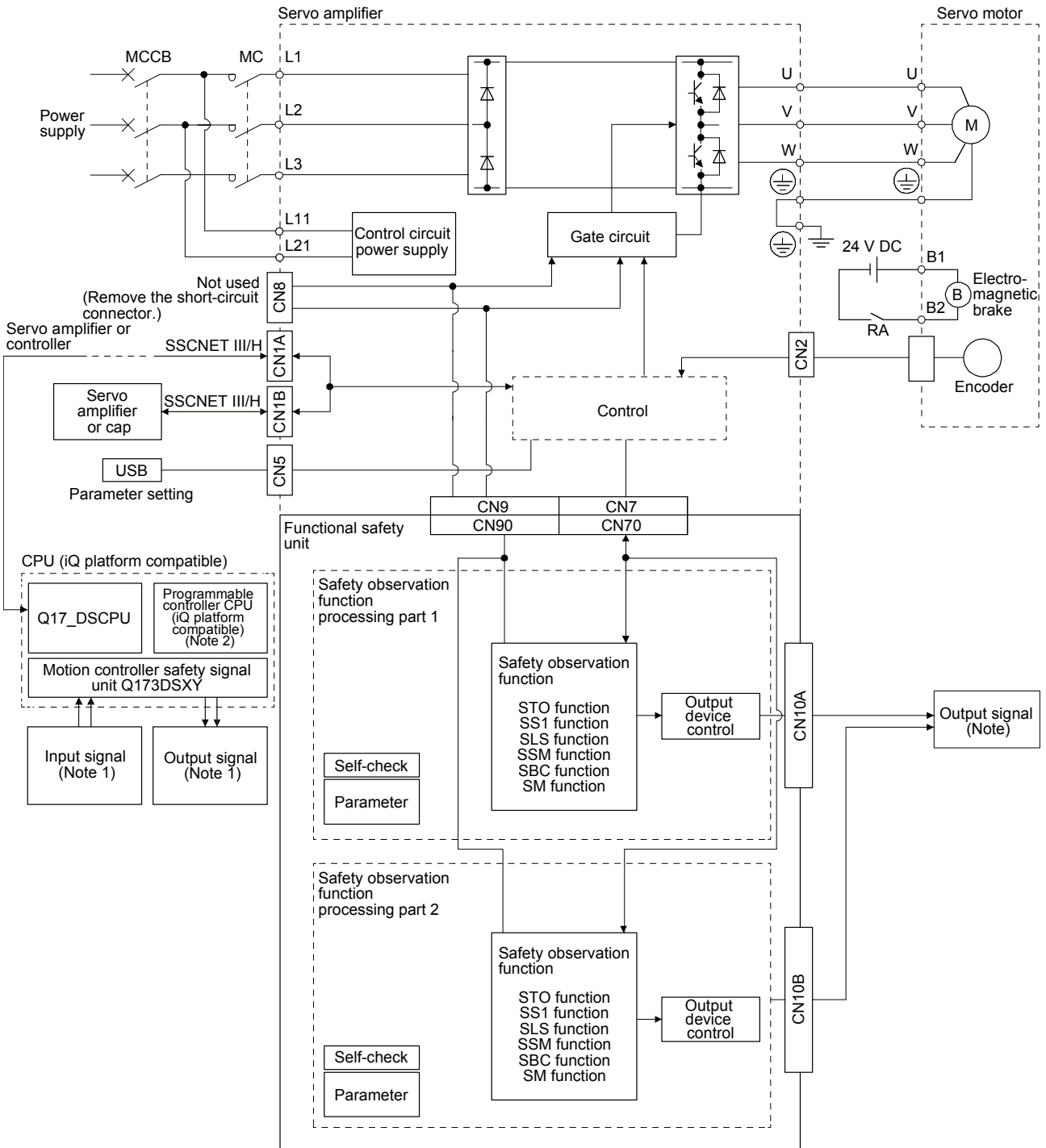


Note. Safety switch, safety relay, etc.

# 1. FUNCTIONS AND CONFIGURATION

## (2) When using a drive safety integrated motion controller

The following block diagram shows an operation of the safety observation function from a drive safety integrated motion controller through SSCNET III/H. The electric wiring can be omitted.



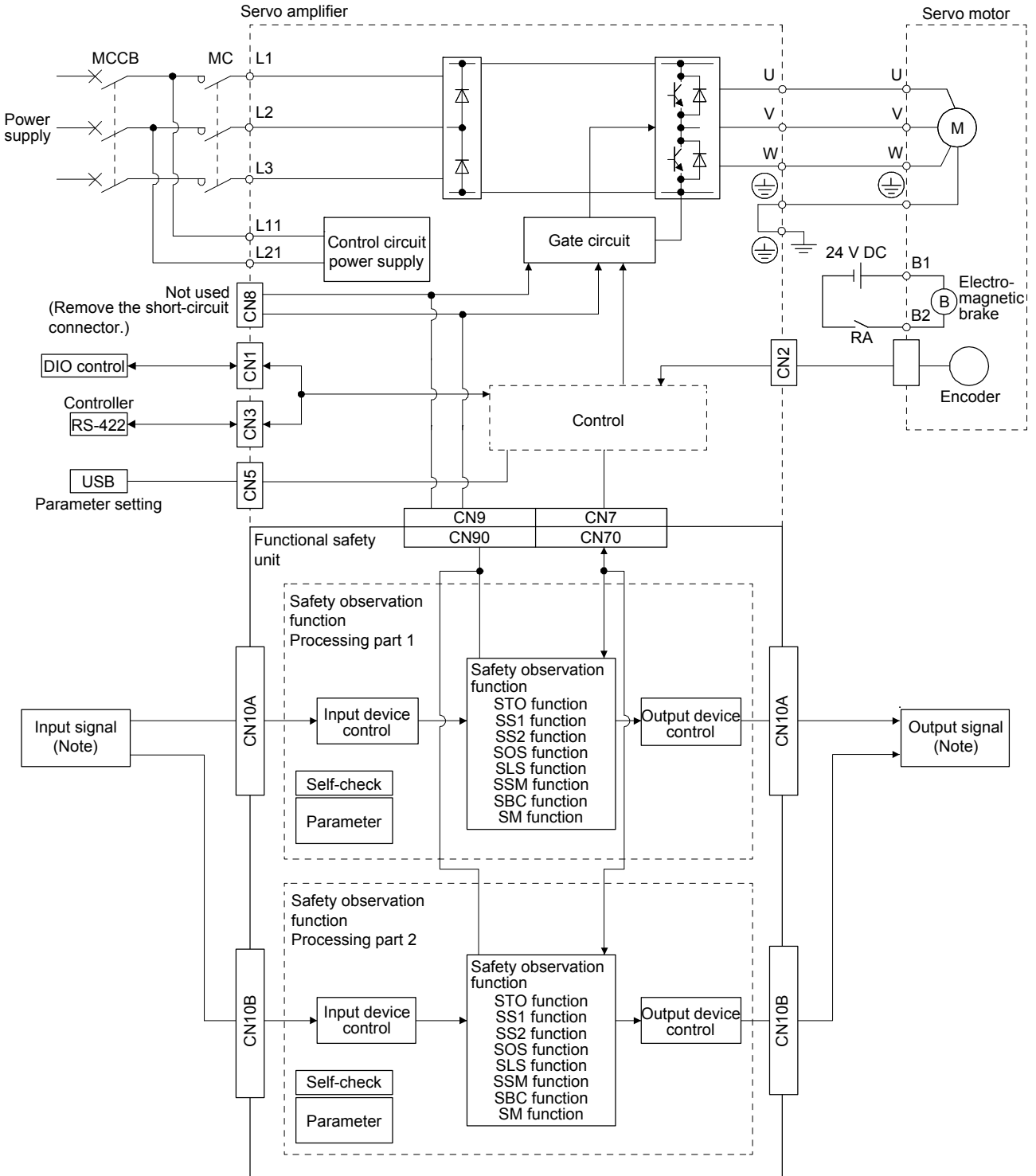
Note 1. Safety switch, safety relay, etc.

Note 2. The safety observation function is certified by Certification Body only by combination of Q17\_DSCPU/Q17\_DSXY and QnUD(E)(H)CPU programmable controller.

# 1. FUNCTIONS AND CONFIGURATION

## 1.3.2 MR-J4-\_A\_-RJ

The following block diagram shows an operation of the safety observation function using input devices assigned to pins of the CN10A and CN10B connectors. By diagnosis of input signals, the amplifier complies with safety level Category 4, PL e, SIL 3.



Note. Safety switch, safety relay, etc.

# 1. FUNCTIONS AND CONFIGURATION

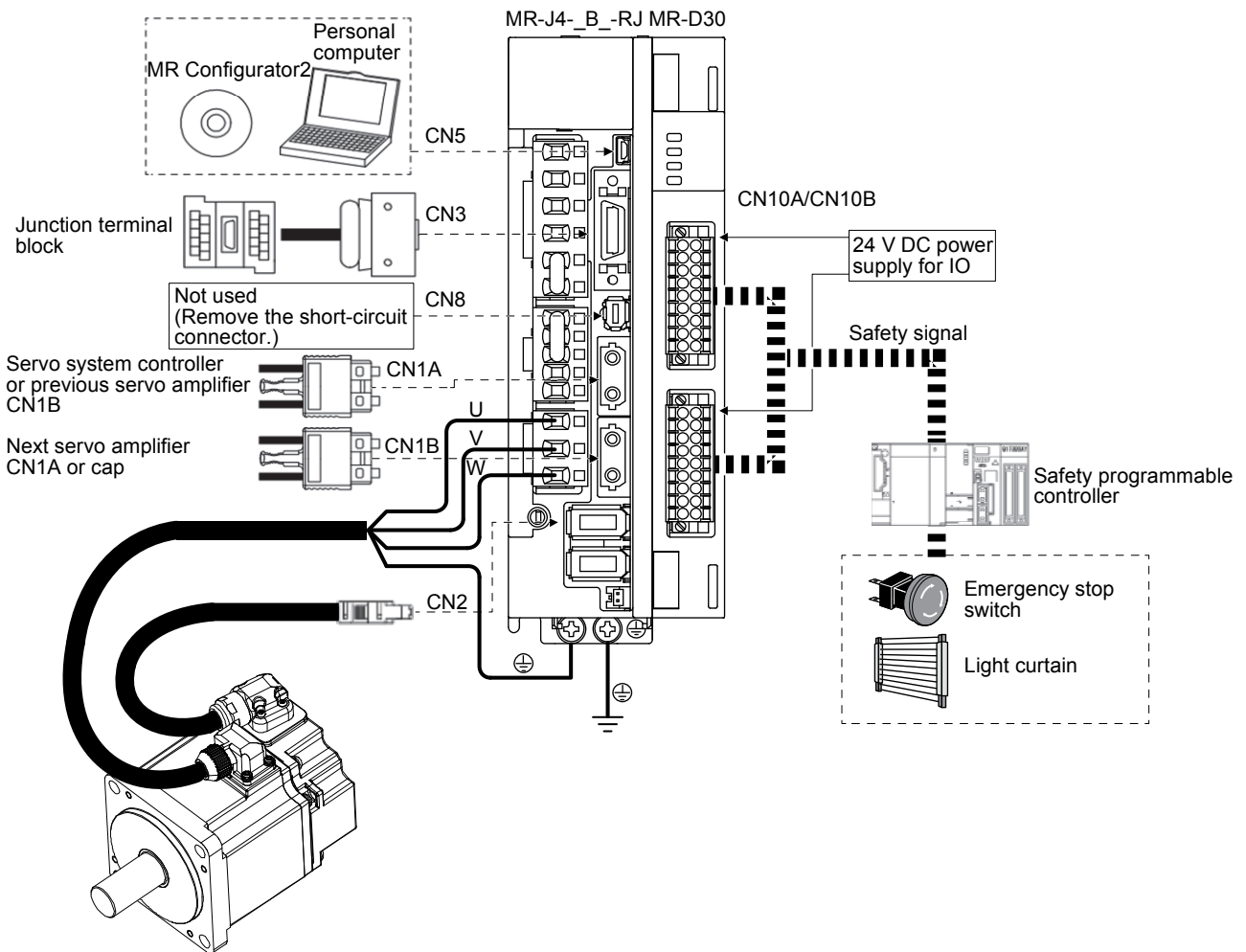
## 1.4 System configuration

### 1.4.1 MR-J4-\_B\_-RJ

Wirings other than in diagram are common with MR-J4-\_B\_-RJ. Refer to "MR-J4-\_B\_-RJ) Servo Amplifier Instruction Manual".

#### (1) When using input signals

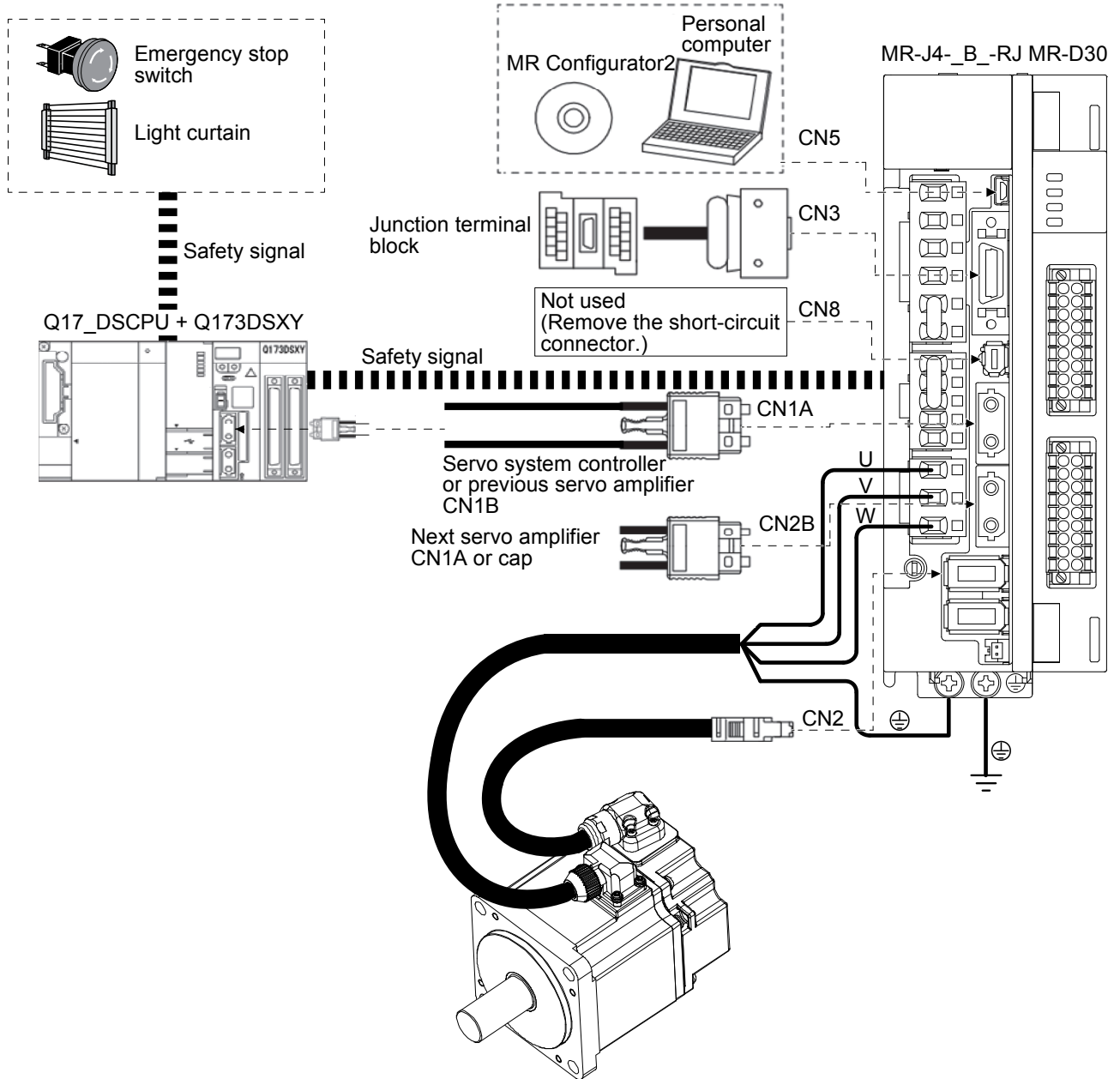
<b>POINT</b>
● Remove the short-circuit connector on CN8.



# 1. FUNCTIONS AND CONFIGURATION

(2) When using a drive safety integrated motion controller

POINT
● Remove the short-circuit connector on CN8.

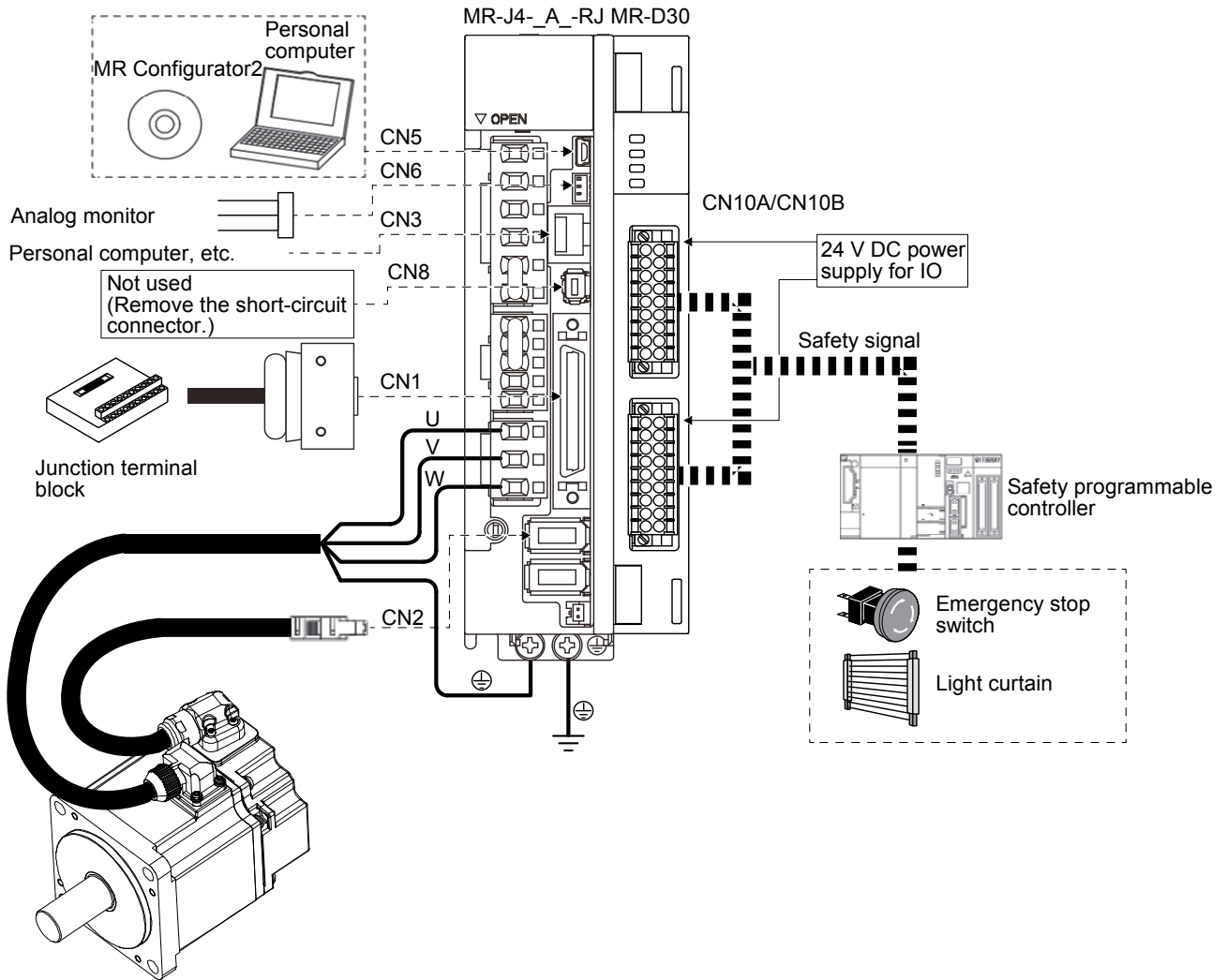


# 1. FUNCTIONS AND CONFIGURATION

## 1.4.2 MR-J4-\_A\_-RJ

POINT
● Remove the short-circuit connector on CN8.

Wirings other than in diagram are common with MR-J4-\_A\_-RJ. Refer to "MR-J4-\_A\_-RJ) Servo Amplifier Instruction Manual".



# 1. FUNCTIONS AND CONFIGURATION

## 1.5 Standard specifications

Model		MR-D30
Output	Rated voltage	24 V DC
	Rated current [A]	0.3
Interface power supply	Voltage	24 V DC $\pm$ 10%
	Power supply capacity [A]	0.8 (Note 1)
Safety performance	Standards certified by CB	EN ISO 13849-1 Category 4, PL e and Category 3, PL d IEC 61508 SIL 2 and SIL 3 EN 62061 SIL CL 2 and SIL CL 3 EN 61800-5-2 SIL 2 and SIL 3
	Mean time to dangerous failure	MTTFd $\geq$ 100 [years]
	Effectiveness of fault monitoring of a system or subsystem	DC $\geq$ 90 [%]
	Average probability of dangerous failures per hour	PFH = $6.57 \times 10^{-9}$ [1/h]
	Mission time	TM = 20 [years]
	Response performance (Note 2)	Using input device: 15 ms or less
	Speed observation resolution	Depends on a command resolution (22 bit position command: 0.1 r/min or less)
	Position observation resolution	1/32 rev
	Input device	6 points $\times$ 2 systems (source/sink)
	Output device	Source: 3 points $\times$ 2 systems and 1 point $\times$ 1 system Sink: 1 point $\times$ 1 system
Safety observation function (IEC/EN 61800-5-2)	Safe torque off (STO)	Category 4, PL e, SIL 3 (Note 3)/Category 3, PL d, SIL 2
	Safe stop 1 (SS1)	Category 4, PL e, SIL 3 (Note 3)/Category 3, PL d, SIL 2
	Safely-limited speed (SLS) (Note 7)	Category 4, PL e, SIL 3 (Note 3, 4)/Category 3, PL d, SIL 2
	Safe speed monitor (SSM) (Note 7)	Category 4, PL e, SIL 3 (Note 3, 4)/Category 3, PL d, SIL 2
	Safe brake control (SBC)	Category 4, PL e, SIL 3 (Note 3)/Category 3, PL d, SIL 2
	Safe operating stop (SOS) (Note 5, 7)	Category 4, PL e, SIL 3 (Note 3)/Category 3, PL d, SIL 2
	Safe stop 2 (SS2) (Note 5, 7)	Category 4, PL e, SIL 3 (Note 3)/Category 3, PL d, SIL 2
Safety observation function	Status monitor (STO/SOS)	Category 4, PL e, SIL 3/Category 3 PL d, SIL 2 (Note 6)
Compliance to global standards	CE marking	EMC: EN 61800-3 MD: EN ISO 13849-1, EN 61800-5-2, EN 62061
Structure (IP rating)		Natural cooling, open (mounted on a servo amplifier: IP20, MR-D30 (single): IP00)
Environment	Ambient temperature	Operation: 0 °C to 55 °C (non-freezing), storage: -20 °C to 65 °C (non-freezing)
	Ambient humidity	Operation: 5 %RH to 90 %RH (non-condensing), storage: 5 %RH to 90 %RH (non-condensing)
	Ambience	Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust
	Altitude	1000 m or less above sea level
	Vibration resistance	5.9 m/s <sup>2</sup> , 10 Hz to 57 Hz
Mass [g]		150

# 1. FUNCTIONS AND CONFIGURATION

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- Note
1. This is the value applicable when all I/O signals are used. The current capacity can be decreased by reducing the number of I/O points.
  2. Time from STO input off to energy shut off
  3. To meet Category 4, PL e, SIL 3, an input diagnosis using test pulses is required.
  4. To meet Category 4, PL e, SIL 3, using with an HG-KR\_W0C, HG-SR\_W0C, or HG-JR\_W0C servo motor is required.
  5. To enable SS2 and SOS, using with an HG-KR\_W0C, HG-SR\_W0C, or HG-JR\_W0C servo motor is required.
  6. For the safety level which can be enabled, refer to the section of "Safety observation function (IEC/EN 61800-5-2)".
  7. Linear servo system, direct drive servo system, and fully closed loop system are not compatible with SLS, SSM, SS2, and SOS.



# 1. FUNCTIONS AND CONFIGURATION

## 1.6 Function list

Function		Description
Safety function	STO	Shut-off response time 15 ms or less (using input device) 60 ms or less (using SSCNET III/H) (Note 1)
	SS1	Deceleration delay time 0 ms to 60000 ms (parameter setting)
	SBC	Shut-off response time 15 ms or less (using input device) 60 ms or less (using SSCNET III/H) (Note 1)
	SLS1/SLS2/SLS3/SLS4	Observation speed 0 r/min to 10000 r/min (parameter setting) (Note 2)
	SSM	Observation speed 0 r/min to 10000 r/min (parameter setting)
	SS2	Deceleration delay time 0 ms to 60000 ms (parameter setting)
	SOS	Observation position 0 rev to 100 rev (parameter setting)
	Status monitor (SM)	Response time 200 $\mu$ s
Input/output function	Input device	Number of inputs 6 points $\times$ 2 systems
		Mismatch permissible time of duplication input mismatch detection 1 ms to 60000 ms (parameter setting)
		Test pulse off time 0.444 ms to 1.77 ms (parameter setting)
		Test pulse interval 1 s or less
		Noise rejection filter 0.888 ms to 28.4 ms (parameter setting)
	Output device	Number of outputs 4 points $\times$ 2 systems (source)
		Test pulse off time 0.444 ms to 1.77 ms (parameter setting)
		Test pulse interval 1 s or less
Parameter setting		Failure diagnosis by duplication parameter, writing protection by password
Safety communication function	Safety communication cycle 14.2 ms to 28.4 ms (parameter setting)	
	Safety communication delay time 60 ms or less (Note 1)	

Note 1. This is when the safety communication cycle is 14.2 ms.

2. Each observation speed can be set separately.

3. MR-D30 manufactured in September, 2014 or earlier has three output points. Connecting a circuit to DO4NA or DO4PB of MR-D30 manufactured in September, 2014 or earlier may cause a malfunction of MR-D30. Connecting MR-D30 manufactured in September, 2014 or earlier to the servo amplifier will deactivate displays about DO4\_ of MR Configurator2.

## 1.7 Combinations with servo amplifiers and servo motors

POINT
<ul style="list-style-type: none"> <li>● MR-D30 is used with MR-J4-_B_-RJ servo amplifier with software version B3 or later, or MR-J4-_A_-RJ servo amplifier with software version B5 or later.</li> <li>● When you use a servo motor with functional safety, MR-BT6VCASE battery case cannot be used.</li> </ul>

The lists of servo amplifier and servo motor that can be used with MR-D30 are as follows. The usable safety observation function and achievable safety performance level vary depending on each servo motor to use. Refer to section 4.1 for details.

# 1. FUNCTIONS AND CONFIGURATION

## (1) 200 V class

Servo amplifier	Rotary servo motor		Linear servo motor (primary side)	Direct drive motor
	Servo motor	Servo motor with functional safety		
MR-J4-10B-RJ MR-J4-10A-RJ	HG-KR053 HG-KR13 HG-MR053 HG-MR13	HG-KR053W0C HG-KR13W0C		
MR-J4-20B-RJ MR-J4-20A-RJ	HG-KR23 HG-MR23	HG-KR23W0C	LM-U2PAB-05M-0SS0 LM-U2PBB-07M-1SS0	TM-RFM002C20
MR-J4-40B-RJ MR-J4-40A-RJ	HG-KR43 HG-MR43	HG-KR43W0C	LM-H3P2A-07P-BSS0 LM-H3P3A-12P-CSS0 LM-K2P1A-01M-2SS1 LM-U2PAD-10M-0SS0 LM-U2PAF-15M-0SS0	TM-RFM004C20
MR-J4-60B-RJ MR-J4-60A-RJ	HG-SR51 HG-SR52 HG-JR53	HG-SR51W0C HG-SR52W0C HG-JR53W0C	LM-U2PBD-15M-1SS0	TM-RFM006C20 TM-RFM006E20
MR-J4-70B-RJ MR-J4-70A-RJ	HG-KR73 HG-MR73 HG-JR73 HG-UR72	HG-KR73W0C HG-JR73W0C	LM-H3P3B-24P-CSS0 LM-H3P3C-36P-CSS0 LM-H3P7A-24P-ASS0 LM-K2P2A-02M-1SS1 LM-U2PBF-22M-1SS0	TM-RFM012E20 TM-RFM012G20 TM-RFM040J10
MR-J4-100B-RJ MR-J4-100A-RJ	HG-SR81 HG-SR102 HG-JR53 (Note 1) HG-JR103	HG-SR81W0C HG-SR102W0C HG-JR53W0C (Note 1) HG-JR103W0C		TM-RFM018E20
MR-J4-200B-RJ MR-J4-200A-RJ	HG-SR121 HG-SR201 HG-SR152 HG-SR202 HG-JR73 (Note 1) HG-JR103 (Note 1) HG-JR153 HG-JR203 HG-RR103 HG-RR153 HG-UR152	HG-SR121W0C HG-SR201W0C HG-SR152W0C HG-SR202W0C HG-JR73W0C (Note 1) HG-JR103W0C (Note 1) HG-JR153W0C HG-JR203W0C	LM-H3P3D-48P-CSS0 LM-H3P7B-48P-ASS0 LM-H3P7C-72P-ASS0 LM-FP2B-06M-1SS0 LM-K2P1C-03M-2SS1 LM-U2P2B-40M-2SS0	
MR-J4-350B-RJ MR-J4-350A-RJ	HG-SR301 HG-SR352 HG-JR153 (Note 1) HG-JR203 (Note 1) HG-JR353 HG-RR203 HG-UR202	HG-SR301W0C HG-SR352W0C HG-JR153W0C (Note 1) HG-JR203W0C (Note 1) HG-JR353W0C	LM-H3P7D-96P-ASS0 LM-K2P2C-07M-1SS1 LM-K2P3C-14M-1SS1 LM-U2P2C-60M-2SS0	TM-RFM048G20 TM-RFM072G20 TM-RFM120J10
MR-J4-500B-RJ MR-J4-500A-RJ	HG-SR421 HG-SR502 HG-JR353 (Note 1) HG-JR503 HG-RR353 HG-RR503 HG-UR352 HG-UR502	HG-SR421W0C HG-SR502W0C HG-JR353W0C (Note 1) HG-JR503W0C	LM-FP2D-12M-1SS0 LM-FP4B-12M-1SS0 LM-K2P2E-12M-1SS1 LM-K2P3E-24M-1SS1 LM-U2P2D-80M-2SS0	TM-RFM240J10
MR-J4-700B-RJ MR-J4-700A-RJ	HG-SR702 HG-JR703 HG-JR503 (Note 1) HG-JR601 HG-JR701M	HG-SR702W0C HG-JR703W0C HG-JR503W0C (Note 1) HG-JR701MW0C (Note 2)	LM-FP2F-18M-1SS0 LM-FP4D-24M-1SS0	

# 1. FUNCTIONS AND CONFIGURATION

Servo amplifier	Rotary servo motor		Linear servo motor (primary side)	Direct drive motor
	Servo motor	Servo motor with functional safety		
MR-J4-11KB-RJ MR-J4-11KA-RJ	HG-JR903 HG-JR801 HG-JR12K1 HG-JR11K1M	HG-JR903W0C HG-JR11K1MW0C (Note 2)	LM-FP4F-36M-1SS0	
MR-J4-15KB-RJ MR-J4-15KA-RJ	HG-JR15K1 HG-JR15K1M	HG-JR15K1MW0C (Note 2)	LM-FP4F-48M-1SS0	
MR-J4-22KB-RJ MR-J4-22KA-RJ	HG-JR20K1 HG-JR25K1 HG-JR22K1M	HG-JR22K1MW0C (Note 2)		

Note 1. This combination increases the maximum torque from 300% to 400% of the rated torque.  
2. This will be available in the future.

## (2) 400 V class

Servo amplifier	Rotary servo motor		Linear servo motor (primary side)
	Servo motor	Servo motor with functional safety	
MR-J4-60B4-RJ MR-J4-60A4-RJ	HG-SR524 HG-JR534	HG-SR524W0C HG-JR534W0C	
MR-J4-100B4-RJ MR-J4-100A4-RJ	HG-SR1024 HG-JR534 (Note 1) HG-JR734 HG-JR1034	HG-SR1024W0C HG-JR534W0C (Note 1) HG-JR734W0C HG-JR1034W0C	
MR-J4-200B4-RJ MR-J4-200A4-RJ	HG-SR1524 HG-SR2024 HG-JR734 (Note 1) HG-JR1034 (Note 1) HG-JR1534 HG-JR2034	HG-SR1524W0C HG-SR2024W0C HG-JR734W0C (Note 1) HG-JR1034W0C (Note 1) HG-JR1534W0C HG-JR2034W0C	
MR-J4-350B4-RJ MR-J4-350A4-RJ	HG-SR3524 HG-JR1534 (Note 1) HG-JR2034 (Note 1) HG-JR3534	HG-SR3524W0C HG-JR1534W0C (Note 1) HG-JR2034W0C (Note 1) HG-JR3534W0C	
MR-J4-500B4-RJ MR-J4-500A4-RJ	HG-SR5024 HG-JR3534 (Note 1) HG-JR5034	HG-SR5024W0C HG-JR3534W0C (Note 1) HG-JR5034W0C	
MR-J4-700B4-RJ MR-J4-700A4-RJ	HG-SR7024 HG-JR5034 (Note 1) HG-JR6014 HG-JR701M4 HG-JR7034	HG-SR7024W0C HG-JR5034W0C (Note 1) HG-JR7034W0C HG-JR701M4W0C (Note 2)	
MR-J4-11KB4-RJ MR-J4-11KA4-RJ	HG-JR8014 HG-JR12K14 HG-JR11K1M4 HG-JR9034	HG-JR9034W0C HG-JR11K1M4W0C (Note 2)	
MR-J4-15KB4-RJ MR-J4-15KA4-RJ	HG-JR15K14 HG-JR15K1M4	HG-JR15K1M4W0C (Note 2)	
MR-J4-22KB4-RJ MR-J4-22KA4-RJ	HG-JR20K14 HG-JR25K14 HG-JR22K1M4	HG-JR22K1M4W0C (Note 2)	LM-FP5H-60M-1SS0

Note 1. This combination increases the maximum torque from 300% to 400% of the rated torque.  
2. This will be available in the future.

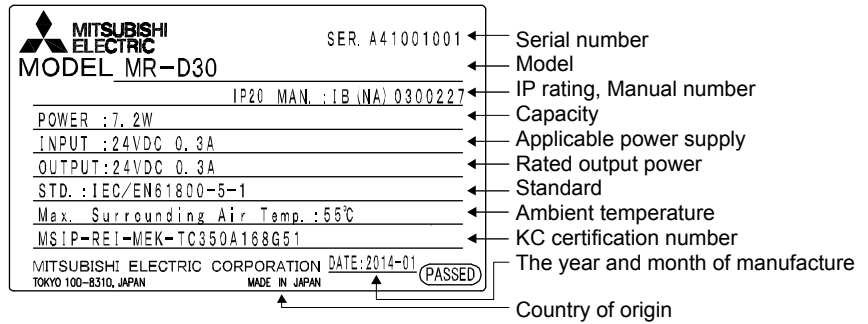
# 1. FUNCTIONS AND CONFIGURATION

## (3) 100 V class

Servo amplifier	Rotary servo motor		Linear servo motor (primary side)	Direct drive motor
	Servo motor	Servo motor with functional safety		
MR-J4-10B1-RJ MR-J4-10A1-RJ	HG-KR053 HG-KR13 HG-MR053 HG-MR13	HG-KR053W0C HG-KR13W0C		
MR-J4-20B1-RJ MR-J4-20A1-RJ	HG-KR23 HG-MR23	HG-KR23W0C	LM-U2PAB-05M-0SS0 LM-U2PBB-07M-1SS0	TM-RFM002C20
MR-J4-40B1-RJ MR-J4-40A1-RJ	HG-KR43 HG-MR43	HG-KR43W0C	LM-H3P2A-07P-BSS0 LM-H3P3A-12P-CSS0 LM-K2P1A-01M-2SS1 LM-U2PAD-10M-0SS0 LM-U2PAF-15M-0SS0	TM-RFM004C20

## 1.8 Rating plate

The following shows an example of rating plate for explanation of each item.



# 1. FUNCTIONS AND CONFIGURATION

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## 1.9 Risk assessments

To ensure safety, users should decide all the risk assessments and residual risks in the entire machine equipment. A company and individual who constructed the safety related system must take full responsibility for installation and commissioning of the system. Additionally, when complying with a European machinery directive, the system must acquire safety standards certification as a whole.

Perform all risk assessments and safe level certification to the machine or the system as a whole. It is recommended that a Certification Body final safety certification of the system be used.

The following shows residual risks concerning the safety observation function of this product.

### 1.9.1 Common residual risks in each function

- (1) At the shipment to end-users, check the settings of safety related components with programming tools and monitored/displayed contents on display and record and save the setting data concerning the safety observation function and the programming tools you used. Perform them using a check sheet, etc.
- (2) The safety will not be ensured such as in assembling machine until installing, wiring, and adjustment are completed properly. Install, wire, and adjust your system referring installation guide for each unit.
- (3) Only qualified personnel are authorized to install, start-up, repair or adjust the machines in which these components are installed. Only trained engineers should install and operate the equipment. (ISO 13849-1 Table F.1 No.5)
- (4) Separate the wiring for safety observation function from other signal wiring.  
(ISO 13849-1 Table F.1 No.1)
- (5) Protect the cables with appropriate ways (routing them in a cabinet, using a cable guard, etc.).
- (6) We recommend using a switch, relay, sensor, etc. which comply with safety standards. When using a switch, relay, sensor, etc. which do not comply with safety standards, perform a safety confirmation.
- (7) Keep the required clearance/creepage distance depending on voltage you use.
- (8) The time to a safety observation error depends on parameter settings.

# 1. FUNCTIONS AND CONFIGURATION

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## 1.9.2 Residual risks in each function

### (1) Speed monitoring (SLS)

- (a) Speed monitoring function guarantees the servo motor speed, but it does not guarantee the actual machine safety speed. Set parameters so that the safe speed of the machine is the same as the safety speed of the specified motor.
- (b) Check if the speed of the monitored servo axis is the same as the actual speed by using a tachometer, etc. considering the speed includes an error caused by the command and encoder resolution.
- (c) The defect of the mechanical section such as slid of shaft and wanting of a timing belt, etc. is not covered. Be sure to eliminate the risk of mechanical section before operation.
- (d) Speed monitoring error detection time is set to 1 ms. Error in shorter than this time is not detected.
- (e) After speed is over the limit, safety observation error (shut-off signal off) does not occur during the speed error detection time set by the parameter. Make sure that safety can be ensured during this period.

### (2) Safe speed monitor (SSM)

When SSM is used as a restart trigger, perform it according to IEC 60204-1.

### (3) Safe brake control (SBC)


This function guarantees only that power to mechanic break is properly supplied and abrasion of the brake cannot be detected. Check this function regularly that the mechanic brake can operate.



## 2. INSTALLATION

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### 2. INSTALLATION

 **WARNING** ● To prevent electric shock, ground each equipment securely.

 **CAUTION**

- Stacking in excess of the specified number of product packages is not allowed.
- Install the equipment on incombustible material. Installing them directly or close to combustibles will lead to a fire.
- Install the servo amplifier and the servo motor in a load-bearing place in accordance with the Instruction Manual.
- Do not get on or put heavy load on the equipment. Otherwise, it may cause injury.
- Use the equipment within the specified environment. For the environment, refer to section 1.5.
- Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier and MR-D30.
- Do not block the intake and exhaust areas of the servo amplifier and MR-D30. Otherwise, it may cause a malfunction.
- Do not drop or strike the servo amplifier and MR-D30. Isolate them from all impact loads.
- Do not install or operate the servo amplifier and MR-D30 which have been damaged or have any parts missing.
- When the product has been stored for an extended period of time, contact your local sales office.
- When handling the servo amplifier and MR-D30, be careful about the edged parts such as corners of them.
- The servo amplifier and MR-D30 must be installed in a metal cabinet.
- When fumigants that contain halogen materials such as fluorine, chlorine, bromine, and iodine are used for disinfecting and protecting wooden packaging from insects, they cause malfunction when entering our products. Please take necessary precautions to ensure that remaining materials from fumigant do not enter our products, or treat packaging with methods other than fumigation (heat method). Additionally, disinfect and protect wood from insects before packing products.


**POINT**

- When pulling out CNP1, CNP2, and CNP3 connectors of 200 V/100 V class servo amplifiers of 600 W or lower, pull out the CN3 connector beforehand.



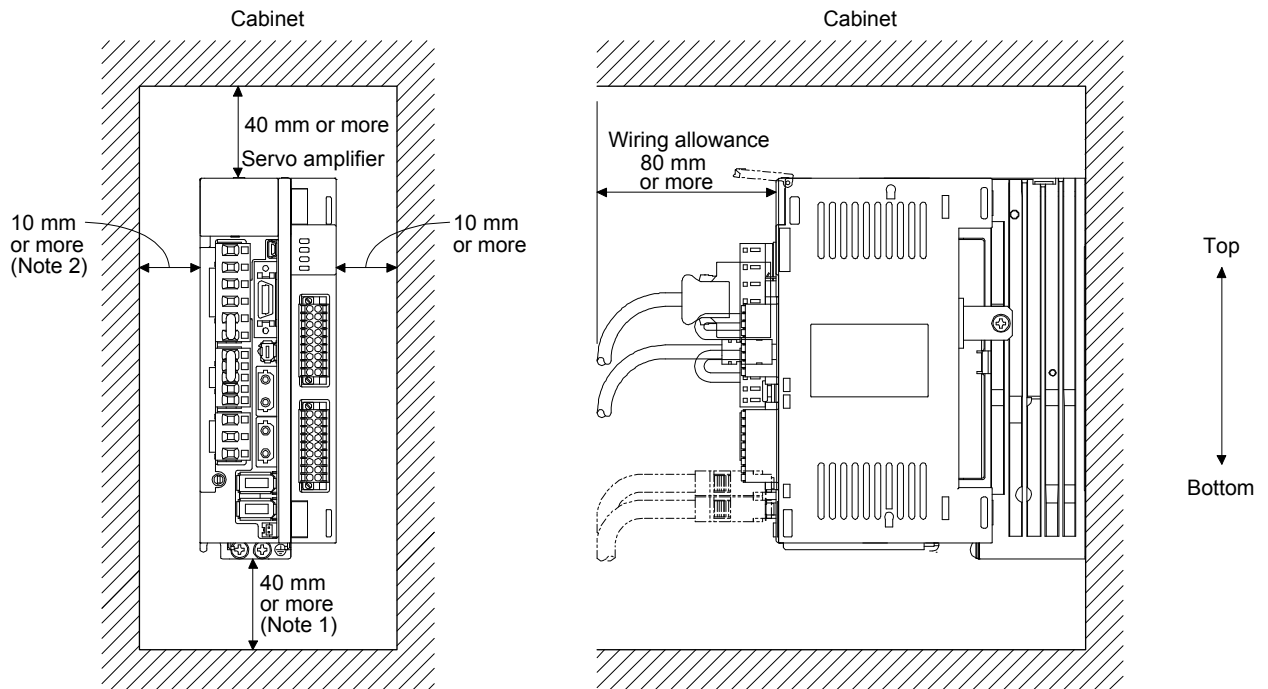
## 2. INSTALLATION

### 2.1 Installation direction and clearances

 <b>CAUTION</b>	● The equipment must be installed in the specified direction. Otherwise, it may cause a malfunction.
	● Leave specified clearances between the servo amplifier/MR-D30 and the cabinet walls or other equipment. Otherwise, it may cause a malfunction.

#### (1) Installation clearances of the servo amplifier

##### (a) Installation of one servo amplifier



Note 1. For the 11 kW to 22 kW servo amplifiers, the clearance between the bottom and the ground will be 120 mm or more.

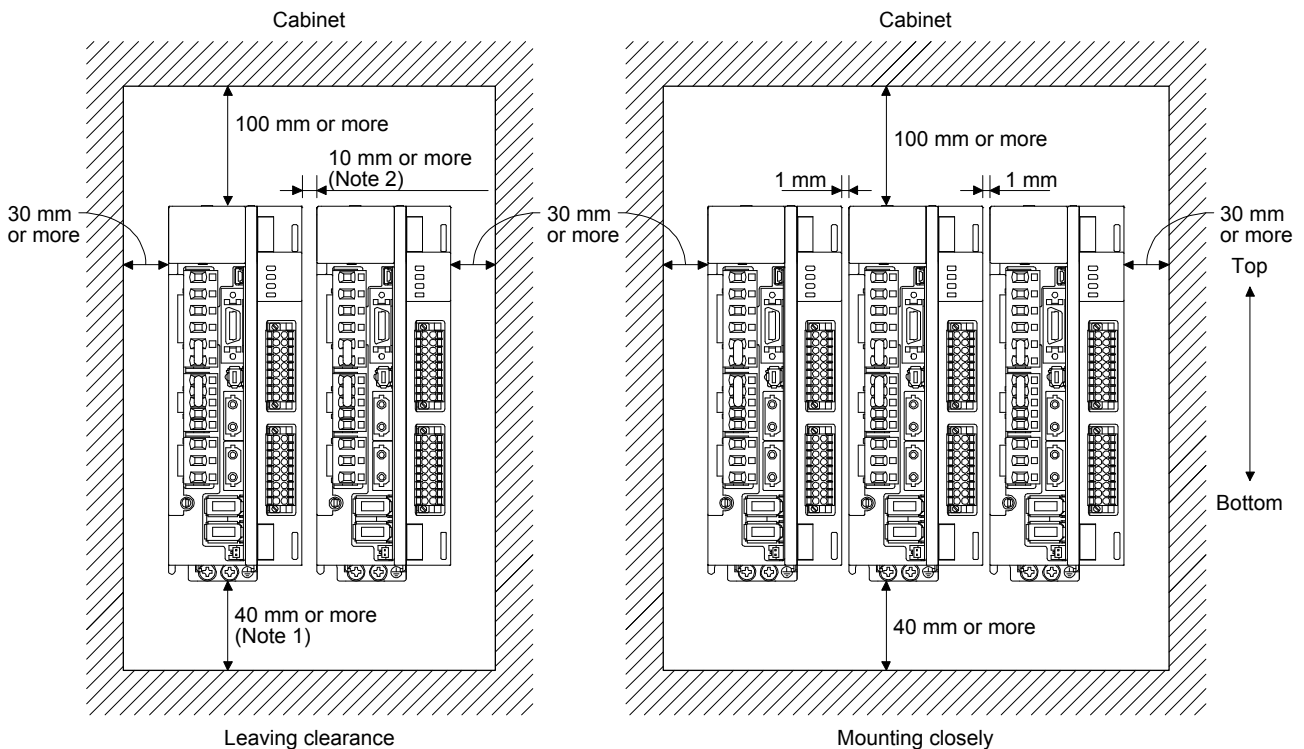
2. For the MR-J4-500\_-RJ, the clearance between the left side and wall will be 25 mm or more.

## 2. INSTALLATION

### (b) Installation of two or more servo amplifiers

POINT
<ul style="list-style-type: none"> <li>● Close mounting is possible depending on the capacity of the servo amplifier. Refer to section 1.3.1 of "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual" or section 1.3 of "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual" for possible/impossible of close mounting.</li> <li>● When mounting the servo amplifiers closely, do not install the servo amplifier whose depth is larger than that of the left side servo amplifier since CNP1, CNP2, and CNP3 connectors cannot be disconnected.</li> </ul>

Leave a large clearance between the top of the servo amplifier and the cabinet walls, and install a cooling fan to prevent the internal temperature of the cabinet from exceeding the environment. When mounting the servo amplifiers closely, leave a clearance of 1 mm between the adjacent servo amplifiers in consideration of mounting tolerances. In this case, keep the ambient temperature within 0 °C to 45 °C or use the servo amplifier with 75% or less of the effective load ratio.



- Note 1. For the 11 kW to 22 kW servo amplifiers, the clearance between the bottom and the ground will be 120 mm or more.  
 2. When you install MR-J4-500\_-RJ on the right side, the clearance between the left side and the wall will be 25 mm or more.

### (2) Others

When using heat generating equipment such as the regenerative option, install them with full consideration of heat generation so that the servo amplifier is not affected. Install the servo amplifier on a perpendicular wall in the correct vertical direction.

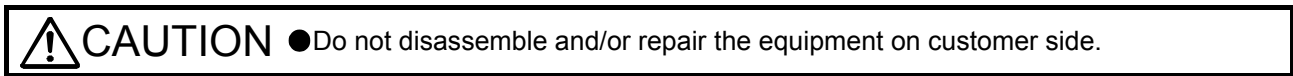
## 2. INSTALLATION

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### 2.2 Keep out foreign materials

- (1) When drilling in the cabinet, prevent drill chips and wire fragments from entering MR-D30 and servo amplifier.
- (2) Prevent oil, water, metallic dust, etc. from entering the servo amplifier through openings in the cabinet or a cooling fan installed on the ceiling.
- (3) When installing the cabinet in a place where toxic gas, dirt and dust exist, conduct an air purge (force clean air into the cabinet from outside to make the internal pressure higher than the external pressure) to prevent such materials from entering the cabinet.

### 2.3 Inspection items



It is recommended that the following points periodically be checked.

- (1) Check for loose terminal block screws. Retighten any loose screws.
- (2) Check the cables and the like for scratches or cracks. Inspect them periodically according to operating conditions especially when the servo motor is movable.
- (3) Check that the connector is securely connected to the servo amplifier.
- (4) Check that the wires are not coming out from the connector.
- (5) Check for dust accumulation on the servo amplifier.
- (6) Check for unusual noise generated from the servo amplifier.

### 2.4 Parts having service lives

MR-D30 has no parts for replacement.

### 2.5 Maintenance

<b>POINT</b>
● When you order a repair, please return the MR-D30 with a note of No. of occurred alarm.

The parameters of MR-D30 are protected by passwords to prevent incorrect settings. The parameters of MR-D30 which are returned for fixing/investigation will be initialized. The parameters and other settings need to be set again.

Changing the combination of MR-D30 and MR-J4 servo amplifier will trigger [AL. 7A.4 Functional safety unit combination error (safety observation function)] and the safety observation function you set will not operate.

## 2. INSTALLATION

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### 2.6 Installation and removal of MR-D30

#### WARNING

- Before installing or removing MR-D30, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier.

#### CAUTION

- Avoid installing and removing MR-D30 repeatedly. Any contact failure of the connector may be caused.
- Avoid unsealing MR-D30 to be free of dust and dirt against the connector except installing. Make sure to use the pre-packing when storing.
- Avoid using MR-D30 of which the hook and knobs for fixing are damaged. Any contact failure of the connector may be caused.
- When mounting/dismounting MR-D30 to/from MR-J4-500\_-RJ to MR-J4-22K\_-RJ and MR-J4-350\_4-RJ to MR-J4-22K\_4-RJ servo amplifiers, avoid dropping out the installing screw inside it. Otherwise, it may cause a malfunction.
- When mounting MR-D30 to MR-J4-500\_-RJ to MR-J4-22K\_-RJ and MR-J4-350\_4-RJ to MR-J4-22K\_4-RJ servo amplifiers, avoid damaging the control board by the fixing plate. Otherwise, it may cause a malfunction.
- Make sure to tighten MR-D30 with the enclosed installing screws when installing.

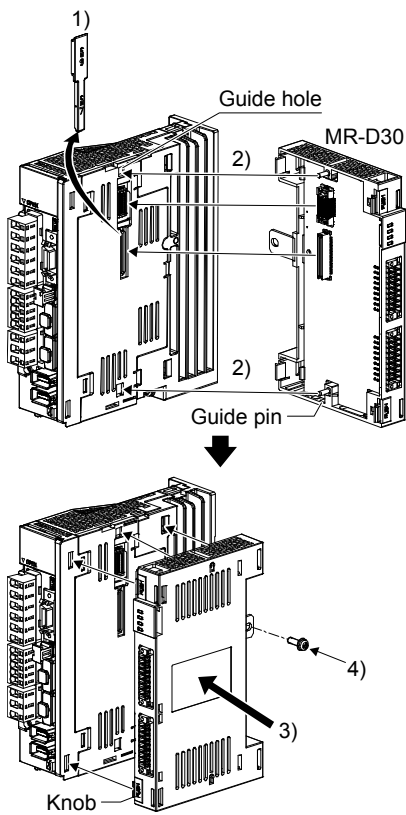
#### POINT

- The internal circuits of the servo amplifier and MR-D30 may be damaged by static electricity. Always take the following precautions.
  - Ground human body and work bench.
  - Do not touch the conductive areas, such as connector pins and electrical parts, directly by hand.

## 2. INSTALLATION

### (1) MR-J4-200\_(4)-RJ or less and MR-J4-350\_-RJ

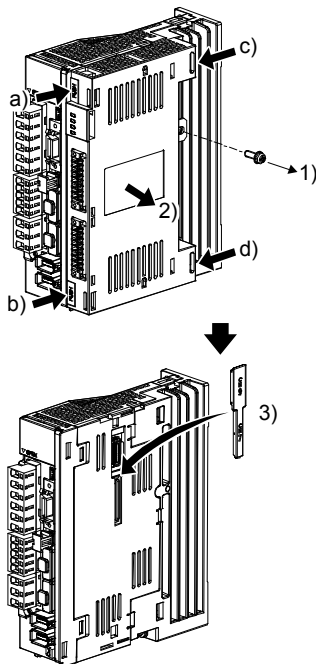
#### (a) Installation of MR-D30



- 1) Remove the covers of CN7 and CN9 connectors. Make sure to store the removed cover.
- 2) Find the guide hole on the side of the servo amplifier. To the guide hole, insert the MR-D30's guide pins.

- 3) Push the four corners of the side of MR-D30 simultaneously to the servo amplifier until the four knobs click so that CN7 and CN9 connectors are connected straight.
- 4) Tighten the unit with the enclosed installing screw (M4).

#### (b) Removal of MR-D30



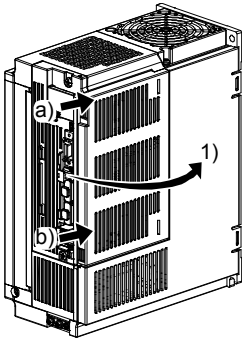
- 1) Remove the installing screw.
- 2) Keep pushing the knobs ( a ), b), c), d)), pull out MR-D30 to the arrow direction. Avoid pulling out MR-D30 while it is tightened with the installation screw.

- 3) After removing MR-D30, make sure to cap the CN7 and CN9 connectors to avoid dust and dirt.

## 2. INSTALLATION

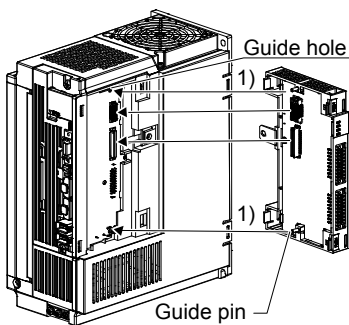
(2) MR-J4-500\_-RJ to MR-J4-700\_-RJ and MR-J4-350\_4-RJ to MR-J4-700\_4-RJ

(a) Removal of the side cover

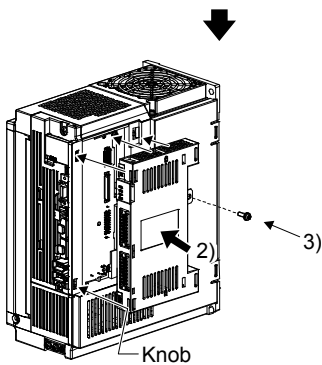


- 1) Keep pushing the knobs ( a ) , b ) ) and pull out the side cover to the arrow direction.

(b) Installation of MR-D30

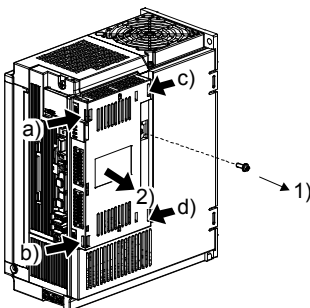


- 1) Find the guide hole on the side of the servo amplifier. To the guide hole, insert the MR-D30's guide pins.



- 2) Push the four corners of the side of MR-D30 simultaneously to the servo amplifier until the four knobs click so that CN7 and CN9 connectors are connected straight.
- 3) Tighten the unit with the enclosed installing screw (M4).

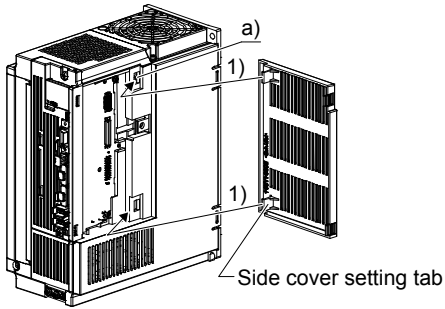
(c) Removal of MR-D30



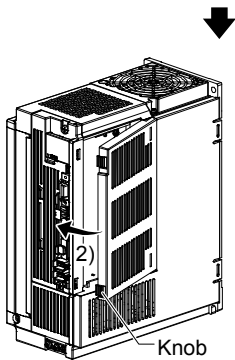
- 1) Remove the installing screw.
- 2) Keep pushing the knobs ( a ) , b ) , c ) , d ) , pull out MR-D30 to the arrow direction. Avoid pulling out MR-D30 while it is tightened with the installation screw.

## 2. INSTALLATION

### (d) Installation of the side cover



1) Insert the side cover setting tabs into the sockets a) of servo amplifier.



2) Push the side cover at the supporting point a) until the knobs click.

### (3) MR-J4-11K\_(4)-RJ to MR-J4-22K\_(4)-RJ

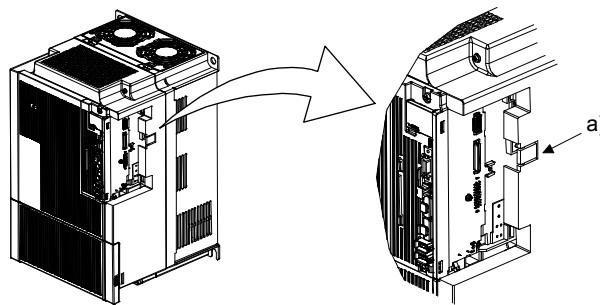


**CAUTION** ● Avoid touching any remained burr after cutting off the part a) of the case. Otherwise, it may cause injury.

The installing screw holes for the MR-J4-11K\_(4)-RJ to MR-J4-22K\_(4)-RJ are covered and the screw hole for mounting is not shown at shipping. When installing the unit for the first time, cut off the part a) of the case after removing the side cover.

When cutting off the part a), avoid damaging the case of the servo amplifier. After cutting off it, inside of the servo amplifier has been exposed even though the side cover and the unit are installed. Avoid unwanted parts from entering through the opened area into the servo amplifier.

For installing or removing the unit, refer to (2) in this section. The side cover structure is the same for MR-J4-11K\_(4)-RJ to MR-J4-22K\_(4)-RJ and for this unit. Install or remove the side cover with the same way as for the unit.



### 3. SIGNALS AND WIRING

#### 3. SIGNALS AND WIRING

**! WARNING**

- Any person who is involved in wiring should be fully competent to do the work.
- Before wiring, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier.
- Ground the servo amplifier and servo motor securely.
- Do not attempt to wire the servo amplifier and servo motor until they have been installed. Otherwise, it may cause an electric shock.
- The cables should not be damaged, stressed, loaded, or pinched. Otherwise, it may cause an electric shock.
- To avoid an electric shock, insulate the connections of the power supply terminals.

**! CAUTION**

- Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly, resulting in injury.
- Connect cables to the correct terminals. Otherwise, a burst, damage, etc. may occur.
- Ensure that polarity (+/-) is correct. Otherwise, a burst, damage, etc. may occur.
- The surge absorbing diode installed to the DC relay for control output should be fitted in the specified direction. Otherwise, the emergency stop and other protective circuits may not operate.

MR-D30  
DO4NB  
DO4PB  
24 V DC  
RA

For sink output interface

MR-D30  
DO24VA/  
DO24VB/  
DO4PA  
Control output signal  
24 V DC  
RA

For source output interface

- Use a noise filter, etc. to minimize the influence of electromagnetic interference. Electromagnetic interference may be given to the electronic equipment used near the servo amplifier.
- Do not install a power capacitor, surge killer or radio noise filter (optional FR-BIF-(H)) with the power line of the servo motor.
- When using a regenerative resistor, switch power off with the alarm signal. Otherwise, a transistor fault or the like may overheat the regenerative resistor, causing a fire.
- Do not modify the equipment.
- Connect the servo amplifier power output (U, V, and W) to the servo motor power input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.

Servo amplifier  
U  
V  
W

Servo motor  
U  
V  
W  
M

Servo amplifier  
U  
V  
W

Servo motor  
U  
V  
W  
M

- Connecting a servo motor of the wrong axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.



### 3. SIGNALS AND WIRING

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POINT																																													
● The following abbreviations do not indicate functions but hardware abbreviations (H/W abbreviation) meaning connector pin No.																																													
<table border="1"><thead><tr><th>H/W abbreviation</th><th>Pin No.</th></tr></thead><tbody><tr><td>DI1A</td><td>CN10A-4</td></tr><tr><td>DI2A</td><td>CN10A-13</td></tr><tr><td>DI3A</td><td>CN10A-5</td></tr><tr><td>DI4A</td><td>CN10A-14</td></tr><tr><td>DI5A</td><td>CN10A-6</td></tr><tr><td>DI6A</td><td>CN10A-15</td></tr><tr><td>DI1B</td><td>CN10B-4</td></tr><tr><td>DI2B</td><td>CN10B-13</td></tr><tr><td>DI3B</td><td>CN10B-5</td></tr><tr><td>DI4B</td><td>CN10B-14</td></tr><tr><td>DI5B</td><td>CN10B-6</td></tr><tr><td>DI6B</td><td>CN10B-15</td></tr></tbody></table>	H/W abbreviation	Pin No.	DI1A	CN10A-4	DI2A	CN10A-13	DI3A	CN10A-5	DI4A	CN10A-14	DI5A	CN10A-6	DI6A	CN10A-15	DI1B	CN10B-4	DI2B	CN10B-13	DI3B	CN10B-5	DI4B	CN10B-14	DI5B	CN10B-6	DI6B	CN10B-15	<table border="1"><thead><tr><th>H/W abbreviation</th><th>Pin No.</th></tr></thead><tbody><tr><td>DO1A</td><td>CN10A-8</td></tr><tr><td>DO2A</td><td>CN10A-17</td></tr><tr><td>DO3A</td><td>CN10A-9</td></tr><tr><td>DO4NA</td><td>CN10A-18</td></tr><tr><td>DO1B</td><td>CN10B-8</td></tr><tr><td>DO2B</td><td>CN10B-17</td></tr><tr><td>DO3B</td><td>CN10B-9</td></tr><tr><td>DO4PB</td><td>CN10B-16</td></tr></tbody></table>	H/W abbreviation	Pin No.	DO1A	CN10A-8	DO2A	CN10A-17	DO3A	CN10A-9	DO4NA	CN10A-18	DO1B	CN10B-8	DO2B	CN10B-17	DO3B	CN10B-9	DO4PB	CN10B-16
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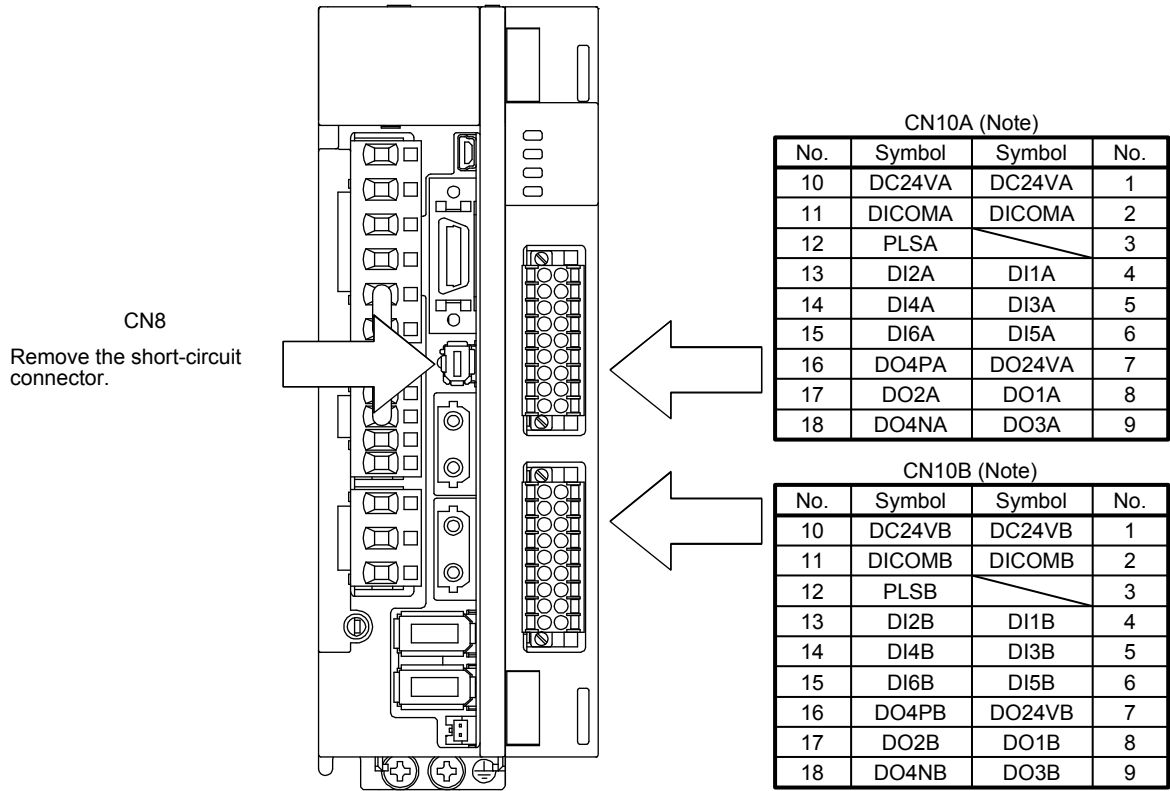
For signals and wiring of servo amplifiers, refer to "MR-J4-\_B\_(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-\_A\_(-RJ) Servo Amplifier Instruction Manual".

### 3. SIGNALS AND WIRING

#### 3.1 Connectors and pin assignment

The servo amplifier front view shown is an example of the MR-J4-20B-RJ or less. Refer to section 4.4.1 for functions that can be assigned to DI1\_ to DI6\_, and section 4.4.2 for DO1\_ to DO4\_.

Refer to section 3.4 of "MR-J4-\_B\_(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-\_A\_(-RJ) Servo Amplifier Instruction Manual" for connectors other than CN10A and CN10B.



Note. DO4PA (CN10A-16), DO4NA (CN10A-18), DO4PB (CN10B-16), and DO4NB (CN10B-18) are not supported by MR-D30 manufactured in September, 2014 or earlier. Do not connect anything to the pins.

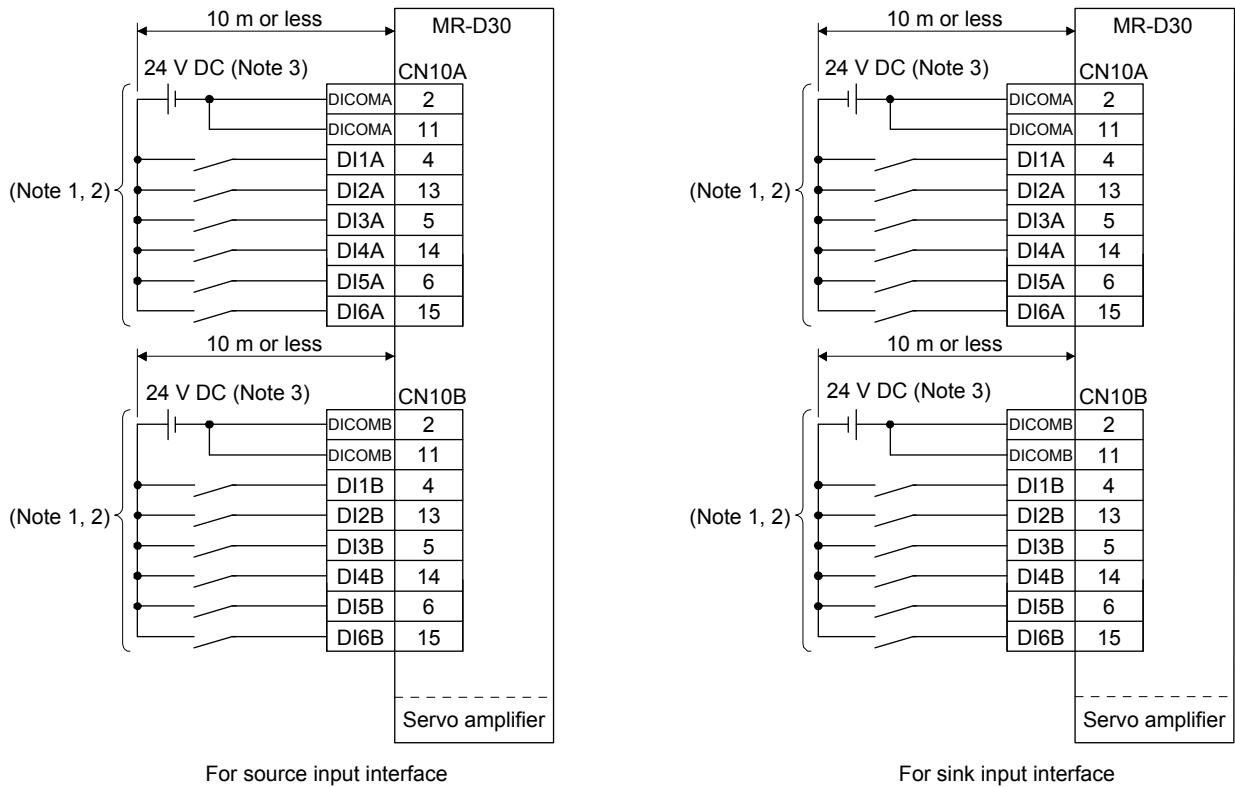
### 3. SIGNALS AND WIRING

#### 3.2 I/O signal connection example

Consider 15 ms or lower delay time during input (DI1A to DI6A and DI1B to DI6B) to output (DO1A to DO4A and DO1B to DO4B) when connecting cascade.

Refer to section 3.2 of "MR-J4-\_B\_(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-\_A\_(-RJ) Servo Amplifier Instruction Manual" for connection examples of servo amplifiers.

#### 3.2.1 Input signal



- Note 1. Separate all the external wires by two types, CN10A and CN10B.  
 Note 2. Assign each input device to the following combinations of connector and pin. For details of each device, refer to section 4.4.1 and 4.4.2.

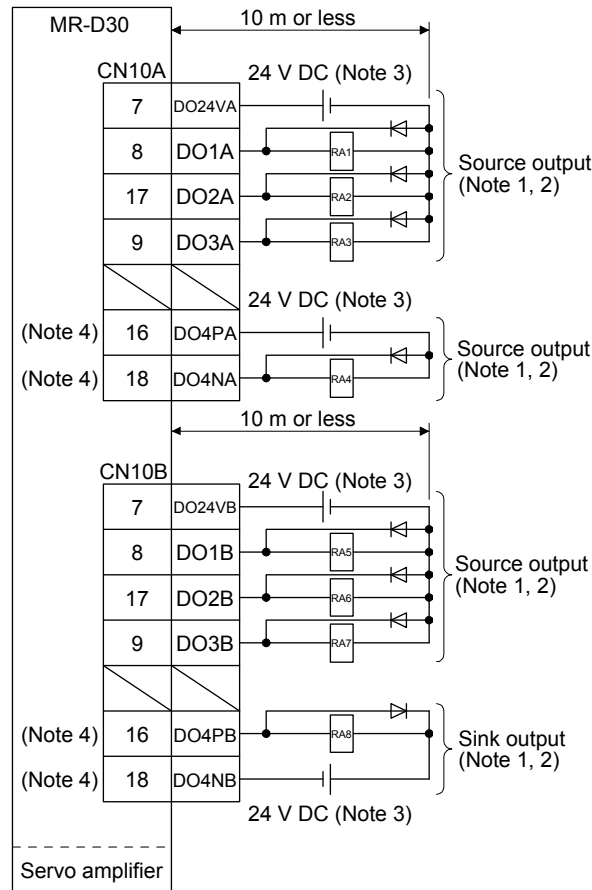
Combination of connector and pin for input
DI1A (CN10A-4)/DI1B (CN10B-4)
DI2A (CN10A-13)/DI2B (CN10B-13)
DI3A (CN10A-5)/DI3B (CN10B-5)
DI4A (CN10A-14)/DI4B (CN10B-14)
DI5A (CN10A-6)/DI5B (CN10B-6)
DI6A (CN10A-15)/DI6B (CN10B-15)

3. Supply 24 V DC  $\pm$  10% to interfaces from outside. When all the I/O points are used, the required current capacity is 0.8 A in total. The current capacity can be decreased by reducing the number of I/O points. Refer to section 3.3.1 that gives the current value necessary for the interface. The illustration of the 24 V DC power supply is divided between input signal and output signal for convenience. However, they can be configured by one.

### 3. SIGNALS AND WIRING

#### 3.2.2 Output signal

DO1A to DO3A, DO1B to DO3B, and DO4NA can be used as source output. DO4PB can be used as sink output.



- Note 1. Separate all the external wires by two types, CN10A and CN10B. Be sure to wire them separately by the two types for power supply for IO (24 V DC, 0 V common). Do not mix them when wiring.
- Note 2. Assign each output device to the following combinations of connector and pin. For details of each device, refer to section 4.4.1 and 4.4.2.

Combination of connector and pin for output
DO1A (CN10A-8)/DO1B (CN10B-8)
DO2A (CN10A-17)/DO2B (CN10B-17)
DO3A (CN10A-9)/DO3B (CN10B-9)
DO4NA (CN10A-18)/DO4PB (CN10B-16)

- Note 3. Supply 24 V DC  $\pm$  10% to interfaces from outside. When all the I/O points are used, the required current capacity is 0.8 A in total. The current capacity can be decreased by reducing the number of I/O points. Refer to section 3.3.1 that gives the current value necessary for the interface. The illustration of the 24 V DC power supply is divided between input signal and output signal for convenience. However, they can be configured by one.
- Note 4. DO4PA (CN10A-16), DO4NA (CN10A-18), DO4PB (CN10B-16), and DO4NB (CN10B-18) are not supported by MR-D30 manufactured in September, 2014 or earlier. Do not connect anything to the pins.

### 3. SIGNALS AND WIRING

#### 3.3 Connection of I/O interface

The following shows a connection process of I/O interface. Refer to this section and make connection with the external device.

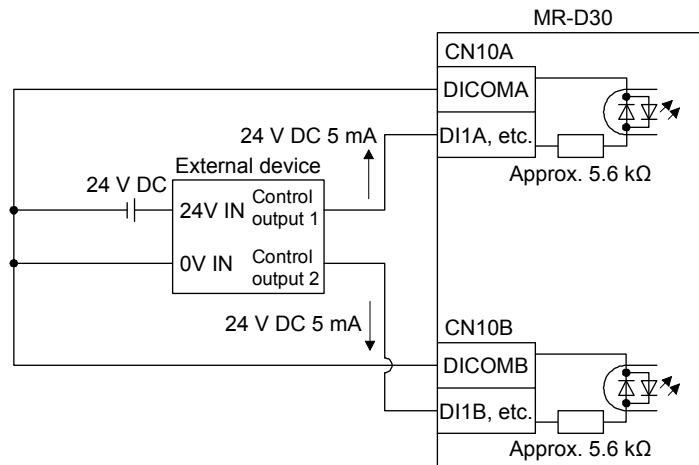
##### 3.3.1 Source output

This is an input circuit in which the anode of the photocoupler is the input terminal. Transmit signals from source (open collector) type transistor output, relay switch, etc.

The wirings differ by device for connecting and executing test pulse diagnosis and not executing test pulse diagnosis. Refer to section 4.4.1 for the test pulse diagnosis. (Rated current: 5 mA, maximum current: 10 mA)

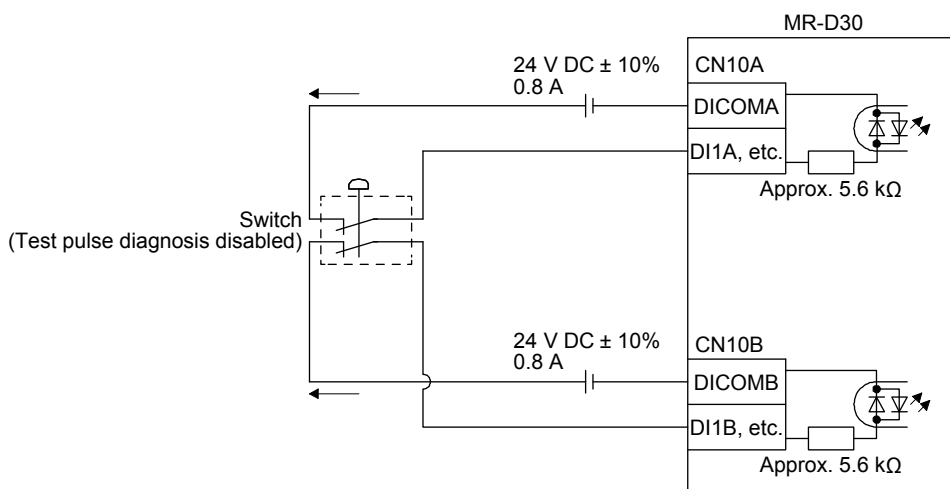
##### (1) Connection of external device

Connect the output signal of external device to DI \_\_.



##### (2) Switch connection (not executing a test pulse diagnosis)

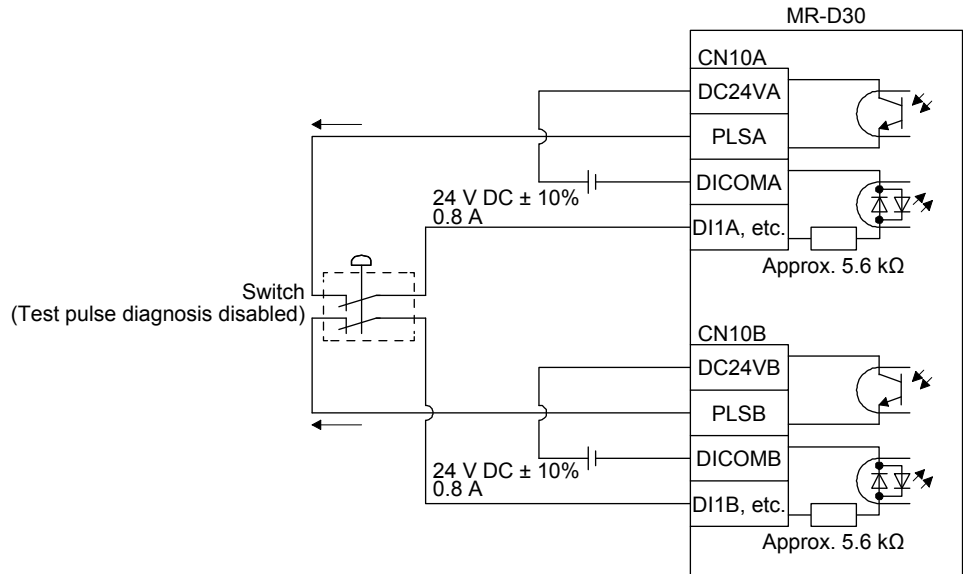
Wire without using PLSA and PLSB.



### 3. SIGNALS AND WIRING

(3) Switch connection (executing a test pulse diagnosis)

The pulses for diagnosis will output from PLSA and PLSB. Wire so that the pulse signals outputted from PLSA and PLSB pass through the switch.



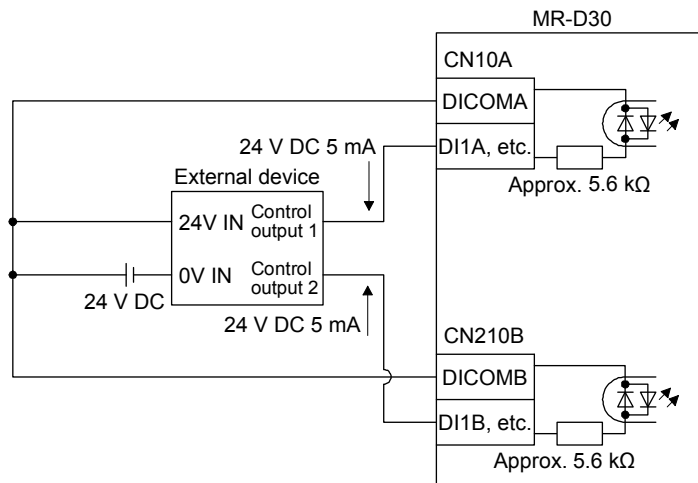
#### 3.3.2 Sink input

This is an input circuit whose photocoupler cathode side is input terminal. Transmit signals from sink (open collector) type transistor output, relay switch, etc.

The wirings differ by device for connecting and executing test pulse diagnosis and not executing test pulse diagnosis. Refer to section 4.4.1 for the test pulse diagnosis. (Rated current: 5 mA, maximum current: 10 mA)

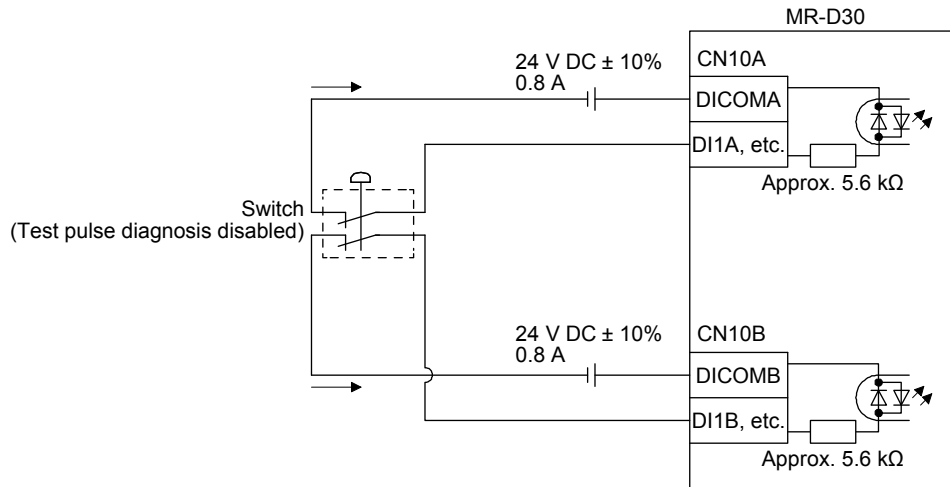
(1) Connection of external device

Connect the output signal of external device to DI \_\_.

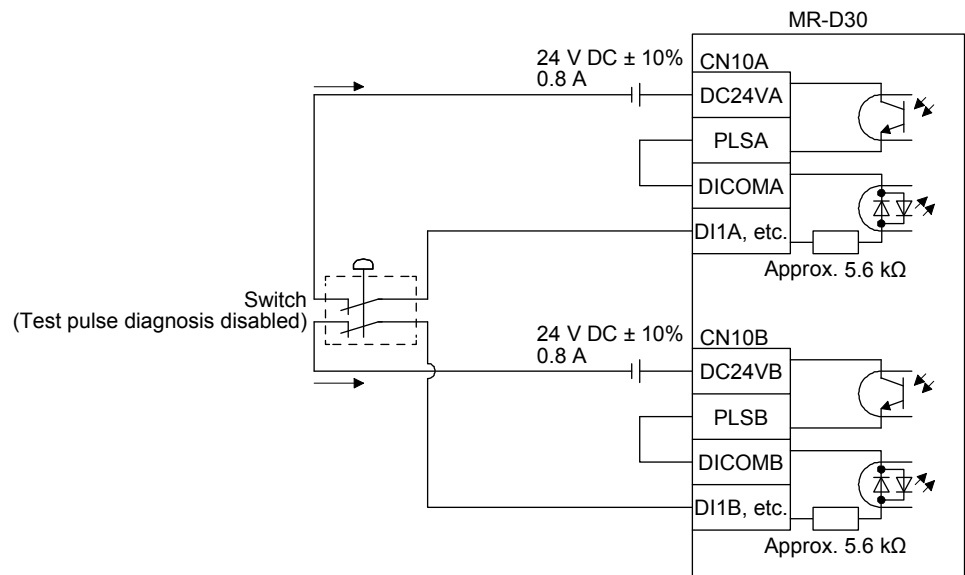


### 3. SIGNALS AND WIRING

- (2) Switch connection (not executing a test pulse diagnosis)  
Wire without using PLSA and PLSB.



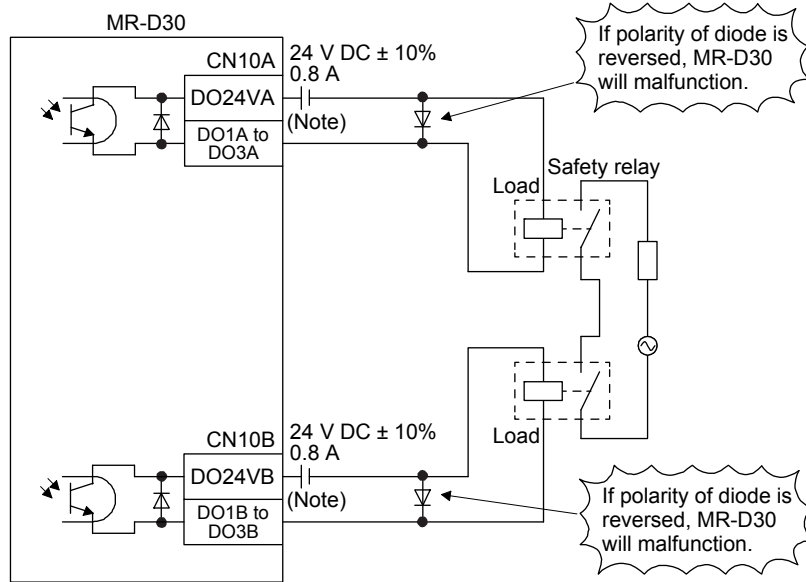
- (3) Switch connection (executing a test pulse diagnosis)  
The pulses for diagnosis will output from PLSA and PLSB. Wire so that the pulse signals outputted from PLSA and PLSB pass through the switch.



### 3. SIGNALS AND WIRING

#### 3.3.3 DO1\_ to DO3\_ source output

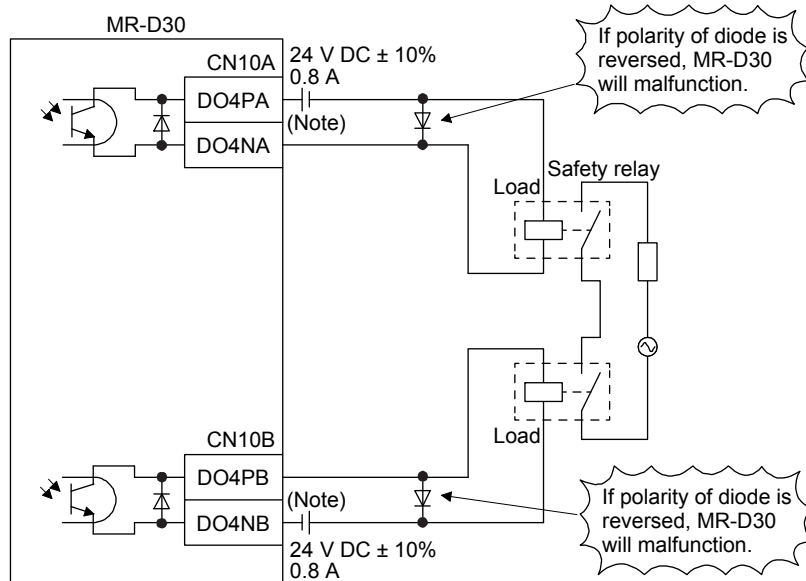
When the output transistor is turned on, the current will flow from the output terminal to a load. A lamp, relay, or photocoupler can be driven. Install a diode (D) for an inductive load, or install an inrush current suppressing resistor (R) for a lamp load. (Rated current: 5 mA to 40 mA, maximum current: 50 mA, inrush current: 100 mA or less) A maximum of 2.4 V voltage drop occurs in MR-D30.



Note. If polarity of power is reversed, the safety relay may malfunction.

#### 3.3.4 DO4NA source output and DO4NB sink output

DO4NA as source output and DO4PB as sink output can be combined to use. As for DO4NA, when the output transistor is turned on, the current will flow from the output terminal to a load. As for DO4PB, when the output transistor is turned on, the current will flow from a load to the output terminal. A lamp, relay, or photocoupler can be driven. Install a diode (D) for an inductive load, or install an inrush current suppressing resistor (R) for a lamp load. (Rated current: 5 mA to 40 mA, maximum current: 50 mA, inrush current: 100 mA or less) A maximum of 2.4 V voltage drop occurs in MR-D30.



Note. If polarity of power is reversed, the safety relay may malfunction.

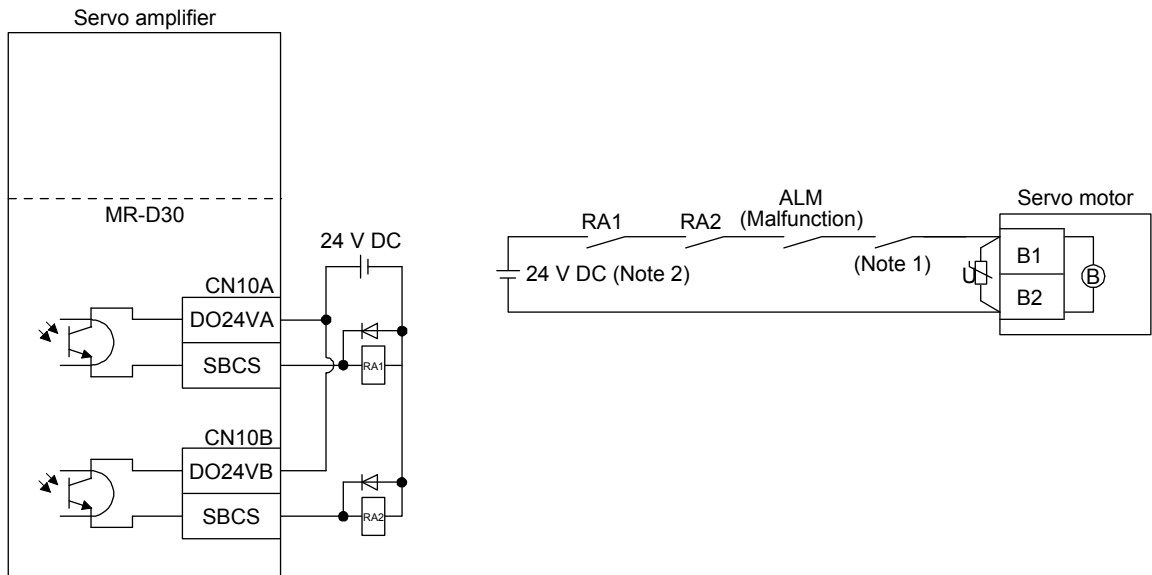


### 3. SIGNALS AND WIRING

#### 3.4 Wiring for SBC output

SBCS (SBC output) can be used by connecting to the electromagnetic brake on the servo motor. Wire it so that the electromagnetic brake operates when SBCS (SBC output) turns off. Using MBR of servo amplifier (electromagnetic brake interlock) is not necessary.

Refer to section 4.5.6 for the operation sequence for when using SBC function.



- Note
1. Create the circuit in order to shut off by interlocking with the emergency stop switch.
  2. Do not use the 24 V DC interface power supply for the electromagnetic brake.

### 3. SIGNALS AND WIRING

#### 3.5 Noise reduction techniques

##### (1) Grounding shield of shielded cable

The following show measures against malfunctions of MR-D30 and servo amplifier for when a device which generates excessive noise is set around MR-D30.

Ground a shield of the shielded cable by the side of MR-D30 and be careful for the cable after grounding should not be affected by electromagnetic induction of the cable before grounding.

Ground the shielded part whose insulator was partly removed to a wide face of the cabinet. You can also use clamp metal parts as figure 3.2. Mask the paint work which touches the clamp metal part of the inside cabinet when using them.

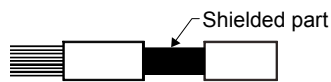


Figure 3.1 Exposing shielded part

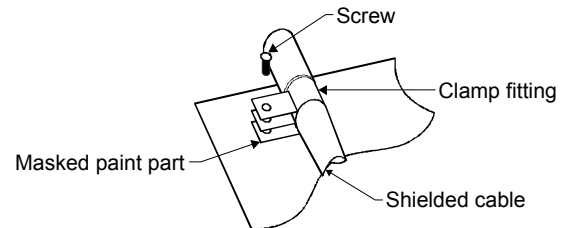
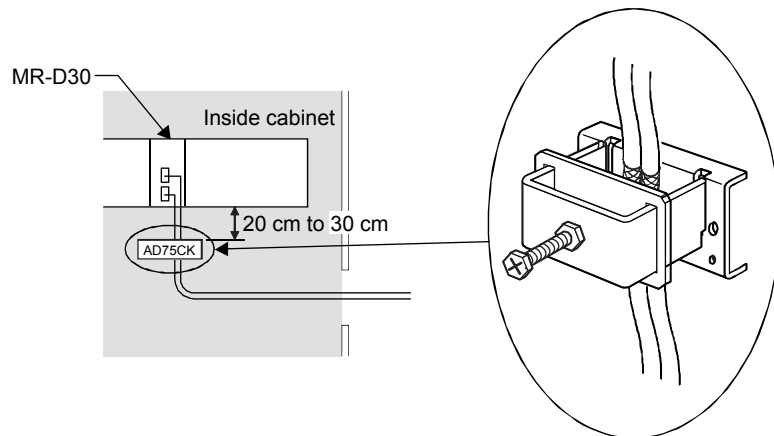


Figure 3.2 Grounding shield

Ground the shield of the cable for input signals close to MR-D30 (20 cm to 30 cm or shorter).

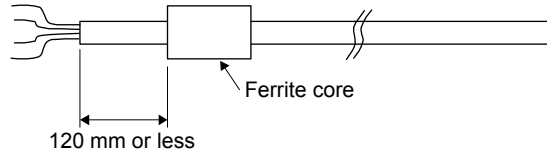


### 3. SIGNALS AND WIRING

#### (2) Ferrite core

A ferrite core is effective for noise reduction to approximately 10 MHz band of conduction noise and from 30 MHz to 100 MHz band of radiated noise. When shielding effectiveness of a shielded cable to outside cabinet is not enough or conduction noise from a power supply line should be suppressed, it is recommended to install a ferrite core.

Install a ferrite core as the part of the cable in the following illustration. If the part of installation is not proper, the ferrite core will not be effective.

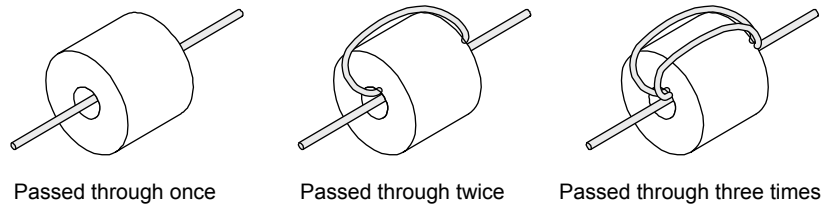


Installing ferrite cores to the input signal wires and cables will achieve more noise suppression effect. The following shows an example.

Model	Impedance [ $\Omega$ ] (Note)	
	ZCAT3035-1330 (TDK)	10 MHz to 100 MHz
	80	150

Note. The values include wires (reference values) and not guaranteed values.

Additionally, ESD-SR-250 (NEC TOKIN), E04SRM563218 (SEIWA ELECTRIC), etc. are also found. The more the number of passing times through a ferrite core increases, the more effective it is. It is recommended to pass it through twice or more.



### 3. SIGNALS AND WIRING

#### 3.6 Signal explanations

##### 3.6.1 Input device

Assign the devices to DI1\_ to DI6\_ with [Pr. PSD02 Input device selection DI1] to [Pr. PSD07 Input device selection DI6]. Refer to section 4.4.1 for details.

Using the drive safety integrated motion controller enables you to input through SSCNET III/H.

Device	Symbol	Connector and pin No.	Function	Input pin status which the function turns to be enabled
STO command	STOC	CN10A-4 CN10A-5	The STO function operates by the STO command. Refer to section 4.5.1 for details of the STO function.	Opened
SS1 command	SS1C	CN10A-6 CN10A-13	The SS1 function operates by the SS1 command. Refer to section 4.5.2 for details of the SS1 function.	Opened
SS2 command	SS2C	CN10A-14 CN10A-15	The SS2/SOS functions operate by the SS2 command. Refer to section 4.5.3 for details of the SS1 function.	Opened
SLS1 command	SLS1C	CN10B-4 CN10B-5 CN10B-6	The SLS function 1 operates by the SLS1 command. [Pr. PSA07 SLS deceleration monitoring time 1] and [Pr. PSA11 SLS speed 1] are used as parameters. Refer to section 4.5.4 for details of the SLS function.	Opened
SLS2 command	SLS2C	CN10B-13 CN10B-14 CN10B-15	The SLS function 2 operates by the SLS2 command. [Pr. PSA08 SLS deceleration monitoring time 2] and [Pr. PSA12 SLS speed 2] are used as parameters. Refer to section 4.5.4 for details of the SLS function.	Opened
SLS3 command	SLS3C		The SLS function 3 operates by the SLS3 command. [Pr. PSA09 SLS deceleration monitoring time 3] and [Pr. PSA13 SLS speed 3] are used as parameters. Refer to section 4.5.4 for details of the SLS function.	Opened
SLS4 command	SLS4C		The SLS function 4 operates by the SLS4 command. [Pr. PSA10 SLS deceleration monitoring time 4] and [Pr. PSA14 SLS speed 4] are used as parameters. Refer to section 4.5.4 for details of the SLS function.	Opened
Test pulse output A	PLSA	CN10A-12	Outputs test pulses for external wiring diagnosis.	
Test pulse output B	PLSB	CN10B-12	Outputs test pulses for external wiring diagnosis.	

### 3. SIGNALS AND WIRING

#### 3.6.2 Output device

The status monitor (SM) of the safety observation function is output from DO1\_ to DO4\_. The devices can be assigned to DO1\_ to DO4\_ with [Pr. PSD08 Output device selection DO1] to [Pr. PSD11 Output device selection DO4]. Refer to section 4.4.2 for details. Using the drive safety integrated motion controller enables you to output through SSCNET III/H. Then, DO1\_ to DO4\_ can be used simultaneously.

Device	Symbol	Connector and pin No.	Function	Output pin status during operation
SSM output	SSMS	CN10A-8 CN10A-9 CN10A-17	Indicates that the servo motor speed is at SLS speed or less while speed observation is operating by SLS function. Refer to section 4.5.5 for details.	Closed
SBC output	SBCS	CN10A-18 CN10B-8	Outputs a control signal of the electromagnetic brake. Refer to section 4.5.6 for details.	Opened
STO output	STOS	CN10B-9 CN10B-17	This is a monitor output signal meaning that the STO function is operating. Refer to section 4.5.1 for details.	Opened
SOS output	SOSS	CN10B-16	This is a monitor output signal meaning that the servo motor in stop state is being monitored with the SS2/SOS functions. Refer to section 4.5.3 for details.	Opened
SS1 output	SS1S		This is a monitor output signal meaning that the SS1 function is operating. Refer to section 4.5.2 for details.	Opened
SS2 output	SS2S		This is a monitor output signal meaning that the SS2/SOS function is operating. Refer to section 4.5.3 for details.	Opened
SLS1 output	SLS1S		This is a monitor output signal meaning that the SLS function 1 is operating. Refer to section 4.5.4 for details.	Opened
SLS2 output	SLS2S		This is a monitor output signal meaning that the SLS function 2 is operating. Refer to section 4.5.4 for details.	Opened
SLS3 output	SLS3S		This is a monitor output signal meaning that the SLS function 3 is operating. Refer to section 4.5.4 for details.	Opened
SLS4 output	SLS4S		This is a monitor output signal meaning that the SLS function 4 is operating. Refer to section 4.5.4 for details.	Opened

### 3. SIGNALS AND WIRING

#### 3.6.3 Power supply

Name	Symbol	Connector and pin No.	Function and application
Digital input I/F common A	DICOMA	CN10A-2 CN10A-11	This is a common terminal for input signal. Input 24 V DC (24 V DC $\pm$ 10% 0.8 A) for I/O interface. The power supply capacity changes depending on the number of I/O interface points to be used. For sink interface, connect + of 24 V DC external power supply. For source interface, connect - of 24 V DC external power supply.
Test pulse power supply input A	DC24VA	CN10A-1 CN10A-10	Input a power supply to output test pulses for external wiring diagnosis. Connect + of the 24 V DC external power supply.
Digital output I/F common A	DO24VA	CN10A-7	This is a common terminal for output signal. For source interface, connect + of the 24 V DC external power supply.
Digital output I/F DO4A power supply	DO4PA	CN10A-16	This is a power supply terminal of DO4A output signal. Connect + of 24 V DC external power supply.
Digital input I/F common B	DICOMB	CN10B-2 CN10B-11	This is a common terminal for input signal. Input 24 V DC (24 V DC $\pm$ 10% 0.8 A) for I/O interface. The power supply capacity changes depending on the number of I/O interface points to be used. For sink interface, connect + of 24 V DC external power supply. For source interface, connect - of 24 V DC external power supply.
Test pulse power supply input B	DC24VB	CN10B-1 CN10B-10	Input a power supply to output test pulses for external wiring diagnosis. Connect + of the 24 V DC external power supply.
Digital output I/F common B	DO24VB	CN10B-7	This is a common terminal for output signal. For source interface, connect + of the 24 V DC external power supply.
Digital output I/F DO4B power supply	DO4NB	CN10B-18	This is a power supply terminal of DO4B output signal. Connect - of the 24 V DC external power supply.

### 3. SIGNALS AND WIRING

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#### 3.7 Wiring method of CN10A/CN10B connectors

Wiring to CN10 and CN10B, use the connector DFMC 1, 5/9-STF-3, 5 (Phoenix Contact) packed with the amplifier.

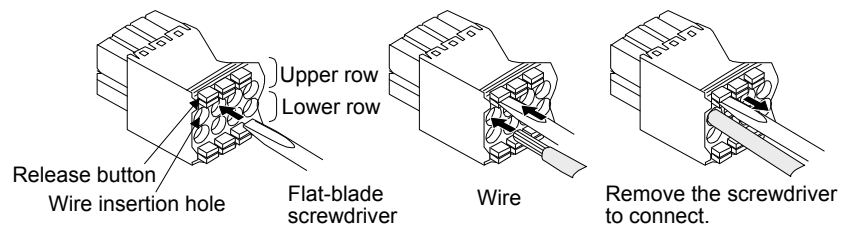
(1) Fabrication on cable insulator

Fabricate a wire using its applicable wire size of AWG 24 to 16 and strip the wire end to make the stripped length 10 mm ± 0.5 mm.

(2) Inserting wire

With pressing the release button with a flat-blade screwdriver with the blade edge width of 2.0 mm to 2.5 mm, insert a wire all the way in. And remove the screwdriver.

It is recommended to use "model: SZS 0,4X2,5, product No.: 1205037" of Phoenix Contact for the flat head screwdriver.



(3) Removing wire

With pressing the release button with a flat-blade screwdriver, pull out the wire.

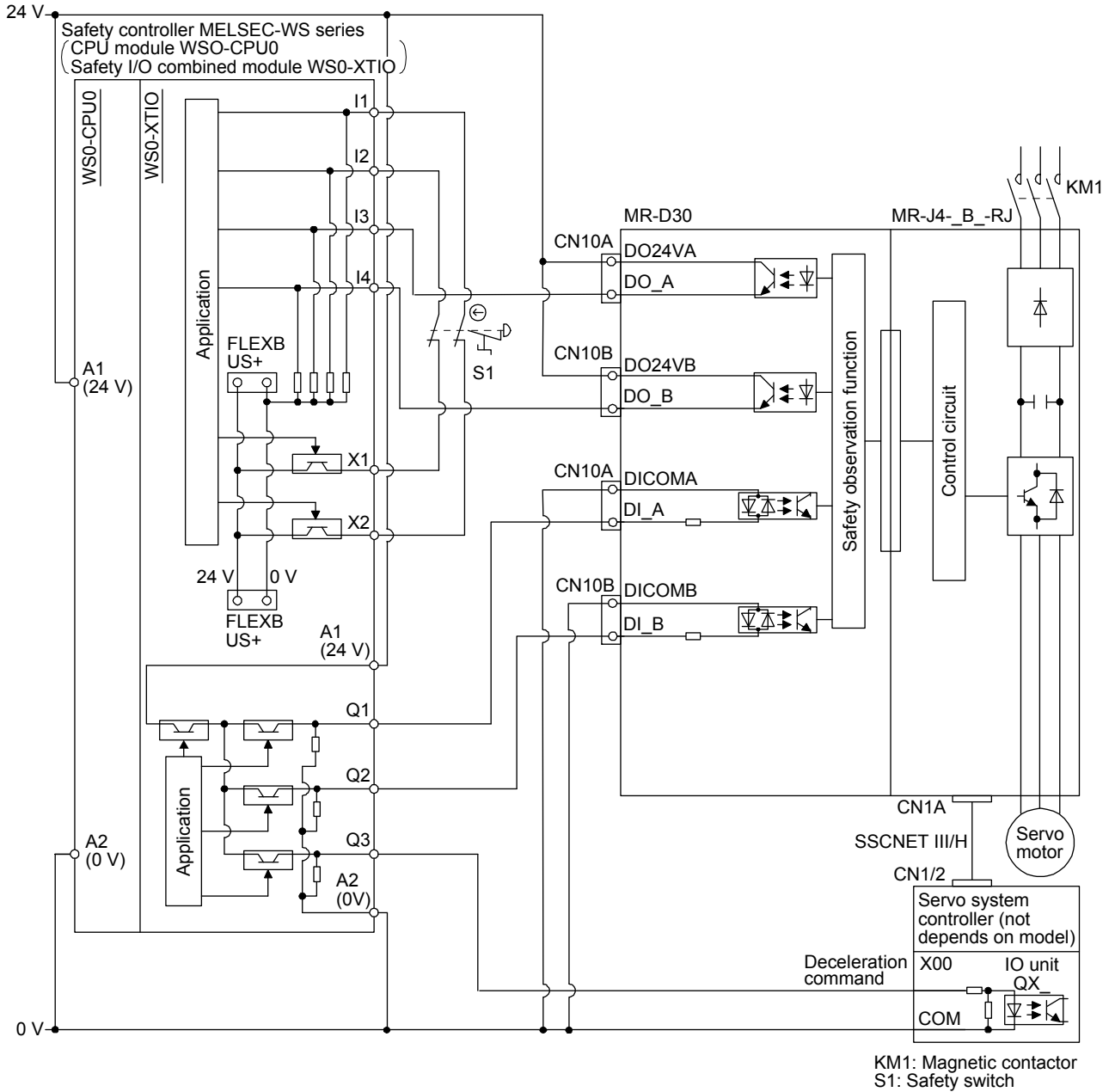
### 3. SIGNALS AND WIRING

#### 3.8 Connection example with other devices

##### 3.8.1 MR-J4-\_B\_-RJ

###### (1) Connection diagram with safety controller

The following connection diagram shows an operation of the safety observation function using input devices assigned to pins of the CN10A and CN10B connectors with a safety controller. By diagnosis of input signals, the amplifier complies with safety level Category 4, PL e, SIL 3.

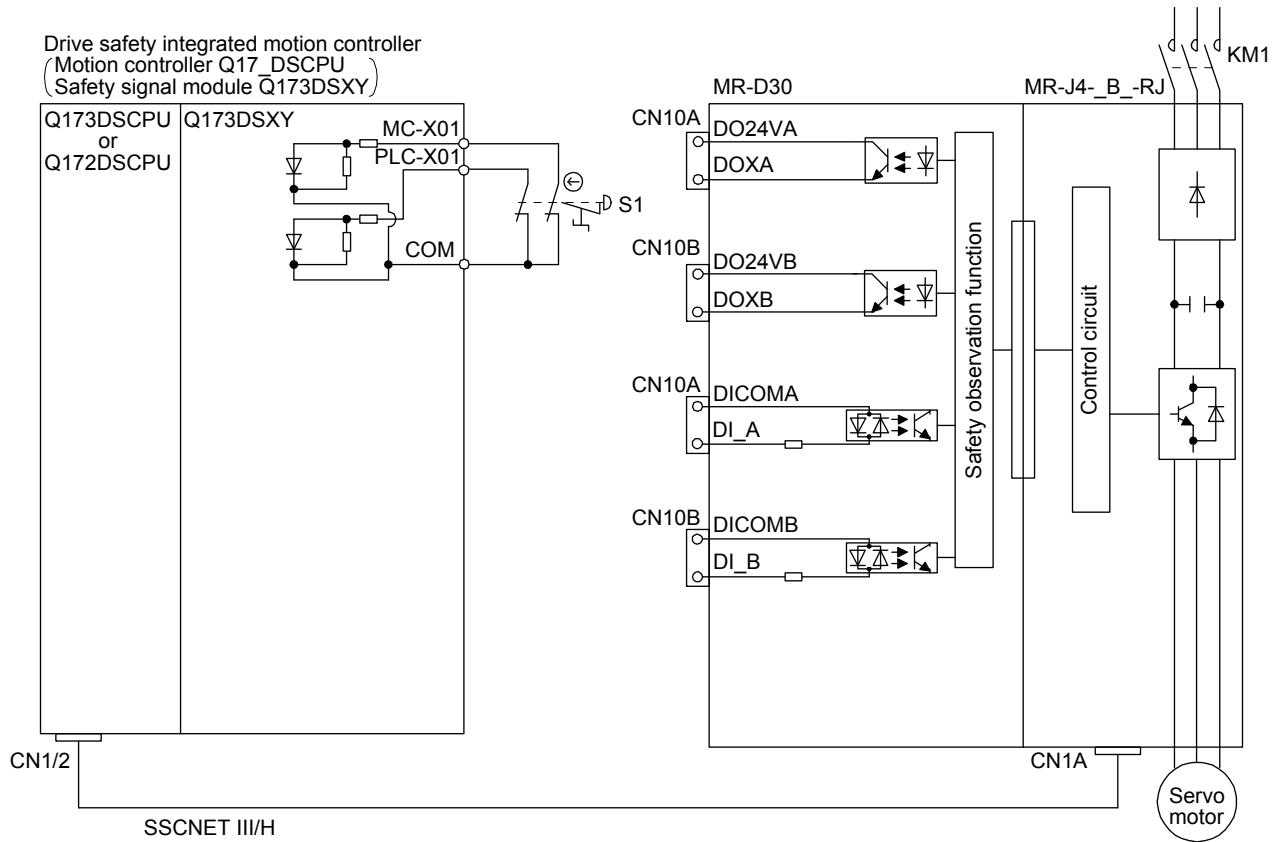




### 3. SIGNALS AND WIRING

(2) Connection diagram with drive safety integrated motion controller

The following connection diagram shows an operation of the safety observation function from a drive safety integrated motion controller through SSCNET III/H. The electric wiring can be omitted.

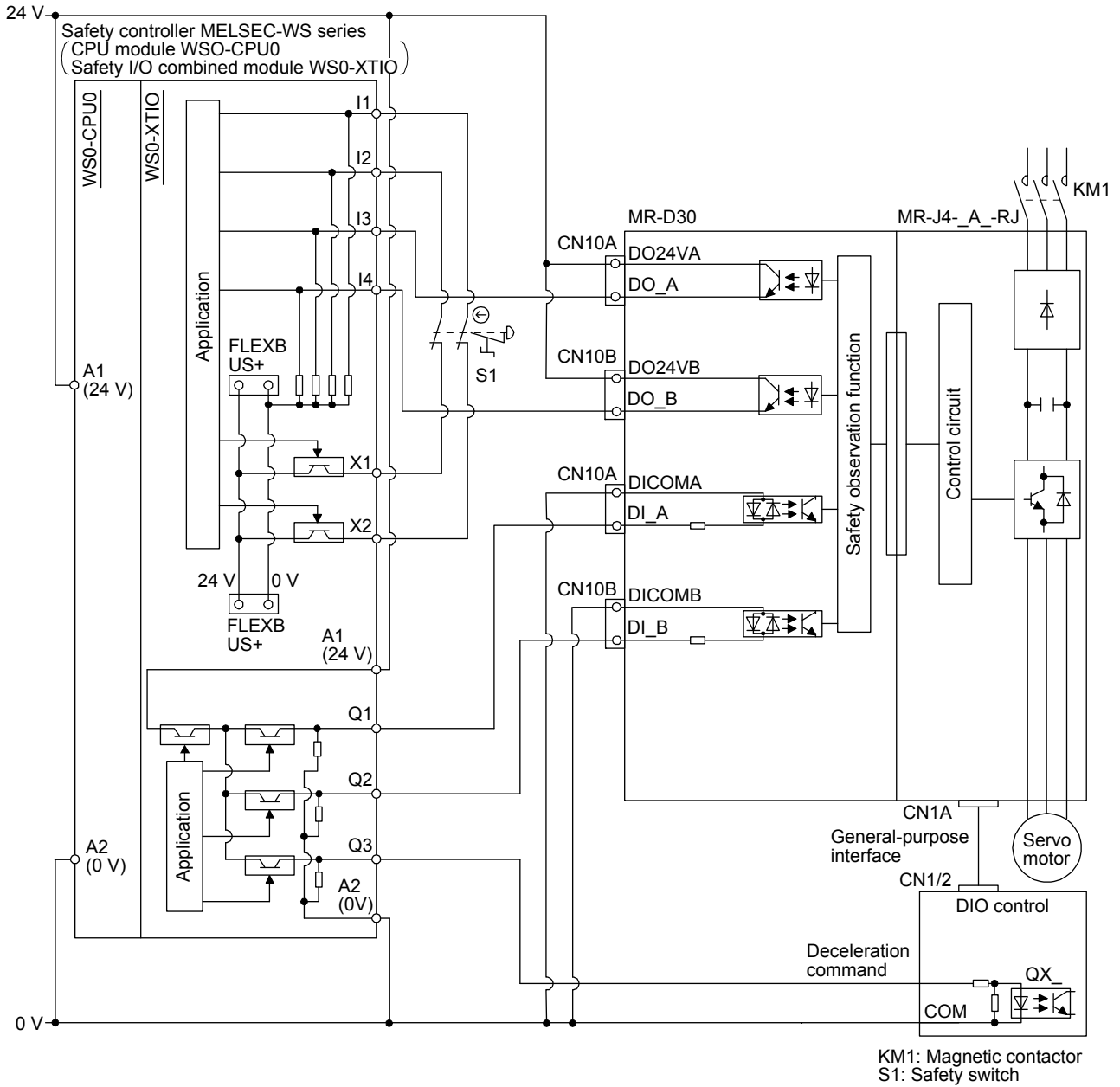


KM1: Magnetic contactor  
S1: Safety switch

### 3. SIGNALS AND WIRING

#### 3.8.2 MR-J4-\_A\_-RJ

The following connection diagram shows an operation of the safety observation function using input devices assigned to pins of the CN10A and CN10B connectors with a safety controller. By diagnosis of input signals, the amplifier complies with safety level Category 4, PL e, SIL 3.



## 3. SIGNALS AND WIRING

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### 3.9 Power-on sequence

Maintain about 0.5 s to 2 s in addition to the startup time of the servo amplifier in the system using MR-D30 and servo motor with functional safety for the initial diagnosis of the encoder.

## 4. SAFETY OBSERVATION FUNCTION

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### 4. SAFETY OBSERVATION FUNCTION

POINT																																													
●The following abbreviations do not indicate functions but hardware abbreviations (H/W abbreviation) meaning connector pin No.																																													
<table border="1"><thead><tr><th>H/W abbreviation</th><th>Pin No.</th></tr></thead><tbody><tr><td>DI1A</td><td>CN10A-4</td></tr><tr><td>DI2A</td><td>CN10A-13</td></tr><tr><td>DI3A</td><td>CN10A-5</td></tr><tr><td>DI4A</td><td>CN10A-14</td></tr><tr><td>DI5A</td><td>CN10A-6</td></tr><tr><td>DI6A</td><td>CN10A-15</td></tr><tr><td>DI1B</td><td>CN10B-4</td></tr><tr><td>DI2B</td><td>CN10B-13</td></tr><tr><td>DI3B</td><td>CN10B-5</td></tr><tr><td>DI4B</td><td>CN10B-14</td></tr><tr><td>DI5B</td><td>CN10B-6</td></tr><tr><td>DI6B</td><td>CN10B-15</td></tr></tbody></table>	H/W abbreviation	Pin No.	DI1A	CN10A-4	DI2A	CN10A-13	DI3A	CN10A-5	DI4A	CN10A-14	DI5A	CN10A-6	DI6A	CN10A-15	DI1B	CN10B-4	DI2B	CN10B-13	DI3B	CN10B-5	DI4B	CN10B-14	DI5B	CN10B-6	DI6B	CN10B-15	<table border="1"><thead><tr><th>H/W abbreviation</th><th>Pin No.</th></tr></thead><tbody><tr><td>DO1A</td><td>CN10A-8</td></tr><tr><td>DO2A</td><td>CN10A-17</td></tr><tr><td>DO3A</td><td>CN10A-9</td></tr><tr><td>DO4NA</td><td>CN10A-18</td></tr><tr><td>DO1B</td><td>CN10B-8</td></tr><tr><td>DO2B</td><td>CN10B-17</td></tr><tr><td>DO3B</td><td>CN10B-9</td></tr><tr><td>DO4PB</td><td>CN10B-16</td></tr></tbody></table>	H/W abbreviation	Pin No.	DO1A	CN10A-8	DO2A	CN10A-17	DO3A	CN10A-9	DO4NA	CN10A-18	DO1B	CN10B-8	DO2B	CN10B-17	DO3B	CN10B-9	DO4PB	CN10B-16
H/W abbreviation	Pin No.																																												
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DO3B	CN10B-9																																												
DO4PB	CN10B-16																																												

## 4. SAFETY OBSERVATION FUNCTION

### 4.1 Safety observation function specification

The achievable safety level and usable safety observation function will be affected depending on devices to connect. Also, parameter needs to be set in proportion to connecting machine. The following shows servo motors and parameter settings required to meet each functional safety level.

#### (1) Shut off/Observation function

##### (a) When using a drive safety integrated motion controller

Safety observation function		Connected device	Parameter setting
STO function SS1 function	SLS function	Servo motor with functional safety	Position/speed observation Pr. PSA02
Category 3, PL d, SIL 2	Category 3, PL d, SIL 2	Not required	-- 0 0 (no execution)

##### (b) Using input device

Safety observation function			Connected device		Parameter setting		
STO function SS1 function	SLS function	SS2/SOS function	Device for connecting to input devices (DI1_ to DI6_) (example)	Servo motor with functional safety	Position/speed observation Pr. PSA02	(a)Built-in test pulse diagnosis Pr. PSD24 Pr. PSD25	Fixing-diagnosis at start-up Pr. PSD27 Pr. PSD28
Category 3, PL d, SIL 2	/	/	Push button switch for emergency stop, safety switch, enable switch	Not required	-- 0 0 (no execution)	0 (no execution)	1 (execution)
			Safety programmable controller (Note 1), safety controller (Note 1)	Not required	-- 0 0 (no execution)	0 (no execution)	1 (execution)
Category 4, PL e, SIL 3			Push button switch for emergency stop, safety switch, enable switch	Not required	-- 0 0 (no execution)	1 (execution)	1 (execution)
			Safety programmable controller (Note 2), safety controller (Note 2)	Not required	-- 0 0 (no execution)	0 (no execution)	0 (no execution)
Category 3, PL d, SIL 2	Category 3, PL d, SIL 2	/	Push button switch for emergency stop, safety switch, enable switch	Not required	-- 2 0 (execution)	0 (no execution)	1 (execution)
			Safety programmable controller (Note 1), safety controller (Note 1)	Not required	-- 2 0 (execution)	0 (no execution)	1 (execution)
Category 4, PL e, SIL 3			Push button switch for emergency stop, safety switch, enable switch	Not required	-- 2 0 (execution)	1 (execution)	1 (execution)
			Safety programmable controller (Note 2), safety controller (Note 2)	Not required	-- 2 0 (execution)	0 (no execution)	0 (no execution)
Category 3, PL d, SIL 2	Category 3, PL d, SIL 2	Category 3, PL d, SIL 2	Push button switch for emergency stop, safety switch, enable switch	Required	-- 1 0 (execution)	0 (no execution)	1 (execution)
			Safety programmable controller (Note 1), safety controller (Note 1)	Required	-- 1 0 (execution)	0 (no execution)	1 (execution)
Category 4, PL e, SIL 3	Category 4, PL e, SIL 3	Category 4, PL e, SIL 3	Push button switch for emergency stop, safety switch, enable switch	Required	-- 1 0 (execution)	1 (execution)	1 (execution)
			Safety programmable controller (Note 2), safety controller (Note 2)	Required	-- 1 0 (execution)	0 (no execution)	0 (no execution)

Note 1. Set the IO diagnosis pulses of the controller to disabled (not use).

Note 2. Set the IO diagnosis pulses of the controller to enabled (use). The controller needs to be compatible with SIL 3.

## 4. SAFETY OBSERVATION FUNCTION

### (2) Output function

Safety observation function				Connected device		Parameter setting	
SSM function	Status monitor function (STO/SS1/SBC)			Device for connecting to output devices (DO1_ to DO4_) (example)	Servo motor with functional safety	Position/speed observation	(a) Built-in test pulse diagnosis
SSMS	STOS/SS1S/SBCS	SLS1S/SLS2S/SLS3S/SLS4S	SOSS/SS2S			Pr. PSA02	Pr. PSD29
	Category 3, PL d, SIL 2			Magnetic contactor, safety relay	Not required	-- 0 0 (no execution)	0 (no execution) (Note 3)
				Drive safety integrated motion controller, magnetic contactor, safety relay	Not required	-- 0 1 (no execution)	0 (no execution) (Note 3)
	Category 4, PL e, SIL 3			Safety programmable controller (Note 1), safety controller (Note 1)	Not required	-- 0 0 (no execution)	1 (execution)
	Safety programmable controller (Note 2), safety controller (Note 2)			Not required	-- 0 0 (no execution)	0 (no execution) (Note 3)	
Category 3, PL d, SIL 2	Category 3, PL d, SIL 2	Category 3, PL d, SIL 2		Magnetic contactor, safety relay	Not required	-- 2 0 (execution)	0 (no execution) (Note 3)
				Drive safety integrated motion controller, magnetic contactor, safety relay	Not required	-- 2 1 (execution)	0 (no execution) (Note 3)
	Category 4, PL e, SIL 3			Safety programmable controller (Note 1), safety controller (Note 1)	Not required	-- 2 0 (execution)	1 (execution)
	Safety programmable controller (Note 2), safety controller (Note 2)			Not required	-- 2 0 (execution)	0 (no execution) (Note 3)	
Category 3, PL d, SIL 2	Category 3, PL d, SIL 2	Category 3, PL d, SIL 2	Category 3, PL d, SIL 2	Magnetic contactor, safety relay	Required	-- 1 0 (execution)	0 (no execution) (Note 3)
Category 4, PL e, SIL 3	Category 4, PL e, SIL 3	Category 4, PL e, SIL 3	Category 4, PL e, SIL 3	Safety programmable controller (Note 1), safety controller (Note 1)	Required	-- 1 1 (execution)	1 (execution)
				Safety programmable controller (Note 2), safety controller (Note 2)	Required	-- 1 1 (execution)	0 (no execution)

- Note 1. Set the IO diagnosis pulses on the controller side (compatible with SIL 3) to disabled (not use).  
 Note 2. Set the IO diagnosis pulses on the controller side (compatible with SIL 3) to enabled (use).  
 Note 3. It is recommended to check (diagnose) that the output devices operates correctly at least once in 24 hours.

### 4.2 Safety diagnosis function list

Diagnosis item	Description
I/O device	Duplication input mismatch detection
	Diagnoses the duplicated input device status are matched.
	Input device test pulse diagnosis
	This function diagnoses that the input circuit and the external connecting machine is not fixing when condition is ON.
	Output device test pulse diagnosis
	This function diagnoses the output circuit and the external connecting machine is not fixing when condition is ON.
	Safety device fixing diagnosis at start-up
	When turning on the power, turn each input device on and off individually several times to diagnose fixing.

# 4. SAFETY OBSERVATION FUNCTION

## 4.3 Startup

### 4.3.1 Switching power on for the first time

When switching power on for the first time, follow this section to make a startup.

"MR-J4-\_B\_" means "MR-J4-\_B\_(-RJ) Servo Amplifier Instruction Manual" and "MR-J4-\_A\_" means "MR-J4-\_A\_(-RJ) Servo Amplifier Instruction Manual".

	Description	Reference
Wiring/preparation	Check of servo amplifier wirings	Check whether the servo amplifier and servo motor are wired correctly using visual inspection, DO forced output function, etc. MR-J4-_B_ Section 4.5.1 MR-J4-_A_ Section 4.5.8
	Check of MR-D30 wirings	Check whether MR-D30 is wired correctly using visual inspection, DO forced output function, etc. Section 4.3.4 Section 4.3.1 (2)
	Surrounding environment check	Check the surrounding environment of the servo amplifier and servo motor. MR-J4-_B_ Section 4.1.3 MR-J4-_A_ Section 4.1.3
	Check of parameters	Set the parameters as necessary, such as the used operation mode and regenerative option selection. MR-J4-_B_ Chapter 5 MR-J4-_A_ Chapter 5
Startup of servo amplifier	STO cancel with inputting STO command	Cancel the STO state by a controller or an input signal. As necessary, set MR-D30 parameters. STO state can be canceled by setting [Pr. PSA01 Safety observation function activation setting] to "___ 1" to enable the safety observation function. The servo motor does not operate until this setting is complete because [AL. 7A] occurs. Section 4.3.4
	Test operation of the servo motor alone in test operation mode	For the test operation, with the servo motor disconnected from the machine and operated at the speed as low as possible, check whether the servo motor rotates correctly. MR-J4-_B_ Section 4.5 MR-J4-_A_ Section 4.2.3 Section 4.3.3 Section 4.4.3
	Test operation of the servo motor alone by commands	For the test operation with the servo motor disconnected from the machine and operated at the speed as low as possible, give commands to the servo amplifier and check whether the servo motor rotates correctly.
	Test operation with the servo motor and machine connected	Connect the servo motor with the machine, and check machine motions by transmitting operation commands from the controller.
	Gain adjustment	Make gain adjustment to optimize the machine motions. MR-J4-_B_ Chapter 6 MR-J4-_A_ Chapter 6
	Parameter setting (actual operation)	Set the parameter referring to section 4.4 and section 4.5.
	Password setting	Lock the safety observation function parameter 1 ([Pr. PSA__]) by password. Section 4.3.2
Startup of safety observation function	Parameter inspection	Read the each parameter and test by the procedure to see if it is set correctly.
	Operation check of safety observation function	Check if the safety observation function operates correctly.
	Actual operation	
	Stop	Stop giving commands and stop operation.

## 4. SAFETY OBSERVATION FUNCTION

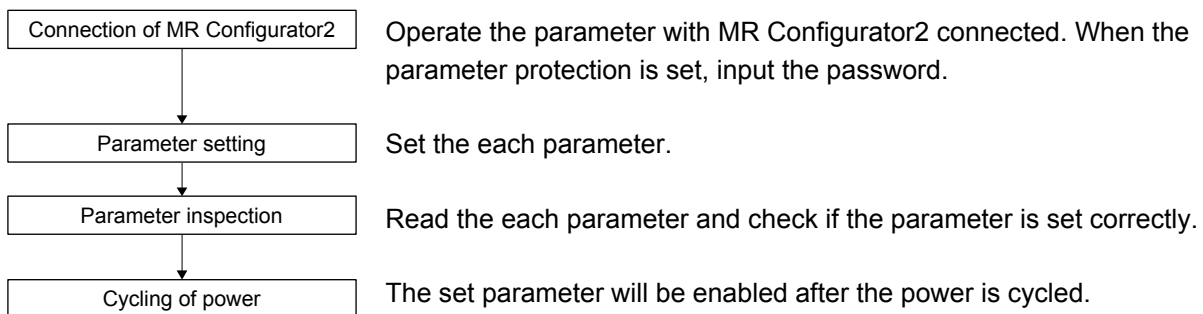
### 4.3.2 Parameter

When using MR-D30, the safety observation function parameters 1 ([Pr. PSA\_ \_]), SSCNET III/H parameters ([Pr. PSC\_ \_]) and I/O device parameters ([Pr. PSD\_ \_]) can be set by using MR Configurator2. Execute the setting that involves safety observation function by these parameter groups. The following shows the difference between these and other parameter groups. The password is set to MR-D30 to prevent changing the parameter. The default password is "000000". Change the password to prevent changing parameter carelessly.

- (a) The safety observation function parameters 1 ([Pr. PSA\_ \_]), SSCNET III/H parameters ([Pr. PSC\_ \_]) and I/O device parameters ([Pr. PSD\_ \_]) need to be set with MR Configurator2. These parameter groups are saved to MR-D30.
- (b) Set the password to prevent changing the setting easily.
- (c) After changing the setting, the power needs to be cycled.
- (d) After changing the setting, check to see if the parameters are correct.
- (e) The parameters of MR-D30 cannot be set with the parameter unit.

#### (1) Parameter setting procedure

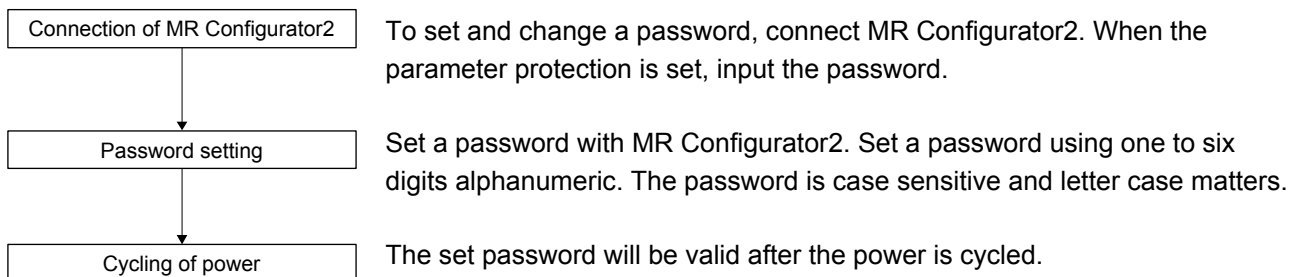
Set the parameter by the procedure as follows.



#### (2) Protection by password.

Set a password to the safety observation function parameters 1 ([Pr. PSA\_ \_]), SSCNET III/H parameters ([Pr. PSC\_ \_]), and I/O device parameters ([Pr. PSD\_ \_]) to prevent changing them easily. There are no restrictions for reading parameters when a password is set. However, changing parameter is restricted until the password is confirmed.

##### (a) Setting and changing password





## 4. SAFETY OBSERVATION FUNCTION

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(b) If you forgot the password

If you forgot the password, you can reconfigure the parameter settings by initializing MR-D30.

Initialize the password by the password initializing function of MR Configurator2. When the password is initialized, all the parameter setting values will be initialized. [AL. 7A Parameter setting error (safety observation function)] occurs until the parameter is set again.

### 4.3.3 Mandatory parameters to be set

The following parameters must be set.

Parameter	Name
PSA01	Safety observation function activation setting
PSA02	Functional safety unit setting
PSA03	SS1/SS2 monitoring deceleration time

(1) [Pr. PSA01 Safety observation function activation setting]

Check the contents of [Pr. PSA \_\_ ], [Pr. PSC \_\_ ], and [Pr. PSD \_\_ ] and set [Pr. PSA01 Safety observation function activation setting] to " \_\_ \_\_ 1". Until this parameter is set, STO cannot be canceled due to [AL. 7A Parameter setting error (safety observation function)] occurrence.

(2) [Pr. PSA02 Functional safety unit setting]

Set the items according to your system configuration. The recommended parameter settings and achievable safety level differs by the system structure. Refer to section 4.1 for details.

(3) [Pr. PSA03 SS1/SS2 monitoring deceleration time]

The parameter for SS1 function must be set because the function will be used when an error is detected by self-diagnosis. Set a proper value referring to section 4.5.2.

### 4.3.4 Test operation

(1) Summary

When using MR-D30, parameter setting is necessary for using the test operation. Set [Pr. PSA02 Functional safety unit setting] to " \_\_ \_\_ 2". The diagnosis function and safety observation function are partially disabled in the test operation mode. The mode can be used for the JOG operation, positioning operation, machine analyzer, etc. for when the startup of safety devices is not complete. Note the following for test drive mode.

(a) Set the test operation mode. For details, refer to section 4.5 of "MR-J4-\_B\_(-RJ) Servo Amplifier Instruction Manual" or section 4.5.10 of "MR-J4-\_A\_(-RJ) Servo Amplifier Instruction Manual" for other servo amplifiers.

(b) I/O diagnosis will not be operated.

(c) Operate with great care because the safety observation function is disabled.

(d) If the servo motor operates abnormally, use EM2 (Forced stop 2) to stop it.

For details of test operation, refer to section 4.4 and 4.5 of "MR-J4-\_B\_(-RJ) Servo Amplifier Instruction Manual" or chapter 4 of "MR-J4-\_A\_(-RJ) Servo Amplifier Instruction Manual" for other servo amplifiers. To stop the test operation, set [Pr. PSA02 Functional safety unit setting] to " \_\_ \_\_ 0" or " \_\_ \_\_ 1" according to your system configuration, and cycle the power.

## 4. SAFETY OBSERVATION FUNCTION

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### (2) DO forced output

Output signals of DO1\_ to DO4\_ can be switched on/off forcibly and independently regardless of servo status. This function is used to check the wirings of signal output, etc. Exercise control on the DO forced output screen of MR Configurator2.

This function can be used only when [Pr. PSA02 Functional safety unit setting] is set to "\_ \_ \_ 2" (test operation mode).

### 4.3.5 Unit replacement

When an MR-D30 that has already been installed to MR-J4\_-RJ servo amplifier once is installed to the other MR-J4\_-RJ servo amplifier, [AL. 7A Parameter setting error (safety observation function)] will occur. To use the MR-D30 with other MR-J4\_-RJ servo amplifier, initialize the password by the password initializing function of MR Configurator2. When the password is initialized, all the parameter will be initialized. [AL. 7A Parameter setting error (safety observation function)] occurs until the parameter is set again.

## 4.4 I/O function

### 4.4.1 Input device

#### (1) Summary

Input devices cannot be used when a drive safety integrated motion controller is in use. The input devices of MR-D30 have the following characteristics.

##### (a) Input device selection

Any device can be assigned to DI1\_ to DI6\_ with parameters.

##### (b) Duplication of the input wiring

The input error will be detected immediately by verifying input signals with duplicated wirings.

##### (c) Fixing-diagnosis at start-up

When starting-up, turn each input device off and on repeatedly for failure diagnosis including external wirings. Enabled/disabled can be switched with [Pr. PSD27] and [Pr. PSD28].

##### (d) Diagnosis with test pulses

Executes a failure diagnosis including external wirings by applying the pulse signal that temporarily turns off while an input signal is on. Enabled/disabled can be selected with [Pr. PSD24] and [Pr. PSD25].

Set any test pulse width considering the wiring length of the external circuit, impedance of the circuit, etc. If the pulse width is not enough, change the test pulse off time with [Pr. PSD26 Input device - Test pulse off time].

##### (e) Noise rejection filter

This function is to reduce the noise to input signals.

## 4. SAFETY OBSERVATION FUNCTION

### (2) Input device selection

#### (a) Input device selection

The input devices can be assigned to DI1\_ to DI6\_ with [Pr. PSD02 Input device selection DI1] to [Pr. PSD07 Input device selection DI6].

CN10A		CN10B		Parameter
Pin No.	H/W abbreviation	Pin No.	H/W abbreviation	
4	DI1A	4	DI1B	[Pr. PSD02 Input device selection DI1]
13	DI2A	13	DI2B	[Pr. PSD03 Input device selection DI2]
5	DI3A	5	DI3B	[Pr. PSD04 Input device selection DI3]
14	DI4A	14	DI4B	[Pr. PSD05 Input device selection DI4]
6	DI5A	6	DI5B	[Pr. PSD06 Input device selection DI5]
15	DI6A	15	DI6B	[Pr. PSD07 Input device selection DI6]

For details of each input device, refer to the following section. Additionally, one input device cannot be assigned to multiple connector pins of the same connector.

Input signal	Reference
STOC (STO command)	Section 4.5.1
SS1C (SS1 command)	Section 4.5.2
SS2C (SS2 command)	Section 4.5.3
SLS1C (SLS1 command)	Section 4.5.4
SLS2C (SLS2 command)	
SLS3C (SLS3 command)	
SLS4C (SLS4 command)	

#### (b) Input device automatic activation selection

Setting [Pr. PSD01 Input device automatic activation selection] activates operation command of each function automatically. The automatically activated input device will be discriminated as enabled regardless of input device condition and the compatible function will operate automatically.

SLS1C (SLS1 command), SLS2C (SLS2 command), SLS3C (SLS3 command), and SLS4C (SLS4 command) can be automatically activated.

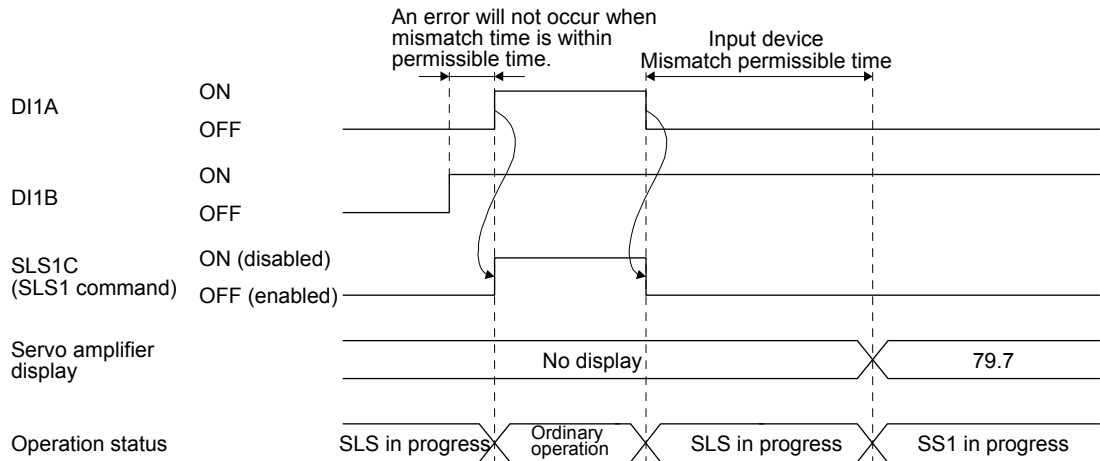
## 4. SAFETY OBSERVATION FUNCTION

### (3) Duplication of the input wiring

#### (a) Duplication of the input wiring

Switch DI\_A and DI\_B within the mismatch permissible time.

This function continuously monitors whether signals of duplicated input are matched. The corresponding input device will be discriminated as off when a mismatch is detected. The following shows the operation sequence when SLS1C (SLS1 command) is assigned to DI1. SLS1C (SLS1 command) is off while DI1A and DI1B are mismatching. SLS1C (SLS1 command) is on when both DI1A and DI1B turn on. When the mismatch continued over mismatch permissible time specified by the parameter, [AL. 79.7 Mismatched input signal error] occurs and SS1 function operates.



#### (b) Parameter setting

To the input devices that are assigned by [Pr. PSD02 Input device selection DI1] to [Pr. PSD07 Input device selection DI6], set the following parameters. Setting the mismatch permissible time to 0 disables the diagnosis.

Parameter No.	Name
PSD18	Mismatch permissible time DI1
PSD19	Mismatch permissible time DI2
PSD20	Mismatch permissible time DI3
PSD21	Mismatch permissible time DI4
PSD22	Mismatch permissible time DI5
PSD23	Mismatch permissible time DI6

### (4) Fixing-diagnosis at start-up

When the power of MR-D30 is turned on, each input pin can be checked by turning the signal off and on repeatedly.

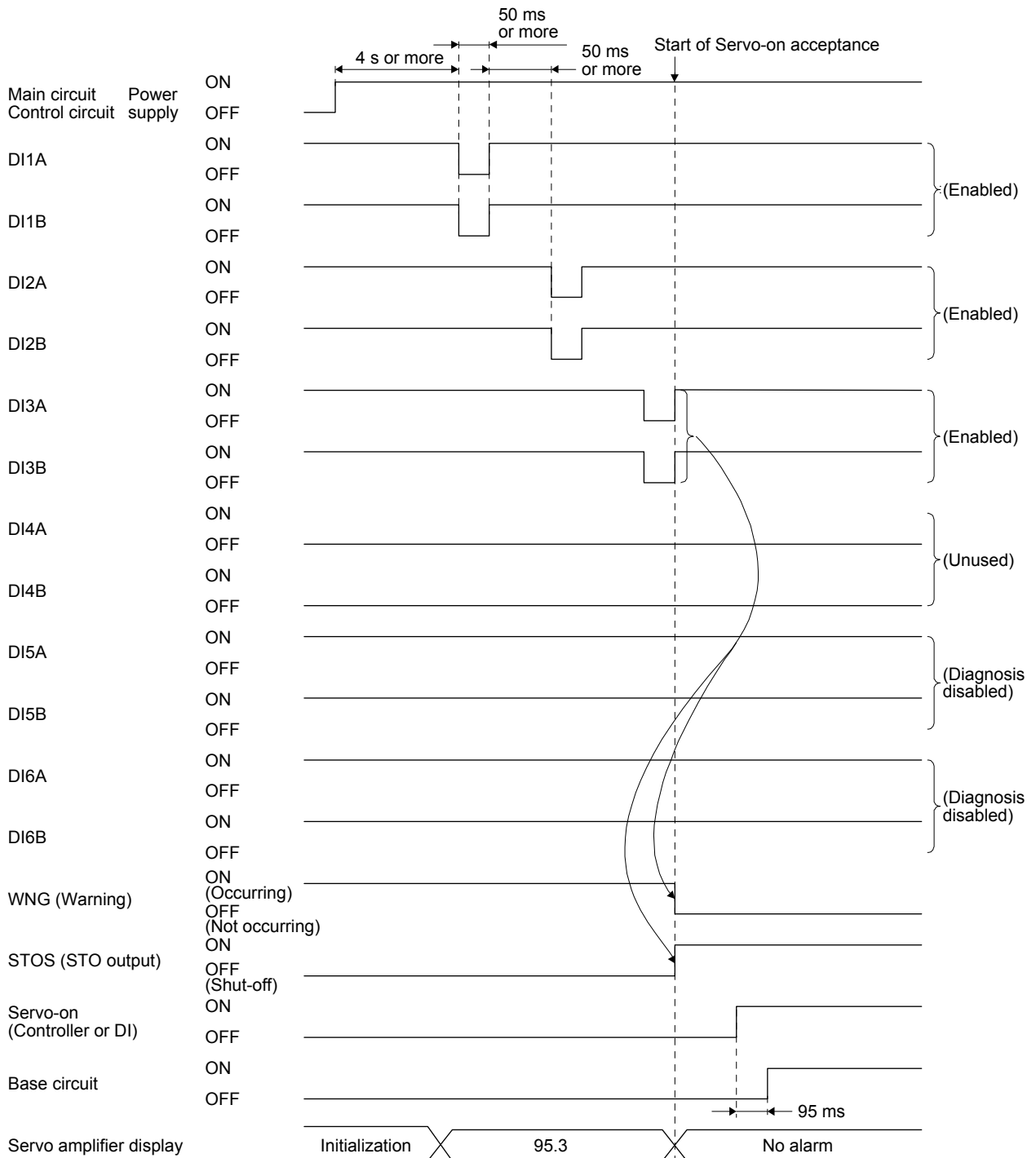
# 4. SAFETY OBSERVATION FUNCTION

## (a) Executing fixing-diagnosis at start-up

This function diagnoses a fixing by turning each DI1\_ to DI6\_ on to off and off to on singly. The warning will be reset when all the diagnoses are completed and STO state will be canceled. Input "on" to except the pin whose diagnosis is in progress.

Diagnosing targets are pins to which function is assigned with [Pr. PSD02 Input device selection DI1] to [Pr. PSD07 Input device selection DI6] and "Execute" is also selected in [Pr. PSD27 Input device - Fixing-diagnosis execution selection 1 at start-up] and [Pr. PSD28 Input device - Fixing-diagnosis execution selection 2 at start-up].

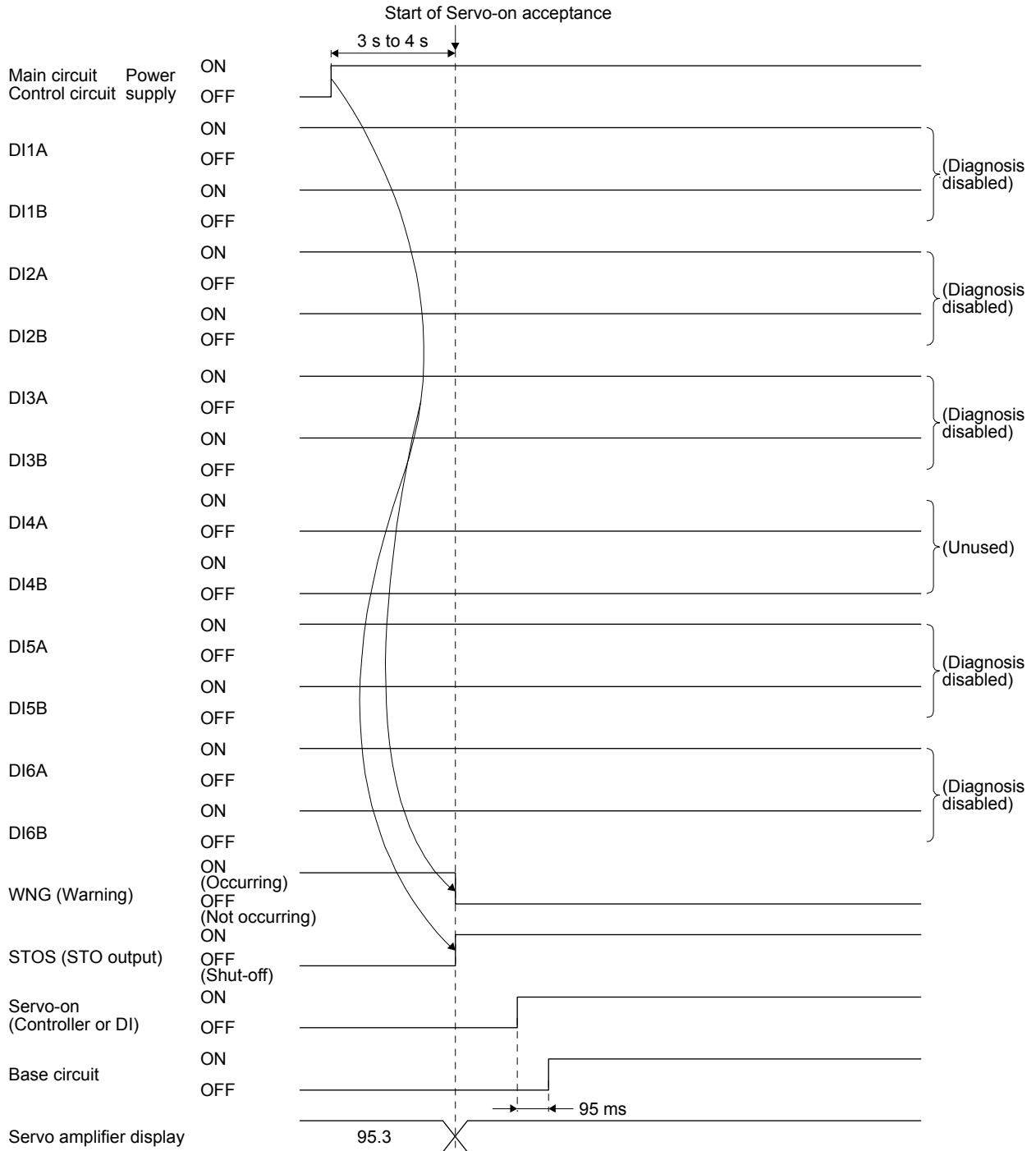
Additionally, the diagnosis will not operate to the pin (unused pin) to which an input device is not assigned with [Pr. PSD02 Input device selection DI1] to [Pr. PSD07 Input device selection DI6].



# 4. SAFETY OBSERVATION FUNCTION

## (b) Not executing fixing-diagnosis at start-up

When there is no target of the fixing-diagnosis at start-up, an internal diagnosis after power-on will be executed, warning will be reset at the moment of all the input devices on, and STO state will be canceled.



## 4. SAFETY OBSERVATION FUNCTION

### (c) Parameter setting

Set for pins to which input devices are assigned with [Pr. PSD02 Input device selection DI1] to [Pr. PSD07 Input device selection DI6] and set whether execute the fixing-diagnosis at start-up or not with [Pr. PSD27 Input device - Fixing-diagnosis execution selection 1 at start-up] and [Pr. PSD28 Input device - Fixing-diagnosis execution selection 2 at start-up].

The achievable safety level will be affected by the settings of [Pr. PSD27] and [Pr. PSD28]. Refer to section 4.1 for details.

### (5) Diagnosis with test pulses

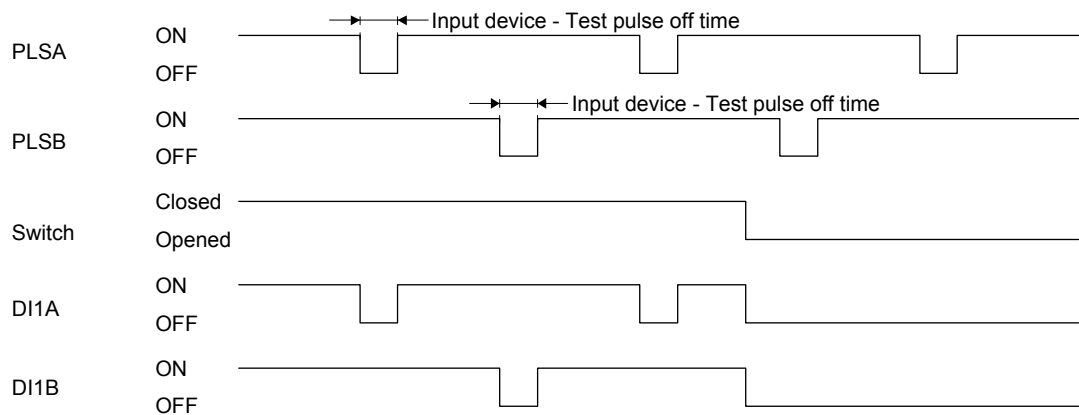
#### (a) When connecting a device which does not have a diagnosis function (such as switch)

The external wirings can be diagnosed by using pulse signal outputted from PLSA/PLSB. Refer to section 3.3 and check if the wiring is possible to execute the test pulse diagnosis.

The following shows the operation sequence to execute the test pulse diagnosis by the switch connected to DI1A and DI1B. The off-pulses are outputted from PLSA/PLSB periodically.

PLSA/PLSB outputs off-pulses at different timing, they will not output the off-pulses at the same time.

The width of off-pulses can be set with [Pr. PSD26 Input device test pulse off time]. Set it so that external devices such as switches etc. do not get affected by output pulses.



[AL. 79.5 Input device error] occurs when an error is detected by the test pulse diagnosis.

Whether each input device to execute the test pulse diagnosis or not can be set with [Pr. PSD24 Input device - Test pulse diagnosis execution selection 1] and [Pr. PSD25 Input device - Test pulse diagnosis execution selection 2].

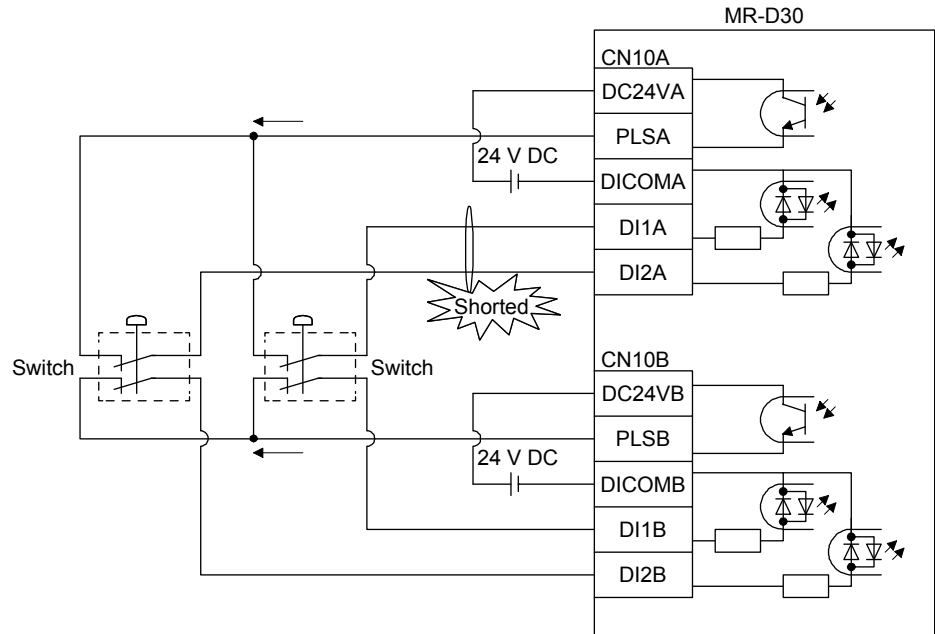
#### (b) When connecting a device which has a diagnosis function (such as safety controller)

To diagnose external wirings, use diagnosis function of the device. The test pulse diagnosis of MR-D30 cannot be used. Set the relevant device settings to "0" (not diagnose) with [Pr. PSD24 Input device - Test pulse diagnosis execution selection 1] and [Pr. PSD25 Input device - Test pulse diagnosis execution selection 2].

## 4. SAFETY OBSERVATION FUNCTION

### (c) Cautions for executing test pulse diagnosis by multiple devices.

When there are multiple target input devices of the test pulse diagnosis, share PLSA/PLSB with those input devices. A short-circuit failure between wirings sharing PLSA/PLSB cannot be detected with the test pulse diagnosis. Execute an input device fixing-diagnosis at start-up (refer to section 4.4.1 (4)) in addition.



### (d) Parameter setting

Set the following parameters for DI1\_ to DI6\_ which input devices are assigned to by [Pr. PSD02 Input device selection DI1] to [Pr. PSD07 Input device selection DI6].

Parameter	Name
PSD24	Input device - Test pulse diagnosis execution selection 1
PSD25	Input device - Test pulse diagnosis execution selection 2
PSD26	Input device - Test pulse off time

Execute the test pulse diagnosis or select with [Pr. PSD24 Input device - Test pulse diagnosis execution selection 1] and [Pr. PSD25 Input device - Test pulse diagnosis execution selection 2]. Set the off time of test pulse outputted from PLSA/PLSB to [Pr. PSD26 Input device - Test pulse off time].

The achievable safety level will be affected depending on using input devices and parameter settings of this function. Refer to section 4.1 for details.



## 4. SAFETY OBSERVATION FUNCTION

### (6) Noise rejection filter

#### (a) Summary

The noise rejection filter is a function to set a filtering time to reduce the noise of input signals. Set the filtering time of noise rejection filter with [Pr. PSD12 Input device - Noise rejection filtering time D11] to [Pr. PSD17 Input device - Noise rejection filtering time D16].

The tolerance to chattering or noise will rise when noise rejection filtering time is longer. However, the response to input signals will be slower. The response to input signals will be faster when noise rejection filtering time is shorter. However, the tolerance to chattering or noise will drop.

When the test pulses are in superposition at input signals, the noise rejection filtering time needs to be set considering off time of the test pulses. The following shows the specific settings of the noise rejection filtering time.

Structure		Noise rejection filtering time
Using a switch	Executing a test pulse diagnosis	Set 0.888 ms or longer time than set time in [Pr. PSD26 Input device - Test pulse off time].
	Not executing a test pulse diagnosis	Set 0.888 ms or longer time.
Using a device	Test pulses are in superposition at output signal of the device.	Set 0.888 ms or longer time than test pulse off time outputted from the device.
	Test pulses are not in superposition at output signal of the device.	Set 0.888 ms or longer time.

#### (b) Parameter setting

With the following parameters, set the noise rejection filtering time to each input device to which function is assigned with [Pr. PSD02 Input device selection D11] to [Pr. PSD07 Input device selection D16]. Also, the response time of input devices will change depending on the noise rejection filtering time, refer to section 4.4.1 (7) in addition.

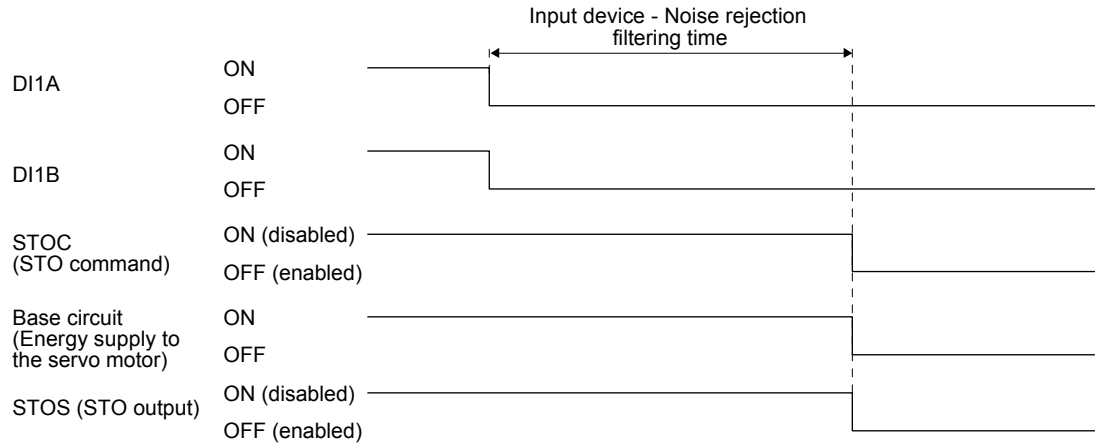
Parameter	Name
PSD12	Input device - Noise rejection filtering time D11
PSD13	Input device - Noise rejection filtering time D12
PSD14	Input device - Noise rejection filtering time D13
PSD15	Input device - Noise rejection filtering time D14
PSD16	Input device - Noise rejection filtering time D15
PSD17	Input device - Noise rejection filtering time D16

## 4. SAFETY OBSERVATION FUNCTION

### (7) Response time of input device

The response time of input devices will change depending on noise rejection filtering time set with [Pr. PSD12 Input device - Noise rejection filtering time DI1] to [Pr. PSD17 Input device - Noise rejection filtering time DI6].

The following example shows a sequence for when STOC (STO command) is assigned to DI1\_. A delay equal to the input device noise rejection filtering time occurs in the response time from signals are inputted to input devices until the corresponding functions switch to enabled/disabled.



## 4. SAFETY OBSERVATION FUNCTION

### 4.4.2 Output device

#### (1) Summary

The output device of the status monitor function (SM) of MR-D30 has following functions.

##### (a) Output device selection

Any device can be assigned to DO1\_ to DO4\_ with parameters.

##### (b) Duplication of the output

Outputs same signal duplicately by duplicated wiring. With this, a function will not be lost even if an error occurs in one output device.

DO4\_ can be configured with source output and sink output in combination.

##### (c) Diagnosis with test pulses

Executes a failure diagnosis including external wirings by applying the pulse signal that temporarily turns off while an output signal is on. Enabled/disabled can be selected with [Pr. PSD29 Output device - Test pulse diagnosis execution selection].

#### (2) Output device selection

The devices can be assigned to DO1\_ to DO4\_ with [Pr. PSD08 Output device selection DO1] to [Pr. PSD11 Output device selection DO4].

CN10A		CN10B		Parameter
Pin No.	H/W abbreviation	Pin No.	H/W abbreviation	
8	DO1A	8	DO1B	[Pr. PSD08 Output device selection DO1]
17	DO2A	17	DO2B	[Pr. PSD09 Output device selection DO2]
9	DO3A	9	DO3B	[Pr. PSD10 Output device selection DO3]
18	DO4NA	16	DO4PB	[Pr. PSD11 Output device selection DO4]

For details of each output device, refer to the following section. For output devices, the same signal can be assigned to different terminal.

Output signal	Reference
STOS (STO output)	Section 4.5.1
SS1S (SS1 output)	Section 4.5.2
SS2S (SS2 output)	Section 4.5.3
SLS1S (SLS1 output)	Section 4.5.4
SLS2S (SLS2 output)	Section 4.5.4
SLS3S (SLS3 output)	Section 4.5.4
SLS4S (SLS4 output)	Section 4.5.4
SSMS (SSM output)	Section 4.5.5
SOSS (SOS output)	Section 4.5.3
SBCS (SBC output)	Section 4.5.6

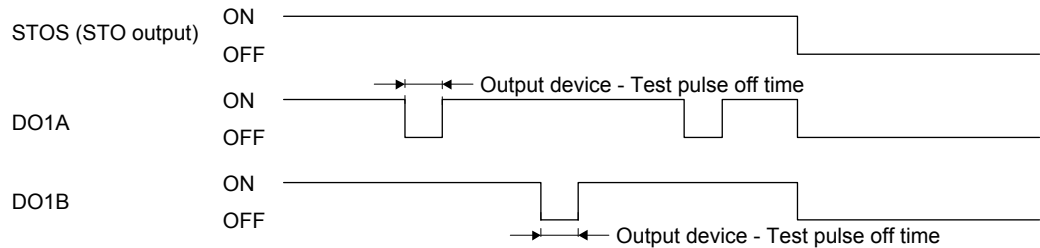
## 4. SAFETY OBSERVATION FUNCTION

### (3) Diagnosis with test pulses

#### (a) Test pulse diagnosis function

Diagnoses an error of wiring by periodically outputting off-pulses when DO1\_ to DO4\_ are on.

The following shows the operation sequence for when STOS (STO output) is assigned to DO1\_. The off-pulses will be outputted to DO1A and DO1B periodically when STOS (STO output) is on. DO1A and DO1B output off-pulses at different timing, they will not output the off-pulses at the same time. The width of off-pulses can be set with [Pr. PSD30 Output device - Test pulse off time]. Set the parameter so that external devices are not affected by outputted off-pulses.



[AL. 79.6 Output device error] occurs when an error is detected by test pulse diagnosis. Whether each output device to execute the test pulse diagnosis or not can be set with [Pr. PSD29 Output device - Test pulse diagnosis execution selection].

#### (b) Parameter setting

To the input device that is assigned by [Pr. PSD08 Output device selection DO1] to [Pr. PSD11 Output device selection DO4], set the following parameter.

Parameter No.	Name
PSD29	Output device - Test pulse diagnosis execution selection
PSD30	Output device - Test pulse off time

Set whether each output device to execute test pulse diagnosis or not with [Pr. PSD29 Output device - Test pulse diagnosis execution selection]. Set the off time of test pulse outputted from output devices to [Pr. PSD30 Output device - Test pulse off time].

The achievable safety level will be affected depending on the device you use and parameter settings of this function. Refer to section 4.1 for details.

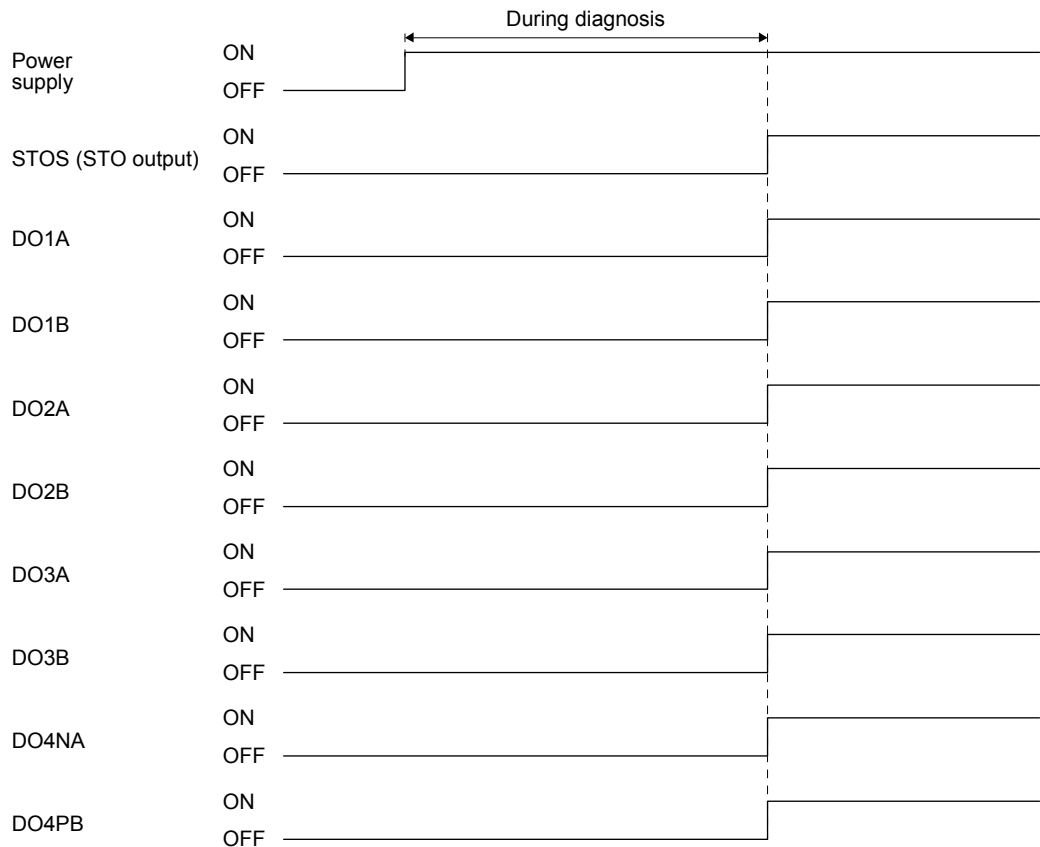
## 4. SAFETY OBSERVATION FUNCTION

### (4) Input signal conditions at start-up/error detection

#### (a) At start-up

Each output device outputs off fixing from power-on of MR-D30 until the diagnosis completes. After the diagnosis is completed, devices assigned with [Pr. PSD08 Output device selection DO1] to [Pr. PSD11 Output device selection DO4] will be outputted.

A point of time of diagnosis completion differs depending on using input device or using safety compatible motion controller. Refer to section 4.4.1 (4) for diagnosis for when using input devices. Refer to section 4.4.3 for diagnosis for when using safety compatible motion controller.



#### (b) At error detection

Each output device will turn off when an alarm that disables SSM at error detection of MR-D30 occurs. Refer to chapter 7 for corresponding alarm Nos. When a non-corresponding alarm is occurring, assigned devices will be outputted continuously.

## 4. SAFETY OBSERVATION FUNCTION

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### 4.4.3 Using a drive safety integrated motion controller

#### (1) Summary

When input devices are used, a drive safety integrated motion controller cannot be used. Using a safety compatible motion controller brings the following characteristics.

##### (a) Transmitting each function command input through network

STOC (STO command), SS1C (SS1 command), SLS1C (SLS1 command), SLS2C (SLS2 command), SLS3C (SLS3 command), and SLS4C (SLS4 command) can be transmitted through network.

##### (b) Feedback for each function output through network

Safety position data of servo motor with functional safety, STOS (STO output), SSMS (SSM output), etc. can be transmitted through network.

#### (2) Parameter setting

Set a communication cycle for SSCNET III/H with the following parameter. Set the same value as of the motion controller to "Safety communication - Communication cycle". When a different value is set, [AL. 7C.1 Functional safety unit communication cycle error (safety observation function)] will occur.

Parameter	Name
PSC01	Safety communication - Communication cycle

### 4.4.4 Servo motor with functional safety

Using a servo motor with functional safety enables you to use speed monitoring functions and position monitoring functions without external encoders for duplication of encoders.

When using a servo motor with functional safety, set [Pr. PSA02 Functional safety unit setting] to "\_\_ 1 \_\_".

When not using it, set [Pr. PSA02] to "\_\_ 0 \_\_". Refer to section 4.1 for details.

## 4. SAFETY OBSERVATION FUNCTION

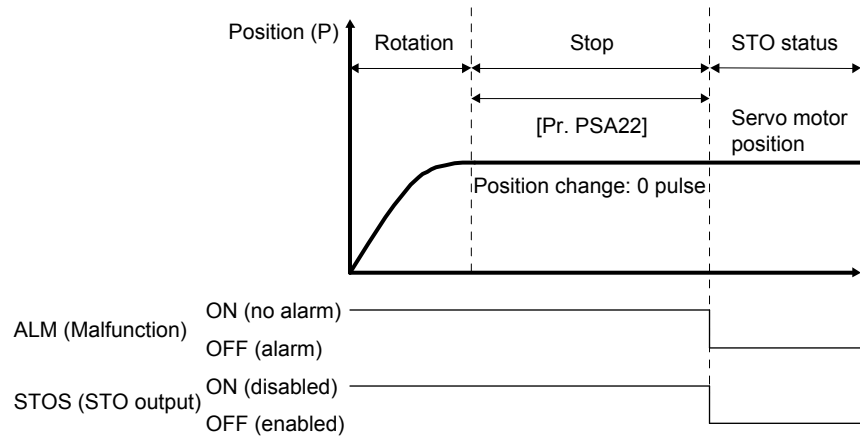
### 4.4.5 Position feedback fixing diagnosis function

#### (1) Summary

The position feedback fixing diagnosis function generates [AL. 79.8 Position feedback fixing error] to make the amplifier STO state when position data from the encoder is fixed.

#### (2) Operation summary

The position feedback fixing diagnosis function will be enabled when the safety observation function is enabled and moreover the amplifier is not STO state. When a position feedback does not change for the time set with [Pr. PSA22 Position feedback fixing error detection time], [AL. 79.8 Position feedback fixing error] occurs and the STO function operates.



# 4. SAFETY OBSERVATION FUNCTION

## 4.5 Safety observation function

### 4.5.1 STO function

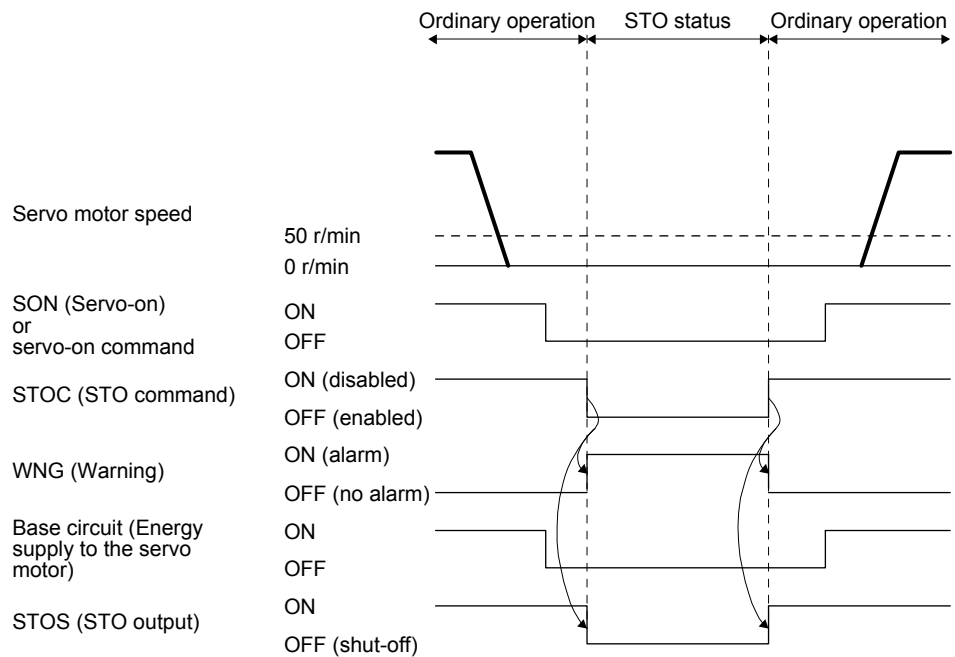
#### (1) Summary

Shuts off servo motor drive energy electronically with based on an input signal from an external device (secondary-side output shut-off). This corresponds to stop category 0 of IEC 60204-1. The STO function is also used for an emergency stop when an error is detected in internal diagnosis. Use the STO function while the servo motor stops.

#### (2) Operation sequence

##### (a) STOC (STO command)

Turn off STOC (STO command) only when the servo motor stops after servo off. The STO function will operate by turning off STOC (STO command). While STO is in operation, power to the servo motor is shut off and the dynamic brake activates. Turning STOC (STO command) back to on will return to normal operation.



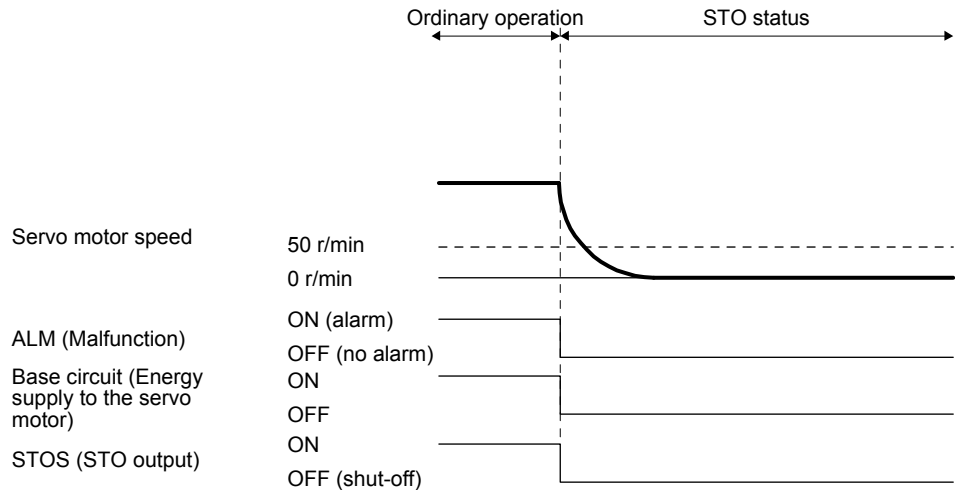


## 4. SAFETY OBSERVATION FUNCTION

### (b) Alarm occurrence

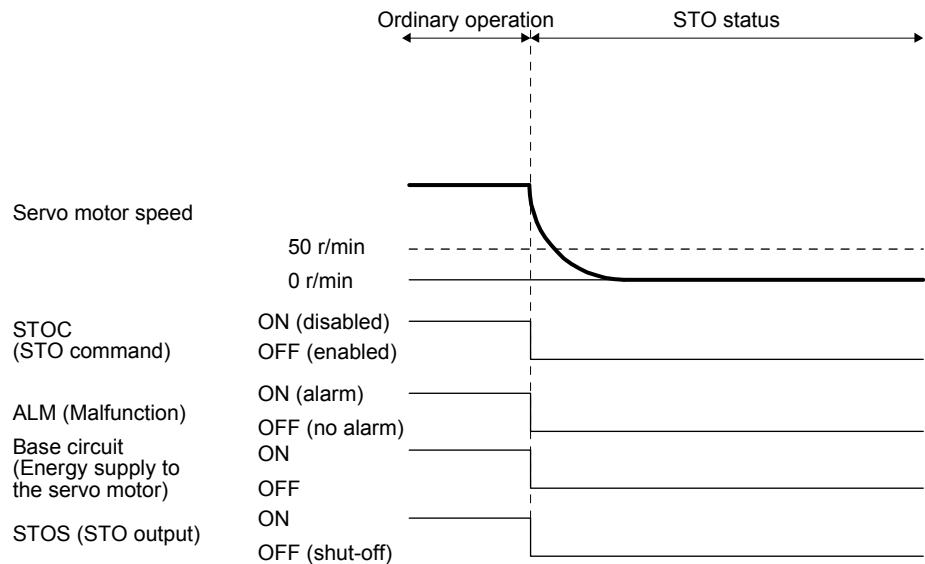
The STO function operates also during alarm occurrence. While STO is in operation, power to the servo motor is shut off and the dynamic brake activates. For alarms which activate STO, refer to chapter 7. For returning to normal operation, refer to section 4.5.10.

The timing chart is for STO/DB stop method.



### (c) STO shut-off during servo motor operation

Turn off STOC (STO command) only when the servo motor stops after servo off. [AL. 63 STO timing error] occurs if STOC (STO command) is turned off during operation. Use the SS1 function when decelerating at the same time.



### (3) Parameter setting

Set the parameter referring to section 4.3.3. Set parameters referring to section 4.4.1 when using the STO function with input devices, and section 4.4.3 when using the STO function with safety compatible motion controller.

Additionally, when using STOS (STO output) with output devices, refer to 4.4.2 to set parameters.

## 4. SAFETY OBSERVATION FUNCTION

### 4.5.2 SS1 function

#### (1) Summary

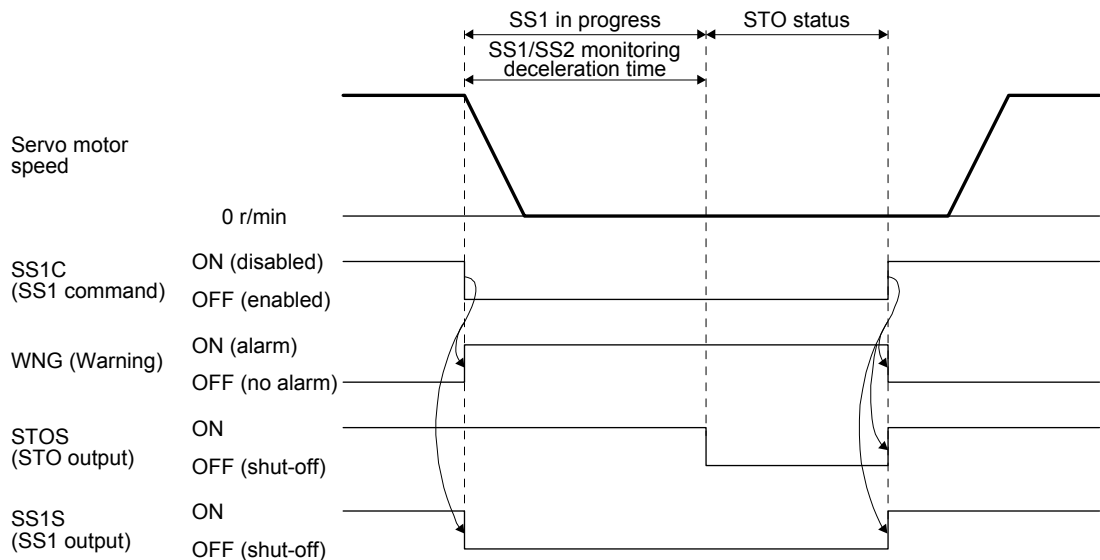
Starts deceleration based on an input signal from an external device (EM2). After a specified time for the check of stop, the STO function will be activated (SS1). This corresponds to stop category 1 of IEC 60204-1.

Be sure to set parameters because the SS1 function is also used for an emergency stop when an error is detected in internal diagnosis.

#### (2) Summary of sequence

##### (a) SS1C (SS1 command)

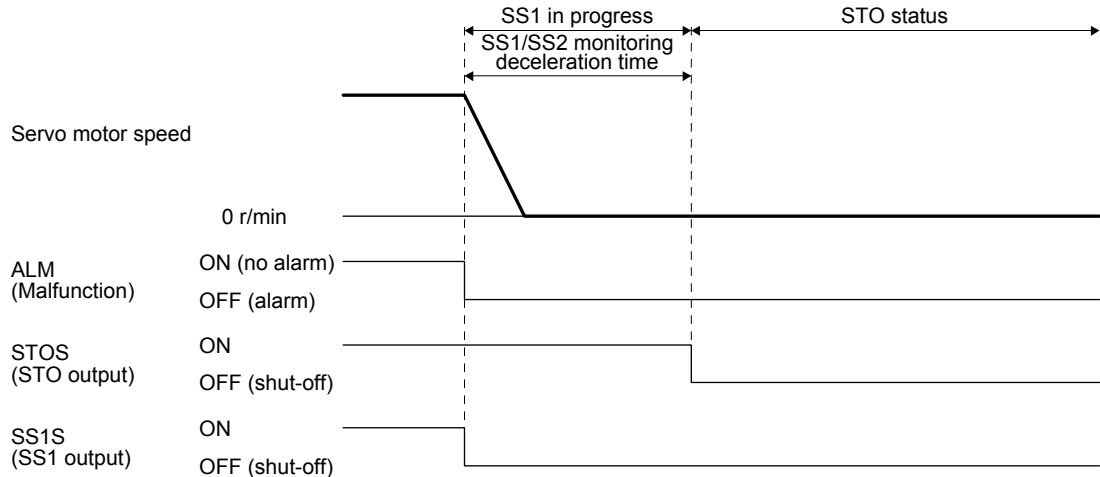
The following shows operation sequence of the SS1 function. The SS1 function will operate by turning off SS1C (SS1 command). The servo motor decelerates with the dynamic brake, electronic dynamic brake, or forced stop. Simultaneously, the time from activation of the SS1 function is calculated, and the STO function will operate when the time specified with [PSA03 SS1/SS2 monitoring deceleration time] has passed. Turning SS1C (SS1 command) back to on will return to normal operation.



## 4. SAFETY OBSERVATION FUNCTION

### (b) Alarm occurrence

The SS1 function operates also during alarm occurrence. After the alarm occurrence, the servo motor decelerates with the dynamic brake, electronic dynamic brake, or forced stop. Simultaneously, the time from activation of the SS1 function is calculated, and the STO function will operate when the time specified with [PSA03 SS1/SS2 monitoring deceleration time] has passed. For alarms which activate the SS1 function, refer to chapter 7. For returning to normal operation, refer to section 4.5.10.



### (3) Stop method

#### (a) Category of stop method

The stop method of the servo motor is decided depending on the parameter setting or a cause of activating the SS1 function. The following table shows stop method of the servo motor during SS1 function operation. For the operation sequence of the each stop method, refer to (b) to (d).

Servo amplifier parameter		Servo amplifier capacity	Control mode during SS1 function operation	Stop method (Note 1)		
[Pr. PA04] Forced stop deceleration function selection	[Pr. PF06] Electronic dynamic brake selection			Activated by SS1C (SS1 command)	Activated by alarm occurrence (Note 2)	
				When the stop method of alarm is SS1/SD	When the stop method of alarm is SS1/EDB	
Enabled	Automatic	600 W or less	Torque control mode	EDB	EDB	EDB
			Other than torque control mode	SD	SD	EDB
	700 W or more	Torque control mode	DB	DB	DB	
		Other than torque control mode	SD	SD	DB	
Disabled			Torque control mode	DB	DB	DB
			Other than torque control mode	SD	SD	DB
Disabled	Automatic	600 W or less		EDB	EDB	EDB
		700 W or more		DB	DB	DB
	Disabled				DB	DB

Note 1. The following shows three stop methods of DB, EDB, and SD.

- DB: Stops with dynamic brake. (Coasts for the servo amplifier without dynamic brake.)
- EDB: Electronic dynamic brake stop
- SD: Forced stop deceleration

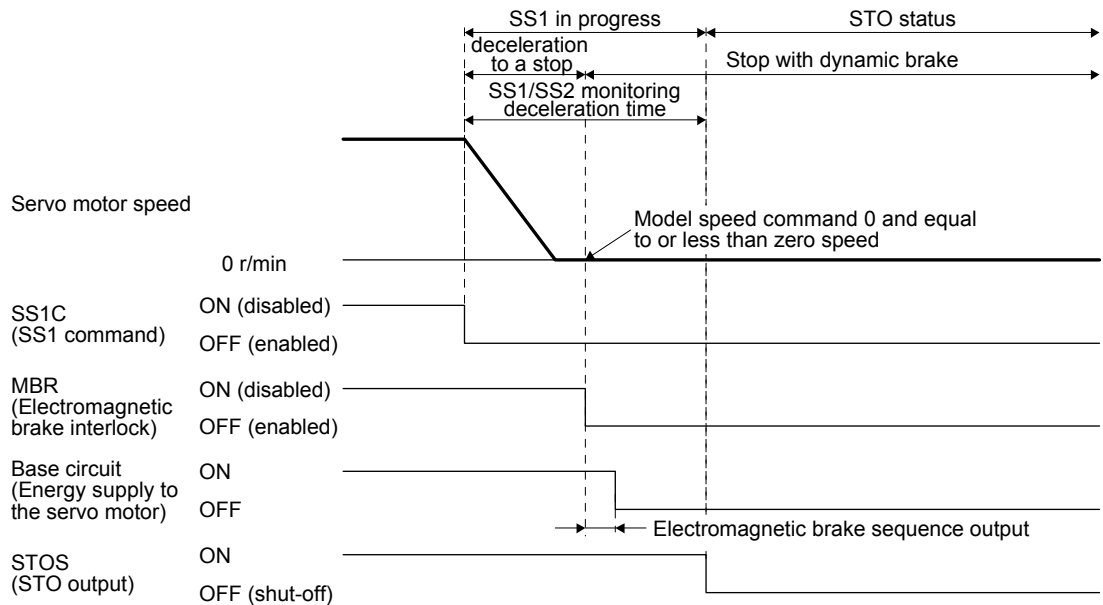
2. The stop method varies depending on the stop method of alarm. For the stop method of each alarm, refer to chapter 7.

## 4. SAFETY OBSERVATION FUNCTION

### (b) Stop with forced stop deceleration

Refer to section 3.6 of "MR-J4-\_B\_(-RJ) Servo Amplifier Instruction Manual" or section 3.7 of "MR-J4-\_A\_(-RJ) Servo Amplifier Instruction Manual" for operation of forced stop deceleration.

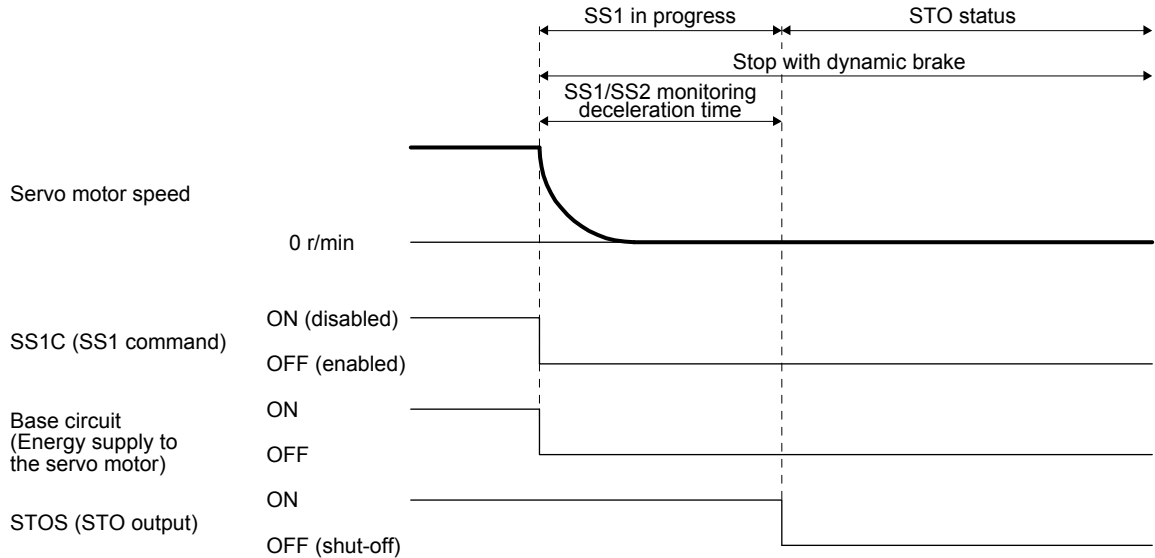
When the SS1 function operates, the motor will decelerate according to [Pr. PC24 Forced stop deceleration time constant]. When the deceleration command is completed and the servo motor speed is decreased to the setting of [Pr. PC07 Zero speed] or less, the base circuit will be shut off and the dynamic brake will be activated after the delay time specified with [Pr. PC02 Electromagnetic brake sequence output] has passed. When SS1/SS2 monitoring deceleration time is shorter than actual deceleration time to a stop, the STO function operates during the deceleration.



## 4. SAFETY OBSERVATION FUNCTION

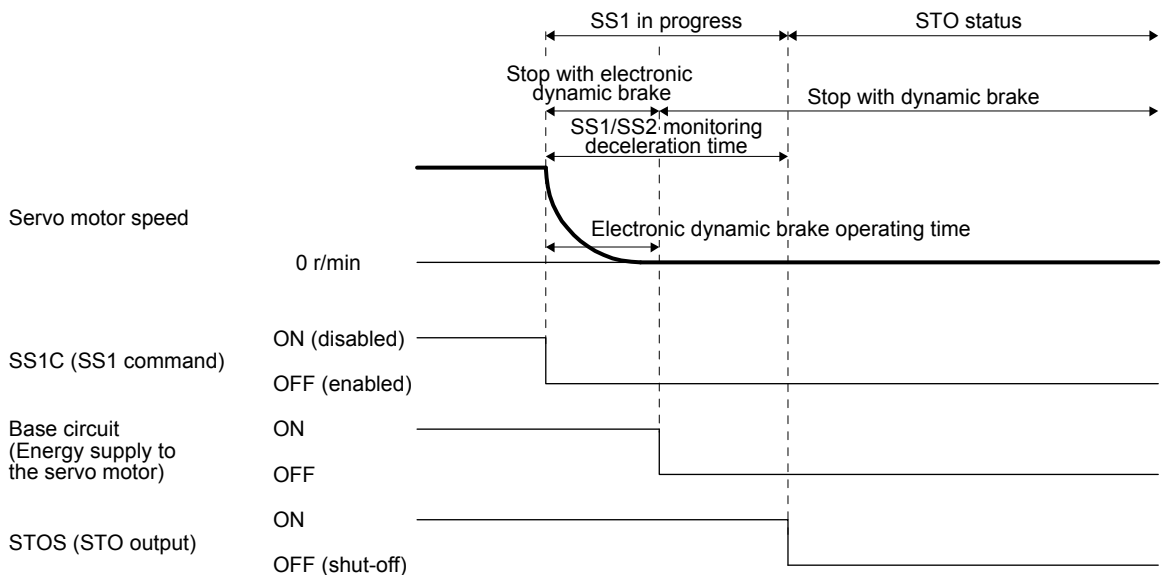
### (c) Stop with dynamic brake

When the SS1 function operates, the servo motor will be stopped with the dynamic brake. Additionally, refer to section 3.6 of "MR-J4-\_B\_(-RJ) Servo Amplifier Instruction Manual" or section 3.7 of "MR-J4-\_A\_(-RJ) Servo Amplifier Instruction Manual" for operation of the dynamic brake.



### (d) Stop with electronic dynamic brake

When the SS1 function operates, the servo motor will be stopped with the electric dynamic brake. When the time has passed after the SS1 function start reaches the setting of [Pr. PF12 Electronic dynamic brake operating time], the dynamic brake will be activated. If the setting of [Pr. PSA03 SS1/SS2 monitoring deceleration time] is shorter than that of [Pr. PF12 Electronic dynamic brake operating time], the dynamic brake will be activated at the moment of reaching the set value of [Pr. PSA03 SS1/SS2 monitoring deceleration time].



## 4. SAFETY OBSERVATION FUNCTION

### (4) Parameter setting

Set the parameter referring to section 4.3.3. Set parameters referring to section 4.4.1 when using the SS1 function with input devices, and section 4.4.3 when using the SS1 function with safety compatible motion controller. Additionally, when using SS1S (SS1 output) with output devices, refer to 4.4.2 to set parameters.

The SS1 function is used for an emergency stop when an error is detected in internal diagnosis.

Therefore, be sure to set [Pr. PSA03 SS1/SS2 monitoring deceleration time] to a time required for the servo motor to stop.

### 4.5.3 SS2/SOS function

#### (1) Summary

When SS2C (SS2 command) turns off, the SS2/SOS function executes the stop observation (SOS) after a delay time set in advance or after standby until the servo motor stop is detected (SS2).

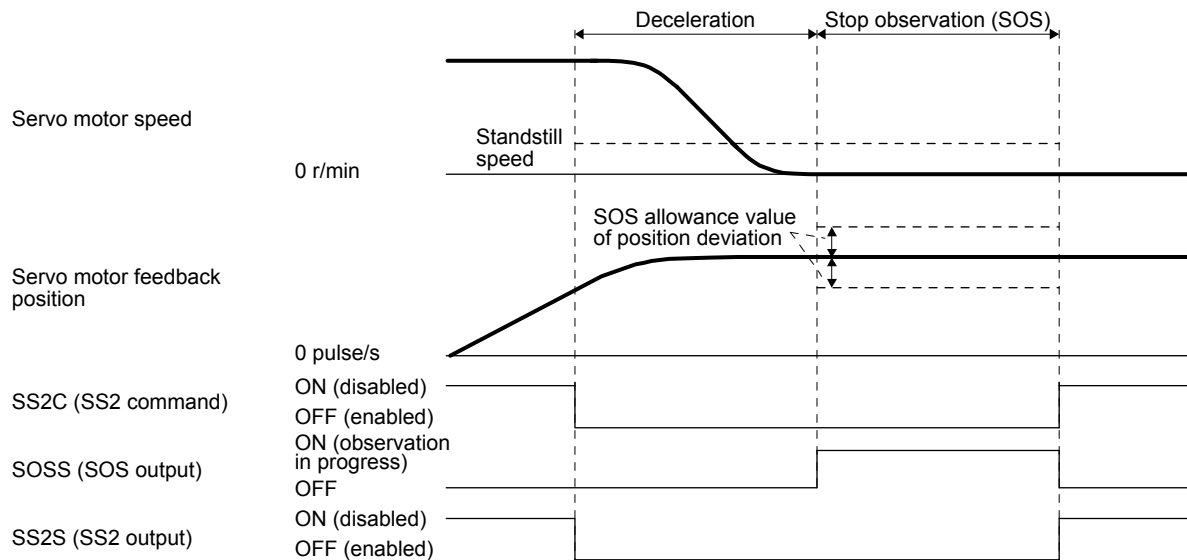
#### (2) Summary of sequence

The SS2/SOS function will operate by turning off SS2C (SS2 command).

The SS2/SOS function executes monitoring deceleration at first. Next, it will wait until the speed decelerates a fixed speed or until a specified time passes. During the time, please execute deceleration with the controller. Refer to (3) of this section for details of speed observation and delay time observation during deceleration.

After the deceleration is complete, the stop observation starts. As the stop observation, speed command, speed feedback, and position feedback are the targets. Refer to (4) of this section for details of these observations. SOSS (SOS output) outputs on during stop observation.

The SS2/SOS function ends by returning SS2C (SS2 command) to on.

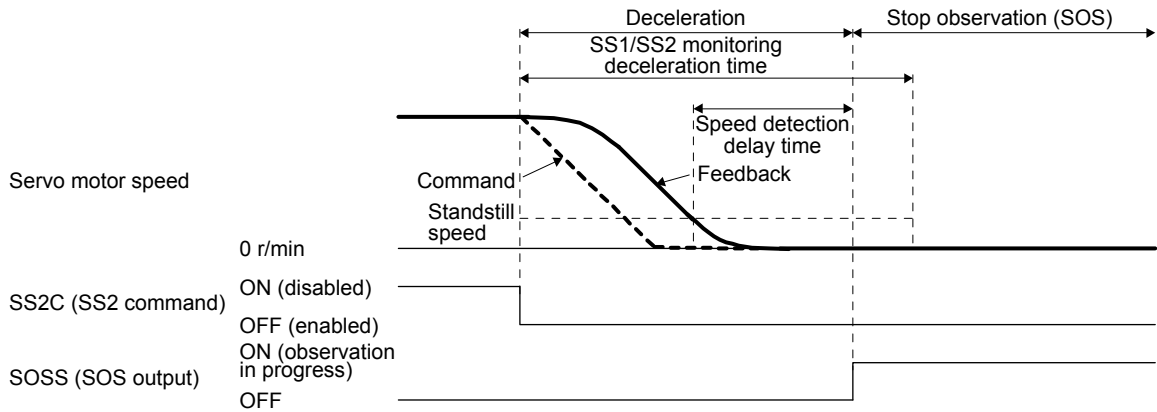


## 4. SAFETY OBSERVATION FUNCTION

### (3) Deceleration observation

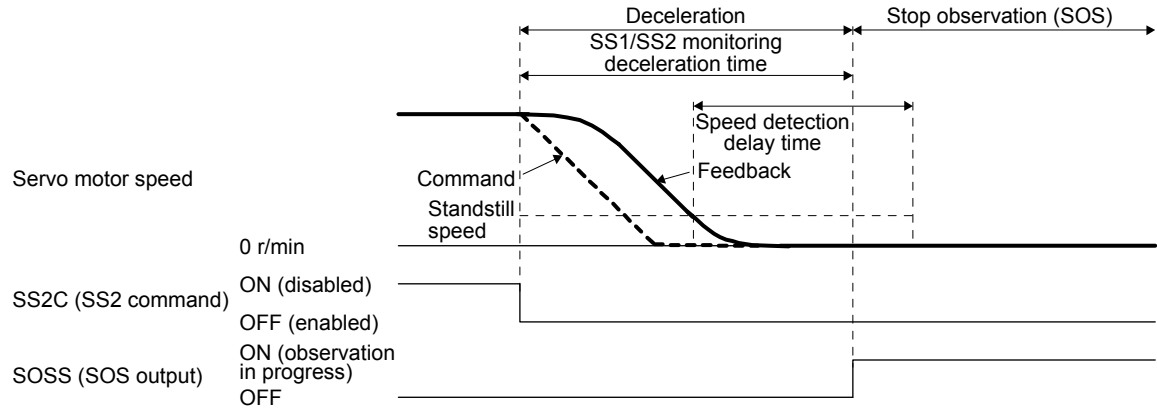
#### (a) Speed observation at deceleration

The deceleration will be assumed as completion and the stop observation (SOS) will start when both absolute value of the speed command and speed feedback are set value of [Pr. PSA04 SS2/SOS standstill speed] or lower during deceleration. However, when the speed is lower than the standstill speed, the stop observation will start after the setting time of [Pr. PSA15 SLS/SS2/SOS speed detection delay time].



#### (b) Delay time observation during deceleration

The deceleration will be assumed as completion and the stop observation (SOS) will start when the time after starting SS2/SOS function reaches the set time of [Pr. PSA03 SS1/SS2 Deceleration observation time].



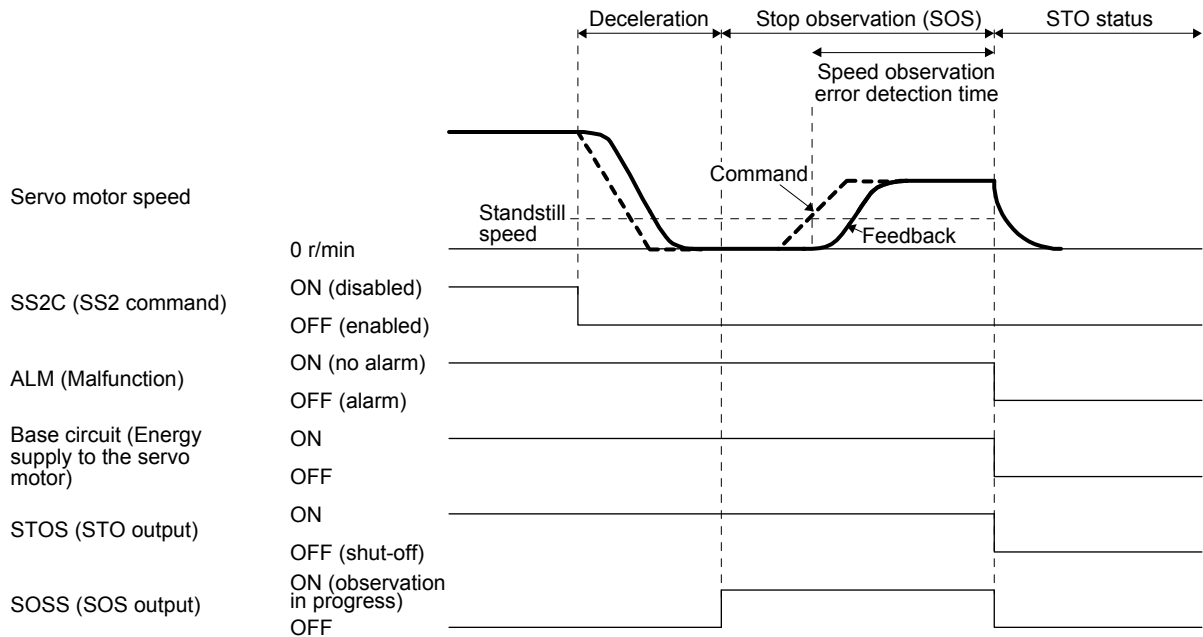
## 4. SAFETY OBSERVATION FUNCTION

### (4) Stop observation

The SOS function observes both command speed and feedback speed.

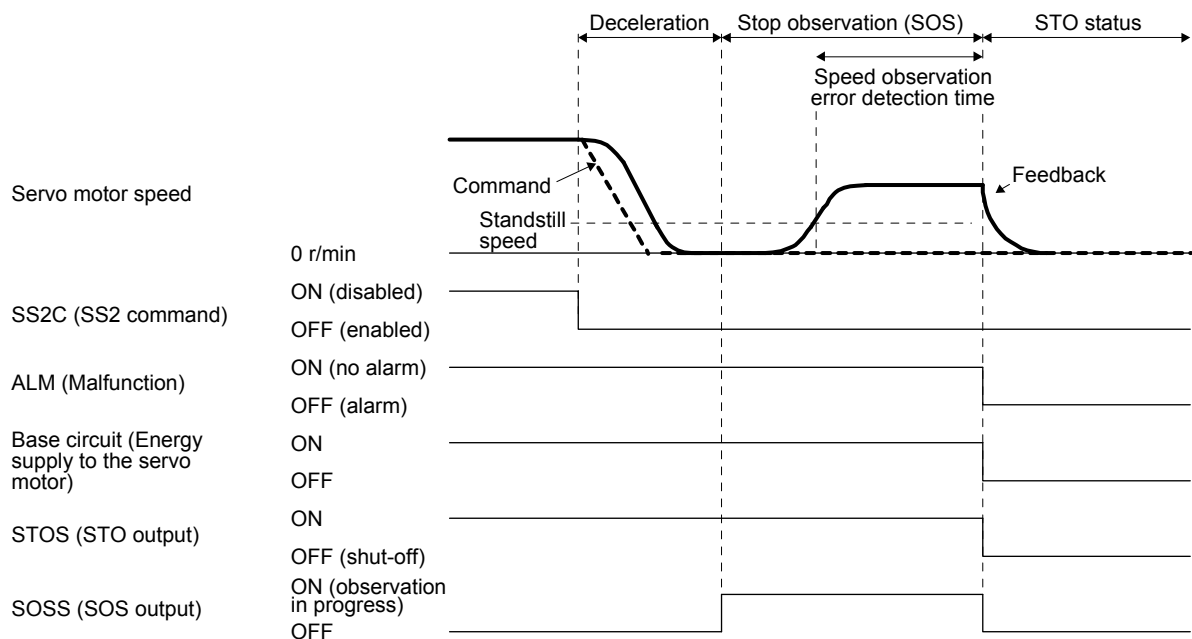
#### (a) Speed command observation

This observes that an absolute value of the command speed does not exceed the set value of [Pr. PSA04 SS2/SOS standstill speed] during stop observation. When an excess of command speed continues for the set value of [Pr. PSA15 SLS/SS2/SOS speed detection delay time], the STO function will start.



#### (b) Speed feedback observation

This observes that an absolute value of the speed feedback does not exceed the set value of [Pr. PSA04 SS2/SOS standstill speed] during stop observation. When an excess of speed feedback continues for the set value of [Pr. PSA15 SLS/SS2/SOS speed detection delay time], the STO function will start.

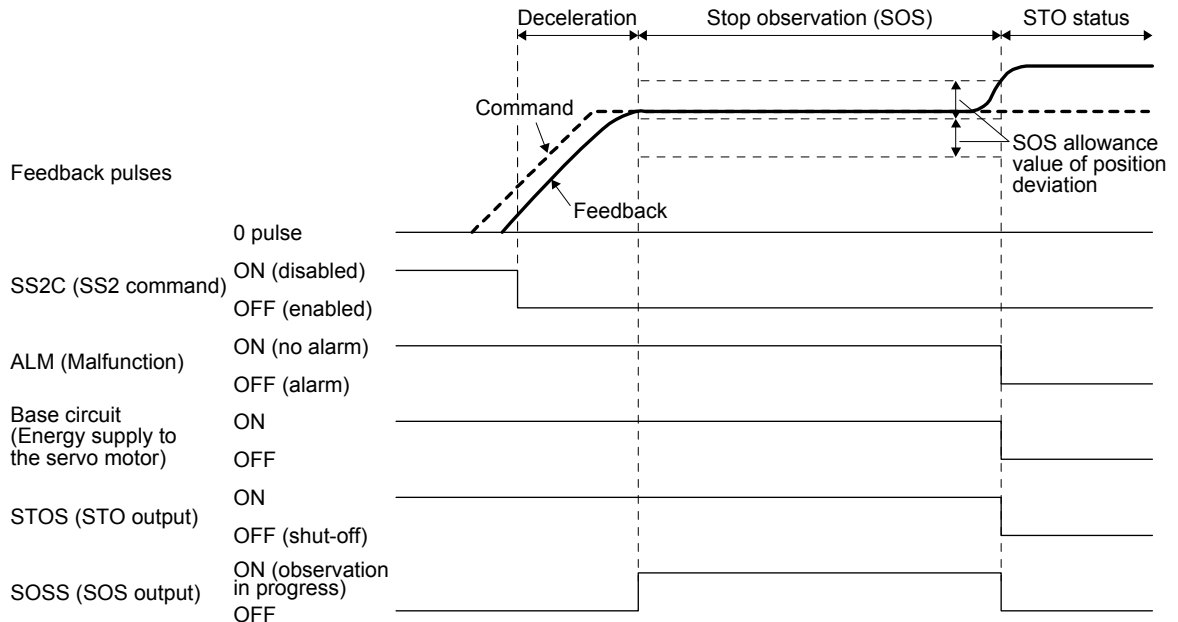




## 4. SAFETY OBSERVATION FUNCTION

### (c) Position feedback observation during a stop

This observes that an absolute value of the position feedback variation from the start of the stop observation (SOS) is within the set value of [Pr. PSA05 SOS allowance value of position deviation] during stop observation. The STO function operates when the travel distance exceeding the set value of [Pr. PSA05 SOS allowance value of position deviation] is detected.



### (5) Parameter setting

Set the parameter referring to section 4.3.3. Set parameters referring to section 4.4.1 when using the SS2/SOS function with input devices, and section 4.4.3 when using the SS2/SOS function with safety compatible controller. Additionally, when using SS2S (SS2 output) and SOSS (SOS output) with output devices, refer to 4.4.2 to set parameters.

To use the SS2/SOS function, a servo motor with functional safety is required. Refer to section 4.4.4 for servo motors with functional safety. When using the SS2/SOS function, set the parameters as follows.

Parameter	Name
PSA03	SS1/SS2 monitoring deceleration time
PSA04	SS2/SOS standstill speed
PSA05	SOS allowance value of position deviation
PSA06	SOS allowance value of position deviation unit selection
PSA15	SLS/SS2/SOS speed detection delay time
PSA17	SOS position detection delay time

#### (a) SS1/SS2 monitoring deceleration time

Set enough time for the servo motor to stop referring operation sequence.

#### (b) SS2/SOS standstill speed

Set servo motor speed which the servo motor is assumed as stopped referring operation sequence.

#### (c) SOS allowance value of position deviation, SOS allowance value of position deviation unit selection

Set an allowance value of position deviation during stop observation referring to the operation sequence.

## 4. SAFETY OBSERVATION FUNCTION

### (d) SLS/SS2/SOS speed detection delay time

You can set a delay time for when the speed decelerates lower than standstill speed until the start of stop observation and for when the speed accelerates higher than standstill speed during stop observation until the start of the STO function by using [Pr. PSA15 SLS/SS2/SOS speed detection delay time].

### (e) SOS position detection delay time

You can set a delay time for when the travel distance exceeds a threshold until the start of the STO function by using [Pr. PSA17 SOS position detection delay time].

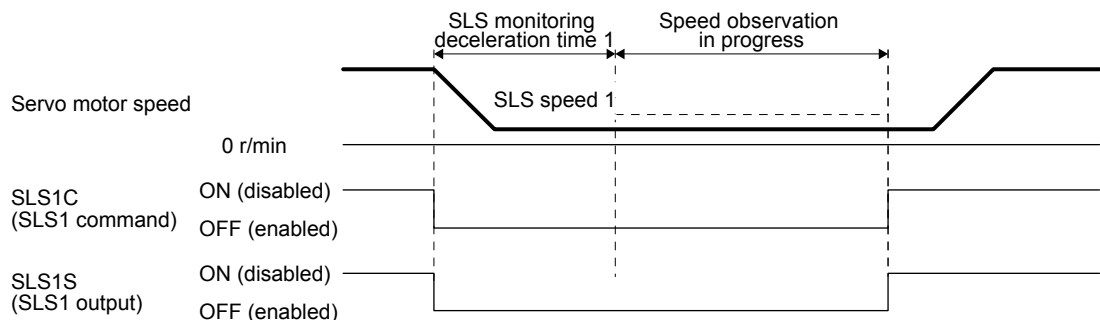
### 4.5.4 SLS function

#### (1) Summary

This is a function to observe whether the speed is within a regulated speed limit value. When the speed is over a specified speed, energy will be shut off by STO. The STO function operates when the servo motor speed exceeding the SLS speed is detected. The SLS function observes both command speed and feedback speed.

#### (2) Summary of sequence

The SLS function starts to operate by turning off SLS\_C (SLS\_command). Speed observation will be started when the delay time specified with the parameter has passed after SLS\_C (SLS\_command) is turned off. During the speed observation, the servo motor speed is observed to be equal to or less than the SLS speed specified with the parameter. The speed observation will be terminated by turning on SLS\_C (SLS\_command).



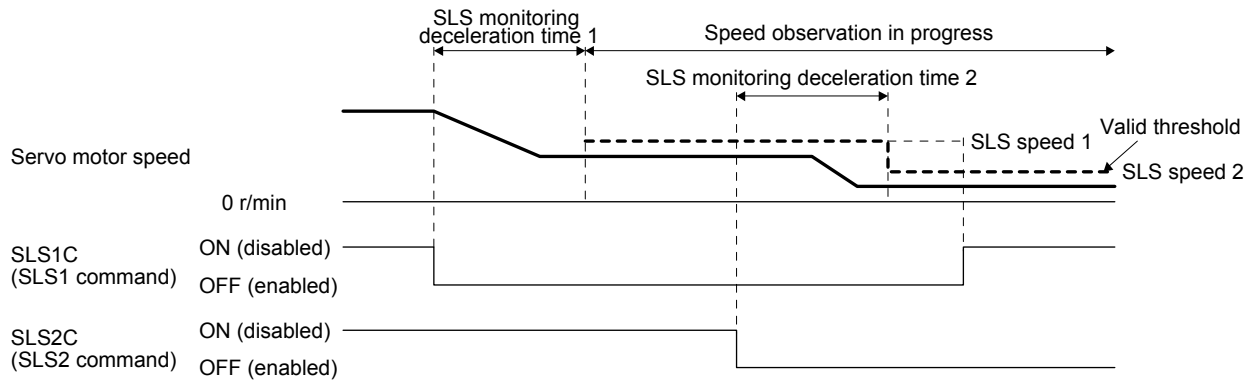
#### (3) Parameter switching

With the SLS function, four patterns of SLS speed and SLS deceleration monitoring time can be set. The following table shows SLS deceleration monitoring time and SLS speed enabled with each command of SLS1, SLS2, SLS3, and SLS4.

SLS command	SLS deceleration monitoring time	SLS speed
SLS1 command	[Pr. PSA07 SLS deceleration monitoring time 1]	[Pr. PSA11 SLS speed 1]
SLS2 command	[Pr. PSA08 SLS deceleration monitoring time 2]	[Pr. PSA12 SLS speed 2]
SLS3 command	[Pr. PSA09 SLS deceleration monitoring time 3]	[Pr. PSA13 SLS speed 3]
SLS4 command	[Pr. PSA10 SLS deceleration monitoring time 4]	[Pr. PSA14 SLS speed 4]

## 4. SAFETY OBSERVATION FUNCTION

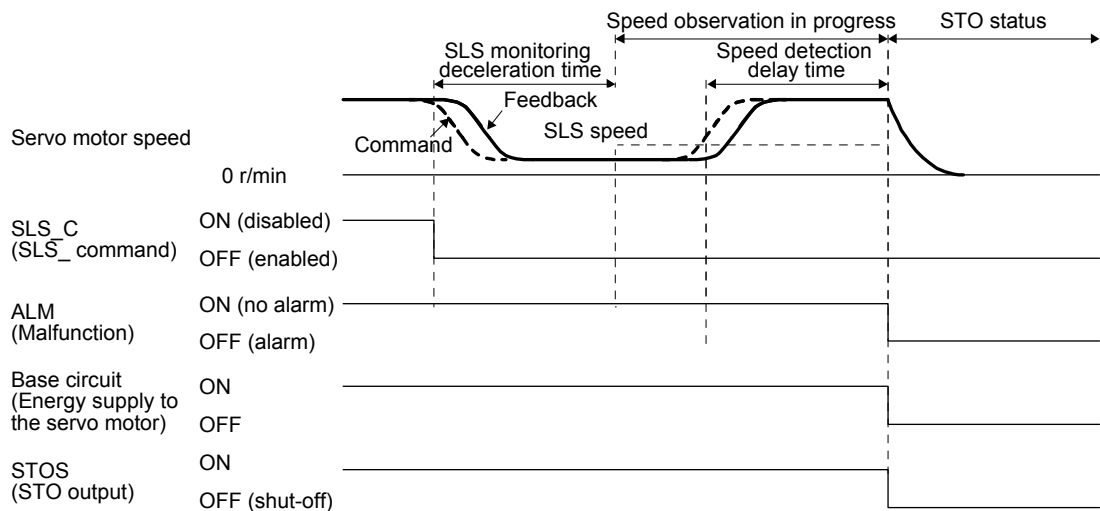
The following shows a sequence for when SLS1 and SLS2 commands are simultaneously turned off. Multiple speed observations are executed simultaneously. However, a valid threshold for speed would be the smallest SLS speed. In the following sequence, the value of SLS speed 2 is smaller than that of SLS speed 1. Thus, observation will be executed by SLS speed 2 while both SLS1 and SLS2 commands are enabled.



### (4) Speed observation

#### (a) Speed command observation

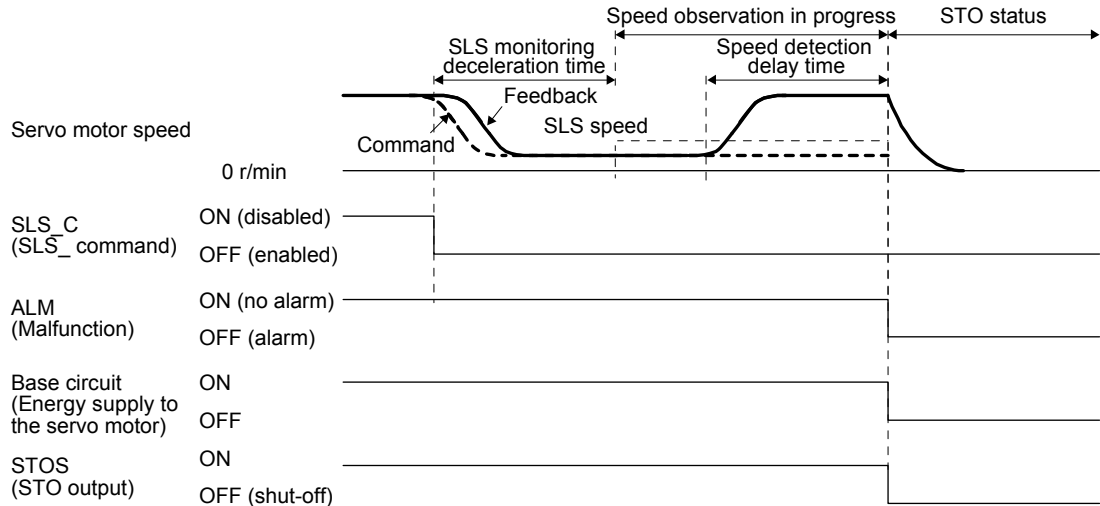
During the speed observation, an absolute value of the speed command is observed not to exceed the SLS speed. The STO function operates when the speed command exceeding the SLS speed is detected. However, when the speed is higher than the SLS speed, the STO function will start after the setting time of [Pr. PSA15 SLS/SS2/SOS speed detection delay time].



## 4. SAFETY OBSERVATION FUNCTION

### (b) Speed feedback observation

During the speed observation, an absolute value of the speed feedback is observed not to exceed the SLS speed. When an excess of speed feedback continues for the set value of [Pr. PSA15 SLS/SS2/SOS speed detection delay time], the STO function will start.



### (5) Parameter setting

Set the parameter referring to section 4.3.3. Set parameters referring to section 4.4.1 when using the SLS function with input devices, and section 4.4.3 when using the SLS function with safety compatible motion controller.

When using the SLS function, set the parameters as follows.

Parameter	Name
PSA07	SLS deceleration monitoring time 1
PSA08	SLS deceleration monitoring time 2
PSA09	SLS deceleration monitoring time 3
PSA10	SLS deceleration monitoring time 4
PSA11	SLS speed 1
PSA12	SLS speed 2
PSA13	SLS speed 3
PSA14	SLS speed 4
PSA15	SLS/SS2/SOS speed detection delay time

#### (a) SLS deceleration monitoring time 1 to SLS deceleration monitoring time 4

Set a time from SLS\_C (SLS\_command) off to the speed observation start referring to the operation sequence. Set enough time for the servo motor to decelerate to the SLS speed or less. Four parameters are available for SLS1C (SLS1 command) to SLS4C (SLS4 command). However, it is not necessary to set a parameter with no possibility to be enabled.

#### (b) SLS speed 1 to SLS speed 4

Set a speed threshold for the speed observation referring to the operation sequence. Four parameters are available for SLS1C (SLS1 command) to SLS4C (SLS4 command). However, it is not necessary to set a parameter with no possibility to be enabled.

#### (c) SLS speed detection delay time

Set an error detection time for the time detected. This parameter changes the delay time to activate the STO function after the speed exceeds the SLS speed during the speed observation.

## 4. SAFETY OBSERVATION FUNCTION

### 4.5.5 SSM function

#### (1) Summary

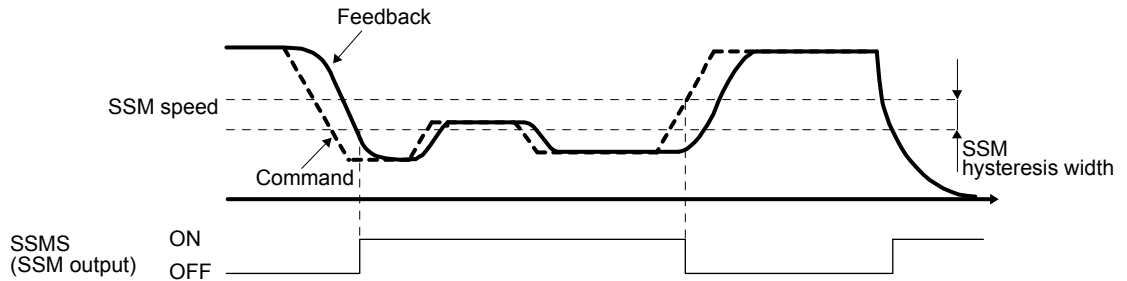
Outputs a signal when the servo motor speed is within a regulated speed.

#### (2) Operation sequence

##### (a) SSMS (SSM output)

In the SSM function, SSMS (SSM output) is on when both the speed command and the speed feedback are equal to or lower than the setting of [Pr. PSA18 SSM speed]. Absolute values of the speed command and the speed feedback are observed not to exceed the SSM speed. SSMS (SSM output) is off when the either one exceeding the SSM speed is detected.

SSMS (SSM output) is on when the absolute values of both the speed command and the speed feedback are decreased, exceeding the setting value of [Pr. PSA20 SSM hysteresis width] from the SSM speed. Setting [Pr. PSA20 SSM hysteresis width] properly prevents chattering of SSMS (SSM output) at the time of the servo motor speed change around the SSM speed.



#### (3) Parameter setting

When using the SSM function, set the parameters as follows.

Parameter	Name
PSA18	SSM speed
PSA19	SSM hysteresis width

##### (a) SSM speed

Set a speed threshold for the speed observation referring to the operation sequence.

##### (b) SSM hysteresis width

Set a hysteresis width necessary to prevent chattering of SSMS (SSM output) referring to the operation sequence.

## 4. SAFETY OBSERVATION FUNCTION

### 4.5.6 SBC function

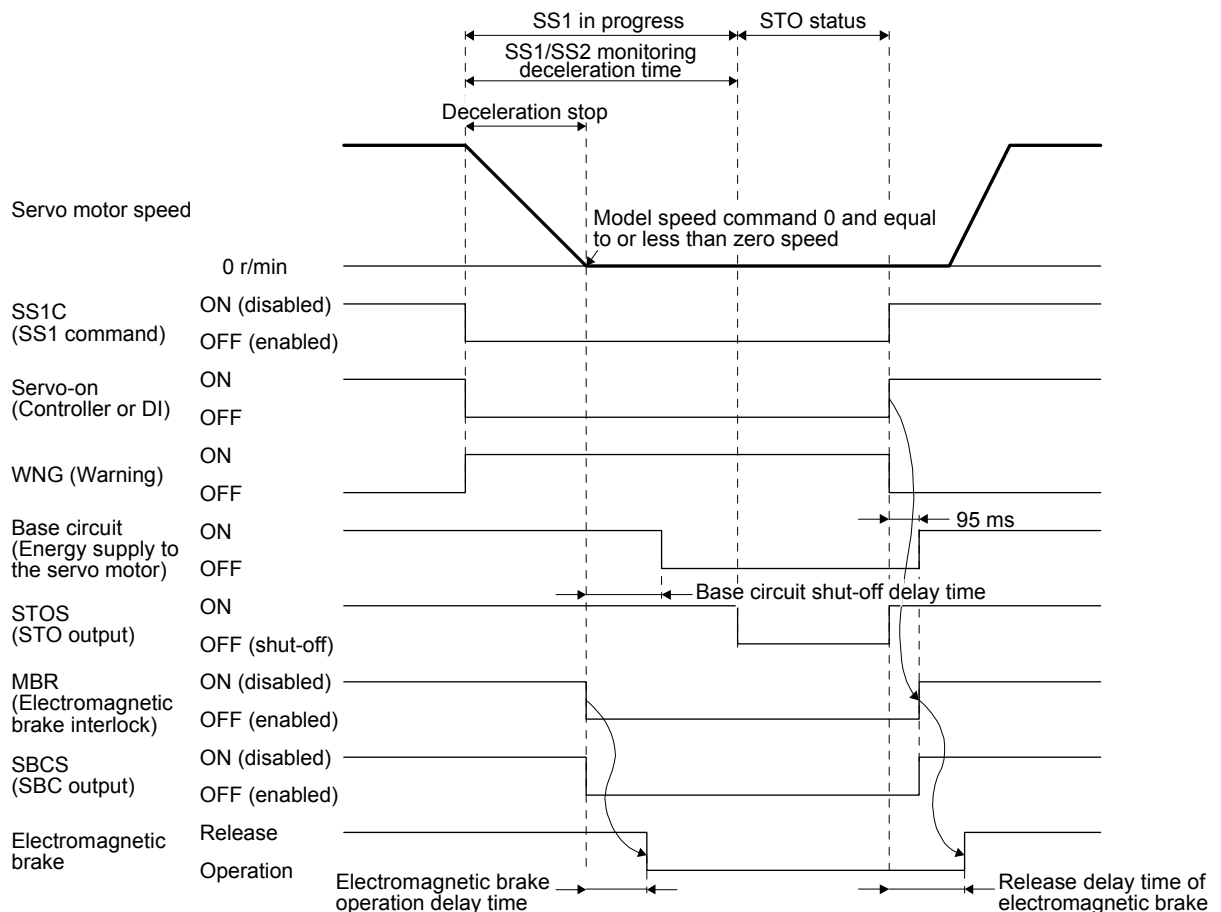
POINT
<p>● Use SBCS (SBC output) for activating the electromagnetic brake. There is no need to use MBR (Electromagnetic brake interlock).</p>

#### (1) Summary

Outputs a signal for an external brake control.

#### (2) Operation sequence

The following shows an operation sequence during an operation of SS1 and a return from STO state. The configuration shows that the electromagnetic brake operates when SBCS (SBC output) is off. By setting [Pr. PC02 Base circuit shut-off delay time] and [Pr. PSA03 SS1/SS2 monitoring deceleration time] properly, the electromagnetic brake operates preventing dropping of vertical axis. Vertical axis freefall prevention function is also available.



Note. When the STO function shuts the power off, the dynamic brake will stop from start of the STO function until the electromagnetic brake starts operating. Be aware that vertical axis may drop.

#### (3) Parameter setting

Set the parameter referring to section 4.3.3. Set parameters for the output devices referring to section 4.4.2.

## 4. SAFETY OBSERVATION FUNCTION

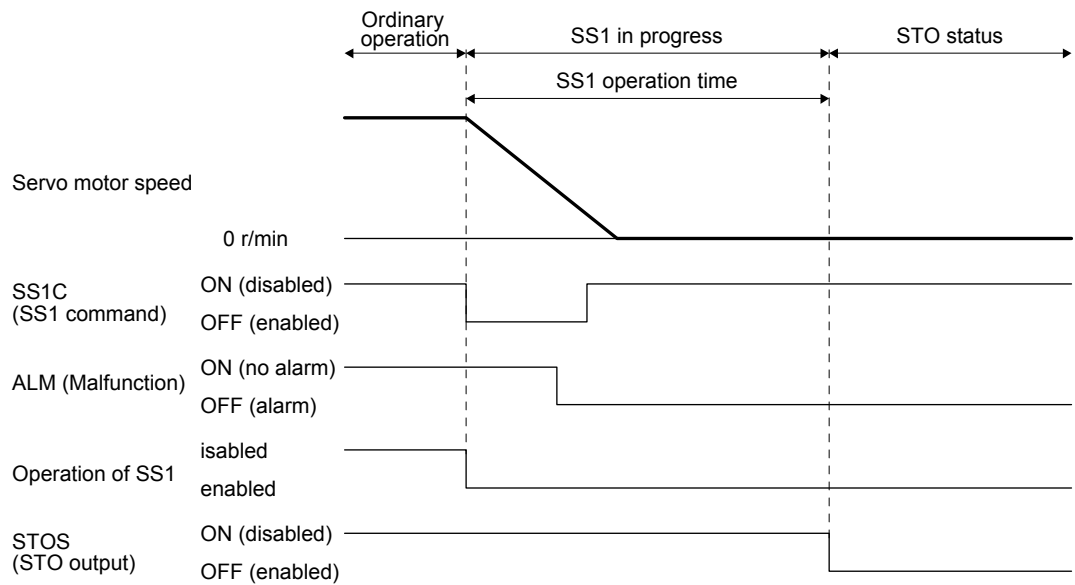
### 4.5.7 Status monitor (SM) function

Each function state of SSM, SBC, STO, SOS, SS1, SS2, and SLS will be outputted by signals. This function is not the one defined in IEC/EN 61800-5-2. The function is an original function of the functional safety unit. For details of device, refer to section 3.6.2.

### 4.5.8 Multiple inputs of safety observation functional operation commands

Operation commands which have the same function can be input simultaneously for operation commands of the safety observation function. For example, SS1C (SS1 command) input and SS1 input due to an alarm occurrence can occur simultaneously.

When there are multiple operation triggers for a function and at least one of them is valid, the function will start. The following shows an operation sequence for when an alarm occurs during the operation of SS1 by SS1C (SS1 command) as an example.



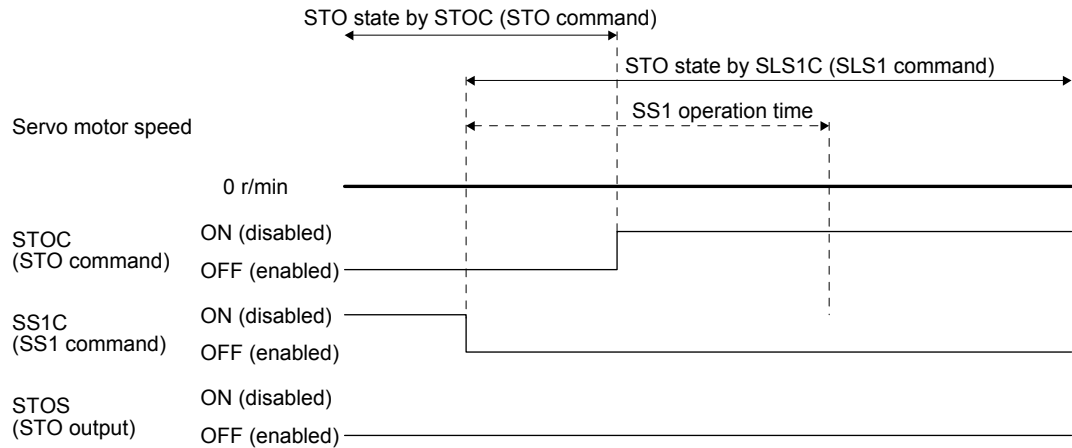
As triggers of the SS1 function, SS1C (SS1 command) and ALM (Malfunction) are input. However, a timer counting the SS1/SS2 monitoring deceleration time is the only one counting from SS1C (SS1 command) which was started first. At the moment of SS1C (SS1 command) returning to on, the SS1 function is being enabled by ALM (Malfunction), thus, the SS1 function continues the operation.

## 4. SAFETY OBSERVATION FUNCTION

### 4.5.9 Simultaneous operation of STO and SS1 functions

When SS1C (SS1 command) turns off during the operation of the STO function, deceleration and time count by the SS1 function will not be executed and the STO function continues the operation.

As the following sequence, time count of the SS1 function will not be executed if SS1C (SS1 command) turns off during the STO state by STOC (STO command). Even if STOC (STO command) is turned on, the STO state by SS1C (SS1 command) continues without being canceled.



Similarly, when STOC (STO command) is turned off during the operation of the SS1 function, both deceleration of SS1 and time count will be canceled.

### 4.5.10 At alarm occurrence

When an error occurs during operation, the corresponding alarm or warning is displayed. If any alarm or warning has occurred, refer to section 7 and take the appropriate action.

#### (1) Summary

##### (a) Stop method

The following stop methods are available when MR-D30 is used.

Stop method	Explanation
DB	Stops with dynamic brake. (Coasts for the servo amplifier without dynamic brake.)
EDB	600 W or less servo amplifiers: Stops with electronic dynamic brake. 700 W or more servo amplifiers: Stops with dynamic brake.
SD	The forced stop deceleration is performed.
STO/DB	Stops with dynamic brake by activating the STO function. For the operation sequence of this stop method, refer to 4.5.1.
SS1/EDB	Activates the SS1 function. 600 W or less servo amplifiers: Stops with electronic dynamic brake. 700 W or more servo amplifiers: Stops with dynamic brake. For the operation sequence of this stop method, refer to 4.5.2.
SS1/SD	Activates the SS1 function. The forced stop deceleration is performed. For the operation sequence of this stop method, refer to 4.5.2.

STO/DB, SS1/EDB, and SS1/ED are mainly an internal alarm of MR-D30. The STO state continues until the power is cycled or reset.

##### (b) Safety observation function stop

If a serious error is detected in MR-D30, the SLS and SSM functions will stop. For the alarms which stop these functions, refer to chapter 7. When the function stops, output devices will output off.



## 4. SAFETY OBSERVATION FUNCTION

### (c) Alarm reset

After a cause of the alarm is removed, the alarm can be canceled with one of the following methods.

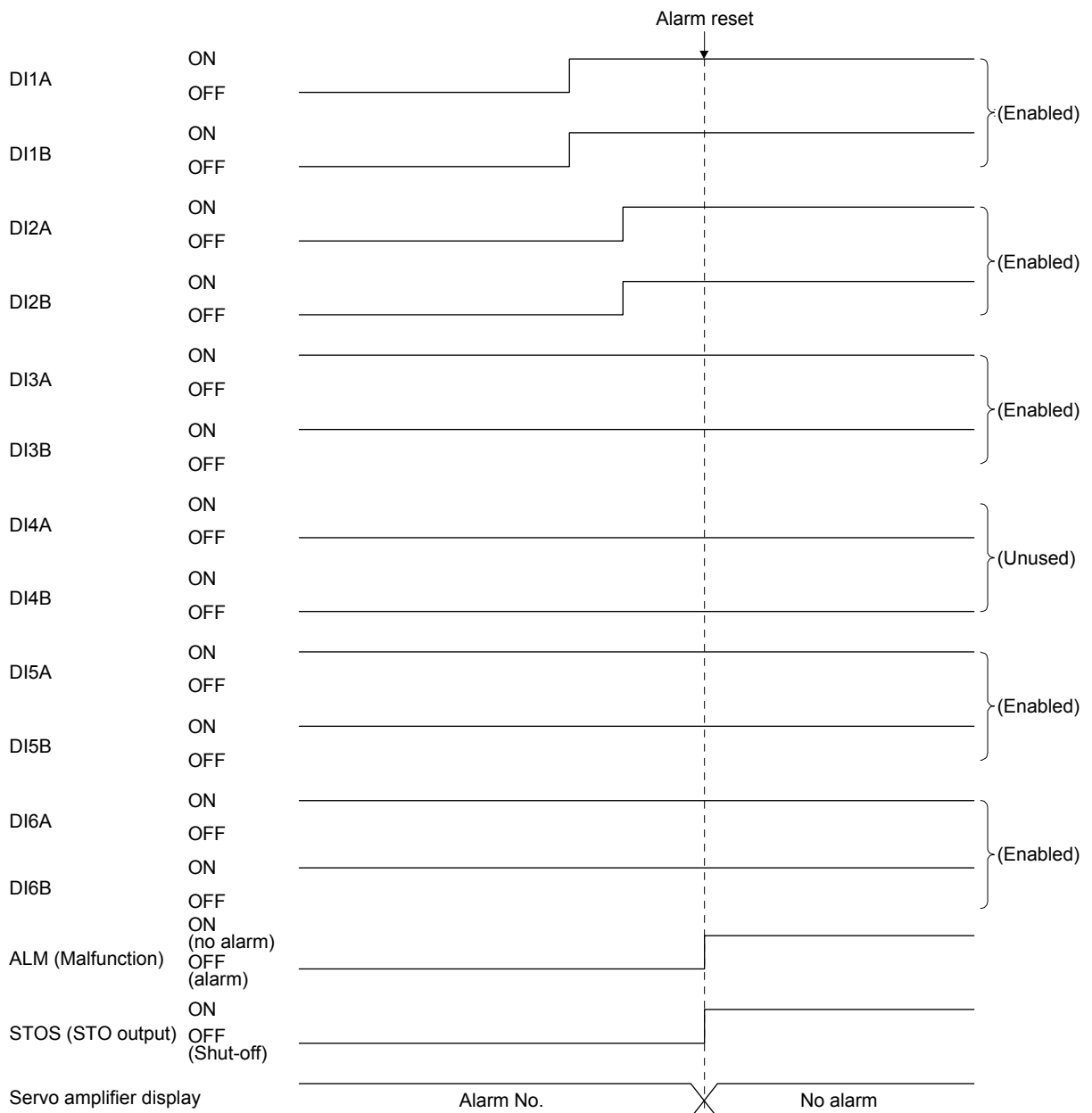
- Error reset
- CPU reset
- Power off to on

### (2) How to reset alarm of safety observation function

#### (a) Using input device

Refer to chapter 7 for the list of alarms supporting reset operation in the alarms of safety observation function.

STO will be canceled and return to normal operation when the cause of an alarm occurrence is removed and alarm reset is executed with all the enabled input devices on. It is no problem if the pin (unused pin) to which an input device is not assigned with [Pr. PSD02 Input device selection DI1] to [Pr. PSD07 Input device selection DI6] is off.

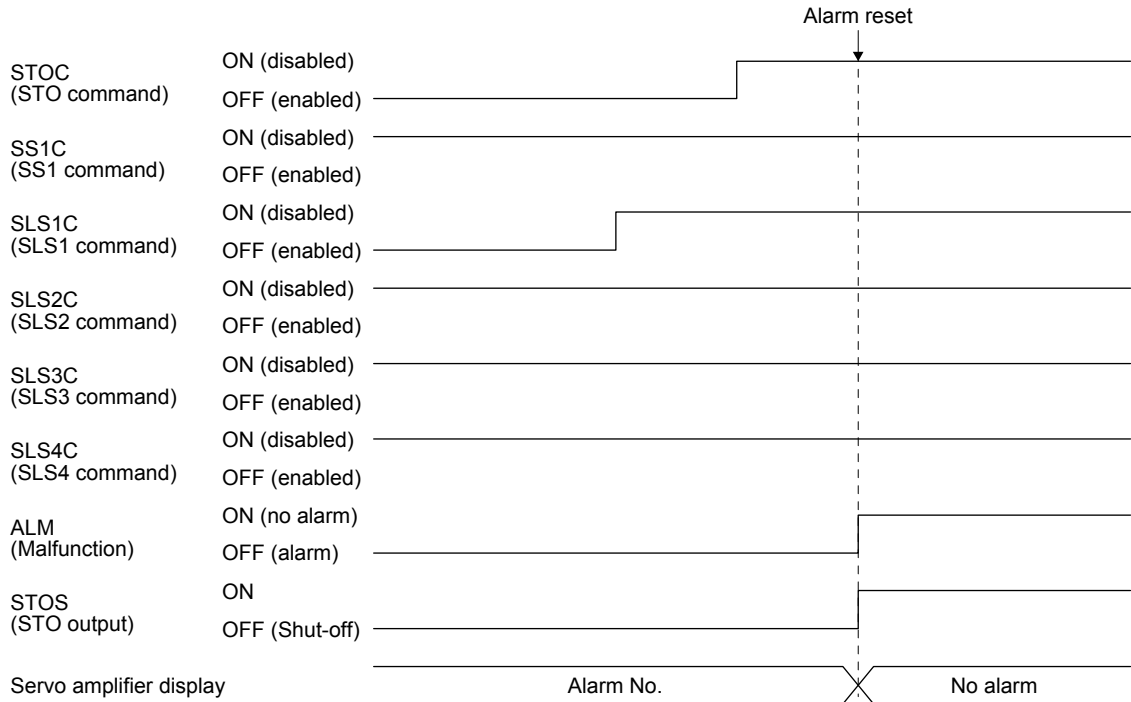


## 4. SAFETY OBSERVATION FUNCTION

(b) When using a drive safety integrated motion controller

Refer to chapter 7 for the list of alarms supporting reset operation in the alarms of safety observation function.

STO will be canceled and return to normal operation when the cause of the alarm occurrence is removed and alarm reset is executed with all commands on: STOC (STO command), SS1C (SS1 command), SS2C (SS2 command), SLS1C (SLS1 command), SLS2C (SLS2 command), SLS3C (SLS3 command), and SLS4C (SLS4 command).





## 5. PARAMETERS

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### 5. PARAMETERS

#### CAUTION

- Never make a drastic adjustment or change to the parameter values as doing so will make the operation unstable.
- If fixed values are written in the digits of a parameter, do not change these values.
- Do not change parameters for manufacturer setting.
- Do not set a value other than the described values to each parameter.

#### POINT

- For parameters of servo amplifiers, refer to "MR-J4-\_B\_(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-\_A\_(-RJ) Servo Amplifier Instruction Manual".

#### 5.1 Parameter list

#### POINT

- The parameter whose symbol is preceded by \* is enabled with the following conditions:
  - \*: After setting the parameter, cycle the power or reset the controller.
  - \*\* : After setting the parameter, cycle the power.
- Abbreviations of operation modes indicate the followings.
  - Standard: Standard (semi closed loop system) use of the rotary servo motor
  - Full.: Fully closed loop system use of the rotary servo motor
  - Lin.: Linear servo motor use
  - DD: Direct drive (DD) motor use

# 5. PARAMETERS

## 5.1.1 Safety observation function parameters 1 ([Pr. PSA\_ \_])

No.	Symbol	Name	Initial value	Unit	Password protection	Input mode		Operation mode					
						With drive safety integrated motion controller	Input device	Servo motor	Servo motor with functional safety	Lin.	Full.	DD	
PSA01	**SOA	Safety observation function activation setting	0000h			○	○	○	○	○	○	○	○
PSA02	**SMD	Functional safety unit setting	0000h			○	○	○	○	○	○	○	○
PSA03	**SST	SS1/SS2 monitoring deceleration time	1000	[ms]		○	○	○	○	○	○	○	○
PSA04	**SSS	SS2/SOS standstill speed	50			○	○	○	○	○	○	○	○
PSA05	**SSDP	SOS allowance value of position deviation	3			○	○	○	○	○	○	○	○
PSA06	**SAOP1	SOS allowance value of position deviation unit selection	0			○	○	○	○	○	○	○	○
PSA07	**SLSDT1	SLS deceleration monitoring time 1	1000	[ms]		○	○	○	○	○	○	○	○
PSA08	**SLSDT2	SLS deceleration monitoring time 2	1000	[ms]		○	○	○	○	○	○	○	○
PSA09	**SLSDT3	SLS deceleration monitoring time 3	1000	[ms]		○	○	○	○	○	○	○	○
PSA10	**SLSDT4	SLS deceleration monitoring time 4	1000	[ms]		○	○	○	○	○	○	○	○
PSA11	**SLSS1	SLS speed 1	50	[r/min]		○	○	○	○	○	○	○	○
PSA12	**SLSS2	SLS speed 2	50	[r/min]		○	○	○	○	○	○	○	○
PSA13	**SLSS3	SLS speed 3	50	[r/min]		○	○	○	○	○	○	○	○
PSA14	**SLSS4	SLS speed 4	50	[r/min]		○	○	○	○	○	○	○	○
PSA15	**SLST	SLS/SS2/SOS speed detection delay time	10	[ms]		○	○	○	○	○	○	○	○
PSA16		For manufacturer setting	0000h			○	○	○	○	○	○	○	○
PSA17	**SOSPT	SOS position detection delay time	0	[ms]		○	○	○	○	○	○	○	○
PSA18	**SSMS	SSM speed	50	[r/min]		○	○	○	○	○	○	○	○
PSA19	**SSMHW	SSM hysteresis width	20	[r/min]		○	○	○	○	○	○	○	○
PSA20	**SMERL	Motor encoder revolution - Low	4304	[pulse/rev]		○	○	○	○	○	○	○	○
PSA21	**SMERH	Motor encoder revolution - High	419	[×10000 pulse/rev]		○	○	○	○	○	○	○	○
PSA22	**SAADT	Position feedback fixing error detection time	60	[min]		○	○	○	○	○	○	○	○
PSA23		For manufacturer setting	0000h										
PSA24			0000h										
PSA25			0000h										
PSA26			0000h										
PSA27			0000h										
PSA28			0000h										
PSA29			0000h										
PSA30			0000h										
PSA31			0000h										
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PSA44			0000h										
PSA45			0000h										
PSA46			0000h										
PSA47			0000h										
PSA48			0000h										
PSA49			0000h										

## 5. PARAMETERS

No.	Symbol	Name	Initial value	Unit	Password protection		Input mode		Operation mode			
					With drive safety integrated motion controller	Input device	Servo motor	Servo motor with functional safety	Lin.	Full.	DD	
PSA50		For manufacturer setting	0000h									
PSA51			0000h									
PSA52			0000h									
PSA53			0000h									
PSA54			0000h									
PSA55			0000h									
PSA56			0000h									
PSA57			0000h									
PSA58			0000h									
PSA59			0000h									
PSA60			0000h									
PSA61			0000h									
PSA62			0000h									
PSA63			0000h									
PSA64			0000h									

### 5.1.2 SSCNET III/H parameters ([Pr. PSC\_ \_])

No.	Symbol	Name	Initial value	Unit	Password protection		Input mode		Operation mode										
					With drive safety integrated motion controller	Input device	Servo motor	Servo motor with functional safety	Lin.	Full.	DD								
PSC01	**SNC	Safety communication - Communication cycle	0006h			○	○	○	○	○	○	○							
PSC02	**SNAS	Safety communication - Axis number selection	0000h										○	○	○	○	○	○	○
PSC03	**SNPOL	Safety communication - Servo motor rotation direction selection with functional safety	0000h										○	○	○	○	○	○	○
PSC04		For manufacturer setting	0000h																
PSC05			0000h																
PSC06			0000h																
PSC07			0000h																
PSC08			0000h																
PSC09			0000h																
PSC10			0000h																
PSC11			0000h																
PSC12			0000h																
PSC13			0000h																
PSC14			0000h																
PSC15			0000h																
PSC16			0000h																
PSC17			0000h																
PSC18			0000h																
PSC19			0000h																
PSC20			0000h																
PSC21			0000h																
PSC22			0000h																

# 5. PARAMETERS

No.	Symbol	Name	Initial value	Unit	Password protection	Input mode		Operation mode			
						With drive safety integrated motion controller	Input device	Servo motor	Servo motor with functional safety	Lin.	Full.
PSC23		For manufacturer setting	0000h								
PSC24			0000h								
PSC25			0000h								
PSC26			0000h								
PSC27			0000h								
PSC28			0000h								
PSC29			0000h								
PSC30			0000h								
PSC31			0000h								
PSC32			0000h								
PSC33			0000h								
PSC34			0000h								
PSC35			0000h								
PSC36			0000h								
PSC37			0000h								
PSC38			0000h								
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PSC40			0000h								
PSC41			0000h								
PSC42			0000h								
PSC43			0000h								
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PSC45			0000h								
PSC46			0000h								
PSC47			0000h								
PSC48			0000h								
PSC49			0000h								
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PSC59			0000h								
PSC60			0000h								
PSC61			0000h								
PSC62			0000h								
PSC63			0000h								
PSC64			0000h								

# 5. PARAMETERS

## 5.1.3 Safety I/O device parameters ([Pr. PSD\_ \_])

No.	Symbol	Name	Initial value	Unit	Password protection	Input mode		Operation mode				
						With drive safety integrated motion controller	Input device	Servo motor	Servo motor with functional safety	Lin.	Full.	DD
PSD01	**SDIA	Input device automatic activation selection	0000h		○	○	○	○	○	○	○	○
PSD02	**SDI1	Input device selection DI1	0000h		○	○	○	○	○	○	○	○
PSD03	**SDI2	Input device selection DI2	0000h		○	○	○	○	○	○	○	○
PSD04	**SDI3	Input device selection DI3	0000h		○	○	○	○	○	○	○	○
PSD05	**SDI4	Input device selection DI4	0000h		○	○	○	○	○	○	○	○
PSD06	**SDI5	Input device selection DI5	0000h		○	○	○	○	○	○	○	○
PSD07	**SDI6	Input device selection DI6	0000h		○	○	○	○	○	○	○	○
PSD08	**SDO1	Output device selection DO1	0000h		○	○	○	○	○	○	○	○
PSD09	**SDO2	Output device selection DO2	0000h		○	○	○	○	○	○	○	○
PSD10	**SDO3	Output device selection DO3	0000h		○	○	○	○	○	○	○	○
PSD11	**SDO4	Output device selection DO4 (available in the future)	0000h		○	○	○	○	○	○	○	○
PSD12	**SDIF1	Input device - Noise rejection filtering time DI1	0001h		○	○	○	○	○	○	○	○
PSD13	**SDIF2	Input device - Noise rejection filtering time DI2	0001h		○	○	○	○	○	○	○	○
PSD14	**SDIF3	Input device - Noise rejection filtering time DI3	0001h		○	○	○	○	○	○	○	○
PSD15	**SDIF4	Input device - Noise rejection filtering time DI4	0001h		○	○	○	○	○	○	○	○
PSD16	**SDIF5	Input device - Noise rejection filtering time DI5	0001h		○	○	○	○	○	○	○	○
PSD17	**SDIF6	Input device - Noise rejection filtering time DI6	0001h		○	○	○	○	○	○	○	○
PSD18	**SDIDT1	Mismatch permissible time DI1	20	[ms]	○	○	○	○	○	○	○	○
PSD19	**SDIDT2	Mismatch permissible time DI2	20	[ms]	○	○	○	○	○	○	○	○
PSD20	**SDIDT3	Mismatch permissible time DI3	20	[ms]	○	○	○	○	○	○	○	○
PSD21	**SDIDT4	Mismatch permissible time DI4	20	[ms]	○	○	○	○	○	○	○	○
PSD22	**SDIDT5	Mismatch permissible time DI5	20	[ms]	○	○	○	○	○	○	○	○
PSD23	**SDIDT6	Mismatch permissible time DI6	20	[ms]	○	○	○	○	○	○	○	○
PSD24	**SDIP1	Input device - Test pulse diagnosis execution selection 1	1111h		○	○	○	○	○	○	○	○
PSD25	**SDIP2	Input device - Test pulse diagnosis execution selection 2	0011h		○	○	○	○	○	○	○	○
PSD26	**SDIPW	Input device - Test pulse off time	0001h		○	○	○	○	○	○	○	○
PSD27	**SDID1	Input device - Fixing-diagnosis execution selection 1 at start-up	1111h		○	○	○	○	○	○	○	○
PSD28	**SDID2	Input device - Fixing-diagnosis execution selection 2 at start-up	0011h		○	○	○	○	○	○	○	○
PSD29	**SDOP	Output device - Test pulse execution selection	1111h		○	○	○	○	○	○	○	○
PSD30	**SDOPW	Output device - Test pulse off time	0000h		○	○	○	○	○	○	○	○
PSD31		For manufacturer setting	0000h		○	○	○	○	○	○	○	○
PSD32			0000h		○	○	○	○	○	○	○	○
PSD33			0000h		○	○	○	○	○	○	○	○
PSD34			0000h		○	○	○	○	○	○	○	○
PSD35			0000h		○	○	○	○	○	○	○	○
PSD36			0000h		○	○	○	○	○	○	○	○
PSD37			0000h		○	○	○	○	○	○	○	○
PSD38			0000h		○	○	○	○	○	○	○	○
PSD39			0000h		○	○	○	○	○	○	○	○
PSD40			0000h		○	○	○	○	○	○	○	○
PSD41			0000h		○	○	○	○	○	○	○	○
PSD42			0000h		○	○	○	○	○	○	○	○
PSD43			0000h		○	○	○	○	○	○	○	○
PSD44			0000h		○	○	○	○	○	○	○	○
PSD45			0000h		○	○	○	○	○	○	○	○
PSD46			0000h		○	○	○	○	○	○	○	○
PSD47			0000h		○	○	○	○	○	○	○	○
PSD48			0000h		○	○	○	○	○	○	○	○
PSD49			0000h		○	○	○	○	○	○	○	○



## 5. PARAMETERS

No.	Symbol	Name	Initial value	Unit	Password protection	Input mode		Operation mode				
						With drive safety integrated motion controller	Input device	Servo motor	Servo motor with functional safety	Lin.	Full.	DD
PSD50		For manufacturer setting	0000h									
PSD51			0000h									
PSD52			0000h									
PSD53			0000h									
PSD54			0000h									
PSD55			0000h									
PSD56			0000h									
PSD57			0000h									
PSD58			0000h									
PSD59			0000h									
PSD60			0000h									
PSD61			0000h									
PSD62			0000h									
PSD63			0000h									
PSD64			0000h									

## 5. PARAMETERS

### 5.2 Detailed list of parameters

POINT
<ul style="list-style-type: none"> <li>● Set a value to each "x" in the "Setting digit" columns.</li> <li>● This parameter cannot be used in the J3 compatibility mode.</li> </ul>

#### 5.2.1 Safety observation function parameters 1 ([Pr. PSA\_\_])

No.	Symbol	Name and function	Initial value [unit]	Setting range																					
PSA01	**SOA	Safety observation function activation setting Select enabled/disabled of MR-D30 parameter settings.	<table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ _ x</td> <td>           Functional safety unit activation setting            0: Disabled            1: Enabled             While this parameter is disabled, STO cannot be canceled due to [AL. 7A.2 Parameter setting range error (safety observation function)] occurrence. Before enabling this parameter, check the setting of each parameter that they have no problem.         </td> <td>0h</td> <td>0h to 1h</td> </tr> <tr> <td>_ _ x _</td> <td>For manufacturer setting</td> <td>0h</td> <td style="text-align: center;">/</td> </tr> <tr> <td>_ x _</td> <td></td> <td>0h</td> <td style="text-align: center;">/</td> </tr> <tr> <td>x _ _ _</td> <td></td> <td>0h</td> <td style="text-align: center;">/</td> </tr> </tbody> </table>		Setting digit	Explanation	Initial value	Setting range	__ _ x	Functional safety unit activation setting 0: Disabled 1: Enabled  While this parameter is disabled, STO cannot be canceled due to [AL. 7A.2 Parameter setting range error (safety observation function)] occurrence. Before enabling this parameter, check the setting of each parameter that they have no problem.	0h	0h to 1h	_ _ x _	For manufacturer setting	0h	/	_ x _		0h	/	x _ _ _		0h	/	
			Setting digit	Explanation	Initial value	Setting range																			
			__ _ x	Functional safety unit activation setting 0: Disabled 1: Enabled  While this parameter is disabled, STO cannot be canceled due to [AL. 7A.2 Parameter setting range error (safety observation function)] occurrence. Before enabling this parameter, check the setting of each parameter that they have no problem.	0h	0h to 1h																			
			_ _ x _	For manufacturer setting	0h	/																			
_ x _		0h	/																						
x _ _ _		0h	/																						
PSA02	**SMD	Functional safety unit setting Make basic settings of MR-D30 functions.	<table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ _ x</td> <td>           Input mode selection            0: Safety observation function control by input device            1: Safety observation function control using drive safety integrated motion controller            2: Test operation             Please note that the safety observation function will not operate while test operation is selected. For test operation, refer to "MR-J4-B_(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-A_(-RJ) Servo Amplifier Instruction Manual".         </td> <td>0h</td> <td>0h to 2h</td> </tr> <tr> <td>_ _ x _</td> <td>           Safety observation function - Position/speed observation setting            0: Using STO/SS1/SBC without executing position/speed observation (SLS/SSM/SOS/SS2)            1: Executing position/speed observation with servo motor with functional safety (compatible with MR-D30 with software version A1 or later and servo amplifier with software version B5 or later)            2: Executing position/speed observation without servo motor with functional safety         </td> <td>0h</td> <td>0h to 2h</td> </tr> <tr> <td>_ x _</td> <td>For manufacturer setting</td> <td>0h</td> <td style="text-align: center;">/</td> </tr> <tr> <td>x _ _ _</td> <td></td> <td>0h</td> <td style="text-align: center;">/</td> </tr> </tbody> </table>		Setting digit	Explanation	Initial value	Setting range	__ _ x	Input mode selection 0: Safety observation function control by input device 1: Safety observation function control using drive safety integrated motion controller 2: Test operation  Please note that the safety observation function will not operate while test operation is selected. For test operation, refer to "MR-J4-B_(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-A_(-RJ) Servo Amplifier Instruction Manual".	0h	0h to 2h	_ _ x _	Safety observation function - Position/speed observation setting 0: Using STO/SS1/SBC without executing position/speed observation (SLS/SSM/SOS/SS2) 1: Executing position/speed observation with servo motor with functional safety (compatible with MR-D30 with software version A1 or later and servo amplifier with software version B5 or later) 2: Executing position/speed observation without servo motor with functional safety	0h	0h to 2h	_ x _	For manufacturer setting	0h	/	x _ _ _		0h	/	
			Setting digit	Explanation	Initial value	Setting range																			
			__ _ x	Input mode selection 0: Safety observation function control by input device 1: Safety observation function control using drive safety integrated motion controller 2: Test operation  Please note that the safety observation function will not operate while test operation is selected. For test operation, refer to "MR-J4-B_(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-A_(-RJ) Servo Amplifier Instruction Manual".	0h	0h to 2h																			
			_ _ x _	Safety observation function - Position/speed observation setting 0: Using STO/SS1/SBC without executing position/speed observation (SLS/SSM/SOS/SS2) 1: Executing position/speed observation with servo motor with functional safety (compatible with MR-D30 with software version A1 or later and servo amplifier with software version B5 or later) 2: Executing position/speed observation without servo motor with functional safety	0h	0h to 2h																			
_ x _	For manufacturer setting	0h	/																						
x _ _ _		0h	/																						
PSA03	**SST	SS1/SS2 monitoring deceleration time Set a deceleration time of the SS1 function and SS2/SOS function. This parameter is used for the following two functions. (1) When setting time passes during deceleration of the SS1 function, the STO function will operate. (2) When setting time passes during deceleration of the SS2/SOS function, the stop observation (SOS) will operate. (compatible with MR-D30 with software version A1 or later and servo amplifier with software version B5 or later)	1000 [ms]	0 to 60000																					

## 5. PARAMETERS

No.	Symbol	Name and function	Initial value [unit]	Setting range																
PSA04	**SSS	<p>SS2/SOS standstill speed</p> <p>Set a standstill speed. When an absolute value of the servo motor speed is lower than the set value of this parameter, the servo motor will be assumed as stopped.</p> <p>Concretely, this parameter is used for the following two functions.</p> <p>(1) When the speed becomes slower than the set value of this parameter during deceleration of the SS2/SOS function, the stop observation (SOS) will operate.</p> <p>(2) When the speed becomes higher than the set value of this parameter during stop observation (SOS) of the SS2/SOS function, the STO function will operate.</p> <p>This parameter is used with MR-D30 with software version A1 or later, and servo amplifier with software version B5 or later.</p>	50 [rev/min]	0 to 10000																
PSA05	**SSDP	<p>SOS allowance value of position deviation</p> <p>Specify an allowance value of position deviation during stop observation (SOS) of the SS2/SOS function. When a position deviation travels more than the specified position with this parameter after starting stop observation, the STO function will operate.</p> <p>The SOS allowance value of position deviation will be clamped with 100 rev when the setting value of [Pr. PSA06 SOS allowance value of position deviation unit selection] is "0".</p> <p>This parameter is used with MR-D30 with software version A1 or later, and servo amplifier with software version B5 or later.</p> <p>Note. Setting unit can be changed in [Pr. PSA06].</p>	3 [rev] (Note)	0 to 1000																
PSA06	**SAOP1	<p>SOS allowance value of position deviation unit selection</p> <p>Select a setting unit of the SOS allowance value of position deviation set in [Pr. PSA05].</p> <p>This parameter is used with MR-D30 with software version A1 or later, and servo amplifier with software version B5 or later.</p> <table border="1" data-bbox="375 1037 1345 1294"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>___x</td> <td>SOS allowance value of position deviation unit selection 0: 1 rev 1: 0.1 rev 2: 0.01 rev</td> <td>0h</td> <td>0h to 2h</td> </tr> <tr> <td>__x_</td> <td rowspan="3">For manufacturer setting</td> <td>0h</td> <td rowspan="3"></td> </tr> <tr> <td>_x_</td> <td>0h</td> </tr> <tr> <td>x___</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	___x	SOS allowance value of position deviation unit selection 0: 1 rev 1: 0.1 rev 2: 0.01 rev	0h	0h to 2h	__x_	For manufacturer setting	0h		_x_	0h	x___	0h		
Setting digit	Explanation	Initial value	Setting range																	
___x	SOS allowance value of position deviation unit selection 0: 1 rev 1: 0.1 rev 2: 0.01 rev	0h	0h to 2h																	
__x_	For manufacturer setting	0h																		
_x_		0h																		
x___		0h																		
PSA07	**SLSDT1	<p>SLS deceleration monitoring time 1</p> <p>Set a threshold of the time from enabled SLS1 command to speed observation start. Specify enough time for deceleration to a safety speed from enabled SLS1 command. As necessary, execute such as deceleration control with the controller during the delay time.</p>	1000 [ms]	0 to 60000																
PSA08	**SLSDT2	<p>SLS deceleration monitoring time 2</p> <p>Set a threshold of the time from enabled SLS2 command to speed observation start. Specify enough time for deceleration to a safety speed from enabled SLS2 command. As necessary, execute such as deceleration control with the controller during the delay time.</p>	1000 [ms]	0 to 60000																
PSA09	**SLSDT3	<p>SLS deceleration monitoring time 3</p> <p>Set a threshold of the time from enabled SLS3 command to speed observation start. Specify enough time for deceleration to a safety speed from enabled SLS3 command. As necessary, execute such as deceleration control with the controller during the delay time.</p>	1000 [ms]	0 to 60000																
PSA10	**SLSDT4	<p>SLS deceleration monitoring time 4</p> <p>Set a threshold of the time from enabled SLS4 command to speed observation start. Specify enough time for deceleration to a safety speed from enabled SLS4 command. As necessary, execute such as deceleration control with the controller during the delay time.</p>	1000 [ms]	0 to 60000																
PSA11	**SLSS1	<p>SLS speed 1</p> <p>Set a threshold of a safety speed for when the SLS function operates by the SLS1 command. When an absolute value of the servo motor speed exceeds this value during speed observation of the SLS function, the STO function will operate.</p>	50 [r/min]	0 to 10000																

## 5. PARAMETERS

No.	Symbol	Name and function	Initial value [unit]	Setting range
PSA12	**SLSS2	SLS speed 2 Set a threshold of a safety speed for when the SLS function operates by the SLS2 command. When an absolute value of the servo motor speed exceeds this value during speed observation of the SLS function, the STO function will operate.	50 [r/min]	0 to 10000
PSA13	**SLSS3	SLS speed 3 Set a threshold of a safety speed for when the SLS function operates by the SLS3 command. When an absolute value of the servo motor speed exceeds this value during speed observation of the SLS function, the STO function will operate.	50 [r/min]	0 to 10000
PSA14	**SLSS4	SLS speed 4 Set a threshold of a safety speed for when the SLS function operates by the SLS4 command. When an absolute value of the servo motor speed exceeds this value during speed observation of the SLS function, the STO function will operate.	50 [r/min]	0 to 10000
PSA15	**SLST	SLS/SS2/SOS speed detection delay time Specify filtering time of the delay filter which decides whether a servo motor speed exceeds or below a threshold during speed observation. Response time of speed observation will be affected by this parameter setting. This parameter affects the following response time. <ul style="list-style-type: none"> <li>Time after the speed excesses during speed observation of the SLS function until the STO function starts</li> <li>Time after the speed decelerates lower than standstill speed during speed observation of the SS2/SOS function until the stop observation (SOS) starts (compatible with MR-D30 with software version A1 or later and servo amplifier with software version B5 or later)</li> <li>Time after the speed accelerates higher than standstill speed during stop observation (SOS) of the SS2/SOS function until the STO function starts (compatible with MR-D30 with software version A1 or later and servo amplifier with software version B5 or later)</li> </ul>	0 [ms]	0 to 2000
PSA17	**SOSPT	SOS position detection delay time Set a filtering time of the delay filter which decides that motor position excesses a threshold at position observation. Response time of position observation will be affected by this parameter setting. This parameter affects the following response time. <ul style="list-style-type: none"> <li>Time after the position deviation of position feedback becomes out of allowance value of position deviation during stop observation of the SS2/SOS function until the STO function starts</li> </ul> This parameter is used with MR-D30 with software version A1 or later, and servo amplifier with software version B5 or later.	0 [ms]	0 to 2000
PSA18	**SSMS	SSM speed Set a threshold of a safety speed for when the SSM function operates. SSMS (SSM output) will turn off when an absolute value of the servo motor speed exceeds this speed and will turn on when the value is below this speed. However, these decisions have hysteresis specified with [Pr. PSA19]. When an alarm which disables SSM occurs, SSMS (SSM output) will turn off.	50 [r/min]	0 to 10000
PSA19	**SSMHW	SSM hysteresis width Set a hysteresis width of the SSM function speed decision. Be sure to specify a value lower than [Pr. PSA18]. When setting a value of [Pr. PSA18] or more will trigger [AL. 7A.3 Parameter combination error (safety observation function)].	20 [r/min]	0 to 10000
PSA20	**SMERL	Motor encoder revolution - Low Set an encoder resolution of the servo motor. Set lower four digits in decimal numbers with this parameter.	4304 [pulse/ rev]	0 to 9999
PSA21	**SMERH	Motor encoder revolution - High Set an encoder resolution of the servo motor. Set upper four digits in decimal numbers with this parameter. Please do not set "0" for the servo motor encoder resolution (either [Pr. PSA20] or [Pr. PSA21]). When setting "0" will trigger [AL. 7A.3 Parameter combination error (safety observation function)]. When the value set for the servo motor encoder resolution ([Pr. PSA20] and [Pr. PSA21]) is not match with the resolution of the actually connected encoder, [AL. 7A.3 Parameter combination error (safety observation function)] will occur.	419 [×10000 pulse/ rev]	0 to 9999
PSA22	**SAADT	Position feedback fixing error detection time Set a time until [AL. 79.8 Position feedback fixing error] is detected. Setting "0" will disable a diagnosis for [AL. 79.8 Position feedback fixing error].	60 [min]	0 to 65535

## 5. PARAMETERS

### 5.2.2 SSCNET III/H parameters ([Pr. PSC\_ \_])

No.	Symbol	Name and function	Initial value [unit]	Setting range																																																				
PSC01	**SNC	<p>Safety communication - Communication cycle</p> <p>Select a communication cycle for the safety communication.</p> <p>Set the same value as of the motion controller to "Safety communication - Communication cycle". When a different value is set, [AL. 7C.1 Functional safety unit communication cycle error (safety observation function)] will occur.</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ _ x</td> <td>Safety communication - Communication cycle 6: 14.2 ms 7: 28.4 ms</td> <td>6h</td> <td>6h to 7h</td> </tr> <tr> <td>_ _ x _</td> <td rowspan="3">For manufacturer setting</td> <td>0h</td> <td rowspan="3">/</td> </tr> <tr> <td>_ x _</td> <td>0h</td> </tr> <tr> <td>x _ _ _</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	__ _ x	Safety communication - Communication cycle 6: 14.2 ms 7: 28.4 ms	6h	6h to 7h	_ _ x _	For manufacturer setting	0h	/	_ x _	0h	x _ _ _	0h																																						
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__ _ x	Safety communication - Communication cycle 6: 14.2 ms 7: 28.4 ms	6h	6h to 7h																																																					
_ _ x _	For manufacturer setting	0h	/																																																					
_ x _		0h																																																						
x _ _ _		0h																																																						
PSC02	**SNAS	<p>Safety communication - Axis number selection</p> <p>Set an axis No. for the safety communication.</p> <p>This parameter is used with MR-D30 with software version A1 or later, and servo amplifier with software version B5 or later.</p> <p>For MR-J4-_A_-RJ, this parameter is disabled.</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>_ _ x x</td> <td>Safety communication - Axis number selection Refer to table 5.1 for settings. Set the same axis No. as the setting of MR-J4_B_-RJ servo amplifier. Setting a different No. will trigger [AL. 7A.3 Parameter combination error (safety observation function)]. For axis No. selection of MR-J4_B_-RJ servo amplifiers, refer to "MR-J4-_B_-RJ Servo Amplifier Instruction Manual".</td> <td>00h</td> <td>00h to 0Fh</td> </tr> <tr> <td>_ x _ _</td> <td>For manufacturer setting</td> <td>0h</td> <td>/</td> </tr> <tr> <td>x _ _ _</td> <td>Safety communication - Enabling axis number selection 0: Disabled (using axis selection rotary switch) 1: Enabled (using the setting of the first digit of [Pr. PSD02])</td> <td>0h</td> <td>0h to 1h</td> </tr> </tbody> </table> <p style="text-align: center;">Table 5.1 Axis No. selection</p> <table border="1"> <thead> <tr> <th>Setting value</th> <th>Axis No.</th> <th>Setting value</th> <th>Axis No.</th> </tr> </thead> <tbody> <tr><td>00</td><td>1</td><td>08</td><td>9</td></tr> <tr><td>01</td><td>2</td><td>09</td><td>10</td></tr> <tr><td>02</td><td>3</td><td>0A</td><td>11</td></tr> <tr><td>03</td><td>4</td><td>0B</td><td>12</td></tr> <tr><td>04</td><td>5</td><td>0C</td><td>13</td></tr> <tr><td>05</td><td>6</td><td>0D</td><td>14</td></tr> <tr><td>06</td><td>7</td><td>0E</td><td>15</td></tr> <tr><td>07</td><td>8</td><td>0F</td><td>16</td></tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	_ _ x x	Safety communication - Axis number selection Refer to table 5.1 for settings. Set the same axis No. as the setting of MR-J4_B_-RJ servo amplifier. Setting a different No. will trigger [AL. 7A.3 Parameter combination error (safety observation function)]. For axis No. selection of MR-J4_B_-RJ servo amplifiers, refer to "MR-J4-_B_-RJ Servo Amplifier Instruction Manual".	00h	00h to 0Fh	_ x _ _	For manufacturer setting	0h	/	x _ _ _	Safety communication - Enabling axis number selection 0: Disabled (using axis selection rotary switch) 1: Enabled (using the setting of the first digit of [Pr. PSD02])	0h	0h to 1h	Setting value	Axis No.	Setting value	Axis No.	00	1	08	9	01	2	09	10	02	3	0A	11	03	4	0B	12	04	5	0C	13	05	6	0D	14	06	7	0E	15	07	8	0F	16		
Setting digit	Explanation	Initial value	Setting range																																																					
_ _ x x	Safety communication - Axis number selection Refer to table 5.1 for settings. Set the same axis No. as the setting of MR-J4_B_-RJ servo amplifier. Setting a different No. will trigger [AL. 7A.3 Parameter combination error (safety observation function)]. For axis No. selection of MR-J4_B_-RJ servo amplifiers, refer to "MR-J4-_B_-RJ Servo Amplifier Instruction Manual".	00h	00h to 0Fh																																																					
_ x _ _	For manufacturer setting	0h	/																																																					
x _ _ _	Safety communication - Enabling axis number selection 0: Disabled (using axis selection rotary switch) 1: Enabled (using the setting of the first digit of [Pr. PSD02])	0h	0h to 1h																																																					
Setting value	Axis No.	Setting value	Axis No.																																																					
00	1	08	9																																																					
01	2	09	10																																																					
02	3	0A	11																																																					
03	4	0B	12																																																					
04	5	0C	13																																																					
05	6	0D	14																																																					
06	7	0E	15																																																					
07	8	0F	16																																																					

## 5. PARAMETERS





No.	Symbol	Name and function	Initial value [unit]	Setting range																		
PSC03	**SNPOL	<p>Safety communication - Servo motor rotation direction selection with functional safety</p> <p>Select a rotation direction to the command pulses of servo motor with functional safety in safety communication. When using a safety compatible controller with servo motor with functional safety as a combination, set the same value as the servo motor rotation direction of the MR-J4-_B_-RJ servo amplifier.</p> <p>MR-J4-_B_-RJ: [Pr. PA14 Rotation direction selection/travel direction selection]</p> <p>For the setting of servo motor rotation direction of MR-J4-_B_-RJ servo amplifiers, refer to "MR-J4-_B_-RJ Servo Amplifier Instruction Manual".</p> <p>This parameter is used with MR-D30 with software version A1 or later, and servo amplifier with software version B5 or later.</p> <p>For MR-J4-_A_-RJ, this parameter is disabled.</p>																				
		<table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>___x</td> <td>Safety communication - Servo motor rotation direction selection with functional safety Refer to table 5.2 for settings.</td> <td>0h</td> <td>0h to 1h</td> </tr> <tr> <td>__x_</td> <td rowspan="3">For manufacturer setting</td> <td>0h</td> <td></td> </tr> <tr> <td>_x__</td> <td>0h</td> <td></td> </tr> <tr> <td>x___</td> <td>0h</td> <td></td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	___x	Safety communication - Servo motor rotation direction selection with functional safety Refer to table 5.2 for settings.	0h	0h to 1h	__x_	For manufacturer setting	0h		_x__	0h		x___	0h			
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		<p>Table 5.2 Servo motor rotation direction selection with functional safety</p> <table border="1"> <thead> <tr> <th rowspan="2">Setting value</th> <th colspan="2">Servo motor rotation direction with functional safety</th> </tr> <tr> <th>When forward rotation pulse is input</th> <th>When reverse rotation pulse is input</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>CCW</td> <td>CW</td> </tr> <tr> <td>1</td> <td>CW</td> <td>CCW</td> </tr> </tbody> </table>	Setting value	Servo motor rotation direction with functional safety		When forward rotation pulse is input	When reverse rotation pulse is input	0	CCW	CW	1	CW	CCW									
Setting value	Servo motor rotation direction with functional safety																					
	When forward rotation pulse is input	When reverse rotation pulse is input																				
0	CCW	CW																				
1	CW	CCW																				

## 5. PARAMETERS

### 5.2.3 Safety I/O device parameters ([Pr. PSD\_\_])

No.	Symbol	Name and function	Initial value [unit]	Setting range																																		
PSD01	**SDIA	<p>Input device automatic activation selection</p> <p>This setting is enabled only when input device is used. The SLS function can be activated automatically with this setting. A command set to automatic activation with this setting will be off (the function enabled) at system start-up and will start any function automatically. Concretely, setting automatic activation for SLS1C to SL41C will switch the speed observation by the SLS function to always enabled condition.</p> <table border="1"> <thead> <tr> <th colspan="2">Setting digit</th> <th rowspan="2">Explanation</th> <th rowspan="2">Initial value</th> <th rowspan="2">Setting range</th> </tr> <tr> <th>HEX</th> <th>BIN</th> </tr> </thead> <tbody> <tr> <td>___x</td> <td>___x</td> <td>SLS1C (SLS1 command) 0: Disable automatic activation 1: Enable automatic activation</td> <td rowspan="4">0h</td> <td rowspan="4">0h to Fh</td> </tr> <tr> <td>__x_</td> <td>__x_</td> <td>SLS2C (SLS2 command) 0: Disable automatic activation 1: Enable automatic activation</td> </tr> <tr> <td>_x__</td> <td>_x__</td> <td>SLS3C (SLS3 command) 0: Disable automatic activation 1: Enable automatic activation</td> </tr> <tr> <td>x___</td> <td>x___</td> <td>SLS4C (SLS4 command) 0: Disable automatic activation 1: Enable automatic activation</td> </tr> <tr> <td>__x_</td> <td>/</td> <td rowspan="3">For manufacturer setting</td> <td>0h</td> <td>/</td> </tr> <tr> <td>_x_</td> <td>/</td> <td>0h</td> <td>/</td> </tr> <tr> <td>x__</td> <td>/</td> <td>0h</td> <td>/</td> </tr> </tbody> </table>	Setting digit		Explanation	Initial value	Setting range	HEX	BIN	___x	___x	SLS1C (SLS1 command) 0: Disable automatic activation 1: Enable automatic activation	0h	0h to Fh	__x_	__x_	SLS2C (SLS2 command) 0: Disable automatic activation 1: Enable automatic activation	_x__	_x__	SLS3C (SLS3 command) 0: Disable automatic activation 1: Enable automatic activation	x___	x___	SLS4C (SLS4 command) 0: Disable automatic activation 1: Enable automatic activation	__x_	/	For manufacturer setting	0h	/	_x_	/	0h	/	x__	/	0h	/		
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__x_	/	For manufacturer setting	0h	/																																		
_x_	/		0h	/																																		
x__	/		0h	/																																		
PSD02	**SDI1	<p>Input device selection DI1</p> <p>Select an input device to assign to DI1A (CN10A-4) and DI1B (CN10B-4). When you set "Safety observation function control by input device" with [Pr. PSA02], always assign one or more device to [Pr. PSD02] to [Pr. PSD07]. When no device is set, [AL. 7A.3 Parameter combination error (safety observation function)] will occur. Additionally, the same input device cannot be assigned to multiple connectors to pin. When a device is assigned to multiple connectors to pin, [AL. 7A.3 Parameter combination error (safety observation function)] will occur.</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__xx</td> <td>Input device selection DI1 Refer to table 5.1 for settings.</td> <td>00h</td> <td>00h to 07h</td> </tr> <tr> <td>_x__</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td>/</td> </tr> <tr> <td>x___</td> <td>0h</td> <td>/</td> </tr> </tbody> </table> <p style="text-align: center;">Table 5.1 Input device selection</p> <table border="1"> <thead> <tr> <th>Setting value</th> <th>Input device</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>None</td> </tr> <tr> <td>01</td> <td>STOC (STO command)</td> </tr> <tr> <td>02</td> <td>SS1C (SS1 command)</td> </tr> <tr> <td>03</td> <td>SS2C (SS2 command)</td> </tr> <tr> <td>04</td> <td>SLS1C (SLS1 command)</td> </tr> <tr> <td>05</td> <td>SLS2C (SLS2 command)</td> </tr> <tr> <td>06</td> <td>SLS3C (SLS3 command)</td> </tr> <tr> <td>07</td> <td>SLS4C (SLS4 command)</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	__xx	Input device selection DI1 Refer to table 5.1 for settings.	00h	00h to 07h	_x__	For manufacturer setting	0h	/	x___	0h	/	Setting value	Input device	00	None	01	STOC (STO command)	02	SS1C (SS1 command)	03	SS2C (SS2 command)	04	SLS1C (SLS1 command)	05	SLS2C (SLS2 command)	06	SLS3C (SLS3 command)	07	SLS4C (SLS4 command)			
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## 5. PARAMETERS

No.	Symbol	Name and function	Initial value [unit]	Setting range	
PSD03	**SDI2	Input device selection DI2 Select an input device to assign to DI2A (CN10A-13) and DI2B (CN10B-13). Setting method is the same as [Pr. PSD02].			
		Setting digit	Explanation	Initial value	Setting range
		__ x x	Input device selection DI2 Refer to table 5.1 for settings.	00h	00h to 07h
		_ x _ _ x _ _ _	For manufacturer setting	0h 0h	
PSD04	**SDI3	Input device selection DI3 Select an input device to assign to DI3A (CN10A-5) and DI3B (CN10B-5). Setting method is the same as [Pr. PSD02].			
		Setting digit	Explanation	Initial value	Setting range
		__ x x	Input device selection DI3 Refer to table 5.1 for settings.	00h	00h to 07h
		_ x _ _ x _ _ _	For manufacturer setting	0h 0h	
PSD05	**SDI4	Input device selection DI4 Select an input device to assign to DI4A (CN10A-14) and DI4B (CN10B-14). Setting method is the same as [Pr. PSD02].			
		Setting digit	Explanation	Initial value	Setting range
		__ x x	Input device selection DI4 Refer to table 5.1 for settings.	00h	00h to 07h
		_ x _ _ x _ _ _	For manufacturer setting	0h 0h	
PSD06	**SDI5	Input device selection DI5 Select an input device to assign to DI5A (CN10A-6) and DI5B (CN10B-6). Setting method is the same as [Pr. PSD02].			
		Setting digit	Explanation	Initial value	Setting range
		__ x x	Input device selection DI5 Refer to table 5.1 for settings.	00h	00h to 07h
		_ x _ _ x _ _ _	For manufacturer setting	0h 0h	



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No.	Symbol	Name and function	Initial value [unit]	Setting range																																						
PSD07	**SDI6	Input device selection DI6 Select an input device to assign to DI6A (CN10A-15) and DI6B (CN10B-15). Setting method is the same as [Pr. PSD02].																																								
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_ x _ _	For manufacturer setting	0h																																								
x _ _ _		0h																																								
PSD08	**SDO1	Output device selection DO1 Select an input device to assign to DO1A (CN10A-8) and DO1B (CN10B-8).																																								
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PSD09	**SDO2	Output device selection DO2 Select an input device to assign to DO2A (CN10A-17) and DO2B (CN10B-17). Setting method is the same as [Pr. PSD08].																																								
		<table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ x x</td> <td>Output device selection DO2 Refer to table 5.2 for settings.</td> <td>00h</td> <td>00h to 0Ah</td> </tr> <tr> <td>_ x _ _</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td rowspan="2"></td> </tr> <tr> <td>x _ _ _</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	__ x x	Output device selection DO2 Refer to table 5.2 for settings.	00h	00h to 0Ah	_ x _ _	For manufacturer setting	0h		x _ _ _	0h																										
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## 5. PARAMETERS

No.	Symbol	Name and function	Initial value [unit]	Setting range																																									
PSD10	**SDO3	Output device selection DO3 Select an input device to assign to DO3A (CN10A-9) and DO3B (CN10B-9). Setting method is the same as [Pr. PSD08].																																											
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x _ _ _		0h																																											
PSD11	**SDO4	Output device selection DO4 Select an output device to assign to DO4NA (CN10A-18) and DO4PB (CN10B-16). Setting method is the same as [Pr. PSD08].																																											
		<table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ x x</td> <td>Output device selection DO4 Refer to table 5.2 for settings.</td> <td>00h</td> <td>00h to 0Ah</td> </tr> <tr> <td>_ x _ _</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td rowspan="2"></td> </tr> <tr> <td>x _ _ _</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	__ x x	Output device selection DO4 Refer to table 5.2 for settings.	00h	00h to 0Ah	_ x _ _	For manufacturer setting	0h		x _ _ _	0h																													
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x _ _ _		0h																																											
PSD12	**SDIF1	Input device - Noise rejection filtering time DI1 Select a filtering time to reduce noise of DI1A (CN10A-4) and DI1B (CN10B-4).																																											
		<table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ x x</td> <td>Noise rejection filtering time DI1 Refer to table 5.3 for settings.</td> <td>01h</td> <td>00h to 05h</td> </tr> <tr> <td>_ x _ _</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td rowspan="2"></td> </tr> <tr> <td>x _ _ _</td> <td>0h</td> </tr> </tbody> </table> <p style="text-align: center;">Table 5.3 Filtering time selection</p> <table border="1"> <thead> <tr> <th>Setting value</th> <th>Filtering time [ms]</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>0.888</td> </tr> <tr> <td>01</td> <td>1.777</td> </tr> <tr> <td>02</td> <td>3.555</td> </tr> <tr> <td>03</td> <td>7.111</td> </tr> <tr> <td>04</td> <td>14.22</td> </tr> <tr> <td>05</td> <td>28.44</td> </tr> </tbody> </table> <p>Set a proper value referring the following table.</p> <table border="1"> <thead> <tr> <th colspan="2">Configuration</th> <th>Noise rejection filtering time</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Using a switch</td> <td>Executing a test pulse diagnosis</td> <td>Set 0.888 ms or longer time than set time in [Pr. PSD26 Input device - Test pulse off time].</td> </tr> <tr> <td>Not executing a test pulse diagnosis</td> <td>Set 0.888 ms or longer time.</td> </tr> <tr> <td rowspan="2">Using a device which has diagnosis function</td> <td>Test pulses are in superposition at output signal of the device.</td> <td>Set 0.888 ms or longer time than test pulse off time outputted from the device.</td> </tr> <tr> <td>Test pulses are not in superposition at output signal of the device.</td> <td>Set 0.888 ms or longer time.</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	__ x x	Noise rejection filtering time DI1 Refer to table 5.3 for settings.	01h	00h to 05h	_ x _ _	For manufacturer setting	0h		x _ _ _	0h	Setting value	Filtering time [ms]	00	0.888	01	1.777	02	3.555	03	7.111	04	14.22	05	28.44	Configuration		Noise rejection filtering time	Using a switch	Executing a test pulse diagnosis	Set 0.888 ms or longer time than set time in [Pr. PSD26 Input device - Test pulse off time].	Not executing a test pulse diagnosis	Set 0.888 ms or longer time.	Using a device which has diagnosis function	Test pulses are in superposition at output signal of the device.	Set 0.888 ms or longer time than test pulse off time outputted from the device.	Test pulses are not in superposition at output signal of the device.	Set 0.888 ms or longer time.		
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## 5. PARAMETERS

No.	Symbol	Name and function	Initial value [unit]	Setting range														
PSD13	**SDIF2	<p>Input device - Noise rejection filtering time DI2                      Select a filtering time to reduce noise of DI2A (CN10A-13) and DI2B (CN10B-13).                      Setting method is the same as [Pr. PSD12].</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ x x</td> <td>Noise rejection filtering time DI2 Refer to table 5.3 for settings.</td> <td>01h</td> <td>00h to 05h</td> </tr> <tr> <td>_ x _ _</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td rowspan="2"></td> </tr> <tr> <td>x _ _ _</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	__ x x	Noise rejection filtering time DI2 Refer to table 5.3 for settings.	01h	00h to 05h	_ x _ _	For manufacturer setting	0h		x _ _ _	0h		
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_ x _ _	For manufacturer setting	0h																
x _ _ _		0h																
PSD14	**SDIF3	<p>Input device - Noise rejection filtering time DI3                      Select a filtering time to reduce noise of DI3A (CN10A-5) and DI3B (CN10B-5).                      Setting method is the same as [Pr. PSD12].</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ x x</td> <td>Noise rejection filtering time DI3 Refer to table 5.3 for settings.</td> <td>01h</td> <td>00h to 05h</td> </tr> <tr> <td>_ x _ _</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td rowspan="2"></td> </tr> <tr> <td>x _ _ _</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	__ x x	Noise rejection filtering time DI3 Refer to table 5.3 for settings.	01h	00h to 05h	_ x _ _	For manufacturer setting	0h		x _ _ _	0h		
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__ x x	Noise rejection filtering time DI3 Refer to table 5.3 for settings.	01h	00h to 05h															
_ x _ _	For manufacturer setting	0h																
x _ _ _		0h																
PSD15	**SDIF4	<p>Input device - Noise rejection filtering time DI4                      Select a filtering time to reduce noise of DI4A (CN10A-14) and DI4B (CN10B-14).                      Setting method is the same as [Pr. PSD12].</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ x x</td> <td>Noise rejection filtering time DI4 Refer to table 5.3 for settings.</td> <td>01h</td> <td>00h to 05h</td> </tr> <tr> <td>_ x _ _</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td rowspan="2"></td> </tr> <tr> <td>x _ _ _</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	__ x x	Noise rejection filtering time DI4 Refer to table 5.3 for settings.	01h	00h to 05h	_ x _ _	For manufacturer setting	0h		x _ _ _	0h		
Setting digit	Explanation	Initial value	Setting range															
__ x x	Noise rejection filtering time DI4 Refer to table 5.3 for settings.	01h	00h to 05h															
_ x _ _	For manufacturer setting	0h																
x _ _ _		0h																
PSD16	**SDIF5	<p>Input device - Noise rejection filtering time DI5                      Select a filtering time to reduce noise of DI5A (CN10A-6) and DI5B (CN10B-6).                      Setting method is the same as [Pr. PSD12].</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ x x</td> <td>Noise rejection filtering time DI5 Refer to table 5.3 for settings.</td> <td>01h</td> <td>00h to 05h</td> </tr> <tr> <td>_ x _ _</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td rowspan="2"></td> </tr> <tr> <td>x _ _ _</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	__ x x	Noise rejection filtering time DI5 Refer to table 5.3 for settings.	01h	00h to 05h	_ x _ _	For manufacturer setting	0h		x _ _ _	0h		
Setting digit	Explanation	Initial value	Setting range															
__ x x	Noise rejection filtering time DI5 Refer to table 5.3 for settings.	01h	00h to 05h															
_ x _ _	For manufacturer setting	0h																
x _ _ _		0h																

## 5. PARAMETERS

No.	Symbol	Name and function	Initial value [unit]	Setting range														
PSD17	**SDIF6	<p>Input device - Noise rejection filtering time DI6            Select a filtering time to reduce noise of DI6A (CN10A-15) and DI6B (CN10B-15).            Setting method is the same as [Pr. PSD12].</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>__ x x</td> <td>Noise rejection filtering time DI6 Refer to table 5.3 for settings.</td> <td>01h</td> <td>00h to 05h</td> </tr> <tr> <td>_ x _ _</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td rowspan="2"></td> </tr> <tr> <td>x _ _ _</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	__ x x	Noise rejection filtering time DI6 Refer to table 5.3 for settings.	01h	00h to 05h	_ x _ _	For manufacturer setting	0h		x _ _ _	0h		
Setting digit	Explanation	Initial value	Setting range															
__ x x	Noise rejection filtering time DI6 Refer to table 5.3 for settings.	01h	00h to 05h															
_ x _ _	For manufacturer setting	0h																
x _ _ _		0h																
PSD18	**SDIDT1	<p>Mismatch permissible time DI1            Set a threshold of mismatch time of DI1A (CN10A-4) and DI1B (CN10B-4). When a mismatch of DI1A and DI1B continues over the setting value, [AL. 79.7 Mismatched input signal error] will occur. Setting "0" will disable alarm detections.</p>	20 [ms]	0 to 60000														
PSD19	**SDIDT2	<p>Mismatch permissible time DI2            Set a threshold of mismatch time of DI2A (CN10A-13) and DI2B (CN10B-13). When a mismatch of DI2A and DI2B continues over the setting value, [AL. 79.7 Mismatched input signal error] will occur. Setting "0" will disable alarm detections.</p>	20 [ms]	0 to 60000														
PSD20	**SDIDT3	<p>Mismatch permissible time DI3            Set a threshold of mismatch time of DI3A (CN10A-5) and DI3B (CN10B-5). When a mismatch of DI3A and DI3B continues over the setting value, [AL. 79.7 Mismatched input signal error] will occur. Setting "0" will disable alarm detections.</p>	20 [ms]	0 to 60000														
PSD21	**SDIDT4	<p>Mismatch permissible time DI4            Set a threshold of mismatch time of DI4A (CN10A-14) and DI4B (CN10B-14). When a mismatch of DI4A and DI4B continues over the setting value, [AL. 79.7 Mismatched input signal error] will occur. Setting "0" will disable alarm detections.</p>	20 [ms]	0 to 60000														
PSD22	**SDIDT5	<p>Mismatch permissible time DI5            Set a threshold of mismatch time of DI5A (CN10A-6) and DI5B (CN10B-6). When a mismatch of DI5A and DI5B continues over the setting value, [AL. 79.7 Mismatched input signal error] will occur. Setting "0" will disable alarm detections.</p>	20 [ms]	0 to 60000														
PSD23	**SDIDT6	<p>Mismatch permissible time DI6            Set a threshold of mismatch time of DI6A (CN10A-15) and DI6B (CN10B-15). When a mismatch of DI6A and DI6B continues over the setting value, [AL. 79.7 Mismatched input signal error] will occur. Setting "0" will disable alarm detections.</p>	20 [ms]	0 to 60000														

## 5. PARAMETERS

No.	Symbol	Name and function	Initial value [unit]	Setting range																				
PSD24	**SDIP1	<p>Input device - Test pulse diagnosis execution selection 1</p> <p>Select whether diagnose DI1_ to DI4_ or not by test pulses outputted from PLSA/PLSB.</p> <p>When executing test pulse diagnosis with external device, etc., set "0 (Not diagnose)".</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>___x</td> <td>Test pulse diagnosis execution selection DI1 Select whether diagnose DI1_ or not. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>__x_</td> <td>Test pulse diagnosis execution selection DI2 Select whether diagnose DI2_ or not. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>_x__</td> <td>Test pulse diagnosis execution selection DI3 Select whether diagnose DI3_ or not. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>x___</td> <td>Test pulse diagnosis execution selection DI4 Select whether diagnose DI4_ or not. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	___x	Test pulse diagnosis execution selection DI1 Select whether diagnose DI1_ or not. 0: Not diagnose 1: Diagnose	1h	0h to 1h	__x_	Test pulse diagnosis execution selection DI2 Select whether diagnose DI2_ or not. 0: Not diagnose 1: Diagnose	1h	0h to 1h	_x__	Test pulse diagnosis execution selection DI3 Select whether diagnose DI3_ or not. 0: Not diagnose 1: Diagnose	1h	0h to 1h	x___	Test pulse diagnosis execution selection DI4 Select whether diagnose DI4_ or not. 0: Not diagnose 1: Diagnose	1h	0h to 1h		
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___x	Test pulse diagnosis execution selection DI1 Select whether diagnose DI1_ or not. 0: Not diagnose 1: Diagnose	1h	0h to 1h																					
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_x__	Test pulse diagnosis execution selection DI3 Select whether diagnose DI3_ or not. 0: Not diagnose 1: Diagnose	1h	0h to 1h																					
x___	Test pulse diagnosis execution selection DI4 Select whether diagnose DI4_ or not. 0: Not diagnose 1: Diagnose	1h	0h to 1h																					
PSD25	**SDIP2	<p>Input device - Test pulse diagnosis execution selection 2</p> <p>Select whether diagnose DI5_/DI6_ or not by test pulses outputted from PLSA/PLSB.</p> <p>When executing test pulse diagnosis with external device, etc., set "0 (Not diagnose)".</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>___x</td> <td>Test pulse diagnosis execution selection DI5 Select whether diagnose DI5_ or not. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>__x_</td> <td>Test pulse diagnosis execution selection DI6 Select whether diagnose DI6_ or not. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>_x__</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td rowspan="2"></td> </tr> <tr> <td>x___</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	___x	Test pulse diagnosis execution selection DI5 Select whether diagnose DI5_ or not. 0: Not diagnose 1: Diagnose	1h	0h to 1h	__x_	Test pulse diagnosis execution selection DI6 Select whether diagnose DI6_ or not. 0: Not diagnose 1: Diagnose	1h	0h to 1h	_x__	For manufacturer setting	0h		x___	0h				
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PSD26	**SDIPW	<p>Input device - Test pulse off time</p> <p>Select off-pulse time of test pulses outputted from PLSA/PLSB.</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>___x</td> <td>Input device - Test pulse off time 1: 0.888 ms 2: 1.777 ms</td> <td>1h</td> <td>1h to 2h</td> </tr> <tr> <td>__x_</td> <td rowspan="3">For manufacturer setting</td> <td>0h</td> <td rowspan="3"></td> </tr> <tr> <td>_x__</td> <td>0h</td> </tr> <tr> <td>x___</td> <td>0h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	___x	Input device - Test pulse off time 1: 0.888 ms 2: 1.777 ms	1h	1h to 2h	__x_	For manufacturer setting	0h		_x__	0h	x___	0h						
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## 5. PARAMETERS

No.	Symbol	Name and function	Initial value [unit]	Setting range																				
PSD27	**SDID1	Input device - Fixing-diagnosis execution selection 1 at start-up Select whether execute a fixing-diagnosis of DI1_ to DI4_ or not at start-up.	<table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>_ _ _ x</td> <td>Fixing-diagnosis execution selection DI1 at start-up Select whether execute a fixing-diagnosis of DI1_ or not at start-up. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>_ _ x _</td> <td>Fixing-diagnosis execution selection DI2 at start-up Select whether execute a fixing-diagnosis of DI2_ or not at start-up. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>_ x _ _</td> <td>Fixing-diagnosis execution selection DI3 at start-up Select whether execute a fixing-diagnosis of DI3_ or not at start-up. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>x _ _ _</td> <td>Fixing-diagnosis execution selection DI4 at start-up Select whether execute a fixing-diagnosis of DI4_ or not at start-up. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> </tbody> </table>		Setting digit	Explanation	Initial value	Setting range	_ _ _ x	Fixing-diagnosis execution selection DI1 at start-up Select whether execute a fixing-diagnosis of DI1_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h	_ _ x _	Fixing-diagnosis execution selection DI2 at start-up Select whether execute a fixing-diagnosis of DI2_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h	_ x _ _	Fixing-diagnosis execution selection DI3 at start-up Select whether execute a fixing-diagnosis of DI3_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h	x _ _ _	Fixing-diagnosis execution selection DI4 at start-up Select whether execute a fixing-diagnosis of DI4_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h
			Setting digit	Explanation	Initial value	Setting range																		
			_ _ _ x	Fixing-diagnosis execution selection DI1 at start-up Select whether execute a fixing-diagnosis of DI1_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h																		
			_ _ x _	Fixing-diagnosis execution selection DI2 at start-up Select whether execute a fixing-diagnosis of DI2_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h																		
			_ x _ _	Fixing-diagnosis execution selection DI3 at start-up Select whether execute a fixing-diagnosis of DI3_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h																		
x _ _ _	Fixing-diagnosis execution selection DI4 at start-up Select whether execute a fixing-diagnosis of DI4_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h																					
PSD28	**SDID1	Input device - Fixing-diagnosis execution selection 2 at start-up Select whether execute a fixing-diagnosis of DI5_/DI6_ or not at start-up.	<table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>_ _ _ x</td> <td>Fixing-diagnosis execution selection DI5 at start-up Select whether execute a fixing-diagnosis of DI5_ or not at start-up. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>_ _ x _</td> <td>Fixing-diagnosis execution selection DI6 at start-up Select whether execute a fixing-diagnosis of DI6_ or not at start-up. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>_ x _ _</td> <td rowspan="2">For manufacturer setting</td> <td>0h</td> <td rowspan="2"></td> </tr> <tr> <td>x _ _ _</td> <td>0h</td> </tr> </tbody> </table>		Setting digit	Explanation	Initial value	Setting range	_ _ _ x	Fixing-diagnosis execution selection DI5 at start-up Select whether execute a fixing-diagnosis of DI5_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h	_ _ x _	Fixing-diagnosis execution selection DI6 at start-up Select whether execute a fixing-diagnosis of DI6_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h	_ x _ _	For manufacturer setting	0h		x _ _ _	0h		
			Setting digit	Explanation	Initial value	Setting range																		
			_ _ _ x	Fixing-diagnosis execution selection DI5 at start-up Select whether execute a fixing-diagnosis of DI5_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h																		
			_ _ x _	Fixing-diagnosis execution selection DI6 at start-up Select whether execute a fixing-diagnosis of DI6_ or not at start-up. 0: Not diagnose 1: Diagnose	1h	0h to 1h																		
			_ x _ _	For manufacturer setting	0h																			
x _ _ _	0h																							

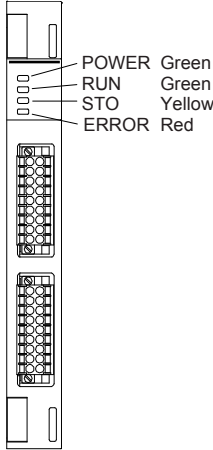
## 5. PARAMETERS

No.	Symbol	Name and function	Initial value [unit]	Setting range																												
PSD29	**SDOP	<p>Output device - Test pulse diagnosis execution selection</p> <p>Select whether diagnose DO1_ to DO4_ or not by test pulses. Selecting "0" (Not diagnose) will not transmit test pulses from DO1_ to DO4_.</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>___ x</td> <td>Test pulse diagnosis execution selection DO1 Select whether diagnose DO1_ or not by test pulses. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>_ _ x _</td> <td>Test pulse diagnosis execution selection DO2 Select whether diagnose DO2_ or not by test pulses. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>_ x _ _</td> <td>Test pulse diagnosis execution selection DO3 Select whether diagnose DO3_ or not by test pulses. 0: Not diagnose 1: Diagnose</td> <td>1h</td> <td>0h to 1h</td> </tr> <tr> <td>x _ _ _</td> <td>Test pulse diagnosis execution selection DO4 Select whether diagnose DO4_ or not by test pulses. 0: Not diagnose 1: Diagnose This digit is available with MR-D30 manufactured in October, 2014 or later.</td> <td>1h</td> <td>0h to 1h</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	___ x	Test pulse diagnosis execution selection DO1 Select whether diagnose DO1_ or not by test pulses. 0: Not diagnose 1: Diagnose	1h	0h to 1h	_ _ x _	Test pulse diagnosis execution selection DO2 Select whether diagnose DO2_ or not by test pulses. 0: Not diagnose 1: Diagnose	1h	0h to 1h	_ x _ _	Test pulse diagnosis execution selection DO3 Select whether diagnose DO3_ or not by test pulses. 0: Not diagnose 1: Diagnose	1h	0h to 1h	x _ _ _	Test pulse diagnosis execution selection DO4 Select whether diagnose DO4_ or not by test pulses. 0: Not diagnose 1: Diagnose This digit is available with MR-D30 manufactured in October, 2014 or later.	1h	0h to 1h										
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PSD30	**SDOPW	<p>Output device - Test pulse off time</p> <p>Select off-pulse time of test pulses outputted from DO1_ to DO4_. This setting is enabled for DO1_ to DO4_ only when "1" (Diagnose) was set with [Pr. PSD29].</p> <table border="1"> <thead> <tr> <th>Setting digit</th> <th>Explanation</th> <th>Initial value</th> <th>Setting range</th> </tr> </thead> <tbody> <tr> <td>___ x</td> <td>Test pulse off time DO1 Select off-pulse time outputted from DO1_. Refer to table 5.4 for settings.</td> <td>0h</td> <td>0h to 2h</td> </tr> <tr> <td>_ _ x _</td> <td>Test pulse off time DO2 Select off-pulse time outputted from DO2_. Refer to table 5.4 for settings.</td> <td>0h</td> <td>0h to 2h</td> </tr> <tr> <td>_ x _ _</td> <td>Test pulse off time DO3 Select off-pulse time outputted from DO3_. Refer to table 5.4 for settings.</td> <td>0h</td> <td>0h to 2h</td> </tr> <tr> <td>x _ _ _</td> <td>Test pulse off time DO4 Select off pulse time outputted from DO4_. Refer to table 5.4 for settings. This digit is available with MR-D30 manufactured in October, 2014 or later.</td> <td>0h</td> <td>0h to 2h</td> </tr> </tbody> </table> <p style="text-align: center;">Table 5.4 Off time selection</p> <table border="1"> <thead> <tr> <th>Setting value</th> <th>Off time [ms]</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0.444</td> </tr> <tr> <td>1</td> <td>0.888</td> </tr> <tr> <td>2</td> <td>1.777</td> </tr> </tbody> </table>	Setting digit	Explanation	Initial value	Setting range	___ x	Test pulse off time DO1 Select off-pulse time outputted from DO1_. Refer to table 5.4 for settings.	0h	0h to 2h	_ _ x _	Test pulse off time DO2 Select off-pulse time outputted from DO2_. Refer to table 5.4 for settings.	0h	0h to 2h	_ x _ _	Test pulse off time DO3 Select off-pulse time outputted from DO3_. Refer to table 5.4 for settings.	0h	0h to 2h	x _ _ _	Test pulse off time DO4 Select off pulse time outputted from DO4_. Refer to table 5.4 for settings. This digit is available with MR-D30 manufactured in October, 2014 or later.	0h	0h to 2h	Setting value	Off time [ms]	0	0.444	1	0.888	2	1.777		
Setting digit	Explanation	Initial value	Setting range																													
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Setting value	Off time [ms]																															
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1	0.888																															
2	1.777																															

## 6. DISPLAY

### 6. DISPLAY

MR-D30 has four LED indications. They indicate the followings.



LED	Lighting status	Description
POWER	Lit	Power is being supplied.
	Extinguished	Power is not supplied.
RUN	Lit	The safety observation function is performing. STO, SS1, SS2/SOS, or SLS function is being executed normally, performing shutoff or observation.
	Extinguished	The safety observation function is not performing. Because the operation commands are not inputted or an internal diagnosis error has occurred.
STO	Lit	STO function is performing. The power to the motors is shut off.
	Extinguished	STO function is not performing. The power to the motors is not shut off.
ERROR	Lit	Some errors have been detected for MR-D30. (Note)
	Flickering	Some errors have been detected for MR-D30.
	Extinguished	An error is not being detected in MR-D30.

Note. When a servo amplifier which is not compatible with MR-D30 is connected to MR-D30, ERROR will light. Check if MR-D30 is connected to the MR-J4-\_B\_-RJ servo amplifier with the software version B3 or later, or the MR-J4-\_A\_-RJservo amplifier with the software version B5 or later. (Refer to section 1.1.)

The following shows indication example of each state.

POWER	RUN	STO	ERROR	Servo amplifier display	Status	Description
●	●	●	●	Normal	Power off	Power is not supplied.
○	●	○	●	95_ or Ab	During diagnosis	A diagnosis has not been completed. When input devices are used, perform the fixing diagnosis at start-up. When using a drive safety integrated motion controller, connect networks.
○	●	●	●	Normal	Safety observation function is not performing.	The safety observation function is not performing.
○	○	○	●	95_	Safety observation function is performing. (shut-off)	STO and SS1 functions are performing.
○	○	●	●	Normal	Safety observation function is performing. (observation in progress)	SLS or SS2/SOS function is performing.
○	●/○	○	◎/○	Alarm No.	Error has occurred.	An error has been detected. Refer to chapter 7 for error details. (Note)
○	○	○	○	Alarm No.	Error has occurred (watchdog)	Watchdog is occurring due to parts error, such as the CPU.

(○: Lit, ◎: Flickers, ●: Extinguished)

Note. When a servo amplifier which is not compatible with MR-D30 is connected to MR-D30, "ERROR" will light. Check if MR-D30 is connected to the MR-J4-\_B\_-RJ servo amplifier with the software version B3 or later, or the MR-J4-\_A\_-RJservo amplifier with the software version B5 or later. (Refer to section 1.1.)





## 7. TROUBLESHOOTING

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### 7. TROUBLESHOOTING

POINT
● Refer to "MELSERVO-J4 Servo Amplifier Instruction Manual (Troubleshooting)" for details of alarms and warnings.
● This chapter shows alarms and warnings which can occur by using a servo amplifier with MR-D30. For other alarms, refer to each servo amplifier instruction manual.
● As soon as an alarm occurs, make the Servo-off status and interrupt the main circuit power.
● [AL. 37 Parameter error] and warnings are not recorded in the alarm history.

#### 7.1 Alarm and warning list

The following shows alarms and warnings which are added for the functional safety unit.

When the alarm or the warning occurs, refer to "MELSERVO-J4 Servo Amplifier Instruction Manual (Troubleshooting)" to remove the failure. When an alarm occurs, ALM (Malfunction) will be off.

After its cause has been removed, the alarm can be deactivated in any of the methods marked ○ in the alarm deactivation column in the following table. For the procedures of alarm reset, refer to section 4.5.10.

Warnings are automatically canceled after the cause of occurrence is removed.

# 7. TROUBLESHOOTING

## (1) Alarms

	No.	Name	Detail No.	Detail name	Stop method (Note 1, 2)	Alarm which SSM is disabled (Note 4)	Alarm reset		
							Error reset	CPU reset	Power off to on
Alarm	34	SSCNET receive error 1	34.5	SSCNET receive data error (safety observation function)	SD	/	○	○	○
			34.6	SSCNET communication data error (safety observation function)	SD	/	○	○	○
	36	SSCNET receive error 2	36.2	Continuous communication data error (safety observation function)	SD	/	○	○	○
	63	STO timing error	63.5	STO by functional safety unit	STO/DB	/	○	○	○
	64	Functional safety unit setting error	64.1	STO input error	DB	/	/	/	○
			64.2	Compatibility mode setting error	DB	/	/	/	○
			64.3	Operation mode setting error	DB	/	/	/	○
	65	Functional safety unit connection error	65.1	Functional safety unit communication error 1	SD	○	/	/	○
			65.2	Functional safety unit communication error 2	SD	○	/	/	○
			65.3	Functional safety unit communication error 3	SD	○	/	/	○
			65.4	Functional safety unit communication error 4	SD	○	/	/	○
			65.5	Functional safety unit communication error 5	SD	○	/	/	○
			65.6	Functional safety unit communication error 6	SD	○	/	/	○
			65.7	Functional safety unit communication error 7	SD	○	/	/	○
			65.8	Functional safety unit shut-off signal error 1	DB	○	/	/	○
	66	Encoder initial communication error (safety observation function)	66.1	Encoder initial communication - Receive data error 1 (safety observation function)	DB	○	/	/	○
			66.2	Encoder initial communication - Receive data error 2 (safety observation function)	DB	○	/	/	○
			66.3	Encoder initial communication - Receive data error 3 (safety observation function)	DB	○	/	/	○
			66.7	Encoder initial communication - Transmission data error 1 (safety observation function)	DB	○	/	/	○
			66.9	Encoder initial communication - Process error (safety observation function)	DB	○	/	/	○
	67	Encoder normal communication error 1 (safety observation function)	67.1	Encoder communication - Receive data error 1 (safety observation function)	DB	○	/	/	○
			67.2	Encoder communication - Receive data error 2 (safety observation function)	DB	○	/	/	○
			67.3	Encoder communication - Receive data error 3 (safety observation function)	DB	○	/	/	○
			67.4	Encoder communication - Receive data error 4 (safety observation function)	DB	○	/	/	○
			67.7	Encoder communication - Transmission data error 1 (safety observation function)	DB	○	/	/	○
	79	Functional safety unit diagnosis error	79.1	Functional safety unit power voltage error	STO/DB	○	○ (Note 3)	/	○
			79.2	Functional safety unit internal error	STO/DB	○	/	/	○
			79.3	Abnormal temperature of functional safety unit	SS1/SD	○	○ (Note 3)	/	○
			79.4	Servo amplifier error	SS1/SD	○	/	/	○
			79.5	Input device error	SS1/SD	○	/	/	○
			79.6	Output device error	SS1/SD	○	/	/	○
			79.7	Mismatched input signal error	SS1/SD	○	/	/	○
			79.8	Position feedback fixing error	STO/DB	○	/	/	○
	7A	Parameter setting error (safety observation function)	7A.1	Parameter verification error (safety observation function)	STO/DB	○	/	/	○
			7A.2	Parameter setting range error (safety observation function)	STO/DB	○	/	/	○
			7A.3	Parameter combination error (safety observation function)	STO/DB	○	/	/	○
			7A.4	Functional safety unit combination error (safety observation function)	STO/DB	○	/	/	○

## 7. TROUBLESHOOTING

	No.	Name	Detail No.	Detail name	Stop method (Note 1, 2)	Alarm which SSM is disabled (Note 4)	Alarm reset		
							Error reset	CPU reset	Power off to on
Alarm	7B	Encoder diagnosis error (safety observation function)	7B.1	Encoder diagnosis error 1 (safety observation function)	SS1/EDB	○	/	/	○
			7B.2	Encoder diagnosis error 2 (safety observation function)	SS1/EDB	○	/	/	○
			7B.3	Encoder diagnosis error 3 (safety observation function)	SS1/EDB	○	/	/	○
			7B.4	Encoder diagnosis error 4 (safety observation function)	SS1/EDB	○	/	/	○
	7C	Functional safety unit communication diagnosis error (safety observation function)	7C.1	Functional safety unit communication cycle error (safety observation function)	SS1/SD	○	○ (Note 3)	○	○
			7C.2	Functional safety unit communication data error (safety observation function)	SS1/SD	○	○ (Note 3)	/	○
	7D	Safety observation error	7D.1	Stop observation error	STO/DB	○	/	/	○
			7D.2	Speed observation error	STO/DB	/	○ (Note 3)	/	○

Note 1. The following shows stop methods.

DB: Stops with dynamic brake. (Coasts for the servo amplifier without dynamic brake.)

SD: Forced stop deceleration

STO/DB: Dynamic brake stop operating STO function

SS1/SD: Forced stop deceleration operating SS1 function

SS1/EDB: Electronic dynamic brake stop (available with specified servo motors)

Refer to the following table for the specified servo motors. The stop method for other than the specified servo motors is SS1/DB.

Series	Servo motor
HG-KR	HG-KR053/HG-KR13/HG-KR23/HG-KR43
HG-MR	HG-MR053/HG-MR13/HG-MR23/HG-MR43
HG-SR	HG-SR51/HG-SR52

For other stop methods, refer to section 4.5.2 (3) (a).

- This is applicable when [Pr. PA04] is set to the initial value. The stop system of SD can be changed to DB using [Pr. PA04].
- Reset this while all the safety observation functions are stopped.
- The SSM function will be disabled and each output device will turn off.

### (2) Warnings

	No.	Name	Detail No.	Detail name	Stop method (Note 1, 2)	Alarm which SSM is disabled with (Note 3)
Warning	95	STO warning	95.3	STO warning 1 (safety observation function)	STO/DB	○
			95.4	STO warning 2 (safety observation function)	STO/DB	○
			95.5	STO warning 3 (safety observation function)	STO/DB	/
	E6	Servo forced stop warning	E6.2	SS1 forced stop warning 1 (safety observation function)	SS1/SD	/
			E6.3	SS1 forced stop warning 2 (safety observation function)	SS1/SD	○

Note 1. The following shows stop methods.

DB: Stops with dynamic brake. (Coasts for the servo amplifier without dynamic brake.)

SD: Forced stop deceleration

STO/DB: Dynamic brake stop operating STO function

- This is applicable when [Pr. PA04] is set to the initial value. The stop system of SD can be changed to DB using [Pr. PA04].
- The SSM function will be disabled and each output device will turn off.

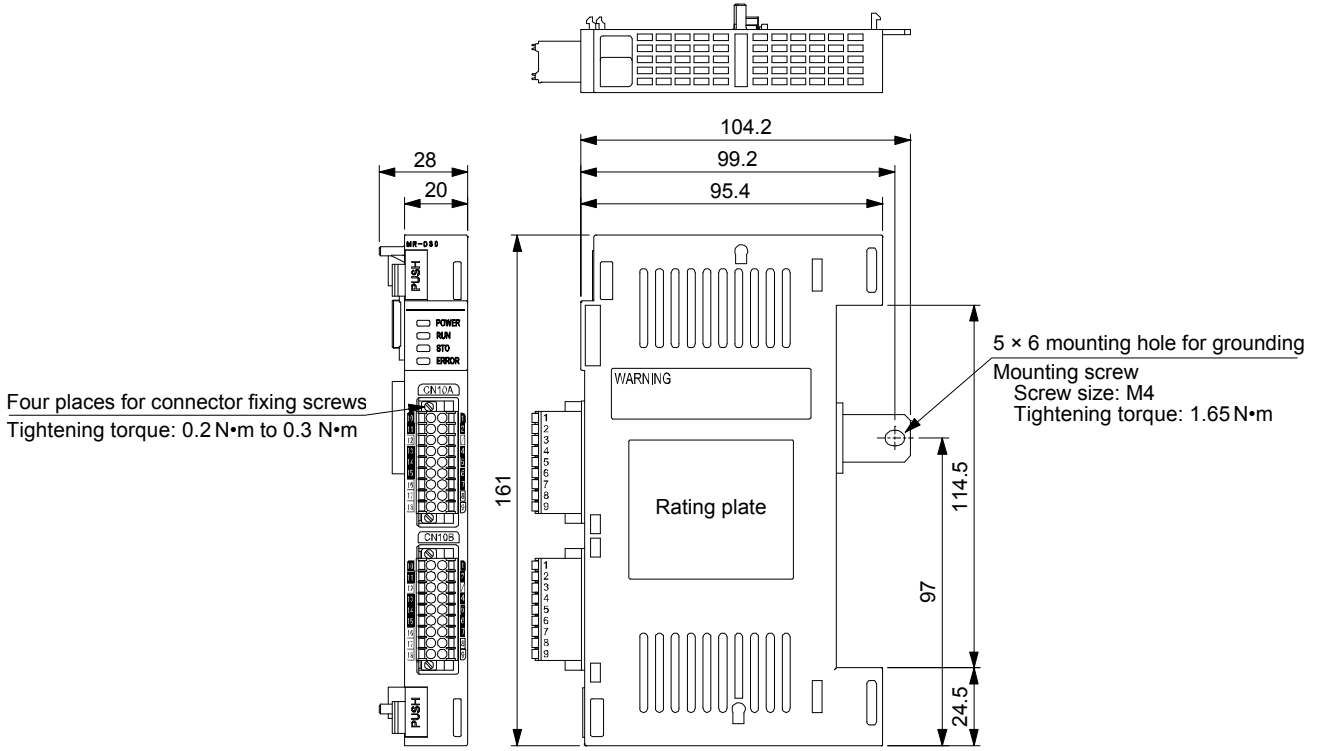


# 8. DIMENSIONS

## 8. DIMENSIONS

### 8.1 MR-D30 functional safety unit

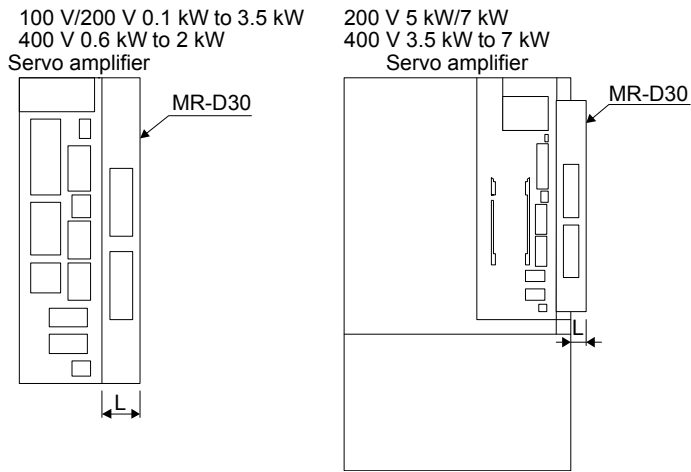
[Unit: mm]



Mass: 0.15 kg

## 8. DIMENSIONS

### 8.2 When an MR-D30 is mounted on a servo amplifier





Servo amplifier	L [mm]
MR-J4-10_1-RJ to MR-J4-40_1-RJ MR-J4-10_-RJ to MR-J4-100_-RJ MR-J4-60_4-RJ to MR-J4-100_4-RJ	20
MR-J4-200_-RJ/MR-J4-350_-RJ MR-J4-200_4-RJ	15
MR-J4-500_-RJ/MR-J4-700_-RJ MR-J4-350_4-RJ to MR-J4-700_4-RJ	10
MR-J4-11K_-RJ to MR-J4-22K_-RJ MR-J4-11K_4-RJ to MR-J4-22K_4-RJ	0

# APPENDIX

## App. 1 EC declaration of conformity

MR-D30 complies with the safety components laid down in the machinery directive.

### App. 1.1 Combination not using servo motors with functional safety


<b>ZERTIFIKAT</b> ◆ <b>CERTIFICATE</b> ◆ <b>인증증서</b> ◆ <b>CERTIFICADO</b> ◆ <b>CERTIFICAT</b>	 Product Service
	<h2>CERTIFICATE</h2>
	<b>No. Z10 14 09 66509 015</b>
	<b>Holder of Certificate: MITSUBISHI ELECTRIC CORPORATION</b> <b>Nagoya Works</b> 5-1-14, Yada-Minami Higashi-ku, Nagoya-shi Aichi 461-8670 JAPAN
	<b>Factory(ies):</b> 87457
	<b>Certification Mark:</b> 
	<b>Product:</b> <b>AC servo systems</b>
	<b>Model(s):</b> <b>Functional Safety Unit MR-D30</b>
	<b>Parameters:</b> Safety Functions (EN 61800-5-2): STO, SS1, SBC: Cat4, PLe, SIL3 SLS, SSM : Cat3, PLd, SIL2 Status Monitor(SM): Cat4 or 3, PLe or d, SIL3 or 2 Ambient temperature: Operation: 0°C to 55°C Storage: -20°C to 65°C Altitude: Max. 1000m above sea level This unit will be installed for MR-J4 Servo Encoder type: Standard
	<b>Tested according to:</b> EN ISO 13849-1/AC:2009 (Cat 3/4, PL d/e) EN 62061/AC:2010 (SILCL 2/3) IEC 61508-1:2010 (SIL 2/3) IEC 61508-2:2010 (SIL 2/3) IEC 61508-3:2010 (SIL 2/3) IEC 61508-4:2010 (SIL 2/3) IEC 61800-5-1:2007 IEC 61800-5-2:2007 IEC 61326-3-1:2008

The product was tested on a voluntary basis and complies with the essential requirements. The certification mark shown above can be affixed on the product. It is not permitted to alter the certification mark in any way. In addition the certification holder must not transfer the certificate to third parties. See also notes overleaf.

**Test report no.:** MN85710T  
**Valid until:** 2019-09-22

*Peter Weiss*  
**Date,** 2014-09-25 (Peter Weiss)

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TUV®



App. 1.2 Combination with servo motors with functional safety

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ CERTIFICADO ◆ CERTIFICAT



Product Service


## CERTIFICATE

No. Z10 14 09 66509 016

**Holder of Certificate:** MITSUBISHI ELECTRIC CORPORATION  
 Nagoya Works  
 5-1-14, Yada-Minami  
 Higashi-ku, Nagoya-shi  
 Aichi  
 461-8670 JAPAN

**Factory(ies):** 87457

**Certification Mark:**



**Product:** AC servo systems  
**Model(s):** Functional Safety Unit MR-D30  
**Parameters:**

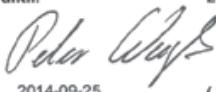
Safety Functions (EN 61800-5-2):  
 STO, SS1, SBC, SLS, SSM, SOS, SS2: Cat4, PL e, SIL3  
 Status Monitor(SM): Cat4 or 3, PL e or d, SIL3 or 2  
 Ambient temperature:  
 Operation: 0°C to 55°C  
 Storage: -20°C to 65°C  
 Altitude: Max. 1000m above sea level  
 This unit will be installed for MR-J4 Servo amplifier  
 Encoder type: Functional Safety

**Tested according to:**


EN ISO 13849-1/AC:2009 (Cat 3/4, PL d/e)  
 EN 62061/AC:2010 (SILCL 2/3)  
 IEC 61508-1:2010 (SIL 2/3)  
 IEC 61508-2:2010 (SIL 2/3)  
 IEC 61508-3:2010 (SIL 2/3)  
 IEC 61508-4:2010 (SIL 2/3)  
 IEC 61800-5-1:2007  
 IEC 61800-5-2:2007  
 IEC 61326-3-1:2008

The product was tested on a voluntary basis and complies with the essential requirements. The certification mark shown above can be affixed on the product. It is not permitted to alter the certification mark in any way. In addition the certification holder must not transfer the certificate to third parties. See also notes overleaf.

**Test report no.:** MN85710T  
**Valid until:** 2019-09-22



**Date,** 2014-09-25 ( Peter Weiss )



A1 / 04.11

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REVISION

\*The manual number is given on the bottom left of the back cover.

Print Data	*Manual Number	Revision
Apr. 2014	SH(NA)030132-A	First edition
Jan. 2015	SH(NA)030132-B	<p>Servo motors with functional safety are added.                      SS2/SOS/SM functions are added.                      DO4_ is added.                      The status monitor function is added.                      MR-J4-_A_-RJ is added.</p> <p>Safety Instructions</p> <p>(2) Wiring                      The diagram is added.</p> <p>Section 1.1                      The table is changed.</p> <p>Section 1.1 (1)                  The sentences are changed.</p> <p>Section 1.1 (2)                  The table is changed.</p> <p>Section 1.2                      Added.</p> <p>Section 1.3.1                    The diagram is changed.</p> <p>Section 1.3.2                    Added.</p> <p>Section 1.4.1                    POINT is added.</p> <p>Section 1.4.2                    Added.</p> <p>Section 1.5                      The table is changed.</p> <p>Section 1.6                      The table is changed.</p> <p>Section 1.7                      Sentences of POINT and table are changed.</p> <p>Section 1.9.1 (8)                The sentences are changed.</p> <p>Section 1.9.2 (2), (3)         The sentences are changed.</p> <p>Section 2.1 (1) (b)             The sentences in POINT are changed.</p> <p>Section 2.6                      The sentences of Note are changed.</p> <p>Section 2.6 (1)                 The diagram is changed.</p> <p>Chapter 3                        The diagram of CAUTION and POINT are changed.</p> <p>Section 3.1                      The sentences and diagram are changed. Note is added.</p> <p>Section 3.2.1                    The diagram is changed.</p> <p>Section 3.2.2                    The diagram is changed.</p> <p>Section 3.3.1 (1)                The diagram is changed.</p> <p>Section 3.3.2 (1)                The diagram is changed.</p> <p>Section 3.3.3                    The sentences and diagram are changed.</p> <p>Section 3.3.4                    Added.</p> <p>Section 3.5                      Item name and sentences are changed.</p> <p>Section 3.6.1                    The table is changed.</p> <p>Section 3.6.2                    The sentences and table are changed.</p> <p>Section 3.6.3                    The table is changed.</p> <p>Section 3.8.1 (1)                The sentences are added and diagram is changed.</p> <p>Section 3.8.1 (2)                The sentences are added and diagram is changed.</p> <p>Section 3.8.2                    Added.</p> <p>Section 3.9                      Added.</p> <p>Chapter 4                        POINT is changed.</p> <p>Section 4.1                      Added.</p> <p>Section 4.1 (1)                  The table is changed.</p> <p>Section 4.1 (2)                  The table is changed.</p> <p>Section 4.1 (3)                  The table is changed.</p> <p>Section 4.3.1                    The table is changed.</p> <p>Section 4.3.2 (e)                Added.</p> <p>Section 4.3.3                    The table is changed.</p> <p>Section 4.3.3 (3)                The item name is changed.</p> <p>Section 4.3.4 (1)                The sentences are changed.</p> <p>Section 4.3.4 (2)                The sentences are changed.</p> <p>Section 4.4.1 (1) (d)            The sentences are added.</p> <p>Section 4.4.1 (2) (a)            The table is changed.</p>

Print Data	*Manual Number	Revision	
Jan. 2015	SH(NA)030132-B	Section 4.4.1 (3) (a)	The sentences are added.
		Section 4.4.1 (4) (a)	The diagram is changed.
		Section 4.4.1 (4) (b)	The diagram is changed.
		Section 4.4.1 (5) (a)	The sentences are added.
		Section 4.4.1 (5) (b)	The sentences are added.
		Section 4.4.1 (6)	The table is changed.
		Section 4.4.2 (1) (a)	The sentences are changed.
		Section 4.4.2 (1) (b)	The sentences are changed.
		Section 4.4.2 (2)	The sentences and table are changed.
		Section 4.4.2 (3) (a)	The sentences are changed.
		Section 4.4.2 (3) (b)	The sentences are changed.
		Section 4.4.2 (4) (a)	The sentences and diagram are changed.
		Section 4.4.3 (1) (b)	The sentences are changed.
		Section 4.4.3 (1) (c)	Deleted.
		Section 4.4.4	Added.
		Section 4.4.5	Added.
		Section 4.5.1 (2) (a)	The sentences and diagram are changed.
		Section 4.5.1 (2) (b)	The sentences and diagram are changed.
		Section 4.5.2 (2) (a)	The sentences and diagram are changed.
		Section 4.5.2 (2) (a)	The sentences and diagram are changed.
		Section 4.5.2 (2) (b)	The sentences and diagram are changed.
		Section 4.5.2 (2) (c)	The sentences and diagram are changed.
		Section 4.5.2 (3) (b)	The sentences and diagram are changed.
		Section 4.5.2 (3) (c)	The sentences and diagram are changed.
		Section 4.5.2 (3) (d)	The sentences and diagram are changed.
		Section 4.5.3	Added.
		Section 4.5.4	The sentences are changed.
		Section 4.5.4 (4) (a)	The sentences are changed.
		Section 4.5.4 (4) (b)	The sentences are changed.
		Section 4.5.4 (5)	The table is changed.
		Section 4.5.5 (2) (a)	The diagram is changed.
		Section 4.5.6 (2)	The sentences and diagram are changed.
		Section 4.5.6 (3)	The sentences are changed.
		Section 4.5.9 (2)	Added.
		Chapter 5	The sentences in POINT are changed.
		Section 5.1	The table is changed.
		Section 5.2.1	The table is changed.
		Section 5.2.2	The table is changed.
		Section 5.2.3	The table is changed.
		Chapter 6	The table and Note are changed.
		Section 7.1 (1)	The table is changed.
		Section 8.1	The diagram is changed.
		Section 8.2	The table is changed.
		APPENDIX	Added.

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Taiwan	SETSUYO ENTERPRISE CO., LTD. 6F, No.105, Wugong 3rd Road, Wugu District, New Taipei City 24889, Taiwan, R.O.C.	Tel : +886-2-2299-2499 Fax : +886-2-2299-2509
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Singapore	MITSUBISHI ELECTRIC ASIA PTE. LTD. 307, Alexandra Road, Mitsubishi Electric Building, Singapore 159943	Tel : +65-6473-2308 Fax : +65-6476-7439
Thailand	MITSUBISHI ELECTRIC FACTORY AUTOMATION (THAILAND) CO., LTD. 12th Floor, SV.City Building, Office Tower 1, No. 896/19 and 20 Rama 3 Road, Kwaeng Bangpongpan, Khet Yannawa, Bangkok 10120, Thailand	Tel : +66-2682-6522 to 6531 Fax : +66-2682-6020
Indonesia	PT. MITSUBISHI ELECTRIC INDONESIA Gedung Jaya 11th Floor, JL. MH. Thamrin No.12, Jakarta Pusat 10340, Indonesia	Tel : +62-21-3192-6461 Fax : +62-21-3192-3942
Vietnam	MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED Unit 01-04, 10th Floor, Vincom Center, 72 Le Thanh Ton Street, District 1, Ho Chi Minh City, Vietnam	Tel : +84-8-3910-5945 Fax : +84-8-3910-5947
India	MITSUBISHI ELECTRIC INDIA PVT. LTD. Pune Branch Emerald House, EL -3, J Block, M.I.D.C Bhosari, Pune - 411026, Maharashtra, India	Tel : +91-20-2710-2000 Fax : +91-20-2710-2100
Australia	MITSUBISHI ELECTRIC AUSTRALIA PTY. LTD. 348 Victoria Road, P.O. Box 11, Rydalmere, N.S.W 2116, Australia	Tel : +61-2-9684-7777 Fax : +61-2-9684-7245

MELSERVO is a trademark or registered trademark of Mitsubishi Electric Corporation in Japan and/or other countries.  
All other product names and company names are trademarks or registered trademarks of their respective companies.

## Warranty

### 1. Warranty period and coverage

We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

### [Term]

The term of warranty for Product is twelve (12) months after your purchase or delivery of the Product to a place designated by you or eighteen (18) months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

### [Limitations]

- (1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.  
It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.
- (2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.
- (3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
  - (i) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
  - (ii) a failure caused by any alteration, etc. to the Product made on your side without our approval
  - (iii) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
  - (iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
  - (v) any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
  - (vi) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
  - (vii) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
  - (viii) any other failures which we are not responsible for or which you acknowledge we are not responsible for

### 2. Term of warranty after the stop of production

- (1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.
- (2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

### 3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

### 4. Exclusion of responsibility for compensation against loss of opportunity, secondary loss, etc.

Whether under or after the term of warranty, we assume no responsibility for any damages arisen from causes for which we are not responsible, any losses of opportunity and/or profit incurred by you due to a failure of the Product, any damages, secondary damages or compensation for accidents arisen under a specific circumstance that are foreseen or unforeseen by our company, any damages to products other than the Product, and also compensation for any replacement work, readjustment, start-up test run of local machines and the Product and any other operations conducted by you.

### 5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

### 6. Application and use of the Product

- (1) For the use of our General-Purpose AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in General-Purpose AC Servo, and a backup or fail-safe function should operate on an external system to General-Purpose AC Servo when any failure or malfunction occurs.
- (2) Our General-Purpose AC Servo is designed and manufactured as a general purpose product for use at general industries. Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used  
In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used. We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

MODEL	MR-D30 INSTRUCTIONMANUAL
MODEL CODE	1CW817

# MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : TOKYO BLDG MARUNOUCHI TOKYO 100-8310