IAI

Quality and Innovation

RCON System

Instruction Manual First Edition ME0384-1C

Specifications Section

Chapter 1 RCON Overview
Chapter 2 System Configuration and Specifications
Chapter 3 Gateway Unit
Chapter 4 Driver Unit
Chapter 5 Simple Absolute Unit
Chapter 6 Expansion Units
Chapter 7 Preventive Maintenance/Predictive Maintenance

Startup Section

Chapter 1 Overview
Chapter 2 Mounting and Wiring
Chapter 3 Absolute Reset
Chapter 4 Network Configuration
Chapter 5 Basic Operation Confirmation and Adjustment

Maintenance Section

Chapter 1 Maintenance and Inspection
Chapter 2 Troubleshooting

Appendix

Chapter 1 Connectable Actuators

IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

The DVD enclosed with the product contains instruction manuals for IAI products.
When using the product, refer to the necessary sections of the applicable instruction manual by printing them out or displaying them on a PC.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
-
-

RCON System Instruction Manual Configuration

Product name	Instruction manual name	Control number
RCON Gateway Unit	First Step Guide	ME0382
RCON Driver Unit	First Step Guide	ME0383
RCON System	Instruction Manual (this document)	ME0384
SCON-CB Controller	SCON-CB/CGB/LC/LCG Instruction Manual	ME0340
PC Software for RC/EC	RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
Touch Panel Teaching Pendant	TB-02/02D Instruction Manual	ME0355
Data Setter	TB-03 Instruction Manual	ME0376
24V Power Supply Unit	PSA-24 Instruction Manual	ME0379
Calculator	Calculator Instruction Manual	ME0381

Contents

Safety Guide ···· Intro-1
Precautions for Handling ···· Intro-8
Precautions for PC connection to RCON gateway unit
grounded at positive terminal of 24 VDC power supply ···· Intro-13
International Standard Compliance ···· Intro-15
Warranty ···· Intro-16
Actuator Coordinate System ···· Intro-18

[Specifications Section]
Chapter 1 RCON Overview
1.1 Overview ···· 1-1
1.2 Features ···· 1-2
Field network control operation mode ···· 1-4
List of functions by operation mode ···· 1-5
1.3 General Specifications ···· 1-6

Chapter 2 System Configuration and Specifications
2.1 System Configuration ···· 2-1
2.2 Configuration Unit List ···· 2-2
2.3 Specifications ···· 2-5
General specifications ···· 2-5
Drive-source cutoff ···· 2-7
Power supply capacity ···· 2-9
Power ON sequence ···· 2-11
Inrush current ···· 2-13
Operating temperature range ···· 2-15
Installation conditions ···· 2-16
Unit connection restrictions ···· 2-19
2.4 External Dimensions ···· 2-22
Controller (8-axis without fan) ···· 2-22
Controller (8-axis with fan) ···· 2-23
Controller (16-axis without fan) ···· 2-24
Controller (16-axis with fan) ···· 2-25
2.5 Connection Diagrams ···· 2-26
Power and stop sections ···· 2-26
Motor/encoder circuit ···· 2-28
AUTO/MANU mode switching circuit wiring ···· 2-32
Field network wiring ···· 2-33

Chapter 3 Gateway Unit
3.1 Overview ···· 3-1
3.2 How to Read the Model Number ···· 3-2
How to read the model nameplate ···· 3-3
3.3 Gateway Unit and Accessories ···· 3-4
3.4 Part Names/Functions and External Dimensions ···· 3-5
Part names ···· 3-5
LED display ···· 3-7

Ethernet connector ··· 3-8
AUTO/MANU switch ··· 3-8
SIO connector ··· 3-9
USB connector ··· 3-10
System I/O connector ··· 3-11
Motor power connector ··· 3-12
Control power connector ··· 3-13
Field network connector ··· 3-14
Connectors ··· 3-14
Terminal unit ··· 3-15
External dimensions ··· 3-16
3.5 Field Network General Specifications ··· 3-18
CC-Link ··· 3-18
CC-Link IE ··· 3-19
DeviceNet ··· 3-20
EtherCAT ··· 3-21
EtherNet/IP ··· 3-22
PROFIBUS-DP ··· 3-23
PROFINET IO ··· 3-24
3.6 Operation Function List ··· 3-25
Field network control operation mode ··· 3-25
List of functions by operation mode ··· 3-26
3.7 Address Configuration ··· 3-27
Overall address configuration example ··· 3-29
Gateway control/status signals ··· 3-40
Power supply unit status signal ··· 3-42
Position table ··· 3-45
Direct numerical control mode assignment ··· 3-61
Simple direct mode assignment ··· 3-67
Positioner 1 mode assignment ··· 3-71
Positioner 2 mode assignment ··· 3-74
Positioner 3 mode assignment ··· 3-75
Positioner 5 mode assignment ··· 3-78
3.8 I/O Signals ··· 3-81
Timing of I/O signals ··· 3-81
Function of I/O signals ··· 3-82
Timing of basic operation ··· 3-105
Other basic operations ··· 3-113
3.9 Gateway Parameter Configuration Tool ··· 3-128
Tool startup ··· 3-128
Menu descriptions ··· 3-129
Special parameter setting function descriptions ··· 3-131
Operation mode setting ··· 3-138
Operation mode individual setting ··· 3-140
Axis number assignment change ··· 3-141
Editing driver unit configuration ··· 3-142
3.10 Actuator Information Management Function ··· 3-151
Overview ··· 3-151
Actuators with information management function supported ··· 3-152
Actuator information management function ··· 3-153
Parameters for actuator information management function setting ··· 3-156

Chapter 4 Driver Unit

4.1 Overview ··· 4-1
4.2 How to Read the Model Number ··· 4-2
How to read the model nameplate ··· 4-3

4.3 Driver Unit and Components ········ 4-4
4.4 Part Names/Functions and External Dimensions ········ 4-5
Part names ········ 4-5
LED display ········ 4-7
Jog switch ········ 4-8
Brake release switch ········ 4-9
Motor/encoder connector ········ 4-9
Drive source shutoff connector ········ 4-13
Fan connector ········ 4-14
Connectors ········ 4-14
Fan unit ········ 4-15
External dimensions ········ 4-16
4.5 Parameters ········ 4-18
Parameter list ········ 4-19
Actuator stroke ········ 4-24
Actuator dynamic characteristics ········ 4-31
External interface ········ 4-53
Servo gain adjustment ········ 4-58
4.6 Precautions for Rotary Type ········ 4-73
4.7 Precautions for Gripper Type ········ 4-76
4.8 Various Functions ········ 4-80
Vibration damping control function ········ 4-80
Collision detection function ········ 4-87
Power-saving function ········ 4-90

Chapter 5 Simple Absolute Unit

5.1 Overview ········ 5-1
5.2 How to Read the Model Number ········ 5-2
How to read the model nameplate ········ 5-3
5.3 Simple Absolute Unit and Components ········ 5-4
5.4 General Specifications ········ 5-5
5.5 Part Names/Functions and External Dimensions ········ 5-7
Part names ········ 5-7
LED display ········ 5-8
Actuator cable connector/driver unit cable connector ········ 5-8
External dimensions ········ 5-9
5.6 Precautions ········ 5-10

Chapter 6 Expansion Unit

6.1 Overview ········ 6-1
6.2 How to Read the Model Number ········ 6-2
How to read the model nameplate ········ 6-2
6.3 Expansion Unit and Components ········ 6-3
6.4 Part Names/Functions and External Dimensions ········ 6-4
Part names ········ 6-4
SCON cable connector ········ 6-6
Connectors ········ 6-7
External dimensions ········ 6-8

Chapter 7 Preventive Maintenance/Predictive Maintenance

7.1 Preventive Maintenance Function ········ 7-1
- Driver unit ········ 7-1
- Gateway unit ········ 7-1

7.2 Predictive Maintenance Function ········ 7-2
- Fan ········ 7-2
- Overload warning ········ 7-2

[Startup Section]

Chapter 1 Overview

1.1 Checking the Product ········ 1-1

1.2 Tools to Use ········ 1-5

1.3 Startup Procedure ········ 1-6

Chapter 2 Mounting and Wiring

2.1 Installation ········ 2-1
- Requests/Precautions ········ 2-1
- Unit connection ········ 2-4
- DIN rail mounting ········ 2-5

2.2. Wiring ········ 2-6
- Controller wiring ········ 2-6
- Actuator wiring ········ 2-9
- CC-Link wiring ········ 2-11

Chapter 3 Absolute Reset

3.1 Absolute Reset ········ 3-1
- Overview ········ 3-1

3.2 Simple Absolute Unit Wiring ········ 3-2

3.3 Parameter Setting ········ 3-5

3.4 Absolute Reset Procedure ········ 3-6

3.5 Absolute Battery ········ 3-11

3.6 Precautions ········ 3-13

Chapter 4 Network Configuration

4.1 How to Use the Gateway Parameter Configuration Tool ········ 4-1
- PC software setting ········ 4-1
- RCON setting: CC-Link (for PiC of PLC wiring / programming) ········ 4-14

4.2 Master Side Setting ········ 4-23
- PLC setting: CC-Link (for PiC of PLC wiring / programming) ········ 4-23

4.3 PC Software for RC/EC Setting ········ 4-36
- PC software for RC/EC setting ········ 4-36
- Position data registration ········ 4-40

4.4 Address Configuration ········ 4-48
- Overall address configuration example ········ 4-50
- Gateway control/status signals ········ 4-61
- Power supply unit status signal ········ 4-63

Chapter 5 Basic Operation Confirmation and Adjustment

5.1 Operation Confirmation with PC Software 5-1
Home return 5-10
Jog travel 5-12
Position travel 5-13
5.2 Servo Gain Adjustment 5-16

[Maintenance Section]
Chapter 1 Maintenance and Inspection

1.1 Periodic Inspection 1-1
Periodic inspection items 1-2
1.2 Requests When Replacing Units 1-4
1.3 Consumable Parts 1-5
1.4 Maintenance Information 1-6

Chapter 2 Troubleshooting

2.1 Troubleshooting 2-1
2.2 Failure Diagnostics 2-2
Operation failure 2-2
Low positioning and velocity accuracy (incorrect operation) 2-3
Generation of abnormal noise or vibration 2-4
Communication failure 2-4
2.3 Gateway Unit Alarm Causes and Countermeasures 2-5
Causes and countermeasures of individual alarms 2-5
2.4 Driver Unit/Simple Absolute Unit Alarm Causes and Countermeasures 2-9
Alarm levels 2-9
Simple alarm codes 2-10
Causes and countermeasures of individual alarms 2-12

[Appendix]
Chapter 1 Connectable Actuators

1.1 List of Actuator Specifications 1-1
AC servo motor specification actuators 1-1
DC brush-less motor specification actuators 1-14
Stepper motor specification actuators 1-15
1.2 Correlation Diagrams of Speed and Payload 1-94
RCP2 slider type 1-94
RCP2 slider type (motor side-mounted) 1-95
RCP2 rod standard type 1-96
RCP2 with single guide type 1-97
RCP2 with double guide type 1-98
RCP2W dust-proof/splash-proof rod type 1-99
RCP3 slider type 1-100
RCP3 table type 1-101
RCP4 slider type (high-output enabled) 1-102
RCP4 rod type (high-output enabled) 1-104
RCP4W dust-proof/splash-proof rod type (high-output enabled) 1-106
RCP5 slider type (high-output enabled) 1-107
RCP5 rod type (high-output enabled) 1-108
RCP6 slider type (high-output enabled) 1-109
RCP6 wide slider type (high-output enabled) 1-111

RCP6 rod type (high-output enabled) ···· 1-113
RCP6 radial cylinder type (high-output enabled) ···· 1-115
RCP6 wide radial cylinder type (high-output enabled) ···· 1-117
RCP6 table type (high-output enabled) ···· 1-119
RCP6CR clean specification slider type (high-output enabled) ···· 1-123
RCP6CR clean specification wide slider type (high-output enabled) ···· 1-124
RCP6W dust-proof/splash-proof rod type (high-output enabled) ···· 1-125
RCP6W dust-proof/splash-proof rod type ···· 1-127
RCP6W dust-proof/splash-proof rod type (high-output enabled) ···· 1-128
RCP6W dust-proof/splash-proof rod type ···· 1-130
RCP6W dust-proof/splash-proof radial cylinder type (high-output enabled) ···· 1-131
RCP6W dust-proof/splash-proof radial cylinder type ···· 1-133
RCP6W dust-proof/splash-proof radial cylinder type (high-output enabled) ···· 1-134
RCP6W dust-proof/splash-proof radial cylinder type ···· 1-136
RCP6W dust-proof/splash-proof wide radial cylinder type (high-output enabled) ···· 1-137
RCP6W dust-proof/splash-proof wide radial cylinder type ···· 1-139
RCP6W dust-proof/splash-proof wide radial cylinder type (high-output enabled) ···· 1-140
RCP6W dust-proof/splash-proof wide radial cylinder type ···· 1-142
Push force and current limit value ···· 1-143
1.3 List of Actuators That Support Information Management Function ···· 1-155
Stepper motor specification actuators ···· 1-155
AC servo motor specification actuators ···· 1-156
Revision history ···· 1-159

Safety Guide

The Safety Guide is intended to permit safe use of the product and thus to prevent risks and property damage.
Be sure to read it before handling the product.

Safety Precautions for Our Products

Common safety precautions for the use of robots in various operations are indicated here.

No.	Operation	Precautions
1	Model Selection	● This product is not intended or designed for applications where high levels of safety are required, and so cannot guarantee that human lives will be protected. Accordingly, do not use it in any of the following applications. (1) Medical equipment used to maintain, control or otherwise affect human life or physical health (2) Mechanisms or machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.) (3) Machinery components essential for safety (safety devices etc.) ● Do not use the product outside the range of the specifications. Otherwise, the product life may be drastically shortened, and product damage or facilities stoppage may occur. ● Do not use it in any of the following environments. (1) Locations with flammable gases, ignitable objects or explosives (2) Locations with potential exposure to radiation (3) Locations with ambient temperature or relative humidity exceeding the specifications range (4) Locations where radiant heat is applied by direct sunlight or other large heat source (5) Locations where condensation occurs due to abrupt temperature changes (6) Locations with corrosive gases (sulfuric acid, hydrochloric acid etc.) (7) Locations exposed to significant amounts of dust, salt or iron powder (8) Locations subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model with brake. If a model without brake is selected, the moving parts may fall when the power is turned OFF, causing accidents such as injury or workpiece damage.

No.	Operation	Precautions
2	Transportation	● When transporting heavy objects, do the work with two or more persons or utilize equipment such as a crane. ● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● During transportation, carefully consider the carrying positions, weight, and weight balance, and be careful to avoid collisions or dropping. ● Use appropriate transportation measures for transport. The actuators available for transportation with a crane have eyebolts attached or tapped holes to mount bolts. Follow the instructions in the instruction manual for each model. ● Do not climb onto the package. ● Do not put anything heavy that could deform the package on it. ● When using a crane with capacity of 1t or more, have an operator qualified for crane operation and sling work. ● When using a crane or equivalent equipment, make sure not to suspend loads exceeding the equipment's rated load. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. Also, check to make sure that the hook is free of damage. ● Do not climb on loads suspended from cranes. ● Do not leave loads suspended from cranes for long periods. ● Do not stand under loads suspended from cranes.
3	Storage and Preservation	● For the storage and preservation environment, see the installation environment. However, give especial consideration to the prevention of condensation. ● Store the products so as to prevent them from falling over or down in the case of natural disasters such as earthquakes.
4	Installation and Startup	(1) Installation of robot body and controller, etc. ● Be sure to securely hold and fix the product (including the workpiece). If the product falls over, is dropped, or operates abnormally, it may lead to damage and injury. Also, be equipped for falls over or down due to natural disasters such as earthquakes. ● Do not climb on or put anything on the product. Otherwise, this may lead to accidental falling, injury or damage to the product due to falling objects, product loss of function or performance degradation, or shortening of product life. ● When using the product in any of the places specified below, provide sufficient shielding. (1) Locations where electrical noise is generated (2) Locations with strong electrical or magnetic fields (3) Locations with mains or power lines passing nearby (4) Locations where the product may come in contact with water, oil or chemical spray

		(2) Cable wiring ● Use IAI genuine cables for connecting the actuator and controller, and for the teaching tools. ● Do not scratch cables, bend them forcibly, pull them, coil them, snag them, or place heavy objects on them. Otherwise, this may lead to fire, electric shock, or abnormal operation due to leakage or conduction malfunction. ● Perform the wiring for the product after turning OFF the power to the unit, and avoid miswiring. ● When wiring DC power (+24V), be careful with the positive/negative polarity. Incorrect connections may lead to fire, product breakdown or abnormal operation. ● Connect the cable connector securely so that there is no disconnection or looseness. Otherwise, this may lead to fire, electric shock, or abnormal operation of the product. ● Never cut or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Otherwise, this may lead to fire or abnormal operation of the product.
		(3) Grounding ● Grounding must be performed, in order to prevent electric shocks or electrostatic charge, enhance noise-resistant performance and control unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, be sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more for grounding work. For safeguard grounding, it is necessary to select an appropriate wire diameter for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards). ● Perform Class D grounding (former Class 3 grounding, with ground resistance 100Ω or below).

4	Installation and Startup	(4) Safety measures ● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● When the product is operating or in the ready mode, take safety measures (such as the installation of safety/protection fences) so that nobody can enter the area within the robot's movable range. Contact with an operating robot may lead to death or serious injury. ● Be sure to install an emergency stop circuit so that the unit can be stopped immediately in an emergency during operation. ● Take safety measures such that turning the power ON alone will not start up the unit. Otherwise, this may cause the product to start unexpectedly, leading to injury or product damage. ● Take safety measures such that emergency stop cancel or recovery after power failure alone will not start up the unit. Otherwise, this may lead to injury or equipment damage. ● When installation or adjustment operation is to be performed, display signs such as "Operating: No Power ON!" etc. Sudden power input may cause electric shock or injury. ● Take measures to prevent workpieces, etc. from falling during power failures or emergency stop. ● Wear protection gloves, goggles and safety shoes, as necessary, to secure safety. ● Do not insert fingers or objects into the openings in the product. Otherwise, this may lead to injury, electric shock, product damage, or fire. ● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces.
5	Teaching	● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● Perform teaching operation from outside the safety/protection fence, if possible. If operation must be performed within the safety/protection fence, prepare "Work Regulations" and make sure that all the workers acknowledge and understand them well. ● When operation is to be performed inside the safety/protection fence, operators should have emergency stop switches available at hand so that the unit can be stopped at any time if abnormalities occur. ● When operation is to be performed inside the safety/protection fence, have a monitor standing by in addition to the operator(s) so that the unit can be stopped at any time if abnormalities occur. Also, keep watch on the operation so that a third party cannot operate the switches carelessly. ● Place a sign indicating "Operating" where it can be seen easily. ● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces. * Safety/protection fence: If there is no safety/protection fence, the movable range should be indicated.

6	Trial Operation	● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● After teaching or programming, carry out trial operation step by step before switching to automatic operation. ● When trial operation is to be performed inside the safety/protection fence, use the same work procedure, determined in advance, as teaching operation. ● Be sure to confirm program operation at safe speeds. Otherwise, this may lead to accidents due to unexpected motion caused by program error, etc. ● Do not touch the terminal block or any of the various setting switches while the equipment is live. Otherwise, this may lead to electric shock or abnormal operation.
7	Automatic Operation	● Check before starting automatic operation or restarting after operation stop that there is nobody within the safety/protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is ready for automatic operation and that there is no alarm indication. ● Be sure to start automatic operation from outside the safety/protection fence. ● If the product produces abnormal heat, smoke, odor, or noise, immediately stop it and turn OFF the power switch. Otherwise, this may lead to fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Otherwise, this may lead to injury or product damage due to unexpected product motion during recovery from the power failure.

8	Maintenance and Inspection	● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● Perform the work outside the safety/protection fence, if possible. If operation must be performed within the safety/protection fence, prepare "Work Regulations" and make sure that all the workers acknowledge and understand them well. ● When work is to be performed inside the safety/protection fence, turn OFF the power switch as a rule. ● When operation is to be performed inside the safety/protection fence, operators should have emergency stop switches available at hand so that the unit can be stopped at any time if abnormalities occur. ● When operation is to be performed inside the safety/protection fence, have a monitor standing by in addition to the operator(s) so that the unit can be stopped at any time if abnormalities occur. Also, keep watch on the operation so that a third party cannot operate the switches carelessly. ● Place a sign indicating "Operating" where it can be seen easily. ● For the grease for the guide or ball screw, use appropriate grease according to the Instruction Manual for each model. ● Do not perform dielectric strength testing. Otherwise, this may lead to damage to the product. ● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces. ● The slider or rod may be misaligned from the stop position if the servo is turned OFF. Avoid injury or damage due to unnecessary operation. ● Be careful not to lose the cover or any removed screws, and be sure to return the product to the original condition after maintenance and inspection work. Otherwise, this may lead to product damage or injury due to incomplete mounting. * Safety/protection fence: If there is no safety/protection fence, the movable range should be indicated.
9	Modification and Disassembly	● Do not modify, disassemble/assemble, or use maintenance parts not specified on your own discretion.
10	Disposal	● When the product exceeds its useful life or is no longer needed, dispose of it properly as industrial waste. ● When removing the actuator for disposal, avoid dropping components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may rupture or generate toxic gases.
11	Other	● If you are equipped with a medical device such as a pacemaker, do not approach the product or its wiring, as the device may be affected. ● See the Overseas Standard Compliance Manual to check compliance with overseas standards if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure safety.

Precaution Indications

The safety precautions are divided into "Danger", "Warning", "Caution" and "Notice" according to the warning level, as follows, and described in the Instruction Manual for each model.

Level	Degree of risk to persons and property	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	⚠ Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	⚠ Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	⚠ Caution
Notice	This indicates a situation in which, while injury is not a likely result, the precautions should be observed in order to use the product appropriately.	(!) Notice

Precautions for Handling

1. Make sure to observe the usage conditions, environment, and specification range of the product. Failure to observe these could cause decreased performance or product breakdown.

2. Use the correct teaching tool.
   Refer to the following item and use compatible tools for PC software and teaching pendant usable for this controller.
   [Refer to Startup Section Chapter 1 1.2 Tools to Use]

3. Back up data in order to be prepared for a breakdown.
   Non-volatile memory is used for backup memory of this controller. Registered position data and parameters are written in this memory and backed up. Therefore, these data will normally not be lost even if the power is turned off. However, be sure to save the latest data to enable a quick recovery process in case this controller needs to be replaced with a substitute due to breakdown, etc.

   How to save
   (1) Save to an external memory or a hard disk using PC software
   (2) Record position table and parameters in writing

4. Perform initial operation setting.
   This controller is compatible with 7 types of field network to support various applications, and provided with 6 types of operation modes. These settings can be made during initial setting.
   Set operation mode to suit the application at startup.
   [Refer to Startup Section Chapter 4 Network Configuration]

Warning

- It is dangerous if operation settings of the control sequence and field network are not matched, as it will not only prevent normal operation but can also lead to unpredictable operation.

5. Servo ON signal SON must be entered to enable operation.
   The SON signal puts the actuator into an operable status.

6. Calendar function time setting
   Gateway alarm code 84A "Real Time Clock Oscillation Stop Detected" may occur when turning the power on for the first time after delivery. In that case, set the current time with the teaching tool.
   When fully charged, time data can be retained approximately 10 days after the power is turned OFF.
   At shipment, time will be set but the unit will not be fully charged. Therefore, even if the above-mentioned number of days has not passed from shipment, the time data may be lost.

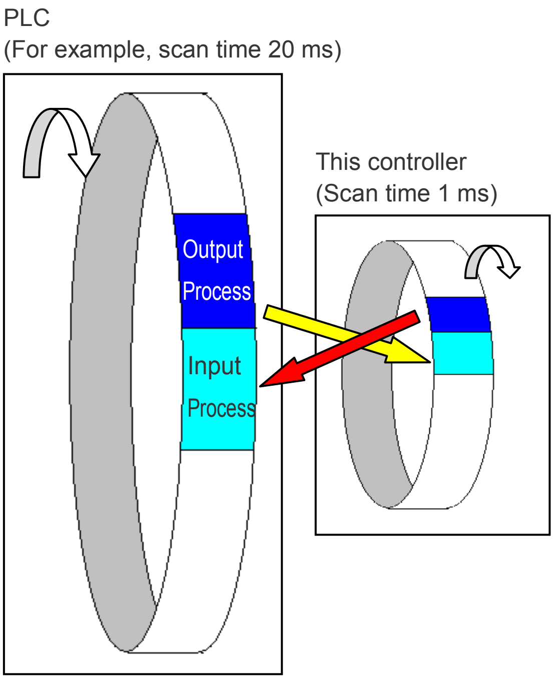
7. Be careful of rubbing or twisting when using the through hole of the rotary actuator.
   If using a rotary actuator with rotational center through hole, with cables, etc. inserted to the through hole, take measures against wear due to rubbing, or wire disconnection due to twisting.
   Be particularly cautious if the actuator is 360-degree specification, as it can infinitely rotate in the same direction.

8. There are restrictions on index mode operation of the rotary actuator.
   With use of Parameter No. 79 "Rotation Mode Select", rotary actuators with 360-degree specification allow selection of normal mode which provides limited rotation operation, or index mode which enables multi-rotation control.
   [Refer to Specification Section Chapter 4 4.5 Parameters]
   The index mode has the following restrictions.
   (1) In jog or inching operation using teaching tools such as PC software, etc., the one-time command range enables a maximum of 360° in jog operation, or 1° in inching operation.
   (2) Pushing cannot be performed. For push torque, settings other than 0 cannot be made.
   (3) Do not repetitively execute positioning commands around 0 degree numerous times while traveling in the vicinity of 0 degree. The rotation direction may switch, or operation may become unstable.
   (4) Software stroke limit is disabled in index mode.

9. Creation of sequence programs

When creating a sequence program, be careful of the following.

If exchanging data between devices with different scan time, the length of time required for a reliable signal reading process is greater than the longer scan time. (In order to safely perform the reading process on the PLC side, we recommend using a timer set value of at least twice the longer scan time.)



● Operational image

As shown in the diagram, if exchanging data between 2 devices with different scan time, obviously the I/O timing will not match.

When the signal of this controller turns ON, there is no guarantee that the PLC will read it immediately.

In cases like this, in order to achieve reliable reading, set the PLC side to read after a period greater than the longer scan time has passed.

This also applies when the reading is performed on the controller side.

On this occasion, make sure the safety factor of the timer setting is 2 to 4 times or more of the scan time.

As the timer is also processed within the scanning process, setting below the scan time is dangerous.

The example shown in the diagram indicates that even if this controller performs output process once every 1 ms, the PLC can only recognize once every 20 ms.

The PLC only performs the output process once every 20 ms, meaning that it keeps recognizing the same output status for that period.

Also, if reading is performed while the other device is rewriting output, incorrect signals may be read at times. Wait until the rewriting is completely finished (allow interval of 2 scans or more), then perform reading. In terms of the output-side device, do not allow its output to change until the other device finishes the reading. Additionally, an input constant is set for the input component to prevent mistaken detection of noise, etc. so it only accepts signals that last more than a certain period of time. It is necessary to add this period of time as well.

10. PLC timer setting

    The PLC timer setting should not be at minimum set value.

    If "1" is set, some PLCs turn ON somewhere between 0 and 100 ms with a 100 ms timer, or between 0 and 10 ms with a 10 ms timer.

    Consequently, the process which will be performed is the same as when a timer is not set, which may lead to failures such as failing to position to a specified position No. in positioner mode, etc.

    The minimum set value of the 10 ms timer should be "2", and when required to set to 100 ms, use the 10 ms timer and set it to "10".

11. Battery-less absolute specification actuators

    (1) For stepper motor specification, parameter setting allows switching between absolute specification and incremental specification.

    · Parameter No. 83 "Absolute Unit" 0: Not in use (incremental specification)
    1: In use (absolute specification)

    (2) RCP5 series actuators will perform slight position adjustment operation due to characteristics of the stepper motor during initial servo ON only, after the power is turned ON.
    Maximum travel during position adjustment operation is 0.025 x lead length [mm].
    Additionally, until servo turns ON, the present position displayed on the teaching tool will be the coordinates prior to the adjustment operation.

    (3) After the power is turned ON followed by the initial servo ON, home return complete signal HEND will be output.

    (4) If the initial servo ON is executed outside range of the software limit, no error will be output. After traveling within the range, monitoring of the software limit will start.

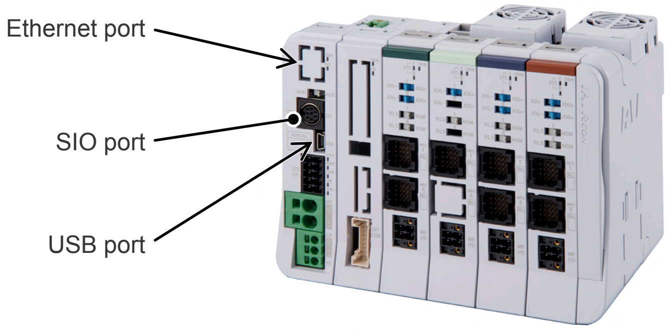
    (5) If the motor unit is removed from the actuator for motor replacement, etc., be sure to perform home return motion (absolute reset).

12. External communication ports

The RCON gateway unit has 3 types of communication port.

- SIO port (RS-485 round connector)
- USB port (USB mini-B connector)
- Ethernet port *Optional, support planned for 2019 onward

Do not simultaneously connect multiple ports for communication. This may result in a communication error, or unpredictable operation.

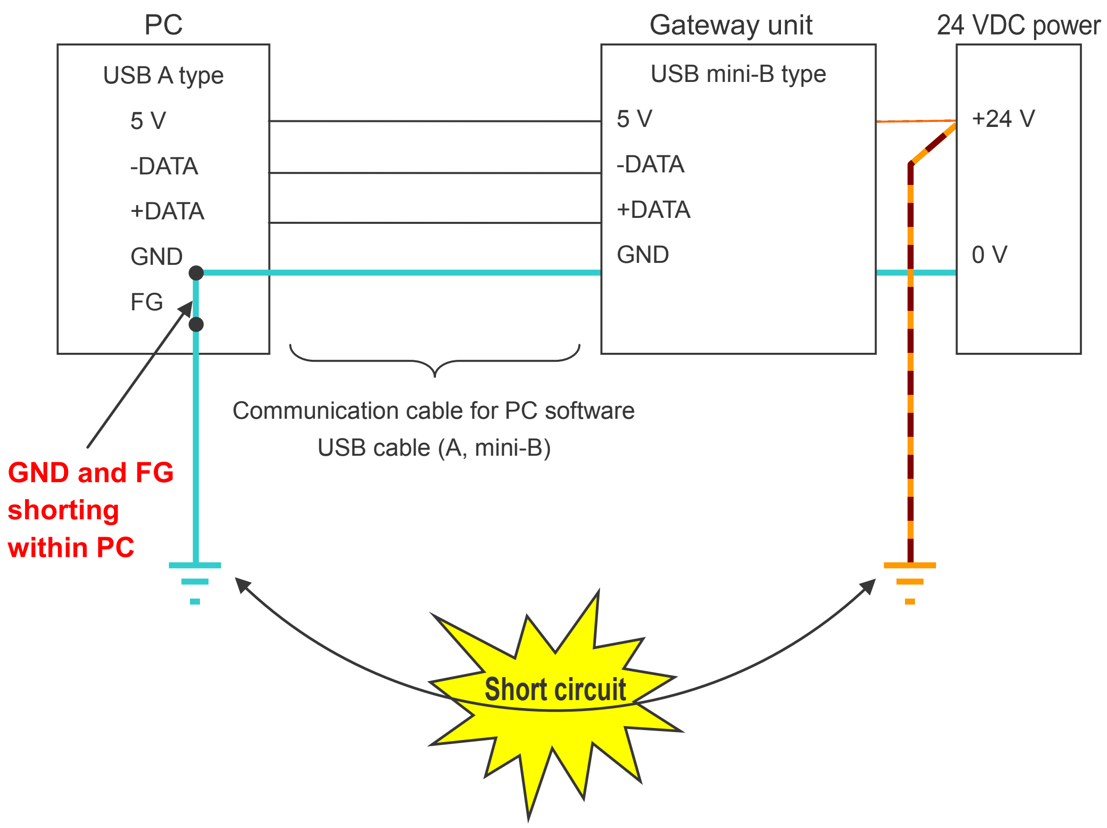


13. Supported standards for CC-Link IE

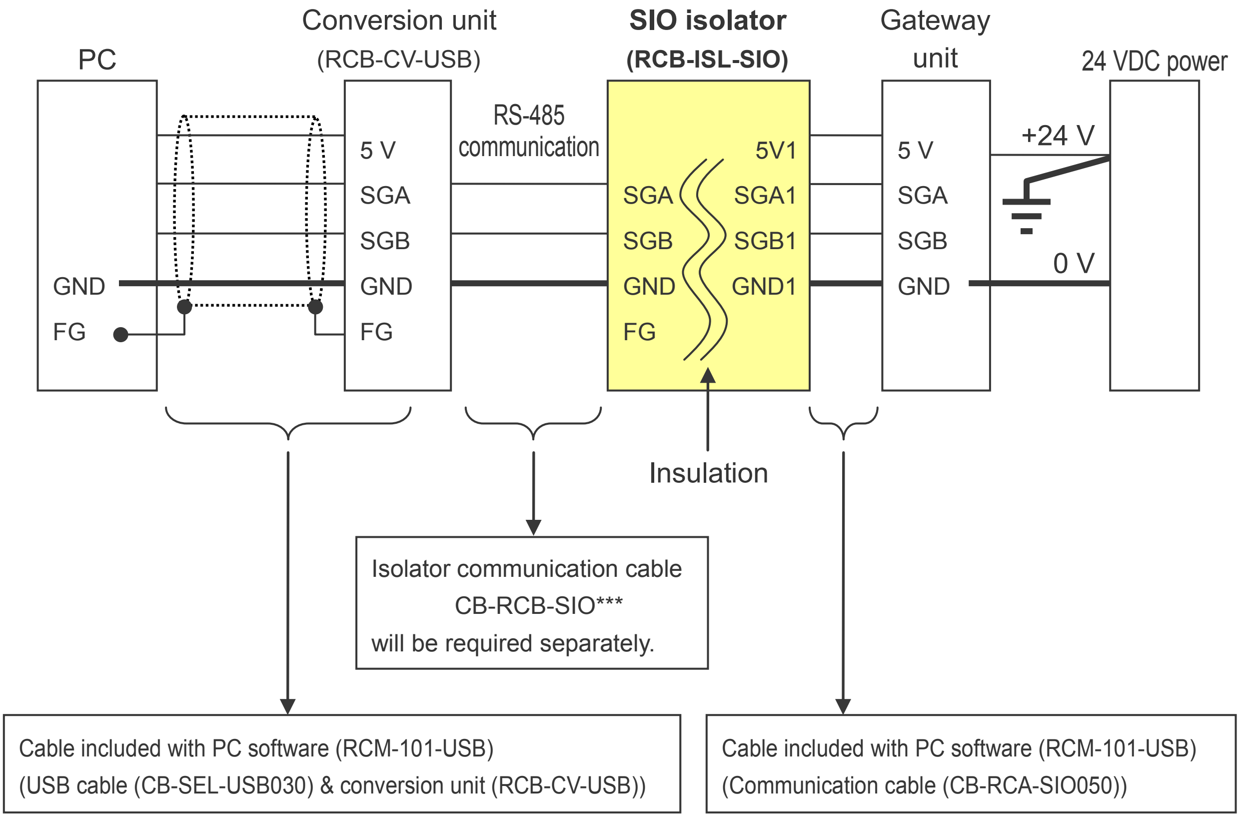
Our product supports CC-Link IE Field only.

Precautions for PC connection to RCON gateway unit grounded at positive terminal of 24 VDC power supply

If the RCON gateway unit is grounded at the positive terminal of the 24 VDC power supply, a PC cannot be connected to the USB connector (mini-B) of the gateway unit.
If connected directly, short-circuiting of the power will occur as shown in the diagram below, causing malfunction of the PC.



If the gateway unit is grounded at the positive terminal of the 24 VDC power supply, use an SIO isolator (RCB-ISL-SIO) as shown in the diagram below when connecting a PC to the SIO connector of the gateway unit.
If a PC is connected to the gateway unit without using an SIO isolator, the power will short-circuit and cause the PC to malfunction.



Caution

- RS-232 conversion unit (RCB-CV-MW) cannot be used.

International Standard Compliance

This product complies with the following overseas standards.
Refer to the Overseas Standard Compliance Manual (ME0287) for more detailed information.

RoHS Directive	CE Marking	UL Certification
○	○	To be acquired

Warranty

1. Warranty period

Whichever of the following periods is shorter:

- ● 18 months after shipment from IAI
- ● 12 months after delivery to a specified location
- ● 2,500 operational hours

2. Scope of the warranty

Our products are covered by warranty when all of the following conditions are met.
Faulty products covered by warranty will be replaced or repaired free of charge:

(1) The breakdown or malfunction in question pertains to our product as delivered by IAI or our authorized dealer.
(2) The breakdown or malfunction in question occurred during the warranty period.
(3) The breakdown or malfunction in question occurred while the product was in use for an appropriate purpose under the operating conditions and operating environment specified in the instruction manual and catalog.
(4) The breakdown or malfunction in question was caused by a specification defect, malfunction, or poor product quality.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:

(1) Anything other than our product
(2) Modification or repair performed by a party other than IAI (unless approved by IAI)
(3) Anything that could not be easily predicted with the level of science and technology available at the time of shipment from IAI
(4) Natural disaster, unnatural disaster, incident or accident for which we are not liable
(5) Natural fading of paint or other symptoms of aging
(6) Wear, depletion or other expected results of use
(7) Operation noise, vibration or other subjective sensations not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

3. Honoring the warranty

As a rule, the product must be consigned to IAI for repair under warranty.

4. Limited liability

(1) We assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
(2) We assume no liability for any program or control method created by the customer to operate our product or for the results of any such program or control method.

5. Conformance with applicable standards/regulations, etc., and application conditions

(1) If our product is combined with another product or any system, equipment, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules.
The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc.
In such a case we assume no liability for the conformance of our product with the applicable standards, etc.
(2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications.
Contact IAI if you must use our product for any of these applications:
  (1) Medical equipment used to maintain, control or otherwise affect human life or physical health
  (2) Mechanisms and machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)
  (3) Machinery components essential for safety (safety devices etc.)
  (4) Equipment used to handle cultural assets, art or other irreplaceable items
(3) Contact IAI in advance if our product is to be used in any condition or environment that differs from that specified in the catalog or instruction manual.

6. Other items excluded from warranty

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:
(1) Guidance for mounting/adjustment and witnessing of test operation
(2) Maintenance and inspection
(3) Technical guidance and education on operating/wiring methods, etc.
(4) Technical guidance and education on programming and other items related to programs

Actuator Coordinate System

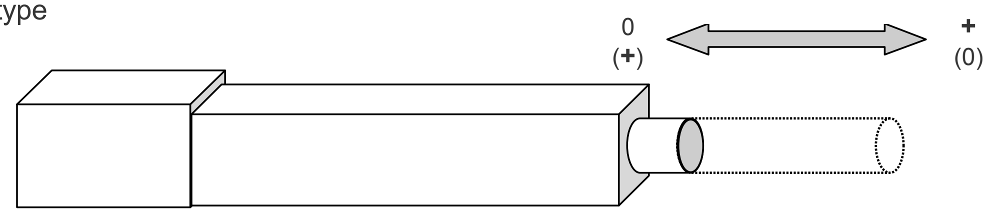
Unless indicated as home reverse specification (option), the direction of home return for the linear axis is on the motor side, the rotary axis is on the counterclockwise side, and the gripper is on the outside (open side).

Caution

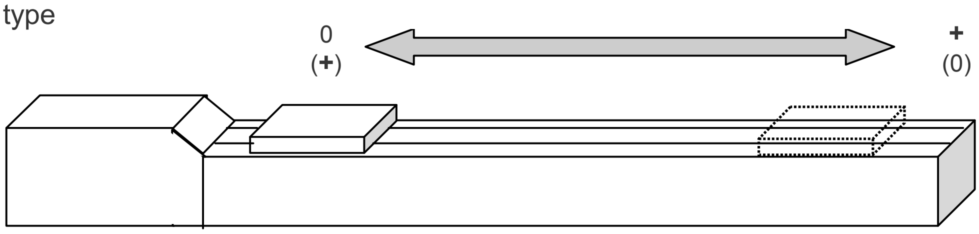
- Homing direction cannot be changed with some models.
- If it becomes necessary to reverse the homing direction after assembly to equipment, check the model of the applicable actuator to ensure that the homing direction is changeable.
- For models with which change is not possible, the actuator must be changed.
  Contact IAI if anything is unclear.

The 0 in the figure below shows home. The parentheses show home reverse specification.

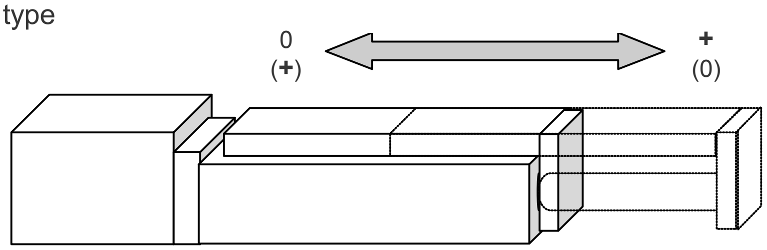
(1) Rod type



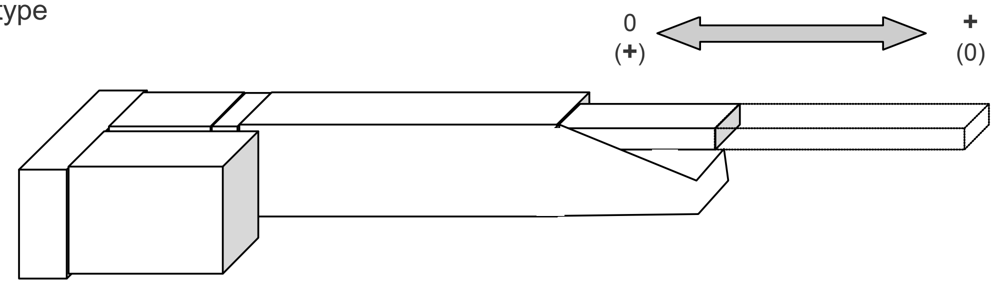
(2) Slider type



(3) Table type

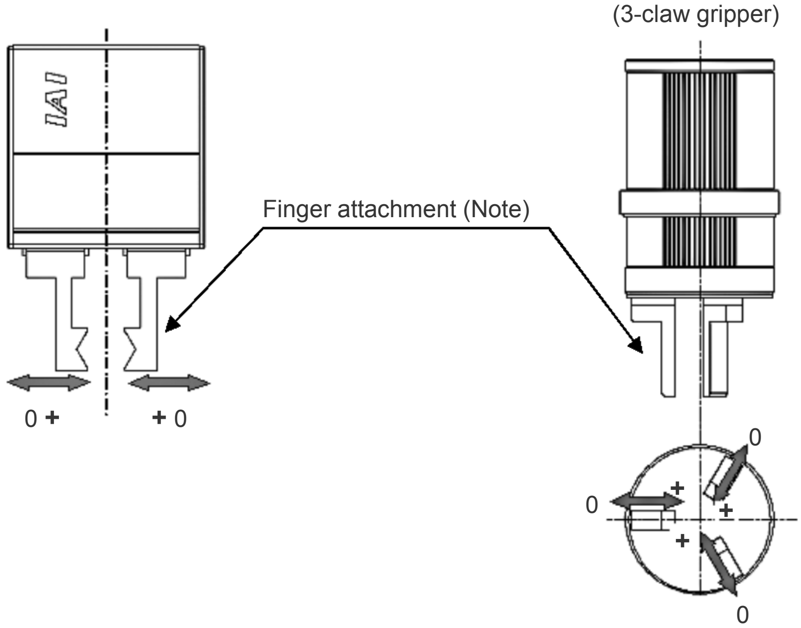


(4) Arm type



(5) Gripper type

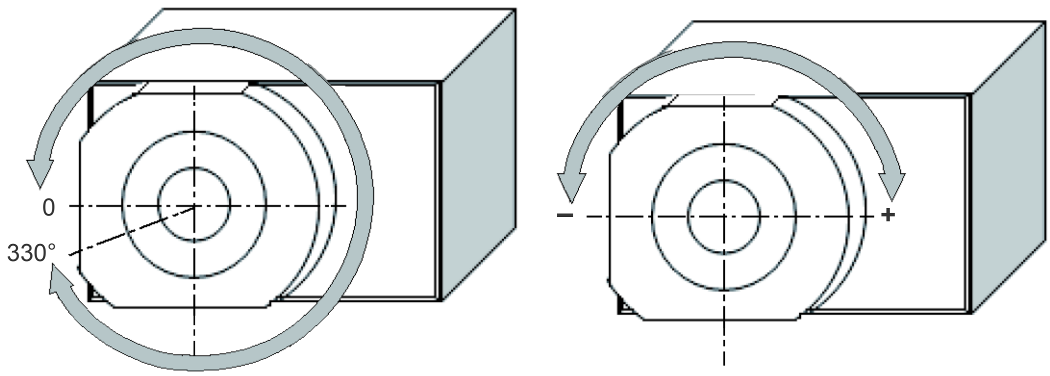
(3-claw gripper)



Note: The finger attachment is not an accessory for the actuator. It is to be prepared by the customer.

(6) Rotary type

(330-degree rotation specification) (Multi-rotation specification)



In the home reverse specification for the multi-rotation specification, the +/- directions are the reverse of the figure.

Specifications Section

Chapter 1

RCON Overview

1.1 Overview 1-1

1.2 Features 1-2

Field network control operation mode 1-4

List of functions by operation mode 1-5

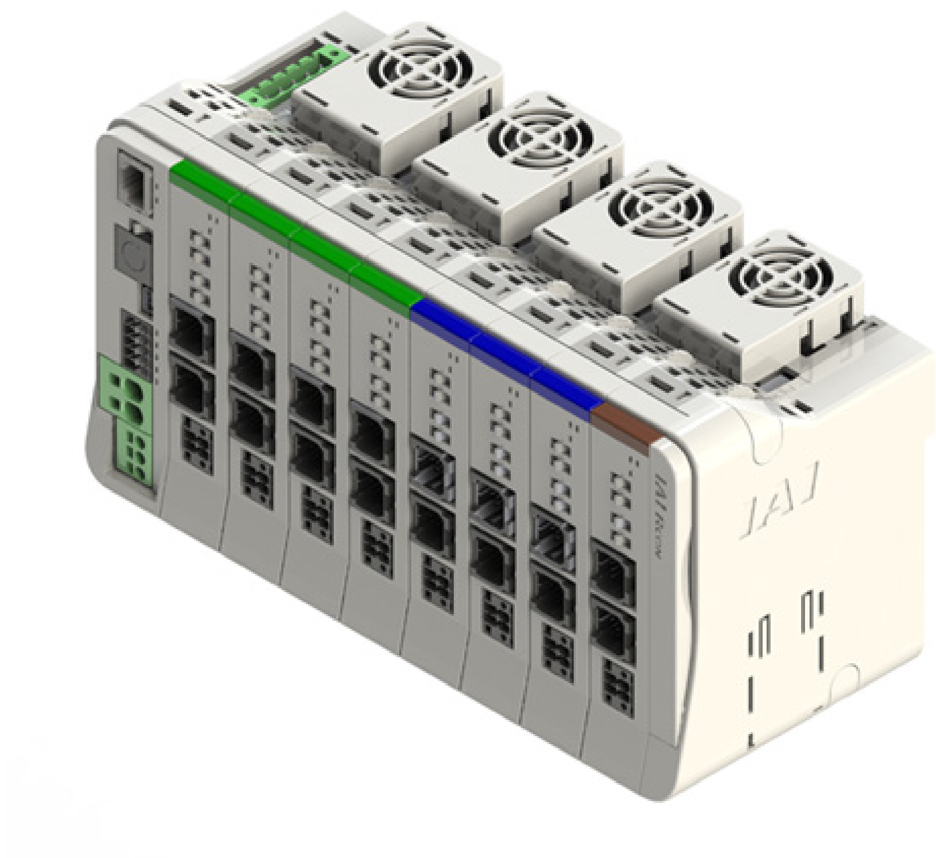
1.3 General Specifications 1-6

1.1 Overview

RCON is a host programmable controller (hereafter PLC) dedicated for operating a ROBO Cylinder or commercial robots using a field network.

1 gateway unit set serves as the field network connection interface to which multiple driver units can be freely configured for control of up to 16 axes (Note 1).

There are 7 types of gateways, for CC-Link, CC-Link IE (Note 2), DeviceNet, EtherCAT, EtherNet /IP, PROFIBUS-DP and PROFINET IO.
There are also 4 types of driver units, for RCP Series, High Thrust RCP Series, RCA Series and RCD Series.



Driver unit x 8 (16-axis specification), with fan unit

Note 1: When direct numerical control mode is used with field networks other than CC-Link or CC-Link IE, up to 8 axes can be connected.

Note 2: Only CC-Link IE Field is supported.

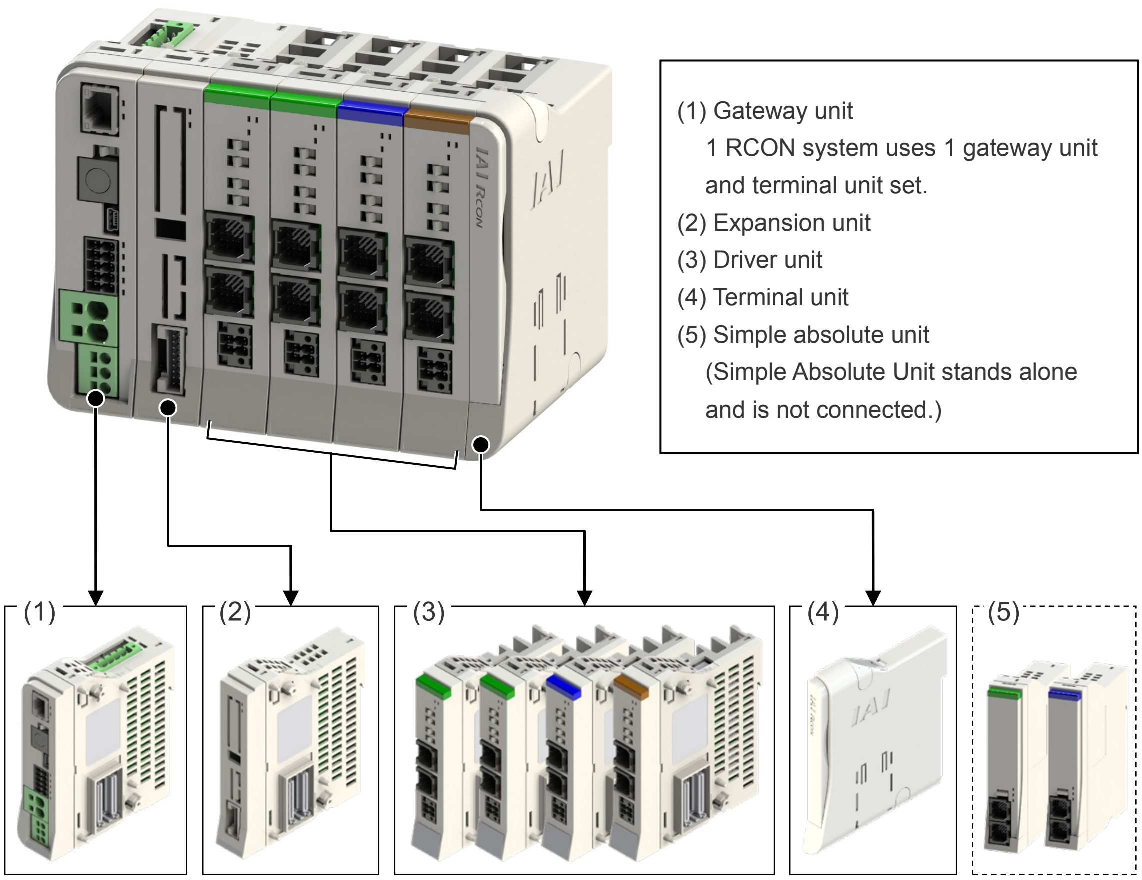
1.2 Features

(1) Modular connections with excellent expansibility

The following 5 types of units can be freely combined to build the RCON system.
Max. number of connectable axes is 16 axes (Note 1).

All ROBO Cylinder models (RCP/High Thrust RCP Series, RCA/RCL Series, RCD Series) can be connected. Expansion units can also be used to connect an RCON-supported specification SCON-CB controller for controlling an RCS series ROBO Cylinder or ISB or DDA commercial robots.

Each driver unit can also connect to a simple absolute unit to support simple absolute type ROBO Cylinders.



Note 1: When direct numerical control mode is used with field networks other than CC-Link or CC-Link IE, up to 8 axes can be connected.

(2) Ultra-compact size

Gateway units/driver units have an ultra-compact size of width 30 mm/22.6 mm x height 115 mm x depth 95 mm.

The smallest combination with 16 axes connected has width 223.4 mm x height 115 mm x depth 95 mm.

This contributes to control panel miniaturization.

(3) High performance

Adopts total frame communication for a communication cycle time within 3 ms even with 16 axes connected. This is the same even if SCON is connected via an expansion unit.

A high-heat dissipation structure is adopted to support ambient temperatures up to 55°C.

Duty cycle is restricted at 55°C environments, but there is no duty restriction with a fan unit mounted.

The operating temperatures of the simple absolute unit and SCON are up to 40°C.

(4) Enhanced preventive and predictive maintenance functions

The present position and motor current value can be monitored, as well as the travel count, travel distance, and motor overload status.

In addition, there are functions for predicting the life using the internal capacitor temperature and operation time, and for monitoring decreases in fan rotation speed.

The actuator body can register individual actuator information. The individual information can be checked at IAI even if the actuator is removed from the controller and returned.

(5) Improved usability

Equipped with a USB port as standard. Connection to a PC is possible using a commercial USB cable. Ethernet ports are planned to be made available as options.

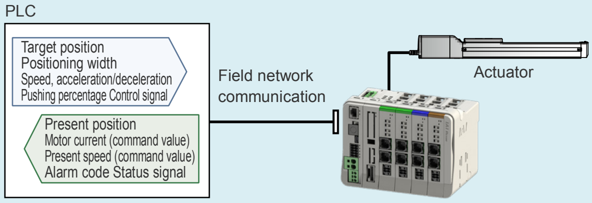
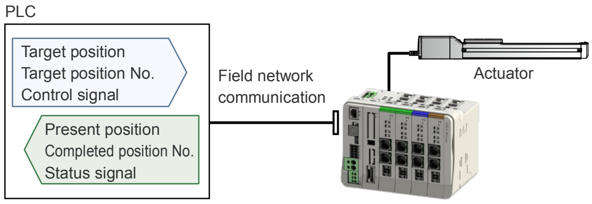
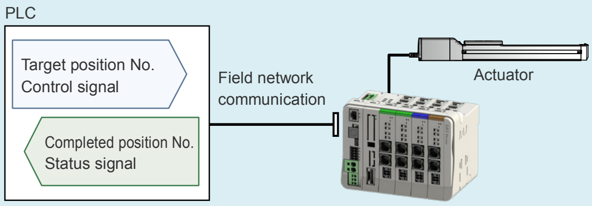
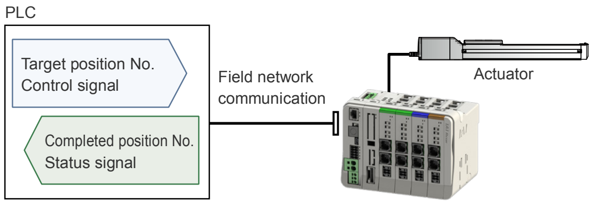
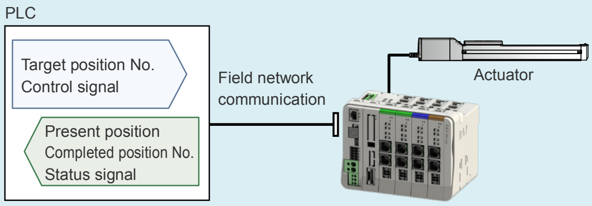
A JOG switch and brake switch are equipped on the front of the driver unit. Operation is easy even without a teaching tool.

(6) 6 types of operation modes

The following 6 operation modes can be used with RCON regardless of the host field network type. Operation mode can be selected to suit the application.

Field network control operation mode

The field network control operation mode can be selected from the following control modes. Data required for operation (target position, speed, acceleration, push current value, etc.) are written by a connected PLC or other host controller into the specified addresses.

Operation mode	Content	Overview
Direct numerical control mode	This mode allows designating the target position, speed, acceleration/deceleration, and current limit value for pushing numerically. Also, it is capable of monitoring the present position, present speed, and the command current value with 0.01mm increments.	
Simple direct mode / Positioner 1 mode	The simple direct mode can modify any of the stored target positions by numerical value. Both modes allow monitoring of the present position numerically with 0.01mm increments. Positioner 1 mode can store up to 128 points of position data, and can move to the stored position. Both modes allow monitoring of the present position numerically with 0.01mm increments.	
Positioner 2 mode	Registers up to 128 points of position data, and can stop at the registered position. This mode does not allow monitoring of the present position. This mode has less in/out data transfer volume than the Positioner 1 mode.	
Positioner 3 mode	Registers up to 128 points of position data, and can stop at the registered position. This mode does not allow monitoring of the present position. This mode has less in/out data transfer volume than the Positioner 2 mode, and controls travel with the minimum of signals.	
Positioner 5 mode	Registers up to 16 points of position data, and can stop at the registered position. This mode has less in/out data transfer volume and fewer positioning tables than the Positioner 2 mode, and allows monitoring of the present position numerically with 0.1mm increments.	

List of functions by operation mode

	Direct numerical control mode	Simple direct mode	Positioner 1 mode	Positioner 2 mode	Positioner 3 mode	Positioner 5 mode
Number of positioning points	Unlimited	128 points	128 points	128 points	128 points	16 points
Home return motion	○	○	○	○	○	○
Positioning operation	○	○	△	△	△	△
Speed, acceleration/ deceleration settings	○	△	△	△	△	△
Different acceleration and deceleration settings	×	△	△	△	△	△
Pitch feed (Incremental)	○	△	△	△	×	△
JOG operation	△	△	△	△	×	△
Position data write	×	×	○	○	×	×
Push-motion operation	○	△	△	△	△	△
Speed changes while traveling	○	△	△	△	△	△
Pausing	○	○	○	○	○	○
Zone signal output	△ (2 points)	△ (2 points)	△ (2 points)	△ (2 points)	△ (1 point)	△ (2 points)
Position zone signal output	×	△	△	△	×	×
Overload warning output	○	○	○	○	×	○
Vibration control (Note 1)	×	△	△	△	△	△
Present position reading (Note 2) (Resolution)	○ (0.01mm)	○ (0.01mm)	○ (0.01mm)	×	×	○ (Note 3) (0.1mm)

* ○: Direct setting is possible, △: Position data or parameter input is required, ×: The operation is not supported.

Note 1: This function is limited to the AC servo motor specification.

Note 2: The resolution when connecting a SCON controller to control a DD motor is 0.001 degree (0.01 degree for positioner 5 mode only).

Note 3: The maximum output value in positioner 5 mode is 3,276.7 mm (327.67 degrees for DD motor). To control the actuator in an operation range exceeding the maximum value, select a different operation mode.

1.3 General Specifications

RCON system general specifications are listed below.

Item	Specifications
Power supply voltage	24VDC ±10%
Power supply current	Differs with system configuration (refer to "2.3 Specifications/Power supply capacity (page 2-9)" for details)
Number of controlled axes	1~16 axes (Note 1) (driver unit can be freely combined)
Supported field networks	CC-Link, CC-Link IE, DeviceNet, EtherCAT, EtherNet/IP, PROFIBUS-DP, PROFINET IO (slave station)
Configuration units	Gateway unit, driver unit, simple absolute unit, expansion unit (refer to "2.2 Configuration Unit List (page 2-2)" for details)
Emergency stop/Enable operation	Collective system support with gateway unit STOP signal input, equipped with connectors capable of shutting off the drive power supply to individual axes of each driver unit
Usage environment	Pollution degree 2
Ambient operating temperature	0~55°C (0~40°C for simple absolute units and SCON) (refer to "2.3 Specifications/Operating temperature range (page 2-15)" for details)
Ambient operating humidity	85% RH or less (non-condensing)
Degree of protection	IP20
Regulation/standard	CE Marking, UL Certification (planned)
External dimensions	Differ with system configuration
Connections between each unit	Unit connection method (refer to "Startup Section 2.1 Installation/Unit connection (page 2-4)" for details)
Installation/mounting method	DIN rail (35 mm) mounting

Note 1: Maximum number of connectable axes

Mode / Field network	Direct numerical control mode	Simple direct mode	Positioner 1 mode	Positioner 2 mode	Positioner 3 mode	Positioner 5 mode
CC-Link	16 axes	16 axes	16 axes	16 axes	16 axes	16 axes
CC-Link IE	16 axes	16 axes	16 axes	16 axes	16 axes	16 axes
DeviceNet	8 axes	16 axes	16 axes	16 axes	16 axes	16 axes
EtherCAT	8 axes	16 axes	16 axes	16 axes	16 axes	16 axes
EtherNet/IP	8 axes	16 axes	16 axes	16 axes	16 axes	16 axes
PROFIBUS-DP	8 axes	16 axes	16 axes	16 axes	16 axes	16 axes
PROFINET-IO	8 axes	16 axes	16 axes	16 axes	16 axes	16 axes

Specifications Section

Chapter 2

System Configuration and Specifications

2.1 System Configuration 2-1

2.2 Configuration Unit List 2-2

2.3 Specifications 2-5

General specifications 2-5

Drive-source cutoff 2-7

Power supply capacity 2-9

Power ON sequence 2-11

Inrush current 2-13

Operating temperature range 2-15

Installation conditions 2-16

Unit connection restrictions 2-19

2.4 External Dimensions ······ 2-22
Controller (8-axis without fan) ······ 2-22
Controller (8-axis with fan) ······ 2-23
Controller (16-axis without fan) ······ 2-24
Controller (16-axis with fan) ······ 2-25

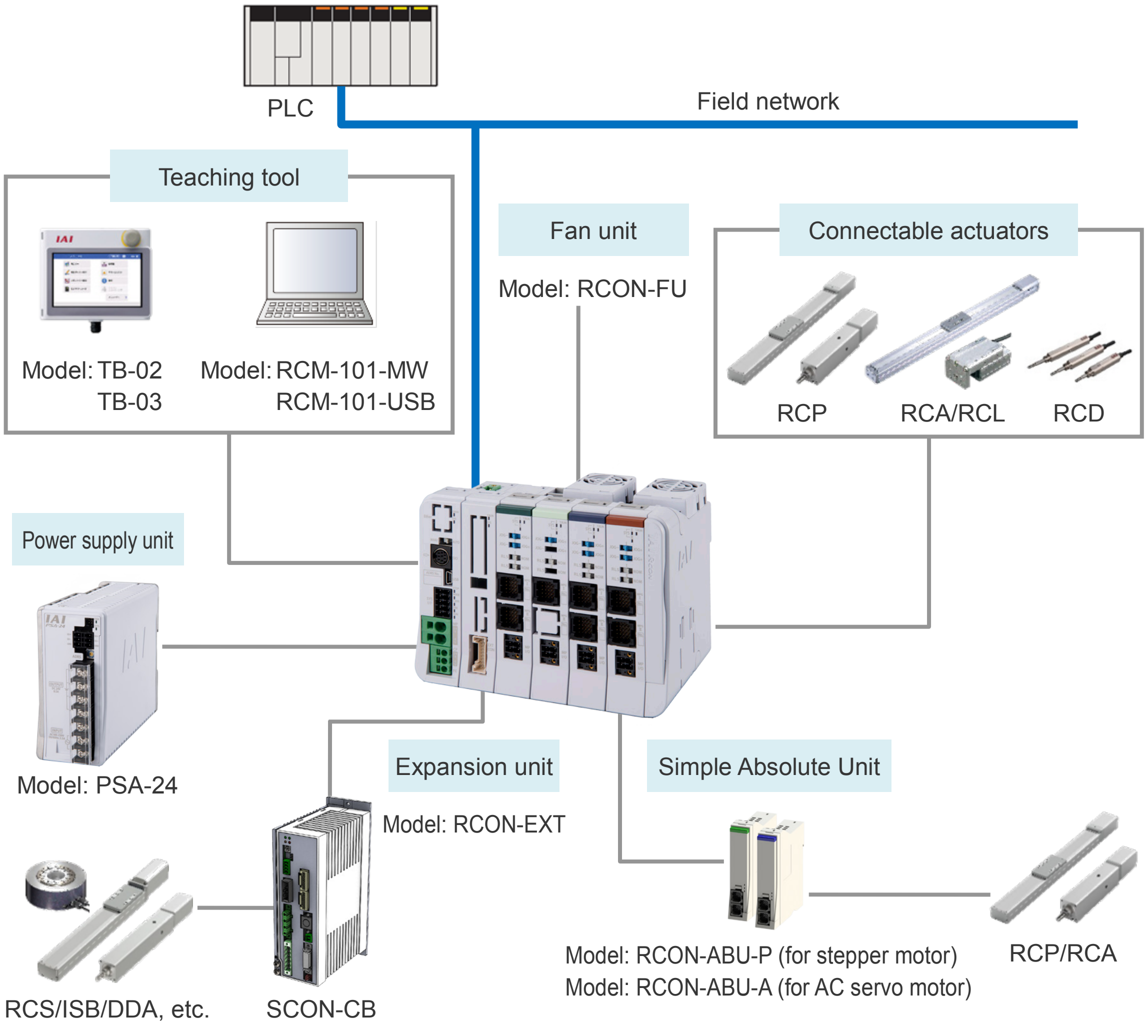
2.5 Connection Diagrams ······ 2-26
Power and stop sections ······ 2-26
Motor/encoder circuit ······ 2-28
AUTO/MANU mode switching circuit wiring ······ 2-32
Field network wiring ······ 2-33

Specifications Section

Chapter 2 System Configuration and Specifications

2.1 System Configuration

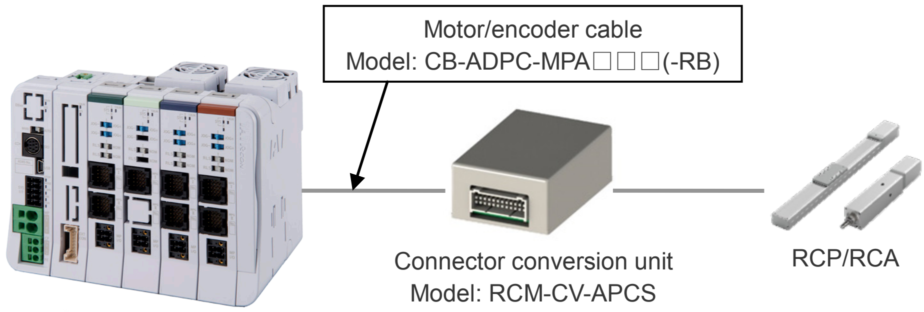
The following shows the system configuration.



[Precautions when selecting a motor/encoder cable]

Depending on the actuator model, a connector conversion unit and a motor/encoder cable, etc., may be required to connect the driver unit and the simple absolute unit.

For details, refer to "2.5 Connection Diagrams / Motor/encoder circuit (page 2-28)".

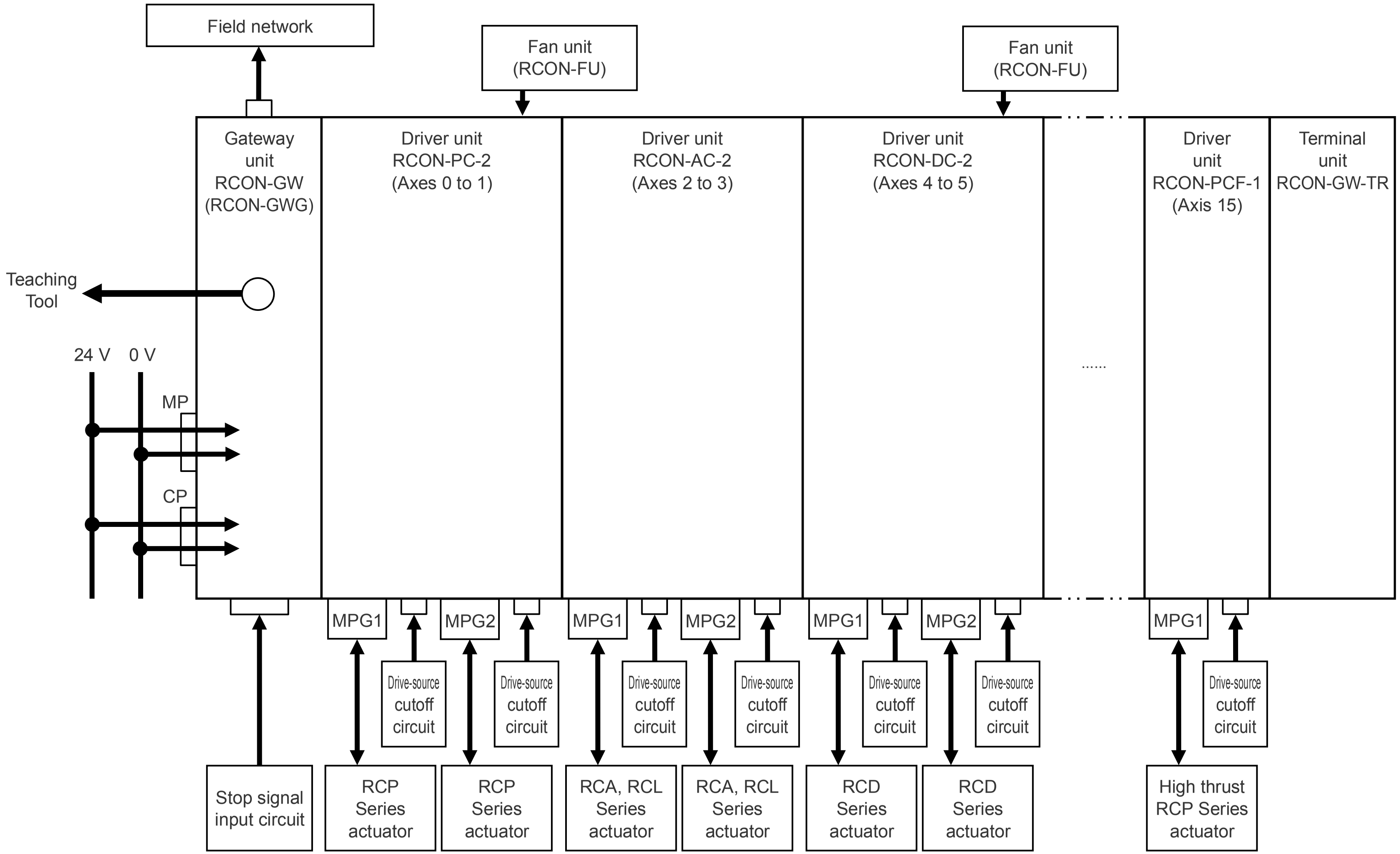


2.2 Configuration Unit List

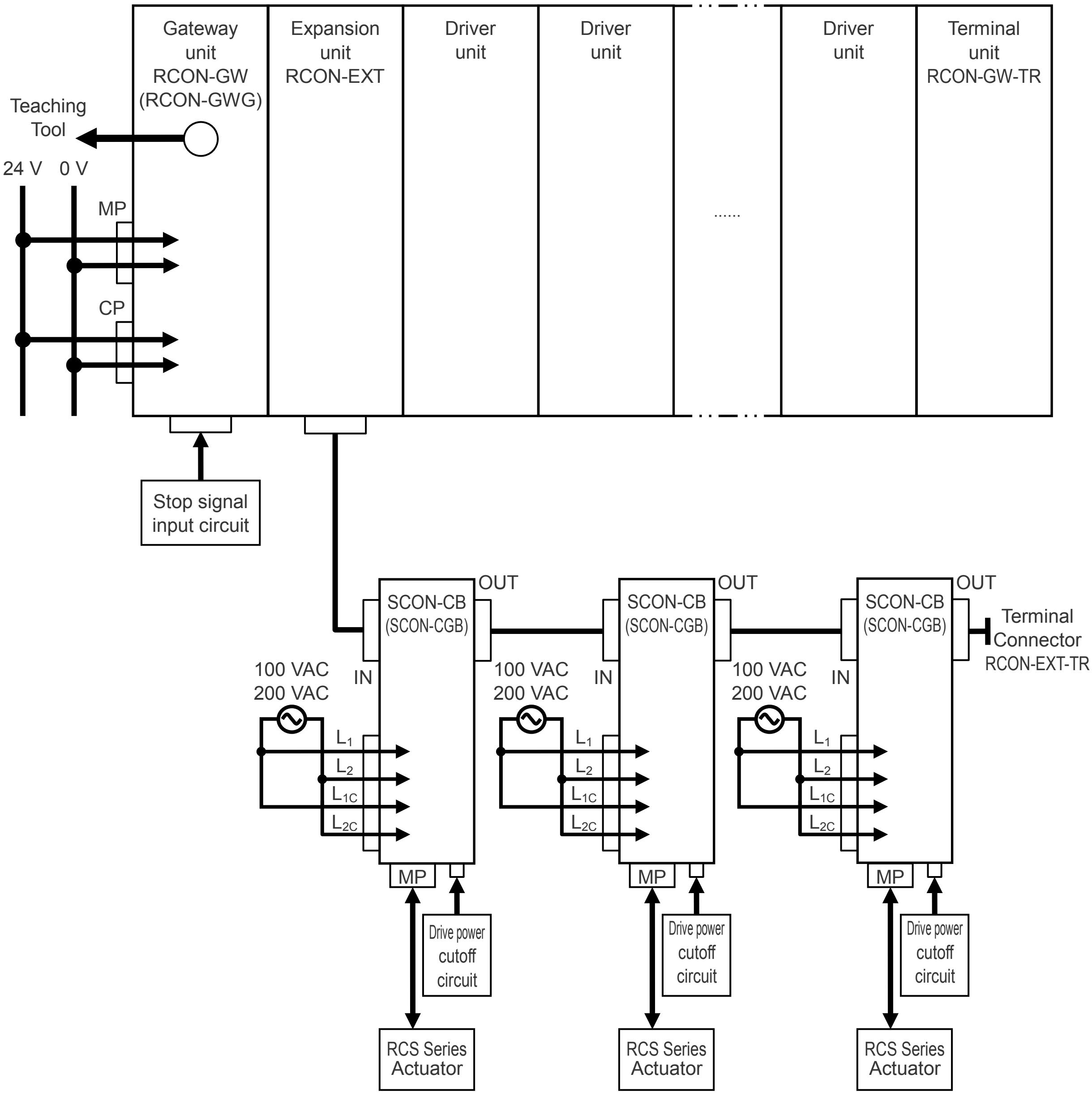
The units that configure the RCON system are listed below.

Product name		Model
Gateway unit (GWG: Safety category type)	CC-Link specification	RCON-GW(GWG)-CC
	CC-Link IE specification	RCON-GW(GWG)-CIE
	DeviceNet specification	RCON-GW(GWG)-DV
	EtherCAT specification	RCON-GW(GWG)-EC
	EtherNet/IP specification	RCON-GW(GWG)-EP
	PROFIBUS-DP specification	RCON-GW(GWG)-PR
	PROFINET IO specification	RCON-GW(GWG)-PRT
Expansion unit	For SCON-CB connection	RCON-EXT
	Terminal connector (for SCON-CB)	RCON-EXT-TR
Driver unit	Stepper motor, 1-axis specification	RCON-PC-1
	Stepper motor, 2-axis specification	RCON-PC-2
	High thrust stepper motor, 1-axis specification	RCON-PCF-1
	AC servo motor, 1-axis specification	RCON-AC-1
	AC servo motor, 2-axis specification	RCON-AC-2
	DC brush-less motor, 1-axis specification	RCON-DC-1
	DC brush-less motor, 2-axis specification	RCON-DC-2
Terminal unit	Included with gateway unit	RCON-GW-TR
Simple Absolute Unit (1-axis specification)	For RCON-PC	RCON-ABU-P
	For RCON-AC	RCON-ABU-A
Fan unit	One for every two driver units	RCON-FU

RCON configuration example (1) When SCON-CB is not connected



RCON configuration example (2)　　When SCON-CB is connected



2.3 Specifications

General specifications

The specifications regarding installation conditions are listed below.

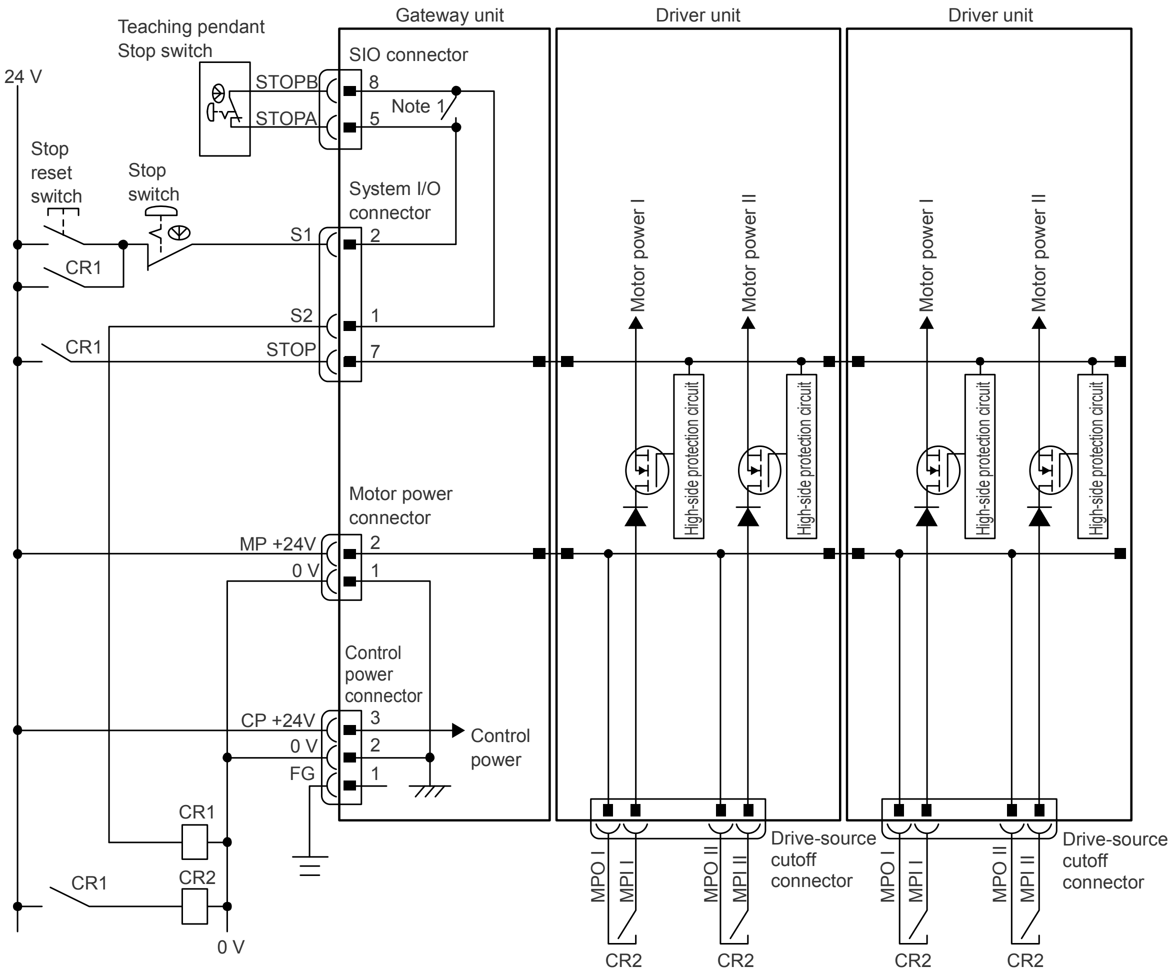
Item	Specifications		
Ambient operating temperature	0~55°C (with temperature derating) (0~40°C for simple absolute units) → Refer to "Operating temperature range (page 2-15)" for details		
Ambient operating humidity	85% RH or less, non-condensing		
Ambient storage temperature	-20~70℃ (0~40°C for simple absolute units)		
Operating atmosphere	Avoid corrosive gas and in particular avoid excessive dust		
Altitude	1,000m		
Vibration resistance	Frequency: 10~57 Hz/Amplitude: 0.075mm, Frequency: 57~150 Hz/ Acceleration: 9.8m/s^2 XYZ directions Sweep time: 10 minutes Number of sweeps: 10 times		
Shock resistance	Drop height: 800mm 1 corner, 3 edges, 6 faces		
Overvoltage category	I		
Electric shock protection mechanism	Class III		
Pollution degree	II		
Degree of protection	IP20		
Insulation withstanding voltage	500VDC 10MΩ		
Generated heat (per unit)	RCON-PC	PowerCON: No	5.0W
		PowerCON: Yes	8.0W
	RCON-PCF	PowerCON: No	19.2W
	RCON-AC	Standard / High accel/decel / Energy saving	4.5W
	RCON-DC	Standard	3.0W
Cooling method	Natural air cooling and forced air cooling by fan unit		

The specifications regarding control are listed below.

<table>
<tr><th>Item</th><th colspan="4">Specifications</th></tr>
<tr><td>Number of controlled axes</td><td colspan="4">1~16-axis (When direct numerical control mode is used with field networks other than CC-Link or CC-Link IE, up to 8 axes can be connected.)</td></tr>
<tr><td rowspan="12">Encoder resolution [pulse/r]</td><td rowspan="3">Stepper motor</td><td colspan="2">Incremental</td><td>800</td></tr>
<tr><td rowspan="2">Battery-less Absolute</td><td>RCP4/RCP5</td><td>800</td></tr>
<tr><td>RCP6</td><td>8,192</td></tr>
<tr><td rowspan="7">AC servo motor</td><td>Incremental</td><td rowspan="2">RCA</td><td>800</td></tr>
<tr><td>Battery-less Absolute</td><td>16,384</td></tr>
<tr><td rowspan="5">Incremental</td><td>RCA2-***N/NA</td><td>1,048</td></tr>
<tr><td>Except RCA2-***N/NA</td><td>800</td></tr>
<tr><td>RCL-SA1/4, RA1/4</td><td>715</td></tr>
<tr><td>RCL-SA2/5, RA2/5</td><td>855</td></tr>
<tr><td>RCL-SA3/6, RA3/6</td><td>1,145</td></tr>
<tr><td rowspan="2">DC brush-less motor</td><td rowspan="2">Incremental</td><td>RCD-RA1D/GRSN</td><td>400</td></tr>
<tr><td>RCD-RA1DA/GRSNA</td><td>480</td></tr>
<tr><td>Cable length</td><td colspan="4">Motor/encoder cable: 20 m or less (10 m or less for RCD),
SCON connection cable: 3 m or less per cable, total length of 10 m or less</td></tr>
<tr><td>Field network interface</td><td colspan="4">CC-Link, CC-Link IE, DeviceNet, EtherCAT, EtherNet/IP, PROFIBUS-DP, PROFINET IO</td></tr>
<tr><td rowspan="4">SIO interface</td><td rowspan="2">Teaching port</td><td>Communication method</td><td colspan="2">RS485</td></tr>
<tr><td>Communication speed</td><td colspan="2">9.6/19.2/38.4/57.6/115.2/230.4 kbps</td></tr>
<tr><td rowspan="2">USB port</td><td>Communication method</td><td colspan="2">USB</td></tr>
<tr><td>Communication speed</td><td colspan="2">12 Mbps</td></tr>
<tr><td>Data recording device</td><td colspan="4">Position data and parameters are saved in non-volatile memory.
(Unlimited rewrites)</td></tr>
<tr><td>Calendar function</td><td colspan="4">Retention function: About 10 days Charging time: About 100 hours</td></tr>
<tr><td>Safety category compatibility</td><td colspan="4">B (The safety category specification can support up to 4 external circuits)</td></tr>
<tr><td>Drive-source cutoff method</td><td colspan="4">Drive source cutoff for each axis by semiconductor</td></tr>
<tr><td>Protection functionality</td><td colspan="4">Overcurrent, abnormal temperature, encoder disconnection, overload</td></tr>
<tr><td>Preventive/ predictive maintenance functions</td><td colspan="4">Low electrolytic capacitor capacity and low fan rotation speed</td></tr>
<tr><td>Regulation/ standard</td><td colspan="4">CE Marking, UL Certification (planned)</td></tr>
</table>

Drive-source cutoff

Motor power is supplied from the gateway unit, but the circuit block related to the drive-source cutoff is only available for the driver unit.



Wiring diagram: Stop and drive-source cutoff

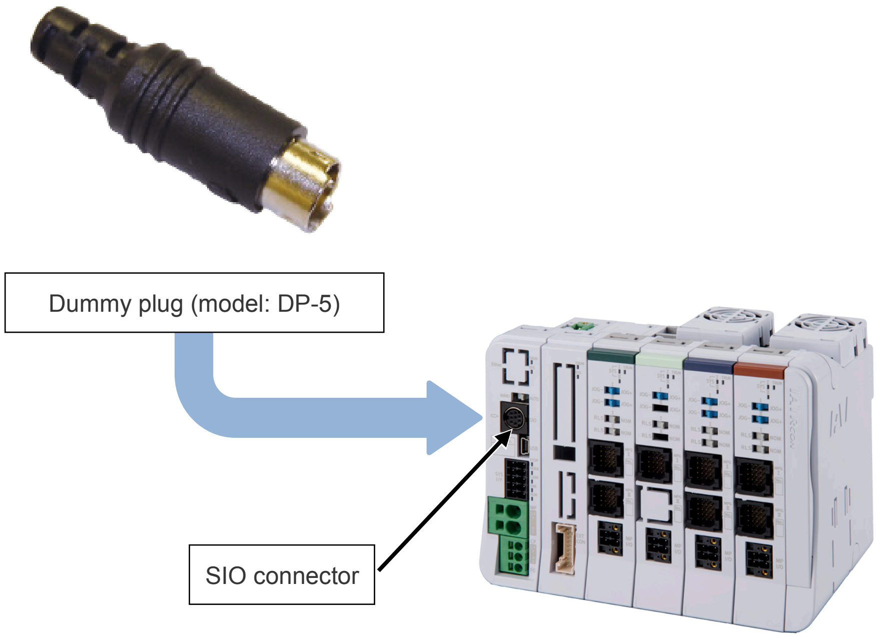
Item	Specifications
STOP input	24 VDC ±10% / 10mA or less
S1 and S2 input	24 VDC ±10% / 0.1A or less

■ The driver unit has a drive source cutoff circuit that uses a semiconductor for each axis, enabling drive source cutoff by external circuit for each axis.

■ The motor power for all driver units is cut off when the gateway unit system I/O connector STOP signal is input. When using an expansion unit to connect a SCON controller, the motor power supply for the SCON controller is also cut off.

■ The drive source cutoff circuit via semiconductor has an overcurrent detection function and an inrush current restriction function.

■ In the safety category specifications, the controller automatically identifies that the teaching pendant is inserted, and no relay for switching wiring is equipped (Wiring diagram note 1). Connect a dummy plug to the SIO connector to use the unit.



Power supply capacity

Power capacity is divided into two parts, control power capacity and motor power capacity.
Each power source is input from the gateway control power connector and the motor power connector. The user must make sure that 0 V of the control and motor power is used in common.

The necessary power capacity is calculated from adding the "total control power capacity of the unit in use" and the "total motor power capacity of the connected actuator".

The current rating for 24VDC power must exceed the total current rating for motor power capacity, and the peak current must exceed the total motor power capacity. However, when multiple axes are connected, provided that not all of the actuators' operation timing is the same, the resulting value is not a simple total, because the rated current/maximum current do not flow simultaneously.

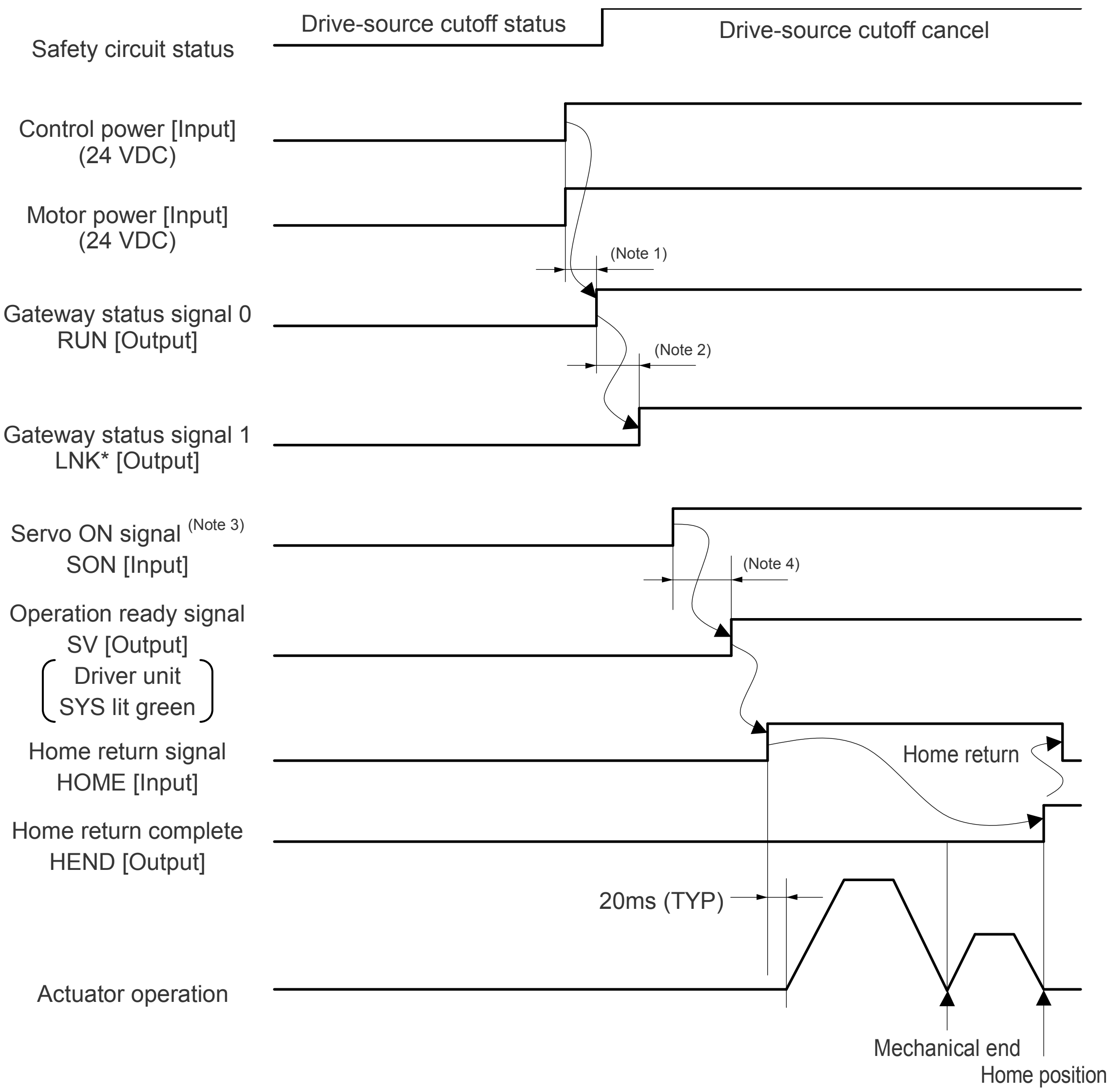
The specifications regarding power capacity are listed below.

Item	Specifications		
Power supply voltage	24VDC ±10%		
Control power capacity (per unit)	Gateway unit (includes terminal unit)		0.8 A (Ethernet option: No) 1.0 A (Ethernet option: Yes)
	Driver unit (common for all types)	Brake: No	0.2A
		Brake: Yes (1-axis specification)	0.4A
		Brake: Yes (2-axis specification)	0.6A
	Expansion unit		0.1A
	Simple absolute unit (common to all types)		0.2A

Item	Actuator/Driver unit				Rated Current	Max. current	
						When energy-saving is set	
Motor power capacity (1 axis per actuator)	Stepper motor /RCON-PC	20P/28P		Without PowerCON	0.8A	–	–
		28P/35P/42P/56P		Without PowerCON	1.9A	–	–
				With PowerCON	2.3A	–	3.9A
	Stepper motor /RCON-PCF	56SP/60P/86P		Without PowerCON	5.7A	–	–
	AC servo motor /RCON-AC	RCA	5W	Standard / Hi-accel./decel.	1.0A	–	3.3A
			10W	Standard / Hi-accel./decel. / Energy-saving	1.3A	2.5A	4.4A
			20W		1.3A	2.5A	4.4A
			20W (20S)		1.7A	3.4A	5.1A
			30W		1.3A	2.2A	4.0A
		RCL	2W	Standard / Hi-accel./decel.	0.8A	–	4.6A
			5W		1.0A	–	6.4A
			10W		1.3A	–	6.4A
	DC brush-less motor /RCON-DC	3W		Standard	0.7A	–	1.5A

Power ON sequence

The procedure from turning on the RCON system to the home return command is as follows.
(1) Supply the control power and motor power (24 VDC).
(2) Cancel the STOP signal input or the drive shutoff status and set to conductive status.
(3) After confirming that the gateway status signals 0 "RUN" and 1 "LNK*" are ON, input the servo ON signal SON.
(4) After confirming that the operation ready signal SV is ON, input the home return signal HOME. home return motion begins. When home return is completed, the home return complete signal HEND is output.



For details on the gateway status signal, refer to "3.7 Address Configuration / Gateway control / status signals (page 3-40)".

Note 1: When the power is turned ON, the RCON system starts up. When field network communication between the gateway unit and host device is established, the gateway status signal 0 "RUN signal" turns ON. After confirming that the RUN signal is ON, begin communication with the gateway unit.

Note 2: If the gateway unit and driver unit are communicating normally, the gateway status signal 1 "LNK* signal (* is axis number)" turns ON.

If a communication error occurs between the gateway unit and driver unit, "LNK* signal" turns OFF. However, the ERRT alarm is not generated until the "communication retry count" set in the gateway parameter configuration tool is exceeded, until which retries are repeated.
If the communication becomes normal after repeated retries, "LNK* signal" turns ON. The signal may also turn ON after temporarily turning OFF due to sudden noise.

Regarding the "communication retry count", refer to "3.9 Gateway Parameter Configuration Tool / Special parameter setting function descriptions" (page 3-131)".

Note 3: After checking the RUN signal and LNK* signal, input the SON signal. The actuator goes into servo ON status.

Note 4: When the first SON signal is input after power ON, the motor performs excitation phase detection operation (stepper motor specification) or magnetic pole phase detection operation (AC servo motor specification).
After confirming that the operation ready signal SV is ON, input the travel command or home return command.

Caution

- If the servo is turned ON in the vicinity of the mechanical end, the magnetic pole phase will not be properly detected, causing abnormal operation, uncertain magnetic pole error or excitation detection error.
  Turn ON the servo in a position away from the mechanical end.
- If the power has been turned OFF, wait 1 second or more before rebooting the power.
  Otherwise, the product may malfunction.

Inrush current

Only the driver unit generates inrush current.
The inrush current values are listed below.

Item	Specifications	
Inrush current (About 5 ms)	RCON-PC	8.3A
	RCON-PCF	10.0A
	RCON-AC	10.0A
	RCON-DC	10.0A

When multiple driver units are used, depending on the capacity of the 24VDC power source, a voltage drop might occur when the units are turned on.

In the RCON system, the timing can be adjusted with the following two parameters to reduce the risk of voltage drop due to inrush current. Inrush current lasts for about 5 ms per axis. Adjust the timing as warranted, within a range such that the offset does not affect operation.

[Driver shutdown release delay time]
The gateway parameter configuration tool is equipped with a function that offsets the release timing of the drive source cutoff circuit of each driver unit. It offsets the release timing, which allows it to suppress any possible voltage drops.

5 ms per axis has been set for the initial value.

For details, refer to "3.9 Gateway Parameter Configuration Tool / Special parameter setting function descriptions (page 3-131)".

Stepper motor specification only

[Servo ON Delay Time Adjustment (Parameter No. 190)]

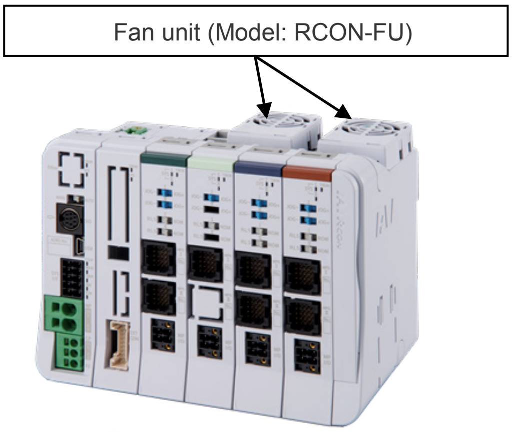
No.	Name	Symbol	Unit	Input range	Default initial value setting
190	Servo ON delay time adjustment	SONA	ms	0 to 9,999	0

This parameter adjusts the time from when servo ON command signal SON is input until servo ON.
By shifting the timing of each actuator, instantaneous power can be suppressed when the servo ON command is applied at the same time.

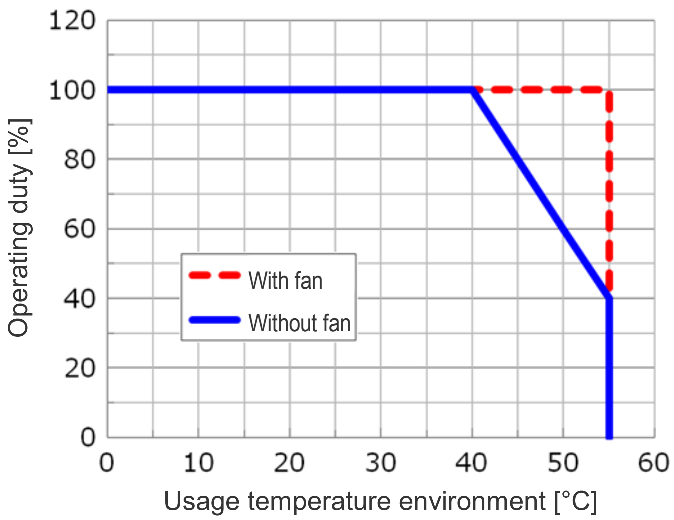
For details, refer to "4.5 Parameters / Actuator dynamic characteristics (page 4-51)".

Operating temperature range

The operating temperature of the gateway unit/driver unit is within the range of 0~55°C. However, there is temperature derating that depends on whether a fan unit is installed.



Operation without derating is possible without a fan unit at 0 to 40°C; however, at 40 to 55°C, actuator operating duty must be reduced by 20% every 5°C.
With fan unit, operation is possible up to 55°C without derating.



Caution

- Under conditions where the temperature is higher than 55°C, the unit cannot be used, regardless of the operating duty.
- When used under unsuitable conditions, the alarm code 0CA "Heating error" may be generated, causing the actuator to stop.
- The operating temperature of the simple absolute unit and SCON controller is within the range of 0~40°C. It cannot be used under conditions where the temperature is higher than 40°C.

Installation conditions

[Installation Environment]

Usage is possible in environments of pollution degree 2[*1] or equivalent.

*1 Pollution degree 2: Environment in which generally only nonconductive pollution occurs, but temporary conductive pollution may occur due to condensation. (IEC60664-1)

(1) Installation environment

Avoid the following locations for installation.

- Where the ambient temperature exceeds the range of 0 to 55℃
  (If there is no fan unit, derating is available.)
  For simple absolute units and SCON, where the ambient temperature exceeds the range of 0 to 40℃
- Where the temperature changes rapidly and condensation occurs
- Where the relative humidity exceeds 85% RH
- Where the unit is exposed to odorous or combustible gases
- Where the unit is exposed to significant amounts of dust, salt or iron powder
- Where the unit is subject to direct vibration or impact
- Where the unit receives direct sunlight
- Where the unit may come in contact with water, oil or chemical spray
- Where vents are blocked [see the section for installation and noise countermeasures]

If the unit is used in any of the following locations, provide sufficient shielding measures:

- Where noise is generated due to static electricity, etc.
- Where there are strong electrical or magnetic fields
- Where mains or power lines pass nearby

(2) Storage/preservation environment

For the storage and preservation environment, see the installation environment. However, give especial consideration to the prevention of condensation.

Unless especially specified, desiccant is not included in the package at shipping. If the product is to be stored/preserved in an environment where condensation is anticipated, take condensation preventive measures for the package overall from the exterior, or directly after opening the package.

[Installation and mounting]

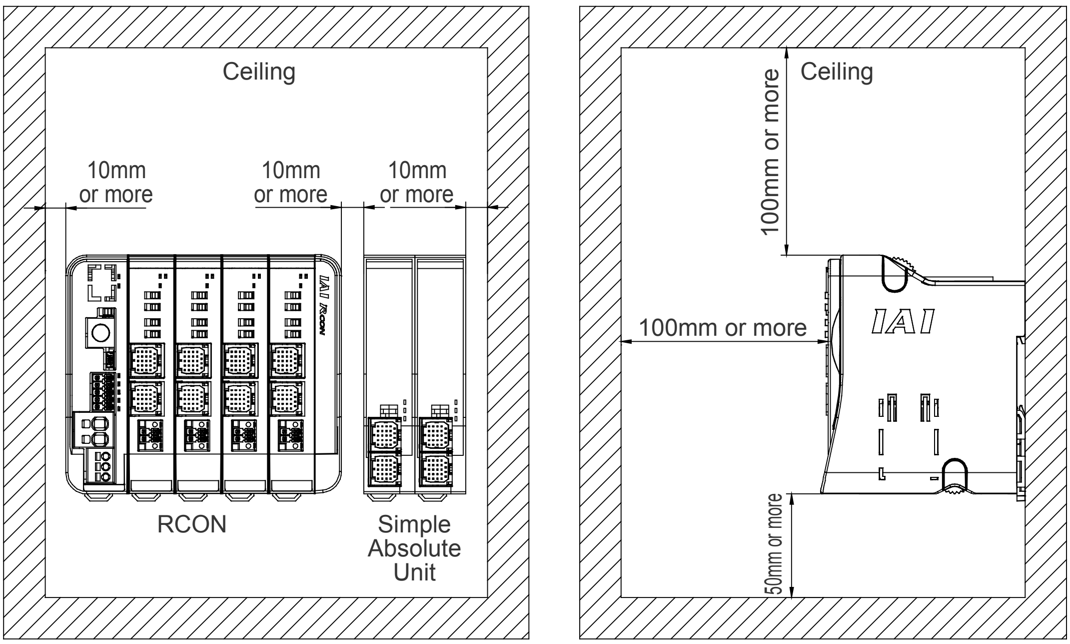
Consider the size of the control panel, placement of the RCON controller, cooling and the like when designing and manufacturing so that the ambient temperature is 0 to 55°C.
(If it has no fan unit, there is derating.)
When installing a simple absolute unit or SCON on the same control panel, design and manufacture so that the ambient temperature is 0 to 40°C.

In particular, the performance may deteriorate when the temperature around the simple absolute unit (battery) is too low or too high. Make sure that the temperature is as close to room temperature as possible. (The recommended temperature is about 20°C.)

Item	Specifications
Installation direction	Vertical mounting (exhaust side on top)
Installation method	DIN rail mounting
Installation conditions	See figure below

Item		Specifications
Ambient operating temperature	With fan unit	0 to 55°C
	Without fan unit	0 to 55°C (Note 1)
Ground		Class D grounding

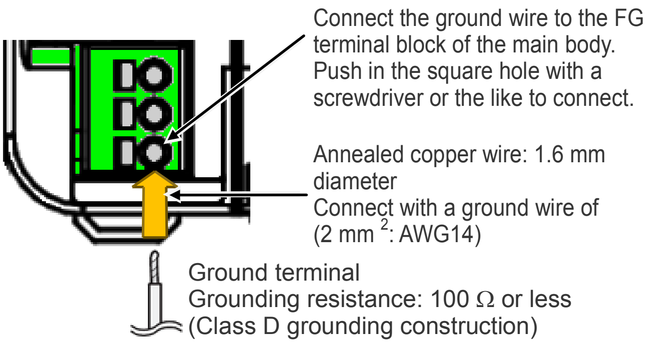
Note 1: If there is no fan unit, derating is available.

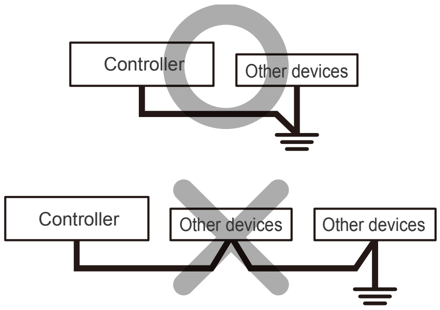


* Simple absolute units can be installed in close contact with each other.

[Noise countermeasures and mounting method]

(1) Grounding for noise countermeasures (frame ground)





Grounding wires should not be connected in common with other devices and separate controllers should be grounded.

(2) Notes on wiring method

1) Twist the 24 VDC power wiring.

2) Separate the wiring of signal wires and encoders from power supply lines and power lines.

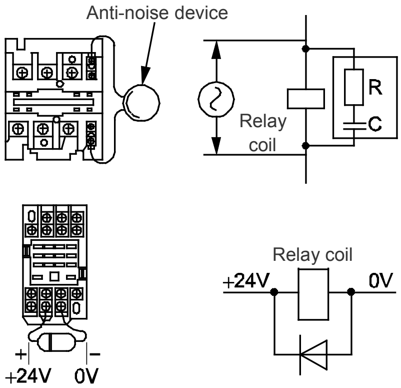
(3) Noise sources and noise prevention

For the same power supply path and power supply device in the same device, take measures against noise.

Countermeasure examples for noise sources are shown below.

1) AC solenoid valve / magnetic switch / relay
   [Measure] Install an anti-noise device in parallel with the coil.

2) DC solenoid valve / magnetic switch / relay
   [Measure] Install a diode in parallel with the coil or use the diode built-in type.

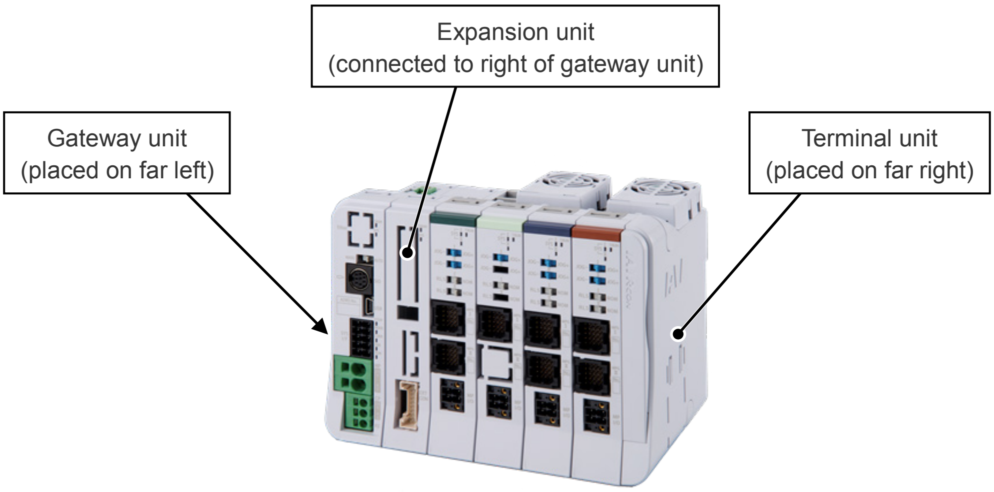


Unit connection restrictions

The RCON system has the following restrictions.
Check the following descriptions and then make a selection for each unit.

(1) Unit arrangement
The RCON system has a unit-connecting configuration. Each of the units has the same connector and the same locking configuration, which allows the units to be connected in any order. However, the arrangement of the following units is restricted.

Gateway unit: Placed on the far left of the RCON system.
Terminal unit: Placed on the far right of the RCON system.
Expansion unit: Connected to the right of the gateway unit.



Also, only one of the units above can be connected per system.

(2) Number of connectable driver units

Up to 16 axes (Note 1) can be controlled with each gateway unit.

Structurally, there is no upper limit as to how many units can be connected, but keep the number of driver units to a maximum of 16 axes. If 17 or more actuators are to be controlled, use a configuration of 2 or more gateway units.

Note 1: When direct numerical control mode is used with field networks other than CC-Link or CC-Link IE, up to 8 axes can be connected.

(3) Current limit values

The current limit values used for selection calculation are listed below.

Item	Current limit values for selection calculation
Control power (CP)	9.0A or less
Motor power (MP)	37.5A or less

Based on the RCON system configuration, make sure for each unit that the calculated result for control power and motor power does not exceed the current limit value for selection calculation. Note that the gateway unit is not included in the calculations.

Calculation examples are shown below.

[Control power] * The gateway unit is not included in the calculations.

Ex. 1	Actuators x 16 axes; all axes equipped with brakes (2 axes per unit)
	Driver unit (with brake) 0.6 A x 8 = 4.8 A ⇒ **OK**
Ex. 2	Actuators x 16 axes; all axes equipped with brakes (1 axes per unit)
	Driver unit (with brake) 0.4 A x 16 = 6.4 A ⇒ **OK**
Ex. 3	Actuators x 16 axes; all axes equipped with brakes (2 axes per unit); all axes simple absolute
	Driver unit (with brake) 0.6 A x 8 + simple absolute 0.2 A x 16 = 8.0 A ⇒ **OK**
Ex. 4	Actuators x 16 axes; all axes equipped with brakes (1 axes per unit); all axes simple absolute
	Driver unit (with brake) 0.4 A x 16 + simple absolute 0.2 A x 16 = 9.6 A ⇒ **Not OK**

[Motor power]

Ex. 5	RCON-PC (with PowerCON) x 16 axes RCON-PC (with PowerCON) rated current 2.3 A x 16 axes = 36.8 A ⇒ **OK**
Ex. 6	For RCON-PCF x 16 axes or 6 axes RCON-PCF rated current 5.7 A x 16 axes = 91.2 A ⇒ **Not OK** RCON-PCF rated current 5.7 A x 6 axes = 34.2 A ⇒ **OK**
Ex. 7	RCON-PC (without PowerCON), RCON-AC, RCON-DC The rated voltage of all units is low, and even 16 axes do not exceed the current limit value. ⇒ **OK**
Ex. 8	RCON-PCF x 3 axes, RCON-PC (with PowerCON) x 7 axes, and RCON-AC x 3 axes 5.7 x 3 + 2.3 x 7 + 1.3 x 3 = 37.1A ⇒ **OK**

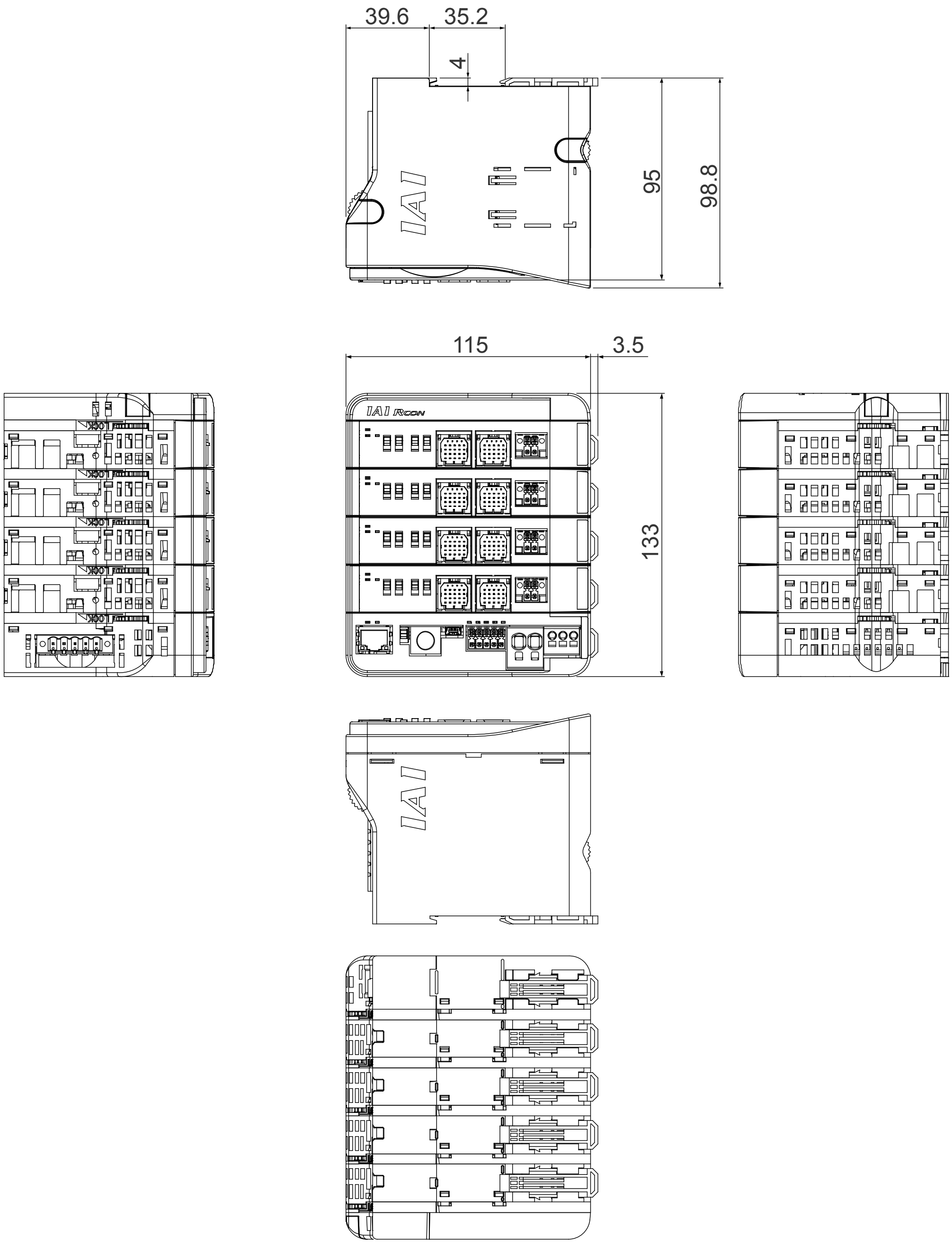
Caution

- Supposing that the operation pattern is that all axes only perform acceleration/deceleration simultaneously, and operating duty is 100%, the motor power must be calculated by using the maximum current value.
- If the motor power must be calculated in more detail, use the calculator software. When the operating conditions and the operating pattern of the actuator are set, the necessary power capacity can be calculated automatically.
  For details on operation, see the "Calculator Instruction Manual (ME0381)".

2.4 External Dimensions

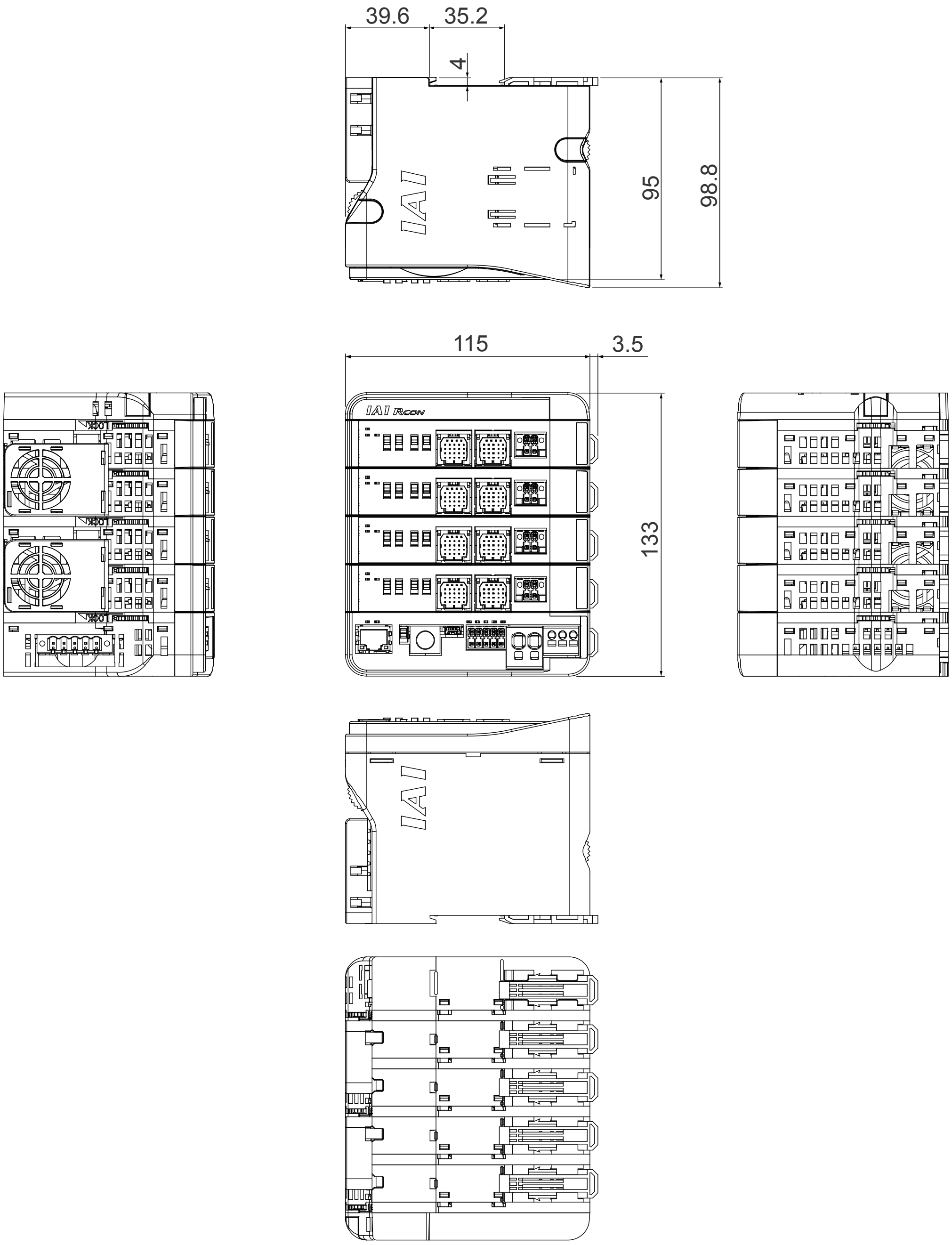
Controller (8-axis without fan)

Item	Specifications
External dimensions	W 133 x H 115 x D 95 mm
Weight	Approx. 926 g (gateway unit + 2-axis driver unit x 4+ terminal unit)
External view	See figure below



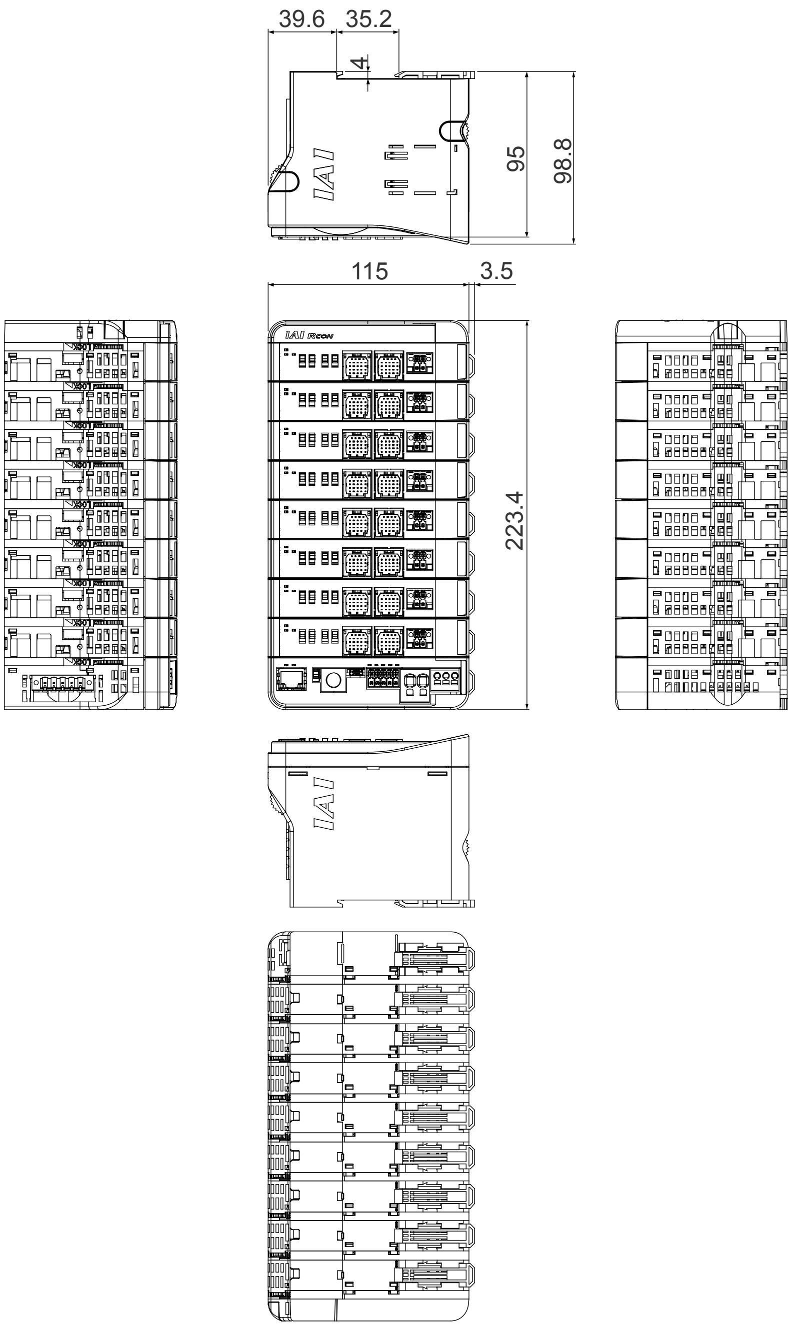
Controller (8-axis with fan)

Item	Specifications
External dimensions	W 133 x H 115 x D 95 mm
Weight	Approx. 956 g (gateway unit + 2-axis driver unit x 4 + fan unit x 2 + terminal unit)
External view	See figure below



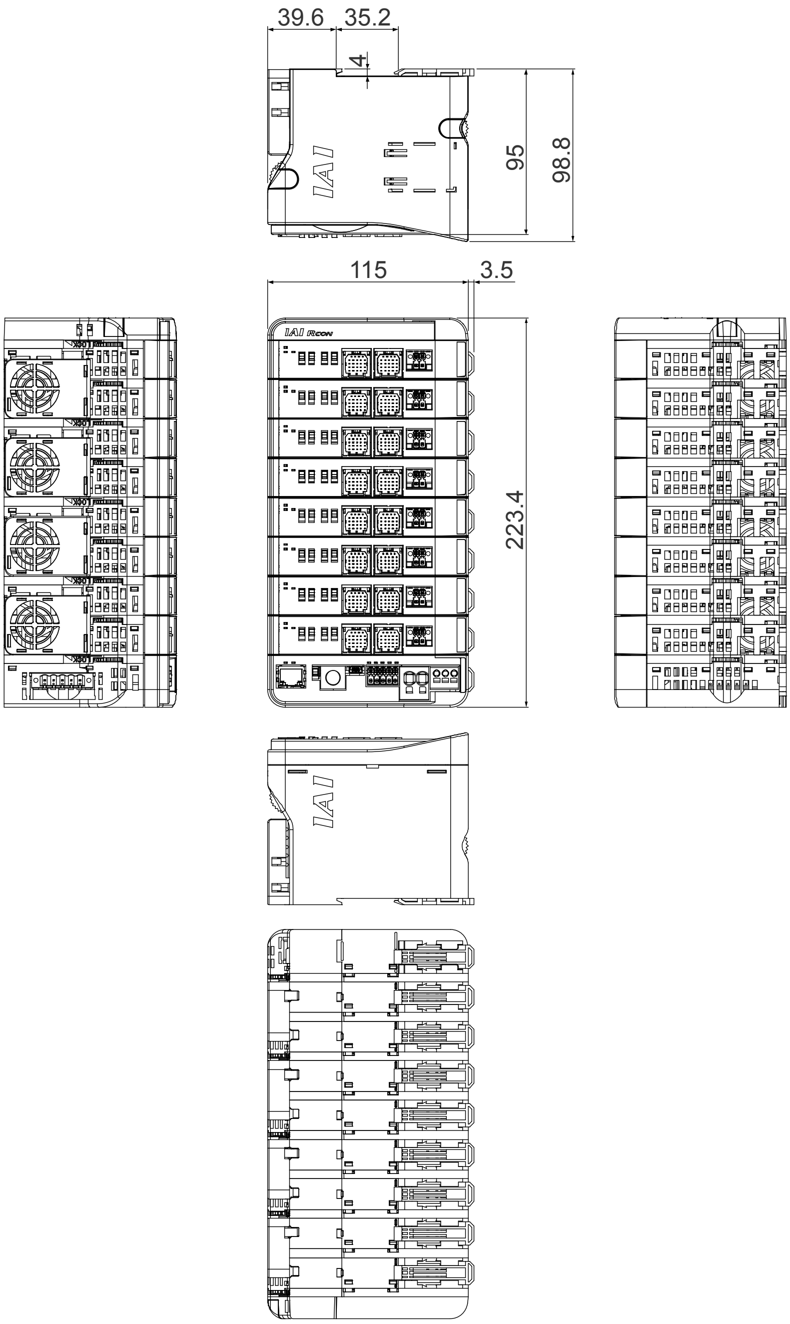
Controller (16-axis without fan)

Item	Specifications
External dimensions	W 223.4 x H 115 x D95 mm
Weight	Approx. 1,646 g (gateway unit + 2-axis driver unit x 8 + terminal unit)
External view	See figure below



Controller (16-axis with fan)

Item	Specifications
External dimensions	W 223.4 x H 115 x D95 mm
Weight	Approx. 1,706 g (gateway unit + 2-axis driver unit x 8 + fan unit x 4 + terminal unit)
External view	See figure below



2.5 Connection Diagrams

Sample connection arrangement diagrams are shown below.

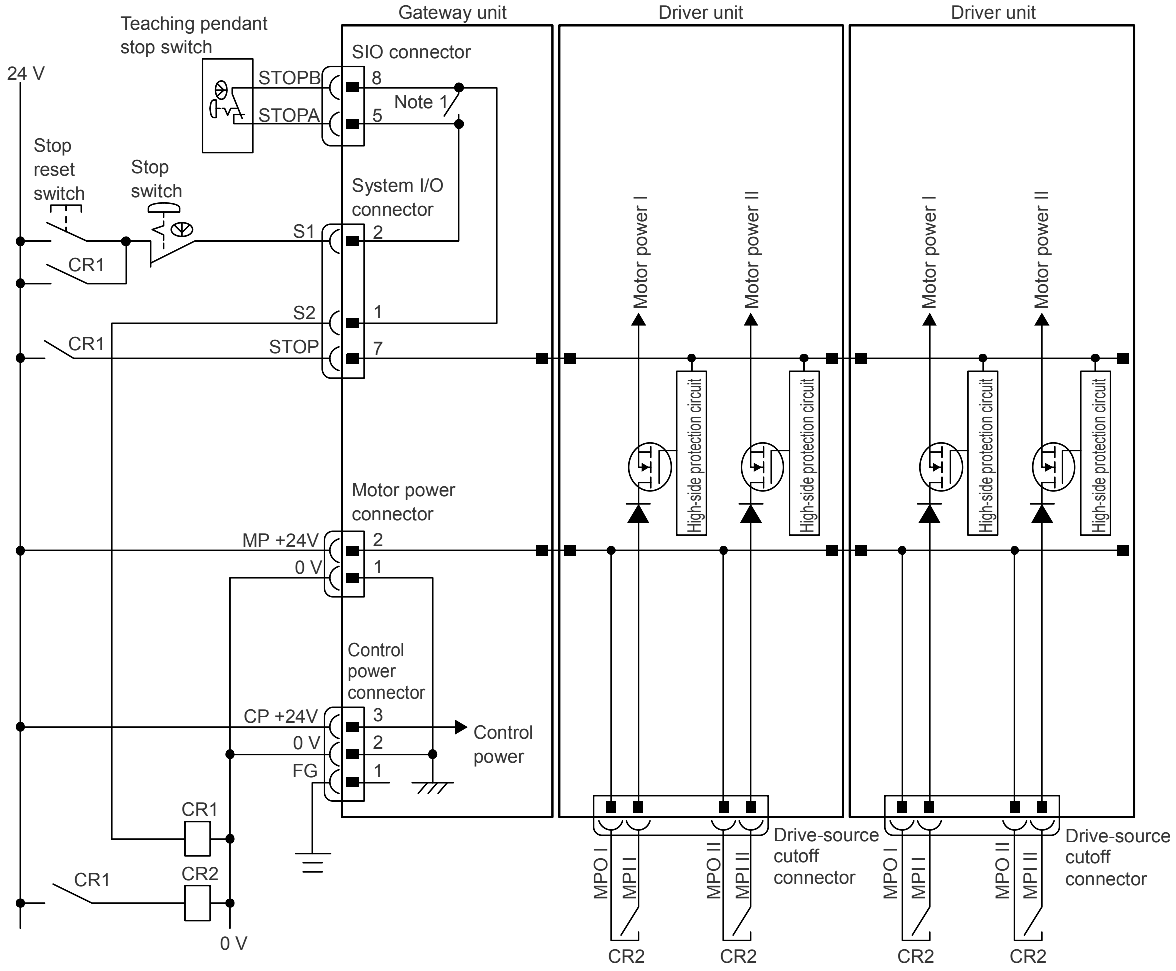
Power and stop sections

This is an example of a circuit which reflects the stop switch of the teaching pendant to the equipment stop circuit.

The circuit related to RCON's drive-source cutoff is shown below. For RCON, motor power is supplied from the gateway unit, but the circuit related to the drive-source cutoff is only available for the driver unit.

· Each driver unit has an interface that can shut off the external drive source of each axis.

· The driver unit has a drive-source cutoff circuit that uses a semiconductor for each axis. Motor power is cut off by a STOP signal. The drive source cutoff circuit via semiconductor has a high side overcurrent detection function and an inrush current restriction function.



Note 1: RCON-GW : If nothing is connected to the SIO connector, S1 and S2 will be short-circuited in the controller.

RCON-GWG : If nothing is connected to the SIO connector, S1 and S2 will not be short-circuited in the controller.
To short-circuit, connect the supplied dummy plug DP-5 to the SIO connector.

Note 2: When externally shutting off the motor drive source to comply with the safety category or the like, connect a contact such as a relay to the wiring between the MPI* and MPO* terminals.

Note 3: The rating of the STOP signal to be turned ON/OFF with the contact CR1 is 24 VDC / 10 mA or less.

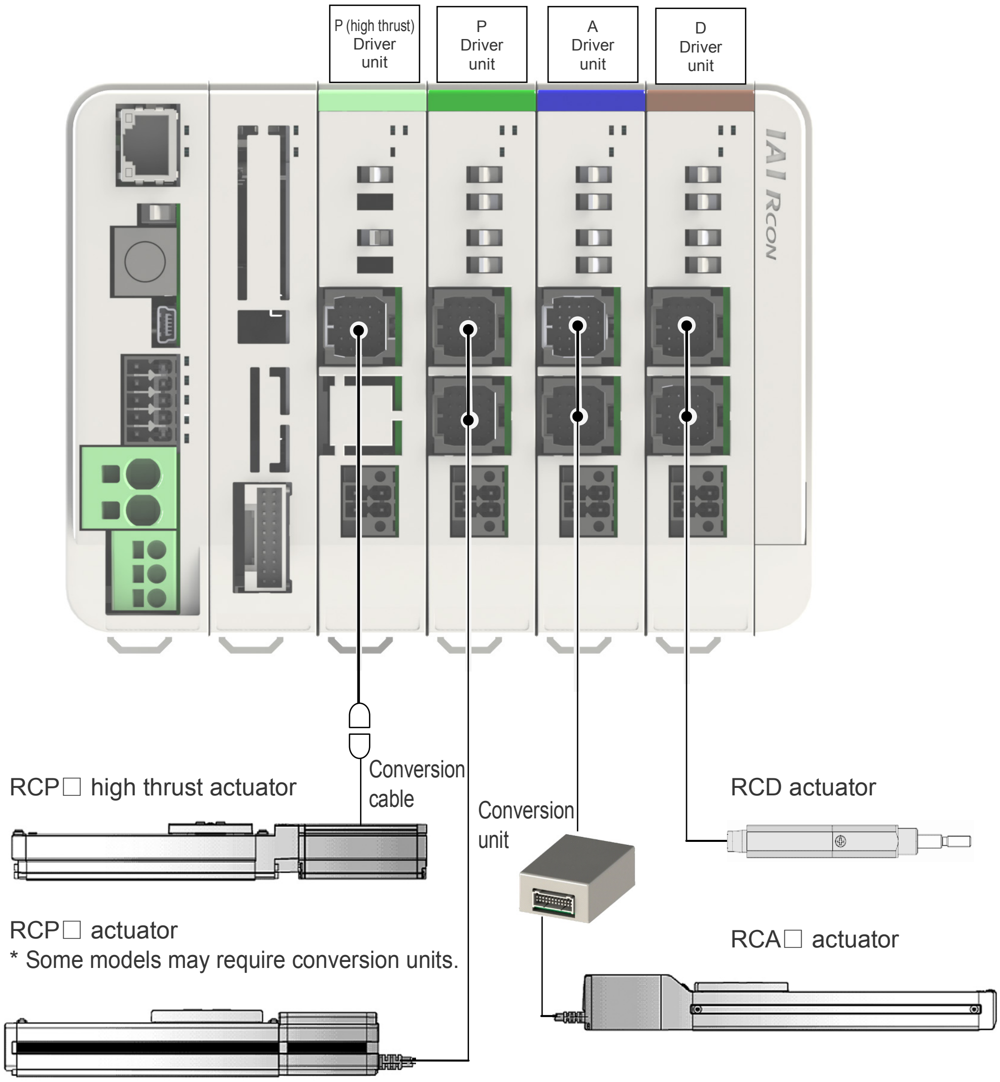
Note 4: The CR1 coil current must be 0.1 A or less.

(Note) When supplying power by turning ON/OFF 24 VDC, leave 0 V connected and supply/cut off +24 V.

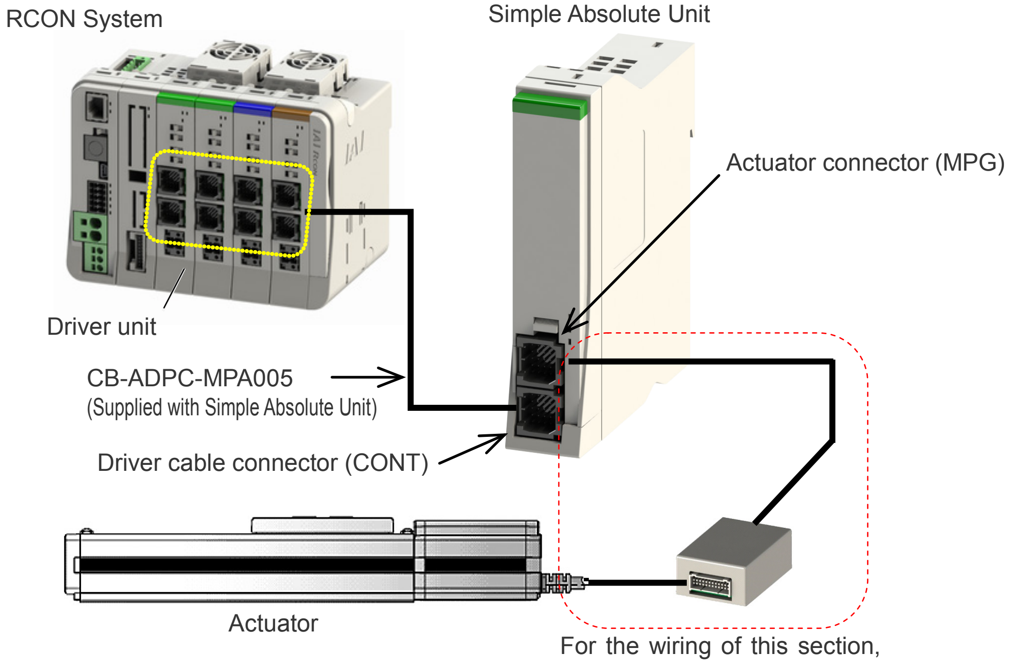
Warning

- The teaching pendant can stop all the actuators connected to the RCON, but it cannot stop the system.

Motor/encoder circuit



[Simple Absolute Unit Wiring]



For the wiring of this section, refer to the RCON connection cable list on the next page.

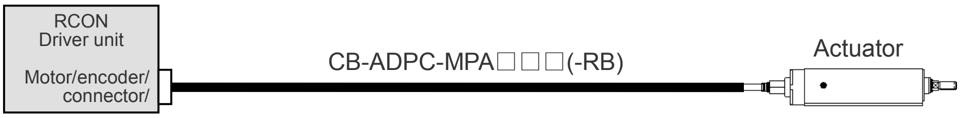
RCON Connection Cable List

No.	Actuator		RCON connection cable Note 1 (-RB: Robot cable)	Conversion unit	Wiring diagram
	Series	Target type			
(1)	RCP6 RCP6CR RCP6W RCP5 RCP5CR RCP5W	Other than high thrust type	CB-ADPC-MPA□□□(-RB)	-	A
(2)		High thrust type	CB-ADPC-MPA□□□(-RB) CB-CAN-AJ002 (conversion cable)	-	B
(3)	RCP4 RCP4CR RCP4W	Gripper (GR*), ST4525E, SA3/RA3	CB-ADPC-MPA□□□(-RB)	-	A
(4)		High thrust type	CB-ADPC-MPA□□□(-RB) CB-CAN-AJ002 (conversion cable)	-	B
(5)		Other than (3), (4)	CB-ADPC-MPA□□□(-RB) CB-CAN-AJ002 (conversion cable)	-	B
(6)	RCP3		CB-RCAPC-MPA□□□(-RB)	-	C
(7)	RCP2 RCP2CR RCP2W	RCP2 (standard type) Rotary compact type RCP2-RTBS/RTBSL/RTCS/RTCSL	CB-ADPC-MPA□□□(-RB) CB-RPSEP-MPA□□□	Required	D
(8)		RCP2CR (clean room type), RCP2W (dust-proof/splash-proof type) Rotary (RT*) of above types GRS/GRM/GR3SS/GR3SM of above types	CB-ADPC-MPA□□□(-RB)	-	A
(9)		All (standard / clean room / dust-proof/splash-proof) types of GRSS/GRLS/GRST/GRHM/GRHB Short type (RCP2 only) RCP2-SRA4R/SRGS4R/SRGD4R	CB-RCAPC-MPA□□□(-RB)	-	C
(10)		High thrust type	CB-ADPC-MPA□□□(-RB) CB-CFA-MPA□□□-RB	Required	D
(11)		Other than (7) to (10)	CB-ADPC-MPA□□□(-RB) CB-PSEP-MPA□□□	Required	D
(12)	RCA2/RCA2CR/RCA2W, RCL		CB-RCAPC-MPA□□□(-RB)	-	C
(13)	RCA RCACR RCAW	Short type (RCA only) RCA-SRA4R/SRGS4R/SRGD4R	CB-RCAPC-MPA□□□(-RB)	-	C
(14)		Other than (13)	CB-ADPC-MPA□□□(-RB) CB-ASEP2-MPA□□□	Required	D
(15)	RCD	RCD-RA1D (old connector)	CB-ADPC-MPA□□□(-RB) CB-CAN-AJ002 (conversion cable)	-	B
(16)		RCD-RA1DA, RCD-GRSNA	CB-ADPC-MPA□□□(-RB)	-	A

Note 1: Up to 20 m from each driver unit to the actuator, with or without the conversion unit.
However, the maximum length from the D driver unit to the RCD actuator will be 10 m.

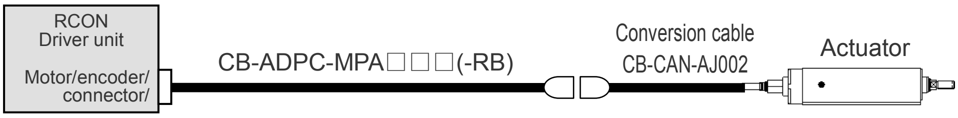
Wiring diagram A

(1) RCP6, RCP5 (other than high thrust type)
(3) RCP4 Gripper (GR*), ST4525E, SA3/RA3
(8) RCP2CR/RCP2W rotary (RT*) and GRS/GRM/GR3SS/GR3SM
(16) RCD-RA1DA, RCD-GRSNA



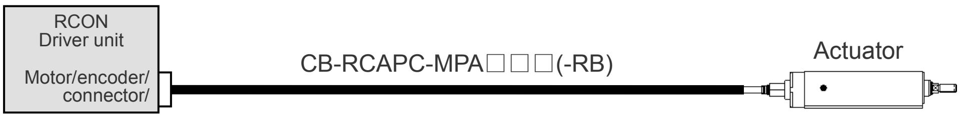
Wiring diagram B

(2) RCP6 high thrust type, RCP5 high thrust type
(4) RCP4 high thrust type
(5) Other than RCP4 (gripper, ST4525E, SA3/RA3, high thrust type)
(15) RCD-RA1D (old connector)



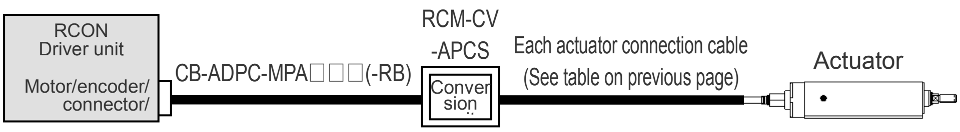
Wiring diagram C

(6) RCP3
(9) RCP2/RCP2CR/RCP2W-GRSS/GRLS/GRST/GRHM/GRHB,
RCP2 short type (SRA4R/SRGS4R/SRGD4R)
(12) RCA2, RCL
(13) RCA short type (SRA4R/SRGS4R/SRGD4R)



Wiring diagram D

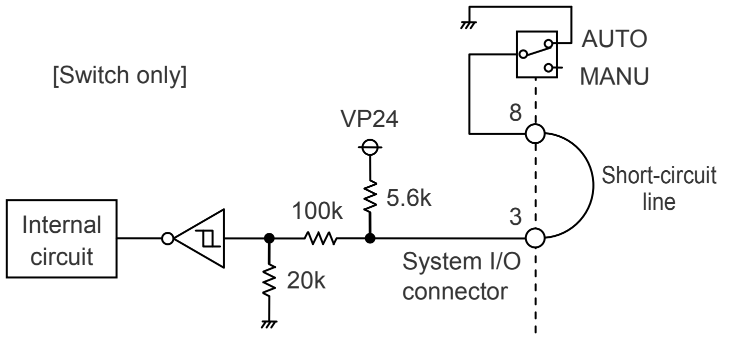
(7) RCP2-RTBS/RTBSL/RTCS/RTCSL
(10) RCP2 high thrust type
(11) RCP2, excluding some (refer to table above for details)
(14) Other than RCA short type (SRA4R/SRGS4R/SRGD4R)



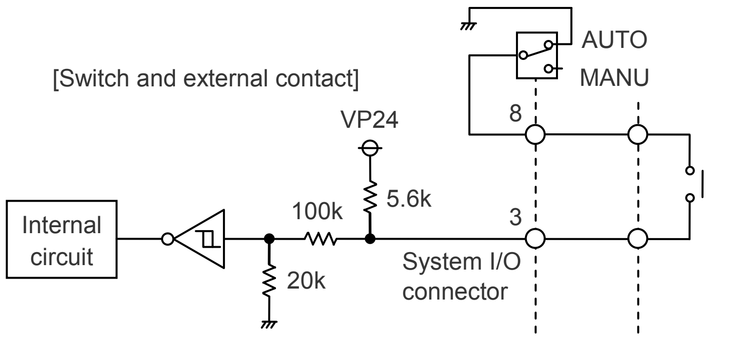
AUTO/MANU mode switching circuit wiring

You can also switch AUTO/MANU by connecting the PLC/contact to the AUTO/MANU (automatic/manual operation) input of the system I/O connector of the gateway unit.
There are 3 types of AUTO/MANU mode switching circuit,as shown below.

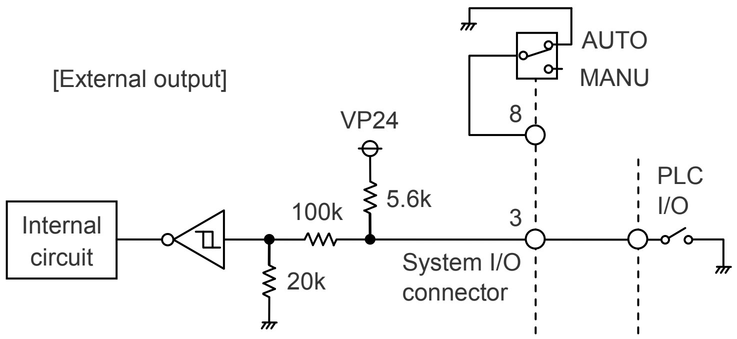
(1) Switch only
The configuration is such that the AUTO/MANU input (3, 8-pin) in the system I/O connector is short-circuited with a short-circuited line and switched only with the switch.



(2) Switch and external contact
Connect the switch and external contact in series as shown in the figure. It is AUTO if both are connected and MANU if one is open.



(3) External output
Connect the AUTO/MANU signal input 3-pin in the system I/O connector to the PLC, etc. It is AUTO at PLC I/O output ON (0 V) and MANU at OFF (open). In this case, the AUTO/MANU switch will be disabled.



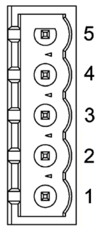
Note that the specification of the system I/O connector is as follows.

Item	Specifications
Input current	5mA
Leakage current	Max. 1 mA
Isolation method	Non-isolated

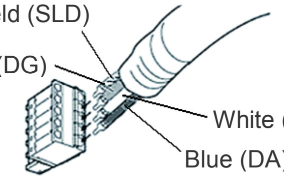
Field network wiring

For details of the connection method, follow the instruction manuals of the master unit of each field network and the PLC configured.

[CC-Link]

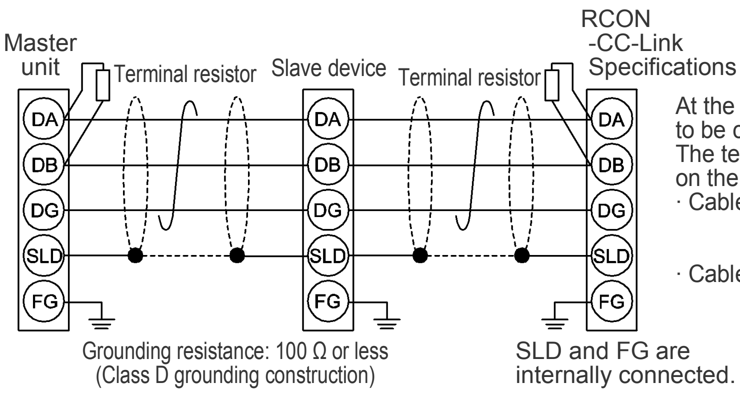


Controller side
Connector top view



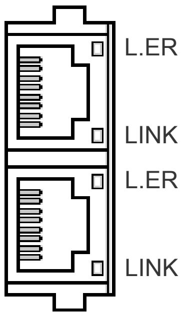
Connector name	CC-Link cable connector	Remarks
Cable side	MSTB2.5/5-ST-5.08 ABGY AU (Phoenix Contact)	Standard accessories
Controller side	MSTB2.5/5-G-5.08AU (Phoenix Contact)	

Pin No.	Signal name (color scheme)	Description	Compatible wire diameter
1	DA (blue)	Signal line A	CC-Link dedicated cable
2	DB (white)	Signal line B	
3	DG (yellow)	Digital ground	
4	SLD	Connects the shield of shielded cables (5-pin FG and control power connector 1-pin FG connected internally)	
5	FG	Frame ground (4-pin SLD and control power connector 1-pin FG connected internally)	



At the terminal, a terminal resistor needs to be connected.
The terminal resistor varies depending on the type of CC-Link dedicated cable.
· Cable FANC-SBH: 130 Ω 1/2 W (CC-Link dedicated high performance cable)
· Cable FANC-SB: 110 Ω 1/2 W (CC-Link dedicated cable)

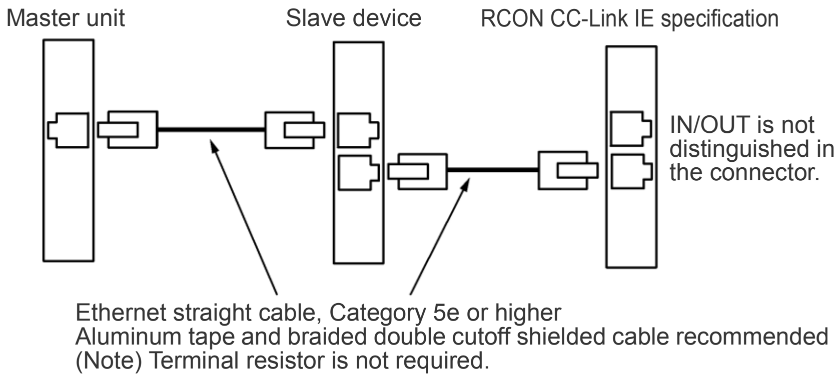
[CC-Link IE]



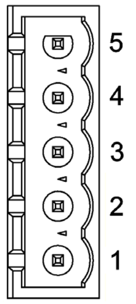
Controller side
Connector top view

Connector name	CC-Link IE cable connector	Remarks
Cable side	Ethernet ANSI/TIA/EIA-568-B Category 5e or higher shielded 8P8C modular plug (RJ-45)	To be prepared by the customer
Controller side	Ethernet ANSI/TIA/EIA-568-B Category 5e or higher shielded 8P8C modular jack (RJ-45)	

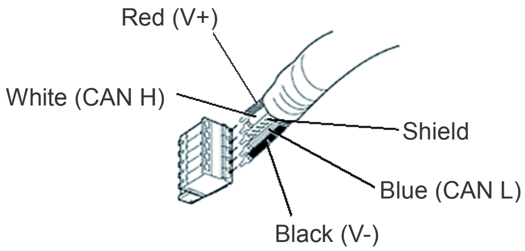
Pin No.	Signal name	Description	Compatible wire diameter
1	TD+	Transmit data +	For the Ethernet cable, use a straight STP cable of Category 5e or higher.
2	TD-	Transmit data -	
3	RD+	Receive data +	
4	–	Not used	
5	–	Not used	
6	RD-	Receive data -	
7	–	Not used	
8	–	Not used	



[DeviceNet]

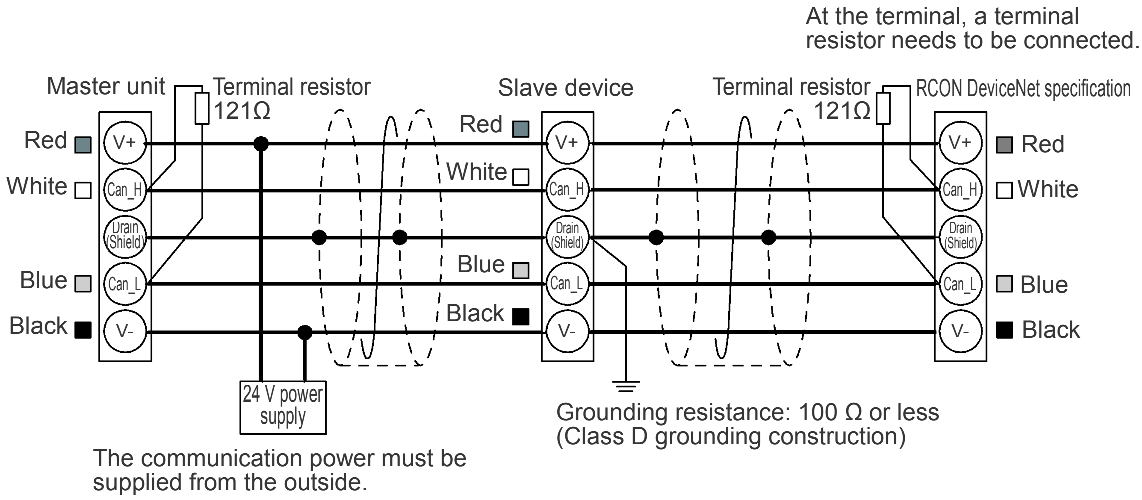


Controller side
Connector top view

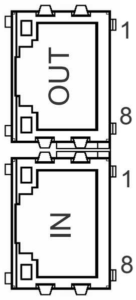


Connector name	DeviceNet cable connector	Remarks
Cable side	MSTB2.5/5-STF-5.08 AUM (Phoenix Contact)	Standard accessories
Controller side	MSTBA2.5/5-GF-5.08 AU (Phoenix Contact)	

Pin No.	Signal name (color scheme)	Description	Compatible wire diameter
1	V- (black)	Power supply cable - side	DeviceNet dedicated cable
2	CAN L (blue)	Signal data Low side	
3	–	Digital ground	
4	CAN H (white)	Signal data High side	
5	V+ (red)	Power supply cable + side	



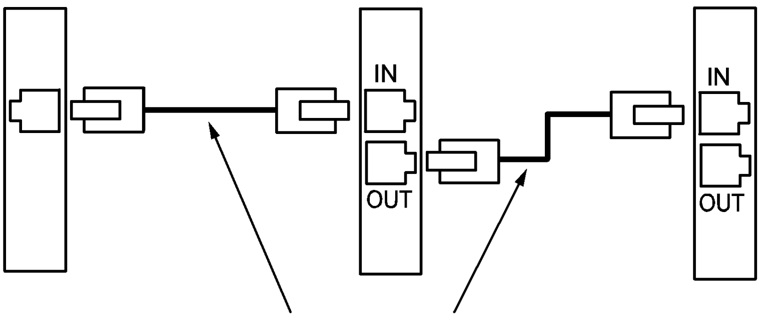
[EtherCAT]



Controller side
Connector top view

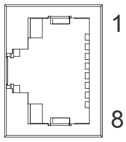
Connector name	EtherCAT cable connector	Remarks
Cable side	Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular plug (RJ45)	To be prepared by the customer
Controller side	Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular jack (RJ45)	

Pin No.	Signal name	Description	Compatible wire diameter
1	TD+	Transmit data +	For the Ethernet cable, use a straight STP cable of Category 5 or higher.
2	TD-	Transmit data -	
3	RD+	Receive data +	
4	–	Not used	
5	–	Not used	
6	RD-	Receive data -	
7	–	Not used	
8	–	Not used	

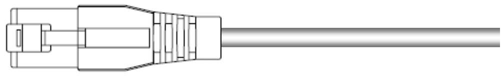


Ethernet straight cable, Category 5 or higher
Aluminum tape and braided double cutoff shielded cable recommended
(Note) Terminal resistor is not required.

[EtherNet/IP] [PROFINET IO]

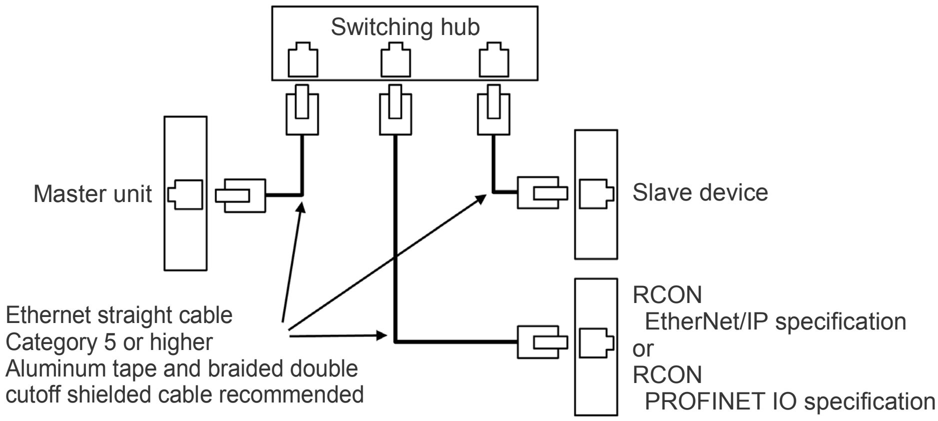


Controller side
Connector top view

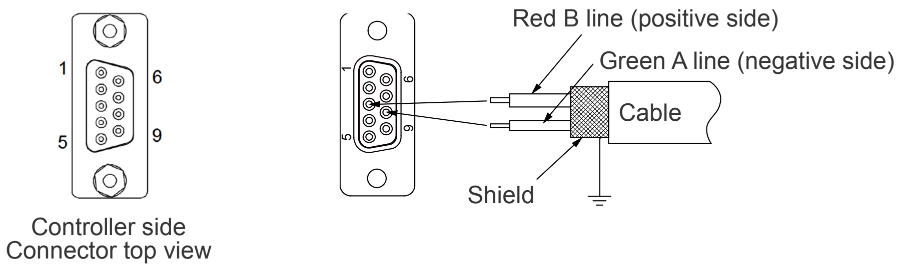


Connector name	EtherNet/IP, PROFINET IO cable connector	Remarks
Cable side	Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular plug (RJ45)	To be prepared by the customer
Controller side	Ethernet ANSI/TIA/EIA-568-B Category 5 or higher shielded 8P8C modular jack (RJ45)	

Pin No.	Signal name	Description	Compatible wire diameter
1	TD+	Transmit data +	For the Ethernet cable, use a straight STP cable of Category 5 or higher.
2	TD-	Transmit data -	
3	RD+	Receive data +	
4	–	Not used	
5	–	Not used	
6	RD-	Receive data -	
7	–	Not used	
8	–	Not used	

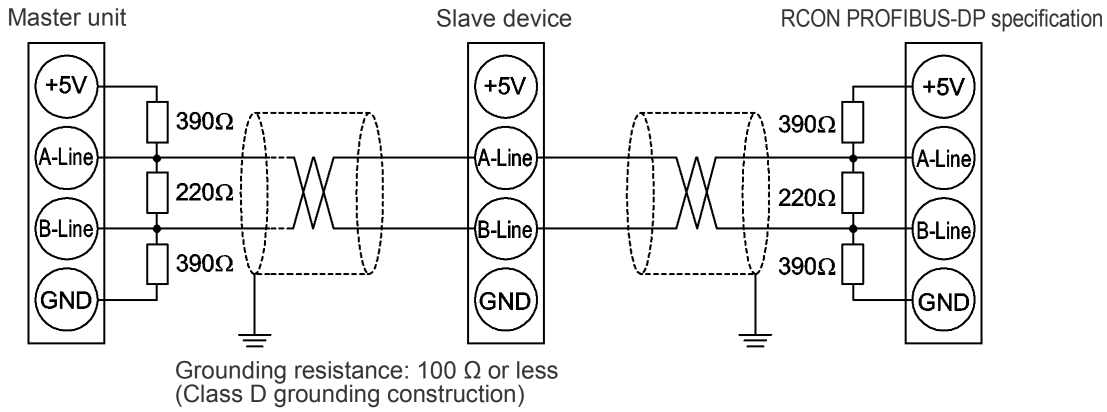


[PROFIBUS-DP]



Connector name	PROFIBUS-DP cable connector	Remarks
Cable side	9-pin D sub connector (male)	To be prepared by the customer
Controller side	9-pin D sub connector (female)	

Pin No.	Signal name	Description	Compatible wire diameter
1	NC	Not connected	PROFIBUS-DP dedicated cable (Type A: EN5017)
2	NC	Not connected	
3	B-Line	Signal line B (RS-485)	
4	RTS	Transmission request	
5	GND	Signal GND (insulation)	
6	+5 V	+5 V output (isolated)	
7	NC	Not connected	
8	A-Line	Signal line A (RS-485)	
9	NC	Not connected	



Specifications Section

Chapter 3

Gateway Unit

3.1 Overview 3-1

3.2 How to Read the Model Number 3-2

How to read the model nameplate 3-3

3.3 Gateway Unit and Accessories 3-4

3.4 Part Names/Functions and External Dimensions 3-5

Part names 3-5

LED display 3-7

Ethernet connector 3-8

AUTO/MANU switch 3-8

SIO connector 3-9

USB connector 3-10

System I/O connector 3-11

Motor power connector 3-12

Control power connector 3-13

Field network connector 3-14

Connectors 3-14

Terminal unit 3-15
External dimensions 3-16

3.5 Field Network General Specifications 3-18
CC-Link 3-18
CC-Link IE 3-19
DeviceNet 3-20
EtherCAT 3-21
EtherNet/IP 3-22
PROFIBUS-DP 3-23
PROFINET IO 3-24

3.6 Operation Function List 3-25
Field network control operation mode 3-25
List of functions by operation mode 3-26

3.7 Address Configuration 3-27
Overall address configuration example 3-29
Gateway control/status signals 3-40
Power supply unit status signal 3-42
Position table 3-45
Direct numerical control mode assignment 3-61
Simple direct mode assignment 3-67
Positioner 1 mode assignment 3-71
Positioner 2 mode assignment 3-74
Positioner 3 mode assignment 3-75
Positioner 5 mode assignment 3-78

3.8 I/O Signals 3-81
Timing of I/O signals 3-81
Function of I/O signals 3-82
Timing of basic operation 3-105
Other basic operations 3-113

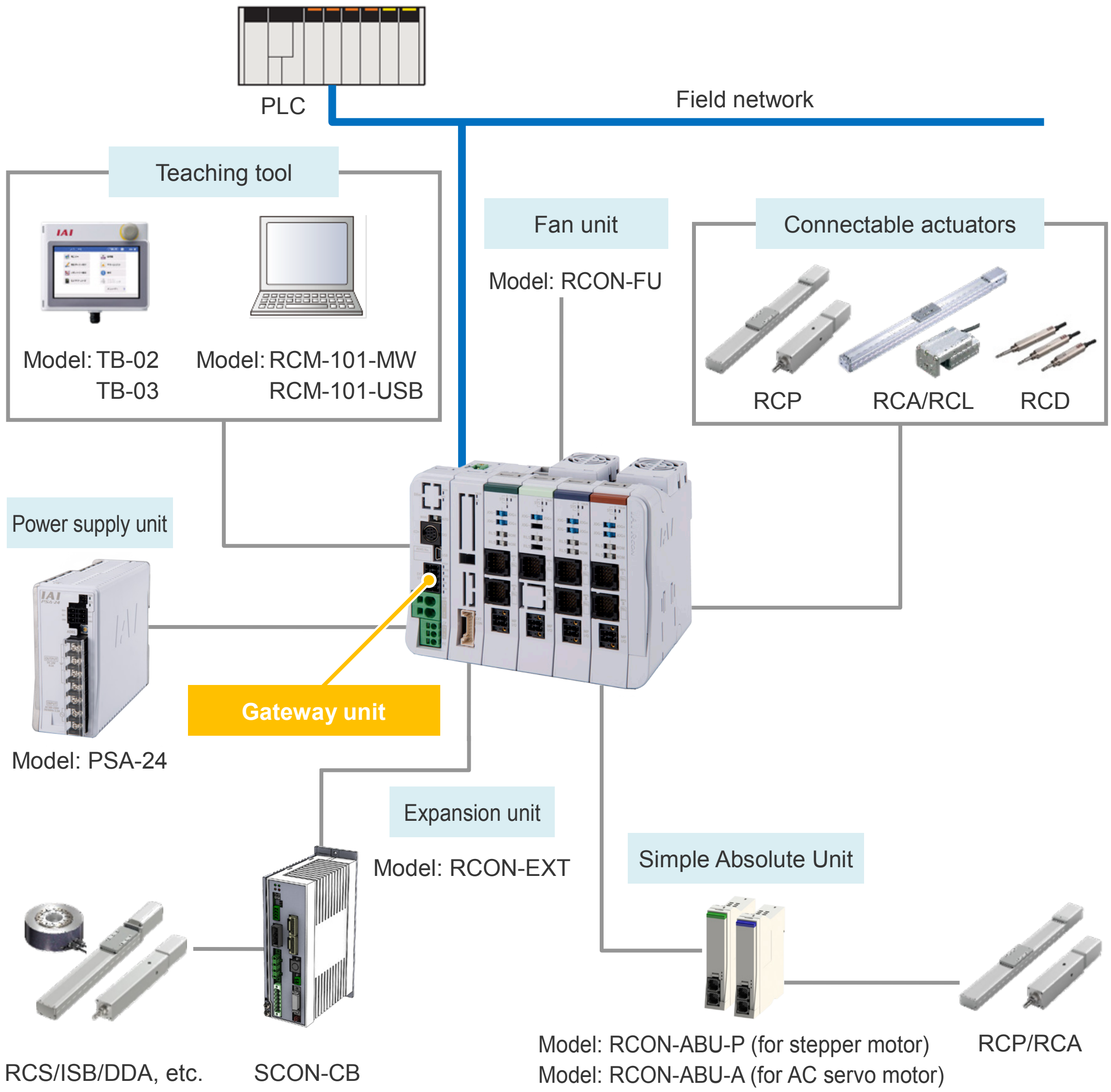
3.9 Gateway Parameter Configuration Tool ························ 3-128
Tool startup ························ 3-128
Menu descriptions ························ 3-129
Special parameter setting function descriptions ························ 3-131
Operation mode setting ························ 3-138
Operation mode individual setting ························ 3-140
Axis number assignment change ························ 3-141
Editing driver unit configuration ························ 3-142

3.10 Actuator Information Management Function ················ 3-151
Overview ························ 3-151
Actuators with information management function supported ····· 3-152
Actuator information management function ························ 3-153
Parameters for actuator information management function setting ······ 3-156

3.1 Overview

The gateway unit is a slave station with a gateway function for connecting the ROBO Cylinder and industrial robot to the field network of the host PLC. It supports 7 kinds of field networks (CC-Link, CC-Link IE (Note 1), DeviceNet, EtherCAT, EtherNet/IP, PROFIBUS-DP, PROFINET IO).

Up to 16 SCON-CB axes (Note 2) can be connected via the dedicated RCON system driver unit (RCON-PC/PCF/AC/DC) and the expansion units. In addition to controlling each connected actuator, operating status and various information can be monitored.



Note 1: Only CC-Link IE Field is supported.

Note 2: When direct numerical control mode is used with field networks other than CC-Link or CC-Link IE, up to 8 axes can be connected.

3.2 How to Read the Model Number

The model of the gateway unit is as follows.

Gateway unit model

RCON – [Type] – [I/O Type] – [Options]

Type

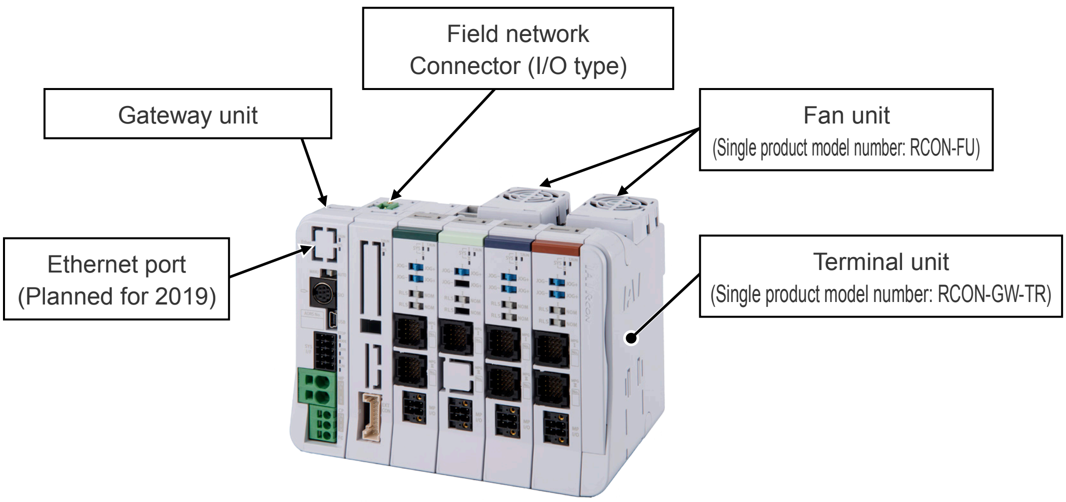
GW	Standard type
GWG	Safety category Type

I/O Type

CC	CC-Link connection specification
CIE	CC-Link IE connection specification (Note 1)
DV	DeviceNet connection specification
EC	EtherCAT connection specification
EP	EtherNet /IP connection specification
PR	PROFIBUS-DP connection specification
PRT	PROFINET IO connection specification

Options

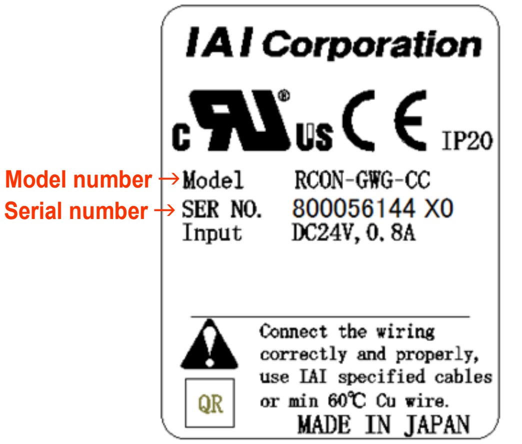
ET	Ethernet port installation specification
FU*	Fan unit mounting (*: Specify the number of units, 1 ~ 8)
TRN	Without terminal unit



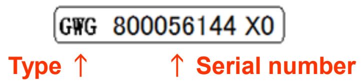
Note 1: Only CC-Link IE Field is supported.

How to read the model nameplate

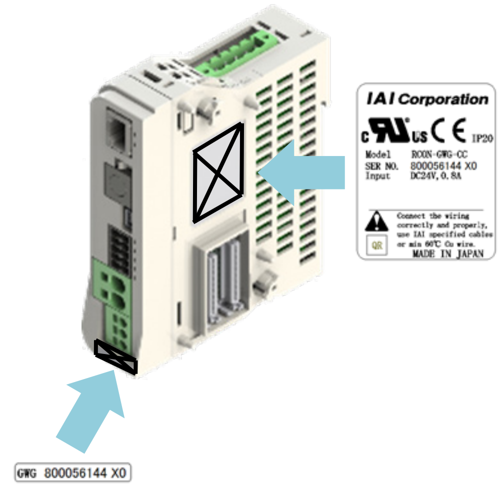
[Gateway Unit]



* The nameplate design reflects UL

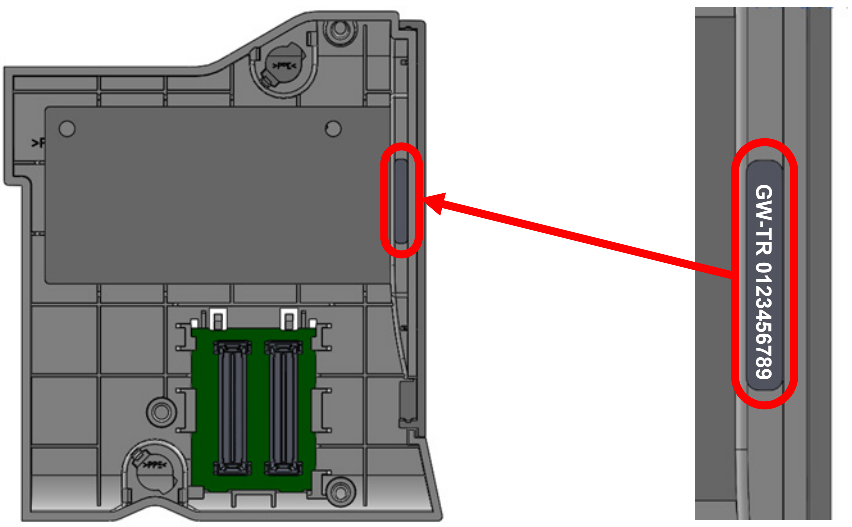


[Nameplate Location]



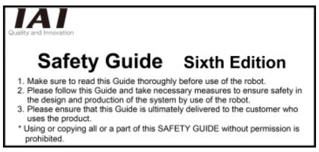
[Terminal Unit]

[Nameplate Location]



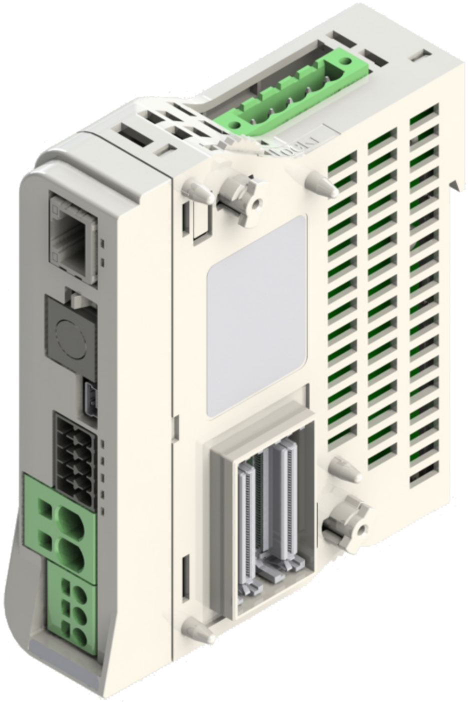
3.3 Gateway Unit and Accessories

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

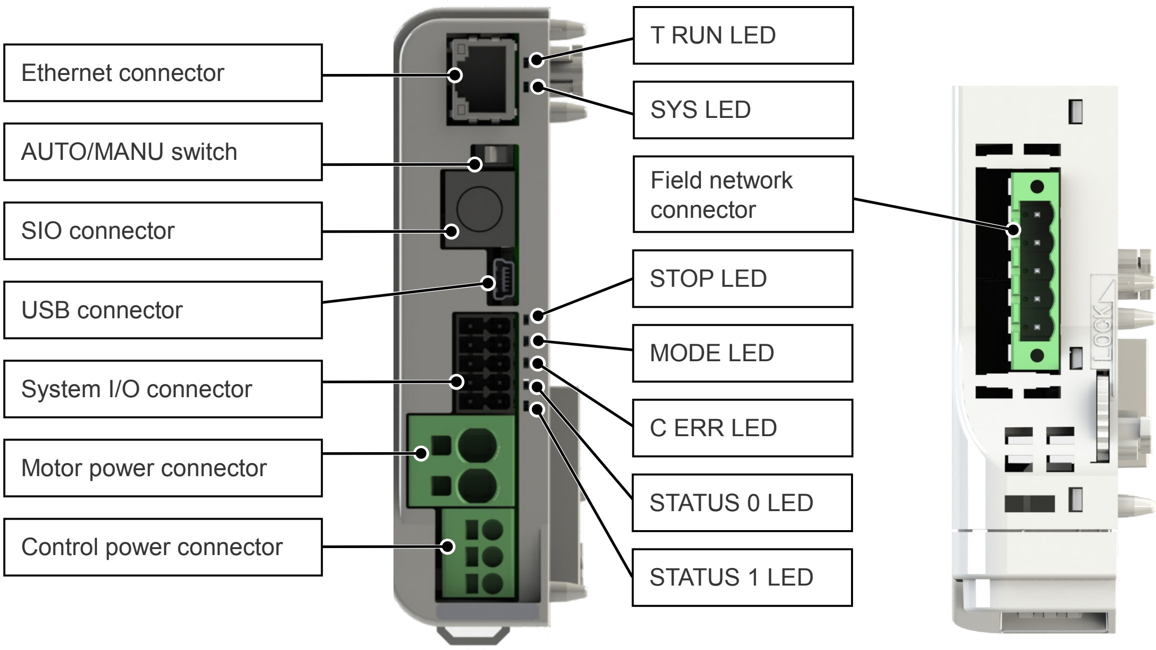
Part name	Shape	Quantity	Remarks
Gateway unit		1	Model example: RCON-GW/GWG
Terminal unit		1	Single product model number: RCON-GW-TR (Not supplied with TRN specification)
System I/O connector		1	Single product model number: DFMC1.5/5-ST-3.5 (Phoenix Contact)
Field network connector		1	Depends on I/O type
Dummy plug		1	Model Name: DP-5 (Supplied with GWG specification)
First Step Guide		1	
Safety Guide		1	
Instruction Manual DVD		1	

3.4 Part Names/Functions and External Dimensions

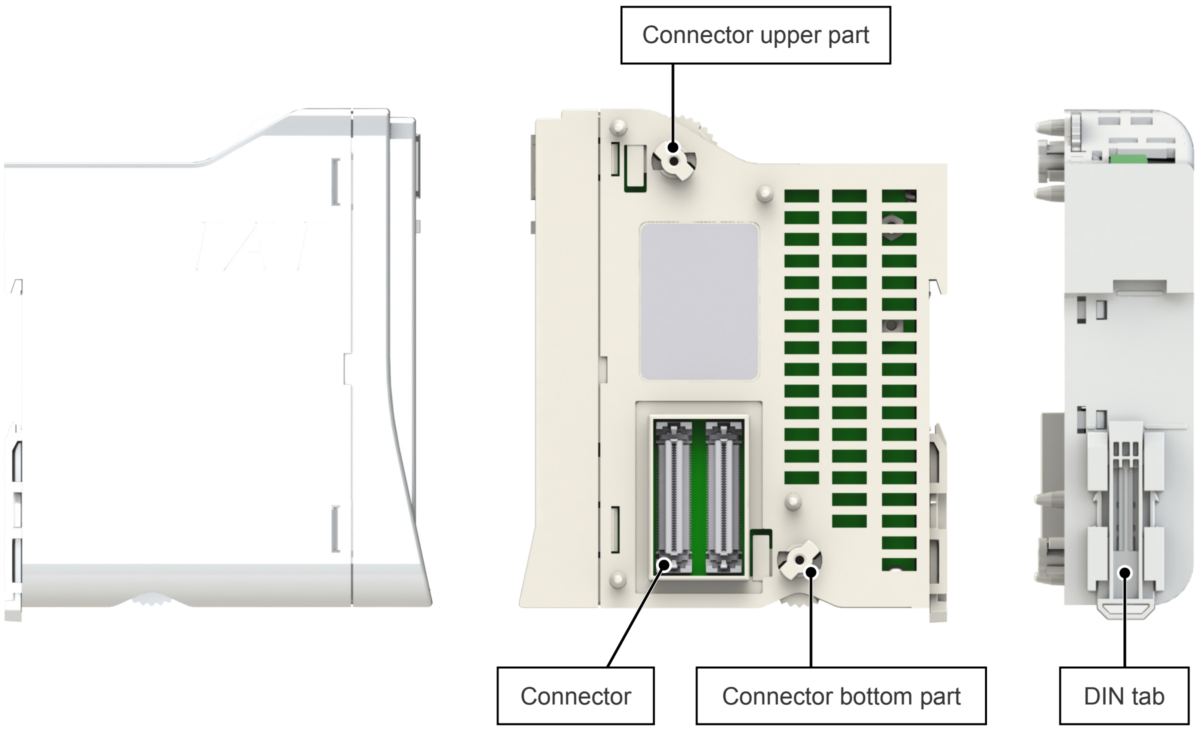
Part names



RCON-GW



Front　　Top



Left side　　Right side　　Rear

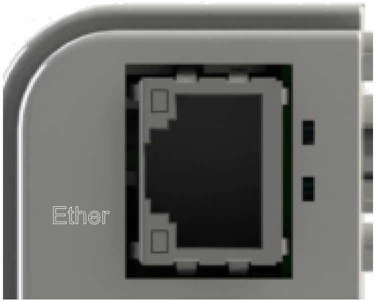
LED display

LED for indicating gateway unit status and field network status.

Panel notation	Display color	Status	Description
T RUN	Green	Light ON	Normal internal bus communication
		Blinking	Waiting for initialization signal
	Orange	Light ON	Bus communication error generated
SYS	Green	Light ON	Normal operation (It also lights up green when an alarm is generated in the driver unit or simple absolute unit)
	Orange	Light ON	Gateway alarm triggered
STOP	Red	Light ON	STOP signal input present (driver unit drive power cut-off)
		Light OFF	STOP signal input absent
MODE	Green	Light ON	AUTO (automatic operation) mode ON
		Light OFF	MANU (manual operation) mode ON
C ERR	Orange	Light ON	Field network error generated
		Light OFF	Field network operating normally
STATUS 0	–	–	Differs with field network Refer to "3.5 Field Network General Specifications (page 3-18)"
STATUS 1	–	–	Differs with field network Refer to "3.5 Field Network General Specifications (page 3-18)"

Ethernet connector

A connector for connecting to Ethernet. Equipped only when the Ethernet option is selected. (Not currently supported, to be equipped from 2019 on)



Pin No.	Signal name	Description
1	TXP	Transmit data + side
2	TXN	Transmit data - side
3	RXP	Receive data + side
4	NC	Not connected
5	NC	Not connected
6	RXN	Receive data - side
7	NC	Not connected
8	NC	Not connected

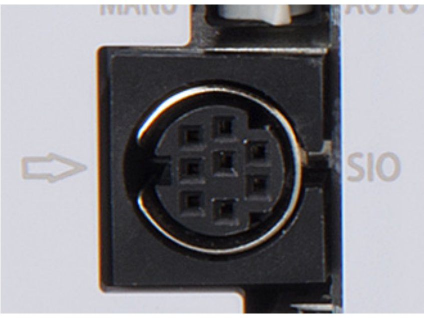
AUTO/MANU switch

Switches between automatic and manual operation. System I/O connector AUTO/MANU input is connected in series.

Symbol	Description
AUTO	Online operation mode that enables reception of commands from host devices such as PLCs
MANU	Teaching operation mode that enables reception of commands from host devices such as PLCs

SIO connector

A connector for connecting the teaching pendant to PC software. PC software can also be connected with a USB.



Pin No.	Signal name	Description
1	TP_SD+	Teaching pendant/PC RS-485 differential signal + side
2	TP_SD-	Teaching pendant/PC RS-485 differential signal - side
3	T5V	Teaching pendant 5 V output
4	ENB	Enable signal input
5	STOPA	Stop line A
6	T24V	Teaching pendant 24 V output
7	GND	0 V
8	STOPB	Stop line B
9 (shell)	GND	0 V

USB connector

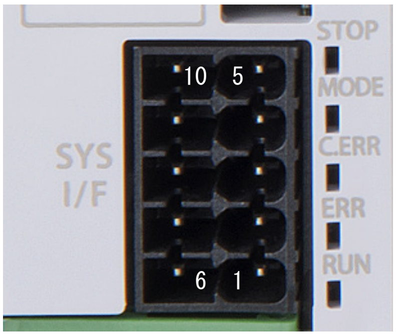
A connector for connecting to PC software.

Connector name: 51387-0530 (Molex)

Pin No.	Signal name	Description
1	VBUS	USB power
2	D-	USB signal line -
3	D+	USB signal line +
4	NC	Not connected
5	GND	0 V
Shell	GND	0 V

System I/O connector

External AUTO/MANU switching input, STOP input, PSA-24 serial communication line equipped. Note that the following pin No. are short-circuited at shipment. (Pins #1 and #6, pins #2 and #7, pins #3 and #8)



Cable connector name: DFMC1.5/5-ST-3.5 (Phoenix Contact)

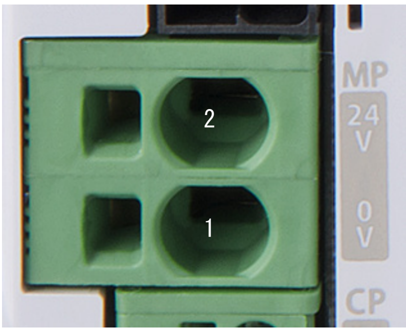
Pin No.	Signal name	Description
1	S2	Teaching pendant STOP switch input contact
2	S1	Teaching pendant STOP switch output contact
3	AUTO/MANU-	AUTO/MANU signal input
4	GND	0 V
5	PS24_SD-	PSA-24 RS-485 differential signal - side
6	STOP+	STOP +24 V power supply output
7	STOP-	STOP input
8	AUTO/MANU+	AUTO/MANU +24 V power supply output
9	NC	Not connected
10	PS24_SD+	PSA-24 RS-485 differential signal + side

Cable side connector compatible wire

Item	Specifications
Compatible wire	AWG24 ~ 16
Strip length	10.0mm

Motor power connector

Motor power +24 V supply connector. Supplies power to the motor of the driver unit linked to the gateway unit.



Pin No.	Signal name	Description
1	GND	0 V
2	MP	Motor power +24 V input

Motor power connector compatible wire

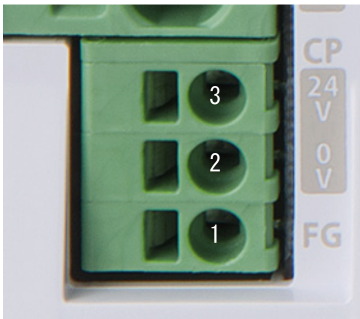
Item	Specifications
Compatible wire	AWG24 ~ 8
Strip length	15.0mm

Caution

- Select a wire with thickness that tolerates the rated current total value obtained in "2.3 Specifications/Power supply capacity (page 2-9)".

Control power connector

Control power +24 V and FG connector. Supplies power for the control power of all units linked to the gateway unit and for the actuator brake.



Pin No.	Signal name	Description
1	FG	Frame ground
2	GND	0 V
3	CP	Control power +24 V input

Control power connector compatible wire

Item	Specifications
Compatible wire	AWG24 ~ 12
Strip length	10.0mm

Caution

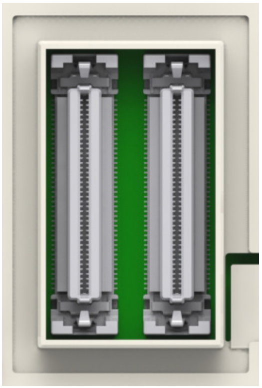
- Select a wire with thickness that tolerates the rated current total value obtained in "2.3 Specifications/Power supply capacity (page 2-9)".

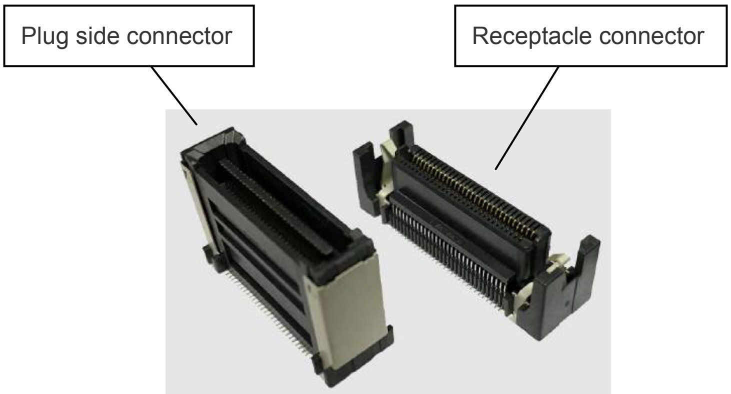
Field network connector

A connector for connecting to field networks. Field network details are listed in "3.5 Field Network General Specifications (page 3-18)".

Connectors

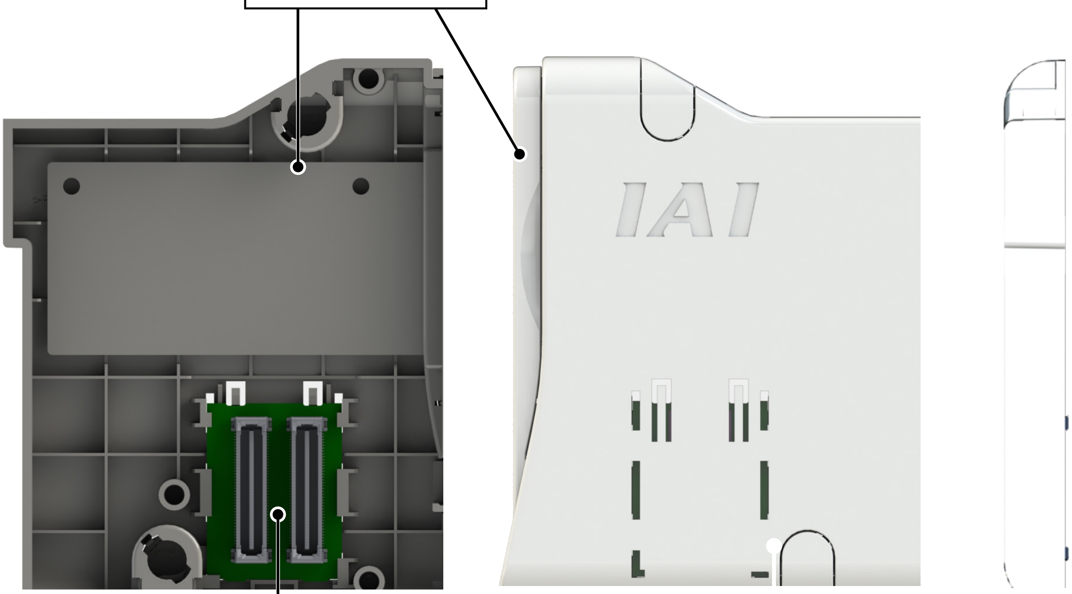
A connector for use between units. Two identical connectors are used. The connectors have a floating structure that absorbs connector misalignment due to housing mating or mounting misalignment between connectors.





Terminal unit

RCON-GW-TR



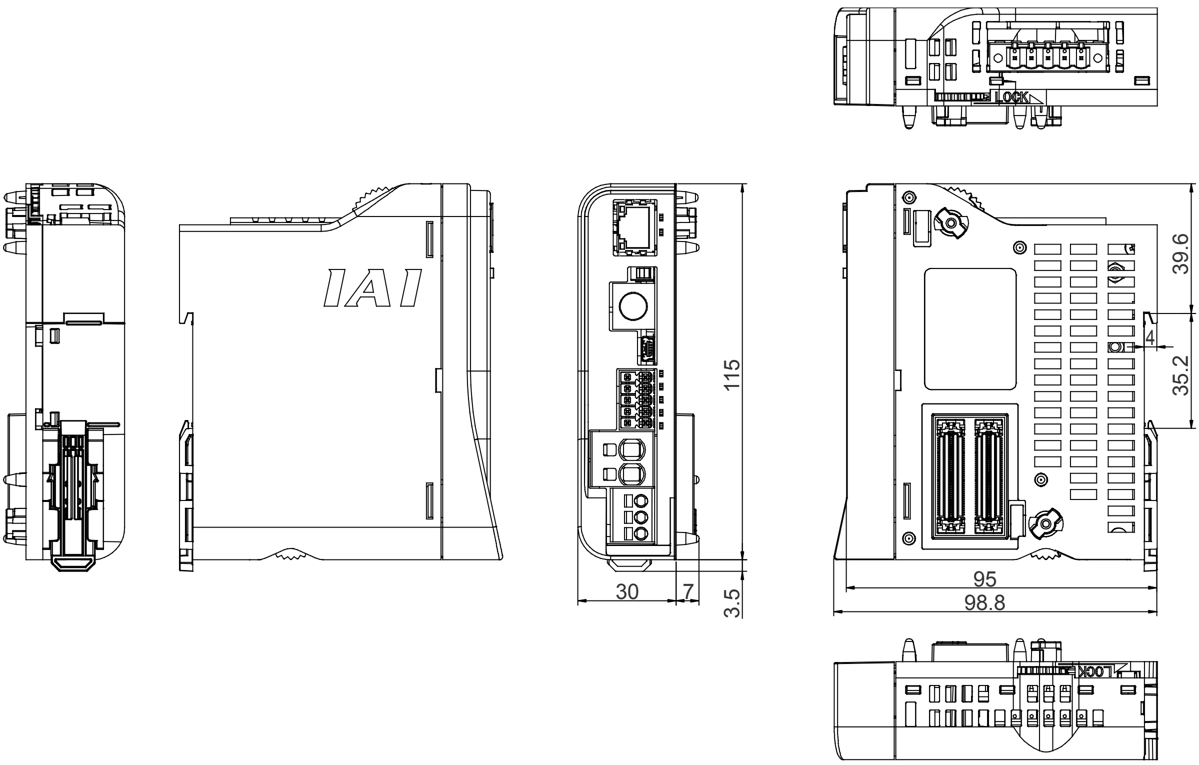
Left side Right side Rear

Pulling the terminal unit card part forward releases the card. The card has 8 grid squares on each side that enable the information for 16 axes total to be written.

External dimensions

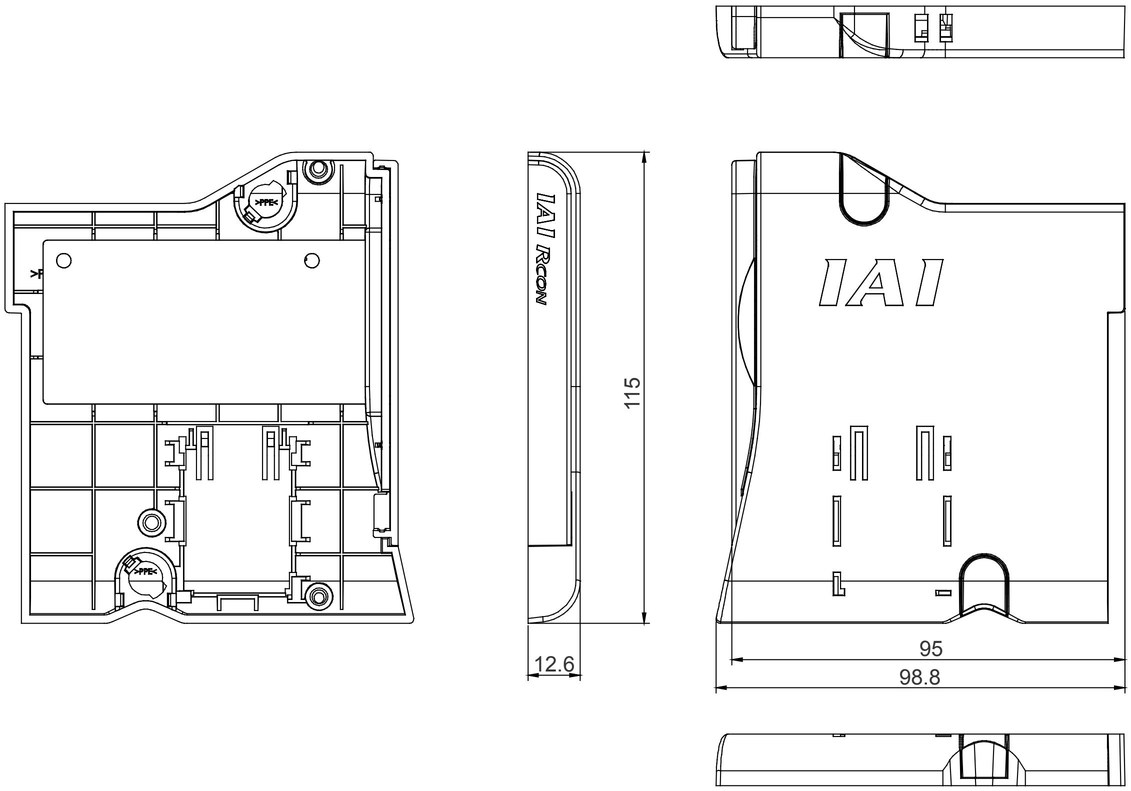
Gateway unit

Item	Specifications
External dimensions	W 30 mm x H 115 mm x D 95 mm
Weight	About 157g
External view	See figure below



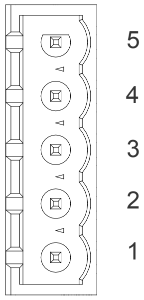
Terminal unit

Item	Specifications
External dimensions	W 12.6 mm x H 115 mm x D 95 mm
Weight	About 49g
External view	See figure below



3.5 Field Network General Specifications

CC-Link



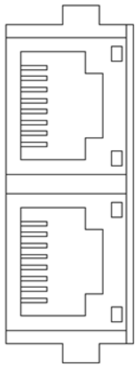
Cable connector name: MSTB2.5/5-STF-5.08 AU (Phoenix Contact)

Pin No.	Signal name	Description
1	DA	Signal line A
2	DB	Signal line B
3	DG	Digital ground
4	SLD	Connects the shield of shielded cables (This connector's 5-pin FG and the control power connector's 1 pin FG are connected internally)
5	FG	Frame ground (This connector's 4-pin SLD and the control power connector's 1 pin FG are connected internally)

LED display

Name	Panel notation	Display color	Status	Description
STATUS 0	RUN	Green	Light ON	After joining the network, refresh & poll normal reception or refresh normal reception
			Light OFF	1. Network not joined 2. Channel carrier detected 3. Timeout 4. Hardware reset in progress
STATUS 1	ERR	Orange	Light ON	1. CRC error 2. Station number setting error when reset canceled (0 or 65 stations or more, including occupied stations) 3. Baud rate setting error when reset canceled (Baud rate set to 5 or more)
			Blinking (0.4 s blinking)	Value of station number or baud rate setting changed when reset canceled
			Light OFF	1. Normal communication 2. Hardware reset in progress

CC-Link IE

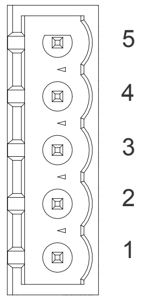


Cable/connector specifications: Ethernet ANSI/TIA/EIA-568-B Category 5e or higher, shielded
8P8C modular plug (RJ45)
* It is to be prepared by the customer.

LED display

Name	Panel notation	Display color	Status	Description
STATUS 0	MS	Green	Light ON	Normal operation
			Light OFF	Hardware error generated
		Orange	Light ON	Error generated
			Light OFF	Normal operation
STATUS 1	NS	Green	Light ON	Cyclic transmission ON
			Blinking	Cyclic transmission OFF
			Light OFF	Cyclic transmission not yet implemented, fragmented
		Orange	Light ON	Receive data error
			Light OFF	Receive data normal
LINK	–	Green	Light ON	Link up
			Light OFF	Link down
L.ER	–	Orange	Light ON	Receive data error
			Light OFF	Receive data normal

DeviceNet



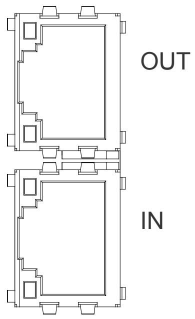
Cable connector name: MSTB2.5/5-STF-5.08 AU M (Phoenix Contact)

Pin No.	Pin color scheme	Description
1	Black	Power supply cable - side
2	Blue	Signal data Low side
3	–	Digital ground
4	White	Signal data High side
5	Red	Power supply cable + side

LED display

Name	Panel notation	Display color	Status	Description
STATUS 0	MS	Green	Light ON	Normal operation
			Blinking (1 Hz)	No configuration information, incomplete information, or device test operation required
		Orange	Light ON	Non-recoverable fault
			Blinking (1 Hz)	Recoverable fault
		Green/orange	Alternate blinking	Self-diagnosis
STATUS 1	NS	Green	Light ON	Online, connection established
			Blinking (1 Hz)	Online, connection not established
		Orange	Light ON	Fatal error
			Blinking (1 Hz)	Connection timeout
		Orange/green	Alternate blinking	Self-diagnosis
			Light OFF	Offline

EtherCAT

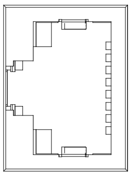


Cable/connector specifications: Ethernet ANSI/TIA/EIA-568-B Category 5 or higher, shielded
8P8C modular plug (RJ45)
* It is to be prepared by the customer.

LED display

Name	Panel notation	Display color	Status	Description
STATUS 0	ERR	Orange	Light ON	Signal component (module) error
			Blinking (continuous)	Configuration information (settings) error ON: 200 ms / OFF: 200 ms
			Blinking (2 times)	Watchdog timer/timeout ON: 200 ms x 2 / OFF: 1,000 ms
			Light OFF	Initialized status
STATUS 1	RUN	Green	Light ON	Normal operation (OPERATION) status
			Blinking (continuous)	PRE-OPERATION status ON: 200 ms / OFF: 200 ms
			Blinking (1 time)	SAFE OPERATION status ON: 200 ms / OFF: 1,000 ms
		Orange	Blinking	Signal component (module) error

EtherNet/IP

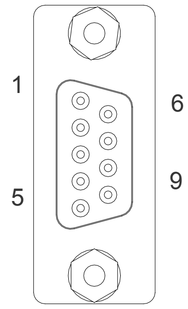


Cable/connector specifications: Ethernet ANSI/TIA/EIA-568-B Category 5 or higher, shielded
8P8C modular plug (RJ45)
* It is to be prepared by the customer.

LED display

Name	Panel notation	Display color	Status	Description
STATUS 0	MS	Green	Light ON	Normal operation
			Blinking	No configuration information, or scanner in idle status
		Orange	Light ON	Non-recoverable fault
			Blinking	Recoverable fault
STATUS 1	NS	Green	Light ON	Online, connection established
			Blinking	Online, connection not established
		Orange	Light ON	Fatal error, IP address duplication error
			Blinking	Connection timeout
		Green/orange	Light OFF	No IP address

PROFIBUS-DP



Cable side connector name: 9-pin D sub connector (male)

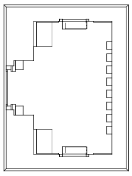
* It is to be prepared by the customer.

Pin No.	Signal name	Description
1	NC	Not connected
2	NC	Not connected
3	B-Line	Signal line B (RS-485)
4	RTS	Transmission request
5	GND	0 V (isolated)
6	+5 V	+5 V output (isolated)
7	NC	Not connected
8	A-Line	Signal line A (RS-485)
9	NC	Not connected
Housing	FG	Frame ground (control power connector 1-pin FG connected internally)

LED display

Name	Panel notation	Display color	Status	Description
STATUS 0	MS	Green	Light ON	Initialization complete
			Blinking	Initialization complete, diagnosis event found
		Orange	Light ON	Exception error
		Green/orange	Light OFF	Uninitialized
STATUS 1	NS	Green	Light ON	Online, data exchange
			Blinking	Online, clear status
		Orange	Light ON	Parameter error
			Blinking	Configuration information error
		Green/orange	Light OFF	Offline

PROFINET IO



Cable/connector specifications: Ethernet ANSI/TIA/EIA-568-B Category 5 or higher, shielded 8P8C modular plug (RJ45)
* It is to be prepared by the customer.

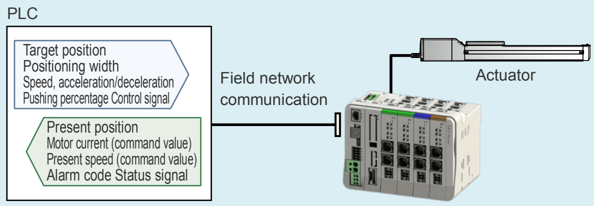
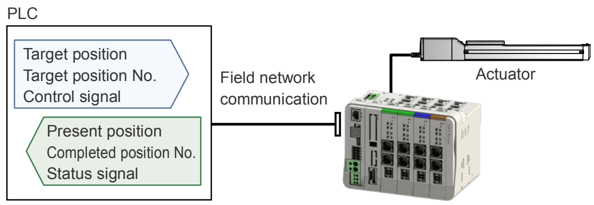
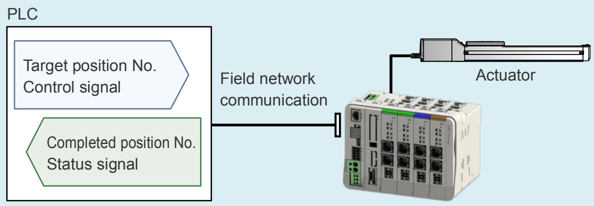
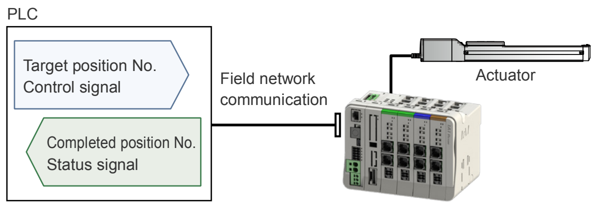
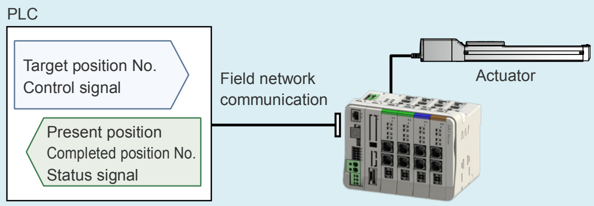
LED display

Name	Panel notation	Display color	Status	Description
STATUS 0	MS	Green	Light ON	Normal communication
			Blinking (1 time)	Network being diagnosed
			Blinking (2 times)	Engineering tool is identifying the node
		Orange	Light ON	Exception error generated (hardware failure)
			Blinking (1 time)	Settings and actual network configuration differ
			Blinking (2 times)	IP address not set
			Blinking (3 times)	Station name not set
			Blinking (4 times)	Internal error generated
		Green/orange	Light OFF	Initializing
STATUS 1	NS	Green	Light ON	Online status (normal communication: RUN)
			Blinking	Online status (STOP)
		Green/orange	Light OFF	No connection

3.6 Operation Function List

Field network control operation mode

The field network control operation mode can be selected from the following control modes. Data required for operation (target position, speed, acceleration, push current value, etc.) are written by a connected PLC or other host controller into the specified addresses.

Operation mode	Content	Overview
Direct numerical control mode	This mode allows designating the target position, speed, acceleration/deceleration, and current limit value for pushing numerically. Also, it is capable of monitoring the present position, present speed, and the command current value with 0.01mm increments.	
Simple direct mode / Positioner 1 mode	The simple direct mode can modify any of the stored target positions by numerical value. Both modes allow monitoring of the present position numerically with 0.01mm increments. Positioner 1 mode can store up to 128 points of position data, and can move to the stored position. Both modes allow monitoring of the present position numerically with 0.01mm increments.	
Positioner 2 mode	Registers up to 128 points of position data, and can stop at the registered position. This mode does not allow monitoring of the present position. This mode has less in/out data transfer volume than the Positioner 1 mode.	
Positioner 3 mode	Registers up to 128 points of position data, and can stop at the registered position. This mode does not allow monitoring of the present position. This mode has less in/out data transfer volume than the Positioner 2 mode, and controls travel with the minimum of signals.	
Positioner 5 mode	Registers up to 16 points of position data, and can stop at the registered position. This mode has less in/out data transfer volume and fewer positioning tables than the Positioner 2 mode, and allows monitoring of the present position numerically with 0.1mm increments.	

List of functions by operation mode

	Direct numerical control mode	Simple direct mode	Positioner 1 mode	Positioner 2 mode	Positioner 3 mode	Positioner 5 mode
Number of positioning points	Unlimited	128 points	128 points	128 points	128 points	16 points
Home return motion	○	○	○	○	○	○
Positioning operation	○	○	△	△	△	△
Speed, acceleration/ deceleration settings	○	△	△	△	△	△
Different acceleration and deceleration settings	×	△	△	△	△	△
Pitch feed (Incremental)	○	△	△	△	×	△
JOG operation	△	△	△	△	×	△
Position data write	×	×	○	○	×	×
Push-motion operation	○	△	△	△	△	△
Speed changes while traveling	○	△	△	△	△	△
Pausing	○	○	○	○	○	○
Zone signal output	△ (2 points)	△ (2 points)	△ (2 points)	△ (2 points)	△ (1 point)	△ (2 points)
Position zone signal output	×	△	△	△	×	×
Overload warning output	○	○	○	○	×	○
Vibration control (Note 1)	×	△	△	△	△	△
Present position reading (Note 2) (Resolution)	○ (0.01mm)	○ (0.01mm)	○ (0.01mm)	×	×	○ (Note 3) (0.1mm)

* ○: Direct setting is possible, △: Position data or parameter input is required, ×: The operation is not supported.

Note 1: This function is limited to the AC servo motor specification.

Note 2: The resolution when connecting a SCON controller to control a DD motor is 0.001 degree (0.01 degree for positioner 5 mode only).

Note 3: The maximum output value in positioner 5 mode is 3,276.7 mm (327.67 degrees for DD motor). To control the actuator in an operation range exceeding the maximum value, select a different operation mode.

3.7 Address Configuration

The RCON address configuration is the same for all driver units regardless of field network type. Addresses occupied by the network are configured differently depending on the 8-word fixed region and data region that changes with operation mode and number of axes. Each operation mode and occupied data region is as follows.
Direct numerical control mode, simple direct mode and positioner 1~3 and 5 modes can be mixed for use and the model for each axis can be selected arbitrarily.

Fixed region (8-word)

+

Data region

Direct numerical control mode (8-word) × Number of Axes	+	Simple direct mode (4-word) × Number of Axes	+	Positioner 1 mode (4-word) × Number of Axes	+	Positioner 2, 5 mode (2-word) × Number of Axes	+	Positioner 3 mode (1-word) × Number of Axes

(1) Fixed region configuration

	PLC output ⇒ RCON			RCON ⇒ PLC input		
	High byte	Low byte	Word count	High byte	Low byte	Word count
Gateway control region	Gateway control signal 0		2	Gateway status signal 0		2
	Gateway control signal 1			Gateway status signal 1		
Power supply unit region *	Not available.		6	Power supply unit status signal 0		6
	Not available.			Power supply unit status signal 1		
	Not available.			Power supply unit status signal 2		
	Not available.			Power supply unit status signal 3		
	Not available.			Power supply unit status signal 4		
	Not available.			Not available.		

* Occupied as a data region even if a power supply unit is not connected.

(2) Direct numerical control mode data region configuration

	PLC output ⇒ each axis input: High byte	PLC output ⇒ each axis input: Low byte	Word count	Each axis output ⇒ PLC input: High byte	Each axis output ⇒ PLC input: Low byte	Word count
Direct specified region	Specified position data (L) *		2	Present position data (L)) *		2
	Specified position data (H)) *			Present position data (H)) *		
	Specified positioning width (L)) *		2	Present current value (L)) *		2
	Specified positioning width (H)) *			Present current value (H)) *		
	Specified speed		1	Present speed data		1
	Specified acceleration/deceleration		1	Not available.		1
	Pushing current limit value		1	Alarm code		1
Control signal region	Control signal		1	Status signal		1

*(L) is the low word of a 2-word datum while (H) is the high word of a 2-word datum.

(3) Simple direct mode and positioner 1 mode data region configuration

	PLC output ⇒ each axis input: High byte	Low byte	Word count	Simple direct mode	Positioner 1 mode	Each axis output ⇒ PLC input: High byte	Low byte	Word count	Simple direct mode	Positioner 1 mode
Position data specified region	Specified position data (L)		2	○	x*	Present position data (L)		2	○	○
	Specified position data (H)					Present position data (H)				
Position specified region	Command position No.		1	○	○	Completed position No.		1	○	○
Control signal region	Control signal		1	○	○	Status signal		1	○	○

* Positioner 1 mode does not use the position data specified region (PLC ⇒ each axis input), but it is occupied as a data region.

(4) Positioner 2 mode data region configuration

	High byte	Low byte	Word count	High byte	Low byte	Word count
Position specified region	Command position No.		1	Completed position No.		1
Control signal region	Control signal		1	Status signal		1

(5) Positioner 3 mode data region configuration

	High byte	Low byte	Word count	High byte	Low byte	Word count
Control signal region	Control signal	Command position No.	1	Status signal	Completed position No.	1

(6) Positioner 5 mode data region configuration

	High byte	Low byte	Word count	High byte	Low byte	Word count
Position specified region	Command position No.		1	Present position data (0.1 mm increments)		1
Control signal region	Control signal		1	Status signal		1

Overall address configuration example

Shows the overall address configuration for each 4-word mode axis (simple direct/positioner 1) for 12 axes, each 8-word mode axis (direct numerical control) for 2 axes connected, or each 2-word mode axis (positioner 2/positioner 5) for 16 axes connected.
Note that CC-Link and DeviceNet are assigned with word addresses while PROFIBUS uses byte addresses.

[For CC-Link]
The following page shows a CC-Link configuration example.
Fixed 8-word region is assigned to the bit register (RX/RY), while the region for each axis is assigned to the word register (RWr/RWw).

■ CC-Link overall address configuration example (direct numerical control mode + simple direct mode/positioner 1 mode) shows direct numerical control mode connection for 2 axes and simple direct or positioner 1 mode connection for 12 axes.

PLC output ⇒ RCON / RCON ⇒ PLC input

Output register	High byte Low byte	Input register	High byte Low byte	
RY0F ~ 00	Gateway control signal 0	RX0F ~ 00	Gateway status signal 0	8 words each Fixed region
RY1F ~ 10	Gateway control signal 1	RX1F ~ 10	Gateway status signal 1	
RY2F ~ 20	(Not available)	RX2F ~ 20	Power supply unit status signal 0	
RY3F ~ 30	(Not available)	RX3F ~ 30	Power supply unit status signal 1	
RY4F ~ 40	(Not available)	RX4F ~ 40	Power supply unit status signal 2	
RY5F ~ 50	(Not available)	RX5F ~ 50	Power supply unit status signal 3	
RY6F ~ 60	(Not available)	RX6F ~ 60	Power supply unit status signal 4	
RY7F ~ 70	(Not available)	RX7F ~ 70	(Not available)	

*1 PLC master extended cyclic settings	Output register		Input register		
16-word 1x multiplier *2	RWw 00H	(Axis 0) Specified position data (L)	RWr 00H	(Axis 0) Present position data (L)	4 words each Positioner 1 /simple direct
	RWw 01H	(Axis 0) Specified position data (H)	RWr 01H	(Axis 0) Present position data (H)	
	RWw 02H	(Axis 0) Command position No.	RWr 02H	(Axis 0) Completed position No.	
	RWw 03H	(Axis 0) Control signal	RWr 03H	(Axis 0) Status signal	
	RWw 04H	(Axis 1) Specified position data (L)	RWr 04H	(Axis 1) Present position data (L)	4 words each
	RWw 05H	(Axis 1) Specified position data (H)	RWr 05H	(Axis 1) Present position data (H)	
	RWw 06H	(Axis 1) Command position No.	RWr 06H	(Axis 1) Completed position No.	
	RWw 07H	(Axis 1) Control signal	RWr 07H	(Axis 1) Status signal	
	RWw 08H	(Axis 2) Specified position data (L)	RWr 08H	(Axis 2) Present position data (L)	4 words each
	RWw 09H	(Axis 2) Specified position data (H)	RWr 09H	(Axis 2) Present position data (H)	
	RWw 0AH	(Axis 2) Command position No.	RWr 0AH	(Axis 2) Completed position No.	
	RWw 0BH	(Axis 2) Control signal	RWr 0BH	(Axis 2) Status signal	
	RWw 0CH	(Axis 3) Specified position data (L)	RWr 0CH	(Axis 3) Present position data (L)	4 words each
	RWw 0DH	(Axis 3) Specified position data (H)	RWr 0DH	(Axis 3) Present position data (H)	
	RWw 0EH	(Axis 3) Command position No.	RWr 0EH	(Axis 3) Completed position No.	
	RWw 0FH	(Axis 3) Control signal	RWr 0FH	(Axis 3) Status signal	
32-word 4x multiplier setting 2 stations	:	:		:	4 words each
	RWw 1FH	(Axis 7) Control signal	RWr 1FH	(Axis 7) Status signal	
64-word 8x multiplier	:	:	:	:	
	RWw 2FH	(Axis 11) Control signal	RWr 2FH	(Axis 11) Status signal	
	RWw 30H	(Axis 12) Specified position data (L)	RWr 30H	(Axis 12) Present position data (L)	8 words each Direct numerical mode
	RWw 31H	(Axis 12) Specified position data (H)	RWr 31H	(Axis 12) Present position data (H)	
	RWw 32H	(Axis 12) Specified positioning width (L)	RWr 32H	(Axis 12) Present current value (L)	
	RWw 33H	(Axis 12) Specified positioning width (H)	RWr 33H	(Axis 12) Present current value (H)	
	RWw 34H	(Axis 12) Specified speed	RWr 34H	(Axis 12) Present speed data	
	RWw 35H	(Axis 12) Specified acceleration/deceleration	RWr 35H	(Not available)	
	RWw 36H	(Axis 12) Pushing current limit value	RWr 36H	(Axis 12) Alarm code	
	RWw 37H	(Axis 12) Control signal	RWr 37H	(Axis 12) Status signal	
	RWw 38H	(Axis 13) Specified position data (L)	RWr 38H	(Axis 13) Present position data (L)	8 words each
	RWw 39H	(Axis 13) Specified position data (H)	RWr 39H	(Axis 13) Present position data (H)	
	RWw 3AH	(Axis 13) Specified positioning width (L)	RWr 3AH	(Axis 13) Present current value (L)	
	RWw 3BH	(Axis 13) Specified positioning width (H)	RWr 3BH	(Axis 13) Present current value (H)	
	RWw 3CH	(Axis 13) Specified speed	RWr 3CH	(Axis 13) Present speed data	
	RWw 3DH	(Axis 13) Specified acceleration/deceleration	RWr 3DH	(Not available)	
	RWw 3EH	(Axis 13) Pushing current limit value	RWr 3EH	(Axis 13) Alarm code	
	RWw 3FH	(Axis 13) Control signal	RWr 3FH	(Axis 13) Status signal	

*1 Extended cyclic settings are performed based on the occupancy information displayed with the gateway parameter configuration tool.

*2 Operation is also possible with CC-Link Ver.1.10 if extended cyclic 1x multiplier settings (4 stations occupied) are within the usable range.

■ CC-Link overall address configuration example (positioner 2 mode)

An example showing positioner 2 mode connection for 16 axes.

PLC output ⇒ RCON / RCON ⇒ PLC input

Output register	High byte / Low byte	Input register	High byte / Low byte
RY0F ~ 00	Gateway control signal 0	RX0F ~ 00	Gateway status signal 0
RY1F ~ 10	Gateway control signal 1	RX1F ~ 10	Gateway status signal 1
RY2F ~ 20	(Not available)	RX2F ~ 20	Power supply unit status signal 0
RY3F ~ 30	(Not available)	RX3F ~ 30	Power supply unit status signal 1
RY4F ~ 40	(Not available)	RX4F ~ 40	Power supply unit status signal 2
RY5F ~ 50	(Not available)	RX5F ~ 50	Power supply unit status signal 3
RY6F ~ 60	(Not available)	RX6F ~ 60	Power supply unit status signal 4
RY7F ~ 70	(Not available)	RX7F ~ 70	(Not available)

8 words each
Fixed region

*1 PLC master extended cyclic settings	Output register		Input register	
	RWw 00H	(Axis 0) Command position No.	RWr 00H	(Axis 0) Completed position No.
	RWw 01H	(Axis 0) Control signal	RWr 01H	(Axis 0) Status signal
	RWw 02H	(Axis 1) Command position No.	RWr 02H	(Axis 1) Completed position No.
	RWw 03H	(Axis 1) Control signal	RWr 03H	(Axis 1) Status signal
	RWw 04H	(Axis 2) Command position No.	RWr 04H	(Axis 2) Completed position No.
	RWw 05H	(Axis 2) Control signal	RWr 05H	(Axis 2) Status signal
	RWw 06H	(Axis 3) Command position No.	RWr 06H	(Axis 3) Completed position No.
	RWw 07H	(Axis 3) Control signal	RWr 07H	(Axis 3) Status signal
	RWw 08H	(Axis 4) Command position No.	RWr 08H	(Axis 4) Completed position No.
	RWw 09H	(Axis 4) Control signal	RWr 09H	(Axis 4) Status signal
16-word	RWw 0AH	(Axis 5) Command position No.	RWr 0AH	(Axis 5) Completed position No.
	RWw 0BH	(Axis 5) Control signal	RWr 0BH	(Axis 5) Status signal
1x multiplier setting 4	RWw 0CH	(Axis 6) Command position No.	RWr 0CH	(Axis 6) Completed position No.
*2	RWw 0DH	(Axis 6) Control signal	RWr 0DH	(Axis 6) Status signal
	RWw 0EH	(Axis 7) Command position No.	RWr 0EH	(Axis 7) Completed position No.
	RWw 0FH	(Axis 7) Control signal	RWr 0FH	(Axis 7) Status signal
	RWw 10H	(Axis 8) Command position No.	RWr 10H	(Axis 8) Completed position No.
	RWw 11H	(Axis 8) Control signal	RWr 11H	(Axis 8) Status signal
	RWw 12H	(Axis 9) Command position No.	RWr 12H	(Axis 9) Completed position No.
	RWw 13H	(Axis 9) Control signal	RWr 13H	(Axis 9) Status signal
	RWw 14H	(Axis 10) Command position No.	RWr 14H	(Axis 10) Completed position No.
	RWw 15H	(Axis 10) Control signal	RWr 15H	(Axis 10) Status signal
	RWw 16H	(Axis 11) Command position No.	RWr 16H	(Axis 11) Completed position No.
	RWw 17H	(Axis 11) Control signal	RWr 17H	(Axis 11) Status signal
	RWw 18H	(Axis 12) Command position No.	RWr 18H	(Axis 12) Completed position No.
	RWw 19H	(Axis 12) Control signal	RWr 19H	(Axis 12) Status signal
32-word	RWw 1AH	(Axis 13) Command position No.	RWr 1AH	(Axis 13) Completed position No.
	RWw 1BH	(Axis 13) Control signal	RWr 1BH	(Axis 13) Status signal
4x multiplier setting 2	RWw 1CH	(Axis 14) Command position No.	RWr 1CH	(Axis 14) Completed position No.
	RWw 1DH	(Axis 14) Control signal	RWr 1DH	(Axis 14) Status signal
	RWw 1EH	(Axis 15) Command position No.	RWr 1EH	(Axis 15) Completed position No.
	RWw 1FH	(Axis 15) Control signal	RWr 1FH	(Axis 15) Status signal

2 words each

*1 Extended cyclic settings are performed based on the occupancy information displayed with the gateway parameter configuration tool.

*2 Operation is also possible with CC-Link Ver.1.10 if extended cyclic 1x multiplier settings (4 stations occupied) are within the usable range.

[For CC-Link IE]

Fixed 8-word region is assigned to the bit register (RX/RY), while the region for each axis is assigned to the word register (RWr/RWw).

■ CC-Link IE overall address configuration example (direct numerical control mode + simple direct mode/positioner 1 mode) shows direct numerical control mode connection for 2 axes and simple direct or positioner 1 mode connection for 12 axes.

PLC output ⇒ RCON / RCON ⇒ PLC input

Output register	High byte / Low byte	Input register	High byte / Low byte	
RY0F ~ 00	Gateway control signal 0	RX0F ~ 00	Gateway status signal 0	8 words each Fixed region
RY1F ~ 10	Gateway control signal 1	RX1F ~ 10	Gateway status signal 1	
RY2F ~ 20	(Not available)	RX2F ~ 20	Power supply unit status signal 0	
RY3F ~ 30	(Not available)	RX3F ~ 30	Power supply unit status signal 1	
RY4F ~ 40	(Not available)	RX4F ~ 40	Power supply unit status signal 2	
RY5F ~ 50	(Not available)	RX5F ~ 50	Power supply unit status signal 3	
RY6F ~ 60	(Not available)	RX6F ~ 60	Power supply unit status signal 4	
RY7F ~ 70	(Not available)	RX7F ~ 70	(Not available)	

Output register		Input register		
RWw 00H	(Axis 0) Specified position data (L)	RWr 00H	(Axis 0) Present position data (L)	4 words each Positioner 1 /simple direct
RWw 01H	(Axis 0) Specified position data (H)	RWr 01H	(Axis 0) Present position data (H)	
RWw 02H	(Axis 0) Command position No.	RWr 02H	(Axis 0) Completed position No.	
RWw 03H	(Axis 0) Control signal	RWr 03H	(Axis 0) Status signal	
RWw 04H	(Axis 1) Specified position data (L)	RWr 04H	(Axis 1) Present position data (L)	4 words each
RWw 05H	(Axis 1) Specified position data (H)	RWr 05H	(Axis 1) Present position data (H)	
RWw 06H	(Axis 1) Command position No.	RWr 06H	(Axis 1) Completed position No.	
RWw 07H	(Axis 1) Control signal	RWr 07H	(Axis 1) Status signal	
RWw 08H	(Axis 2) Specified position data (L)	RWr 08H	(Axis 2) Present position data (L)	4 words each
RWw 09H	(Axis 2) Specified position data (H)	RWr 09H	(Axis 2) Present position data (H)	
RWw 0AH	(Axis 2) Command position No.	RWr 0AH	(Axis 2) Completed position No.	
RWw 0BH	(Axis 2) Control signal	RWr 0BH	(Axis 2) Status signal	
RWw 0CH	(Axis 3) Specified position data (L)	RWr 0CH	(Axis 3) Present position data (L)	4 words each
RWw 0DH	(Axis 3) Specified position data (H)	RWr 0DH	(Axis 3) Present position data (H)	
RWw 0EH	(Axis 3) Command position No.	RWr 0EH	(Axis 3) Completed position No.	
RWw 0FH	(Axis 3) Control signal	RWr 0FH	(Axis 3) Status signal	
⋮	⋮		⋮	4 words each
RWw 1FH	(Axis 7) Control signal	RWr 1FH	(Axis 7) Status signal	
⋮	⋮	⋮	⋮	
RWw 2FH	(Axis 11) Control signal	RWr 2FH	(Axis 11) Status signal	
RWw 30H	(Axis 12) Specified position data (L)	RWr 30H	(Axis 12) Present position data (L)	8 words each Direct numerical mode
RWw 31H	(Axis 12) Specified position data (H)	RWr 31H	(Axis 12) Present position data (H)	
RWw 32H	(Axis 12) Specified positioning width (L)	RWr 32H	(Axis 12) Present current value (L)	
RWw 33H	(Axis 12) Specified positioning width (H)	RWr 33H	(Axis 12) Present current value (H)	
RWw 34H	(Axis 12) Specified speed	RWr 34H	(Axis 12) Present speed data	
RWw 35H	(Axis 12) Specified acceleration/deceleration	RWr 35H	(Not available)	
RWw 36H	(Axis 12) Pushing current limit value	RWr 36H	(Axis 12) Alarm code	
RWw 37H	(Axis 12) Control signal	RWr 37H	(Axis 12) Status signal	
RWw 38H	(Axis 13) Specified position data (L)	RWr 38H	(Axis 13) Present position data (L)	8 words each
RWw 39H	(Axis 13) Specified position data (H)	RWr 39H	(Axis 13) Present position data (H)	
RWw 3AH	(Axis 13) Specified positioning width (L)	RWr 3AH	(Axis 13) Present current value (L)	
RWw 3BH	(Axis 13) Specified positioning width (H)	RWr 3BH	(Axis 13) Present current value (H)	
RWw 3CH	(Axis 13) Specified speed	RWr 3CH	(Axis 13) Present speed data	
RWw 3DH	(Axis 13) Specified acceleration/deceleration	RWr 3DH	(Not available)	
RWw 3EH	(Axis 13) Pushing current limit value	RWr 3EH	(Axis 13) Alarm code	
RWw 3FH	(Axis 13) Control signal	RWr 3FH	(Axis 13) Status signal	

Specifications Section

Chapter 3 Gateway Unit

■ CC-Link IE overall address configuration example (positioner 2 mode)

An example showing positioner 2 mode connection for 16 axes.

PLC output ⇒ RCON

Output register	High byte Low byte
RY0F ~ 00	Gateway control signal 0
RY1F ~ 10	Gateway control signal 1
RY2F ~ 20	(Not available)
RY3F ~ 30	(Not available)
RY4F ~ 40	(Not available)
RY5F ~ 50	(Not available)
RY6F ~ 60	(Not available)
RY7F ~ 70	(Not available)

RCON ⇒ PLC input

Input register	High byte Low byte
RX0F ~ 00	Gateway status signal 0
RX1F ~ 10	Gateway status signal 1
RX2F ~ 20	Power supply unit status signal 0
RX3F ~ 30	Power supply unit status signal 1
RX4F ~ 40	Power supply unit status signal 2
RX5F ~ 50	Power supply unit status signal 3
RX6F ~ 60	Power supply unit status signal 4
RX7F ~ 70	(Not available)

8 words each
Fixed region

Output register	
RWw 00H	(Axis 0) Command position No.
RWw 01H	(Axis 0) Control signal
RWw 02H	(Axis 1) Command position No.
RWw 03H	(Axis 1) Control signal
RWw 04H	(Axis 2) Command position No.
RWw 05H	(Axis 2) Control signal
RWw 06H	(Axis 3) Command position No.
RWw 07H	(Axis 3) Control signal
RWw 08H	(Axis 4) Command position No.
RWw 09H	(Axis 4) Control signal
RWw 0AH	(Axis 5) Command position No.
RWw 0BH	(Axis 5) Control signal
RWw 0CH	(Axis 6) Command position No.
RWw 0DH	(Axis 6) Control signal
RWw 0EH	(Axis 7) Command position No.
RWw 0FH	(Axis 7) Control signal
RWw 10H	(Axis 8) Command position No.
RWw 11H	(Axis 8) Control signal
RWw 12H	(Axis 9) Command position No.
RWw 13H	(Axis 9) Control signal
RWw 14H	(Axis 10) Command position No.
RWw 15H	(Axis 10) Control signal
RWw 16H	(Axis 11) Command position No.
RWw 17H	(Axis 11) Control signal
RWw 18H	(Axis 12) Command position No.
RWw 19H	(Axis 12) Control signal
RWw 1AH	(Axis 13) Command position No.
RWw 1BH	(Axis 13) Control signal
RWw 1CH	(Axis 14) Command position No.
RWw 1DH	(Axis 14) Control signal
RWw 1EH	(Axis 15) Command position No.
RWw 1FH	(Axis 15) Control signal

Input register	
RWr 00H	(Axis 0) Completed position No.
RWr 01H	(Axis 0) Status signal
RWr 02H	(Axis 1) Completed position No.
RWr 03H	(Axis 1) Status signal
RWr 04H	(Axis 2) Completed position No.
RWr 05H	(Axis 2) Status signal
RWr 06H	(Axis 3) Completed position No.
RWr 07H	(Axis 3) Status signal
RWr 08H	(Axis 4) Completed position No.
RWr 09H	(Axis 4) Status signal
RWr 0AH	(Axis 5) Completed position No.
RWr 0BH	(Axis 5) Status signal
RWr 0CH	(Axis 6) Completed position No.
RWr 0DH	(Axis 6) Status signal
RWr 0EH	(Axis 7) Completed position No.
RWr 0FH	(Axis 7) Status signal
RWr 10H	(Axis 8) Completed position No.
RWr 11H	(Axis 8) Status signal
RWr 12H	(Axis 9) Completed position No.
RWr 13H	(Axis 9) Status signal
RWr 14H	(Axis 10) Completed position No.
RWr 15H	(Axis 10) Status signal
RWr 16H	(Axis 11) Completed position No.
RWr 17H	(Axis 11) Status signal
RWr 18H	(Axis 12) Completed position No.
RWr 19H	(Axis 12) Status signal
RWr 1AH	(Axis 13) Completed position No.
RWr 1BH	(Axis 13) Status signal
RWr 1CH	(Axis 14) Completed position No.
RWr 1DH	(Axis 14) Status signal
RWr 1EH	(Axis 15) Completed position No.
RWr 1FH	(Axis 15) Status signal

2 words each

[For DeviceNet]

■ DeviceNet overall address configuration example (direct numerical control mode + simple direct mode/positioner 1 mode)
Shows direct numerical control mode connection for 2 axes and simple direct or positioner 1 mode connection for 12 axes.

Relative CH *	PLC output ⇒ RCON (High byte / Low byte)	RCON ⇒ PLC input (High byte / Low byte)	
0	Gateway control signal 0	Gateway status signal 0	8 words each Fixed region
1	Gateway control signal 1	Gateway status signal 1	
2	(Not available)	Power supply unit status signal 0	
3	(Not available)	Power supply unit status signal 1	
4	(Not available)	Power supply unit status signal 2	
5	(Not available)	Power supply unit status signal 3	
6	(Not available)	Power supply unit status signal 4	
7	(Not available)	(Not available)	
8	(Axis 0) Specified position data (L)	(Axis 0) Present position data (L)	4 words each Positioner 1 /simple direct mode
9	(Axis 0) Specified position data (H)	(Axis 0) Present position data (H)	
10	(Axis 0) Command position No.	(Axis 0) Completed position No.	
11	(Axis 0) Control signal	(Axis 0) Status signal	
12	(Axis 1) Specified position data (L)	(Axis 1) Present position data (L)	4 words each
13	(Axis 1) Specified position data (H)	(Axis 1) Present position data (H)	
14	(Axis 1) Command position No.	(Axis 1) Completed position No.	
15	(Axis 1) Control signal	(Axis 1) Status signal	
16	(Axis 2) Specified position data (L)	(Axis 2) Present position data (L)	4 words each
17	(Axis 2) Specified position data (H)	(Axis 2) Present position data (H)	
18	(Axis 2) Command position No.	(Axis 2) Completed position No.	
19	(Axis 2) Control signal	(Axis 2) Status signal	
20	(Axis 3) Specified position data (L)	(Axis 3) Present position data (L)	4 words each
21	(Axis 3) Specified position data (H)	(Axis 3) Present position data (H)	
22	(Axis 3) Command position No.	(Axis 3) Completed position No.	
23	(Axis 3) Control signal	(Axis 3) Status signal	
⋮	⋮	⋮	4 words each
39	(Axis 7) Control signal	(Axis 7) Status signal	
⋮	⋮	⋮	
55	(Axis 11) Control signal	(Axis 11) Status signal	
56	(Axis 12) Specified position data (L)	(Axis 12) Present position data (L)	8 words each Direct numerical mode
57	(Axis 12) Specified position data (H)	(Axis 12) Present position data (H)	
58	(Axis 12) Specified positioning width (L)	(Axis 12) Present current value (L)	
59	(Axis 12) Specified positioning width (H)	(Axis 12) Present current value (H)	
60	(Axis 12) Specified speed	(Axis 12) Present speed data	
61	(Axis 12) Specified acceleration/deceleration	(Not available)	
62	(Axis 12) Pushing current limit value	(Axis 12) Alarm code	
63	(Axis 12) Control signal	(Axis 12) Status signal	
64	(Axis 13) Specified position data (L)	(Axis 13) Present position data (L)	8 words each
65	(Axis 13) Specified position data (H)	(Axis 13) Present position data (H)	
66	(Axis 13) Specified positioning width (L)	(Axis 13) Present current value (L)	
67	(Axis 13) Specified positioning width (H)	(Axis 13) Present current value (H)	
68	(Axis 13) Specified speed	(Axis 13) Present speed data	
69	(Axis 13) Specified acceleration/deceleration	(Not available)	
70	(Axis 13) Pushing current limit value	(Axis 13) Alarm code	
71	(Axis 13) Control signal	(Axis 13) Status signal	

* Relative CH is the CH number relative to the gateway head CH

■ DeviceNet overall address configuration example (positioner 2 mode)

An example showing positioner 2 mode connection for 16 axes.

Relative CH *	PLC output ⇒ RCON (High byte / Low byte)	RCON ⇒ PLC input (High byte / Low byte)	
0	Gateway control signal 0	Gateway status signal 0	8 words each Fixed region
1	Gateway control signal 1	Gateway status signal 1	
2	(Not available)	Power supply unit status signal 0	
3	(Not available)	Power supply unit status signal 1	
4	(Not available)	Power supply unit status signal 2	
5	(Not available)	Power supply unit status signal 3	
6	(Not available)	Power supply unit status signal 4	
7	(Not available)	(Not available)	
8	(Axis 0) Command position No.	(Axis 0) Completed position No.	2 words each
9	(Axis 0) Control signal	(Axis 0) Status signal	
10	(Axis 1) Command position No.	(Axis 1) Completed position No.	
11	(Axis 1) Control signal	(Axis 1) Status signal	
12	(Axis 2) Command position No.	(Axis 2) Completed position No.	
13	(Axis 2) Control signal	(Axis 2) Status signal	
14	(Axis 3) Command position No.	(Axis 3) Completed position No.	
15	(Axis 3) Control signal	(Axis 3) Status signal	
16	(Axis 4) Command position No.	(Axis 4) Completed position No.	
17	(Axis 4) Control signal	(Axis 4) Status signal	
18	(Axis 5) Command position No.	(Axis 5) Completed position No.	
19	(Axis 5) Control signal	(Axis 5) Status signal	
20	(Axis 6) Command position No.	(Axis 6) Completed position No.	
21	(Axis 6) Control signal	(Axis 6) Status signal	
22	(Axis 7) Command position No.	(Axis 7) Completed position No.	
23	(Axis 7) Control signal	(Axis 7) Status signal	
24	(Axis 8) Command position No.	(Axis 8) Completed position No.	
25	(Axis 8) Control signal	(Axis 8) Status signal	
26	(Axis 9) Command position No.	(Axis 9) Completed position No.	
27	(Axis 9) Control signal	(Axis 9) Status signal	
28	(Axis 10) Command position No.	(Axis 10) Completed position No.	
29	(Axis 10) Control signal	(Axis 10) Status signal	
30	(Axis 11) Command position No.	(Axis 11) Completed position No.	
31	(Axis 11) Control signal	(Axis 11) Status signal	
32	(Axis 12) Command position No.	(Axis 12) Completed position No.	
33	(Axis 12) Control signal	(Axis 12) Status signal	
34	(Axis 13) Command position No.	(Axis 13) Completed position No.	
35	(Axis 13) Control signal	(Axis 13) Status signal	
36	(Axis 14) Command position No.	(Axis 14) Completed position No.	
37	(Axis 14) Control signal	(Axis 14) Status signal	
38	(Axis 15) Command position No.	(Axis 15) Completed position No.	
39	(Axis 15) Control signal	(Axis 15) Status signal	

* Relative CH is the CH number relative to the gateway head CH

[For PROFIBUS-DP, EtherNet/IP, EtherCAT]

■ Overall address configuration example (direct numerical control mode + simple direct mode/positioner 1 mode)

Shows direct numerical control mode connection for 2 axes and simple direct or positioner 1 mode connection for 12 axes.

Relative byte *	PLC output ⇒ RCON High byte / Low byte	RCON ⇒ PLC input High byte / Low byte	
0	Gateway control signal 0	Gateway status signal 0	8 words each Fixed region
2	Gateway control signal 1	Gateway status signal 1	
4	(Not available)	Power supply unit status signal 0	
6	(Not available)	Power supply unit status signal 1	
8	(Not available)	Power supply unit status signal 2	
10	(Not available)	Power supply unit status signal 3	
12	(Not available)	Power supply unit status signal 4	
14	(Not available)	(Not available)	
16	(Axis 0) Specified position data (L)	(Axis 0) Present position data (L)	4 words each Positioner 1 /simple direct mode
18	(Axis 0) Specified position data (H)	(Axis 0) Present position data (H)	
20	(Axis 0) Command position No.	(Axis 0) Completed position No.	
22	(Axis 0) Control signal	(Axis 0) Status signal	
24	(Axis 1) Specified position data (L)	(Axis 1) Present position data (L)	4 words each
26	(Axis 1) Specified position data (H)	(Axis 1) Present position data (H)	
28	(Axis 1) Command position No.	(Axis 1) Completed position No.	
30	(Axis 1) Control signal	(Axis 1) Status signal	
32	(Axis 2) Specified position data (L)	(Axis 2) Present position data (L)	4 words each
34	(Axis 2) Specified position data (H)	(Axis 2) Present position data (H)	
36	(Axis 2) Command position No.	(Axis 2) Completed position No.	
38	(Axis 2) Control signal	(Axis 2) Status signal	
40	(Axis 3) Specified position data (L)	(Axis 3) Present position data (L)	4 words each
42	(Axis 3) Specified position data (H)	(Axis 3) Present position data (H)	
44	(Axis 3) Command position No.	(Axis 3) Completed position No.	
46	(Axis 3) Control signal	(Axis 3) Status signal	
⋮	⋮	⋮	4 words each
78	(Axis 7) Control signal	(Axis 7) Status signal	
⋮	⋮	⋮	
110	(Axis 11) Control signal	(Axis 11) Status signal	
112	(Axis 12) Specified position data (L)	(Axis 12) Present position data (L)	8 words each Direct numerical mode
114	(Axis 12) Specified position data (H)	(Axis 12) Present position data (H)	
116	(Axis 12) Specified positioning width (L)	(Axis 12) Present current value (L)	
118	(Axis 12) Specified positioning width (H)	(Axis 12) Present current value (H)	
120	(Axis 12) Specified speed	(Axis 12) Present speed data	
122	(Axis 12) Specified acceleration/deceleration	(Not available)	
124	(Axis 12) Pushing current limit value	(Axis 12) Alarm code	
126	(Axis 12) Control signal	(Axis 12) Status signal	
128	(Axis 13) Specified position data (L)	(Axis 13) Present position data (L)	8 words each
130	(Axis 13) Specified position data (H)	(Axis 13) Present position data (H)	
132	(Axis 13) Specified positioning width (L)	(Axis 13) Present current value (L)	
134	(Axis 13) Specified positioning width (H)	(Axis 13) Present current value (H)	
136	(Axis 13) Specified speed	(Axis 13) Present speed data	
138	(Axis 13) Specified acceleration/deceleration	(Not available)	
140	(Axis 13) Pushing current limit value	(Axis 13) Alarm code	
142	(Axis 13) Control signal	(Axis 13) Status signal	

* Relative byte is the byte address relative to the gateway head

■ Overall address configuration example (positioner 2 mode)

An example showing positioner 2 mode connection for 16 axes.

	PLC output ⇒ RCON		RCON ⇒ PLC input		
Relative byte *	High byte	Low byte	High byte	Low byte	
0	Gateway control signal 0		Gateway status signal 0		8 words each Fixed region
2	Gateway control signal 1		Gateway status signal 1		
4	(Not available)		Power supply unit status signal 0		
6	(Not available)		Power supply unit status signal 1		
8	(Not available)		Power supply unit status signal 2		
10	(Not available)		Power supply unit status signal 3		
12	(Not available)		Power supply unit status signal 4		
14	(Not available)		(Not available)		
16	(Axis 0) Command position No.		(Axis 0) Completed position No.		2 words each
18	(Axis 0) Control signal		(Axis 0) Status signal		
20	(Axis 1) Command position No.		(Axis 1) Completed position No.		
22	(Axis 1) Control signal		(Axis 1) Status signal		
24	(Axis 2) Command position No.		(Axis 2) Completed position No.		
26	(Axis 2) Control signal		(Axis 2) Status signal		
28	(Axis 3) Command position No.		(Axis 3) Completed position No.		
30	(Axis 3) Control signal		(Axis 3) Status signal		
32	(Axis 4) Command position No.		(Axis 4) Completed position No.		
34	(Axis 4) Control signal		(Axis 4) Status signal		
36	(Axis 5) Command position No.		(Axis 5) Completed position No.		
38	(Axis 5) Control signal		(Axis 5) Status signal		
40	(Axis 6) Command position No.		(Axis 6) Completed position No.		
42	(Axis 6) Control signal		(Axis 6) Status signal		
44	(Axis 7) Command position No.		(Axis 7) Completed position No.		
46	(Axis 7) Control signal		(Axis 7) Status signal		
48	(Axis 8) Command position No.		(Axis 8) Completed position No.		
50	(Axis 8) Control signal		(Axis 8) Status signal		
52	(Axis 9) Command position No.		(Axis 9) Completed position No.		
54	(Axis 9) Control signal		(Axis 9) Status signal		
56	(Axis 10) Command position No.		(Axis 10) Completed position No.		
58	(Axis 10) Control signal		(Axis 10) Status signal		
60	(Axis 11) Command position No.		(Axis 11) Completed position No.		
62	(Axis 11) Control signal		(Axis 11) Status signal		
64	(Axis 12) Command position No.		(Axis 12) Completed position No.		
66	(Axis 12) Control signal		(Axis 12) Status signal		
68	(Axis 13) Command position No.		(Axis 13) Completed position No.		
70	(Axis 13) Control signal		(Axis 13) Status signal		
72	(Axis 14) Command position No.		(Axis 14) Completed position No.		
74	(Axis 14) Control signal		(Axis 14) Status signal		
76	(Axis 15) Command position No.		(Axis 15) Completed position No.		
78	(Axis 15) Control signal		(Axis 15) Status signal		

* Relative byte is the byte address relative to the gateway head

[For PROFINET-IO]

■ PROFINET-IO overall address configuration example (direct numerical control mode + simple direct mode/positioner 1 mode)
Shows direct numerical control mode connection for 2 axes and simple direct or positioner 1 mode connection for 12 axes.

4-word Module count	PLC output ⇒ RCON (High byte / Low byte)	RCON ⇒ PLC input (High byte / Low byte)	
1	Gateway control signal 0	Gateway status signal 0	8 words each Fixed region
	Gateway control signal 1	Gateway status signal 1	
	(Not available)	Power supply unit status signal 0	
	(Not available)	Power supply unit status signal 1	
2	(Not available)	Power supply unit status signal 2	
	(Not available)	Power supply unit status signal 3	
	(Not available)	Power supply unit status signal 4	
	(Not available)	(Not available)	
3	(Axis 0) Specified position data (L)	(Axis 0) Present position data (L)	4 words each Positioner 1 /simple direct mode
	(Axis 0) Specified position data (H)	(Axis 0) Present position data (H)	
	(Axis 0) Command position No.	(Axis 0) Completed position No.	
	(Axis 0) Control signal	(Axis 0) Status signal	
4	(Axis 1) Specified position data (L)	(Axis 1) Present position data (L)	4 words each
	(Axis 1) Specified position data (H)	(Axis 1) Present position data (H)	
	(Axis 1) Command position No.	(Axis 1) Completed position No.	
	(Axis 1) Control signal	(Axis 1) Status signal	
5	(Axis 2) Specified position data (L)	(Axis 2) Present position data (L)	4 words each
	(Axis 2) Specified position data (H)	(Axis 2) Present position data (H)	
	(Axis 2) Command position No.	(Axis 2) Completed position No.	
	(Axis 2) Control signal	(Axis 2) Status signal	
6	(Axis 3) Specified position data (L)	(Axis 3) Present position data (L)	4 words each
	(Axis 3) Specified position data (H)	(Axis 3) Present position data (H)	
	(Axis 3) Command position No.	(Axis 3) Completed position No.	
	(Axis 3) Control signal	(Axis 3) Status signal	
⋮	⋮	⋮	4 words each
14	(Axis 11) Specified position data (L)	(Axis 11) Present position data (L)	4 words each
	(Axis 11) Specified position data (H)	(Axis 11) Present position data (H)	
	(Axis 11) Command position No.	(Axis 11) Completed position No.	
	(Axis 11) Control signal	(Axis 11) Status signal	
15	(Axis 12) Specified position data (L)	(Axis 12) Present position data (L)	8 words each Direct numerical mode
	(Axis 12) Specified position data (H)	(Axis 12) Present position data (H)	
	(Axis 12) Specified positioning width (L)	(Axis 12) Present current value (L)	
	(Axis 12) Specified positioning width (H)	(Axis 12) Present current value (H)	
16	(Axis 12) Specified speed	(Axis 12) Present speed data	
	(Axis 12) Specified acceleration/deceleration	(Not available)	
	(Axis 12) Pushing current limit value	(Axis 12) Alarm code	
	(Axis 12) Control signal	(Axis 12) Status signal	
17	(Axis 13) Specified position data (L)	(Axis 13) Present position data (L)	8 words each
	(Axis 13) Specified position data (H)	(Axis 13) Present position data (H)	
	(Axis 13) Specified positioning width (L)	(Axis 13) Present current value (L)	
	(Axis 13) Specified positioning width (H)	(Axis 13) Present current value (H)	
18	(Axis 13) Specified speed	(Axis 13) Present speed data	
	(Axis 13) Specified acceleration/deceleration	(Not available)	
	(Axis 13) Pushing current limit value	(Axis 13) Alarm code	
	(Axis 13) Control signal	(Axis 13) Status signal	

■ PROFINET-IO overall address configuration example (positioner 2 mode)

An example showing positioner 2 mode connection for 16 axes.

4-word Module count	PLC output ⇒ RCON (High byte / Low byte)	RCON ⇒ PLC input (High byte / Low byte)	
1	Gateway control signal 0	Gateway status signal 0	8 words each Fixed region
	Gateway control signal 1	Gateway status signal 1	
	(Not available)	Power supply unit status signal 0	
	(Not available)	Power supply unit status signal 1	
2	(Not available)	Power supply unit status signal 2	
	(Not available)	Power supply unit status signal 3	
	(Not available)	Power supply unit status signal 4	
	(Not available)	(Not available)	
3	(Axis 0) Command position No.	(Axis 0) Completed position No.	2 words each
	(Axis 0) Control signal	(Axis 0) Status signal	
	(Axis 1) Command position No.	(Axis 1) Completed position No.	
	(Axis 1) Control signal	(Axis 1) Status signal	
4	(Axis 2) Command position No.	(Axis 2) Completed position No.	
	(Axis 2) Control signal	(Axis 2) Status signal	
	(Axis 3) Command position No.	(Axis 3) Completed position No.	
	(Axis 3) Control signal	(Axis 3) Status signal	
5	(Axis 4) Command position No.	(Axis 4) Completed position No.	
	(Axis 4) Control signal	(Axis 4) Status signal	
	(Axis 5) Command position No.	(Axis 5) Completed position No.	
	(Axis 5) Control signal	(Axis 5) Status signal	
6	(Axis 6) Command position No.	(Axis 6) Completed position No.	
	(Axis 6) Control signal	(Axis 6) Status signal	
	(Axis 7) Command position No.	(Axis 7) Completed position No.	
	(Axis 7) Control signal	(Axis 7) Status signal	
7	(Axis 8) Command position No.	(Axis 8) Completed position No.	
	(Axis 8) Control signal	(Axis 8) Status signal	
	(Axis 9) Command position No.	(Axis 9) Completed position No.	
	(Axis 9) Control signal	(Axis 9) Status signal	
8	(Axis 10) Command position No.	(Axis 10) Completed position No.	
	(Axis 10) Control signal	(Axis 10) Status signal	
	(Axis 11) Command position No.	(Axis 11) Completed position No.	
	(Axis 11) Control signal	(Axis 11) Status signal	
9	(Axis 12) Command position No.	(Axis 12) Completed position No.	
	(Axis 12) Control signal	(Axis 12) Status signal	
	(Axis 13) Command position No.	(Axis 13) Completed position No.	
	(Axis 13) Control signal	(Axis 13) Status signal	
10	(Axis 14) Command position No.	(Axis 14) Completed position No.	
	(Axis 14) Control signal	(Axis 14) Status signal	
	(Axis 15) Command position No.	(Axis 15) Completed position No.	
	(Axis 15) Control signal	(Axis 15) Status signal	

Gateway control/status signals

The first 2 words for each I/O in the gateway unit address configuration are signals for controlling and monitoring the status of the gateway unit.

PLC output

									Address*			
									CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO
									–	Relative CH	Relative byte	Relative module
Gateway Control signal 0	b15	b14	b13	b12	b11	b10	b9	b8	RY 0*	+0	+0	+0
	MON	–	–	–	–	–	–	–				
	b7	b6	b5	b4	b3	b2	b1	b0			+1	
	–	–	–	–	–	–	–	–				
Gateway Control signal 1	b15	b14	b13	b12	b11	b10	b9	b8	RY 1*	+1	+2	
	–	–	–	–	–	–	–	–				
	b7	b6	b5	b4	b3	b2	b1	b0			+3	
	–	–	–	–	–	–	–	–				

PLC input

									Address*			
									CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO
									–	Relative CH	Relative byte	Relative module
Gateway Status signal 0	b15	b14	b13	b12	b11	b10	b9	b8	RX 0*	+0	+0	+0
	RUN	LERC	ERRT	MOD	ALMH	ALML	–	SEMG				
	b7	b6	b5	b4	b3	b2	b1	b0			+1	
	ALMC128	ALMC64	ALMC32	ALMC16	ALMC8	ALMC4	ALMC2	ALMC1				
Gateway Status signal 1	b15	b14	b13	b12	b11	b10	b9	b8	RX 1*	+1	+2	
	LNK15	LNK14	LNK13	LNK12	LNK11	LNK10	LNK9	LNK8				
	b7	b6	b5	b4	b3	b2	b1	b0			+3	
	LNK7	LNK6	LNK5	LNK4	LNK3	LNK2	LNK1	LNK0				

*Address is the address relative to the gateway head.
CC-Link, CC-Link IE, and DeviceNet have word addresses while PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses. PROFINET-IO uses 4-word module addresses.
The * in CC-Link and CC-Link IE bit register addresses is 0 to F.
For CC-Link and CC-Link IE, b10 to b15 are bA to bF. (Hexadecimal notation)
For PROFIBUS-DP, EtherNet/IP, and EtherCAT, b8 to b15 are b0 to b7. (Byte addresses)

I/O signal list

Signal type		Bit	Symbol name	Content
PLC output	Control signal 0	15	MON	PLC control output is enabled when ON ("1") (PLC output is reflected on controller unit) and disabled when OFF ("0").
		14-0	–	Not available. Keep this OFF ("0") normally.
	Control signal 1	15-0	–	Not available.
PLC input	Status signal 0	b15	RUN	Turns ON when gateway is in normal operation.
		b14	LERC	Turns ON and stays ON when an ERR-C error is generated while operating. Enabled when ERR-C generation is configured with the gateway parameter configuration tool.
		b13	ERRT	Turns ON if a gateway or axis communication error is detected.
		b12	MOD	Turns ON if MANU is selected with the unit front operation mode setting switch, and turns OFF when AUTO is selected.
		b11	ALMH	Turns ON if an error occurs that requires the gateway to be restarted. (Likely due to a mistaken parameter setting. Confirm as needed.)
		b10	ALML	Turns ON if a minor error caused by the gateway occurs. (Likely that calendar data has been deleted. Confirm as needed.)
		b9	–	Not available
		b8	SEMG	Turns ON when the system I/O connector STOP input is OFF (stop). All connected axes will go to stop status if this bit turns ON.
		b7	ALMC 1 ~ 128	Outputs alarm codes caused by the gateway. [For details, refer to "Maintenance Section Chapter 2 2.3 Causes and Countermeasures of Gateway Unit Alarms"]
		b6		
		b5		
		b4		
		b3		
		b2		
		b1		
		b0		
	Status signal 1	b15	LNK15	When communication between the gateway unit and the driver unit is solidly established, the bit No. that the gateway recognizes as enabled turns ON. Axis No. 0 = LNK0 ~ Axis No. 15 = LNK15
		b14	LNK14	
		b13	LNK13	
		b12	LNK12	
		b11	LNK11	
		b10	LNK10	
		b9	LNK9	
		b8	LNK8	
		b7	LNK7	
		b6	LNK6	
		b5	LNK5	
		b4	LNK4	
		b3	LNK3	
		b2	LNK2	
		b1	LNK1	
		b0	LNK0	

Power supply unit status signal

The I/O 8 words from the gateway unit head address are fixed regions, but within these are 6 words assigned to power supply unit status signals, enabling the power supply status to be confirmed.

(1) Address configuration

Request command region and response command region comprise 6 words for each I/O. Address is the address relative to the gateway head.

(1) For CC-Link and CC-Link IE

Bit Address	PLC output ⇒ gateway ⇒ each axis input: b15 High byte b8	b7 Low byte b0	Each axis output ⇒ gateway ⇒ PLC input: b15 High byte b8	b7 Low byte b0	Bit Address
RY 2F~20	Not available		Power supply unit status signal 0		RX 2F~20
RY 3F~30	Not available		Power supply unit status signal 1		RX 3F~30
RY 4F~40	Not available		Power supply unit status signal 2		RX 4F~40
RY 5F~50	Not available		Power supply unit status signal 3		RX 5F~50
RY 6F~60	Not available		Power supply unit status signal 4		RX 6F~60
RY 7F~70	Not available		Not available		RX 7F~70

(2) For DeviceNet

Word Address	PLC output ⇒ gateway ⇒ each axis input: b15 High byte b8	b7 Low byte b0	Each axis output ⇒ gateway ⇒ PLC input: b15 High byte b8	b7 Low byte b0
+2	Not available		Power supply unit status signal 0	
+3	Not available		Power supply unit status signal 1	
+4	Not available		Power supply unit status signal 2	
+5	Not available		Power supply unit status signal 3	
+6	Not available		Power supply unit status signal 4	
+7	Not available		Not available	

(3) For PROFIBUS-DP, EtherNet/IP, and EtherCAT

*1 Byte Address	PLC output ⇒ gateway ⇒ each axis input		Each axis output ⇒ gateway ⇒ PLC input	
	b15 High byte b8	b7 Low byte b0	b15 High byte b8	b7 Low byte b0
+4/+5	Not available		Power supply unit status signal 0	
+6/+7	Not available		Power supply unit status signal 1	
+8/+9	Not available		Power supply unit status signal 2	
+10/+11	Not available		Power supply unit status signal 3	
+12/+13	Not available		Power supply unit status signal 4	
+13/+14	Not available		Not available	

*1 b8 to b15 of the high byte are b0 to b7.

(4) For PROFINET-IO

*2 Module Address	PLC output ⇒ gateway ⇒ each axis input		Each axis output ⇒ gateway ⇒ PLC input	
	b15 High byte b8	b7 Low byte b0	b15 High byte b8	b7 Low byte b0
+0	Not available		Power supply unit status signal 0	
	Not available		Power supply unit status signal 1	
	Not available		Power supply unit status signal 2	
+1	Not available		Power supply unit status signal 3	
	Not available		Power supply unit status signal 4	
	Not available		Not available	

*2 PROFINET-IO uses 4-word unit module addresses.

(2) I/O signal

The details of the power supply unit status signal address configuration are as follows.

PLC input

Power supply unit Status signal 0~4	b15	b14	b13	b12	b11	b10	b9	b8
	LNK	–	–	–	–	OPMV	FANW	FANA
	b7	b6	b5	b4	b3	b2	b1	b0
	PSMV							

I/O signal list

Signal type		Bit	Symbol name	Content
PLC input	Power unit Status signal 0 ~ 4	b15	LNK	When communication between the gateway unit and the power supply unit is solidly established, it turns ON when the gateway unit recognizes it as enabled.
		b14 ~ 11	–	Not available
		b10	OPMV	ON when a reading error occurs in monitored data.
		b9	FANW	Generates a message level alarm (alarm code 04C "Fan rotation speed drop") when the fan rotation speed decreases 30%. ON when an alarm occurs and OFF when the alarm is canceled.
		b8	FANA	If the fan rotation speed drops 50%, an operation cancel level alarm (alarm code 0D6 "Fan error detection") is generated, and the actuator stops. ON when an alarm occurs and OFF when the alarm is canceled.
		b7 b6 b5 b4 b3 b2 b1 b0	PSMV	Monitors the item selected using the gateway parameter configuration tool. [For details of the selection method, refer to "3.9 Gateway Parameter Configuration Tool (page 3-128)"] One of the following seven items can be monitored. (1) Output voltage: 0~255 V (2) Voltage of auxiliary winding: 0~255 V (3) Output current: 0~25.5 A (0.1 A increments) (4) Peak hold current: 0~25.5 A (0.1 A increments) (5) Load factor: 0~255% (6) Fan rotation speed: 0~25,500 r/min (100 r/min increments) (7) Internal temperature: 0~255°C

Monitored items

Item	Content
(1) Output voltage	This power supply can vary the output voltage according to the load. The output voltage monitoring value changes, but this is not abnormal.
(2) Voltage of auxiliary winding	Control power supply voltage inside the power supply unit. As with the output voltage, it changes according to the load on the output voltage side.
(3) Output current	Instantaneous value of output current.
(4) Peak hold current	Peak value of output current.
(5) Load factor	Ratio of integral value of output current and rated output current. If this value exceeds 100%, the output voltage is cut off as an overload error.
(6) Fan rotation speed	Fan rotation speed.
(7) Internal temperature	Temperature in the vicinity of the output capacitor on the secondary side.

Position table

Each driver unit can operate in 6 types of modes, direct numerical control mode, simple direct mode, positioner 1~3 and 5 modes, depending on the gateway unit.
Simple direct mode and positioner mode require the creation of a position table in advance, using a teaching tool, in order to perform positioning.

Reference

PC software operating method	PC software manual (ME0155)
Teaching pendant operating method	Teaching pendant manual (ME0355)
Data setter operation method	Data setter manual (ME0375)

The position table is explained using a sample PC software screen.
(The displayed contents differ for teaching pendants)

No.	Position [mm]	Speed [mm/s]	Acceleration [G]	Deceleration [G]	Push [%]	Threshold [%]	Positioning width [mm]	Zone+ [mm]	Zone- [mm]	Acceleration/ deceleration Mode	Incremental	Gain set
0	0.00	100.00	0.30	0.30	0	0	0.10	0.00	0.00	0	0	0
1	100.00	100.00	0.30	0.30	0	0	0.10	0.00	0.00	0	0	0
2	1-line comment can be input											
3												

Stop Mode	Vibration damping No.	Drive torque limit [%]	Connected No.	Wait time [s]	Comment
0	0	100	1	10.00	Test 1
0	0	100	0	5.00	Test 2

Caution

- When using the rotary type or gripper type, be sure to confirm the following.
  "4.6 Precautions for Rotary Type (page 4-73)"
  "4.7 Precautions for Gripper Type (page 4-76)"

(1) No.
Displays the position data No.

Caution

- Do not use position No. 0 if the position has play.
- Even if not at Position No. 0 at the first servo ON after power ON, the complete position number output will be 0 and the status will be the same as when positioning to Position No. 0. The complete position No. output is 0 while the actuator is moving.
- To use position No. 0, take the command log with the sequence program and check the complete position No. 0 in accordance with the log.

(2) Position [mm]
Input the target position to which the actuator is to travel.
Absolute coordinates specification : Input the distance from the actuator home position.
Relative coordinates specification : This means the relative amount treating the present position as the home position and feeding by equivalent pitch.

No.	Position [mm]			Incremental		
0	5.00			0		Absolute coordinates specification Target position is 5 mm from home
1	10.00			1		Relative coordinates specification Plus 10 mm from present position
2	-10.00			1		Relative coordinates specification Minus 10 mm from present position

(3) Speed [mm/s]
Input the speed at which the actuator is to travel.
Initial values differ depending on the actuator type.

Caution

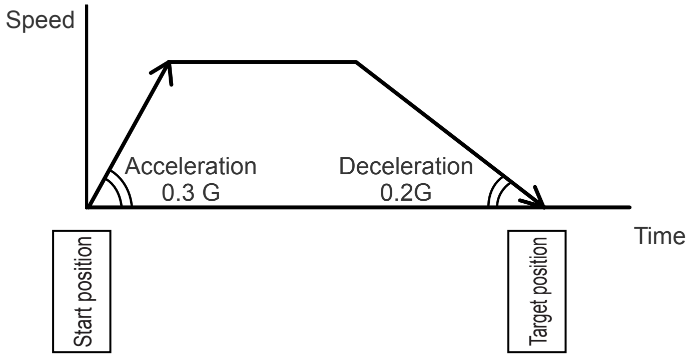
- Do not attempt to set above the maximum speed or below the minimum speed. Setting above the maximum speed or below the minimum speed may lead to abnormal noise or unstable speeds.
- For the maximum speed and minimum speed, refer to "Appendix Chapter 1 Connectable Actuators".
- The minimum speed can be calculated with the equation below.
  Minimum speed [mm/s] = Lead [mm/r] / Encoder resolution [pulse/r] x 1000 [1/s]

(4) Acceleration/deceleration [G]

Input the acceleration/deceleration rate at which the actuator is to travel. Use a value within the rated range.

Take care, as it is possible to input a number larger that the catalog rated value.

Reduce the number if the object to be conveyed vibrates during acceleration/deceleration, causing problems.



Acceleration/deceleration is rapid when the number is increased and gradual when it is decreased.

Caution

- For acceleration/deceleration, refer to "Appendix Chapter 1 Connectable Actuators", or to the actuator catalog or instruction manual, and set so that the specified acceleration/deceleration is not exceeded.
- Input appropriate values so that excessive shock and vibration are not applied to the actuator, in consideration of the installation conditions and the shape of the conveyed object.
- Increasing this number greatly affects the allowable payload. Also, take care as this can cause failure.

(5) Push [%]

Select "positioning" or "push-motion operation".

The factory default setting is 0.

0 : Normal positioning operation

Non-0 : Displays the current limit value. Setting this will configure push-motion operation mode.

Caution

- Changing the push speed may result in a force different from the original push force.
- When the push speed is changed, measure and check the actual push force.
- For the push force, refer to "Appendix Chapter 1 Connectable Actuators".

(6) Threshold [%]

Sets the threshold value for collision judgment.

When the present position is within the position zone range and the time set in parameter No. 50 "Load output judgment time" is exceeded and the command torque value set in the position table "Threshold" is exceeded, a collision is judged to have happened.

After judgment, the load output judgment signal LOAD turns ON, the collision detection alarm is generated and the servo turns OFF.

Not available with actuators of other than stepper motor specification. Do not enter the threshold; leave it as 0.

For details, refer to "4.8 Various Functions / Collision detection function (page 4-87)".

(7) Positioning width [mm]

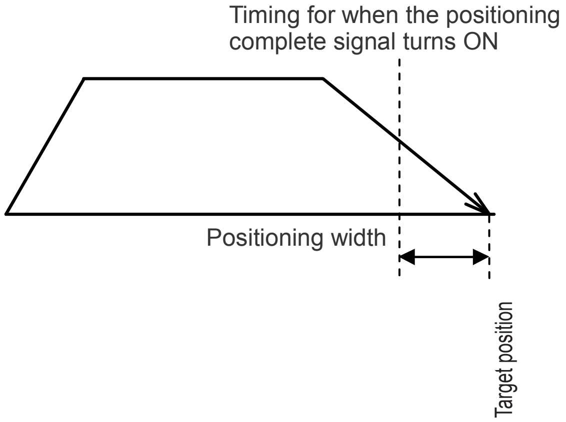
Handling of set value differs between "positioning" and "push-motion operation".

[Positioning operation]

Defines how far before the target position the positioning complete signal should turn ON.

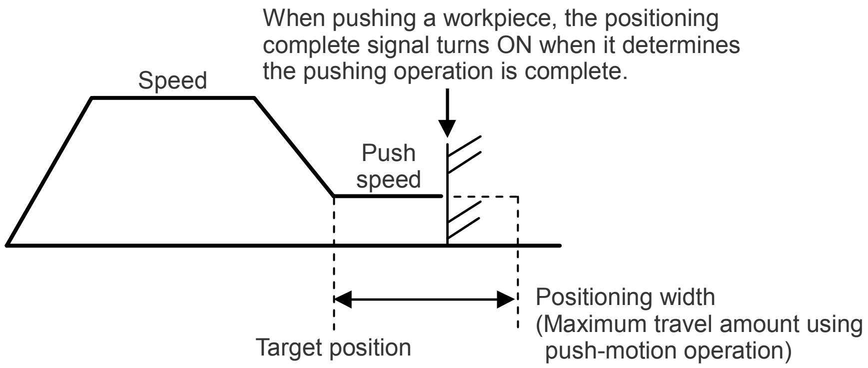
Even if the positioning complete turns ON, the actuator will continue to move to the target position.

Increasing the positioning width value will speed up the next sequence operation, which will shorten the tact time. Set the optimum value by looking at the overall balance of the equipment.



[Push-motion Operation]

Defines the maximum travel amount using push-motion operation from the target position. Considering the mechanical variation of the workpieces, set the positioning width so as not to complete positioning before pressing against the workpiece.



When using direct numerical control mode, changing parameter No. 181 "Push Mode" enables SEP push-motion operation. Refer to page 4-50 for more information.

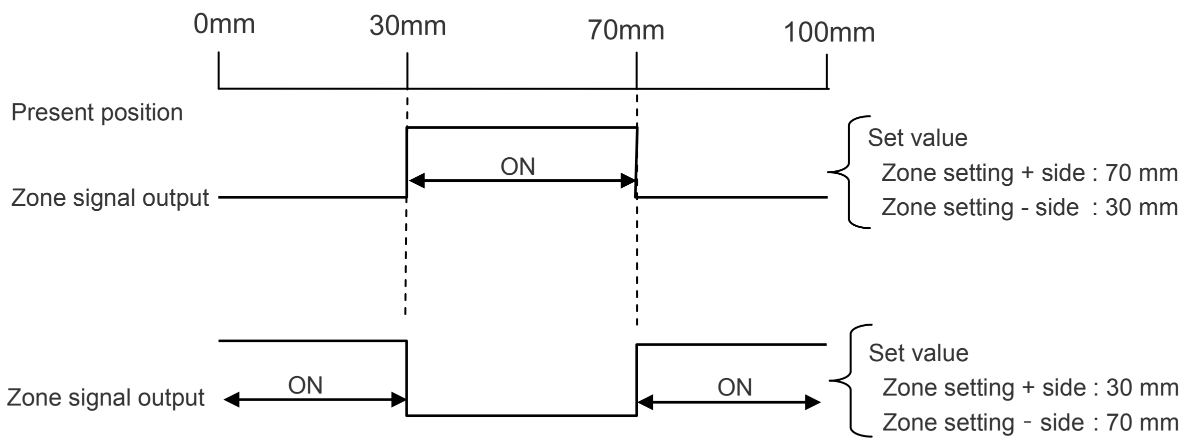
(8) Zone +/- [mm]

Defines the region in which the zone output signal turns ON.

This can be set individually for each target position.

Only the zone setting of the position No. traveling is enabled, and the zone settings of other position No. are disabled.

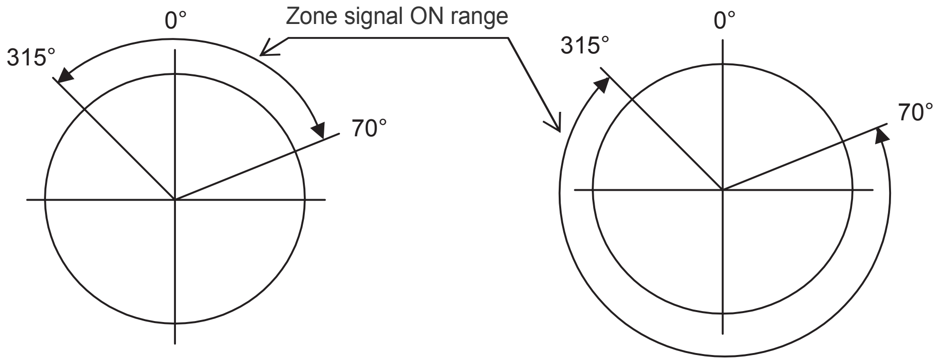
For linear axis



Caution

- Unless the zone signal detection range is set at a value above minimum resolution, a signal will not be output.
- The minimum resolution can be calculated with the equation below.
  Minimum resolution [mm/pulse] = Actuator lead [mm/r] / Encoder resolution [pulse/r]

For rotary actuator in index mode



Set value
Zone setting + side: 70°
Zone setting – side: 315°

Set value
Zone setting + side: 315°
Zone setting – side: 70°

(9) Acceleration/deceleration mode

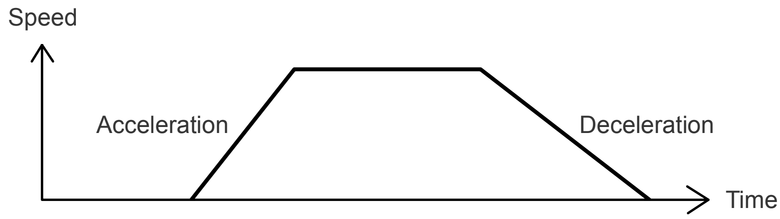
Defines acceleration/deceleration pattern characteristics.

The factory default setting is 0.

0: Trapezoid pattern
1: S-motion
2: First-order delay filter

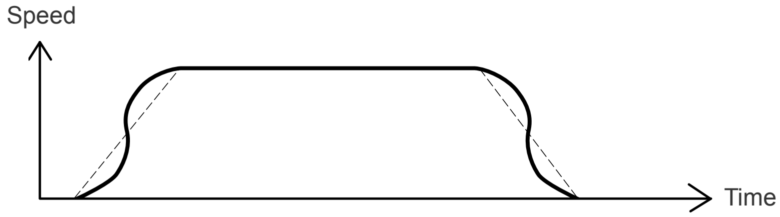
[Trapezoid pattern]

Acceleration and deceleration are configured in the "Acceleration" and "Deceleration" fields of the position table.



[S-motion]

When accelerating, a curve which starts gently then sharply increases partway through is drawn. This should be used when fast tact time is required so high acceleration/deceleration is wanted, yet a gradual start and stop are required.



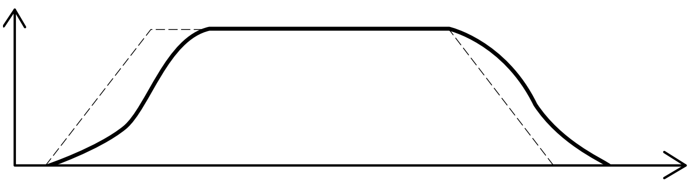
The degree of S-motion ratio setting is set with parameter No. 56 "S-motion Ratio Setting". Setting unit is % and the setting range is 0 to 100.
(The figure above is a graph when set to 100%.)
However, this is not reflected for jogging/inching operations via a PC or teaching pendant.

Caution

- In the following cases S-motion becomes disabled.
  (1) When a position command or direct numerical value command with S-motion is set during actuator operation.
  (2) When using a rotary actuator in index mode.
  (3) When set such that the acceleration time or deceleration time exceeds 2 seconds.
  (4) When parameter No. 56 is set to 0.
- The acceleration/deceleration time does not change, but as per the figure above, the acceleration/deceleration exceeds that set in the position table. (Max. 2x)
- Avoid pauses during acceleration or deceleration operation. Speed changes (acceleration) will occur, which may be dangerous.

[First-order delay filter]

This draws a more gentle acceleration/deceleration curve compared to trapezoidal patterns.
The shock at acceleration/deceleration is relieved, but the cycle time becomes longer.
Use for applications where minor vibrations to the workpiece during acceleration/deceleration are to be avoided.



The amount of first-order delay is set by parameter No. 55 "Position command primary filter time constant". The setting unit is ms and can be set from 0.0 to 100.0 in 0.1ms increments.
However, this is not reflected for jogging/inching operations via a PC or teaching pendant.

Caution

- In the following cases the first-order delay filter becomes disabled.
  (1) When a position command or direct numerical value command with the first-order delay filter is set during actuator operation.
  (2) When using a rotary actuator in index mode.
  (3) When parameter No. 55 is set to 0.

(10) Incremental
Defines whether using absolute coordinate specifications or relative coordinate specifications.
The factory default setting is 0.
0: Absolute coordinates specified
1: Relative coordinates specified

Caution

- When performing relative movement, do not output a travel command smaller than the minimum resolution value (actuator lead length / encoder resolution). Also, do not use a travel command smaller than the positioning repeatability.
- As the travel command is for the same position as the positioning complete status, deviation occurs, but normal positioning control is not possible.

(11) Transported load/Gain set

This item has different functions depending on motor specifications.

Motor specification	Function
Stepper motor specification	Transported load
Servo motor specification	Gain set

[Transported load] Stepper motor specification function only

Registers four types of load weight with the teaching tool and registers which of them to use by number (0 to 3). Based on the number (load weight) set in this section, the smart tuning function calculates the optimum speed and acceleration/deceleration.

Setting	Name
0	Transported load pattern No. 0
1	Transported load pattern No. 1
2	Transported load pattern No. 2
3	Transported load pattern No. 3

[Gain set] Servo motor specification function only

6 parameters required for servo gain adjustment are collected together as 1 set. 4 kinds of sets can be registered, enabling the servo gain to be switched for each positioning operation. By using the PC software's offboard tuning function, it is possible to obtain a setting close to the optimum setting.

When using this function and setting for high-speed operation, or when setting a payload exceeding the rated value, it may be necessary to set the home return gain.

For details on the setting method and precautions of the load weight, smart tuning function and off-board tuning function, refer to the following instruction manuals.

Reference

PC software operating method	PC software manual (ME0155)
Teaching pendant operating method	Teaching pendant manual (ME0355)
Data setter operation method	Data setter manual (ME0375)

Parameters configured in 1 set are as follows.
- Servo gain number (position gain)
- Positional feedforward gain
- Velocity loop proportional gain
- Velocity loop integral gain
- Torque filter constant
- Current control band number

Set the gain corresponding to the position No. to be operated with the specified gain setting. For details about each gain parameter, refer to "4.5 Parameters/Servo gain adjustment (page 4-58)".

Setting	Parameter set selection	Parameter No.
0	Gain set 0	7, 71, 31 to 33, 54
1	Gain set 1	120 ~ 125
2	Gain set 2	126 ~ 131
3	Gain set 3	132 ~ 137

(12) Stop mode

The servo can be turned OFF automatically at a fixed time after completion of positioning, for power saving.

Time setting is performed with parameter No. 36 to 38 Automatic servo OFF delay time 1 to 3, enabling three time options to be selected.

Servo motor specification and DC brush-less motor specification allow selection from 0 to 3.

Stepper motor specification allows selection from 0 to 7.

Set value	Operation after positioning complete	Selectable specifications
0	Servo ON as is	All specifications
1	After a fixed time (parameter No. 36 set value) AUTO servo OFF	All specifications
2	After a fixed time (parameter No. 37 set value) AUTO servo OFF	All specifications
3	After a fixed time (parameter No. 38 set value) AUTO servo OFF	All specifications
4	Full servo control	Stepper motor specification
5	Fixed time (parameter No. 36 set value) After full servo control, AUTO servo OFF	Stepper motor specification
6	Fixed time (parameter No. 37 set value) After full servo control, AUTO servo OFF	Stepper motor specification
7	Fixed time (parameter No. 38 set value) After full servo control, AUTO servo OFF	Stepper motor specification

Caution

- There is no holding torque during AUTO servo OFF. Take care with this setting, as the actuator will move if external force is applied.
- Do not use AUTO servo OFF when the next travel command is relative specifications (pitch feed). Misalignment may occur.
- Do not use AUTO servo OFF with push-motion operation. The pushing force will be lost.
- AUTO servo OFF does not function if operating in teaching mode with PC software.

[Full servo control method]

Holding current can be reduced by using servo control with stepper motors.

While the degree of reduction varies depending on the actuator model and load conditions, the holding current drops to about 1/2 to 1/4.

No position deviation will occur as the system maintains the servo ON status. The actual holding current can be checked using the current monitor screen within PC software.

(13) Vibration damping No.

Servo motor specification function only
Not available with direct numerical control mode

Suppresses vibration (resonance) of the load attached to the actuator.

Handles 3 types of vibrations.

For each vibration, 4 parameters are established and treated as 1 set.

The position table configures parameter sets that correspond to the position No. that needs vibration damping.

For details, refer to "4.8 Various Functions/Vibration damping control function (page 4-80)".

Setting	Vibration damping frequency (natural frequency)	Parameter No.
0	Normal position control (no vibration damping)	-
1	Vibration damping parameter set 1	97 ~ 100
2	Vibration damping parameter set 2	101 ~ 104
3	Vibration damping parameter set 3	105 ~ 108

This function is limited to servo motor specification actuators.

For stepper motor specification or DC brush-less motor specification actuators, this should be set to 0.

Caution

- The vibration frequency that can be suppressed (targeted natural frequency) is 0.5Hz to 30Hz.
- Vibration of the load to which vibration is induced due to the actuator connected to this controller is applicable. Other vibrations cannot be damped.
- Vibration in the same direction as the direction of movement of the actuator is applicable. Other vibration directions cannot be damped.
- Home return and push-motion operation are not applicable.
- If the vibration frequency setting is low, the tact time may increase. At less than about 6 Hz, the positioning convergence time will be over 150ms.

(14) Drive torque limit [%] / Push speed [mm/s]

The expansion function can be switched by setting parameter No. 191 "Position data expansion function setting".

Parameter No.191 set value	Available expansion functions
0	Not displayed (disabled)
1	Drive torque limit
2	Push speed

Drive torque limit : Sets the travel current limit value during position travel. [%]
Push speed : Sets the push speed for push-motion operation. [mm/s]

Warning

- The drive torque limit function changes the output of the actuator.
- The actuator may display unexpected behavior depending on the application, setting, operation and control.
- This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury. Make sure that safety is ensured and operation is stable before use.

[Examples of unexpected behavior]

■ When mounted vertically and used in applications where the workpiece is moved vertically
If the "drive torque limit" is set too low, not only does it become impossible to move the workpiece, but the unit stops and becomes unable to support the workpiece, which may cause it to fall.

■ When a travel command to a position number is given while moving to a different position number
When the "drive torque limit" of the position number commanded afterward is high, the unit may suddenly start moving.

(15) Connection No.
After completing travel, this sets the position No. to continue traveling.
If "wait time" is not set, this function will be disabled.

This function is subject to the following precautions. Be sure to check before use.

(1) AUTO/MANU mode
- This function can only be enabled in AUTO mode. When performing continuous operation with PC software, use the easy programming function.

(2) Gateway operation mode
- In simple direct mode, this function is disabled.
- An alarm is generated when a position number exceeding the maximum number of positions according to the operation mode of the gateway unit is set as the connection destination during position linking travel.
- An alarm is generated when the operation mode of the gateway unit is changed to a mode with fewer position numbers, if the linked position numbers are out of range during position linking travel after position data editing.

(3) Position linking operation
- If the destination is set so that the linked positions are looped, operation will continue endlessly.
  For example, if a multi-rotation specification rotary actuator is set to repeat incremental movement in index mode, it continues to rotate.
- Set appropriate wait times, etc., in order not to exceed the duty limit.
- Also, when operating endlessly, position travel will not be completed.
  In order to stop the unit, pause it by turning ON pause signal STP, then input reset signal RES and perform remaining travel distance cancel or turn OFF the servo.
- When a travel command is issued to the linked position, the cycle time displayed on the tool is added up to the command complete signal MEND output of the travel complete position including the wait time.
  Also, when looping a linked destination position, the cycle time continues to be added.
  When the counter upper limit value is exceeded, the count will start again from 0.000 sec.

(16) Wait time [s]

After completing travel, this sets the standby time until the next position No. operation starts. Enabled only when "Connection No." is set.

This function can only be enabled in AUTO mode. When performing continuous operation with PC software, use the easy programming function.

(17) Comments

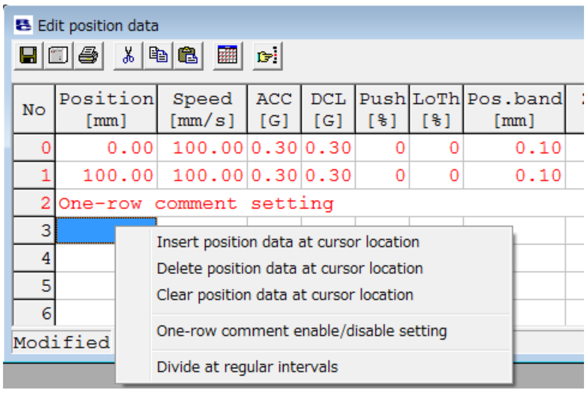
Up to 20 alphanumeric characters can be input.

Input comments are saved to the controller.

(18) 1-line comment

Up to 56 alphanumeric characters can be input.

Right-clicking on the position data and enabling [One-row comment enable/disable setting] will allow you to enter 1-line comments. Disabling it will clear any comment you have entered.



To edit a comment, type in the comment to display the setting screen. Enter a comment on the setting screen and click OK.

Direct numerical control mode assignment

Assigning the direct numerical control mode is as follows.
Set the current limit value in push-motion, acceleration/deceleration and speed within the range of the applicable actuator specifications, and set the target position data within the software stroke range.

> Setting units: Current limit value = 1%, Acceleration/deceleration = 0.01 G, Speed = 1.0 mm/s or 0.1 mm/s, Position data/Positioning width = 1/100 mm

PLC output = Axis control signal

Address *

1 word = 16 bits

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	
RWw m+0	n + 0	(High byte) n + 0 (Low byte) n + 1	p+0																	Specified position data (signed integer)
RWw m+1	n + 1	n + 2 n + 3																		Specified position data (signed integer)
RWw m+2	n + 2	n + 4 n + 5		32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1	Positioning width
RWw m+3	n + 3	n + 6 n + 7		–	–	–	–	–	–	–	–	–	–	–	–	524,288	262,144	131,072	65,536	Positioning width
RWw m+4	n + 4	n + 8 n + 9		32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1	Speed
RWw m+5	n + 5	n + 10 n + 11		32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1	Acceleration/deceleration
RWw m+6	n + 6	n + 12 n + 13		–	–	–	–	–	–	–	256	128	64	32	16	8	4	2	1	Pushing current limit value
RWw m+7	n + 7	n + 14 n + 15	(From next word) p+1	BKRL	INC	DIR	PUSH	–	–	–	JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	CSTR	Control signal

* m is the head register address of each axis. n is the head relative address of each axis.
p is the head module address of each axis.
CC-Link, CC-Link IE, and DeviceNet have word addresses, PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses, and PROFINET-IO uses 4-word module addresses.

PLC input = Axis status signal

Address * CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	1 word = 16 bits
RWr m+0	n + 0	(High byte) n + 0 (Low byte) n + 1	p+0																	Present position data (signed integer)
RWr m+1	n + 1	n + 2 n + 3																		Present position data (signed integer)
RWr m+2	n + 2	n + 4 n + 5																		Motor command current value (signed integer)
RWr m+3	n + 3	n + 6 n + 7																		Motor command current value (signed integer)
RWr m+4	n + 4	n + 8 n + 9		32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1	Present speed
RWr m+5	n + 5	n + 10 n + 11		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	(Not available)
RWr m+6	n + 6	n + 12 n + 13																		Alarm code
RWr m+7	n + 7	n + 14 n + 15	(From next word p+1)	EMGS	CRDY	ZONE2	ZONE1	–	–	–	MEND	ALML	–	PSFL	SV	ALM	MOVE	HEND	PEND	Status signal

* m is the head register address of each axis. n is the head relative address of each axis.
p is the head module address of each axis.
CC-Link, CC-Link IE, and DeviceNet have word addresses, PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses, and PROFINET-IO uses 4-word module addresses.

Note: When direct numerical control mode is used with field networks other than CC-Link or CC-Link IE, up to 8 axes can be connected.

[I/O Signal List] Direct numerical control mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC output	Position specified data	32-bit data	–	Set in hexadecimal as 32-bit signed integer (unit: 0.01 mm; 0.001° for DD motor). Ex) For +25.40 mm, specify as 0009ECH (decimal 2540). ● The maximum set value is +9,999.99 mm = 999999 (decimal) = 0F423FH (hexadecimal). ● For negative numbers, specify with 2's complement. ● Set the position data within the software stroke range.	Page 3-107
	Positioning width	32-bit data	–	Specify in hexadecimal as 32-bit integer (unit: 0.01 mm; 0.001° for DD motor). Ex) For +25.40 mm, specify as 0009ECH (decimal 2540). ● Set the position data within the software stroke range. ● Specify the direction of push-motion operation with DIR. ● Note that when the specified positioning width data is not set, the parameter No.10 "Positioning width initial value" will not be applied.	Page 3-107
	Speed	16-bit data	–	Set in hexadecimal as 16-bit integer (unit: 1.0 mm/s or 0.1 mm/s). Ex) For 200 mm/s, specify as 00C8H (decimal 200). ● If the speed is not set or set as "0", it will remain stopped. Alarm will not be triggered. If the speed is changed by setting to "0" during travel, it will decelerate and stop. ● The unit can be switched with the gateway parameter configuration tool. (It is set to 1.0 mm/s by default.)	Page 3-107
	Acceleration/ deceleration	16-bit data	–	Specify in hexadecimal as a 16-bit integer (unit: 0.01G). Ex) When setting at 0.20 G, specify as 0014H (decimal 20). ● Note that when the acceleration/deceleration is not set, the parameter No.9 "Acceleration/deceleration initial value" will not be applied. ● The acceleration and deceleration cannot be individually set. They will be set together as acceleration/deceleration.	Page 3-107

[I/O Signal List] Direct numerical control mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC output	Pushing current limit value	16-bit data	–	Set the current limit value in push-motion operation in hexadecimal. (Unit %) The setting range is 00H to 1FFH, where FFH = 100% and 1FFH = 200%. Ex) To set to 50%, specify FFH x 50% = 255 x 50% = 127 (decimal) = 7FH.	Page 3-107
	Control signal	b15	BKRL	Forced brake release	3.8 [15]
		b14	INC	Incremental [OFF: absolute position command, ON: relative position command]	3.8 [20]
		b13	DIR	Specified push direction [ON : travel in home reverse direction, OFF: travel in home direction] (Note) This signal is enabled when CON push-motion method is selected.	3.8 [17]
		b12	PUSH	Push-motion specification [ON: push-motion operation, OFF: positioning operation]	3.8 [16]
		b11	–	Not available	–
		b10			
		b9			
		b8	JOG+	+Jog [ON: travel in home reverse direction, OFF: Stop]	3.8 [10]
		b7	JOG-	-Jog [ON: travel in home direction, OFF: Stop]	
		b6	JVEL	Jog velocity/inching distance switchover [OFF: Uses RCON parameter No. 26 "Jog velocity" and No. 48 "Inching setting value" ON: Uses RCON parameter No. 47 "Jog velocity 2 setting value or command vel. setting value" (Note 1) and No. 49 "Inching 2 setting value"]	3.8 [11]
		b5	JISL	Jog/Inching switching [ON: Inching, OFF: Jog]	3.8 [12]
		b4	SON	Servo ON command [ON: Servo ON, OFF: Servo OFF]	3.8 [5]
		b3	RES	Reset [ON to execute reset]	3.8 [4]
		b2	STP	Pausing [ON: Pause, OFF: Pause cancel]	3.8 [8]
		b1	HOME	Home return [ON to execute home return command. Even when turned OFF midway, it will run until completion]	3.8 [6]
		b0	CSTR	Positioning start [ON to execute travel command. Even when turned OFF midway, it will run until completion]	3.8 [7]

Note 1: When command speed setting = 0: operates at the value of RCON parameter No. 47 "PIO Jog velocity 2". When command speed setting ≠ 0: operates at the command speed set value.

Specifications Section

Chapter 3 Gateway Unit

[I/O Signal List] Direct numerical control mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC input	Present position data	32-bit data	–	Outputs the present position data in hexadecimal as 32-bit signed integer (unit: 0.01 mm; 0.001° for DD motor). Ex) For +25.4 mm, it will be 000009ECH (decimal 2540). ● For negative numbers, 2's complement will be displayed.	Page 3-107
	Motor command current value	32-bit data	–	Outputs the motor command current value data in hexadecimal as a 32-bit signed integer (unit: mA). Ex) For +1A (+1000mA), it will be 000003E8H (decimal 1000). ● For negative numbers, 2's complement will be displayed.	Page 3-107
	Present speed	16-bit data	–	Outputs in hexadecimal as 16-bit integer (unit: 1.0 mm/s or 0.1 mm/s). Change the unit using the gateway parameter configuration tool. Ex) For 200 mm/s, specify as 00C8H (decimal 200).	Page 3-107
	Alarm code	16-bit data	–	Outputs the currently generated alarm code. (ALM is ON.) For the alarm contents, refer to "Maintenance Section Chapter 2 Troubleshooting". Note that this is not the same as the simple alarm code.	Page 3-107
	Status signal	b15	EMGS	Emergency stop status [ON: Emergency stop status]	3.8 [2]
		b14	CRDY	Controller ready [ON: Ready]	3.8 [1]
		b13	ZONE2	Zone output monitor 2 [ON : Present position is within the setting range of zone 2, OFF: Limit position is not within the setting range]	3.8 [9]
		b12	ZONE1	Zone output monitor 1 [ON : Present position is within the setting range of zone 1, OFF: Limit position is not within the setting range]	
		b11	–	Not available.	–
		b10			
		b9			
		b8	MEND	Command complete [ON : When in positioning complete, push-motion complete or idling status after travel, OFF: Travel start or servo OFF]	3.8 [19]
		b7	ALML	Minor malfunction alarm output [ON: When overload warning or message level alarm occurs]	3.8 [21]
		b6	–	Not available	–
		b5	PSFL	Push-motion operation contactless [ON: push-motion operation completed contactless]	3.8 [18]

[I/O Signal List] Direct numerical control mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC input	Status signal	b4	SV	Operation ready [ON: Operation ready (Servo ON)]	3.8 [5]
		b3	ALM	Alarm [ON: Alarm generated, OFF: No alarm]	3.8 [3]
		b2	MOVE	Traveling [ON: Traveling, OFF: Stopped]	3.8 [6] [7]
		b1	HEND	Home return complete [ON: Maintaining home after home return complete]	3.8 [6]
		b0	PEND	Positioning complete [ON : After completion, stopped at servo ON, OFF: For contactless push-motion, stopped at servo OFF]	3.8 [5] ~ [7]

Simple direct mode assignment

Assigning the simple direct mode is as follows.

PLC output = Axis control signal

Address *

1 word = 16 bits

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	
RWw m + 0	n + 0	(High byte) n + 0 (Low byte) n + 1	p+0																	Specified position data (signed integer)
RWw m + 1	n + 1	n + 2 n + 3																		Specified position data (signed integer)
RWw m + 2	n + 2	n + 4 n + 5		-	-	-	-	-	-	-	-	-	PC64	PC32	PC16	PC8	PC4	PC2	PC1	Command position No.
RWw m + 3	n + 3	n + 6 n + 7	From next word p+1	BKRL	-	-	-	-	-	-	JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	CSTR	Control signal

PLC input = Axis status signal

Address *

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	
RWr m + 0	n + 0	(High byte) n + 0 (Low byte) n + 1	p+0																	Present position data (signed integer)
RWr m + 1	n + 1	n + 2 n + 3																		Present position data (signed integer)
RWr m + 2	n + 2	n + 4 n + 5		-	-	-	-	-	-	-	-	-	PM64	PM32	PM16	PM8	PM4	PM2	PM1	Completed position No.
RWr m + 3	n + 3	n + 6 n + 7	From next word p+1	EMGS	CRDY	ZONE2	ZONE1	PZONE	-	-	MEND	ALML	LOAD	PSFL	SV	ALM	MOVE	HEND	PEND	Status signal

* m is the head register address of each axis. n is the head relative address of each axis.
p is the head module address of each axis.
CC-Link, CC-Link IE, and DeviceNet have word addresses, PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses, and PROFINET-IO uses 4-word module addresses.

[I/O Signal List] Simple direct mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC output	Position specified data	32-bit data	–	Set in hexadecimal as 32-bit signed integer (unit: 0.01 mm; 0.001° for DD motor). Ex) For +25.40 mm, set as 0009ECH (decimal 2540). ● The maximum set value is +9,999.99 mm = 999999 (decimal) = 000F423FH (hexadecimal). ● For negative numbers, specify with 2's complement.	Page 3-109
	Command position No.	b6-b0	PC**	The travel data not specified by the position data are set in the position table. This position No. will be specified in binary.	Page 3-109
	Control signal	b15	BKRL	Forced brake release [ON: forced brake, OFF: brake enabled]	3.8 [15]
		b14	–	Not available	–
		b13			
		b12			
		b11			
		b10			
		b9			
		b8	JOG+	+Jog [ON: travel in home reverse direction, OFF: Stop]	3.8 [10]
		b7	JOG-	-Jog [ON: travel in home direction, OFF: Stop]	
		b6	JVEL	Jog velocity/inching distance switchover [OFF: Use RCON parameter No. 26 "Jog velocity" and No. 48 "Inching set value" ON : Use RCON parameter No. 47 "Jog velocity 2" and No. 49 "Inching 2 set value"]	3.8 [11]
		b5	JISL	Jog/Inching switching [ON: Inching, OFF: Jog]	3.8 [12]
		b4	SON	Servo ON [ON: Servo ON, OFF: Servo OFF]	3.8 [5]
		b3	RES	Reset [ON to execute reset]	3.8 [4]
		b2	STP	Pausing [ON: Pause, OFF: Pause cancel]	3.8 [8]
		b1	HOME	Home return [ON to execute home return command. Even when turned OFF midway, it will run until completion]	3.8 [6]
		b0	CSTR	Positioning start [ON to execute travel command. Even when turned OFF midway, it will run until completion]	3.8 [7]

[I/O Signal List] Simple direct mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC input	Present position data	32-bit data	–	Outputs in hexadecimal as 32-bit signed integer (unit: 0.01 mm; 0.001° for DD motor). Ex) For +25.40 mm, outputs as 0009ECH (decimal 2540). ● The maximum output value is +9,999.99 mm = 999999 (decimal) = 000F423FH (hexadecimal). ● For negative numbers, 2's complement will be displayed.	Page 3-109
	Complete position No.	b6-b0	PM**	Reads the completed position No. in binary. Outputs the simple alarm code while alarm is generated. (Maintenance Section 2.4 Driver Unit/Simple Absolute Unit Alarm Causes and Countermeasures/Simple Alarm Codes)	Page 3-109
	Status signal	b15	EMGS	Emergency stop status [ON: Emergency stop status]	3.8 [2]
		b14	CRDY	Controller ready [ON: Ready]	3.8 [1]
		b13	ZONE2	Zone output monitor 2 [ON : Present position is within the setting range of zone 2, OFF: Limited position is not within the setting range]	3.8 [9]
		b12	ZONE1	Zone output monitor 1 [ON : Present position is within the setting range of zone 1, OFF: Limited position is not within the setting range]	
		b11	PZONE	Position zone output monitor [ON when the present position is within the position zone setting]	
		b10	–	Not available.	–
		b9			
		b8	MEND	Command complete [ON : When in positioning complete, push-motion complete or idling status after travel, OFF: Travel start or servo OFF]	3.8 [19]
		b7	ALML	Minor malfunction alarm output [ON: When overload warning or message level alarm occurs]	3.8 [21]
		b6	LOAD	Load output judgment [ON: When collision is detected]	3.8 [22]
		b5	PSFL	Push-motion operation contactless [ON: push-motion operation completed contactless]	3.8 [18]
		b4	SV	Operation ready [ON: Operation ready (Servo ON)]	3.8 [5]
		b3	ALM	Alarm [ON: Alarm generated, OFF: No alarm]	3.8 [3]
		b2	MOVE	Traveling [ON: Traveling, OFF: Stopped]	3.8 [6] [7]

[I/O Signal List] Simple direct mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC input	Status signal	b1	HEND	Home return complete [ON: Maintaining home after home return complete]	3.8 [6]
		b0	PEND	Positioning complete [ON : After completion, stopped at servo ON, OFF: For contactless push-motion, stopped at servo OFF]	3.8 [5] ~ [7]

Positioner 1 mode assignment

Assigning the positioner 1 mode is as follows.

PLC output = Axis control signal

Address *

1 word = 16 bits

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	
RWw m + 0	n + 0	(High byte) n + 0 (Low byte) n + 1	p+0																	Specified position data (signed integer)
RWw m + 1	n + 1	n + 2 n + 3																		Specified position data (signed integer)
RWw m + 2	n + 2	n + 4 n + 5		–	–	–	–	–	–	–	–	–	PC64	PC32	PC16	PC8	PC4	PC2	PC1	Command position No.
RWw m + 3	n + 3	n + 6 n + 7	(From next word p+1)	BKRL	–	–	–	–	MODE	PWRT	JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	CSTR	Control signal

PLC input = Axis status signal

Address *

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	
RWr m + 0	n + 0	(High byte) n + 0 (Low byte) n + 1	p+0																	Present position data (signed integer)
RWr m + 1	n + 1	n + 2 n + 3																		Present position data (signed integer)
RWr m + 2	n + 2	n + 4 n + 5		–	–	–	–	–	–	–	–	–	PM64	PM32	PM16	PM8	PM4	PM2	PM1	Completed position No.
RWr m + 3	n + 3	n + 6 n + 7	(From next word p+1)	EMGS	CRDY	ZONE2	ZONE1	PZONE	MODES	WEND	MEND	ALML	LOAD	PSFL	SV	ALM	MOVE	HEND	PEND	Status signal

* m is the head register address of each axis. n is the head relative address of each axis.
p is the head module address of each axis.
CC-Link, CC-Link IE, and DeviceNet have word addresses, PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses, and PROFINET-IO uses 4-word module addresses.

[I/O Signal List] Positioner 1/2 mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC output	Command position No.	b6-b0	PC**	Specifies the command position No. in binary.	Page 3-109
	Control signal	b15	BKRL	Forced brake release [ON: forced brake, OFF: brake enabled]	3.8 [15]
		b14	–	Not available	–
		b13			
		b12			
		b11			
		b10	MODE	Teaching mode command [OFF: Normal operation mode, ON: Teaching mode]	3.8 [13]
		b9	PWRT	Position data import command [ON: Position data import]	3.8 [14]
		b8	JOG+	+Jog [ON: travel in home reverse direction, OFF: Stop]	3.8 [10]
		b7	JOG-	-Jog [ON: travel in home direction, OFF: Stop]	
		b6	JVEL	Jog velocity/inching distance switchover [OFF: Use RCON parameter No. 26 Jog velocity and No. 48 Inching set value ON : Use RCON parameter No. 47 Jog velocity 2 and No. 49 Inching 2 set value]	3.8 [11]
		b5	JISL	Jog/Inching switching [ON: Inching, OFF: Jog]	3.8 [12]
		b4	SON	Servo ON [ON: Servo ON, OFF: Servo OFF]	3.8 [5]
		b3	RES	Reset [ON to execute reset]	3.8 [4]
		b2	STP	Pausing [ON: Pause, OFF: Pause cancel]	3.8 [8]
		b1	HOME	Home return [ON to execute home return command. Even when turned OFF midway, it will run until completion]	3.8 [6]
		b0	CSTR	Positioning start [ON to execute travel command. Even when turned OFF midway, it will run until completion]	3.8 [7]

[I/O Signal List] Positioner 1/2 mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC input	Present position data	32-bit data	–	Outputs in hexadecimal as 32-bit signed integer (unit: 0.01 mm; 0.001° for DD motor). Ex) For +25.40 mm, outputs as 0009ECH (decimal 2540). ● The maximum output value is +9,999.99 mm = 999999 (decimal) = 000F423FH (hexadecimal). ● For negative numbers, 2's complement will be displayed.	Page 3-109
	Complete position No.	b6-b0	PM**	Reads the completed position No. in binary. Outputs the simple alarm code while alarm is generated. (Refer to Maintenance Section P. 2-10)	Page 3-109
	Status signal	b15	EMGS	Emergency stop status [ON: Emergency stop status]	3.8 [2]
		b14	CRDY	Controller ready [ON: Ready]	3.8 [1]
		b13	ZONE2	Zone output monitor 2 [ON : Present position is within the setting range of zone 2, OFF: Limited position is not within the setting range]	3.8 [9]
		b12	ZONE1	Zone output monitor 1 [ON : Present position is within the setting range of zone 1, OFF: Limited position is not within the setting range]	
		b11	PZONE	Position zone output monitor [ON when the present position is within the position zone setting]	
		b10	MODES	Teaching mode status [ON for teaching mode]	3.8 [13]
		b9	WEND	Position data import complete [ON when position data import completes]	3.8 [14]
		b8	MEND	Command complete [ON : When in positioning complete, push-motion complete or idling status after travel, OFF: Travel start or servo OFF]	3.8 [19]
		b7	ALML	Minor malfunction alarm output [ON: When overload warning or message level alarm occurs]	3.8 [21]
		b6	LOAD	Load output judgment [ON: When collision is detected]	3.8 [22]
		b5	PSFL	Push-motion operation contactless [ON: push-motion operation completed contactless]	3.8 [18]
		b4	SV	Operation ready [ON: Operation ready (Servo ON)]	3.8 [5]
		b3	ALM	Alarm [ON: Alarm generated, OFF: No alarm]	3.8 [3]
		b2	MOVE	Traveling [ON: Traveling, OFF: Stopped]	3.8 [6] [7]
		b1	HEND	Home return complete [ON: Maintaining home after home return complete]	3.8 [6]
		b0	PEND	Positioning complete [ON : After completion, stopped at servo ON, OFF: For contactless push-motion, stopped at servo OFF]	3.8 [5] ~ [7]

Positioner 2 mode assignment

Assigning the positioner 2 mode is as follows.

PLC output = Axis control signal

Address *

1 word = 16 bits

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
RWw m + 0	n + 0	(High byte) n + 0 (Low byte) n + 1	p+0	-	-	-	-	-	-	-	-	-	PC64	PC32	PC16	PC8	PC4	PC2	PC1
				Command position No.															
RWw m + 1	n + 1	n + 2 n + 3	From next word p+1	BKRL	-	-	-	-	MODE	PWRT	JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	CSTR
				Control signal															

PLC input = Axis status signal

Address *

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
RWr m + 0	n + 0	(High byte) n + 0 (Low byte) n + 1	p+0	-	-	-	-	-	-	-	-	-	PM64	PM32	PM16	PM8	PM4	PM2	PM1
				Completed position No.															
RWr m + 1	n + 1	n + 2 n + 3	From next word p+1	EMGS	CRDY	ZONE2	ZONE1	PZONE	MODES	WEND	MEND	ALML	LOAD	PSFL	SV	ALM	MOVE	HEND	PEND
				Status signal															

* m is the head register address of each axis. n is the head relative address of each axis.
p is the head module address of each axis.
CC-Link, CC-Link IE, and DeviceNet have word addresses, PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses, and PROFINET-IO uses 4-word module addresses.

I/O signal list and alarm content list are all the same except for "Present position data" in positioner 1 mode. In positioner 1 mode, the "Present position data" is included in the PLC input signal. It is not included in positioner 2 mode. Refer to pages 3-70 and 3-71.

Positioner 3 mode assignment

Assigning the positioner 3 mode is as follows.

PLC output = Axis control signal

Address *

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO
RWw m + 0	n + 0	(High byte) n + 0 (Low byte) n + 1	p+0

1 word = 16 bits

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
BKRL	–	–	SON	RES	STP	HOME	CSTR	–	PC64	PC32	PC16	PC8	PC4	PC2	PC1
Control signal								Command position No.							

PLC input = Axis status signal

Address *

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO
RWr m + 0	n + 0	(High byte) n + 0 (Low byte) n + 1	p+0

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
EMGS	ZONEI	PSFL	SV	ALM	MOVE	HEND	PEND	–	PM64	PM32	PM16	PM8	PM4	PM2	PM1
Status signal								Completed position No.							

* m is the head register address of each axis. n is the head relative address of each axis.
p is the head module address of each axis.
CC-Link, CC-Link IE, and DeviceNet have word addresses, PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses, and PROFINET-IO uses 4-word module addresses.

[I/O Signal List] Positioner 3 mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC output	Control signal	b15	BKRL	Forced brake release [ON: forced brake, OFF: brake enabled]	3.8 [15]
		b14	–	Not available	–
		b13			
		b12	SON	Servo ON [ON: Servo ON, OFF: Servo OFF]	3.8 [5]
		b11	RES	Reset [ON to execute reset]	3.8 [4]
		b10	STP	Pausing [ON: Pause, OFF: Pause cancel]	3.8 [8]
		b9	HOME	Home return [ON to execute home return command. Even when turned OFF midway, it will run until completion]	3.8 [6]
		b8	CSTR	Positioning start [ON to execute travel command. Even when turned OFF midway, it will run until completion]	3.8 [7]
	Command position No.	b7	–	Not available	–
		b6-b0	PC**	Specifies the command position No. in binary.	3-111 Page

[I/O Signal List] Positioner 3 mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC input	Status signal	b15	EMGS	Emergency stop status [ON: Emergency stop status]	3.8 [2]
		b14	ZONE1	Zone output monitor 1 [ON : Present position is within the setting range of zone 1, OFF: Limited position is not within the setting range]	3.8 [9]
		b13	PSFL	Push-motion operation contactless [ON: push-motion operation completed contactless]	3.8 [18]
		b12	SV	Operation ready [ON: Operation ready (Servo ON)]	3.8 [5]
		b11	ALM	Alarm [ON: Alarm generated, OFF: No alarm]	3.8 [3]
		b10	MOVE	Traveling [ON: Traveling, OFF: Stopped]	3.8 [6] [7]
		b9	HEND	Home return complete [ON: Maintaining home after home return complete]	3.8 [6]
		b8	PEND	Positioning complete [ON : After completion, stopped at servo ON, OFF: For contactless push-motion, stopped at servo OFF]	3.8 [5] ~ [7]
	Complete position No.	b7	–	Not available	–
		b6-b0	PM**	Reads the completed position No. in binary. Outputs the simple alarm code while alarm is generated. (Refer to Maintenance Section P. 2-10)	3-111 Page

Positioner 5 mode assignment

Assigning the positioner 5 mode is as follows.

PLC output = Axis control signal

Address *

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO
RWw m + 0	n + 0	(High byte) n + 0 / (Low byte) n + 1	p+0
RWw m + 1	n + 1	n + 2 / n + 3	From next word p+1

1 word = 16 bits

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
-	-	-	-	-	-	-	-	-	-	-	-	PC8	PC4	PC2	PC1
Command position No.															
BKRL	-	-	-	-	-	-	JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	CSTR
Control signal															

PLC input = Axis status signal

Address *

CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO
RWr m + 0	n + 0	(High byte) n + 0 / (Low byte) n + 1	p+0
RWr m + 1	n + 1	n + 2 / n + 3	From next word p+1

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Present position data (signed integer)															
EMGS	CRDY	ZONE2	ZONE1	PM8	PM4	PM2	PM1	MEND	ALML	PSFL	SV	ALM	MOVE	HEND	PEND
Status signal/completed position No.															

* m is the head register address of each axis. n is the head relative address of each axis.
p is the head module address of each axis.
CC-Link, CC-Link IE, and DeviceNet have word addresses, PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses, and PROFINET-IO uses 4-word module addresses.

Caution

- The maximum present position data that can be output in positioner 5 mode is 3,276.7 mm (327.67° for DD motor).
- If the maximum value is exceeded, the present position data will not be correctly output. This may lead to display or operation malfunction, resulting in personal injury or device damage.
- For use in an operation range exceeding the maximum value, select a different operation mode.

[I/O Signal List] Positioner 5 mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC output	Command position No.	b3-b0	PC**	Specifies the command position No. in binary.	Page 3-111
	Control signal	b15	BKRL	Forced brake release [ON: forced brake, OFF: brake enabled]	3.8 [15]
		b14	–	Not available	–
		b13			
		b12			
		b11			
		b10			
		b9			
		b8	JOG+	+Jog [ON : travel in home reverse direction, OFF: Stop]	3.8 [10]
		b7	JOG-	-Jog [ON: travel in home direction, OFF: Stop]	
		b6	JVEL	Jog velocity/inching distance switchover [OFF: Use RCON parameter No. 26 Jog velocity and No. 48 Inching set value ON : Use RCON parameter No. 47 Jog velocity 2 and No. 49 Inching 2 set value]	3.8 [11]
		b5	JISL	Jog/Inching switching [ON: Inching, OFF: Jog]	3.8 [12]
		b4	SON	Servo ON [ON: Servo ON, OFF: Servo OFF]	3.8 [5]
		b3	RES	Reset [ON to execute reset]	3.8 [4]
		b2	STP	Pausing [ON: Pause, OFF: Pause cancel]	3.8 [8]
		b1	HOME	Home return [ON to execute home return command. Even when turned OFF midway, it will run until completion]	3.8 [6]
		b0	CSTR	Positioning start [ON to execute travel command. Even when turned OFF midway, it will run until completion]	3.8 [7]

[I/O Signal List] Positioner 5 mode (ON = corresponding bit is "1", OFF = corresponding bit is "0")

Signal type		Bit	Signal name	Content	Details
PLC input	Present position	16 bits	–	Outputs in hexadecimal as 16-bit signed integer (unit: 0.1 mm; 0.01° for DD motor). Ex) For +24.40 mm, outputs as 0009ECH (decimal 2540). ● The maximum output value is +3,276.7 mm = 32767 (decimal) = 7FFFH (hexadecimal). ● For negative numbers, 2's complement will be displayed.	Page 3-111
	Status signal, complete position No.	b15	EMGS	Emergency stop status [ON: Emergency stop status]	3.8 [2]
		b14	CRDY	Controller ready [ON: Ready]	3.8 [1]
		b13	ZONE2	Zone output monitor 2 [ON : Present position is within the setting range of zone 2, OFF: Limited position is not within the setting range]	3.8 [9]
		b12	ZONE1	Zone output monitor 1 [ON : Present position is within the setting range of zone 1, OFF: Limited position is not within the setting range]	
		b11-b8	PM**	Reads the completed position No. in binary. Outputs the simple alarm code while alarm is generated. (Refer to Maintenance Section P. 2-10)	3-111 Page
		b7	MEND	Command complete [ON : When in positioning complete, push-motion complete or idling status after travel, OFF: Travel start or servo OFF]	3.8 [19]
		b6	ALML	Minor malfunction alarm output [ON: When overload warning or message level alarm occurs]	3.8 [21]
		b5	PSFL	Push-motion operation contactless [ON: push-motion operation completed contactless]	3.8 [18]
		b4	SV	Operation ready [ON: Operation ready (Servo ON)]	3.8 [5]
		b3	ALM	Alarm [ON: Alarm generated, OFF: No alarm]	3.8 [3]
		b2	MOVE	Traveling [ON: Traveling, OFF: Stopped]	3.8 [6] [7]
		b1	HEND	Home return complete [ON: Maintaining home after home return complete]	3.8 [6]
		b0	PEND	Positioning complete [ON : After completion, stopped at servo ON, OFF: For contactless push-motion, stopped at servo OFF]	3.8 [5] ~ [7]

3.8 I/O Signals

Specifications Section

Chapter 3 Gateway Unit

Timing of I/O signals

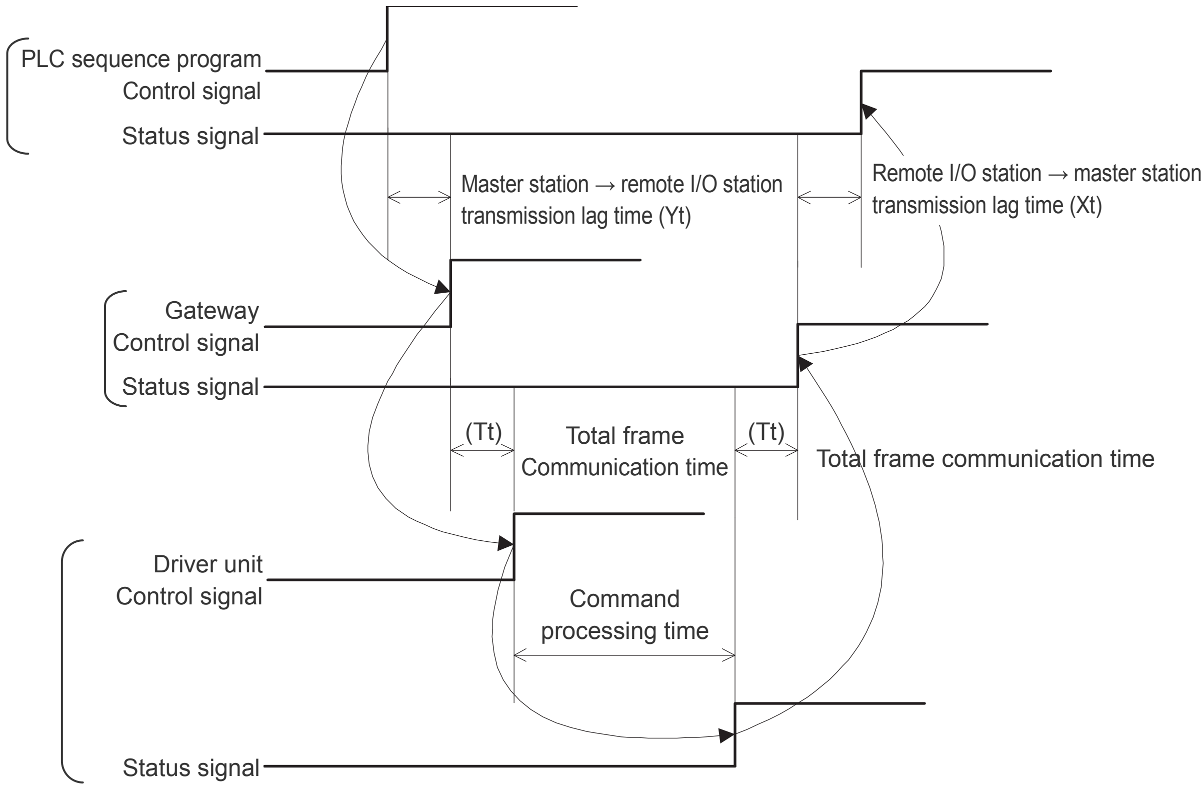
In order to operate the actuator with a PLC sequence program, various control signals are turned ON; the maximum response time until their response (status) signals return to the PLC is expressed with the following formula.
The PLC is the master station and the gateway unit the remote I/O station.

Maximum response time (ms) = Yt + Xt + Tt + command processing time (operation time, etc.)

Tt = max. 3 ms: Total frame communication time

Yt : Master station → remote I/O station transmission lag time
Xt : Remote I/O station → master station transmission lag time
(Yt and Xt: Field network transmission lag time)

For the transmission lag time from the master station to the remote I/O station (Yt) and from the remote I/O station to the master station (Xt), refer to the instruction manuals for the field network master units and mounted PLC.



If a communication error is generated due to problems on the transmission pathway, etc., communication retry takes place and the total frame communication time (Tt) may take longer than usual.
If communication cannot be normally performed, an operation cancel level alarm (alarm code 8DE "Driver unit communication error") is generated, and the actuator stops.

Function of I/O signals

I/O signals are prepared for each axis No.
ON means that the corresponding bit is "1" and OFF means the corresponding bit is "0".

[1] Controller ready (CRDY) PLC input signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	×	○

Regardless of the alarm status, servo status and the like, when the power is turned ON, driver unit initialization normally completes, and control is enabled, it turns ON.
It will turn ON even during alarm status if the driver unit is enabled.

[2] Emergency stop (EMGS) PLC input signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	○	○

It turns ON in STOP signal input status (motor drive power is cut off). It turns OFF when the STOP signal input is canceled.
Also, the SYS of the driver unit LED lights up in red.
On the host device such as a PLC, apply appropriate safety measures such as interlocking using this signal.
It is not an output signal caused by the driver unit alarm.

[3] Alarm (ALM) PLC input signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	○	○

It is a signal that turns OFF when it is normal and turns ON when an alarm of operation cancel level or higher is generated.
This signal turns OFF when the reset signal RES is turned ON while the operation cancel level alarm is generated. (For a cold start level alarm, the power must be turned on again.)
Also, the SYS of the driver unit LED lights up in red.
For details on alarms, refer to "Maintenance Section Chapter 2 2.4 Simple Absolute Unit Alarm Causes and Countermeasures".

[4] Reset (RES) PLC output signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	○	○

The reset signal RES has two functions: it resets the alarm when an alarm is generated and suspends operation when it is in pause.

(1) If this signal is turned ON while an alarm of operation cancel level is being generated, the alarm will be canceled. (For a cold start level alarm, the power must be turned on again.)
Check the cause of the alarm and resolve the cause before resetting the alarm. Resetting the alarm repeatedly without resolving the cause and repeating the activation may cause serious malfunction such as motor burnout.

(2) If this signal is turned from OFF to ON while paused, it is possible to cancel the remaining travel distance and interrupt the operation.

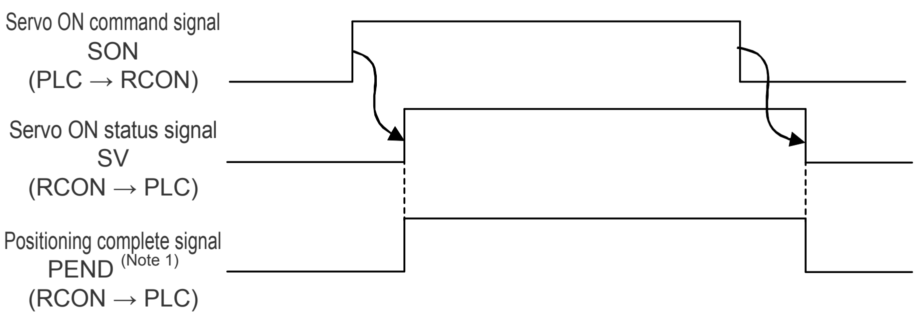
[5] Servo ON command (SON) PLC output signal
Servo ON status (SV) PLC input signal
Positioning complete (PEND) PLC input signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	○	○

(1) The servo ON command signal SON is a signal that puts the actuator into an operable status.

(2) When servo is turned ON and operation is enabled, the servo ON signal SV turns ON. At the same time, the positioning complete signal PEND turns ON.
Also, the SYS of the driver unit LED of the corresponding axis No. on the front panel lights up in green.

(3) Even if power is supplied to the controller, it cannot be operated while the SV signal is OFF.
When the SON signal is turned OFF while the actuator is in operation, the actuator stops and the servo turns OFF.
For actuator with brake, the brake will activate.

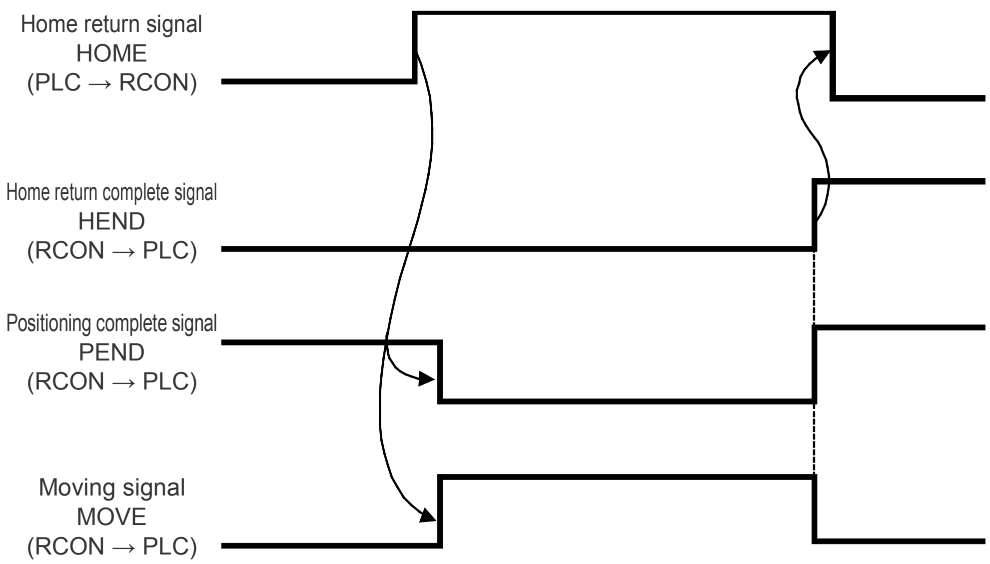


Note 1: PEND is not turned on while in pause.

[6] Home return (HOME) **PLC output signal**
Home return complete (HEND) **PLC input signal**
Positioning complete (PEND) **PLC input signal**
Traveling (MOVE) **PLC input signal**

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	○	○

Home return signal HOME is a signal for performing home return motion.
When the HOME signal is turned ON, home return motion starts as the signal starts up (ON edge). When the home return motion is completed, the home return complete signal HEND turns ON. The HEND signal will stay ON unless the home is lost. During home return motion, the positioning complete signal PEND turns OFF and the moving signal MOVE turns ON.



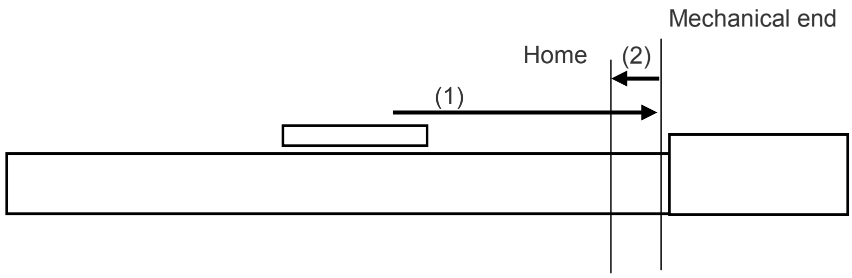
Caution

- In the positioner mode and simple direct mode, when an actuator with incremental specification is connected and the positioning command is made to the position without performing home return at power on, positioning is executed after home position is automatically restored after the power is turned on (first time only).
- Note that in the direct numerical control mode, when a positioning command to the position is made without executing home return at power-on, alarm code 083 "Absolute position travel command in home return uncompleted status" is generated and operation is canceled.

Specifications Section
Chapter 3 Gateway Unit

Unless indicated as home reverse specification (option), the direction of home return for the linear axis is on the motor side, the rotary axis is on the counterclockwise side, and the gripper is on the outside (open side).
For details, refer to "Actuator Coordinate System (page Intro-18)".

(1) Operation of slider type/rod type/table type actuator



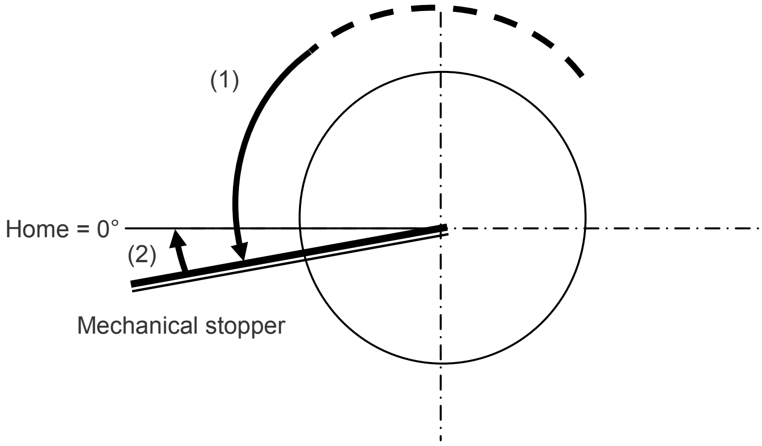
(1) With the HOME signal ON, the unit begins traveling toward the mechanical end at the home return speed.
The travel speed is 20 mm/s for most actuators, with some exceptions by model.
(2) The unit reverses at the mechanical end and stops at the home position. The travel distance at this time will be the set value of parameter No. 22 "Homing offset".

Caution

- In the home reverse specification, the unit moves in the reverse direction.
- When changing Parameter No. 22 "Homing offset", be sure to refer to page 4-28.

(2) Operation of rotary actuator

[330° rotation specification]

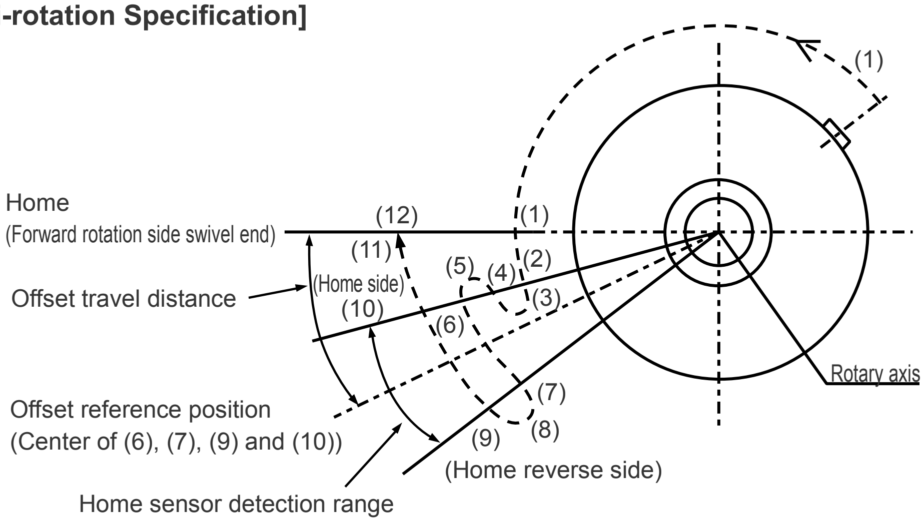


(1) When the HOME signal is turned ON, the rotary part rotates in the CCW (counterclockwise) direction as seen from the load side. The speed is 20 deg/s.
(2) The unit reverses by the mechanical stopper and stops at the home position. The travel distance at this time will be the set value of parameter No. 22 "Homing offset".

Caution

- When changing Parameter No. 22 "Homing offset", be sure to refer to page 4-28.

[Multi-rotation Specification]

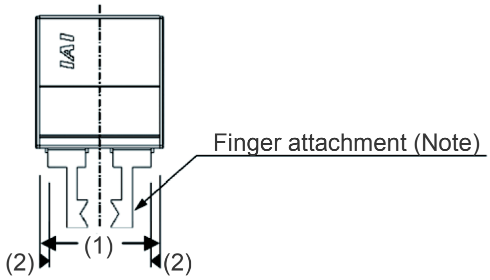


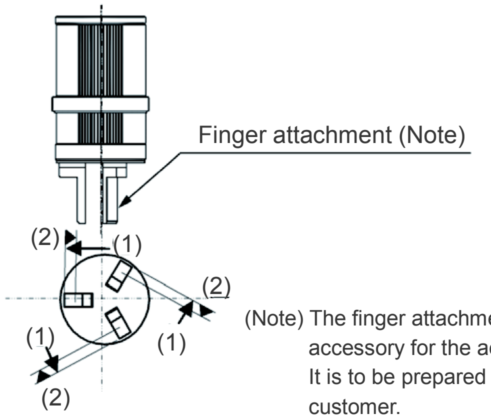
(1) When home return is commanded, the rotary part rotates in the CCW (counterclockwise) direction as seen from the load side.
The speed is 20 deg/s.
(2) The home sensor turns ON.
(3) It travels in reverse.
(4) Confirm that the home sensor turns OFF as it returns to the position beyond the detection range of the home sensor.
(5) It travels in reverse.
(6) Check again that the home sensor is ON.
(7) Confirm that the home sensor turns OFF beyond the detection range on the home reverse side of the home sensor.
(8) It travels in reverse.
(9) Check that the home sensor is ON.
(10) Confirm that the home sensor turns OFF beyond the detection range on the home side of the home sensor.
(11) Calculate the detection range center of the home sensor from the results of (6), (7), (9) and (10).
(12) It travels by the set value of parameter No.22 "Homing offset" from the position in (11) and stops at the home position.

Caution

- In the reverse rotation specification, the unit moves in the reverse direction.
- When changing Parameter No. 22 "Homing offset", be sure to refer to page 4-28.

(3) For gripper





(Note) The finger attachment is not an accessory for the actuator. It is to be prepared by the customer.

(1) The unit travels toward the mechanical end (outside) at the home return speed.
(2) The unit reverses at the mechanical end and stops at the home position. The travel distance at this time is a fixed value for each actuator and cannot be changed.

Caution

- When changing Parameter No. 22 "Homing offset", be sure to refer to page 4-28.

[7] Positioning start (CSTR) **PLC output signal**
Traveling (MOVE) **PLC input signal**
Positioning complete (PEND) **PLC input signal**

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	○	○

The positioning start signal CSTR is processed at the startup edge (ON edge) and positioned at the target position of the specified position No. or the position set in the target position register of the PLC.

(1) When the CSTR signal is turned ON, the actuator starts acceleration based on the data in the specified position table for positioning to the target position.
(2) When the operation is started, the positioning complete signal PEND turns OFF. At this time, turn OFF the CSTR signal. If the CSTR signal is not turned OFF, output of the complete position No. and PEND signal will not turn ON when positioning is completed.
(3) When positioning is completed, the position No. of the positioning complete is output in binary data by complete position No. PM1 to PM**, and at the same time the PEND signal will turn ON.
(4) The moving signal MOVE turns ON at the same time as the travel starts, and the PEND signal turns ON, or turns OFF when the travel command output is completed.
(5) The PEND signal turns ON when the remaining travel distance enters the positioning width range. Once turned ON, the PEND signal will remain ON unless the CSTR signal is turned ON again, or servo is turned OFF.

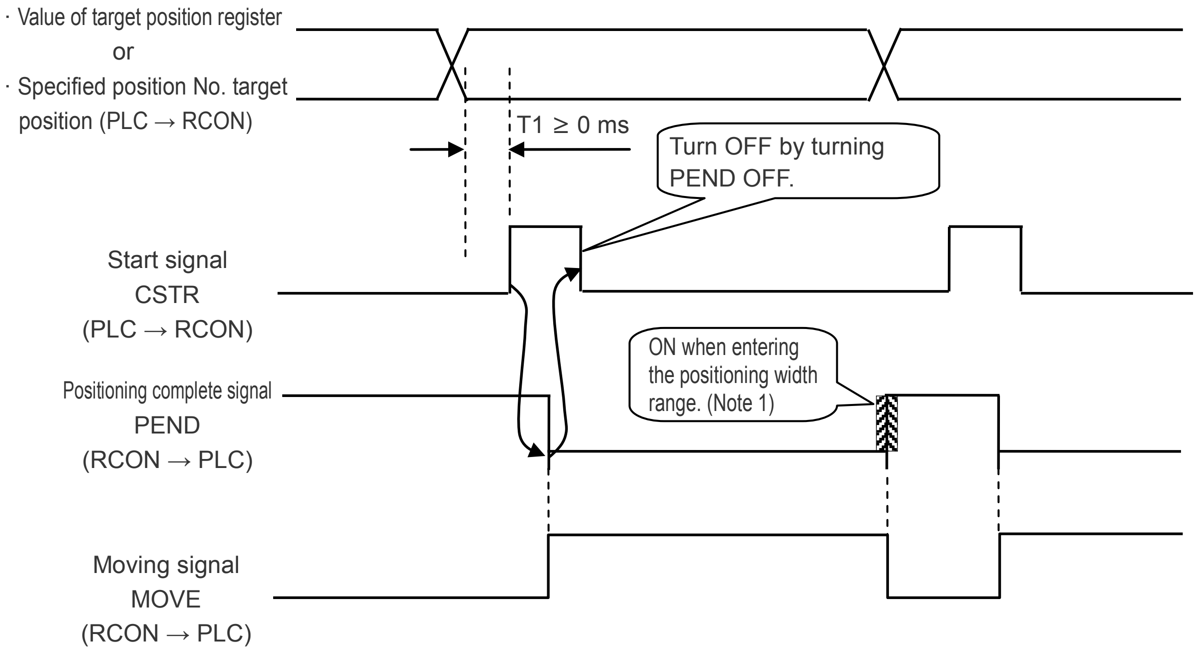
The PEND signal output method can be switched in parameter No. 39 "Positioning complete signal output method".

No.	Name	Symbol	Unit	Input range	Default initial value setting
39	Positioning complete signal output method	PEND	–	0: PEND 1: INP	0

A parameter to select the positioning complete signal type.
Output status after positioning complete varies according to whether the servo is ON or OFF.

Set value	Signal identification	During servo ON (during positioning complete)	During servo OFF
0	PEND	Will not turn OFF even if present position is outside the range of positioning width	Unconditional OFF
1	INP	Will turn ON if present position is within the range of positioning width and OFF outside the range.	

Output format will be the same for the complete position No. output PM1 to PM **.



Note 1: The MOVE signal turns ON simultaneously as PEND signal is turned OFF, and it turns OFF when command from the controller to the motor is completed. Therefore, if the positioning width is set high, the PEND signal may turn ON before the MOVE signal turns OFF. If the positioning width is set low, the MOVE signal may turn OFF before the PEND signal turns ON.

Caution

- The PEND signal turns OFF once it enters servo OFF status or emergency stop while stopped at the target position.
- If the CSTR signal remains ON, the PEND signal will not turn ON even if positioning is completed.

[8] Pause (STP) **PLC output signal**

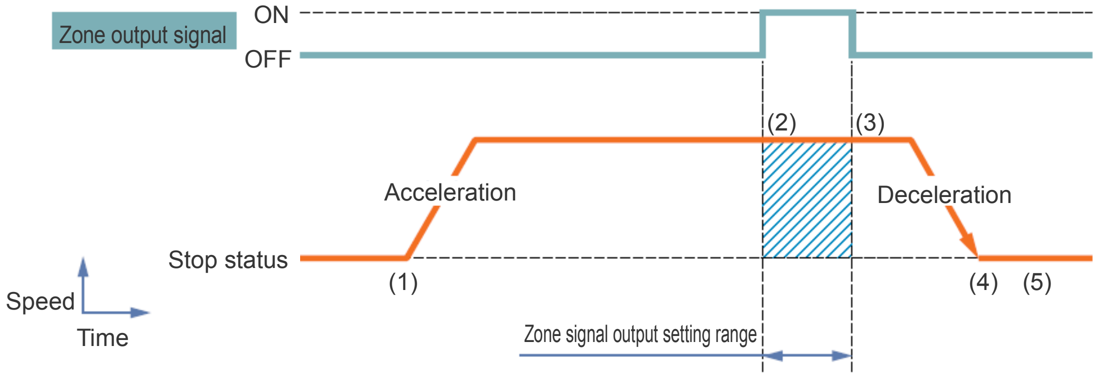
Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	○	○

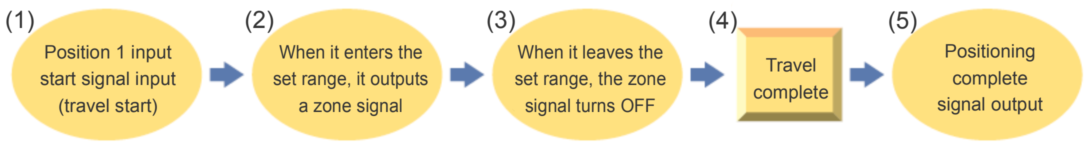
When this signal is turned ON, the axis decelerates and stops. If it is turned OFF, the axis travel will resume.

The acceleration value at restart of operation and deceleration value at stop are values in acceleration/deceleration of the position No. set in the specified position No. register in the positioner mode and simple direct mode, and are values in the acceleration/deceleration register in the direct numerical control mode.

[9] Zone 1 (ZONE1) **PLC input signal**
Zone 2 (ZONE2) **PLC input signal**
Position zone (PZONE) **PLC input signal**

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	△ (PZONE not available)	○	○	○	△ (ZONE 1 only)	△ (PZONE not available)





The signal turns ON while the actuator is passing through a specified position (zone range) or while the actuator is stopped.
There are two types of zone signals.

They can judge pass/fail of the completion position at push-motion completion, set the continuous operation range in pitch feed, perform operation interlock of other devices within the setting range, and so on.

(1) Zone signal (ZONE1, ZONE2)

Turns ON in any range set in the parameter.

Set the zone range in the following parameters.

(1) ZONE1 : Parameter No. 1 (zone boundary 1 + side), parameter No. 2 (zone boundary 1 - side)

(2) ZONE2 : Parameter No. 23 (zone boundary 2 + side), parameter No. 24 (zone boundary 2 - side)

The zone signal is valid during drive source cutoff after home return is completed as long as the home is not lost due to an alarm or the like.

(2) Position zone signal (PZONE)

Turns ON in any range set in the position table.

No.	Position [mm]	Speed [mm/s]	Acceleration [G]	Deceleration [G]	Push [%]	Threshold [%]	Positioning width [mm]	Zone+ [mm]	Zone- [mm]	Acceleration/ deceleration mode	Incremental	Gain set	Stop mode
0													
1	0.00	250.00	0.20	0.20	0	0	0.10	50.00	30.00	0	0	0	0
2	100.00	250.00	0.20	0.20	0	0	0.10	70.00	60.00	0	0	0	0
3	50.00	250.00	0.20	0.20	50	0	20.00	60.00	65.00	0	0	0	0

Setting the zone range

The zone range is set in the position table.

During the execution of the position No. for which the zone range is set, its set value will be enabled. It is valid during drive source cutoff even after it is stopped as long as the actuator is operated and the home is not lost due to an alarm or the like.

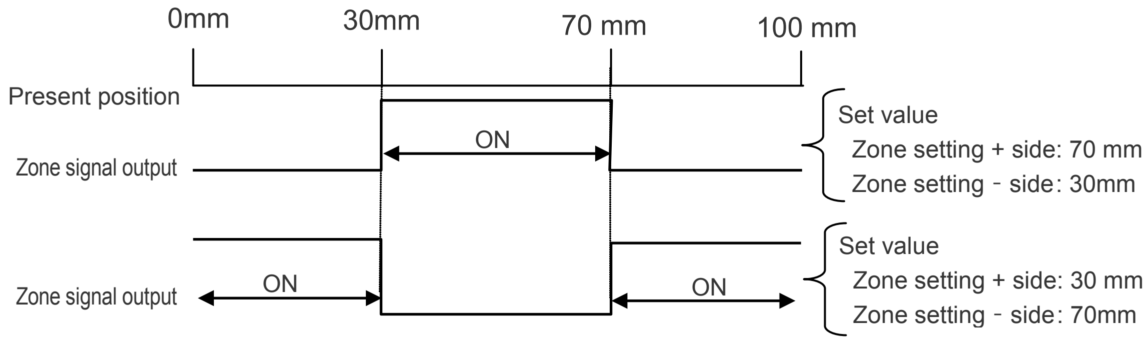
(3) Set value and signal output range

The zone output range varies depending on the difference between the set value on the + side and - side of the zone.

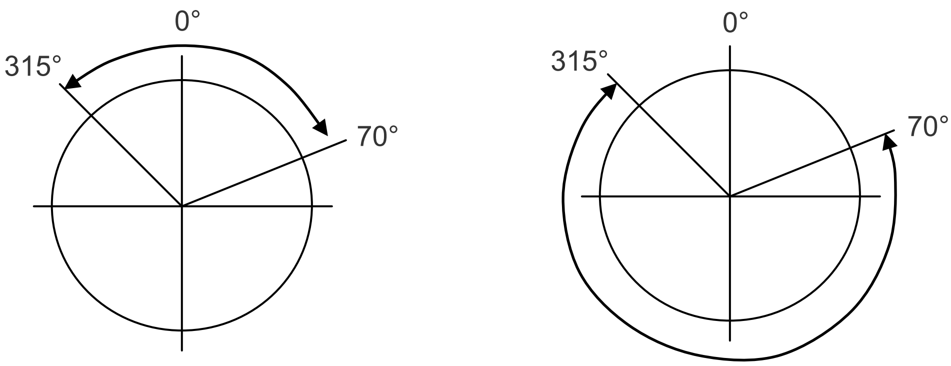
(1) + side set value > - side set value: zone signal ON within the range of - side set value to + side set value, OFF when out of range

(2) + side set value < - side set value: zone signal OFF within the range of + side set value to - side set value, ON when out of range

[For linear axis]



[For rotary actuator of multi-rotation specification in index mode]



Set value
Zone setting + side: 70°
Zone setting – side: 315°

Set value
Zone setting + side: 315°
Zone setting – side: 70°

Caution

- This signal is enabled after home return is completed. It will not be output only by turning on the power.

[10] + Jog (JOG+) **PLC output signal**
- Jog (JOG -) **PLC output signal**

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	×	○

It is a start command for jog or inching operation.
The + command operates in the home reverse direction, and the - command in the home direction.

(1) Jog operation
The jog operation is available when the jog/inching switching signal JISL is OFF.
While the JOG+ signal is ON, the actuator moves in the home reverse direction, and when it is OFF it decelerates and stops.
While the JOG- signal is ON, the actuator moves in the home direction, and when it is OFF it decelerates and stops.

The operation is performed with the set values of the following parameters.
- Travel is at the following speeds, depending on the ON/OFF position of the jog speed/inching distance switching signal JVEL.
  When JVEL signal is OFF: operates in the value of parameter No. 26 "PIO Jog velocity".
  When JVEL signal is ON: operates in the value of parameter No. 47 "PIO Jog velocity 2".
- Note that when the JVEL signal is ON, it operates at the following speed in direct numerical control mode.
  When speed setting value = 0: operates at the value of parameter No. 47 "PIO Jog velocity 2".
  When speed setting value ≠ 0: operates at the speed set value.
  (For details, see "3.7 Address Configuration / Direct numerical control mode assignment (page 3-61).")
- Acceleration/deceleration operate at the rated acceleration/deceleration (dependent on actuator).
- When both JOG+ and JOG- signal turn ON, it decelerates and stops.

(2) Inching (incremental) operation
Inching operation is available when the JISL signal is ON.
When the jog signal is turned ON once, it travels a fixed distance for the inching distance set in the parameter.
When the JOG+ signal is ON, it moves in the home reverse direction, and when the JOG- signal is ON, it moves in the home direction.

The operation is performed with the set values of the following parameters.

- It moves with the following speeds depending on the ON/OFF position of the JVEL signal.
  When JVEL signal is OFF: operates in the value of parameter No. 26 "PIO Jog velocity".
  When JVEL signal is ON: operates in the value of parameter No. 47 "PIO jog velocity 2".
- The travel distance will be set according to separate parameters depending on ON/OFF of the JVEL signal.
  When JVEL signal is OFF: operates in the value of parameter No. 48 "PIO inching distance".
  When JVEL signal is ON: operates in the value of parameter No. 49 "PIO inching distance 2".
- Acceleration/deceleration operate at the rated acceleration/deceleration (dependent on actuator).

During normal operation, even if JOG+ or JOG- signal is turned ON, normal operation will continue. (Jog signal will be ignored)
While paused, it will not operate even if JOG+ signal or JOG- signal is turned ON.

Caution

- Beware of collision with the mechanical end since the software stroke limit is disabled before home return completes.

[11] Jog speed / inching distance switching (JVEL) PLC output signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	×	○

This is a parameter switching signal that specifies the speed and inching distance during jog and inching (incremental) operation.

It changes as follows according to the JVEL signal, JISL signal and field network control mode.

JVEL signal	Jog operation: JISL = OFF	Inching operation: JISL = ON
OFF	Parameter No.26 "PIO Jog velocity"	Parameter No.26 "PIO Jog velocity" Parameter No.48 "PIO inching distance"
ON	Parameter No.47 "PIO Jog velocity 2" (Note 1)	Parameter No.47 "PIO Jog velocity 2" Parameter No.49 "PIO inching distance 2"

Note 1: For direct numerical control mode, it operates at the following speed.
When speed setting value = 0 : operates at the value of parameter No. 47 "PIO Jog velocity 2"
When speed setting value ≠ 0 : operates at the speed set value
(For details, see "3.7 Address Configuration / Direct numerical control mode assignment (page 3-61).")

[12] Jog/inching switching (JISL) PLC output signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	×	○

It is a switching signal between jog operation and inching (incremental) operation.

When JISL signal is OFF : Jog operation

When JISL signal is ON : Inching operation

If the JISL signal is switched to ON (inching) during jog operation, it decelerates and stops, and switches to the inching function.

If the JISL signal is switched to OFF (jog) during inching operation, it switches to the jog function after the travel is completed.

		Jog operation	Inching operation
JISL		OFF	ON
JVEL = OFF	Speed	Parameter No. 26 "Jog velocity"	Parameter No. 26 "Jog velocity"
	Travel distance	–	Parameter No. 48 "Inching"
	Acceleration/ deceleration	Rated value (dependent on actuator)	Rated value (dependent on actuator)
JVEL = ON	Speed	Parameter No. 47 "Jog velocity 2" (Note 1)	Parameter No. 47 "Jog velocity 2"
	Travel distance	–	Parameter No. 49 "Inching 2"
	Acceleration/ deceleration	Rated value (dependent on actuator)	Rated value (dependent on actuator)
Operation		While JOG+ / JOG- is ON	When the rising edge (ON edge) of JOG+ / JOG- is detected

Note 1: For direct numerical control mode, it operates at the following speed.

When speed setting value = 0 : operates at the value of parameter No. 47 "PIO Jog velocity 2"

When speed setting value ≠ 0 : operates at the speed set value

(For details, see "3.7 Address Configuration / Direct numerical control mode assignment (page 3-61).")

[13] Teaching mode command (MODE) **PLC output signal**
Teaching mode signal (MODES) **PLC input signal**

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	×	×	○	○	×	×

When the teaching mode command signal MODE is turned ON, it changes from the normal operation mode to the teaching mode.
Teaching mode signal MODES turns ON when it switches to the teaching mode.
On the PLC side, confirm that the teaching mode signal MODES is turned ON before performing teaching operation.

In order to switch from the normal operation mode to the teaching mode, the following status is required.

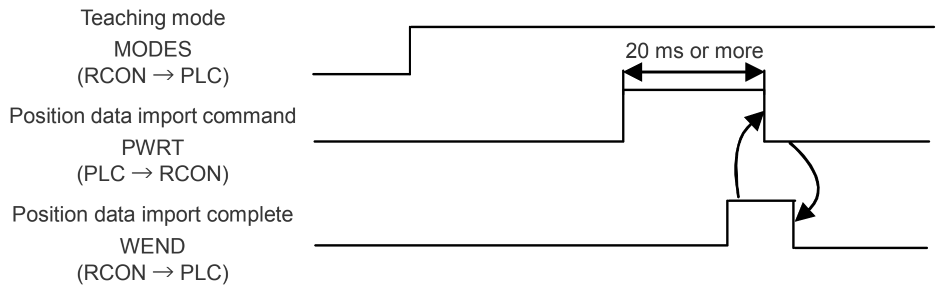
- Actuator operation (motor) is stopped
- JOG+ signal and JOG- signal are OFF
- The position data import command signal PWRT and positioning start signal CSTR are OFF

(Note) If the PWRT signal is not OFF, it will not return to the normal operation mode.

[14] Position data import command (PWRT) **PLC output signal**
Position data import complete (WEND) **PLC input signal**

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	×	×	○	○	×	×

Position data import command signal PWRT is enabled when the teaching mode signal MODES is ON.
When the PWRT signal is turned ON (Note 1), the present position data will be written in the position field of the position number set in the PLC's specified position number channel. (Note 2)
When writing is completed, the position data import complete signal WEND turns ON.
Make sure that the WEND signal is turned ON in the host PLC, then turn OFF the PWRT signal.
If PWRT signal is turned OFF before WEND signal turns ON, WEND signal will not turn ON.
When PWRT signal is turned OFF, WEND signal will turn OFF.
Note 1: Be sure to keep ON continuously for 20 ms or more. If it is less than 20 ms, writing may not be executed.
Note 2: If data other than the position data is undefined, the parameter initial value will be written. For details, refer to "4.5 Parameters (page 4-18)".



[15] Forced brake release (BKRL) PLC output signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	○	○

While the forced brake release signal BKRL is ON, the brake will be released. For an actuator with brake, the brake is automatically controlled by servo ON/OFF. When assembling to a device, performing direct teaching (Note 1) or the like, it may be necessary to release the brake in order to move the slider or rod by hand.

Note 1 Direct teaching: Operation where the slider or rod is moved by hand and the coordinate values imported into the position table

Warning

- Be careful when releasing the brake. Releasing carelessly may cause injury or damage to the actuator body, workpiece or surrounding devices due to the slider or rod falling.
- After releasing the brake, be sure to return the brake to the enabled status. It is very dangerous to operate with the brake released. It may cause injury or damage to the actuator body, workpiece or surrounding devices due to the slider or rod falling.

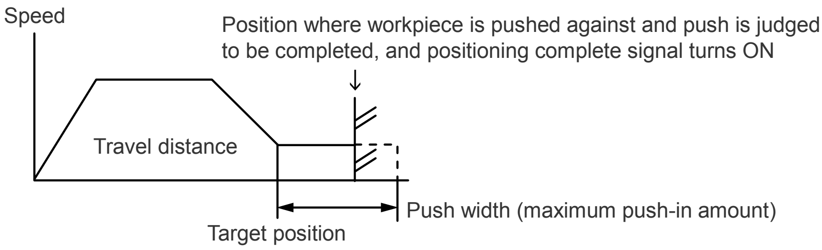
[16] Push-motion specification (PUSH) **PLC output signal**

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	×	×	×	×	×

Executing a travel command after turning this signal ON will activate push-motion operation.
When this signal is OFF, normal positioning operation will be performed.
Select the same push mode as the CON type, such as the PCON controller, or the same one as the SEP type, such as PSEP, in Parameter No. 181 "Push Mode". Refer to page 4-50 for the selection method.

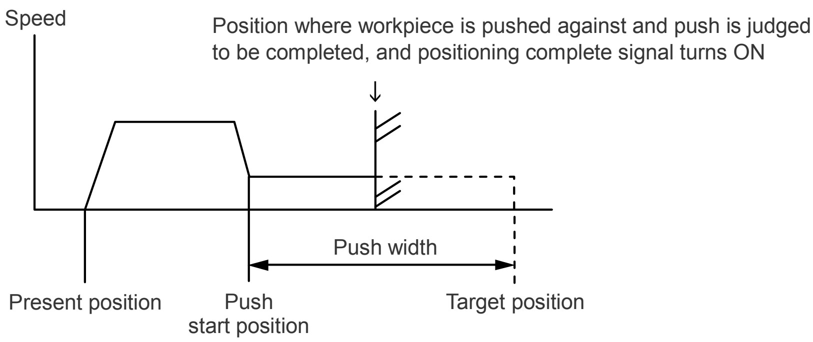
(1) CON mode push

After reaching the target position from the present position, (Note 1), it travels only the distance set for push width at push speed.
During push motion, once the workpiece is pushed against and the push is judged to be completed, positioning complete signal PEND will turn ON.
Note 1: In direct numerical control mode, it is the value input in the target position register.



(2) SEP mode push

Push-motion operation is performed at the distance set in the positioning width (direct numerical control mode) from the target position (Note 1) as the start position. Note that there is no pull-operation mode.
During push motion, once the workpiece is pushed against and the push is judged to be completed, PEND will turn ON.
Note 1: In direct numerical control mode, it is the value input in the target position register.



[17] Push direction specification (DIR) PLC output signal

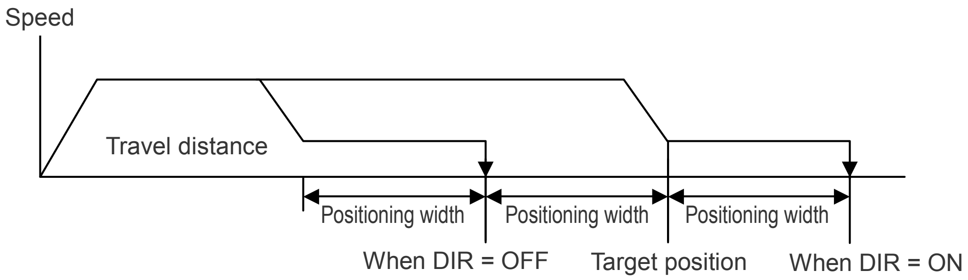
Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	×	×	×	×	×

Specifies the direction of push-motion.

When this signal is turned OFF, push-motion is performed toward the value obtained by subtracting the positioning width from the target position.

When this signal is turned ON, push-motion is performed toward the value obtained by adding the positioning width to the target position.

This signal is disabled when normal positioning operation is selected.



[18] Push-motion contactless (PSFL) PLC input signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	○	○

ON when push-motion operation is performed but does not touch the workpiece, even after traveling the distance set by the positioning width of the controller's position table or positioning width register of the PLC.

[19] Command complete signal (MEND) PLC input signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	×	○

This signal turns ON when the travel to the target position commanded from the host is completed.

It is almost the same control as the positioning complete PEND signal, but this signal will turn ON even if in push-motion contactless.

It turns OFF at servo OFF and drive source cutoff. Also, if positioning start signal CSTR is ON, it will not turn ON even if movement to the target position is completed.

[20] Incremental specification (INC) **PLC output signal**

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	×	×	×	×	×

When this signal is ON, if a travel command is executed, it will travel by the value input in the target position register of the PLC with the present position as a reference. (Relative travel)
When this signal is OFF, it travels to the position set by the value of the target position register of the PLC.

[21] Minor malfunction alarm (ALML) **PLC input signal**

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	○	○	○	○	×	○

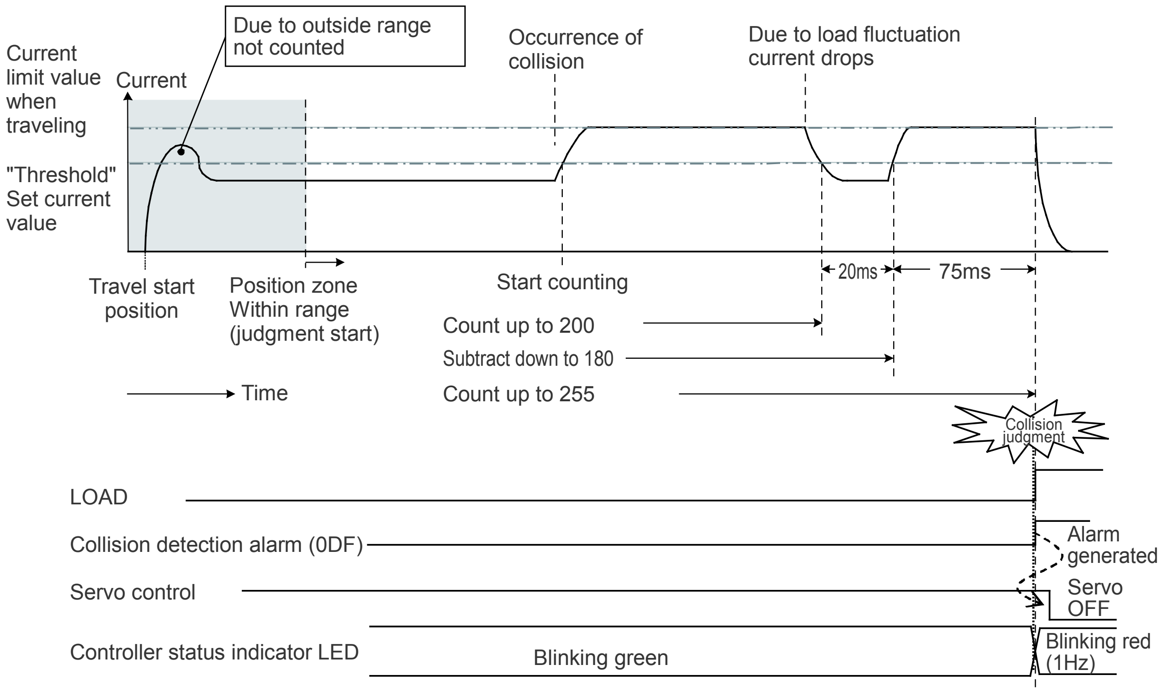
This signal turns ON when an overload warning or message level alarm is generated.
For details, refer to Parameter No. 151 "Minor Trouble Alarm Output Select" (page 4-55).

[22] Load output judgment (LOAD) PLC input signal

Operation mode	Direct numerical control	Simple direct	Positioner 1	Positioner 2	Positioner 3	Positioner 5
○: Y ×: N	×	○	○	○	×	×

When the present position is within the position zone range and the time set in parameter No. 50 "Load output judgment time" is exceeded and the command torque value set in the position table "Threshold" is exceeded, a collision is judged to have happened.
After judgment, the load output judgment signal LOAD turns ON, the collision detection alarm is generated and the servo turns OFF.

◎Example of Judgment (at judgment time of 255 ms)



Specifications Section

Chapter 3 Gateway Unit

Timing of basic operation

[Operation preparation]

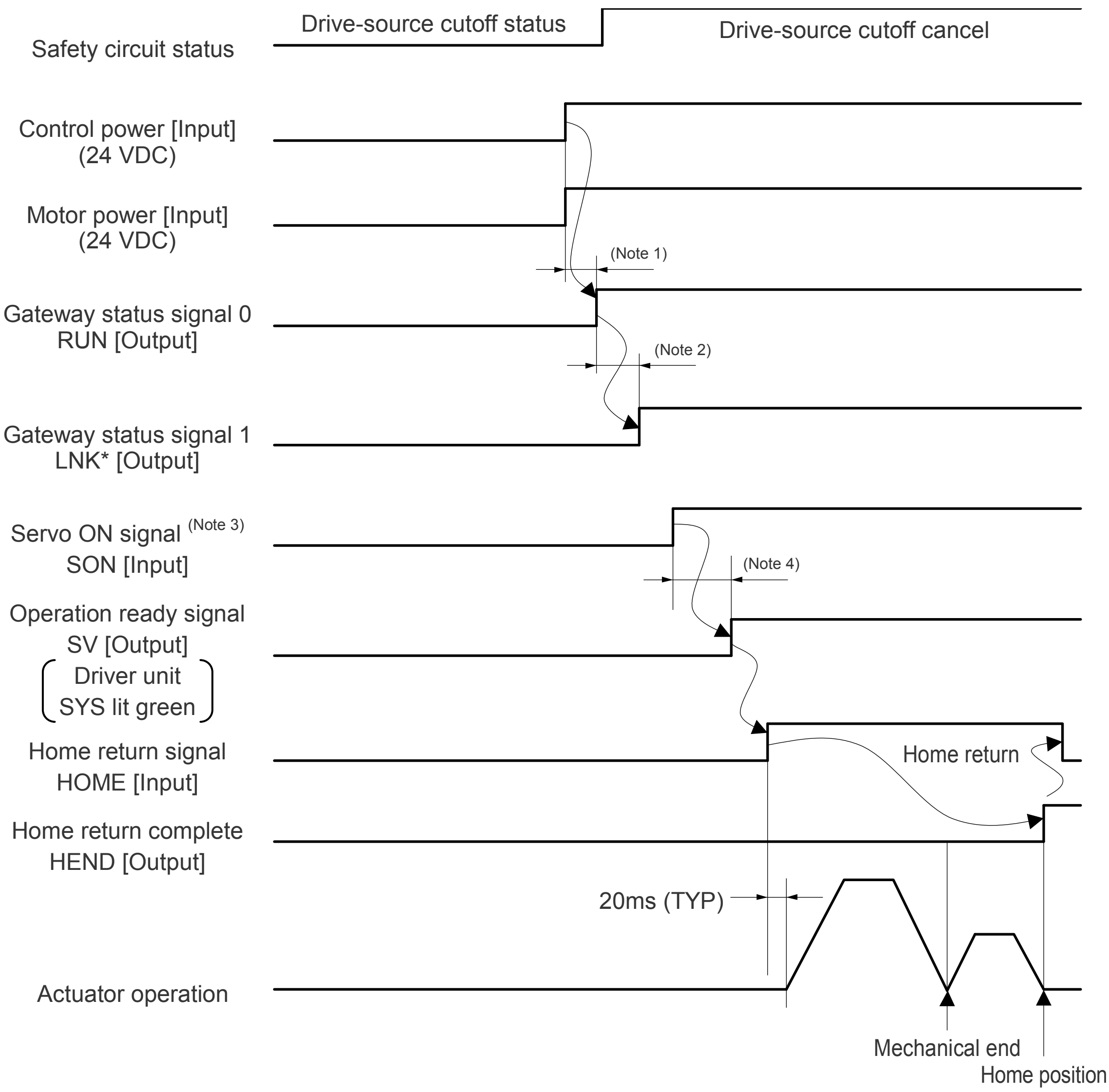
The procedure from turning on the RCON system to the home return command is as follows.

(1) Supply the control power and motor power (24 VDC).

(2) Cancel the STOP signal input or the drive shutoff status and set to conductive status.

(3) After confirming that the gateway status signals 0 "RUN" and 1 "LNK*" are ON, input the servo ON signal SON.

(4) After confirming that the operation ready signal SV is ON, input the home return signal HOME. home return motion begins. When home return is completed, the home return complete signal HEND is output.



For details on the gateway status signal, refer to "3.7 Address Configuration / Gateway control / status signal (page 3-40)".

Note 1: When the power is turned ON, the RCON system starts up. When field network communication between the gateway unit and host device is established, the gateway status signal 0 "RUN signal" turns ON. After confirming that the RUN signal is ON, begin communication with the gateway unit.

Note 2: If the gateway unit and driver unit are communicating normally, the gateway status signal 1 "LNK* signal (* is axis number)" turns ON.

If a communication error occurs between the gateway unit and driver unit, "LNK* signal" turns OFF. However, the ERRT alarm is not generated until the "communication retry count" set in the gateway parameter configuration tool is exceeded, until which retries are repeated.
If the communication becomes normal after repeated retries, "LNK* signal" turns ON.
The signal may also turn ON after temporarily turning OFF due to sudden noise.

Regarding the "communication retry count", refer to "3.9 Gateway Parameter Configuration Tool / Special parameter setting function descriptions" (page 3-131)".

Note 3: After checking the RUN signal and LNK* signal, input the SON signal. The actuator goes into servo ON status.

Note 4: When the first SON signal is input after power ON, the motor performs excitation phase detection operation (stepper motor specification) or magnetic pole phase detection operation (AC servo motor specification).
After confirming that the operation ready signal SV is ON, input the travel command or home return command.

Caution

- If the servo is turned ON in the vicinity of the mechanical end, the magnetic pole phase will not be properly detected, causing abnormal operation, uncertain magnetic pole error or excitation detection error.
  Turn ON the servo in a position away from the mechanical end.
- If the power has been turned OFF, wait 1 second or more before rebooting the power. Otherwise, the product may malfunction.

[Operation in direct numerical control mode]

Specify the data in the PLC position data specification register, positioning width register, speed register, acceleration/deceleration register and push-motion current limit value register.

● Operation example (push-motion operation)

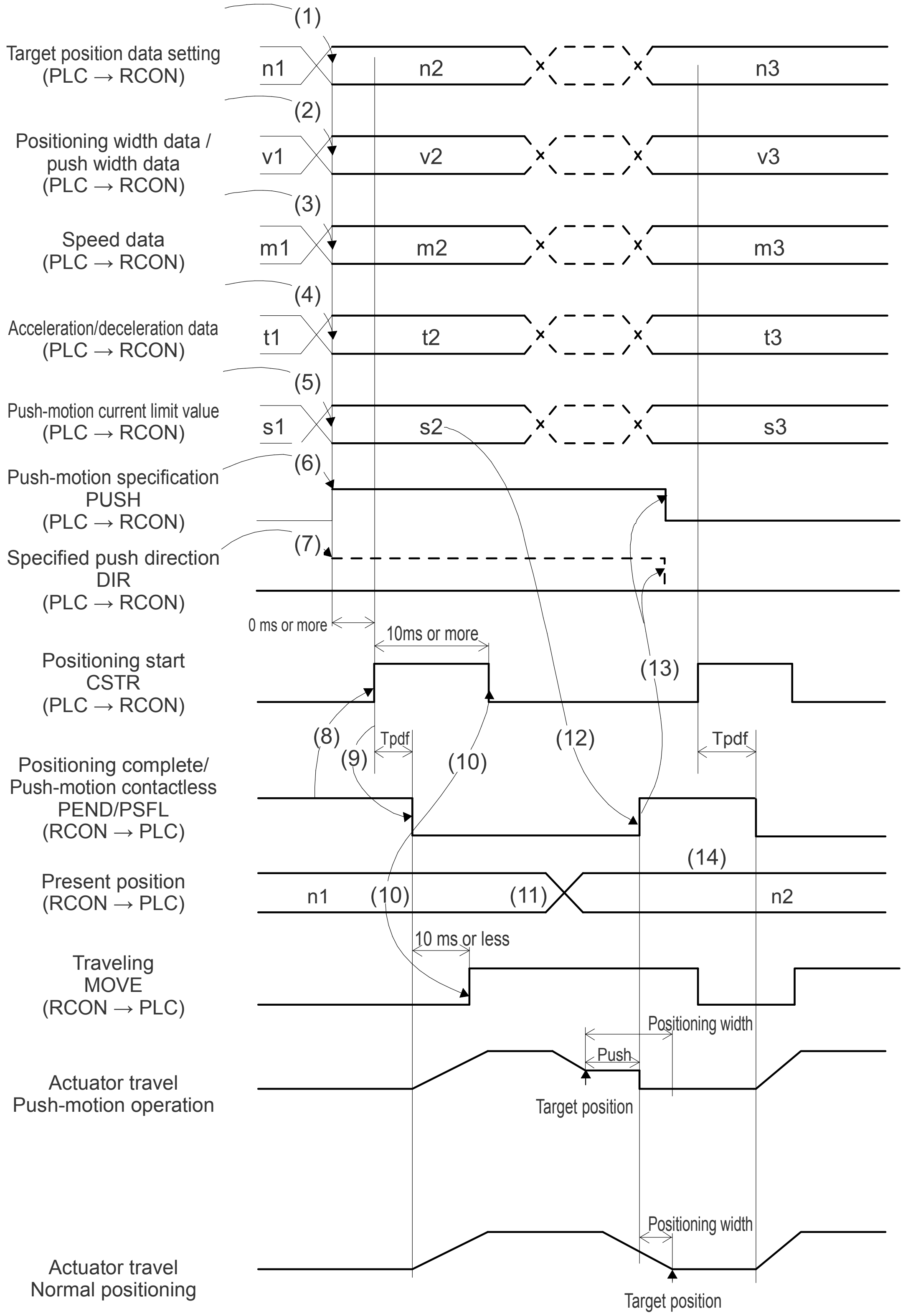
<Preparation> Using the gateway parameter configuration tool, set the axis number to be used in the direct numerical control mode. For details, refer to "3.9 Gateway Parameter Configuration Tool / Operation mode setting" (page 3-138).

(1) Set the target position data in the position data specification register.
(2) Set the push width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the acceleration/deceleration data in the acceleration/deceleration register.
(5) Set the push-motion current limit data in the push-motion current limit value register.
(6) Set the push-motion specification signal PUSH to ON.
(7) Specify the push-motion direction with the push-motion direction specification signal DIR.
(8) While the positioning complete signal PEND is ON or the moving signal MOVE is OFF, turn ON the positioning start signal CSTR.
The data set in (1) to (5) are read into the RCON at the rising edge of the CSTR signal.
(9) After the CSTR signal is turned ON, the PEND signal turns OFF after Tpdf.
(10) Confirm that the PEND signal is OFF or the MOVE signal is ON, then turn OFF the CSTR signal. However, be sure to set an interval of 10 ms or more from CSTR signal ON until signal OFF. Do not change the value of each register until the CSTR signal is turned OFF.
(11) The present position data is constantly being updated.
(12) The PEND signal turns ON when the CSTR signal is OFF and the motor current reaches the current limit value set in (5). (Push-motion complete)
Even if the push width set in (2) is reached, if the motor current does not reach the current limit value set in (5), the push-motion contactless signal PSFL turns ON. In this case, the PEND signal will not turn ON. (Push-motion contactless)
(13) After the PEND signal or PSFL signal turns ON, turn OFF the PUSH signal.

● Operation example (normal positioning operation)

For normal positioning operation, turn the PUSH signal OFF.

When the remaining travel distance enters the positioning width range set in the positioning width register, the PEND signal turns ON when the CSTR signal is OFF.



Tpdf = Yt + 6 + Xt (minimum value) to Yt + 6 + Xt + 12 (maximum value)

[Simple direct mode/positioner 1 operation]

Set the target position data to PLC position data specification register (in simple direct mode) or register the target position to the RCON position table (in positioner 1 mode), and register other data such as speed, acceleration/deceleration, positioning width and push-motion force in the position table for operation.

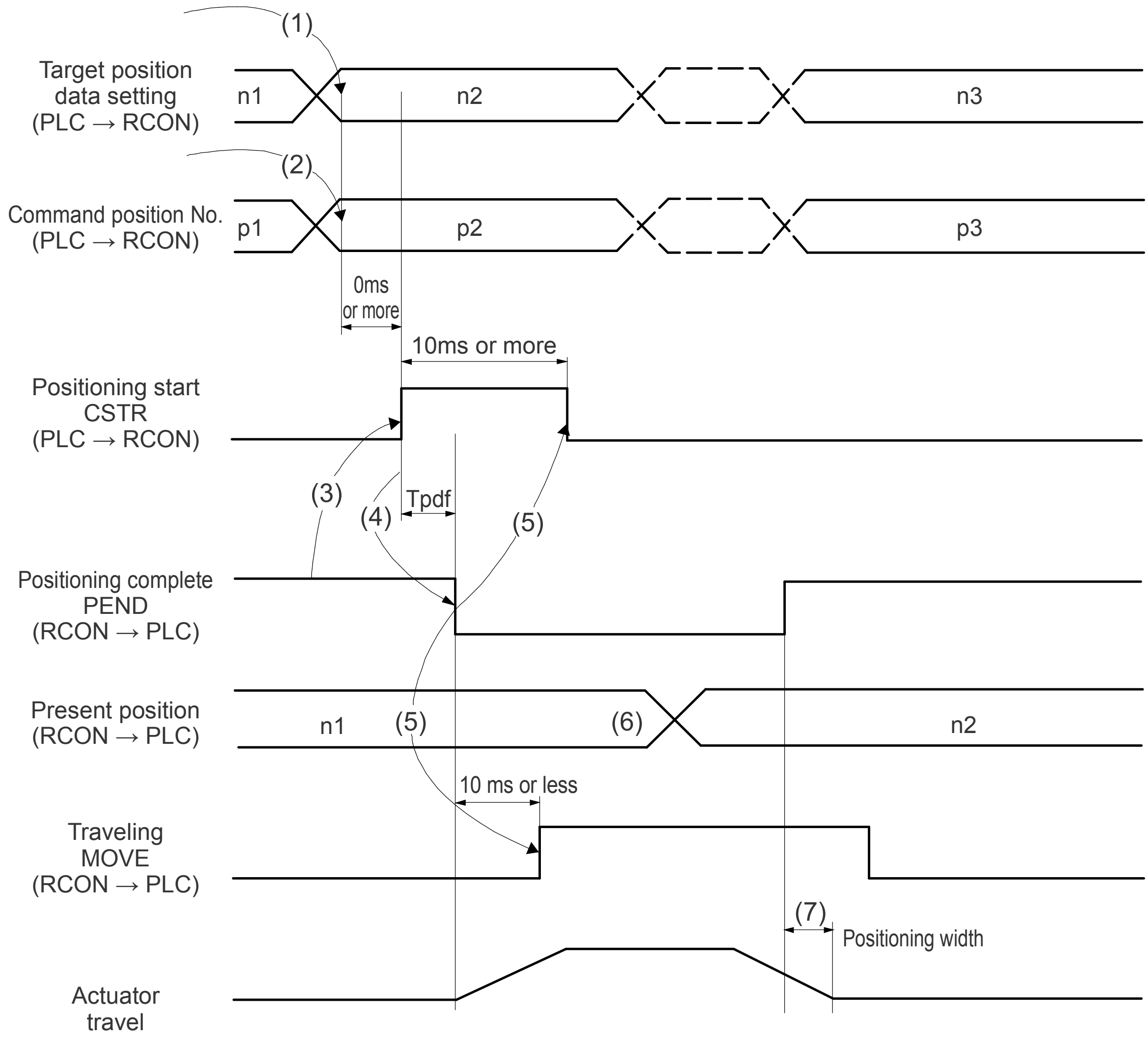
● Operation example (normal positioning operation in simple direct mode)

<Preparation> Using the gateway parameter configuration tool, set the axis number to be used in the simple direct mode. For details, refer to "3.9 Gateway Parameter Configuration Tool / Operation mode setting" (page 3-138).
Register the position data (speed, acceleration/deceleration, push width, etc.) other than the target position in the position table.

(1) Set the target position data in the position data specification register.
(2) Register the position No. for which the speed, acceleration/deceleration and the like are set in the command position No. register.
(3) While the positioning complete signal PEND is ON or the moving signal MOVE is OFF, turn ON the positioning start signal CSTR
The data set in (1) and (2) are read into the RCON at the rising edge of the CSTR signal.
(4) After the CSTR signal is turned ON, the PEND signal turns OFF after Tpdf.
(5) Confirm that the PEND signal is OFF or the MOVE signal is ON, then turn OFF the CSTR signal. However, be sure to set an interval of 10 ms or more from CSTR signal ON until signal OFF. Do not change the value of each register until the CSTR signal is turned OFF.
(6) The present position data is constantly being updated.
(7) When the remaining travel distance of the actuator enters the positioning width range set in the position data, the PEND signal turns ON when the CSTR signal is OFF, and the complete position number is output to the complete position number register.
The present position data may slightly change due to vibration or the like even while it is stopped.
(8) The target position data can be changed while traveling.
To change the target position, change the target position data and turn ON the CSTR signal once the PLC scan time has elapsed.
Turn OFF the CSTR signal after satisfying the same conditions as (5) above.

● Operation example (push-motion operation)

For push-motion operation, set the current limit value in the push-motion force field and push width in the positioning width field of the position table in the <Preparation> step. If positioning is performed on this set position No., push-motion operation will be activated.



Tpdf = Yt + 6 + Xt (minimum value) to Yt + 6 + Xt + 12 (maximum value)

[Operation in positioner 2, 3, and 5 modes]

Register the target position, speed, acceleration/deceleration, positioning width, push-motion and the like to the RCON position table.

● Operation example (positioning operation)

<Preparation> Using the gateway parameter configuration tool, set the axis number to be used in the positioner 2, 3 or 5 mode. For details, refer to "3.9 Gateway Parameter Configuration Tool / Operation mode setting" (page 3-138).

Register the position data (target position, speed, acceleration/deceleration etc.) in the position table.

(1) Register the position No. for which the speed, acceleration/deceleration and the like are set in the command position No. register.

(2) While the positioning complete signal PEND is ON or the moving signal MOVE is OFF, turn ON the positioning start signal CSTR.

The data set in (1) are read into the RCON at the rising edge of the CSTR signal.

(3) After the CSTR signal is turned ON, the PEND signal turns OFF after Tpdf.

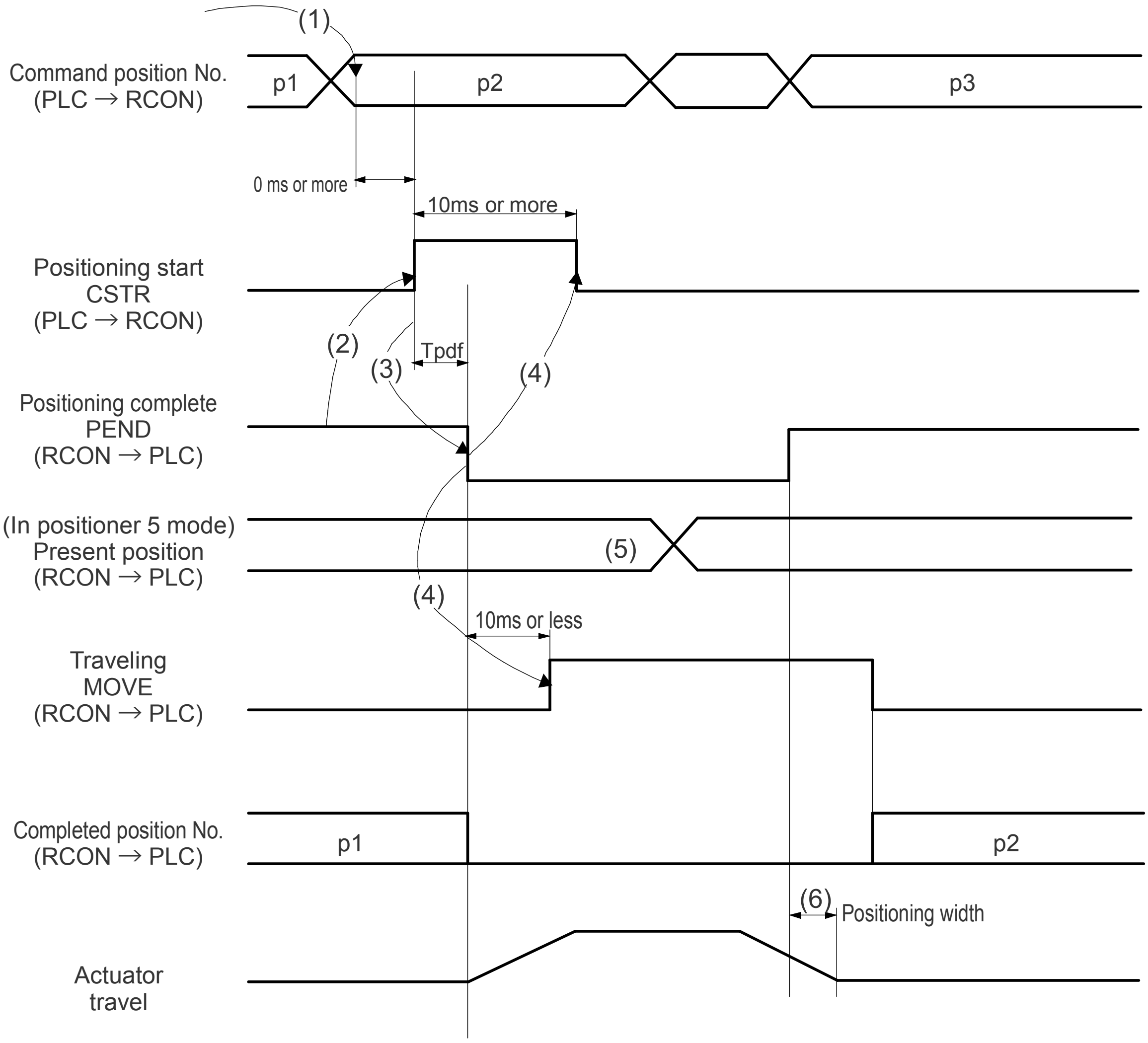
(4) Confirm that the PEND signal is OFF or the MOVE signal is ON, then turn OFF the CSTR signal. However, be sure to set an interval of 10 ms or more from CSTR signal ON until signal OFF. Do not change the value of each register until the CSTR signal is turned OFF.

(5) In positioner 5 mode, the present position data is constantly being updated.

(6) When the remaining travel distance of the actuator enters the positioning width range set in the position data, the PEND signal turns ON when the CSTR signal is OFF, and the complete position number is output to the complete position number register.

● Operation example (push-motion operation)

For push-motion operation, set the current limit value in the push-motion field and push width in the positioning width field of the position table in the preparation step. If positioning is performed on this set position No., push-motion operation will be activated.



Tpdf = Yt + 6 + Xt (minimum value) to Yt + 6 + Xt + 12 (maximum value)

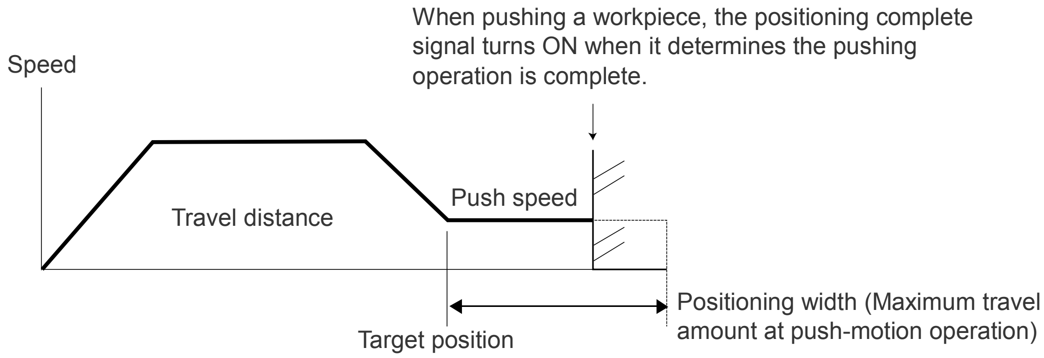
Other basic operations

[Push-motion Operation]

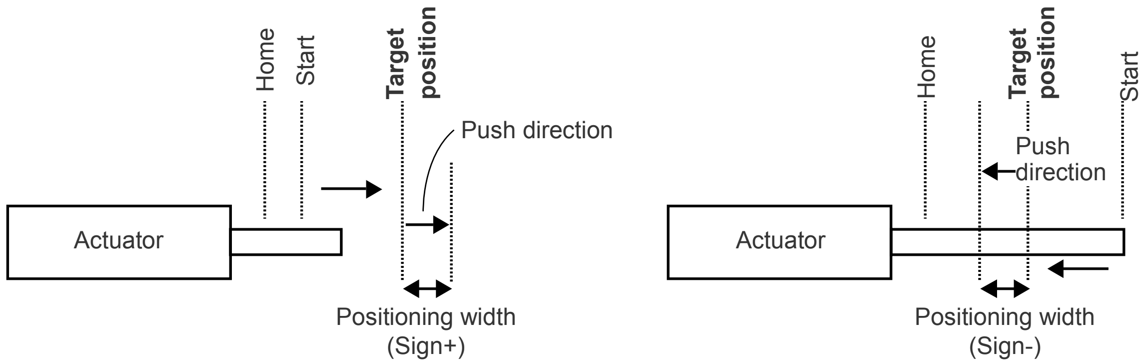
(1) Basic operation

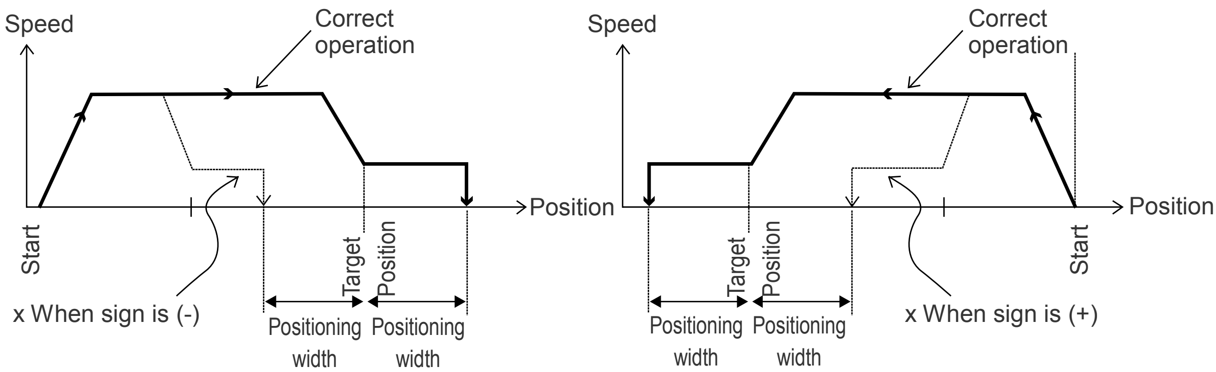
After moving to the set target position as shown below, advance at the set push speed with push motion by the positioning width set as the maximum travel amount.

When the pushing force reaches a certain value during push motion, it is judged that pushing is completed and the positioning complete signal PEND becomes "1" (ON).



Concept of push direction





As shown in the figure above, when pushing from the start point toward the target position in the direction in which the coordinate value increases, the push direction is positive (+), and when pushing in the direction in which the coordinate value decreases, the push direction is negative (-). Pushing in the wrong direction will lead to improper operation, as the push-motion operation will start at the start point and continue to the distance (positioning width × 2); take care.

■ Push mode specification

- For positioner 1~3 and 5 mode and simple direct mode, set a numerical value to something other than 0 in the "Push" column of the position table. (Pushing current limit value)
- For direct numerical control mode, set the value to the current limit value area at the time of pushing (8-bit), and set the control signal PUSH (bit 12) to "1" (ON).

■ Push speed

Set Parameter No. 34 "Push velocity".
(Individually set for each actuator model at shipment.)

■ Maximum travel amount at push-motion operation

- For positioner 1~3 and 5 mode and simple direct mode, set in the "Positioning width" column of the position table.
- For direct numerical control mode, set a numerical value for the positioning width area.
  (When setting, consider the workpiece installation positioning error and the indentation of elastic workpieces.)

■ Push direction

- For positioner 1~3 and 5 mode and simple direct mode, the sign in the "Positioning width" column of the position table.
- For direct numerical control mode, set the control signal DIR (bit 13) to "0" (OFF) or "1" (ON).

■ Pushing complete recognition

- Recognition of pushing complete is done by motor generated torque (pushing force) and push time.
- Set the push current limit value (%) in the "Push" column of the position table. • For direct numerical control mode, set in the push current limit value register.
  Determine the push force from the workpiece characteristics (shape, material etc.) and then the push current limit value from the actuator "Push force - Current limit value" relationship diagram.
- Set the value of Pushing Stop Recognition Time in Parameter No. 6.
  (The factory default setting is 255 ms.)

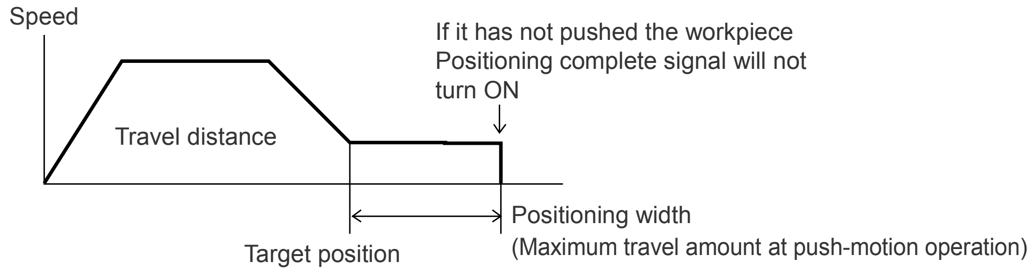
■ Continuous pushing

- When it is determined that push-motion operation is complete, positioning complete signal PEND becomes "1" (ON), but continuous push-motion operation is performed until the next travel command (command position number and positioning start signal CSTR) is issued.

(2) For push-motion contactless

Even if it travels the distance set for positioning width, positioning complete signal PEND will not be output if it has not pushed the workpiece (the current of the motor has not reached the current limit value at the time of pushing). However, completed position No. is output.

At this time, PSFL of status signal bit 5 becomes "1" (ON).

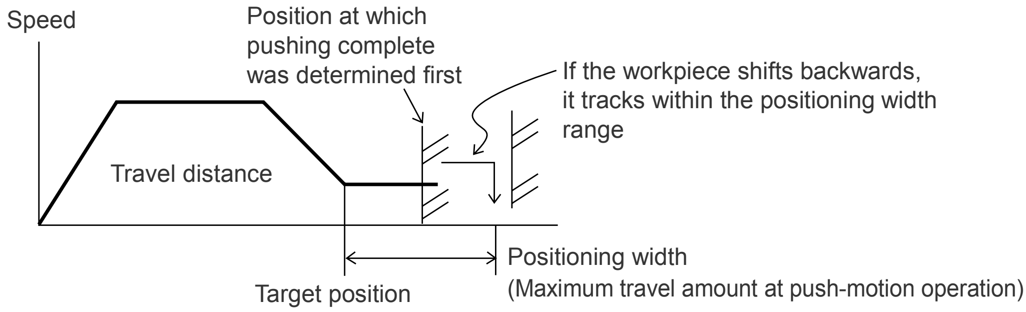


(3) If the workpiece moves after pushing

■ If the workpiece moves in the pushing direction

Once the workpiece moves in the pushing direction after pushing is completed, the actuator tracks the workpiece within the range of the positioning width.

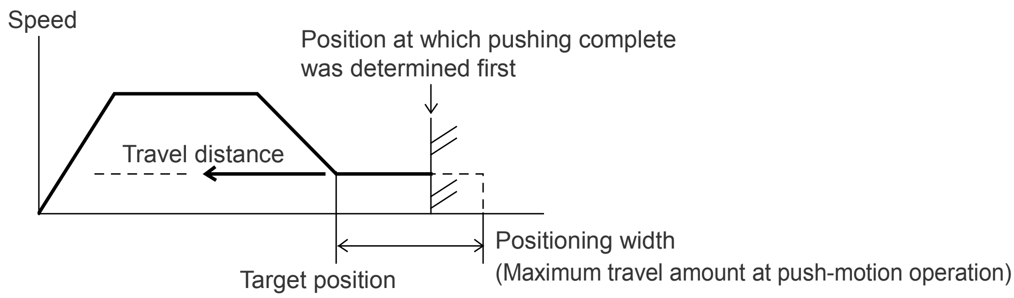
If the traveling current value becomes smaller than the pushing current limit value, the positioning complete signal PEND will be "0" (OFF). When it reaches the current limit value again, it becomes "1" (ON).



■ If the workpiece moves in the direction opposite to the push direction (when the reaction force from the workpiece is too strong and it is pushed back)

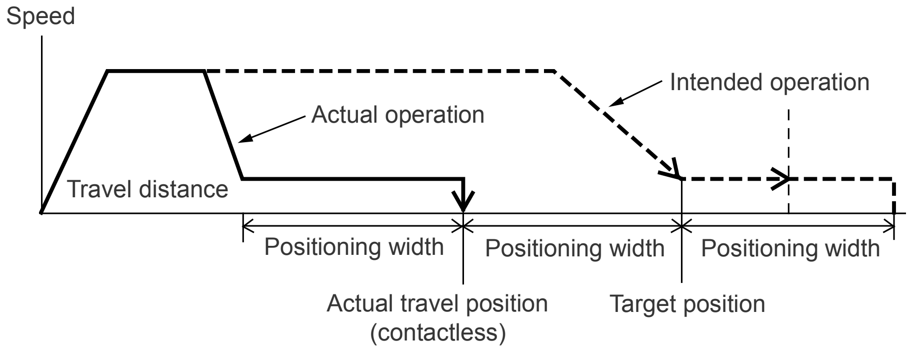
If pushed back due to reaction force from the workpiece after pushing is completed, the actuator is pushed back to the utmost until the pushing force and the reaction force from the workpiece are balanced.

At this time, the positioning complete signal PEND remains "1" (ON). When pushed back to the target position, an alarm is generated.



(4) If push direction is set incorrectly

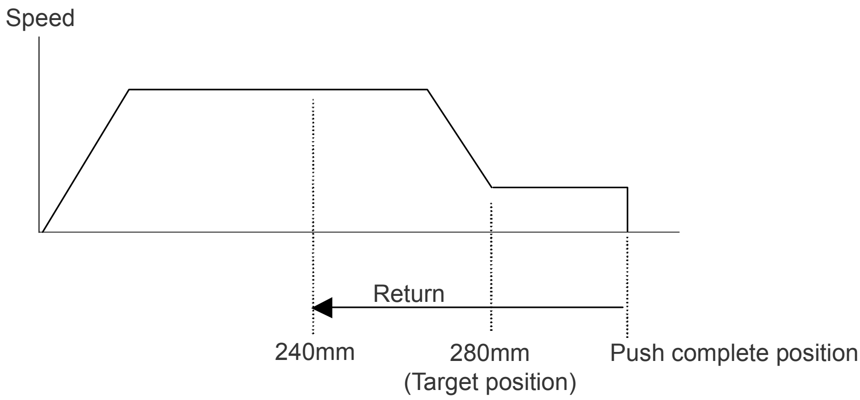
If the push direction is set incorrectly, be careful as it will be displaced by (positioning width x 2) as shown below.



(5) If return after pushing is performed by relative coordinate specification

Be aware that for relative coordinate specification, the reference position is the target position of the position No. that pushed, not the current position where pushing has stopped after completion.

In this example, if you set the position No. to -40 mm of the relative coordinate, it will move to the position 280 - 40 = 240 mm. However, if pushing is specified, it will move relatively from the stop position.



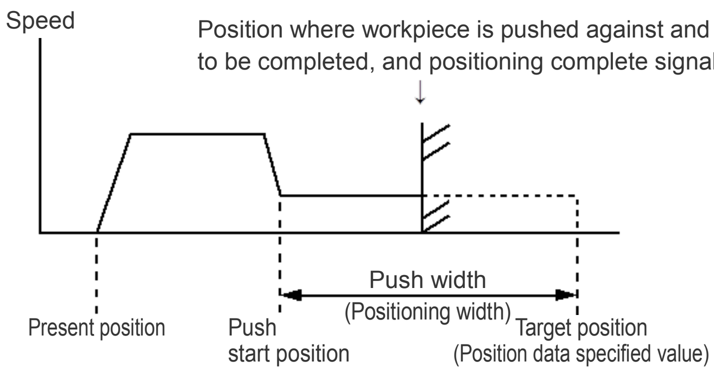
(6) When SEP is set as push mode

When using direct numerical control mode, if parameter No. 181 is set to "1", the push mode can be changed to SEP.

[Push Mode (Parameter No. 181)]

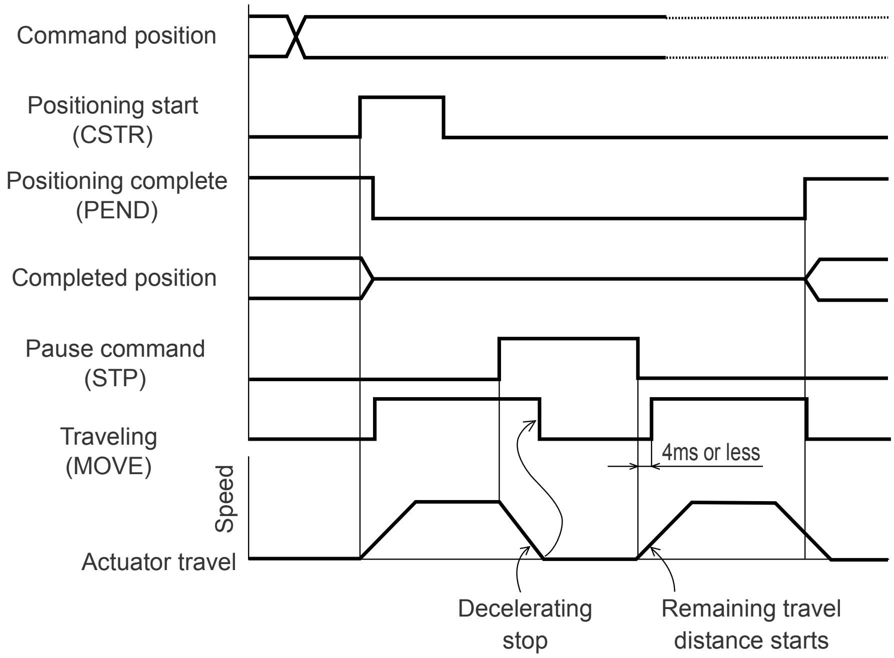
No.	Name	Symbol	Unit	Input range	Default initial value setting
181	Push mode	SPOS	–	0: CON mode 1: SEP mode	0

Push-motion operation is performed with the position obtained by subtracting the distance set for the positioning width from the target position (position data specified value) as the start position.
Pull-motion operation is not available.
During push motion, once the workpiece is pushed against and the push is judged to be completed, PEND will turn ON.

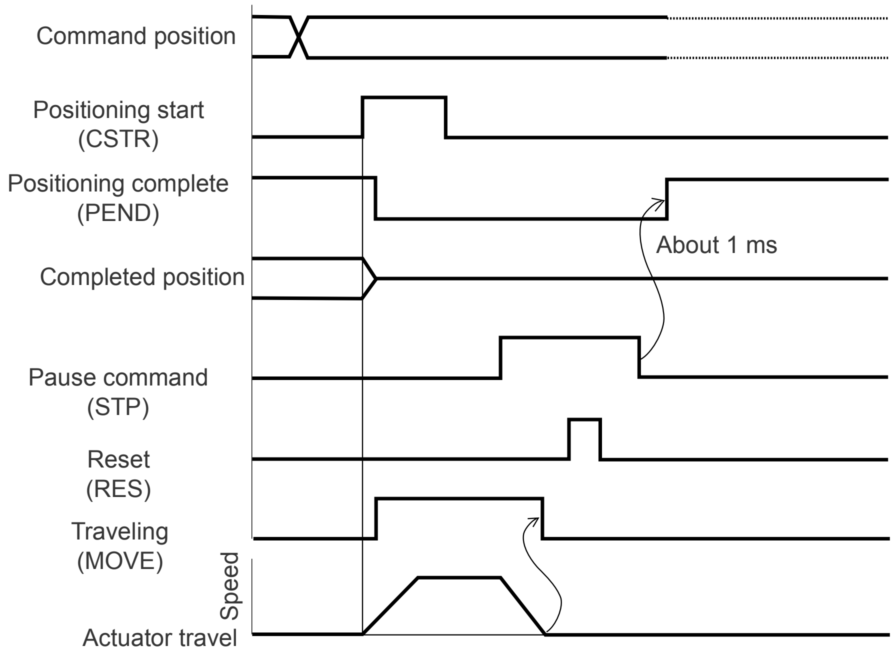


[Pausing]

Deceleration to a stop occurs when the pause command signal STP is set to "1" (ON) during actuator operation and the remaining travel distance is suspended. If the STP signal is set to "0" (OFF) again, movement over the remaining travel distance is resumed.

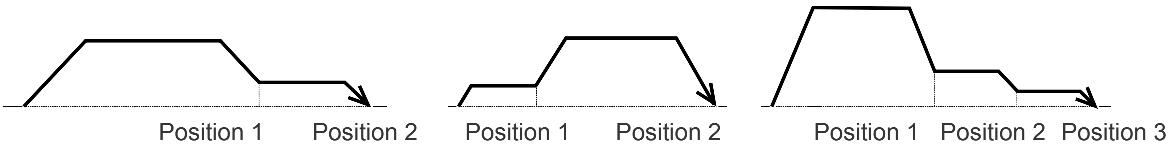


If reset signal RES is set to "1" (ON) while paused, it is possible to cancel the remaining travel distance. After that, the positioning complete signal PEND becomes "1" (ON) in about 1 ms when cancellation of the pause command signal STP is recognized. (Detects the RES signal and cancels it.)



[Speed changes while traveling]

Multiple speed control is possible with one operation. While traveling, you can slow down or speed up from a given point. However, position data is required every time the speed changes.

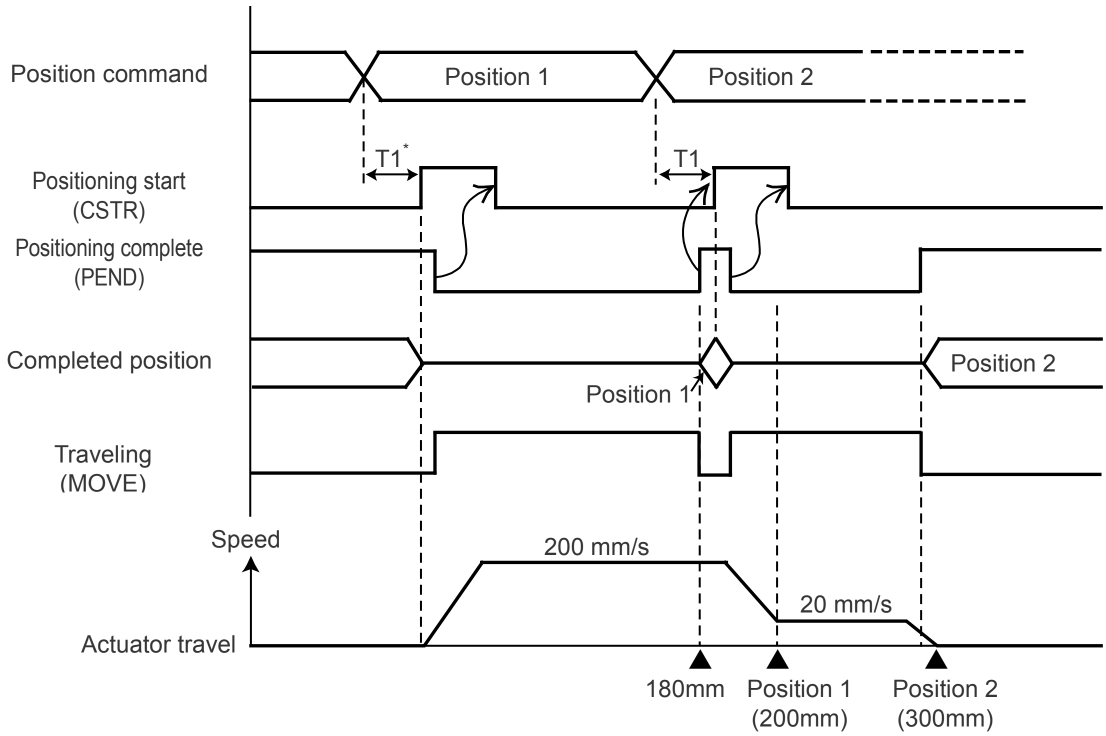


This function is effective for cases where the material to be conveyed is soft, the workpiece may fall due to its shape, such as bottles, and when vibration or shocks while stopping are undesirable.

(Example) When positioning to position 2 (300 mm from home), it moves to an intermediate position 1 (200 mm from home) at 200 mm/s speed, and thereafter at 20 mm/s speed.

Position table example

No.	Position [mm]	Speed [mm/s]	Acceleration [G]	Deceleration [G]	Push [%]		Positioning width [mm]		Comment
0	*	*	*	*	*		*		
1	200.00	200.00	0.30	0.30	0		20.00		
2	300.00	20.00	0.30	0.30	0		0.10		



* Consider the scan time of the host controller, so that T1 ≥ 0 ms.

Caution

- When the positioning start signal CSTR is set to "1" (ON), positioning complete signal PEND changes to "0" (OFF) and the moving signal MOVE changes to "1" (ON).
  Set the start signal CSTR to "1" (ON); after confirming that the PEND signal is "0" (OFF), set the CSTR signal back to "0" (OFF).
- If you increase the positioning width at position 1, speed change can be performed smoothly without having to pause.
- When a pause command is issued during home return, the travel command is suspended if before mechanical end pushing; if after push reverse operation, it starts over from home return.

[Operation at Different Acceleration/Deceleration Speeds]

(1) In positioner 1~3 and 5 mode and simple direct mode

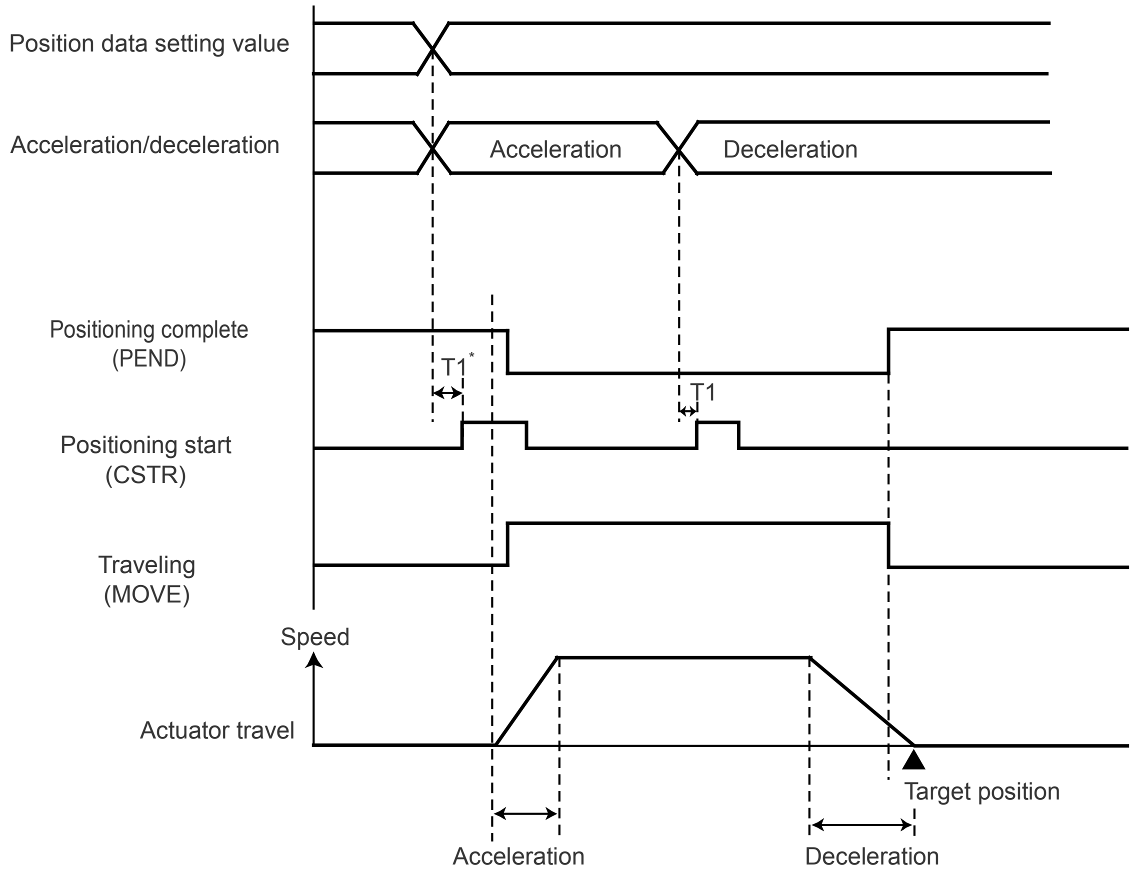
Acceleration and deceleration can be set separately in the position table.

(2) In direct numerical control mode

In this mode, acceleration and deceleration cannot be set separately.

Acceleration/deceleration can be set together.

Acceleration/deceleration data (16-bit data) is valid when data is received by the driver unit (rising edge "0" (OFF) → "1" (ON) of CSTR signal), so to set a different deceleration from acceleration, change the acceleration/deceleration data while traveling.



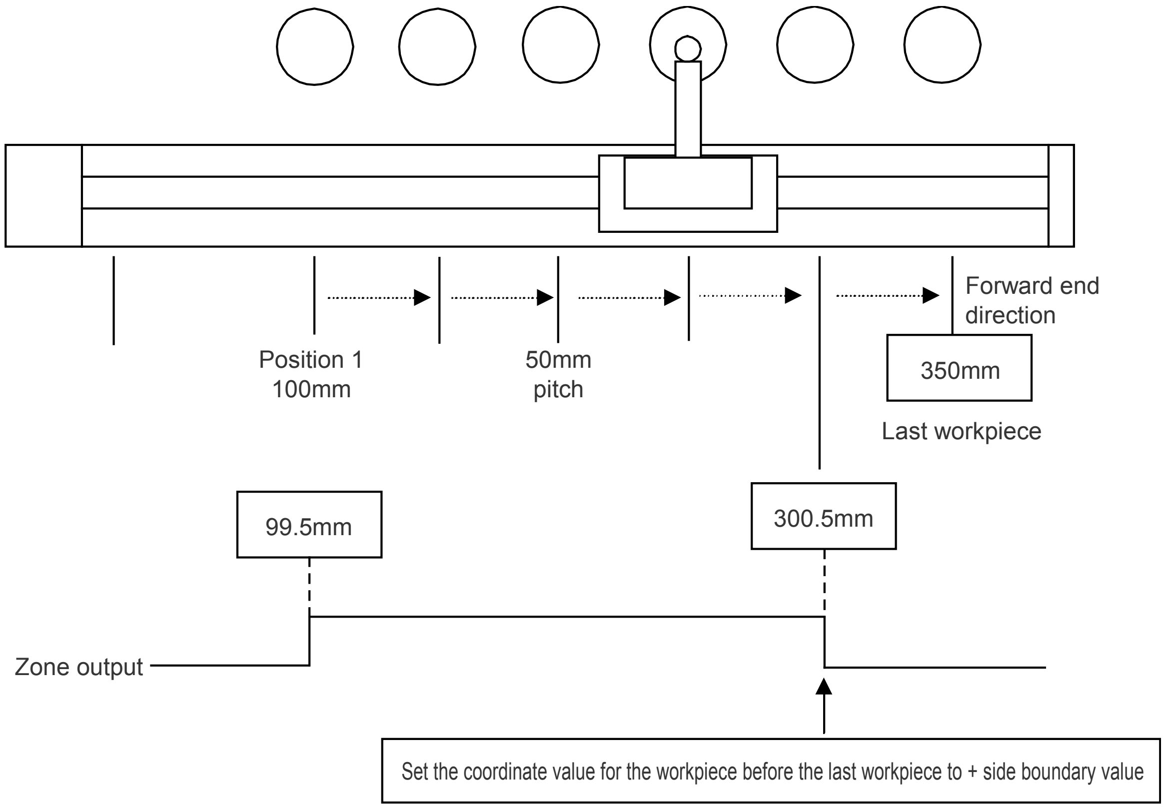
* Consider the scan time of the host controller, so that T1 ≥ 0 ms.

[Operation by Specifying Relative Coordinates]

Relative coordinates for the target position of the position table can also be specified, allowing use for equidistant positioning operations.

(1) Example for operation in positioner 1~3 and 5 mode

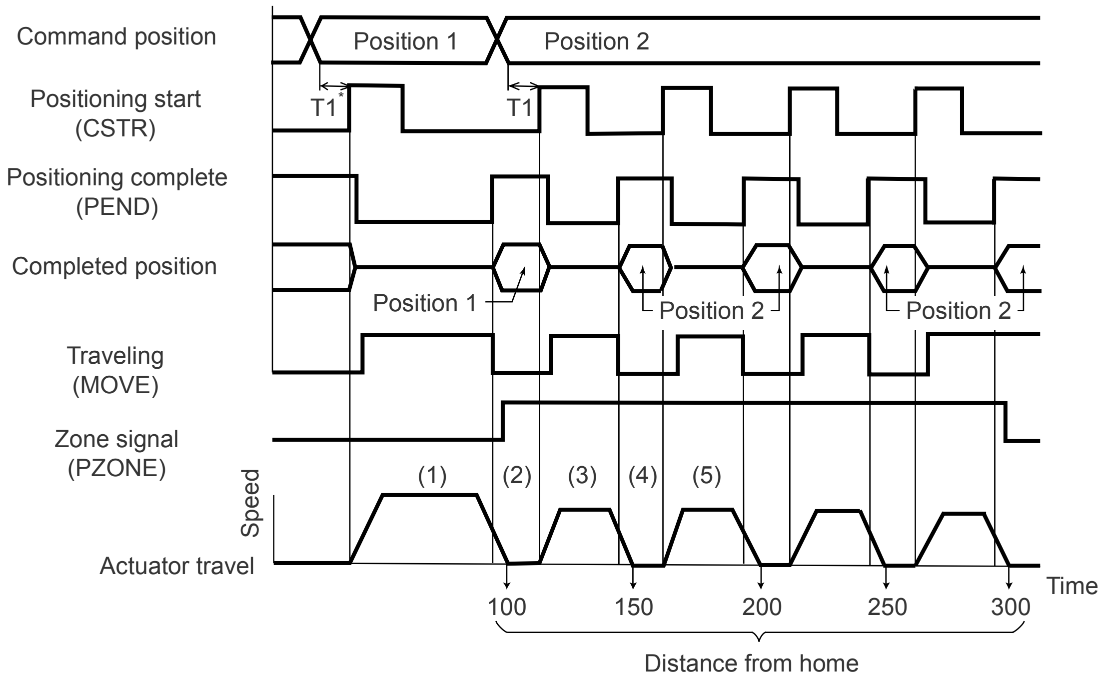
Here is an example for positioning with 50 mm pitch starting from position No. 1. Create a position table like the one below. The end of operation judgment is carried out by performing count management on the PLC side. Double checking is possible if a zone signal is used together.



Position table example

No.	Position [mm]	Zone+ [mm]	Zone- [mm]	Incremental	Comment
0	*	*	*	0	
1	100.00	300.50	99.50	0	
2 =	50.00	300.50	99.50	1	

Indicates the relative coordinate specification with the teaching tool.



* Consider the scan time of the host controller, so that T1 ≥ 0 ms.

[Description of Operation]

(1) Positioning to position 1 (100.00 mm) is carried out

(2) When positioning to position 1 is completed, positioning complete signal PEND changes to "1" (ON). The zone signal PZONE also changes to "1" (ON).
Switch position No. 1 → 2 and set the start signal CSTR to "1" (ON).

(3) When travel starts, PEND signal changes from "1" (ON) to "0" (OFF) and the moving signal MOVE changes from "0" (OFF) to "1" (ON). After confirming that the PEND signal is "0" (OFF), set the CSTR signal to "0" (OFF).

(4) After moving by 50 mm again, the PEND signal changes to "1" (ON) and the MOVE signal changes to "0" (OFF). At this time, the travel count is counted as 1 by the PLC. Next, set the CSTR signal for the second 50 mm movement to "1" (ON).

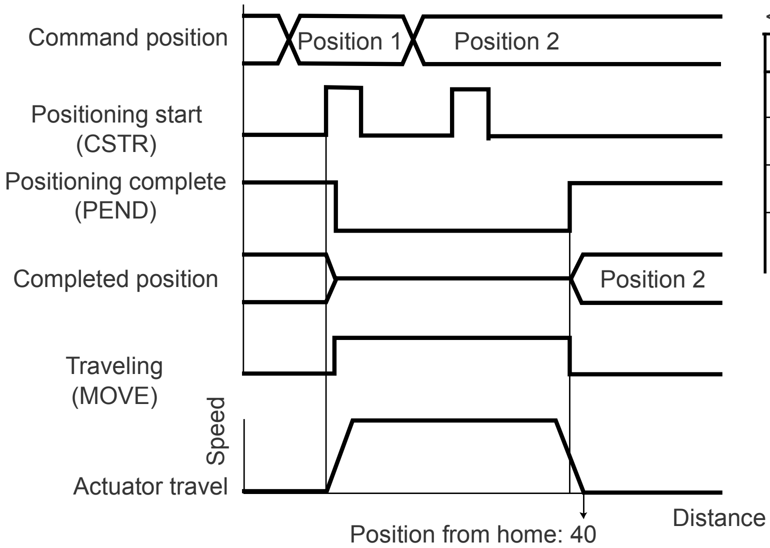
(5) Operations (3) and (4) below are repeated.

The PLC side confirms the state of the PZONE signal after positioning complete, and if it is "0" (OFF), it recognizes it as the last workpiece position.
If the count on the PLC side does not match the state of the zone signal, the signal timing may not have been synchronized.

(2) Precautions for positioning operation

When selecting and inputting position No. of the relative coordinates during positioning operation and performing start input, it travels to the first position plus the amount of relative travel. (If the amount of relative travel is negative, it moves to the position subtracted from the first position.)

Example: If start input of position 2 is performed during travel to position 1, it will go to a position 40mm from home.

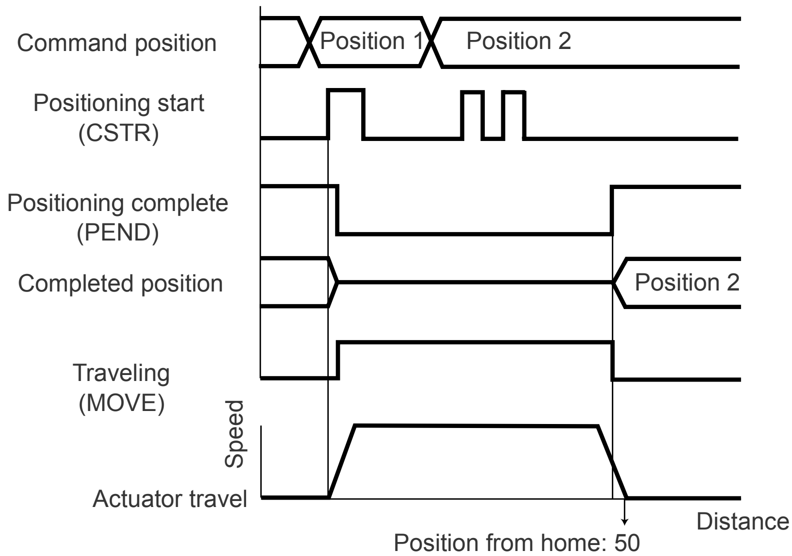


<Position table with teaching tool>

No.	Position	Speed
0	*	*
1	30	100
2	10	100
⋮	⋮	⋮

Also, when performing start input to the position No. of the relative coordinates during positioning operation multiple times, it travels to the first position plus the amount of relative travel x the count.

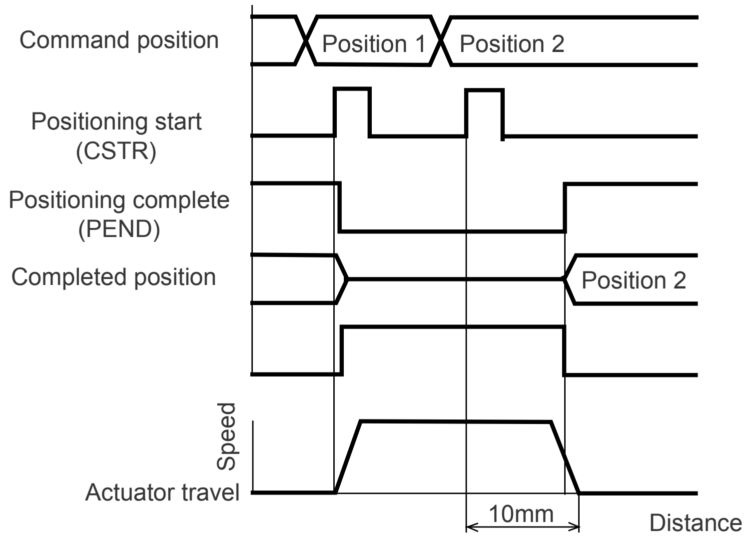
Example: If start input of position 2 is performed twice during travel to position 1, it will go to a position 50mm from home.



(3) Precautions for push-motion operation

When selecting and inputting position No. (pushing designation) of the relative coordinates while traveling in push mode, it travels to the input position plus the relative travel amount. Therefore, the end point position is not fixed.

Example: If start input of position 2 is performed during travel to position 1 in push mode, it will go to a position 10mm from the input position.



<Position table with teaching tool>

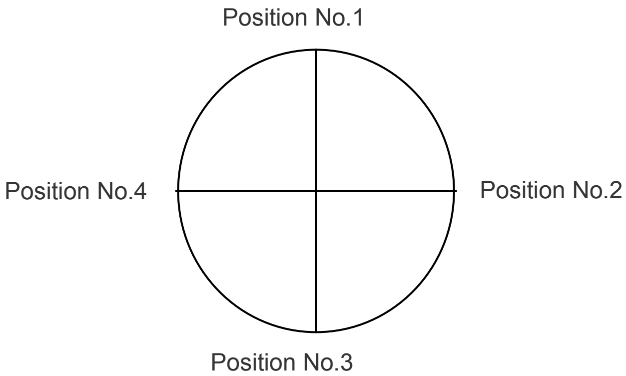
No.	Position	Speed
0	*	*
1	50	100
2	= 10	100
⋮	⋮	⋮

[Shortcut control of multi-rotation specification rotary actuator]

(1) Setting shortcut selection

Shortcut selection can be set to enabled/disabled in parameter No. 80 "Rotary axis shortcut select". When shortcut selection is enabled, it is also possible to operate only in the same direction.

[Operation examples]

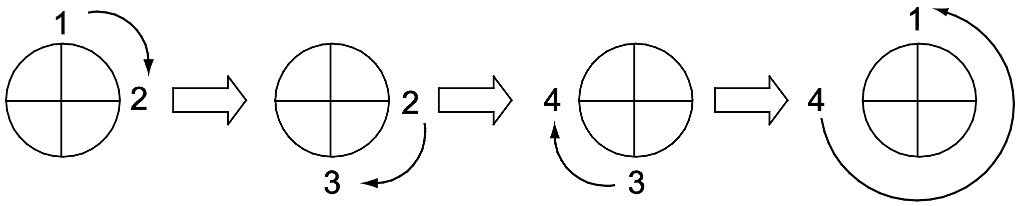


Position No.	Position
1	0.00
2	90.00
3	180.00
4	270.00

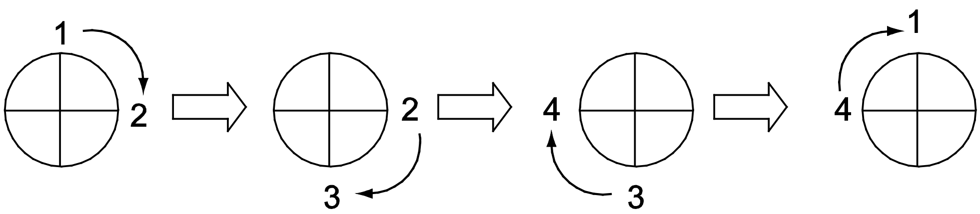
Enter the position data as 1 deg = 1 mm. (Ex) 1.2 is treated as 1.2 deg.

When operating in order of positions 1 → 2 → 3 → 4 → 1, operation differs according to whether shortcut selection is disabled or enabled.

- Disabled



- Enabled

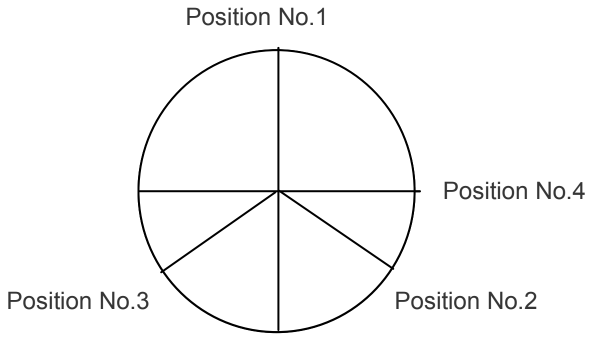


(2) Infinite rotation control

When shortcut selection is enabled for continuous operation in the same direction, it is possible to perform continuous rotation in the same manner as a motor. Proceed as follows to perform continuous operation.

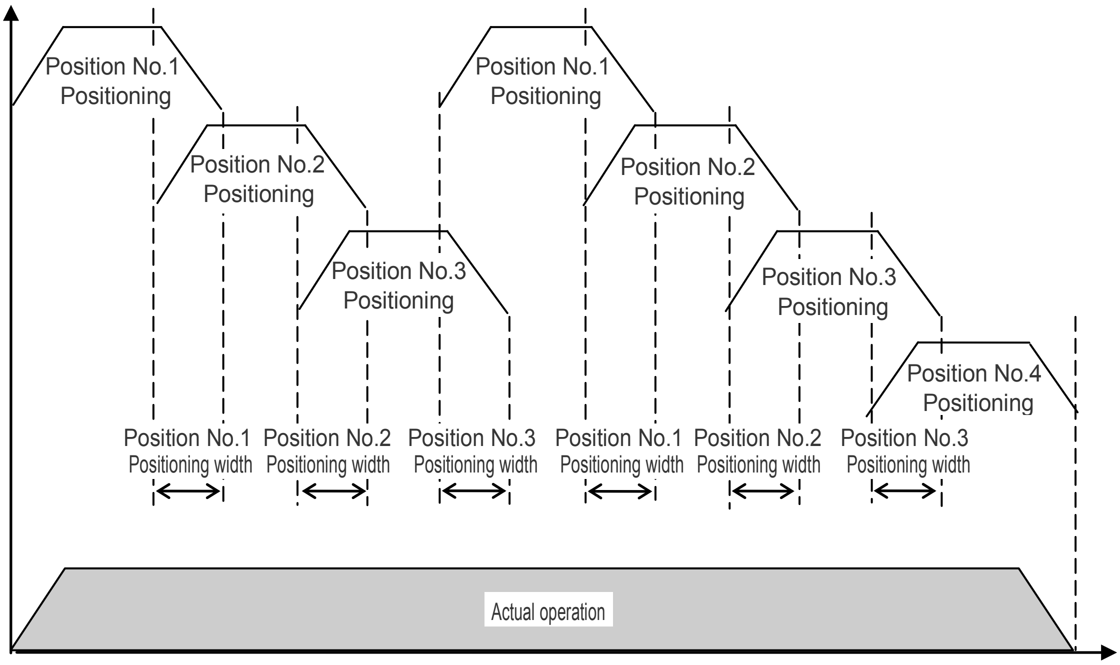
[Operation examples]

This example shows 2 rotations, finally stopping at position No. 4.



Position No.	Position
1	0.00
2	120.00
3	240.00
4	90.00

Enter the position data as 1 deg = 1 mm. (Ex) 1.2 is treated as 1.2 deg.



(1) Expand the positioning width setting of Position No. 1 to 3 to a position forward of the position where deceleration starts.

(2) If positioning is performed at Position No. 1, the positioning complete signal PEND turns ON before deceleration starts.
Position No. 2 positioning is performed by turning ON the PEND signal. Similarly, positioning is performed in the order of position No. 3 → 1 → 2 → 3 → 4. In normal positioning, the position data commanded afterward is always prioritized, which enables continuous rotation.

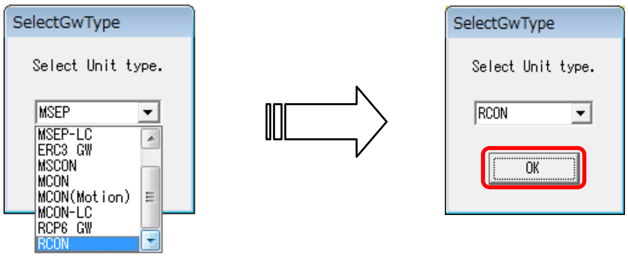
(3) At this point, if the speed setting is the same for Position No. 1 to 4, it is possible to rotate at the same speed and set the stop position to No. 4. The number of rotations is determined by how many times positions No. 1 to 3 are repeated.

3.9 Gateway Parameter Configuration Tool

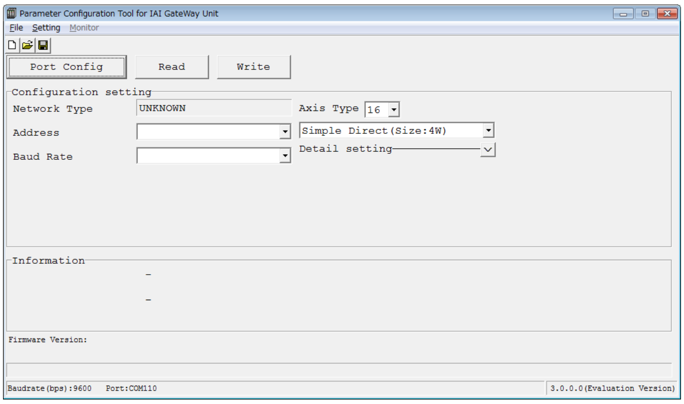
Use the gateway parameter configuration tool to select the operation mode of the RCON system and to set various functions. The screen design differs slightly depending on the OS of the PC.

Tool startup

1 After turning on the RCON system, starting the gateway parameter configuration tool will display the following screen. Select "RCON" and press OK.



2 The main screen will be displayed. Even if the gateway unit cannot be detected, the main screen will be displayed. When you press "Import" on this screen, parameters will be imported from the detected gateway unit.
Press the "Transfer" button to transfer the parameters. However, note that they cannot be transferred if the address or communication speed is not selected.



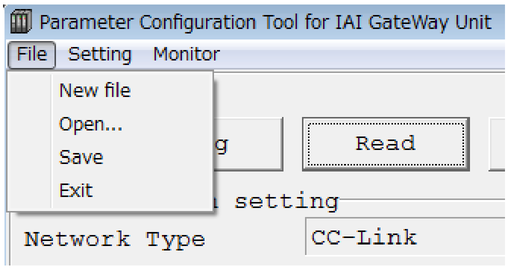
Main screen (initial state)

Caution

- If the actual number of connected axes of the RCON system does not match the number of axes set and transferred in the gateway parameter configuration tool, the PC software for RC/EC cannot be connected.
- Set and transfer the gateway parameters suitably according to the actual unit configuration and the number of connected axes.

Menu descriptions

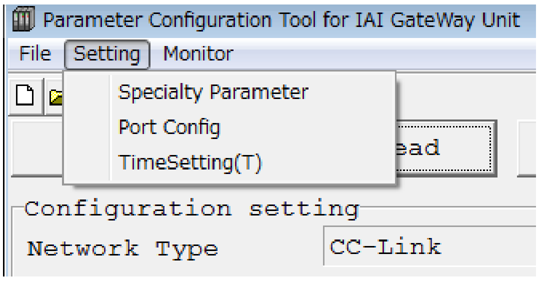
[File menu]



On the main screen, click on the file menu on the upper left to display the menu items as shown above.

- New file : Creates a new network parameter and operation mode parameter.
- Open : Opens the saved parameter file and reflects it to the main screen.
- Save : Saves the parameters held by the tool to a file.
- Exit : Terminates the tool.

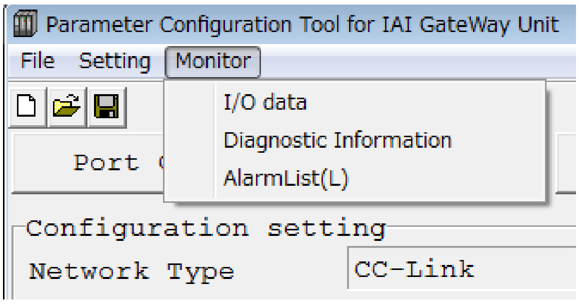
[Settings menu]



Click the "Settings" menu in the upper left of the main screen to display the settings menu items.

- Specialty Parameter : Sets parameters related to gateway unit processing.
  [Refer to "GW parameters /2/3, GW mode selection" on pages 3-131 to 3-133]
- Port Config : Sets the communication speed between the tool and PC and the COM port number.
- TimeSetting (T) : Sets the time to be held in the gateway unit.
  [See "Time setting" on page 3-135]

[Monitor menu]

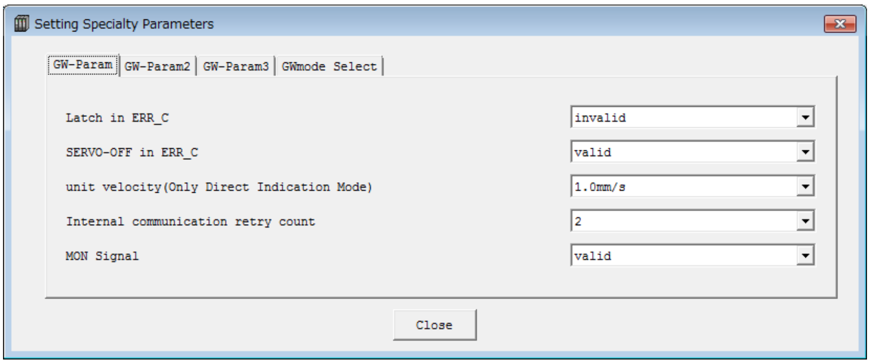


Click the "Monitor" menu in the upper left of the main screen to display the monitor menu items.
(Note) "Monitor" cannot be selected before reading in the parameters.

- I/O data : Displays the communication contents between the host PLC and gateway unit.
  [See "I/O Data (register monitor)" on page 3-136]
- Diagnostic Information: Displays the number of ERRT and ERRC generated, number of stops and scan time.
  [See "Diagnostic information" on page 3-137]
- AlarmList (L) : Imports and displays the alarm list held in the gateway unit.
  [See "Alarm list" on page 3-137]

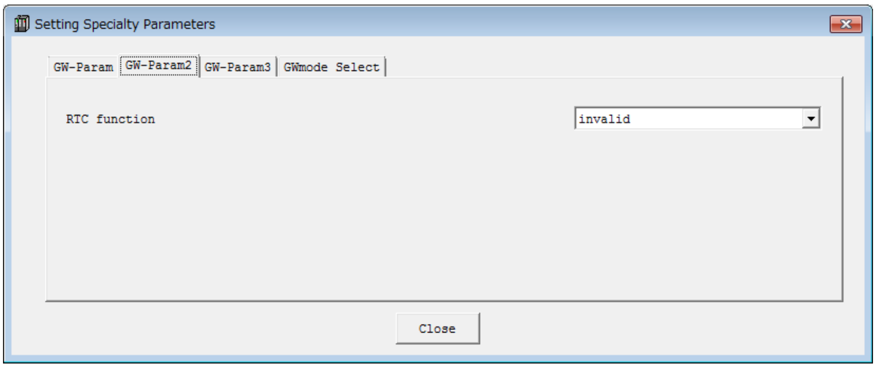
Special parameter setting function descriptions

[GW parameters]



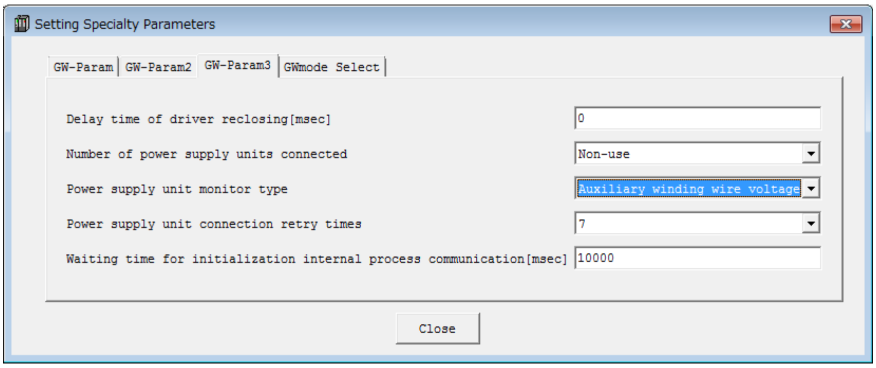
- ERR_T/C occur latch : Selects whether to continue the error in recoverable state after ERRT and ERRC occur.
- SERVO-OFF in ERR_C : Selects whether to turn the servo of the connected axis OFF when ERRC is generated.
- Speed unit (in direct numerical control mode) : Selects the speed unit from 1.0 mm/s or 0.1 mm/s.
- Internal communication retry count : In AUTO, this is used to set the number of communication retries with the connected axis.
- MON signal : Select whether to use MON signal to control enable/disable of the PLC → gateway unit commands.

[GW parameters 2]



- Calendar function: Selects whether to set an alarm or not when the time setting disappears.

[GW parameters 3]

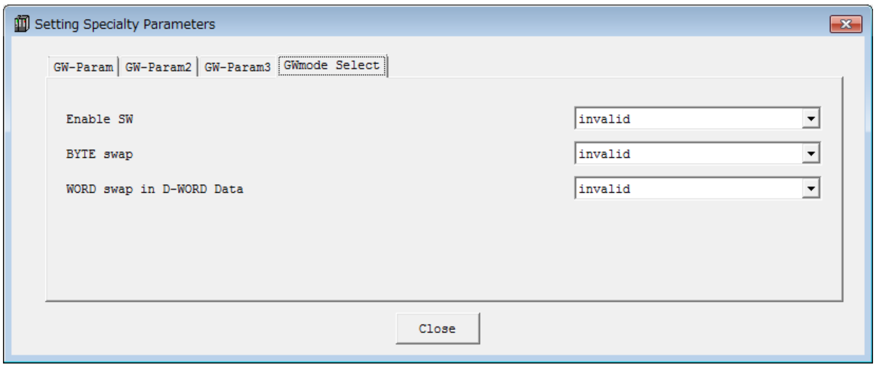


- Delay time of driver reclosing : Sets the delay time (interval) when sequentially supplying power to each axis of the driver unit.
  It is used for the purpose of reducing inrush current by shifting the timing of power supplied to each axis.
- Number of power supply units connected : Sets the number of IAI power supply units (Model: PSA-24) that are connected to the gateway unit.
  Up to 5 units can be connected.
- Power supply unit monitor type : Selects the monitor item of the power supply unit.
  One item of those in the following table can be monitored.

Item	Description
Output voltage	This power supply can vary the output voltage according to the load. The output voltage monitoring value changes, but this is not abnormal.
Voltage of auxiliary winding	Control power supply voltage inside the power supply unit. As with the output voltage, it changes according to the load on the output voltage side.
Output current	Instantaneous value of output current.
Peak hold current	Peak value of output current.
Load factor	Ratio of integral value of output current and rated output current. If this value exceeds 100%, the output voltage is cut off as an overload error.
Fan rotation speed	Fan rotation speed.
Internal temperature	Temperature in the vicinity of the output capacitor on the secondary side.

- Power supply unit connection retry times : Sets the number of retries when a communication error occurs.
- Initialization internal communication wait time : Sets additional wait time until the driver unit starts internal communication.

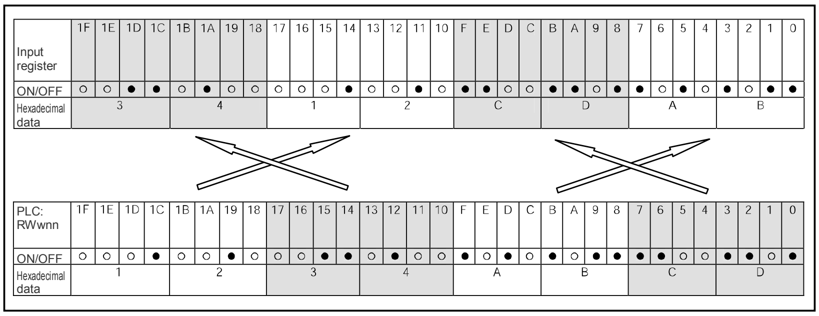
[GW mode selection]

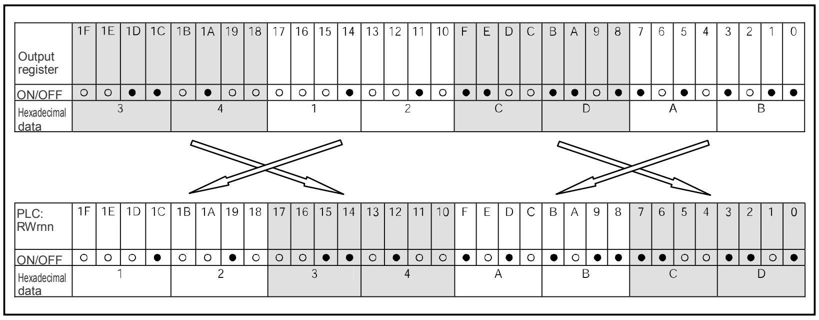


- Enable SW : Selects whether to enable/disable the enable switch of the TP.
- Byte swap : Set the byte swap. [See "Byte swap" on page 3-134]
- Word swap in D-WORD Data : Sets whether the W word size data is to be swapped in word size. [See "W word data word swap" on page 3-134]

Byte swap : Swaps the master and slave bytes of transmitted/received data.
Set according to the master to be connected as necessary.

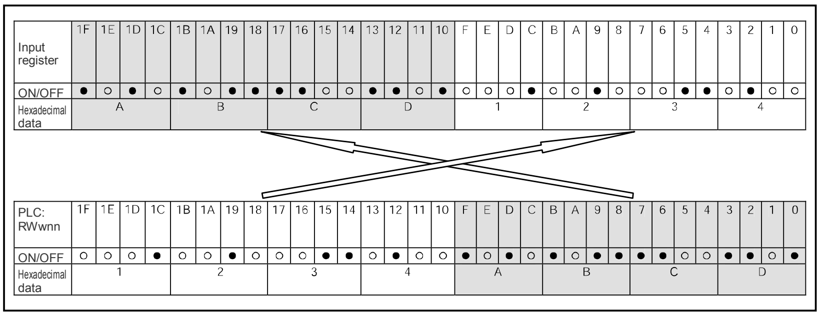
●: ON
○: OFF

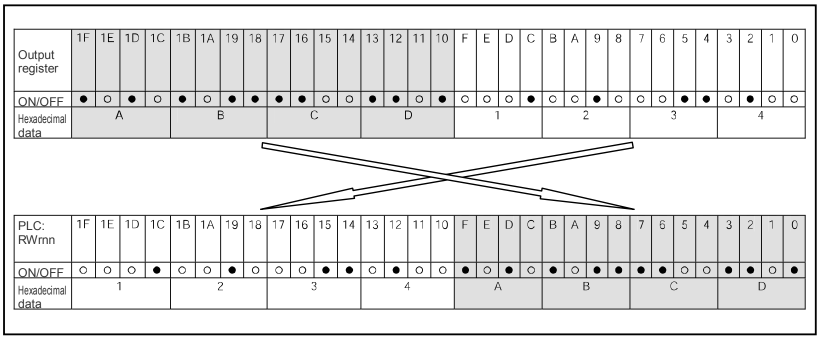




Word swap in D-WORD Data : Swaps the master and slave of transmitted/received data of W word size in word unit.
Set according to the master to be connected as necessary.

●: ON
○: OFF

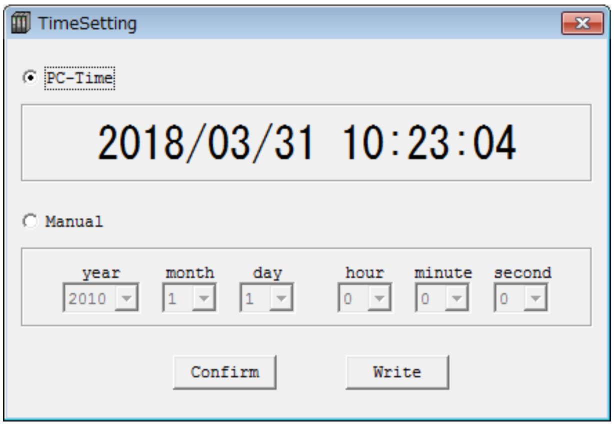




Specifications Section

Chapter 3 Gateway Unit

[Time setting]



When PC-Time is selected, the current time of the PC is acquired and set to the gateway unit. Once manual setting is selected, set any time set in the time editing on the screen to the gateway unit.

By pressing "Write", time is transferred and written to the gateway unit.

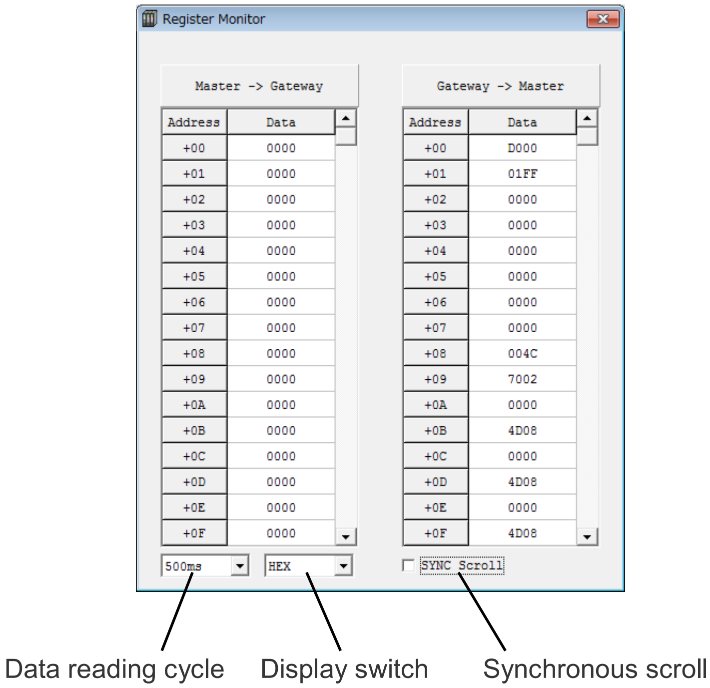
When "Confirm" is pressed, the time data currently held in the gateway unit will be read out and displayed.

Caution

The clock (calendar) function of the gateway unit is effective for about 10 days from the time gateway unit is turned off, given that the capacitor is sufficiently charged.

When the time data is lost, the current time will be the time elapsed from 2000/1/1 0:00:00 as the time when the power is turned on.

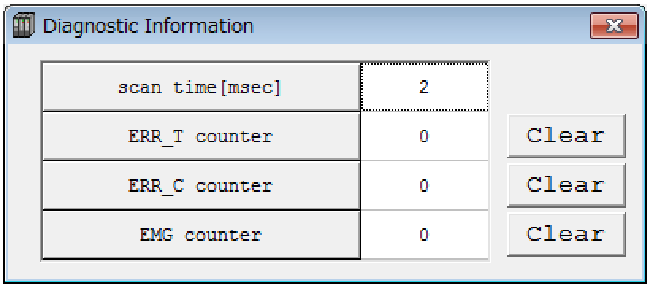
[I/O data (register monitor)]



The data that the gateway received from the master and transmission data returned to the master are displayed on this register monitor screen.

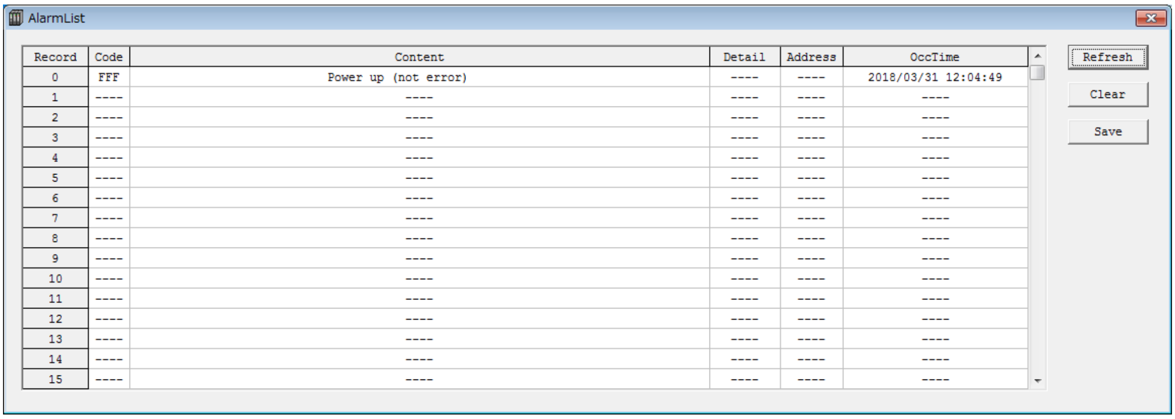
- Data read cycle : Select the update cycle of the display data between 100 and 500 ms
- Display switch : Select either binary or hexadecimal display
- SYNC Scroll : When checked, the transmitted/received data will be scrolled at the same time

[Diagnostic information]



The number of communication errors (ERRC, ERRT) and the number of stops (EMG) detected can be counted.

[Alarm list]

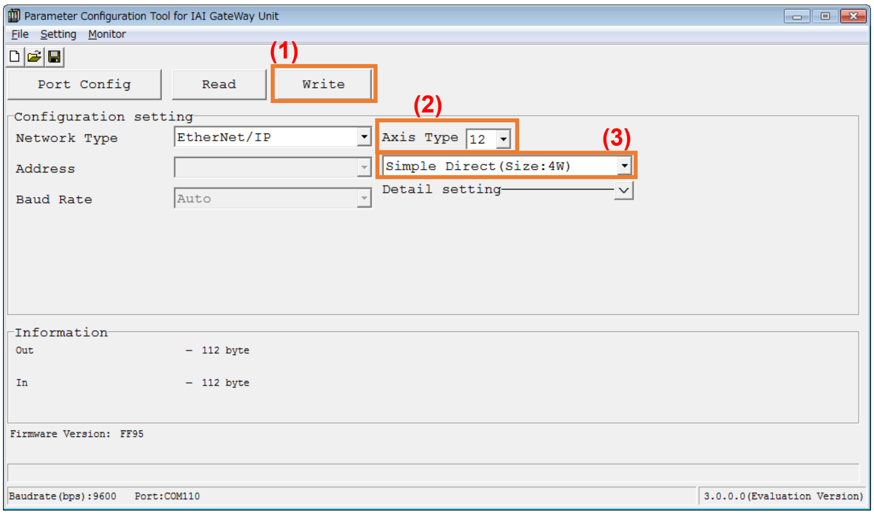


Record	Code	Content	Detail	Address	OccTime
0	FFF	Power up (not error)	----	----	2018/03/31 12:04:49
1	----	----	----	----	----
2	----	----	----	----	----
3	----	----	----	----	----
4	----	----	----	----	----
5	----	----	----	----	----
6	----	----	----	----	----
7	----	----	----	----	----
8	----	----	----	----	----
9	----	----	----	----	----
10	----	----	----	----	----
11	----	----	----	----	----
12	----	----	----	----	----
13	----	----	----	----	----
14	----	----	----	----	----
15	----	----	----	----	----

Press "Refresh" to read out the alarm list again from the gateway unit.
Press "Clear" to delete all alarm lists held by the gateway unit.
Press "Save" to save the alarm list held by the gateway unit in CSV format.
For the alarm details, refer to "Maintenance Section Chapter 2 Troubleshooting".

Operation mode setting

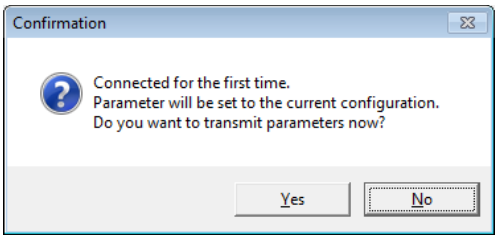
The operation after main screen reading is as follows.



(1) Reading

For the first connection, the following dialog will be displayed.

Press "Yes" to transfer the parameters that match the current configuration.



(2) Number of axes setting

Sets the number of axes of the actuator to be controlled

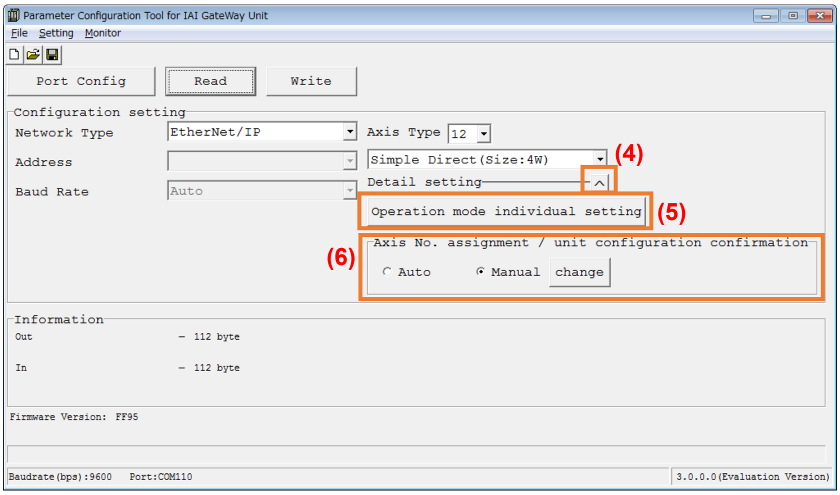
(3) Operation mode setting

Sets all operation modes of all driver units connected to this gateway unit at once. The operation mode options are as follows.

No.	Operation mode setting	No.	Operation mode setting
1	Positioner 1 (size: 4 W)	5	Direct numerical control (size: 8 W)
2	Positioner 2 (size: 2 W)	6	Simple direct (size: 4 W)
3	Positioner 3 (size: 1 W)	7	Individual setting (see (5))
4	Positioner 5 (size: 2 W)		

Specifications Section

Chapter 3 Gateway Unit



(4) Detailed setting display

When you press "Detail setting", the following buttons will be displayed.

· [Operation mode individual setting] button ((5))

· "Axis number assignment change" button and automatic/manual axis number assignment switching ((6))

(5) Operation mode individual setting

When you press "Operation mode individual setting", the "Operation mode individual setting screen" will be displayed.

For details on the individual setting screen, see "Operation mode individual setting" on page 3-140.

(6) Axis number assignment change

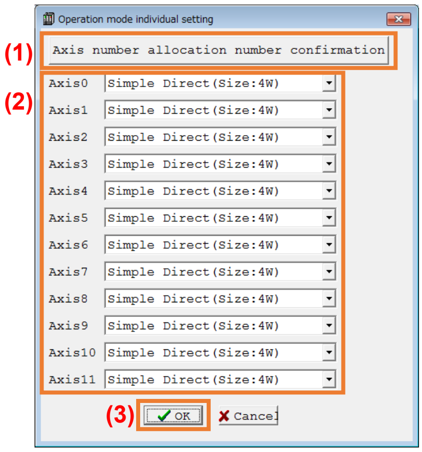
When you press "Change" in axis number assignment, the "Axis number assignment change screen" will be displayed. For the axis number assignment change method, refer to "Axis number assignment change" on page 3-141.

Operation for automatic assignment and manual assignment is as follows.

	"Change" button for axis number assignment	Axis number
Automatic assignment	Disabled	Serial numbers
Manual assignment	Enabled	Values set on the axis number assignment change screen

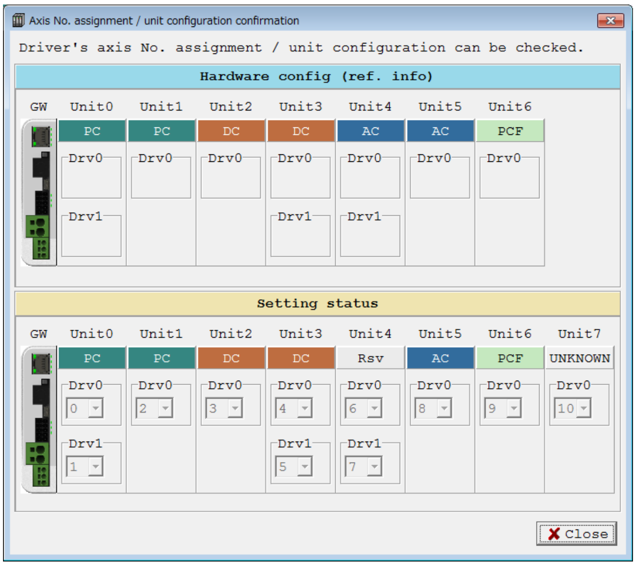
Operation mode individual setting

The operation for operation mode individual setting is as follows.



(1) Axis number assignment confirmation

When "Axis number allocation number confirmation" button is pressed, the "Axis number assignment / unit configuration confirmation screen" opens. Note that axis numbers cannot be edited on this screen.



(2) Operation mode individual setting

Set in order to set the operation mode for each axis.

(3) OK

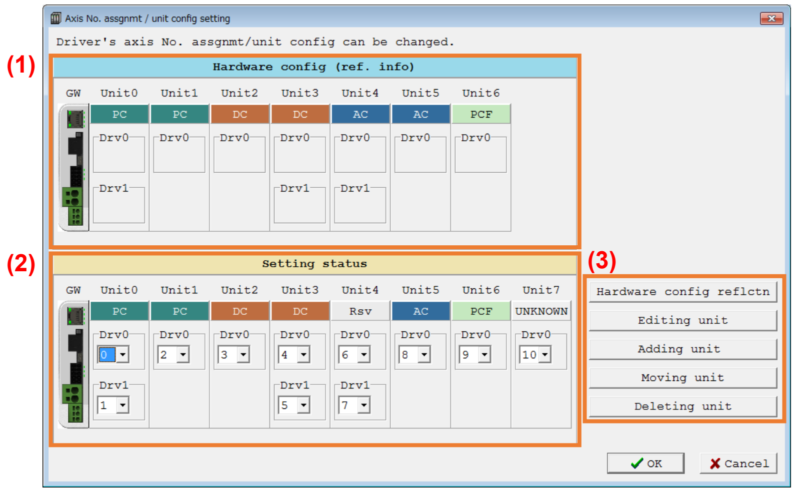
It confirms the change and returns to the main screen. If the operation mode of each axis is not the same, the display on the main screen will be individually set.

Specifications Section

Chapter 3 Gateway Unit

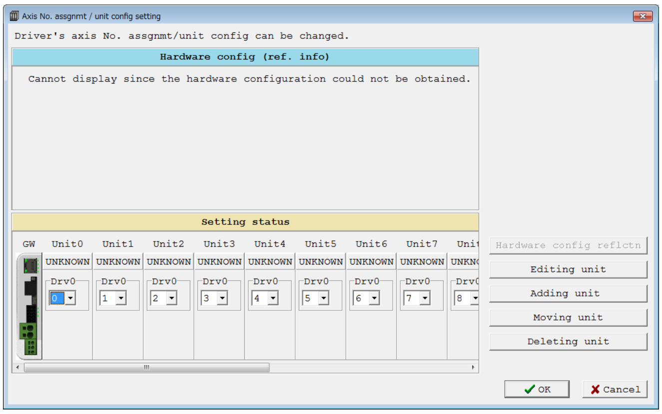
Axis number assignment change

The operation of axis number assignment change is as follows.



(1) Hardware configuration (reference information)

Displays the driver unit configuration connected to the gateway unit. When creating or editing, if the configuration cannot be read due to a communication error, the following screen will be displayed.



(2) Setting status

The axis number assignment can be changed on this screen.

The unit configuration shows the setting of the previous transfer.

(3) Unit configuration edit button

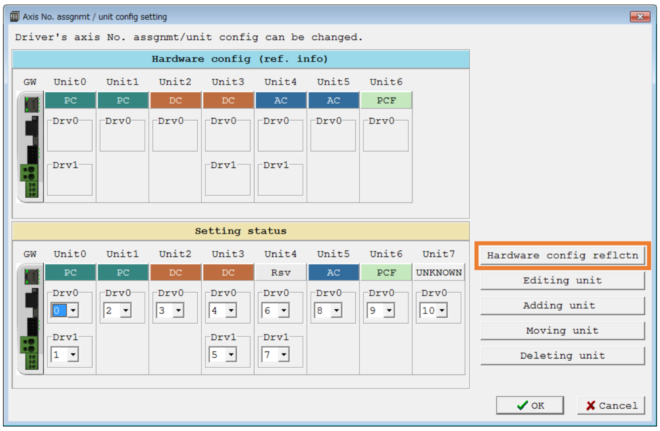
Displays various screens for editing the driver unit configuration displayed in (2). For details on editing the unit configuration, refer to "Editing driver unit configuration" on page 3-142.

Editing driver unit configuration

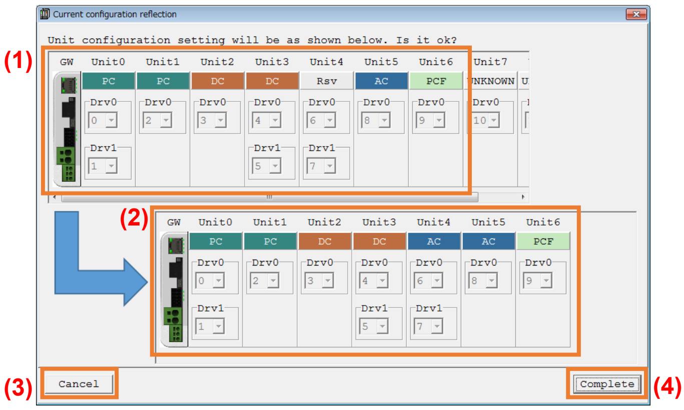
The driver unit configuration editing method is as follows.

1 Reflect the current driver unit configuration

(1) On the "Axis number assignment / Unit configuration confirmation screen", press "Current configuration reflection".



(2) The configuration of the actual driver unit will be imported.



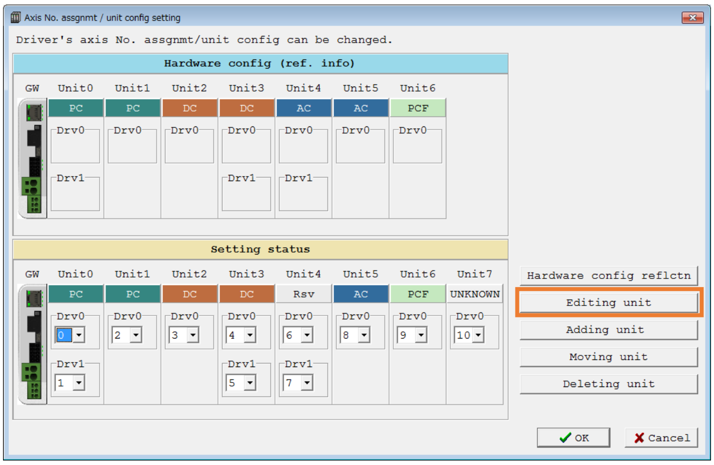
(3) Confirm the unit configuration and press "Complete".
It will be reflected in the "Axis number assignment / Unit configuration confirmation screen".

Caution

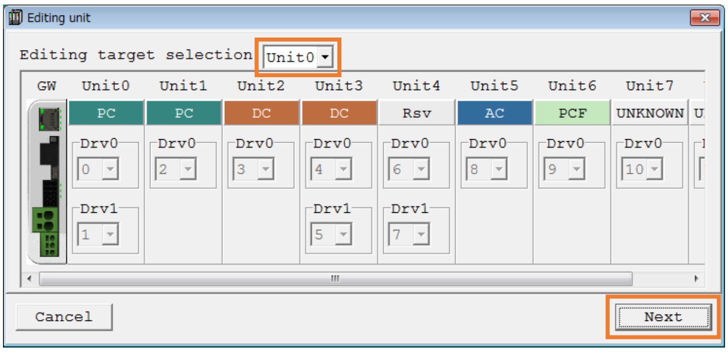
- If the actual number of connected axes of the RCON system does not match the number of axes set and transferred in the gateway parameter configuration tool, the PC software for RC/EC cannot be connected.
- Set and transfer the gateway parameters suitably according to the actual unit configuration and the number of connected axes.

2 Edit the settings of the specific driver unit

(1) On the "Axis number assignment / Unit configuration confirmation screen", press "Editing unit".

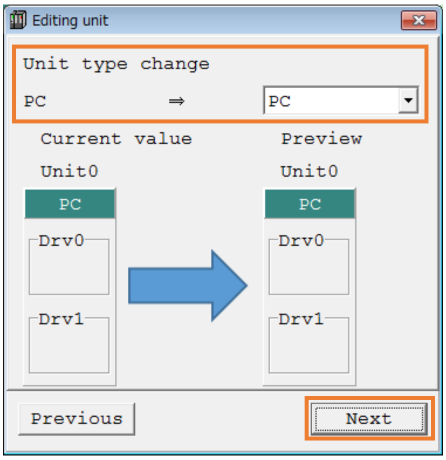


(2) "Editing unit screen" opens.
Select the driver units to be edited and press "Next".



(3) "Unit type change screen" opens.

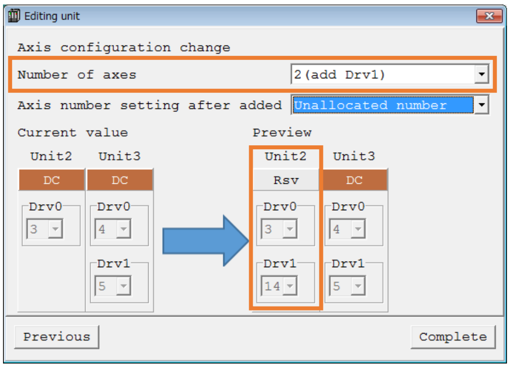
Select the unit type from the following 6 types and press "Next".

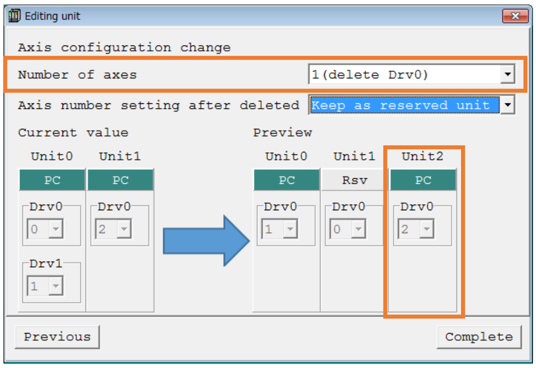


Unit type
PC, PCF, AC, DC, SCON, reserved

(4) "Axis configuration change screen" opens.

First, select the number of axes to be used in the driver unit.

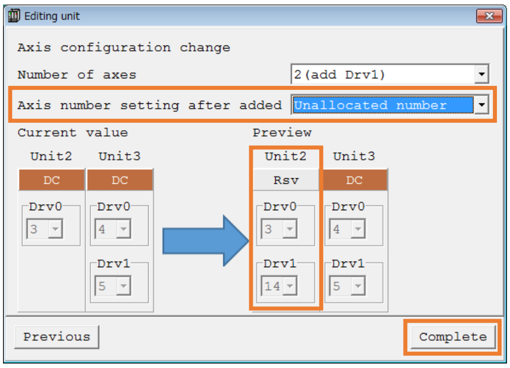


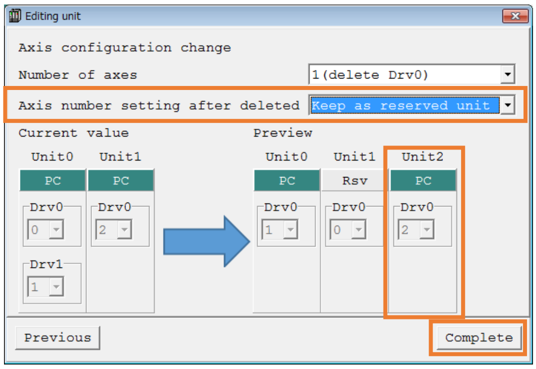


Number of axes of selected driver unit	Selection item
1-axis	1 *1
	2 (add to Drv0)
	2 (add to Drv1)
2-axis	1 (delete Drv0)
	1 (delete Drv1)
	2

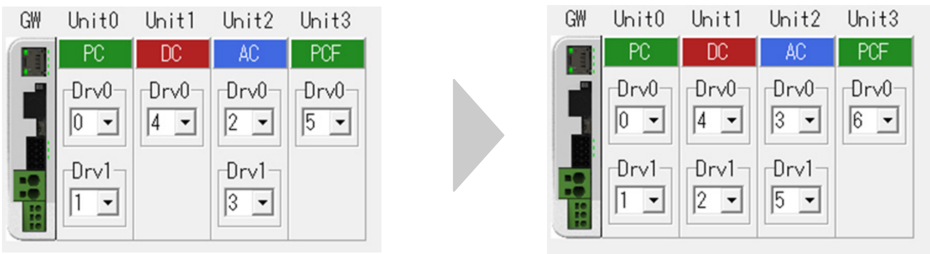
*1: Since PCF and SCON are 1 unit 1 axis, the selection item will be only 1.

(5) Next, set the axis number after adding/deleting.
Select from the following selection items and press "Complete".

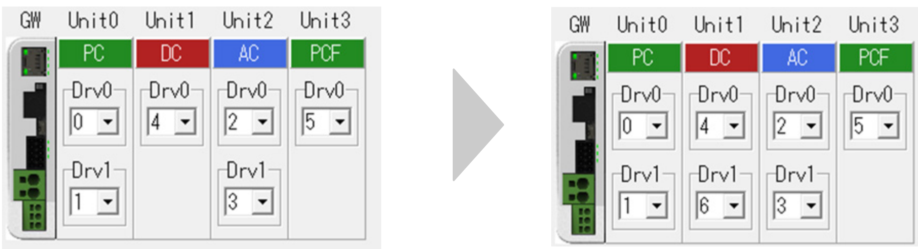




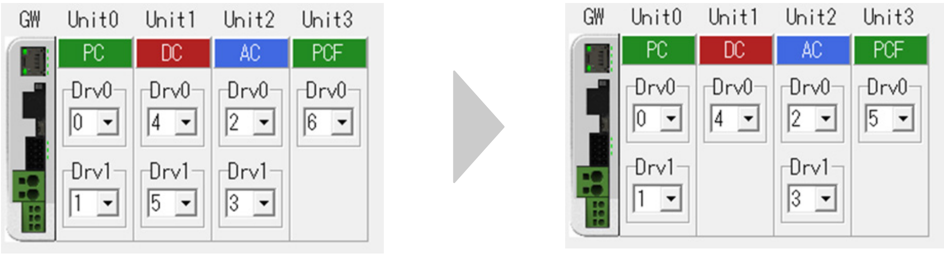
Number of Axes	Selection item	Axis number setting change results
When adding	Shift	Shifts the axis number of the added drivers from before.
	Unallocated number	Sets unassigned number to the added driver.
When deleting	Shift	Shifts the axis number of the deleted driver from before.
	Keep as reserved unit	Adds the reserved unit after the edited unit and leaves the axis number.



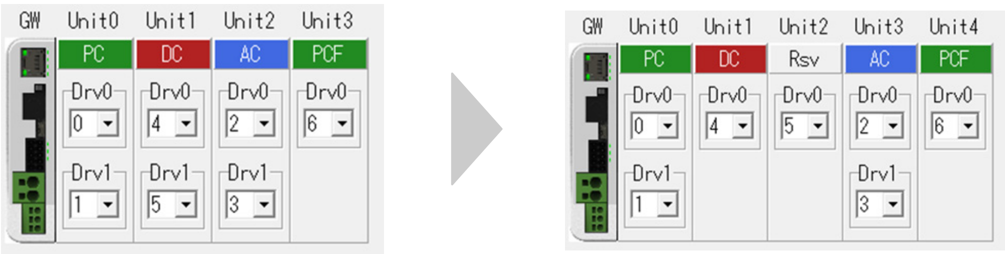
<When Drv1 is added to Unit1 and "Shift" is selected>



<When Drv1 is added to Unit1 and "Unallocated number" is selected>



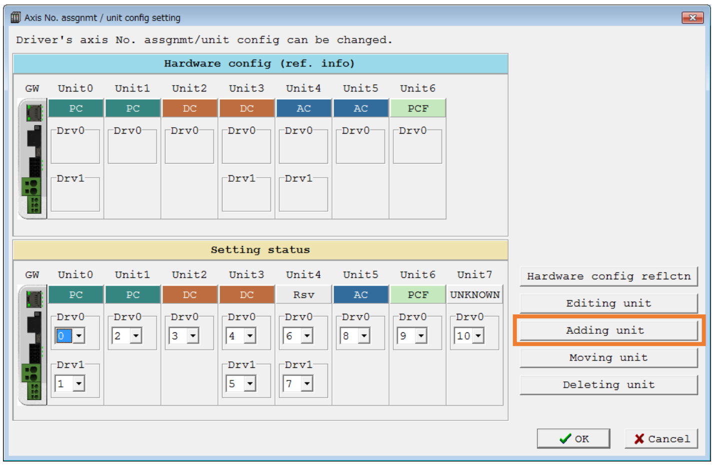
<When Drv1 is deleted from Unit1 and "Shift" is selected>



<When Drv1 is deleted from Unit1 and "Keep as reserved unit" is selected>

3 Add the driver unit

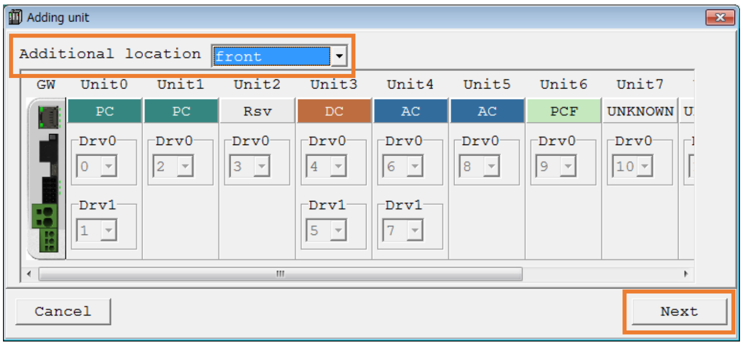
(1) In "Axis number assignment / Unit configuration confirmation screen", press "Adding unit".



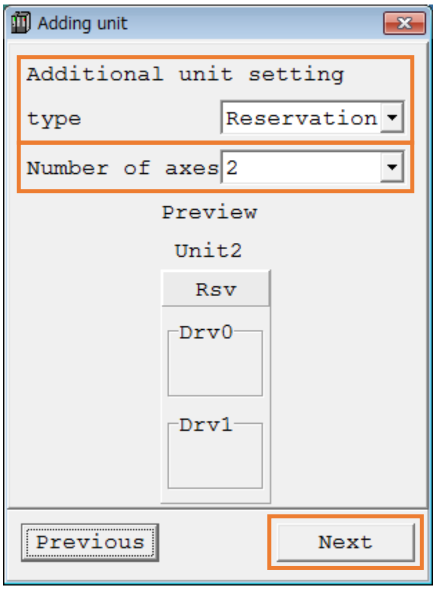
Specifications Section

Chapter 3 Gateway Unit

(2) "Additional location screen" opens.
Select the position to which the driver unit is to be added and press "Next".

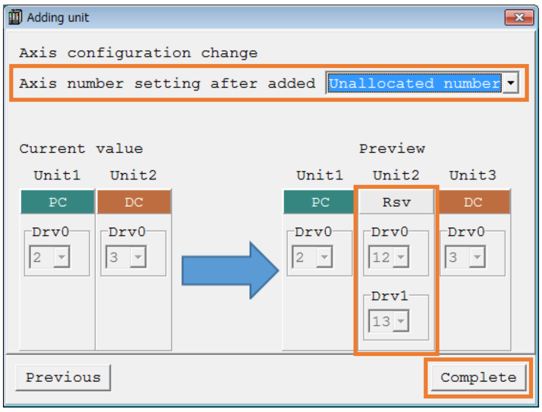


(3) "Adding unit screen" opens.
Select the unit type from the following 6 types and select the number of axes, then press "Next".



Unit type
PC, PCF, AC, DC, SCON, reserved

(4) "Axis configuration change screen" opens.
First, select the number of axes to be used in the driver unit.



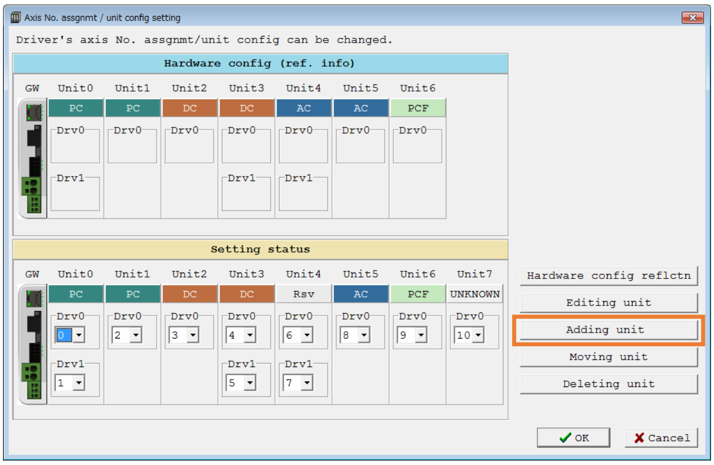
Selection item	Axis number setting change results
Unallocated number	Sets unassigned number.
Shift	Shifts the axis number of the added drivers from before.

<When the reserved unit is added to Unit1-Unit2 and " Unallocated number" is selected>

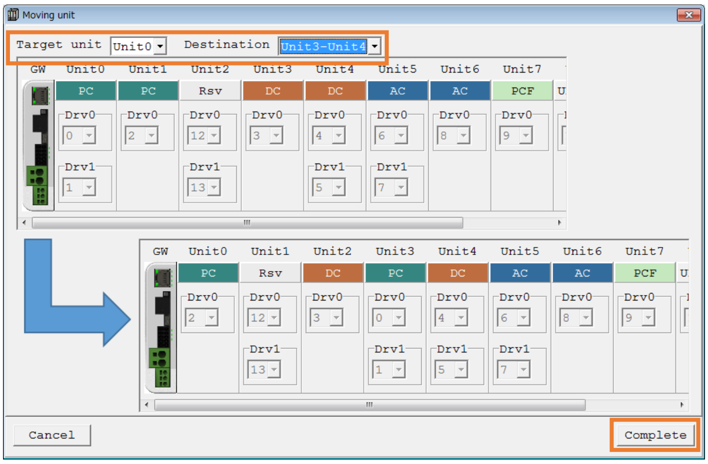
<When the reserved unit is added to Unit1-Unit2 and "Shift" is selected>

4 Move the driver unit

(1) On the "Axis number assignment / Unit configuration confirmation screen", press "Moving unit".

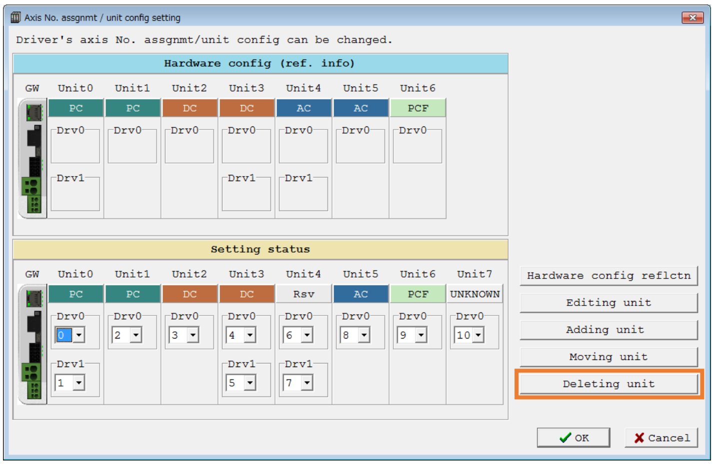


(2) "Moving unit screen" opens.
Select the driver unit to be moved and its position, and press "Complete".



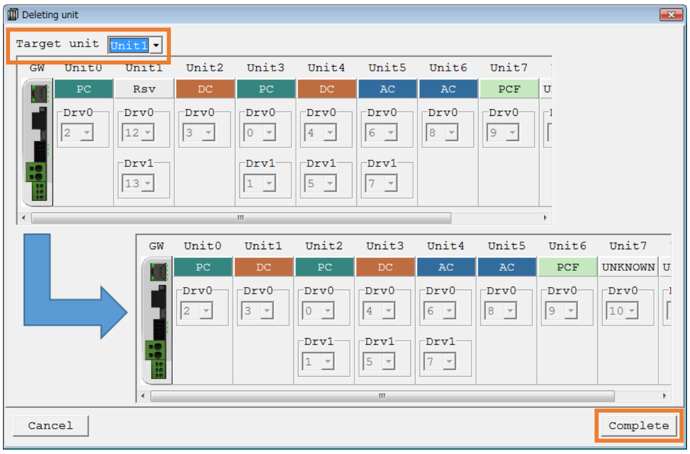
5 Delete the driver unit

(1) On the "Axis number assignment / Unit configuration confirmation screen", press "Deleting unit".



(2) "Deleting unit screen" opens.

Select the driver units to be deleted and press "Complete".



Specifications Section

Chapter 3 Gateway Unit

3.10 Actuator Information Management Function

Overview

IAI actuators have the following 3 types of information management function. This information is saved in the actuator and can be confirmed through the RCON system.

[Individual identification information]

The actuator's serial number and model information have been written to the actuator at the factory shipment.

[Maintenance Information]

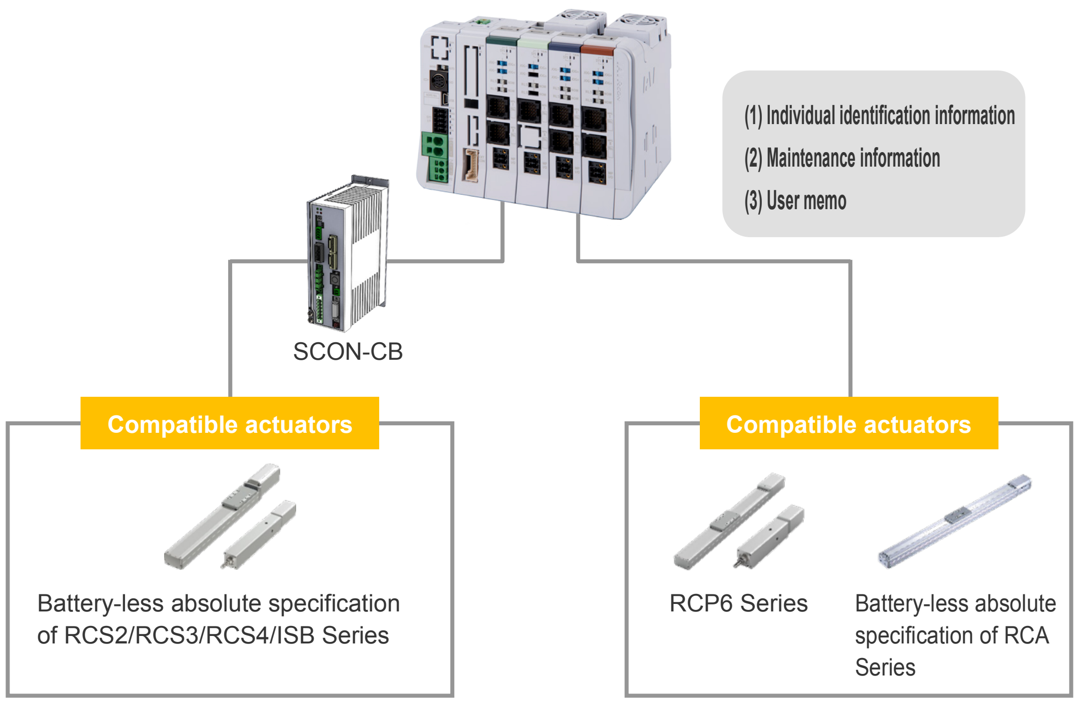
The actuator's maintenance information is saved in the actuator.

When the actuator is returned to our company for repair, this allows us to acquire more information, which can be useful for repair and failure analysis.

[User memo]

It has a memo function that allows the customer to freely enter information such as "For process ■■ of device ●●" or "Motor was exchanged on January 1st 20▲▲". The entered information will be saved in the actuator.

It can be used for maintenance and repair.



Actuators with information management function supported

Actuators that satisfy the following 2 conditions support the information management function.

- High resolution battery-less absolute encoder compatible model
- Models whose function version supports the information management function

[High resolution battery-less absolute encoder compatible model]

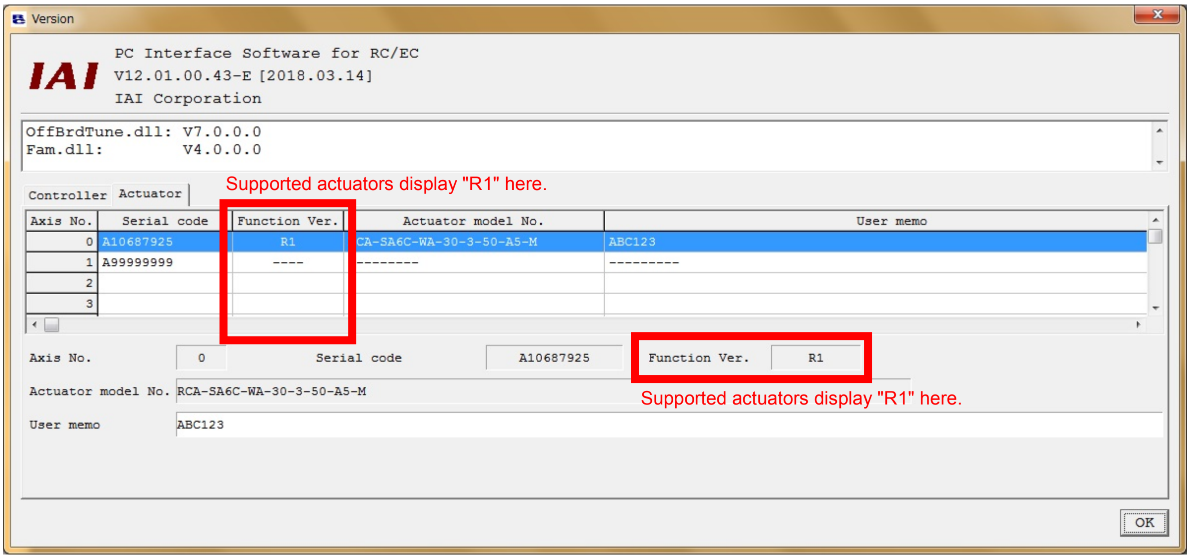
The following series types are mainly applicable.

RCP6-SA/WSA/TA/RA/RRA/WRA, RCP6CR-SA/WSA, RCP6W-RA/RRA/WRA RCA-SA, RCACR-SA, RCS2-SA/RA/RGS/RGD, RCS2CR-SA, RCS2-RA13R RCS3-SA/SS/RA, RCS3P-SA/SS, RCS3CR-SA/SS, RCS3PCR-SA/SS RCS4-SA/WSA/TA/RA/RRA/WRA, RCS4CR-SA/WSA ISB/ISPB-SXM/SXL/MXM/MXMX/MXL/LXM/LXMX/LXL/LXUWX, ISDB/ISPDB-S/M/MX/L/LX, ISDBCR/ISPDBCR-S/M/MX/L/LX

For details, see the "Appendix Chapter 1 1.3 List of Actuators That Support Information Management Function".

[Models whose function version supports information management function]

Models whose function version is "R1" or later



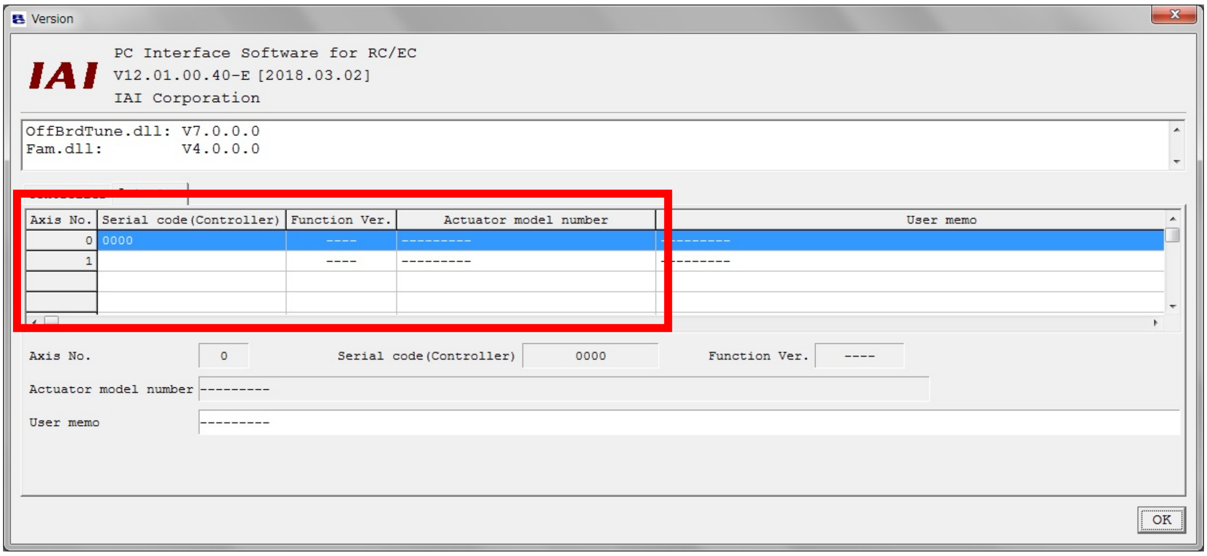
Actuator information management function

Details of the 3 function types are as follows.

[Individual identification information]

Using the teaching pendant or PC software for RC/EC, you can check the information written on the actuator connected to the RCON system.

Serial No., function version, and model number are written at factory shipment.



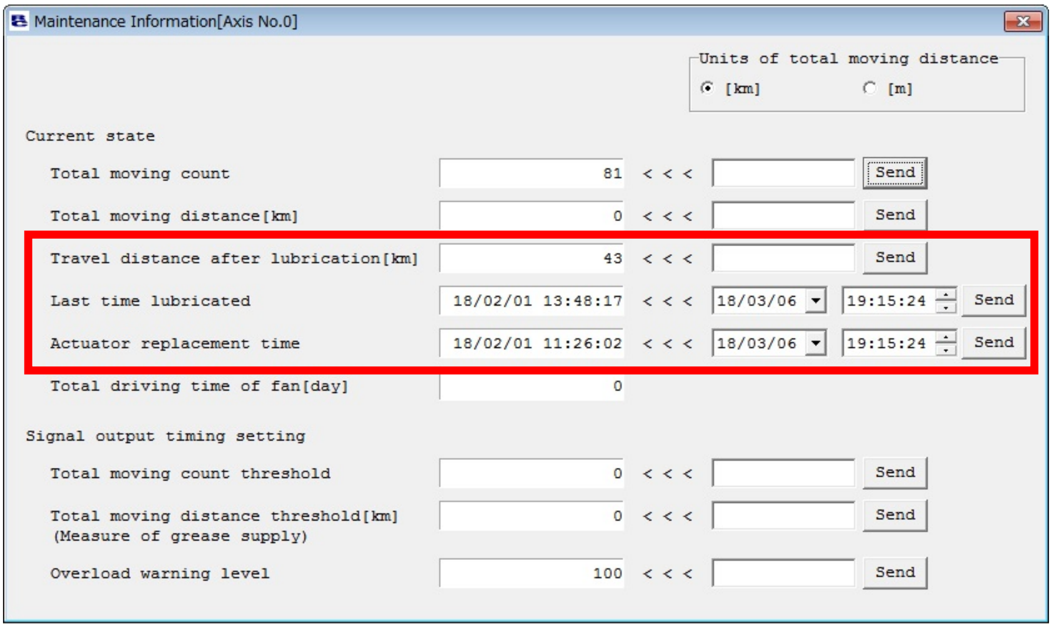
For teaching tool operation, refer to the following instruction manuals.

Reference

PC software operating method	PC software manual (ME0155)
Teaching pendant operating method	Teaching pendant manual (ME0355)
Data setter operation method	Data setter manual (ME0375)

[Maintenance Information]

In addition to the information saved in the RCON system (total travel count, total travel distance), the actuator maintenance information (travel distance, lubrication time, replacement time, etc.) can be managed. The actuator maintenance information is saved in the actuator.

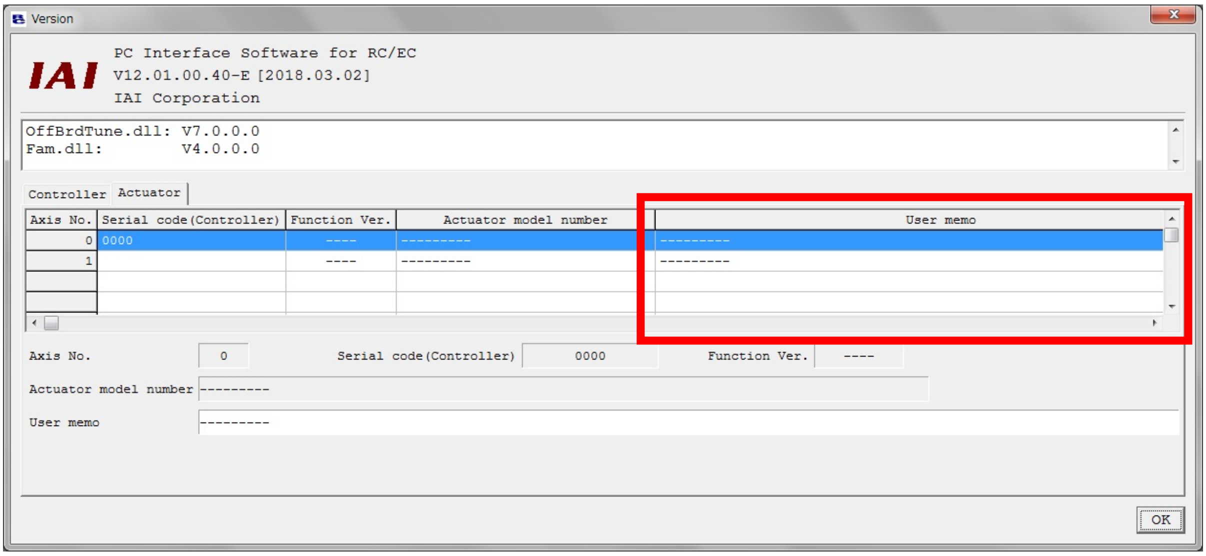


Requests

- To update the actuator's maintenance information, update the information with the teaching tool. Otherwise, restart the RCON system or perform a software reset.
- If the unit is operated continuously without turning the RCON system off, information updates to the actuator will not be performed. Take note.

[User memo]

Any 124-byte character string (124 1-byte characters, 62 2-byte characters) can be saved.
You can confirm, enter and edit using the teaching tool.



Parameters for actuator information management function setting

Parameters related to this function are as follows.

AC servo motor specification and stepper motor specification only

[Actuator recognition function (parameter No. 192)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
192	Actuator recognition function	FEAR	–	0: Disabled 1: Enabled	In accordance with actuator

Selects whether to use the actuator recognition function or not.
Select "0" when connecting an actuator not compatible with the actuator recognition function or when not using this function.

When an actuator not compatible with the actuator recognition function is connected, the alarm code 0A1 "Parameter data error" occurs when this parameter is "1".

Specifications Section

Chapter 4

Driver Unit

4.1 Overview ···· 4-1

4-2 How to Read the Model Number ···· 4-2

How to read the model nameplate ···· 4-3

4-3 Driver Unit and Components ···· 4-4

4-4 Part Names/Functions and External Dimensions ···· 4-5

Part names ···· 4-5

LED display ···· 4-7

Jog switch ···· 4-8

Brake release switch ···· 4-9

Motor/encoder connector ···· 4-9

Drive source shutoff connector ···· 4-13

Fan connector ···· 4-14

Connectors ···· 4-14

Fan unit ···· 4-15

External dimensions ···· 4-16

4.5 Parameters ········· 4-18
Parameter list ········· 4-19
Actuator stroke ········· 4-24
Actuator dynamic characteristics ········· 4-31
External interface ········· 4-53
Servo gain adjustment ········· 4-58

4.6 Precautions for Rotary Type ········· 4-73

4.7 Precautions for Gripper Type ········· 4-76

4.8 Various Functions ········· 4-80
Vibration damping control function ········· 4-80
Collision detection function ········· 4-87
Power-saving function ········· 4-90

4.1 Overview

The driver unit is a dedicated controller for RCON systems.

There are 4 types of driver unit available to suit the type of actuator motor controllable. Additionally, up to 2 axes are controllable by a single driver unit.

Basic functions and performance are the same as PCON/ACON/DCON controllers. These controllers use field network communication via a gateway unit, as described in Chapter 3, for control.

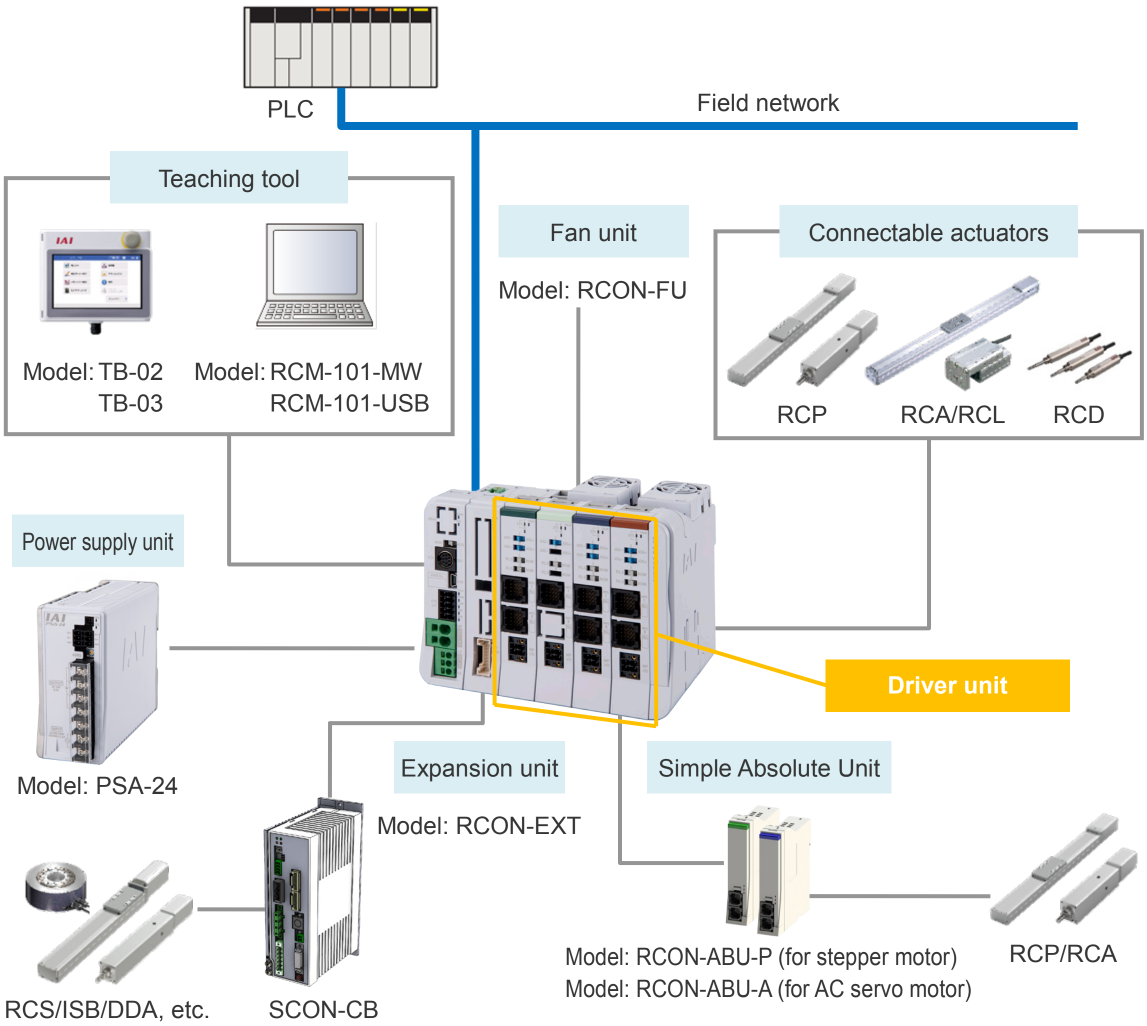
[Features]

■ Compatible with battery-less absolute specification and incremental specification. Additionally, connection of a simple absolute unit allows support for simple absolute specification.

■ Compatible with stepper motor PowerCON specification and high thrust specification.

■ Driver units are directly connected so that the hassles of wiring can be significantly reduced.

■ DIN rail mounting makes it easy to mount onto control boards, etc.



4.2 How to Read the Model Number

The model of the driver unit is as follows.
1-axis specification or 2-axis specification can be selected for RCON-PC/AC/DC.
Only 1-axis specification is available for RCON-PCF.

Driver unit model

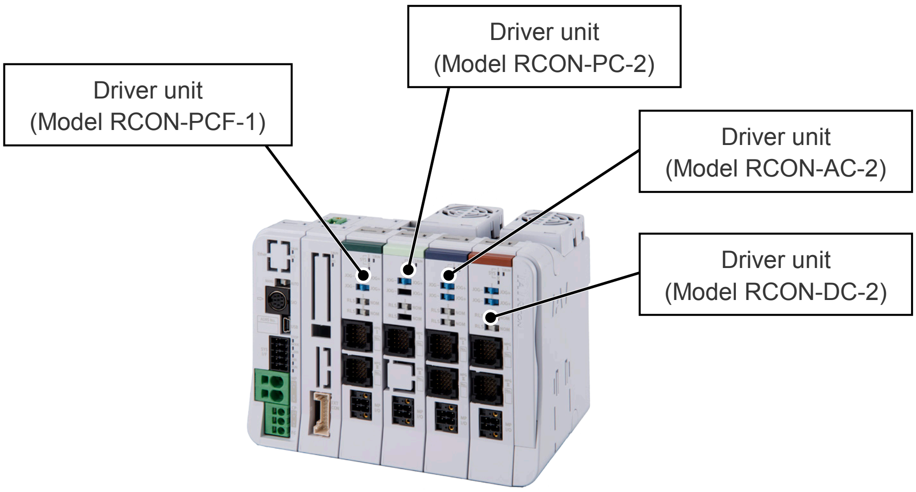
RCON – [Type] – [Number of Axes]

Type

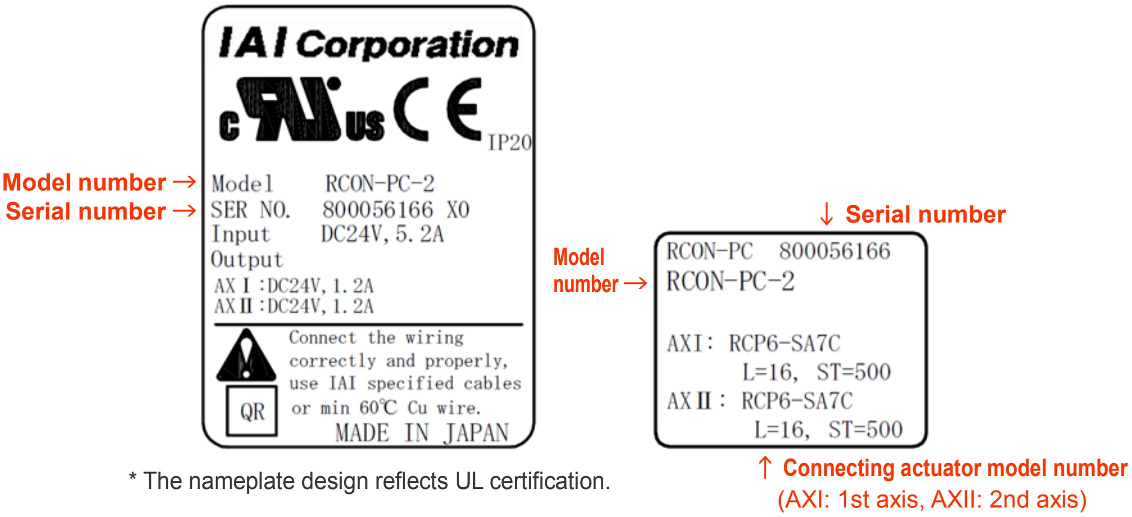
PC	Stepper motor Type
PCF	Stepper motor 56SP/60P/86P Compatible type
AC	AC servo motor type
DC	DC brush-less motor type

Number of Axes

1	1-axis specification
2	2-axis specification

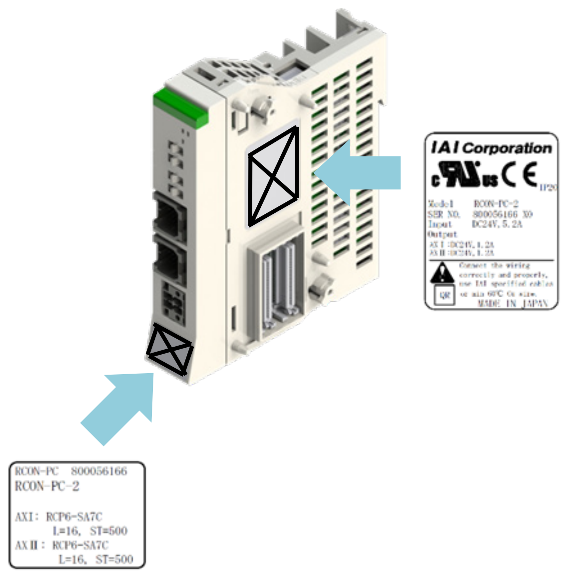


How to read the model nameplate



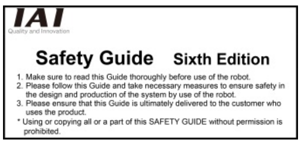
* The nameplate design reflects UL certification.

[Nameplate Location]



4.3 Driver Unit and Components

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

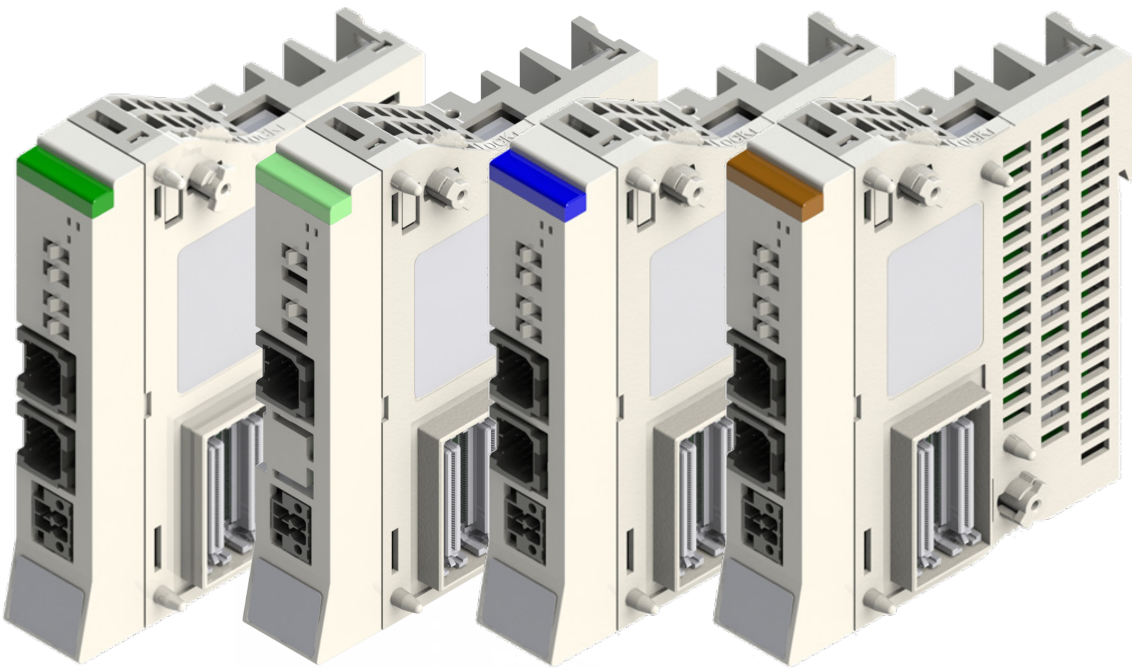
Part name	Shape	Quantity	Remarks
Driver unit		1	Model example: RCON-PC/PCF/AC/DC
Drive source shutoff connector		1	Model: DFMC1.5/2-STF-3.5 * Supplied with driver unit
First Step Guide		1	
Safety Guide		1	

Specifications Section

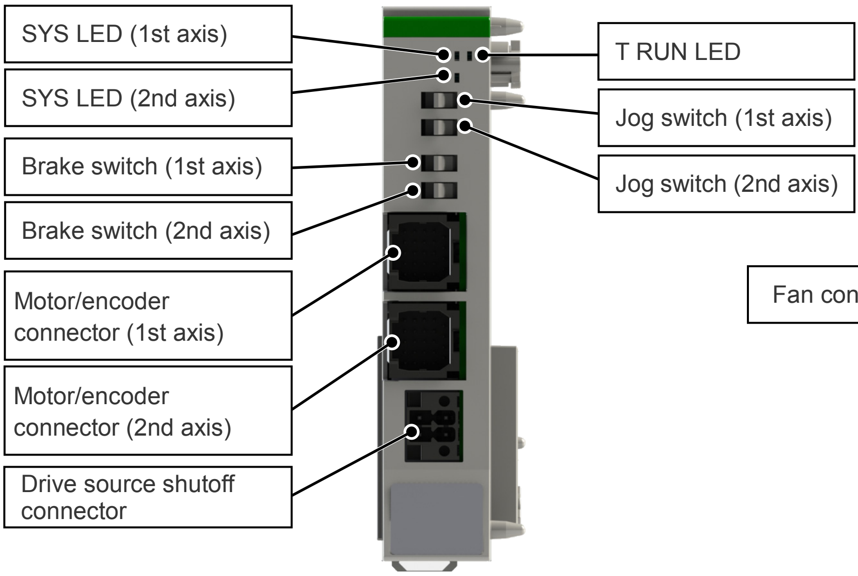
Chapter 4 Driver Unit

4.4 Part Names/Functions and External Dimensions

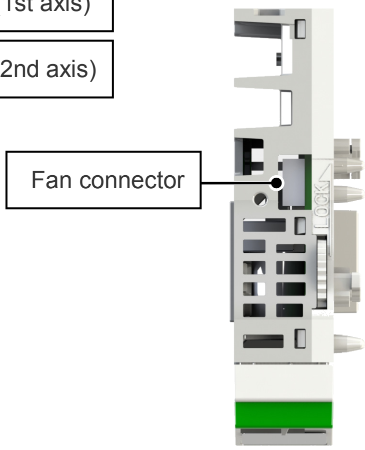
Part names



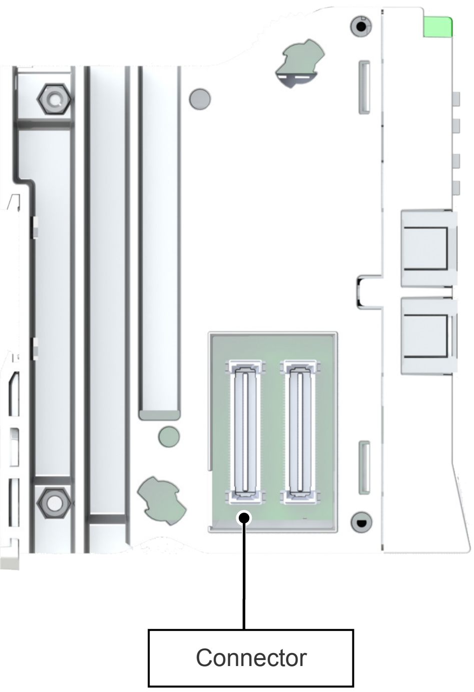
RCON-PC (green) | RCON-PCF (light green) | RCON-AC (blue) | RCON-DC (brown)



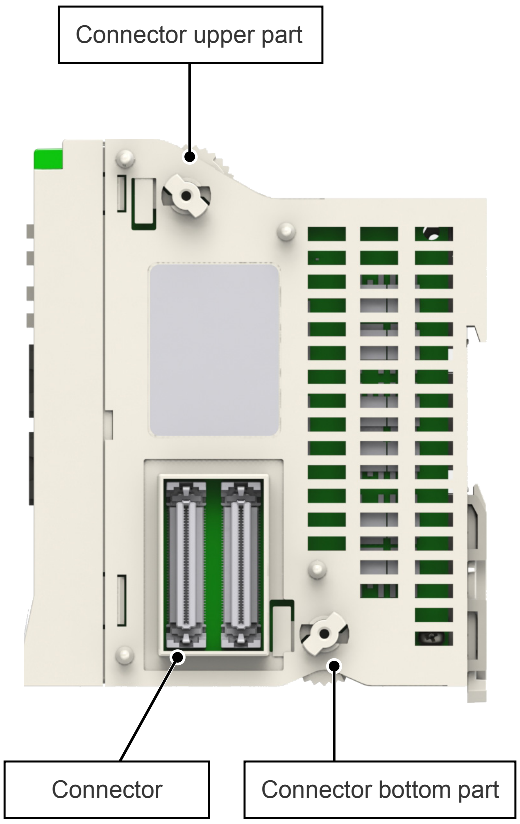
Front



Top



Left side

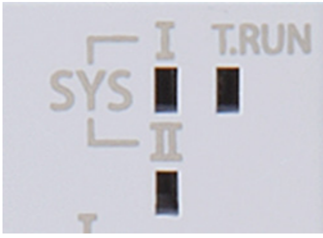


Right side

Rear

LED display

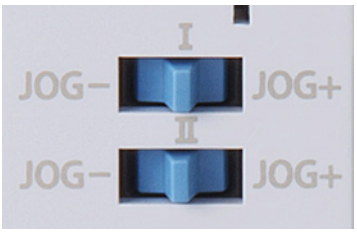
Panel notation	Display color	Status	Description
T RUN	Green	Light ON	Normal internal bus communication
		Blinking	Waiting for initialization signal, initialization communication failed
	Orange	Light ON	Bus communication error generated
	Light OFF		Communication stop
SYS (I: 1st axis II: 2nd axis)	Green	Light ON	Servo ON
		Blinking	Automatic servo OFF (blinks at 0.5 Hz)
	Red	Light ON	Alarm triggered, STOP input triggered
		Blinking	Collision detection (blinks at 1 Hz)
	Light OFF		Servo OFF, axis disable setting (gateway parameters)



Jog switch

A switch for jog operation. I indicates the 1st axis, and II indicates the 2nd axis.
If parameter No. 194 "JOG Switch" (page 4-57) is set to "1", this switch will be enabled.

Tilt the switch to the JOG+ side to perform jog operation in the + direction, and to the JOG- side for jog operation in the - direction. Tilting the switch further increases the jog speed step by step. However, if home return is not complete, the jog speed will be home return speed.
When performing jog operation with the JOG switch with servo ON, the servo will be ON even after completion; with servo OFF, perform jog operation after servo ON and the servo will be OFF after completion.
Note that the operation of the jog switch is enabled only in MANU teaching mode. It is disabled in MANU monitor mode and AUTO mode.
The jog switch is also disabled when opening the screen in which the actuator can be operated with the teaching tool. When opening the screen in which operation can be done with the jog switch, the actuator will decelerate and stop.



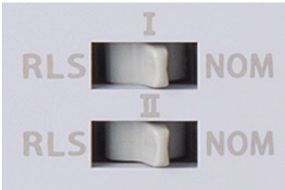
Symbol	Description
JOG+	Jog operation in + direction (home reverse direction)
JOG-	Jog operation in - direction (home direction)

Caution

- The jog switch is disabled when the communication with the teaching tool is disconnected while the screen in which the actuator can be operated with the teaching tool is opened.
- To enable jog switch operation again, turn the RCON system on again or perform software reset.

Brake release switch

A switch for forced brake release. I indicates the 1st axis, and II indicates the 2nd axis.
Should be on NOM side during normal operation. On NOM side, the brake will be released by servo ON and locked by servo OFF. On BKRLS side, there will be forced release regardless of servo ON/OFF (except when control power is OFF).



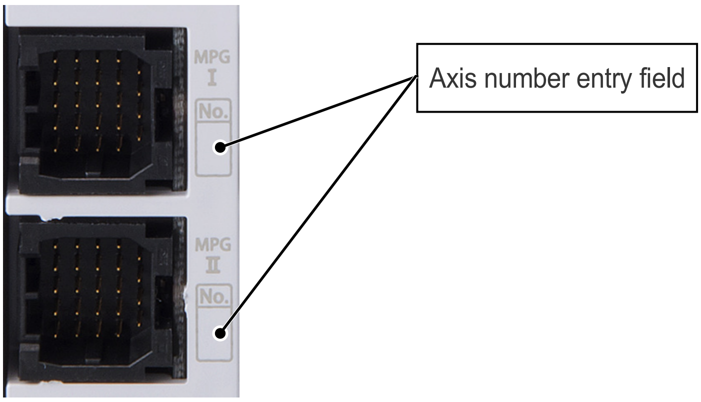
Symbol	Description
BKRLS	Brake release (Brake Release)
NOM	Brake lock (Normal)

Warning

- Be careful when releasing the brake. Releasing carelessly may cause injury or damage to the actuator body, workpiece or surrounding devices due to the slider or rod falling.
- After releasing the brake, be sure to return the brake to the enabled status. It is very dangerous to operate with the brake released. It may cause injury or damage to the actuator body, workpiece or surrounding devices due to the slider or rod falling.

Motor/encoder connector

A connector to connect to the actuator. I indicates the 1st axis, and II indicates the 2nd axis.
In RCON, the axis numbers will be automatically allocated from the unit closest to the gateway unit (except for the axis connecting to the SCON connection unit). Axis numbers can be changed as needed to any number with the gateway parameter configuration tool.



RCON-PC/PCF Driver Unit

Pin No.	Signal name	Description
1	A+	Encoder phase A+ input
2	BK-	Brake release - side
3	ϕA+	Motor drive line phase A+
4	ϕA-	Motor drive line phase A-
5	VMM	Motor power line
6	A-	Encoder phase A- input
7	GND	0 V
8	LS+	Limit switch + side
9	VMM	Motor power line
10	ϕB+	Motor drive line phase B+
11	B+	Encoder phase B+ input
12	ENC_SD+	Battery-less absolute signal line +
13	LS_GND	Ground for limit switch
14	LS-	Limit switch - side
15	ϕB-	Motor drive line phase B-
16	B-	Encoder phase B- input
17	ENC_SD-	Battery-less absolute signal line -
18	VPS	Encoder line driver enable output
19	NC	Not connected
20	BK+	Brake release + side
21	VCC	Encoder for motor power 5V
22	CF_VCC	Encoder for high-thrust motor power 5V
23	NC	Not connected
24	FG	Frame ground

RCON-AC Driver Unit

Pin No.	Signal name	Description
1	B+	Encoder phase B+ input
2	LS-	Limit switch - side
3	U	Motor drive line phase U
4	W	Motor drive line phase W
5	V	Motor drive line phase V
6	B-	Encoder phase B- input
7	GND	0 V
8	BK+	Brake release + side
9	NC	Not connected
10	NC	Not connected
11	Z+ / ENC_SD+	Encoder phase Z+ input / Battery-less absolute signal line +
12	A+	Encoder phase A+ input
13	LSGND	Ground for limit switch
14	BK-	Brake release - side
15	NC	Not connected
16	Z- / ENC_SD-	Encoder phase Z- input / Battery-less absolute signal line -
17	A-	Encoder phase A- input
18	VPS	Encoder line driver enable output
19	NC	Not connected
20	LS+	Limit switch + side
21	VCC	Encoder power 5V
22	NC	Not connected
23	NC	Not connected
24	FG	Frame ground

RCON-DC Driver Unit

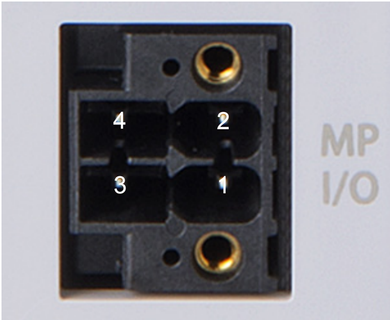
Pin No.	Signal name	Description
1	B+	Encoder phase B+ input
2	LS-	Limit switch - side
3	U	Motor drive line phase U
4	W	Motor drive line phase W
5	V	Motor drive line phase V
6	B-	Encoder phase B- input
7	GND	0 V
8	BK+	Brake release + side
9	NC	Not connected
10	NC	Not connected
11	HS_U	Hall sensor phase U
12	A+	Encoder phase A+ input
13	HS_W	Hall sensor phase W
14	BK-	Brake release - side
15	NC	Not connected
16	HS_V	Hall sensor phase V
17	A-	Encoder phase A- input
18	VPS	Encoder line driver enable output
19	NC	Not connected
20	LS+	Limit switch + side
21	VCC	Encoder power 5V
22	NC	Not connected
23	NC	Not connected
24	FG	Frame ground

Specifications Section

Chapter 4 Driver Unit

Drive source shutoff connector

Drive-source cutoff input. Drive source can be cut off by individual axes.



Cable connector name: DFMC1.5/2-STF-3.5 (Phoenix Contact)

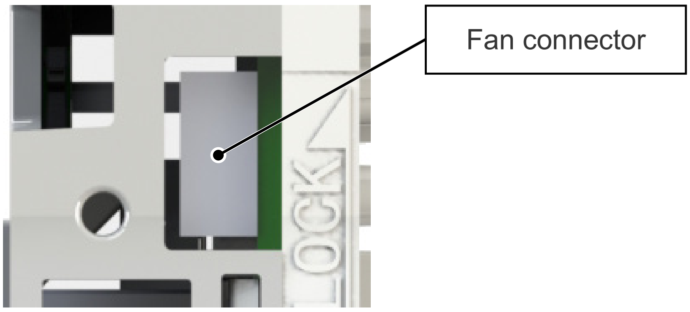
Pin No.	Signal name	Description
1	MPO_II	Motor power output (2nd axis)
2	MPO_I	Motor power output (1st axis)
3	MPI_II	Motor power input (2nd axis)
4	MPI_I	Motor power input (1st axis)

Cable side connector compatible wire

Item	Specifications
Compatible wire	AWG24 ~ 16
Strip length	10.0mm

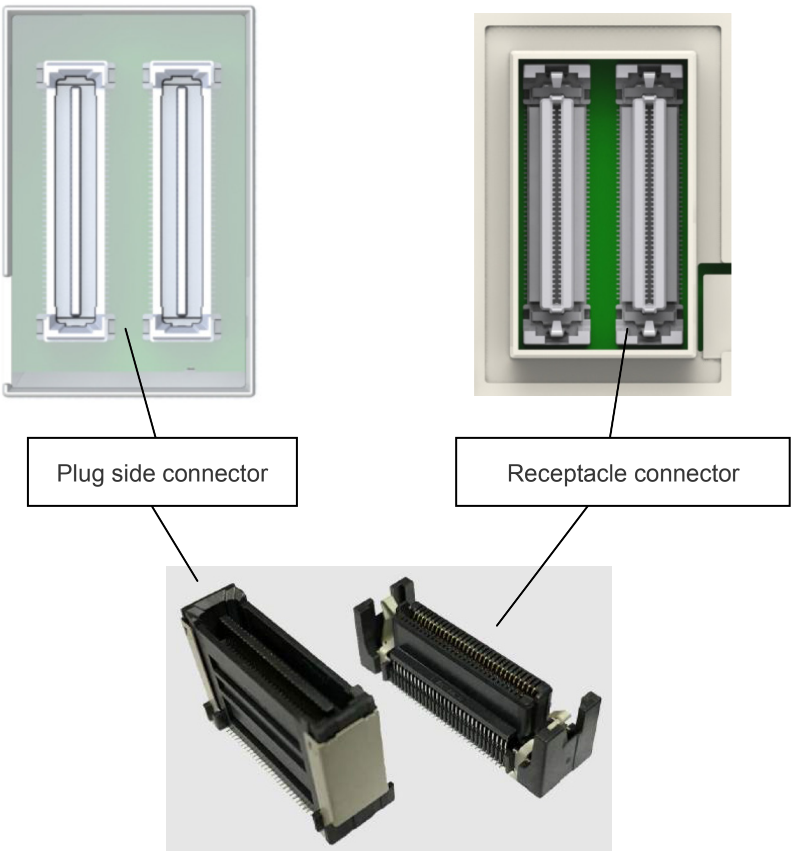
Fan connector

A connector to connect the fan unit. It connects to the fan board connector on the fan unit side.



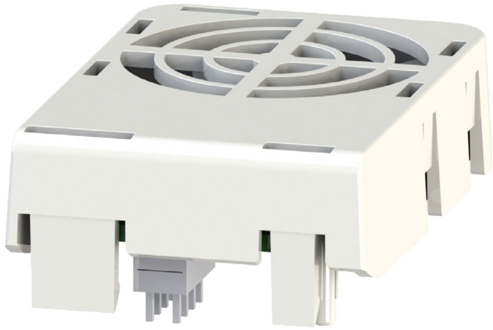
Connectors

A connector for use between units. Two identical connectors are used. The connectors have a floating structure that absorbs connector misalignment due to housing mating or mounting misalignment between connectors.

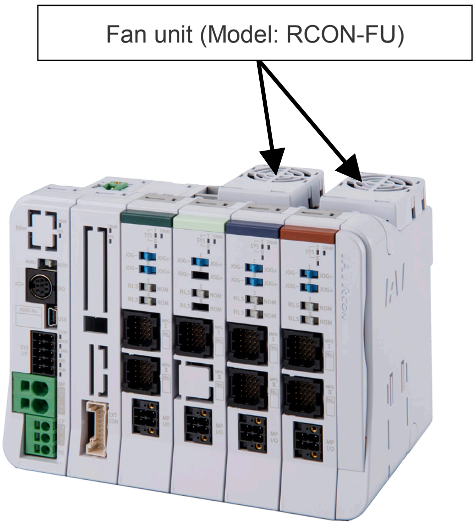


Fan unit

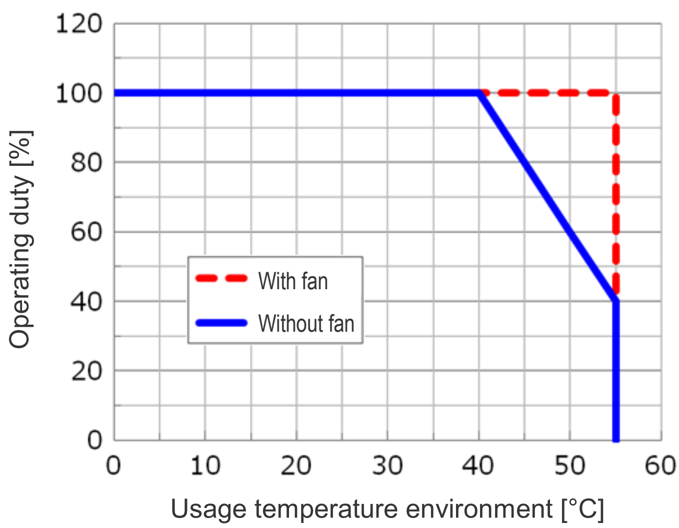
An option for forced air cooling of the driver unit. Use by connecting to the fan connector on the driver unit side. 1 fan unit to be used per 2 driver units.
The fan rotates when the driver unit internal temperature rises and stops when the temperature falls.



Fan unit



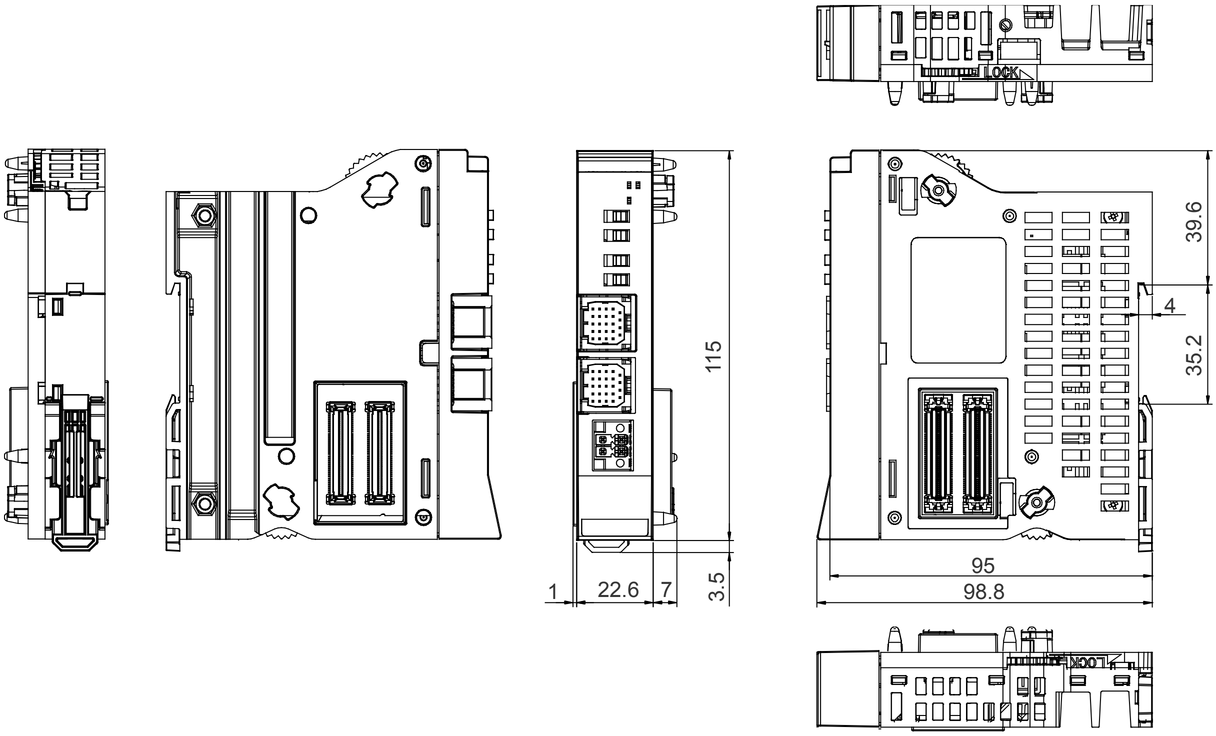
Operation without derating is possible without a fan unit at 0-40°C; however, at 40-55°C, operating duty must be reduced by 20% every 5°C.
With fan unit, operation is possible up to 55°C without derating.



External dimensions

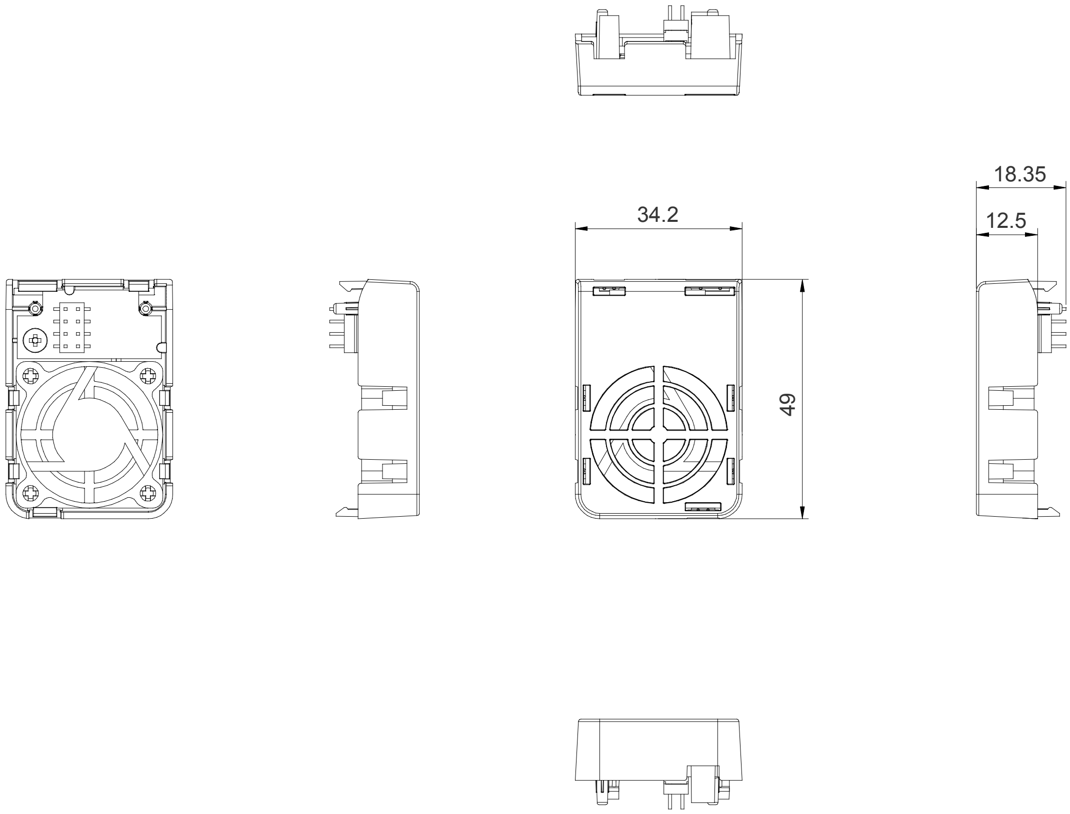
Driver unit (common for all types)

Item	Specifications
External dimensions	W22.6 mm x H115 mm x D95 mm
Weight	About 180g
External view	See figure below



Fan unit

Item	Specifications
External dimensions	W34.2 mm x H49 mm x D12.5 mm
Weight	About 15g
External view	See figure below



4.5. Parameters

Parameter data should be set appropriately according to the application requirements.
When a change is required to the parameters, back up the data before the change so the settings can be recovered at any time.
Backup to PC is possible by using PC software. Backup to a memory card is possible by using a teaching pendant. If data backup is not possible, make notes.

For quick data recovery after investigation of a breakdown, or for replacement of the driver unit, it is also recommended to back up or make notes of the parameters after settings changes.

Changes to the parameters will be enabled after they are edited, written to the driver unit built-in non-volatile memory (FeRAM), and the software is reset or the power rebooted. Note that they will not be enabled only by setting with the teaching tool.

Warning

- Parameter settings significantly influence operation. As well as leading to misoperation or malfunction, incorrect settings are extremely dangerous.
  Settings at shipping enable standard operation. Thoroughly understand the control methods of the RCON system in advance if making a change or performing setting in accordance with the system. Contact IAI if anything is unclear.
- Do not attempt to turn OFF the power of the RCON system while writing parameters.
  Parameters will not be written correctly, possibly causing misoperation, which is extremely dangerous.

Parameter list

The following parameters are available for each actuator.
Parameters should be set and confirmed for each axis number.

Parameters are categorized into the following 4 types depending on the content.

a: Actuator stroke
b: Actuator operational characteristics
c: External interface
d: Servo gain adjustment

Categories are not displayed on the teaching tool.
Also, the unused parameters are not mentioned in the list.

Parameter list (1/5)

No.	Cate-gory	Name	Symbol	Unit (Note 1)	Input range	Default initial value setting	Compatible motor Type (Note 3) P	A	D	Relevant sections
1	a	Zone boundary 1 + side	ZONM	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on + side (Note 2)	○	○	○	4-24
2	a	Zone boundary 1 - side	ZONL	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on - side (Note 2)	○	○	○	4-24
3	a	Soft limit - side	LIMM	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on + side (Note 2)	○	○	○	4-26
4	a	Soft limit - side	LIML	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on - side (Note 2)	○	○	○	4-26
5	a	Homing direction	ORG	–	0: Reverse, 1: Forward	In accordance with actuator (Note 2)	○	○	○	4-27
6	b	Pushing stop recognition time	PSWT	ms	0 to 9,999	255	○	○	○	4-31
7	d	Servo gain number	PLG0	–	0 to 31	In accordance with actuator (Note 2)	○	○	○	4-62
8	b	Velocity initial value	VCMD	mm/s (deg/s)	1 ~ Actuator maximum speed	Actuator rated speed (Note 2)	○	○	○	4-32
9	b	Acc/Dec initial value	ACMD	G	0.01 ~ Actuator max. acceleration/deceleration	Actuator rated acceleration/deceleration (Note 2)	○	○	○	4-32
10	b	Positioning band initial value	INP	mm (deg)	Actuator Min. resolution ~ 999.99	In accordance with actuator (Note 2)	○	○	○	4-32
12	b	Current limit during positioning stop	SPOW	%	35 to 70	In accordance with actuator (Note 2)	○	–	–	4-33
13	b	Current limit during homing	ODPW	%	0 to 100	In accordance with actuator (Note 2)	○	–	–	4-33
					0 to 300		–	○	○	
18	b	Home sensor polarity	LS	–	0 to 2	In accordance with actuator (Note 2)	○	○	–	4-33
22	a	Homing offset	OFST	mm (deg)	0.00 to 9,999.99	In accordance with actuator (Note 2)	○	○	○	4-28
23	a	Zone boundary 2 + side	ZNM2	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on + side (Note 2)	○	○	○	4-24
24	a	Zone boundary 2 - side	ZNL2	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on - side (Note 2)	○	○	○	4-24

Note 1 The unit (deg) is applicable to the rotary actuator or lever-type gripper. It will be displayed as (mm) on the teaching tool.

Note 2 The setting values vary in accordance with the specification of the actuator. At shipping, the parameters are set in accordance with the specification.

Note 3 P: Stepper motor specification, A: AC servo motor specification, D: DC brush-less motor specification

Parameter list (2/5)

No.	Cate-gory	Name	Symbol	Unit (Note 1)	Input range	Default initial value setting	Compatible motor Type (Note 3) P	A	D	Relevant sections
26	b	PIO Jog velocity	JOGV	mm/s (deg/s)	1 to 250 (actuator maximum speed for 250 or less)	In accordance with actuator (Note 2)	○	○	○	4-34
28	b	Excitation signal detection operation Initial travel direction	PHSP	–	0: Reverse, 1: Forward	In accordance with actuator (Note 2)	○	○	–	4-34
29	b	Excitation signal detection time	PHSP	ms	1 to 999	10	○	–	–	4-34
					50 to 999	128	–	○	–	
30	b	Excitation detection type	PHSP	–	0: Conventional mode 1: New mode 1 2: New mode 2	1	○	–	–	4-35
	b	Pole sense type	PHSP	–	0: Current control 1: Distance control 1 2: Distance control 2	1	–	○	–	4-35
31	d	Velocity loop proportional gain	VLPG	–	1 to 27,661	In accordance with actuator (Note 2)	○	○	○	4-63
32	d	Velocity loop integral gain	VLPT	–	1 to 217,270	In accordance with actuator (Note 2)	○	○	○	4-64
33	d	Torque filter constant	TRQF	–	0 to 2,500	In accordance with actuator (Note 2)	○	○	○	4-65
34	b	Push speed	PSHV	mm/s (deg/s)	1 ~ Actuator Maximum push speed	In accordance with actuator (Note 2)	○	○	○	4-36
35	b	Safety velocity	SAFV	mm/s (deg/s)	1 to 250 (actuator maximum speed for 250 or less)	100	○	○	○	4-36
36	b	Automatic servo OFF delay time 1	ASO1	s	0 to 9,999	0	○	○	○	4-37
37	b	Automatic servo OFF delay time 2	ASO2	s	0 to 9,999	0	○	○	○	4-37
38	b	Automatic servo OFF delay time 3	ASO3	s	0 to 9,999	0	○	○	○	4-37
39	b	Positioning complete signal output method	PEND	–	0: PEND 1: INP	0	○	○	○	4-37
43	b	Home confirmation sensor input polarity	HMC	–	0: Sensor not in use 1: a-contact 2: b-contact	In accordance with actuator (Note 2)	○	○	–	4-38
46	b	Velocity override	OVRD	%	1 to 100	100	○	○	○	4-38
47	b	PIO Jog velocity 2	IOV2	mm/s (deg/s)	1 to 250 (actuator maximum speed for 250 or less)	In accordance with actuator (Note 2)	○	○	○	4-39
48	b	PIO inching distance	IOID	mm (deg/s)	0.01 to 1.00	1.00	○	○	○	4-39
49	b	PIO inching distance 2	IOD2	mm (deg/s)	0.01 to 1.00	0.10	○	○	○	4-39
50	b	Load output judgment time	LDWT	ms	0 to 9,999	255	○	–	–	4-39

Note 1 The unit (deg) is applicable to the rotary actuator or lever-type gripper. It will be displayed as (mm) on the teaching tool.

Note 2 The setting values vary in accordance with the specification of the actuator. At shipping, the parameters are set in accordance with the specification.

Note 3 P: Stepper motor specification, A: AC servo motor specification, D: DC brush-less motor specification

Parameter list (3/5)

No.	Cate-gory	Name		Symbol	Unit (Note 1)	Input range	Default initial value setting	Compatible motor type (Note 3) P	A	D	Relevant sections
52	b	Acc/Dec mode initial value		MOD	–	0: Trapezoid pattern 1: S-motion 2: First-order delay filter	0	○	○	○	4-40
53	b	Stop mode initial value		HSTP	–	0 to 3	0 (not in use)	–	○	○	4-40
						0 to 7		○	–	–	
54	d	Current control width number		CLPF	–	0 to 15	In accordance with actuator (Note 2)	–	○	○	4-65
55	d	Position command primary filter time constant		PLPF	ms	0.0 to 100.0	0.0	○	○	○	4-66
56	b	S-motion ratio setting		SCRV	%	0 to 100	0	○	○	○	4-41
71	d	Position feed forward gain		PLFG	–	0 to 100	0	○	○	–	4-67
							50	–	–	○	
77	b	Lead size of ball screw		LEAD	mm (deg)	0.01 to 999.99	In accordance with actuator (Note 2)	○	○	○	4-42
78	b	Axis motion type		ATYP	–	0: Linear axis 1: Rotary axis	In accordance with actuator (Note 2)	○	○	○	4-43
79	b	Rotary axis mode select		ATYP	–	0: Normal mode 1: Index mode	In accordance with actuator (Note 2)	○	○	○	4-44
80	b	Rotary axis shortcut select		ATYP	–	0: Disabled, 1: Enabled	In accordance with actuator (Note 2)	○	○	○	4-45
83	b	Absolute Unit		ETYP	–	0: Not in use, 1: Used	0 (Note 4)	○	○	–	4-45
88	a	Software limit margin		SLMA	mm	0 to 9,999.99	0	○	○	○	4-29
91	b	Current limit value during contactless push stop		PSFC	–	0: Current limit value during stop 1: Current limit value during push	0	○	○	○	4-46
97	d	Set 1 Vibration damping parameters	Damping characteristics coefficient 1	DC11	–	0 to 1,000	10	–	○	–	4-68
98	d		Damping characteristics coefficient 2	DC21	–	0 to 1,000	1,000	–	○	–	
99	d		Natural frequency	NP01	1/1,000Hz	500 to 30,000	10,000	–	○	–	
100	d		Notch filter gain	NFG1	–	1 to 20,000	9,990	–	○	–	
101	d	Set 2 Vibration damping parameters	Damping characteristics coefficient 1	DC12	–	0 to 1,000	10	–	○	–	
102	d		Damping characteristics coefficient 2	DC22	–	0 to 1,000	1,000	–	○	–	
103	d		Natural frequency	NP02	1/1,000Hz	500 to 30,000	10,000	–	○	–	
104	d		Notch filter gain	NFG2	–	1 to 20,000	9,990	–	○	–	
105	d	Set 3 Vibration damping parameters	Damping characteristics coefficient 1	DC13	–	0 to 1,000	10	–	○	–	
106	d		Damping characteristics coefficient 2	DC23	–	0 to 1,000	1,000	–	○	–	
107	d		Natural frequency	NP03	1/1,000Hz	500 to 30,000	10,000	–	○	–	
108	d		Notch filter gain	NFG3	–	1 to 20,000	9,990	–	○	–	
109	d	Vibration damping No. initial value		CTLF	–	0 to 3	0	–	○	–	4-68

Note 1 The unit (deg) is applicable to the rotary actuator or lever-type gripper. It will be displayed as (mm) on the teaching tool.

Note 2 The setting values vary in accordance with the specification of the actuator. At shipping, the parameters are set in accordance with the specification.

Note 3 P: Stepper motor specification, A: AC servo motor specification, D: DC brush-less motor specification

Note 4 When using the simple absolute unit, change the parameter No. 83 to "1" and perform absolute reset before use.

Parameter list (4/5)

No.	Cate-gory	Name	Symbol	Unit (Note 1)	Input range	Default initial value setting	Compatible motor Type (Note 3) P	A	D	Relevant sections
110	b	Stop method during SrvOFF	PSOF	–	0: Sudden stop 1: Decelerating stop	0	○	○	○	4-46
112	c	Monitoring mode select	FMNT	–	0: Not in use 1: Monitor function 1 2: Monitor function 2 3: Monitor function 3	1	○	○	○	4-53
113	c	Monitoring cycle	FMNT	ms	1 to 60,000	1	○	○	○	4-54
120	d	Servo gain number 1	PLG1	–	0 to 31	In accordance with actuator (Note 2)	–	○	–	4-69
121	d	Position feed forward gain 1	PLF1	–	0 to 100	0	–	○	–	
122	d	Velocity loop proportional gain 1	VLG1	–	1 to 27,661	In accordance with actuator (Note 2)	–	○	–	
123	d	Velocity loop integral gain 1	VLT1	–	1 to 217,270	In accordance with actuator (Note 2)	–	○	–	
124	d	Torque filter constant 1	TRF1	–	0 to 2,500	In accordance with actuator (Note 2)	–	○	–	
125	d	Current control width number 1	CLP1	–	0 to 15	In accordance with actuator (Note 2)	–	○	–	
126	d	Servo gain number 2	PLG2	–	0 to 31	In accordance with actuator (Note 2)	–	○	–	
127	d	Position feed forward gain 2	PLF2	–	0 to 100	0	–	○	–	
128	d	Velocity loop proportional gain 2	VLG2	–	1 to 27,661	In accordance with actuator (Note 2)	–	○	–	
129	d	Velocity loop integral gain 2	VLT2	–	1 to 217,270	In accordance with actuator (Note 2)	–	○	–	
130	d	Torque filter constant 2	TRF2	–	0 to 2,500	In accordance with actuator (Note 2)	–	○	–	
131	d	Current control width number 2	CLP2	–	0 to 15	In accordance with actuator (Note 2)	–	○	–	
132	d	Servo gain number 3	PLG3	–	0 to 31	In accordance with actuator (Note 2)	–	○	–	
133	d	Position feed forward gain 3	PLF3	–	0 to 100	0	–	○	–	
134	d	Velocity loop proportional gain 3	VLG3	–	1 to 27,661	In accordance with actuator (Note 2)	–	○	–	
135	d	Velocity loop integral gain 3	VLT3	–	1 to 217,270	In accordance with actuator (Note 2)	–	○	–	
136	d	Torque filter constant 3	TRF3	–	0 to 2,500	In accordance with actuator (Note 2)	–	○	–	
137	d	Current control width number 3	CLP3	–	0 to 15	In accordance with actuator (Note 2)	–	○	–	
138	d	Servo gain switch time constant	GCFT	ms	10 to 2,000	10	–	○	–	4-70
139	a	Home preset value	PRST	mm	-9,999.99 to 9,999.99	In accordance with actuator (Note 2)	–	○	–	4-30
143	b	Overload load level ratio	OLWL	%	50 to 100	100	○	○	○	4-47

Note 1 The unit (deg) is applicable to the rotary actuator or lever-type gripper. It will be displayed as (mm) on the teaching tool.

Note 2 The setting values vary in accordance with the specification of the actuator.At shipping, the parameters are set in accordance with the specification.

Note 3 P: Stepper motor specification, A: AC servo motor specification, D: DC brush-less motor specification

Specifications Section

Chapter 4 Driver Unit

Specifications Section

Chapter 4 Driver Unit

Parameter list (5/5)

No.	Cate-gory	Name	Symbol	Unit (Note 1)	Input range	Default initial value setting	Compatible motor Type (Note 3) P	A	D	Relevant sections
144	d	GS magnification upper limit	GSUL	%	0 to 1,023	0 (Disabled)	○	–	–	4-71
145	d	GS velocity loop proportional gain	GSPC	–	1 to 50,000	750	○	–	–	4-71
146	d	GS velocity loop integral gain	GSIC	–	1 to 500,000	4,500	○	–	–	4-72
147	c	Total travel count threshold	TMCT	times	0 to 999,999,999	0 (Disabled)	○	○	○	4-54
148	c	Total travel distance threshold	ODOT	m	0 to 999,999,999	0 (Disabled)	○	○	○	4-55
151	c	Minor malfunction alarm output select	FSTP	–	0: Output during overload warning 1: Message level Alarm output	1	○	○	○	4-55
152	b	High output setting	BUEN	–	0: Disabled, 1: Enabled	In accordance with actuator (Note 2)	○	–	–	4-47
153	d	BU velocity loop proportional gain	BUPC	–	1 to 10,000	In accordance with actuator (Note 2)	○	–	–	4-72
154	d	BU velocity loop integral gain	BUIC	–	1 to 100,000	In accordance with actuator (Note 2)	○	–	–	4-72
155	b	Absolute battery retention time	AIP	–	0: 20 days 1: 15 days 2: 10 days 3: 5 days	0	○	○	–	4-48
158	c	Enabled/disabled axis select	EFCT	–	0: Enabled, 1: Disabled	0	○	○	○	4-56
166	b	Startup current limit expansion Function	DCET	–	0: Disabled, 1: Enabled	0	○	–	–	4-49
168	b	Collision detection function	CODT	–	0 to 7	0	○	–	–	4-49
181	b	Push mode	SPOS	–	0: CON mode 1: SEP mode	0	○	○	○	4-50
182	b	Auto current adj. select	ACDS	–	0: Disabled, 1: Enabled	0	○	–	–	4-51
190	b	Servo ON delay time adjustment	SONA	ms	0 to 9,999	0	○	–	–	4-51
191	b	Position data expansion function setting	EXT	–	0: Not displayed 1: Drive torque limit 2: Push speed	0	○	○	○	4-52
192	c	Actuator recognition function	FEAR	–	0: Disabled, 1: Enabled	In accordance with actuator (Note 2)	○	○	–	4-56
194	c	JOG switch	JGSW	–	0: Enabled, 1: Disabled	0	○	○	○	4-57

Note 1 The unit (deg) is applicable to the rotary actuator or lever-type gripper. It will be displayed as (mm) on the teaching tool.

Note 2 The setting values vary in accordance with the specification of the actuator.At shipping, the parameters are set in accordance with the specification.

Note 3 P: Stepper motor specification, A: AC servo motor specification, D: DC brush-less motor specification

Actuator stroke

Each actuator is set individually.

Caution

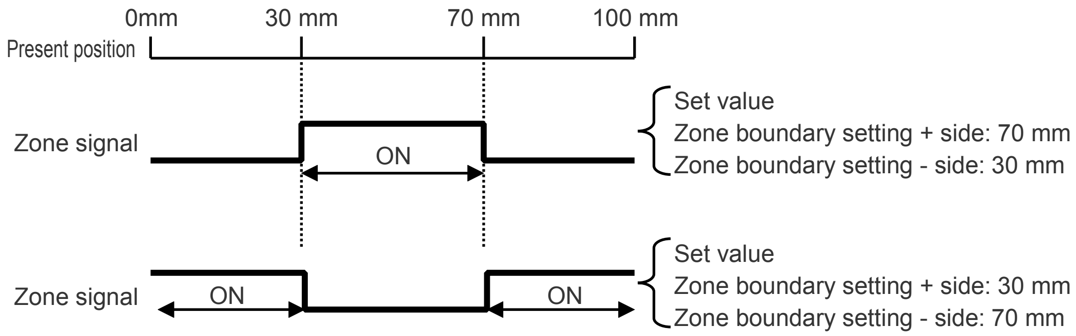
- After changing (writing) parameters, perform a software reset or power reboot so that the set values can be reflected.
- The unit (deg) is applicable to the rotary actuator or lever-type gripper. Note that it will be displayed as mm on the teaching tool.

[Zone Boundary 1 + Side, Zone Boundary 1 - Side (Parameter No. 1, No. 2)]
[Zone Boundary 2 + Side, Zone Boundary 2 - Side (Parameter No. 23, No. 24)]

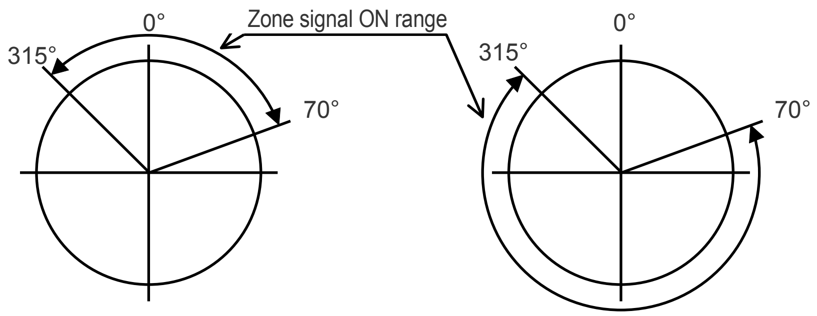
No.	Name	Symbol	Unit	Input range	Default initial value setting
1	Zone boundary 1 + side	ZONM	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on + side
2	Zone boundary 1 - side	ZONL	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on - side
23	Zone boundary 2 + side	ZNM2	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on + side
24	Zone boundary 2 - side	ZNL2	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on - side

Set the range to turn zone signals (ZONE1, ZONE2) ON.
The minimum setting unit is 0.01 mm (deg).
If the same value is set for zone boundary setting + side and zone boundary setting - side, a zone signal will not be output.
Setting examples are shown below.

[For linear axis]



[For rotary actuator in index mode]



Caution

- Unless the zone signal detection range is set at a value above minimum resolution, a signal will not be output.
- The minimum resolution can be calculated with the equation below.
  Minimum resolution [mm/pulse] = Actuator lead [mm/r] / Encoder resolution [pulse/r]

[Soft Limit + Side, Soft Limit - Side (Parameter No. 3, No. 4)]

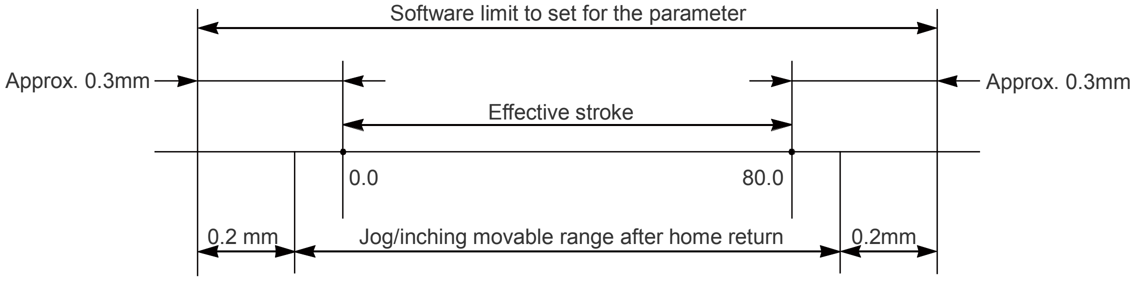
No.	Name	Symbol	Unit	Input range	Default initial value setting
3	Soft limit + side	LIMM	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on + side
4	Soft limit - side	LIML	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on - side

0.3 mm (deg) is added to the outside of the effective actuator stroke for the default setting. Change as required to prevent collision when there are obstacles, or when used slightly above effective stroke within the movable range.
The minimum setting unit is 0.01mm.

Caution

- At this time, take extra care not to set incorrect values as this will lead to a collision with the mechanical end.
- If changing, set a value extended by 0.3 mm to the outside of the effective stroke.

Example) To set the effective stroke between 0.0 mm and 80.0 mm
Parameter No.3 (+ side) 80.3
Parameter No.4 (- side) -0.3



The movable range of jog or inching after home return will be 0.2 mm inside the set value.
Alarm code 0D9 "Software limit over error" occurs when the set value exceeds the value set in parameter No. 88 "Soft limit margin" (default setting = 0). If parameter No. 88 is not set, the value set for this parameter will become a detection value of the alarm code 09D "Software limit over error."

[Homing Direction (Parameter No.5)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
5	Homing direction	ORG	–	0: Reverse, 1: Forward	In accordance with actuator

Unless indicated as home reverse specification (option), the direction of home return for the linear axis is on the motor side, the rotary axis is on the counterclockwise side, and the gripper is on the outside (open side).
For details, refer to "Actuator coordinate system (page Intro-18)".

Caution

- Homing direction cannot be changed with some models.
- If it becomes necessary to reverse the homing direction after assembly to equipment, check the model of the applicable actuator to ensure that the homing direction is changeable.
- For models with which change is not possible, the actuator must be changed.
  Contact IAI if anything is unclear.

[Homing offset(Parameter No. 22)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
22	Homing offset	OFST	mm (deg)	0.00 to 9,999.99	In accordance with actuator

Sets the distance from the mechanical end to the home position.
Home is adjustable in the following cases.

·To match the actuator home position and the mechanical home position after assembly into equipment.
·To set a new home position after reversing the default home direction.
·To eliminate a slight deviation from the previous home position generated after replacing the actuator.

Adjustment process
(1) Perform home return motion.
(2) Check amount of deviation.
(3) Change the parameter.
(4) After setting, repeat home return motion several times to confirm that the actuator always returns to the same home position.

Caution

- If the homing offset has been changed, the software limit parameter also needs to be reviewed.
  If the value must be set above the default setting, contact IAI.
- For the absolute specification, if a value close to an integral multiplication of the lead length (including homing offset 0) is set for the homing offset, servo lock status may ensue in the Z-phase during the absolute reset, and coordinates may deviate by the lead length.
- For absolute specification, never set a value close to an integral multiplication of the lead length.
  Secure sufficient margin.

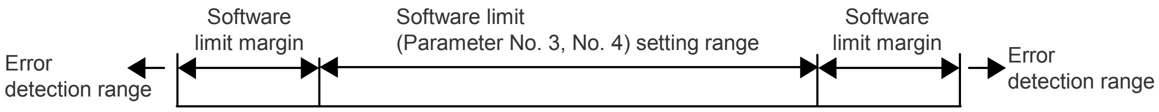
[Zone Boundary 2 + Side, Zone Boundary 2 - Side (Parameter No. 23, No. 24)]

Refer to page 4-24 (Parameter No. 23, No. 24) for more information.

[Software Limit Margin (Parameter No. 88)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
88	Software limit margin	SLMA	mm (deg)	0 to 9,999.99	0

A parameter for over error detection setting with regard to the values set for Parameter No. 3 and Parameter No. 4.
Normally, setting change is not required.



AC servo motor specification only

[Home preset value (Parameter No.139)]

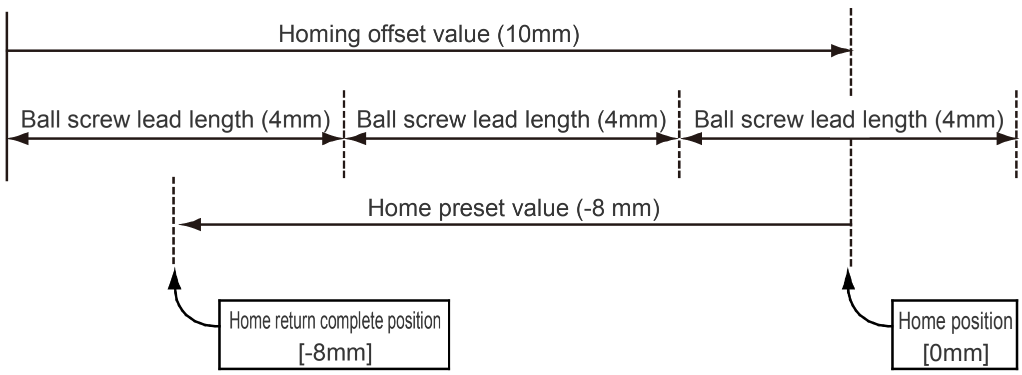
No.	Name	Symbol	Unit	Input range	Default initial value setting
139	Home preset value	PRST	mm	-9,999.99 to 9,999.99	In accordance with actuator

When using an actuator of absolute specification, set "homing offset value+ this parameter set value" within the range of "0 to ball screw lead length". (Z-phase near the mechanical end must be registered as reference)
The allowable values are multiples of ± ball screw lead length including 0.00.
(0.00 if the homing offset value is within the range of 0 to ball screw lead length)
Also, if a value other than 0.00 is set to this parameter, the home return complete position will not be 0.00, but the home position + this parameter position.
For the incremental specification actuator, be sure to set to 0.00.

Caution

- If the homing offset value and this parameter setting do not meet the above conditions, the home position may be shifted by the multiple of the ball screw lead length when restarted after home return.

<Configuration example 1>
For ball screw lead length of 4 mm and homing offset of 10 mm, set this parameter to -8 mm.



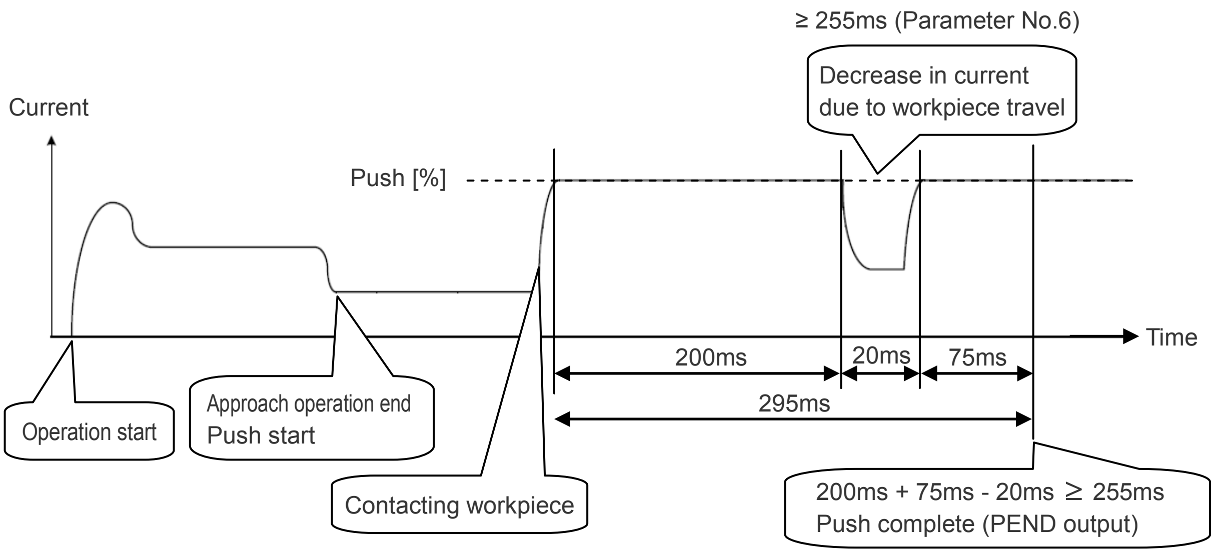
Actuator dynamic characteristics

[Pushing Stop Recognition Time (Parameter No. 6)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
6	Pushing stop recognition time	PSWT	ms	0 to 9,999	255

A parameter to set completion judgment time of push-motion operation.
The torque (current limit value) set in % in "Pushing" in the position table is monitored, and the pushing complete signal PEND turns ON when the load current reaches the following conditions during push-motion operation. PEND signal turns ON when the conditions are satisfied even if the workpiece is not stopped.

(Accumulated time in which current has reached push value [%]) - (accumulated time in which current is less than push value [%])



[Velocity Initial Value (Parameter No. 8)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
8	Velocity initial value	VCMD	mm/s (deg/s)	1 ~ Actuator maximum speed	Actuator rated speed

The actuator rated speed is set at shipment.
This value will be written automatically in the speed field of the applicable position No. when target position is written in an unregistered position table.
Enter frequently used values for convenience.

[Acc/Dec Initial Value (Parameter No. 9)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
9	Acc/Dec initial value	ACMD	G	0.01 ~ Actuator max. acceleration/deceleration	Actuator rated acceleration/deceleration

The actuator rated acceleration/deceleration is set at shipment.
This value will be written automatically in the acceleration/deceleration field of the applicable position No. when target position is written in an unregistered position table.
Enter frequently used values for convenience.

[Positioning Band (In-Position) Initial Value (Parameter No. 10)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
10	Positioning band initial value	INP	mm (deg)	Actuator min. resolution ~ 999.99	In accordance with actuator

This value will be written automatically in the positioning width field of the applicable position No. when target position is written in an unregistered position table.
Enter frequently used values for convenience.
The minimum resolution can be calculated with the equation below.
Minimum resolution [mm/pulse] = Actuator lead [mm/r] / Encoder resolution [pulse/r]
For RCP2/3/4/5 Series, a value 3 times the minimum resolution will be the minimum input range.

Stepper motor specification only

[Current Limit During Positioning Stop (Parameter No. 12)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
12	Current limit during positioning stop	SPOW	%	0 to 70	In accordance with actuator

By increasing the value, torque retention during stop will be increased.
There is normally no need to make changes. If significant external force is applied during the stop, it is necessary to increase the set value. Contact IAI.

AC servo motor specification and stepper motor specification only

[Current Limit During Homing (Parameter No. 13)]

No.	Name	Symbol	Unit	Input range	Default initial value setting	Specifications
13	Current limit during homing	ODPW	%	0 to 100	In accordance with actuator	Stepper motor specification
				0 to 300		AC servo motor specification DC brush-less motor specification

A current value suited to the actuator standard specifications is set at shipment.
By increasing the value, home return torque will be increased.
There is normally no need to make changes. During vertical use, if home return motion completes before the normal position due to the fixing method or load bearing conditions, it is necessary to increase the set value. Contact IAI.

AC servo motor specification and stepper motor specification only

[Home Sensor Polarity (Parameter No. 18)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
18	Home sensor polarity	LS	–	0 to 2	In accordance with actuator

A parameter to select input polarity of the home sensor.
Home sensor is optional.

Set value	Content
0	Standard specification (home sensor not in use)
1	Input is a-contact
2	Input is b-contact

[PIO Jog Velocity (Parameter No. 26)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
26	PIO Jog velocity	JOGV	mm/s (deg/s)	1 to 250 (actuator maximum speed for 250 or less)	In accordance with actuator

A setting for jog operation speed when jog speed/inching switch signal JVEL is OFF.
Set an ideal value to suit the application.

AC servo motor specification and stepper motor specification only

[Excitation Signal Detection Operation Travel Direction (Parameter No. 28)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
28	Excitation signal detection operation travel direction	PHSP	–	0: Reverse 1: Forward	In accordance with actuator

After turning the power ON, the first servo ON detects excitation. Operation direction during detection is set.
There is normally no need to make changes. Set in a direction which makes movement of the motor easy if the mechanical end or an obstacle is contacted when power is turned ON.
If the direction without contact is the same as the home return direction, set the same value as Parameter No. 5 "Home Return Direction." If the direction is opposite, set the value opposite to that of Parameter No. 5 (1 if No. 5 is 0, 0 if No. 5 is 1).
For simple absolute specification and RCP5 Series, it detects excitation upon home return motion complete.

[Excitation Signal Detection Time (Parameter No. 29)]

No.	Name	Symbol	Unit	Input range	Default initial value setting	Specifications
29	Excitation signal detection time	PHSP	ms	1 to 999	10	Stepper motor specification
				50 to 999	128	AC servo motor specification

After turning the power ON, the first servo ON detects excitation. Set this detection time.
There is normally no need to make changes. Adjustment of this parameter can be effective at times when an excitation detection error or abnormal operation has occurred.
Contact IAI when changing this parameter.
For simple absolute specification and RCP5 Series, it detects excitation upon home return motion complete.

Stepper motor specification only

[Excitation Detection Type (Parameter No. 30)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
30	Excitation detection type	PHSP	–	0: Conventional mode 1: New mode 1 (For vertical mount) 2: New mode 2 (For horizontal mount)	1

After turning the power ON, the first servo ON detects excitation. The new mode makes this operation smooth and quiet.
For example, if the actuator is mounted vertically, setting new mode 2 (for horizontal mount) may cause the slider or rod to fall during excitation detection operation. Be sure to mount in the designated direction. Set new mode 1 if anything falls even if mounted in the designated direction.
For simple absolute specification and RCP5 Series, it detects excitation upon home return motion complete.

AC servo motor specification only

[Pole Sense Type (Parameter No. 30)]

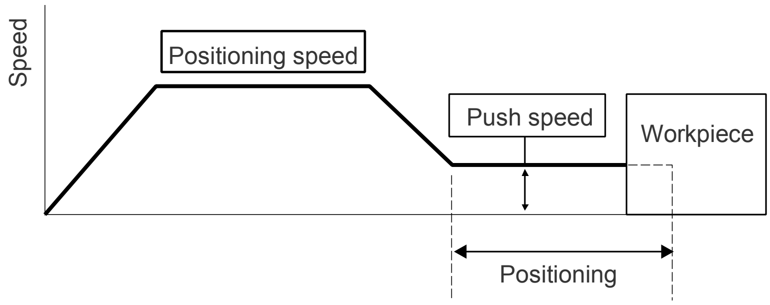
No.	Name	Symbol	Unit	Input range	Default initial value setting
30	Pole sense type	PHSP	–	0: Current control 1: Distance control 1 2: Distance control 2	1

After turning the power ON, the first servo ON detects polarity. The operation method is set at this time.
There is normally no need to make changes.

[Push Velocity (Parameter No. 34)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
34	Push velocity	PSHV	mm/s (deg/s)	1 ~ Actuator maximum push speed	In accordance with actuator

A parameter to set speed during push-motion operation.
The setting at shipment is according to the actuator specifications. For details, refer to "Appendix Chapter 1 Connectable Actuators".
Contact IAI if the setting needs to be changed. The designated push force may not be attainable if the speed is changed. Also, when setting slower speeds, the limit should be 5 mm/s.



Caution

- If positioning speed of the position table is set below this parameter, the push speed will be the same as the positioning speed.
- Note that if the push speed is set in the position table in parameter No. 191 "Position data expansion function setting", that set value becomes enabled.

[Safety Velocity (Parameter No. 35)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
35	Safety velocity	SAFV	mm/s (deg/s)	1 to 250 (actuator maximum speed for 250 or less)	100

A parameter to set the maximum speed for manual operation under safety speed selection on the teaching tool. For your safety, do not attempt to set unless it is necessary.

[Automatic Servo OFF Delay Time 1, 2 & 3 (Parameter No. 36, No. 37 & No. 38)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
36	Automatic servo OFF delay time 1	ASO1	s	0 to 9,999	0
37	Automatic servo OFF delay time 2	ASO2	s	0 to 9,999	0
38	Automatic servo OFF delay time 3	ASO3	s	0 to 9,999	0

Set the duration from the time after positioning complete until automatic servo OFF when using the power-saving function.
For details, refer to "4.8 Various Functions / Power-Saving Function (page 4-90)".

[Positioning Complete Signal Output Method (Parameter No. 39)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
39	Positioning complete signal output method	PEND	–	0: PEND 1: INP	0

A parameter to select the positioning complete signal type.
Output status after positioning complete varies according to whether the servo is ON or OFF.

Set value	Signal identification	During servo ON (during positioning complete)	During servo OFF
0	PEND	Will not turn OFF even if present position is outside the range of positioning width	Unconditional OFF
1	INP	Will turn ON if present position is within the range of positioning width and OFF outside the range.	

Output format will be the same for the complete position No. output PM1 to PM **.

AC servo motor specification and stepper motor specification only

[Home Confirmation Sensor Input Polarity (Parameter No. 43)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
43	Home confirmation sensor input polarity	HMC	–	0: Sensor not in use 1: a-contact 2: b-contact	In accordance with actuator

Sets input signal polarity of the home confirmation sensor (optional).
The home confirmation sensor is mounted on the mechanical end. If inverted before reaching the mechanical end due to interference, etc. it will be recognized as a positioning diversion and alarm code 0BA "Home Sensor Undetected" will be output.
There is normally no need to make changes.

Set value	Content
0	Home confirmation sensor not in use
1	Sensor polarity is a-contact
2	Sensor polarity is b-contact

[Velocity Override (Parameter No. 46)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
46	Velocity override	OVRD	%	1 to 100	100

When executing travel commands from the PLC side, override can be applied against the travel speed set in the "Speed" field in the position table. Minimum setting unit is 1%, and input range is 1 to 100%.
Invalid against travel commands from a teaching tool such as PC software.
Actual travel speed = [speed set in position table] x [set value of Parameter No. 46]

Example) If the value in the "Speed" column of the position table is 500 mm/s and parameter No. 46 is 20%, the actual travel speed will be 100 mm/s.

[PIO Jog Velocity 2 (Parameter No. 47)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
47	PIO Jog velocity 2	IOV2	mm/s (deg/s)	1 to 250 (actuator maximum speed for 250 or less)	In accordance with actuator

A setting for jog operation speed when jog speed/inching switch signal JVEL is ON.
Set an ideal value to suit the application.

Note that for direct numerical control mode, it operates only at this parameter value if JVEL signal is ON and speed setting value = 0.
(Operates at speed setting value if the JVEL signal is ON and speed set value ≠ 0.)

[PIO Inching Distance and PIO Inching Distance 2 (Parameter No. 48 & No. 49)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
48	PIO inching distance	IOID	mm	0.01 to 1.00	1.00
49	PIO inching distance 2	IOD2	mm	0.01 to 1.00	0.10

Sets inching distance against inching input command from PLC.
Parameter No. 49 is for inching distance when JOG speed/inching distance switch signal JVEL is ON.
Setting over 1mm is not possible.

[Load Output Judgment Time (Parameter No. 50)]

Stepper motor specification only

No.	Name	Symbol	Unit	Input range	Default initial value setting
50	Load output judgment time	LDWT	ms	0 to 9,999	255

Sets the time required to judge the load judgment output signal LOAD ON of the collision detection function.
When the present position is within the position zone range and both the time set in this parameter and the command torque value set in the position table "Threshold" are exceeded, the LOAD signal is turned ON.
For details of the collision detection function, refer to "4-8 Various Functions / Collision detection function (page 4-87)".

[Acc/Dec Mode Initial Value (Parameter No. 52)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
52	Acc/Dec mode initial value	MOD	–	0 to 2	0 (Trapezoid)

This value will be set automatically as "Acc/Dec mode" of the applicable position No. when the target position is written in an unregistered position table.
For the acceleration/deceleration mode, refer to "3.7 Address Configuration / Position table (page 3-45)".

Set value	Content
0	Trapezoid pattern
1	S-motion
2	First-order delay filter

[Stop Mode Initial Value (Parameter No. 53)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
53	Stop mode initial value	HSTP	–	0 to 3 (Except for stepper motor specification) 0 to 7 (Stepper motor specification)	0 (Not in use)

A parameter to set the power-saving function.
For details, refer to "4.8 Various Functions / Power-saving function (page 4-90)".

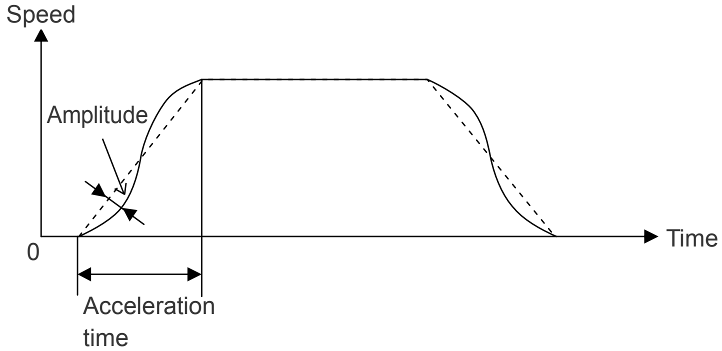
Specifications Section

Chapter 4 Driver Unit

[S-Motion Ratio Setting (Parameter No. 56)]

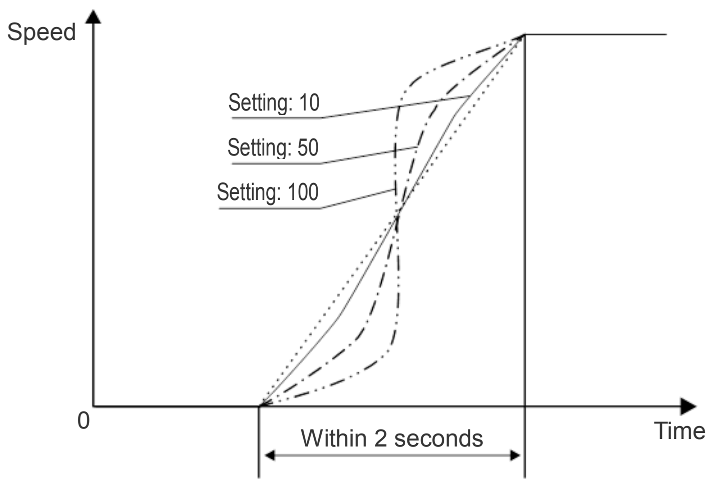
No.	Name	Symbol	Unit	Input range	Default initial value setting
56	S-motion ratio setting	SCRV	%	0 to 100	0

Used when the value of "Acc/Dec mode" field in the position table is set to 1 (S-motion ratio setting).
This softens the shocks of acceleration/deceleration without extending the cycle time.



S-motion is the sinusoidal waveform of a single cycle of acceleration time.
This parameter specifies degree of amplitude.

Setting [%]	Degree of amplitude
0	No S-motion (dotted line in the image diagram)
10	Amplitude of sinusoidal wave x 0.1 (solid line in the image diagram)
50	Amplitude of sinusoidal wave x 0.5 (single-dot chain line in the image diagram)
100	Amplitude of sinusoidal wave x 1 (double-dot chain line in the image diagram)



Caution

- Be sure to execute the command while the actuator is stopped.
- Because it changes speed, etc. during travel, even if executing position command or direct numerical value command with S-motion setting while the actuator is under operation, the control will be trapezoid instead of S-motion.
- For rotary actuator in the index mode, S-motion control is disabled. Even if S-motion control is specified, the control will be trapezoid.
- Do not use S-motion control if the setting of the acceleration time or the deceleration time exceeds 2 seconds. The control will be trapezoid.
- Avoid pauses during acceleration or deceleration operation. Speed changes (acceleration) will occur, which may be dangerous.

[Lead Size of Ball Screw (Parameter No. 77)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
77	Ball screw lead length	LEAD	mm	0.01 to 999.99	In accordance with actuator

Sets ball screw lead length.
A value suited to the actuator characteristics is set at shipment.

Caution

- Changing the setting will not only make operation at the instructed speed, acceleration/deceleration or travel distance impossible but also cause an alarm or malfunction to occur.

[Axis Motion Type (Parameter No. 78)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
78	Axis motion type	ATYP	–	0: Linear axis 1: Rotary axis	In accordance with actuator

Sets the type of actuator to use.

Connecting actuator	Set value	Remarks
Linear axis	0	Actuator other than rotary type
Rotary axis	1	Rotary type actuator

Caution

- Do not attempt to change the setting. This may lead to alarms or malfunctions.

[Rotary Axis Mode Select (Parameter No. 79)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
79	Rotary axis mode select	ATYP	–	0: Normal mode 1: Index mode	In accordance with actuator

Sets rotary axis mode.
When parameter No. 78 "Axis Motion Type" is set to "1: Rotary axis," the present value expression will be fixed to 0 ~ 359.99 by selecting index mode. Selection of the index mode will enable shortcut control.

Set value	Content
0	Normal mode
1	Index mode

Index mode cannot be specified with an absolute specification actuator.

Caution

- Push-motion operation is not available during index mode. Even if data is input for the push-motion of position data, it will become invalid and normal travel will be executed. Also, the positioning width will be the parameter positioning width initial value.
- When changing the index mode setting to normal mode, the software limit value should also be changed. If the software limit value is set to 0, a parameter data error will occur. Value extended by 0.3mm to the outside of the effective stroke should be set.

[Rotary Axis Shortcut Select (Parameter No. 80)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
80	Rotary axis shortcut select	ATYP	–	0: Disabled, 1: Enabled	In accordance with actuator

Sets whether to enable or disable shortcut when positioning other than relative position travel with multi-rotation specification rotary actuator.
Shortcut refers to performing an operation in a direction that requires less travel towards the next positioning.

Set value	Content
0	Shortcut disabled
1	Shortcut enabled

For details, refer to "3.8 I/O Signals / Shortcut control of multi-rotation specification rotary actuator (page 3-126)".

AC servo motor specification and stepper motor specification only

[Absolute Unit (Parameter No.83)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
83	Absolute Unit	ETYP	–	0: Not in use, 1: Used	0 (not in use)

For stepper motor specification

Set 1 for simple absolute specification.

For the battery-less absolute specification, the factory default value is 1. Change the setting to 0 when using in incremental specification.

For servo motor specification

Set 1 for simple absolute specification.

Battery-less absolute specification cannot be used in incremental specification.

[Current Limit Value During Contactless Push Stop (Parameter No. 91)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
91	Current limit value during contactless push stop	FSTP	–	0: Current limit value during stop 1: Current limit value during push	0

Select current limit value during stop when contactless push has occurred.
Servo will be locked by this current limit value until the next travel command.

Set value	Content
0	Uses Current Limit During Positioning Stop (Parameter No. 12).
1	Uses the current limit value during push-motion set in the position table.

[Stop Method During SrvOFF (Parameter No. 110)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
110	Stop method during SrvOFF	PSOF	–	0: Sudden stop 1: Decelerating stop	0

Selects Servo OFF command, drive source cutoff, and stop mode of actuator during alarm generation (operation cancel level).

<table>
<tr><th rowspan="3">Stop command</th><th colspan="4">Set value</th></tr>
<tr><th colspan="2">0: Sudden stop</th><th colspan="2">1: Decelerating stop</th></tr>
<tr><th>During vibration control</th><th>During normal positioning control</th><th>During vibration control</th><th>During normal positioning control</th></tr>
<tr><td>Pausing</td><td>Vibration control decelerating stop</td><td>Normal decelerating stop</td><td rowspan="4">Vibration control decelerating Stop</td><td rowspan="4">Normal decelerating Stop</td></tr>
<tr><td>Servo OFF</td><td colspan="2" rowspan="3">Sudden stop with emergency stop torque</td></tr>
<tr><td>Drive-source cutoff</td></tr>
<tr><td>Alarm
(Operation cancel level)</td></tr>
<tr><td>Alarm
(Cold start)</td><td colspan="4">Sudden stop with emergency stop torque</td></tr>
</table>

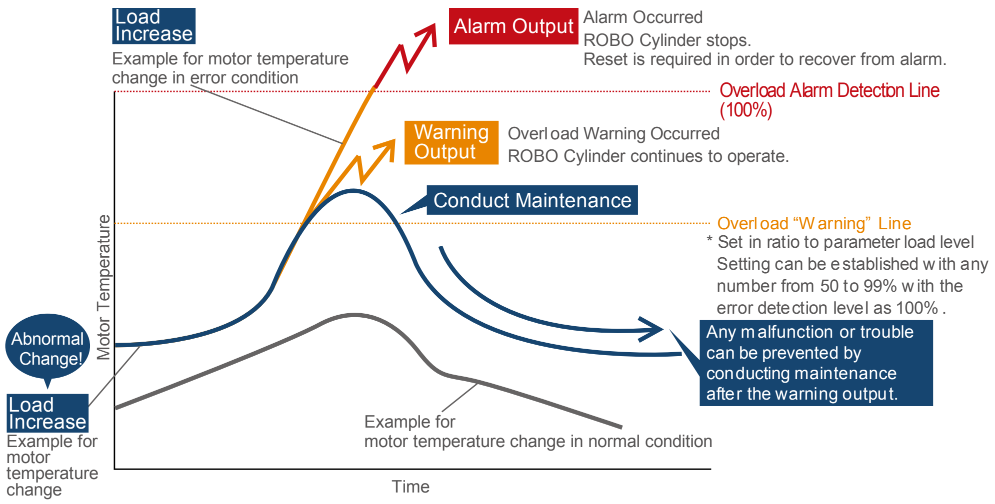
[Overload Load Level Ratio (Parameter No.143)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
143	Overload load level ratio	OLWL	%	50 to 100	100

Outputs alarm code 048 overload warning (message level) when motor temperature exceeds the ratio set in this parameter if motor temperature under rated operation is set as 100%.
For details, refer to "Chapter 7 7.2 Predictive Maintenance Function / Overload Warning (page 7-2)".

No judgment will be made when set as 100%.

Using this function enables monitoring of motor temperature changes caused by dried-up grease or wear and tear on parts.
A warning is output when the preset value is exceeded.
This enables detection of abnormalities before a breakdown or a malfunction occurs.



Warning output enables detection of items such as those below.
- Time to supply grease
- Time to replace components
- Time to implement mechanical tuning

[High Output Setting (Parameter No.152)]

Stepper motor specification only

No.	Name	Symbol	Unit	Input range	Default initial value setting
152	High output setting	BUEN	–	0: Disabled 1: Enabled	In accordance with actuator

Set if high output function is to be used. However, it is necessary to connect an actuator that supports high output.
(Actuators that support high output: RCP4, RCP5 and RCP6 Series)

AC servo motor specification and stepper motor specification only

[ABS Battery Retaining Time (Parameter No. 155)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
155	ABS battery retaining time	AIP	–	0: 20 days 1: 15 days 2: 10 days 3: 5 days	0

This function is limited to the simple absolute specification. Set encoder positional data retention time after turning the power supply to the actuator OFF. The setting is available in 4 levels. The lower the motor rotation speed setting is, the longer the retention time of the positional data can be. If there is a possibility of external force moving the workpiece conveying components of the actuator such as the slider or rod while power is OFF, refer to the following table and calculate motor revolution based on movement speed and set the value of this parameter faster. If the motor revolution exceeds the set value, positional data will be lost.

The motor rotation speed can be calculated with the equation below.
Motor revolution [r/min] = Movement speed [mm/s] / Actuator lead [mm] x 60 [s/min]

For details, refer to "Startup Section Chapter 3 3.5 Absolute Battery (page 3-11)".

Parameter No.155 settings	Upper limit of encoder rotation speed when power is OFF [r/min]		Battery retaining time guideline [days]	Retaining time per 1 hour of charge time (guideline) [h]
	If connected actuator is not RCA2-***NA	If connected actuator is RCA2-***NA		
0	100	75	20	6.6
1	200	150	15	5.0
2	400	300	10	3.3
3	800	600	5	1.6

[Startup Current Limit Expansion Function (Parameter No. 166)]

Stepper motor specification only

No.	Name	Symbol	Unit	Input range	Default initial value setting
166	Startup current limit expansion function	DCET	–	0: Disabled 1: Enabled	0 (Disabled)

This function is limited to certain models such as grippers.
When moving from stop status to target position, the drive control involves an impact at the instant when travel starts.
Effective for applications with significant load friction.
In the following cases, this function will not work even if this parameter is enabled.
(1) Home return motion
(2) During the first evacuation operation after push completion
(3) During the first travel after pause release
(4) When a travel command is executed during travel

[Collision Detection Function (Parameter No. 168)]

Stepper motor specification only

No.	Name	Symbol	Unit	Input range	Default initial value setting
168	Collision detection function	CODT	–	0 to 7	0

A function to generate a collision detection alarm and stop traveling (servo OFF) when the actuator collides. Detects within the set range of the position zone.
For details, refer to "4.8 Various Functions / Collision detection function (page 4-87)".

Set value	Content	Alarm level
0	No detection will be made (same even if 2, 4, 6 are set)	–
1	Detects within the set range of the position zone.	Operation cancel level
3 (Note 1)	Detects within the set range of the position zone; however, no detection will be made in the following cases. ·First travel after pause release ·Travel from stop status within position zone range	
5	Detects within the set range of the position zone.	Message level
7 (Note 1)	Detects within the set range of the position zone; however, no detection will be made in the following cases. ·First travel after pause release ·Travel from stop status within position zone range	

Note 1: This setting can avoid occurrence of false detection due to current value during acceleration.

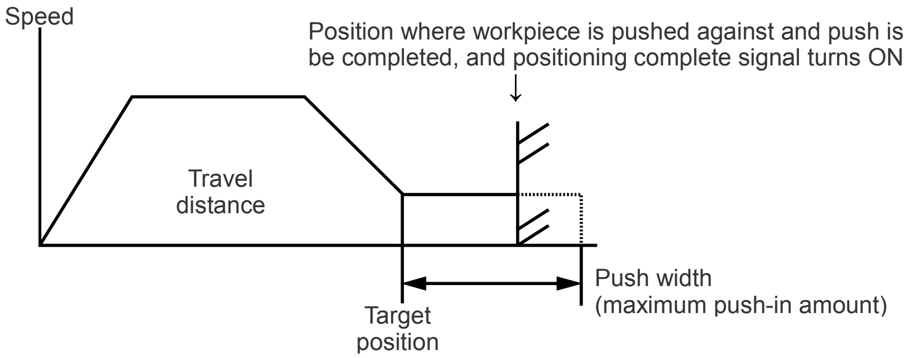
[Push Mode (Parameter No. 181)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
181	Push mode	SPOS	–	0: CON mode 1: SEP mode	0

Selects CON mode or SEP mode for the push mode.
The SEP method can be used only in direct numerical control mode.

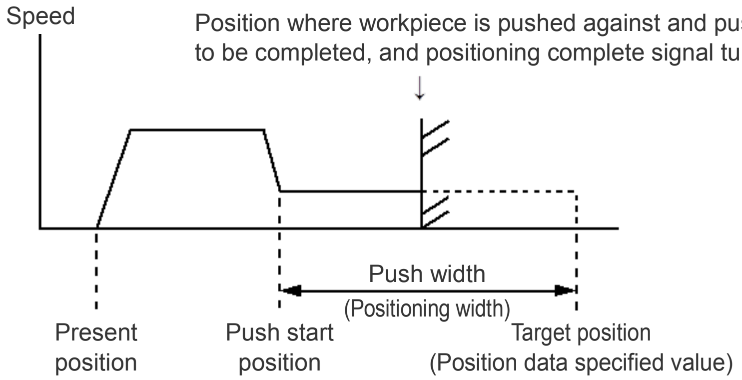
(1) CON mode push

After reaching the target position from the present position, (Note 1), it travels only the distance set for push width at push speed.
During push motion, once the workpiece is pushed against and the push is judged to be completed, positioning complete signal PEND will turn ON.
Note 1: In direct numerical control mode, it is the value input in the target position register.



(2) SEP mode push

Push-motion operation is performed with the position obtained by subtracting the distance set for the positioning width from the target position (position data specified value) as the start position.
Pull-motion operation is not available.
During push motion, once the workpiece is pushed against and the push is judged to be completed, PEND will turn ON.



Specifications Section
Chapter 4 Driver Unit

Stepper motor specification only

[Auto Current Adj. Select (Parameter No. 182)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
182	Auto current adj. select	ACDS	–	0: Disabled 1: Enabled	0

When automatic current down function is not used, regardless of the size of the external force, the current set in parameter No. 12 "Current Limit During Positioning Stop" applies after positioning stop.
When automatic current down function is enabled, it maintains the present position at the current in accordance with the size of the external force. Effective for reduction of power consumption when transported load is small.
For details, refer to "4.8 Various Functions / Power-saving function (page 4-90)".

Stepper motor specification only

[Servo ON Delay Time Adjustment (Parameter No. 190)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
190	Servo ON delay time adjustment	SONA	ms	0 to 9,999	0

This parameter adjusts the time from when servo ON command signal SON is input until servo ON.
By shifting the timing of each actuator, instantaneous power can be suppressed when the servo ON command is applied at the same time.

Stepper motor specification only

[Position Data Expansion Function Setting (Parameter No. 191)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
191	Position data expansion function setting	EXT	–	0: No function 1: Drive torque limit 2: Push speed	0 (No function)

The "parameter selection area" function in the position data table can be selected.

Set value	Display item
0	Not displayed
1	Drive torque limit
2	Push speed

Drive torque limit : Sets the travel current limit value during position travel. [%]
Push speed : Sets the push speed limit value during position travel. [mm/s]

External interface

[Monitoring Mode Select (Parameter No. 112)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
112	Monitoring mode select	FMNT	–	0: Not in use 1: Monitor function 1 2: Monitor function 2 3: Monitor function 3	1

Servo monitoring can be performed by connecting PC software.
Select monitoring mode function (number of channels for servo monitor) with this parameter.
Refer to the manual for PC software for RC/EC (ME0155).

Set value	Content
0	Not in use
1	Set in 4CH record mode
2	Set in 8CH record mode
3	Set in 2CH record mode

[Monitoring Cycle (Parameter No. 113)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
113	Monitoring cycle	FMNT	ms	1 to 60,000	1

Sets initial value (Note 1) of time cycle (sampling cycle) to obtain data when monitoring mode is selected.
Data obtaining interval can be extended by increasing the value of this parameter.
The initial value is set at 1ms. Up to 60,000 ms can be set in 1ms increments.

For RCON-PC/PCF/AC		For RCON-DC	
1ms cycle setting	60,000ms cycle setting	1ms cycle setting	60,000ms cycle setting
During 4CH record mode: Maximum 3,584 seconds	During 4CH record mode: Maximum 59 hours and 44 minutes	During 4CH record mode: Maximum 4,096 seconds	During 4CH record mode: Maximum 68 hours and 16 minutes
During 8CH record mode: Maximum 1,792 seconds	During 8CH record mode: Maximum 29 hours and 52 minutes	During 8CH record mode: Maximum 2,048 seconds	During 8CH record mode: Maximum 34 hours and 8 minutes
During 2CH record mode: Maximum 7,168 seconds	During 2CH record mode: Maximum 119 hours and 28 minutes	During 2CH record mode: Maximum 8,192 seconds	During 2CH record mode: Maximum 136 hours and 32 minutes

Note 1: Sampling cycle can be changed by using PC software for RC/EC.

[Total Travel Count Threshold (Parameter No.147)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
147	Total travel count threshold	TMCT	times	0 to 999,999,999	0 (Disabled)

When total travel count exceeds the set value of this parameter, alarm code 04E "Travel Count Threshold Over" will send a notification.
No judgment will be made when set as 0.

[Total Travel Distance Threshold (Parameter No. 148)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
148	Total travel distance threshold	ODOT	m	0 to 999,999,999	0 (Disabled)

When total travel distance exceeds the set value of this parameter, alarm code 04F "Travel Distance Threshold Over" will send a notification.
No judgment will be made when set as 0.

[Minor Trouble Alarm Output Select (Parameter No. 151)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
151	Minor trouble alarm output select	FSTP	–	0: Overload warning output 1: Message level alarm output	1

If 0 is set, when parameter No. 143 "Overload Load Level Ratio" is exceeded, the minor malfunction alarm signal *ALML will be output.
If 1 is set, when a message level alarm is generated, *ALML signal will be output.

[Enabled/Disabled Axis Select (Parameter No. 158)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
158	Enabled/disabled axis select	EFCT	–	0: Enabled 1: Disabled	0

If operation is required with fewer axes than the purchased number of axes, alarms can be avoided by disabling this parameter.
During startup, etc., operation can be performed by connecting specific axes only, or to use for future expansion.

AC servo motor specification and stepper motor specification only

[Actuator Recognition Function (parameter No. 192)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
192	Actuator recognition function	FEAR	–	0: Disabled 1: Enabled	In accordance with actuator

Selects whether to use the actuator information management function or not.
Select "0" when connecting an actuator not compatible with the actuator information management function or when not using this function.

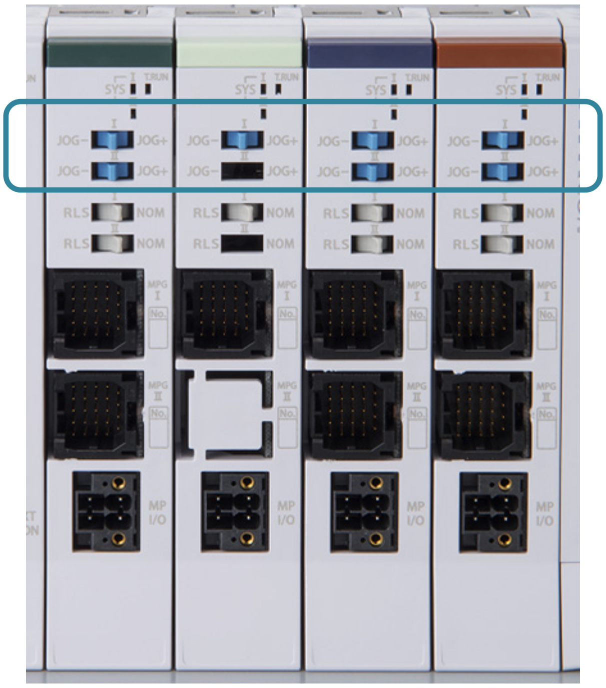
When an actuator not compatible with the actuator information management function is connected, the alarm code 0A1 "Parameter data error" occurs when this parameter is "1".

For details, refer to "3.10 Actuator Information Management Function (page 3-151)".

[JOG Switch (Parameter No. 194)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
194	JOG switch	JGSW	–	0: Disabled 1: Enabled	0 (Disabled)

Either Enabled or Disabled can be selected for the JOG switch on the front of the driver unit. When Disabled is selected with this parameter, the actuator does not operate even if the JOG switch is operated.



Servo gain adjustment

At shipment from factory, parameters are set so that operation at rated load (maximum) is within the payload capacity of the actuator and with stable operating characteristics.
However, at the actual usage sites, it may be necessary to perform servo adjustment.
This section explains the basic servo adjustment method.

Caution

- It is dangerous to make excessive settings suddenly. Damage to the equipment or the actuator or injury may occur, so proceed with caution.
- Also, make sure to keep a record as you work so that it can be restored at any time.
- If you face problems which cannot be resolved, contact IAI.

Adjustment of stepper motor and AC servo motor

No.	Problems	Adjustment method
1	• Positioning takes time • Positioning accuracy is insufficient • Tact time needs to be shorter	• Set Parameter No. 55 "Position Command Primary Filter Time Constant" to "0" if it is set. • Increase Parameter No. 7 "Servo Gain Number". The increased set value improves tracking of position command. As a guideline for setting, set 3 to 10, at most 15 or less. If it is too high, overshoot may occur, which will cause sound and vibration. • When increasing Parameter No. 7 "Servo Gain Number", Parameter No. 31 "Velocity Loop Proportional Gain" should also be increased accordingly in order to ensure stability of the control system. • When increasing Parameter No. 31 "Velocity Loop Proportional Gain", make sure to set it to about 20% of the initial value. Adjust Parameter No. 7 "Servo Gain Number" as a priority.
2	Vibration occurs during acceleration/deceleration	• This may be caused by excessive "Acceleration/Deceleration Setting," or inadequate rigidity of the device on which the actuator is mounted. • Lower "Acceleration/Deceleration Setting". • Lower Parameter No. 7 "Servo Gain Number". If Parameter No. 7 "Servo Gain Number" is too low, convergence will take longer. • Or consider reinforcing the device.

No.	Problems	Adjustment method
3	• Speed irregularity occurs during travel • Speed accuracy is insufficient	• Increase Parameter No. 31 "Velocity Loop Proportional Gain". The increased set value improves tracking of speed command. If it is too large, mechanical system vibration may occur. As a setting guideline, try to increase <u>the initial values by about 20%</u> respectively.
4	Abnormal noise In particular, high-pitched noise occurs when stopping or at low speed (50 mm/s or less).	• Enter Parameter No. 33 "Torque Filter Constant". As a setting guideline, try to increase by 50 respectively. If it is too large, stability of the control system may be impaired and vibration may occur. [Important] Before adjustment This phenomenon is likely to occur when the rigidity of the mechanical system is not maintained. Even with the actuator alone, resonance may occur in the belt drive or if the stroke exceeds 600 mm. Before adjustment, make sure that: (1) Parameter No. 7 "Servo Gain Number", Parameter No. 31 "Velocity Loop Proportional Gain" and Parameter No. 32 "Velocity Loop Integral Gain" are not set too high. (2) Rigidity of the load is maintained as much as possible. Mounting is not loose and there is no play, etc. (3) The actuator body has been installed firmly with the prescribed torque. (4) There is no distortion on the mounting surface of the actuator.
5	• Trajectory accuracy needs to be higher • Constant speed needs to be higher • Response needs to be better	• Refer to adjustment methods No. 1 to 3 described above and adjust Parameter No. 7 "Servo Gain Number" and Parameter No. 31 "Velocity Loop Proportional Gain" to optimize the conditions. [Reference] Selection of the actuator (motor) is the most important factor. The servo motor is very sensitive to the magnitude of load inertia. If the moment of inertia on the load side (load inertia) is too large with respect to the moment of inertia of the motor itself (motor inertia), the servo motor will cause the motor to be wagged by the load, as it were, resulting in unstable control. Therefore, in order to improve trajectory, position, speed, response, etc., it is necessary to reduce the load inertia ratio. For applications such as coating, if trajectory accuracy, constant velocity, response, etc. are called for, it is recommended to make the actuator ball screw lead as small as possible and to select an actuator with a higher motor capacity.

No.	Problems	Adjustment method
6	• The static friction of the load is large and travel start is slow • The load inertia is large and response is poor when stopping • Tact time needs to be shorter	• Set Parameter No. 71 "Positional Feedforward Gain". Estimated setting is from 10 to 50. As the set value increases, the deviation amount is reduced and responsiveness improves. Setting a high value may cause vibration or noise. • Adjust Parameter No. 7 "Servo Gain Number" and Parameter No. 31 "Velocity Loop Proportional Gain" to further improve responsiveness.
7	There is a shock when starting or stopping	• Set Parameter No. 55 "Position Command Primary Filter Time Constant" to about 50 ms. If no improvement is observed, increase gradually. If improvement is observed, gradually lower the set value to the limit. If this setting is made, the settling time will be extended and the tact time will increase. Positioning accuracy also deteriorates. Also, in order to solve the fundamental problem, we recommend replacing the host positioning unit with one with acceleration/deceleration function.

Adjustment of DC brush-less motor

<table>
<tr><th>No.</th><th>Problems</th><th>Adjustment method</th></tr>
<tr><td>1</td><td>• Hunting occurs when positioning stops
• Speed irregularity occurs during travel
• Speed accuracy is insufficient</td><td>Set the parameters following the procedure below and check the operation. When the motion improves, end the adjustment. There is no need to proceed to the next step.
Step 1: Change Parameter No. 32 "Velocity Loop Integral Gain", set the following 5 values in order and check the operation.
<table>
<tr><th>Setting order</th><th>Velocity loop integral gain setting value</th></tr>
<tr><td>1</td><td>411</td></tr>
<tr><td>2</td><td>592</td></tr>
<tr><td>3</td><td>925</td></tr>
<tr><td>4</td><td>1,645</td></tr>
<tr><td>5</td><td>3,700</td></tr>
</table>
If the operation does not improve, perform step 2.
Step 2: Change Parameter No. 31 "Velocity Loop Proportional Gain" and Parameter No. 32 "Velocity Loop Integral Gain"
Set the following 6 values in order and check the operation.
<table>
<tr><th colspan="3">● Load is 0.2 kg or less</th></tr>
<tr><th>Setting order</th><th>Velocity loop proportional gain setting value</th><th>Velocity loop integral gain setting value</th></tr>
<tr><td>1</td><td>42</td><td>382</td></tr>
<tr><td>2</td><td>42</td><td>520</td></tr>
<tr><td>3</td><td>42</td><td>749</td></tr>
<tr><td>4</td><td>42</td><td>1,171</td></tr>
<tr><td>5</td><td>42</td><td>2,081</td></tr>
<tr><td>6</td><td>42</td><td>4,683</td></tr>
</table>
<table>
<tr><th colspan="3">● Load is heavier than 0.2 kg</th></tr>
<tr><th>Setting order</th><th>Velocity loop proportional gain setting value</th><th>Velocity loop integral gain setting value</th></tr>
<tr><td>1</td><td>32</td><td>231</td></tr>
<tr><td>2</td><td>32</td><td>315</td></tr>
<tr><td>3</td><td>32</td><td>453</td></tr>
<tr><td>4</td><td>32</td><td>708</td></tr>
<tr><td>5</td><td>32</td><td>1,259</td></tr>
<tr><td>6</td><td>32</td><td>2,833</td></tr>
</table>
If the operation does not improve, contact IAI.</td></tr>
<tr><td>2</td><td>Abnormal noise
In particular, high-pitched noise occurs when stopping or at low speed（20 mm/s or less）</td><td>Change Parameter No. 31 "Velocity Loop Proportional Gain" and Parameter No. 32 "Velocity Loop Integral Gain" to the following values and confirm.
Velocity Loop Proportional Gain: 32
Velocity Loop Integral Gain: 231</td></tr>
</table>

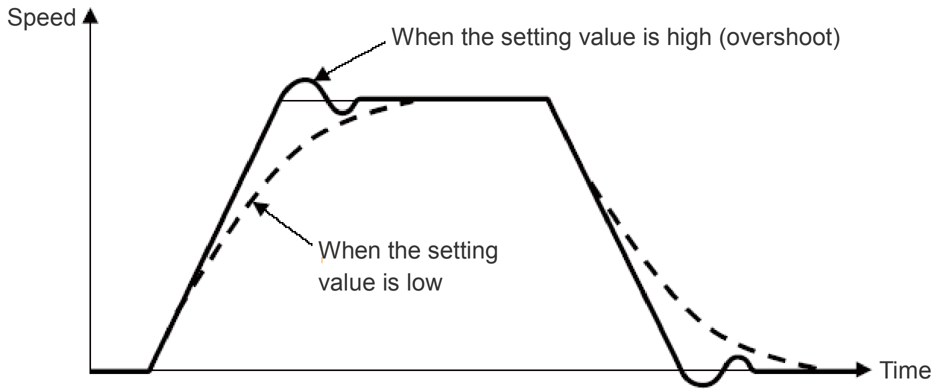
[Servo Gain Number (Parameter No. 7)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
7	Servo gain number	PLGO	–	0 to 31	In accordance with actuator

Called position loop gain, position control system proportional gain, etc., this is the parameter that sets the response of the position control loop. The increased set value improves tracking of position command. If it is too high, overshoot may occur.

If the setting value is low, tracking performance with respect to the position command becomes worse, and positioning takes time.

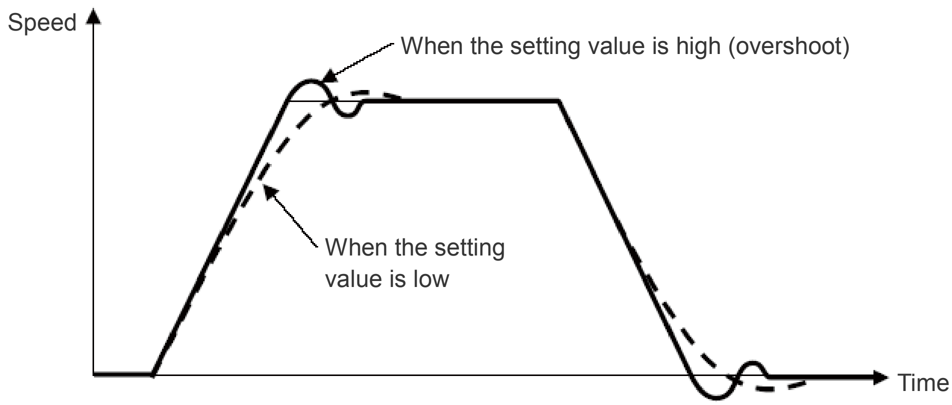
In systems with low mechanical rigidity and systems with low natural frequency, mechanical resonance occurs when the setting value is increased, and this may cause not only vibration and noise, but also overload malfunctions.



[Velocity Loop Proportional Gain (Parameter No. 31)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
31	Velocity loop proportional gain	VLPG	–	1 to 27,661	In accordance with actuator

This parameter determines the response of the velocity loop. The increased set value improves tracking of speed command. The higher the setting value, the greater the load inertia becomes. If it is too high, overshoot and oscillation, as well as vibration in the mechanical system may occur.

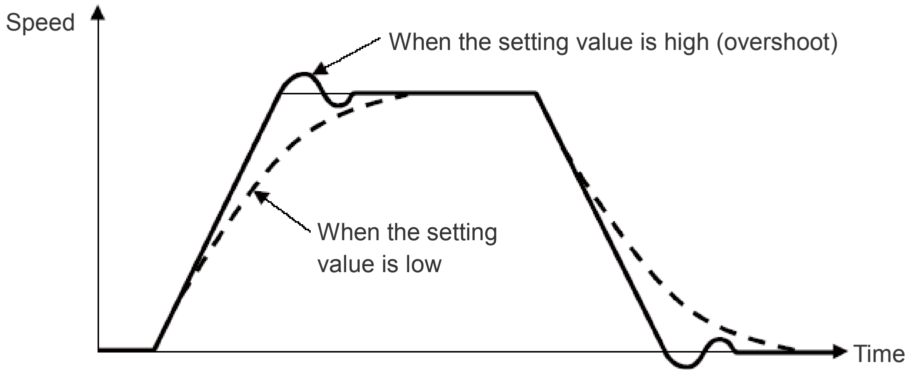


For the conditions for using this item in the stepper motor specification, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] at the bottom of the following page.

[Velocity Loop Integral Gain (Parameter No. 32)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
32	Velocity loop integral gain	VLPT	–	1 to 217,270	In accordance with actuator

Machines have friction. "Velocity Loop Integral Gain" is the parameter which corresponds to deviation caused by external factors, such as friction. The increased set value improves the repulsive force against load fluctuation.
If it is too high, overshoot and oscillation, as well as vibration in the mechanical system may occur.
Adjust appropriately while observing the response.



For the conditions for using this item in the stepper motor specification, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] below.

[Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain]
Each of the 3 parameters - No. 31, 145, and 153 for Velocity Loop Proportional Gain and Parameters No. 32, 146, and 154 for Velocity Loop Integral Gain - of the stepper motor specification can be set, but only 1 of them will be enabled at the time of operation.
The conditions for selecting which parameter No. setting value is enabled are shown below.

Enabled Parameter No.

		High Output Setting (Parameter No.152)	
		0 (Disabled)	**1 (Enabled)**
Gain scheduling (Parameter No.144)	~ 100 (Disabled)	Parameters No.31, 32	Parameters No.153, 154
	101 ~ (Enabled)	Parameters No.145, 146	Parameters No.145, 146

[Torque Filter Constant (Parameter No. 33)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
33	Torque filter constant	TRQF	–	0 to 2,500	In accordance with actuator

This parameter sets the filter time constant for the torque command. This parameter may prevent resonance if vibration or noise is generated during operation due to mechanical resonance. It is effective for torsional resonance of the ball screw (several hundred Hz).

AC Servo Motor Specification and DC brush-less motor specification only

[Current Control Width Number (Parameter No. 54)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
54	Current control width number	CLPF	–	0 to 15	In accordance with actuator

This parameter is a manufacturer adjustment parameter that determines the responsiveness of the current loop control. Therefore, it must not be changed. The stability of the control system may be impaired, which is extremely dangerous.

[Position Command Primary Filter Time Constant (Parameter No. 55)]

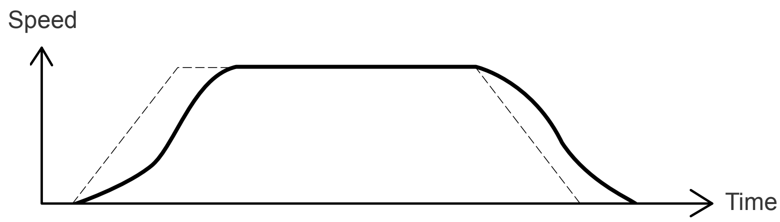
No.	Name	Symbol	Unit	Input range	Default initial value setting
55	Position command primary filter time constant	PLPF	ms	0.0 to 100.0	0.0

Used when the value of "Acc/Dec mode" field in the position table is set to 2(First-order delay filter).

This draws a more gentle acceleration/deceleration curve compared to trapezoidal patterns.

The shock at acceleration/deceleration is relieved, but the cycle time becomes longer.

Use for applications where minor vibrations to the workpiece during acceleration/deceleration are to be avoided.



The amount of first-order delay is set by parameter No. 55 "Position command primary filter time constant". The setting unit is ms and can be set from 0.0 to 100.0 in 0.1ms increments.

However, this is not reflected for jogging/inching operations via a PC or teaching pendant.

Caution

- In the following cases the first-order delay filter becomes disabled.
  (1) When a position command or direct numerical value command with the first-order delay filter is set during actuator operation.
  (2) When using a rotary actuator in index mode.
  (3) When parameter No. 55 is set to 0.

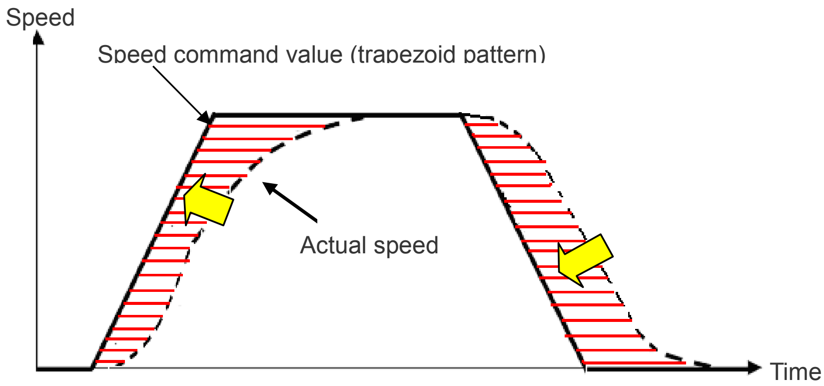
[Positional Feedforward Gain (Parameter No. 71)]

No.	Name	Symbol	Unit	Input range	Default initial value setting	Specifications
71	Positional feed forward gain	PLFG	–	0 to 100	0	AC servo motor specification Stepper motor specification
					50	DC brush-less motor specification

Sets the feed forward gain amount of the position control system.
Performing this setting increases the servo gain and improves responsiveness of the position control loop. Properly adjust Parameter No. 7 "Servo Gain Number" and Parameter No. 31 "Velocity Loop Proportional Gain", etc., to further improve the tact time and following performance. As a result, positioning time can be shortened.
Gain adjustment of position, speed, and current loop in the feedback control directly changes the response of the servo control system, so affecting the stability of the control system due to inappropriate setting may cause vibration and abnormal noise. However, this parameter only changes the speed command value, so it is irrelevant to the servo loop, and it does not make the control system unstable or generate persistent vibration and noise. However, if the setting is excessive, every time it operates, vibration and noise may be generated until the machine follows the command value.

For the trapezoidal operation pattern, the value obtained by multiplying speed command by "feed forward gain" is added to the speed command so as to reduce the following delay of the speed and the position deviation.

Control delay occurs in feedback control that performs control according to the results. In contrast, compensation control independent of control delay is performed.



Caution

- Vibration damping control function cannot be used when using feed forward gain (setting other than 0).

AC servo motor specification only

[Damping Characteristics Coefficient 1, 2 / Natural Frequency / Notch Filter Gain (Parameters No. 97 to 108)]

	No.	Name	Symbol	Unit	Input range	Default initial value setting
Parameters Set 1	97	Damping characteristics coefficient 1	DC11	–	0 to 1,000	10
	98	Damping characteristics coefficient 2	DC21	–	0 to 1,000	1,000
	99	Natural frequency	NP01	1/1,000Hz	500 to 30,000	10,000
	100	Notch filter gain	NFG1	–	1 to 20,000	9,990
Parameters Set 2	101	Damping characteristics coefficient 1	DC12	–	0 to 1,000	10
	102	Damping characteristics coefficient 2	DC22	–	0 to 1,000	1,000
	103	Natural frequency	NP02	1/1,000Hz	500 to 30,000	10,000
	104	Notch filter gain	NFG2	–	1 to 20,000	9,990
Parameters Set 3	105	Damping characteristics coefficient 1	DC13	–	0 to 1,000	10
	106	Damping characteristics coefficient 2	DC23	–	0 to 1,000	1,000
	107	Natural frequency	NP03	1/1,000Hz	500 to 30,000	10,000
	108	Notch filter gain	NFG3	–	1 to 20,000	9,990

A parameter dedicated to vibration damping control.
For details, refer to "4.8 Various Functions/Vibration damping control function (page 4-80)".

AC servo motor specification only

[Vibration Suppression No. Initial Value (Parameter No. 109)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
109	Vibration suppression No. initial value	CTLF	–	0 to 3	0

A parameter dedicated to vibration damping control.
For details, refer to "4.8 Various Functions/Vibration damping control function (page 4-80)".

AC servo motor specification only

[Servo Gain Number / Positional Feedforward Gain / Velocity Loop Proportional Gain / Velocity Loop Integral Gain / Torque Filter Constant / Current Control Width Number (Parameters No. 120 to 137)]

	No.	Name	Symbol	Unit	Input range	Default initial value setting
Gain set 1	120	Servo gain number 1	PLG1	–	0 to 31	In accordance with actuator
	121	Positional feedforward gain 1	PLF1	–	0 to 100	
	122	Velocity loop proportional gain 1	VLG1	–	1 to 27,661	
	123	Velocity loop integral gain 1	VLT1	–	1 to 217,270	
	124	Torque filter constant 1	TRF1	–	0 to 2,500	
	125	Current control width number 1	CLP1	–	0 to 15	
Gain set 2	126	Servo gain number 2	PLG2	–	0 to 31	In accordance with actuator
	127	Positional feedforward gain 2	PLF2	–	0 to 100	
	128	Velocity loop proportional gain 2	VLG2	–	1 to 27,661	
	129	Velocity loop integral gain 2	VLT2	–	1 to 217,270	
	130	Torque filter constant 2	TRF2	–	0 to 2,500	
	131	Current control width number 2	CLP2	–	0 to 15	
Gain set 3	132	Servo gain number 3	PLG3	–	0 to 31	In accordance with actuator
	133	Positional feedforward gain 3	PLF3	–	0 to 100	
	134	Velocity loop proportional gain 3	VLG3	–	1 to 27,661	
	135	Velocity loop integral gain 3	VLT3	–	1 to 217,270	
	136	Torque filter constant 3	TRF3	–	0 to 2,500	
	137	Current control width number 3	CLP3	–	0 to 15	

● Servo Gain Number 1/2/3 (Parameters No. 120, 126, 132)

These parameters determine the response of the position control loop.
For details, refer to Parameter No. 7 "Servo Gain Number (page 4-62)".

● Positional Feedforward Gain 1/2/3 (Parameters No. 121, 127, 133)

Sets the feed forward gain amount of the position control system.
For details, refer to Parameter No. 71 "Positional Feedforward Gain (page 4-67)".

● Velocity Loop Proportional Gain 1/2/3 (Parameters No. 122, 128, 134)
This parameter determines the response of the speed control loop.
For details, refer to Parameter No. 31 "Velocity Loop Proportional Gain (page 4-63)".

● Velocity Loop Integral Gain 1/2/3 (Parameters No. 123, 129, 135)
This parameter determines the response of the speed control loop.
For details, refer to Parameter No. 32 "Velocity Loop Integral Gain (page 4-64)".

● Torque Filter Constant 1/2/3 (Parameters No. 124, 130, 136)
This parameter determines the filter time constant for the torque command.
For details, refer to Parameter No. 33 "Torque Filter Constant (page 4-65)".

● Current Control Width Number 1/2/3 (Parameters No. 125, 131, 137)
Set the control band of the current control system.
For details, refer to Parameter No. 54 "Current Control Width Number (page 4-65)".

[Reference] Refer to "3.7 Address Configuration / Position Table (page 3-45)".

AC servo motor specification only

[Servo Gain Switch Time Constant (Parameter No.138)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
138	Servo gain switch time constant	GCFT	ms	10 to 2,000	10

If the position table is instructed to switch the servo gain set, switching will be completed after a period that exceeds 3 times the setting time of this parameter after the operation of the specified position No. starts.

Caution

● If the setting is shortened, operation of the actuator may become unstable due to sudden gain change.

Stepper motor specification only

[GS Magnification Upper Limit (Parameter No.144)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
144	GS magnification upper limit	GSUL	%	0 to 1,023	0 (Disabled)

Gain scheduling is a function that changes the gain according to the operation speed.
For this parameter, set the high magnification to change the gain.
The set value of GS Velocity Loop Proportional Gain (Parameter No. 145) and GS Velocity Loop Integral Gain (Parameter No. 146) changes at the set magnification.

Set value	Content
100 or less	Gain scheduling disabled
101 to 1,023	Gain scheduling enabled (Recommended value 300)

[GS Velocity Loop Proportional Gain (Parameter No. 145)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
145	GS velocity loop proportional gain	GSPC	–	1 to 30,000	In accordance with actuator

When Parameter No. 144 "GS Magnification Upper Limit" is set to 101 or higher, the setting of this parameter becomes valid for the Velocity Loop Proportional Gain.
For details, refer to Parameter No. 31 "Velocity Loop Proportional Gain (page 4-63)".

For the conditions for using this item, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] on the bottom of page 4-64.

Stepper motor specification only

[GS Velocity Loop Integral Gain (Parameter No. 146)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
146	GS velocity loop integral gain	GSIC	–	1 to 500,000	In accordance with actuator

When Parameter No. 144 "GS Magnification Upper Limit" is set to 101 or higher, the setting of this parameter becomes valid for the Velocity Loop Integral Gain.
For details, refer to Parameter No. 32 "Velocity Loop Integral Gain (page 4-64)".

For the conditions for using this item, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] on the bottom of page 4-64.

Stepper motor specification only

[BU Velocity Loop Proportional Gain (Parameter No. 153)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
153	BU velocity loop proportional gain	BUPC	–	1 to 10,000	In accordance with actuator

When Parameter No. 152 "High Output Setting" is enabled and Parameter No. 144 "GS Magnification Upper Limit" is set to 100 or less, the setting of this parameter is enabled for Velocity Loop Proportional Gain.
For details, refer to Parameter No. 31 "Velocity Loop Proportional Gain (page 4-63)".

For the conditions for using this item, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] on the bottom of page 4-64.

Stepper motor specification only

[BU Velocity Loop Integral Gain (Parameter No. 154)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
154	BU velocity loop integral gain	BUIC	–	1 to 100,000	In accordance with actuator

When Parameter No. 152 "High Output Setting" is enabled and Parameter No. 144 "GS Magnification Upper Limit" is set to 100 or less, the setting of this parameter is enabled for Velocity Loop Proportional Gain.
For details, refer to Parameter No. 32 "Velocity Loop Integral Gain (page 4-64)".

For the conditions for using this item, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] on the bottom of page 4-64.

4.6 Precautions for Rotary Type

(1) Homing direction

Home position is the counter-clockwise moving end of the output shaft.

The multi-rotation specification includes a reverse-rotation specification. For reverse-rotation specification, the homing direction is clockwise.

Caution

- If the homing direction is changed by changing the parameter after delivery, the homing direction will be reversed. However, do not change the parameter of homing direction, as the home position will deviate due to structural reasons.

(2) Operation (position setting) range

Position value is the travel angle from home position.

[330-degree Rotation Specification]

Position specification range 0~330 degrees

[Multi-rotation Specification]

The multi-rotation specification actuator has two operation modes: normal mode with finite rotation and index mode (Note 1) capable of multiple rotation. The operation mode can be selected in parameter No. 79 "Rotary axis mode select". In addition, shortcut selection can be set to enabled/disabled in parameter No. 80 "Rotary axis shortcut select".

The table below shows the parameter settings and operation specifications in the respective modes.

Rotary axis mode select Parameter No.79	Rotary axis shortcut select Parameter No.80	Present position display (Note 3)	Absolute position command range (Note 3)	Relative position command range (Note 3)	Software limit Enabled/disabled
0 (Normal mode)	0 (Disabled)	-9,999.99 to 9,999.99 (Note 2)	-0.15 to 9,999.15 (Note 2)	-9,999.30 to 9,999.30 (Note 2)	Enabled
1 (Index mode)	0 ~ 359.99	0 ~ 359.99	0 ~ 359.99	-360.00 ~ 360.00	Disabled

Note 1: Index mode cannot be used for actuators with absolute specification that do not use DD motors.

Note 2: Restricted to the range of the software limit.

Note 3: The minimum resolution of the DD motor is 0.001°.

(3) Angular velocity and acceleration/deceleration command

Angular velocity (deg/s) is the command value for rotation angle.

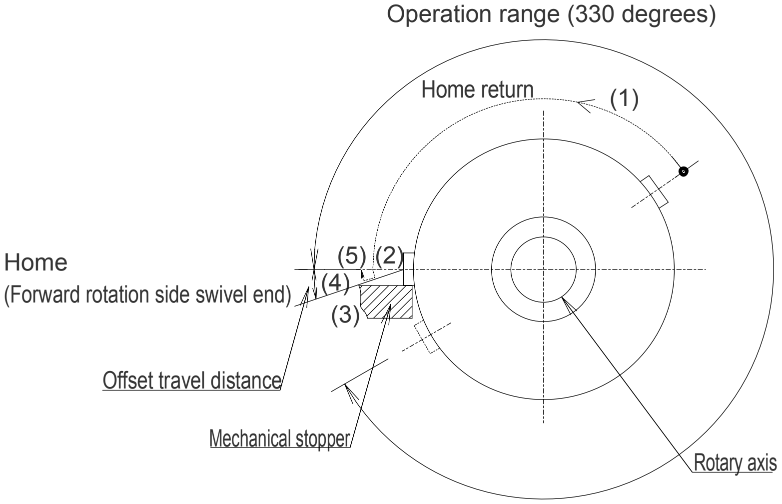
Acceleration/deceleration is specified as "G" in the program.

Rated angular acceleration/deceleration: 0.3G = 2,940 deg/s

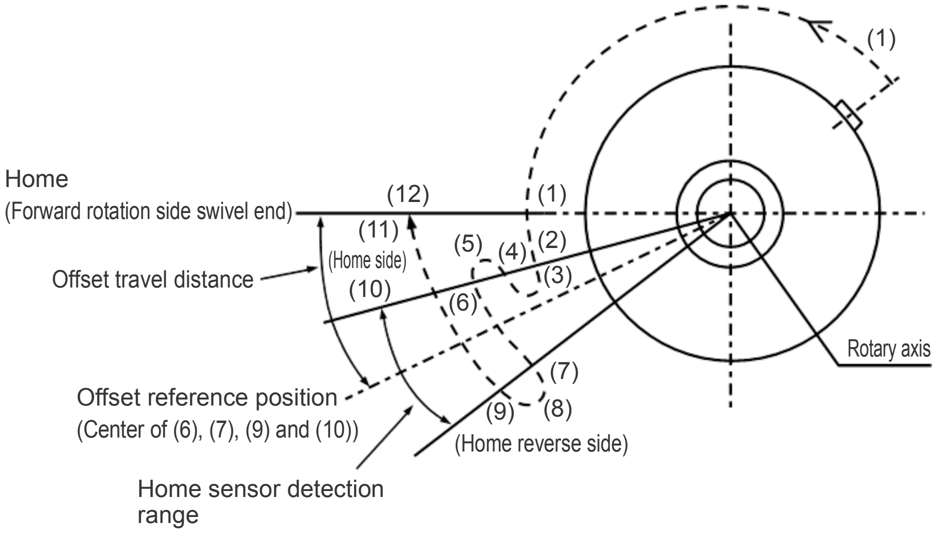
(4) Home return motion

[330-degree Rotation Specification]

(1) Start home return → (2) Mechanical stopper detection → (3) Inversion → (4) Travel by offset amount → (5) Home position



[Multi-rotation Specification]



(1) When home return is commanded, the rotary part rotates in the CCW (counterclockwise) direction as seen from the load side.
The speed is 20 deg/s.
(2) The home sensor turns ON.
(3) It travels in reverse.
(4) Confirm that the home sensor turns OFF as it returns to the position beyond the detection range of the home sensor.
(5) It travels in reverse.
(6) Check again that the home sensor is ON.
(7) Confirm that the home sensor turns OFF beyond the detection range on the home reverse side of the home sensor.
(8) It travels in reverse.
(9) Check that the home sensor is ON.
(10) Confirm that the home sensor turns OFF beyond the detection range on the home side of the home sensor.
(11) Calculate the detection range center of the home sensor from the results of (6), (7), (9) and (10).
(12) It travels by the set value of parameter No.22 "Homing offset" from the position in (11) and stops at the home position.

Caution

- In the home reverse specification, the unit moves in the reverse direction.
- When changing Parameter No. 22 "Homing offset", be sure to refer to page 4-28.

4.7 Precautions for Gripper Type

(1) Finger part operation

[Definition of position]

Home is the position where the fingers are open. Position command is the travel distance from home position of this single finger to the closed side.

Therefore, the maximum command value is 5mm for RCP2-GRS type, or 7mm for RCP2-GRM type.

As for the stroke of 2-claw type, the total travel distance value of both fingers is shown in the specifications.

Therefore, the travel distance of a single finger is half of the stroke.

[Definition of velocity and acceleration/deceleration]

Command value is per single finger.

Relative velocity and acceleration/deceleration of the 2-claw type are twice as much as the command value.

[Operation mode for gripper applications]

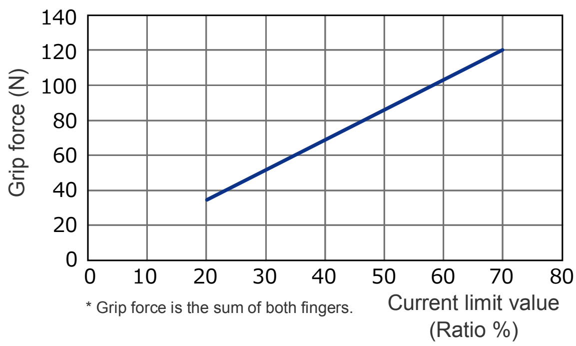
When using as a gripper that involves gripping of workpieces, be sure to use in "push mode".

Caution

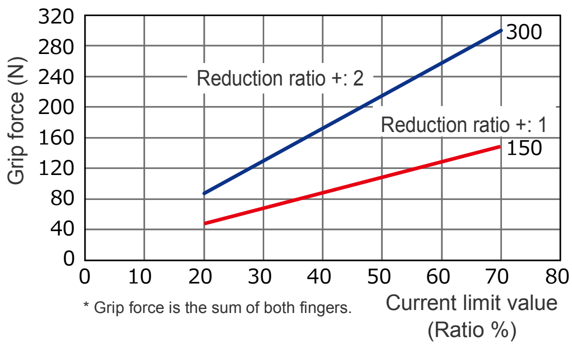
- If used in "positioning mode", a servo error may occur while the workpiece is being gripped, or the workpiece may be dropped.

[Graph of Gripping Force vs Current Limit Value]

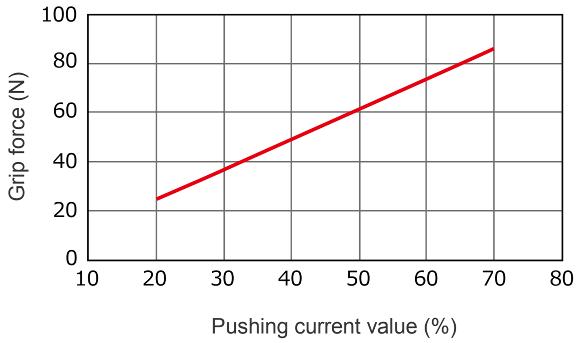
[RCP6-GRT7A]



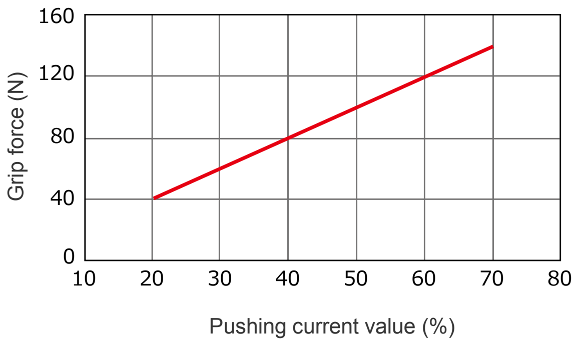
[RCP6-GRT7B]



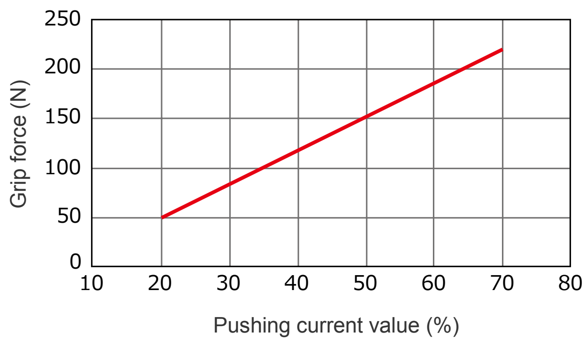
[RCP4-GRSML]



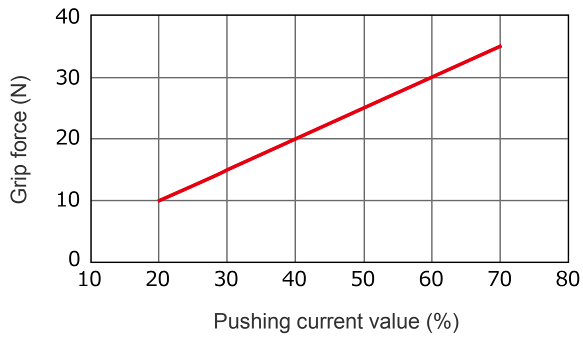
[RCP4-GRSLL]



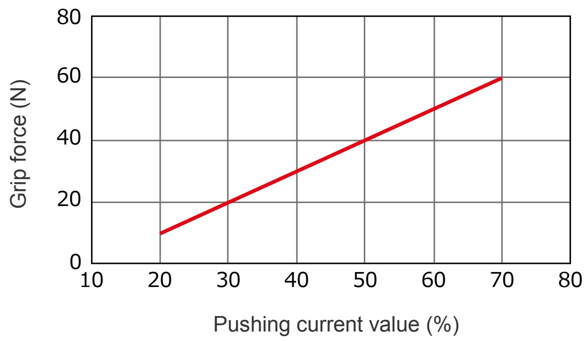
[RCP4-GRSWL]



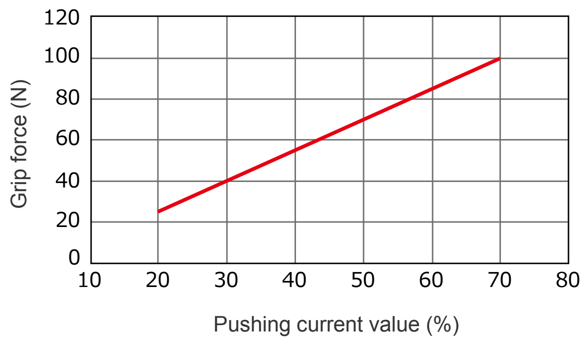
[RCP4-GRLM]



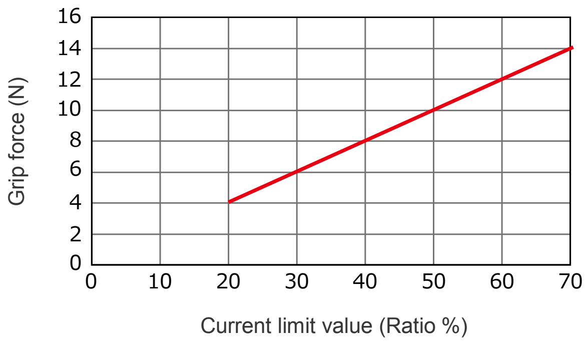
[RCP4-GRLL]



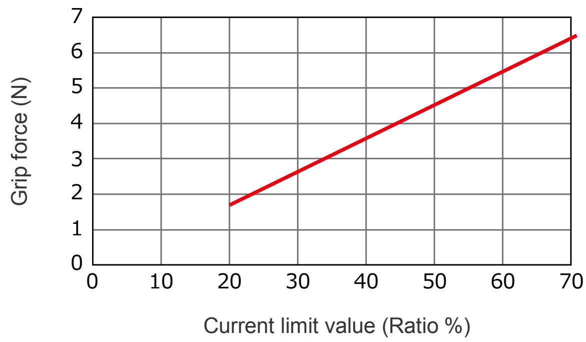
[RCP4-GRLW]



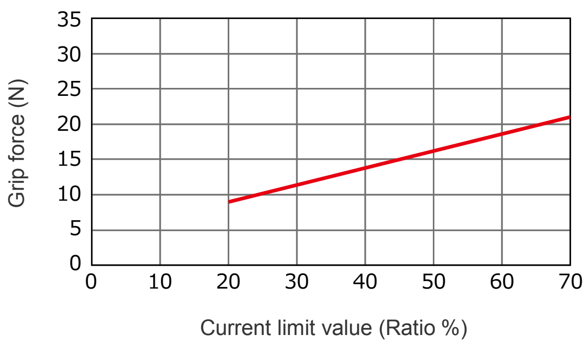
[RCP2-GRSS]



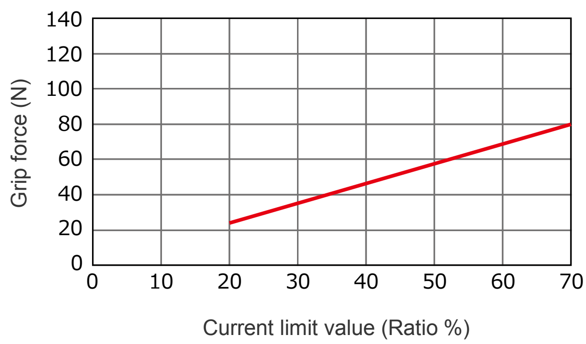
[RCP2-GRLS]



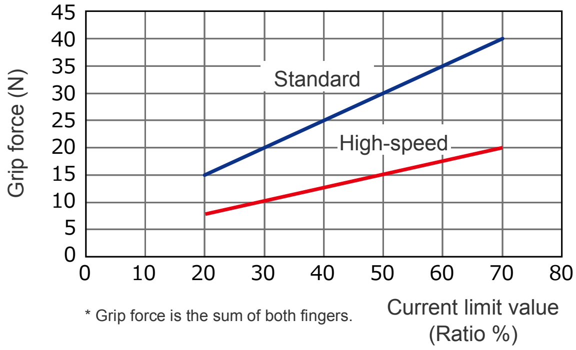
[RCP2-GRS]



[RCP2-GRM]

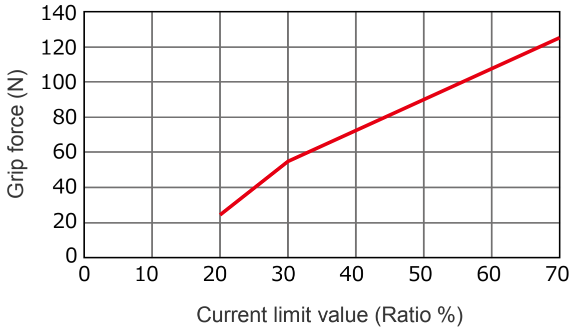


[RCP2-GRST]

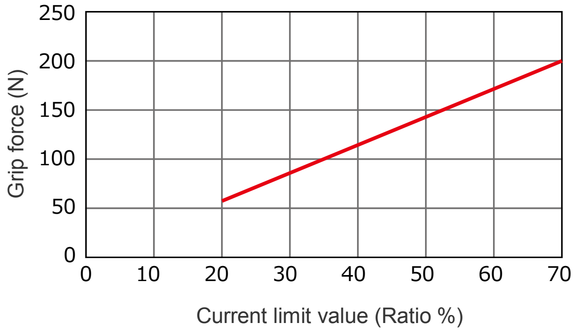


* Grip force is the sum of both fingers.

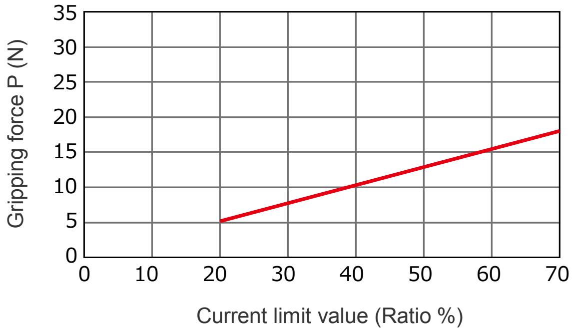
[RCP2-GRHM]



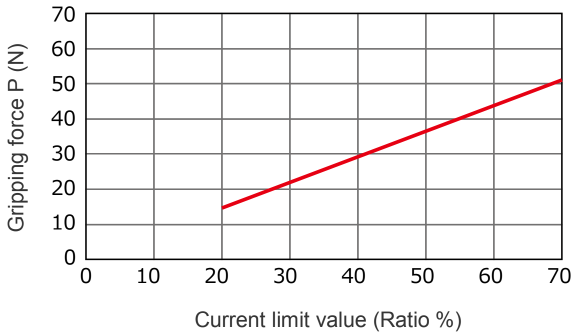
[RCP2-GRHB]



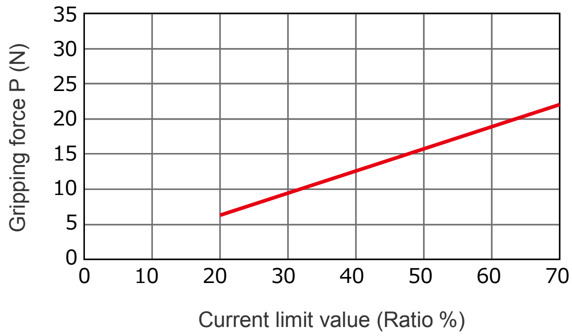
[RCP2-GR3LS]



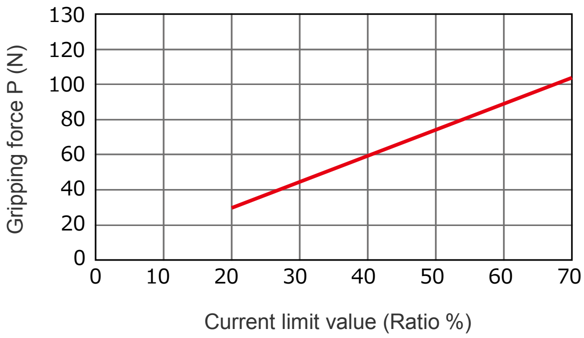
[RCP2-GR3LM]



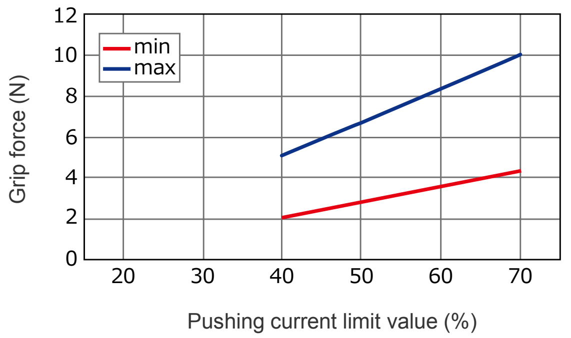
[RCP2-GR3SS]



[RCP2-GR3SM]



[RCD-GRSNA]



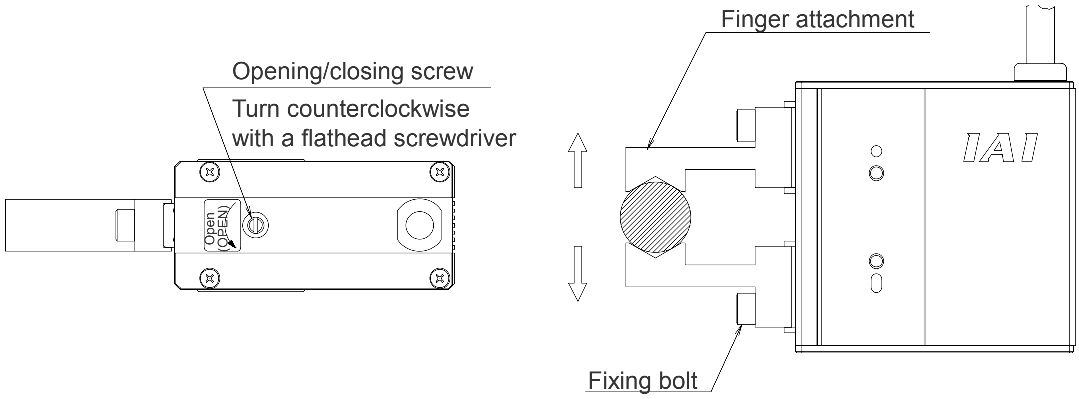
(2) Removing gripped workpieces

This gripper is structured to maintain its gripping force by self-locking the workpiece even during servo OFF or controller power shut-off.

When removal of a gripped workpiece is necessary during power shut-off, turn the opening/closing screw or remove the finger attachment on one side to remove the workpiece.

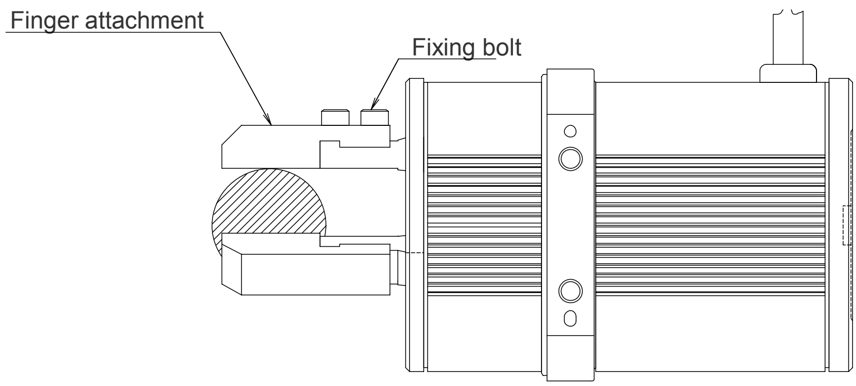
[2-claw Type]

Turn the opening/closing screw or remove the finger attachment on one side.



[3-claw Type]

Remove one of the finger attachments.



4.8 Various Functions

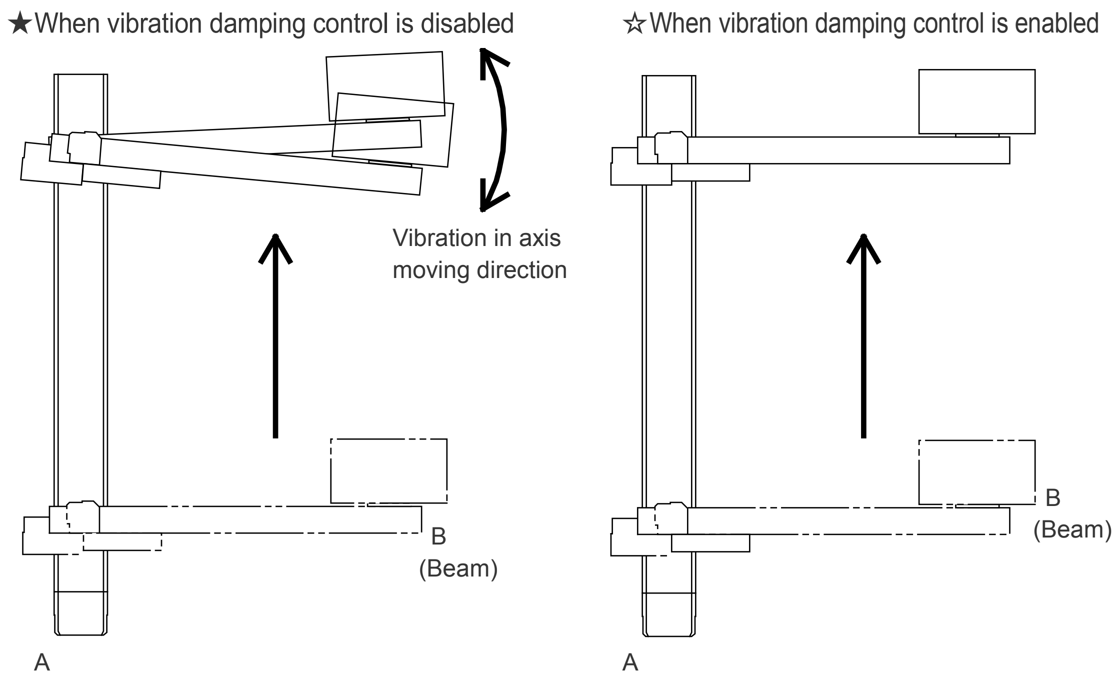
Vibration damping control function

AC servo motor specification only

Vibration damping control function controls the vibration caused by operation of IAI actuators. The vibration which can be suppressed is vibration in the same direction as operation of the actuator, with frequency ranging from 0.5 to 30Hz.
Measure the generated vibration frequency and set with the parameter. Three types of frequency are available to set for the parameter which can be selected using the position table to be reflected to vibration control of the operation. Multiple setting is not available for a single travel command (position data).

This function is dedicated for the AC servo motor specification. Also, it is not available with direct numerical control mode.
When using this function, check the precautions on the next page.

[Operational Image of the Function]
The following diagram is an example of 2-axis configuration of an IAI actuator.
Operation of actuator A causes vibration to actuator B which is equivalent to a beam. By measuring vibration B in the travel direction of actuator A, and performing vibration damping control against the operation of A, vibration B can be suppressed. Vibration B caused by the operation of actuator B cannot be suppressed by actuator A.



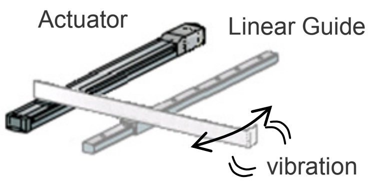
Caution

- Use of frequency analysis tool for vibration damping control
  To use the frequency analysis tool for vibration damping control built into the PC software for RC/EC, it is necessary to acquire the key file (Fam.dll) and copy it into the folder containing the file to execute the PC software for RC/EC (RcPc.exe). Consult with IAI about the key file.
  For operation method, refer to "Chapter 14 Frequency Analysis Function for Vibration Damping Control" in the instruction manual for the PC software for RC/EC.

- Vibration subject to vibration damping control
  The vibration is caused by an IAI actuator, in the same direction as the travel direction of the actuator.

- Vibration not subject to vibration damping control
  1) The vibration source is other than operation of the actuator
  2) The vibration source is in a direction different from the travel direction of the actuator
  3) Vibration of vibrating objects (This function is to move objects that are susceptible to vibration without vibrating, and it cannot control vibrations which have already started)

- Conditions when vibration damping control is unlikely to be effective
  1) When the vibration frequency desired to be controlled matches the frequency of the motor mechanical angle (motor rotation speed), or frequency of the motor electrical angle
  Frequency of motor mechanical angle (motor rotation speed): Operation speed [mm/s]/lead length [mm]
  Frequency of motor electrical angle: Frequency of the shaft with servo-motor is 4 times the mechanical angle
  Example: Shaft with servo-motor
  For lead length: 20mm, operation speed 100mm/s
  Frequency of mechanical angle (motor rotation speed): 5Hz
  Frequency of electrical angle (4 times frequency of mechanical angle): 20Hz
  2) When the vibration damping requires higher speed response than the set speed control response, speed response cannot catch up with vibration control.
  3) When the device is similar to the diagram at right, as the actuator cannot directly control the vibration, the effect may be reduced or unachievable.



Caution

- Home return motion and push-motion operation are not subject to vibration damping control
  Vibration cannot be suppressed during home return motion and push-motion operation. When operation is performed by setting push motion, alarm code 0A2 "Position data error" will occur.

- Usage in conjunction with feed forward gain is forbidden
  This function cannot be used in conjunction with feed forward gain.

- Usage and switching of vibration damping control during travel operation are forbidden
  During operation of the actuator, vibration damping control and positioning operation are not switchable. If switching is commanded, alarm code 0C5 "Unauthorized control system transmission command error" will occur.

- Responsivity of vibration damping control
  Vibration damping control causes a "delay" in the speed commanded based on an operation plan. Therefore, the cycle time will be longer.
  The lower the set vibration frequency is, the more significant the "delay" will be.

- Considering servo gain
  If the servo gain is not appropriately set, the effect of vibration damping control may be reduced. Before setting the vibration damping control, adjust servo gain first.

[Setting Procedure]

Use by following the procedures of measurement and setting below.

Before setting vibration damping control
Is the startup procedure up to test run adjustment 2 completed?
→ Refer to "Startup Section 1.3 Startup Procedure."

No → Perform startup setting following the startup procedure.

↓ Yes

Determination of vibration to control
Perform operation in AUTO mode and check the vibration source.
Is the vibration source an IAI actuator, and is the direction of the vibration the same as the direction of operation?

No → The vibration cannot be controlled with this function. Take other

↓ Yes

Measurement of natural frequency
Measure natural frequency with one of the following methods.
- Use the frequency analysis tool for vibration damping control built into the PC software for RC/EC. Arrange referring to precautions on page 4-81 "Use of frequency analysis tool for vibration damping control."
- Use measuring devices such as a vibrometer (acceleration pickup, etc).
- Calculate based on video picture image data.

↓

Parameter setting for vibration damping control [Refer to following page]
- Set the measured natural frequency with the parameter. With the frequency analysis tool for vibration damping control built into the PC software for RC/EC, it can be written in the parameter from the tool.
- Set related parameters.

↓

Vibration damping control parameter set No. settings
In the vibration column of the position No. to perform vibration damping control, set the vibration damping control parameter set No. to use.

↓

Test run (check effect of vibration control)
Operate the actuator.
Is the vibration control effect sufficiently achieved?

No → (return to Measurement of natural frequency)

↓ Yes

The setting is completed.

[Parameter Setting for Vibration Damping Control]

Set parameters related to vibration damping control. Related parameters are as described below.

Parameters No.	Parameters Set No.	Parameter Name	Unit	at shipping	Input range
97	1	Damping characteristics coefficient 1	Rate	10	0 ~ 1,000
98		Damping characteristics coefficient 2	Rate	1,000	0 ~ 1,000
99		Natural frequency	1/1,000Hz	10,000	500 ~ 30,000
100		Notch filter gain	Rate	9,990	1 ~ 20,000
101	2	Damping characteristics coefficient 1	Rate	10	0 ~ 1,000
102		Damping characteristics coefficient 2	Rate	1,000	0 ~ 1,000
103		Natural frequency	1/1,000Hz	10,000	500 ~ 30,000
104		Notch filter gain	Rate	9,990	1 ~ 20,000
105	3	Damping characteristics coefficient 1	Rate	10	0 ~ 1,000
106		Damping characteristics coefficient 2	Rate	1,000	0 ~ 1,000
107		Natural frequency	1/1,000Hz	10,000	500 ~ 30,000
108		Notch filter gain	Rate	9,990	1 ~ 20,000
109		Vibration suppression No. initial value		0	0 ~ 3
110		Stop method during SrvOFF		0	0, 1

[Damping Characteristics Coefficient 1, 2 (Parameter No. 97/98, 101/102, 105/106)]

Do not attempt to change this item.

[Natural Frequency [1/1,000Hz] (Parameter No. 99, 103, 107)]

Set the measured natural frequency of the load. With the frequency analysis tool for vibration damping control built into the PC software for RC/EC, it can be set in the parameter directly from the tool.

Exhibits even higher vibration control performance if the setting is made as close as possible to the natural frequency of the load.

[Reference] Other vibration measuring methods

· Use measuring devices such as a vibrometer (acceleration pickup, etc)

· Calculate from video picture image data

[Notch Filter Gain (Parameter No. 100, 104, 108)]

Set the notch filter gain following the table below in accordance with the measured natural frequency of the load. Make fine adjustments if overshooting, etc. occurs.
If the notch filter gain setting is high, overshooting will occur during positioning stop.
If the notch filter gain setting is low, undershooting will occur during positioning stop.

Measured natural frequency [Hz]	Notch filter gain set value
0.5	9,900
1	9,980
2 ~ 30	9,990

[Vibration Suppression No. Initial Value (Parameter No. 109)]

When position is written in an unregistered position table, the initial value of this parameter will be automatically set in the "Vibration Suppression No.". To change the setting, rewrite the set value by editing the position table afterwards.

0: Normal positioning control (initial value)
1: Use vibration damping control parameter set 1
2: Use vibration damping control parameter set 2
3: Use vibration damping control parameter set 3

[Stop Method during SrvOFF (Parameter No. 110)]

The relations between parameter setting and each stop command are as described below.

<table>
<tr><th rowspan="3">Stop command</th><th colspan="4">Stop method during servo OFF Set value</th></tr>
<tr><th colspan="2">0: Sudden stop</th><th colspan="2">1: Decelerating stop</th></tr>
<tr><th>During vibration control</th><th>During normal positioning control</th><th>During vibration control</th><th>During normal positioning control</th></tr>
<tr><td>Pausing</td><td>Vibration control decelerating stop</td><td>Normal decelerating stop</td><td rowspan="4">Vibration control decelerating stop</td><td rowspan="4">Normal decelerating stop</td></tr>
<tr><td>Servo OFF</td><td colspan="2" rowspan="3">Sudden stop with emergency stop torque</td></tr>
<tr><td>Drive-source cutoff</td></tr>
<tr><td>Alarm
(Operation cancel level)</td></tr>
<tr><td>Alarm
(Cold start)</td><td colspan="4">Sudden stop with emergency stop torque</td></tr>
</table>

[Position Data Setting]

In order to enable vibration damping control, set the parameter set No. to use in the vibration damping No. column of the position data.

(Note) Vibration damping control cannot be used during push-motion operation.

No.	Position [mm]	Speed [mm/s]	Acceleration [G]	Deceleration [G]	Push [%]	Threshold [%]	Positioning width [mm]	Zone+ [mm]	Zone- [mm]	Acceleration/ deceleration mode	Incremental	Gain set	Stop mode	Vibration damping No.
0														
1	0.00	50.00	0.01	0.01	0	0	0.10	0.00	0.00	0	0	0	0	0
2	50.00	50.00	0.01	0.01	0	0	0.10	0.00	0.00	0	0	0	0	1
3	50.00	50.00	0.01	0.01	50	0	0.10	0.00	5.00	0	0	0	0	3
4														

Set natural frequency 1 (enabled)
Set natural frequency 3 (Alarm generation: "0A2 Position data error" cannot be used in conjunction with push-motion operation.)

Specifications Section

Chapter 4 Driver Unit

Collision detection function

Stepper motor specification only

This function stops the operation immediately when the actuator comes into contact with an object.
Fully understand the descriptions in this section and use without any safety or operational issues.
The collision detection function is a function to stop operation by generating an alarm and turning the servo OFF when the command current value exceeds the set value. Detection range can also be set.

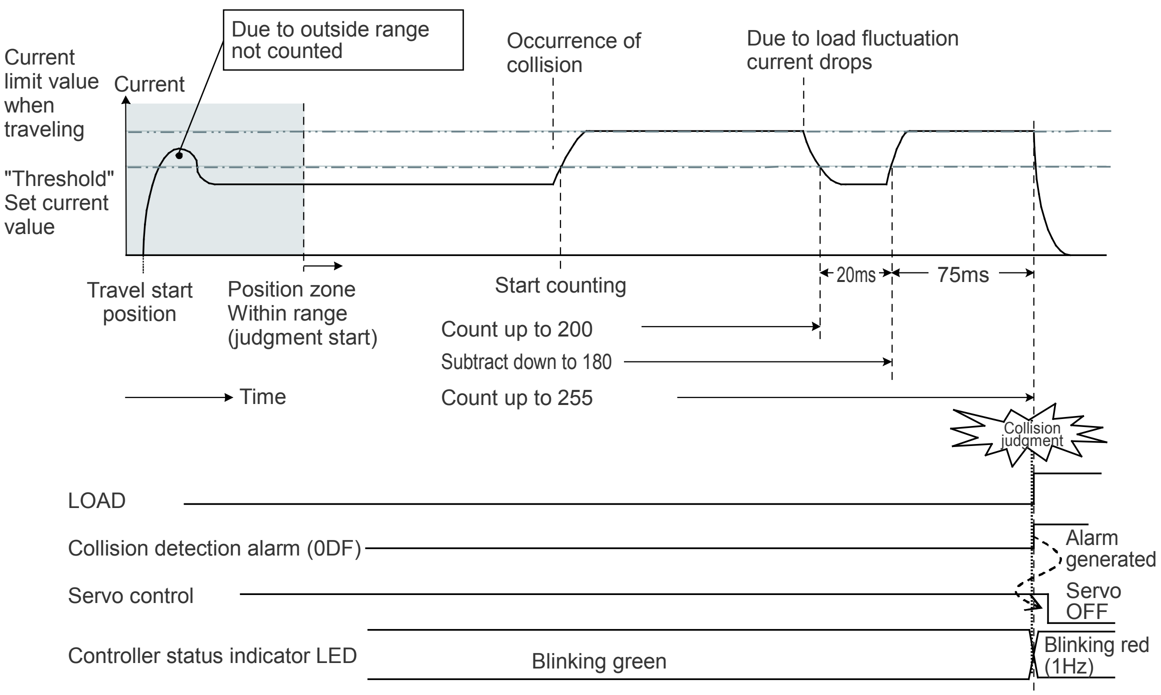
Caution

- This is an auxiliary function to reduce damage to workpieces, etc. in case of unexpected events.
- No compensation will be offered for unexpected damages.
- This function must be set in accordance with expected collisions, therefore appropriate values vary depending on the system. Check thoroughly before use.

[Collision Judgment]

When the present position is within the position zone range and the time set in parameter No. 50 "Load output judgment time" is exceeded and the command torque value set in the position table "Threshold" is exceeded, a collision is judged to have happened.
After judgment, the load output judgment signal LOAD turns ON, the collision detection alarm is generated and the servo turns OFF.

◎ Example of Judgment (at judgment time of 255 ms)



[Setting]

(1) Selecting functions to be used

Set with a parameter. Set Parameter No. 168 "Collision Detection Function."

Set value	Content	Alarm level
0	No detection will be made（same even if 2, 4, 6 are set）	–
1	Detects within the set range of the position zone.	Operation cancel level
3 (Note 1)	Detects within the set range of the position zone; however, no detection will be made in the following cases. · First travel after pause release · Travel from stop status within position zone range	
5	Detects within the set range of the position zone.	Message level
7 (Note 1)	Detects within the set range of the position zone; however, no detection will be made in the following cases. · First travel after pause release · Travel from stop status within position zone range	

Note 1: This setting helps to avoid false detection due to increased current during acceleration.

(2) Setting of detection current value

Set the "threshold" field of the position table to 0 ~ 100 [%]. No detection will be made if 0 is set.

(3) Setting of judgment time

Set with a parameter. Set Parameter No. 50 "Load Output Judgment Time."

Set range: 0 to 9,999 [ms] (initial value 255ms)

(4) Setting of judgment range (position zone)

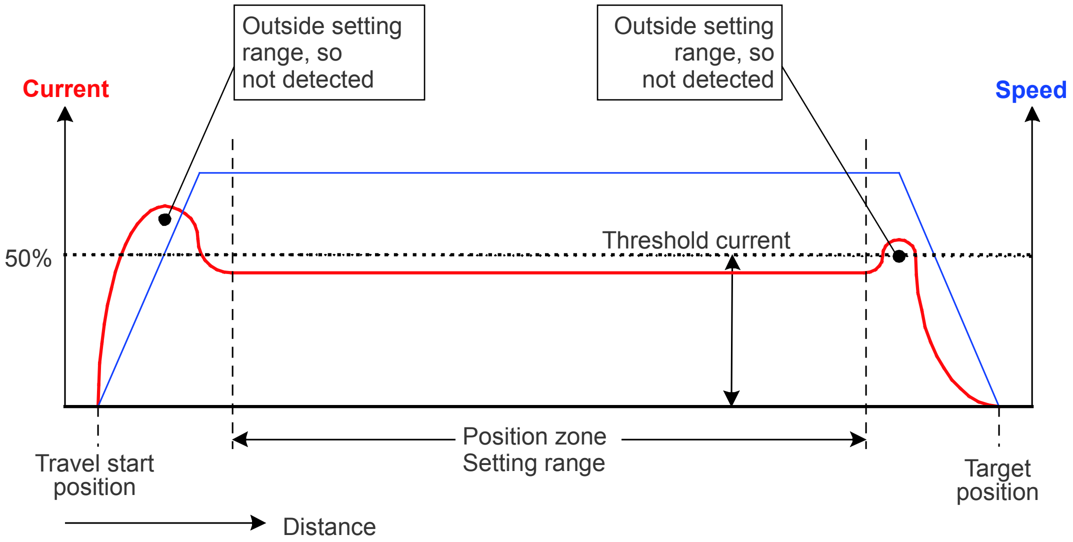
Set the range in "zone +" and "zone -" of the position table. When setting, be sure to set the value of "zone -" smaller than that of "zone +."

Set range: 0.00 to actuator stroke length [mm]

[Adjustment]

Make adjustments using the following descriptions as a guideline.

- Judgment range: Avoid acceleration regions that may require a large amount of current, and configure over the range where collisions may occur.
- Detection current value: Consider travel speed, weight of the workpiece, etc., and set as low as possible over ranges where false detection is unlikely to occur. (Set the current value slightly higher than required during constant travel and make fine adjustments.)



Power-saving function

[AUTO Servo OFF and Full Servo Function]

Equipped with AUTO servo OFF (setting available for all motor specifications) and full servo function (stepper motor specification only) to reduce power consumption while the actuator is stopped. Fully understand the descriptions in this section and use without any safety or operational issues.

With automatic servo OFF function, the servo turns OFF automatically after a certain period of time once positioning is completed. Once the next positioning start signal CSTR is commanded, the servo automatically turns ON and executes positioning operation. Since holding current does not flow during the stop, power consumption can be reduced.
Three types of setting are available for the period of time from positioning complete to servo OFF.

With the full servo function, the power consumption can be reduced by servo-controlling the stepper motor with a relatively large stop current.
To stop the stepper motor completely with minimal vibration, a current is constantly supplied. Also, when the value of the encoder deviates from the target position by ±3 counts, it will not be returned to the target position. However, activating the full servo function will enable returning even with the deviation of 1 count.
As with the full servo function, the RCP6 Series performs home return even with deviation of 1 count. Therefore, the full servo function cannot be used for RCP6.

With the power-saving function, the status of the actuator determines which is to be enabled: the setting of Parameter No. 53, or "stop mode" in the position table. The details are as described below.

Status	Setting
Home return complete and on stand-by (positioning to the target position not performed)	Execution of power-saving function at the value set for Parameter No. 53 (Stop mode setting of position No. disabled)
After turning the power ON, stand-by state with servo ON (positioning to the target position not performed)	Execution of power-saving function at the value set for Parameter No. 53 (Stop mode setting of position No. disabled)
Positioning complete in the target position set in the position table	Execution of power-saving function at the value set for "stop mode" of each position No. (Set value of Parameter No. 53 disabled)

Caution

- Do not use this function if operation after automatic servo OFF is pitch feed (relative travel).
- Slight position deviation may occur due to turning the servo ON/OFF. Additionally, if the position deviates due to application of external force during servo OFF, positioning to the correct position will become impossible since the position at startup is the reference point for pitch feed operation.
- Automatic servo OFF function is disabled for push-motion operation. Do not use it. This function will be enabled upon completion of positioning operation. For push-motion operation, it will be enabled only when contactless (completion of operation without contact = same status as positioning complete).
- There is no holding torque during AUTO servo OFF. The actuator will move if external force is applied. Take extra care regarding interference and safety when setting.
- If jog or inching operation is performed while operating with full servo function, full servo function will be disabled. Full servo function will be enabled again by moving to the position No. for which full servo function is enabled.

[Setting Time until Automatic Servo OFF]

Three types of setting are available for delay time from positioning complete until servo OFF. Set in the following parameters in units of second [s].

Parameter No.	Name	Unit	Input range	Initial value
36	Automatic servo OFF delay time 1	s	0 ~ 9,999	0
37	Automatic servo OFF delay time 2	s	0 ~ 9,999	0
38	Automatic servo OFF delay time 3	s	0 ~ 9,999	0

[Setting of Power-saving Method]

Select from the following conditions, and set in "stop mode" of the position table, or with Parameter No. 53 using a numerical value.
For AC servo motor specification and DC brush-less motor specification, select from 0 to 3.
For stepper motor specification, select from 0 to 7.
[Reference] Refer to "3.7 Address Configuration / Position table (page 3-45)".

Set value	Operation after positioning complete	Selectable specifications
0	Servo ON as is	All specifications
1	After a fixed time (parameter No. 36 set value) automatic servo OFF	All specifications
2	After a fixed time (parameter No. 37 set value) automatic servo OFF	All specifications
3	After a fixed time (parameter No. 38 set value) automatic servo OFF	All specifications
4	Full servo control	Stepper motor specification (Excluding RCP6 Series)
5	After full servo control for a fixed time (parameter No. 36 set value), automatic servo OFF	Stepper motor specification
6	After full servo control for a fixed time (parameter No. 37 set value), automatic servo OFF	Stepper motor specification
7	After full servo control for a fixed time (parameter No. 38 set value), automatic servo OFF	Stepper motor specification

Caution

- There is no holding torque during AUTO servo OFF. The actuator will move if external force is applied. Take extra care when setting.
- Do not use AUTO servo OFF when the next travel command is relative specifications (pitch feed). Misalignment may occur.
- Do not use AUTO servo OFF with push-motion operation. The pushing force will be lost.
- AUTO servo OFF does not function if operating in teaching mode with PC software.

[Status of Positioning Complete Signal when AUTO Servo OFF Selected]

If AUTO servo OFF is executed, the status is no longer positioning complete as the servo is turned OFF. Therefore, the positioning complete signal PEND turns OFF. By changing the PEND signal into an in-position signal that determines if the unit is stopped in the range of positioning width instead of the positioning complete signal, the signal can be made not to turn OFF even during servo OFF.

Perform this setting with Parameter No. 39.

Set value of parameter No.39	Description of PEND signal	Signal output status during AUTO servo OFF
		PEND
0	Positioning complete signal	OFF
1	In-position signal	ON

(Note) Status LED SYS blinks green during AUTO servo OFF.

(1) When Parameter No. 39 = 0

Operation of actuator	Positioning operation	AUTO servo OFF stand-by	Servo OFF	Positioning operation
Servo status	ON	ON	OFF	ON
Complete position No. output (Present position number output)	PM1~** = 0	PM1~** = Output	PM1~** = 0	PM1~** = 0
Positioning complete signal PEND	OFF	ON	OFF	OFF

Servo OFF delay time (Parameter No.36~38)

(2) When Parameter No. 39 = 1

Operation of actuator	Positioning operation	AUTO servo OFF stand-by	Servo OFF	Positioning operation
Servo status	ON	ON	OFF	ON
Complete position No. output (Present position number output)	PM1~** = 0	PM1~** = Output	PM1~** = Output	PM1~** = 0
Positioning complete signal PEND	OFF	ON	ON	OFF

Servo OFF delay time (Parameter No.36~38)

[Auto current down function]

Stepper motor specification only

(1) Function selection parameter

Energized at a set current (Note 1) regardless of size of the external force for complete stop after positioning operation, and when auto current down adjustment is not used. With the use of auto current down adjustment, energization is done with consideration of the impact of external force, so it is effective for reduction of power consumption when transported load is small, etc.

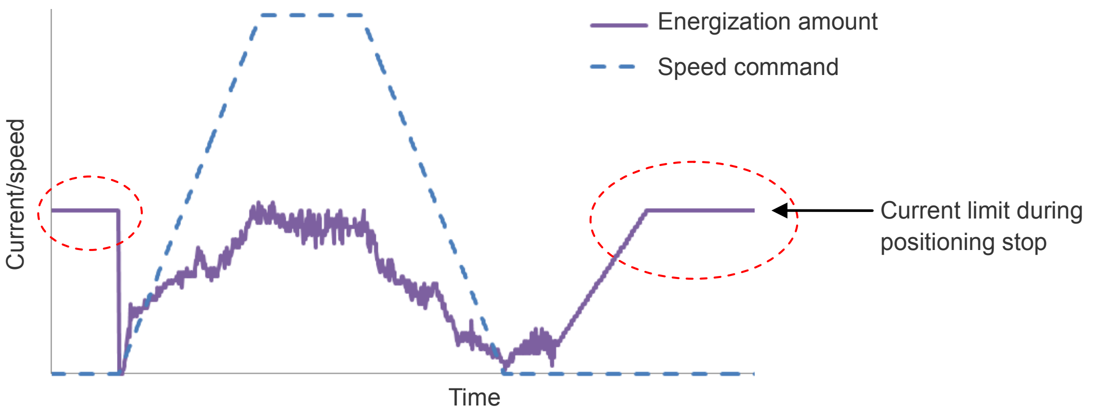
Note 1: Parameter No. 12 "Current Limit during Positioning Stop"

Set auto current down adjustment enable/disable with Parameter No. 182.

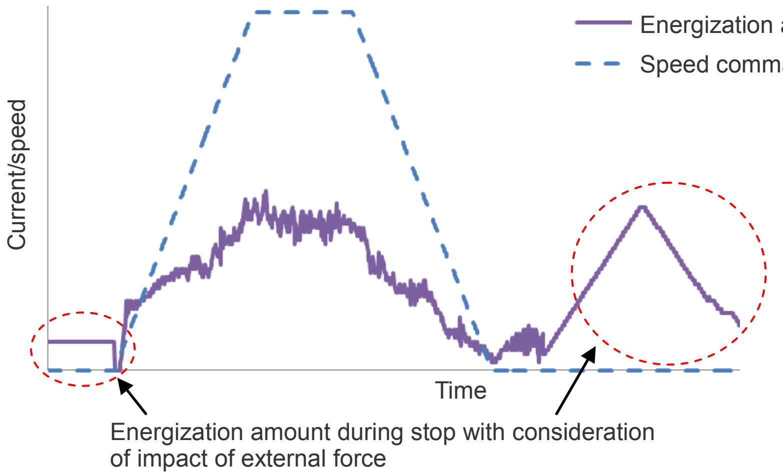
Parameter No.	Name	Unit	Input range	at shipping
182	Auto current adj. select	–	0: Disabled, 1: Enabled	0

"Relations of energization amount and speed command during positioning operation" are shown below for disabled/enabled auto current down function.

●Auto current down adjustment: Disabled



●Auto current down adjustment: Enabled



(2) Control with function enabled

1) The same process as the existing complete stop function will be performed until the energization amount reaches current limit during positioning stop (parameter).
2) After completion of current energization during stop, the state is maintained until target position deviation does not occur (zero).
3) In accordance with whether target deviation is present or not, the energization amount will be manipulated.
   · Without target position deviation, energization decreases by a fixed amount
   · With target position deviation, energization increases by a fixed amount

The following restrictions are applicable for the manipulation of the energization amount.

· Decrease in energization amount ⇒ When process transition of increase is performed more than a set number of times, only increase process will be executed.
· Minimum energization amount is defined per actuator basis, and without position deviation, it allows energization amount to increase to the applicable amount.
· Maximum energization amount is current limit value during positioning stop (parameter), and allows energization amount to increase to the applicable amount.

(3) Precautions

1) Difference in target position deviation depending on the encoder resolution

For actuator with lead length 24 [mm/r]

■ If the encoder resolution is 800 [pulse/r], it allows the energization amount to decrease until target position deviation of 24÷800 = 0.0300 [mm] is generated.
■ If the encoder resolution is 8,192 [pulse/r], it allows the energization amount to decrease until target position deviation of 24÷8,192 = 0.0029... [mm] is generated.

2) Precautions for high-resolution encoder

For an actuator with built-in high resolution encoder, when positioning complete status continues for an extended period of time, even if this function is enabled, the energization amount will eventually rise to current limit value during positioning stop (parameter).

Specifications Section

Chapter 5

Simple Absolute Unit

5.1 Overview ········· 5-1

5.2 How to Read the Model Number ········· 5-2

How to read the model nameplate ········· 5-3

5.3 Simple Absolute Unit and Components ········· 5-4

5.4 General Specifications ········· 5-5

5.5 Part Names/Functions and External Dimensions ········· 5-7

Part names ········· 5-7

LED display ········· 5-8

Actuator cable connector/driver unit cable connector ········· 5-8

External dimensions ········· 5-9

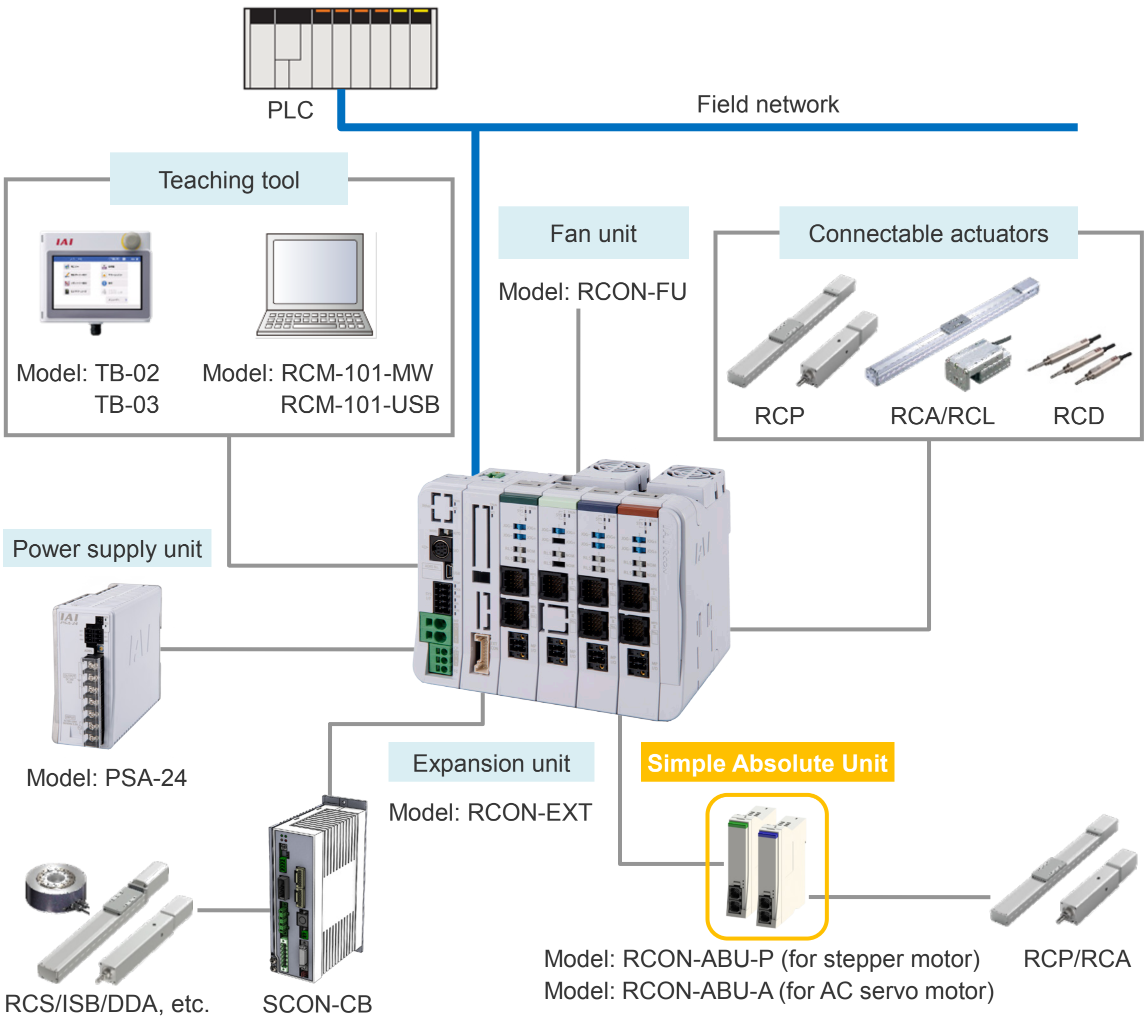
5.6 Precautions ········· 5-10

Specifications Section

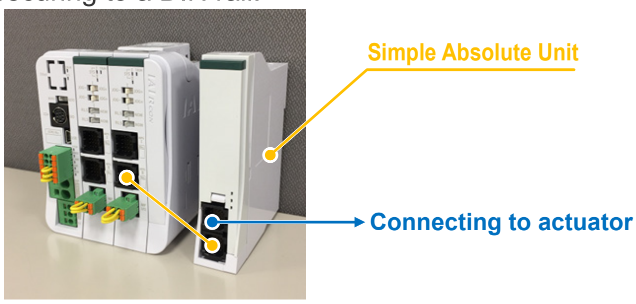
Chapter 5 Simple Absolute Unit

5.1 Overview

Incremental specification actuators can be used as absolute specification models by adding a simple absolute unit to the driver unit.
After absolute reset, home return motion is not required even if turning the control power supply OFF and then ON again.



However, simple absolute units do not have a unit-connectable structure. Connect to the driver unit with a cable after securing to a DIN rail.



5.2 How to Read the Model Number

The simple absolute unit models are as follows.

1 simple absolute unit is required for each actuator axis.

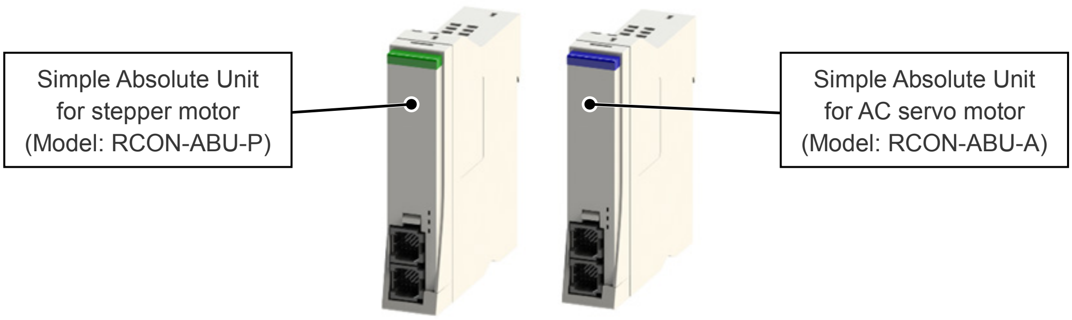
Note that RCON-PCF and RCON-DC are not supported.

Simple absolute unit model

RCON – **ABU** – □

Motor type

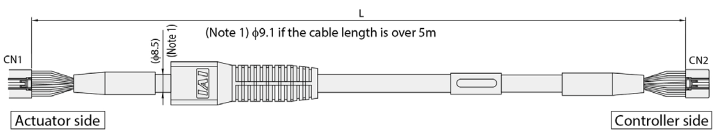
P	Stepper motor type
A	AC servo motor type



A cable (model: CB-ADPC-MPA005, length 50 cm) is included for connection to the driver unit. Cables of lengths other than 50 cm must be prepared separately as needed. The cable length should be selected based on the driver unit and simple absolute unit installation positions.

Model Number CB-ADPC-MPA□□□/CB-ADPC-MPA□□□-RB
Standard cable / Robot cable

*Please indicate the cable length (L) in □□□, e.g.) 030 = 3m



Minimum bending radius R 5m or less r = 68mm or more (Dynamic bending condition)
Longer than 5m r = 73mm or more (Dynamic bending condition)

* The robot cable is designed for flex-resistance: Please use the robot cable if the cable needs to be installed through the cable track.

* Please contact IAI if the cable length other than above is needed.

CN1
DF62C-24S-2.2C (HIROSE ELECTRIC CO., LTD.)

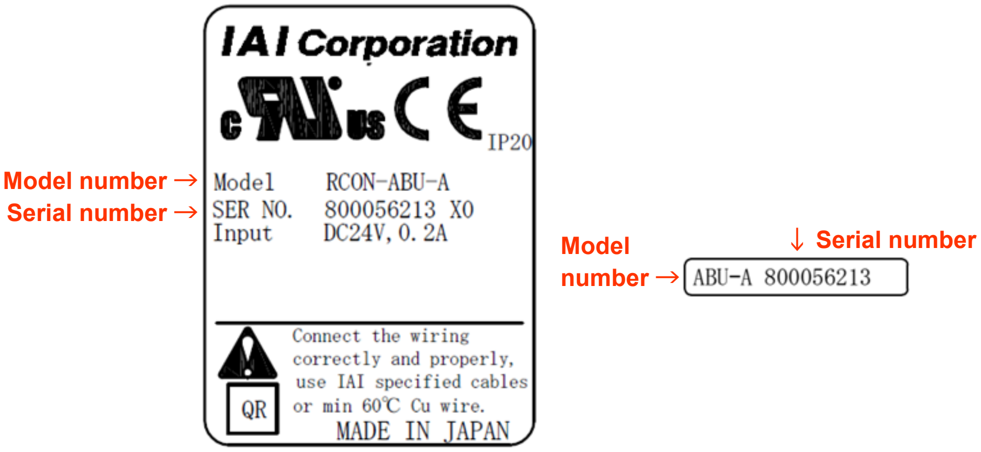
Color	Signal name			Pin
	D	A	P	No.
Blue (AWG22/19)	U	U	ϕA	3
Orange (AWG22/19)	V	V	VMM	5
Brown (AWG22/19)	-	-	ϕB	10
Gray (AWG22/19)	-	-	VMM	9
Green (AWG22/19)	W	W	ϕ_A	4
Red (AWG22/19)	-	-	ϕ_B	15
Black (AWG26)	-	BK+	LS+	8
Yellow (AWG26)	-	BK-	LS-	14
Blue (AWG26)	A+	A+	SA[mABS]	12
Orange (AWG26)	A-	A-	SB[mABS]	17
Green (AWG26)	B+	B+	A+	1
Brown (AWG26)	B-	B-	A-	6
Gray (AWG26)	HS1_IN	Z+/SA[mABS]	B+	11
Red (AWG26)	HS2_IN	Z-/SB[mABS]	B-	16
Blue (AWG26)	-	LS+	BK+	20
Orange (AWG26)	-	LS-	BK-	2
Gray (AWG26)	VCC	VCC	VCC	21
Red (AWG26)	GND	GND	GND	7
Brown (AWG26)	-	VPS/BAT-	VPS	18
Green (AWG26)	HS3_IN	LS_GND	LS_GND	13
-	-	-	-	19
Pink (AWG26)	-	BAT+	CF_VCC	22
-	-	-	-	23
Black (AWG26)	FG	FG	FG	24

Center Interposition

CN2
DF62C-24S-2.2C (HIROSE ELECTRIC CO., LTD.)

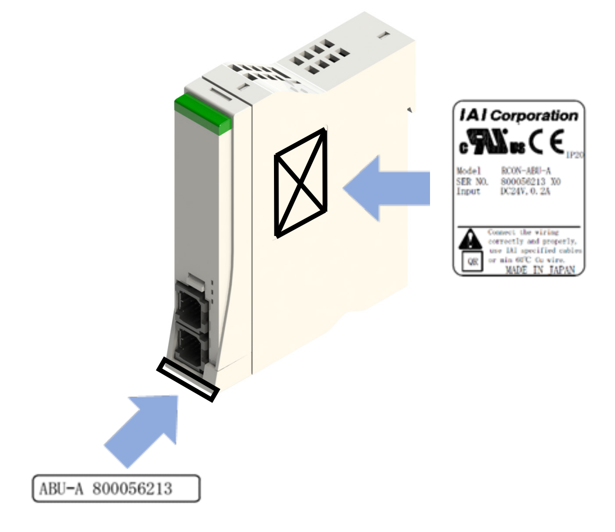
Pin	Signal name			Color
No.	P	A	D	
3	ϕA	U	U	Blue (AWG22/19)
5	VMM	V	V	Orange (AWG22/19)
10	ϕB	-	-	Brown (AWG22/19)
9	VMM	-	-	Gray (AWG22/19)
4	ϕ_A	W	W	Green (AWG22/19)
15	ϕ_B	-	-	Red (AWG22/19)
8	LS+	BK+	-	Black (AWG26)
14	LS-	BK-	-	Yellow (AWG26)
12	SA[mABS]	A+	A+	Blue (AWG26)
17	SB[mABS]	A-	A-	Orange (AWG26)
1	A+	B+	B+	Green (AWG26)
6	A-	B-	B-	Brown (AWG26)
11	B+	Z+/SA[mABS]	HS1_IN	Gray (AWG26)
16	B-	Z-/SB[mABS]	HS2_IN	Red (AWG26)
20	BK+	LS+	-	Blue (AWG26)
2	BK-	LS-	-	Orange (AWG26)
21	VCC	VCC	VCC	Gray (AWG26)
7	GND	GND	GND	Red (AWG26)
18	VPS	VPS/BAT-	-	Brown (AWG26)
13	LS_GND	LS_GND	HS3_IN	Green (AWG26)
19	-	-	-	-
22	CF_VCC	BAT+	-	Pink (AWG26)
23	-	-	-	-
24	FG	FG	FG	Black (AWG26)

How to read the model nameplate



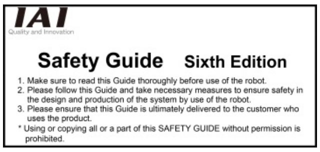
*The nameplate design reflects UL certification.

[Nameplate Location]



5.3 Simple Absolute Unit and Components

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

Part name	Shape	Quantity	Remarks
Simple Absolute Unit		1	
Absolute battery		1	Model Name: AB-7
Motor/encoder cable		1	Model Name: CB-ADPC-MPA005 * Supplied with Simple Absolute Unit
First Step Guide	 IAI Quality and Innovation RCON-PC/PCF/AC/DC, RCON-FU RCON-ABU-A/P, RCON-EXT Driver Unit, Fan Unit, Simple Absolute Unit, Extension Unit First Step Guide First Edition Thank you for purchasing our product. Make sure to read the Safety Guide and detailed Instruction Manual (DVD) included with the product in addition to this First Step Guide to ensure correct use. This Instruction Manual is original. Warning: Operation of this equipment requires detailed installation and operation instructions which are provided on the DVD Manual included in the box this device was packaged in. It should be retained with this device at all times. A copy of the DVD Manual can be requested by contacting your nearest IAI Sales Office listed at the back cover of the Instruction Manual or on the First Step Guide. • Using or copying all or part of this Instruction Manual without permission is prohibited. • The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.	1	
Safety Guide	 IAI Quality and Innovation Safety Guide Sixth Edition 1. Make sure to read this Guide thoroughly before use of the robot. 2. Please follow this Guide and take necessary measures to ensure safety in the design and production of the system by use of the robot. 3. Please ensure that this Guide is ultimately delivered to the customer who uses the product. * Using or copying all or a part of this SAFETY GUIDE without permission is prohibited.	1	

5.4 General Specifications

[Absolute Battery Specifications]

Item	Specifications
Type	Cylindrical sealed nickel-metal hydride battery
Manufacturer	FDK Corporation
Model	AB-7
Nominal voltage	3.6 V
Rated capacity	3,100 mAh
Nominal capacity	3,700 mAh
Average life	Approx. 3 years (varies widely with operating conditions)
Weight	190 g
Charging time	Approx. 72 hours

[Absolute Battery Charging]

Charge for at least 72 hours continuously if using for the first time, after replacing the battery, and when power has been turned off for extended periods. The battery is charged while 24 VDC is supplied to RCON.

If RCON power is turned OFF beyond the data retention time, the data will be lost, so charge regularly.

The battery has a limited lifetime that gradually decreases data retention time. Replace the battery when the retention time decreases significantly even if properly charged.

Data retention time (approximate time when battery is new)

Parameter No.155 settings	Upper limit of encoder rotation speed when power is OFF [r/min]		Battery retaining time guideline [days]	Retaining time per 1 hour of charge time (guideline) [h]
	If connected actuator is not RCA2-***NA	If connected actuator is RCA2-***NA		
0	100	75	20	6.6
1	200	150	15	5.0
2	400	300	10	3.3
3	800	600	5	1.6

For details, refer to "Specifications Section Chapter 4 4.5 Parameters (page 4-48)".

(Example) When used under the following conditions: "Monday ~ Friday: 8 hours charging / 16 hours discharging per day, Saturdays and Sundays: discharging"
Connected axis: When not RCA2-***NA

(1) If Parameter No. 155 is set to 3...
Total charge: 8 [h] operation per day x 1.6 [h] retention time per 1 hour charge x 5 [days] weekdays = 64 [h]
Total discharge: Nightly down time 16 [h] x weekdays 5 [days] + weekend down time 48 [h] = 128 [h]
→ If starting on Monday from a fully charged state, the total discharge amount exceeds the total charge amount by 64 [h] in one week, so the full charge amount decreases by 64 [h] each week. Accordingly, a full charge is required every 10 days.

(2) If Parameter No. 155 is set to 2...
Total charge: 8 [h] operation per day x 3.3 [h] retention time per 1 hour charge x 5 [days] weekdays = 132 [h]
Total discharge: Nightly down time 16 [h] x weekdays 5 [days] + weekend down time 48 [h] = 128 [h]
→ If starting on Monday, the total charge amount exceeds the total discharge amount, so there is no need to maintain continuous full charge. Charge increases by 4 [h] each week.

[Absolute Battery Voltage Drop Detection]

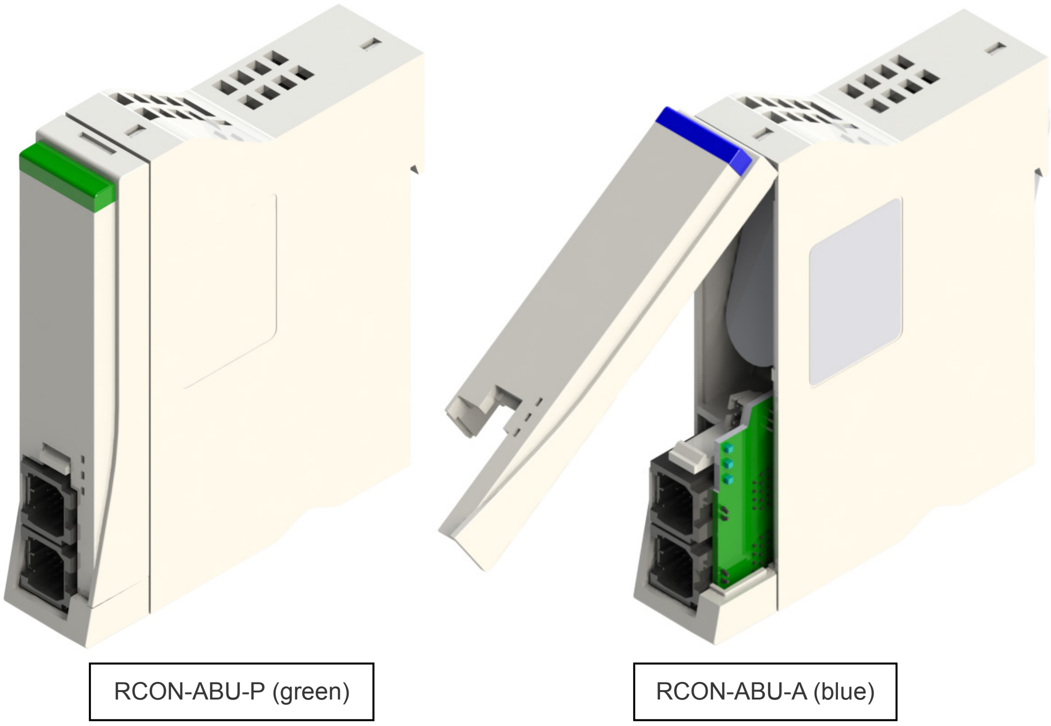
If the absolute battery voltage drops, error detection is performed in accordance with the voltage.

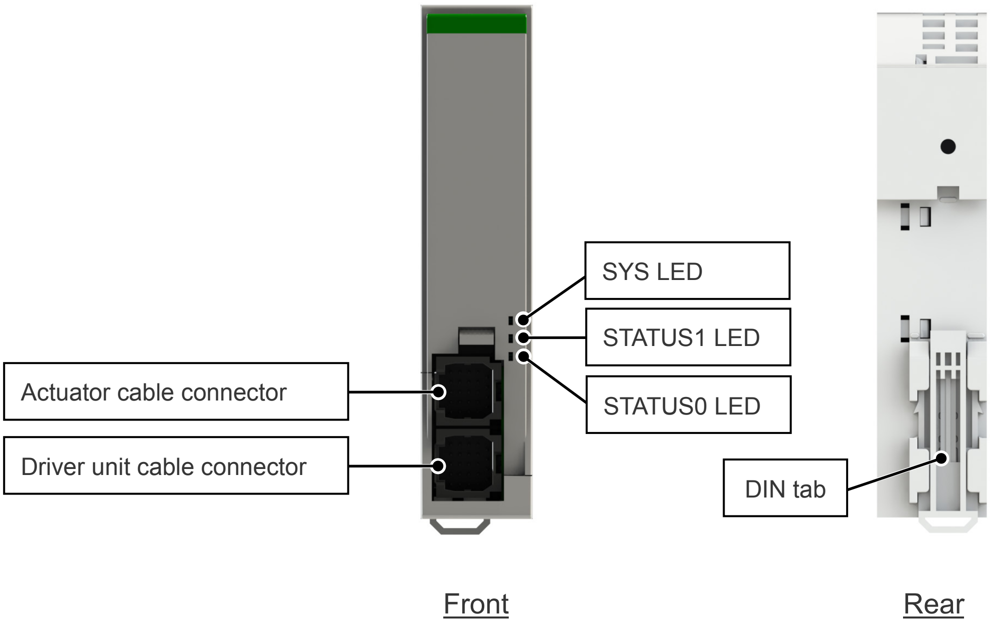
Voltage	Output signal status	Alarm code
2.5V ±8% or less	Alarm signal *ALM OFF	0EE "Absolute encoder error detection 2" or 0EF "Absolute encoder error detection 3"

If an alarm occurs, absolute reset must be performed after replacing the battery.
RCON checks the battery voltage at power ON. Detection does not occur even if the battery voltage drops to the alarm level while RCON is energized.

5.5 Part Names/Functions and External Dimensions

Part names





LED display

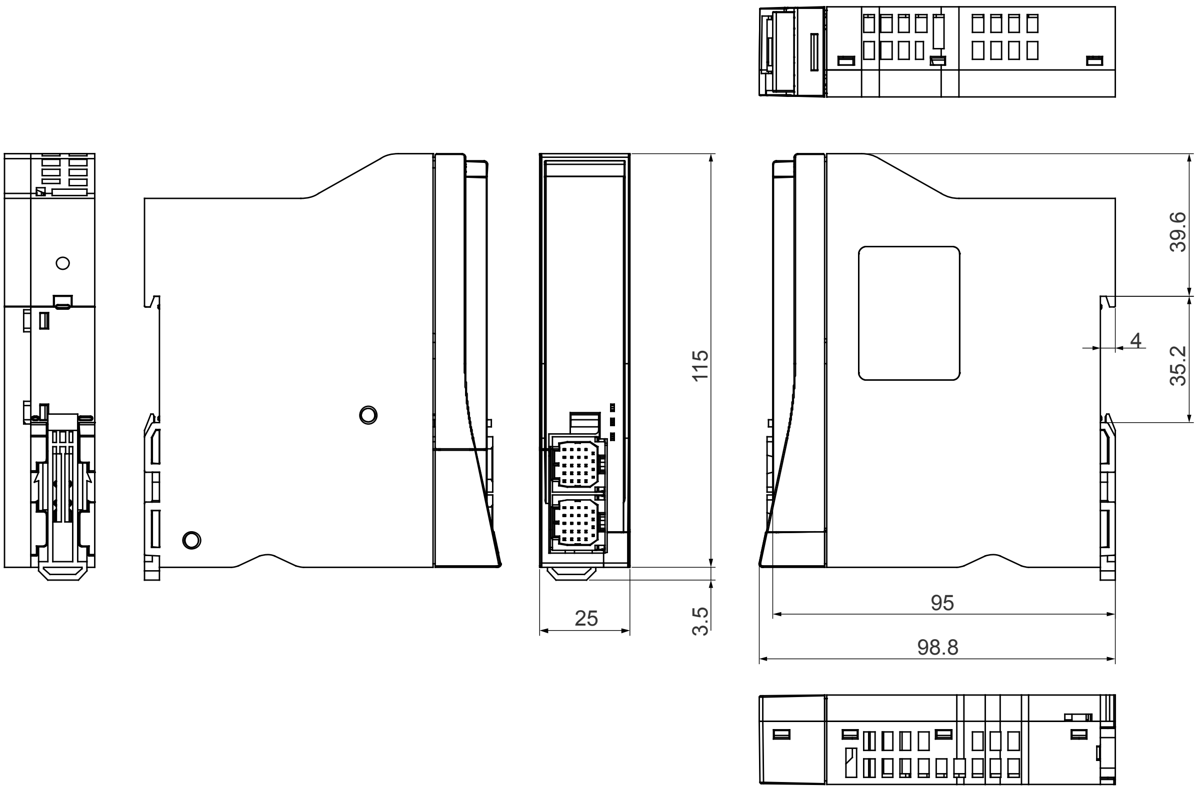
Panel notation	Display color	Status	Description
SYS	Green	Light ON	Normal operation
	Red	Light ON	Alarm triggered
STATUS1	Green	Light ON	Home return complete
	Red	Light ON	Home return not complete
STATUS0	Green	Light ON	Battery fully charged
	Red	Light ON	Battery not connected
	Orange (green/red)	Light ON	Battery charging

Actuator cable connector/driver unit cable connector

Connect the simple absolute unit to an actuator using an actuator cable connector (MPG), and to a driver unit with the driver unit cable connector (CONT). There are two types, one for stepper motors and one for AC servo motors, as the pin arrangement of the MPG connector differs. A color panel can be used for identification, as with the driver unit.

External dimensions

Item	Specifications
External dimensions	W22.6 mm x H115 mm x D95 mm
Weight	Approx. 270 g (of which 183 g is the battery)
External view	See figure below



5.6 Precautions

[Precautions when Changing Parameters]

If the following parameters are changed, an absolute error will occur. After changing the parameters, absolute reset must be performed once again.

(1) Parameter No.5 "Homing direction"
(2) Parameter No. 22 "Homing offset"
(3) Parameter No. 77 "Ball screw lead length"
(4) Parameter No. 78 "Axis motion type"

[Absolute Battery Handling]

Always observe the following safety precautions.

(1) Do not disassemble under any circumstances. The electrolyte is a strong alkali solution. It is harmful to skin and clothing.
(2) Never short the electrodes out (never directly connect + and - electrodes). Devices may be damaged, or the generated heat may cause burns.
(3) Never place into fire, as it may burst.
Also do not submerge underwater, as the battery will cease to function.
(4) Do not solder directly.
The safety mechanism may explode due to damage to the safety valve in the battery cap.
(5) If the power remains shut OFF for an extended period of time with the connector connected, deep discharge will take place, leakage may occur and the performance/life of the battery may be significantly lowered.
Unplug the connector when shutting OFF the power for extended periods of time due to equipment relocation, remodeling, etc.
(6) When disposing, take measures such as the use of an appropriate collection box installed at a recycling center.

Specifications Section

Chapter 6

Expansion Unit

6.1 Overview ························· 6-1

6.2 How to Read the Model Number ························· 6-2

How to read the model nameplate ························· 6-2

6.3 Expansion Unit and Components ························· 6-3

6.4 Part Names/Functions and External Dimensions ························· 6-4

Part names ························· 6-4

SCON cable connector ························· 6-6

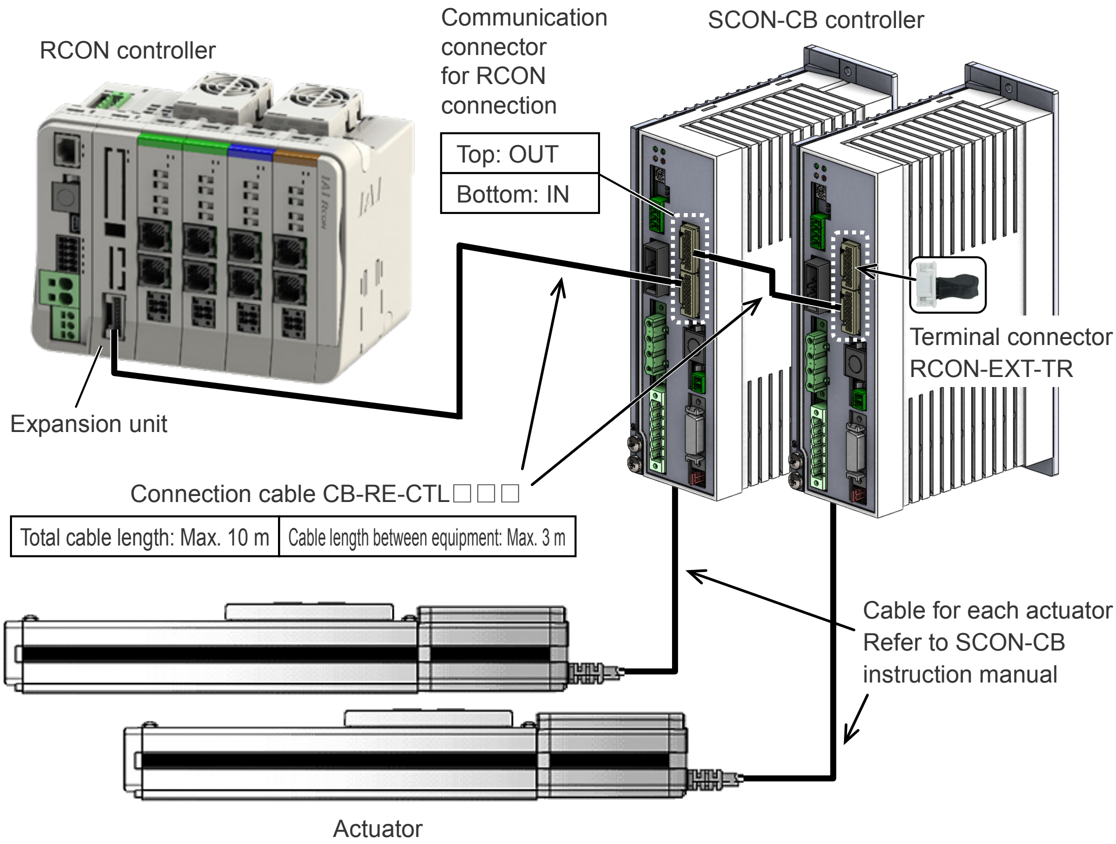
Connectors ························· 6-7

External dimensions ························· 6-8

6.1 Overview

The expansion unit is for connecting a SCON-CB controller to the RCON system.
As seen from the front, the gateway unit is placed to the left end of the RCON system, while the expansion unit is located on the right side of the gateway unit during use.

The expansion unit and the SCON-CB controller are connected with a dedicated cable (model: CB-RE-CTL□□□). When connecting two or more SCON-CB controllers, connect the SCON-CB units together with a dedicated cable. Up to 16 axes can be controlled by combining with a driver unit.



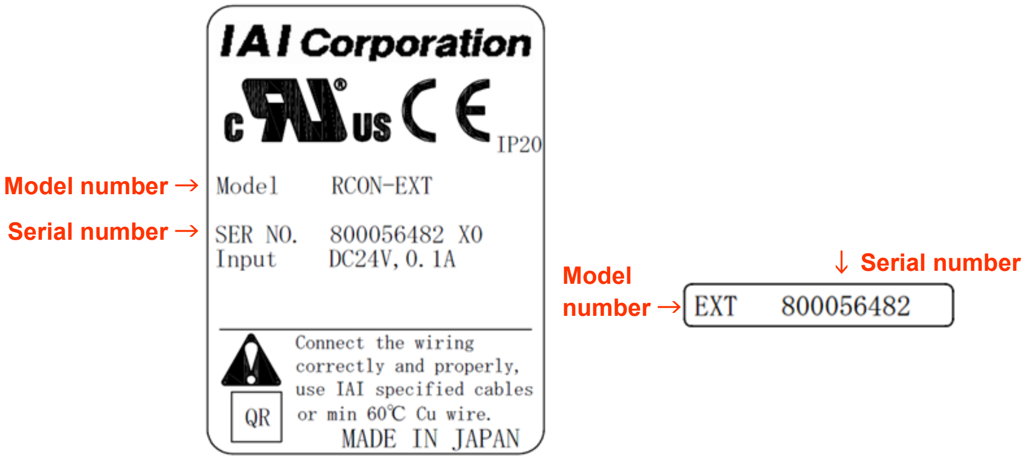
6.2 How to Read the Model Number

The model of the expansion unit is as follows.

Expansion unit model

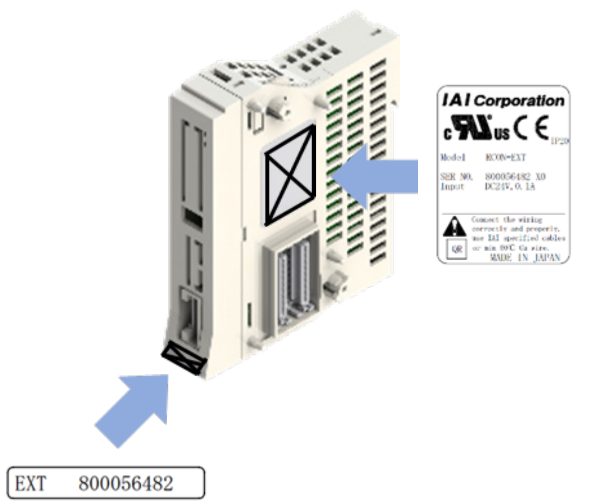
RCON – EXT

How to read the model nameplate



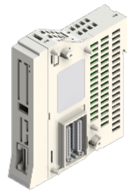
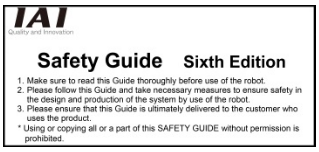
*** The nameplate design reflects UL certification**

[Nameplate Location]



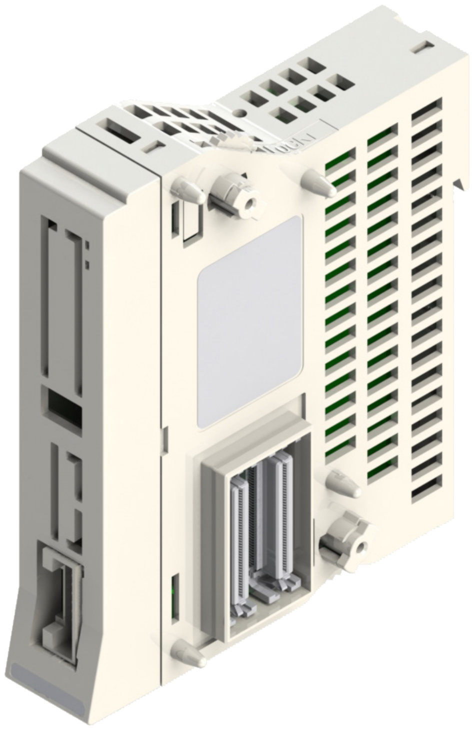
6.3 Expansion Unit and Components

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light,contact your local IAI distributor.

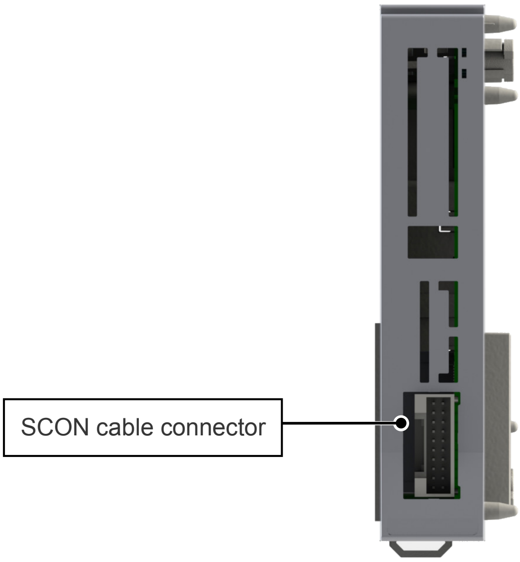
Part name	Shape	Quantity	Remarks
Expansion unit		1	
Terminal connector		1	Single product model number: RCON-EXT-TR
First Step Guide		1	
Safety Guide		1	

6.4 Part Names/Functions and External Dimensions

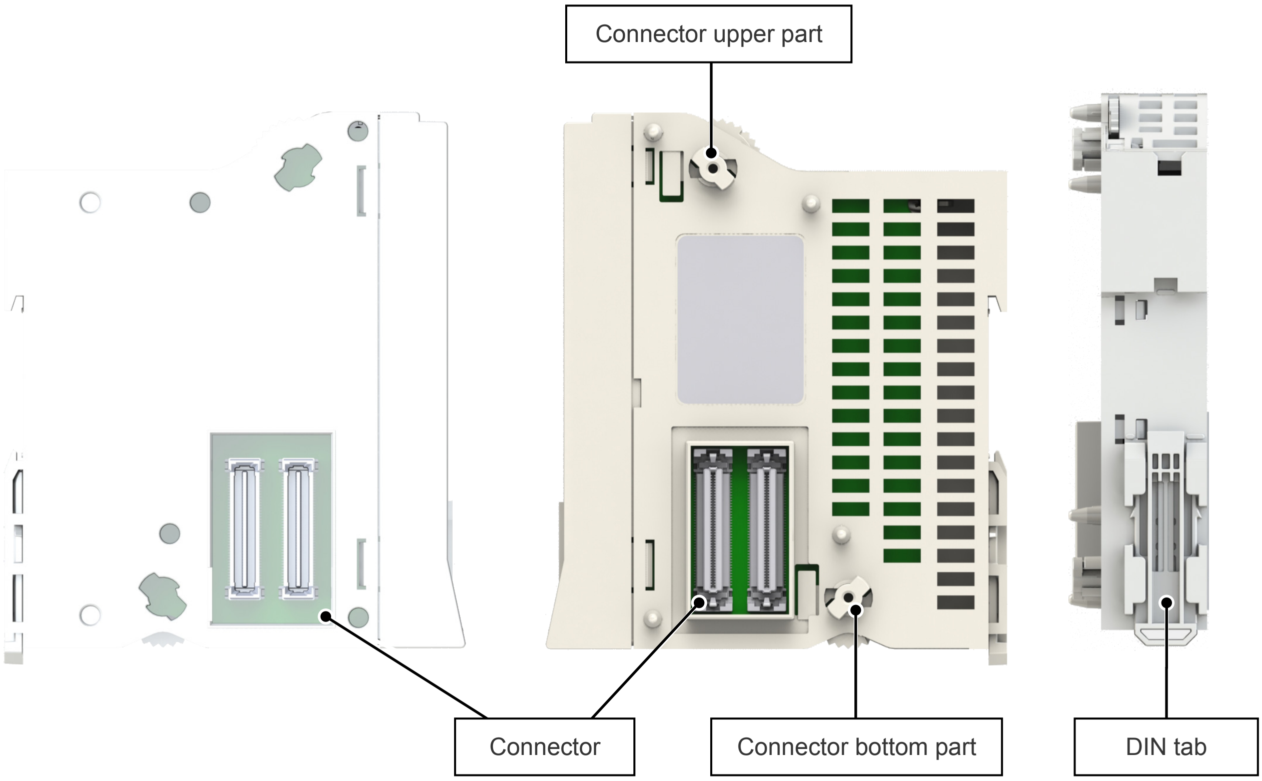
Part names



RCON-EXT



Front



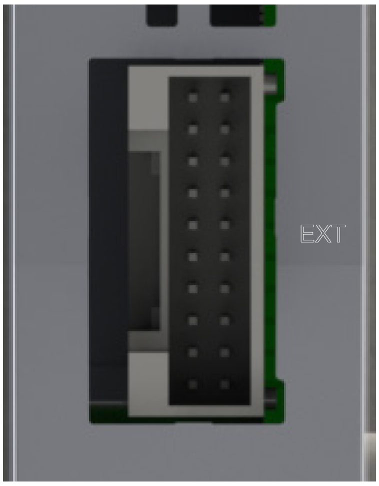
Left side

Right side

Rear

SCON cable connector

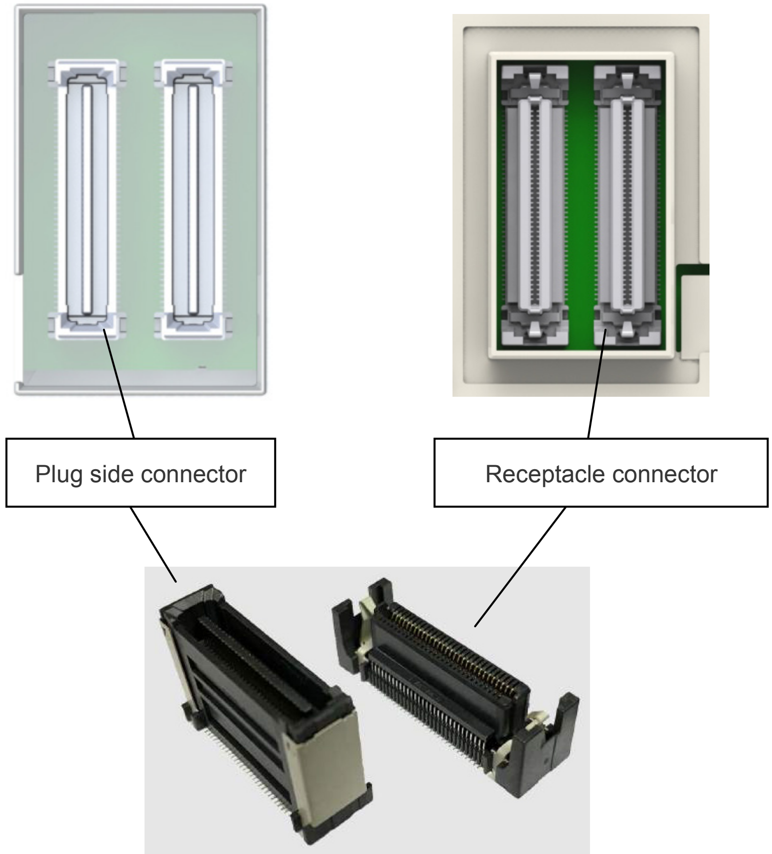
A cable connector for connecting the expansion unit and SCON.



Pin No.	Signal name	Description
1	VP24	Expansion module 24 V power
2	GND	0 V
3	DRV_DY	Driver dedicated internal bus signal differential transmit line +
4	DRV_RA	Driver dedicated internal bus signal differential receive line +
5	DRV_DZ	Driver dedicated internal bus signal differential transmit line -
6	DRV_RB	Driver dedicated internal bus signal differential receive line -
7	AM_SD+	MODBUS differential line +
8	AM_SD-	MODBUS differential line -
9	ACT_PULSE+	Driver signal timing notification signal differential line +
10	ACT_PULSE-	Driver signal timing notification signal differential line -
11	SYNC_PULSE+	Driver synchronizing signal differential line +
12	SYNC_PULSE-	Driver synchronizing signal differential line -
13	RTC_1Hz	1 Hz toggle signal
14	CONE_IN	Unit connection check signal
15	STOP	Stop signal
16	ENABLE	Enable signal
17	NC	Not connected
18	GW_RESET	Gateway reset signal
19	FG	Frame ground

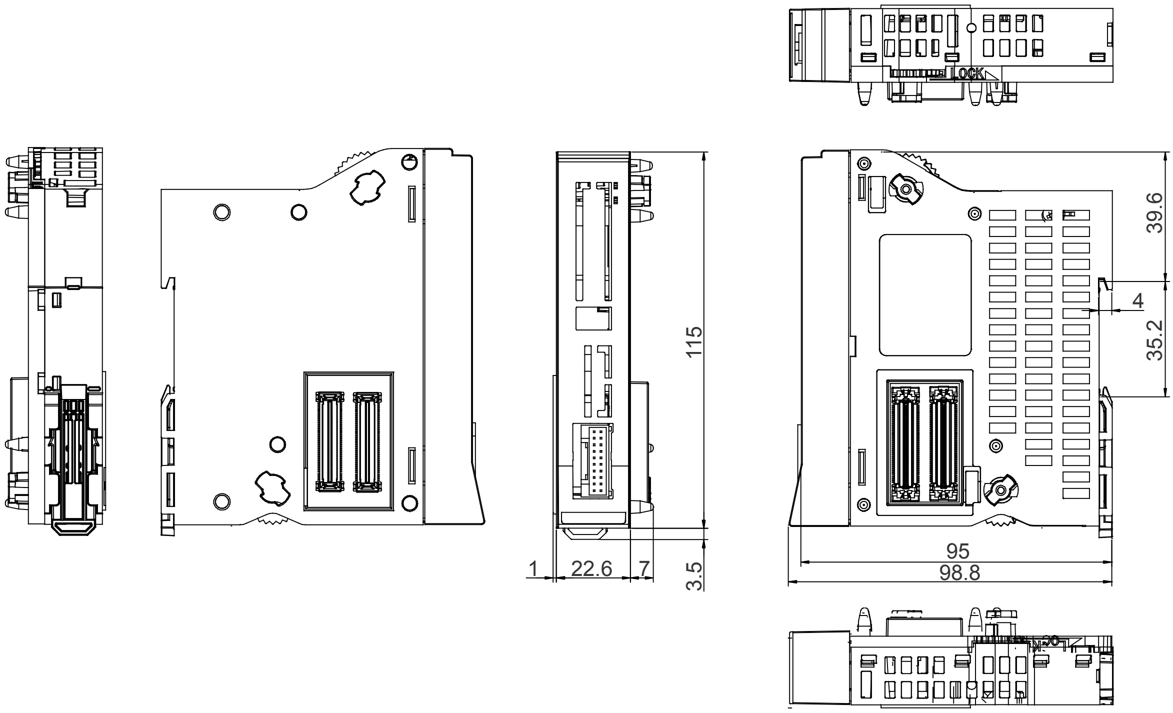
Connectors

A connector for use between units. Two identical connectors are used. The connectors have a floating structure that absorbs connector misalignment due to housing mating or mounting misalignment between connectors.



External dimensions

Item	Specifications
External dimensions	W22.6 mm x H115 mm x D95 mm
Weight	About 99g
External view	See figure below



Specifications Section

Chapter 7

Preventive Maintenance/Predictive Maintenance

7.1 Preventive Maintenance Function 7-1

Driver unit 7-1

Gateway unit 7-1

7.2 Predictive Maintenance Function 7-2

Fan 7-2

Overload warning 7-2

7.1 Preventive Maintenance Function

The RCON system has a preventive maintenance function for the capacitor and a predictive maintenance function for the fan unit.

Driver unit

The temperature of the capacitor for the motor power supply of the driver unit is monitored to calculate the service life.

A message level alarm is generated (alarm code 04A "Estimated life exceeded warning") when the electrostatic capacity decreases 20%. When an alarm is generated, although the capacity of the capacitor is not zero (dried-out), we recommend replacing it as soon as possible.

Gateway unit

The temperature of the capacitor for the gateway unit calendar function is monitored to calculate the service life.

A message level alarm is generated (alarm code 84C "Calendar function backup capacitor estimated life exceeded") when the electrostatic capacity decreases 50%. When an alarm is generated, although the capacity of the capacitor is not zero (dried-out), we recommend replacing it as soon as possible.

7.2 Predictive Maintenance Function

Fan

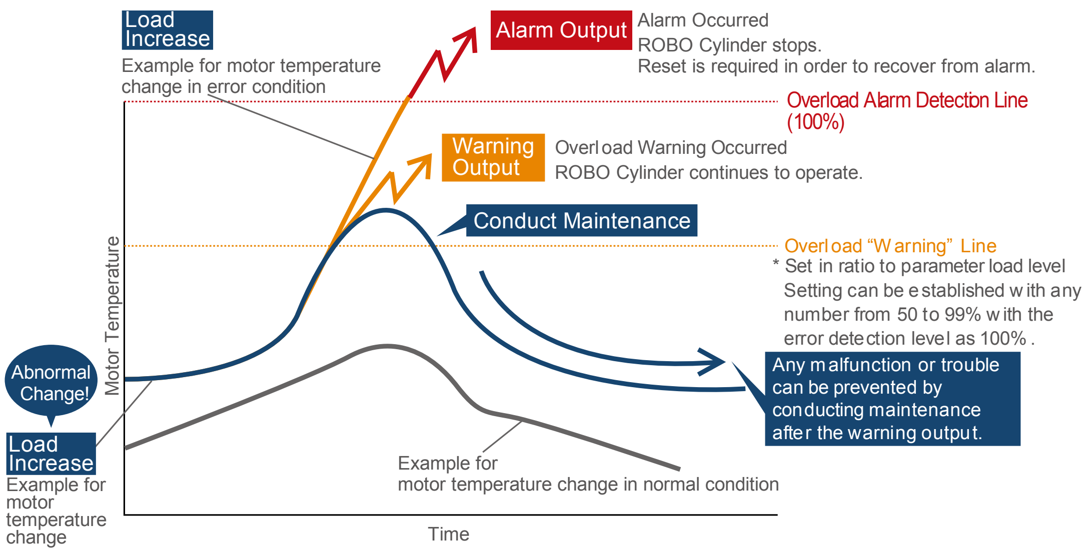
The fan rotation speed of the fan unit attached to the driver unit is monitored.

A message level alarm is generated (alarm code 04C "Fan rotation speed drop") when the fan rotation speed decreases 30%. When an alarm is generated, although the fan will not have stopped completely, we recommend replacing it as soon as possible.

Note that if the fan rotation speed drops 50%, an operation cancel level alarm (alarm code 0D6 "Fan error detection") is generated, and the actuator stops. Replace the fan and reset the alarm to resume operation.

Overload warning

Using this function enables monitoring of motor temperature changes caused by dried-up grease or wear and tear on parts. A warning is output when the preset value is exceeded.
This enables detection of abnormalities before a breakdown or a malfunction occurs.



> Warning output enables detection of items such as those below.
> - Time to supply grease
> - Time to replace components
> - Time to implement mechanical tuning

Parameters related are as follows.

[Overload Load Level Ratio (Parameter No.143)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
143	Overload load level ratio	OLWL	%	50 to 100	100

Outputs alarm code 048 overload warning (message level) when motor temperature exceeds the ratio set in this parameter if motor temperature under rated operation is set as 100%.
[See page 4-55 (Parameter No. 151) for details]

No judgment will be made when set as 100%.

[Minor Trouble Alarm Output Select (Parameter No. 151)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
151	Minor trouble alarm output select	FSTP	–	0: At overload warning Output 1: Message level alarm output	1

If 0 is set, when overload load level ratio (Parameter No. 143) is exceeded, a minor malfunction alarm signal *ALML will be output.
If 1 is set, when a message level alarm is generated, *ALML signal will be output.

Startup Section

Chapter 1

Overview

1.1 Checking the Product 1-1
1.2 Tools to Use 1-5
1.3 Startup Procedure 1-6

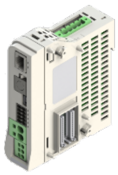
1.1 Checking the Product

Prepare the following devices.

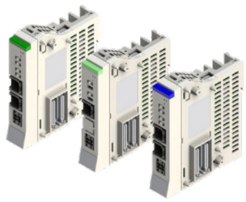
Caution

- The RCON system does not link each unit; individual units are packaged and shipped.
- When unpacking, make sure first that each unit you ordered is present in the correct quantity.
- Below are examples of the products shipped together.

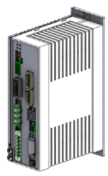
[RCON Gateway Unit]

Part name	Shape	Quantity	Remarks
RCON gateway unit		1	Model example: RCON-GW/GWG
Field network cable connector		1	Model: MSTB2.5/5-ST-5.08 ABGY AU * Supplied with RCON gateway unit
Fan unit (Option)		Depends on gateway unit model	Model: RCON-FU * Supplied with RCON gateway unit
System I/O connector		1	Model: DFMC1.5/5-ST-3.5 * Supplied with RCON gateway unit
Terminal unit		1	Model: RCON-GW-TR * Supplied with RCON gateway unit

[RCON Driver Unit]

Part name	Shape	Quantity	Remarks
RCON Driver Unit		Customer specification dependent	Model example: RCON-PC/PCF/AC/DC
Drive source shutoff connector		1 (per unit)	Model: DFMC1.5/2-STF-3.5

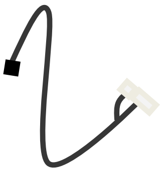
[Expansion Unit]

Part name	Shape	Quantity	Remarks
SCON connection unit		1	Model: RCON-EXT
SCON Controller		Customer specification dependent	Model: SCON-CB-***-RC-0-*
Terminal connector (Terminal resistor)		1	Model: RCON-EXT-TR * Included with RCON-EXT
Connection cable		Customer specification dependent	Model: CB-RE-CTL*** * Required for connecting the expansion unit and SCON. An accessory with SCON-CB-RC specification.

[Actuator (RCP6)]

Part name	Shape	Quantity	Remarks
Actuator (RCP6-SA*C-WA)		Customer specification dependent	Model example: RCP6-**
Motor/encoder cable		1	Model: CB-ADPC-MPA***/ CB-ADPC-MPA***-RB * Supplied with the actuator

[Actuator (RCA)]

Part name	Shape	Quantity	Remarks
Actuator (RCA-SA*C-WA)		Customer specification dependent	Model: RCA-**
Motor/encoder cable		1	Model: CB-ASEP2-MPA*** * Supplied with the actuator
Connector conversion unit		1	Model: RCM-CV-APCS * Required for connecting to the RCON driver unit. Prepare this product separately.
Motor/encoder cable		1	Model: CB-ADPC-MPA***/ CB-ADPC-MPA***-RB * Required for connecting to the RCON driver unit. Prepare this product separately.

[Other peripheral equipment]

Part name	Shape	Quantity	Remarks
24VDC power supply		1	Model: PSA-24* * Commercially available 24 VDC power supply can also be used
Teaching pendant		1	Model: TB-02/03-* * Either teaching pendant or PC software is required
PC software for RC/EC		1	Model: RCM-101-USB * Either teaching pendant or PC software is required

1.2 Tools to Use

The tools used for constructing and starting up the RCON system are PC software for RC/EC or a teaching pendant, and the gateway parameter configuration tool.

[PC software for RC/EC]

- RCM-101-*-* Ver.13.00.00.00 or later

[Teaching pendant]

- TB-02/TB-02D Ver.2.10 or later
- TB-03 Ver.2.10 or later

[Gateway parameter configuration tool]

- Ver.3.1.0.0 or later

The gateway parameter configuration tool is included in the PC software for RC/EC CD-ROM, but you can also download the latest version from our website.
For the operation of PC software for RC/EC and teaching pendant, refer to the following instruction manual.

For an example of using the gateway parameter configuration tool, refer to "4.1 How to Use the Gateway Parameter Configuration Tool (page 4-1)". For details, refer to "Specifications Section Chapter 3 3.9 Gateway Parameter Configuration Tool ".

Reference

PC software operating method	PC software manual (ME0155)
Teaching pendant operating method	Teaching pendant manual (ME0355)
Data setter operation method	Data setter manual (ME0375)

1.3 Startup Procedure

When using this product for the first time, refer to the following procedure and pay attention so as to avoid checking or wiring errors.
This section describes the startup procedure of the RCON system. For installation and wiring of miscellaneous devices connected to the network, controllers and actuators, follow the respective instruction manuals (DVDs).

Checking the package
Are all deliverables present?
No. → Contact IAI or the local IAI distributor.

↓ Yes

Assembling RCON (connecting the unit)
Connect the units to be used, such as gateway unit, driver unit and expansion unit.

↓

Installation and wiring
Install and wire the actuator and controller.
→ **Priority check items**
· Is the frame ground (FG) connected?
· Are noise countermeasures provided?

↓ Yes

Initial setting (gateway setting) * Gateway parameter configuration tool is used.
Set the unit configuration, number of axes, axis number, operation mode, address (station number), field network communication speed and the like according to the system. If the number of axes is incorrect, the PC software cannot be connected.

↓

Initial setting (driver unit/expansion unit setting) * PC software for RC/EC is used.
Set the parameters for each controller.

↓

Communication setting of PLC (master unit)
* Refer to the PLC instruction manual.
Set the PLC node address (station number), communication speed, etc.
← **Priority check items**
· Are the continuous mode and control sequence that supports the system incorporated?

↓

Power ON
(1) When using the expansion unit, turn on the power of the SCON connected to the expansion unit.
(2) Turn on the power of the RCON.
(3) Turn on the power of the PLC (master unit).

↓

Confirming that communication is established
· Make sure that communication is established, with the gateway unit LED.
· Make sure that communication is also established on the PLC (master unit).
* Refer to the PLC instruction manual.
No. → Check the cause of the error through the LEDs and the like and take appropriate actions. If the cause is unknown, try setting again from the beginning.

↓ Yes

Checking the safety circuit
Confirm that the stop circuit (drive-source cutoff circuit) operates normally.
No. → Check the circuit.

↓ Yes

Communication is established and it is ready for operation.
Check the system operation and make adjustments.

↓ Next page

From previous page

Servo ON
Turn ON the servo of all connected axes using the teaching tool.

⚠Caution:
- Keep this operation as far away from the mechanical end and interfering objects as possible. If anything makes contact, move it away. When turning ON the servo, there may be contact with the mechanical end or an interfering object, which will generate an alarm.
- If mounted vertically, repeating servo ON/OFF at the same position may cause the unit to slightly descend due to its own weight. Be careful not to snag hands or damage workpieces.

Check items
Is the status LED SYS* for driver of the axis number given the servo ON command lit in green?

No. → If an alarm is generated, check the alarm description from the teaching tool and take appropriate action.

Yes

Checking the safety circuit
Does the emergency stop circuit (drive-source cutoff circuit) operate normally, and does the servo turn OFF?

No. → Check the emergency stop circuit.

Yes

Position data setting (excluding direct numerical control mode)
Set the position (*), speed, acceleration/deceleration and the like in each position table. * No need to set in simple direct mode

Test run adjustment 1
(1) Cancel the emergency stop and set the unit to low speed without placing a workpiece, and confirm the operation with instructions from the teaching tool.
(2) Place the workpiece, set the speed in automatic operation and check the operation with instructions from the teaching tool.

Check items
Is vibration or noise generated?

No. → Check whether there is a problem with the installation of the actuator, whether the usage conditions have exceeded the rating, etc. Perform servo adjustment if necessary.

Yes

Link to field network
(1) Set the AUTO/MANU switch to the AUTO side and turn the power on again.
(2) When the link with the master unit is established, turn on the MON signal of the gateway control signal.
(While MON signal is ON, control from the field network is possible.)

Yes

Test run adjustment 2
Output travel commands from the host (PLC, etc.) to the controller and confirm by system operation.

⚠ Caution

- If the actual number of connected axes of the RCON system does not match the number of axes set and transferred in the gateway parameter configuration tool, the PC software for RC/EC cannot be connected.
- Set and transfer the gateway parameters suitably according to the actual unit configuration and the number of connected axes.

Startup
Section

Chapter 2

Mounting and Wiring

2.1 Installation ······ 2-1
Requests/Precautions ······ 2-1
Unit connection ······ 2-4
DIN rail mounting ······ 2-5
2.2. Wiring ······ 2-6
Controller wiring ······ 2-6
Actuator wiring ······ 2-9
CC-Link wiring ······ 2-11

2.1 Installation

Requests/Precautions

In order to enhance the reliability of RCON and to fully utilize its functions, consider the following before installation.

[Installation Environment]

Usage is possible in environments of pollution degree 2*1 or equivalent.

*1 Pollution degree 2: Environment in which generally only nonconductive pollution occurs, but temporary conductive pollution may occur due to condensation. (IEC60664-1)

Avoid the following locations for installation.

- Where the ambient temperature exceeds the range of 0 to 55°C
  (If there is no fan unit, derating is available.)
  For simple absolute units and SCON, where the ambient temperature exceeds the range of 0 to 40°C
- Where the temperature changes rapidly and condensation occurs
- Where the relative humidity exceeds 85% RH
- Where the unit is exposed to odorous or combustible gases
- Where the unit is exposed to significant amounts of dust, salt or iron powder
- Where the unit is subject to direct vibration or impact
- Where the unit receives direct sunlight
- Where the unit may come in contact with water, oil or chemical spray
- Where vents are blocked [see the section for installation and noise countermeasures]

If the unit is used in any of the following locations, provide sufficient shielding measures:

- Where noise is generated due to static electricity, etc.
- Where there are strong electrical or magnetic fields
- Where mains or power lines pass nearby

[Installation and mounting]

Consider the size of the control panel, placement of the RCON controller, cooling and the like when designing and manufacturing so that the ambient temperature is 0 to 55°C.

(If it has no fan unit, there is derating.)

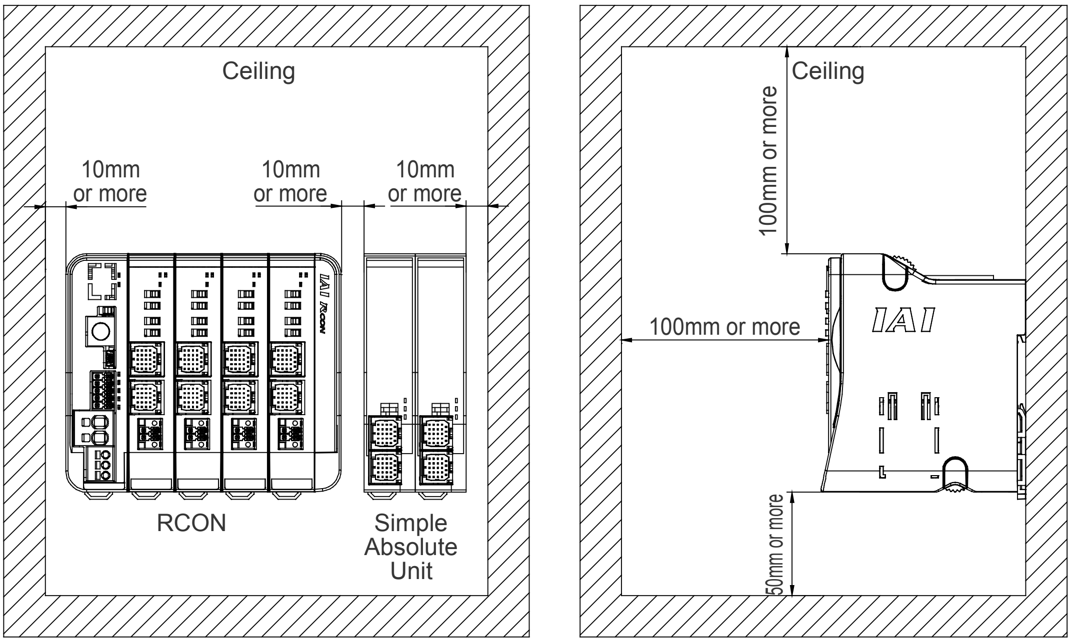
When installing a simple absolute unit or SCON on the same control panel, design and manufacture so that the ambient temperature is 0 to 40°C.

In particular, the performance may deteriorate when the temperature around the simple absolute unit (battery) is too low or too high. Make sure that the temperature is as close to room temperature as possible. (The recommended temperature is about 20°C.)

Item	Specifications
Installation direction	Vertical mounting (exhaust side on top)
Installation method	DIN rail mounting
Installation conditions	See figure below

Item		Specifications
Ambient operating temperature	With fan unit	0 to 55°C
	Without fan unit	0 to 55°C (Note 1)
Ground		Class D grounding

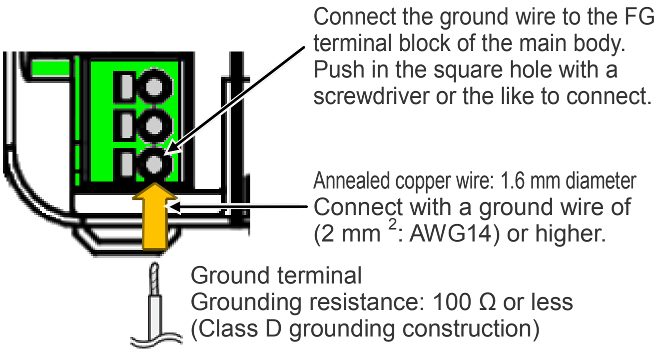
Note 1: If there is no fan unit, derating is available.

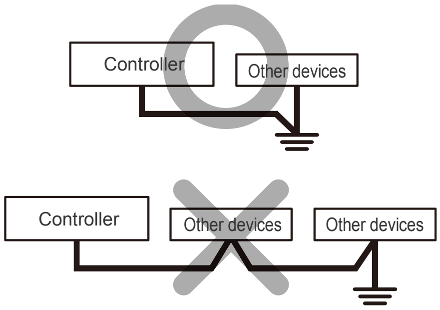


* Simple absolute units can be installed in close contact with each other.

[Noise countermeasures and mounting method]

(1) Grounding for noise countermeasures (frame ground)





Grounding wires should not be connected in common with other devices and separate controllers should be grounded.

(2) Notes on wiring method

1) Twist the 24 VDC power wiring.

2) Separate the wiring of signal wires and encoders from power supply lines and power lines.

(3) Noise sources and noise prevention

For the same power supply path and power supply device in the same device, take measures against noise.

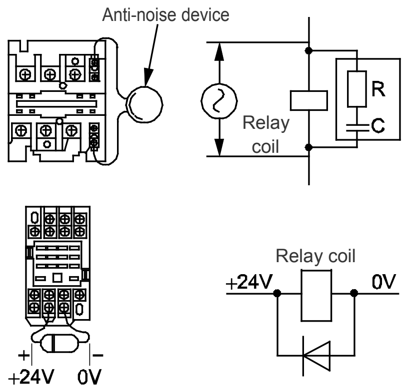
Countermeasure examples for noise sources are shown below.

1) AC solenoid valve / magnetic switch / relay

[Measure] Install an anti-noise device in parallel with the coil.

2) DC solenoid valve / magnetic switch / relay

[Measure] Install a diode in parallel with the coil or use the diode built-in type.



Unit connection

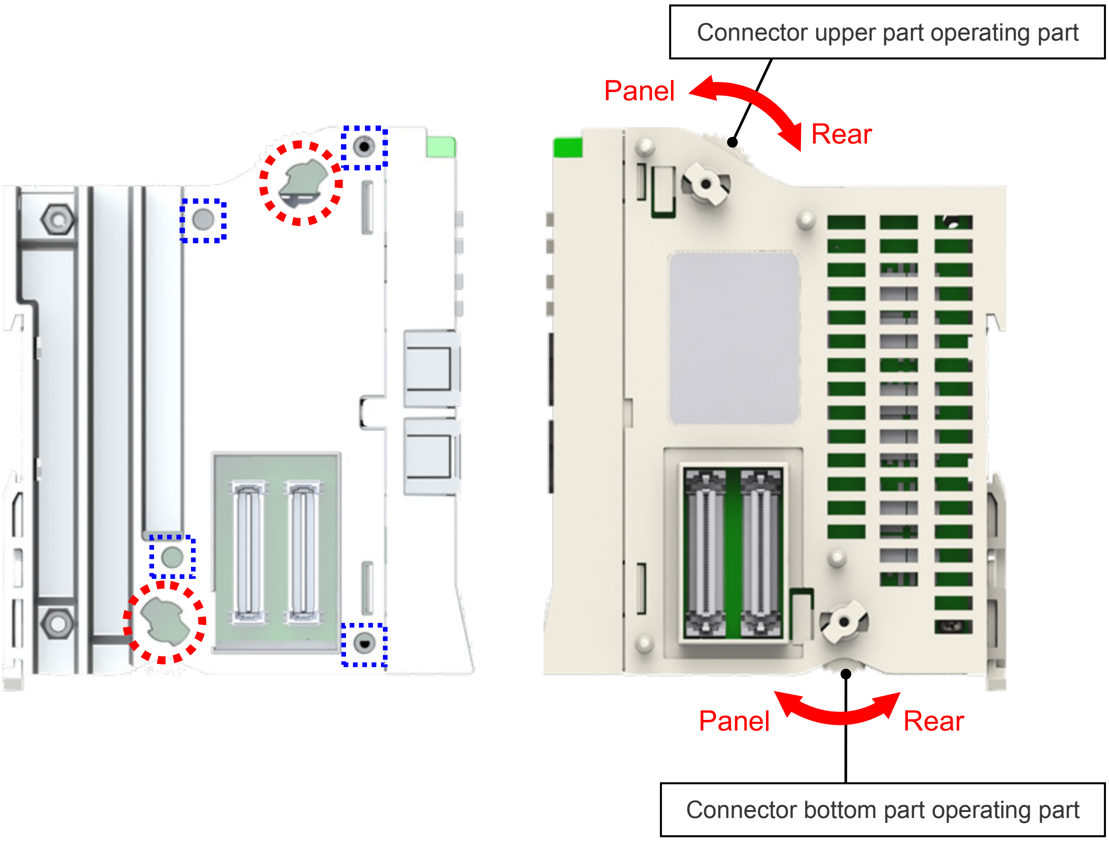
Connect the unit before mounting on a DIN rail.

(1) Turn the operating parts of the connector upper/bottom part towards the panel and position on the panel end.

(2) The 2 sections circled with a dashed line and the 4 positioning bosses within the square dotted lines are used as a total of 6 mating sections for positioning 2 units.

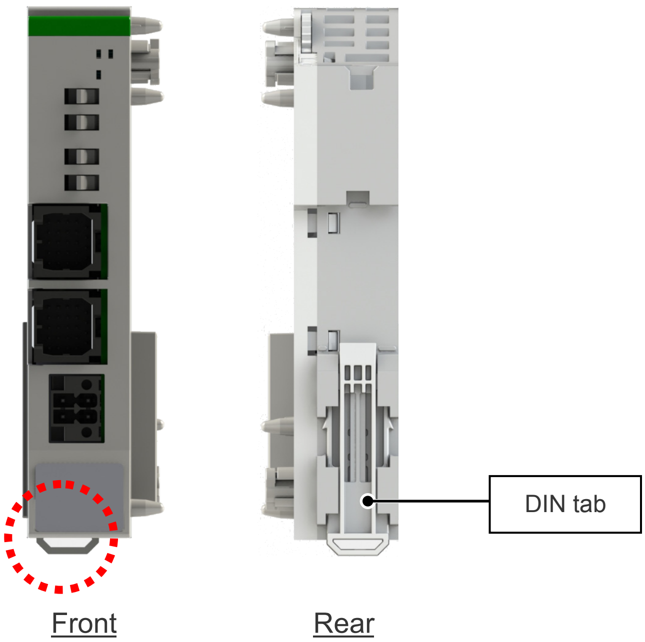
(3) When positioning is completed, insert the cable connectors x 2 so that they are firmly connected.

(4) Turn the operating parts of the connector upper/bottom part towards the rear, rotating firmly until you feel a click.



DIN rail mounting

Pull down the DIN tab visible from the lower part of the housing rear (circled in a dashed line in the figure below), mount on the DIN rail, then push the DIN operating part upward to lock it.



2.2. Wiring

Controller wiring

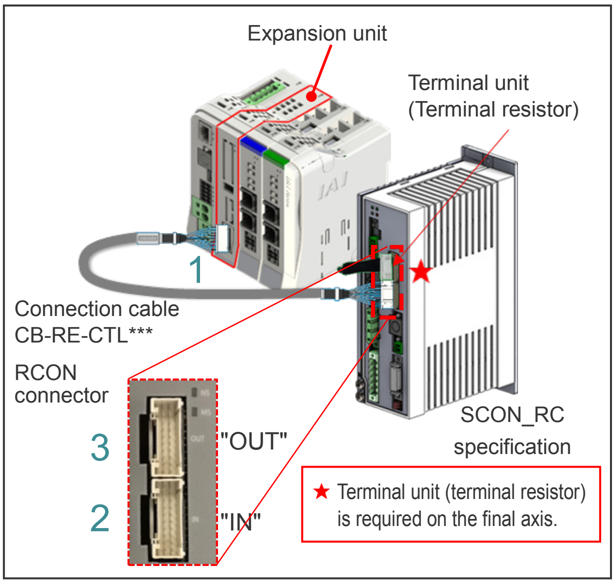
[Connection between SCON and expansion unit]

If including an expansion unit in the RCON system specification, be sure to connect with the following procedure.

1 Connect the cable to the expansion unit.

2 Insert the other end of the cable end connected to the expansion unit to the SCON "IN" side of the RCON cable connector.

3 Insert the terminal unit (terminal resistor) into the RCON connector on the SCON "OUT" side.



For the wiring of the SCON main body, refer to "SCON-CB/CGB controller manual (ME0340)".

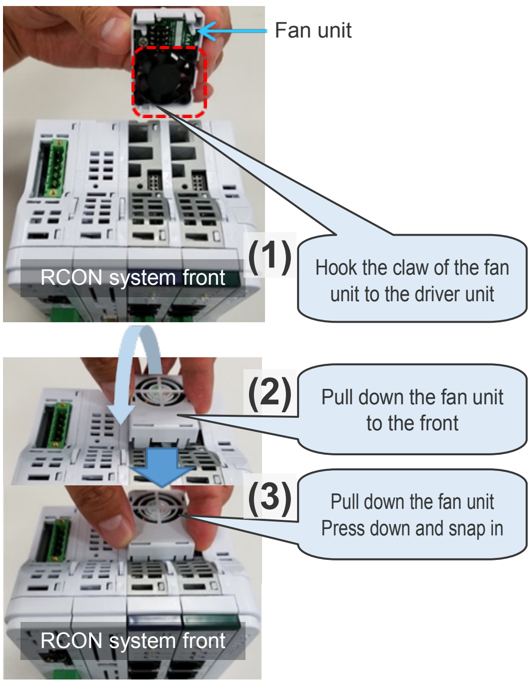
[When installing optional fan unit]

(1) Adjust the installation orientation of the RCON system and fan unit.

Hook the claw of the fan unit to the driver unit as shown in the figure on the right.

(2) Pull down the fan unit to the front of the RCON system.

(3) Press the fan unit from the top and snap in.



[Power supply wiring to RCON system]

To supply power to the RCON system, power supply wiring to the RCON gateway unit is required.

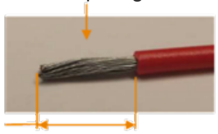
The example below shows the wiring of the RCON gateway unit and the IAI 24 VDC power supply unit PSA-24.

Items to prepare
RCON system/wiring

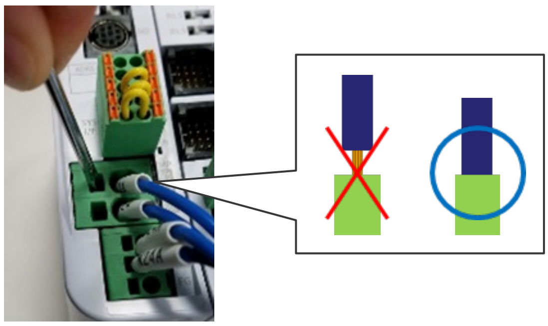
To supply power to the controller, mount the power connector and wire each terminal.
Perform 1 to 4 with reference to the figure and connection diagram below.

[Wiring method to power connector]

(1) Refer to the supplement on the next page for each wiring diameter.



(2) The strip length of the wiring is
- MP: 15 mm
- CP: 10 mm



(3) Insert the wire all the way into the terminal port while pushing the flathead screwdriver into the hole next to the wire insertion port.

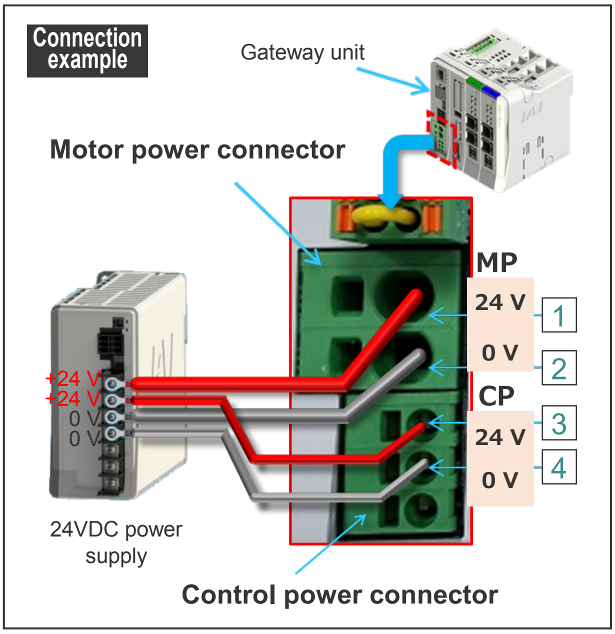
(4) Remove the screwdriver.

1 Connect the "24 V" of MP (motor power connector) to the +24 V terminal of the 24 VDC power supply.

2 Connect the "0 V" of MP (motor power connector) to the 0 V terminal of the 24 VDC power supply.

3 Connect the "24 V" of CP (control power connector) to the +24 V terminal of the 24 VDC power supply.

4 Connect the "0 V" of CP (control power connector) to the 0 V terminal of the 24 VDC power supply.



[Electric wire diameter used for RCON power supply wiring]

For the wires to be connected to the power connector, use the following applicable wires.

Compatible wire

<table>
<tr><th colspan="2">Signal name</th><th>Content</th><th>Compatible wire diameter</th></tr>
<tr><td rowspan="2">MP</td><td>24 V</td><td rowspan="2">Motor drive power supply</td><td rowspan="2">AWG24 ~ 8</td></tr>
<tr><td>0 V</td></tr>
<tr><td rowspan="3">CP</td><td>24 V</td><td rowspan="3">Control power input</td><td rowspan="3">AWG24 ~ 12</td></tr>
<tr><td>0 V</td></tr>
<tr><td>FG</td></tr>
</table>

The controller current consumption varies depending on the controller model and the motor type of the actuator to be connected. Refer to "Specification Section Chapter 2 2.3 Specifications/Power Capacity".

Caution

- If an electric wire thinner than the applicable diameter is used, errors may occur due to voltage drop or the capacity of the actuator may deteriorate.

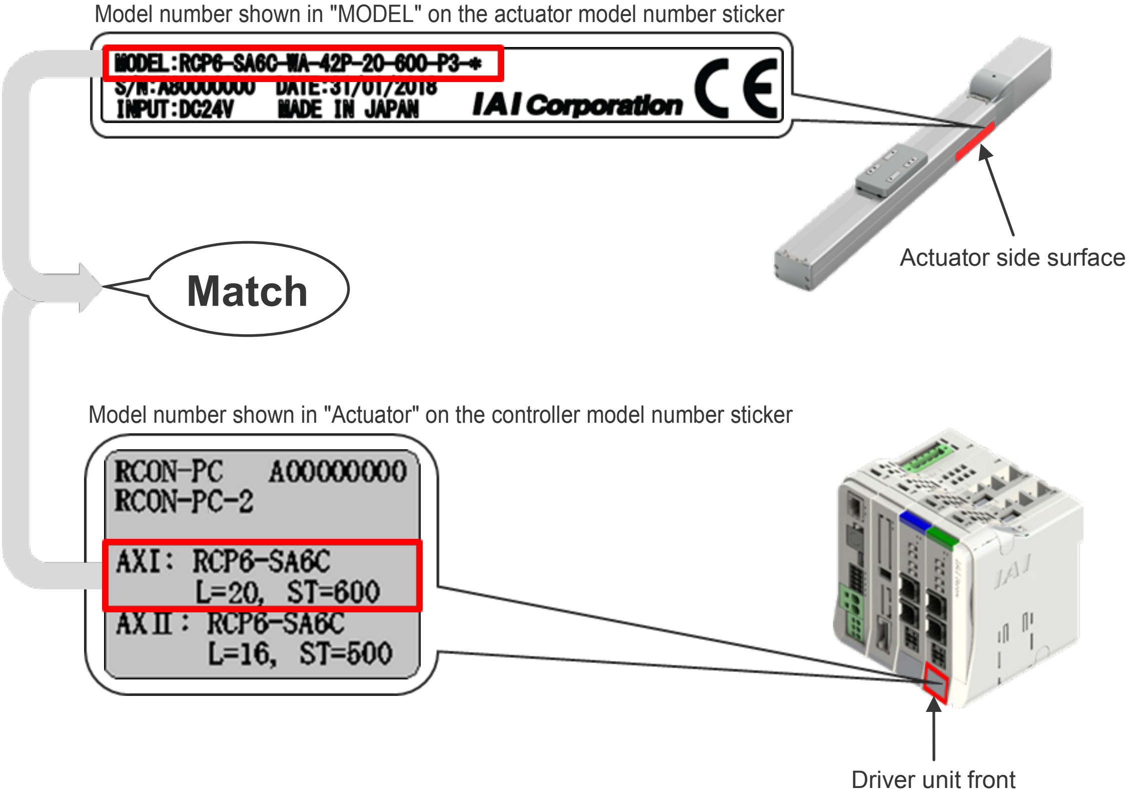
Actuator wiring

[Checking actuator and controller model numbers]

Before connecting the actuator, make sure that the combination with the controller is correct. Connectable actuator models are listed on the model number sticker on the left side of the controller.

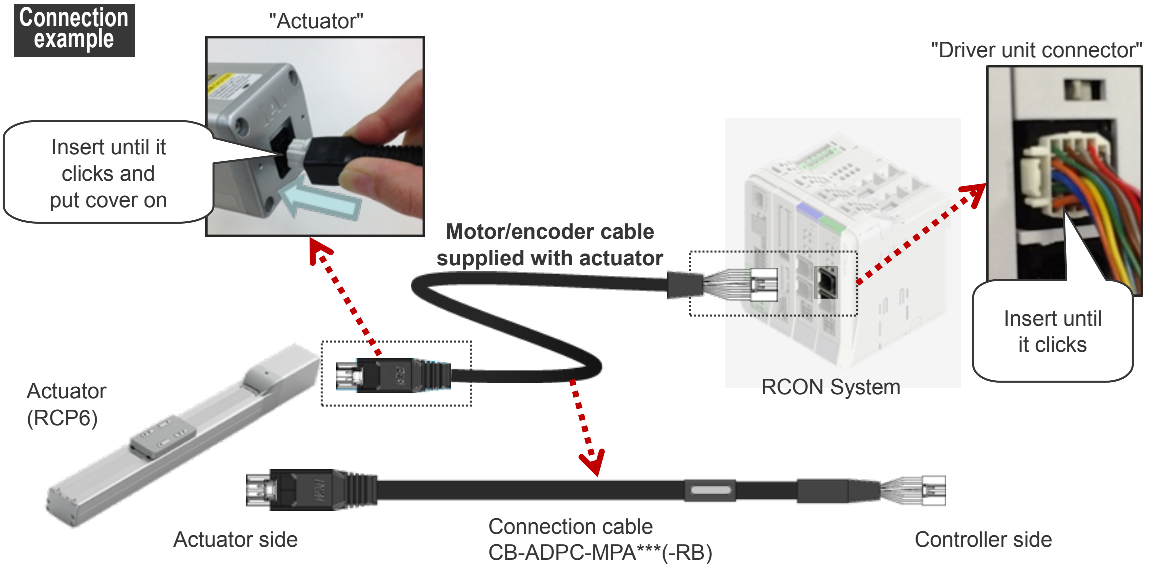
Items to prepare

Controller/actuator/motor encoder cable



[Connecting motor/encoder cable]

● Connecting RCP6 (other than high thrust) / RCP5 (other than high thrust) / RCD series to RCON

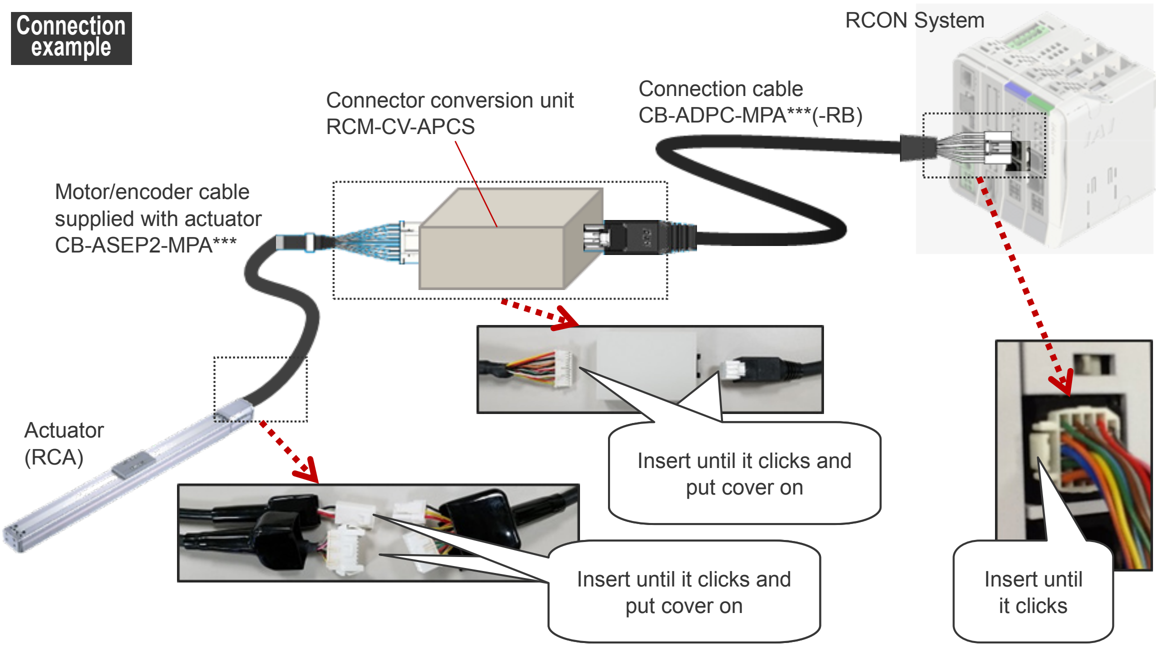


Caution

● Precautions when selecting a motor/encoder cable

Depending on the actuator model, conversion cable CB-CAN-AJ002 and connector conversion unit RCM-CV-APCS may be required to connect the driver unit and the simple absolute unit.

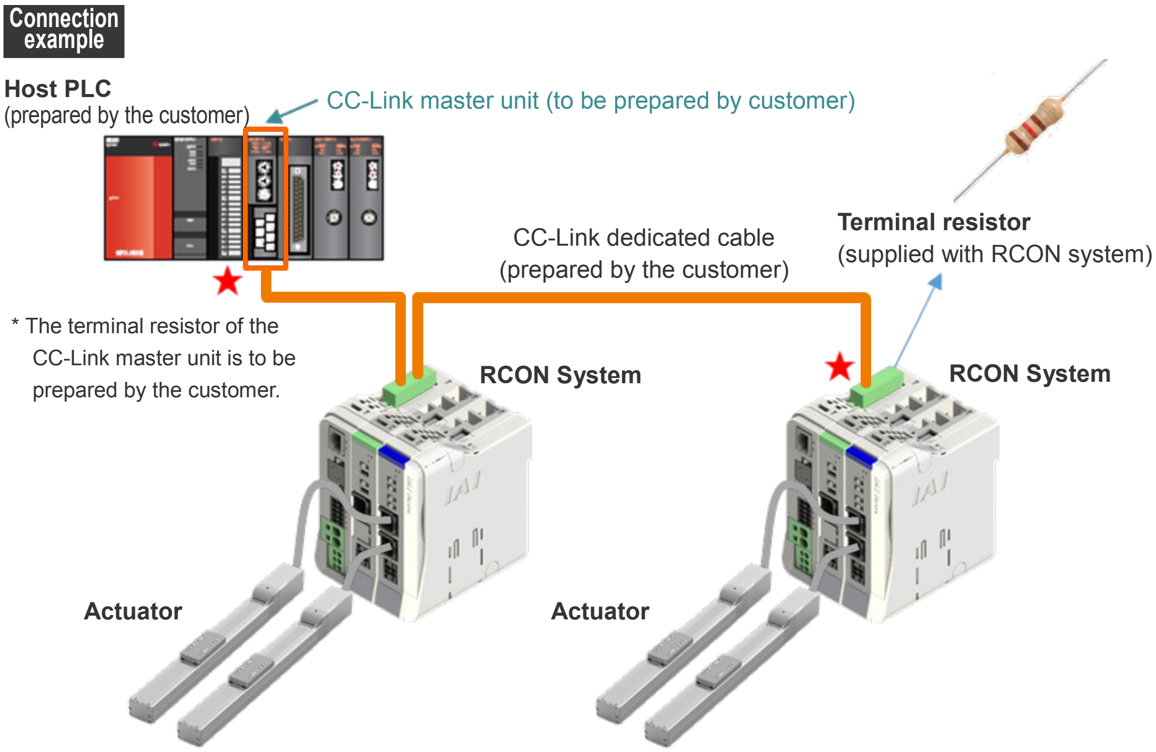
● Connecting RCON and RCP/RCA Series other than the above



CC-Link wiring

This manual introduces the example of connecting with a CC-Link master unit with a Mitsubishi Electric PLC as the host PLC.

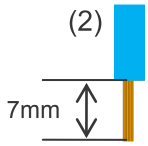
[Connecting the host PLC and two RCON systems]



[CC-Link dedicated cable and cable connector wiring method]

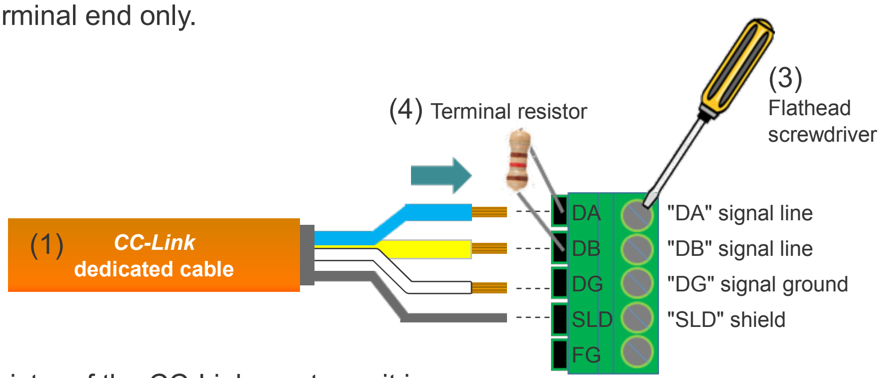
(1) Prepare a CC-Link dedicated cable.

(2) Strip 7mm of insulation from each wire end.



(3) Insert the stripped wiring in the direction of the arrow in the figure below to the back of the connector and tighten with a flathead screwdriver.

(4) (★in "Connection image" above)
Attach the controller attached terminal resistor (Note 1) between the connectors DA and DB at the network terminal end only.



CC-Link cable connector
(*MSTB2.5/5-STF-5.08AU*)

* The terminal resistor of the CC-Link master unit is to be prepared by the customer.

(5) Other CC-Link dedicated cables are wired in the same manner as in (1) to (4).

Point!

● The terminal resistor to be used may differ depending on the CC-Link dedicated cable type.
Cable FANC-SBH (CC-Link dedicated high-performance cable): Terminal resistor: 130 Ω
Cable FANC-SB (CC-Link dedicated cable): Terminal resistor: 110 Ω

Startup Section

Chapter 3

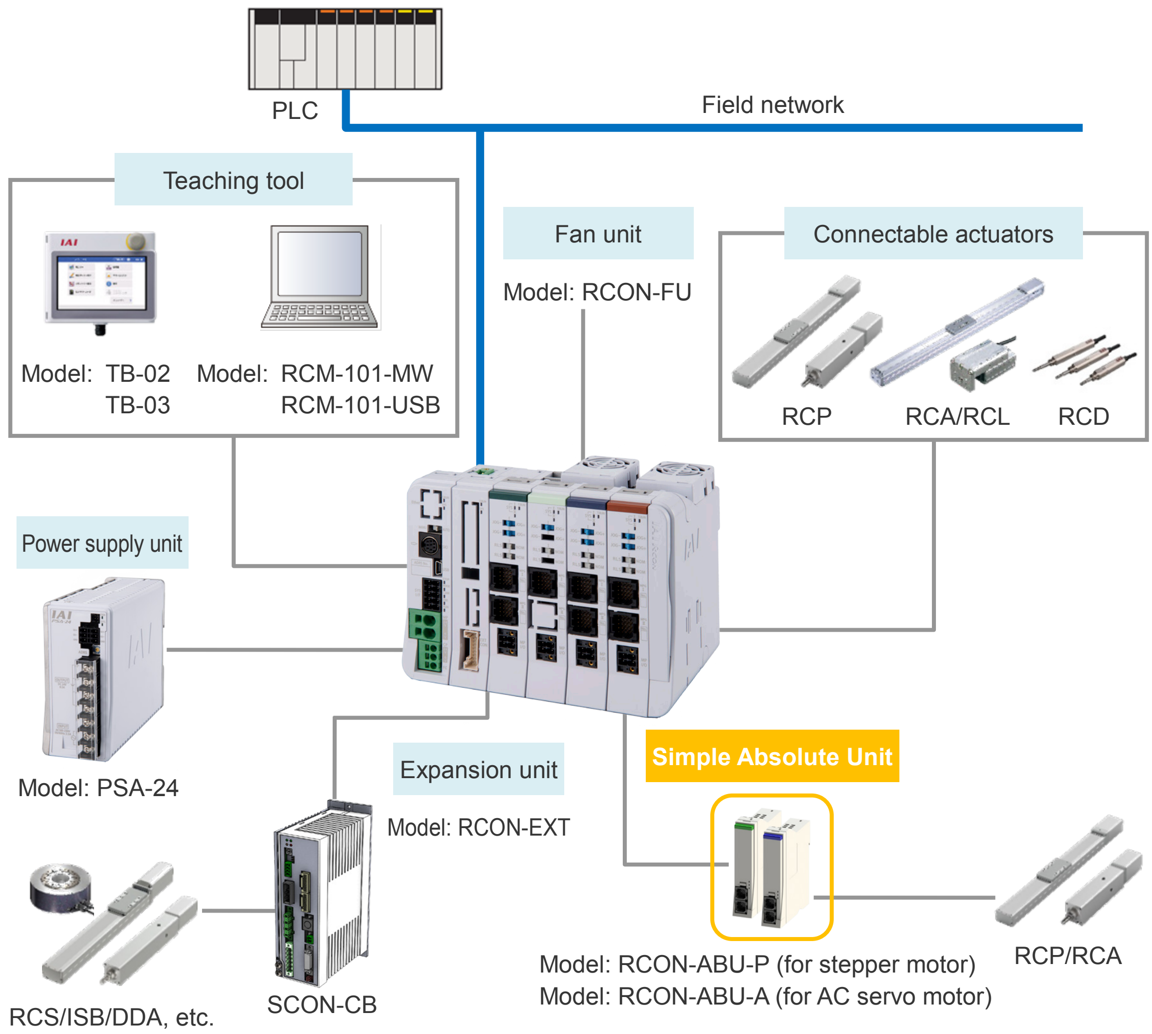
Absolute Reset

3.1 Absolute Reset ········· 3-1
Overview ········· 3-1
3.2 Simple Absolute Unit Wiring ········· 3-2
3.3. Parameter Setting ········· 3-5
3.4 Absolute Reset Procedure ········· 3-6
3.5 Absolute Battery ········· 3-11
3.6 Precautions ········· 3-13

3.1 Absolute Reset

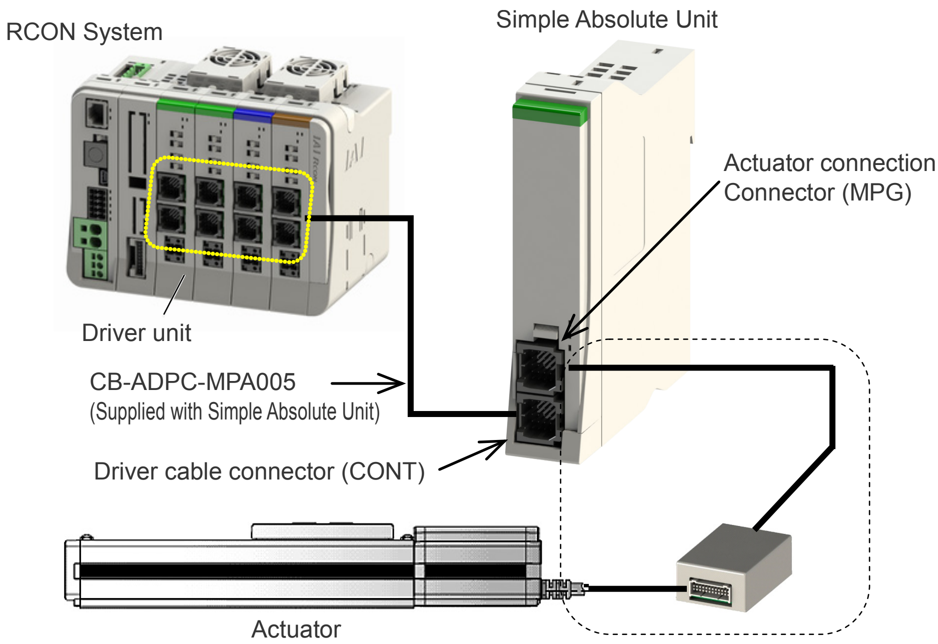
Overview

Incremental specification actuators can be used as absolute specification models by adding a simple absolute unit to the driver unit.
After absolute reset, home return motion is not required even if turning the control power supply OFF and then ON again.



3.2 Simple Absolute Unit Wiring

When using a simple absolute unit, perform wiring as shown below.
1 simple absolute unit is required for each actuator.



For the wiring of this section, refer to the RCON connection cable list on the next page.

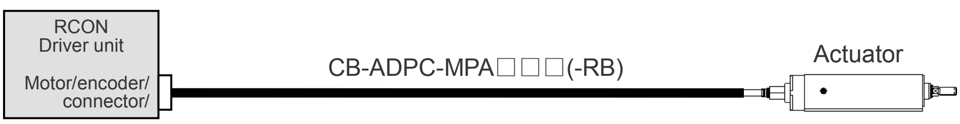
RCON Connection Cable List

No.	Actuator		Connection cable Note 1 (-RB: Robot cable)	Conversion unit	Wiring diagram
	Series	Target type			
(3)	RCP4 RCP4CR RCP4W	Gripper (GR*), ST4525E, SA3/RA3	CB-ADPC-MPA□□□(-RB)	-	A
(4)		High thrust type	CB-ADPC-MPA□□□(-RB) CB-CAN-AJ002 (conversion cable)	-	B
(5)		Other than (3), (4)	CB-ADPC-MPA□□□(-RB) CB-CAN-AJ002 (conversion cable)	-	B
(6)	RCP3		CB-RCAPC-MPA□□□(-RB)	-	C
(7)	RCP2 RCP2CR RCP2W	RCP2 (standard type) RTBS/RTBSL/RTCS/RTCSL	CB-ADPC-MPA□□□(-RB) CB-RPSEP-MPA□□□	Required	D
(8)		RCP2CR (clean room type), RCP2W (Dust-proof/splash-proof type) Rotary (RT*) of above types GRS/GRM/GR3SS/GR3SM of above types	CB-ADPC-MPA□□□(-RB)	-	A
(9)		All (standard / clean room / dust-proof/splash-proof) types of GRSS/GRLS/GRST/GRHM/GRHB Short type (RCP2-SRA4R/SRGS4R/SRGD4R)	CB-RCAPC-MPA□□□(-RB)	-	C
(10)		High thrust type	CB-ADPC-MPA□□□(-RB) CB-CFA-MPA□□□(-RB)	Required	D
(11)		Other than (7) to (10)	CB-ADPC-MPA□□□(-RB) CB-PSEP-MPA□□□	Required	D
(12)	RCA2/RCA2CR/RCA2W, RCL		CB-RCAPC-MPA□□□(-RB)	-	C
(13)	RCA RCACR RCAW	Short type (RCA-RA4R/SRGS4R/SRGD4R)	CB-RCAPC-MPA□□□(-RB)	-	C
(14)		Other than (13)	CB-ADPC-MPA□□□(-RB) CB-ASEP2-MPA□□□	Required	D

Note 1: Up to 20 m from each driver unit to the actuator, with or without the conversion unit.

Wiring diagram A

(3) RCP4 Gripper (GR*), ST4525E, SA3/RA3
(8) RCP2CR/RCP2W rotary (RT*) and GRS/GRM/GR3SS/GR3SM

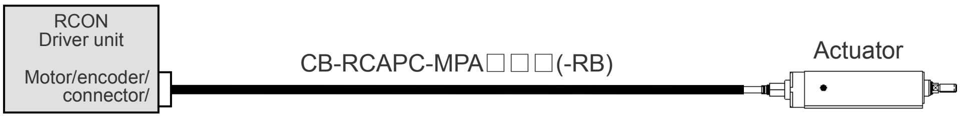


Wiring diagram B

(4) RCP4 high thrust type
(5) Other than RCP4 (gripper, ST4525E, SA3/RA3, high thrust type)

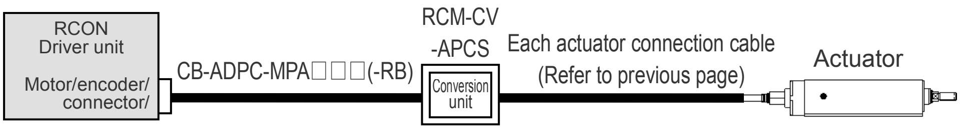
Wiring diagram C

(6) RCP3
(9) RCP2/RCP2CR/RCP2W-GRSS/GRLS/GRST/GRHM/GRHB,
RCP2 short type (SRA4R/SRGS4R/SRGD4R)
(12) RCA2, RCL
(13) RCA short type (SRA4R/SRGS4R/SRGD4R)



Wiring diagram D

(7) RCP2-RTBS/RTBSL/RTCS/RTCSL
(10) RCP2 high thrust type
(11) RCP2, excluding some (refer to table above for details)
(14) Other than RCA short type (SRA4R/SRGS4R/SRGD4R)



Startup Section

Chapter 3 Absolute Reset

3.3 Parameter Setting

In the RCON system, the factory default setting of the parameter No. 83 "Absolute unit" is "0". For axes used in the simple absolute specification by connecting a simple absolute unit, change the parameter to "1".

AC servo motor specification and stepper motor specification only

[Absolute Unit (Parameter No.83)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
83	Absolute Unit	ETYP	–	0: Not in use 1: In use	0

For stepper motor specification

Set 1 for simple absolute specification.
For the battery-less absolute specification, the factory default value is 1. Change the setting to 0 when using in incremental specification.

For servo motor specification

Set 1 for simple absolute specification.
Battery-less absolute specification cannot be used in incremental specification.

3.4 Absolute Reset Procedure

The simple absolute specification and battery-less absolute specification retain the encoder position information even when the power is turned off. With these specifications, there is no need to perform home return every time at startup.
For simple absolute specification, home must be registered (absolute reset) in the following cases (1) to (3).

(1) Initial startup
(2) When the power of RCON system is turned off and the battery of the simple absolute unit is replaced
(3) When the motor/encoder cable is removed from the simple absolute unit

For battery-less absolute specification, home must be registered in the following cases (1) and (2).

(1) When replacing motor
(2) When absolute error occurs

Absolute reset is performed by operating a teaching tool such as PC software for RC/EC or issuing a command from the host PLC. Each procedure is shown below.

[Absolute reset procedure from teaching tool]

(1) Connect the driver unit and actuator.

(2) For the simple absolute specification, connect the simple absolute unit between the driver unit and actuator.

(3) Connect the teaching tool and turn on the RCON system power.

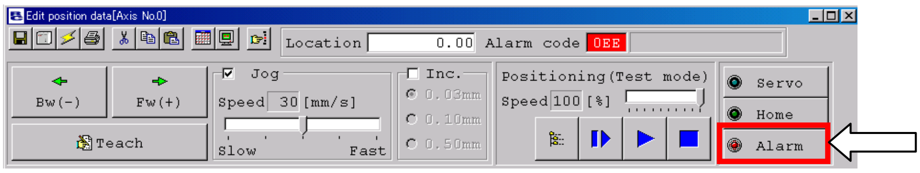
(4) When absolute encoder error is displayed on the teaching tool, reset the alarm.

(5) Perform home return. When home return is completed, the home position is memorized at the same time as it is established.

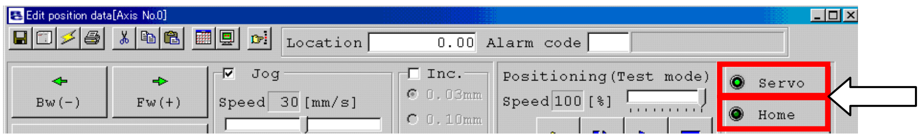
Each procedure by teaching tool is shown below

[For PC software for RC/EC]

1 Select the position data from the main screen and press the Alarm button.

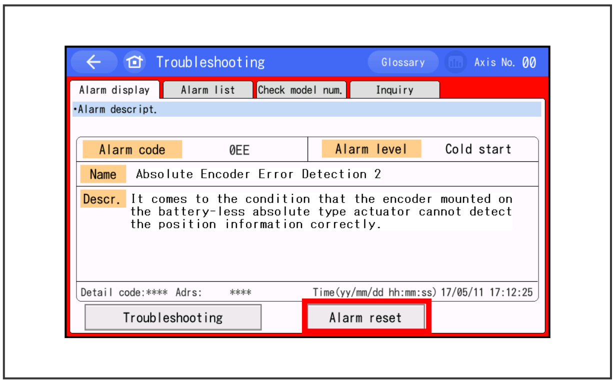


2 After turning the servo ON with the Servo button, press the Home button.

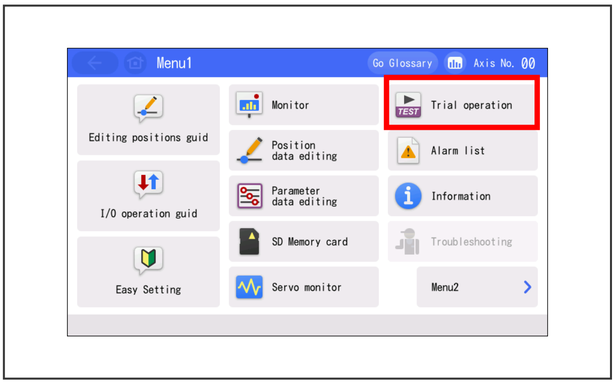


[For teaching pendant (TB-02/TB-03)]

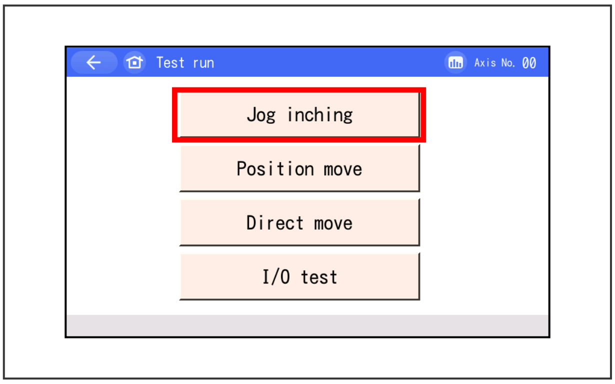
1 Touch Alarm reset .



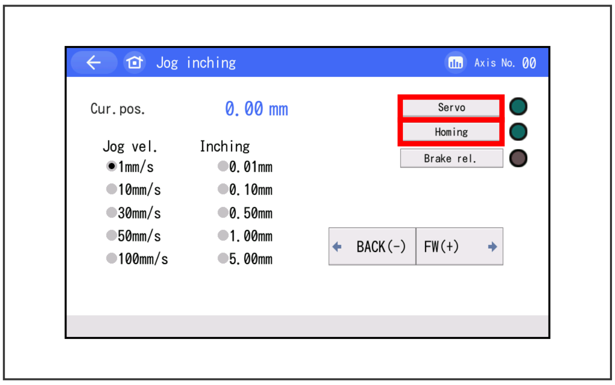
2 Touch Trial operation on the Menu 1 screen.



3 On the test run screen, ouch Jog inching .



4 On the jog/inching screen, turn the servo on by touching Servo , then touch Homing .



[When performing absolute reset from host]

Perform the following procedure.

(1) Supply the control power and motor power (24 VDC).

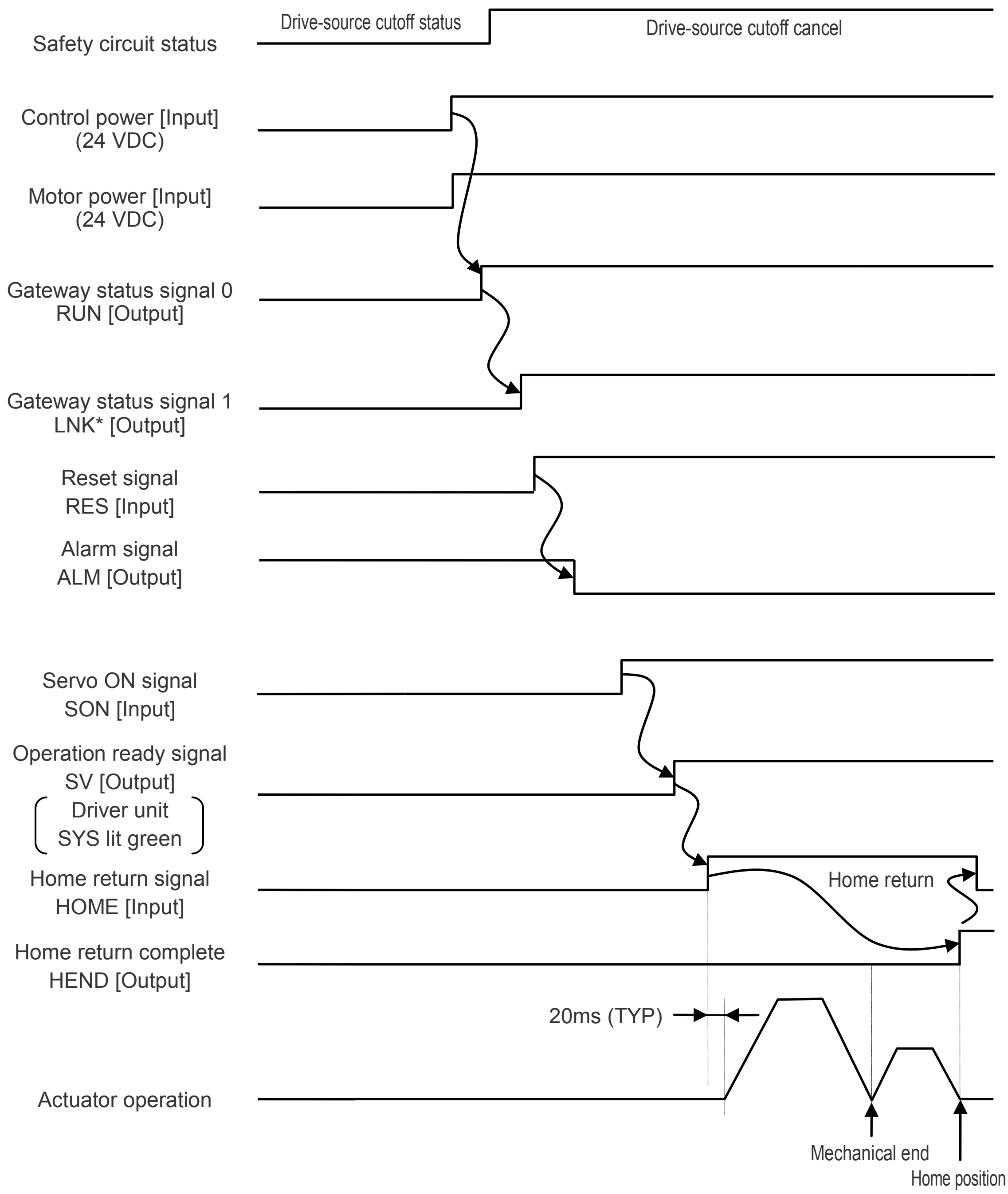
(2) Cancel the STOP signal input or the drive shutoff status and set to conductive status.

(3) Confirm that the absolute encoder error alarm is output.
(Confirm that the alarm signal ALM is ON.)

(4) Input the reset signal RES and reset the alarm.
The RES signal is processed with ON edge, but if the cause of the other alarm is not removed, the alarm (ALM signal ON) will recur. Check the causes of the other alarms and take appropriate actions.

(5) After confirming that the ALM signal is OFF, input the servo ON signal SON.

(6) After confirming that the operation ready signal SV is ON, input the home return signal HOME. Home return motion begins. When home return is completed, the home return complete signal HEND is output.


Safety circuit status
Drive-source cutoff status
Drive-source cutoff cancel
Control power [Input]
(24 VDC)
Motor power [Input]
(24 VDC)
Gateway status signal 0
RUN [Output]
Gateway status signal 1
LNK* [Output]
Reset signal
RES [Input]
Alarm signal
ALM [Output]
Servo ON signal
SON [Input]
Operation ready signal
SV [Output]
Driver unit
SYS lit green
Home return signal
HOME [Input]
Home return
Home return complete
HEND [Output]
20ms (TYP)
Actuator operation
Mechanical end
Home position

3.5 Absolute Battery

[Absolute Battery Specifications]

Item	Specifications
Type	Cylindrical sealed nickel-metal hydride battery
Manufacturer	FDK Corporation
Model	AB-7
Nominal voltage	3.6 V
Rated capacity	3,100 mAh
Nominal capacity	3,700 mAh
Average life	Approx. 3 years (varies widely with operating conditions)
Weight	190 g
Charging time	Approx. 72 hours

[Absolute Battery Charging]

Charge for at least 72 hours continuously if using for the first time, after replacing the battery, and when power has been turned off for extended periods. The battery is charged while 24 VDC is supplied to RCON.

If RCON power is turned OFF beyond the data retention time, the data will be lost, so charge regularly.
The battery has a limited lifetime that gradually decreases data retention time. Replace the battery when the retention time decreases significantly even if properly charged.

Data retention time (approximate time when battery is new)

Parameter No.155 settings	Upper limit of encoder rotation speed when power is OFF [r/min]		Battery retaining time guideline [days]	Retaining time per 1 hour of charge time (guideline) [h]
	If connected actuator is not RCA2-***NA	If connected actuator is RCA2-***NA		
0	100	75	20	6.6
1	200	150	15	5.0
2	400	300	10	3.3
3	800	600	5	1.6

For details, refer to "Specifications Section Chapter 4 4.5 Parameters (page 4-48)".

(Example) When used under the following conditions: "Monday ~ Friday: 8 hours charging / 16 hours discharging per day, Saturdays and Sundays: discharging"
Connected axis: When not RCA2-***NA

(1) If Parameter No. 155 is set to 3...
Total charge: 8 [h] operation per day x 1.6 [h] retention time per 1 hour charge x 5 [days] weekdays = 64 [h]
Total discharge: Nightly down time 16 [h] x weekdays 5 [days] + weekend down time 48 [h] = 128 [h]
→ If starting on Monday from a fully charged state, the total discharge amount exceeds the total charge amount by 64 [h] in one week, so the full charge amount decreases by 64 [h] each week. Accordingly, a full charge is required every 10 days.

(2) If Parameter No. 155 is set to 2...
Total charge: 8 [h] operation per day x 3.3 [h] retention time per 1 hour charge x 5 [days] weekdays = 132 [h]
Total discharge: Nightly down time 16 [h] x weekdays 5 [days] + weekend down time 48 [h] = 128 [h]
→ If starting on Monday, the total charge amount exceeds the total discharge amount, so there is no need to maintain continuous full charge. Charge increases by 4 [h] each week.

[Absolute Battery Voltage Drop Detection]

If the absolute battery voltage drops, error detection is performed in accordance with the voltage.

Voltage	Output signal status	Alarm code
2.5V ±8% or less	Alarm signal *ALM OFF	0EE "Absolute encoder error detection 2" or 0EF "Absolute encoder error detection 3"

If an alarm occurs, absolute reset must be performed after replacing the battery.
RCON checks the battery voltage at power ON. Detection does not occur even if the battery voltage drops to the alarm level while RCON is energized.

3.6 Precautions

[Precautions when changing parameters]

If the following parameters are changed, an absolute error will occur. After changing the parameters, absolute reset must be performed once again.

(1) Parameter No.5 "Homing direction"
(2) Parameter No. 22 "Homing offset"
(3) Parameter No. 77 "Ball screw lead length"
(4) Parameter No. 78 "Axis motion type"

[Absolute Battery handling]

Always observe the following safety precautions.

(1) Do not disassemble under any circumstances. The electrolyte is a strong alkali solution. It is harmful to skin and clothing.
(2) Never short the electrodes out (never directly connect + and - electrodes). Devices may be damaged, or the generated heat may cause burns.
(3) Never place into fire, as it may burst.
Also do not submerge underwater, as the battery will cease to function.
(4) Do not solder directly.
The safety mechanism may explode due to damage to the safety valve in the battery cap.
(5) If the power remains shut OFF for an extended period of time with the connector connected, deep discharge will take place, leakage may occur and the performance/life of the battery may be significantly lowered.
Unplug the connector when shutting OFF the power for extended periods of time due to equipment relocation, remodeling, etc.
(6) When disposing, take measures such as the use of an appropriate collection box installed at a recycling center.

Startup Section

Chapter 4

Network Configuration

4.1 How to Use the Gateway Parameter Configuration Tool 4-1

PC software setting 4-1

RCON setting: CC-Link (for PiC of PLC wiring / programming) 4-14

4.2 Master Side Setting 4-23

PLC setting: CC-Link (for PiC of PLC wiring / programming) 4-23

4.3 PC Software for RC/EC Setting 4-36

PC software for RC/EC setting 4-36

Position data registration 4-40

4.4 Address Configuration 4-48

Overall address configuration example 4-50

Gateway control/status signals 4-61

Power supply unit status signal 4-63

4.1 How to Use the Gateway Parameter Configuration Tool

PC software setting

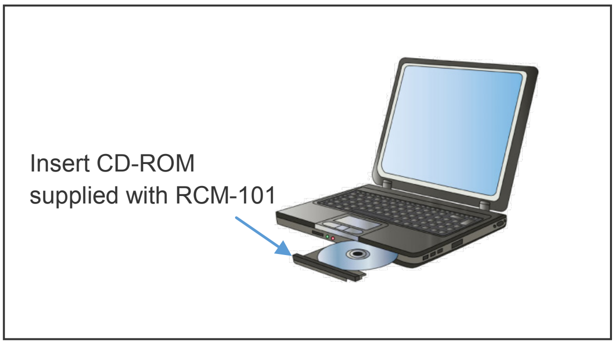
[Installing gateway parameter configuration tool]

Items to prepare

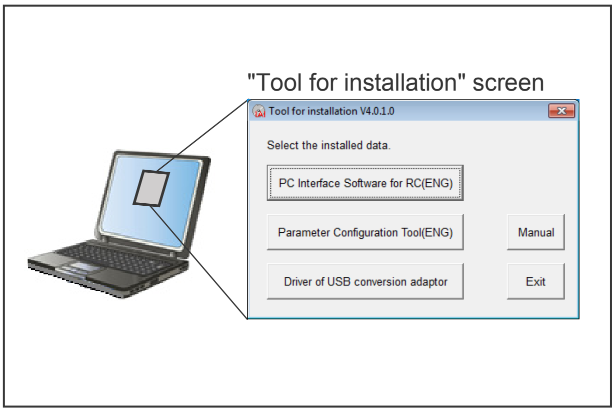
RCON system / PC / RCM-101 supplied CD-ROM / cable

This section describes the operating environment on a PC with Windows 7.

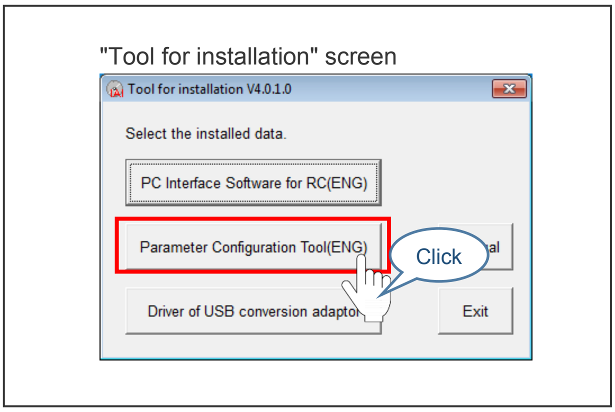
1 (1) Insert the CD-ROM supplied with RCM-101-USB into the CD drive of the PC.



(2) The "Tool for installation" screen will be displayed.

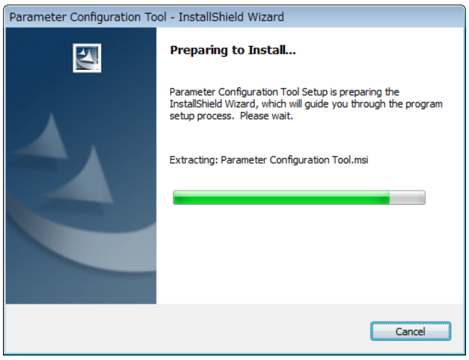


2 Click the "Tool for installation" screen Parameter Configuration Tool(ENG) .



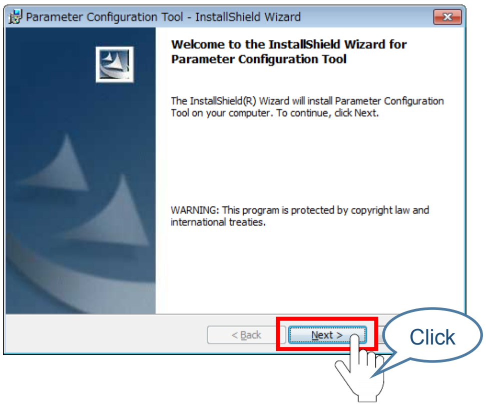
3 (1) When installation preparation of the gateway parameter configuration tool is started, the "Parameter configuration tool InstallShield Wizard" screen will be displayed.

"Parameter configuration tool - InstallShield Wizard" screen



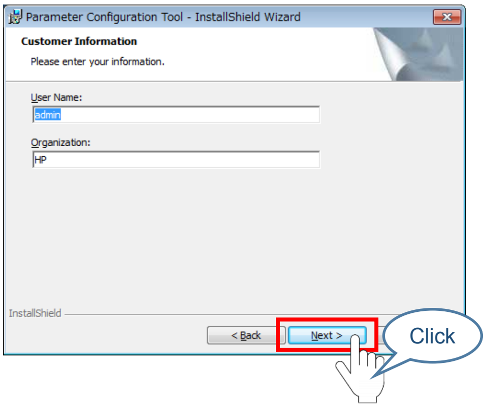
(2) After the screen switches to the one at right, click Next > .

"Parameter configuration tool - InstallShield Wizard" screen



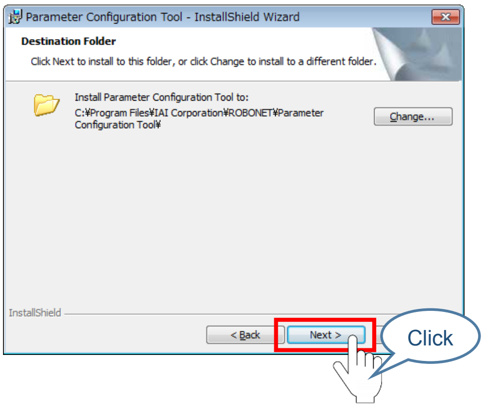
(3) Click Next > .

"Parameter configuration tool - InstallShield Wizard" screen



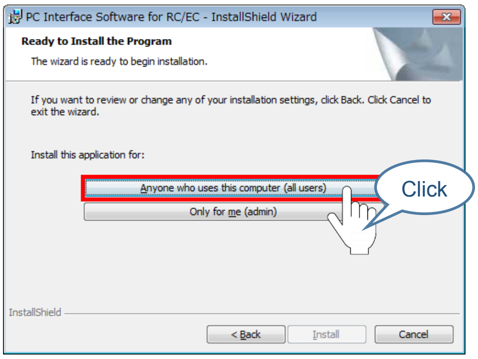
(4) Click Next > .

"Parameter configuration tool - InstallShield Wizard" screen



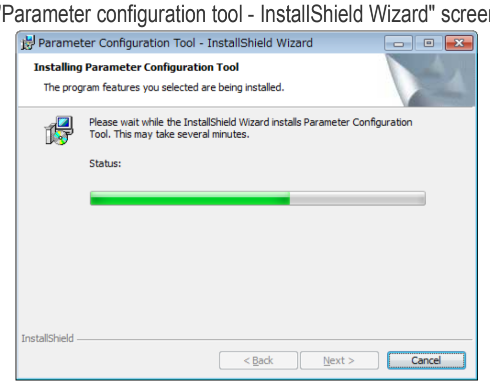
(5) Click Anyone who uses this computer (all users) .

"Parameter configuration tool - InstallShield Wizard" screen



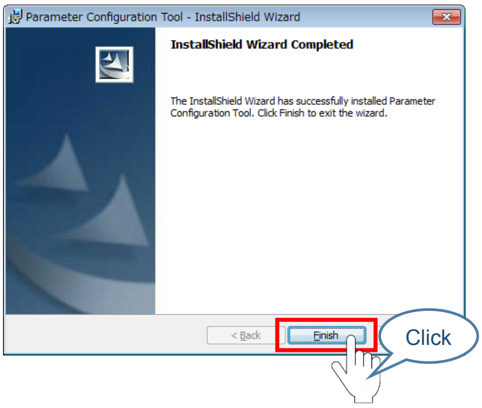
(6) The screen on the bottom right appears and the installation of the gateway parameter configuration tool starts.

"Parameter configuration tool - InstallShield Wizard" screen

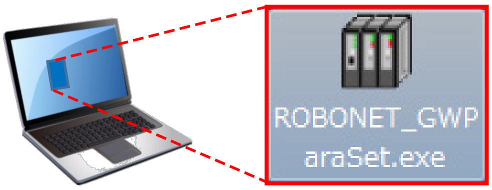


(7) When the screen on the bottom right appears, the installation of the gateway parameter configuration tool is completed.
Click Finish .

"Parameter configuration tool - InstallShield Wizard" screen



Make sure the shortcut for "Gateway parameter configuration tool" is displayed.



This concludes the installation of the gateway parameter configuration tool.

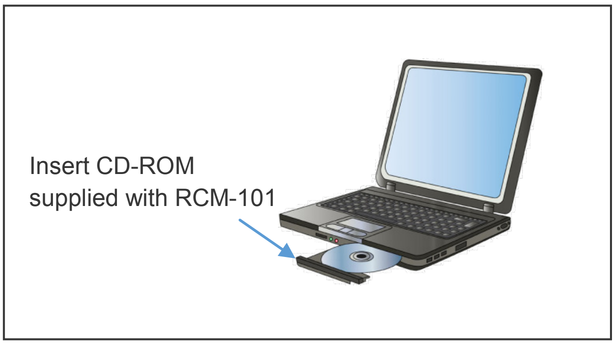
Startup Section

Chapter 4 Network Configuration

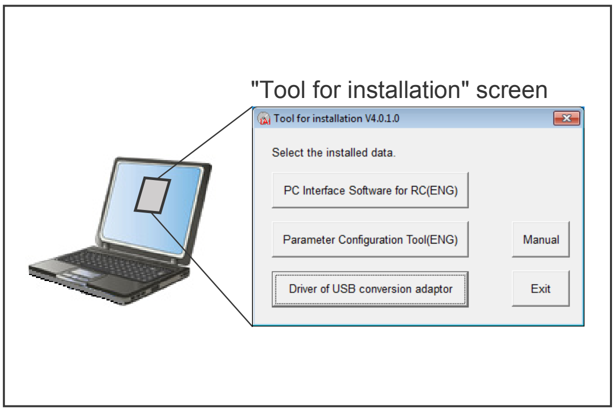
[Installing USB driver and connecting with controller communication]

The operation is explained in the IAI PC software for RC/EC (PC OS environment is Windows 7).

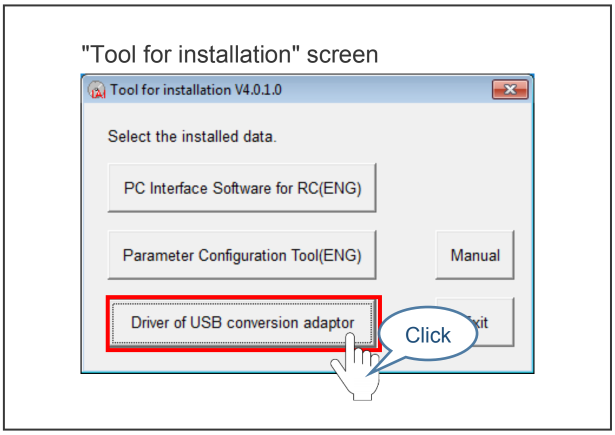
1 (1) Insert the CD-ROM supplied with RCM-101-USB into the CD drive of the PC.



(2) The "Tool for installation" screen will be displayed.

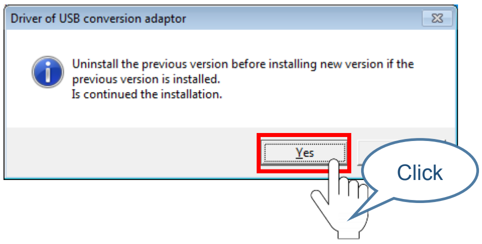


2 Click the "Tool for installation" screen [Driver of USB conversion adaptor].



3 When the "Driver of USB conversion adaptor" screen is displayed, click Yes .

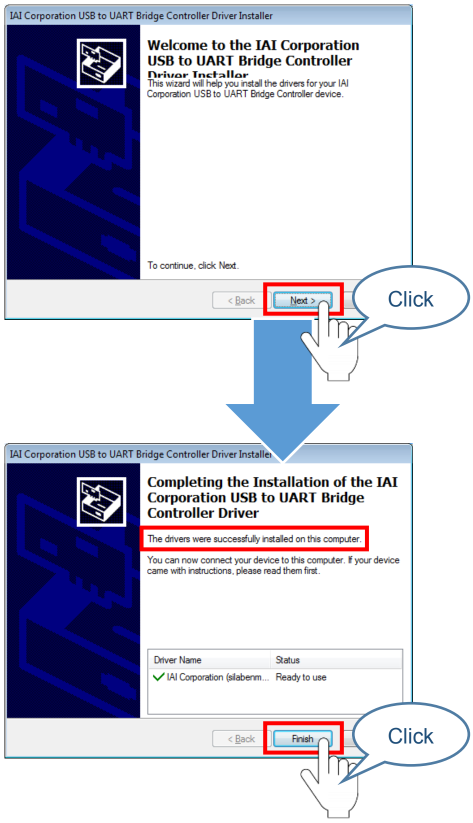
"Driver of USB conversion adaptor" screen



4 "IAI Corporation USB to UART Bridge Controller Driver Installer"
When the screen is displayed, click Next > .

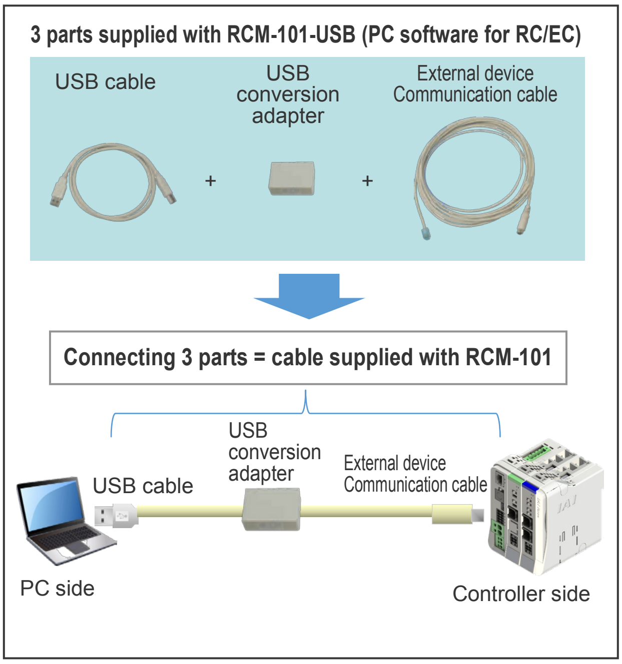
When the message "The driver was successfully installed on this computer" is displayed on the same screen, click Finish .

"IAI Corporation USB to UART Bridge Controller Driver Installer" screen



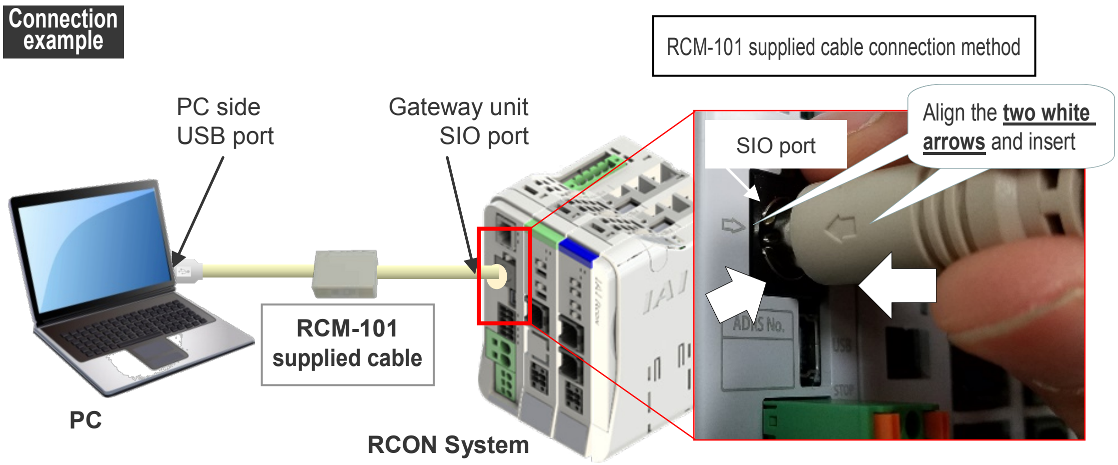
5 Connect the RCM-101 supplied cable.

(1) As shown in the figure on the right, connect the 3 parts supplied with RCM-101-USB.



This cable is hereafter referred to as "RCM-101 supplied cable".

(2) Connect the RCM-101 supplied cable as shown below.

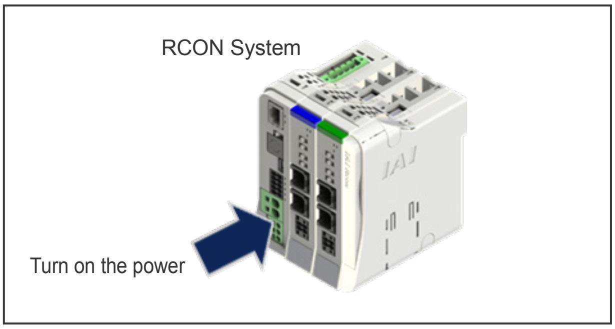


Caution

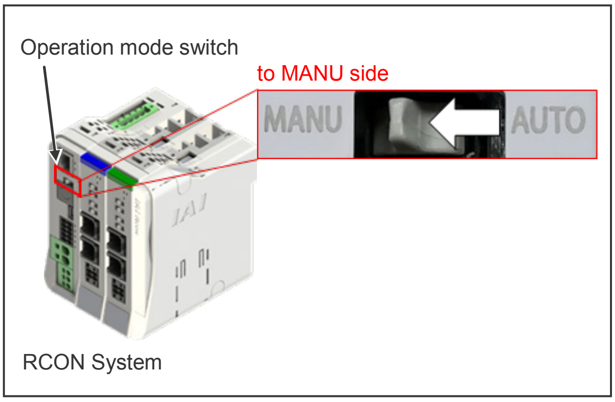
- When connecting the RCM-101 supplied cable to the gateway unit "SIO" port, insert matching the two white arrows as shown in the red frame above. Failure to do so may cause damage to the connector.

6 Turn on the RCON system.

After connecting the RCM-101 cable, turn on the 24 VDC power.



7 Tilt the operation mode switch on the front of the gateway unit to the **"MANU"** side.

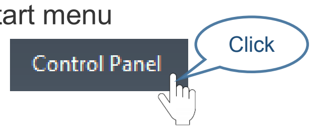


8 Check whether the USB driver installed in 1 to 4 is installed correctly on the PC on the Windows "Device Manager" screen.

<How to open Device Manager>

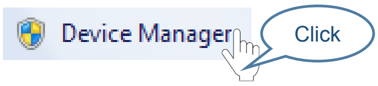
(1) Windows start menu
Bottom left

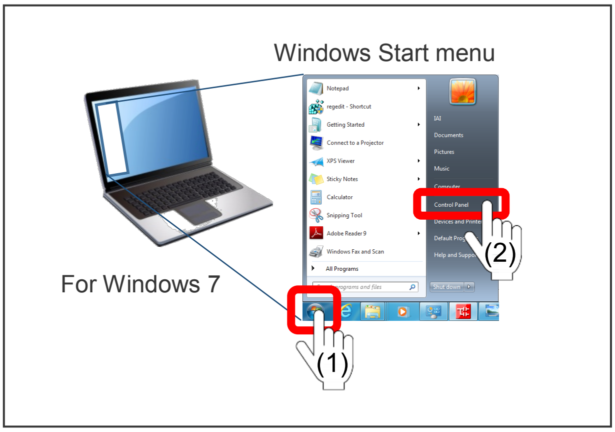
(2) Windows start menu
Upper right



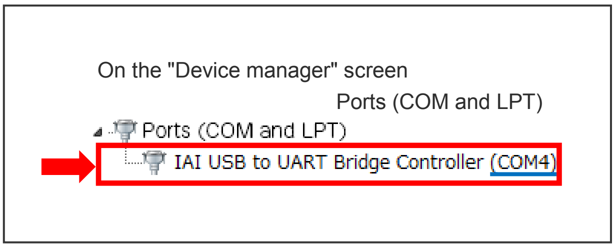
(3) On the next displayed screen

(4) On the next displayed screen



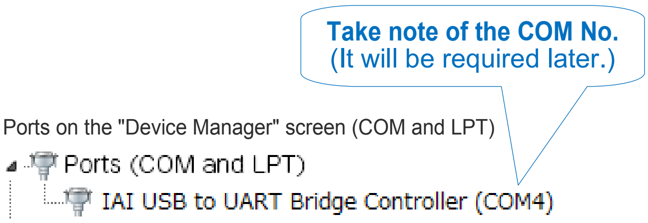


(5) If the "Device Manager" screen is displayed and "IAI USB to UART Bridge Controller (COM*)" is displayed in the "Ports (COM and LPT)" item, the USB driver installation is completed normally.



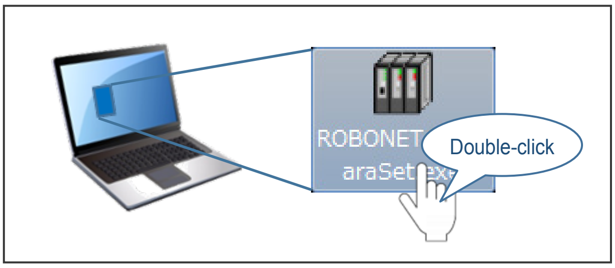
Point!

- Communicates with the RCON system using the COM port of the displayed PC.
- Take note of the COM No. as it may be required later.



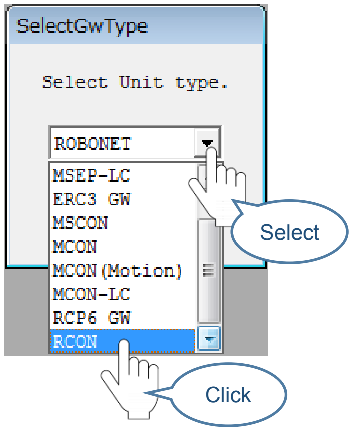
9 Start up the gateway parameter configuration tool.

(1) Double click the "Gateway parameter configuration tool" icon.



(2) Select and click "RCON" from "SelectGwType" screen.

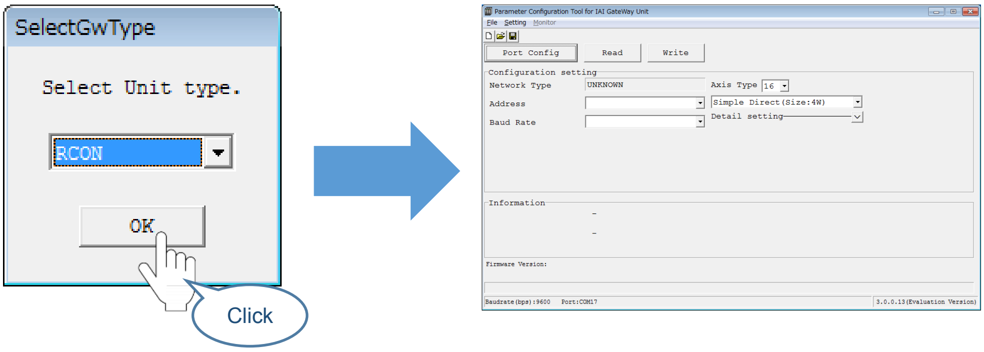
"SelectGwType" screen



(3) Clicking OK will open the "Parameter configuration tool" main screen.

"SelectGwType" screen

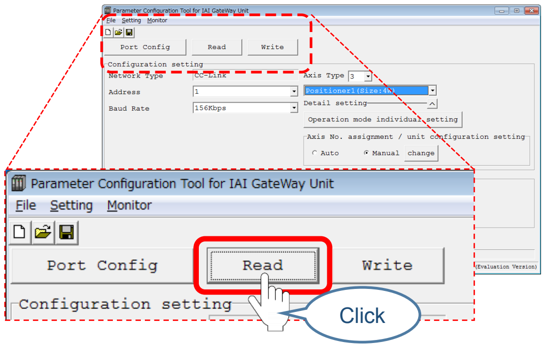
"Parameter configuration tool" main screen



10 Import the parameters.

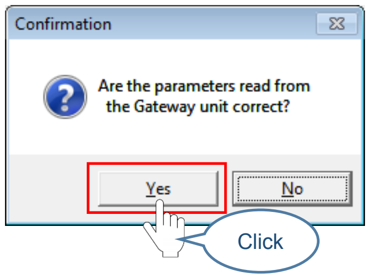
(1) Click Read on the "Parameter configuration tool" main screen .

"Parameter configuration tool" main screen



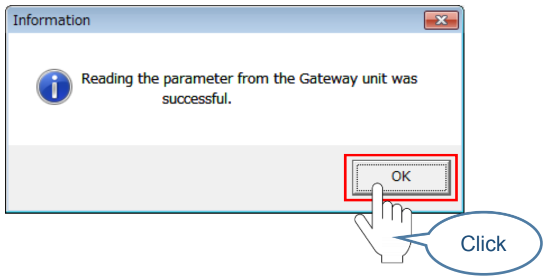
(2) When the "Confirmation" screen appears, click Yes .

"Confirmation" screen



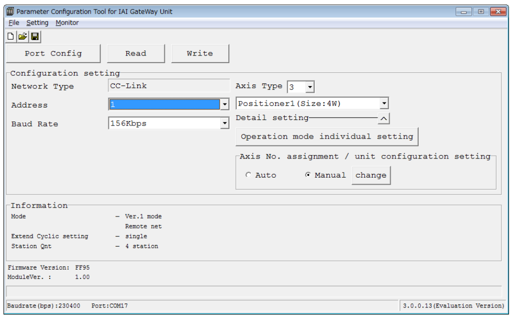
(3) When the "Information" screen appears, click OK .

"Information" screen



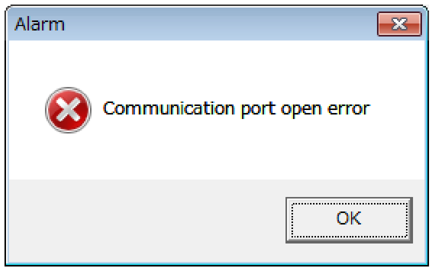
(4) As shown in the figure on the right, if the parameters in the gateway unit are displayed on the "Parameter configuration tool" main screen, communication has been established.

"Parameter configuration tool" main screen



(5) If "Communication port open error" screen is displayed when importing parameters, communication connection has failed.

"Communication port open error" screen



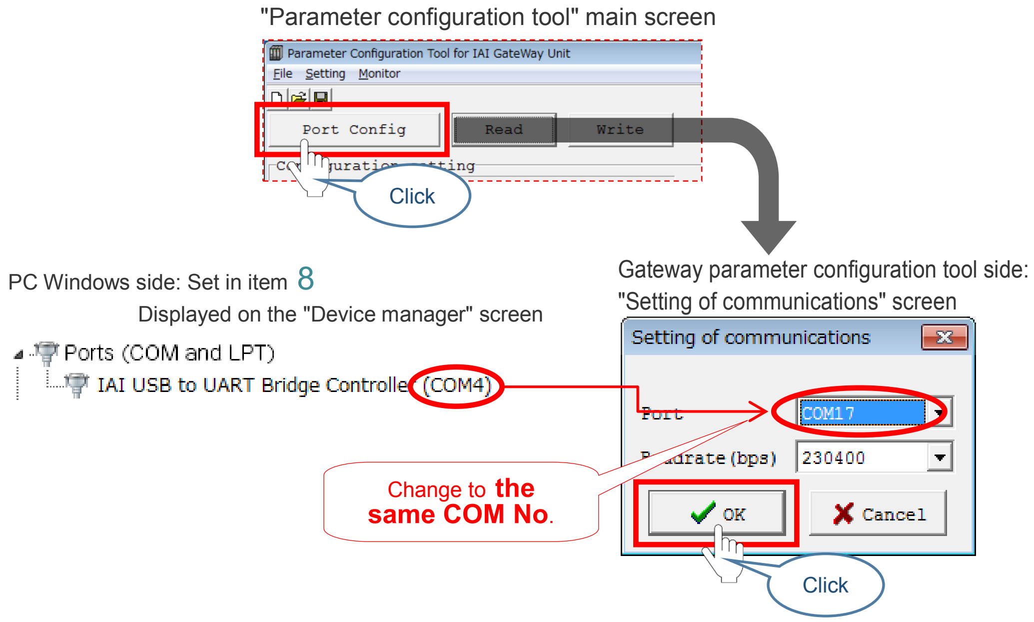
[Causes of communication connection failure]

- Mismatched communication port
- Disconnected communication cable
- Connection problem of communication cable connector
- Gateway unit side, PC side malfunction
- PC software double startup

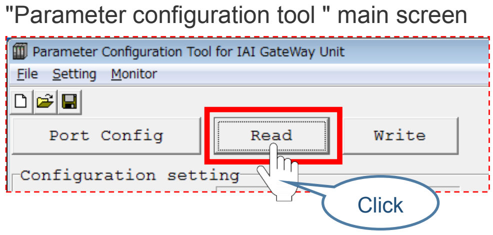
may be possible causes.

[If connection is not possible due to a communication port open error]

(1) Change the port number on the "Setting" → "Setting of communications" screen on the "Parameter configuration tool " main screen so that it is the same as the COM No. on the Device Manager screen on Windows.



(2) Click Read on the "Parameter configuration tool" main screen to reconnect with the RCON gateway unit.



This concludes the installation of the USB driver.

RCON setting: CC-Link (for PiC of PLC wiring / programming)

[Setting RCON gateway parameters]

Items to prepare

RCON system / PC / RCM-101 supplied cable

The operation is explained in the gateway parameter configuration tool (PC OS environment is Windows 7).

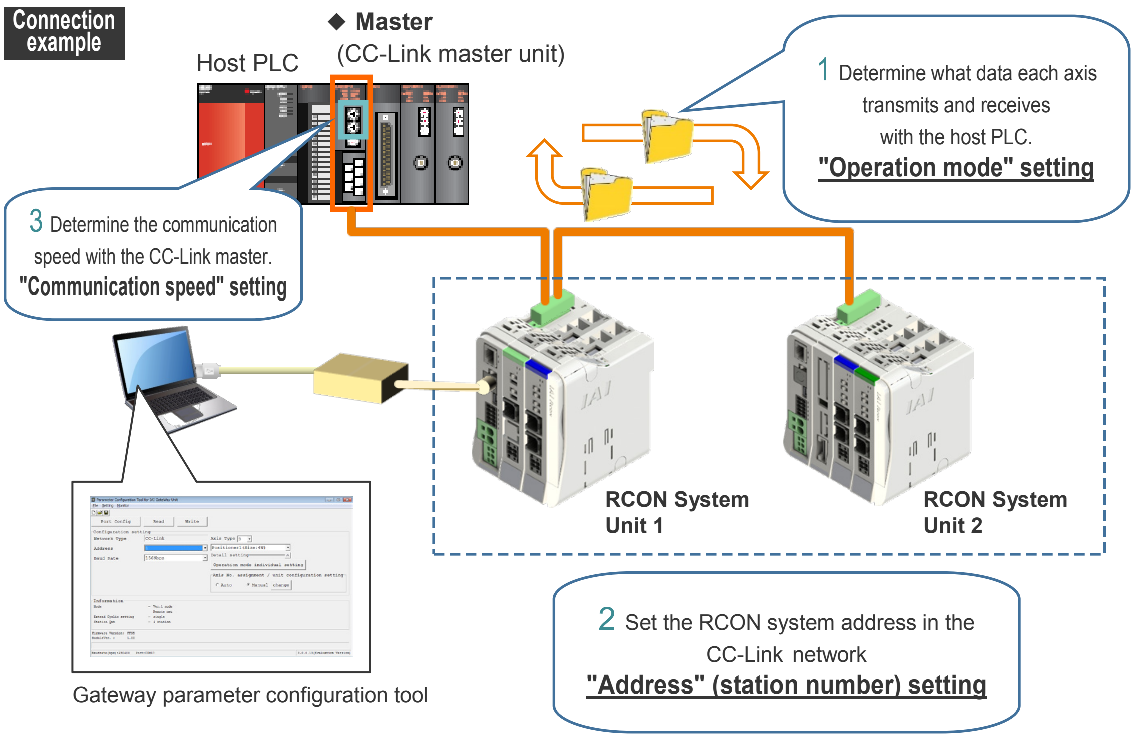
Caution

- The operation mode of the RCON gateway is set up using the gateway parameter configuration tool (Ver.3.1.0.0 or later).

The gateway parameter configuration tool is used to set up the RCON system (indicated as Unit 1 and 2).

Items to be set on the controller side are 1 to 3 below.

[Connecting RCON and gateway parameter configuration tool]

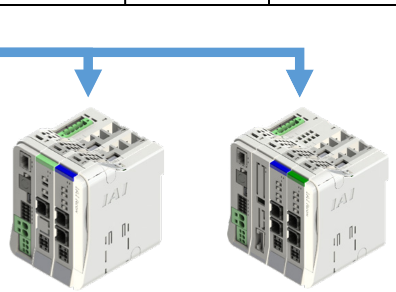


1 Set the "operation mode".

(1) Determine the control method from the host PLC. Select from the following 6 types.

	1	2	3	4	5	6
	Direct numerical control mode	Simple direct mode	Positioner 1 mode	Positioner 2 mode	Positioner 3 mode	Positioner 5 mode
Number of positioning points	Unlimited	128 points	128 points	128 points	128 points	16 points
Home return motion	○	○	○	○	○	○
Positioning operation	○	○	△	△	△	△
Speed, acceleration/deceleration settings	○	△	△	△	△	△
Different acceleration and deceleration settings	×	△	△	△	△	△
Pitch feed (Incremental)	○	△	△	△	×	△
JOG operation	△	△	△	△	×	△
Position data write	×	×	○	○	×	×
Push-motion operation	○	△	△	△	△	△
Speed changes while traveling	○	△	△	△	△	△
Pausing	○	○	○	○	○	○
Zone signal output	△ (2 points)	△ (2 points)	△ (2 points)	△ (2 points)	△ (1 point)	△ (2 points)
Position zone signal output	×	△	△	△	×	×
Overload warning output	○	○	○	○	×	○
Vibration control (Note 1)	×	△	△	△	△	△
Present position reading (Resolution)	○ (0.01mm)	○ (0.01mm)	○ (0.01mm)	×	×	○ (0.1mm)

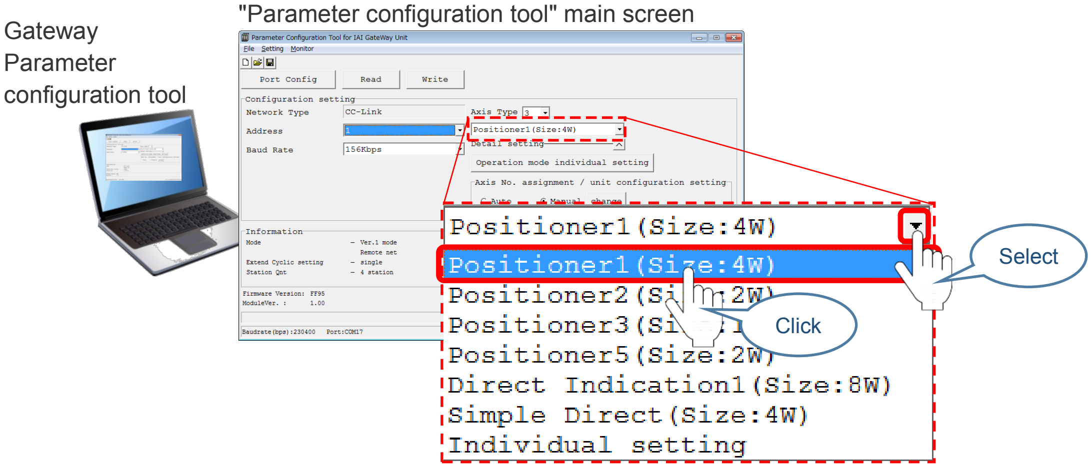
(2) When the mode selection is completed in (1), it is input to the gateway unit using the gateway parameter configuration tool. In this manual, the RCON system (Units 1 and 2) is set as shown at right (example).



RCON System Unit 1

RCON System Unit 2

(3) Select and click the communication speed setting value confirmed in (1).



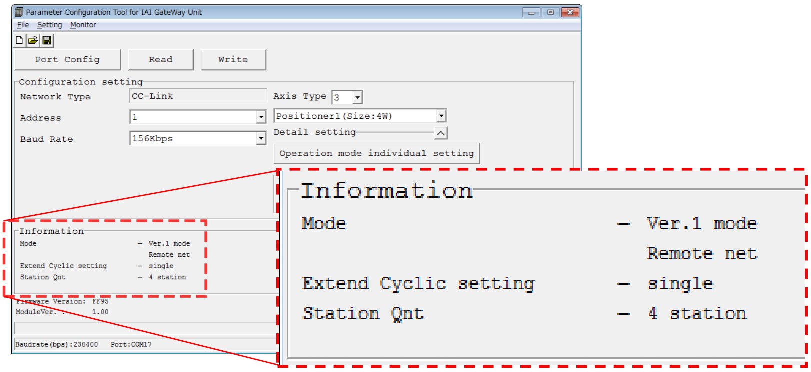
Point!

- Here is how to set all the axes connected to the gateway unit to the same "operation mode" collectively.

To individually set the "operation mode" of the connected axes, refer to "Specifications Section 3.9 Gateway Parameter Configuration Tool/Operation mode setting (page 3-138)".

(4) Take notes of the occupancy information on the "Parameter configuration tool" main screen. This is the information required for setting the 2 "Address" (CC-Link station number) and PLC shown on the next page.

"Parameter configuration tool" main screen



The example displays the following occupancy information.

RCON System Unit 1

Occupancy information

By station type : Ver.1

Remote device station

Extended cyclic : 1x

Number of occupied stations : 4 stations occupied

RCON System Unit 2

Occupancy information

By station type : Ver.2

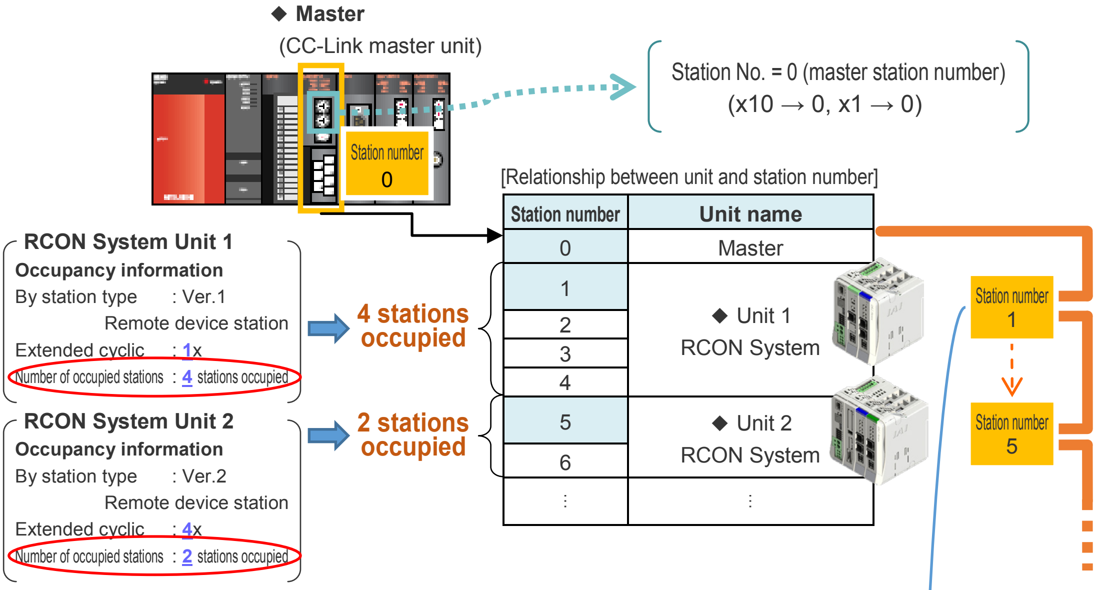
Remote device station

Extended cyclic : 4x

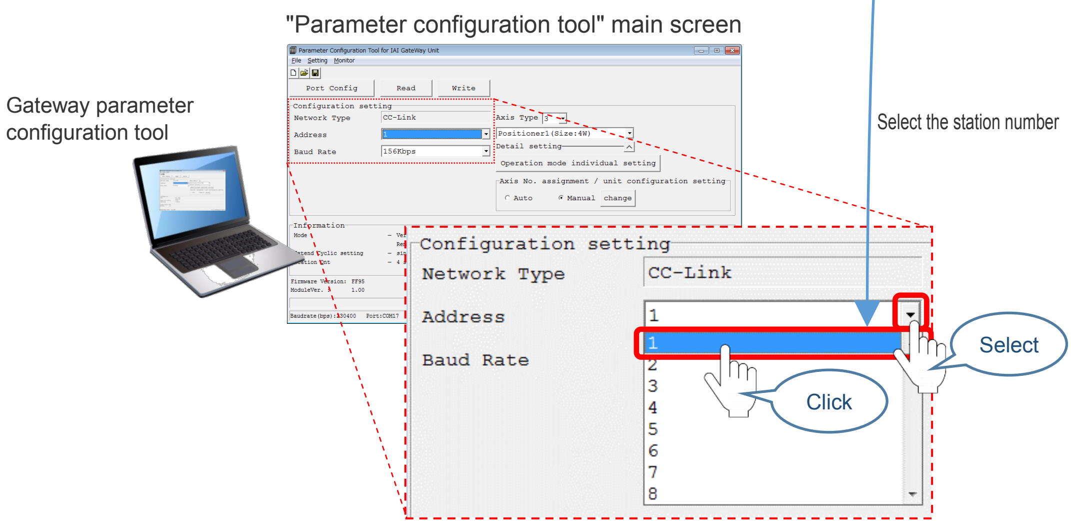
Number of occupied stations : 2 stations occupied

2 Set the "address" (CC-Link station number).

(1) Check the address (station number) set value with reference to the following figure.



(2) Select and click the address (station number) set value confirmed in (1).

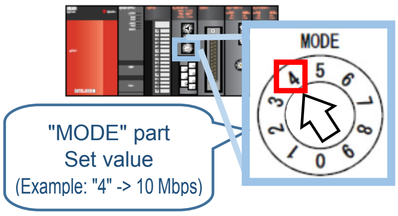


Point!

- When connecting multiple units to the master unit, it is necessary to ensure that there will be no duplicate RCON system station numbers in the same CC-Link network. Also, make sure that the respective number of occupied stations will not be the same.

3 Set the "Communication speed".

(1) Check the address (station number) set value with reference to the following figure.

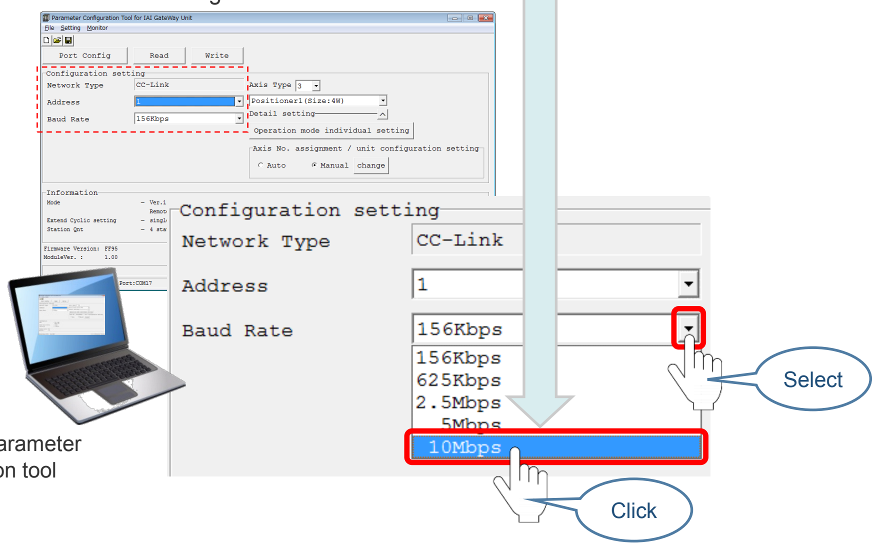
CC-Link master unit "MODE" set value 	PLC side Communication speed
0 (Initial value)	156 kbps
1	625 kbps
2	2.5 Mbps
3	5 Mbps
4	10 Mbps

Noise resistance: **High**

Communication speed: **Fast**

(2) Select and click the same numerical value as the CC-Link master unit "MODE" set value confirmed in (1).

"Parameter configuration tool" main screen

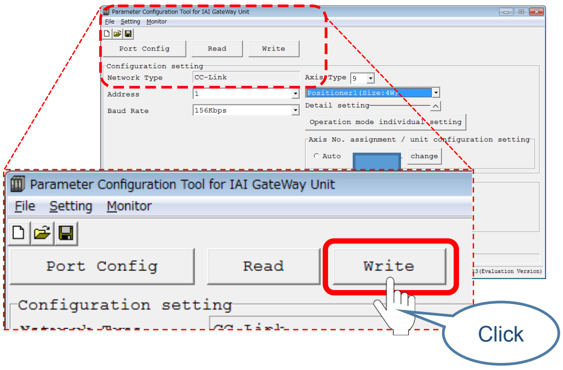


[Transferring and writing parameters]

4

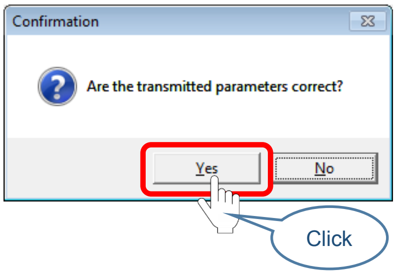
(1) Click Write on the "Parameter configuration tool" main screen .

"Parameter configuration tool" main screen



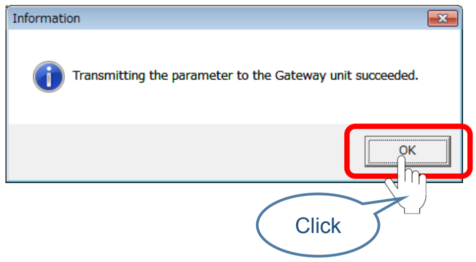
(2) When the "Confirmation" screen appears, click Yes .

"Confirmation" screen



(3) When the parameter writing is completed and the "Information" screen appears, click OK .

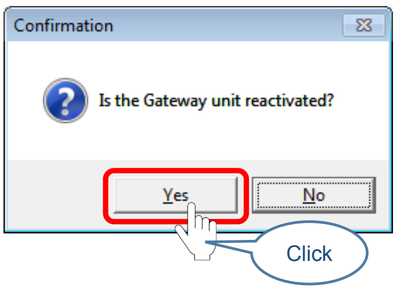
"Information" screen



(4) When the "Confirmation" screen appears, click Yes .

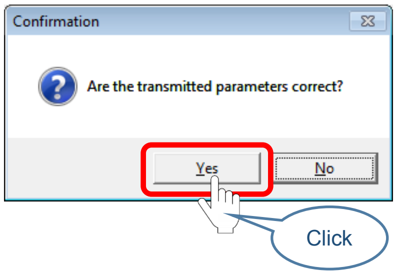
The gateway unit restarts.

"Confirmation" screen



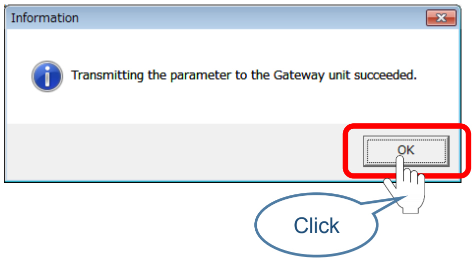
(5) When the " Confirmation " screen appears, click Yes .

"Confirmation" screen



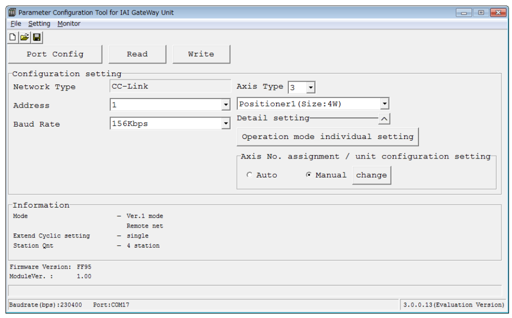
(6) When the "Information" screen appears, click OK .

"Information" screen



(7) When the " Parameter configuration tool" main screen is loaded, check whether the changed contents are reflected.

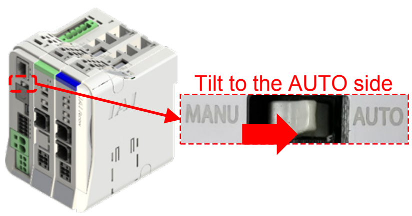
"Parameter configuration tool" main screen



This completes the CC-Link network setting of the RCON system.
Check the communication status between each unit.

Caution

- For subsequent adjustment, when operating from the PLC, return the AUTO/MANU switch on the front of the gateway unit to AUTO.
- If left on the MANU side, operation from the PLC will not be possible.



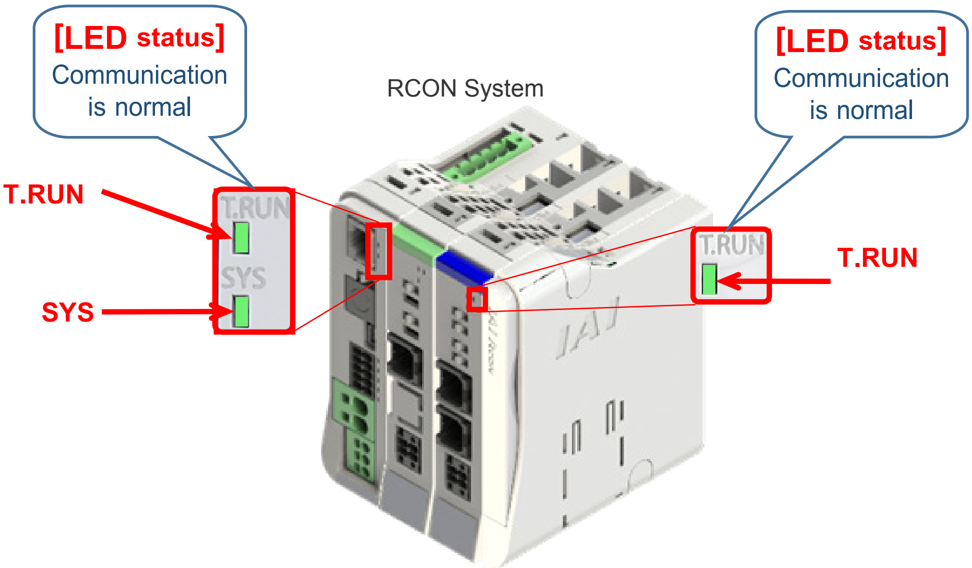
Caution

- If the actual number of connected axes of the RCON system does not match the number of axes set and transferred in the gateway parameter configuration tool, the PC software for RC/EC cannot be connected.
- Confirm the actual number of connected axes and change the gateway parameters, or read the present driver unit configuration with the gateway parameter configuration tool for transfer. For details, refer to Specifications Section Chapter 3 Gateway Parameter Configuration Tool (page 3-138).

[Checking inter-unit communication status of the RCON system]

5 Check the communication status in the RCON system.

Look at the LEDs on the front of the RCON system gateway unit and driver unit (T.RUN and SYS) and check if they are in the same status (normal communication) as ▭ in the table below.



Gateway unit side LED display

Panel notation	Display status	Definition of display
T RUN	Lit	Normal internal bus communication
	Blinking	Waiting for initialization signal
	Lit	Bus communication error generated
SYS	Lit	Normal operation
	Lit	Gateway alarm triggered

Driver unit side LED display

Panel notation	Display status	Definition of display
T RUN	Lit	Normal internal bus communication
	Blinking	Waiting for initialization signal
	Lit	Bus communication error generated

Startup Section

Chapter 4 Network Configuration

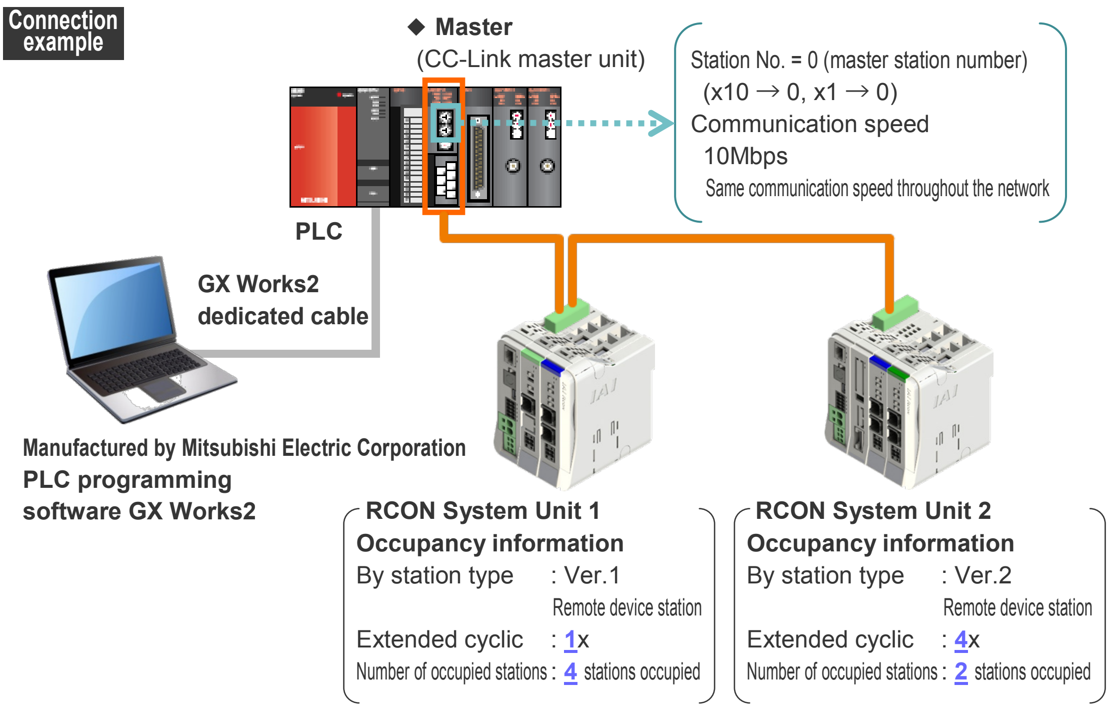
4.2 Master Side Setting

PLC setting: CC-Link (for PiC of PLC wiring / programming)

Items to prepare

PLC / CC-Link master unit / PC / GX Works2 / communication cable

Ex) Two RCON units are connected to the CC-Link master unit of PLC.



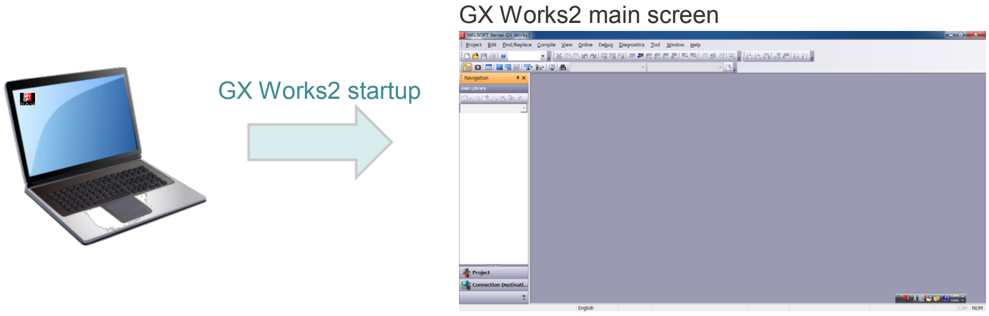
[Connection between PLC and PC software]

Start up the Mitsubishi Electric Co., Ltd. PLC programming software GX Works2 and connect the CC-Link master unit.

For installation procedure and the like of GX Works2,
refer to "Appendix 14.1 Installing GX Works2" in Mitsubishi Electric Co., Ltd. Engineering Software GX Works2 Version 1 Operating Manual (Common Edition).

1 

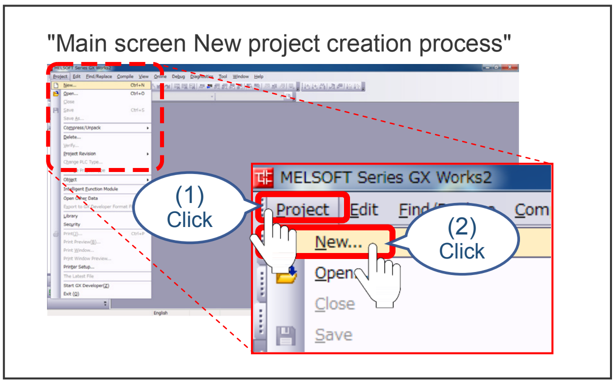
Double-click the "GX Works2" icon to start the software.



To perform USB communication with the PLC CPU, it is necessary to install the USB driver.
For USB driver installation, refer to "Appendix 16 Installation Procedure of USB Driver" in Mitsubishi Electric Co., Ltd. Engineering Software GX Works2 Version 1 Operating Manual (Common Edition).

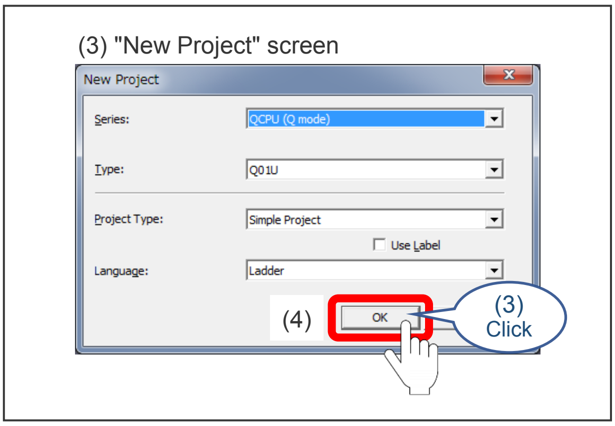
2 At the top left of the GX Works2 main screen, click in the order of

(1) "Project (P)"
(2) "New (N)"
in order.



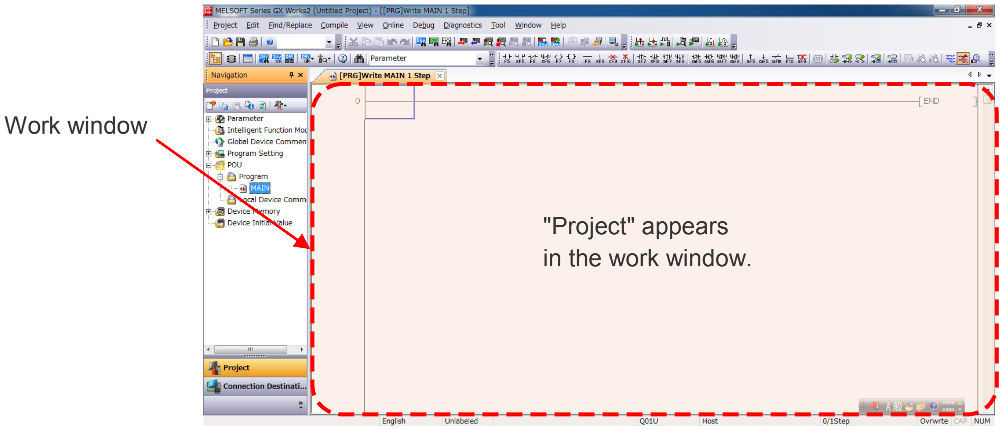
(3) The "New Project" screen opens.

(4) After setting the prerequisites on the "New Project" screen (in this manual, set in the "New Project" screen as shown at right), click OK.



(5) "Project" will be displayed in the work window of the main screen.

Main screen



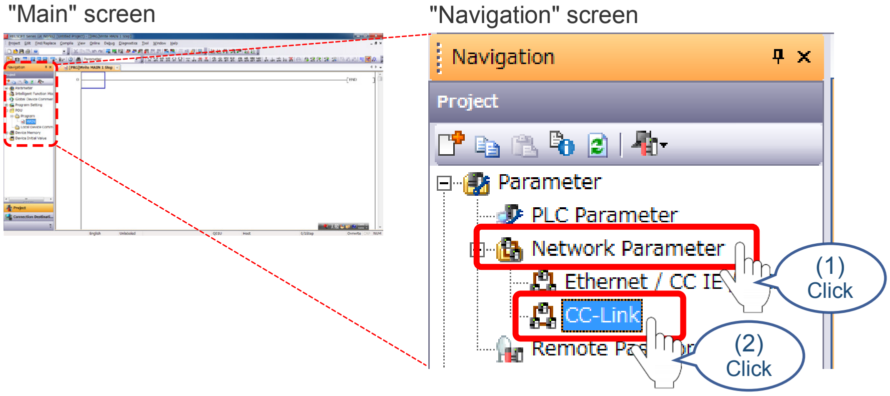
[Setting network parameters]

3

Open the "Network parameters" screen.

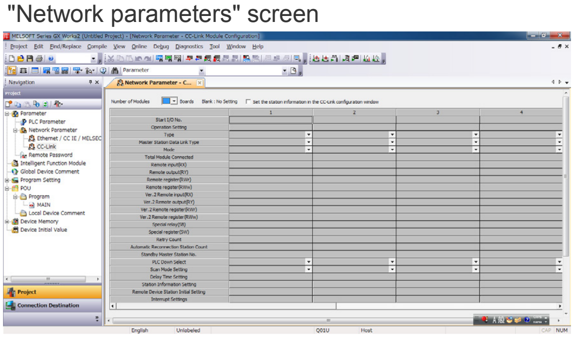
From the "Navigation" screen in the tree view on the left side of the main screen, click and select (1) "Network parameters" then (2) "CC-Link".

"Main" screen "Navigation" screen



Open the "Network parameters" screen in CC-Link.

"Network parameters" screen

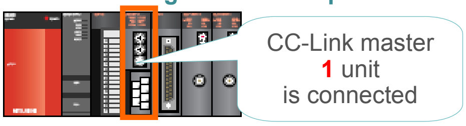


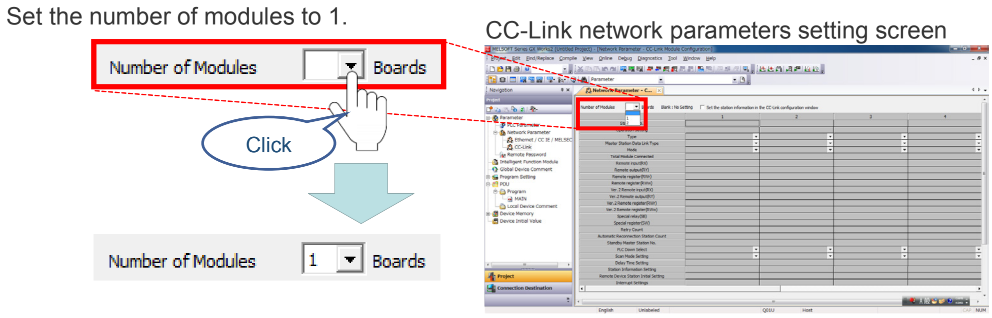
4

Enter the "number of modules" in CC-Link network.

For "PLC unit configuration example" as shown below, one CC-Link network unit is connected.

PLC unit configuration example

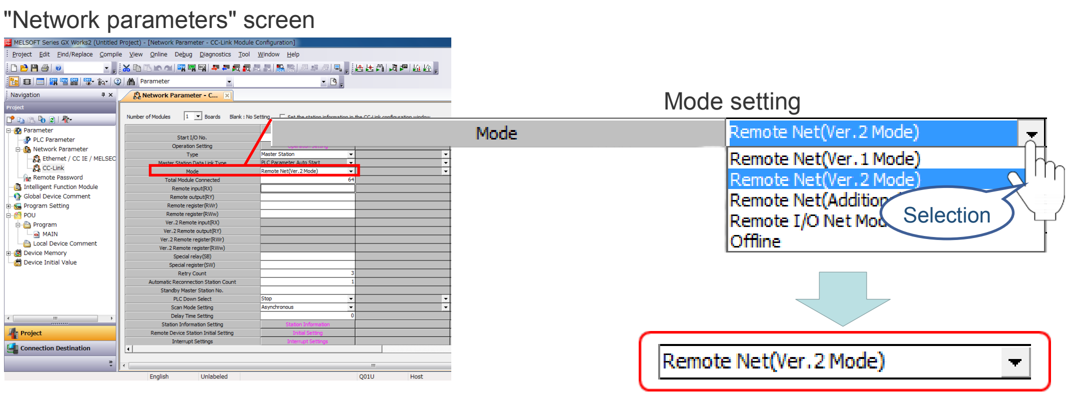




5

Set the CC-Link network mode.

Make sure that **"Mode setting"** in the CC-Link network parameter setting screen is selected in [Remote Network - Ver.2 mode].

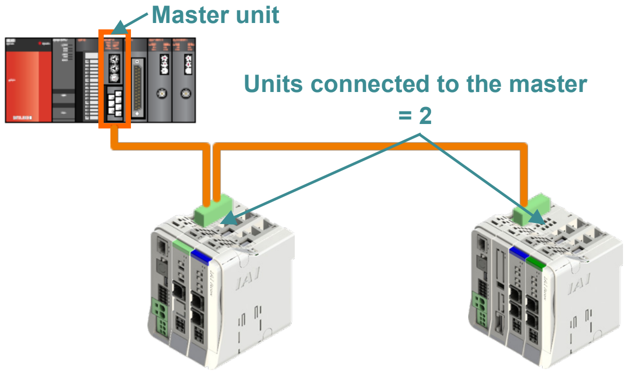


Point!

- RCON's CC-Link unit operates in Remote network - Ver.2 mode.

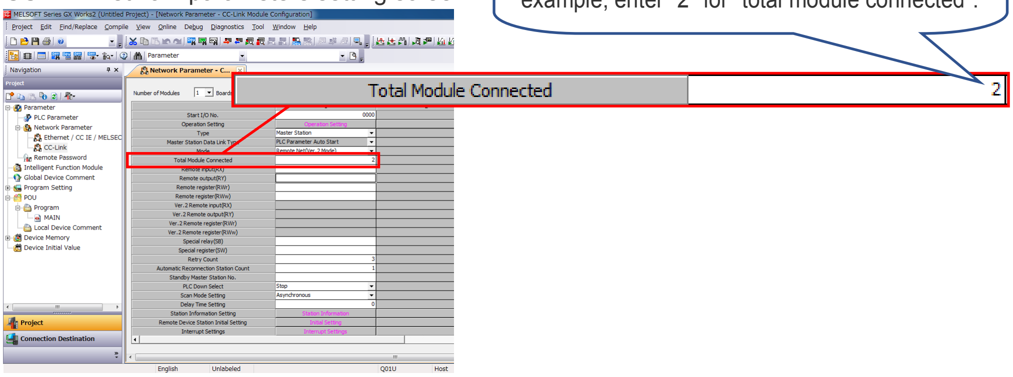
6 Enter the "total module connected" to the CC-Link master.

Connection example



Since there are two units connected to the CC-Link master in the above connection example, enter "2" for "total module connected".

CC-Link network parameters setting screen

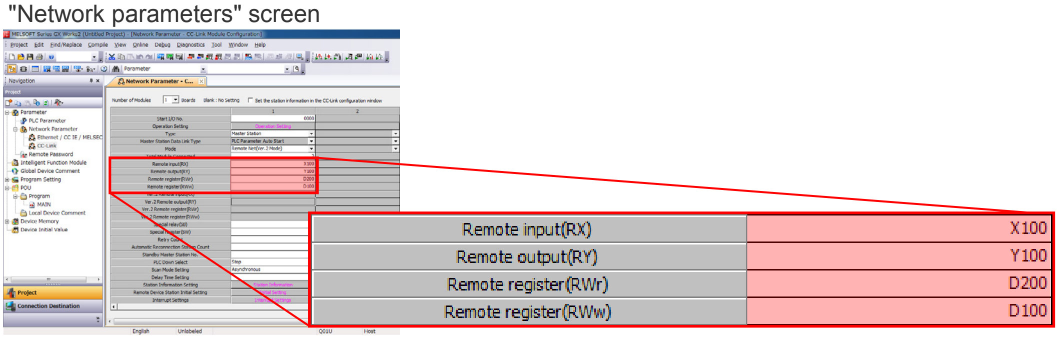


7 Set the "leading I/O number".

Next, we set the "I/O leading No." to be assigned to each unit connected to the master unit.

Set according to your context. In this case, we will set it as below.

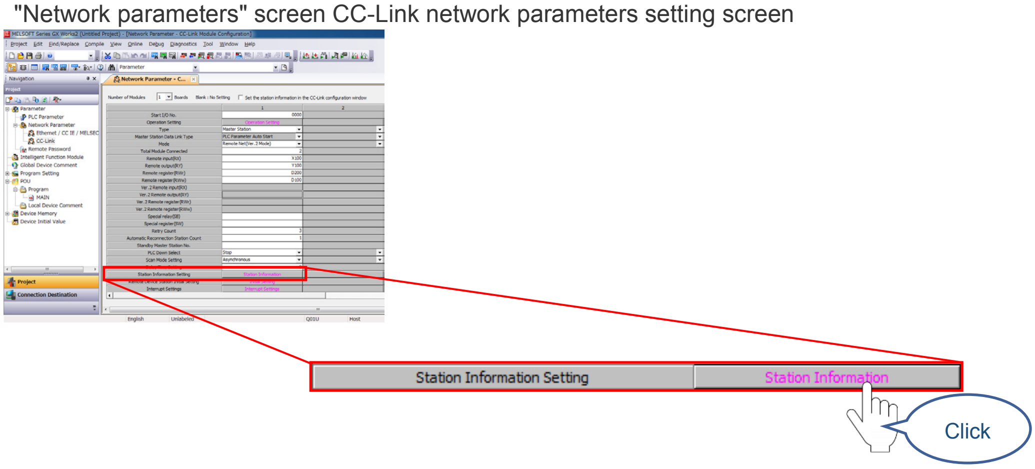
"Network parameters" screen



8 Open the "CC-Link station information" screen.

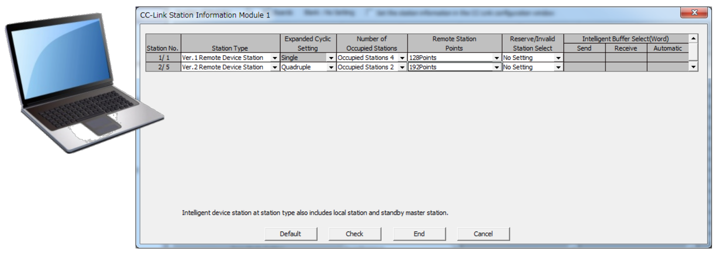
(1) Click Station Information in the CC-Link "Network parameters" screen.

"Network parameters" screen CC-Link network parameters setting screen



(2) "CC-Link station information" screen will be displayed.

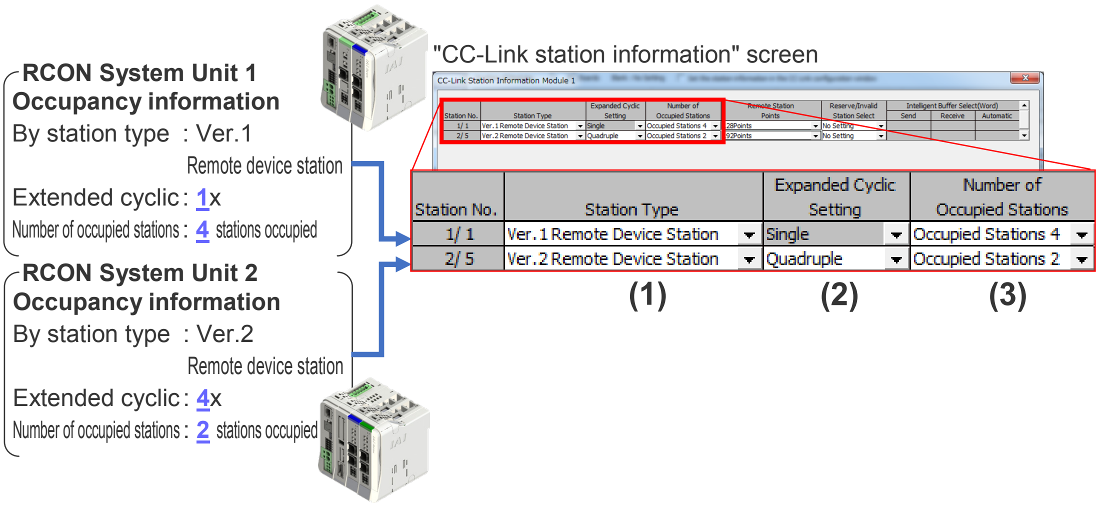
"CC-Link station information" screen



9 Set the "CC-Link station information".

Set the occupancy information obtained based on the example.

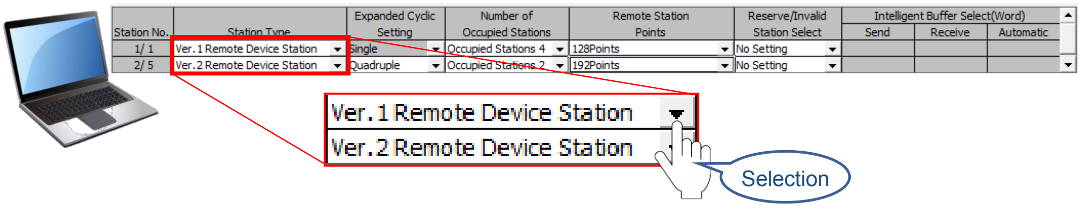
The RCON system Unit 1 is set to "number of units / station number: 1/1" and the RCON system Unit 2 to "number of units / station number → 2/5".



(1) Select the "station type".

Select "Ver.1 remote device station" for "number of units / station number: 1/1" and "Ver.2 remote device station" for "number of units / station number: 2/5".

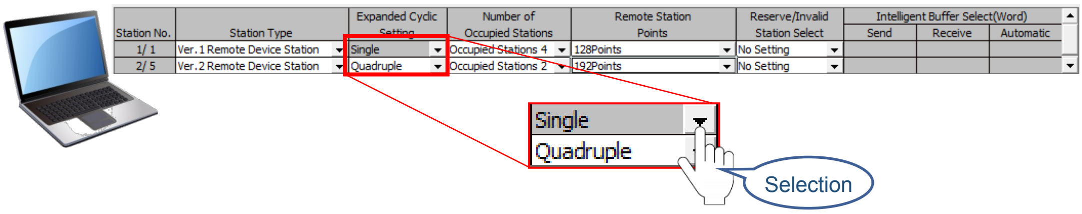
"CC-Link station information" screen



(2) Perform the "extended cyclic setting".

"Number of units / station number: 1/1" is fixed at "Single". Select "Quadruple" for the "number of units / station number: 2/5".

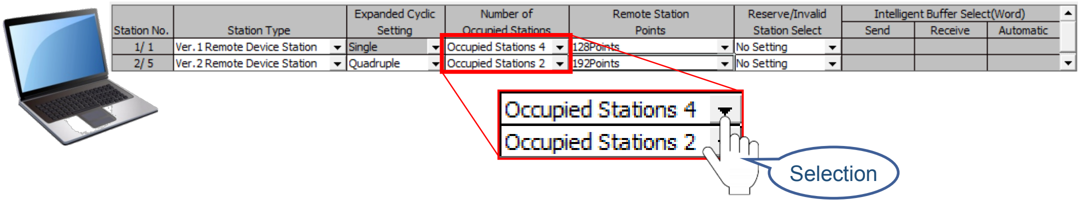
"CC-Link station information" screen



(3) Set the "number of occupied stations".

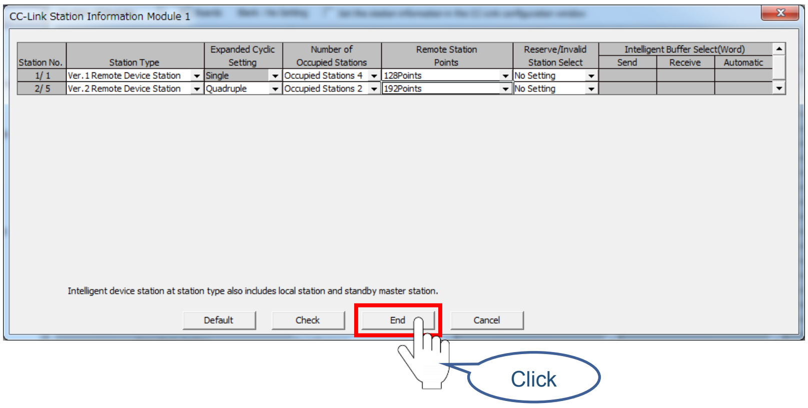
"Number of units / station number: 1/1" is fixed at "4 stations occupied". Select "2 stations occupied" for the "number of units / station number: 2/5".

"CC-Link station information" screen



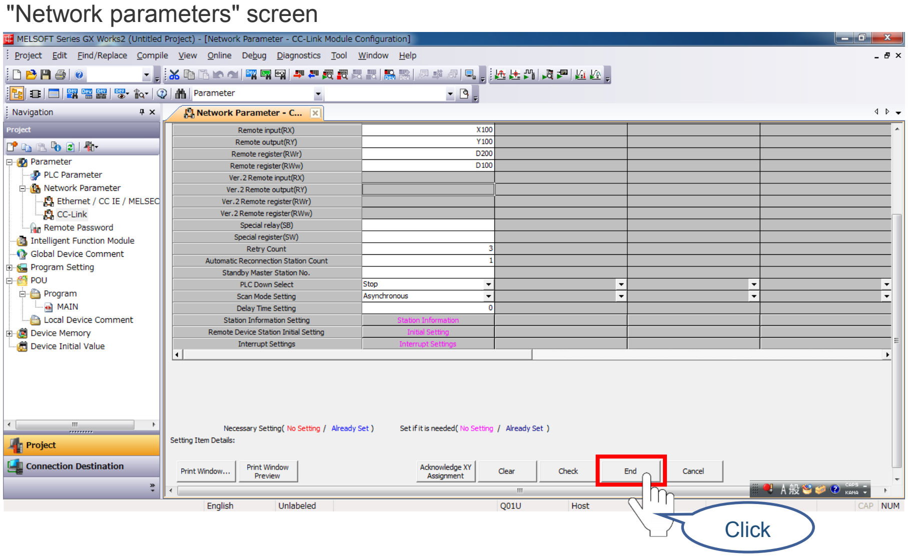
(4) When "CC-Link station information" is set, click End on the same screen.

"CC-Link station information" screen



(5) When it returns to the "Network parameters" screen, click End.

"Network parameters" screen



Writes the last set network parameters to PLC.

[Saving network parameters]

10 Write the network parameters to PLC.

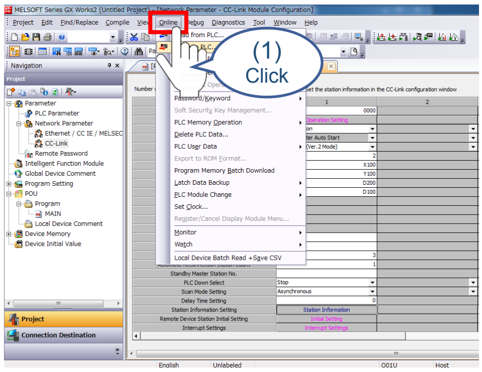
Caution

- The following description is based on one example. Be careful not to accidentally delete your valuable data.

(1) Click Online on the menu bar.

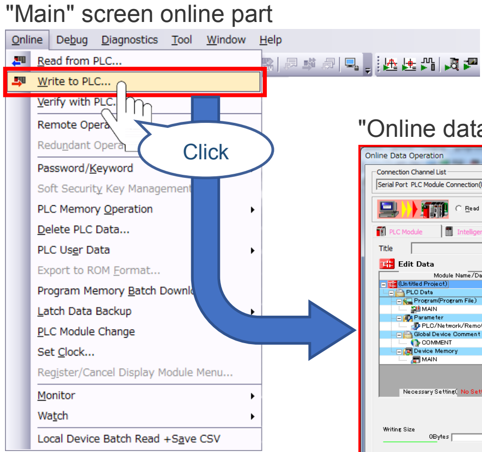
Mitsubishi Electric PLC programming software GX Works2

"Main" screen

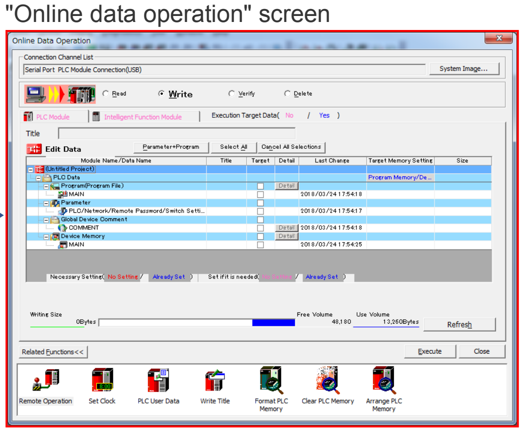


(2) Clicking on Write to PLC... will display the "PC write" screen.

"Main" screen online part

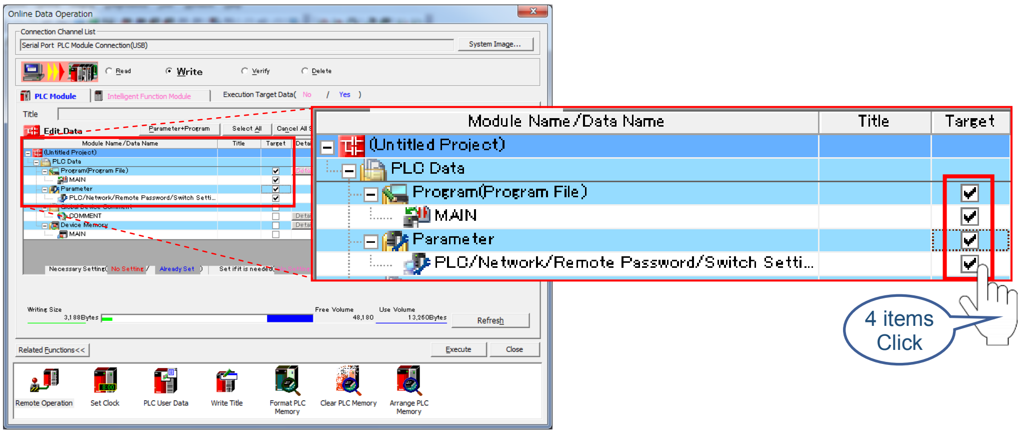


"Online data operation" screen



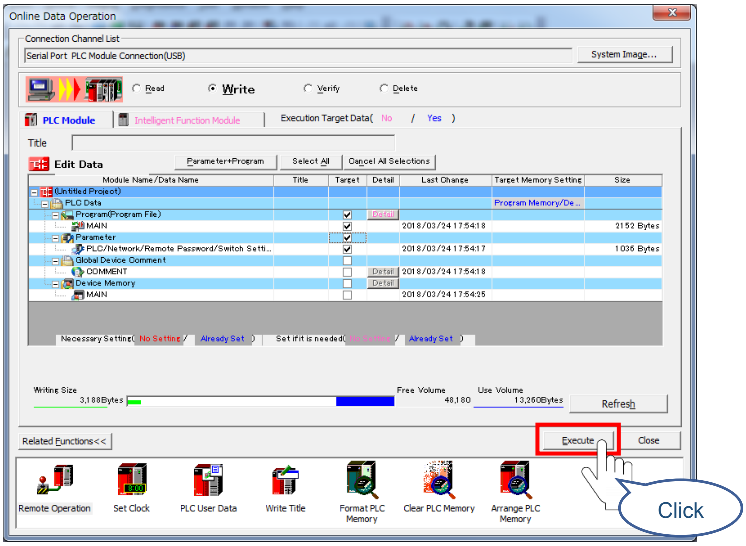
(3) On the "Online data operation" screen, click the checkboxes ☐ for "Program (program file)", "MAIN", "Parameter" and "PC / network / remote password" to change to ☑ .

"Online data operation" screen



(4) Click Execute .

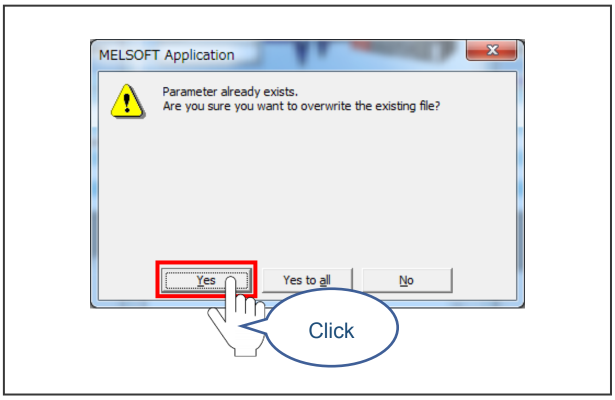
"Online data operation" screen



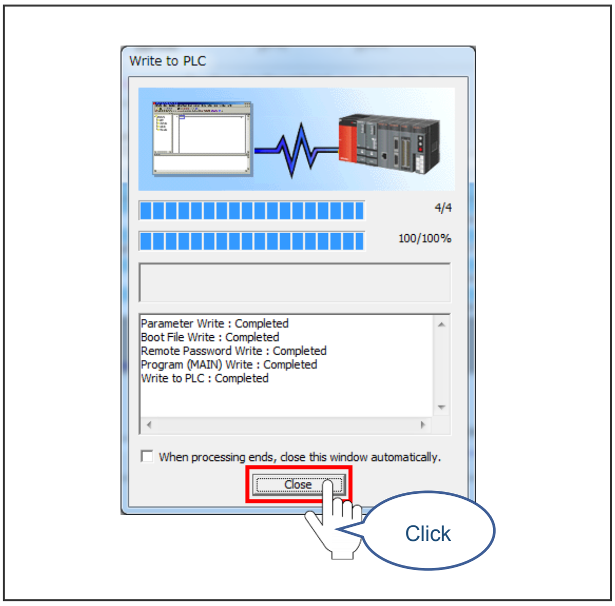
Caution

- The following description is based on one example. Be careful not to accidentally delete your valuable data.

(5) When the following message is displayed, click Yes .



(6) When the parameter is written and the condition shown in the following figure is achieved, click Close .
This concludes the PLC network configuration.

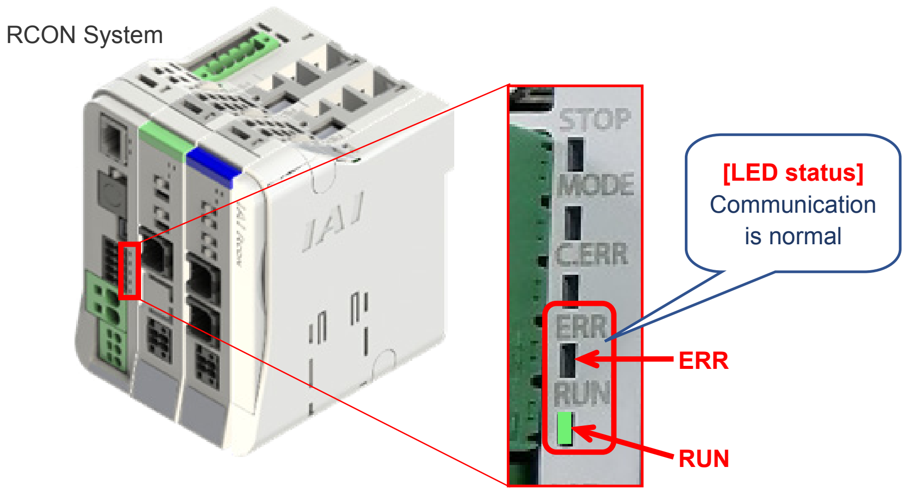


[Confirming CC-Link communication status]

Confirm the communication between the CC-Link master unit and the RCON system.

1 Check the communication status in the RCON system.

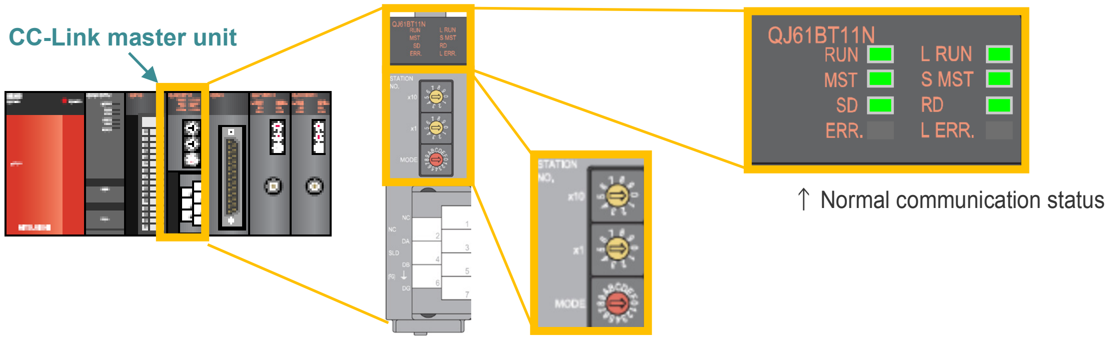
Check the LED (ERR and RUN) status (color) on the front of the gateway unit to confirm the status (normal communication) of the part.



Status LED	Display status	Definition of display
ERR	■ Lit	・Error status ・Time between power-on or software reset to the end of CC-Link initialization
	■ Light off	・Normal communication
	★(0.4 s)	・The station number or communication speed setting changed during communication
RUN	■ Lit	・In communication
	■ Light off	・When not in communication

★ indicates blinking. The value in ( ) is the blinking cycle.

2 Look at the LED status on the front of the CC-Link master and judge whether it is communicating normally.



No.	LED name		Applications
1	RUN		The operation status will be displayed.
		Light ON	Normal operation
		Light OFF	Hardware error or watchdog timer error generated
2	L RUN		The status of the data link will be displayed.
		Light ON	Data link in process
		Light OFF	Data link not executed
3	SD		The data transmission status will be displayed.
		Light ON	Transmitting data
		Light OFF	Data not transmitted
4	RD		The data receipt status will be displayed.
		Light ON	Receiving data
		Light OFF	Data not transmitted
5	ERR.		The error status of the master/local unit will be displayed. Refer to Mitsubishi Electric Co., Ltd. Instruction Manual for error details.
		Light ON	One of the following errors has occurred. · Error was detected in all stations. · The setting of "station number setting switch" or "transmission speed / mode setting switch" of the master/local main unit is out of the range. · The master stations are duplicated on the same network. · There is an error in the network setting. · CC-Link cable is disconnected. Or there is influence of noise, etc.
		Light OFF	Normal operation.
6	L ERR.		The status of the data link error will be displayed
		Light ON	Data link error has occurred in the local station.
		Flashing at regular intervals ★	The setting of the master unit full-surface panel switch on the right has been changed while the power was turned on.
		Flashing at regular intervals ★	Communication is unstable due to the following causes. · Terminal resistor is not connected. Impacted by noise
		Light OFF	Normal operation.

★ indicates blinking. MST S MST indicate whether or not the master station and standby master station are in operation as master stations.

4.3 PC Software for RC/EC Setting

PC software for RC/EC setting

Items to prepare

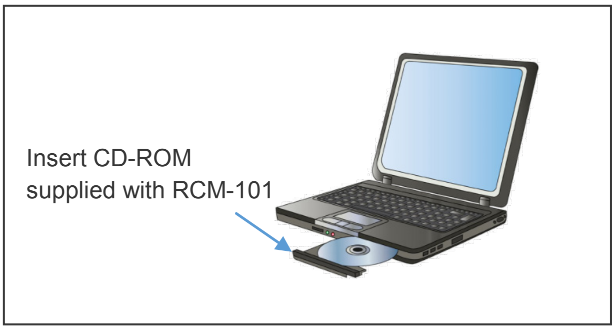
RCON system / PC / RCM-101 supplied CD-ROM / cable

[Installing PC software for RC/EC]

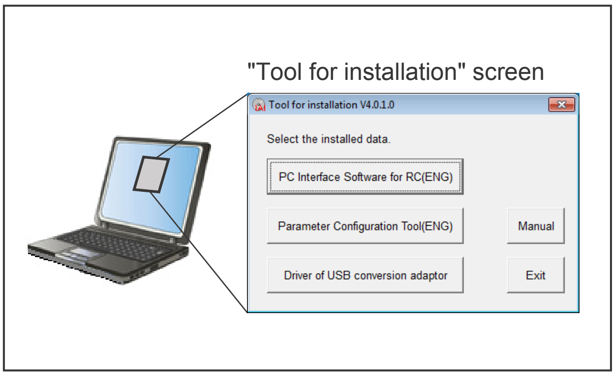
The operation is explained in the IAI PC software for RC/EC (PC OS environment is Windows 7).

1

(1) Insert the CD-ROM supplied with RCM- 101-USB into the CD drive of the PC.



(2) The "Tool for installation" screen will be displayed.

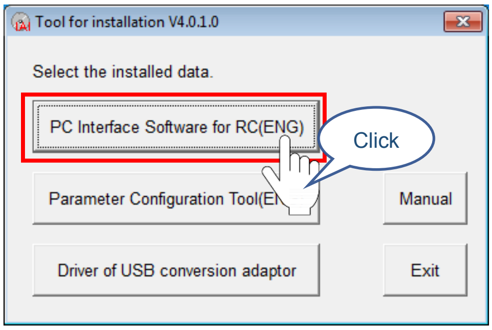


Point!

- When the startup method window is displayed when CD-ROM is inserted, select "Autoplay". If the contents of the folder are displayed, double-click and execute "IAI_Install".

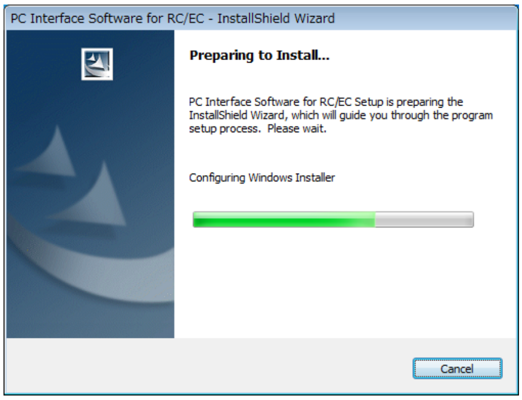
2 (1) Click PC Interface Software for RC(ENG) .

"Tool for installation" screen



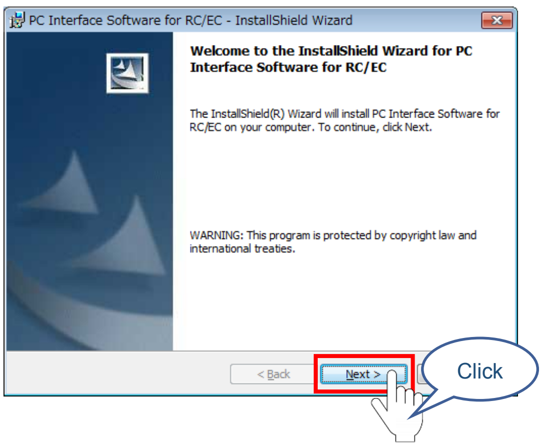
(2) When the installation preparation of PC software for RC/EC starts, "PC software for RC/EC InstallShield Wizard" screen will be displayed.

"PC software for RC/EC - InstallShield Wizard" screen



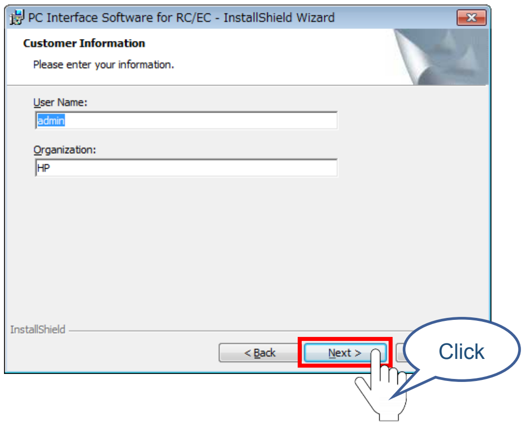
(3) After the screen switches to the one at right, click Next > .

"PC software for RC/EC - InstallShield Wizard" screen



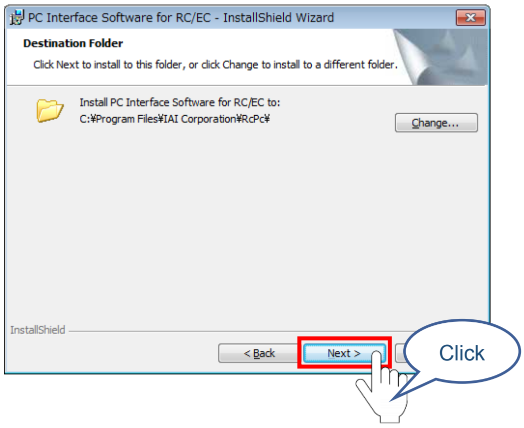
(4) Click Next > .

"PC Interface Software for RC/EC - InstallShield Wizard" screen



(5) Click Next > .

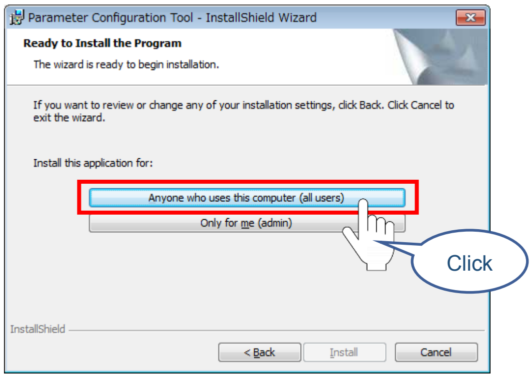
"PC Interface Software for RC/EC - InstallShield Wizard" screen



(6) Click

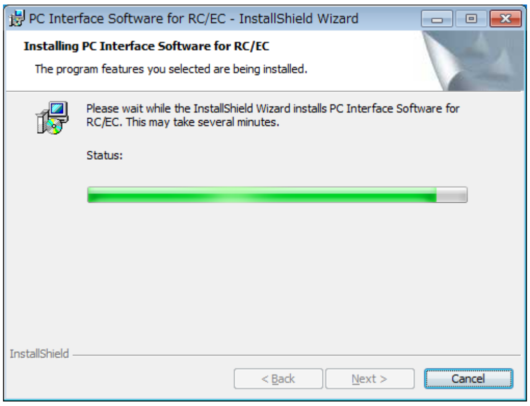
Anyone who uses this computer (all users) .

"PC Interface Software for RC/EC - InstallShield Wizard" screen



(7) The screen on the bottom right will be displayed and the installation of the PC software for RC/EC will start.

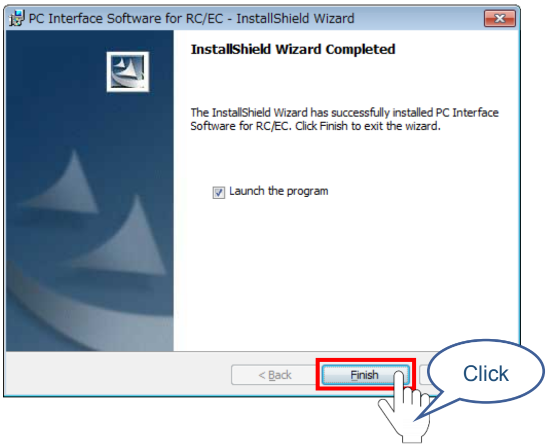
"PC Interface Software for RC/EC - InstallShield Wizard" screen



(8) When the screen on the bottom right is displayed, the installation of the PC software for RC/EC is finished.

Click  .

"PC Interface Software for RC/EC - InstallShield Wizard" screen



(9) Confirm that the "PC Interface Software for RC/EC" shortcut is displayed on your PC.

This concludes the installation of PC software for RC/EC.

Startup Section

Chapter 4 Network Configuration

Position data registration

Items to prepare

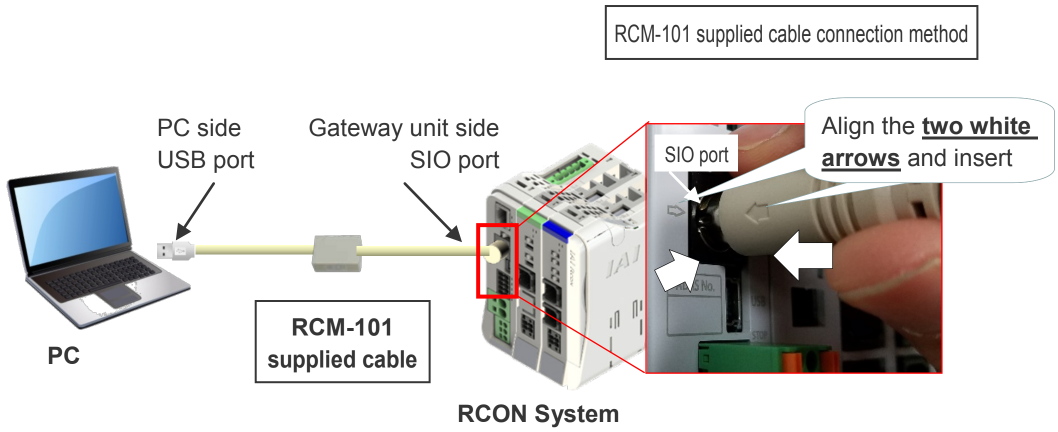
RCON system / actuator / PC communication cable / motor/encoder cable

1 Connect the PC software for RC/EC.

Caution

- Operate the actuator through the following procedure. Before starting operation, make sure that there is no interfering object within the movable range of the actuator.

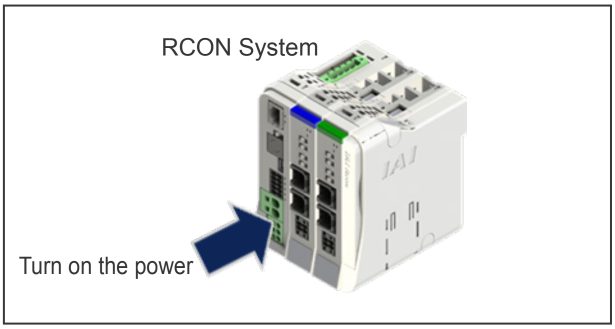
(1) Connect the RCM-101 supplied cable as shown below.



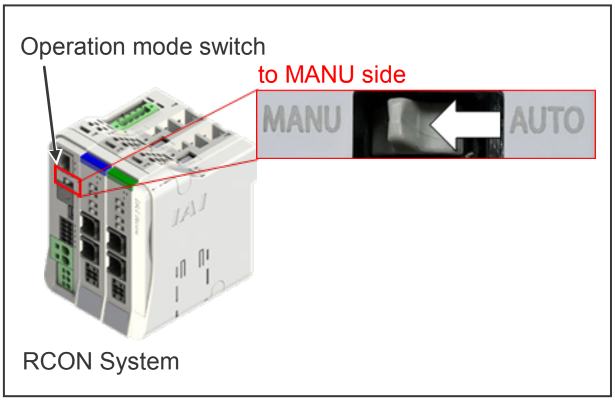
Caution

- When connecting the RCM-101 supplied cable to the gateway unit "SIO" port, insert matching the two white arrows as shown in the red frame above. Failure to do so may cause damage to the connector.

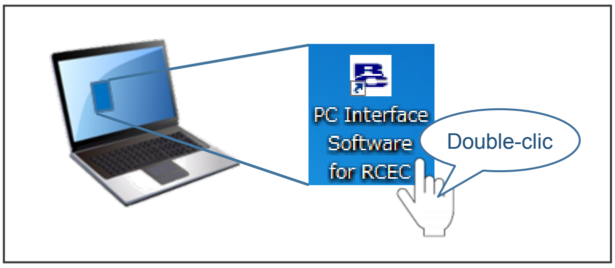
(2) After connecting the RCM-101 cable, supply 24 VDC power to the RCON system.



(3) Tilt the operation mode switch on the front of the gateway unit to the **"MANU"** side.



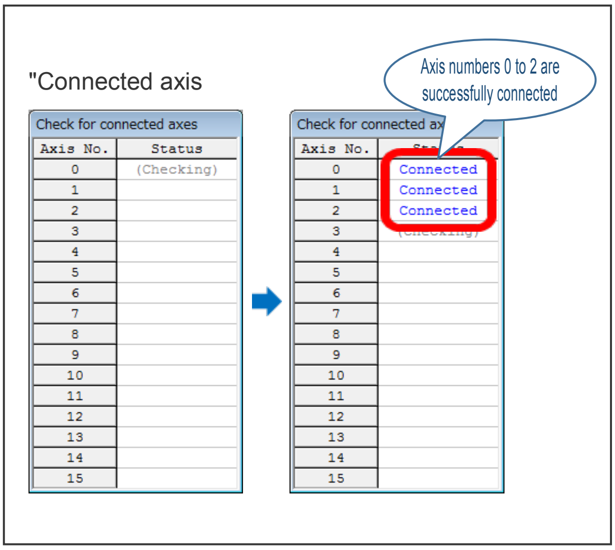
(4) Double-click the "PC software for RC/EC" icon to start up the software.



(5) The "Connected axis check" screen will be displayed.

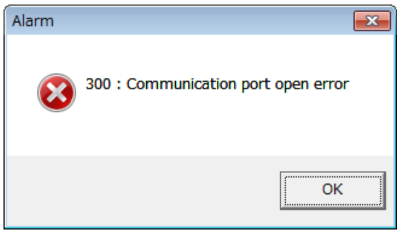
If it shows "connected" in blue, it means that the corresponding axis is successfully connected.

(The display on the right shows an example of successful connection when axes are set to No. 0 to No. 2.)



(6) If "300: Communication port open error" screen is displayed, communication connection has failed.
The following causes may be possible, so review the procedure from item 1.

"Alarm" screen



[Causes of communication connection failure]

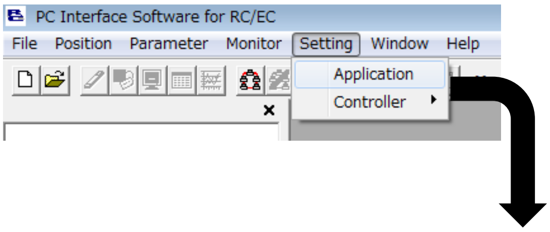
- Mismatched communication port (COM port)
- Disconnected communication cable
- Connection problem of communication cable connector
- Gateway unit side, PC side malfunction
- PC software double startup

may be possible causes.

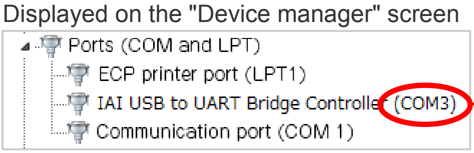
[If connection failed, check here first.]

(1) "Setting (S)" → "Application (A)" on the upper left corner on the screen of the PC software for RC/EC
→ Change the port number on the "Setting of application" screen to the COM number on the Windows Device Manager screen.

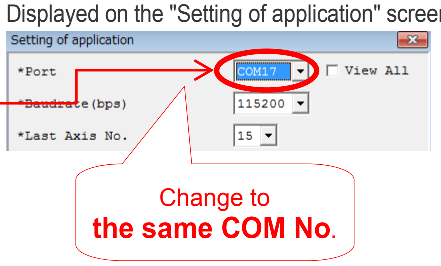
"PC Interface Software for RC/EC" main screen

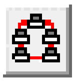


PC Windows:
Displayed on the "Device manager" screen

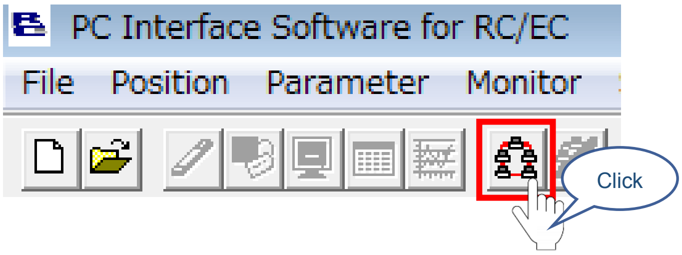


PC software for RC/EC:
Displayed on the "Setting of application" screen



(2) Click the "Check Connected Axes" icon  in the upper left corner of the PC software for RC/EC to connect with the RCON system.

"PC Interface Software for RC/EC" main screen



If connection is not possible, check from step 1 again.

Caution

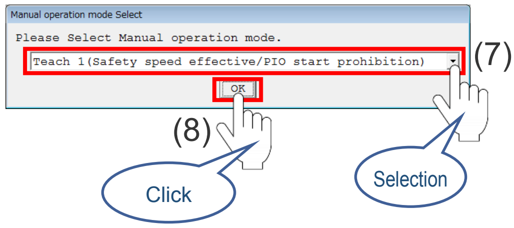
- If the actual number of connected axes of the RCON system does not match the number of axes set and transferred in the gateway parameter configuration tool, the PC software for RC/EC cannot be connected.
- Confirm the actual number of connected axes and change the gateway parameters, or read the present driver unit configuration with the gateway parameter configuration tool for transfer. For details, refer to Specifications Section Chapter 3 Gateway Parameter Configuration Tool (page 3-138).

When "MANU operation mode selection" screen appears,

(7) Select "Teach mode 1 (Safety speed effective/PIO start prohibition)",

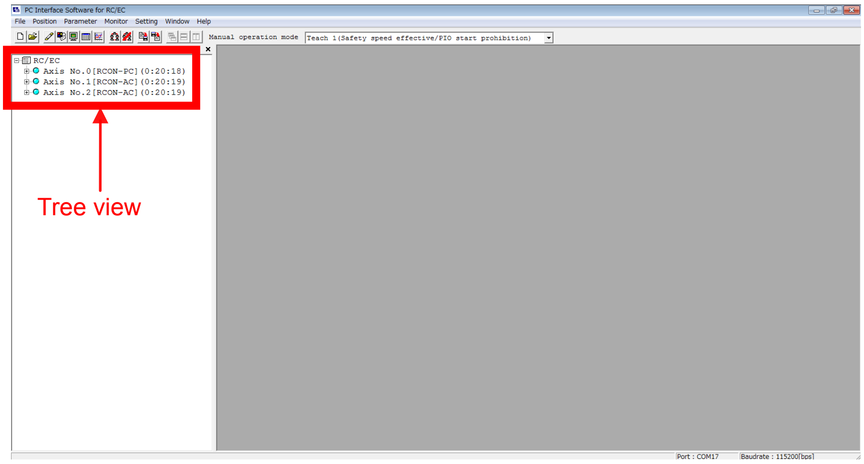
(8) and click OK .

"Manual operation mode Select" screen



(9) The main screen of PC software for RC/EC starts up.

"PC Interface Software for RC/EC" main screen



Point!

● If the icon is not displayed on the tree view, the RCON system and PC software for RC/EC are not connected.

Startup Section

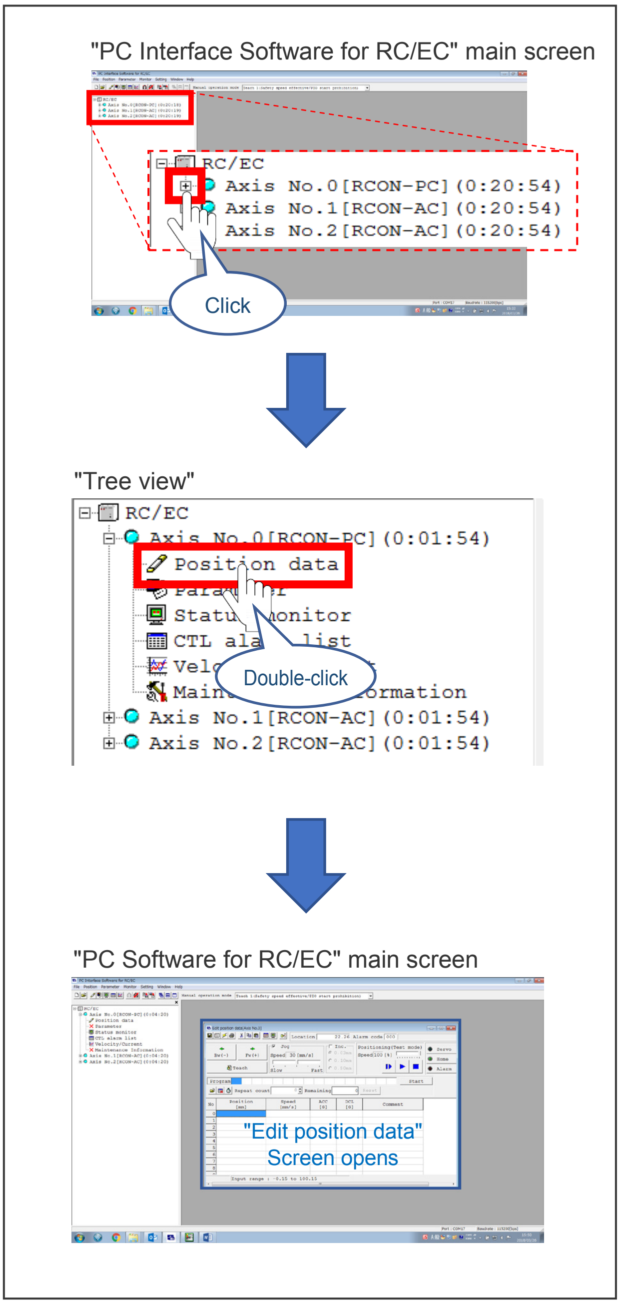
Chapter 4 Network Configuration

2 Open the position data editing screen.

(1) Click ⊞ on the left of axis No. 0 in the tree view on the left end of the main screen to expand each item.

(2) Double click on "Position data".

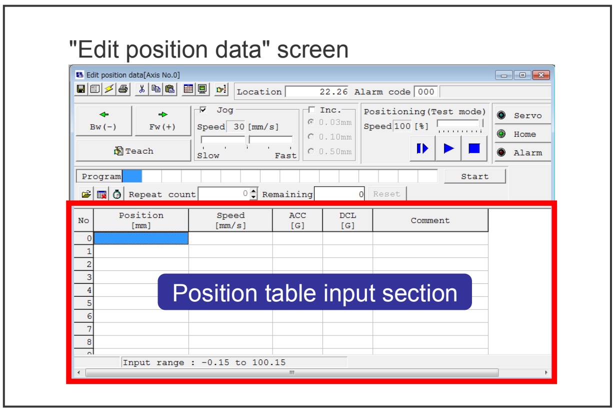
(3) The "Edit position data" screen is displayed.



[Registering target position]

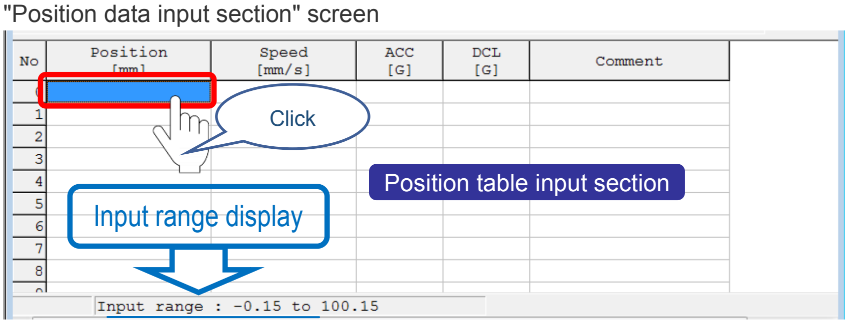
For the details of the position table, refer to the manual for PC software for RC/EC (ME0155).

(1) In the position table input section, enter the "position [mm]" to which the movable part of the actuator is moved.

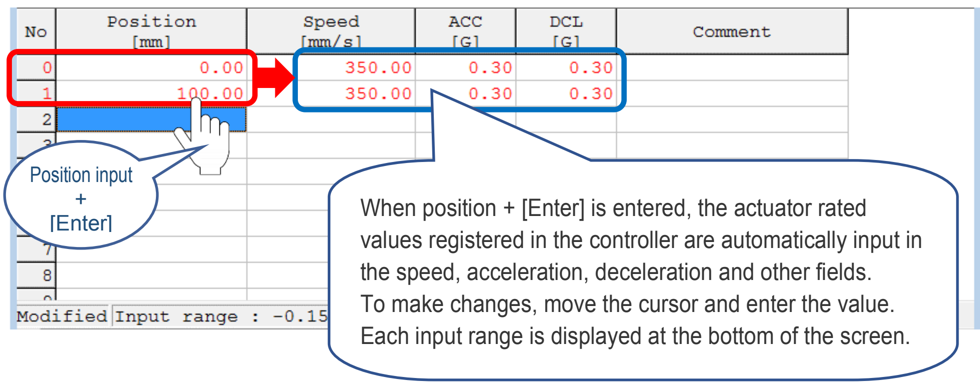


(2) Move the cursor to the position No. "Position [mm]" to be entered in the "position table input section". The range of values that can be entered is displayed at the bottom of the "position table input section".

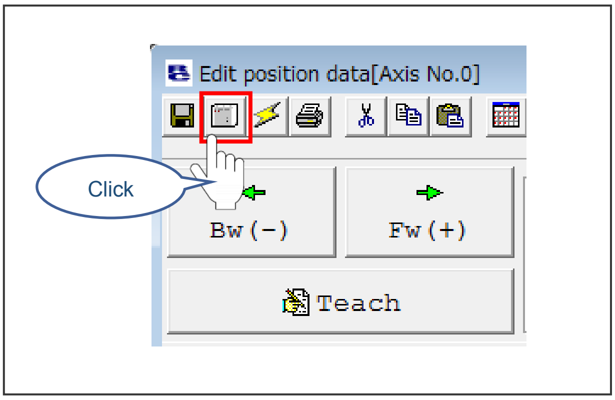
"Position data input section" screen



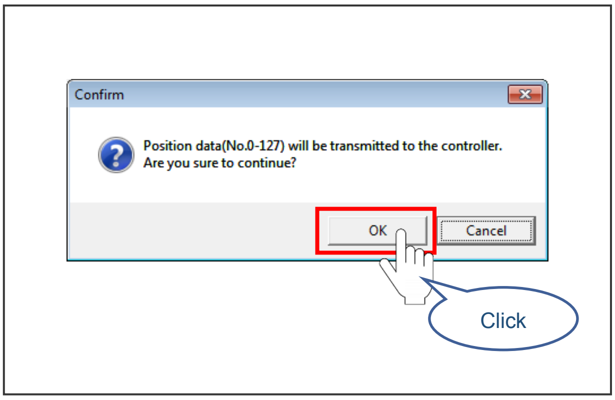
(3) Enter any coordinate value within the range of the values displayed in the "input range" and press [Enter] on your PC. (In the following example, 0 mm is entered in position No. 0 and 100 mm in position No. 1.)



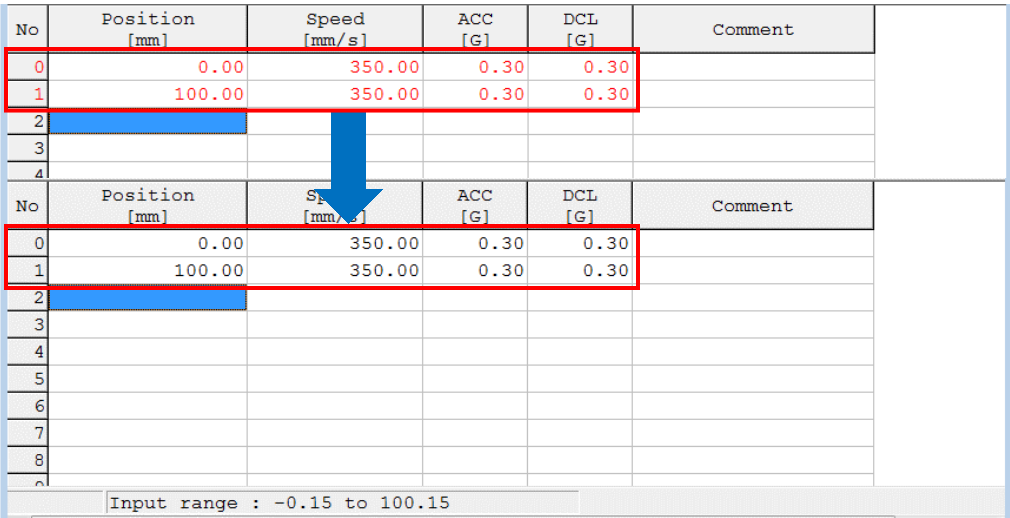
(4) Click (Transfer to controller) in the upper left corner of the edit position data screen.



(5) Click OK when the "Confirm" screen is displayed
.



When the controller transfer of position table data is completed, the number entered changes from red to black.



4.4 Address Configuration

The RCON address configuration is the same for all driver units regardless of field network type. Addresses occupied by the network are configured differently depending on the 8-word fixed region and data region that changes with operation mode and number of axes. Each operation mode and occupied data region is as follows.
Direct numerical control mode, simple direct mode and positioner 1~3 and 5 modes can be mixed for use and the model for each axis can be selected arbitrarily.

<table>
<tr><td colspan="9">Fixed region (8-word)</td></tr>
<tr><td colspan="9">+</td></tr>
<tr><td colspan="9">Data region</td></tr>
<tr><td>Direct numerical control mode (8-word)
×
Number of Axes</td><td>+</td><td>Simple direct mode (4-word)
×
Number of Axes</td><td>+</td><td>Positioner 1 mode (4-word)
×
Number of Axes</td><td>+</td><td>Positioner 2, 5 mode (2-word)
×
Number of Axes</td><td>+</td><td>Positioner 3 mode (1-word)
×
Number of Axes</td></tr>
</table>

(1) Fixed region configuration

<table>
<tr><td></td><td colspan="3">PLC output ⇒ RCON</td><td colspan="3">RCON ⇒ PLC input</td></tr>
<tr><td></td><td>High byte</td><td>Low byte</td><td>Word count</td><td>High byte</td><td>Low byte</td><td>Word count</td></tr>
<tr><td rowspan="2">Gateway control region</td><td colspan="2">Gateway control signal 0</td><td rowspan="2">2</td><td colspan="2">Gateway status signal 0</td><td rowspan="2">2</td></tr>
<tr><td colspan="2">Gateway control signal 1</td><td colspan="2">Gateway status signal 1</td></tr>
<tr><td rowspan="6">Power supply unit region *</td><td colspan="2">Not available.</td><td rowspan="6">6</td><td colspan="2">Power supply unit status signal 0</td><td rowspan="6">6</td></tr>
<tr><td colspan="2">Not available.</td><td colspan="2">Power supply unit status signal 1</td></tr>
<tr><td colspan="2">Not available.</td><td colspan="2">Power supply unit status signal 2</td></tr>
<tr><td colspan="2">Not available.</td><td colspan="2">Power supply unit status signal 3</td></tr>
<tr><td colspan="2">Not available.</td><td colspan="2">Power supply unit status signal 4</td></tr>
<tr><td colspan="2">Not available.</td><td colspan="2">Not available.</td></tr>
</table>

* Occupied as a data region even if a power supply unit is not connected.

(2) Direct numerical control mode data region configuration

	PLC output ⇒ each axis input			Each axis output ⇒ PLC input		
	High byte	Low byte	Word count	High byte	Low byte	Word count
Direct specified region	Specified position data (L) *		2	Present position data (L)) *		2
	Specified position data (H)) *			Present position data (H)) *		
	Specified positioning width (L)) *		2	Present current value (L)) *		2
	Specified positioning width (H)) *			Present current value (H)) *		
	Specified speed		1	Present speed data		1
	Specified acceleration/deceleration		1	Not available.		1
	Pushing current limit value		1	Alarm code		1
Control signal region	Control signal		1	Status signal		1

*(L) is the low word of a 2-word datum while (H) is the high word of a 2-word datum.

(3) Simple direct mode and positioner 1 mode data region configuration

	PLC output ⇒ each axis input					Each axis output ⇒ PLC input				
	High byte	Low byte	Word count	Simple direct mode	Positioner 1 mode	High byte	Low byte	Word count	Simple direct mode	Positioner 1 mode
Position data specified region	Specified position data (L)		2	○	x *	Present position data (L)		2	○	○
	Specified position data (H)					Present position data (H)				
Position specified region	Command position No.		1	○	○	Completed position No.		1	○	○
Control signal region	Control signal		1	○	○	Status signal		1	○	○

* Positioner 1 mode does not use the position data specified region (PLC ⇒ each axis input), but it is occupied as a data region.

(4) Positioner 2 mode data region configuration

	High byte	Low byte	Word count	High byte	Low byte	Word count
Position specified region	Command position No.		1	Completed position No.		1
Control signal region	Control signal		1	Status signal		1

(5) Positioner 3 mode data region configuration

	High byte	Low byte	Word count	High byte	Low byte	Word count
Control signal region	Control signal	Command position No.	1	Status signal	Completed position No.	1

(6) Positioner 5 mode data region configuration

	High byte	Low byte	Word count	High byte	Low byte	Word count
Position specified region	Command position No.		1	Present position data (0.1 mm increments)		1
Control signal region	Control signal		1	Status signal		1

Overall address configuration example

Shows the overall address configuration for each 4-word mode axis (simple direct/positioner 1) for 12 axes, each 8-word mode axis (direct numerical control) for 2 axes connected, or each 2-word mode axis (positioner 2/positioner 5) for 16 axes connected.
Note that CC-Link and DeviceNet are assigned with word addresses while PROFIBUS uses byte addresses.

[For CC-Link]
The following page shows a CC-Link configuration example.
Fixed 8-word region is assigned to the bit register (RX/RY), while the region for each axis is assigned to the word register (RWr/RWw).

■ CC-Link overall address configuration example (direct numerical control mode + simple direct mode/positioner 1 mode) shows direct numerical control mode connection for 2 axes and simple direct or positioner 1 mode connection for 12 axes.

PLC output ⇒ RCON / RCON ⇒ PLC input

Output register	High byte Low byte	Input register	High byte Low byte	
RY0F ~ 00	Gateway control signal 0	RX0F ~ 00	Gateway status signal 0	
RY1F ~ 10	Gateway control signal 1	RX1F ~ 10	Gateway status signal 1	
RY2F ~ 20	(Not available)	RX2F ~ 20	Power supply unit status signal 0	
RY3F ~ 30	(Not available)	RX3F ~ 30	Power supply unit status signal 1	8 words each
RY4F ~ 40	(Not available)	RX4F ~ 40	Power supply unit status signal 2	Fixed region
RY5F ~ 50	(Not available)	RX5F ~ 50	Power supply unit status signal 3	
RY6F ~ 60	(Not available)	RX6F ~ 60	Power supply unit status signal 4	
RY7F ~ 70	(Not available)	RX7F ~ 70	(Not available)	

*1 PLC master extended cyclic settings	Output register		Input register		
	RWw 00H	(Axis 0) Specified position data (L)	RWr 00H	(Axis 0) Present position data (L)	4 words each
	RWw 01H	(Axis 0) Specified position data (H)	RWr 01H	(Axis 0) Present position data (H)	Positioner 1
	RWw 02H	(Axis 0) Command position No.	RWr 02H	(Axis 0) Completed position No.	/simple direct
	RWw 03H	(Axis 0) Control signal	RWr 03H	(Axis 0) Status signal	
	RWw 04H	(Axis 1) Specified position data (L)	RWr 04H	(Axis 1) Present position data (L)	
	RWw 05H	(Axis 1) Specified position data (H)	RWr 05H	(Axis 1) Present position data (H)	4 words each
	RWw 06H	(Axis 1) Command position No.	RWr 06H	(Axis 1) Completed position No.	
	RWw 07H	(Axis 1) Control signal	RWr 07H	(Axis 1) Status signal	
	RWw 08H	(Axis 2) Specified position data (L)	RWr 08H	(Axis 2) Present position data (L)	
	RWw 09H	(Axis 2) Specified position data (H)	RWr 09H	(Axis 2) Present position data (H)	4 words each
16-word	RWw 0AH	(Axis 2) Command position No.	RWr 0AH	(Axis 2) Completed position No.	
	RWw 0BH	(Axis 2) Control signal	RWr 0BH	(Axis 2) Status signal	
1x multiplier	RWw 0CH	(Axis 3) Specified position data (L)	RWr 0CH	(Axis 3) Present position data (L)	
*2	RWw 0DH	(Axis 3) Specified position data (H)	RWr 0DH	(Axis 3) Present position data (H)	4 words each
	RWw 0EH	(Axis 3) Command position No.	RWr 0EH	(Axis 3) Completed position No.	
	RWw 0FH	(Axis 3) Control signal	RWr 0FH	(Axis 3) Status signal	
32-word 4x multiplier setting 2 stations	:	:		:	
	RWw 1FH	(Axis 7) Control signal	RWr 1FH	(Axis 7) Status signal	
	:	:	:	:	4 words each
	RWw 2FH	(Axis 11) Control signal	RWr 2FH	(Axis 11) Status signal	
	RWw 30H	(Axis 12) Specified position data (L)	RWr 30H	(Axis 12) Present position data (L)	
	RWw 31H	(Axis 12) Specified position data (H)	RWr 31H	(Axis 12) Present position data (H)	
	RWw 32H	(Axis 12) Specified positioning width (L)	RWr 32H	(Axis 12) Present current value (L)	8 words each
	RWw 33H	(Axis 12) Specified positioning width (H)	RWr 33H	(Axis 12) Present current value (H)	Direct numerical
	RWw 34H	(Axis 12) Specified speed	RWr 34H	(Axis 12) Present speed data	mode
	RWw 35H	(Axis 12) Specified acceleration/deceleration	RWr 35H	(Not available)	
	RWw 36H	(Axis 12) Pushing current limit value	RWr 36H	(Axis 12) Alarm code	
	RWw 37H	(Axis 12) Control signal	RWr 37H	(Axis 12) Status signal	
	RWw 38H	(Axis 13) Specified position data (L)	RWr 38H	(Axis 13) Present position data (L)	
	RWw 39H	(Axis 13) Specified position data (H)	RWr 39H	(Axis 13) Present position data (H)	
64-word	RWw 3AH	(Axis 13) Specified positioning width (L)	RWr 3AH	(Axis 13) Present current value (L)	
	RWw 3BH	(Axis 13) Specified positioning width (H)	RWr 3BH	(Axis 13) Present current value (H)	
8x multiplier	RWw 3CH	(Axis 13) Specified speed	RWr 3CH	(Axis 13) Present speed data	8 words each
	RWw 3DH	(Axis 13) Specified acceleration/deceleration	RWr 3DH	(Not available)	
	RWw 3EH	(Axis 13) Pushing current limit value	RWr 3EH	(Axis 13) Alarm code	
	RWw 3FH	(Axis 13) Control signal	RWr 3FH	(Axis 13) Status signal	

*1 Extended cyclic settings are performed based on the occupancy information displayed with the gateway parameter configuration tool.

*2 Operation is also possible with CC-Link Ver.1.10 if extended cyclic 1x multiplier settings (4 stations occupied) are within the usable range.

■ CC-Link overall address configuration example (positioner 2 mode)

An example showing positioner 2 mode connection for 16 axes.

PLC output ⇒ RCON / RCON ⇒ PLC input

Output register	High byte / Low byte	Input register	High byte / Low byte	
RY0F ~ 00	Gateway control signal 0	RX0F ~ 00	Gateway status signal 0	8 words each Fixed region
RY1F ~ 10	Gateway control signal 1	RX1F ~ 10	Gateway status signal 1	
RY2F ~ 20	(Not available)	RX2F ~ 20	Power supply unit status signal 0	
RY3F ~ 30	(Not available)	RX3F ~ 30	Power supply unit status signal 1	
RY4F ~ 40	(Not available)	RX4F ~ 40	Power supply unit status signal 2	
RY5F ~ 50	(Not available)	RX5F ~ 50	Power supply unit status signal 3	
RY6F ~ 60	(Not available)	RX6F ~ 60	Power supply unit status signal 4	
RY7F ~ 70	(Not available)	RX7F ~ 70	(Not available)	

PLC master extended cyclic settings *1	Output register		Input register		
16-word, 1x multiplier setting 4 *2	RWw 00H	(Axis 0) Command position No.	RWr 00H	(Axis 0) Completed position No.	2 words each
	RWw 01H	(Axis 0) Control signal	RWr 01H	(Axis 0) Status signal	
	RWw 02H	(Axis 1) Command position No.	RWr 02H	(Axis 1) Completed position No.	
	RWw 03H	(Axis 1) Control signal	RWr 03H	(Axis 1) Status signal	
	RWw 04H	(Axis 2) Command position No.	RWr 04H	(Axis 2) Completed position No.	
	RWw 05H	(Axis 2) Control signal	RWr 05H	(Axis 2) Status signal	
	RWw 06H	(Axis 3) Command position No.	RWr 06H	(Axis 3) Completed position No.	
	RWw 07H	(Axis 3) Control signal	RWr 07H	(Axis 3) Status signal	
	RWw 08H	(Axis 4) Command position No.	RWr 08H	(Axis 4) Completed position No.	
	RWw 09H	(Axis 4) Control signal	RWr 09H	(Axis 4) Status signal	
	RWw 0AH	(Axis 5) Command position No.	RWr 0AH	(Axis 5) Completed position No.	
	RWw 0BH	(Axis 5) Control signal	RWr 0BH	(Axis 5) Status signal	
	RWw 0CH	(Axis 6) Command position No.	RWr 0CH	(Axis 6) Completed position No.	
	RWw 0DH	(Axis 6) Control signal	RWr 0DH	(Axis 6) Status signal	
	RWw 0EH	(Axis 7) Command position No.	RWr 0EH	(Axis 7) Completed position No.	
	RWw 0FH	(Axis 7) Control signal	RWr 0FH	(Axis 7) Status signal	
32-word, 4x multiplier setting 2	RWw 10H	(Axis 8) Command position No.	RWr 10H	(Axis 8) Completed position No.	
	RWw 11H	(Axis 8) Control signal	RWr 11H	(Axis 8) Status signal	
	RWw 12H	(Axis 9) Command position No.	RWr 12H	(Axis 9) Completed position No.	
	RWw 13H	(Axis 9) Control signal	RWr 13H	(Axis 9) Status signal	
	RWw 14H	(Axis 10) Command position No.	RWr 14H	(Axis 10) Completed position No.	
	RWw 15H	(Axis 10) Control signal	RWr 15H	(Axis 10) Status signal	
	RWw 16H	(Axis 11) Command position No.	RWr 16H	(Axis 11) Completed position No.	
	RWw 17H	(Axis 11) Control signal	RWr 17H	(Axis 11) Status signal	
	RWw 18H	(Axis 12) Command position No.	RWr 18H	(Axis 12) Completed position No.	
	RWw 19H	(Axis 12) Control signal	RWr 19H	(Axis 12) Status signal	
	RWw 1AH	(Axis 13) Command position No.	RWr 1AH	(Axis 13) Completed position No.	
	RWw 1BH	(Axis 13) Control signal	RWr 1BH	(Axis 13) Status signal	
	RWw 1CH	(Axis 14) Command position No.	RWr 1CH	(Axis 14) Completed position No.	
	RWw 1DH	(Axis 14) Control signal	RWr 1DH	(Axis 14) Status signal	
	RWw 1EH	(Axis 15) Command position No.	RWr 1EH	(Axis 15) Completed position No.	
	RWw 1FH	(Axis 15) Control signal	RWr 1FH	(Axis 15) Status signal	

*1 Extended cyclic settings are performed based on the occupancy information displayed with the gateway parameter configuration tool.

*2 Operation is also possible with CC-Link Ver.1.10 if extended cyclic 1x multiplier settings (4 stations occupied) are within the usable range.

[For CC-Link IE]

Fixed 8-word region is assigned to the bit register (RX/RY), while the region for each axis is assigned to the word register (RWr/RWw).

■ CC-Link IE overall address configuration example (direct numerical control mode + simple direct mode/positioner 1 mode) shows direct numerical control mode connection for 2 axes and simple direct or positioner 1 mode connection for 12 axes.

PLC output ⇒ RCON / RCON ⇒ PLC input

Output register	High byte Low byte	Input register	High byte Low byte	
RY0F ~ 00	Gateway control signal 0	RX0F ~ 00	Gateway status signal 0	8 words each Fixed region
RY1F ~ 10	Gateway control signal 1	RX1F ~ 10	Gateway status signal 1	
RY2F ~ 20	(Not available)	RX2F ~ 20	Power supply unit status signal 0	
RY3F ~ 30	(Not available)	RX3F ~ 30	Power supply unit status signal 1	
RY4F ~ 40	(Not available)	RX4F ~ 40	Power supply unit status signal 2	
RY5F ~ 50	(Not available)	RX5F ~ 50	Power supply unit status signal 3	
RY6F ~ 60	(Not available)	RX6F ~ 60	Power supply unit status signal 4	
RY7F ~ 70	(Not available)	RX7F ~ 70	(Not available)	

Output register		Input register		
RWw 00H	(Axis 0) Specified position data (L)	RWr 00H	(Axis 0) Present position data (L)	4 words each Positioner 1 /simple direct
RWw 01H	(Axis 0) Specified position data (H)	RWr 01H	(Axis 0) Present position data (H)	
RWw 02H	(Axis 0) Command position No.	RWr 02H	(Axis 0) Completed position No.	
RWw 03H	(Axis 0) Control signal	RWr 03H	(Axis 0) Status signal	
RWw 04H	(Axis 1) Specified position data (L)	RWr 04H	(Axis 1) Present position data (L)	4 words each
RWw 05H	(Axis 1) Specified position data (H)	RWr 05H	(Axis 1) Present position data (H)	
RWw 06H	(Axis 1) Command position No.	RWr 06H	(Axis 1) Completed position No.	
RWw 07H	(Axis 1) Control signal	RWr 07H	(Axis 1) Status signal	
RWw 08H	(Axis 2) Specified position data (L)	RWr 08H	(Axis 2) Present position data (L)	4 words each
RWw 09H	(Axis 2) Specified position data (H)	RWr 09H	(Axis 2) Present position data (H)	
RWw 0AH	(Axis 2) Command position No.	RWr 0AH	(Axis 2) Completed position No.	
RWw 0BH	(Axis 2) Control signal	RWr 0BH	(Axis 2) Status signal	
RWw 0CH	(Axis 3) Specified position data (L)	RWr 0CH	(Axis 3) Present position data (L)	4 words each
RWw 0DH	(Axis 3) Specified position data (H)	RWr 0DH	(Axis 3) Present position data (H)	
RWw 0EH	(Axis 3) Command position No.	RWr 0EH	(Axis 3) Completed position No.	
RWw 0FH	(Axis 3) Control signal	RWr 0FH	(Axis 3) Status signal	
:	:		:	
RWw 1FH	(Axis 7) Control signal	RWr 1FH	(Axis 7) Status signal	4 words each
:	:	:	:	
RWw 2FH	(Axis 11) Control signal	RWr 2FH	(Axis 11) Status signal	
RWw 30H	(Axis 12) Specified position data (L)	RWr 30H	(Axis 12) Present position data (L)	8 words each Direct numerical mode
RWw 31H	(Axis 12) Specified position data (H)	RWr 31H	(Axis 12) Present position data (H)	
RWw 32H	(Axis 12) Specified positioning width (L)	RWr 32H	(Axis 12) Present current value (L)	
RWw 33H	(Axis 12) Specified positioning width (H)	RWr 33H	(Axis 12) Present current value (H)	
RWw 34H	(Axis 12) Specified speed	RWr 34H	(Axis 12) Present speed data	
RWw 35H	(Axis 12) Specified acceleration/deceleration	RWr 35H	(Not available)	
RWw 36H	(Axis 12) Pushing current limit value	RWr 36H	(Axis 12) Alarm code	
RWw 37H	(Axis 12) Control signal	RWr 37H	(Axis 12) Status signal	
RWw 38H	(Axis 13) Specified position data (L)	RWr 38H	(Axis 13) Present position data (L)	8 words each
RWw 39H	(Axis 13) Specified position data (H)	RWr 39H	(Axis 13) Present position data (H)	
RWw 3AH	(Axis 13) Specified positioning width (L)	RWr 3AH	(Axis 13) Present current value (L)	
RWw 3BH	(Axis 13) Specified positioning width (H)	RWr 3BH	(Axis 13) Present current value (H)	
RWw 3CH	(Axis 13) Specified speed	RWr 3CH	(Axis 13) Present speed data	
RWw 3DH	(Axis 13) Specified acceleration/deceleration	RWr 3DH	(Not available)	
RWw 3EH	(Axis 13) Pushing current limit value	RWr 3EH	(Axis 13) Alarm code	
RWw 3FH	(Axis 13) Control signal	RWr 3FH	(Axis 13) Status signal	

■ CC-Link IE overall address configuration example (positioner 2 mode)

An example showing positioner 2 mode connection for 16 axes.

PLC output ⇒ RCON

Output register	High byte Low byte
RY0F ~ 00	Gateway control signal 0
RY1F ~ 10	Gateway control signal 1
RY2F ~ 20	(Not available)
RY3F ~ 30	(Not available)
RY4F ~ 40	(Not available)
RY5F ~ 50	(Not available)
RY6F ~ 60	(Not available)
RY7F ~ 70	(Not available)

RCON ⇒ PLC input

Input register	High byte Low byte
RX0F ~ 00	Gateway status signal 0
RX1F ~ 10	Gateway status signal 1
RX2F ~ 20	Power supply unit status signal 0
RX3F ~ 30	Power supply unit status signal 1
RX4F ~ 40	Power supply unit status signal 2
RX5F ~ 50	Power supply unit status signal 3
RX6F ~ 60	Power supply unit status signal 4
RX7F ~ 70	(Not available)

8 words each
Fixed region

Output register	
RWw 00H	(Axis 0) Command position No.
RWw 01H	(Axis 0) Control signal
RWw 02H	(Axis 1) Command position No.
RWw 03H	(Axis 1) Control signal
RWw 04H	(Axis 2) Command position No.
RWw 05H	(Axis 2) Control signal
RWw 06H	(Axis 3) Command position No.
RWw 07H	(Axis 3) Control signal
RWw 08H	(Axis 4) Command position No.
RWw 09H	(Axis 4) Control signal
RWw 0AH	(Axis 5) Command position No.
RWw 0BH	(Axis 5) Control signal
RWw 0CH	(Axis 6) Command position No.
RWw 0DH	(Axis 6) Control signal
RWw 0EH	(Axis 7) Command position No.
RWw 0FH	(Axis 7) Control signal
RWw 10H	(Axis 8) Command position No.
RWw 11H	(Axis 8) Control signal
RWw 12H	(Axis 9) Command position No.
RWw 13H	(Axis 9) Control signal
RWw 14H	(Axis 10) Command position No.
RWw 15H	(Axis 10) Control signal
RWw 16H	(Axis 11) Command position No.
RWw 17H	(Axis 11) Control signal
RWw 18H	(Axis 12) Command position No.
RWw 19H	(Axis 12) Control signal
RWw 1AH	(Axis 13) Command position No.
RWw 1BH	(Axis 13) Control signal
RWw 1CH	(Axis 14) Command position No.
RWw 1DH	(Axis 14) Control signal
RWw 1EH	(Axis 15) Command position No.
RWw 1FH	(Axis 15) Control signal

Input register	
RWr 00H	(Axis 0) Completed position No.
RWr 01H	(Axis 0) Status signal
RWr 02H	(Axis 1) Completed position No.
RWr 03H	(Axis 1) Status signal
RWr 04H	(Axis 2) Completed position No.
RWr 05H	(Axis 2) Status signal
RWr 06H	(Axis 3) Completed position No.
RWr 07H	(Axis 3) Status signal
RWr 08H	(Axis 4) Completed position No.
RWr 09H	(Axis 4) Status signal
RWr 0AH	(Axis 5) Completed position No.
RWr 0BH	(Axis 5) Status signal
RWr 0CH	(Axis 6) Completed position No.
RWr 0DH	(Axis 6) Status signal
RWr 0EH	(Axis 7) Completed position No.
RWr 0FH	(Axis 7) Status signal
RWr 10H	(Axis 8) Completed position No.
RWr 11H	(Axis 8) Status signal
RWr 12H	(Axis 9) Completed position No.
RWr 13H	(Axis 9) Status signal
RWr 14H	(Axis 10) Completed position No.
RWr 15H	(Axis 10) Status signal
RWr 16H	(Axis 11) Completed position No.
RWr 17H	(Axis 11) Status signal
RWr 18H	(Axis 12) Completed position No.
RWr 19H	(Axis 12) Status signal
RWr 1AH	(Axis 13) Completed position No.
RWr 1BH	(Axis 13) Status signal
RWr 1CH	(Axis 14) Completed position No.
RWr 1DH	(Axis 14) Status signal
RWr 1EH	(Axis 15) Completed position No.
RWr 1FH	(Axis 15) Status signal

2 words each

[For DeviceNet]

■ DeviceNet overall address configuration example (direct numerical control mode + simple direct mode/positioner 1 mode)
Shows direct numerical control mode connection for 2 axes and simple direct or positioner 1 mode connection for 12 axes.

Relative CH *	PLC output ⇒ RCON	RCON ⇒ PLC input	
	High byte / Low byte	High byte / Low byte	
0	Gateway control signal 0	Gateway status signal 0	
1	Gateway control signal 1	Gateway status signal 1	8 words each
2	(Not available)	Power supply unit status signal 0	Fixed region
3	(Not available)	Power supply unit status signal 1	
4	(Not available)	Power supply unit status signal 2	
5	(Not available)	Power supply unit status signal 3	
6	(Not available)	Power supply unit status signal 4	
7	(Not available)	(Not available)	
8	(Axis 0) Specified position data (L)	(Axis 0) Present position data (L)	4 words each
9	(Axis 0) Specified position data (H)	(Axis 0) Present position data (H)	Positioner 1
10	(Axis 0) Command position No.	(Axis 0) Completed position No.	/simple direct mode
11	(Axis 0) Control signal	(Axis 0) Status signal	
12	(Axis 1) Specified position data (L)	(Axis 1) Present position data (L)	
13	(Axis 1) Specified position data (H)	(Axis 1) Present position data (H)	4 words each
14	(Axis 1) Command position No.	(Axis 1) Completed position No.	
15	(Axis 1) Control signal	(Axis 1) Status signal	
16	(Axis 2) Specified position data (L)	(Axis 2) Present position data (L)	
17	(Axis 2) Specified position data (H)	(Axis 2) Present position data (H)	4 words each
18	(Axis 2) Command position No.	(Axis 2) Completed position No.	
19	(Axis 2) Control signal	(Axis 2) Status signal	
20	(Axis 3) Specified position data (L)	(Axis 3) Present position data (L)	
21	(Axis 3) Specified position data (H)	(Axis 3) Present position data (H)	4 words each
22	(Axis 3) Command position No.	(Axis 3) Completed position No.	
23	(Axis 3) Control signal	(Axis 3) Status signal	
:	:	:	
39	(Axis 7) Control signal	(Axis 7) Status signal	4 words each
:	:	:	
55	(Axis 11) Control signal	(Axis 11) Status signal	
56	(Axis 12) Specified position data (L)	(Axis 12) Present position data (L)	
57	(Axis 12) Specified position data (H)	(Axis 12) Present position data (H)	
58	(Axis 12) Specified positioning width (L)	(Axis 12) Present current value (L)	8 words each
59	(Axis 12) Specified positioning width (H)	(Axis 12) Present current value (H)	Direct numerical
60	(Axis 12) Specified speed	(Axis 12) Present speed data	mode
61	(Axis 12) Specified acceleration/deceleration	(Not available)	
62	(Axis 12) Pushing current limit value	(Axis 12) Alarm code	
63	(Axis 12) Control signal	(Axis 12) Status signal	
64	(Axis 13) Specified position data (L)	(Axis 13) Present position data (L)	
65	(Axis 13) Specified position data (H)	(Axis 13) Present position data (H)	
66	(Axis 13) Specified positioning width (L)	(Axis 13) Present current value (L)	
67	(Axis 13) Specified positioning width (H)	(Axis 13) Present current value (H)	
68	(Axis 13) Specified speed	(Axis 13) Present speed data	8 words each
69	(Axis 13) Specified acceleration/deceleration	(Not available)	
70	(Axis 13) Pushing current limit value	(Axis 13) Alarm code	
71	(Axis 13) Control signal	(Axis 13) Status signal	

* Relative CH is the CH number relative to the gateway head CH

■ DeviceNet overall address configuration example (positioner 2 mode)

An example showing positioner 2 mode connection for 16 axes.

Relative CH *	PLC output ⇒ RCON (High byte / Low byte)	RCON ⇒ PLC input (High byte / Low byte)	
0	Gateway control signal 0	Gateway status signal 0	8 words each Fixed region
1	Gateway control signal 1	Gateway status signal 1	
2	(Not available)	Power supply unit status signal 0	
3	(Not available)	Power supply unit status signal 1	
4	(Not available)	Power supply unit status signal 2	
5	(Not available)	Power supply unit status signal 3	
6	(Not available)	Power supply unit status signal 4	
7	(Not available)	(Not available)	
8	(Axis 0) Command position No.	(Axis 0) Completed position No.	2 words each
9	(Axis 0) Control signal	(Axis 0) Status signal	
10	(Axis 1) Command position No.	(Axis 1) Completed position No.	
11	(Axis 1) Control signal	(Axis 1) Status signal	
12	(Axis 2) Command position No.	(Axis 2) Completed position No.	
13	(Axis 2) Control signal	(Axis 2) Status signal	
14	(Axis 3) Command position No.	(Axis 3) Completed position No.	
15	(Axis 3) Control signal	(Axis 3) Status signal	
16	(Axis 4) Command position No.	(Axis 4) Completed position No.	
17	(Axis 4) Control signal	(Axis 4) Status signal	
18	(Axis 5) Command position No.	(Axis 5) Completed position No.	
19	(Axis 5) Control signal	(Axis 5) Status signal	
20	(Axis 6) Command position No.	(Axis 6) Completed position No.	
21	(Axis 6) Control signal	(Axis 6) Status signal	
22	(Axis 7) Command position No.	(Axis 7) Completed position No.	
23	(Axis 7) Control signal	(Axis 7) Status signal	
24	(Axis 8) Command position No.	(Axis 8) Completed position No.	
25	(Axis 8) Control signal	(Axis 8) Status signal	
26	(Axis 9) Command position No.	(Axis 9) Completed position No.	
27	(Axis 9) Control signal	(Axis 9) Status signal	
28	(Axis 10) Command position No.	(Axis 10) Completed position No.	
29	(Axis 10) Control signal	(Axis 10) Status signal	
30	(Axis 11) Command position No.	(Axis 11) Completed position No.	
31	(Axis 11) Control signal	(Axis 11) Status signal	
32	(Axis 12) Command position No.	(Axis 12) Completed position No.	
33	(Axis 12) Control signal	(Axis 12) Status signal	
34	(Axis 13) Command position No.	(Axis 13) Completed position No.	
35	(Axis 13) Control signal	(Axis 13) Status signal	
36	(Axis 14) Command position No.	(Axis 14) Completed position No.	
37	(Axis 14) Control signal	(Axis 14) Status signal	
38	(Axis 15) Command position No.	(Axis 15) Completed position No.	
39	(Axis 15) Control signal	(Axis 15) Status signal	

* Relative CH is the CH number relative to the gateway head CH

[For PROFIBUS-DP, EtherNet/IP, EtherCAT]

■ Overall address configuration example (direct numerical control mode + simple direct mode/positioner 1 mode)

Shows direct numerical control mode connection for 2 axes and simple direct or positioner 1 mode connection for 12 axes.

Relative byte *	PLC output ⇒ RCON (High byte / Low byte)	RCON ⇒ PLC input (High byte / Low byte)	
0	Gateway control signal 0	Gateway status signal 0	8 words each Fixed region
2	Gateway control signal 1	Gateway status signal 1	
4	(Not available)	Power supply unit status signal 0	
6	(Not available)	Power supply unit status signal 1	
8	(Not available)	Power supply unit status signal 2	
10	(Not available)	Power supply unit status signal 3	
12	(Not available)	Power supply unit status signal 4	
14	(Not available)	(Not available)	
16	(Axis 0) Specified position data (L)	(Axis 0) Present position data (L)	4 words each Positioner 1 /simple direct mode
18	(Axis 0) Specified position data (H)	(Axis 0) Present position data (H)	
20	(Axis 0) Command position No.	(Axis 0) Completed position No.	
22	(Axis 0) Control signal	(Axis 0) Status signal	
24	(Axis 1) Specified position data (L)	(Axis 1) Present position data (L)	4 words each
26	(Axis 1) Specified position data (H)	(Axis 1) Present position data (H)	
28	(Axis 1) Command position No.	(Axis 1) Completed position No.	
30	(Axis 1) Control signal	(Axis 1) Status signal	
32	(Axis 2) Specified position data (L)	(Axis 2) Present position data (L)	4 words each
34	(Axis 2) Specified position data (H)	(Axis 2) Present position data (H)	
36	(Axis 2) Command position No.	(Axis 2) Completed position No.	
38	(Axis 2) Control signal	(Axis 2) Status signal	
40	(Axis 3) Specified position data (L)	(Axis 3) Present position data (L)	4 words each
42	(Axis 3) Specified position data (H)	(Axis 3) Present position data (H)	
44	(Axis 3) Command position No.	(Axis 3) Completed position No.	
46	(Axis 3) Control signal	(Axis 3) Status signal	
⋮	⋮	⋮	4 words each
78	(Axis 7) Control signal	(Axis 7) Status signal	
⋮	⋮	⋮	
110	(Axis 11) Control signal	(Axis 11) Status signal	
112	(Axis 12) Specified position data (L)	(Axis 12) Present position data (L)	8 words each Direct numerical mode
114	(Axis 12) Specified position data (H)	(Axis 12) Present position data (H)	
116	(Axis 12) Specified positioning width (L)	(Axis 12) Present current value (L)	
118	(Axis 12) Specified positioning width (H)	(Axis 12) Present current value (H)	
120	(Axis 12) Specified speed	(Axis 12) Present speed data	
122	(Axis 12) Specified acceleration/deceleration	(Not available)	
124	(Axis 12) Pushing current limit value	(Axis 12) Alarm code	
126	(Axis 12) Control signal	(Axis 12) Status signal	
128	(Axis 13) Specified position data (L)	(Axis 13) Present position data (L)	8 words each
130	(Axis 13) Specified position data (H)	(Axis 13) Present position data (H)	
132	(Axis 13) Specified positioning width (L)	(Axis 13) Present current value (L)	
134	(Axis 13) Specified positioning width (H)	(Axis 13) Present current value (H)	
136	(Axis 13) Specified speed	(Axis 13) Present speed data	
138	(Axis 13) Specified acceleration/deceleration	(Not available)	
140	(Axis 13) Pushing current limit value	(Axis 13) Alarm code	
142	(Axis 13) Control signal	(Axis 13) Status signal	

* Relative byte is the byte address relative to the gateway head

■ Overall address configuration example (positioner 2 mode)

An example showing positioner 2 mode connection for 16 axes.

Relative byte *	PLC output ⇒ RCON (High byte / Low byte)	RCON ⇒ PLC input (High byte / Low byte)	
0	Gateway control signal 0	Gateway status signal 0	8 words each Fixed region
2	Gateway control signal 1	Gateway status signal 1	
4	(Not available)	Power supply unit status signal 0	
6	(Not available)	Power supply unit status signal 1	
8	(Not available)	Power supply unit status signal 2	
10	(Not available)	Power supply unit status signal 3	
12	(Not available)	Power supply unit status signal 4	
14	(Not available)	(Not available)	
16	(Axis 0) Command position No.	(Axis 0) Completed position No.	2 words each
18	(Axis 0) Control signal	(Axis 0) Status signal	
20	(Axis 1) Command position No.	(Axis 1) Completed position No.	
22	(Axis 1) Control signal	(Axis 1) Status signal	
24	(Axis 2) Command position No.	(Axis 2) Completed position No.	
26	(Axis 2) Control signal	(Axis 2) Status signal	
28	(Axis 3) Command position No.	(Axis 3) Completed position No.	
30	(Axis 3) Control signal	(Axis 3) Status signal	
32	(Axis 4) Command position No.	(Axis 4) Completed position No.	
34	(Axis 4) Control signal	(Axis 4) Status signal	
36	(Axis 5) Command position No.	(Axis 5) Completed position No.	
38	(Axis 5) Control signal	(Axis 5) Status signal	
40	(Axis 6) Command position No.	(Axis 6) Completed position No.	
42	(Axis 6) Control signal	(Axis 6) Status signal	
44	(Axis 7) Command position No.	(Axis 7) Completed position No.	
46	(Axis 7) Control signal	(Axis 7) Status signal	
48	(Axis 8) Command position No.	(Axis 8) Completed position No.	
50	(Axis 8) Control signal	(Axis 8) Status signal	
52	(Axis 9) Command position No.	(Axis 9) Completed position No.	
54	(Axis 9) Control signal	(Axis 9) Status signal	
56	(Axis 10) Command position No.	(Axis 10) Completed position No.	
58	(Axis 10) Control signal	(Axis 10) Status signal	
60	(Axis 11) Command position No.	(Axis 11) Completed position No.	
62	(Axis 11) Control signal	(Axis 11) Status signal	
64	(Axis 12) Command position No.	(Axis 12) Completed position No.	
66	(Axis 12) Control signal	(Axis 12) Status signal	
68	(Axis 13) Command position No.	(Axis 13) Completed position No.	
70	(Axis 13) Control signal	(Axis 13) Status signal	
72	(Axis 14) Command position No.	(Axis 14) Completed position No.	
74	(Axis 14) Control signal	(Axis 14) Status signal	
76	(Axis 15) Command position No.	(Axis 15) Completed position No.	
78	(Axis 15) Control signal	(Axis 15) Status signal	

* Relative byte is the byte address relative to the gateway head

[For PROFINET-IO]

■ PROFINET-IO overall address configuration example (direct numerical control mode + simple direct mode/positioner 1 mode)

Shows direct numerical control mode connection for 2 axes and simple direct or positioner 1 mode connection for 12 axes.

4-word Module count	PLC output ⇒ RCON High byte / Low byte	RCON ⇒ PLC input High byte / Low byte	
1	Gateway control signal 0	Gateway status signal 0	8 words each Fixed region
	Gateway control signal 1	Gateway status signal 1	
	(Not available)	Power supply unit status signal 0	
	(Not available)	Power supply unit status signal 1	
2	(Not available)	Power supply unit status signal 2	
	(Not available)	Power supply unit status signal 3	
	(Not available)	Power supply unit status signal 4	
	(Not available)	(Not available)	
3	(Axis 0) Specified position data (L)	(Axis 0) Present position data (L)	4 words each Positioner 1 /simple direct mode
	(Axis 0) Specified position data (H)	(Axis 0) Present position data (H)	
	(Axis 0) Command position No.	(Axis 0) Completed position No.	
	(Axis 0) Control signal	(Axis 0) Status signal	
4	(Axis 1) Specified position data (L)	(Axis 1) Present position data (L)	4 words each
	(Axis 1) Specified position data (H)	(Axis 1) Present position data (H)	
	(Axis 1) Command position No.	(Axis 1) Completed position No.	
	(Axis 1) Control signal	(Axis 1) Status signal	
5	(Axis 2) Specified position data (L)	(Axis 2) Present position data (L)	4 words each
	(Axis 2) Specified position data (H)	(Axis 2) Present position data (H)	
	(Axis 2) Command position No.	(Axis 2) Completed position No.	
	(Axis 2) Control signal	(Axis 2) Status signal	
6	(Axis 3) Specified position data (L)	(Axis 3) Present position data (L)	4 words each
	(Axis 3) Specified position data (H)	(Axis 3) Present position data (H)	
	(Axis 3) Command position No.	(Axis 3) Completed position No.	
	(Axis 3) Control signal	(Axis 3) Status signal	
⋮	⋮	⋮	4 words each
14	(Axis 11) Specified position data (L)	(Axis 11) Present position data (L)	4 words each
	(Axis 11) Specified position data (H)	(Axis 11) Present position data (H)	
	(Axis 11) Command position No.	(Axis 11) Completed position No.	
	(Axis 11) Control signal	(Axis 11) Status signal	
15	(Axis 12) Specified position data (L)	(Axis 12) Present position data (L)	8 words each Direct numerical mode
	(Axis 12) Specified position data (H)	(Axis 12) Present position data (H)	
	(Axis 12) Specified positioning width (L)	(Axis 12) Present current value (L)	
	(Axis 12) Specified positioning width (H)	(Axis 12) Present current value (H)	
16	(Axis 12) Specified speed	(Axis 12) Present speed data	
	(Axis 12) Specified acceleration/deceleration	(Not available)	
	(Axis 12) Pushing current limit value	(Axis 12) Alarm code	
	(Axis 12) Control signal	(Axis 12) Status signal	
17	(Axis 13) Specified position data (L)	(Axis 13) Present position data (L)	8 words each
	(Axis 13) Specified position data (H)	(Axis 13) Present position data (H)	
	(Axis 13) Specified positioning width (L)	(Axis 13) Present current value (L)	
	(Axis 13) Specified positioning width (H)	(Axis 13) Present current value (H)	
18	(Axis 13) Specified speed	(Axis 13) Present speed data	
	(Axis 13) Specified acceleration/deceleration	(Not available)	
	(Axis 13) Pushing current limit value	(Axis 13) Alarm code	
	(Axis 13) Control signal	(Axis 13) Status signal	

■ PROFINET-IO overall address configuration example (positioner 2 mode)

An example showing positioner 2 mode connection for 16 axes.

4-word Module count	PLC output ⇒ RCON (High byte / Low byte)	RCON ⇒ PLC input (High byte / Low byte)	
1	Gateway control signal 0	Gateway status signal 0	8 words each Fixed region
	Gateway control signal 1	Gateway status signal 1	
	(Not available)	Power supply unit status signal 0	
	(Not available)	Power supply unit status signal 1	
2	(Not available)	Power supply unit status signal 2	
	(Not available)	Power supply unit status signal 3	
	(Not available)	Power supply unit status signal 4	
	(Not available)	(Not available)	
3	(Axis 0) Command position No.	(Axis 0) Completed position No.	2 words each
	(Axis 0) Control signal	(Axis 0) Status signal	
	(Axis 1) Command position No.	(Axis 1) Completed position No.	
	(Axis 1) Control signal	(Axis 1) Status signal	
4	(Axis 2) Command position No.	(Axis 2) Completed position No.	
	(Axis 2) Control signal	(Axis 2) Status signal	
	(Axis 3) Command position No.	(Axis 3) Completed position No.	
	(Axis 3) Control signal	(Axis 3) Status signal	
5	(Axis 4) Command position No.	(Axis 4) Completed position No.	
	(Axis 4) Control signal	(Axis 4) Status signal	
	(Axis 5) Command position No.	(Axis 5) Completed position No.	
	(Axis 5) Control signal	(Axis 5) Status signal	
6	(Axis 6) Command position No.	(Axis 6) Completed position No.	
	(Axis 6) Control signal	(Axis 6) Status signal	
	(Axis 7) Command position No.	(Axis 7) Completed position No.	
	(Axis 7) Control signal	(Axis 7) Status signal	
7	(Axis 8) Command position No.	(Axis 8) Completed position No.	
	(Axis 8) Control signal	(Axis 8) Status signal	
	(Axis 9) Command position No.	(Axis 9) Completed position No.	
	(Axis 9) Control signal	(Axis 9) Status signal	
8	(Axis 10) Command position No.	(Axis 10) Completed position No.	
	(Axis 10) Control signal	(Axis 10) Status signal	
	(Axis 11) Command position No.	(Axis 11) Completed position No.	
	(Axis 11) Control signal	(Axis 11) Status signal	
9	(Axis 12) Command position No.	(Axis 12) Completed position No.	
	(Axis 12) Control signal	(Axis 12) Status signal	
	(Axis 13) Command position No.	(Axis 13) Completed position No.	
	(Axis 13) Control signal	(Axis 13) Status signal	
10	(Axis 14) Command position No.	(Axis 14) Completed position No.	
	(Axis 14) Control signal	(Axis 14) Status signal	
	(Axis 15) Command position No.	(Axis 15) Completed position No.	
	(Axis 15) Control signal	(Axis 15) Status signal	

Gateway control/status signals

The first 2 words for each I/O in the gateway unit address configuration are signals for controlling and monitoring the status of the gateway unit.

PLC output

									Address*			
									CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO
									–	Relative CH	Relative byte	Relative module
Gateway Control signal 0	b15	b14	b13	b12	b11	b10	b9	b8	RY 0*	+0	+0	+0
	MON	–	–	–	–	–	–	–				
	b7	b6	b5	b4	b3	b2	b1	b0			+1	
	–	–	–	–	–	–	–	–				
Gateway Control signal 1	b15	b14	b13	b12	b11	b10	b9	b8	RY 1*	+1	+2	
	–	–	–	–	–	–	–	–				
	b7	b6	b5	b4	b3	b2	b1	b0			+3	
	–	–	–	–	–	–	–	–				

PLC input

									Address*			
									CC-Link, CC-Link IE	DeviceNet	PROFIBUS-DP, EtherNet/IP, EtherCAT	PROFINET-IO
									–	Relative CH	Relative byte	Relative module
Gateway Status signal 0	b15	b14	b13	b12	b11	b10	b9	b8	RX 0*	+0	+0	+0
	RUN	LERC	ERRT	MOD	ALMH	ALML	–	SEMG				
	b7	b6	b5	b4	b3	b2	b1	b0			+1	
	ALMC128	ALMC64	ALMC32	ALMC16	ALMC8	ALMC4	ALMC2	ALMC1				
Gateway Status signal 1	b15	b14	b13	b12	b11	b10	b9	b8	RX 1*	+1	+2	
	LNK15	LNK14	LNK13	LNK12	LNK11	LNK10	LNK9	LNK8				
	b7	b6	b5	b4	b3	b2	b1	b0			+3	
	LNK7	LNK6	LNK5	LNK4	LNK3	LNK2	LNK1	LNK0				

*Address is the address relative to the gateway head.

CC-Link, CC-Link IE, and DeviceNet have word addresses while PROFIBUS-DP, EtherNet/IP, and EtherCAT use byte addresses. PROFINET-IO uses 4-word module addresses.

The * in CC-Link and CC-Link IE bit register addresses is 0 to F.

For CC-Link and CC-Link IE, b10 to b15 are bA to bF. (Hexadecimal notation)

For PROFIBUS-DP, EtherNet/IP, and EtherCAT, b8 to b15 are b0 to b7. (Byte addresses)

I/O signal list

Signal type		Bit	Symbol name	Content
PLC output	Control signal 0	15	MON	PLC control output is enabled when ON ("1") (PLC output is reflected on controller unit) and disabled when OFF ("0").
		14-0	–	Not available. Keep this OFF ("0") normally.
	Control signal 1	15-0	–	Not available.
PLC input	Status signal 0	b15	RUN	Turns ON when gateway is in normal operation.
		b14	LERC	Turns ON and stays ON when an ERR-C error is generated while operating. Enabled when ERR-C generation is configured with the gateway parameter configuration tool.
		b13	ERRT	Turns ON if a gateway or axis communication error is detected.
		b12	MOD	Turns ON if MANU is selected with the unit front operation mode setting switch, and turns OFF when AUTO is selected.
		b11	ALMH	Turns ON if an error occurs that requires the gateway to be restarted. (Likely due to a mistaken parameter setting. Confirm as needed.)
		b10	ALML	Turns ON if a minor error caused by the gateway occurs. (Likely that calendar data has been deleted. Confirm as needed.)
		b9	–	Not available
		b8	SEMG	Turns ON when the system I/O connector STOP input is OFF (stop). All connected axes will go to stop status if this bit turns ON.
		b7	ALMC 1 ~ 128	Outputs alarm codes caused by the gateway. [For details, refer to "Maintenance Section Chapter 2 2.3 Causes and Countermeasures of Gateway Unit Alarms"]
		b6		
		b5		
		b4		
		b3		
		b2		
		b1		
		b0		
	Status signal 1	b15	LNK15	When communication between the gateway unit and the driver unit is solidly established, the bit No. that the gateway recognizes as enabled turns ON. Axis No. 0 = LNK0 ~ Axis No. 15 = LNK15
		b14	LNK14	
		b13	LNK13	
		b12	LNK12	
		b11	LNK11	
		b10	LNK10	
		b9	LNK9	
		b8	LNK8	
		b7	LNK7	
		b6	LNK6	
		b5	LNK5	
		b4	LNK4	
		b3	LNK3	
		b2	LNK2	
		b1	LNK1	
		b0	LNK0	

Power supply unit status signal

The I/O 8 words from the gateway unit head address are fixed regions, but within these are 6 words assigned to power supply unit status signals, enabling the power supply status to be confirmed.

(1) Address configuration

Request command region and response command region comprise 6 words for each I/O. Address is the address relative to the gateway head.

(1) For CC-Link and CC-Link IE

Bit Address	PLC output ⇒ gateway ⇒ each axis input		Each axis output ⇒ gateway ⇒ PLC input		Bit Address
	b15 High byte b8	b7 Low byte b0	b15 High byte b8	b7 Low byte b0	
RY 2F~20	Not available		Power supply unit status signal 0		RX 2F~20
RY 3F~30	Not available		Power supply unit status signal 1		RX 3F~30
RY 4F~40	Not available		Power supply unit status signal 2		RX 4F~40
RY 5F~50	Not available		Power supply unit status signal 3		RX 5F~50
RY 6F~60	Not available		Power supply unit status signal 4		RX 6F~60
RY 7F~70	Not available		Not available		RX 7F~70

(2) For DeviceNet

Word Address	PLC output ⇒ gateway ⇒ each axis input		Each axis output ⇒ gateway ⇒ PLC input	
	b15 High byte b8	b7 Low byte b0	b15 High byte b8	b7 Low byte b0
+2	Not available		Power supply unit status signal 0	
+3	Not available		Power supply unit status signal 1	
+4	Not available		Power supply unit status signal 2	
+5	Not available		Power supply unit status signal 3	
+6	Not available		Power supply unit status signal 4	
+7	Not available		Not available	

(3) For PROFIBUS-DP, EtherNet/IP, and EtherCAT

*1 Byte Address	PLC output ⇒ gateway ⇒ each axis input: b15 High byte b8	b7 Low byte b0	Each axis output ⇒ gateway ⇒ PLC input: b15 High byte b8	b7 Low byte b0
+4/+5	Not available		Power supply unit status signal 0	
+6/+7	Not available		Power supply unit status signal 1	
+8/+9	Not available		Power supply unit status signal 2	
+10/+11	Not available		Power supply unit status signal 3	
+12/+13	Not available		Power supply unit status signal 4	
+13/+14	Not available		Not available	

*1 b8 to b15 of the high byte are b0 to b7.

(4) For PROFINET-IO

*2 Module Address	PLC output ⇒ gateway ⇒ each axis input: b15 High byte b8	b7 Low byte b0	Each axis output ⇒ gateway ⇒ PLC input: b15 High byte b8	b7 Low byte b0
+0	Not available		Power supply unit status signal 0	
	Not available		Power supply unit status signal 1	
	Not available		Power supply unit status signal 2	
+1	Not available		Power supply unit status signal 3	
	Not available		Power supply unit status signal 4	
	Not available		Not available	

*2 PROFINET-IO uses 4-word unit module addresses.

(2) I/O signal

The details of the power supply unit status signal address configuration are as follows.

PLC input

Power supply unit Status signal 0~4	b15	b14	b13	b12	b11	b10	b9	b8
	LNK	–	–	–	–	OPMV	FANW	FANA
	b7	b6	b5	b4	b3	b2	b1	b0
	PSMV							

I/O signal list

Signal type		Bit	Symbol name	Content
PLC input	Power unit Status signal 0 ~ 4	b15	LNK	When communication between the gateway unit and the power supply unit is solidly established, it turns ON when the gateway unit recognizes it as enabled.
		b14 ~ 11	–	Not available
		b10	OPMV	ON when a reading error occurs in monitored data.
		b9	FANW	Generates a message level alarm (alarm code 04C "Fan rotation speed drop") when the fan rotation speed decreases 30%. ON when an alarm occurs and OFF when the alarm is canceled.
		b8	FANA	If the fan rotation speed drops 50%, an operation cancel level alarm (alarm code 0D6 "Fan error detection") is generated, and the actuator stops. ON when an alarm occurs and OFF when the alarm is canceled.
		b7 b6 b5 b4 b3 b2 b1 b0	PSMV	Monitors the item selected using the gateway parameter configuration tool. [For details of the selection method, refer to "3.9 Gateway Parameter Configuration Tool (page 3-128)"] One of the following seven items can be monitored. (1) Output voltage: 0~255 V (2) Voltage of auxiliary winding: 0~255 V (3) Output current: 0~25.5 A (0.1 A increments) (4) Peak hold current: 0~25.5 A (0.1 A increments) (5) Load factor: 0~255% (6) Fan rotation speed: 0~25,500 r/min (100 r/min increments) (7) Internal temperature: 0~255°C

Monitored items

Item	Content
(1) Output voltage	This power supply can vary the output voltage according to the load. The output voltage monitoring value changes, but this is not abnormal.
(2) Voltage of auxiliary winding	Control power supply voltage inside the power supply unit. As with the output voltage, it changes according to the load on the output voltage side.
(3) Output current	Instantaneous value of output current.
(4) Peak hold current	Peak value of output current.
(5) Load factor	Ratio of integral value of output current and rated output current. If this value exceeds 100%, the output voltage is cut off as an overload error.
(6) Fan rotation speed	Fan rotation speed.
(7) Internal temperature	Temperature in the vicinity of the output capacitor on the secondary side.

Startup
Section

Chapter 5

Basic Operation Confirmation and Adjustment

5.1 Operation Confirmation with PC Software ····················· 5-1
Home return ····· 5-10
Jog travel ····· 5-12
Position travel ····· 5-13
5.2 Servo Gain Adjustment ····· 5-16

5.1 Operation Confirmation with PC Software

Items to prepare
RCON system / actuator / PC / communication cable / motor/encoder cable

1 Connect the PC software for RC/EC.

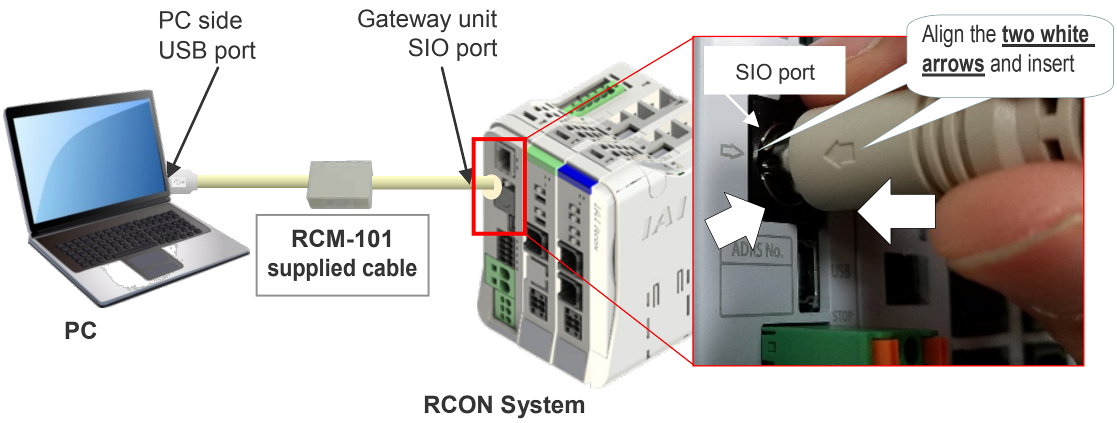
Caution

- Operate the actuator through the following procedure. Before starting operation, make sure that there is no interfering object within the movable range of the actuator.

(1) Connect the RCM-101 supplied cable as shown below.

Connection example

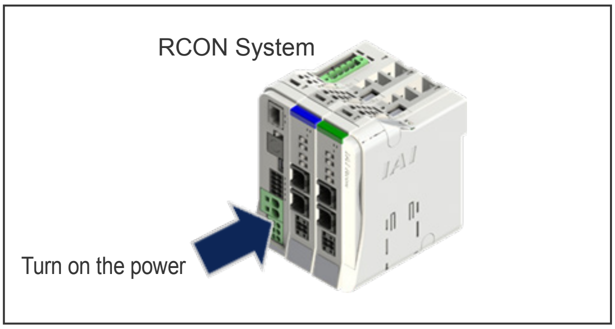
RCM-101 supplied cable connection method



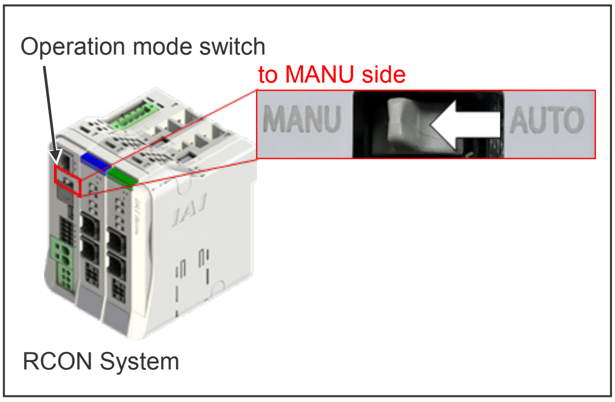
Caution

- When connecting the RCM-101 supplied cable to the gateway unit "SIO" port, insert matching the two white arrows as shown in the red frame above. Failure to do so may cause damage to the connector.

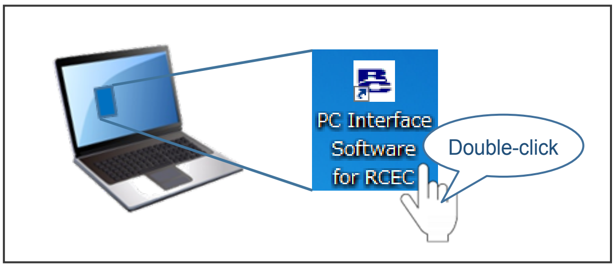
(2) After connecting the RCM-101 cable, turn on 24 VDC power to RCON.



(3) Tilt the operation mode switch on the front of the gateway unit to the **"MANU"** side.



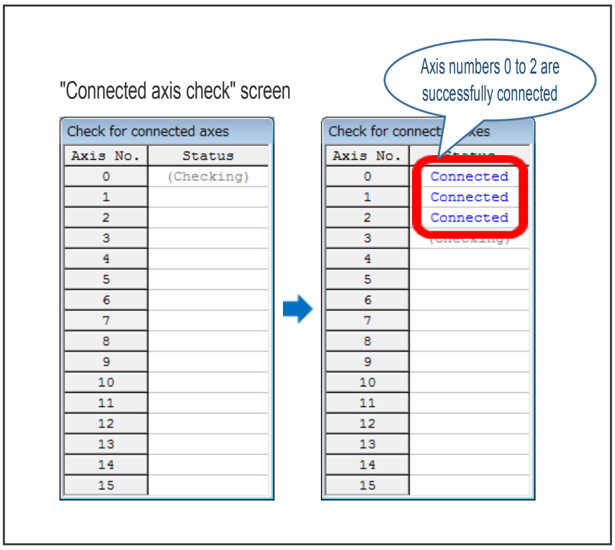
(4) Double-click the "PC software for RC/EC" icon to start up the software.



(5) The "Connected axis check" screen will be displayed.

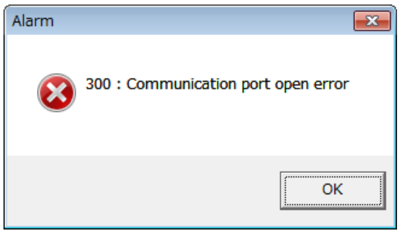
If it shows "connected" in blue, it means that the corresponding axis is successfully connected.

(The display on the right shows an example of successful connection when axes are set to No. 0 to No. 2.)



(6) If "300: Communication port open error" screen is displayed, communication connection has failed.
The following causes may be possible, so review the procedure from item 1.

"Alarm" screen



[Causes of communication connection failure]

- Mismatched communication port (COM port)
- Disconnected communication cable
- Connection problem of communication cable connector
- Gateway unit side, PC side malfunction
- PC software double startup

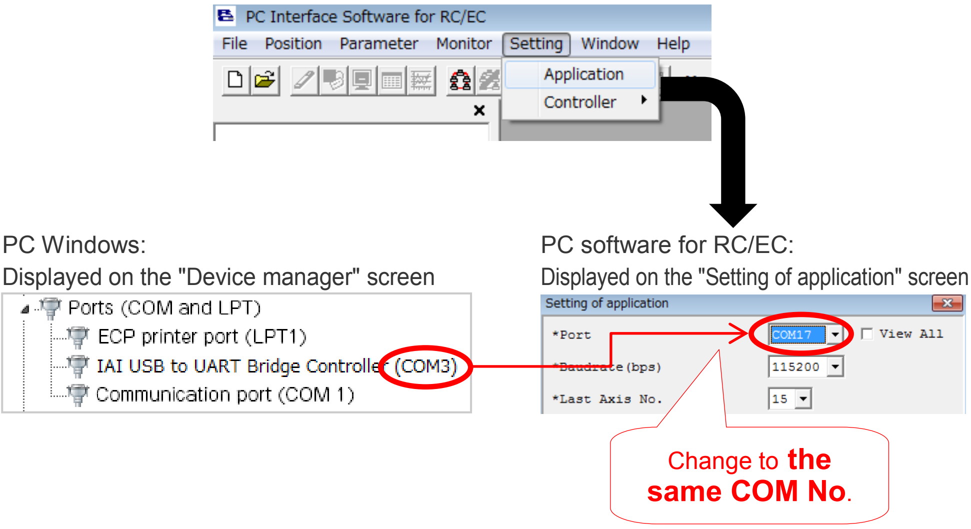
may be possible causes.

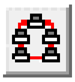
[If connection failed, check here first.]

(1) "Setting (S)" → "Setting of application (A)" on the upper left corner on the screen of the PC software for RC/EC

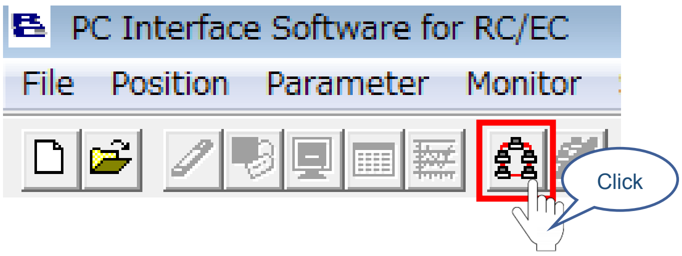
→ Change the port number on the "Setting of application" screen to the COM number on the Windows Device Manager screen.

"PC Interface Software for RC/EC" main screen



(2) Click the "Check Connected Axes" icon  in the upper left corner of the PC software for RC/EC to connect with the RCON system.

"PC Interface Software for RC/EC" main screen



If connection is not possible, check from step 1 again.

Caution

- If the actual number of connected axes of the RCON system does not match the number of axes set and transferred in the gateway parameter configuration tool, the PC software for RC/EC cannot be connected.
- Confirm the actual number of connected axes and change the gateway parameters, or read the present driver unit configuration with the gateway parameter configuration tool for transfer. For details, refer to Specifications Section Chapter 3 Gateway Parameter Configuration Tool (page 3-138).

Startup Section

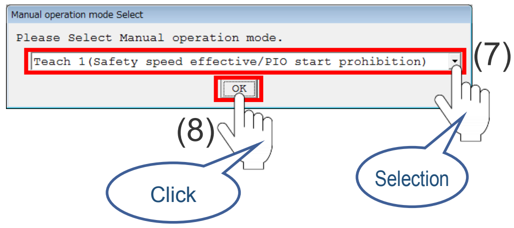
Chapter 5 Basic Operation Confirmation and Adjustment

When "Manual operation mode Select" screen appears,

(7) Select "Teach mode 1 (Safety speed effective/PIO start prohibition)",

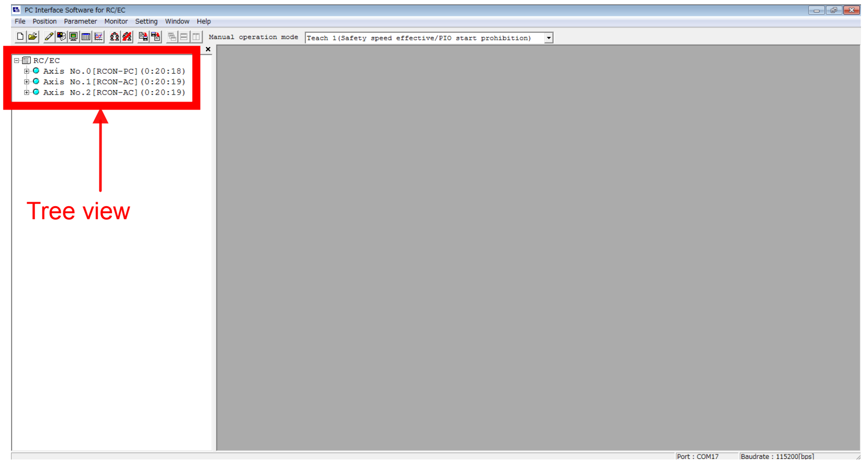
(8) and click OK .

"Manual operation mode Select" screen



(9) The main screen of PC software for RC/EC starts up.

"PC Interface Software for RC/EC" main screen



Point!

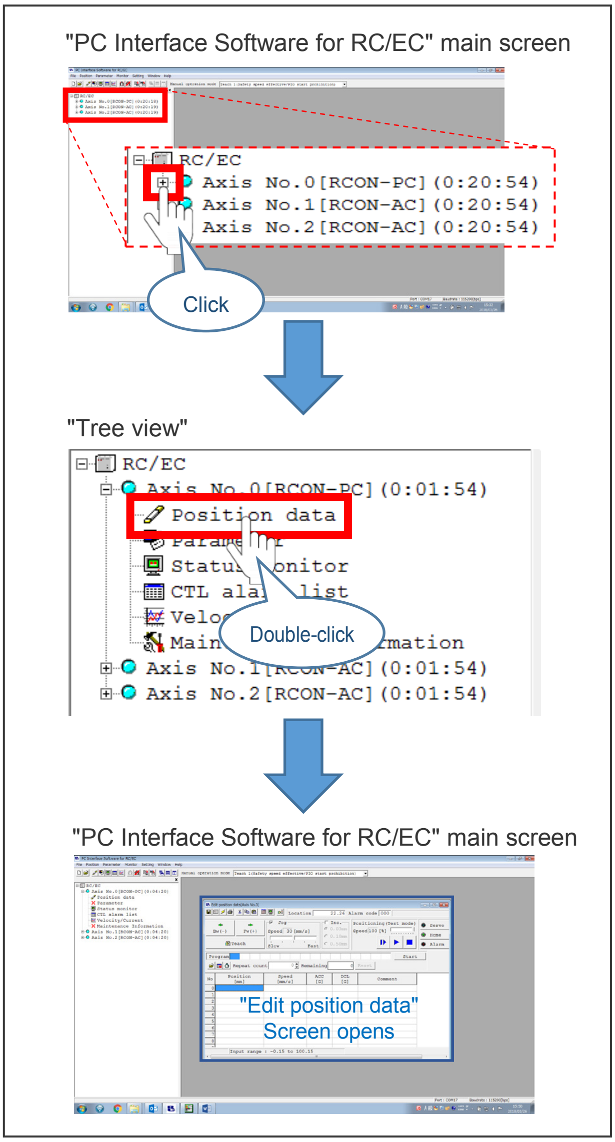
- If the icon is not displayed on the tree view, the controller and PC software for RC/EC are not connected.

2 Open the position data editing screen.

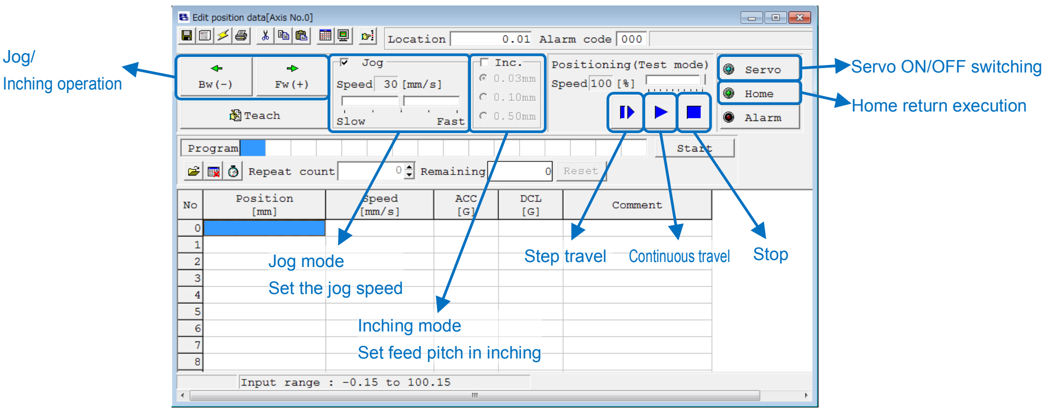
(1) Click [+] on the left of axis No. 0 in the tree view on the left end of the main screen to expand each item.

(2) Double click on "Position data".

(3) The "Edit position data" screen is displayed.

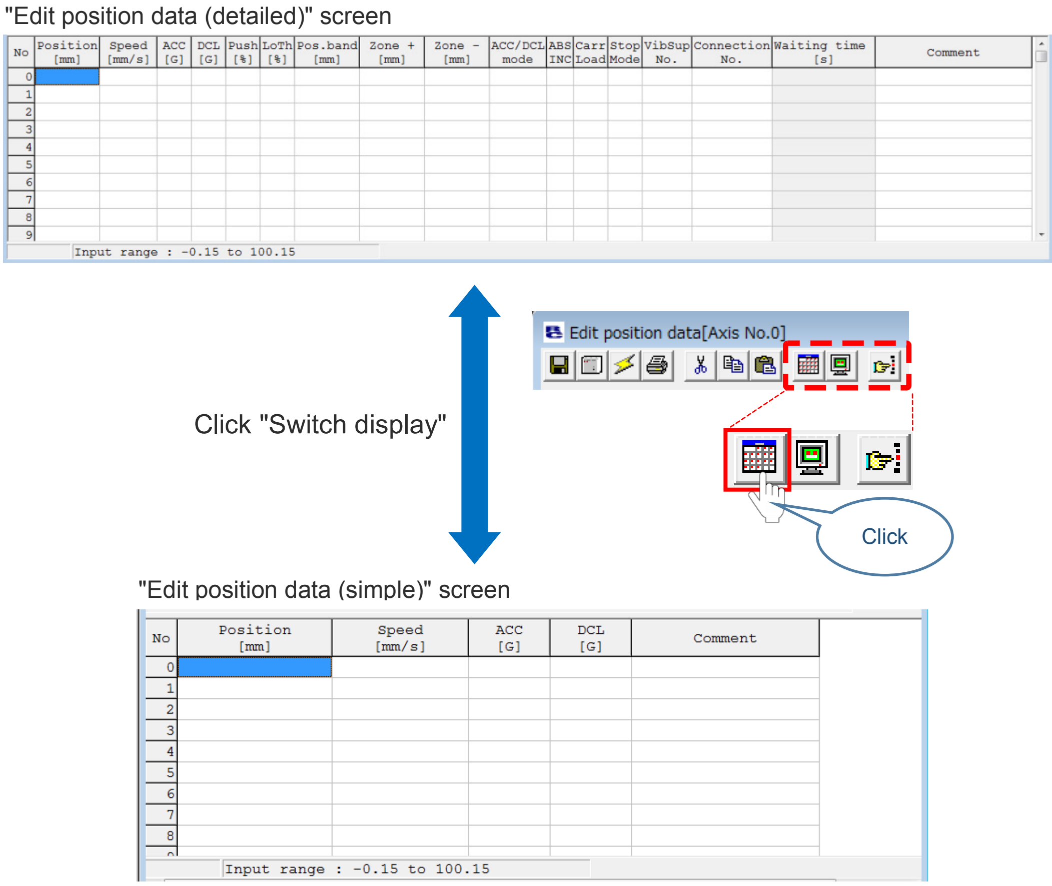


"Edit position data" screen



[Switching edit position data screen]

The "Edit position data (detailed)" screen can be switched to "Edit position data (detailed)" and "Edit position data (simple)".

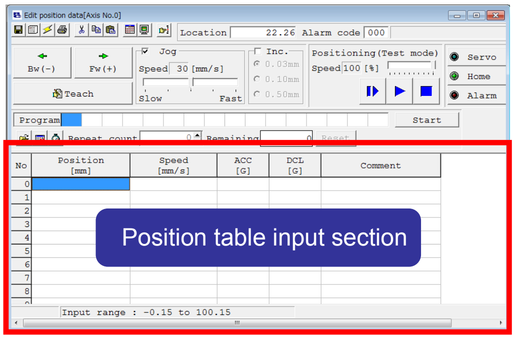


3 Moves to the registered position.

[Registering target position]

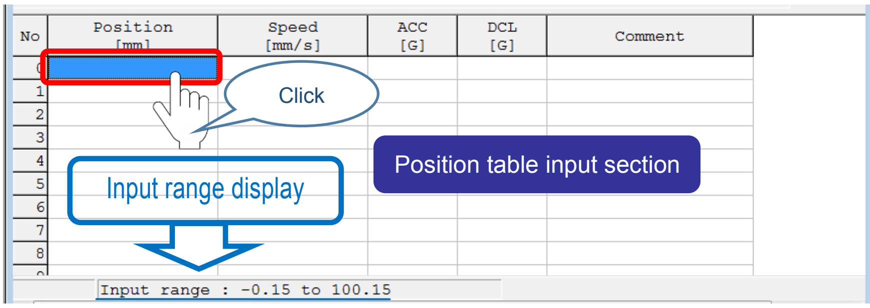
(1) In the position table input section, enter the "position [mm]" to which the movable part of the actuator is to travel.

"Edit position data" screen

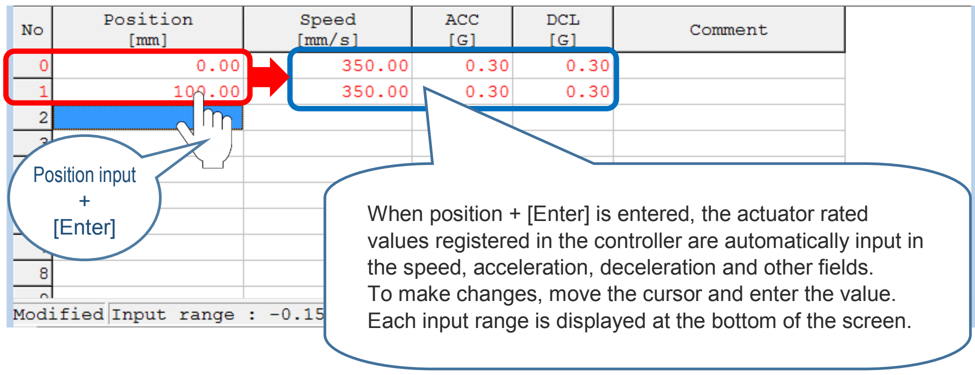


(2) Move the cursor to the position No. "Position [mm]" to be entered in the "position table input section". The range of values that can be entered is displayed at the bottom of the "position table input section".

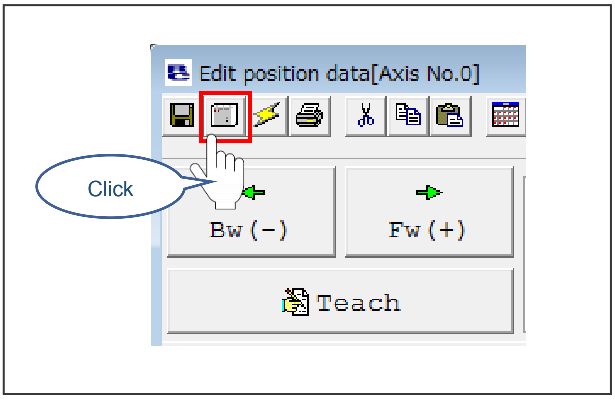
"Position data input section" screen



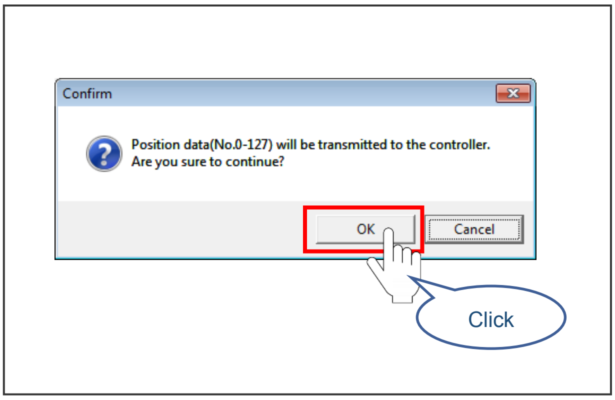
(3) Enter any coordinate value within the range of the values displayed in the "input range" and press [Enter] on your PC. (In the following example, 0 mm is entered in position No. 0 and 100 mm in position No. 1.)



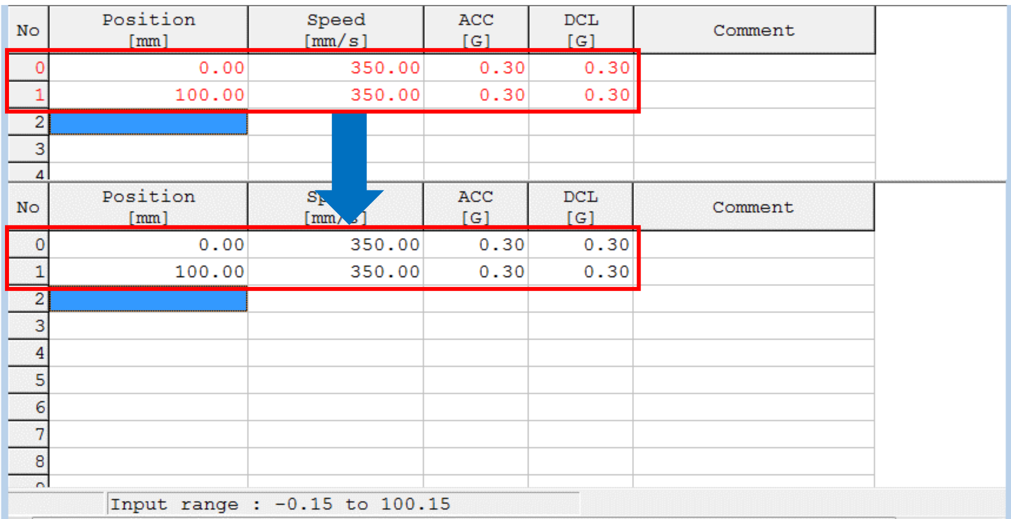
(4) Click (Transfer to controller) in the upper left corner of the edit position data screen.



(5) Click OK when the "Confirm" screen is displayed .



When the controller transfer of position table data is completed, the number entered changes from red to black.

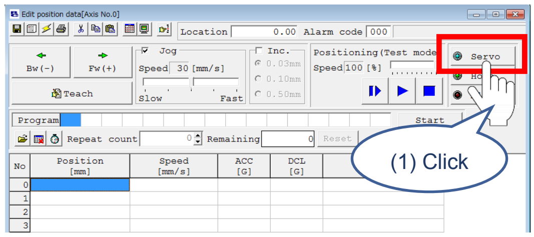


Home return

1 Turn on the actuator motor. (Servo ON)

(1) Click Servo .

"Edit position data" screen



(2) When the servo of the actuator motor normally turns on (motor power on) Servo changes to Servo . (The lamp lights up in light blue.)

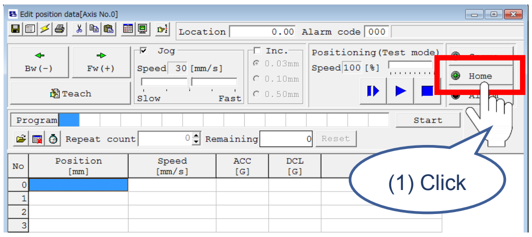
Caution

- When operating the actuator, the motor needs to be turned to servo ON. If an operation command is sent while the servo is off, "Warning: Movement command during servo off" is displayed and the actuator does not start operation.

2 Perform home return for the actuator.

(1) Click Home .

"Edit position data" screen



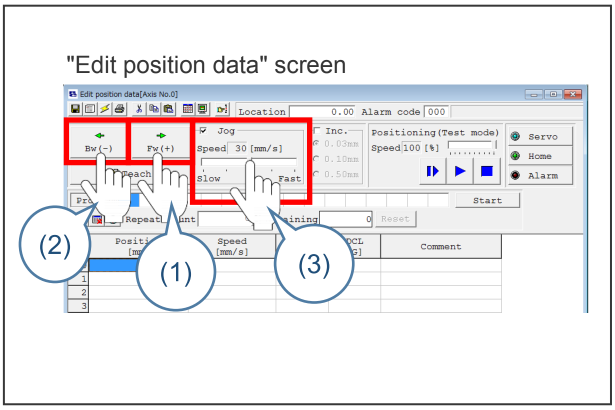
(2) When the actuator starts home return motion and the home return completes normally Home changes to Home . (The lamp lights up in green.)

Caution

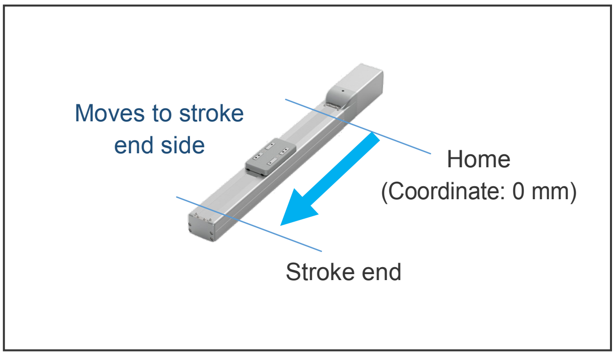
- <u>The home return speed cannot be changed.</u> Increasing this speed may increase the impact when the actuator operating part hits the mechanical end, which may adversely affect the actuator mechanism in the long run or increase the error of the home position.

Jog travel

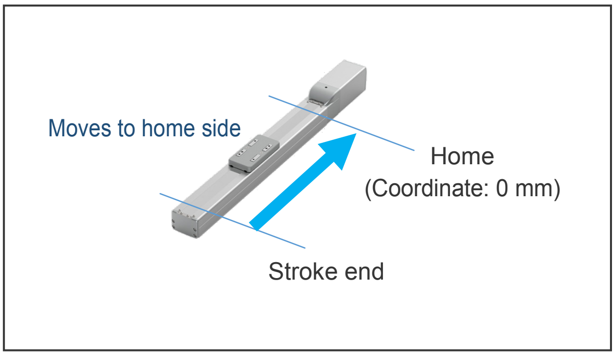
1 Activates the JOG operation of the actuator.



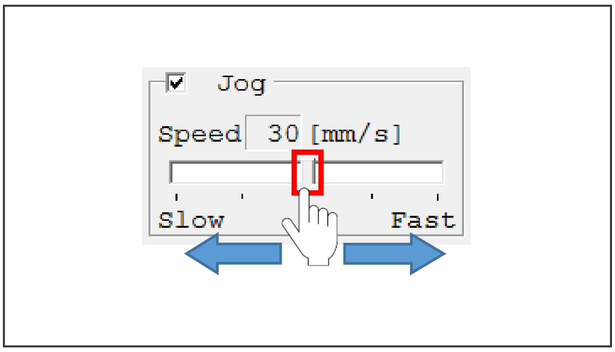
(1) Clicking Fw (+) will move the actuator to the stroke end side.



(2) Clicking Bw (-) will move the actuator to the home direction.



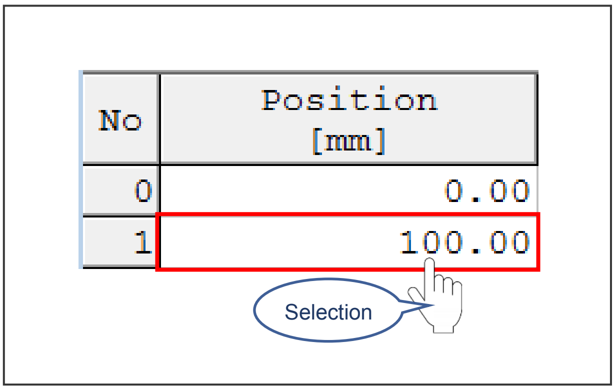
(3) The speed can be adjusted by moving the red frame section below to the left (slow) or right (fast).



Position travel

1 Moves the actuator to the registered position (target position).

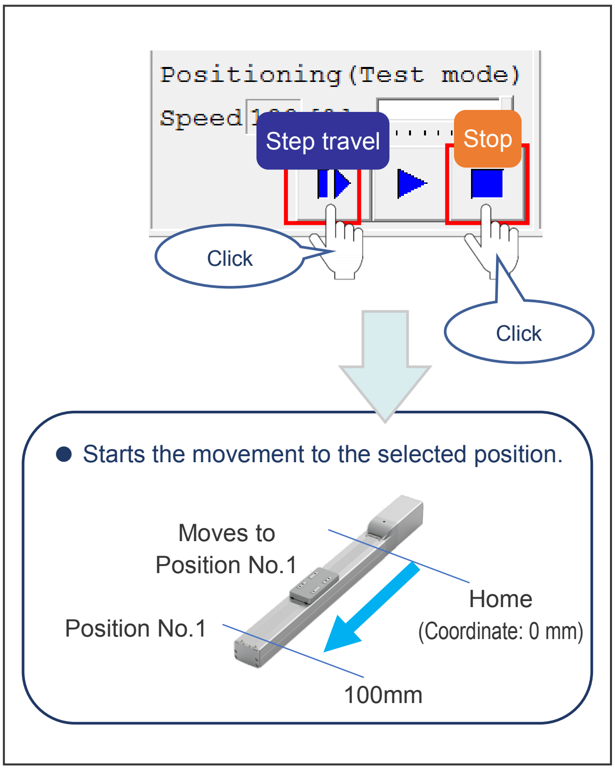
(1) Click and select the position No. column to be moved.



(2) Click in the "Position travel" column.

Stop

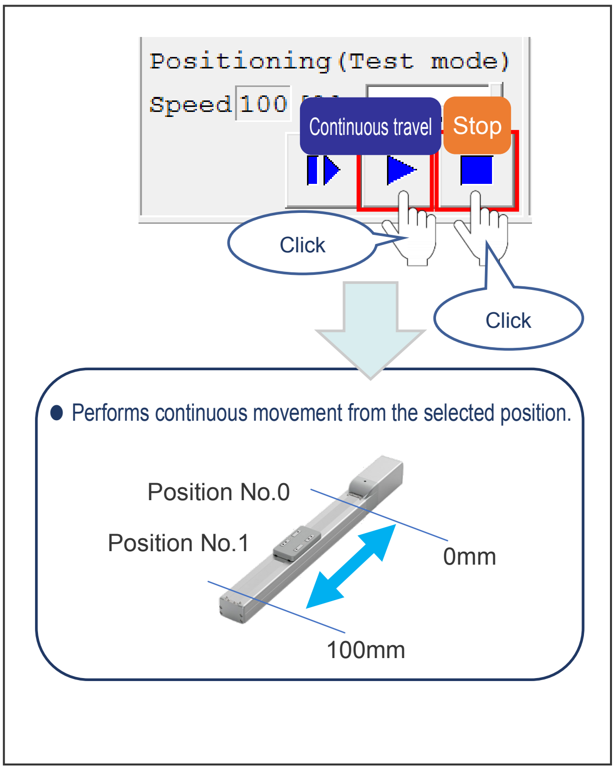
To stop, click .



(3) Click ▶ in the "Position travel" column.

Stop

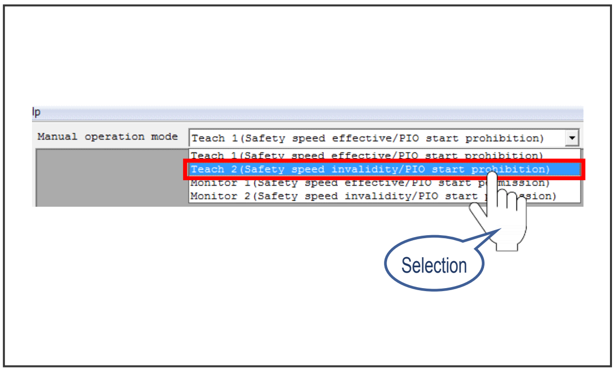
To stop, click ■ .



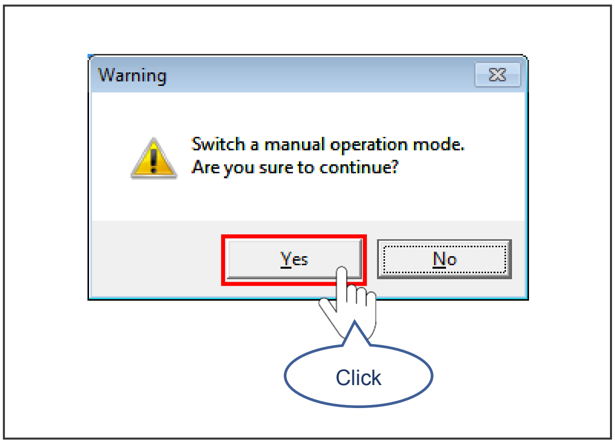
[Test run speed]

When performing a test run, check whether the "safety speed" function is enabled/disabled in [MANU operation mode] in the tool bar. If the safety speed function is enabled, the operation will be restricted by the speed set in parameter No. 35 "Safety velocity", which may prevent operation according to the speed set in the position data. To perform trial run at the speed set in the position data, disable the safety speed function using the following procedure.

(1) Select "Teach mode 2" in [MANU operation mode] in the tool bar.



(2) Click "Yes" on the warning screen.



(3) The safety speed function has been switched.

5.2 Servo Gain Adjustment

At shipment from factory, parameters are set so that operation at rated load (maximum) is within the payload capacity of the actuator and with stable operating characteristics.
However, at the actual usage sites, it may be necessary to perform servo adjustment.
This section explains the basic servo adjustment method.

Caution

- It is dangerous to make excessive settings suddenly. Damage to the equipment or the actuator or injury may occur, so proceed with caution.
- Also, make sure to keep a record as you work so that it can be restored at any time.
- If you face problems which cannot be resolved, contact IAI.

Adjustment of stepper motor and AC servo motor

No.	Problems	Adjustment method
1	• Positioning takes time • Positioning accuracy is insufficient • Tact time needs to be shorter	• Set Parameter No. 55 "Position Command Primary Filter Time Constant" to "0" if it is set. • Increase Parameter No. 7 "Servo Gain Number". The increased set value improves tracking of position command. As a guideline for setting, set 3 to 10, at most 15 or less. If it is too high, overshoot may occur, which will cause sound and vibration. • When increasing Parameter No. 7 "Servo Gain Number", Parameter No. 31 "Velocity Loop Proportional Gain" should also be increased accordingly in order to ensure stability of the control system. • When increasing Parameter No. 31 "Velocity Loop Proportional Gain", make sure to set it to about 20% of the initial value. Adjust Parameter No. 7 "Servo Gain Number" as a priority.
2	Vibration occurs during acceleration/deceleration	• This may be caused by excessive "Acceleration/Deceleration Setting," or inadequate rigidity of the device on which the actuator is mounted. • Lower "Acceleration/Deceleration Setting". • Lower Parameter No. 7 "Servo Gain Number". If Parameter No. 7 "Servo Gain Number" is too low, convergence will take longer. • Or consider reinforcing the device.

No.	Problems	Adjustment method
3	• Speed irregularity occurs during travel • Speed accuracy is insufficient	• Increase Parameter No. 31 "Velocity Loop Proportional Gain". The increased set value improves tracking of speed command. If it is too large, mechanical system vibration may occur. As a setting guideline, try to increase the initial values by about 20% respectively.
4	Abnormal noise In particular, high-pitched noise occurs when stopping or at low speed (50 mm/s or less).	• Enter Parameter No. 33 "Torque Filter Constant". As a setting guideline, try to increase by 50 respectively. If it is too large, stability of the control system may be impaired and vibration may occur. [Important] Before adjustment This phenomenon is likely to occur when the rigidity of the mechanical system is not maintained. Even with the actuator alone, resonance may occur in the belt drive or if the stroke exceeds 600 mm. Before adjustment, make sure that: (1) Parameter No. 7 "Servo Gain Number", Parameter No. 31 "Velocity Loop Proportional Gain" and Parameter No. 32 "Velocity Loop Integral Gain" are not set too high. (2) Rigidity of the load is maintained as much as possible. Mounting is not loose and there is no play, etc. (3) The actuator body has been installed firmly with the prescribed torque. (4) There is no distortion on the mounting surface of the actuator.
5	• Trajectory accuracy needs to be higher • Constant speed needs to be higher • Response needs to be better	• Refer to adjustment methods No. 1 to 3 described above and adjust Parameter No. 7 "Servo Gain Number" and Parameter No. 31 "Velocity Loop Proportional Gain" to optimize the conditions. [Reference] Selection of the actuator (motor) is the most important factor. The servo motor is very sensitive to the magnitude of load inertia. If the moment of inertia on the load side (load inertia) is too large with respect to the moment of inertia of the motor itself (motor inertia), the servo motor will cause the motor to be wagged by the load, as it were, resulting in unstable control. Therefore, in order to improve trajectory, position, speed, response, etc., it is necessary to reduce the load inertia ratio. For applications such as coating, if trajectory accuracy, constant velocity, response, etc. are called for, it is recommended to make the actuator ball screw lead as small as possible and to select an actuator with a higher motor capacity.

No.	Problems	Adjustment method
6	• The static friction of the load is large and travel start is slow • The load inertia is large and response is poor when stopping • Tact time needs to be shorter	• Set Parameter No. 71 "Positional Feedforward Gain". Estimated setting is from 10 to 50. As the set value increases, the deviation amount is reduced and responsiveness improves. Setting a high value may cause vibration or noise. • Adjust Parameter No. 7 "Servo Gain Number" and Parameter No. 31 "Velocity Loop Proportional Gain" to further improve responsiveness.
7	There is a shock when starting or stopping	• Set Parameter No. 55 "Position Command Primary Filter Time Constant" to about 50 ms. If no improvement is observed, increase gradually. If improvement is observed, gradually lower the set value to the limit. If this setting is made, the settling time will be extended and the tact time will increase. Positioning accuracy also deteriorates. Also, in order to solve the fundamental problem, we recommend replacing the host positioning unit with one with acceleration/deceleration function.

Adjustment of DC brush-less motor

<table>
<tr><th>No.</th><th>Problems</th><th>Adjustment method</th></tr>
<tr><td>1</td><td>• Hunting occurs when positioning stops
• Speed irregularity occurs during travel
• Speed accuracy is insufficient</td><td>Set the parameters following the procedure below and check the operation. When the motion improves, end the adjustment. There is no need to proceed to the next step.
Step 1: Change Parameter No. 32 "Velocity Loop Integral Gain", set the following 5 values in order and check the operation.
<table>
<tr><th>Setting order</th><th>Velocity loop integral gain setting value</th></tr>
<tr><td>1</td><td>411</td></tr>
<tr><td>2</td><td>592</td></tr>
<tr><td>3</td><td>925</td></tr>
<tr><td>4</td><td>1,645</td></tr>
<tr><td>5</td><td>3,700</td></tr>
</table>
If the operation does not improve, perform step 2.
Step 2: Change Parameter No. 31 "Velocity Loop Proportional Gain" and Parameter No. 32 "Velocity Loop Integral Gain"
Set the following 6 values in order and check the operation.
<table>
<tr><th colspan="3">● Load is 0.2 kg or less</th></tr>
<tr><th>Setting order</th><th>Velocity loop proportional gain setting value</th><th>Velocity loop integral gain setting value</th></tr>
<tr><td>1</td><td>42</td><td>382</td></tr>
<tr><td>2</td><td>42</td><td>520</td></tr>
<tr><td>3</td><td>42</td><td>749</td></tr>
<tr><td>4</td><td>42</td><td>1,171</td></tr>
<tr><td>5</td><td>42</td><td>2,081</td></tr>
<tr><td>6</td><td>42</td><td>4,683</td></tr>
</table>
<table>
<tr><th colspan="3">● Load is heavier than 0.2 kg</th></tr>
<tr><th>Setting order</th><th>Velocity loop proportional gain setting value</th><th>Velocity loop integral gain setting value</th></tr>
<tr><td>1</td><td>32</td><td>231</td></tr>
<tr><td>2</td><td>32</td><td>315</td></tr>
<tr><td>3</td><td>32</td><td>453</td></tr>
<tr><td>4</td><td>32</td><td>708</td></tr>
<tr><td>5</td><td>32</td><td>1,259</td></tr>
<tr><td>6</td><td>32</td><td>2,833</td></tr>
</table>
If the operation does not improve, contact IAI.</td></tr>
<tr><td>2</td><td>Abnormal noise
In particular, high-pitched noise occurs when stopping or at low speed (20 mm/s or less)</td><td>Change Parameter No. 31 "Velocity Loop Proportional Gain" and Parameter No. 32 "Velocity Loop Integral Gain" to the following values and confirm.
Velocity Loop Proportional Gain: 32
Velocity Loop Integral Gain: 231</td></tr>
</table>

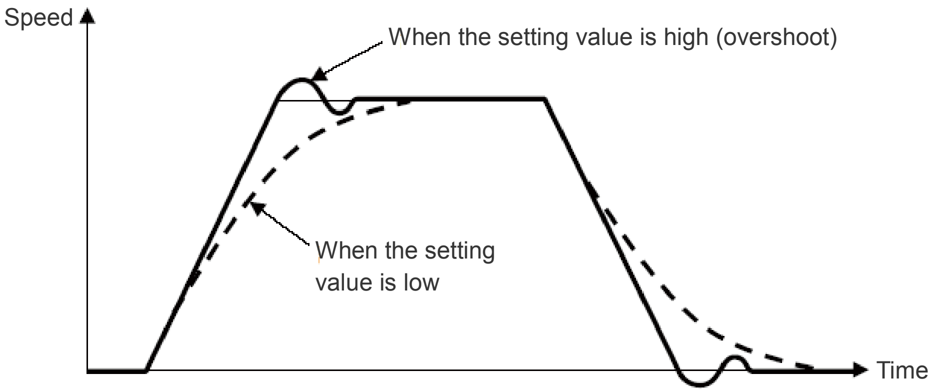
[Servo Gain Number (Parameter No. 7)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
7	Servo gain number	PLGO	–	0 to 31	In accordance with actuator

Called position loop gain, position control system proportional gain, etc., this is the parameter that sets the response of the position control loop. The increased set value improves tracking of position command. If it is too high, overshoot may occur.

If the setting value is low, tracking performance with respect to the position command becomes worse, and positioning takes time.

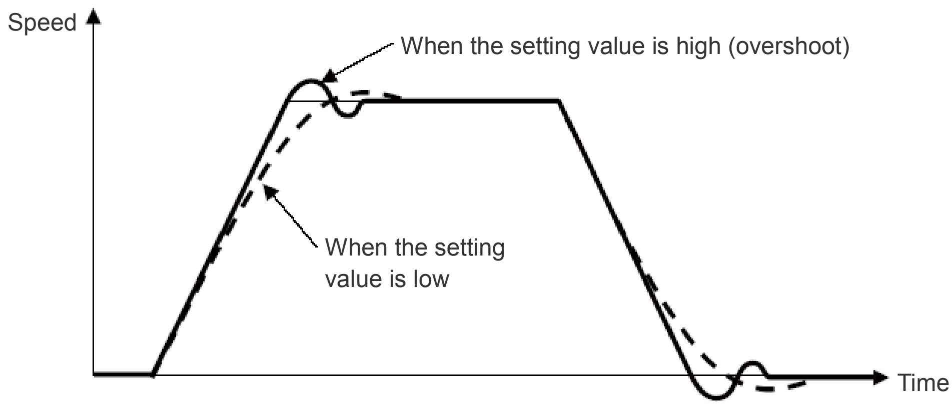
In systems with low mechanical rigidity and systems with low natural frequency, mechanical resonance occurs when the setting value is increased, and this may cause not only vibration and noise, but also overload malfunctions.



[Velocity Loop Proportional Gain (Parameter No. 31)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
31	Velocity loop proportional gain	VLPG	–	1 to 27,661	In accordance with actuator

This parameter determines the response of the velocity loop. The increased set value improves tracking of speed command. The higher the setting value, the greater the load inertia becomes. If it is too high, overshoot and oscillation, as well as vibration in the mechanical system may occur.

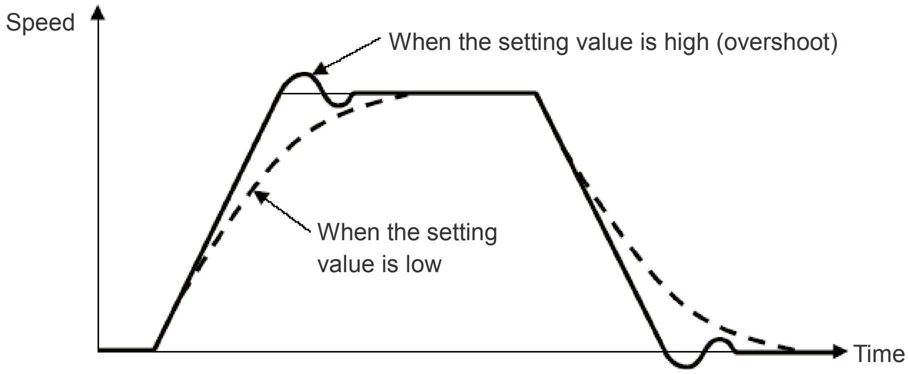


For the conditions for using this item in the stepper motor specification, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] at the bottom of the following page.

[Velocity Loop Integral Gain (Parameter No. 32)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
32	Velocity loop integral gain	VLPT	–	1 to 217,270	In accordance with actuator

Machines have friction. "Velocity Loop Integral Gain" is the parameter which corresponds to deviation caused by external factors, such as friction. The increased set value improves the repulsive force against load fluctuation.
If it is too high, overshoot and oscillation, as well as vibration in the mechanical system may occur.
Adjust appropriately while observing the response.



For the conditions for using this item in the stepper motor specification, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] below.

[Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain]
Each of the 3 parameters - No. 31, 145, and 153 for Velocity Loop Proportional Gain and Parameters No. 32, 146, and 154 for Velocity Loop Integral Gain - of the stepper motor specification can be set, but only 1 of them will be enabled at the time of operation.
The conditions for selecting which parameter No. setting value is enabled are shown below.

Enabled Parameter No.

<table>
<tr><td colspan="2" rowspan="2"></td><th colspan="2">High Output Setting (Parameter No.152)</th></tr>
<tr><th>0 (Disabled)</th><th>1 (Enabled)</th></tr>
<tr><td rowspan="2">Gain scheduling (Parameter No.144)</td><td>~ 100 (Disabled)</td><td>Parameters No.31, 32</td><td>Parameters No.153, 154</td></tr>
<tr><td>101 ~ (Enabled)</td><td>Parameters No.145, 146</td><td>Parameters No.145, 146</td></tr>
</table>

[Torque Filter Constant (Parameter No. 33)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
33	Torque filter constant	TRQF	–	0 to 2,500	In accordance with actuator

This parameter sets the filter time constant for the torque command. This parameter may prevent resonance if vibration or noise is generated during operation due to mechanical resonance. It is effective for torsional resonance of the ball screw (several hundred Hz).

AC Servo Motor Specification and DC brush-less motor specification only

[Current Control Width Number (Parameter No. 54)]

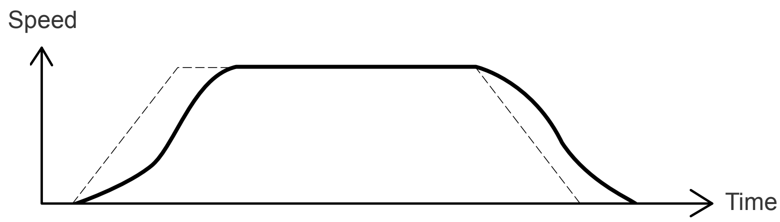
No.	Name	Symbol	Unit	Input range	Default initial value setting
54	Current control width number	CLPF	–	0 to 15	In accordance with actuator

This parameter is a manufacturer adjustment parameter that determines the responsiveness of the current loop control. Therefore, it must not be changed. The stability of the control system may be impaired, which is extremely dangerous.

[Position Command Primary Filter Time Constant (Parameter No. 55)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
55	Position command primary filter time constant	PLPF	ms	0.0 to 100.0	0.0

Used when the value of "Acc/Dec mode" field in the position table is set to 2(First-order delay filter).
This draws a more gentle acceleration/deceleration curve compared to trapezoidal patterns.
The shock at acceleration/deceleration is relieved, but the cycle time becomes longer.
Use for applications where minor vibrations to the workpiece during acceleration/deceleration are to be avoided.



The amount of first-order delay is set by parameter No. 55 "Position command primary filter time constant". The setting unit is ms and can be set from 0.0 to 100.0 in 0.1ms increments.
However, this is not reflected for jogging/inching operations via a PC or teaching pendant.

Caution

- In the following cases the first-order delay filter becomes disabled.
  (1) When a position command or direct numerical value command with the first-order delay filter is set during actuator operation.
  (2) When using a rotary actuator in index mode.
  (3) When parameter No. 55 is set to 0.

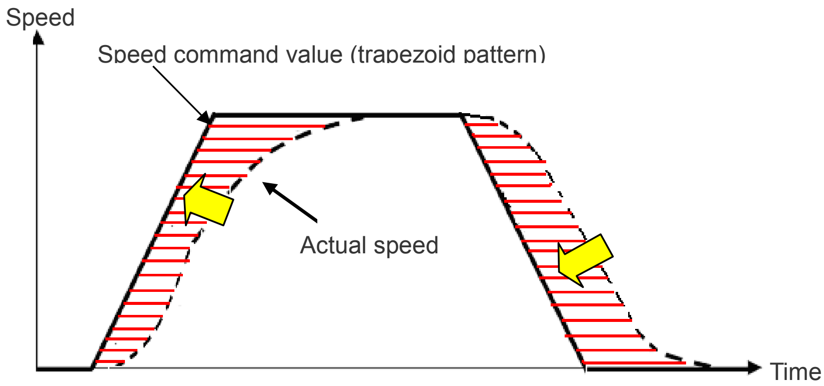
[Positional Feedforward Gain (Parameter No. 71)]

No.	Name	Symbol	Unit	Input range	Default initial value setting	Specifications
71	Positional feed forward gain	PLFG	–	0 to 100	0	AC servo motor specification Stepper motor specification
					50	DC brush-less motor specification

Sets the feed forward gain amount of the position control system.
Performing this setting increases the servo gain and improves responsiveness of the position control loop. Properly adjust Parameter No. 7 "Servo Gain Number" and Parameter No. 31 "Velocity Loop Proportional Gain", etc., to further improve the tact time and following performance. As a result, positioning time can be shortened.
Gain adjustment of position, speed, and current loop in the feedback control directly changes the response of the servo control system, so affecting the stability of the control system due to inappropriate setting may cause vibration and abnormal noise. However, this parameter only changes the speed command value, so it is irrelevant to the servo loop, and it does not make the control system unstable or generate persistent vibration and noise. However, if the setting is excessive, every time it operates, vibration and noise may be generated until the machine follows the command value.

For the trapezoidal operation pattern, the value obtained by multiplying speed command by "feed forward gain" is added to the speed command so as to reduce the following delay of the speed and the position deviation.

Control delay occurs in feedback control that performs control according to the results. In contrast, compensation control independent of control delay is performed.



Caution

- Vibration damping control function cannot be used when using feed forward gain (setting other than 0).

AC servo motor specification only

[Damping Characteristics Coefficient 1, 2 / Natural Frequency / Notch Filter Gain (Parameters No. 97 to 108)]

	No.	Name	Symbol	Unit	Input range	Default initial value setting
Parameters Set 1	97	Damping characteristics coefficient 1	DC11	–	0 to 1,000	10
	98	Damping characteristics coefficient 2	DC21	–	0 to 1,000	1,000
	99	Natural frequency	NP01	1/1,000Hz	500 to 30,000	10,000
	100	Notch filter gain	NFG1	–	1 to 20,000	9,990
Parameters Set 2	101	Damping characteristics coefficient 1	DC12	–	0 to 1,000	10
	102	Damping characteristics coefficient 2	DC22	–	0 to 1,000	1,000
	103	Natural frequency	NP02	1/1,000Hz	500 to 30,000	10,000
	104	Notch filter gain	NFG2	–	1 to 20,000	9,990
Parameters Set 3	105	Damping characteristics coefficient 1	DC13	–	0 to 1,000	10
	106	Damping characteristics coefficient 2	DC23	–	0 to 1,000	1,000
	107	Natural frequency	NP03	1/1,000Hz	500 to 30,000	10,000
	108	Notch filter gain	NFG3	–	1 to 20,000	9,990

A parameter dedicated to vibration damping control.
For details, refer to "Specifications Section Chapter 4 4.8 Various functions/vibration damping control function (page 4-80)".

AC servo motor specification only

[Vibration Suppression No. Initial Value (Parameter No. 109)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
109	Vibration suppression No. initial value	CTLF	–	0 to 3	0

A parameter dedicated to vibration damping control.
For details, refer to "Specifications Section Chapter 4 4.8 Various functions/vibration damping control function (page 4-80)".

AC servo motor specification only

[Servo Gain Number / Positional Feedforward Gain / Velocity Loop Proportional Gain / Velocity Loop Integral Gain / Torque Filter Constant / Current Control Width Number (Parameters No. 120 to 137)]

	No.	Name	Symbol	Unit	Input range	Default initial value setting
Gain set 1	120	Servo gain number 1	PLG1	–	0 to 31	In accordance with actuator
	121	Positional feedforward gain 1	PLF1	–	0 to 100	
	122	Velocity loop proportional gain 1	VLG1	–	1 to 27,661	
	123	Velocity loop integral gain 1	VLT1	–	1 to 217,270	
	124	Torque filter constant 1	TRF1	–	0 to 2,500	
	125	Current control width number 1	CLP1	–	0 to 15	
Gain set 2	126	Servo gain number 2	PLG2	–	0 to 31	In accordance with actuator
	127	Positional feedforward gain 2	PLF2	–	0 to 100	
	128	Velocity loop proportional gain 2	VLG2	–	1 to 27,661	
	129	Velocity loop integral gain 2	VLT2	–	1 to 217,270	
	130	Torque filter constant 2	TRF2	–	0 to 2,500	
	131	Current control width number 2	CLP2	–	0 to 15	
Gain set 3	132	Servo gain number 3	PLG3	–	0 to 31	In accordance with actuator
	133	Positional feedforward gain 3	PLF3	–	0 to 100	
	134	Velocity loop proportional gain 3	VLG3	–	1 to 27,661	
	135	Velocity loop integral gain 3	VLT3	–	1 to 217,270	
	136	Torque filter constant 3	TRF3	–	0 to 2,500	
	137	Current control width number 3	CLP3	–	0 to 15	

- Servo Gain Number 1/2/3 (Parameters No. 120, 126, 132)
  These parameters determine the response of the position control loop.
  For details, refer to Parameter No. 7 "Servo Gain Number (page 5-20)".

- Positional Feedforward Gain 1/2/3 (Parameters No. 121, 127, 133)
  Sets the feed forward gain amount of the position control system.
  For details, refer to Parameter No. 71 "Positional Feedforward Gain (page 5-25)".

● Velocity Loop Proportional Gain 1/2/3 (Parameters No. 122, 128, 134)
This parameter determines the response of the speed control loop.
For details, refer to Parameter No. 31 "Velocity Loop Proportional Gain (page 5-21)".

● Velocity Loop Integral Gain 1/2/3 (Parameters No. 123, 129, 135)
This parameter determines the response of the speed control loop.
For details, refer to Parameter No. 32 "Velocity Loop Integral Gain (page 5-22)".

● Torque Filter Constant 1/2/3 (Parameters No. 124, 130, 136)
This parameter determines the filter time constant for the torque command.
For details, refer to Parameter No. 33 "Torque Filter Constant (page 5-23)".

● Current Control Width Number 1/2/3 (Parameters No. 125, 131, 137)
Set the control band of the current control system.
For details, refer to Parameter No. 54 "Current Control Width Number (page 5-23)".

[Reference] Refer to "Specifications Section Chapter 3 3.7 Address Configuration/Position table (page 3-45)".

AC servo motor specification only

[Servo Gain Switch Time Constant (Parameter No.138)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
138	Servo gain switch time constant	GCFT	ms	10 to 2,000	10

If the position table is instructed to switch the servo gain set, switching will be completed after a period that exceeds 3 times the setting time of this parameter after the operation of the specified position No. starts.

Caution

- If the setting is shortened, operation of the actuator may become unstable due to sudden gain change.

Stepper motor specification only

[GS Magnification Upper Limit (Parameter No.144)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
144	GS magnification upper limit	GSUL	%	0 to 1,023	0 (Disabled)

Gain scheduling is a function that changes the gain according to the operation speed.
For this parameter, set the high magnification to change the gain.
The set value of GS Velocity Loop Proportional Gain (Parameter No. 145) and GS Velocity Loop Integral Gain (Parameter No. 146) changes at the set magnification.

Set value	Content
100 or less	Gain scheduling disabled
101 to 1,023	Gain scheduling enabled (Recommended value 300)

[GS Velocity Loop Proportional Gain (Parameter No. 145)]

No.	Name	Symbol	Unit	Input range	Default initial value setting
145	GS velocity loop proportional gain	GSPC	–	1 to 30,000	In accordance with actuator

When Parameter No. 144 "GS Magnification Upper Limit" is set to 101 or higher, the setting of this parameter becomes valid for the Velocity Loop Proportional Gain.
For details, refer to Parameter No. 31 "Velocity Loop Proportional Gain (page 5-21)".

For the conditions for using this item, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] on the bottom of page 5-22.

[GS Velocity Loop Integral Gain (Parameter No. 146)]

Stepper motor specification only

No.	Name	Symbol	Unit	Input range	Default initial value setting
146	GS velocity loop integral gain	GSIC	–	1 to 500,000	In accordance with actuator

When Parameter No. 144 "GS Magnification Upper Limit" is set to 101 or higher, the setting of this parameter becomes valid for the Velocity Loop Integral Gain.
For details, refer to Parameter No. 32 "Velocity Loop Integral Gain (page 5-22)".

For the conditions for using this item, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] on the bottom of page 5-22.

[BU Velocity Loop Proportional Gain (Parameter No. 153)]

Stepper motor specification only

No.	Name	Symbol	Unit	Input range	Default initial value setting
153	BU velocity loop proportional gain	BUPC	–	1 to 10,000	In accordance with actuator

When Parameter No. 152 "High Output Setting" is enabled and Parameter No. 144 "GS Magnification Upper Limit" is set to 100 or less, the setting of this parameter is enabled for Velocity Loop Proportional Gain.
For details, refer to Parameter No. 31 "Velocity Loop Proportional Gain (page 5-21)".

For the conditions for using this item, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] on the bottom of page 5-22.

[BU Velocity Loop Integral Gain (Parameter No. 154)]

Stepper motor specification only

No.	Name	Symbol	Unit	Input range	Default initial value setting
154	BU velocity loop integral gain	BUIC	–	1 to 100,000	In accordance with actuator

When Parameter No. 152 "High Output Setting" is enabled and Parameter No. 144 "GS Magnification Upper Limit" is set to 100 or less, the setting of this parameter is enabled for Velocity Loop Proportional Gain.
For details, refer to Parameter No. 32 "Velocity Loop Integral Gain (page 5-22)".

For the conditions for using this item, refer to [Selection and use of Velocity Loop Proportional Gain and Velocity Loop Integral Gain] on the bottom of page 5-22.

Maintenance Section

Chapter 1

Maintenance and Inspection

1.1 Periodic Inspection 1-1

Periodic inspection items 1-2

1.2 Requests When Replacing Units 1-4

1.3 Consumable Parts 1-5

1.4 Maintenance Information 1-6

1.1 Periodic Inspection

In order to use the RCON system functions in the best possible condition, it is necessary to perform daily or periodic inspections.

Danger

- Do not touch the terminal while live. This may result in electric shock.
- Connect the absolute battery correctly. Do not charge, disassemble, heat, throw into fire, short-circuit or solder. Incorrect handling of the absolute battery may cause injury or fire due to heating, rupturing or ignition.
- Always shut off the RCON system power supply before cleaning or assembling/disassembling the unit. Electric shocks may result if the power is not shut off.
- Malfunctions may result if the unit connections are tightened loosely.

Caution

- Do not disassemble or modify any unit. This may result in breakdowns, malfunctions, injury or fire.
- Always shut off the RCON system power supply before attaching or removing modules or motor/encoder cables. If not shut off, module breakdowns or malfunctions may result.
- Do not apply shocks to or drop the absolute battery.
  Drops and shocks can damage the absolute battery, causing the liquid inside to leak. If the absolute battery is dropped or suffers impact, do not use and instead discard.
- Before touching a unit, always touch a grounded metallic part to discharge any static electricity accumulated on the body. If static electricity is not discharged, module breakdowns or malfunctions may result.

Periodic inspection items

The RCON systems contain electronic components that may degrade due to the operating environment and require periodic inspection.
It is standard to conduct periodic inspection once every 6 months to one year, but the interval should be shortened in accordance with operating environment.

No.	Inspection items	Inspection details	Judgment criteria	Countermeasures
1	Power supply	Measure between the power supply terminal block to check that the voltage fluctuation is within the reference range	Within voltage fluctuation range 24 V ±10%	Adjust so that the power supply voltage falls within the judgment criteria.
2	Operating environment	Ambient temperature (If used in a panel, the panel temperature is the ambient temperature)	0 to 55°C	Measure the operating temperature with a thermometer and adjust the environment so that it falls within the ambient operating temperature. However, simple absolute units and SCON controllers are 0 to 40°C.
		Operating humidity (Panel humidity if using in a panel)	95% RH or less, non-condensing	Measure the operating humidity with a hygrometer and adjust the environment so that it falls within the ambient operating humidity.
		Atmosphere	No corrosive or flammable gas	Check with an odor or gas sensor.
			No splatters of water, oil, or chemicals	Remove and shield.
			No accumulated dust, debris, salt, or metal powder	Remove and shield.
		Directly exposed to sunlight?	Out of direct sunlight	Shield.
		Subjected to direct vibrations or impacts?	Vibration damping and shock-resistant specifications should be within the range	Install a cushion, etc., for vibration damping and shock resistance.
		Close to a noise source?	None	Move the noise source further away or take shielding countermeasures.
3	Mounting status	Mounting state on each DIN rail	No slack in unit mounting	Re-attach and lock.
4	Connection status	Units firmly connected?	The connector should be tightened firmly	Tighten so that it is no longer loose.
		Cable between simple absolute unit and driver unit securely inserted?	Insert completely	Insert again.

No.	Inspection items	Inspection details	Judgment criteria	Countermeasures
4	Connection status	Wiring connectors loose? (motor/encoder cable, field network cable, stop circuit, etc.)	No looseness	Insert until the lock engages.
		Wiring cable frayed?	No visual abnormalities	Check visually and replace the cable.
5	Absolute battery	Simple absolute unit's absolute battery (AB-7) beyond expiry date or lifespan?	The expiry date is 3 years and should not exceed the date written on a sticker adhered to the battery body	Even if the absolute battery is free of errors, replace it if the expiry date has passed.
6	Preventive/ predictive maintenance function	Preventive/predictive maintenance alarms generated?	No alarm generated	Refer to "Specifications Section Chapter 7 Preventive Maintenance/Predictive Maintenance" for countermeasures.

1.2 Requests When Replacing Units

Pay attention to the following precautions when replacing units after discovering a fault during inspection.

- Unit replacement should be conducted with the power off.
- After replacement, check that the new unit does not have any errors.
- If returning a faulty unit for repairs, write out the nature of the error in as much detail as possible and attach it to the product.
- Be sure to back up position data, parameters and PLC data just in case something goes wrong.

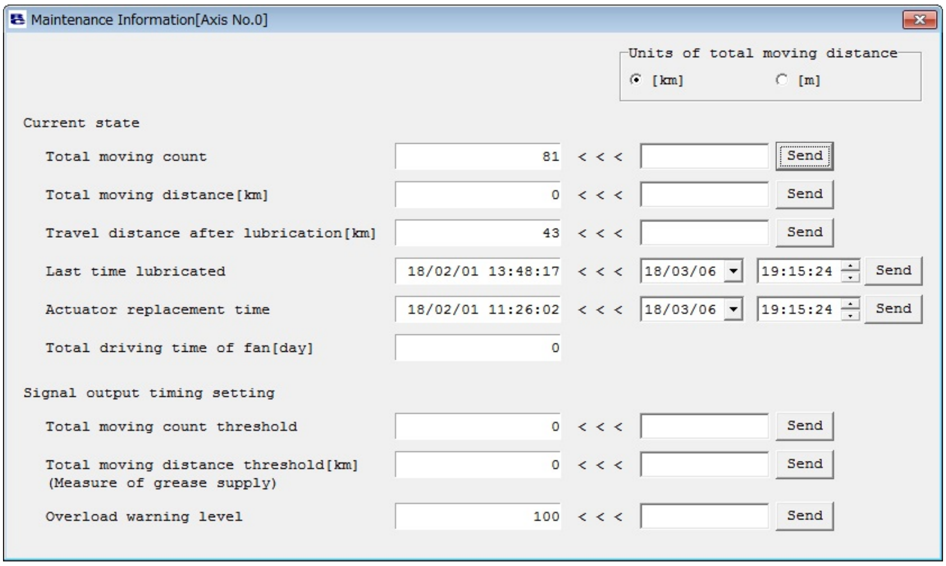
1.3 Consumable Parts

The life of components used in the RCON system is as follows. Refer to "Specifications Section Chapter 7 Preventive Maintenance/Predictive Maintenance" for information about preventive and predictive maintenance.

Item	Guidelines for life	Preventative maintenance function	Predictive maintenance function	Condition
Electrolytic capacitor	5 years	○	-	Ambient temperature 40°C, rated operating mode
Backup capacitor for calendar functions	5 years	○	-	12 h/day ON time at 40°C environment 12 h 20°C environment when stopped (power OFF)
Simple absolute battery	3 years	-	-	Ambient temperature 40°C
Fan unit	3 years	-	○	Ambient temperature 40°C

1.4 Maintenance Information

The number of times the actuator has moved and the travel distance can be accumulated and recorded (Note 1) to the driver unit.
If the set count or distance (Note 2) is exceeded, an alarm (Note 3) and external signal (Note 4) can be output. This enables checking the timing for lubrication and periodic inspection.



Note 1: The details of the records can be checked by using the teaching pendant.
Teaching tool verification method [Refer to the relevant user manual.]

- TB-02/TB-03 [Monitor] → [Maintenance]
- TB-02/TB-03 [Information] → [Maintenance Information]
- RC/EC PC software [Monitor (M)] → [Maintenance Information (I)] → Axis selection

Note 2: Set with Parameter No. 147 "Total travel count target value" and Parameter No. 148 "Total travel distance target value".

Note 3: Outputs a message level alarm "04E travel count target value exceeded" or "04F travel distance target value exceeded".
For details, refer to "Maintenance Section Chapter 2 Troubleshooting".

Note 4: Outputs a minor malfunction alarm (ALML).

Maintenance Section

Chapter 2

Troubleshooting

2.1 Troubleshooting ········· 2-1

2.2 Failure Diagnostics ········· 2-2

Operation failure ········· 2-2

Low positioning and velocity accuracy (incorrect operation) ········· 2-3

Generation of abnormal noise or vibration ········· 2-4

Communication failure ········· 2-4

2.3 Gateway Unit Alarm Causes and Countermeasures ········· 2-5

Causes and countermeasures of individual alarms ········· 2-5

2.4 Driver Unit/Simple Absolute Unit Alarm Causes and Countermeasures ········· 2-9

Alarm levels ········· 2-9

Simple alarm codes ········· 2-10

Causes and countermeasures of individual alarms ········· 2-12

2.1. Troubleshooting

If a problem occurs, check the following points first in order to ensure quick recovery and prevent recurrence of the problem.

(1) Check the status LED (SV/ALM LED) of each RCON system device
Check the SCON controller LED status for each gateway unit, driver unit, simple absolute unit or expansion unit connected.
(2) Check for abnormality in the host device (PLC, etc.)
(3) Check the control power supply, motor power supply and field network power supply voltages
Check for momentary power failure, voltage drop, power failure, etc.
(4) Confirm the generated alarm
Check the alarm information with the teaching tool.
(5) Check the connectors for disconnection or incomplete connection
(6) Check the cables for connection error, disconnection or snagging.
Cut off the main power supply of the equipment (to avoid electric shock) and remove the cables around the measurement point (to avoid conductivity through the surrounding circuit) before checking the conductivity.
(7) Check the network terminal resistor mounting status and resistance
(8) Check the I/O signals
Use a teaching pendant to check for inconsistency or abnormality in the input/output signal status of the host device and RCON system.
(9) Check the noise elimination measures (grounding, connection of noise suppressor, etc.)
(10) Check the events leading to the occurrence of the problem, as well as the operating conditions at the time of occurrence
(11) Analyze the cause
(12) Countermeasures

Caution

- When proceeding with troubleshooting, exclude normally functioning parts from the targets to narrow down the causes.
- First, check (1) to (12) so that countermeasures can be taken swiftly.

2.2 Failure Diagnostics

Abnormal conditions can be roughly divided into the following four types.

- Operation failure
- Low positioning and velocity accuracy (incorrect operation)
- Generation of abnormal noise or vibration
- Failure to communicate

Operation failure

Situation	Possible cause	Confirmation/countermeasure
Gateway unit SYS LED light glows orange at power ON, STOP LED glows red, or driver unit SYSI/SYSII LED light glows red.	(1) Alarm generated. (2) In the process of drive-source cutoff. 1) Stop switch has been pressed. 2) System I/O connector STOP- is not connected. 3) Safety category specification is used but dummy plug is not attached.	(1) Connect a teaching tool and check the error code, then refer to the alarm list to resolve the cause. [See Section 2.3 (page 2-5) and Section 2.4 (page 2-9)] (2) 1) Release the stop switch. 2) Check the system I/O connector (STOP-) wiring connections. [Refer to Specifications Section Chapter 2 2.5 Connection Diagrams (page 2-26)] 3) Insert dummy plug (model number: DP-5) into SIO connector.
Actuator does not operate even though position No. and start signal have been input.	1) Servo OFF status 2) Pause signal is ON 3) Executed positioning command in the stopped position. 4) No positioning data is set in the commanded position No. 5) For direct numerical control mode, the information writing region is incorrect.	1) Is the LED light (SYSI/SYSII) for the driver unit connected to the operating axis glowing green? [Refer to Specifications Section Chapter 4 4.4 Part Names/Functions and External Dimensions] Turn ON Servo ON signal SON. 2) Operation is possible when pause signal STP is OFF, pausing when ON. Turn OFF. 3) Check the sequence or position table setting. 4) Alarm code 0A2 "Position Data Error" appears. Set position data table. 5) Confirm that the writing range is correct.

Situation	Possible cause	Confirmation/countermeasure
Unable to operate even though teaching tool is connected and gateway unit motor and control power are supplied. (Stop switch is in release status on the teaching tool)	1) Stop due to the influence of circuits throughout the facility. 2) Operation mode is AUTO, or is MANU but in monitor mode. 3) Servo OFF status.	1) Supply 24 VDC to STOP- terminal of the system I/O connector. Warning When using the process in 1), return to the original status immediately after adjustment. If operated as is, the disabled stop could lead to a serious accident. 2) Turn AUTO/MANU switch on the front panel of the gateway unit to MANU, and select teaching mode with the teaching tool. 3) Turn the servo ON with the teaching tool.

Low positioning and velocity accuracy (incorrect operation)

Situation	Possible cause	Confirmation/countermeasure
Motion is completed in the middle of home return operation.	The standard IAI home return motion specification is a positioning stop at the home position after pushing against the mechanical end and reversing. When the load is excessive or the unit encounters an obstacle, it may determine that the mechanical end has been reached, without actually having done so. 1) Weight exceeding the rated load is loaded. 2) The unit is striking an obstacle while traveling. 3) The guide has torsional stress due to the securing method of the actuator or uneven tightening of bolts. 4) The sliding resistance of the actuator itself is excessive.	1) Reduce the load. 2) Remove the interfering object. 3) Try loosening the fixing bolt and check if the slider part moves smoothly. If it moves smoothly, check for distortion of the mounting surface, etc., and remount the unit according to the mounting method shown in the actuator instruction manual. 4) Contact IAI.
There is a shock when starting or stopping.	Acceleration/deceleration setting is too high.	Lower the acceleration/deceleration setting.
Overshooting occurs during decelerating stop.	Load inertia is excessive. Deceleration setting is too high.	Lower the deceleration setting.
Positioning accuracy is insufficient.	[Refer to Specification Section Chapter 4 4.5 Parameters/Servo gain adjustment (page 4-58)]	
Uneven speed when traveling.		
Unable to smoothly accelerate/decelerate (speed response is insufficient).		
Positioning completes but positioning complete signal PEND is not output.	Positioning start signal CSTR has not been turned OFF.	CSTR signal must be turned OFF before positioning complete, by turning OFF PEND signal, etc., after traveling starts.

Generation of abnormal noise or vibration

Situation	Possible cause	Confirmation/countermeasure
Generation of abnormal noise or vibration from the actuator itself.	Possible causes of abnormal noise or vibration vary, including load condition, actuator mounting condition, rigidity of the device on which the actuator is mounted, etc.	In some cases, servo adjustment can improve the situation. [Refer to Specification Section Chapter 4 4.5 Parameters/Servo gain adjustment (page 4-58)]
Vibration of load.	1) Acceleration/deceleration setting is too high. 2) Mounting structure or load susceptible to acceleration/deceleration is mounted.	1) Lower the acceleration/deceleration setting. 2) Review the mounting structure or load.

Communication failure

Situation	Possible cause	Confirmation/countermeasure
Unable to connect to host device.	1) Communication speed is mismatched. 2) Machine number (station number) setting is duplicated with another device, or value is outside range. 3) Faulty wiring or disconnection, etc., of communication cables.	1) Match the setting with the host device. [Refer to host device instruction manual] 2) Revise machine number (station number) setting. Machine number (station number) differs depending on the communication method. Refer to field network specification address map and host device instruction manual for details. 3) Review wiring. Confirm that the terminal resistor is connected to the network terminal at the correct value. For DeviceNet specification, confirm that communication power is supplied correctly. [Refer to host device instruction manual]

2.3 Gateway Unit Alarm Causes and Countermeasures

Causes and countermeasures of individual alarms

The alarm codes will be read out in gateway status signal 0 ALMC1 ~ 128 (b0 ~ b7).
For details, refer to "Specifications Section Chapter 3 3.7 Address Configuration (page 3-40)".
(Note) Alarm codes displayed on the gateway parameter configuration tool have "8" added at the beginning of the alarm codes listed below. (Example) If the alarm code is 43, it will be displayed as 843.

Alarm code	Alarm name	Causes/countermeasures
4A (84A)	Real-time clock vibration stop detection	Cause: Time data was lost. Time data can be retained for about 10 days after turning gateway unit power OFF. Countermeasure: Set the time again from the gateway parameter.
4B (84B)	Real-time clock access error	Cause: RCON internal error. Retrieval of internal time data failed. Countermeasure: Reboot the power. If it occurs again, contact IAI.
4C (84C)	Estimated life of backup capacitor for calendar function exceeded	Cause: Gateway interior capacitor capacitance has dropped by 50%. Countermeasure: Replace the gateway body as soon as possible.
50 (850)	Field network communication error (ERR-C)	Cause: Field network link error. If a latch is set with the gateway parameter configuration tool while this error is generated, actuator operation will stop in error status and commands will be ignored until the cancel signal is received. Countermeasure: Check field network settings (node address, communication speed, etc.), wiring, etc.
60 (860)	Dependent axis communication error (ERR-T)	Cause: RCON internal communication error. Communication failure with driver unit connecting actuator axes. Countermeasure: Driver unit may not be inserted, mounting may be faulty (connector not fully inserted), etc.
61 (861)	Dependent axis internal communication error (transmission)	Cause: RCON internal communication error. Communication failure with driver unit connecting actuator axes. Countermeasure: Reboot the power. If it occurs again, contact IAI.
62 (862)	Dependent axis internal communication error (reception)	Cause: RCON internal communication error. Communication failure with driver unit connecting actuator axes. Countermeasure: Reboot the power. If it occurs again, contact IAI.

Alarm code	Alarm name	Causes/countermeasures
6D (86D)	Power supply unit communication error	Cause: Communication error between the gateway unit and power supply unit PSA-24. 1) Communication cable disconnection or connector contact failure 2) Incorrect setting of number of power supply units connected 3) Incorrect address setting of power supply unit rotary switch 4) Influence from noise Countermeasure: 1) Check the cable and connector. 2) Confirm with gateway setting tool. 3) Confirm whether address is duplicated. 4) Take measures against noise, such as revising cable arrangements.
80 (880)	GW parameter error	Cause: Gateway parameters are abnormal. Countermeasure: Check connected axes, operation mode, etc. with gateway parameter configuration tool.
81 (881)	Parameter check sum error	Cause: RCON internal memory data may be damaged. Countermeasure: Reset with the gateway parameter configuration tool, or if backup is available, write in the backup data.
9B (89B)	Field network module error	Cause: Field network module failure is possible. Countermeasure: Contact IAI if this reoccurs even after turning ON the power again.
9C (89C)	Field network module undetected	Cause: Communication circuit board for field network could not be confirmed. 1) Communication circuit board is not inserted. 2) Malfunction of communication circuit board Countermeasure: Reboot the power. If it occurs again, contact IAI.
9D (89D)	Field network module initialization timeout	Cause: Initialization of field network module did not complete after a given period of time. Countermeasure: Reboot the power. If it occurs again, contact IAI.
A0 (8A0)	Excessive control power supply voltage	Cause: Control power supply voltage exceeded the overvoltage judgment value (120% of 24 VDC = 28.8 V). 1) 24 VDC power supply voltage is high 2) Malfunction of parts inside the gateway unit 3) During acceleration/deceleration or servo ON, etc,, consumption current rises momentarily. When remote sensing function is used with power of barely sufficient current capacity, overvoltage may occur in response to the current change. Countermeasure: 1) 2) Check power supply voltage. 3) Consider using a power supply with sufficient current capacity, or avoid using the remote sensing function. If voltage value is normal, contact IAI.
A1 (8A1)	Control power supply voltage drop	Cause: Control power supply voltage went below the voltage drop judgment value (70% of 24 VDC = 16.8 V). 1) 24 VDC power supply voltage is low 2) Malfunction of parts inside the gateway unit Countermeasure: Check power supply voltage. If voltage value is normal, contact IAI.

Alarm code	Alarm name	Causes/countermeasures
A7 (8A7)	External wiring power supply voltage drop	Cause: Gateway unit control power supply voltage has dropped to or below 16.8 V (70% of 24 VDC). 1) Control power supply voltage drop 2) Malfunction of parts inside the gateway unit Countermeasure: 1) Confirm that voltage of 24 VDC ±10% is being applied to the gateway unit control power connector. If the voltage is low, the 24 VDC power supply may have failed. 2) Contact IAI.
BA (8BA)	Number of axes/operation mode mismatch	Cause: 1) Number of axes set with gateway parameters does not match the number of axes calculated from the operation mode set for the gateway. 2) Driver units of 17 axes or more are connected. Countermeasure: 1) As the parameter set value is incorrect, reset the gateway parameters. 2) Reduce the driver units to 16 axes or fewer and set the appropriate gateway parameters.
BC (8BC)	Attached axis communication error	Cause: Communication error generated at total frame communication initial communication. 1) Connector or SCON cable connector is not correctly connected. 2) Interior signal line or SCON connection cable is disconnected. 3) Terminal unit or terminal connector (for SCON) has not been mounted. 4) Communication error due to noise Countermeasure: 1) 2) Confirm that units are firmly connected together. Disconnect the units and then connect them again. Contact IAI if this reoccurs even after turning ON the power again. 3) Mount the terminal unit or terminal connector. 4) Take measures against noise, such as changing cable arrangements.
DD (8DD)	Unit connection check signal error	Cause: Units may not be correctly connected. 1) Connector or SCON cable connector is not correctly connected. 2) Interior signal line or SCON connection cable is disconnected. 3) Terminal unit or terminal connector (for SCON) has not been mounted. Countermeasure: 1) 2) Confirm that units are firmly connected together. Disconnect the units and then connect them again. Contact IAI if this reoccurs even after turning ON the power again. 3) Mount the terminal unit or terminal connector.

Alarm code	Alarm name	Causes/countermeasures
DE (8DE)	Driver unit communication error	Cause: Communication error generated in total frame communication. 1) Connector or SCON cable connector is not correctly connected. 2) Interior signal line or SCON connection cable is disconnected. 3) Terminal unit or terminal connector (for SCON) has not been mounted. 4) Communication error due to noise Countermeasure: 1) 2) Confirm that units are firmly connected together. Disconnect the units and then connect them again. Contact IAI if this reoccurs even after turning ON the power again. 3) Mount the terminal unit or terminal connector. 4) Take measures against noise, such as changing cable arrangements.
FA (8FA)	CPU error	Cause: Abnormal reset detected in gateway board interior CPU. Countermeasure: Reboot the power. If it occurs again, contact IAI.
FFF	Power ON log	A log created when power is turned ON (not an error)

2.4 Driver Unit/Simple Absolute Unit Alarm Causes and Countermeasures

Alarm levels

Alarms are classified into 3 levels depending on the content of the error.

Alarm level	SYS LED I/II	ALM signal	Situation when generated	Alarm content and cancellation method
Message	Green ON	No output	Does not stop	Alarm reset will cancel maintenance output such as overload warning or low battery voltage, or minor issues such as PC software alarms, including teaching tools. [Refer to tool instruction manuals for details]
Operation cancel	Red ON	Outputs	After decelerating stop Servo OFF	Medium-level issue. Alarm can be canceled with alarm reset via PIO or teaching tools.
Cold start	Red ON	Outputs	After decelerating stop Servo OFF	Perform software reset with the teaching tool, or by turning the power ON again. Home return is also required, except for simple absolute specification.

Caution

- Clear alarms only after investigating and resolving the cause in all cases.
  If the cause of the alarm cannot be resolved or the alarm cannot be cleared after resolving the cause, contact IAI.
- If the same error occurs again after clearing the alarm, the cause of the alarm has not been resolved.

Simple alarm codes

When an alarm is generated, the simple alarm code is read by the complete position register (PM8 to PM1) in each mode: simple direct, positioner 1, positioner 2, and positioner 5.

○: ON ●: OFF

ALM	ALM8 (PM8)	ALM4 (PM4)	ALM2 (PM2)	ALM1 (PM1)	Binary Code	Contents: ( ) indicates alarm code
●	●	●	●	●	–	Normal
○	●	●	●	○	1	Collision detection (0DF)
○	●	●	○	●	2	Software reset in servo ON status (090) Position No. error during teaching (091) PWRT signal detected while traveling (092) PWRT signal detected in homing incomplete status (093) Servo ON command after encoder FRAM read/write (09C)
○	●	●	○	○	3	Travel command in servo OFF status (080) Position command in homing incomplete status (082) Absolute position travel command in homing incomplete status (083) Travel command during home return execution (084) Position No. error during travel (085) Position command information data error (0A3) Command deceleration error (0A7)
○	●	○	●	●	4	Fan error detection (0D6) PCB mismatch (0F4)
○	●	○	●	○	5	Cyclic synchronization error (09F)

○: ON ●: OFF

ALM	ALM8 (PM8)	ALM4 (PM4)	ALM2 (PM2)	ALM1 (PM1)	Binary Code	Contents: ( ) indicates alarm code
○	●	○	○	●	6	Parameter data error (0A1) Position data error (0A2) Motor/encoder type not supported (0A8)
○	●	○	○	○	7	Z-phase position error (0B5) Z-phase detection timeout (0B6) Magnetic pole uncertain (0B7) Excitation detection error (0B8) Home sensor not detected (0BA) Home return timeout (0BE)
○	○	●	●	●	8	Excessive actual speed (0C0)
○	○	●	●	○	9	Overcurrent (0C8) Overvoltage (0C9) Overheating (0CA) Current sensor offset adjustment error (0CB) Control power supply voltage error (0CC) Control power supply voltage drop (0CE) Drive source error (0D4)
○	○	●	○	○	11	Deviation counter in homing incomplete status overflow (0D5) Deviation overflow (0D8) Software stroke limit over error (0D9) Push-motion operation range over error (0DC)
○	○	○	●	●	12	Electrical angle mismatch (0B4) Servo error (0C1) Unauthorized control system transition command (0C5) Excessive motor power supply voltage (0D2) Overload (0E0) Driver logic error (0F0)
○	○	○	●	○	13	Encoder transmission error (0E4) Encoder reception error (0E5) Encoder count error (0E6) A, B-phase disconnection (0E8) BLA encoder error detection (0EB) PS-phase disconnection (0EC) Absolute encoder error detection 1 (0ED) Absolute encoder error detection 2 (0EE) Absolute encoder error detection 3 (0EF)
○	○	○	○	●	14	CPU error (0FA) Logic error (0FC)
○	○	○	○	○	15	Non-volatile memory write verify error (0F5) Non-volatile memory write timeout (0F6) Non-volatile memory data destruction (0F8)

Causes and countermeasures of individual alarms

If corresponding driver units are limited, a symbol for the type of the corresponding driver unit is indicated in the alarm code column. Alarm codes with no symbols indicated are common to all driver units.

P: Stepper motor RCP2, RCP3, RCP4, RCP5, and RCP6 Series

A: Servo motor RCA, RCA2, and RCL Series

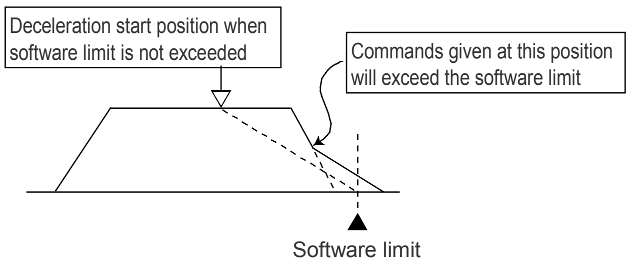
D: DC brush-less motor RCD Series

(1) Message level

Alarm code	Alarm name	Causes/countermeasures
047	Deviation exceeded warning	Cause: Present operating conditions or high actuator sliding resistance may be causing excess deviation. Countermeasure: Lower the acceleration/deceleration setting. Perform maintenance such as greasing, etc.
048	Driver overload warning	Cause: The load current value exceeds the setting of Parameter No. 143 "Overload Load Level Ratio". This alarm retains alarm status until it is reset. This alarm turns ON when the load current value exceeds the setting. Countermeasure: Lower the acceleration/deceleration setting. Or increase the pause ratio.
049 P Driver limited	Collision warning	Cause: The current value of the motor reached the detection current value set by the collision detection function. Countermeasure: Remove the cause of the collision. For an unexpected detection, readjust the collision detection function. [Refer to Specification Section Chapter 4 4.8 Various Functions/Collision detection function (page 4-87)]
04A	Estimated life exceeded warning	Cause: Driver unit motor power capacitor power capacitance has decreased by 20%. Countermeasure: Replace the driver unit as soon as possible.
04C	Low fan rotation speed	Cause: Fan rotation speed of fan unit mounted on driver unit has decreased 30%. Countermeasure: Replace the fan unit as soon as possible.
04D	Fan total running time exceeded	Cause: Fan total running time has exceeded the replacement guidelines. Countermeasure: The alarm can be canceled without replacing the fan unit, but we recommend replacing the fan unit before it breaks down as an aspect of preventive maintenance.
04E	Travel count target value exceeded	Cause: The total travel count set by Parameter No.147 "Total Travel Count Target Value" has been exceeded.
04F	Travel distance target value exceeded	Cause: The total travel distance set by Parameter No.148 "Total Travel Distance Target Value" has been exceeded.
06B	Maintenance information data error	Cause: Maintenance information (total travel count, total travel distance) has been lost. Countermeasure: Contact IAI.
100~ 1FF	Teaching tool alarm	[Refer to teaching tool instruction manual]

(2) Operation cancel level

Alarm code	Alarm name	Causes/countermeasures
080	Travel command during servo OFF	Cause: Travel command was issued in servo OFF status. Countermeasure: Execute travel commands after confirming servo ON status (servo ON signal SV or positioning complete signal PEND is ON).
082	Position travel command in homing incomplete status	Cause: Position travel command was input with home return status incomplete. Countermeasure: Execute travel commands after confirming the home return complete signal HEND is ON.
083	Numerical command with homing incomplete	Cause: Absolute position numerical command was issued in incomplete home return status. (Direct numerical command via field network, etc.) Countermeasure: Perform home return motion, confirm the home return complete signal HEND, and then perform numerical command.
084	Travel command during home return execution	Cause: Travel command was issued during home return execution. Countermeasure: Perform home return motion, confirm the home return complete signal HEND, and then perform travel command.
085	Position No. error during travel	Cause: Position number that does not exist (invalid) in positioner mode was specified. Countermeasure: Check the position table again and specify a valid position number.
090	Software reset command in servo ON status	Cause: A software reset command was issued in servo ON status. Countermeasure: Check that servo is in OFF status (SV signal is OFF status) and issue a software reset command.
091	Position No. error during teaching	Cause: Position number outside the range was specified during teaching. Countermeasure: Set the specified position number to 128 or less in positioner 1/2/3 mode, or 16 or less in positioner 5 mode.
092	PWRT signal detected while traveling	Cause: Input was performed while the present position write signal PWRT was carrying out jog operation. Countermeasure: Input after making sure that JOG+/- signal is not ON and the unit has stopped (moving signal MOVE is OFF).
093	Homing incomplete status PWRT signal detected	Cause: The present position write signal PWRT was input while home return was incomplete. Countermeasure: Input the home return signal HOME first, perform home return, confirm that home return is complete (HEND signal is ON) and then input the signal.
09C P, A Driver limited	Servo ON command after encoder FRAM read/write	Cause: After entering a memo using the user note editing function (a function which allows memos to be saved on the actuator side), the servo was turned ON without RCON system restart or power reboot. Countermeasure: Restart the RCON system or reboot the power.
09F	Cyclic synchronization error	Cause: Communication error generated in total frame communication. 1) Connector or SCON cable connector is not correctly connected. 2) Interior signal line or SCON connection cable is disconnected. 3) Terminal unit or terminal connector (for SCON) has not been mounted. 4) Communication error due to noise Countermeasure: 1) 2) Confirm that units are firmly connected together. Disconnect the units and then connect them again. Contact IAI if this reoccurs even after turning ON the power again. 3) Mount the terminal unit or terminal connector. 4) Take measures against noise, such as changing cable arrangements.

<table>
<tr><th>Alarm code</th><th>Alarm name</th><th>Causes/countermeasures</th></tr>
<tr><td>0A2</td><td>Position data error</td><td>Cause: 1) Travel command for position No. with target position not set in position table position field was issued.
2) Target position value in "Position" field exceeds Parameter No. 3, 4 "Soft Limit Setting Value".
3) Push-motion operation was specified while the damping control function was enabled.
Countermeasure: 1) Set the target position.
2) Bring the target position value within the software limit set value.
3) The damping control function and push-motion operation cannot be used at the same time. Set so that only one of the functions is enabled.</td></tr>
<tr><td>0A3</td><td>Position command information data error</td><td>Cause: 1) The command value at direct numerical command exceeds the set maximum value.
2) Push-motion operation was specified while the damping control function was enabled.
Countermeasure: 1) The code of the command item exceeding the detailed address is displayed. Refer to these values and enter the appropriate values.
<table>
<tr><th>Detailed address (Command item code)</th><th>Command item</th></tr>
<tr><td>0</td><td>Target position</td></tr>
<tr><td>2</td><td>Command speed</td></tr>
<tr><td>4</td><td>Acceleration</td></tr>
<tr><td>6</td><td>Deceleration</td></tr>
<tr><td>8</td><td>Positioning width</td></tr>
<tr><td>C</td><td>Pushing current limit value</td></tr>
<tr><td>D</td><td>Control signal</td></tr>
</table>
2) The damping control function and push-motion operation cannot be used at the same time. Set so that only one of the functions is enabled.</td></tr>
<tr><td>0A7</td><td>Command deceleration error</td><td>Cause: Insufficient deceleration distance when deceleration has been reduced during travel. The software limit has been exceeded when decelerating from the current position after the change.


This occurs because the timing of the next travel command when changing the speed during travel is delayed.
Countermeasure: Set the travel command timing for deceleration change faster.</td></tr>
<tr><td>0B5
A
Driver limited</td><td>Z-phase position error</td><td>Cause: The position where Z-phase was detected during home return was outside the specified range. There is a possibility of encoder failure.
Countermeasure: Contact IAI.</td></tr>
</table>

Alarm code	Alarm name	Causes/countermeasures
0B6 A Driver limited	Z-phase detection timeout	Cause: With simple absolute specification, Z-phase could not be detected at the first servo ON or home return after turning the power on. 1) Contact failure or disconnection of the connector part of the actuator connecting cable. 2) For models with brake, the brake cannot be released. 3) External force is applied and the motor cannot perform detection. 4) The sliding resistance of the actuator itself is excessive. Countermeasure: 1) Check the wiring status of the actuator connecting cable. 2) Check the wiring condition of the brake cable and whether the brake part makes "clicking" sounds when toggling the brake release switch. If not, confirm that power is supplied to the brake. 3) Confirm that there are no assembly errors. 4) If the loading weight is normal, turn OFF the power and then move by hand to check the sliding resistance. If the cause is in the actuator itself, contact IAI.
0BA	Home sensor not detected	Cause: Indicates that the home return motion of an actuator with home sensor has not completed normally. 1) The workpiece interferes with the surroundings during home return. 2) The sliding resistance of the actuator is excessive. 3) Poor mounting, malfunction, or disconnection of the home sensor. Countermeasures: If the workpiece does not interfere with the surroundings, 2) and 3) should be considered. Contact IAI.
0BE	Home return timeout	Cause: Home return motion has not completed within a given period of time from the start. Detailed code: 01 – Home return motion timeout Detailed code: 02 – LS retreat operation timeout Countermeasure: This does not occur in normal operation. The combination of driver unit and actuator may be incorrect. Contact IAI.
0C0	Excessive actual speed	Cause: Motor rotation speed exceeded the allowable rotation speed. 1) The sliding resistance of the actuator is locally excessive. 2) External force is applied momentarily. A sudden speed increase may have occurred before detecting the servo error. Countermeasure: This does not occur in normal operation, so confirm that there are no assembly errors. Also, confirm whether external force is applied in the direction of travel.
0C1	Servo error	Cause: 2 or more seconds have passed without being able to move after receiving the travel command. 1) Connection failure or disconnection of the actuator connecting cable. 2) The brake cannot be released (for models with brake). 3) The load on the motor is large due to external force. 4) The sliding resistance of the actuator is excessive. Countermeasure: 1) Check the wiring status of the actuator connecting cable. 2) If there is no problem with the 24 VDC power supplied to the control power connector of the gateway unit, the RCON system may be faulty. Contact IAI. 3) Confirm that there are no assembly errors in machine components. 4) If the load weight is within the specifications, turn OFF the power supply and manually check the sliding resistance.

Alarm code	Alarm name	Causes/countermeasures
0C5 A Driver limited	Unauthorized control system transition command	Cause: 1) Operation was switched to normal position control operation during "damping control" operation. 2) Operation was switched to "damping control" operation during normal position control operation. Countermeasure: For both 1) and 2), change the sequence so that the next operation is performed after confirming that positioning complete signal PEND is ON.
0CE	Control power supply voltage drop	Cause: Gateway unit control power supply voltage has dropped to or below 19.2 V (80% of 24 VDC). 1) Control power supply voltage drop 2) 24 VDC power supply capacity is insufficient 3) The power supply voltage has dropped. 4) Malfunction of parts inside the RCON system Countermeasure: 1) Confirm that voltage of 24 VDC ±10% is being applied to the gateway unit control power connector. If the voltage is low, the 24 VDC power supply may have failed. 2) Insufficient power capacity for actuator drive. Confirm the required power capacity in the instruction manual and replace the 24 VDC power supply. 3) Contact IAI.
0D2 A, D Driver limited	Excessive motor power supply voltage	Cause: There is a possibility of component failure inside the RCON system. Countermeasure: If it occurs frequently, the probability of RCON system failure is high. Contact IAI.
0D6	Fan error detection	Cause: Fan rotation speed of fan unit mounted on driver unit has decreased 50%. Countermeasure: Replace the fan unit.
0D8	Deviation overflow	Cause: The position deviation counter overflowed. 1) The unit decelerated or stopped due to the influence of external force or overload during travel. 2) The excitation detection operation after power ON is unstable. 3) The power supply voltage has dropped. 4) The servo gain number is too low. Countermeasure: 1) This occurs when the actuator cannot operate according to commands. Check the load condition, such as whether the workpiece is interfering with surrounding objects, whether the brake is released, etc., and resolve the cause. 2) There may be an overload, so review the payload and start home return again. 3) Check power supply voltage. 4) Adjust the servo gain number.
0D9	Software stroke limit over error	Cause: The present position of the actuator exceeds the software stroke limit Countermeasure: Return to the software stroke limit range.
0DC	Push-motion operation range exceeded error	Cause: 1) The push-back force was too strong after pushing was completed, pushing back to the push-motion start setting position. 2) The workpiece was pushed during the approach operation before shifting to push-motion. Countermeasures: 1) Re-set and reduce the push-back force. 2) Correct the push-motion start setting position to the front and shorten the approach distance.

Maintenance Section

Chapter 2 Troubleshooting

Alarm code	Alarm name	Causes/countermeasures
0DF P Driver limited	Collision detection	Cause: Collision of the actuator was detected. Countermeasure: Remove the cause of the collision. For an unexpected detection, readjust the collision detection function. [Refer to Specification Section Chapter 4 4.8 Various Functions/Collision detection function (page 4-87)]
0ED P, A Driver limited	Absolute encoder error detection 1	Cause: The present position changed while reading or saving absolute data. Countermeasures: Do not apply vibration to the actuator.
0EE P, A Driver limited	Absolute encoder error detection 2	Cause: The encoder cannot detect position information normally with battery-less absolute specification or simple absolute specification. 1) The first time power is turned ON after replacing the motor with battery-less absolute specification, or with simplified absolute specification. (Before executing absolute reset) 2) Absolute battery voltage drop. (Simple absolute specification) (When the detail code in the teaching tool error list is 0001H) 3) Disconnection of the actuator connection cable, actuator side attached cable, connector connection failure, or cable insertion/removal. (When the detail code in the teaching tool error list is 0002H) 4) Driver unit parameters have been changed. Countermeasure: 2) After supplying power for 72 hours or more, charge the battery, then perform absolute reset. If it seems to occur frequently even when sufficiently charged, the battery life may be the problem. Replace the battery. For (1), (3), and (4), perform absolute reset. [Refer to Startup Section Chapter 3 Absolute Reset]
0EF P, A Driver limited	Absolute encoder error detection 3	Cause: The encoder cannot detect position information normally with simple absolute specification. (Encoder overspeed error) The present position changed at a speed higher than the rotation speed setting due to an external factor at power cutoff. Countermeasure: Set the rotation speed setting so that it supports higher rotation speeds than the current rotation speed setting. If it occurs again, absolute reset is required. [Refer to Startup Section Chapter 3 Absolute Reset]
0F5	Non-volatile memory write verify error	Cause: When data is written to the non-volatile memory, comparison (verification) is performed to confirm whether the data in the memory matches the write data. At this time, a mismatch was detected. (Failure of non-volatile memory) Countermeasure: Contact IAI if this reoccurs even after turning ON the power again.
200~ 2FF	Teaching tool alarm	[Refer to teaching tool instruction manual]

(3) Cold start level

Alarm code	Alarm name	Causes/countermeasures
0A1	Parameter data error	Cause: Data input range of parameter domain is not appropriate. (Example 1) This error occurs when the magnitude correlation is obviously inappropriate, such as when 300 mm was incorrectly input as the value of the software limit negative side while the value of the software limit positive side was 200.3 mm. (Example 2) For rotary axis, this error is generated when the index mode is changed to the normal mode and the software limit negative side is 0. Set the software limit negative side to the -0.3 mm value added to the outside of the effective stroke. [Refer to Specification Section Chapter 4 4.5 Parameters (page 4-26)] Countermeasure: Change to an appropriate value.
0A8	Motor/encoder type not supported	Cause: A motor or encoder type not supported by this driver unit is connected. Countermeasure: Contact IAI if this alarm is generated with an actuator being controlled, or in case it reoccurs even after reboot.
0B4 A Driver limited	Electrical angle mismatch (inconsistency)	Cause: 1) The position deviation counter is overflowing. 2) Error generated during Z-phase detection. (When the detail code in the teaching tool error list is 0001H) Countermeasure: 1) This error occurs when the actuator cannot be operated. Check the load condition, such as whether the workpiece is interfering with surrounding objects, whether the brake is released, etc. If it occurs during servo ON, check the cable connection, as the encoder wire may be disconnected. If there is no failure in the cable and connector coupler, contact IAI. 2) Reboot the power. If it occurs again, contact IAI.
0B7 A Driver limited	Magnetic pole uncertain	Cause: When magnetic pole phase detection (carried out even with simple absolute specification) was performed in the first servo ON process after power ON, magnetic pole phase could not be detected after a given period of time. 1) Contact failure or disconnection of the connector part of the actuator connecting cable. 2) For models with brake, the brake cannot be released. 3) External force is applied and the motor cannot perform detection. 4) The sliding resistance of the actuator itself is excessive. Countermeasure: 1) Check the wiring status of the actuator connecting cable. 2) Check the wiring condition of the brake cable and whether the brake part makes "clicking" sounds when toggling the brake release switch. If not, confirm that power is supplied to the brake. 3) Confirm that there are no assembly errors. 4) If the loading weight is normal, turn OFF the power and then move by hand to check the sliding resistance. If the cause is in the actuator itself, contact IAI.

Alarm code	Alarm name	Causes/countermeasures
0B8 P Driver limited	Excitation detection error	Cause: When excitation detection was performed in the first servo ON process after power ON, excitation detection operation did not complete after a given period of time. 1) Connection failure or disconnection of the actuator connecting cable. 2) The brake cannot be released (for models with brake). 3) The load on the motor is large due to external force. 4) The power was turned ON while in contact with the mechanical end. 5) The sliding resistance of the actuator is excessive. Countermeasure: 1) Check the wiring status of the actuator connecting cable. 2) If there is no problem with the 24 VDC power supplied to the control power connector of the gateway unit, the RCON system may be faulty. Contact IAI. 3) Confirm that there are no assembly errors in machine components. 4) Move the slider or the rod tip to a point where it will not hit the mechanical end and reboot the power. 5) If the load weight is within the specifications, turn OFF the power supply and manually check the sliding resistance.
0C8	Overcurrent	Cause: The output current of the power supply circuit was abnormally high. Countermeasure: This does not normally occur. There may be insulation deterioration of the motor coil, RCON system failure, etc. Contact IAI.
0C9 P Driver limited	Overvoltage	Cause: The power regenerative circuit voltage reached the judgment value or higher. Countermeasure: There may be an RCON system failure. Contact IAI.
0CA	Overheating	Cause: The temperature of the controller internal parts has exceeded the temperature defined for each actuator. 1) Operating with load conditions exceeding the specified range. 2) The ambient temperature is high. 3) The load on the motor is large due to external force. 4) Defective parts inside the RCON system. Countermeasure: 1) Revise the operation conditions, such as decreasing the acceleration/deceleration speed. 2) Lower the ambient temperature of the RCON system. 3) Confirm that there are no assembly errors in machine components. Note: This error does not normally occur. If it occurs, confirm that it is not (1) to (3) above. If the same problem reoccurs, there may be an RCON system failure. Contact IAI.
0CB	Current sensor offset adjustment error	Cause: During the current detection sensor status check conducted in the startup initialization process, a sensor error was found. 1) Failure of the current detection sensor and peripheral components. 2) Offset adjustment failure. 3) An external force was applied to the actuator at power ON. Countermeasure: If the same error occurs even after rebooting the power with the actuator stationary, replace the circuit board or adjust the offset. Contact IAI.

Alarm code	Alarm name	Causes/countermeasures
0CC	Control power supply voltage error	Cause: Driver unit control power supply voltage has increased to or above 28.8 V (120% of 24 VDC). 1) Control power supply voltage rise 2) Malfunction of parts inside the RCON system Countermeasure: 1) Confirm that voltage of 24 VDC ±10% is being applied to the gateway unit control power connector. If the voltage is low, the 24 VDC power supply may have failed. 2) Contact IAI.
0D4	Drive source error	Cause: 1) Motor power input voltage (input to MPI terminal) is excessive. During acceleration/deceleration or servo ON, etc,, consumption current rises momentarily. When remote sensing function is used with power of barely sufficient capacity, overvoltage may occur in response to the current change. 2) Overcurrent generated in motor power line. Countermeasure: 1) Check power supply voltage being input to MPI terminal. Consider using a power supply with sufficient capacity, or avoid using the remote sensing function. 2) Check the wiring between the actuator and the driver unit. If this error occurs frequently, contact IAI regarding the operating environment and operating conditions.
0D5 P Driver limited	Deviation counter overflow in homing incomplete status	Cause: The position deviation counter overflowed. 1) Impact of external force, etc. or collision with mechanical end during JOG operation, or overload during travel caused the unit to decelerate or stop. 2) The excitation detection operation after power ON is unstable. Countermeasure: 1) This occurs when the actuator cannot operate according to commands. Check the load condition, such as whether the workpiece is interfering with surrounding objects, whether the brake is released, etc., and resolve the cause. 2) There may be an overload, so review the payload.
0E0	Overload	Cause: 1) The workpiece weight exceeds the rated weight, or an external force is applied and the load increased. 2) The brake is not released. (With brake) 3) The sliding resistance of the actuator is locally excessive. Countermeasure: 1) Review the workpiece and its surroundings and remove the cause. 2) If there is no problem with the 24 VDC power supplied to the control power connector of the gateway unit, the RCON system may be faulty. If not released, there may be brake failure, cable disconnection, or RCON system failure. Contact IAI. 3) Move the workpiece by hand if possible and check for any location with excessive sliding resistance. Check for any distortions on the mounting surface. If this error occurs even with a single actuator, contact IAI. ⚠ Caution Make sure to resolve the cause before resuming operation. If you cannot judge whether the cause has been fully resolved, wait at least 30 minutes before switching the power ON to prevent motor coil burnout.

Alarm code	Alarm name	Causes/countermeasures
0E4 P, A Driver limited	Encoder transmission error	Cause: Data transmission and reception between the driver unit and encoder is conducted by serial communication. This error indicates that the data sent from the driver unit was not received properly at the encoder side. 1) Encoder cable is partially disconnected, or connector is not connected properly. 2) Influence from noise. 3) Failure of communication IC mounted on the encoder circuit board. 4) Failure of communication IC mounted on the driver unit circuit board. Countermeasure: 1) Confirm that there is no failure in the cable and connector coupler. 2) Try turning OFF power to all peripheral devices and moving only the driver unit and actuator. If no error is generated, the culprit may be noise. Take measures against noise. If 3) or 4) is the case, replace the encoder or driver unit. Contact IAI if the cause cannot be determined.
0E5 P, A Driver limited	Encoder reception error	Cause: Data from the encoder was not normally received by the driver unit. 1) Connector connection failure (When the detail code in the teaching tool error list is 0002H). 2) Influence from noise (When the detail code in the teaching tool error list is 0001H). 3) Driver unit internal part malfunction (communication part). 4) Initialization of battery-less absolute encoder is not completed. Countermeasure: 1) Check for any wire breakage on a connector and inspect the condition of the wire connections. 2) Try turning OFF power to all peripheral devices and moving only the driver unit and actuator. If no error is generated, the culprit may be noise. Take measures against noise. 3) Replace the actuator (motor part) and/or the driver unit. Contact IAI if the cause cannot be determined.
0E6 P, A Driver limited	Encoder count error	Cause: The encoder cannot detect location information properly. 1) Disconnection of the encoder relay cable or actuator side attached cable, or connector connection failure. 2) Failure of the encoder itself. 3) An error response status was received during initial communication with battery-less absolute encoder. Countermeasure: 1) Check for any wire breakage on a connector and inspect the condition of the wire connections. If there is no cable malfunction, encoder failure may be possible. Contact IAI.
0E8	A-, B-phase disconnection	Cause: The encoder signal cannot be detected normally. 1) Disconnection of the actuator connection cable, actuator side attached cable, or connector connection failure. 2) Failure of the encoder itself. 3) Disconnected axis parameter No. 158 "Enabled/Disabled Axis Select" is 0: Enabled. Countermeasure: 1) Check for any wire breakage on a connector and inspect the condition of the wire connections. 2) If there is no cable malfunction, encoder failure may be possible. Contact IAI. 3) Parameter No. 158 "Enabled/Disabled Axis Select" 1: Disabled. * When the actuator is not connected, this alarm is generated just by setting the reserved axis in the gateway parameter configuration tool or setting the drive unit to "Not set".

Alarm code	Alarm name	Causes/countermeasures
0EB P, A Driver limited	Battery-less Absolute Encoder error detected	Cause: Battery-less absolute encoder cannot detect location information normally. Countermeasure: Check for any wire breakage on a connector and inspect the condition of the wire connections. If there is no cable malfunction, encoder failure may be possible. Contact IAI.
0EC D Driver limited	PS-phase disconnection	Cause: The encoder signal cannot be detected normally. 1) Disconnection of the actuator connection cable, actuator side attached cable, or connector connection failure. 2) Failure of the encoder itself. Countermeasure: 1) Check for any wire breakage on a connector and inspect the condition of the wire connections. If there is no cable malfunction, encoder failure may be possible. Contact IAI.
0F0 A, D Driver limited	Driver logic error	Cause: Excessive load, parameter (motor type) mismatch, noise, RCON system failure, etc. Countermeasure: Contact IAI.
0F4 P, A Driver limited	PCB mismatch	Cause: The circuit board is not supported by the connection motor at startup check. There may be a mismatch between the actuator and driver unit. Check the model numbers. Countermeasure: Contact IAI if this error occurs.
0F6	Non-volatile memory write timeout	Cause: There is no response within the specified time during the data writing to the non-volatile memory. (Failure of non-volatile memory) Countermeasure: Contact IAI if this reoccurs even after turning ON the power again.
0F8	Non-volatile memory data destruction	Cause: Abnormal data was detected by non-volatile memory check at startup. (Failure of non-volatile memory) Countermeasure: Contact IAI if this reoccurs even after turning ON the power again.
0FA	CPU error	Cause: CPU is not operating normally. 1) CPU malfunction. 2) Malfunction caused by noise. Countermeasure: Contact IAI if this reoccurs even after turning ON the power again.
0FC	Logic error (Controller part error)	Cause: RCON system interior is not working properly. 1) Malfunction due to noise or other causes. 2) Failure of a peripheral circuit component. Countermeasure: Reboot the power. If the error occurs again, check for presence of noise. If a spare driver unit is available, replace it and try again. A recurring error with the spare controller suggests presence of noise. Contact IAI if the cause cannot be determined.
300~ 3FF	Teaching tool alarm	[Refer to teaching tool instruction manual]

Maintenance Section

Chapter 2 Troubleshooting

Appendix

Chapter 1

Connectable Actuators

1.1 List of Actuator Specifications 1-1

AC servo motor specification actuators 1-1

DC brush-less motor specification actuators 1-14

Stepper motor specification actuators 1-15

1.2 Correlation Diagrams of Speed and Payload 1-94

RCP2 slider type 1-94

RCP2 slider type (motor side-mounted) 1-95

RCP2 rod standard type 1-96

RCP2 with single guide type 1-97

RCP2 with double guide type 1-98

RCP2W dust-proof/splash-proof rod type 1-99

RCP3 slider type 1-100

RCP3 table type 1-101

RCP4 slider type (high-output enabled) 1-102

RCP4 rod type (high-output enabled) 1-104

RCP4W dust-proof/splash-proof rod type (high-output enabled) 1-106

RCP5 slider type (high-output enabled) 1-107

RCP5 rod type (high-output enabled)········1-108
RCP6 slider type (high-output enabled)········1-109
RCP6 wide slider type (high-output enabled)········1-111
RCP6 rod type (high-output enabled)········1-113
RCP6 radial cylinder type (high-output enabled)········1-115
RCP6 wide radial cylinder type (high-output enabled)········1-117
RCP6 table type (high-output enabled)········1-119
RCP6CR clean specification slider type (high-output enabled)········1-123
RCP6CR clean specification wide slider type (high-output enabled)········1-124
RCP6W dust-proof/splash-proof rod type (high-output enabled)········1-125
RCP6W dust-proof/splash-proof rod type········1-127
RCP6W dust-proof/splash-proof rod type (high-output enabled)········1-128
RCP6W dust-proof/splash-proof rod type········1-130
RCP6W dust-proof/splash-proof radial cylinder type (high-output enabled)········1-131
RCP6W dust-proof/splash-proof radial cylinder type········1-133
RCP6W dust-proof/splash-proof radial cylinder type (high-output enabled)········1-134
RCP6W dust-proof/splash-proof radial cylinder type········1-136
RCP6W dust-proof/splash-proof wide radial cylinder type (high-output enabled)········1-137
RCP6W dust-proof/splash-proof wide radial cylinder type········1-139
RCP6W dust-proof/splash-proof wide radial cylinder type (high-output enabled)········1-140
RCP6W dust-proof/splash-proof wide radial cylinder type········1-142
Push force and current limit value········1-143

1.3 List of Actuators That Support Information Management Function········1-155
Stepper motor specification actuators········1-155
AC servo motor specification actuators········1-156

Revision history········1-159

1.1 List of Actuator Specifications

The specifications included in this list are limited to those needed to set operating conditions and parameters. For other detailed specifications, refer to the catalog or operation manual for your actuator.

Caution

- The push force is based on the rated push speed (factory setting) indicated in the list, and provides only a guideline.
- Make sure the actual push force is equal to or greater than the minimum push force. If not, the push force will not stabilize.
- Do not change the setting of push speed (parameter No.34). If you must change the push speed, consult IAI.
- If, among the operating conditions, the positioning speed is set to a value equal to or smaller than the push speed, the push speed will become the set speed and the specified push force will not generate.

AC servo motor specification actuators

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (rod type)	RA3C	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					5	Horizontal/ vertical	6.25	250	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					2.5	Horizontal/ vertical	3.12	125	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
	RGS3C	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					5	Horizontal/ vertical	6.25	250	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					2.5	Horizontal/ vertical	3.12	125	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
	RGD3C	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					5	Horizontal/ vertical	6.25	250	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					2.5	Horizontal/ vertical	3.12	125	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (rod type)	RA3D	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	0.3	–	–	–
										–	–	–
					5	Horizontal/ vertical	6.25	250	0.3	–	–	–
										–	–	–
					2.5	Horizontal/ vertical	3.12	125	0.2	–	–	–
										–	–	–
	RGS3D	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	0.3	–	–	–
										–	–	–
					5	Horizontal/ vertical	6.25	250	0.3	–	–	–
										–	–	–
					2.5	Horizontal/ vertical	3.12	125	0.2	–	–	–
										–	–	–
	RGD3D	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	0.3	–	–	–
										–	–	–
					5	Horizontal/ vertical	6.25	250	0.3	–	–	–
										–	–	–
					2.5	Horizontal/ vertical	3.12	125	0.2	–	–	–
										–	–	–
	RA3R	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	0.3	–	–	–
										–	–	–
					5	Horizontal/ vertical	6.25	250	0.3	–	–	–
										–	–	–
					2.5	Horizontal/ vertical	3.12	125	0.2	–	–	–
										–	–	–
	RGD3R	Ball screw	20	800	10	Horizontal/ vertical	12.5	500	0.3	–	–	–
										–	–	–
					5	Horizontal/ vertical	6.25	250	0.3	–	–	–
										–	–	–
					2.5	Horizontal/ vertical	3.12	125	0.2	–	–	–
										–	–	–
	RA4C	Ball screw	20	800	12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
			30		12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
	RGS4C	Ball screw	20	800	12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
			30		12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (rod type)	RGD4C	Ball screw	20	800	12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
			30		12	Horizontal/ vertical	15	600	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5	300	Energy-saving spec.: 0.3	–	–	–
									High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75	150	Energy-saving spec.: 0.2	–	–	–
									High acc/dec spec.: 0.2	–	–	–
	RA4D	Ball screw	20	800	12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
			30		12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
	RGS4D	Ball screw	20	800	12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
			30		12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
	RGD4D	Ball screw	20	800	12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
			30		12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (rod type)	RA4R	Ball screw	20	800	12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
			30		12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
	RGD4R	Ball screw	20	800	12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
			30		12	Horizontal/ vertical	15	600	0.3	–	–	–
										–	–	–
					6	Horizontal/ vertical	7.5	300	0.3	–	–	–
										–	–	–
					3	Horizontal/ vertical	3.75	150	0.2	–	–	–
										–	–	–
	SRA4R	Ball screw	20	800	5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	SRGS4R	Ball screw	20	800	5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	SRGD4R	Ball screw	20	800	5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
RCA (slider type)	SA4C	Ball screw	20	Incremental 800 Battery-less Absolute 16384	10	Horizontal/ vertical	12.5 (Note 1)	665	Energy-saving spec.: 0.3 High acc/dec spec.: 1.0	–	–	–
					5	Horizontal/ vertical	6.25 (Note 1)	330	Energy-saving spec.: 0.3 High acc/dec spec.: 1.0	–	–	–
					2.5	Horizontal/ vertical	3.12 (Note 1)	165	Energy-saving spec.: 0.2 High acc/dec spec.: 0.2	–	–	–
	SA4D	Ball screw	20	800	10	Horizontal/ vertical	12.5	665	0.3	–	–	–
					5	Horizontal/ vertical	6.25	330	0.3	–	–	–
					2.5	Horizontal/ vertical	3.12	165	0.2	–	–	–
	SA4R	Ball screw	20	Incremental 800 Battery-less Absolute 16384	10	Horizontal/ vertical	12.5 (Note 1)	665	0.3	–	–	–
					5	Horizontal/ vertical	6.25 (Note 1)	330	0.3	–	–	–
					2.5	Horizontal/ vertical	3.12 (Note 1)	165	0.2	–	–	–

Note 1 Speed with the incremental encoder

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (slider type)	SA5C	Ball screw	20	Incremental 800 Battery-less Absolute 16384	20	Horizontal	25 (Note 1)	1300	Energy-saving spec.: 0.3	–	–	–
						Vertical		800	High acc/dec spec.: 0.8	–	–	–
					12	Horizontal/ vertical	15 (Note 1)	800 (at 50 to 450st) 760 (at 500st)	Energy-saving spec.: 0.3 High acc/dec spec.: 0.8	–	–	–
					6	Horizontal/ vertical	7.5 (Note 1)	400 (at 50 to 450st) 380 (at 500st)	Energy-saving spec.: 0.3 High acc/dec spec.: 0.8	–	–	–
					3	Horizontal/ vertical	3.75 (Note 1)	200 (at 50 to 450st) 190 (at 500st)	Energy-saving spec.: 0.2 High acc/dec spec.: 0.2	–	–	–
	SA5D	Ball screw	20	800	12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st)	0.3	–	–	–
					3	Horizontal/ vertical	3.75	200 (at 50 to 450st) 190 (at 500st)	0.2	–	–	–
	SA5R	Ball screw	20	Incremental 800 Battery-less Absolute 16384	12	Horizontal/ vertical	15 (Note 1)	800 (at 50 to 450st) 760 (at 500st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5 (Note 1)	400 (at 50 to 450st) 380 (at 500st)	0.3	–	–	–
					3	Horizontal/ vertical	3.75 (Note 1)	200 (at 50 to 450st) 190 (at 500st)	0.2	–	–	–
	SA6C	Ball screw	30	Incremental 800 Battery-less Absolute 16384	20	Horizontal	25 (Note 1)	1300 (at 50 to 500st) 1160 (at 550st) 990 (at 600st)	Energy-saving spec.: 0.3	–	–	–
						Vertical		800	High acc/dec spec.: 0.8	–	–	–
					12	Horizontal/ vertical	15 (Note 1)	800 (at 50 to 450st) 760 (at 500st) 640 (at 550st) 540 (at 600st)	Energy-saving spec.: 0.3 High acc/dec spec.: 1.0	–	–	–
					6	Horizontal/ vertical	7.5 (Note 1)	400 (at 50 to 450st) 380 (at 500st) 320 (at 550st) 270 (at 600st)	Energy-saving spec.: 0.3 High acc/dec spec.: 1.0	–	–	–
					3	Horizontal/ vertical	3.75 (Note 1)	200 (at 50 to 450st) 190 (at 500st) 160 (at 550st) 135 (at 600st)	Energy-saving spec.: 0.2 High acc/dec spec.: 0.2	–	–	–
	SA6D	Ball screw	30	800	12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st) 640 (at 550st) 540 (at 600st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st) 320 (at 550st) 270 (at 600st)	0.3	–	–	–
					3	Horizontal/ vertical	3.75	200 (at 50 to 450st) 190 (at 500st) 160 (at 550st) 135 (at 600st)	0.2	–	–	–
	SA6R	Ball screw	30	Incremental 800 Battery-less Absolute 16384	12	Horizontal/ vertical	15 (Note 1)	800 (at 50 to 450st) 760 (at 500st) 640 (at 550st) 540 (at 600st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5 (Note 1)	400 (at 50 to 450st) 380 (at 500st) 320 (at 550st) 270 (at 600st)	0.3	–	–	–
					3	Horizontal/ vertical	3.75 (Note 1)	200 (at 50 to 450st) 190 (at 500st) 160 (at 550st) 135 (at 600st)	0.2	–	–	–

Note 1 Speed with the incremental encoder

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA (slider type)	SS4D	Ball screw	20	800	10	Horizontal/ vertical	12.5	665	0.3	–	–	–
					5	Horizontal/ vertical	6.25	330	0.3	–	–	–
					2.5	Horizontal/ vertical	3.12	165	0.2	–	–	–
	SS5D	Ball screw	20	800	12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st)	0.3	–	–	–
					3	Horizontal/ vertical	3.25	200 (at 50 to 450st) 190 (at 500st)	0.2	–	–	–
	SS6D	Ball screw	30	800	12	Horizontal/ vertical	15	800 (at 50 to 450st) 760 (at 500st) 640 (at 550st) 540 (at 600st)	0.3	–	–	–
					6	Horizontal/ vertical	7.5	400 (at 50 to 450st) 380 (at 500st) 320 (at 550st) 270 (at 600st)	0.3	–	–	–
					3	Horizontal/ vertical	3.25	200 (at 50 to 450st) 190 (at 500st) 160 (at 550st) 135 (at 600st)	0.2	–	–	–
RCA (arm type)	A4R	Ball screw	20	800	10	Horizontal/ vertical	12.5	330	0.2	–	–	–
					5		6.25	165	0.2	–	–	–
	A5R	Ball screw	20	800	12	Horizontal/ vertical	15	400	0.2	–	–	–
					6		7.5	200	0.2	–	–	–
	A6R	Ball screw	30	800	12	Horizontal/ vertical	15	400	0.2	–	–	–
					6		7.5	200	0.2	–	–	–
RCA2 (rod type)	RA2AC	Ball screw	5	800	4	Horizontal/ vertical	5	180 (at 25st) 200 (at 50 to 100st)	0.3	–	–	–
					2		2.5	100	0.3	–	–	–
					1		1.25	50	0.3	–	–	–
	RA2AR	Ball screw	5	800	4	Horizontal/ vertical	5	180 (at 25st) 200 (at 50 to 100st)	0.3	–	–	–
					2		2.5	100	0.3	–	–	–
					1		1.25	50	0.3	–	–	–
	RN3N RN3NA	Ball screw	10	1048	4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2			
					2	Horizontal	1.90	100	0.3			
						Vertical			0.2			
					1	Horizontal	0.95	50	0.2			
						Vertical			0.2			
		Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100	0.2			
					1		0.95	50	0.2			
	RP3N RP3NA	Ball screw	10	1048	4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2			
					2	Horizontal	1.90	100	0.3			
						Vertical			0.2			
					1	Horizontal	0.95	50	0.2			
						Vertical			0.2			
		Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100	0.2			
					1		0.95	50	0.2			

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (rod type)	GS3N GS3NA	Ball screw	10	1048	4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2			
					2	Horizontal	1.90	100	0.3			
						Vertical			0.2			
					1	Horizontal	0.95	50	0.2			
						Vertical			0.2			
		Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100	0.2			
					1		0.95	50	0.2			
	GD3N GD3NA	Ball screw	10	1048	4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2			
					2	Horizontal	1.90	100	0.3			
						Vertical			0.2			
					1	Horizontal	0.95	50	0.2			
						Vertical			0.2			
		Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100	0.2			
					1		0.95	50	0.2			
	SD3N SD3NA	Ball screw	10	1048	4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2			
					2	Horizontal	1.90	100	0.3			
						Vertical			0.2			
					1	Horizontal	0.95	50	0.2			
						Vertical			0.2			
		Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100	0.2			
					1		0.95	50	0.2			
	RN4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	RP4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (rod type)	GS4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	GD4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	SD4N	Ball screw	20	1048	6	Horizontal	5.72	240 (at 25st) 300 (at 50 to 75st)	0.3	–	–	–
						Vertical		200 (at 25st) 300 (at 50 to 75st)	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	200 (at 25st) 300 (at 50 to 75st)	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
RCA2 (slider type)	SA2AC	Ball screw	5	800	4	Horizontal	5	180 (at 25st) 200 (at 50 to 75st)	0.3	–	–	–
						Vertical			0.3	–	–	–
					2	Horizontal	2.5	100	0.3	–	–	–
						Vertical			0.3	–	–	–
					1	Horizontal	1.25	50	0.3	–	–	–
						Vertical			0.3	–	–	–
	SA2AR	Ball screw	5	800	4	Horizontal	5	180 (at 25st) 200 (at 50 to 100st)	0.3	–	–	–
						Vertical			0.3	–	–	–
					2	Horizontal	2.5	100	0.3	–	–	–
						Vertical			0.3	–	–	–
					1	Horizontal	1.25	50	0.3	–	–	–
						Vertical			0.3	–	–	–
	SA3C	Ball screw	10	800	6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	5	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	2.5	100	0.2	–	–	–
						Vertical			0.2	–	–	–

1.1 List of Actuator Specifications

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (slider type)	SA3R	Ball screw	10	800	6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	5	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	2.5	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	SA4C	Ball screw	20	800	10	Horizontal	12.5	380 (at 50st) 500 (at 100 to 500st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	SA4R	Ball screw	20	800	10	Horizontal	12.5	380 (at 50st) 500 (at 100 to 500st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	SA5C	Ball screw	20	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 600st) 910 (at 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.3	–	–	–
						Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.2	–	–	–
					12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (slider type)	SA5R	Ball screw	20	800	12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	–	–	–
						Vertical			0.2	–	–	–
	SA6C	Ball screw	30	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 600st) 910 (at 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.3	–	–	–
						Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.2	–	–	–
					12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (slider type)	SA6R	Ball screw	30	800	12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150 to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					6	Horizontal	7.5	300 (at 50 to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150 (at 50 to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	–	–	–
						Vertical			0.2	–	–	–
RCA2 (table type)	TCA3NA TCA3N TC3N	Ball screw	10	1048	4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.3	–	–	–
						Vertical			0.2	–	–	–
					1	Horizontal	0.95	50	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100	0.2	–	–	–
					1		0.95	50	0.2	–	–	–
	TWA3NA TWA3N TW3N	Ball screw	10	1048	4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.3	–	–	–
						Vertical			0.2	–	–	–
					1	Horizontal	0.95	50	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100	0.2	–	–	–
					1		0.95	50	0.2	–	–	–
	TFA3NA TFA3N TF3N	Ball screw	10	1048	4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.3	–	–	–
						Vertical			0.2	–	–	–
					1	Horizontal	0.95	50	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw	10	1048	4	Horizontal/ vertical	3.81	200	0.2	–	–	–
					2		1.90	100	0.2			
					1		0.95	50	0.2			
	TCA4NA	Ball screw	20	1048	6	Horizontal	5.72	270 (at 30st) 300 (at 50st)	0.3	–	–	–
						Vertical		220 (at 30st) 300 (at 50st)	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw	20	1048	6	Horizontal/ vertical	3.81	200	0.2	–	–	–
					4		1.90	100	0.2			
					2		0.95	50	0.2			

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (table type)	TCA4N TC4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	TWA4NA	Ball screw	20	1048	6	Horizontal	5.72	270 (at 30st) 300 (at 50st)	0.3	–	–	–
						Vertical		220 (at 30st) 300 (at 50st)	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal/ vertical	3.81	220	0.2	–	–	–
					4		1.90	100	0.2	–	–	–
					2		0.95	50	0.2	–	–	–
	TWA4N TW4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	TFA4NA	Ball screw	20	1048	6	Horizontal	5.72	270 (at 30st) 300 (at 50st)	0.3	–	–	–
						Vertical		220 (at 30st) 300 (at 50st)	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw	20	1048	6	Horizontal/ vertical	3.81	220	0.2	–	–	–
					4		1.90	100	0.2	–	–	–
					2		0.95	50	0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (table type)	TFA4N TF4N	Ball screw	20	1048	6	Horizontal	5.72	270	0.3	–	–	–
						Vertical		220	0.2	–	–	–
					4	Horizontal	3.81	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
		Lead screw			6	Horizontal	5.72	220	0.2	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	3.81	200	0.2	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	1.90	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA4C	Ball screw	10	800	6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	5	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	2.5	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA4R	Ball screw	10	800	6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					4	Horizontal	5	200	0.3	–	–	–
						Vertical			0.2	–	–	–
					2	Horizontal	2.5	100	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA5C	Ball screw	20	800	10	Horizontal	12.5	465	0.3	–	–	–
						Vertical		400	0.2	–	–	–
					5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA5R	Ball screw	20	800	10	Horizontal	12.5	465	0.3	–	–	–
						Vertical		400	0.2	–	–	–
					5	Horizontal	6.25	250	0.3	–	–	–
						Vertical			0.2	–	–	–
					2.5	Horizontal	3.12	125	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA6C	Ball screw	20	800	12	Horizontal	15	560	0.3	–	–	–
						Vertical		500	0.2	–	–	–
					6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA6R	Ball screw	20	800	12	Horizontal	15	560	0.3	–	–	–
						Vertical		500	0.2	–	–	–
					6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150	0.2	–	–	–
						Vertical			0.2	–	–	–
	TA7C	Ball screw	30	800	12	Horizontal	15	600	0.3	–	–	–
						Vertical		580	0.2	–	–	–
					6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150	0.2	–	–	–
						Vertical			0.2	–	–	–

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCA2 (table type)	TA7R	Ball screw	30	800	12	Horizontal	15	600	0.3	–	–	–
						Vertical		580	0.2	–	–	–
					6	Horizontal	7.5	300	0.3	–	–	–
						Vertical			0.2	–	–	–
					3	Horizontal	3.75	150	0.2	–	–	–
						Vertical			0.2	–	–	–
RCL	RA1L	Linear	–	715	–	Horizontal/ vertical	42	300	2	0.75	2	2
	RA2L			855		Horizontal/ vertical	42	340	2	1.5	4	4
	RA3L			1145		Horizontal/ vertical	42	450	2	3	8	8
	SA1L			715		Horizontal	42	420	2	–	–	–
	SA2L			855		Horizontal	42	460	2	–	–	–
	SA3L			1145		Horizontal	42	600	2	–	–	–
	SA4L			715		Horizontal	42	1200	2	–	–	–
	SM4L			715		Horizontal	42	1200	2	–	–	–
	SA5L			855		Horizontal	42	1400	2	–	–	–
	SM5L			855		Horizontal	42	1400	2	–	–	–
	SA6L			1145		Horizontal	42	1600	2	–	–	–
	SM6L			1145		Horizontal	42	1600	2	–	–	–

DC brush-less motor specification actuators

Actuator series	Type	Feed screw	Motor output [W]	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCD	RA1D	Lead screw	3	400	2	Horizontal/ vertical	2.5	300	1	0.41	5.98	5
	RA1DA			480								
	GRSN	Lead screw	3	400	2	Horizontal/ vertical	2.5	67	1	2.1	10.0	5
	GRSNA			480								

Stepper motor specification actuators

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (rod type)	RA2C	Ball screw	800	0.5	Horizontal /vertical	1.25	25	0.05	50	100	3
	RA3C	Ball screw	800	5	Horizontal /vertical	6.25	187	0.2	21	73.5	20
				2.5	Horizontal /vertical	3.12	114		50	156.8	
	RGD3C	Ball screw	800	5	Horizontal /vertical	6.25	187	0.2	21	73.5	20
				2.5	Horizontal	3.12	114		50	156.8	
					Vertical		93				
	RA4C	Ball screw	800	10	Horizontal /vertical	12.5	458 (at to 250st) 350 (at 300st)	0.2	30	150	20
				5	Horizontal /vertical	6.25	250 (at 50 to 200st) 237 (at 250st) 175 (at 300st)		75	284	
				2.5	Horizontal	3.12	125 (at 50 to 200st) 118 (at 250st) 87 (at 300st)		150	358	
					Vertical		114				
	RGS4C	Ball screw	800	10	Horizontal /vertical	12.5	458 (at to 250st) 350 (at 300st)	0.2	30	150	20
				5	Horizontal /vertical	6.25	250 (at 50 to 200st) 237 (at 250st) 175 (at 300st)		75	284	
				2.5	Horizontal	3.12	125 (at 50 to 200st) 118 (at 250st) 87 (at 300st)		150	358	
					Vertical		114				
	RGD4C	Ball screw	800	10	Horizontal /vertical	12.5	458 (at to 250st) 350 (at 300st)	0.2	30	150	20
				5	Horizontal /vertical	6.25	250 (at 50 to 200st) 237 (at 250st) 175 (at 300st)		75	284	
				2.5	Horizontal	3.12	125 (at 50 to 200st) 118 (at 250st) 87 (at 300st)		150	358	
					Vertical		114				
	RA6C	Ball screw	800	16	Horizontal	20	450	0.2	75	240	20
					Vertical		400				
				8	Horizontal /vertical	10	210		130	470	
				4	Horizontal /vertical	5	130		300	800	
	RGS6C	Ball screw	800	16	Horizontal	20	450	0.2	75	240	20
					Vertical		400				
				8	Horizontal /vertical	10	210		130	470	
				4	Horizontal /vertical	5	130		300	800	

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (rod type)	RGD6C	Ball screw	800	16	Horizontal	20	450	0.2	75	240	20
					Vertical		400				
				8	Horizontal /vertical	10	210		130	470	
				4	Horizontal /vertical	5	130		300	800	
	RA8C/ RA8R	Ball screw	800	10	Horizontal /vertical	12.5	RA8C: 300 RA8R: 200	0.2	286	1000	10
				5	Horizontal /vertical	6.25	RA8C: 150 RA8R: 100	0.1	571	2000	
	RA10C	Ball screw	800	10	Horizontal	12.5	250	0.04	500	1500	10
					Vertical		167				
				5	Horizontal /vertical	6.25	125	0.02	1000	3000	
				2.5	Horizontal /vertical	3.12	63	0.01	3100	6000	
	SRA4R	Ball screw	800	5	Horizontal /vertical	6.25	250	0.3	26	90	20
				2.5	Horizontal	3.12	125	0.2	50	170	
					Vertical						
	SRGS4R	Ball screw	800	5	Horizontal /vertical	6.25	250	0.3	26	90	20
				2.5	Horizontal	3.12	125	0.2	50	170	
					Vertical						
	SRGD4R	Ball screw	800	5	Horizontal /vertical	6.25	250	0.3	26	90	20
				2.5	Horizontal	3.12	125	0.2	50	170	
					Vertical						
RCP2W (rod type)	RA4C	Ball screw	800	10	Horizontal	12.5	450 (at 50 to 250st) 350 (at 300st)	0.2	30	150	20
					Vertical		250				
				5	Horizontal /vertical	6.25	190 (at 50 to 250st) 175 (at 300st)		75	284	
				2.5	Horizontal	3.12	125 (at 50 to 200st) 115 (at 250st) 85 (at 300st)		150	358	
					Vertical		115 (at 50 to 250st) 85 (at 300st)				
	RA6C	Ball screw	800	16	Horizontal	20	320	0.2	75	240	20
					Vertical		265				
				8	Horizontal /vertical	10	200		150	470	
				4	Horizontal /vertical	5	100		300	800	

Appendix

Chapter 1 Connectable Actuators

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (slider type)	SA5C	Ball screw	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 550st) 980 (at 600st) 850 (at 650st) 740 (at 700st) 650 (at 750st) 580 (at 800st)	0.7	11	39	20
					Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 600st) 740 (at 700st) 650 (at 750st) 580 (at 800st)	0.2			
				12	Horizontal	15	300 (at 50st) 460 (at 100st) 600 (at 150 to 550st) 540 (at 600st) 460 (at 650st) 400 (at 700st) 360 (at 750st) 300 (at 800st)	0.7	40	115	
					Vertical			0.3			
				6	Horizontal	7.5	295 (at 50st) 300 (at 100 to 550st) 270 (at 600st) 230 (at 650st) 200 (at 700st) 180 (at 750st) 150 (at 800st)	0.7	70	210	
					Vertical			0.3			
				3	Horizontal	3.75	150 (at to 550st) 135 (at 600st) 115 (at 650st) 100 (at 700st) 90 (at 750st) 75 (at 800st)	0.7	140	330	
					Vertical			0.3			
	SA5R	Ball screw	800	12	Horizontal	15	300 (at 50st) 460 (at 100st) 600 (at 150 to 550st) 540 (at 600st) 460 (at 650st) 400 (at 700st) 360 (at 750st) 300 (at 800st)	0.3	–	–	–
					Vertical			0.2			
				6	Horizontal	7.5	295 (at 50st) 300 (at 100 to 550st) 270 (at 600st) 230 (at 650st) 200 (at 700st) 180 (at 750st) 150 (at 800st)	0.3	–	–	–
					Vertical			0.2			
				3	Horizontal	3.75	150 (at to 550st) 135 (at 600st) 115 (at 650st) 100 (at 700st) 90 (at 750st) 75 (at 800st)	0.2	–	–	–
					Vertical			0.2			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (slider type)	SA6C	Ball screw	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 550st) 980 (at 600st) 850 (at 650st) 740 (at 700st) 650 (at 750st) 580 (at 800st)	0.7	11	39	20
					Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 600st) 740 (at 700st) 650 (at 750st) 580 (at 800st)	0.2			
				12	Horizontal	15	300 (at 50st) 460 (at 100st) 600 (at 150 to 550st) 540 (at 600st) 460 (at 650st) 400 (at 700st) 360 (at 750st) 300 (at 800st)	0.7	40	115	
					Vertical			0.3			
				6	Horizontal	7.5	295 (at 50st) 300 (at 100 to 550st) 270 (at 600st) 230 (at 650st) 200 (at 700st) 180 (at 750st) 150 (at 800st)	0.7	70	210	
					Vertical			0.3			
				3	Horizontal	3.75	150 (at to 550st) 135 (at 600st) 115 (at 650st) 100 (at 700st) 90 (at 750st) 75 (at 800st)	0.7	140	330	
					Vertical			0.3			
	SA6R	Ball screw	800	12	Horizontal	15	300 (at 50st) 460 (at 100st) 600 (at 150 to 550st) 540 (at 600st) 460 (at 650st) 400 (at 700st) 360 (at 750st) 300 (at 800st)	0.3	–	–	–
					Vertical			0.2			
				6	Horizontal	7.5	295 (at 50st) 300 (at 100 to 550st) 270 (at 600st) 230 (at 650st) 200 (at 700st) 180 (at 750st) 150 (at 800st)	0.3	–	–	–
					Vertical			0.2			
				3	Horizontal	3.75	150 (at to 550st) 135 (at 600st) 115 (at 650st) 100 (at 700st) 90 (at 750st) 75 (at 800st)	0.2	–	–	–
					Vertical			0.2			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (slider type)	SA7C	Ball screw	800	16	Horizontal	20	380(at 50st) 470(at 100st) 533(at 150 to 750st) 480(at 800st)	0.3	90	250	20
					Vertical			0.2			
				8	Horizontal	10	266(at 50 to 750st) 240(at 800st)	0.3	150	500	
					Vertical			0.2			
				4	Horizontal	5	133(at 50 to 750st) 120(at 800st)	0.2	280	800	
					Vertical			0.2			
	SA7R	Ball screw	800	16	Horizontal	20	380(at 50st) 470(at 100st) 533(at 150 to 750st) 480(at 800st)	0.3	–	–	–
					Vertical		380(at 50st) 400(at 100 to 800st)	0.2			
				8	Horizontal	10	266(at 50 to 750st) 240(at 800st)	0.3	–	–	–
					Vertical			0.2			
				4	Horizontal	5	133(at 50 to 750st) 120(at 800st)	0.2	–	–	–
					Vertical			0.2			
RCP2 (slider type)	SS7C	Ball screw	800	12	Horizontal	15	600 (at 50 to 500st) 470 (at 600st)	0.3	40	120	20
					Vertical			0.2			
				6	Horizontal	7.5	300 (at 50 to 500st) 230 (at 600st)	0.3	75	220	
					Vertical			0.2			
				3	Horizontal	3.75	150 (at 50 to 500st) 115 (at 600st)	0.2	140	350	
					Vertical			0.2			
	SS7R	Ball screw	800	12	Horizontal	15	600 (at 50 to 500st) 470 (at 600st)	0.3	–	–	–
					Vertical		440 (at 50 to 500st) 440 (at 600st)	0.2			
				6	Horizontal	7.5	250 (at 50 to 500st) 230 (at 600st)	0.3	–	–	–
					Vertical			0.2			
				3	Horizontal	3.75	105 (at 50 to 500st) 105 (at 600st)	0.2	–	–	–
					Vertical			0.2			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (slider type)	SS8C	Ball screw	800	20	Horizontal	25	666 (at 50 to 800st) 625 (at to 900st) 515 (at to 1000st)	0.3	50	180	20
					Vertical		600 (at 50 to 800st) 600 (at to 900st) 515 (at to 1000st)	0.2			
				10	Horizontal	12.5	333 (at 50 to 800st) 310 (at to 900st) 255 (at to 1000st)	0.3	95	320	
					Vertical		300 (at 50 to 800st) 300 (at to 900st) 255 (at to 1000st)	0.2			
				5	Horizontal	6.25	165 (at 50 to 800st) 155 (at to 900st) 125 (at to 1000st)	0.2	180	630	
					Vertical		150 (at 50 to 800st) 150 (at to 900st) 125 (at to 1000st)	0.2			
	SS8R	Ball screw	800	20	Horizontal	25	600 (at 50 to 800st) 600 (at to 900st) 515 (at to 1000st)	0.3	–	–	–
					Vertical		333 (at 50 to 800st) 333 (at to 900st) 333 (at to 1000st)	0.2			
				10	Horizontal	12.5	300 (at 50 to 800st) 300 (at to 900st) 255 (at to 1000st)	0.3	–	–	–
					Vertical		250 (at 50 to 800st) 250 (at to 900st) 250 (at to 1000st)	0.2			
				5	Horizontal	6.25	160 (at 50 to 800st) 155 (at to 900st) 125 (at to 1000st)	0.2	–	–	–
					Vertical		140 (at 50 to 800st) 140 (at to 900st) 140 (at to 1000st)	0.2			
RCP2 (slider type)	HS8C	Ball screw	800	30	Horizontal	37.5	1200 (at 50 to 800st) 1000 (at to 900st) 800 (at to 1000st)	0.3	–	–	–
					Vertical		750(at 50 to 800st) 750(at to 900st) 750(at to 1000st)	0.2	–	–	–
	HS8R	Ball screw	800	30	Horizontal	37.5	1200(at 50 to 800st) 1000(at to 900st) 800(at to 1000st)	0.3	–	–	–
					Vertical		750(at 50 to 800st) 750(at to 900st) 750(at to 1000st)	0.2	–	–	–
RCP2 (belt type)	BA6/ BA6U	Belt	800	Equivalent to 54	Horizontal	100	1000	0.5	–	–	–
	BA7/ BA7U	Belt	800	Equivalent to 54	Horizontal	100	1500	0.5	–	–	–

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (gripper type)	GRSS	–	800	1.57	–	1.96	78	–	4	14	5
	GRLS	–	800	12	–	15 (deg/s)	600 (deg/s)	–	1.8	6.4	5 (deg/s)
	GRS	–	800	1	–	1.25	33	–	9	21	5
	GRM	–	800	1.1	–	1.37	36	–	23	80	5
	GRST	–	800	1.05	–	1.31	34	–	15	40	5
		–	800	2.27	–	2.83	75	–	7.5	20	5
	GR3LS	–	800	12	–	15 (deg/s)	200 (deg/s)	–	5	18	5 (deg/s)
	GR3LM	–	800	12	–	15 (deg/s)	200 (deg/s)	–	15	51	5 (deg/s)
	GR3SS	–	800	2.5	–	3.12	40	–	7	22	5
	GR3SM	–	800	3	–	3.75	50	–	30	102	5
	GRHM	–	800	2	–	2.5	100	–	25	125	5
	GRHB	–	800	2	–	2.5	100	–	60	200	5
RCP2W (gripper type)	GRSS	–	800	1.57	–	1.96	78	–	4	14	5
	GRLS	–	800	12	–	15 (deg/s)	600 (deg/s)	–	1.8	6.4	5 (deg/s)
	GRS	–	800	1	–	1.25	33	–	9	21	5
	GRM	–	800	1.1	–	1.37	36	–	23	80	5
	GR3SS	–	800	2.5	–	3.12	40	–	7	22	5
	GR3SM	–	800	3	–	3.75	50	–	30	102	5
RCP2 (rotary type)	RTBS	–	800	Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
		–		Gear ratio: 1/45	–	10 (deg/s)	266 (deg/s)	–	–	–	–
	RTBSL	–	800	Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
		–		Gear ratio: 1/45	–	10 (deg/s)	266 (deg/s)	–	–	–	–
	RTCS	–	800	Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
		–		Gear ratio: 1/45	–	10 (deg/s)	266 (deg/s)	–	–	–	–
	RTCSL	–	800	Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
		–		Gear ratio: 1/45	–	10 (deg/s)	266 (deg/s)	–	–	–	–
	RTB	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTBL	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP2 (rotary type)	RTC	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTCL	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTBB	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTBBL	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTCB	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
	RTCBL	–	800	Gear ratio: 1/20	–	22.5 (deg/s)	600 (deg/s)	–	–	–	–
		–		Gear ratio: 1/30	–	15 (deg/s)	400 (deg/s)	–	–	–	–
RCP3 (rod type)	RA2AC	Lead screw	800	4	Horizontal /vertical	5	180 (at 25st) 200 (at 50 to 100st)	0.2	0.9	16.1	5
				2		2.5	100		1.9	28.3	
				1		1.25	50		3.8	39.5	
		Ball screw Standard type	800	4	Horizontal	5	180 (at 25st) 200 (at 50 to 100st)	0.3	3.6	20.9	5
					Vertical			0.2			
				2	Horizontal	2.5	100	0.3	7.2	42.0	
					Vertical			0.2			
				1	Horizontal	1.25	50	0.3	14.4	82.8	
					Vertical			0.2			
		Ball screw High thrust type		4	Horizontal	5	180 (at 25st) 200 (at 50 to 100st)	0.3	6.6	35.7	5
					Vertical			0.2			
				2	Horizontal	2.5	100	0.3	13.2	70.6	
					Vertical			0.2			
				1	Horizontal	1.25	50	0.3	26.4	142.9	
					Vertical			0.2			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP3 (rod type)	RA2BC	Lead screw	800	6	Horizontal /vertical	7.5	180 (at 25st) 280 (at 50st) 300 (at 75 to 150st)	0.2	0.6	11.9	5
				4		5	180 (at 25st) 200 (at 50 to 150st)		0.9	16.1	
				2		2.5	100		1.9	28.3	
		Ball screw Standard type	800	6	Horizontal	7.5	180 (at 25st) 280 (at 50st) 300 (at 75 to 150st)	0.3	1.8	14.3	5
					Vertical			0.2			
				4	Horizontal	5	180 (at 25st) 200 (at 50 to 150st)	0.3	3.6	20.9	
					Vertical			0.2			
				2	Horizontal	2.5	100	0.3	7.2	42.0	
					Vertical			0.2			
				1	Horizontal	1.25	50	0.3	14.4	82.8	
					Vertical			0.2			
		Ball screw High thrust type		6	Horizontal	7.5	180 (at 25st) 280 (at 50st) 300 (at 75 to 150st)	0.3	4.4	24.1	5
					Vertical			0.2			
				4	Horizontal	5	180 (at 25st) 200 (at 50 to 150st)	0.3	6.6	35.7	
					Vertical			0.2			
				2	Horizontal	2.5	100	0.3	13.2	70.6	
					Vertical			0.2			
				1	Horizontal	1.25	50	0.3	26.4	142.9	
					Vertical			0.2			
	RA2AR	Lead screw	800	4	Horizontal /vertical	5	180 (at 25st) 200 (at 50 to 150st)	0.2	0.9	16.1	5
				2		2.5	100		1.9	28.3	
				1		1.25	50		3.8	39.5	
	RA2BR	Lead screw	800	6	Horizontal /vertical	7.5	180 (at 25st) 280 (at 50st) 300 (at 75 to 150st)	0.2	0.6	11.9	5
				4		5	180 (at 25st) 200 (at 50 to 150st)		0.9	16.1	
				2		2.5	100		1.9	28.3	
RCP3 (slider type)	SA2AC	Lead screw	800	4	Horizontal	5	180 (at 25st) 200 (at 50 to 100st)	0.2	–	–	–
				2		2.5	100				
				1		1.25	50				
	SA2BC	Lead screw	800	6	Horizontal	7.5	180 (at 25st) 280 (at 50st) 300 (at 75 to 150st)	0.2	–	–	–
				4		5	180 (at 25st) 200 (at 50 to 150st)				
				2		2.5	100				
	SA2AR	Lead screw	800	4	Horizontal	5	180 (at 25st) 200 (at 50 to 100st)	0.2	–	–	–
				2		2.5	100				
				1		1.25	50				
	SA2BR	Lead screw	800	6	Horizontal	7.5	180 (at 25st) 280 (at 50st) 300 (at 75 to 150st)	0.2	–	–	–
				4		5	180 (at 25st) 200 (at 50 to 150st)				
				2		2.5	100				

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP3 (slider type)	SA3C	Ball screw	800	6	Horizontal	7.5	300	0.3	9	15	20
					Vertical			0.2			
				4	Horizontal	5	200	0.3	14	22	
					Vertical			0.2			
				2	Horizontal	2.5	100	0.2	27	44	
					Vertical			0.2			
	SA3R	Ball screw	800	6	Horizontal	7.5	300	0.3	9	15	–
					Vertical			0.2			
				4	Horizontal	5	200	0.3	14	22	
					Vertical			0.2			
				2	Horizontal	2.5	100	0.2	27	44	
					Vertical			0.2			
	SA4C	Ball screw	800	10	Horizontal	12.5	380 (at 50st) 500 (at 100st to 500st)	0.7	20	34	20
					Vertical			0.3			
				5	Horizontal	6.25	250	0.7	40	68	
					Vertical			0.3			
				2.5	Horizontal	3.12	125	0.7	82	136	
					Vertical			0.3			
	SA4R	Ball screw	800	10	Horizontal	12.5	380 (at 50st) 500 (at 100st to 500st)	0.3	20	34	–
					Vertical			0.2			
				5	Horizontal	6.25	250	0.3	40	68	
					Vertical			0.2			
				2.5	Horizontal	3.12	125	0.2	82	136	
					Vertical			0.2			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP3 (slider type)	SA5C	Ball screw	800	20	Horizontal	25	380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 860 (at 250st) 940 (at 300st) 1000 (at 350 to 600st) 910 (at 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.7	17	28	20
					Vertical		380 (at 50st) 540 (at 100st) 660 (at 150st) 770 (at 200st) 800 (at 250 to 650st) 790 (at 700st) 690 (at 750st) 610 (at 800st)	0.2			
				12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150st to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.7	28	47	
					Vertical			0.3			
				6	Horizontal	7.5	300 (at 50st to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.7	57	95	
					Vertical			0.3			
				3	Horizontal	3.75	150 (at 50st to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.7	113	189	
					Vertical			0.3			
	SA5R	Ball screw	800	12	Horizontal	15	380 (at 50st) 540 (at 100st) 600 (at 150st to 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 370 (at 750st) 330 (at 800st)	0.3	30	47	20
					Vertical			0.2			
				6	Horizontal	7.5	300 (at 50st to 550st) 285 (at 600st) 245 (at 650st) 210 (at 700st) 185 (at 750st) 165 (at 800st)	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150 (at 50st to 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	0.2	112	189	
					Vertical			0.2			

<table>
<tr><th>Actuator series</th><th>Type</th><th>Feed screw</th><th>Encoder resolution</th><th>Lead [mm]</th><th>Mounting direction</th><th>Minimum speed [mm/s]</th><th>Maximum speed [mm/s]</th><th>Maximum acceleration/ deceleration [G]</th><th>Minimum push force [N]</th><th>Maximum push force [N]</th><th>Rated push speed [mm/s]</th></tr>
<tr><td rowspan="14">RCP3 (slider type)</td><td rowspan="8">SA6C</td><td rowspan="8">Ball screw</td><td rowspan="8">800</td><td rowspan="2">20</td><td>Horizontal</td><td rowspan="2">25</td><td>380 (at 50st)
540 (at 100st)
660 (at 150st)
770 (at 200st)
860 (at 250st)
940 (at 300st)
1000 (at 350 to 600st)
910 (at 650st)
790 (at 700st)
690 (at 750st)
610 (at 800st)</td><td>0.7</td><td rowspan="2">17</td><td rowspan="2">28</td><td rowspan="8">20</td></tr>
<tr><td>Vertical</td><td>380 (at 50st)
540 (at 100st)
660 (at 150st)
770 (at 200st)
800 (at 250 to 650st)
790 (at 700st)
690 (at 750st)
610 (at 800st)</td><td>0.2</td></tr>
<tr><td rowspan="2">12</td><td>Horizontal</td><td rowspan="2">15</td><td rowspan="2">380 (at 50st)
540 (at 100st)
600 (at 150st to 550st)
570 (at 600st)
490 (at 650st)
425 (at 700st)
370 (at 750st)
330 (at 800st)</td><td>0.7</td><td rowspan="2">28</td><td rowspan="2">47</td></tr>
<tr><td>Vertical</td><td>0.3</td></tr>
<tr><td rowspan="2">6</td><td>Horizontal</td><td rowspan="2">7.5</td><td rowspan="2">300 (at 50st to 550st)
285 (at 600st)
245 (at 650st)
210 (at 700st)
185 (at 750st)
165 (at 800st)</td><td>0.7</td><td rowspan="2">57</td><td rowspan="2">95</td></tr>
<tr><td>Vertical</td><td>0.3</td></tr>
<tr><td rowspan="2">3</td><td>Horizontal</td><td rowspan="2">3.75</td><td rowspan="2">150 (at 50st to 550st)
140 (at 600st)
120 (at 650st)
105 (at 700st)
90 (at 750st)
80 (at 800st)</td><td>0.7</td><td rowspan="2">113</td><td rowspan="2">189</td></tr>
<tr><td>Vertical</td><td>0.3</td></tr>
<tr><td rowspan="6">SA6R</td><td rowspan="6">Ball screw</td><td rowspan="6">800</td><td rowspan="2">12</td><td>Horizontal</td><td rowspan="2">15</td><td rowspan="2">380 (at 50st)
540 (at 100st)
600 (at 150st to 550st)
570 (at 600st)
490 (at 650st)
425 (at 700st)
370 (at 750st)
330 (at 800st)</td><td>0.3</td><td rowspan="2">30</td><td rowspan="2">47</td><td rowspan="6">20</td></tr>
<tr><td>Vertical</td><td>0.2</td></tr>
<tr><td rowspan="2">6</td><td>Horizontal</td><td rowspan="2">7.5</td><td rowspan="2">300 (at 50st to 550st)
285 (at 600st)
245 (at 650st)
210 (at 700st)
185 (at 750st)
165 (at 800st)</td><td>0.3</td><td rowspan="2">58</td><td rowspan="2">95</td></tr>
<tr><td>Vertical</td><td>0.2</td></tr>
<tr><td rowspan="2">3</td><td>Horizontal</td><td rowspan="2">3.75</td><td rowspan="2">150 (at 50st to 550st)
140 (at 600st)
120 (at 650st)
105 (at 700st)
90 (at 750st)
80 (at 800st)</td><td>0.2</td><td rowspan="2">112</td><td rowspan="2">189</td></tr>
<tr><td>Vertical</td><td>0.2</td></tr>
</table>

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP3 (table type)	TA3C	Ball screw	800	6	Horizontal	7.5	300	0.3	5.4	9	20
					Vertical		200	0.2			
				4	Horizontal	5	200	0.3	8.4	14	
					Vertical		133	0.2			
				2	Horizontal	2.5	100	0.2	16.8	28	
					Vertical		67	0.2			
	TA3R	Ball screw	800	6	Horizontal	7.5	300	0.3	5.4	9	20
					Vertical		200	0.2			
				4	Horizontal	5	200	0.3	8.4	14	
					Vertical		133	0.2			
				2	Horizontal	2.5	100	0.2	16.8	28	
					Vertical		67	0.2			
	TA4C	Ball screw	800	6	Horizontal	7.5	300	0.3	9	15	20
					Vertical			0.2			
				4	Horizontal	5	200	0.3	13.2	22	
					Vertical			0.2			
				2	Horizontal	2.5	100	0.2	26.4	44	
					Vertical			0.2			
	TA4R	Ball screw	800	6	Horizontal	7.5	300	0.3	9	15	20
					Vertical			0.2			
				4	Horizontal	5	200	0.3	13.2	22	
					Vertical			0.2			
				2	Horizontal	2.5	100	0.2	26.4	44	
					Vertical			0.2			
	TA5C	Ball screw	800	10	Horizontal	12.5	465	0.3	20	34	20
					Vertical		400	0.2			
				5	Horizontal	6.25	250	0.3	40	68	
					Vertical			0.2			
				2.5	Horizontal	3.12	125	0.2	82	136	
					Vertical			0.2			
	TA5R	Ball screw	800	10	Horizontal	12.5	465	0.3	20	34	20
					Vertical		400	0.2			
				5	Horizontal	6.25	250	0.3	40	68	
					Vertical			0.2			
				2.5	Horizontal	3.12	125	0.2	82	136	
					Vertical			0.2			
	TA6C	Ball screw	800	12	Horizontal	15	560	0.3	30	47	20
					Vertical		500	0.2			
				6	Horizontal	7.5	300	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150	0.2	112	189	
					Vertical			0.2			
	TA6R	Ball screw	800	12	Horizontal	15	560	0.3	30	47	20
					Vertical		500	0.2			
				6	Horizontal	7.5	300	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150	0.2	112	189	
					Vertical			0.2			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP3 (table type)	TA7C	Ball screw	800	12	Horizontal	15	600	0.3	30	47	20
					Vertical		580	0.2			
				6	Horizontal	7.5	300	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150	0.2	112	189	
					Vertical			0.2			
	TA7R	Ball screw	800	12	Horizontal	15	600	0.3	30	47	20
					Vertical		580	0.2			
				6	Horizontal	7.5	300	0.3	58	95	
					Vertical			0.2			
				3	Horizontal	3.75	150	0.2	112	189	
					Vertical			0.2			
RCP4 (slider type)	SA3C/ SA3R	Ball screw	800	6	Horizontal	7.5	Note: Value when high-thrust function is enabled. 420	1.0	16	58	20
					Vertical			0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 280	1.0	25	86	
					Vertical			0.5			
				2	Horizontal	2.5	Note: Value when high-thrust function is enabled. 140	1.0	49	173	
					Vertical			0.5			
	SA5C	Ball screw	800	20	Horizontal	25	Note: Value when high-thrust function is enabled. 1440 (at 50 to 500st) 1225 (at 550st) 1045 (at 600st) 900 (at 650st) 785 (at 700st) 690 (at 750st) 610 (at 800st)	1.0	16	56	20
					Vertical		Note: Value when high-thrust function is enabled. 1280 (at 50 to 500st) 1225 (at 550st) 1045 (at 600st) 900 (at 650st) 785 (at 700st) 690 (at 750st) 610 (at 800st)	0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 900 (at 50 to 450st) 795 (at 500st) 665 (at 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 375 (at 750st) 330 (at 800st)	1.0	26	93	
					Vertical			0.5			
				6	Horizontal	7.5	Note: Value when high-thrust function is enabled. 450 (at 50 to 450st) 395 (at 500st) 335 (at 550st) 285 (at 600st) 245 (at 650st) 215 (at 700st) 185 (at 750st) 165 (at 800st)	0.1	53	185	
					Vertical			0.5			
				3	Horizontal	3.75	Note: Value when high-thrust function is enabled. 225 (at 50 to 450st) 195 (at 500st) 165 (at 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	1.0	106	370	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP4 (slider type)	SA5R	Ball screw	800	20	Horizontal	25	Note: Value when high-thrust function is enabled. 1440 (at 50 to 500st) 1225 (at 550st) 1045 (at 600st) 900 (at 650st) 785 (at 700st) 690 (at 750st) 610 (at 800st)	1.0	16	56	20
					Vertical		Note: Value when high-thrust function is enabled. 1120 (at 50 to 550st) 1045 (at 600st) 900 (at 650st) 785 (at 700st) 690 (at 750st) 610 (at 800st)	0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 900 (at 50 to 450st) 785 (at 500st) 665 (at 550st) 570 (at 600st). 490 (at 650st). 425 (at 700st). 375 (at 750st) 330 (at 800st)	1.0	26	93	
					Vertical		Note: Value when high-thrust function is enabled. 800 (at 50 to 550st) 785 (at 500st) 665 (at 550st) 570 (at 600st) 490 (at 650st) 425 (at 700st) 375 (at 750st) 330 (at 800st)	0.5			
				6	Horizontal	7.5	Note: Value when high-thrust function is enabled. 450 (at 50 to 450st) 395 (at 500st) 335 (at 550st) 285 (at 600st) 245 (at 650st) 215 (at 700st) 185 (at 750st) 168 (at 800st)	1.0	53	185	
					Vertical			0.5			
				3	Horizontal	3.75	Note: Value when high-thrust function is enabled. 225 (at 50 to 450st) 195 (at 500st) 165 (at 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	1.0	106	370	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP4 (slider type)	SA6C	Ball screw	800	20	Horizontal	25	Note: Value when high-thrust function is enabled. 1440 (at 50 to 500st) 1230 (at550st) 1045 (at600st) 905 (at650st) 785 (at700st) 690 (at750st) 615 (at800st)	1.0	16	56	20
					Vertical		Note: Value when high-thrust function is enabled. 1280 (at 50 to 500st) 1230 (at 550st) 1045 (at 600st) 905 (at 650st) 785 (at 700st) 690 (at 750st) 615 (at 800st)	0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 900 (at 50 to 450st) 795 (at 500st) 670 (at 550st) 570 (at 600st) 490 (at 650st) 430 (at 700st) 375 (at 750st) 335 (at 800st)	1.0	26	93	
					Vertical			0.5			
				6	Horizontal	7.5	Note: Value when high-thrust function is enabled. 450 (at 50 to 450st) 395 (at 500st) 335 (at 550st) 285 (at 600st) 245 (at 650st) 215 (at 700st) 185 (at 750st) 165 (at 800st)	1.0	53	185	
					Vertical			0.5			
				3	Horizontal	3.75	Note: Value when high-thrust function is enabled. 225 (at 50 to 450st) 195 (at 500st) 165 (at 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	1.0	106	370	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP4 (slider type)	SA6R	Ball screw	800	20	Horizontal	25	Note: Value when high-thrust function is enabled. 128 (at 50 to 500st) 1230 (at 550st) 1045 (at 600st) 905 (at 650st) 785 (at 700st) 690 (at 750st) 615 (at 800st)	1.0	16	56	20
					Vertical			0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 900 (at 50 to 450st) 795 (at 500st) 670 (at 550st) 570 (at 600st) 490 (at 650st) 430 (at 700st) 375 (at 750st) 335 (at 800st)	1.0	26	93	
					Vertical			0.5			
				6	Horizontal	7.5	Note: Value when high-thrust function is enabled. 450 (at 50 to 450st) 395 (at 500st) 335 (at 550st) 285 (at 600st) 245 (at 650st) 215 (at 700st) 185 (at 750st) 165 (at 800st)	1.0	53	185	
					Vertical			0.5			
				3	Horizontal	3.75	Note: Value when high-thrust function is enabled. 225 (at 50 to 450st) 195 (at 500st) 165 (at 550st) 140 (at 600st) 120 (at 650st) 105 (at 700st) 90 (at 750st) 80 (at 800st)	1.0	106	370	
					Vertical			0.5			

<table>
<tr><th>Actuator series</th><th>Type</th><th>Feed screw</th><th>Encoder resolution</th><th>Lead [mm]</th><th>Mounting direction</th><th>Minimum speed [mm/s]</th><th>Maximum speed [mm/s]</th><th>Maximum acceleration/ deceleration [G]</th><th>Minimum push force [N]</th><th>Maximum push force [N]</th><th>Rated push speed [mm/s]</th></tr>
<tr><td rowspan="8">RCP4 (slider type)</td><td rowspan="8">SA7C</td><td rowspan="8">Ball screw</td><td rowspan="8">800</td><td rowspan="2">24</td><td>Horizontal</td><td rowspan="2">30</td><td rowspan="2">Note: Value when high-thrust function is enabled.
1200 (at 50 to 600st)
1155 (at 650st)
1010 (at 700st)
890 (at 750st)
790 (at 800st)</td><td>1.0</td><td rowspan="2">32</td><td rowspan="2">112</td><td rowspan="8">20</td></tr>
<tr><td>Vertical</td><td>0.5</td></tr>
<tr><td rowspan="2">16</td><td>Horizontal</td><td rowspan="2">20</td><td>Note: Value when high-thrust function is enabled.
980 (at 50 to 550st)
865 (at 600st)
750 (at 650st)
655 (at 700st)
580 (at 750st)
515 (at 800st)</td><td>1.0</td><td rowspan="2">48</td><td rowspan="2">168</td></tr>
<tr><td>Vertical</td><td>Note: Value when high-thrust function is enabled.
840 (at 50 to 600st)
750 (at 650st)
655 (at 700st)
580 (at 750st)
515 (at 800st)</td><td>0.5</td></tr>
<tr><td rowspan="2">8</td><td>Horizontal</td><td rowspan="2">10</td><td rowspan="2">Note: Value when high-thrust function is enabled.
490 (at 50 to 550st)
430 (at 600st)
375 (at 650st)
325 (at 700st)
290 (at 750st)
255 (at 800st)</td><td>1.0</td><td rowspan="2">96</td><td rowspan="2">336</td></tr>
<tr><td>Vertical</td><td>0.5</td></tr>
<tr><td rowspan="2">4</td><td>Horizontal</td><td rowspan="2">5</td><td>Note: Value when high-thrust function is enabled.
245 (at 50 to 550st)
185 (at 650st)
160 (at 700st)
145 (at 750st)
125 (at 800st)</td><td>1.0</td><td rowspan="2">192</td><td rowspan="2">673</td></tr>
<tr><td>Vertical</td><td>Note: Value when high-thrust function is enabled.
210 (at 50 to 600st)
185 (at 650st)
160 (at 700st)
145 (at 750st)
125 (at 800st)</td><td>0.5</td></tr>
</table>

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP4 (slider type)	SA7R	Ball screw	800	24	Horizontal	30	Note: Value when high-thrust function is enabled. 1000 (at 50 to 700st) 890 (at 750st) 790 (at 800st)	1.0	32	112	20
					Vertical			0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 840 (at 50 to 600st) 750 (at 750st) 655 (at 700st) 580 (at 750st) 515 (at 800st)	1.0	48	168	
					Vertical		Note: Value when high-thrust function is enabled. 700 (at 50 to 650st) 655 (at 700st) 580 (at 750st) 515 (at 800st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 490 (at 50 to 550st) 430 (at 600st) 375 (at 650st) 325 (at 700st) 290 (at 750st) 255 (at 800st)	1.0	96	336	
					Vertical			0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210 (at 50 to 600st) 185 (at 700st) 160 (at 700st) 145 (at 750st) 125 (at 800st)	1.0	192	673	
					Vertical			0.5			
RCP4 (rod type)	RA3C/ RA3R	Ball screw	800	16	Horizontal	20	Note: Value when high-thrust function is enabled. 1120	1.0	15	36	20
					Vertical			0.5			
				10	Horizontal	12.5	Note: Value when high-thrust function is enabled. 700	1.0	16	57	
					Vertical			0.5			
				5	Horizontal	6.25	Note: Value when high-thrust function is enabled. 350	1.0	33	114	
					Vertical			0.5			
				2.5	Horizontal	3.12	Note: Value when high-thrust function is enabled. 175	1.0	65	229	
					Vertical			0.5			
	RA5C	Ball screw	800	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800	1.0	16	56	20
					Vertical			0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 700	1.0	26	93	
					Vertical			0.5			
				6	Horizontal	7.5	Note: Value when high-thrust function is enabled. 450	1.0	53	185	
					Vertical			0.5			
				3	Horizontal	3.75	Note: Value when high-thrust function is enabled. 225	1.0	106	370	
					Vertical			0.5			
	RA5R	Ball screw	800	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800	1.0	16	56	20
					Vertical			0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 700	1.0	26	93	
					Vertical			0.5			
				6	Horizontal	7.5	Note: Value when high-thrust function is enabled. 450	1.0	53	185	
					Vertical			0.5			
				3	Horizontal	3.75	Note: Value when high-thrust function is enabled. 225	1.0	106 370 (When motor type is 42SP)	370 750 (When motor type is 42SP)	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP4 (rod type)	RA6C	Ball screw	800	24	Horizontal	30	Note: Value when high-thrust function is enabled. 800	1.0	52	182	20
					Vertical		Note: Value when high-thrust function is enabled. 600	0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 700	1.0	78	273	
					Vertical		Note: Value when high-thrust function is enabled. 560	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420	1.0	156	547	
					Vertical			0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210	1.0	312	1094	
					Vertical			0.5			
	RA6R	Ball screw	800	24	Horizontal	30	Note: Value when high-thrust function is enabled. 800	1.0	52	182	20
					Vertical		Note: Value when high-thrust function is enabled. 600	0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 700	1.0	78	273	
					Vertical		Note: Value when high-thrust function is enabled. 560	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420	1.0	156	547	
					Vertical			0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210	1.0	312	1094	
					Vertical			0.5			
RCP4 (gripper type)	GRSML	–	800	1.88	–	2.35	(Note) It is the value when high−thrust function is ineffective. 94	0.3	25	87	5
	GRSLL	–	800	2.52	–	3.15	(Note) It is the value when high−thrust function is ineffective. 125	0.3	40	140	5
	GRSWL	–	800	3.14	–	3.93	(Note) It is the value when high−thrust function is ineffective. 157	0.3	50	220	5
	GRLM	–	800	12	–	15 (deg/s)	(Note) It is the value when high−thrust function is ineffective. 600 (deg/s)	0.3	10	35	5
	GRLL	–	800	12	–	15 (deg/s)	(Note) It is the value when high−thrust function is ineffective. 600 (deg/s)	0.3	10	60	5
	GRLW	–	800	12.86	–	16.08 (deg/s)	(Note) It is the value when high−thrust function is ineffective. 643 (deg/s)	0.3	23	90	5
RCP4W (slider type)	SA5C	Ball screw	800	10	Horizontal	12.5	Note: Value when high-thrust function is enabled. 330	0.6	38.2	66.9	20
				5	Horizontal	6.25	Note: Value when high-thrust function is enabled. 165	0.6	42.3	147.9	
	SA6C	Ball screw	800	12	Horizontal	15	Note: Value when high-thrust function is enabled. 400	0.6	35.5	82.8	20
				6	Horizontal	7.5	Note: Value when high-thrust function is enabled. 200	0.6	51.3	179.5	
	SA7C	Ball screw	800	16	Horizontal	20	Note: Value when high-thrust function is enabled. 530	0.6	46.3	161.9	20
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 265	0.6	96.5	337.9	

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP4W (rod type)	RA6C	Ball screw	800	12	Horizontal	15	Note: Value when high-thrust function is enabled. Note: Differs depending on ambient temperature. 500 (at 50st) 560 (at 100 to 400st)	1.0	40	107	20
					Vertical		Note: Value when high-thrust function is enabled. Note: Differs depending on ambient temperature. 500	0.5			
				6	Horizontal	7.5	Note: Value when high-thrust function is enabled. Note: Differs depending on ambient temperature. 360	1.0	79	227	
					Vertical			0.5			
				3	Horizontal	3.75	Note: Value when high-thrust function is enabled. Note: Differs depending on ambient temperature. 180	1.0	159	478	
					Vertical			0.5			
	RA6C (42SP motor)	Ball screw	800	3	Vertical	3.75	Note: Value when high-thrust function is enabled. 70	0.5	354	768	20
	RA7C	Ball screw	800	16	Horizontal	20	Note: Value when high-thrust function is enabled. Note: Differs depending on ambient temperature. 500 (at 50st) 560 (at 100 to 500st)	1.0	94	330	20
					Vertical		Note: Value when high-thrust function is enabled. Note: Differs depending on ambient temperature. 400	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. Note: Differs depending on ambient temperature. 340	1.0	187	670	
					Vertical		Note: Value when high-thrust function is enabled. Note: Differs depending on ambient temperature. 280	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. Note: Differs depending on ambient temperature. 170	1.0	375	1326	
					Vertical		Note: Value when high-thrust function is enabled. Note: Differs depending on ambient temperature. 140	0.5			
	RA7C (56SP motor)	Ball screw	800	4	Vertical	5	Note: Value when high-thrust function is enabled. 80	0.5	515	1358	20
RCP5 (slider type)	SA4C/ SA4R	Ball screw	800	16	Horizontal	20	Note: Value when high-thrust function is enabled. 1260 (at 50 to 400st) 1060 (at 450st) 875 (at 500st)	1.0	21	48	20
					Vertical			0.5			
				10	Horizontal	12.5	Note: Value when high-thrust function is enabled. 785 (at 50 to 400st) 675 (at 450st) 555 (at 500st)	1.0	22	77	
					Vertical			0.5			
				5	Horizontal	6.25	Note: Value when high-thrust function is enabled. 390 (at 50 to 400st) 330 (at 450st) 275 (at 500st)	1.0	44	155	
					Vertical			0.5			
				2.5	Horizontal	3.12	Note: Value when high-thrust function is enabled. 195 (at 50 to 400st) 165 (at 450st) 135 (at 500st)	1.0	88	310	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP5 (slider type)	SA6C/ SA6R	Ball screw	800	20	Horizontal	25	Note: Value when high-thrust function is enabled. SA6C: 1440 (at 50 to 450st) SA6C: 1335 (at 500st) SA6R: 1280 (at 50 to 500st) 1130 (at 550st) 970 (at 600st) 840 (at 650st) 735 (at 700st) 650 (at 750st) 575 (at 800st)	1.0	16	56	20
					Vertical		Note: Value when high-thrust function is enabled. 1280 (at 50 to 500st) 1130 (at 550st) 970 (at 600st) 840 (at 650st) 735 (at 700st) 650 (at 750st) 575 (at 800st)	0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 900 (at 50 to 400st) 885 (at 450st) 735 (at 500st) 620 (at 550st) 535 (at 600st) 460 (at 650st) 405 (at 700st) 335 (at 750st) 315 (at 800st)	1.0	26	93	
					Vertical		Note: Value when high-thrust function is enabled. SA6C: 900 (at 50 to 400st) SA6C: 885 (at 450st) SA6R: 800 (at 50 to 450st) 735 (at 500st) 620 (at 550st) 535 (at 600st) 460 (at 650st) 405 (at 700st) 335 (at 750st) 315 (at 800st)	0.5			
				6	Horizontal	7.5	Note: Value when high-thrust function is enabled. 450 (at 50 to 400st) 435 (at 450st) 365 (at 500st) 305 (at 550st) 265 (at 600st) 230 (at 650st) 200 (at 700st) 175 (at 750st) 155 (at 800st)	1.0	53	185	
					Vertical			0.5			
				3	Horizontal	3.75	Note: Value when high-thrust function is enabled. 225 (at 50 to 400st) 215 (at 450st) 180 (at 500st) 150 (at 550st) 130 (at 600st) 115 (at 650st) 100 (at 700st) 85 (at 750st) 75 (at 800st)	1.0	106	370	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP5 (slider type)	SA7C/ SA7R	Ball screw	800	24	Horizontal	30	Note: Value when high-thrust function is enabled. 1220 (at 50 to 600st) 1145 (at 650st) 1000 (at 700st) 885 (at 750st) 785 (at 800st)	1.0	32	112	20
					Vertical			0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 980 (at 50 to 550st) 875 (at 600st) 755 (at 650st) 660 (at 700st) 585 (at 750st) 520 (at 800st)	1.0	48	168	
					Vertical		Note: Value when high-thrust function is enabled. 840 (at 50 to 600st) 755 (at 650st) 660 (at 700st) 585 (at 750st) 520 (at 800st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 490 (at 50 to 550st) 430 (at 600st) 375 (at 650st) 325 (at 700st) 290 (at 750st) 255 (at 800st)	1.0	96	336	
					Vertical			0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. SA7C: 245 (at 50 to 550st) SA7C: 215 (at 600st) SA7R: 210 (at 50 to 600st) 185 (at 650st) 160 (at 700st) 140 (at 750st) 125 (at 800st)	1.0	192	673	
					Vertical		Note: Value when high-thrust function is enabled. 210 (at 50 to 600st) 185 (at 650st) 160 (at 700st) 140 (at 750st) 125 (at 800st)	0.5			
RCP5 (rod type)	RA4C/ RA4R	Ball screw	800	16	Horizontal	20	Note: Value when high-thrust function is enabled. RA4C: 1120 (at 50 to 360st) RA4C: 1080 (at 410st) RA4R: (at 50 to 410st)	1.0	21	48	20
					Vertical			0.5			
				10	Horizontal	12.5	Note: Value when high-thrust function is enabled. RA4C: 700 (at 50 to 360st) RA4C: 685 (at 410st) RA4R: 610 (at 50 to 410st)	1.0	22	77	
					Vertical			0.5			
				5	Horizontal	6.25	Note: Value when high-thrust function is enabled. 350 (at 50 to 360st) 340 (at 410st)	1.0	44	155	
					Vertical			0.5			
				2.5	Horizontal	3.12	Note: Value when high-thrust function is enabled. 175 (at 50 to 360st) 170 (at 410st)	1.0	88	310	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP5 (rod type)	RA6C/ RA6R	Ball screw	800	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800	1.0	16	56	20
					Vertical			0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 700	1.0	26	93	
					Vertical			0.5			
				6	Horizontal	7.5	Note: Value when high-thrust function is enabled. 450	1.0	53	186	
					Vertical			0.5			
				3	Horizontal	3.75	Note: Value when high-thrust function is enabled. 225 (at 65 to 365st) 220 (at 415st)	1.0	106	370	
					Vertical			0.5			
	RA7C/ RA7R	Ball screw	800	24	Horizontal	30	Note: Value when high-thrust function is enabled. 800	1.0	52	182	20
					Vertical		Note: Value when high-thrust function is enabled. 600	0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. RA7C: 700 RA7R: 560	1.0	78	273	
					Vertical		Note: Value when high-thrust function is enabled. 560	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420	1.0	156	547	
					Vertical		Note: Value when high-thrust function is enabled. RA7C: 420 RA7R: 350	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. RA7C: 210 RA7R: 175	1.0	312	1094	
					Vertical			0.5			

<table>
<tr><th>Actuator series</th><th>Type</th><th>Feed screw</th><th>Encoder resolution</th><th>Lead [mm]</th><th>Mounting direction</th><th>Minimum speed [mm/s]</th><th>Maximum speed [mm/s]</th><th>Maximum acceleration/ deceleration [G]</th><th>Minimum push force [N]</th><th>Maximum push force [N]</th><th>Rated push speed [mm/s]</th></tr>
<tr><td rowspan="5">RCP5 (rod type)</td><td rowspan="5">RA8C</td><td rowspan="5">Ball screw</td><td rowspan="5">800</td><td rowspan="2">20</td><td>Horizontal</td><td rowspan="2">25</td><td>280 (at 50)
405 (at 100st)
505 (at 150st)
585 (at 200st)
600(at 250 to 350st)
520 (at 400st)
440 (at 450st)
360 (at 500st)
320 (at 550st)
280 (at 600st)
240 (at 650st)
220 (at 700st)</td><td rowspan="2">0.2</td><td rowspan="2">167</td><td rowspan="2">500</td><td rowspan="5">10</td></tr>
<tr><td>Vertical</td><td>280 (at 50)
405 (at 100st)
450 (at 150 to 400st)
440 (at 450st)
360 (at 500st)
320 (at 550st)
280 (at 600st)
240 (at 650st)
220 (at 700st)</td></tr>
<tr><td rowspan="2">10</td><td>Horizontal</td><td rowspan="2">12.5</td><td>280 (at 50)
300 (at 100 to 350st)
260 (at 400st)
220 (at 450st)
180 (at 500st)
160 (at 550st)
140 (at 600st)
120 (at 650st)
110 (at 700st)</td><td rowspan="2">0.2</td><td rowspan="2">333</td><td rowspan="2">1000</td></tr>
<tr><td>Vertical</td><td>250 (at 50 to 400st)
220 (at 450st)
180 (at 500st)
160 (at 550st)
140 (at 600st)
120 (at 650st)
110 (at700st)</td></tr>
<tr><td>5</td><td>Horizontal
Vertical</td><td>6.25</td><td>150 (at 50 to 350st)
130 (at 400st)
110 (at 450st)
90 (at 500st)
80 (at 550st)
70 (at 600st)
60 (at 650st)
55 (at 700st)</td><td>0.1</td><td>667</td><td>2000</td></tr>
</table>

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP5 (rod type)	RA8R	Ball screw	800	20	Horizontal	25	280 (at 50) 400 (at 100 to 450st) 360 (at 500st) 320 (at 550st) 280 (at 600st) 240 (at 650st) 220 (at 700st)	0.2	167	500	10
					Vertical		280 (at 50) 400 (at 100 to 450st) 360 (at 500st) 320 (at 550st) 280 (at 600st) 240 (at 650st) 220 (at 700st)				
				10	Horizontal	12.5	200 (at 50 to 450st) 180 (at 500st) 160 (at 550st) 140 (at 600st) 120 (at 650st) 110 (at 700st)	0.2	333	1000	
					Vertical		200 (at 50 to 450st) 180 (at 500st) 160 (at 550st) 140 (at 600st) 120 (at 650st) 110 (at 700st)				
				5	Horizontal	6.25	100 (at 50 to 450st) 90 (at 500st) 80 (at 550st) 70 (at 600st) 60 (at 650st) 55 (at 700st)	0.1	667	2000	
					Vertical						

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP5 (rod type)	RA10C	Ball screw	800	10	Horizontal	12.5	117 (at 50st) 167 (at 100st) 200 (at 150st) 250 (at 200 to 500st) 220 (at 550st) 200 (at 600st) 180 (at 650st) 160 (at 700st) 140 (at 750st) 120 (at 800st)	0.4	429	1500	10
					Vertical		117 (at 50st) 167 (at 100 to 650st) 160 (at 700st) 140 (at 750st) 120 (at 800st)				
				5	Horizontal	6.25	83 (at 50st) 125 (at 100 to 400st) 110 (at 450st) 90 (at 500st) 80 (at 550st) 70 (at 600st) 60 (at 650st) 55 (at 700st) 50 (at 750st) 45 (at 800st)	0.02	857	3000 (at to 550st) 2900 (at 600st) 2500 (at 650st) 2200 (at 700st) 2000 (at 750st) 1800 (at 800st)	
					Vertical						
				2.5	Horizontal	3.12	63 (at 50 to 500st) 55 (at 550st) 50 (at 600st) 45 (at 650st) 40 (at 700st) 35 (at 750st) 30 (at 800st)	0.01	1714	6000 (at to 700st) 5900 (at 750st) 5400 (at 800st)	
					Vertical						
	RA10R	Ball screw	800	10	Horizontal	12.5	117 (at 50st) 167 (at 100st) 200 (at 150 to 600st) 180 (at 650st) 160 (at 700st) 140 (at 750st) 120 (at 800st)	0.04	429	1500	10
					Vertical		117 (at 50st) 140(at 100 to 750st) 120 (at 800st)				
				5	Horizontal	6.25	83 (at 50st) 100 (at 100 to 450st) 90 (at 500st) 80 (at 550st) 70 (at 600st) 60 (at 650st) 55 (at 700st) 50 (at 750st) 45 (at 800st)	0.02	857	3000 (at to 550st) 2900 (at 600st) 2500 (at 650st) 2200 (at 700st) 2000 (at 750st) 1800 (at 800st)	
					Vertical						
				2.5	Horizontal	3.12	50 (at 50 to 600st) 45 (at 650st) 40 (at 700st) 35 (at 750st) 30 (at 800st)	0.01	1714	6000 (at to 700st) 5900 (at 750st) 5400 (at 800st)	
					Vertical						

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP5 (belt type)	BA4/ BA4U	Belt	800	Equivalent to 48	Horizontal	150	890 (at 300st) 1040 (at 400st) 1120 (at 500st) 1160 (at 600st) 1200 (at 700 to1200st)	0.5	–	–	–
	BA6/ BA6U	Belt	800	Equivalent to 48	Horizontal	100	890 (at 300st) 1070 (at 400st) 1220 (at 500st) 1340 (at 600st) 1400 (at 700st) 1440 (at 800st) 1500 (at 900 to 2200st)	0.5	–	–	–
	BA7/ BA7U	Belt	800	Equivalent to 48	Horizontal	100	890 (at 300st) 1070 (at 400st) 1220 (at 500st) 1340 (at 600st) 1450 (at 700st) 1520 (at 800st) 1550 (at 900st) 1600 (at 1000 to 2600st)	0.5	–	–	–
RCP6 (slider type)	SA4C	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 1260(at 50 to 400st) 1060(at 450st) 875(at 500st)	1	21	48	20
					Vertical			0.5			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 785(at 50 to 400st) 675(at 450st) 555(at 500st)	1	22	77	
					Vertical			0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 390(at 50 to 400st) 330(at 450st) 275(at 500st)	1	44	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 195(at 50 to 400st) 165(at 450st) 135(at 500st)	1	89	310	
					Vertical			0.5			
	SA4R	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 1260(at 50 to 400st) 1060(at 450st) 875(at 500st)	1	21	48	20
					Vertical		Note: Value when high-thrust function is enabled. 1120(at 50 to 400st) 1060(at 450st) 875(at 500st)	0.5			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 785(at 50 to 400st) 675(at 450st) 555(at 500st)	1	22	77	
					Vertical			0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 390(at 50 to 400st) 330(at 450st) 275(at 500st)	1	44	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 195(at 50 to 400st) 165(at 450st) 135(at 500st)	1	89	310	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (slider type)	SA6C	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 1440(at 50 to 400st) 1440(at 450st) 1335(at 500st) 1130(at 550st) 970(at 600st) 840(at 650st) 735(at 700st) 650(at 750st) 575(at 800st)	1	16	56	20
					Vertical		Note: Value when high-thrust function is enabled. 1280(at 50 to 400st) 1280(at 450st) 1280(at 500st) 1130(at 550st) 970(at 600st) 840(at 650st) 735(at 700st) 650(at 750st) 575(at 800st)	0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 900(at 50 to 400st) 885(at 450st) 735(at 500st) 620(at 550st) 535(at 600st) 460(at 650st) 405(at 700st) 355(at 750st) 315(at 800st)	1	27	93	
					Vertical			0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 450(at 50 to 400st) 435(at 450st) 365(at 500st) 305(at 550st) 265(at 600st) 230(at 650st) 200(at 700st) 175(at 750st) 155(at 800st)	1	53	185	
					Vertical			0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 50 to 400st) 215(at 450st) 180(at 500st) 150(at 550st) 130(at 600st) 115(at 650st) 100(at 700st) 85(at 750st) 75(at 800st)	1	106	370	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (slider type)	SA6R	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 1280(at 50 to 400st) 1280(at 450st) 1280(at 500st) 1130(at 550st) 970(at 600st) 840(at 650st) 735(at 700st) 650(at 750st) 575(at 800st)	1	16	56	20
					Vertical		Note: Value when high-thrust function is enabled. 1120(at 50 to 400st) 1120(at 450st) 1120(at 500st) 1120(at 550st) 970(at 600st) 840(at 650st) 735(at 700st) 650(at 750st) 575(at 800st)	0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 900(at 50 to 400st) 885(at 450st) 735(at 500st) 620(at 550st) 535(at 600st) 460(at 650st) 405(at 700st) 355(at 750st) 315(at 800st)	1	27	93	
					Vertical		Note: Value when high-thrust function is enabled. 800(at 50 to 400st) 800(at 450st) 735(at 500st) 620(at 550st) 535(at 600st) 460(at 650st) 405(at 700st) 355(at 750st) 315(at 800st)	0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 450(at 50 to 400st) 435(at 450st) 365(at 500st) 305(at 550st) 265(at 600st) 230(at 650st) 200(at 700st) 175(at 750st) 155(at 800st)	1	53	185	
					Vertical			0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 50 to 400st) 215(at 450st) 180(at 500st) 150(at 550st) 130(at 600st) 115(at 650st) 100(at 700st) 85(at 750st) 75(at 800st)	1	106	370	
					Vertical			0.5			

Appendix

Chapter 1 Connectable Actuators

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (slider type)	SA7C	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 1200(at 50 to 500st) 1200(at 550st) 1200(at 600st) 1095(at 650st) 965(at 700st) 850(at 750st) 760(at 800st)	1	32	112	20
					Vertical			0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 980(at 50 to 500st) 965(at 550st) 830(at 600st) 720(at 650st) 635(at 700st) 560(at 750st) 500(at 800st)	1	48	168	
					Vertical		Note: Value when high-thrust function is enabled. 840(at 50 to 500st) 840(at 550st) 830(at 600st) 720(at 650st) 635(at 700st) 560(at 750st) 500(at 800st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 490(at 50 to 500st) 475(at 550st) 410(at 600st) 355(at 650st) 315(at 700st) 275(at 750st) 245(at 800st)	1	96	336	
					Vertical			0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 245(at 50 to 500st) 235(at 550st) 205(at 600st) 175(at 650st) 155(at 700st) 135(at 750st) 120(at 800st)	1	192	673	
					Vertical		Note: Value when high-thrust function is enabled. 210(at 50 to 500st) 210(at 550st) 205(at 600st) 175(at 650st) 155(at 700st) 135(at 750st) 120(at 800st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (slider type)	SA7R	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 1080(at 50 to 550st) 1080(at 600st) 1080(at 650st) 965(at 700st) 850(at 750st) 760(at 800st)	1	32	112	20
					Vertical			0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 840(at 50 to 550st) 830(at 600st) 720(at 650st) 635(at 700st) 560(at 750st) 500(at 800st)	1	48	168	
					Vertical		Note: Value when high-thrust function is enabled. 700(at 50 to 550st) 700(at 600st) 700(at 650st) 635(at 700st) 560(at 750st) 500(at 800st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 50 to 550st) 410(at 600st) 355(at 650st) 315(at 700st) 275(at 750st) 245(at 800st)	1	96	336	
					Vertical			0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210(at 50 to 550st) 205(at 600st) 175(at 650st) 155(at 700st) 135(at 750st) 120(at 800st)	1	192	673	
					Vertical			0.5			

<table>
<tr><th>Actuator series</th><th>Type</th><th>Feed screw</th><th>Encoder resolution</th><th>Lead [mm]</th><th>Mounting direction</th><th>Minimum speed [mm/s]</th><th>Maximum speed [mm/s]</th><th>Maximum acceleration/ deceleration [G]</th><th>Minimum push force [N]</th><th>Maximum push force [N]</th><th>Rated push speed [mm/s]</th></tr>
<tr><td rowspan="8">RCP6 (slider type)</td><td rowspan="8">SA8C</td><td rowspan="8">Ball screw</td><td rowspan="8">8192</td><td rowspan="2">30</td><td>Horizontal</td><td rowspan="2">38</td><td>1200(at 50 to 650st)
1200(at 700st)
1200(at 750st)
1155(at 800st)
1040(at 850st)
940(at 900st)
855(at 950st)
780(at 1000st)
715(at 1050st)
660(at 1100st)</td><td>1</td><td rowspan="2">46</td><td rowspan="2">159</td><td rowspan="8">20</td></tr>
<tr><td>Vertical</td><td>850(at 50 to 650st)
850(at 700st)
850(at 750st)
850(at 800st)
850(at 850st)
850(at 900st)
850(at 950st)
780(at 1000st)
715(at 1050st)
660(at 1100st)</td><td>0.5</td></tr>
<tr><td rowspan="2">20</td><td>Horizontal</td><td rowspan="2">25</td><td>1000(at 50 to 650st)
950(at 700st)
860(at 750st)
770(at 800st)
695(at 850st)
630(at 900st)
570(at 950st)
520(at 1000st)
480(at 1050st)
440(at 1100st)</td><td>1</td><td rowspan="2">68</td><td rowspan="2">239</td></tr>
<tr><td>Vertical</td><td>800(at 50 to 650st)
800(at 700st)
800(at 750st)
770(at 800st)
695(at 850st)
630(at 900st)
570(at 950st)
520(at 1000st)
480(at 1050st)
440(at 1100st)</td><td>0.5</td></tr>
<tr><td rowspan="2">10</td><td>Horizontal</td><td rowspan="2">13</td><td rowspan="2">500(at 50 to 650st)
480(at 700st)
430(at 750st)
385(at 800st)
345(at 850st)
310(at 900st)
285(at 950st)
260(at 1000st)
235(at 1050st)
220(at 1100st)</td><td>1</td><td rowspan="2">137</td><td rowspan="2">478</td></tr>
<tr><td>Vertical</td><td>0.5</td></tr>
<tr><td rowspan="2">5</td><td>Horizontal</td><td rowspan="2">7</td><td rowspan="2">250(at 50 to 650st)
240(at 700st)
215(at 750st)
190(at 800st)
175(at 850st)
155(at 900st)
140(at 950st)
130(at 1000st)
120(at 1050st)
110(at 1100st)</td><td>1</td><td rowspan="2">273</td><td rowspan="2">956</td></tr>
<tr><td>Vertical</td><td>0.5</td></tr>
</table>

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (slider type)	SA8R	Ball screw	8192	30	Horizontal	38	1200(at 50 to 650st) 1200(at 700st) 1200(at 750st) 1155(at 800st) 1040(at 850st) 940(at 900st) 855(at 950st) 780(at 1000st) 715(at 1050st) 660(at 1100st)	1	46	159	20
					Vertical		850(at 50 to 650st) 850(at 700st) 850(at 750st) 850(at 800st) 850(at 850st) 850(at 900st) 850(at 950st) 780(at 1000st) 715(at 1050st) 660(at 1100st)	0.5			
				20	Horizontal	25	1000(at 50 to 650st) 950(at 700st) 860(at 750st) 770(at 800st) 695(at 850st) 630(at 900st) 570(at 950st) 520(at 1000st) 480(at 1050st) 440(at 1100st)	1	68	239	
					Vertical		800(at 50 to 650st) 800(at 700st) 800(at 750st) 770(at 800st) 695(at 850st) 630(at 900st) 570(at 950st) 520(at 1000st) 480(at 1050st) 440(at 1100st)	0.5			
				10	Horizontal	13	500(at 50 to 650st) 480(at 700st) 430(at 750st) 385(at 800st) 345(at 850st) 310(at 900st) 285(at 950st) 260(at 1000st) 235(at 1050st) 220(at 1100st)	1	137	478	
					Vertical		450(at 50 to 650st) 450(at 700st) 430(at 750st) 385(at 800st) 345(at 850st) 310(at 900st) 285(at 950st) 260(at 1000st) 235(at 1050st) 220(at 1100st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (slider type)	SA8R	Ball screw	8192	5	Horizontal	7	250(at 50 to 650st) 240(at 700st) 215(at 750st) 190(at 800st) 175(at 850st) 155(at 900st) 145(at 950st) 130(at 1000st) 120(at 1050st) 110(at 1100st)	1	273	956	20
					Vertical			0.5			
RCP6 (wide slider type)	WSA10C	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 840(at 50 to 300st) 840(at 350st) 840(at 400st) 775(at 450st) 660(at 500st)	1	21	48	20
					Vertical	–		–			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 610(at 50 to 300st) 610(at 350st) 590(at 400st) 490(at 450st) 415(at 500st)	1	22	77	
					Vertical	–		–			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 390(at 50 to 300st) 355(at 350st) 290(at 400st) 245(at 450st) 205(at 500st)	1	44	155	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 50 to 300st) 350(at 350st) 290(at 400st) 245(at 450st) 205(at 500st)	0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 195(at 50 to 300st) 175(at 350st) 145(at 400st) 120(at 450st) 100(at 500st)	1	89	310	
					Vertical		Note: Value when high-thrust function is enabled. 175(at 50 to 300st) 175(at 350st) 145(at 400st) 120(at 450st) 100(at 500st)	0.5			

<table>
<tr><th>Actuator series</th><th>Type</th><th>Feed screw</th><th>Encoder resolution</th><th>Lead [mm]</th><th>Mounting direction</th><th>Minimum speed [mm/s]</th><th>Maximum speed [mm/s]</th><th>Maximum acceleration/ deceleration [G]</th><th>Minimum push force [N]</th><th>Maximum push force [N]</th><th>Rated push speed [mm/s]</th></tr>
<tr><td rowspan="8">RCP6 (wide slider type)</td><td rowspan="8">WSA10R</td><td rowspan="8">Ball screw</td><td rowspan="8">8192</td><td rowspan="2">16</td><td>Horizontal</td><td>1</td><td rowspan="2">Note: Value when high-thrust function is enabled.
840(at 50 to 300st)
840(at 350st)
840(at 400st)
775(at 450st)
660(at 500st)</td><td>1</td><td rowspan="2">21</td><td rowspan="2">48</td><td rowspan="8">20</td></tr>
<tr><td>Vertical</td><td>–</td><td>–</td></tr>
<tr><td rowspan="2">10</td><td>Horizontal</td><td>1</td><td rowspan="2">Note: Value when high-thrust function is enabled.
610(at 50 to 300st)
610(at 350st)
590(at 400st)
490(at 450st)
415(at 500st)</td><td>1</td><td rowspan="2">22</td><td rowspan="2">77</td></tr>
<tr><td>Vertical</td><td>–</td><td>–</td></tr>
<tr><td rowspan="2">5</td><td>Horizontal</td><td rowspan="2">1</td><td>Note: Value when high-thrust function is enabled.
390(at 50 to 300st)
355(at 350st)
290(at 400st)
245(at 450st)
205(at 500st)</td><td>1</td><td rowspan="2">44</td><td rowspan="2">155</td></tr>
<tr><td>Vertical</td><td>Note: Value when high-thrust function is enabled.
305(at 50 to 300st)
305(at 350st)
290(at 400st)
245(at 450st)
205(at 500st)</td><td>0.5</td></tr>
<tr><td rowspan="2">2.5</td><td>Horizontal</td><td rowspan="2">1</td><td>Note: Value when high-thrust function is enabled.
195(at 50 to 300st)
175(at 350st)
145(at 400st)
120(at 450st)
100(at 500st)</td><td>1</td><td rowspan="2">89</td><td rowspan="2">310</td></tr>
<tr><td>Vertical</td><td>Note: Value when high-thrust function is enabled.
175(at 50 to 300st)
175(at 350st)
145(at 400st)
120(at 450st)
100(at 500st)</td><td>0.5</td></tr>
</table>

<table>
<tr><th>Actuator series</th><th>Type</th><th>Feed screw</th><th>Encoder resolution</th><th>Lead [mm]</th><th>Mounting direction</th><th>Minimum speed [mm/s]</th><th>Maximum speed [mm/s]</th><th>Maximum acceleration/ deceleration [G]</th><th>Minimum push force [N]</th><th>Maximum push force [N]</th><th>Rated push speed [mm/s]</th></tr>
<tr><td rowspan="8">RCP6 (wide slider type)</td><td rowspan="8">WSA12C</td><td rowspan="8">Ball screw</td><td rowspan="8">8192</td><td rowspan="2">20</td><td>Horizontal</td><td>25</td><td rowspan="2">Note: Value when high-thrust function is enabled.
800(at 50 to 350st)
800(at 400st)
800(at 450st)
800(at 500st)
800(at 550st)
800(at 600st)
740(at 650st)
650(at 700st)
580(at 750st)
520(at 800st)</td><td>1</td><td rowspan="2">16</td><td rowspan="2">56</td><td rowspan="8">20</td></tr>
<tr><td>Vertical</td><td>–</td><td>–</td></tr>
<tr><td rowspan="2">12</td><td>Horizontal</td><td>15</td><td rowspan="2">Note: Value when high-thrust function is enabled.
600(at 50 to 350st)
600(at 400st)
600(at 450st)
600(at 500st)
535(at 550st)
465(at 600st)
405(at 650st)
355(at 700st)
315(at 750st)
285(at 800st)</td><td>1</td><td rowspan="2">27</td><td rowspan="2">93</td></tr>
<tr><td>Vertical</td><td>–</td><td>–</td></tr>
<tr><td rowspan="2">6</td><td>Horizontal</td><td rowspan="2">8</td><td>Note: Value when high-thrust function is enabled.
450(at 50 to 350st)
435(at 400st)
365(at 450st)
310(at 500st)
265(at 550st)
230(at 600st)
200(at 650st)
175(at 700st)
155(at 750st)
140(at 800st)</td><td>1</td><td rowspan="2">53</td><td rowspan="2">185</td></tr>
<tr><td>Vertical</td><td>Note: Value when high-thrust function is enabled.
400(at 50 to 350st)
400(at 400st)
365(at 450st)
310(at 500st)
265(at 550st)
230(at 600st)
200(at 650st)
175(at 700st)
155(at 750st)
140(at 800st)</td><td>0.5</td></tr>
<tr><td rowspan="2">3</td><td>Horizontal</td><td rowspan="2">4</td><td rowspan="2">Note: Value when high-thrust function is enabled.
225(at 50 to 350st)
215(at 400st)
180(at 450st)
150(at 500st)
130(at 550st)
115(at 600st)
100(at 650st)
85(at 700st)
75(at 750st)
70(at 800st)</td><td>1</td><td rowspan="2">106</td><td rowspan="2">370</td></tr>
<tr><td>Vertical</td><td>0.5</td></tr>
</table>

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide slider type)	WSA12R	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800(at 50 to 350st) 800(at 400st) 800(at 450st) 800(at 500st) 800(at 550st) 800(at 600st) 740(at 650st) 650(at 700st) 580(at 750st) 520(at 800st)	1	16	56	20
					Vertical	–		–			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 600(at 50 to 350st) 600(at 400st) 600(at 450st) 600(at 500st) 535(at 550st) 465(at 600st) 405(at 650st) 355(at 700st) 315(at 750st) 285(at 800st)	1	27	93	
					Vertical	–		–			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 450(at 50 to 350st) 435(at 400st) 365(at 450st) 310(at 500st) 265(at 550st) 230(at 600st) 200(at 650st) 175(at 700st) 155(at 750st) 140(at 800st)	1	53	185	
					Vertical		Note: Value when high-thrust function is enabled. 400(at 50 to 350st) 400(at 400st) 365(at 450st) 310(at 500st) 265(at 550st) 230(at 600st) 200(at 650st) 175(at 700st) 155(at 750st) 140(at 800st)	0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 50 to 350st) 215(at 400st) 180(at 450st) 150(at 500st) 130(at 550st) 115(at 600st) 100(at 650st) 85(at 700st) 75(at 750st) 70(at 800st)	1	106	370	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide slider type)	WSA14C	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 700(at 50 to 500st) 700(at 550st) 700(at 600st) 700(at 650st) 700(at 700st) 700(at 750st) 665(at 800st)	1	32	112	20
					Vertical	–		–			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 560(at 50 to 500st) 560(at 550st) 560(at 600st) 560(at 650st) 550(at 700st) 490(at 750st) 440(at 800st)	1	48	168	
					Vertical	–		–			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 50 to 500st) 400(at 550st) 350(at 600st) 305(at 650st) 270(at 700st) 240(at 750st) 215(at 800st)	1	96	336	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 50 to 500st) 350(at 550st) 350(at 600st) 305(at 650st) 270(at 700st) 240(at 750st) 215(at 800st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210(at 50 to 500st) 200(at 550st) 170(at 600st) 150(at 650st) 135(at 700st) 120(at 750st) 105(at 800st)	1	192	673	
					Vertical		Note: Value when high-thrust function is enabled. 175(at 50 to 500st) 175(at 550st) 170(at 600st) 150(at 650st) 135(at 700st) 120(at 750st) 105(at 800st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide slider type)	WSA14R	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 700(at 50 to 500st) 700(at 550st) 700(at 600st) 700(at 650st) 700(at 700st) 700(at 750st) 665(at 800st)	1	32	112	20
					Vertical	–		–			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 560(at 50 to 500st) 560(at 550st) 560(at 600st) 560(at 650st) 550(at 700st) 490(at 750st) 440(at 800st)	1	48	168	
					Vertical	–		–			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 50 to 500st) 400(at 550st) 350(at 600st) 305(at 650st) 270(at 700st) 240(at 750st) 215(at 800st)	1	96	336	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 50 to 500st) 350(at 550st) 350(at 600st) 305(at 650st) 270(at 700st) 240(at 750st) 215(at 800st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 175(at 50 to 500st) 175(at 550st) 170(at 600st) 150(at 650st) 135(at 700st) 120(at 750st) 105(at 800st)	1	192	673	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide slider type)	WSA16C	Ball screw	8192	20	Horizontal	25	720(at 50 to 650st) 720(at 700st) 720(at 750st) 715(at 800st) 645(at 850st) 590(at 900st) 535(at 950st) 490(at 1000st) 450(at 1050st) 415(at 1100st)	1	68	239	20
					Vertical	–		–			
				10	Horizontal	13	450(at 50 to 650st) 440(at 700st) 395(at 750st) 355(at 800st) 320(at 850st) 290(at 900st) 265(at 950st) 240(at 1000st) 225(at 1050st) 205(at 1100st)	1	137	478	
					Vertical		240(at 50 to 650st) 240(at 700st) 240(at 750st) 240(at 800st) 240(at 850st) 240(at 900st) 240(at 950st) 240(at 1000st) 225(at 1050st) 205(at 1100st)	0.5			
				5	Horizontal	7	195(at 50 to 650st) 195(at 700st) 195(at 750st) 175(at 800st) 160(at 850st) 145(at 900st) 130(at 950st) 120(at 1000st) 110(at 1050st) 100(at 1100st)	1	273	956	
					Vertical		170(at 50 to 650st) 170(at 700st) 170(at 750st) 170(at 800st) 160(at 850st) 145(at 900st) 130(at 950st) 120(at 1000st) 110(at 1050st) 100(at 1100st)	0.5			

<table>
<tr><th>Actuator series</th><th>Type</th><th>Feed screw</th><th>Encoder resolution</th><th>Lead [mm]</th><th>Mounting direction</th><th>Minimum speed [mm/s]</th><th>Maximum speed [mm/s]</th><th>Maximum acceleration/ deceleration [G]</th><th>Minimum push force [N]</th><th>Maximum push force [N]</th><th>Rated push speed [mm/s]</th></tr>
<tr><td rowspan="6">RCP6 (wide slider type)</td><td rowspan="6">WSA16R</td><td rowspan="6">Ball screw</td><td rowspan="6">8192</td><td rowspan="2">20</td><td>Horizontal</td><td>25</td><td rowspan="2">600(at 50 to 650st)
600(at 700st)
600(at 750st)
600(at 800st)
600(at 850st)
590(at 900st)
535(at 950st)
490(at 1000st)
450(at 1050st)
415(at 1100st)</td><td>1</td><td rowspan="2">68</td><td rowspan="2">239</td><td rowspan="6">20</td></tr>
<tr><td>Vertical</td><td>–</td><td>–</td></tr>
<tr><td rowspan="2">10</td><td>Horizontal</td><td rowspan="2">13</td><td>365(at 50 to 650st)
365(at 700st)
365(at 750st)
355(at 800st)
320(at 850st)
290(at 900st)
265(at 950st)
240(at 1000st)
225(at 1050st)
205(at 1100st)</td><td>1</td><td rowspan="2">137</td><td rowspan="2">478</td></tr>
<tr><td>Vertical</td><td>210(at 50 to 650st)
210(at 700st)
210(at 750st)
210(at 800st)
210(at 850st)
210(at 900st)
210(at 950st)
210(at 1000st)
210(at 1050st)
205(at 1100st)</td><td>0.5</td></tr>
<tr><td rowspan="2">5</td><td>Horizontal</td><td rowspan="2">7</td><td>170(at 50 to 650st)
170(at 700st)
170(at 750st)
170(at 800st)
160(at 850st)
145(at 900st)
130(at 950st)
120(at 1000st)
110(at 1050st)
100(at 1100st)</td><td>1</td><td rowspan="2">273</td><td rowspan="2">956</td></tr>
<tr><td>Vertical</td><td>145(at 50 to 650st)
145(at 700st)
145(at 750st)
145(at 800st)
145(at 850st)
145(at 900st)
130(at 950st)
120(at 1000st)
110(at 1050st)
100(at 1100st)</td><td>0.5</td></tr>
</table>

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (rod type)	RA4C	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 840(at 50 to 200st)	1	21	48	20
					Vertical			0.5			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 700(at 50 to 200st)	1	22	77	
					Vertical			0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 350(at 50 to 200st)	1	33	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 175(at 50 to 200st)	1	88	310	
					Vertical			0.5			
	RA4R	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 840(at 50 to 200st)	1	21	48	20
					Vertical			0.5			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 610(at 50 to 200st)	1	22	77	
					Vertical			0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 350(at 50 to 200st)	1	33	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 175(at 50 to 200st)	1	88	310	
					Vertical			0.5			
	RA6C	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800(at 50 to 300st)	1	16	56	20
					Vertical			0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 700(at 50 to 300st)	1	26	93	
					Vertical			0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 450(at 50 to 300st)	1	53	185	
					Vertical			0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 50 to 300st)	1	106	370	
					Vertical			0.5			
	RA6R	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800(at 50 to 300st)	1	16	56	20
					Vertical			0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 700(at 50 to 300st)	1	26	93	
					Vertical			0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 450(at 50 to 300st)	1	53	185	
					Vertical			0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 50 to 300st)	1	106	370	
					Vertical			0.5			
	RA7C	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 860(at 50 to 300st)	1	52	182	20
					Vertical		Note: Value when high-thrust function is enabled. 640(at 50 to 300st)	0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 700(at 50 to 300st)	1	78	273	
					Vertical		Note: Value when high-thrust function is enabled. 560(at 50 to 300st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 50 to 300st)	1	156	547	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 50 to 300st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210(at 50 to 300st)	1	312	1094	
					Vertical		Note: Value when high-thrust function is enabled. 175(at 50 to 300st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (rod type)	RA7R	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 800(at 50 to 300st)	1	52	182	20
					Vertical		Note: Value when high-thrust function is enabled. 640(at 50 to 300st)	0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 560(at 50 to 300st)	1	78	273	
					Vertical			0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 50 to 300st)	1	156	547	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 50 to 300st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 175(at 50 to 300st)	1	312	1094	
					Vertical			0.5			
	RA8C	Ball screw	8192	20	Horizontal	25	600(at 50 to 300st)	0.2	167	500	20
					Vertical		450(at 50 to 300st)				
				10	Horizontal	13	300(at 50 to 300st)	0.2	333	1000	
					Vertical		250(at 50 to 300st)				
				5	Horizontal	7	150(at 50 to 300st)	0.1	667	2000	
					Vertical						
	RA8R	Ball screw	8192	20	Horizontal	25	400(at 50 to 300st)	0.2	167	500	20
					Vertical						
				10	Horizontal	13	200(at 50 to 300st)	0.2	333	1000	
					Vertical						
				5	Horizontal	7	100(at 50 to 300st)	0.1	667	2000	
					Vertical						
RCP6 (radial cylinder type)	RRA4C	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 1120(at 60 to 360st) 1080(at 410st)	1	21	48	20
					Vertical			0.5			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 700(at 60 to 360st) 685(at 410st)	1	22	77	
					Vertical			0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 350(at 60 to 360st) 340(at 410st)	1	44	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 175(at 60 to 360st) 170(at 410st)	1	89	310	
					Vertical			0.5			
	RRA4R	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 840(at 60 to 360st) 840(at 410st)	1	21	48	20
					Vertical			0.5			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 610(at 60 to 360st) 610(at 410st)	1	22	77	
					Vertical			0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 350(at 60 to 360st) 340(at 410st)	1	44	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 175(at 60 to 360st) 170(at 410st)	1	89	310	
					Vertical			0.5			
	RRA6C	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800(at 65 to 365st) 800(at 415st)	1	16	56	20
					Vertical			0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 700(at 65 to 365st) 700(at 415st)	1	26	93	
					Vertical			0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 450(at 65 to 365st) 450(at 415st)	1	53	185	
					Vertical			0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 65 to 365st) 220(at 415st)	1	106	370	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (radial cylinder type)	RRA6R	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800(at 65 to 365st) 800(at 415st)	1	16	56	20
					Vertical			0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 700(at 65 to 365st) 700(at 415st)	1	26	93	
					Vertical			0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 450(at 65 to 365st) 450(at 415st)	1	53	185	
					Vertical			0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 65 to 365st) 220(at 415st)	1	106	370	
					Vertical			0.5			
	RRA7C	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 860(at 70 to 520st)	1	52	182	20
					Vertical		Note: Value when high-thrust function is enabled. 640(at 70 to 520st)	0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 700(at 70 to 520st)	1	78	273	
					Vertical		Note: Value when high-thrust function is enabled. 560(at 70 to 520st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 70 to 520st)	1	156	547	
					Vertical			0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210(at 70 to 520st)	1	312	1094	
					Vertical			0.5			
	RRA7R	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 860(at 70 to 520st)	1	52	182	20
					Vertical		Note: Value when high-thrust function is enabled. 640(at 70 to 520st)	0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 560(at 70 to 520st)	1	78	273	
					Vertical			0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 70 to 520st)	1	156	547	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 70 to 520st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 175(at 70 to 520st)	1	312	1094	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (radial cylinder type)	RRA8C	Ball screw	8192	20	Horizontal	25	280(at 50st) 405(at 100st) 505(at 150st) 585(at 200st) 600(at 250 to 350st) 520(at 400st) 440(at 450st) 360(at 500st) 320(at 550st) 280(at 600st) 240(at 650st) 220(at 700st)	0.2	167	500	10
					Vertical		280(at 50st) 405(at 100st) 450(at 150st) 450(at 200st) 450(at 250 to 350st) 450(at 400st) 440(at 450st) 360(at 500st) 320(at 550st) 280(at 600st) 240(at 650st) 220(at 700st)				
				10	Horizontal	13	280(at 50st) 300(at 100st) 300(at 150st) 300(at 200st) 300(at 250 to 350st) 260(at 400st) 220(at 450st) 180(at 500st) 160(at 550st) 140(at 600st) 120(at 650st) 110(at 700st)	0.2	333	1000	
					Vertical		250(at 50st) 250(at 100st) 250(at 150st) 250(at 200st) 250(at 250 to 350st) 250(at 400st) 220(at 450st) 180(at 500st) 160(at 550st) 140(at 600st) 120(at 650st) 110(at 700st)				
			8192	5	Horizontal	7	150(at 50st) 150(at 100st) 150(at 150st) 150(at 200st) 150(at 250 to 350st) 130(at 400st) 110(at 450st) 90(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st)	0.1	667	2000	
					Vertical						

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (radial cylinder type)	RRA8R	Ball screw	8192	20	Horizontal	25	280(at 50st) 400(at 100 to 450st) 360(at 500st) 320(at 550st) 280(at 600st) 240(at 650st) 220(at 700st)	0.2	167	500	10
					Vertical						
				10	Horizontal	13	200(at 50st) 200(at 100 to 450st) 180(at 500st) 160(at 550st) 140(at 600st) 120(at 650st) 110(at 700st)	0.2	333	1000	
					Vertical						
				5	Horizontal	7	100(at 50st) 100(at 100 to 450st) 90(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st)	0.1	667	2000	
					Vertical						
RCP6 (wide radial cylinder type)	WRA10C	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 700(at 50 to 400st) 700(at 450st) 700(at 500st)	1	21	48	20
					Vertical	–	Note: Value when high-thrust function is enabled. 700(at 50 to 400st) 700(at 450st) 700(at 500st)	–			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 525(at 50 to 400st) 525(at 450st) 490(at 500st)	1	22	77	
					Vertical	–	Note: Value when high-thrust function is enabled. 525(at 50 to 400st) 525(at 450st) 490(at 500st)	–			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 350(at 50 to 400st) 290(at 450st) 240(at 500st)	1	44	155	
					Vertical		Note: Value when high-thrust function is enabled. 260(at 50 to 400st) 260(at 450st) 240(at 500st)	0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 175(at 50 to 400st) 145(at 450st) 120(at 500st)	1	89	310	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide radial cylinder type)	WRA10R	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 700(at 50 to 400st) 700(at 450st) 700(at 500st)	0.7	21	48	20
					Vertical	–	Note: Value when high-thrust function is enabled. 700(at 50 to 400st) 700(at 450st) 700(at 500st)	–			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 525(at 50 to 400st) 525(at 450st) 490(at 500st)	1	22	77	
					Vertical	–	Note: Value when high-thrust function is enabled. 525(at 50 to 400st) 525(at 450st) 490(at 500st)	–			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 350(at 50 to 400st) 290(at 450st) 240(at 500st)	1	44	155	
					Vertical		Note: Value when high-thrust function is enabled. 260(at 50 to 400st) 260(at 450st) 240(at 500st)	0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 175(at 50 to 400st) 145(at 450st) 120(at 500st)	1	89	310	
					Vertical		Note: Value when high-thrust function is enabled. 150(at 50 to 400st) 145(at 450st) 120(at 500st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide radial cylinder type)	WRA12C	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800(at 50 to 400st) 800(at 450st) 800(at 500st)	1	16	56	20
					Vertical	–	Note: Value when high-thrust function is enabled. 800(at 50 to 400st) 800(at 450st) 800(at 500st)	–			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 560(at 50 to 400st) 560(at 450st) 560(at 500st)	1	26	93	
					Vertical	–	Note: Value when high-thrust function is enabled. 560(at 50 to 400st) 560(at 450st) 560(at 500st)	–			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 400(at 50 to 400st) 400(at 450st) 375(at 500st)	1	53	185	
					Vertical		Note: Value when high-thrust function is enabled. 340(at 50 to 400st) 340(at 450st) 340(at 500st)	0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 50 to 400st) 220(at 450st) 185(at 500st)	1	106	370	20
					Vertical		Note: Value when high-thrust function is enabled. 200(at 50 to 400st) 200(at 450st) 185(at 500st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide radial cylinder type)	WRA12R	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800(at 50 to 400st) 800(at 450st) 800(at 500st)	1	16	56	20
					Vertical	–	Note: Value when high-thrust function is enabled. 800(at 50 to 400st) 800(at 450st) 800(at 500st)	–			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 560(at 50 to 400st) 560(at 450st) 560(at 500st)	1	26	93	
					Vertical	–	Note: Value when high-thrust function is enabled. 560(at 50 to 400st) 560(at 450st) 560(at 500st)	–			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 400(at 50 to 400st) 400(at 450st) 375(at 500st)	1	53	185	
					Vertical		Note: Value when high-thrust function is enabled. 280(at 50 to 400st) 280(at 450st) 280(at 500st)	0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 50 to 400st) 220(at 450st) 185(at 500st)	1	106	370	
					Vertical		Note: Value when high-thrust function is enabled. 200(at 50 to 400st) 200(at 450st) 185(at 500st)	0.5			
	WRA14C	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 630(at 50 to 550st) 630(at 600st)	1	52	182	20
					Vertical	–	Note: Value when high-thrust function is enabled. 630(at 50 to 550st) 630(at 600st)	–			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 560(at 50 to 550st) 560(at 600st)	1	78	273	
					Vertical	–	Note: Value when high-thrust function is enabled. 560(at 50 to 550st) 560(at 600st)	–			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 50 to 550st) 395(at 600st)	1	156	547	
					Vertical		Note: Value when high-thrust function is enabled. 210(at 50 to 550st) 210(at 600st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210(at 50 to 550st) 195(at 600st)	1	312	1094	
					Vertical		Note: Value when high-thrust function is enabled. 130(at 50 to 550st) 130(at 600st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide radial cylinder type)	WRA14R	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 630(at 50 to 600st)	1	52	182	20
					Vertical	–	Note: Value when high-thrust function is enabled. 630(at 50 to 600st)	–			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 560(at 50 to 600st)	1	78	273	
					Vertical	–	Note: Value when high-thrust function is enabled. 560(at 50 to 600st)	–			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 350(at 50 to 600st)	1	156	547	
					Vertical		Note: Value when high-thrust function is enabled. 210(at 50 to 600st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 175(at 50 to 600st)	1	312	1094	
					Vertical		Note: Value when high-thrust function is enabled. 130(at 50 to 600st)	0.5			
	WRA16C	Ball screw	8192	20	Horizontal	25	280(at 50st) 405(at 100st) 450(at 150 to 400st) 450(at 450st) 400(at 500st) 340(at 550st) 295(at 600st) 260(at 650st) 225(at 700st) 200(at 750st) 180(at 800st)	0.2	167	500	20
					Vertical	–	280(at 50st) 405(at 100st) 450(at 150 to 400st) 450(at 450st) 400(at 500st) 340(at 550st) 295(at 600st) 260(at 650st) 225(at 700st) 200(at 750st) 180(at 800st)	–			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide radial cylinder type)	WRA16C	Ball screw	8192	10	Horizontal	13	240(at 50st) 240(at 100st) 240(at 150 to 400st) 230(at 450st) 195(at 500st) 165(at 550st) 145(at 600st) 125(at 650st) 110(at 700st) 100(at 750st) 90(at 800st)	0.2	333	1000	20
					Vertical		200(at 50st) 200(at 100st) 200(at 150 to 400st) 200(at 450st) 195(at 500st) 165(at 550st) 145(at 600st) 125(at 650st) 110(at 700st) 100(at 750st) 90(at 800st)				
				5	Horizontal	7	130(at 50st) 130(at 100st) 130(at 150 to 400st) 115(at 450st) 95(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st) 50(at 750st) 45(at 800st)	0.1	667	2000	
					Vertical		100(at 50st) 100(at 100st) 100(at 150 to 400st) 100(at 450st) 95(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st) 50(at 750st) 45(at 800st)				

Appendix

Chapter 1 Connectable Actuators

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide radial cylinder type)	WRA16R	Ball screw	8192	20	Horizontal	25	280(at 50st) 405(at 100st) 420(at 150 to 400st) 420(at 450st) 400(at 500st) 340(at 550st) 295(at 600st) 260(at 650st) 225(at 700st) 200(at 750st) 180(at 800st)	0.2	167	500	20
					Vertical	–	280(at 50st) 405(at 100st) 420(at 150 to 400st) 420(at 450st) 400(at 500st) 340(at 550st) 295(at 600st) 260(at 650st) 225(at 700st) 200(at 750st) 180(at 800st)	–			
				10	Horizontal	13	240(at 50st) 240(at 100st) 240(at 150 to 400st) 230(at 450st) 195(at 500st) 165(at 550st) 145(at 600st) 125(at 650st) 110(at 700st) 100(at 750st) 90(at 800st)	0.2	333	1000	
					Vertical		180(at 50st) 180(at 100st) 180(at 150 to 400st) 180(at 450st) 195(at 500st) 165(at 550st) 145(at 600st) 125(at 650st) 110(at 700st) 100(at 750st) 90(at 800st)				

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (wide radial cylinder type)	WRA16R	Ball screw	8192	5	Horizontal	7	120(at 50st) 120(at 100st) 120(at 150 to 400st) 115(at 450st) 95(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st) 50(at 750st) 45(at 800st)	0.1	667	2000	20
					Vertical		100(at 50st) 100(at 100st) 100(at 150 to 400st) 100(at 450st) 95(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st) 50(at 750st) 45(at 800st)				
RCP6 (table type)	TA4C (Single Block Specifica-tions)	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 980(at 25 to 150st)	1	21	48	20
					Vertical		Note: Value when high-thrust function is enabled. 700(at 25 to 150st)	0.5			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 785(at 25 to 150st)	1	22	77	
					Vertical		Note: Value when high-thrust function is enabled. 700(at 25 to 150st)	0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 390(at 25 to 150st)	1	44	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 195(at 25 to 150st)	1	89	310	
					Vertical			0.5			
	TA4R (Single Block Specifica-tions)	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 980(at 25 to 150st)	1	21	48	20
					Vertical		Note: Value when high-thrust function is enabled. 700(at 25 to 150st)	0.5			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 785(at 25 to 150st)	1	22	77	
					Vertical		Note: Value when high-thrust function is enabled. 700(at 25 to 150st)	0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 390(at 25 to 150st)	1	44	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 195(at 25 to 150st)	1	89	310	
					Vertical			0.5			
	TA4C (Double Block Specifica-tion)	Ball screw	8192	10	Horizontal	13	Note: Value when high-thrust function is enabled. 785(at 40 to 190st) 680(at 240st)	1	22	77	20
					Vertical		Note: Value when high-thrust function is enabled. 700(at 40 to 190st) 680(at 240st)	0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 390(at 40 to 190st) 340(at 240st)	1	44	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 195(at 40 to 190st) 170(at 240st)	1	89	310	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (table type)	TA4R (Double Block Specifica-tion)	Ball screw	8192	10	Horizontal	13	Note: Value when high-thrust function is enabled. 700(at 40 to 190st) 680(at 240st)	1	22	77	20
					Vertical		Note: Value when high-thrust function is enabled. 525(at 40 to 190st) 525(at 240st)	0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 390(at 40 to 190st) 340(at 240st)	1	44	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 195(at 40 to 190st) 170(at 240st)	1	89	310	
					Vertical			0.5			
	TA6C (Single Block Specifica-tions)	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 1120(at 25 to 200st)	1	16	56	20
					Vertical		Note: Value when high-thrust function is enabled. 800(at 25 to 200st)	0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 800(at 25 to 200st)	1	26	93	
					Vertical			0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 400(at 25 to 200st)	1	53	185	
					Vertical			0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 200(at 25 to 200st)	1	106	370	
					Vertical			0.5			
	TA6R (Single Block Specifica-tions)	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 1120(at 25 to 200st)	1	16	56	20
					Vertical		Note: Value when high-thrust function is enabled. 800(at 25 to 200st)	0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 800(at 25 to 200st)	1	26	93	
					Vertical		Note: Value when high-thrust function is enabled. 680(at 25 to 200st)	0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 400(at 25 to 200st)	1	53	185	
					Vertical			0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 200(at 25 to 200st)	1	106	370	
					Vertical			0.5			
	TA6C (Double Block Specifica-tion)	Ball screw	8192	12	Horizontal	15	Note: Value when high-thrust function is enabled. 800(at 45 to 220st) 735(at 270st) 575(at 320st)	1	26	93	20
					Vertical		Note: Value when high-thrust function is enabled. 680(at 45 to 220st) 680(at 270st) 575(at 320st)	0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 400(at 45 to 220st) 365(at 270st) 285(at 320st)	1	53	185	
					Vertical			0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 200(at 45 to 220st) 185(at 270st) 140(at 320st)	1	106	370	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (table type)	TA6R (Double Block Specifica-tion)	Ball screw	8192	12	Horizontal	15	Note: Value when high-thrust function is enabled. 800(at 45 to 220st) 735(at 270st) 575(at 320st)	1	26	93	20
					Vertical		Note: Value when high-thrust function is enabled. 680(at 45 to 220st) 680(at 270st) 575(at 320st)	0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 400(at 45 to 220st) 365(at 270st) 285(at 320st)	1	53	185	
					Vertical			0.5			
	TA6R (Double Block Specifica-tion)	Ball screw	8192	3	Horizontal	4	Note: Value when high-thrust function is enabled. 200(at 45 to 220st) 185(at 270st) 140(at 320st)	1	106	370	
					Vertical			0.5			
	TA7C (Single Block Specifica-tions)	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 1080(at 25 to 300st)	1	32	112	20
					Vertical		Note: Value when high-thrust function is enabled. 860(at 25 to 300st)	0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 700(at 25 to 300st)	1	48	168	
					Vertical		Note: Value when high-thrust function is enabled. 560(at 25 to 300st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 25 to 300st)	1	96	336	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 25 to 300st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210(at 25 to 300st)	1	192	673	
					Vertical			0.5			
	TA7R (Single Block Specifica-tions)	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 1080(at 25 to 300st)	1	32	112	20
					Vertical		Note: Value when high-thrust function is enabled. 860(at 25 to 300st)	0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 700(at 25 to 300st)	1	48	168	
					Vertical		Note: Value when high-thrust function is enabled. 560(at 25 to 300st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 25 to 300st)	1	96	336	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 25 to 300st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210(at 25 to 300st)	1	192	673	
					Vertical			0.5			

Appendix

Chapter 1 Connectable Actuators

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6 (table type)	TA7C (Double Block Specification)	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 700(at 40 to 290st) 700(at 340st) 600(at 390st)	1	48	168	20
					Vertical		Note: Value when high-thrust function is enabled. 560(at 40 to 290st) 560(at 340st) 560(at 390st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 40 to 290st) 365(at 340st) 300(at 390st)	1	96	336	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 40 to 290st) 350(at 340st) 300(at 390st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210(at 40 to 290st) 180(at 340st) 150(at 390st)	1	192	673	
					Vertical			0.5			
	TA7R (Double Block Specification)	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 700(at 40 to 290st) 700(at 340st) 600(at 390st)	1	48	168	20
					Vertical		Note: Value when high-thrust function is enabled. 560(at 40 to 290st) 560(at 340st) 560(at 390st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 40 to 290st) 365(at 340st) 300(at 390st)	1	96	336	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 40 to 290st) 350(at 340st) 300(at 390st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210(at 40 to 290st) 180(at 340st) 150(at 390st)	1	192	673	
					Vertical			0.5			
RCP6CR (slider type)	SA4C	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 1260(at 50 to 400st) 1060(at 450st) 875(at 500st)	1	21	48	20
					Vertical			0.5			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 785(at 50 to 400st) 675(at 450st) 555(at 500st)	1	22	77	
					Vertical			0.5			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 390(at 50 to 400st) 330(at 450st) 275(at 500st)	1	44	155	
					Vertical			0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 195(at 50 to 400st) 165(at 450st) 135(at 500st)	1	89	310	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6CR (slider type)	SA6C	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 1440(at 50 to 400st) 1440(at 450st) 1335(at 500st) 1130(at 550st) 970(at 600st) 840(at 650st) 735(at 700st) 650(at 750st) 575(at 800st)	1	16	56	20
					Vertical		Note: Value when high-thrust function is enabled. 1280(at 50 to 400st) 1280(at 450st) 1280(at 500st) 1130(at 550st) 970(at 600st) 840(at 650st) 735(at 700st) 650(at 750st) 575(at 800st)	0.5			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 900(at 50 to 400st) 885(at 450st) 735(at 500st) 620(at 550st) 535(at 600st) 460(at 650st) 405(at 700st) 355(at 750st) 315(at 800st)	1	27	93	
					Vertical			0.5			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 450(at 50 to 400st) 435(at 450st) 365(at 500st) 305(at 550st) 265(at 600st) 230(at 650st) 200(at 700st) 175(at 750st) 155(at 800st)	1	53	185	
					Vertical			0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 50 to 400st) 215(at 450st) 180(at 500st) 150(at 550st) 130(at 600st) 115(at 650st) 100(at 700st) 85(at 750st) 75(at 800st)	1	106	370	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6CR (slider type)	SA7C	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 1200(at 50 to 500st) 1200(at 550st) 1200(at 600st) 1095(at 650st) 965(at 700st) 850(at 750st) 760(at 800st)	1	32	112	20
					Vertical			0.5			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 980(at 50 to 500st) 965(at 550st) 830(at 600st) 720(at 650st) 635(at 700st) 560(at 750st) 500(at 800st)	1	48	168	
					Vertical		Note: Value when high-thrust function is enabled. 840(at 50 to 500st) 840(at 550st) 830(at 600st) 720(at 650st) 635(at 700st) 560(at 750st) 500(at 800st)	0.5			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 490(at 50 to 500st) 475(at 550st) 410(at 600st) 355(at 650st) 315(at 700st) 275(at 750st) 245(at 800st)	1	96	336	
					Vertical			0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 245(at 50 to 500st) 235(at 550st) 205(at 600st) 175(at 650st) 155(at 700st) 135(at 750st) 120(at 800st)	1	192	673	
					Vertical		Note: Value when high-thrust function is enabled. 210(at 50 to 500st) 210(at 550st) 205(at 600st) 175(at 650st) 155(at 700st) 135(at 750st) 120(at 800st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6CR (slider type)	SA8C	Ball screw	8192	30	Horizontal	38	1200(at 50 to 650st) 1200(at 700st) 1200(at 750st) 1155(at 800st) 1040(at 850st) 940(at 900st) 855(at 950st) 780(at 1000st) 715(at 1050st) 660(at 1100st)	1	46	159	20
					Vertical		850(at 50 to 650st) 850(at 700st) 850(at 750st) 850(at 800st) 850(at 850st) 850(at 900st) 850(at 950st) 780(at 1000st) 715(at 1050st) 660(at 1100st)	0.5			
				20	Horizontal	25	1000(at 50 to 650st) 950(at 700st) 860(at 750st) 770(at 800st) 695(at 850st) 630(at 900st) 570(at 950st) 520(at 1000st) 480(at 1050st) 440(at 1100st)	1	68	239	
					Vertical		800(at 50 to 650st) 800(at 700st) 800(at 750st) 770(at 800st) 695(at 850st) 630(at 900st) 570(at 950st) 520(at 1000st) 480(at 1050st) 440(at 1100st)	0.5			
				10	Horizontal	13	500(at 50 to 650st) 480(at 700st) 430(at 750st) 385(at 800st) 345(at 850st) 310(at 900st) 285(at 950st) 260(at 1000st) 235(at 1050st) 220(at 1100st)	1	137	478	
					Vertical			0.5			
				5	Horizontal	7	250(at 50 to 650st) 240(at 700st) 215(at 750st) 190(at 800st) 175(at 850st) 155(at 900st) 140(at 950st) 130(at 1000st) 120(at 1050st) 110(at 1100st)	1	273	956	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6CR (wide slider type)	WSA10C	Ball screw	8192	16	Horizontal	20	Note: Value when high-thrust function is enabled. 840(at 50 to 300st) 840(at 350st) 840(at 400st) 775(at 450st) 660(at 500st)	1	21	48	20
					Vertical	-		-			
				10	Horizontal	13	Note: Value when high-thrust function is enabled. 610(at 50 to 300st) 610(at 350st) 590(at 400st) 490(at 450st) 415(at 500st)	1	22	77	
					Vertical	-		-			
				5	Horizontal	7	Note: Value when high-thrust function is enabled. 390(at 50 to 300st) 355(at 350st) 290(at 400st) 245(at 450st) 205(at 500st)	1	44	155	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 50 to 300st) 350(at 350st) 290(at 400st) 245(at 450st) 205(at 500st)	0.5			
				2.5	Horizontal	4	Note: Value when high-thrust function is enabled. 195(at 50 to 300st) 175(at 350st) 145(at 400st) 120(at 450st) 100(at 500st)	1	89	310	
					Vertical		Note: Value when high-thrust function is enabled. 175(at 50 to 300st) 175(at 350st) 145(at 400st) 120(at 450st) 100(at 500st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6CR (wide slider type)	WSA12C	Ball screw	8192	20	Horizontal	25	Note: Value when high-thrust function is enabled. 800(at 50 to 350st) 800(at 400st) 800(at 450st) 800(at 500st) 800(at 550st) 800(at 600st) 740(at 650st) 650(at 700st) 580(at 750st) 520(at 800st)	1	16	56	20
					Vertical	-		-			
				12	Horizontal	15	Note: Value when high-thrust function is enabled. 600(at 50 to 350st) 600(at 400st) 600(at 450st) 600(at 500st) 535(at 550st) 465(at 600st) 405(at 650st) 355(at 700st) 315(at 750st) 285(at 800st)	1	27	93	
					Vertical	-		-			
				6	Horizontal	8	Note: Value when high-thrust function is enabled. 450(at 50 to 350st) 435(at 400st) 365(at 450st) 310(at 500st) 265(at 550st) 230(at 600st) 200(at 650st) 175(at 700st) 155(at 750st) 140(at 800st)	1	53	185	
					Vertical		Note: Value when high-thrust function is enabled. 400(at 50 to 350st) 400(at 400st) 365(at 450st) 310(at 500st) 265(at 550st) 230(at 600st) 200(at 650st) 175(at 700st) 155(at 750st) 140(at 800st)	0.5			
				3	Horizontal	4	Note: Value when high-thrust function is enabled. 225(at 50 to 350st) 215(at 400st) 180(at 450st) 150(at 500st) 130(at 550st) 115(at 600st) 100(at 650st) 85(at 700st) 75(at 750st) 70(at 800st)	1	106	370	
					Vertical			0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6CR (wide slider type)	WSA14C	Ball screw	8192	24	Horizontal	30	Note: Value when high-thrust function is enabled. 700(at 50 to 500st) 700(at 550st) 700(at 600st) 700(at 650st) 700(at 700st) 700(at 750st) 665(at 800st)	1	32	112	20
					Vertical	-		-			
				16	Horizontal	20	Note: Value when high-thrust function is enabled. 560(at 50 to 500st) 560(at 550st) 560(at 600st) 560(at 650st) 550(at 700st) 490(at 750st) 440(at 800st)	1	48	168	
					Vertical	-		-			
				8	Horizontal	10	Note: Value when high-thrust function is enabled. 420(at 50 to 500st) 400(at 550st) 350(at 600st) 305(at 650st) 270(at 700st) 240(at 750st) 215(at 800st)	1	96	336	
					Vertical		Note: Value when high-thrust function is enabled. 350(at 50 to 500st) 350(at 550st) 350(at 600st) 305(at 650st) 270(at 700st) 240(at 750st) 215(at 800st)	0.5			
				4	Horizontal	5	Note: Value when high-thrust function is enabled. 210(at 50 to 500st) 200(at 550st) 170(at 600st) 150(at 650st) 135(at 700st) 120(at 750st) 105(at 800st)	1	192	673	
					Vertical		Note: Value when high-thrust function is enabled. 175(at 50 to 500st) 175(at 550st) 170(at 600st) 150(at 650st) 135(at 700st) 120(at 750st) 105(at 800st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6CR (wide slider type)	WSA16C	Ball screw	8192	20	Horizontal	25	720(at 50 to 650st) 720(at 700st) 720(at 750st) 715(at 800st) 645(at 850st) 590(at 900st) 535(at 950st) 490(at 1000st) 450(at 1050st) 415(at 1100st)	1	68	239	20
					Vertical	-		-			
				10	Horizontal	13	450(at 50 to 650st) 440(at 700st) 395(at 750st) 355(at 800st) 320(at 850st) 290(at 900st) 265(at 950st) 240(at 1000st) 225(at 1050st) 205(at 1100st)	1	137	478	
					Vertical		240(at 50 to 650st) 240(at 700st) 240(at 750st) 240(at 800st) 240(at 850st) 240(at 900st) 240(at 950st) 240(at 1000st) 225(at 1050st) 205(at 1100st)	0.5			
				5	Horizontal	7	195(at 50 to 650st) 195(at 700st) 195(at 750st) 175(at 800st) 160(at 850st) 145(at 900st) 130(at 950st) 120(at 1000st) 110(at 1050st) 100(at 1100st)	1	273	956	
					Vertical		170(at 50 to 650st) 170(at 700st) 170(at 750st) 170(at 800st) 160(at 850st) 145(at 900st) 130(at 950st) 120(at 1000st) 110(at 1050st) 100(at 1100st)	0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (rod type)	RA4C	Ball screw	8192	10	Horizontal	13	525(at 50 to 200st)	1	33	77	20
					Vertical		435(at 50 to 200st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		435(at 50 to 200st)	1			
								0.5			
				5	Horizontal	7	350(at 50 to 200st)	1	66	155	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		260(at 50 to 200st)	1			
								0.5			
				2.5	Horizontal	4	175(at 50 to 200st)	1	133	310	
					Vertical		150(at 50 to 200st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		130(at 50 to 200st)	1			
								0.5			
	RA4R	Ball screw	8192	10	Horizontal	13	525(at 50 to 200st)	1	33	77	20
					Vertical		435(at 50 to 200st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		435(at 50 to 200st)	1			
								0.5			
				5	Horizontal	7	350(at 50 to 200st)	1	66	155	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		260(at 50 to 200st)	1			
								0.5			
				2.5	Horizontal	4	175(at 50 to 200st)	1	133	310	
					Vertical		150(at 50 to 200st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		130(at 50 to 200st)	1			
								0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (rod type)	RA6C	Ball screw	8192	12	Horizontal	15	630(at 50 to 300st)	1	40	93	20
					Vertical		525(at 50 to 300st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		525(at 50 to 300st)	1			
								0.5			
				6	Horizontal	8	420(at 50 to 300st)	1	79	185	
					Vertical		370(at 50 to 300st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		315(at 50 to 300st)	1			
								0.5			
				3	Horizontal	4	210(at 50 to 300st)	1	159	370	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		105(at 50 to 300st)	1			
								0.5			
	RA6R	Ball screw	8192	12	Horizontal	15	630(at 50 to 300st)	1	40	93	20
					Vertical		525(at 50 to 300st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		525(at 50 to 300st)	1			
								0.5			
				6	Horizontal	8	420(at 50 to 300st)	1	79	185	
					Vertical		370(at 50 to 300st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		315(at 50 to 300st)	1			
								0.5			
				3	Horizontal	4	210(at 50 to 300st)	1	159	370	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		105(at 50 to 300st)	1			
								0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (rod type)	RA7C	Ball screw	8192	16	Horizontal	20	420(at 50 to 300st)	1	117	273	20
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		280(at 50 to 300st)	1			
								0.5			
				8	Horizontal	10	350(at 50 to 300st)	1	234	547	
					Vertical		280(at 50 to 300st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		140(at 50 to 300st)	1			
								0.5			
				4	Horizontal	5	140(at 50 to 300st)	1	469	1094	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		105(at 50 to 300st)	1			
								0.5			
	RA7R	Ball screw	8192	16	Horizontal	20	420(at 50 to 300st)	1	117	273	20
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		280(at 50 to 300st)	1			
								0.5			
				8	Horizontal	10	350(at 50 to 300st)	1	234	547	
					Vertical		280(at 50 to 300st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		140(at 50 to 300st)	1			
								0.5			
				4	Horizontal	5	140(at 50 to 300st)	1	469	1094	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		105(at 50 to 300st)	1			
								0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (rod type)	RA8C	Ball screw	8192	20	Horizontal	25	350(at 50 to 300st)	0.2	250	500	10
					Vertical		330(at 50 to 300st)				
					Horizontal/ Vertical/ Ambient temperature 5°C or below		300(at 50 to 300st)				
				10	Horizontal	13	200(at 50 to 300st)	0.2	500	1000	
					Vertical						
					Horizontal/ Vertical/ Ambient temperature 5°C or below		170(at 50 to 300st)				
				5	Horizontal	7	100(at 50 to 300st)	0.1	1000	2000	
					Vertical						
					Horizontal/ Vertical/ Ambient temperature 5°C or below		80(at 50 to 300st)				
	RA8R	Ball screw	8192	20	Horizontal	25	350(at 50 to 300st)	0.2	250	500	10
					Vertical		330(at 50 to 300st)				
					Horizontal/ Vertical/ Ambient temperature 5°C or below		300(at 50 to 300st)				
				10	Horizontal	13	200(at 50 to 300st)	0.2	500	1000	
					Vertical						
					Horizontal/ Vertical/ Ambient temperature 5°C or below		170(at 50 to 300st)				
				5	Horizontal	7	100(at 50 to 300st)	0.1	1000	2000	
					Vertical						
					Horizontal/ Vertical/ Ambient temperature 5°C or below		80(at 50 to 300st)				

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (radial cylinder type)	RRA4C	Ball screw	8192	10	Horizontal	13	525(at 50 to 350st) 525(at 400st)	1	33	77	20
					Vertical		435(at 50 to 350st) 435(at 400st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		435(at 50 to 350st) 435(at 400st)	1			
								0.5			
				5	Horizontal	7	350(at 50 to 350st) 340(at 400st)	1	66	155	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		260(at 50 to 350st) 260(at 400st)	1			
								0.5			
				2.5	Horizontal	4	175(at 50 to 350st) 170(at 400st)	1	133	310	
					Vertical		150(at 50 to 350st) 150(at 400st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		105(at 50 to 350st) 105(at 400st)	1			
								0.5			
	RRA4R	Ball screw	8192	10	Horizontal	13	525(at 50 to 350st) 525(at 400st)	1	33	77	20
					Vertical		435(at 50 to 350st) 435(at 400st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		435(at 50 to 350st) 435(at 400st)	1			
								0.5			
				5	Horizontal	7	350(at 50 to 350st) 340(at 400st)	1	66	155	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		260(at 50 to 350st) 260(at 400st)	1			
								0.5			
				2.5	Horizontal	4	175(at 50 to 350st) 170(at 400st)	1	133	310	
					Vertical		150(at 50 to 350st) 150(at 400st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		105(at 50 to 350st) 105(at 400st)	1			
								0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (radial cylinder type)	RRA6C	Ball screw	8192	12	Horizontal	15	630(at 50 to 400st)	1	40	93	20
					Vertical		525(at 50 to 400st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		525(at 50 to 400st)	1			
								0.5			
				6	Horizontal	8	420(at 50 to 400st)	1	79	185	
					Vertical		370(at 50 to 400st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		315(at 50 to 400st)	1			
								0.5			
				3	Horizontal	4	210(at 50 to 400st)	1	159	370	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		105(at 50 to 400st)	1			
								0.5			
	RRA6R	Ball screw	8192	12	Horizontal	15	630(at 50 to 400st)	1	40	93	20
					Vertical		525(at 50 to 400st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		525(at 50 to 400st)	1			
								0.5			
				6	Horizontal	8	420(at 50 to 400st)	1	79	185	
					Vertical		370(at 50 to 400st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		315(at 50 to 400st)	1			
								0.5			
				3	Horizontal	4	210(at 50 to 400st)	1	159	370	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		105(at 50 to 400st)	1			
								0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (radial cylinder type)	RRA7C	Ball screw	8192	16	Horizontal	20	420(at 50 to 500st)	1	117	273	20
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		280(at 50 to 500st)	1			
								0.5			
				8	Horizontal	10	350(at 50 to 500st)	1	234	547	
					Vertical		280(at 50 to 500st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		140(at 50 to 500st)	1			
								0.5			
				4	Horizontal	5	140(at 50 to 500st)	1	469	1094	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		105(at 50 to 500st)	1			
								0.5			
	RRA7R	Ball screw	8192	16	Horizontal	20	420(at 50 to 500st)	1	117	273	20
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		280(at 50 to 500st)	1			
								0.5			
				8	Horizontal	10	350(at 50 to 500st)	1	234	547	
					Vertical		280(at 50 to 500st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		140(at 50 to 500st)	1			
								0.5			
				4	Horizontal	5	140(at 50 to 500st)	1	469	1094	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		105(at 50 to 500st)	1			
								0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (radial cylinder type)	RRA8C	Ball screw	8192	20	Horizontal	25	280(at 50st) 350(at 100 to 450st) 350(at 500st) 320(at 550st) 280(at 600st) 240(at 650st) 220(at 700st)	0.2	250	500	10
					Vertical		280(at 50st) 330(at 100 to 450st) 330(at 500st) 320(at 550st) 280(at 600st) 240(at 650st) 220(at 700st)				
					Horizontal/ Vertical/ Ambient temperature 5°C or below		210(at 50st) 210(at 100 to 450st) 210(at 500st) 210(at 550st) 210(at 600st) 210(at 650st) 210(at 700st)				
				10	Horizontal	13	200(at 50st) 200(at 100 to 450st) 180 (at 500st) 160(at 550st) 140(at 600st) 120(at 650st) 110(at 700st)	0.2	500	1000	
					Vertical						
					Horizontal/ Vertical/ Ambient temperature 5°C or below		130(at 50st) 130(at 100 to 450st) 130(at 500st) 130(at 550st) 130(at 600st) 120(at 650st) 110(at 700st)				
				5	Horizontal	7	100(at 50st) 100(at 100 to 450st) 90(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st)	0.1	1000	2000	
					Vertical						
					Horizontal/ Vertical/ Ambient temperature 5°C or below		60(at 50st) 60(at 100 to 450st) 60(at 500st) 60(at 550st) 60(at 600st) 60(at 650st) 55(at 700st)				

<table>
<tr><th>Actuator series</th><th>Type</th><th>Feed screw</th><th>Encoder resolution</th><th>Lead [mm]</th><th>Mounting direction</th><th>Minimum speed [mm/s]</th><th>Maximum speed [mm/s]</th><th>Maximum acceleration/ deceleration [G]</th><th>Minimum push force [N]</th><th>Maximum push force [N]</th><th>Rated push speed [mm/s]</th></tr>
<tr><td rowspan="9">RCP6W (radial cylinder type)</td><td rowspan="9">RRA8R</td><td rowspan="9">Ball screw</td><td rowspan="9">8192</td><td rowspan="3">20</td><td>Horizontal</td><td rowspan="3">25</td><td>280(at 50st)
350(at 100 to 450st)
350(at 500st)
320(at 550st)
280(at 600st)
240(at 650st)
220(at 700st)</td><td rowspan="3">0.2</td><td rowspan="3">167</td><td rowspan="3">500</td><td rowspan="9">10</td></tr>
<tr><td>Vertical</td><td>280(at 50st)
330(at 100 to 450st)
330(at 500st)
320(at 550st)
280(at 600st)
240(at 650st)
220(at 700st)</td></tr>
<tr><td>Horizontal/ Vertical/ Ambient temperature 5°C or below</td><td>210(at 50st)
210(at 100 to 450st)
210(at 500st)
210(at 550st)
210(at 600st)
210(at 650st)
210(at 700st)</td></tr>
<tr><td rowspan="3">10</td><td>Horizontal</td><td rowspan="3">13</td><td rowspan="2">200(at 50st)
200(at 100 to 450st)
180 (at 500st)
160(at 550st)
140(at 600st)
120(at 650st)
110(at 700st)</td><td rowspan="3">0.2</td><td rowspan="3">333</td><td rowspan="3">1000</td></tr>
<tr><td>Vertical</td></tr>
<tr><td>Horizontal/ Vertical/ Ambient temperature 5°C or below</td><td>130(at 50st)
130(at 100 to 450st)
130(at 500st)
130(at 550st)
130(at 600st)
120(at 650st)
110(at 700st)</td></tr>
<tr><td rowspan="3">5</td><td>Horizontal</td><td rowspan="3">7</td><td rowspan="2">100(at 50st)
100(at 100 to 450st)
90(at 500st)
80(at 550st)
70(at 600st)
60(at 650st)
55(at 700st)</td><td rowspan="3">0.1</td><td rowspan="3">667</td><td rowspan="3">2000</td></tr>
<tr><td>Vertical</td></tr>
<tr><td>Horizontal/ Vertical/ Ambient temperature 5°C or below</td><td>60(at 50st)
60(at 100 to 450st)
60(at 500st)
60(at 550st)
60(at 600st)
60(at 650st)
55(at 700st)</td></tr>
</table>

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (wide radial cylinder type)	WRA10C	Ball screw	8192	10	Horizontal	13	525(at 50 to 400st) 525(at 450st) 490(at 500st)	1	33	77	20
					Vertical	-		-			
					Horizontal/ Vertical/ Ambient temperature 5°C or below	13	350(at 50 to 400st) 350(at 450st) 350(at 500st)	1			
						-		-			
				5	Horizontal	7	350(at 50 to 400st) 290(at 450st) 240(at 500st)	1	66	155	
					Vertical		215(at 50 to 400st) 215(at 450st) 215(at 500st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		215(at 50 to 400st) 215(at 450st) 215(at 500st)	1			
								0.5			
				2.5	Horizontal	4	175(at 50 to 400st) 145(at 450st) 120(at 500st)	1	133	310	
					Vertical		150(at 50 to 400st) 145(at 450st) 120(at 500st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		65(at 50 to 400st) 65(at 450st) 65(at 500st)	1			
								0.5			
	WRA10R	Ball screw	8192	10	Horizontal	13	525(at 50 to 400st) 525(at 450st) 490(at 500st)	1	33	77	20
					Vertical	-		-			
					Horizontal/ Vertical/ Ambient temperature 5°C or below	13	350(at 50 to 400st) 350(at 450st) 350(at 500st)	1			
						-		-			
				5	Horizontal	7	350(at 50 to 400st) 290(at 450st) 240(at 500st)	1	66	155	
					Vertical		215(at 50 to 400st) 215(at 450st) 215(at 500st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		215(at 50 to 400st) 215(at 450st) 215(at 500st)	1			
								0.5			
				2.5	Horizontal	4	175(at 50 to 400st) 145(at 450st) 120(at 500st)	1	133	310	
					Vertical		150(at 50 to 400st) 145(at 450st) 120(at 500st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		65(at 50 to 400st) 65(at 450st) 65(at 500st)	1			
								0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (wide radial cylinder type)	WRA12C	Ball screw	8192	12	Horizontal	15	560(at 50 to 400st) 560(at 450st) 560(at 500st)	1	40	93	20
					Vertical	-		-			
					Horizontal/ Vertical/ Ambient temperature 5°C or below	15	320(at 50 to 400st) 320(at 450st) 320(at 500st)	1			
						-		-			
				6	Horizontal	8	400(at 50 to 400st) 400(at 450st) 375(at 500st)	1	79	185	
					Vertical		220(at 50 to 400st) 220(at 450st) 220(at 500st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		220(at 50 to 400st) 220(at 450st) 220(at 500st)	1			
								0.5			
				3	Horizontal	4	225(at 50 to 400st) 220(at 450st) 185(at 500st)	1	159	370	
					Vertical		140(at 50 to 400st) 140(at 450st) 140(at 500st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		80(at 50 to 400st) 80(at 450st) 80(at 500st)	1			
								0.5			
	WRA12R	Ball screw	8192	12	Horizontal	15	560(at 50 to 400st) 560(at 450st) 560(at 500st)	1	40	93	20
					Vertical	-		-			
					Horizontal/ Vertical/ Ambient temperature 5°C or below	15	320(at 50 to 400st) 320(at 450st) 320(at 500st)	1			
						-		-			
				6	Horizontal	8	400(at 50 to 400st) 400(at 450st) 375(at 500st)	1	79	185	
					Vertical		220(at 50 to 400st) 220(at 450st) 220(at 500st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		220(at 50 to 400st) 220(at 450st) 220(at 500st)	1			
								0.5			
				3	Horizontal	4	225(at 50 to 400st) 220(at 450st) 185(at 500st)	1	159	370	
					Vertical		140(at 50 to 400st) 140(at 450st) 140(at 500st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		80(at 50 to 400st) 80(at 450st) 80(at 500st)	1			
								0.5			

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (wide radial cylinder type)	WRA14C	Ball screw	8192	16	Horizontal	20	420(at 50 to 600st)	1	117	273	20
					Vertical	-		-			
					Horizontal/ Vertical/ Ambient temperature 5°C or below	20	280(at 50 to 600st)	1			
						-		-			
				8	Horizontal	10	280(at 50 to 600st)	1	234	547	
					Vertical		210(at 50 to 600st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		140(at 50 to 600st)	1			
								0.5			
				4	Horizontal	5	130(at 50 to 600st)	1	469	1094	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		70(at 50 to 600st)	1			
								0.5			
	WRA14R	Ball screw	8192	16	Horizontal	20	420(at 50 to 600st)	1	117	273	20
					Vertical	-		-			
					Horizontal/ Vertical/ Ambient temperature 5°C or below	20	280(at 50 to 600st)	1			
						-		-			
				8	Horizontal	10	280(at 50 to 600st)	1	234	547	
					Vertical		210(at 50 to 600st)	0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		140(at 50 to 600st)	1			
								0.5			
				4	Horizontal	5	130(at 50 to 600st)	1	469	1094	
					Vertical			0.5			
					Horizontal/ Vertical/ Ambient temperature 5°C or below		70(at 50 to 600st)	1			
								0.5			

<table>
<tr><th>Actuator series</th><th>Type</th><th>Feed screw</th><th>Encoder resolution</th><th>Lead [mm]</th><th>Mounting direction</th><th>Minimum speed [mm/s]</th><th>Maximum speed [mm/s]</th><th>Maximum acceleration/ deceleration [G]</th><th>Minimum push force [N]</th><th>Maximum push force [N]</th><th>Rated push speed [mm/s]</th></tr>
<tr><td rowspan="7">RCP6W (wide radial cylinder type)</td><td rowspan="7">WRA16C</td><td rowspan="7">Ball screw</td><td rowspan="7">8192</td><td rowspan="4">20</td><td>Horizontal</td><td>25</td><td rowspan="2">280(at 50st)
360(at 100 to 450st)
360(at 500st)
340(at 550st)
295(at 600st)
260(at 650st)
225(at 700st)
200(at 750st)
180(at 800st)</td><td>0.2</td><td rowspan="4">250</td><td rowspan="4">500</td><td rowspan="7">10</td></tr>
<tr><td>Vertical</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">Horizontal/ Vertical/ Ambient temperature 5°C or below</td><td>25</td><td rowspan="2">240(at 50st)
240(at 100 to 450st)
240(at 500st)
240(at 550st)
240(at 600st)
240(at 650st)
225(at 700st)
200(at 750st)
180(at 800st)</td><td>0.2</td></tr>
<tr><td>-</td><td>-</td></tr>
<tr><td rowspan="3">10</td><td>Horizontal</td><td rowspan="3">13</td><td>220(at 50st)
220(at 100 to 450st)
195(at 500st)
165(at 550st)
145(at 600st)
125(at 650st)
110(at 700st)
100(at 750st)
90(at 800st)</td><td rowspan="3">0.2</td><td rowspan="3">500</td><td rowspan="3">1000</td></tr>
<tr><td>Vertical</td><td>160(at 50st)
160(at 100 to 450st)
160(at 500st)
160(at 550st)
145(at 600st)
125(at 650st)
110(at 700st)
100(at 750st)
90(at 800st)</td></tr>
<tr><td>Horizontal/ Vertical/ Ambient temperature 5°C or below</td><td>120(at 50st)
120(at 100 to 450st)
120(at 500st)
120(at 550st)
120(at 600st)
120(at 650st)
110(at 700st)
100(at 750st)
90(at 800st)</td></tr>
</table>

Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (wide radial cylinder type)	WRA16C	Ball screw	8192	5	Horizontal	7	110(at 50st) 110(at 100 to 450st) 95(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st) 50(at 750st) 45(at 800st)	0.1	1000	2000	10
					Vertical		90(at 50st) 90(at 100 to 450st) 90(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st) 50(at 750st) 45(at 800st)				
					Horizontal/ Vertical/ Ambient temperature 5°C or below		80(at 50st) 80(at 100 to 450st) 80(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st) 50(at 750st) 45(at 800st)				
	WRA16R	Ball screw	8192	20	Horizontal	25	280(at 50st) 360(at 100 to 450st) 360(at 500st) 340(at 550st) 295(at 600st) 260(at 650st) 225(at 700st) 200(at 750st) 180(at 800st)	0.2	250	500	10
					Vertical	-		-			
					Horizontal/ Vertical/ Ambient temperature 5°C or below	25 -	240(at 50st) 240(at 100 to 450st) 240(at 500st) 240(at 550st) 240(at 600st) 240(at 650st) 225(at 700st) 200(at 750st) 180(at 800st)	0.2 -			

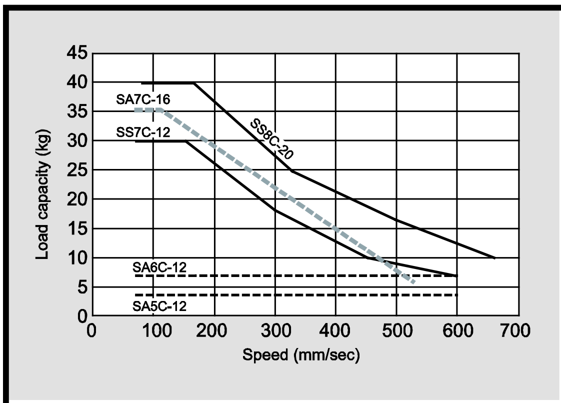
Actuator series	Type	Feed screw	Encoder resolution	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
RCP6W (wide radial cylinder type)	WRA16R	Ball screw	8192	10	Horizontal	13	220(at 50st) 220(at 100 to 450st) 195(at 500st) 165(at 550st) 145(at 600st) 125(at 650st) 110(at 700st) 100(at 750st) 90(at 800st)	0.2	500	1000	10
					Vertical		160(at 50st) 160(at 100 to 450st) 160(at 500st) 160(at 550st) 145(at 600st) 125(at 650st) 110(at 700st) 100(at 750st) 90(at 800st)				
					Horizontal/ Vertical/ Ambient temperature 5°C or below		120(at 50st) 120(at 100 to 450st) 120(at 500st) 120(at 550st) 120(at 600st) 120(at 650st) 110(at 700st) 100(at 750st) 90(at 800st)				
				5	Horizontal	7	110(at 50st) 110(at 100 to 450st) 95(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st) 50(at 750st) 45(at 800st)	0.1	1000	2000	
					Vertical		90(at 50st) 90(at 100 to 450st) 90(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st) 50(at 750st) 45(at 800st)				
					Horizontal/ Vertical/ Ambient temperature 5°C or below		80(at 50st) 80(at 100 to 450st) 80(at 500st) 80(at 550st) 70(at 600st) 60(at 650st) 55(at 700st) 50(at 750st) 45(at 800st)				

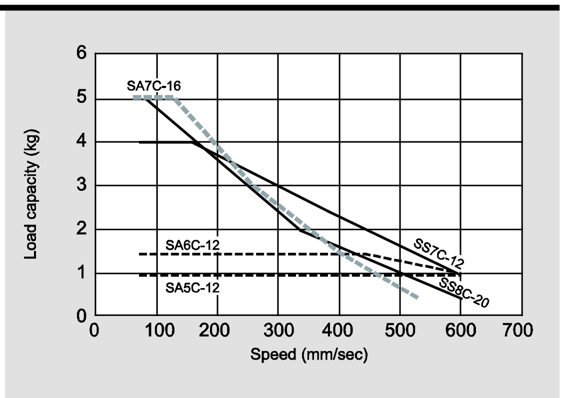
1.2 Correlation Diagrams of Speed and Payload

RCP2 slider type

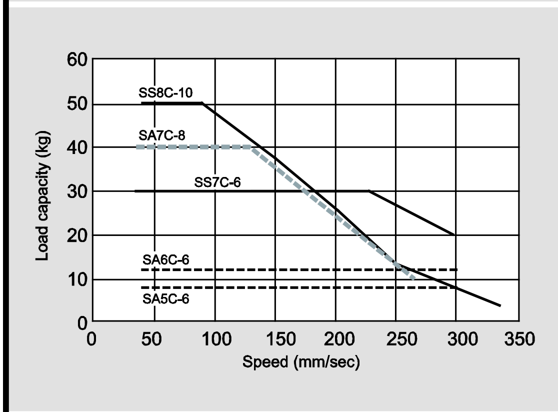
Horizontal installation | Vertical installation

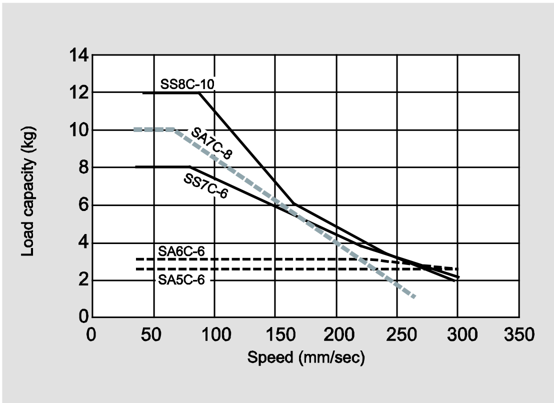
High-speed type



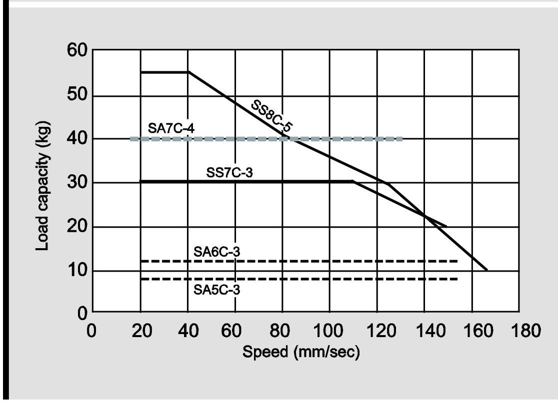


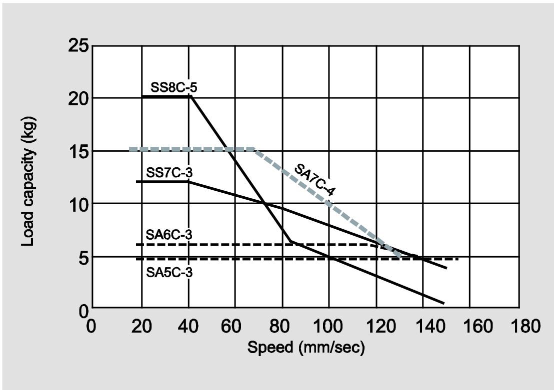
Medium-speed type





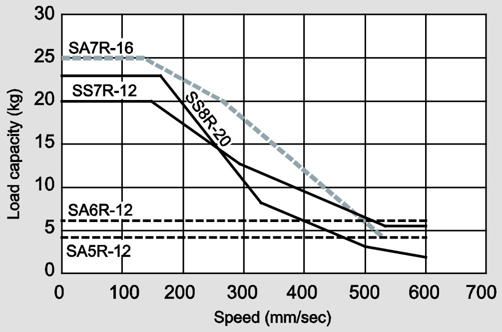
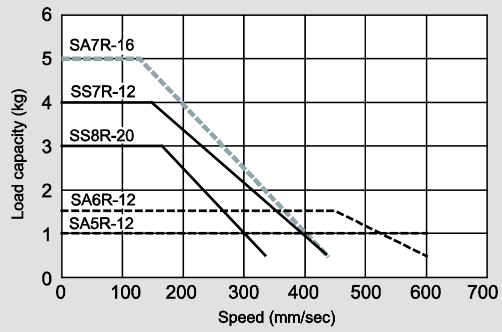
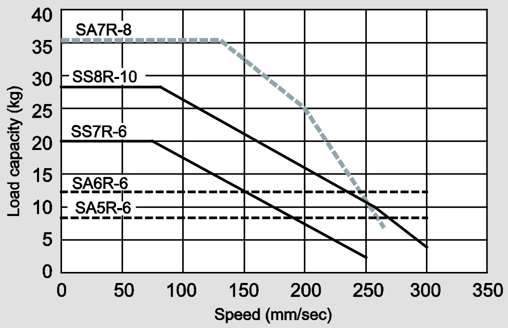
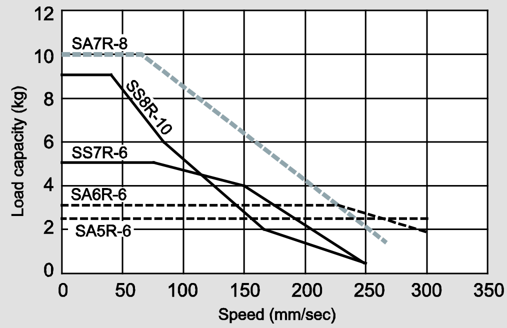
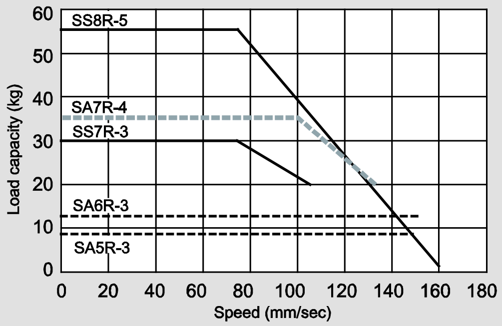
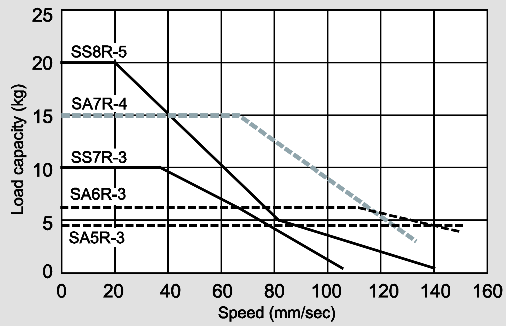
Low-speed type





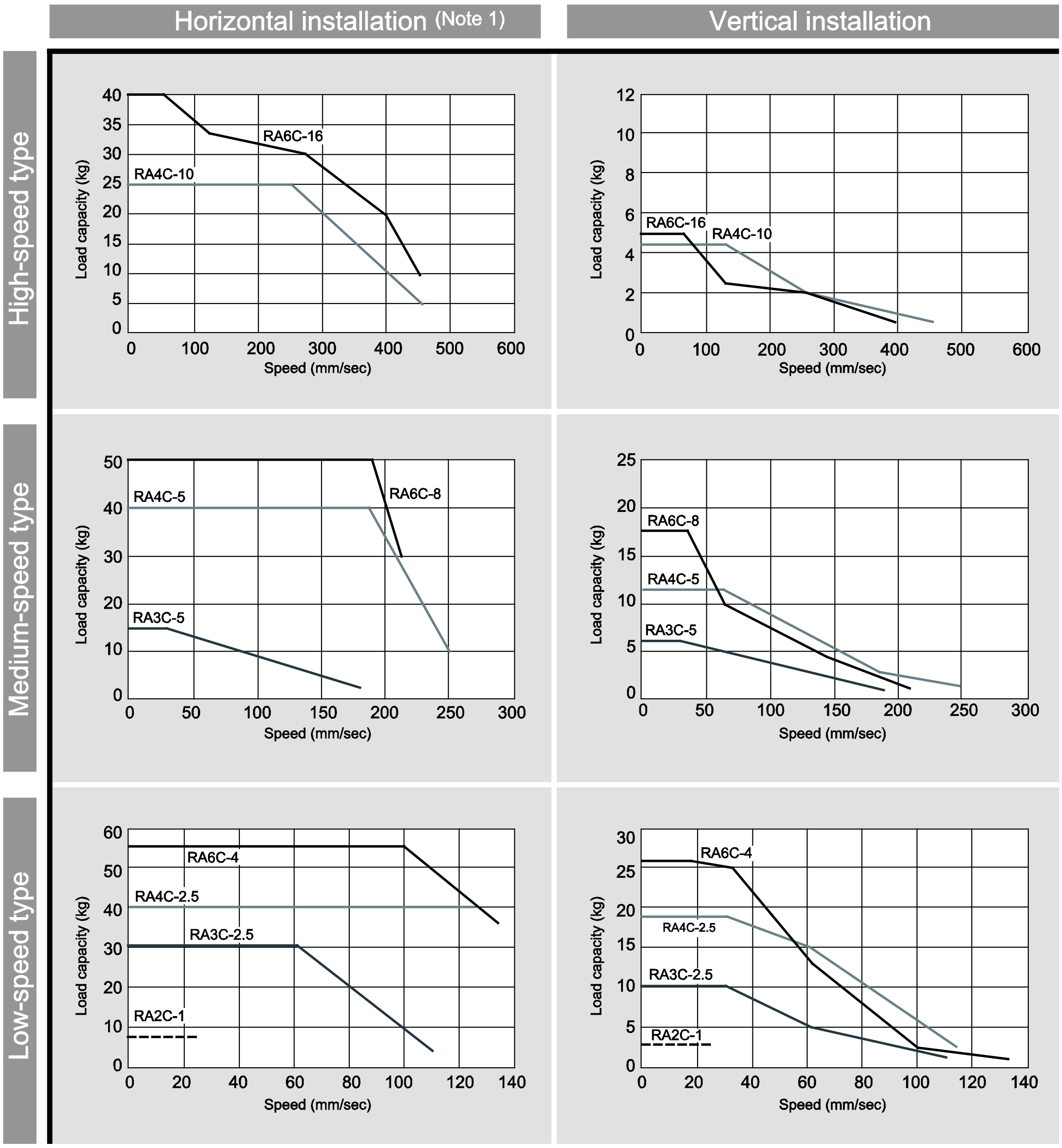
Note: In the above graphs, the number after the model name indicates the lead.

RCP2 slider type (motor side-mounted)

	Horizontal installation	Vertical installation
High-speed type		
Medium-speed type		
Low-speed type		

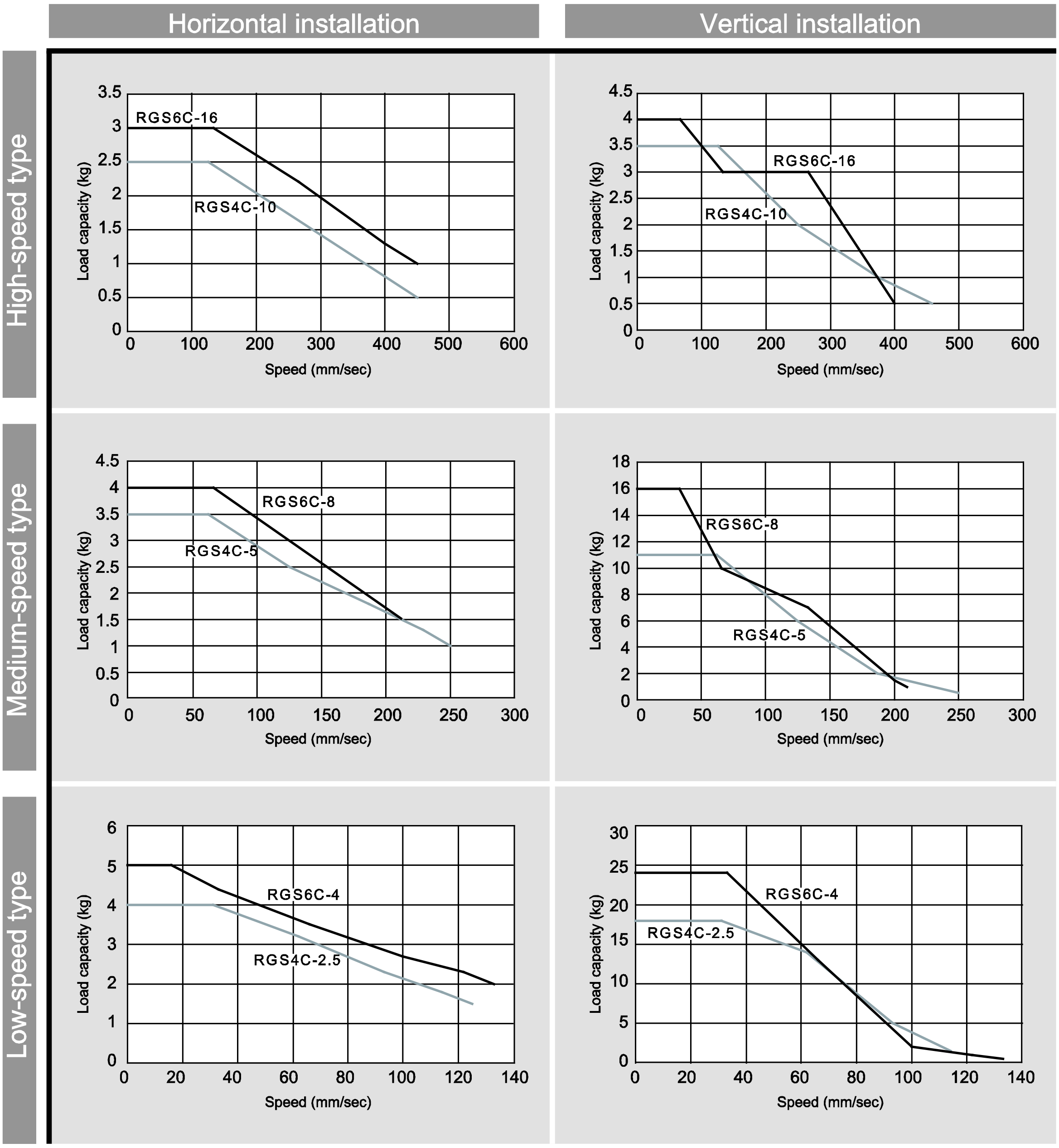
Note: In the above graphs, the number after the model name indicates the lead.

RCP2 rod standard type



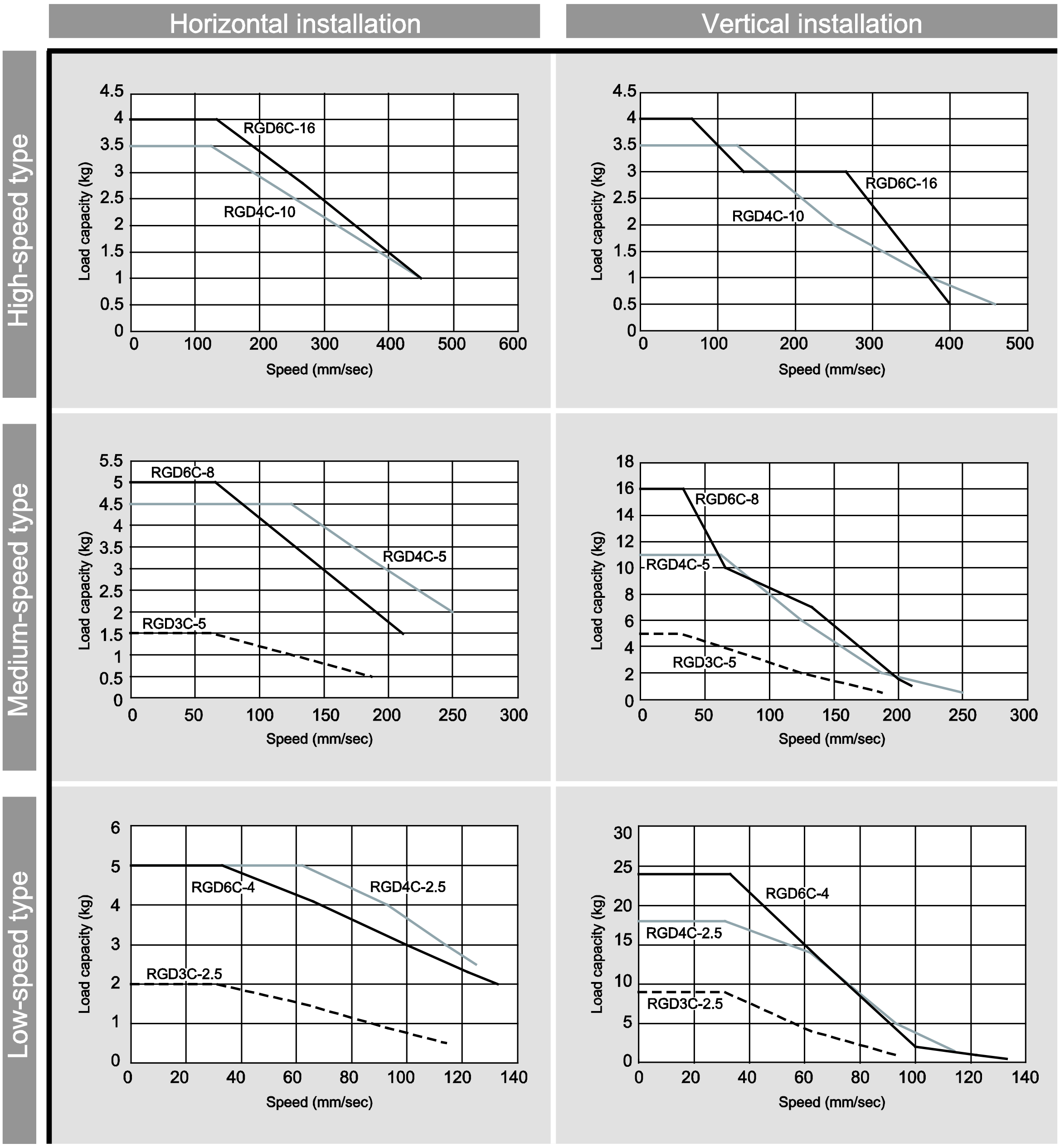
Note: In the above graphs, the number after the model name indicates the lead.
(Note 1) The figures for horizontal installation assume use of an external guide.

RCP2 with single guide type



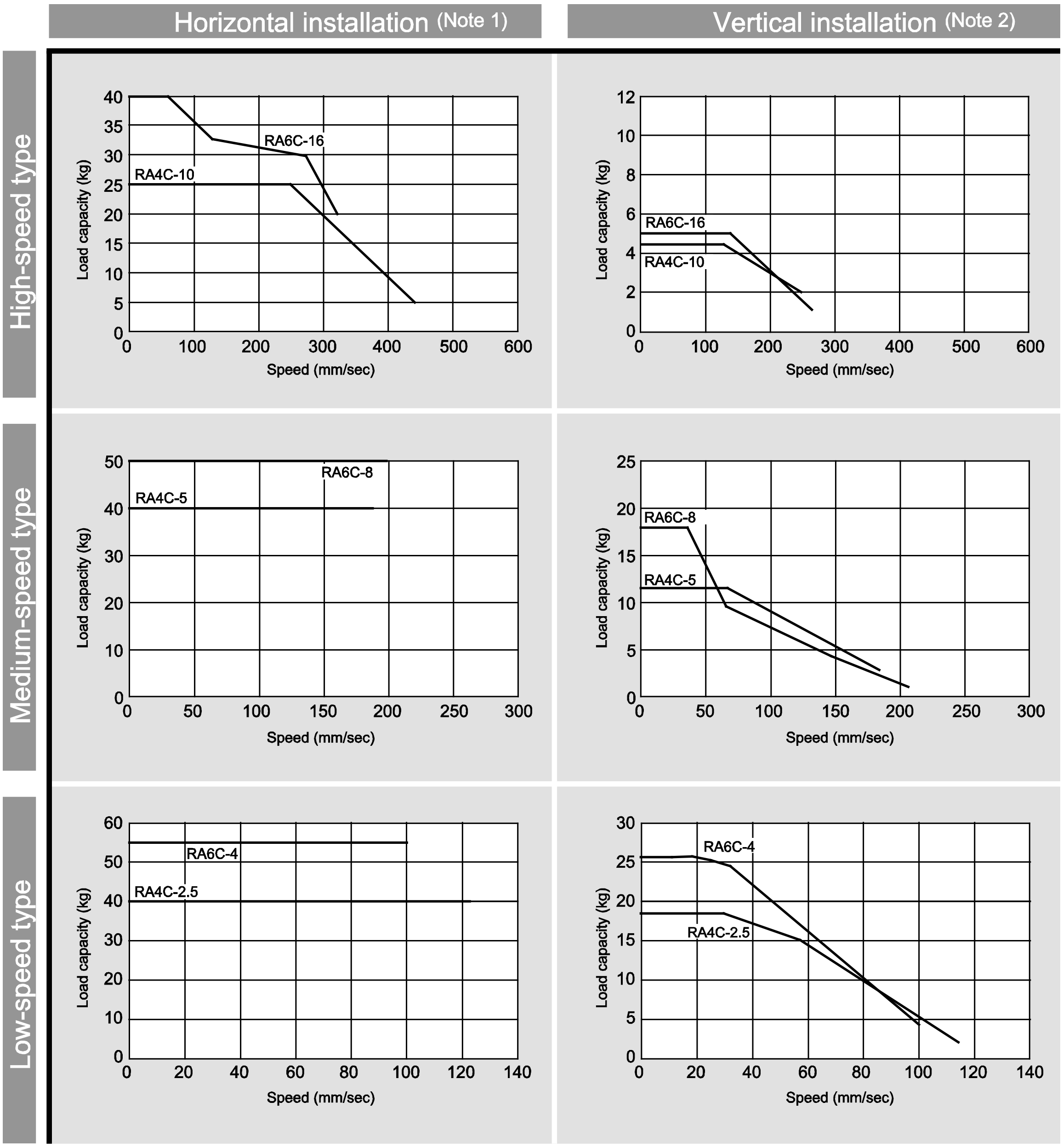
Note: In the above graphs, the number after the model name indicates the lead.

RCP2 with double guide type



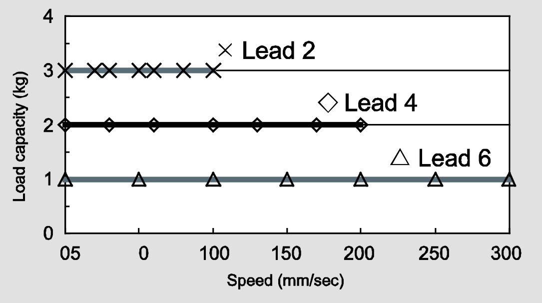
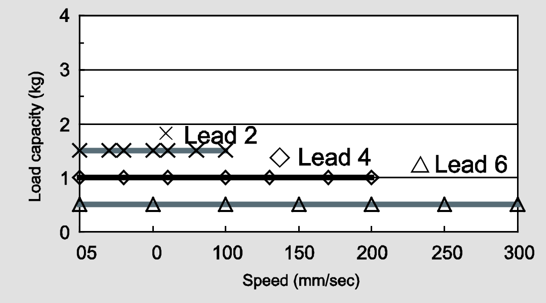
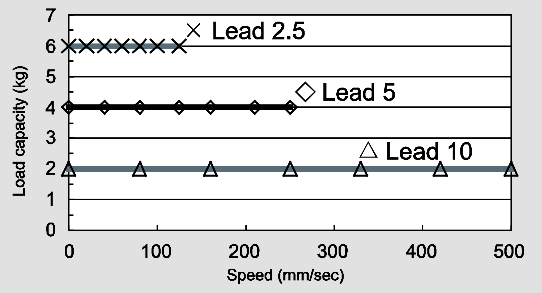
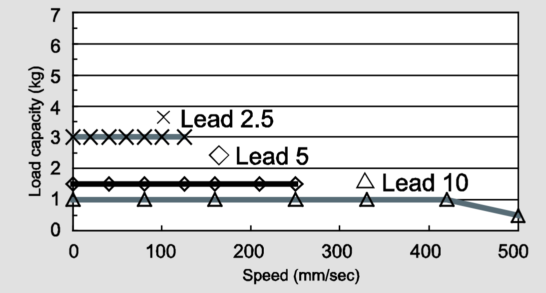
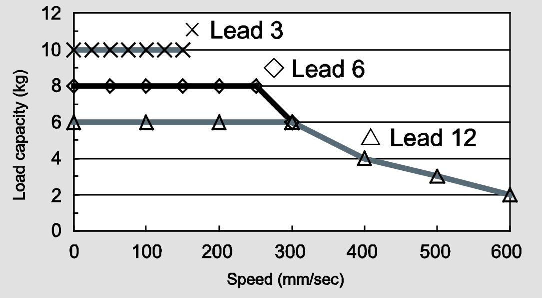
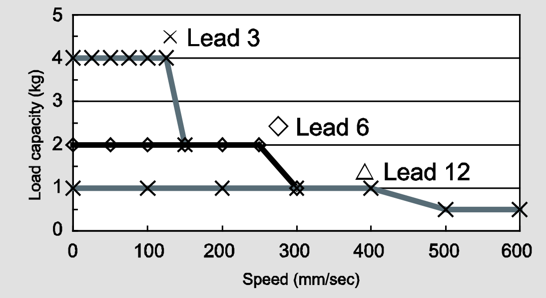
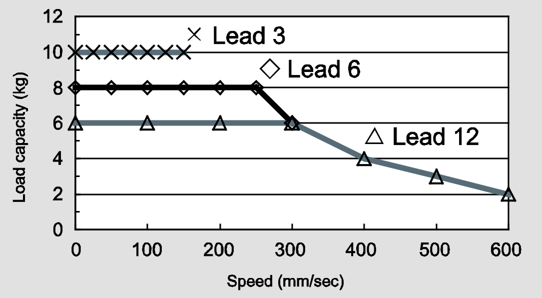
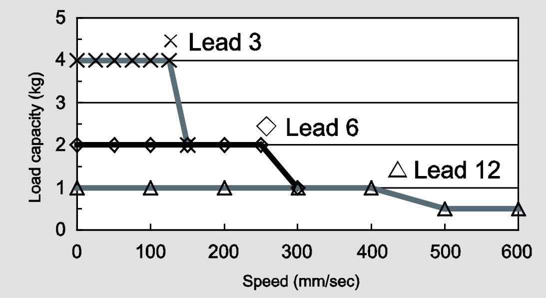
Note: In the above graphs, the number after the model name indicates the lead.

RCP2W dust-proof/splash-proof rod type



Note: In the above graphs, the number after the model name indicates the lead.
(Note 1) The figures for horizontal installation assume use of an external guide.
(Note 2) Use of the actuator at the maximum load capacity corresponding to the applicable speed may cause vibration/overshooting. Select an appropriate model that provides an allowance of approx. 70%.

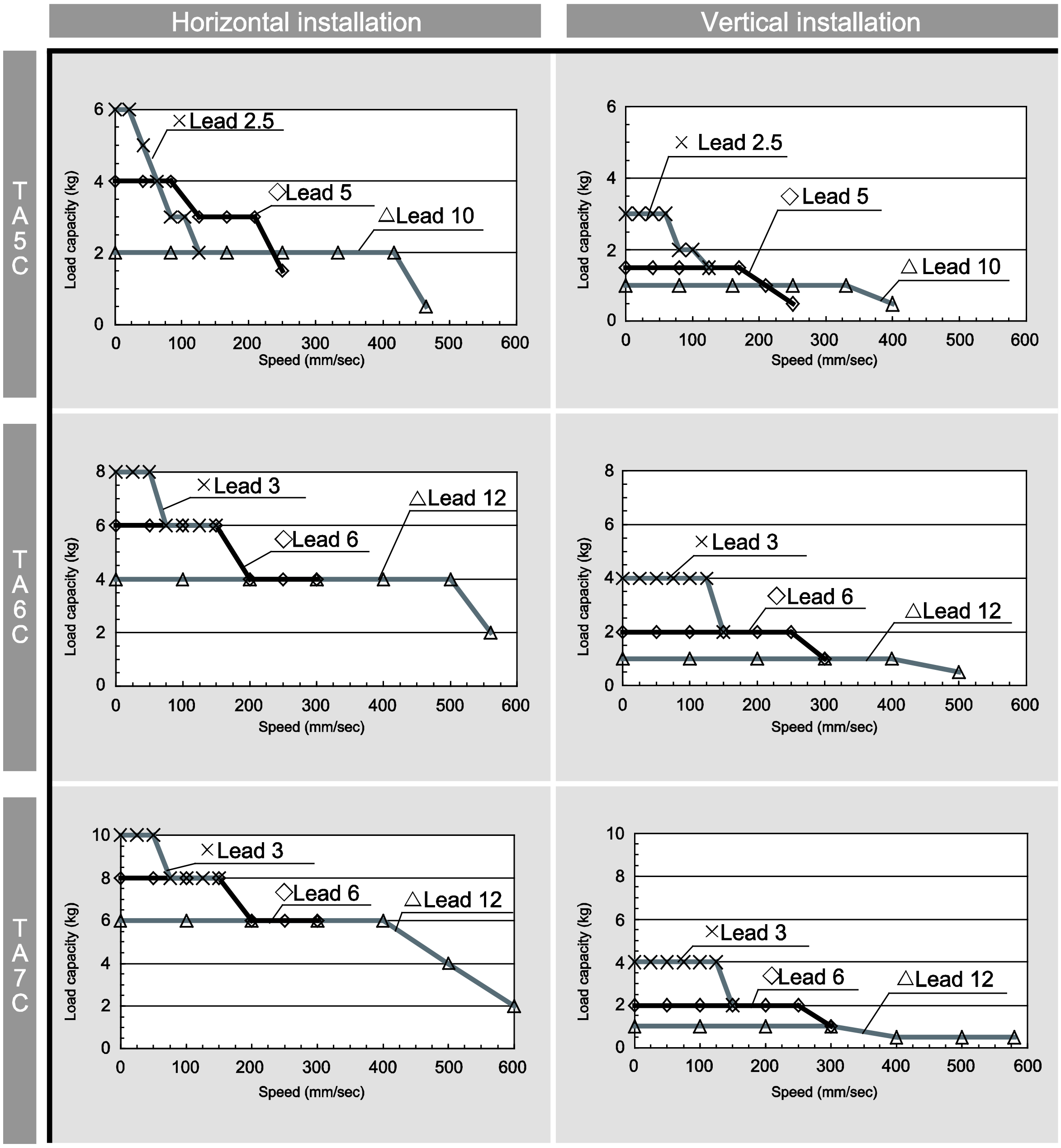
RCP3 slider type

	Horizontal installation	Vertical installation
SA3C		
SA4C		
SA5C		
SA6C		

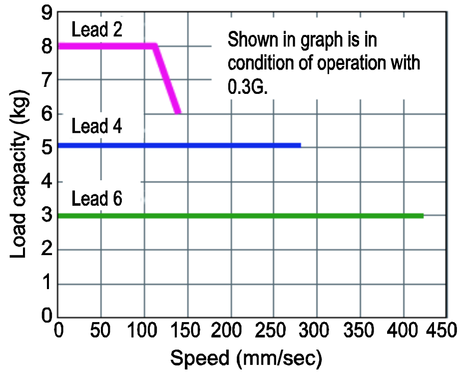
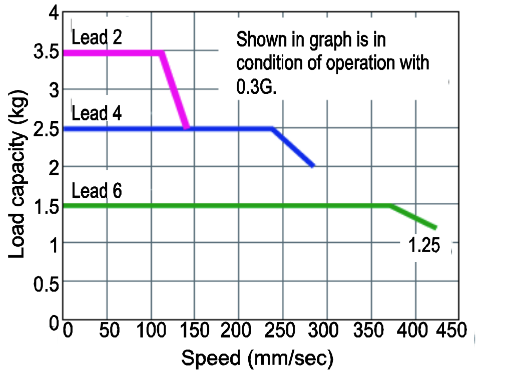
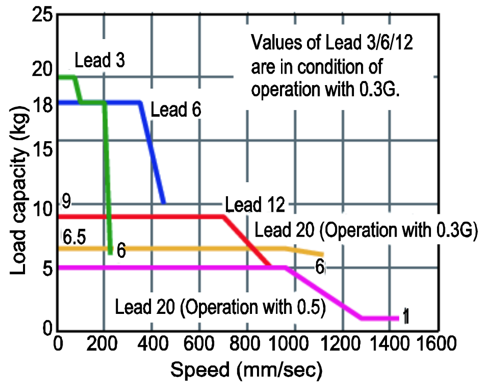
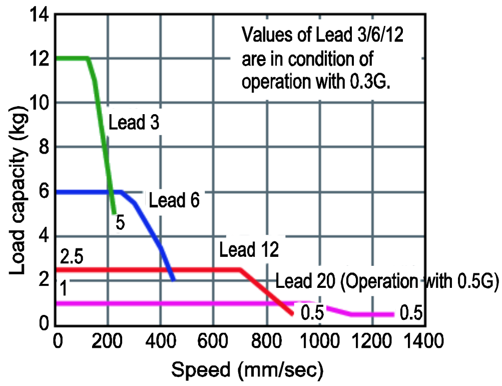
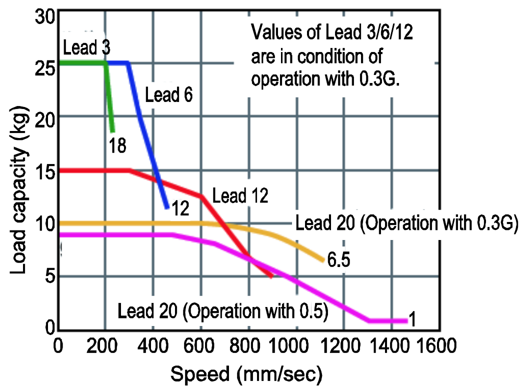
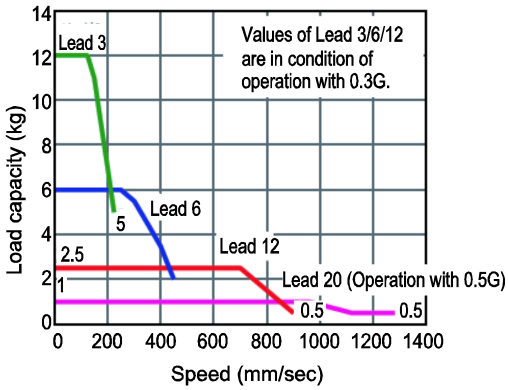
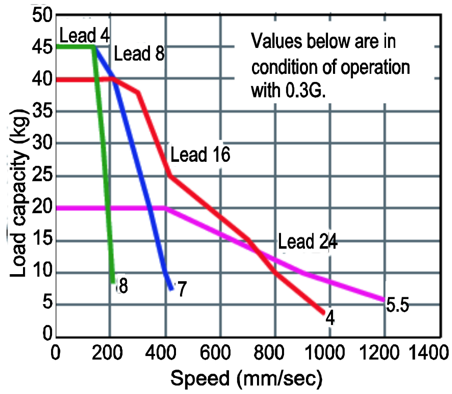
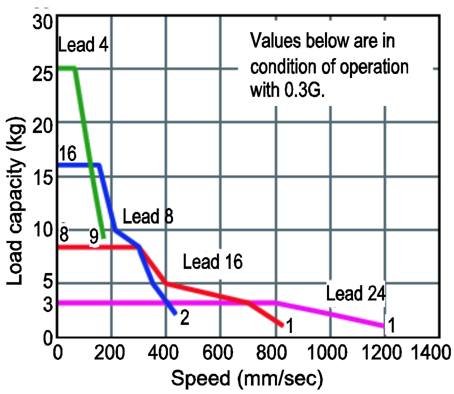
Appendix

Chapter 1 Connectable Actuators

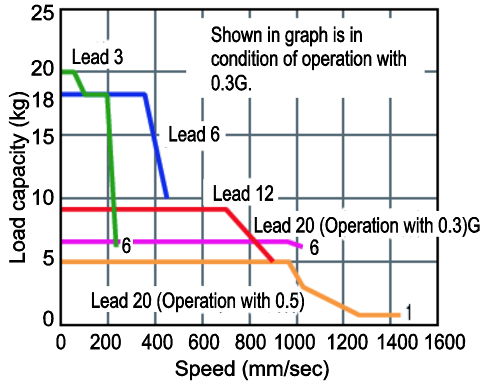
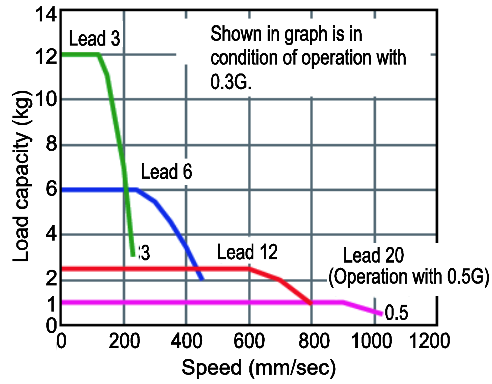
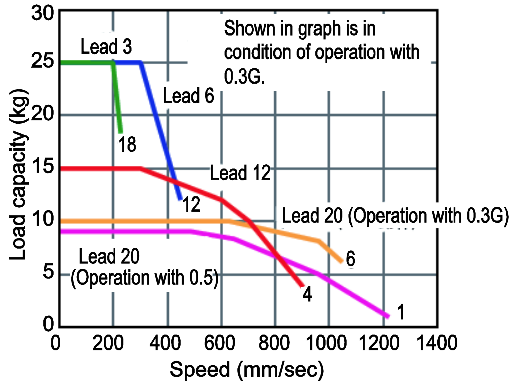
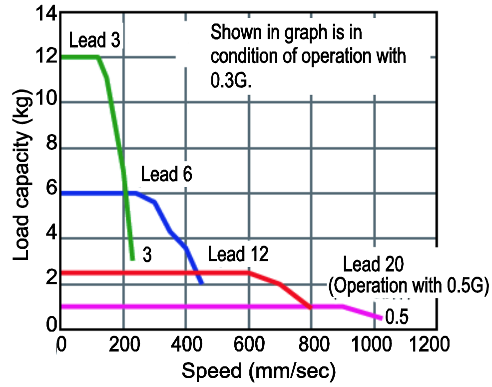
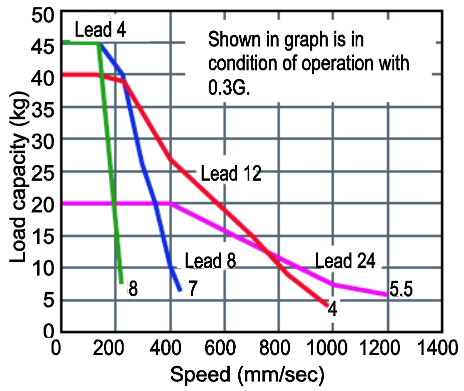
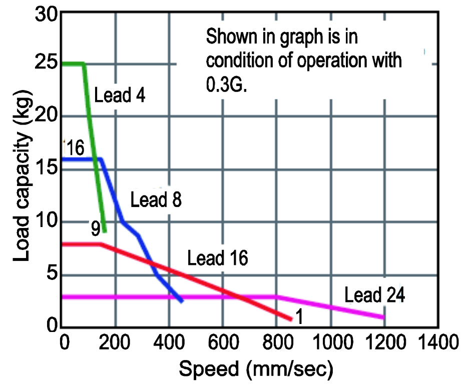
RCP3 table type



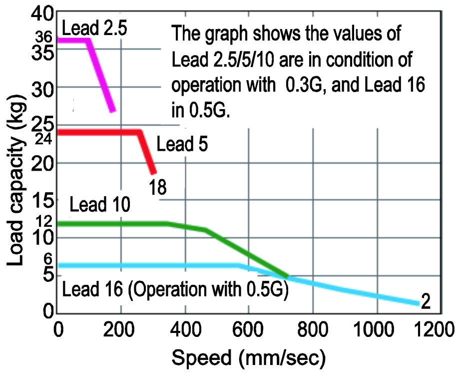
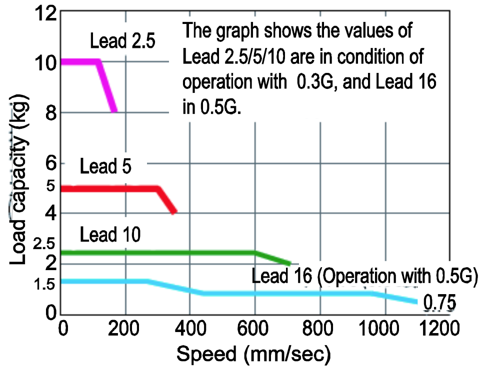
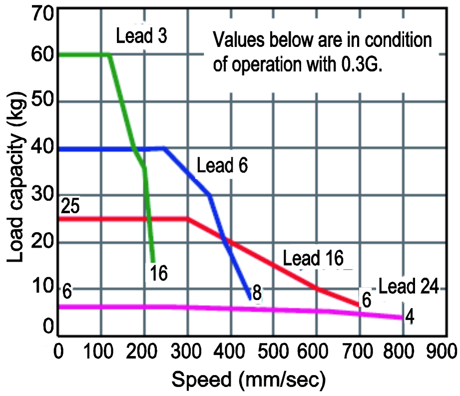
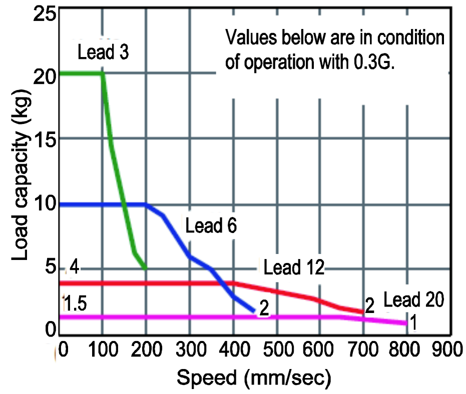
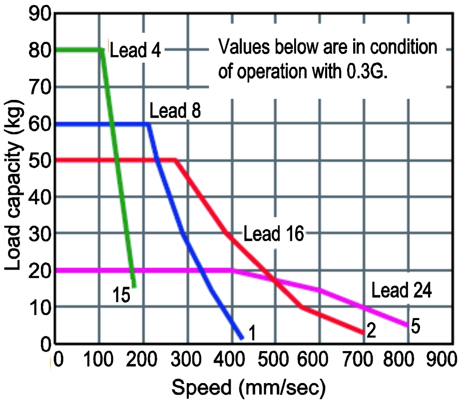
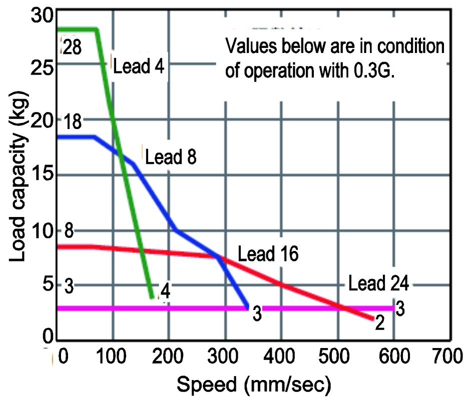
RCP4 slider type (high-output enabled)

	Horizontal installation	Vertical installation
SA3C		
SA5C		
SA6C		
SA7C		

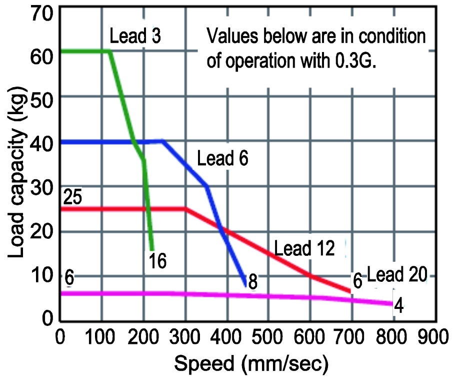
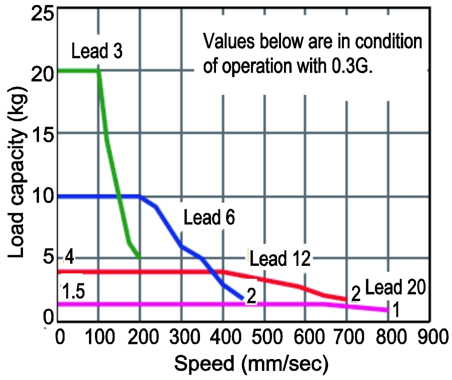
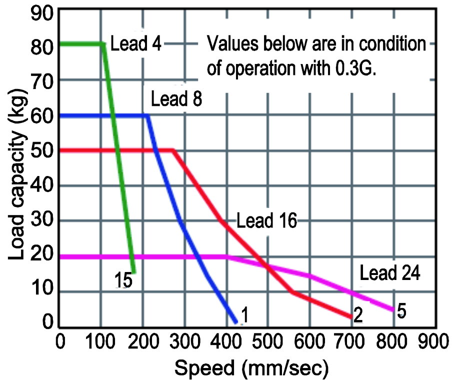
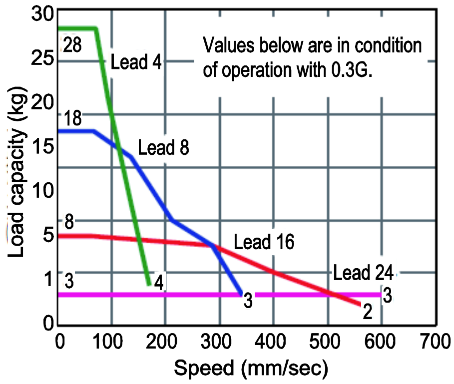
RCP4 slider type (high-output enabled)

	Horizontal installation	Vertical installation
SA5R		
SA6R		
SA7R		

RCP4 rod type (high-output enabled)

	Horizontal installation	Vertical installation
RA3C		
RA5C		
RA6C		

RCP4 rod type (high-output enabled)

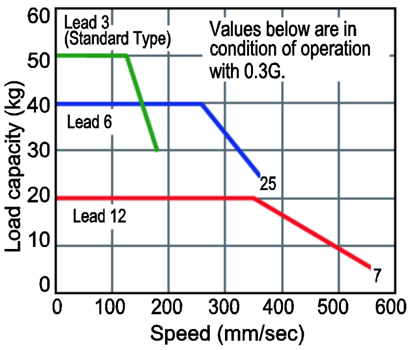
	Horizontal installation	Vertical installation
RA5R		
RA6R		

RCP4W dust-proof/splash-proof rod type (high-output enabled)

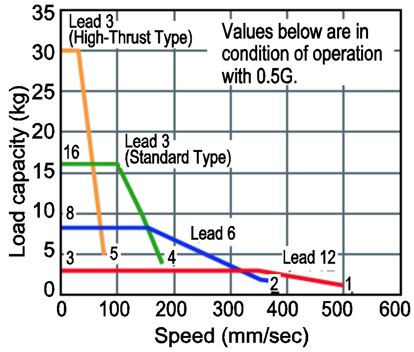
	Horizontal installation	Vertical installation

RA6C

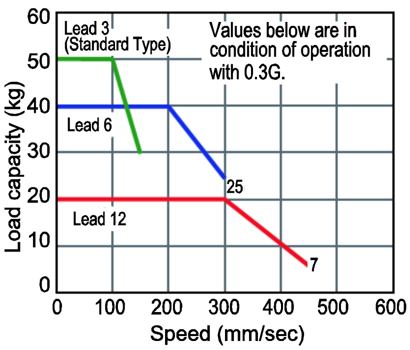
(When environmental temperature is 5degC or higher)



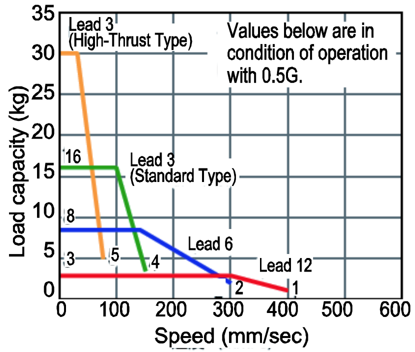
(When environmental temperature is 5degC or higher)



(When environmental temperature is 5degC or higher)

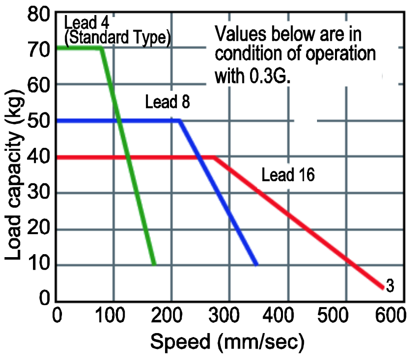


(When environmental temperature is 5degC or higher)

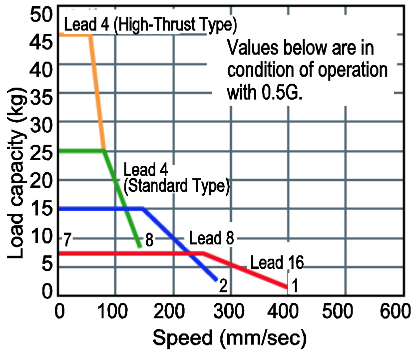


RA7C

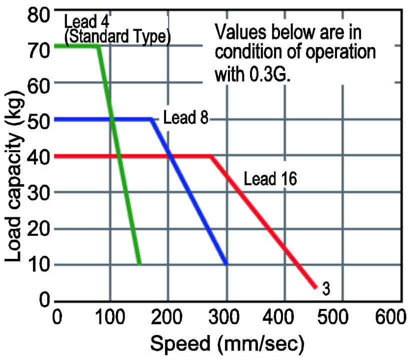
(When environmental temperature is 5degC or higher)



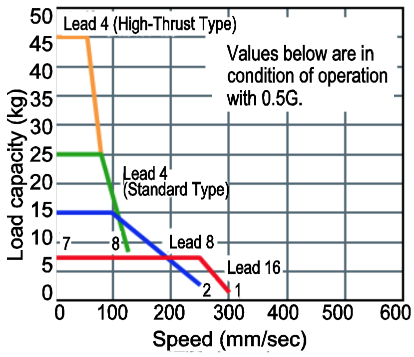
(When environmental temperature is 5degC or higher)



(When environmental temperature is 5degC or higher)



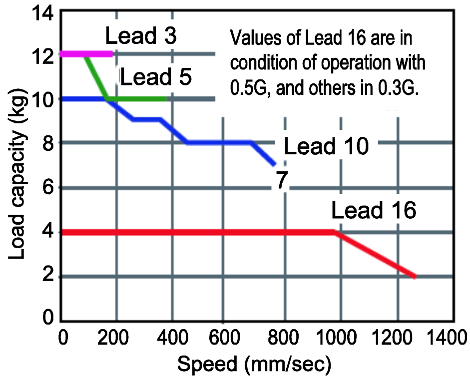
(When environmental temperature is 5degC or higher)

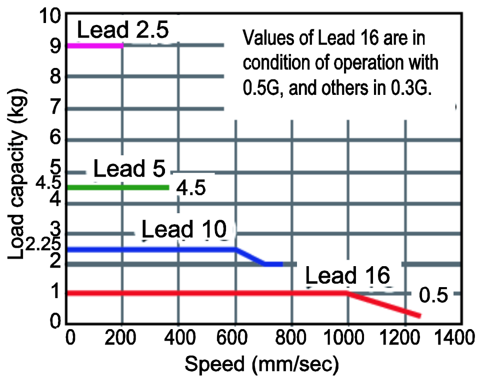


RCP5 slider type (high-output enabled)

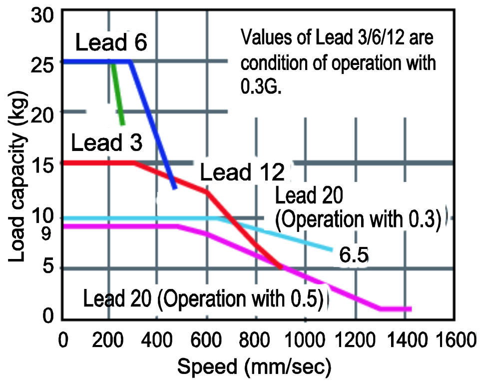
	Horizontal installation	Vertical installation

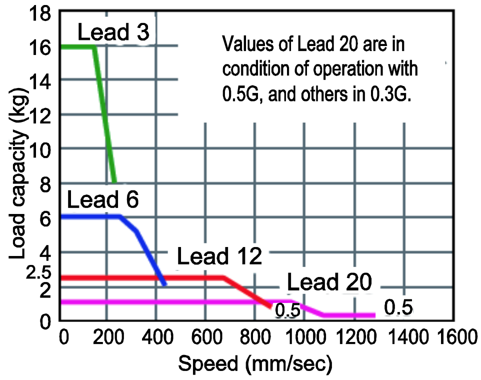
SA4C



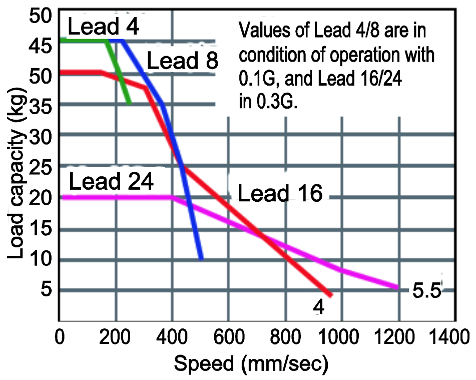


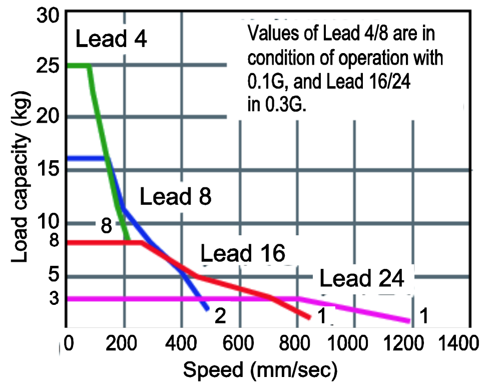
SA6C





SA7C

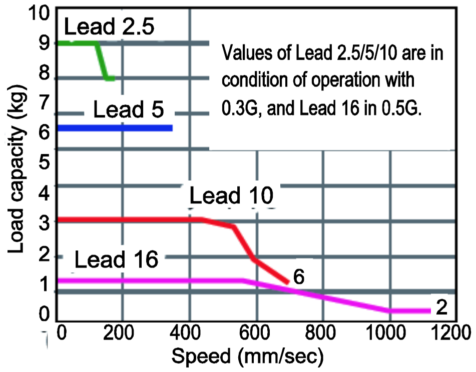


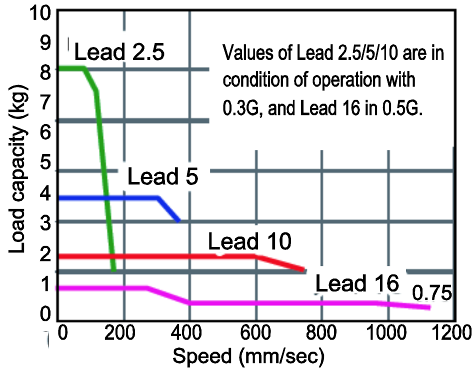


RCP5 rod type (high-output enabled)

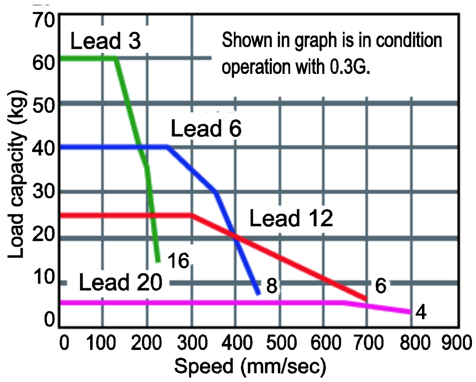
	Horizontal installation	Vertical installation

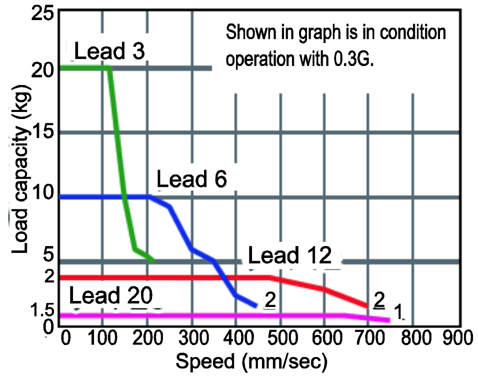
RA4C



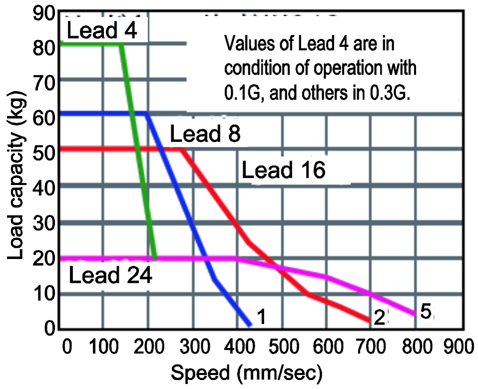


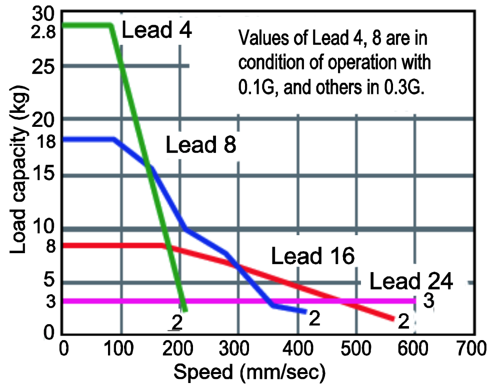
RA6C





RA7C





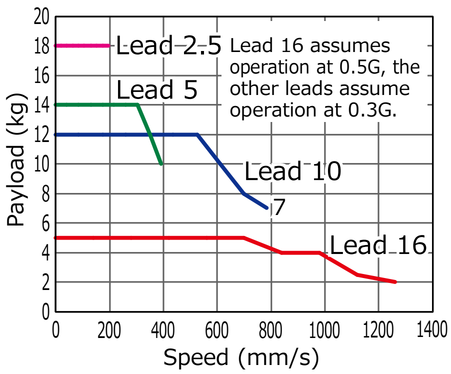
Appendix

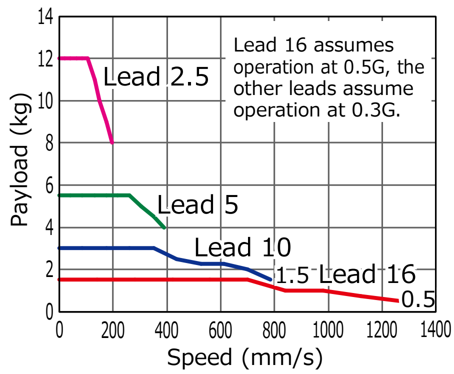
Chapter 1 Connectable Actuators

RCP6 slider type (high-output enabled)

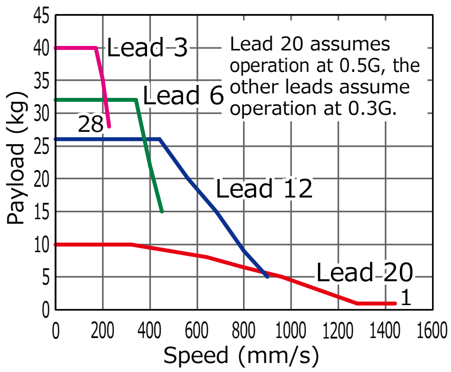
	Horizontal mount	Vertical mount

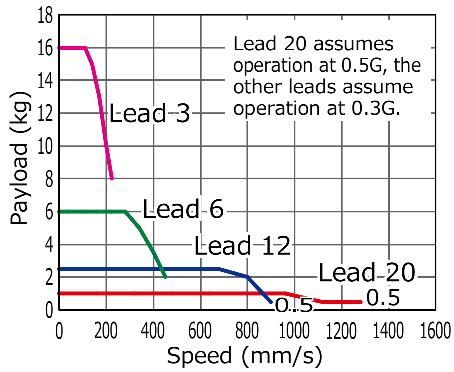
SA4C



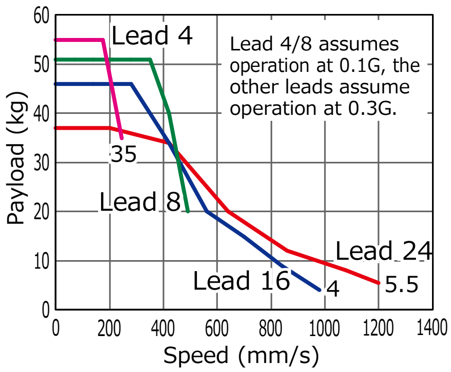


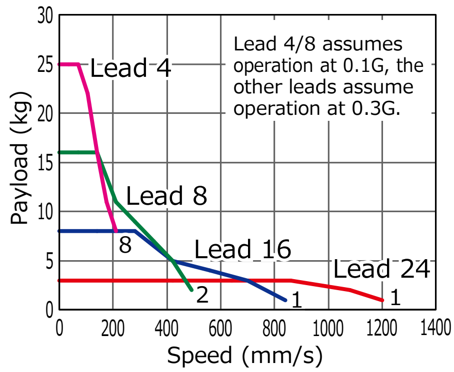
SA6C



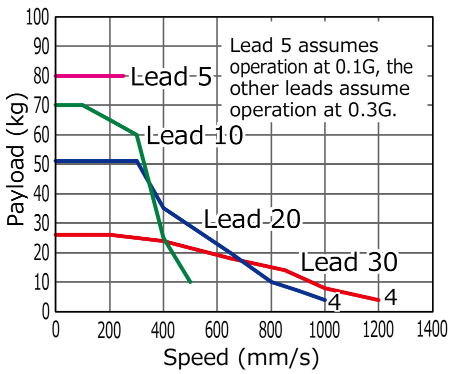


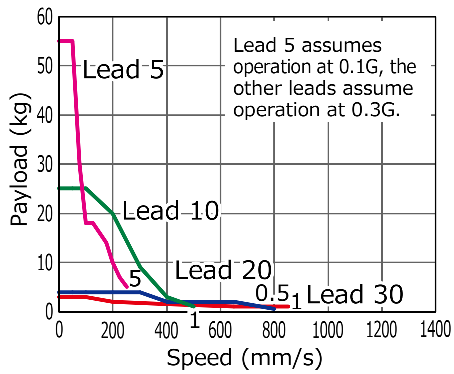
SA7C





SA8C





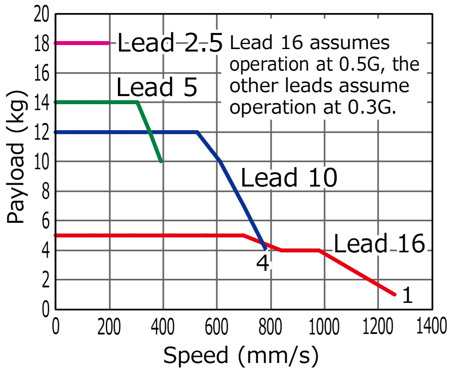
Appendix

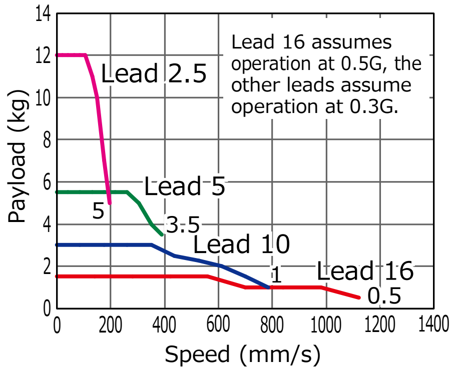
Chapter 1 Connectable Actuators

RCP6 slider type (high-output enabled)

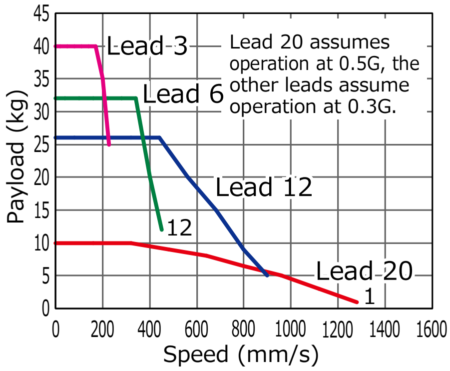
	Horizontal mount	Vertical mount

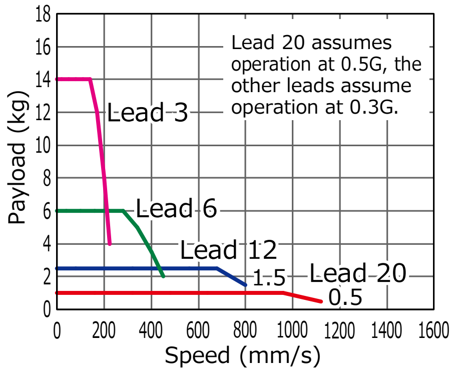
SA4R



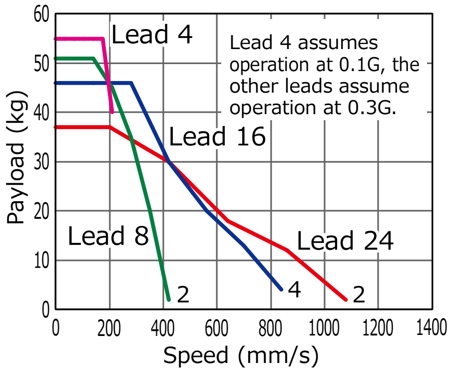


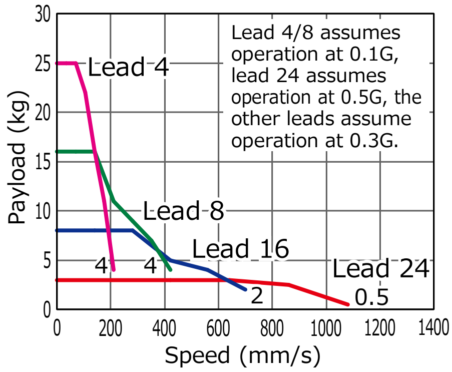
SA6R



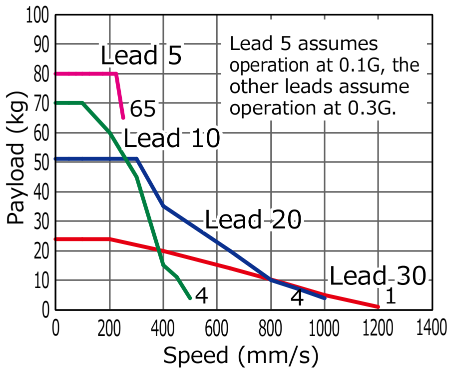


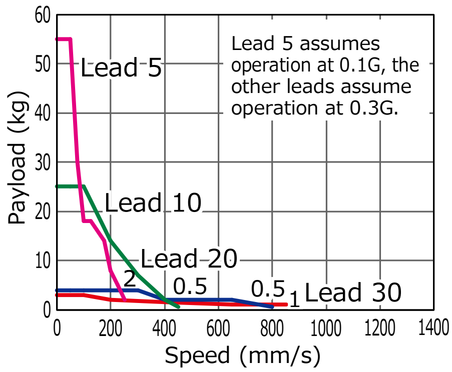
SA7R





SA8R

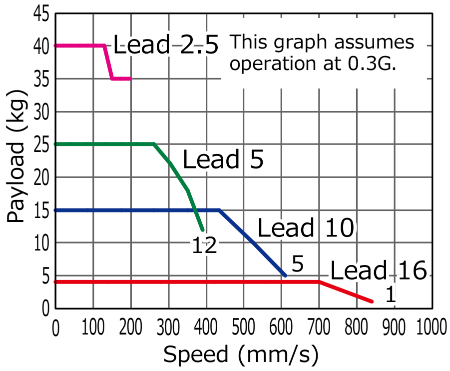


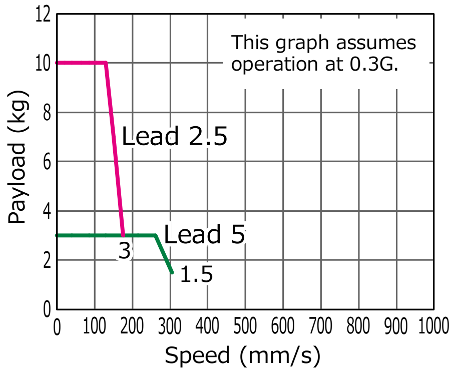


RCP6 wide slider type (high-output enabled)

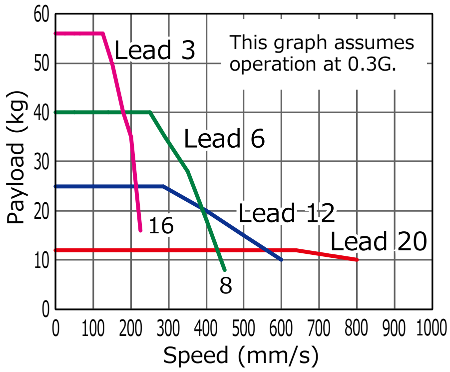
Horizontal mount	Vertical mount

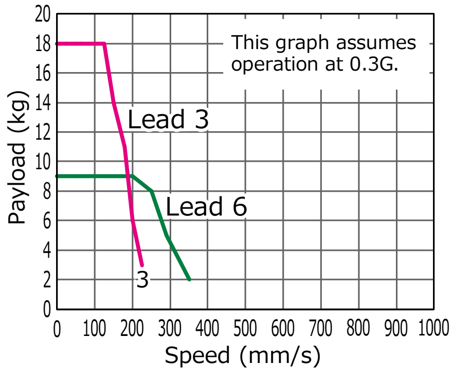
WSA10C



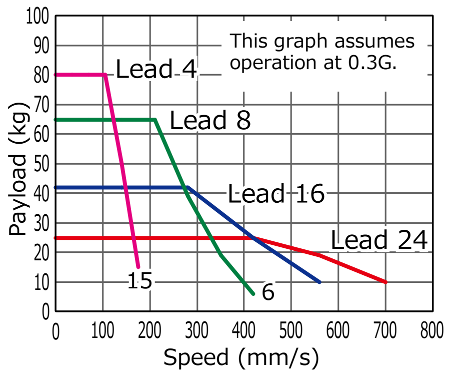


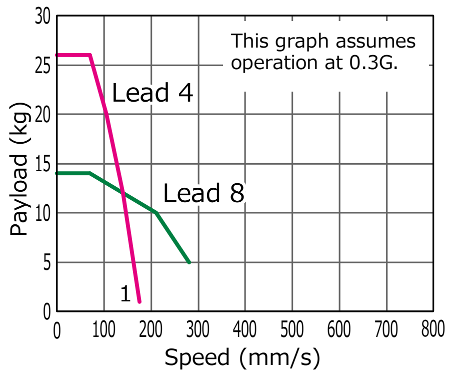
WSA12C



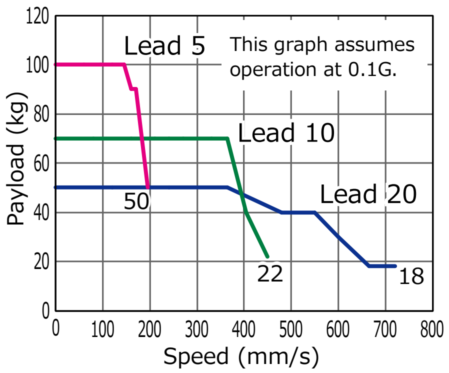


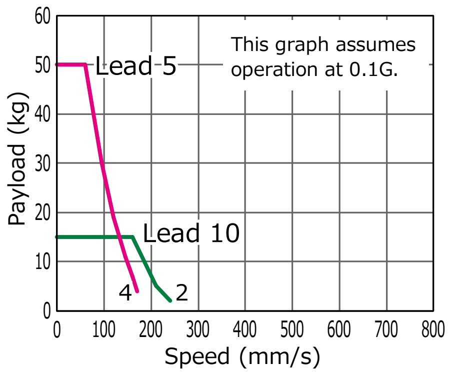
WSA14C





WSA16C





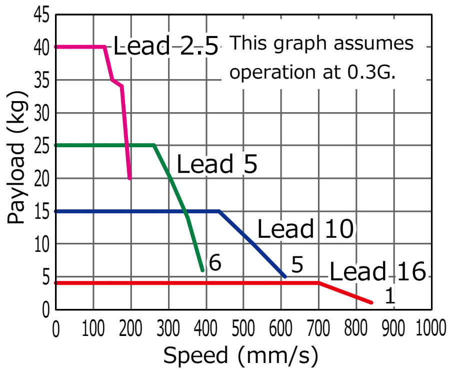
Appendix

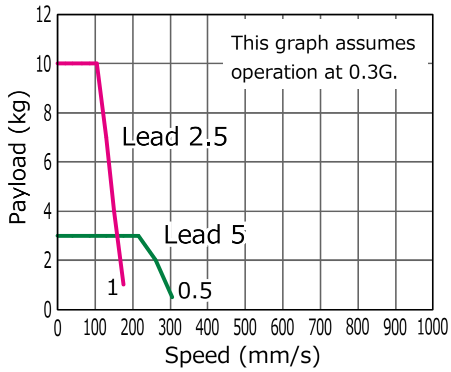
Chapter 1 Connectable Actuators

RCP6 wide slider type (high-output enabled)

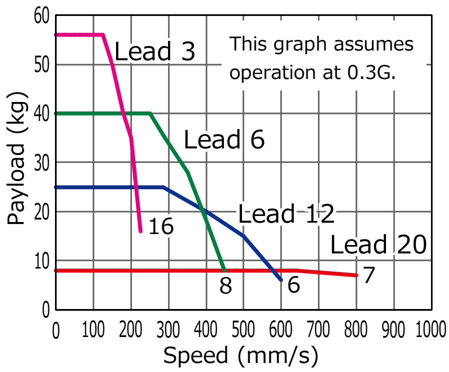
Horizontal mount | **Vertical mount**

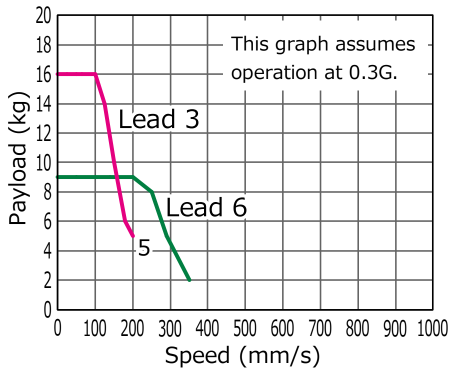
WSA10R



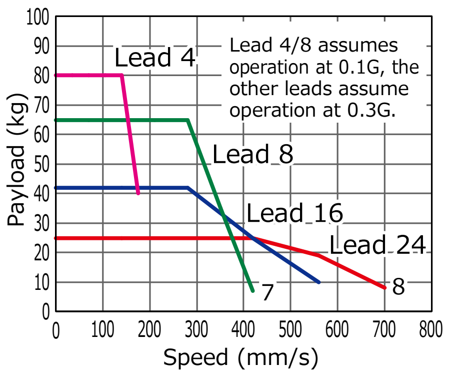


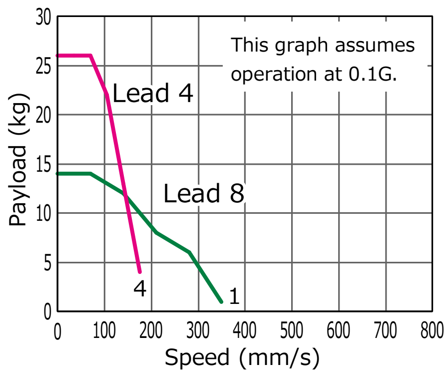
WSA12R



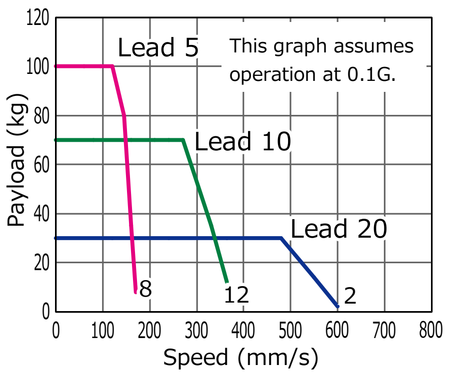


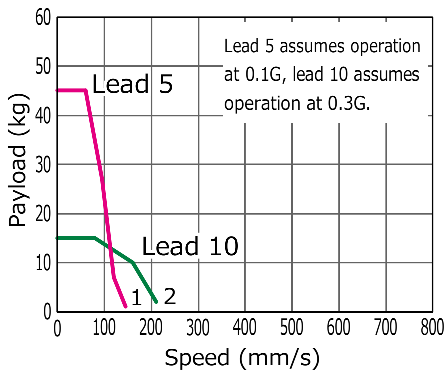
WSA14R





WSA16R





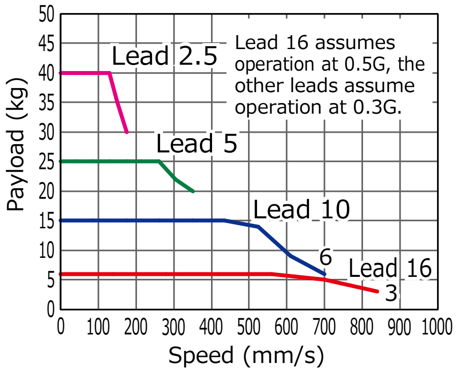
Appendix

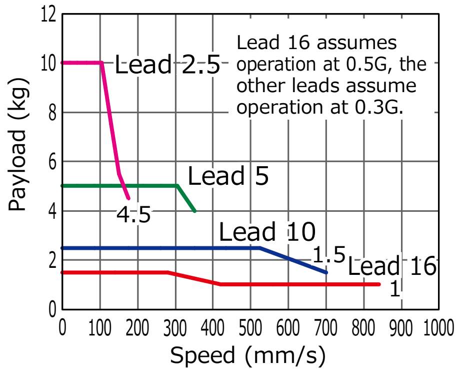
Chapter 1 Connectable Actuators

RCP6 rod type (high-output enabled)

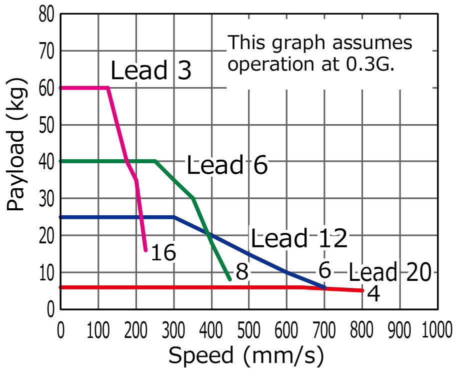
Horizontal mount | **Vertical mount**

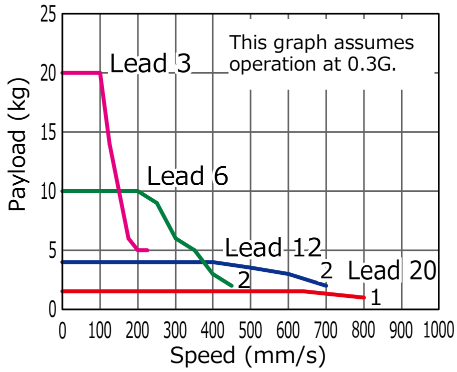
RA4C



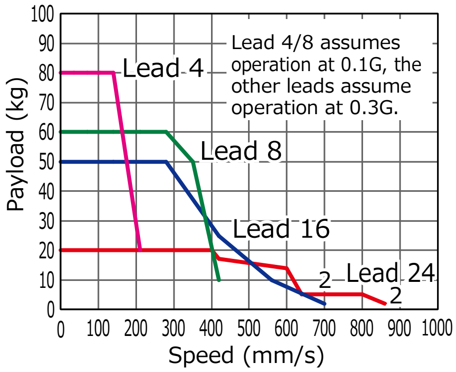


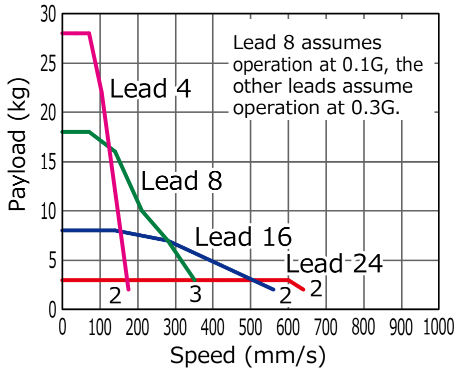
RA6C



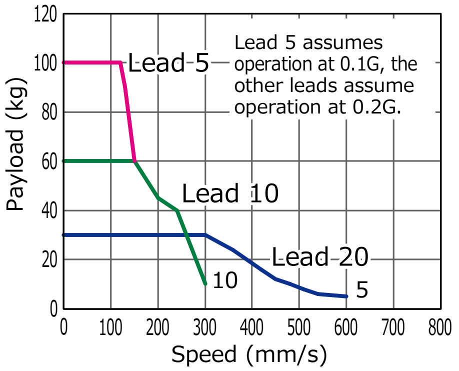


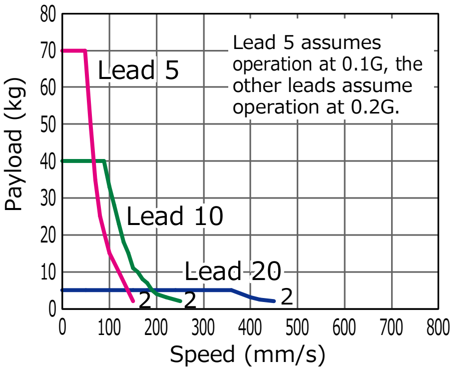
RA7C





RA8C

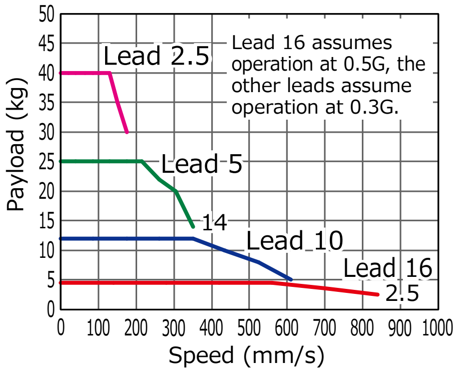


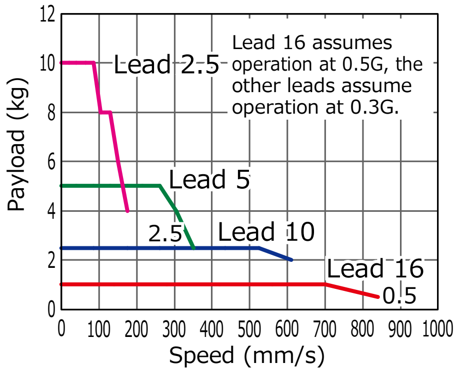


RCP6 rod type (high-output enabled)

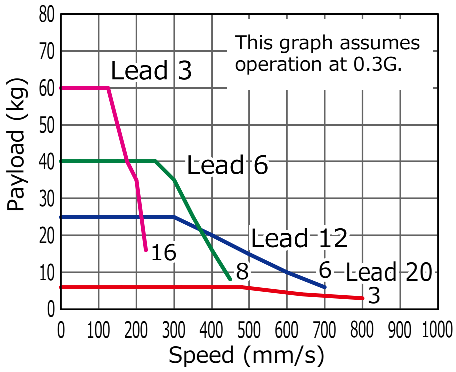
Horizontal mount	Vertical mount

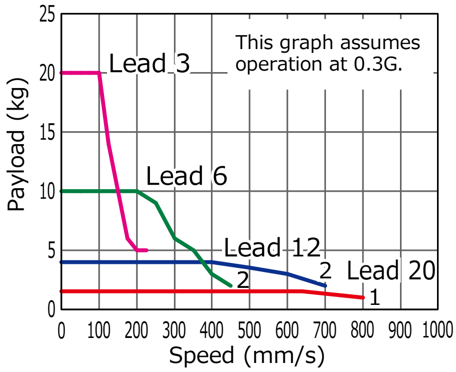
RA4R



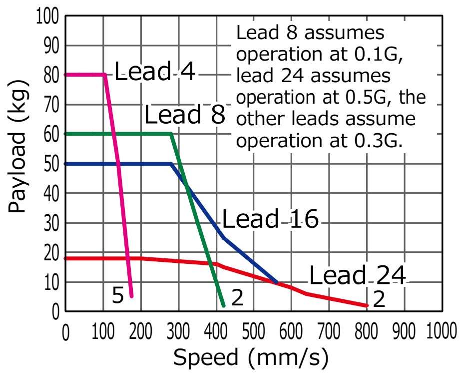


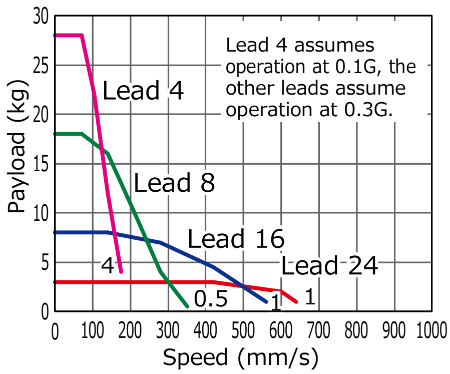
RA6R



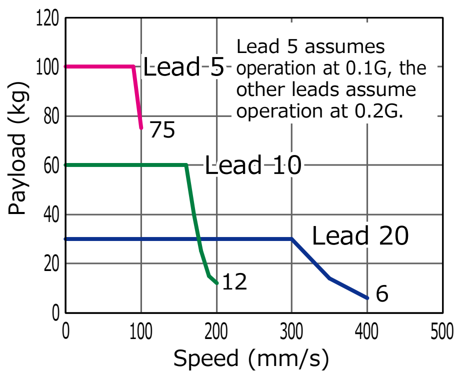


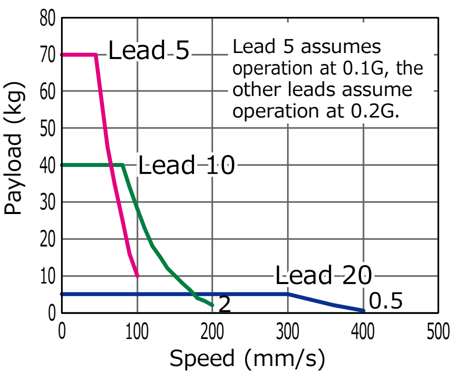
RA7R





RA8R

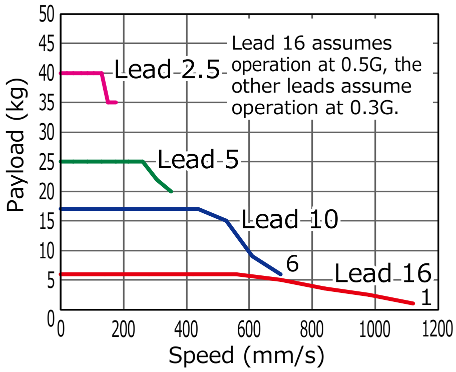
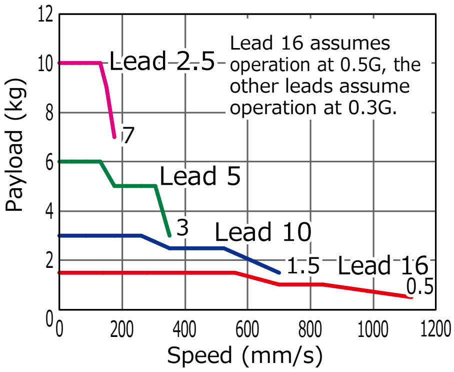
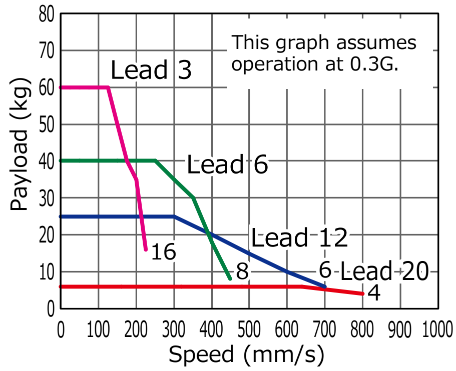
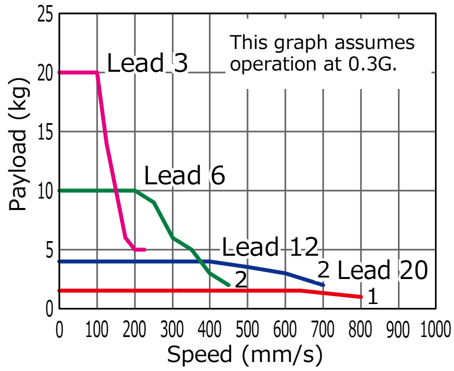
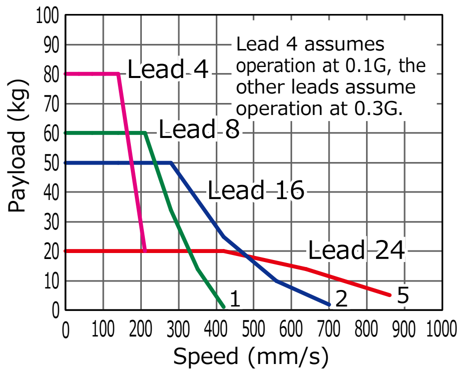
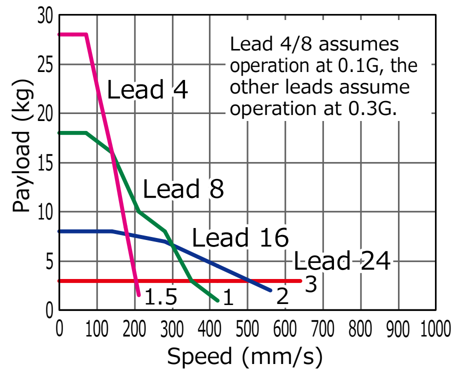
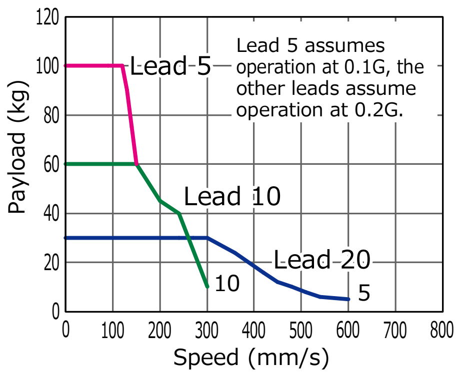
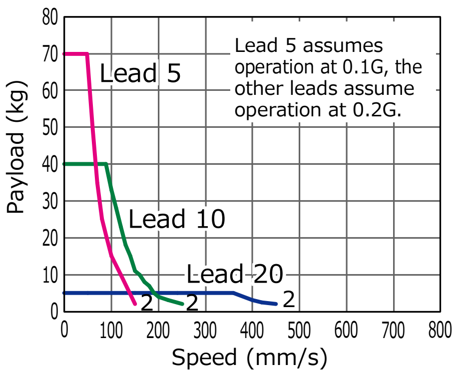




Appendix

Chapter 1 Connectable Actuators

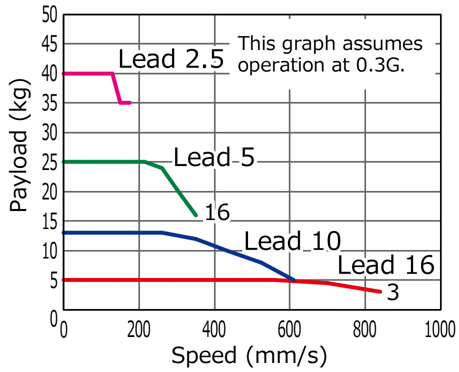
RCP6 radial cylinder type (high-output enabled)

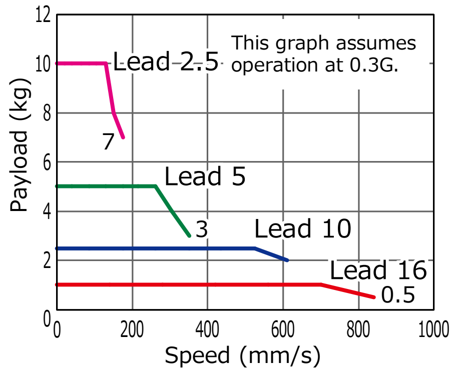
	Horizontal mount	Vertical mount
RRA4C		
RRA6C		
RRA7C		
RRA8C		

RCP6 radial cylinder type (high-output enabled)

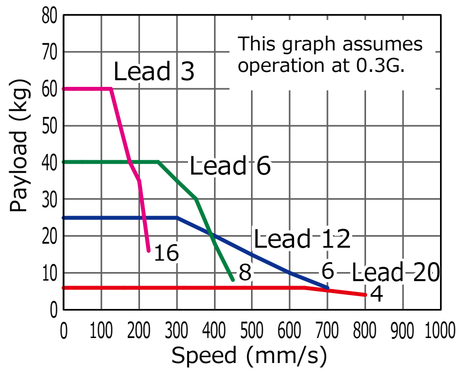
Horizontal mount | **Vertical mount**

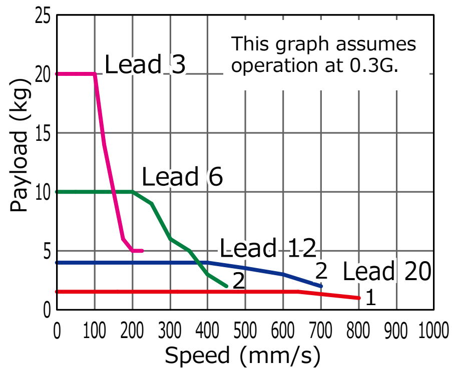
RRA4R



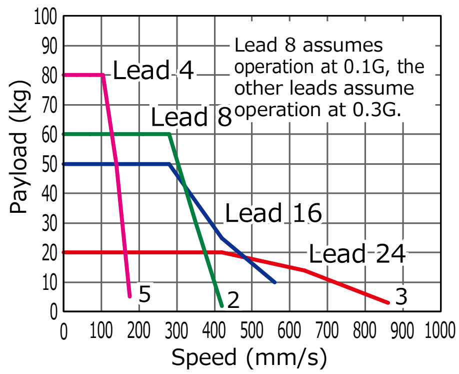


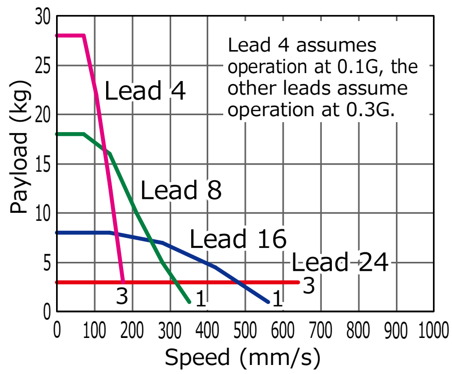
RRA6R



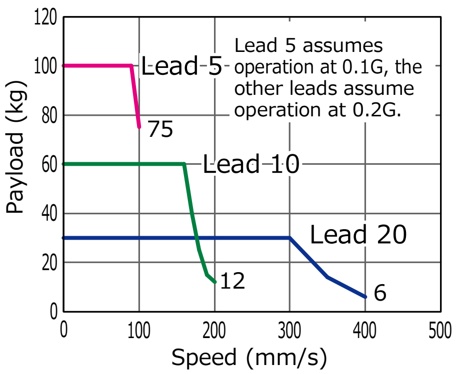


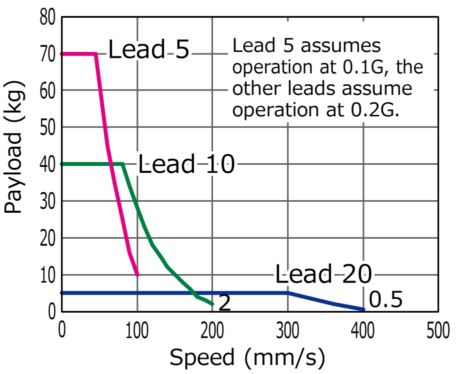
RRA7R





RRA8R





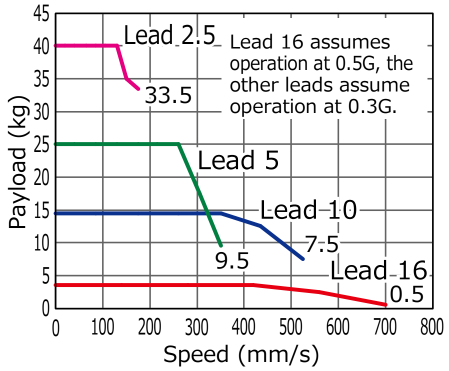
Appendix

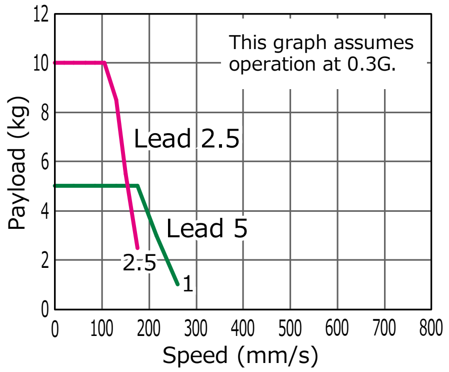
Chapter 1 Connectable Actuators

RCP6 wide radial cylinder type (high-output enabled)

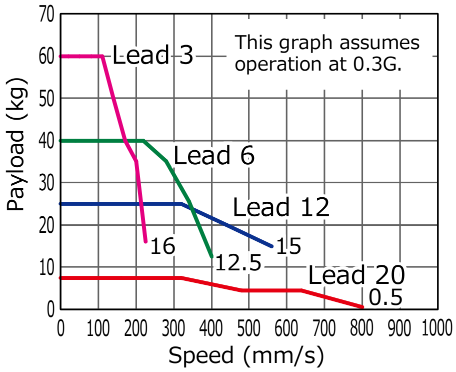
	Horizontal mount	Vertical mount

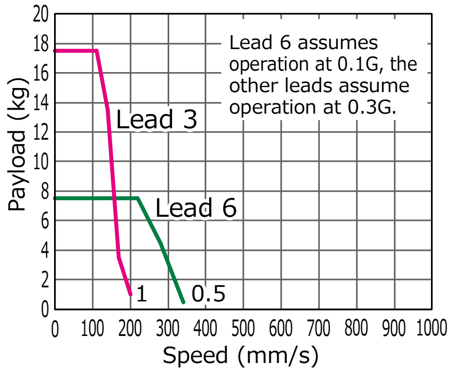
WRA10C



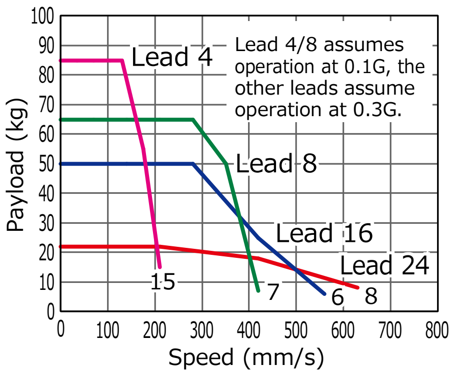


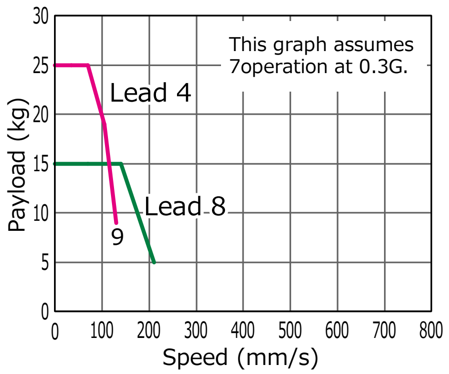
WRA12C



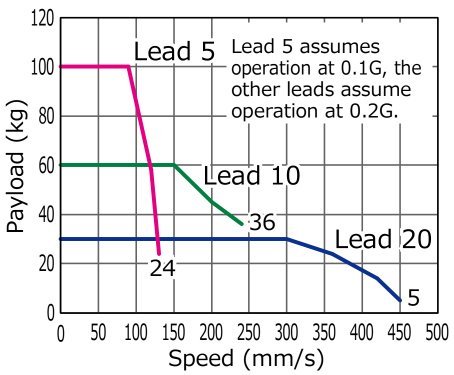


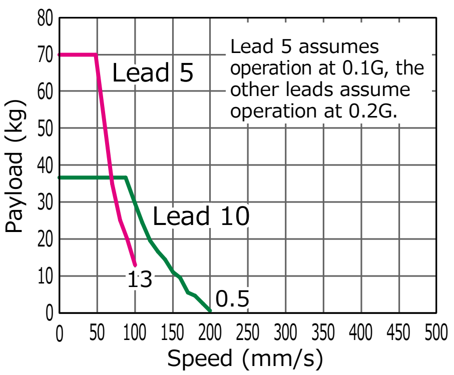
WRA14C





WRA16C

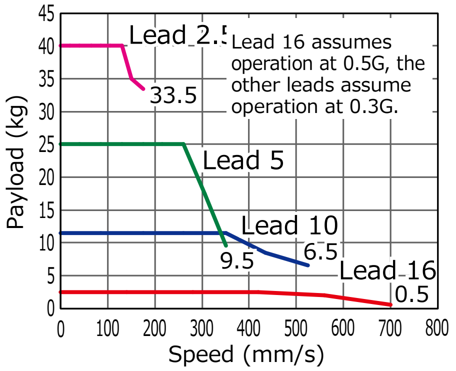


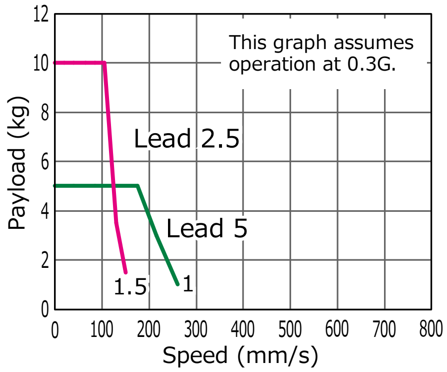


RCP6 wide radial cylinder type (high-output enabled)

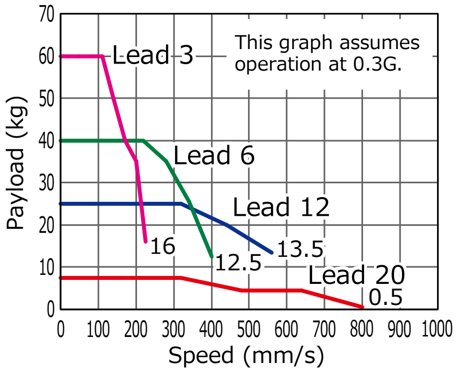
	Horizontal mount	Vertical mount

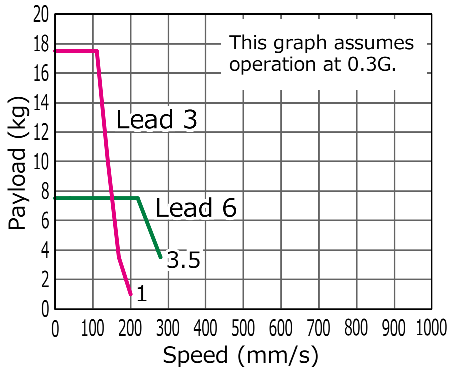
WRA10R



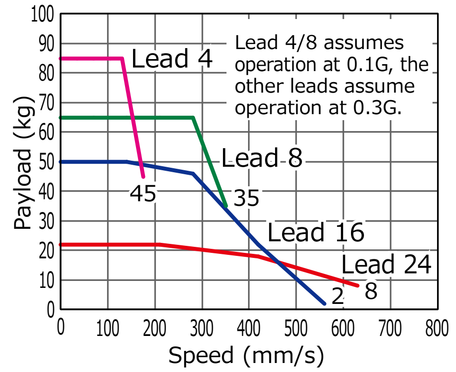


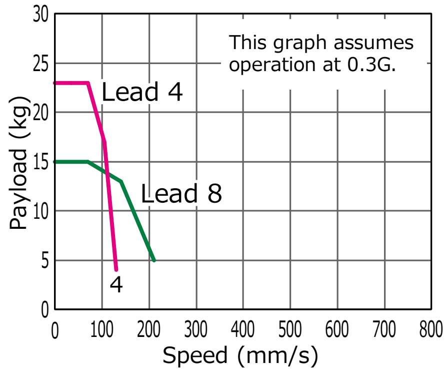
WRA12R



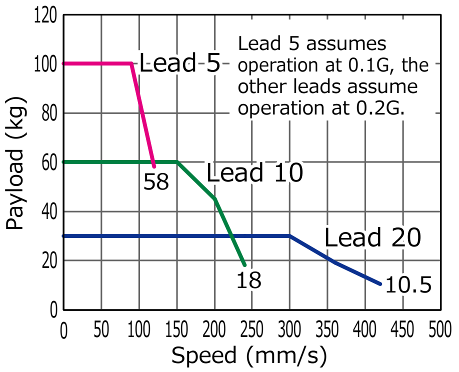


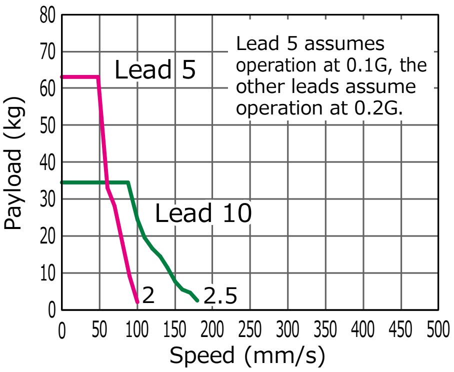
WRA14R





WRA16R

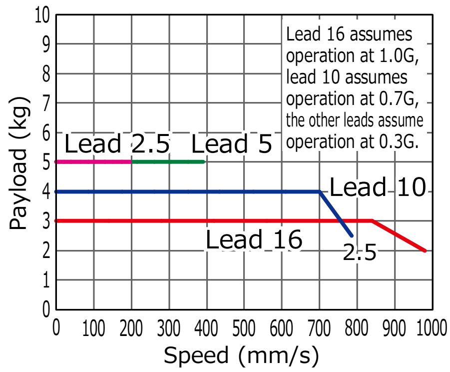


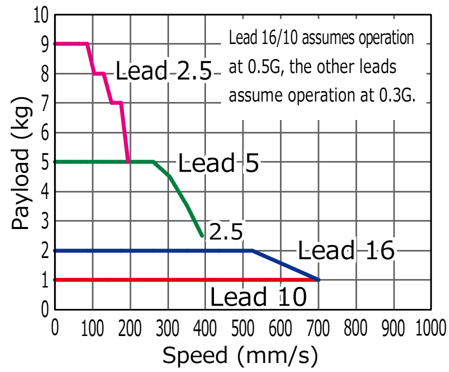


RCP6 table type (high-output enabled)

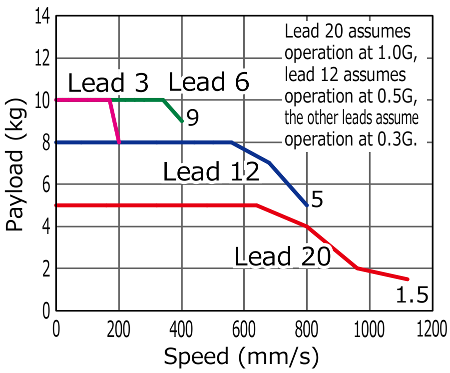
Horizontal mount	Vertical mount

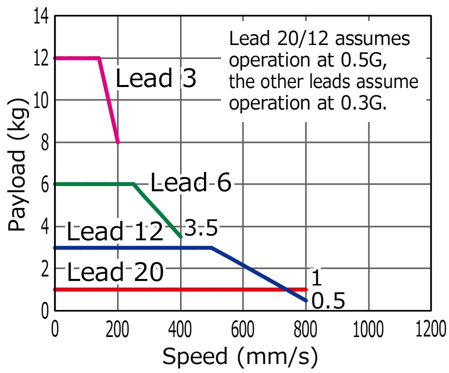
TA4C (Single Block Specifications)



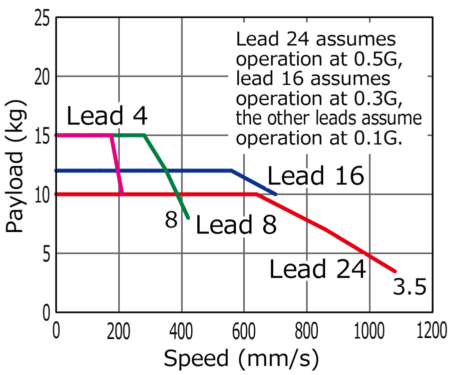


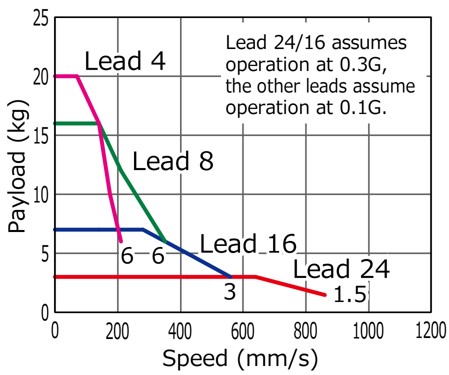
TA6C (Single Block Specifications)



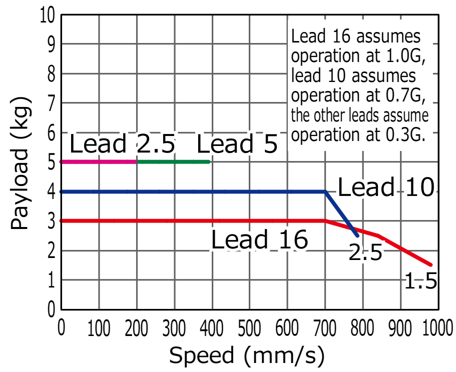
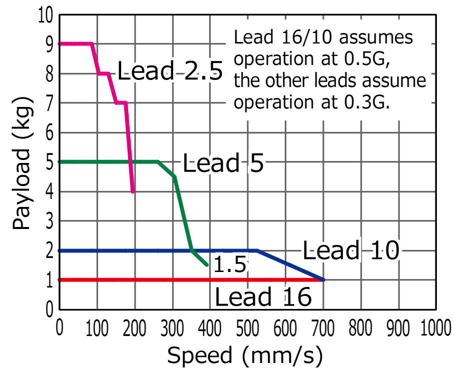
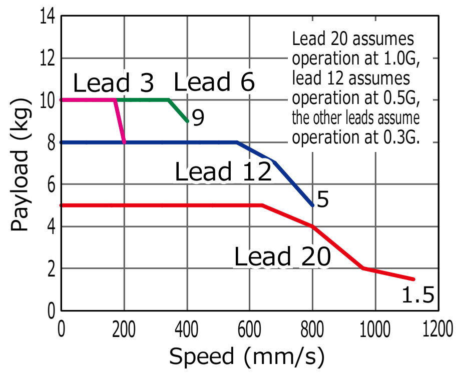
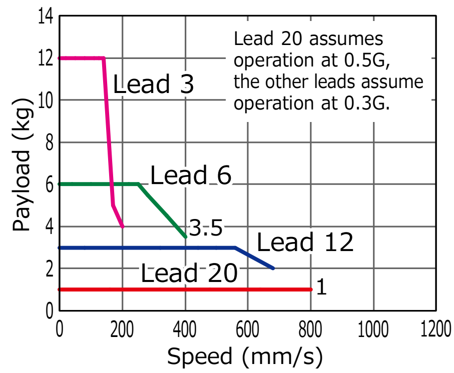
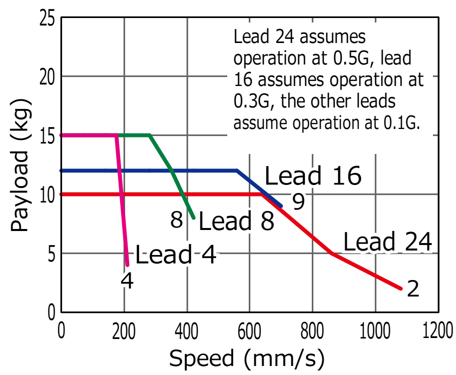
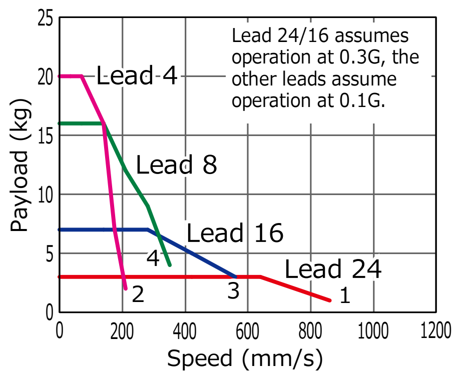


TA7C (Single Block Specifications)





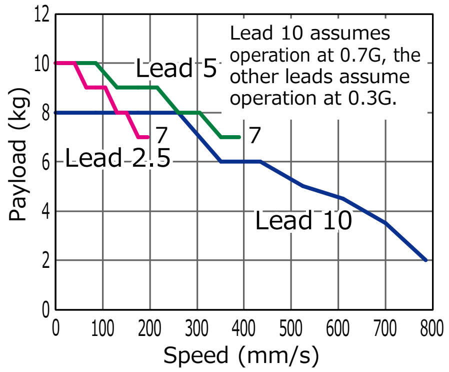
RCP6 table type (high-output enabled)

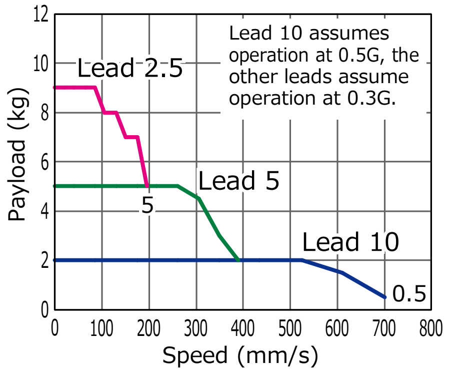
	Horizontal mount	Vertical mount
TA4R (Single Block Specifications)		
TA6R (Single Block Specifications)		
TA7R (Single Block Specifications)		

RCP6 table type (high-output enabled)

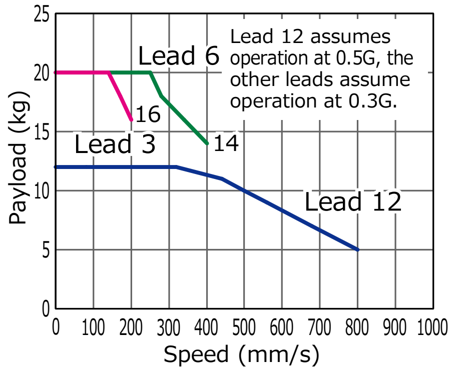
Horizontal mount | **Vertical mount**

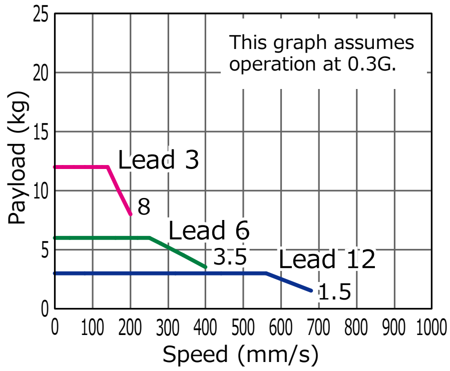
TA4C (Double Block Specification)



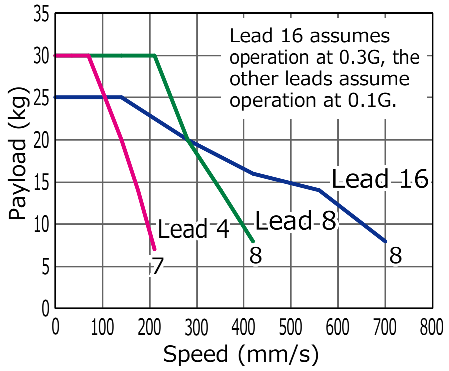


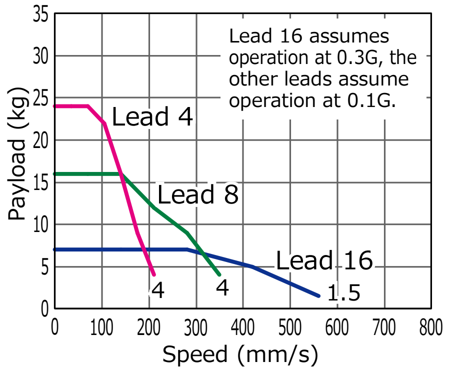
TA6C (Double Block Specification)





TA7C (Double Block Specification)

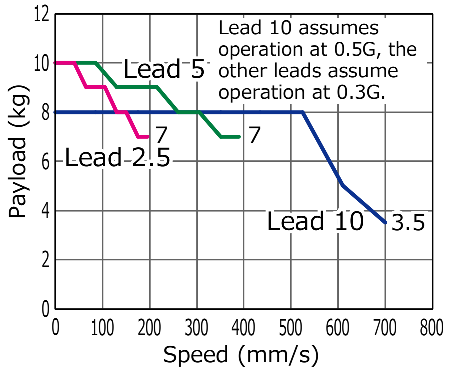


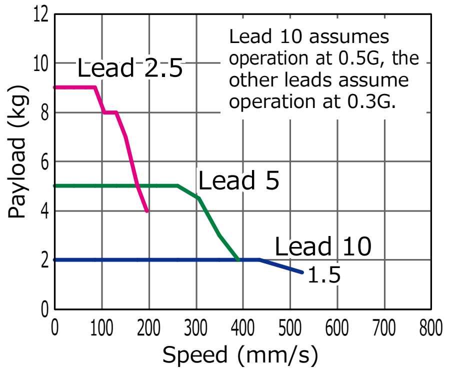


RCP6 table type (high-output enabled)

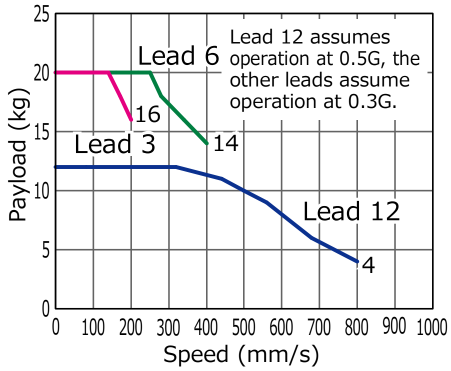
	Horizontal mount	Vertical mount

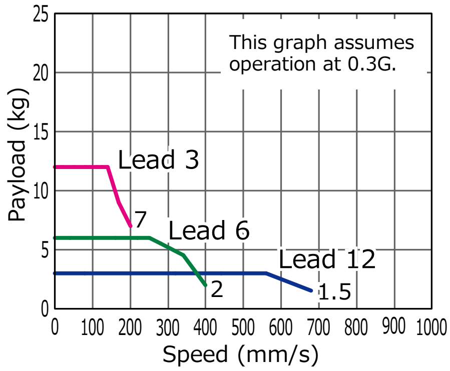
TA4R (Double Block Specification)



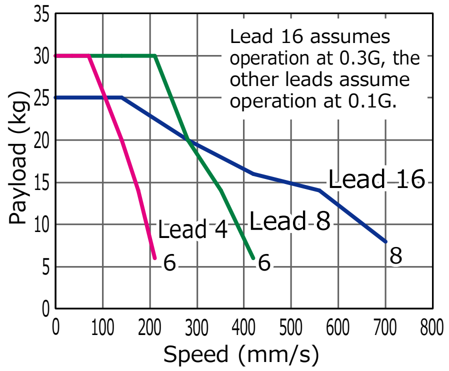


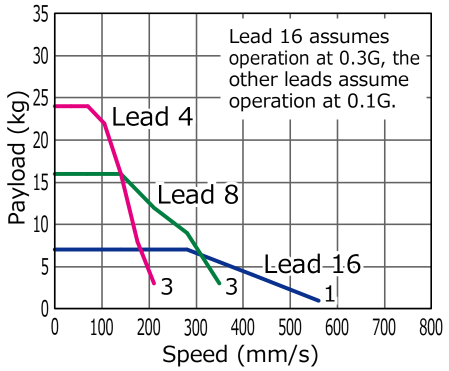
TA6R (Double Block Specification)





TA7R (Double Block Specification)





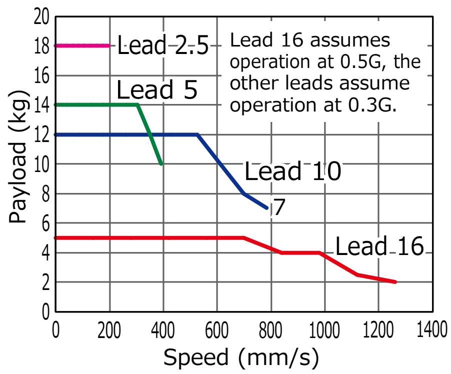
Appendix

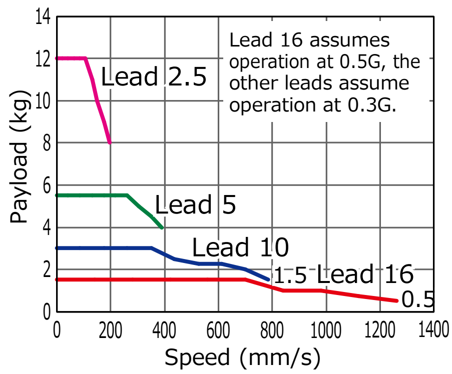
Chapter 1 Connectable Actuators

RCP6CR clean specification slider type (high-output enabled)

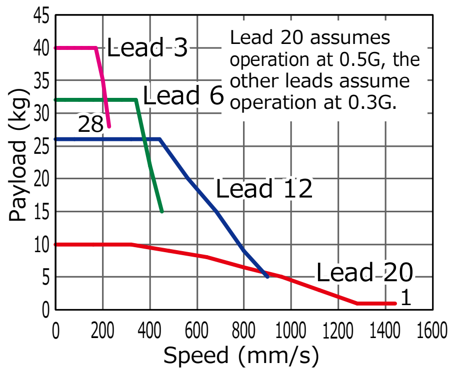
Horizontal mount	Vertical mount

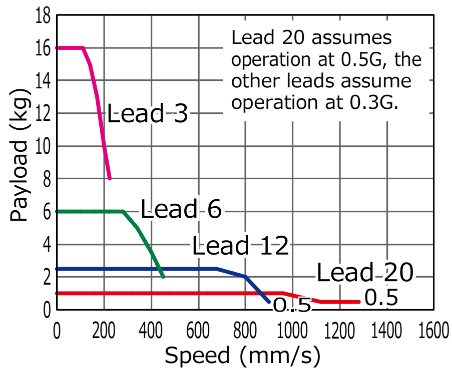
SA4C



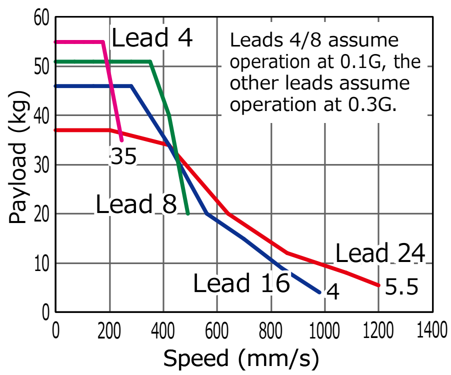


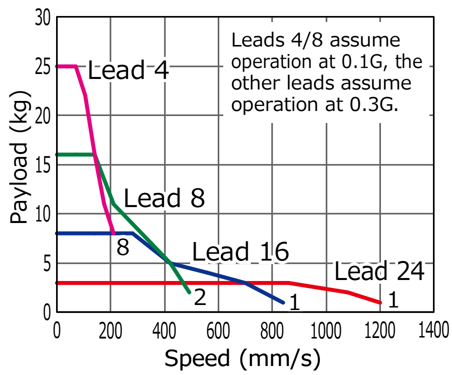
SA6C



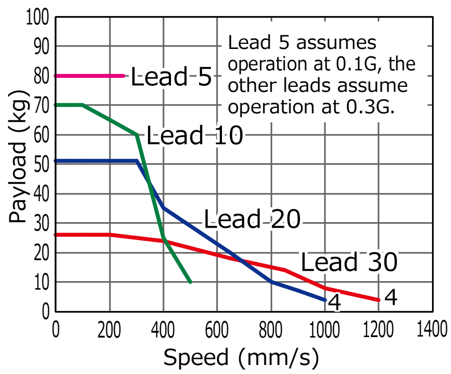


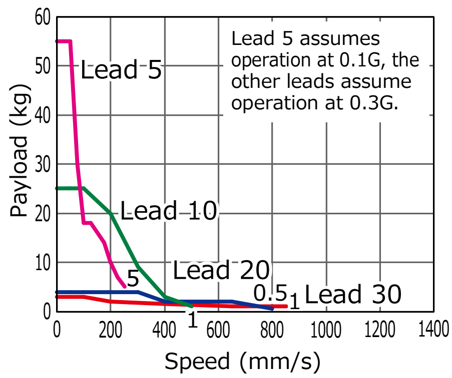
SA7C





SA8C

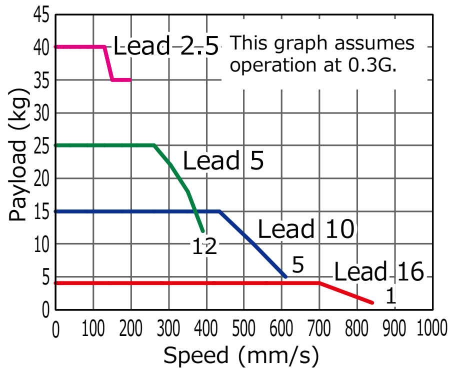


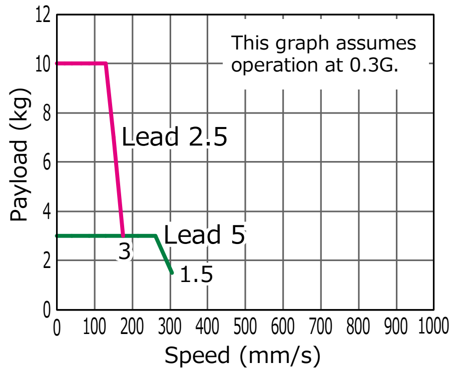


RCP6CR clean specification wide slider type (high-output enabled)

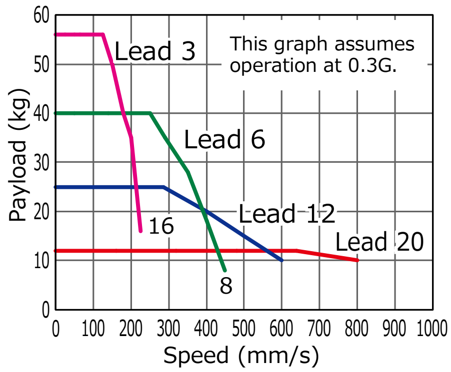
Horizontal mount | Vertical mount

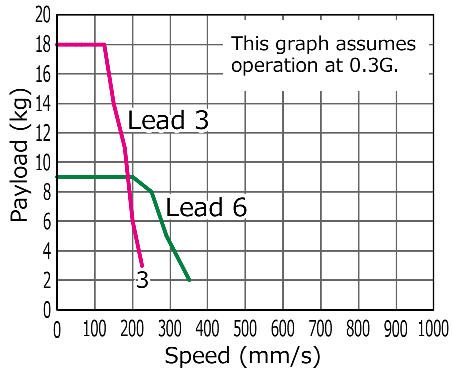
WSA10C



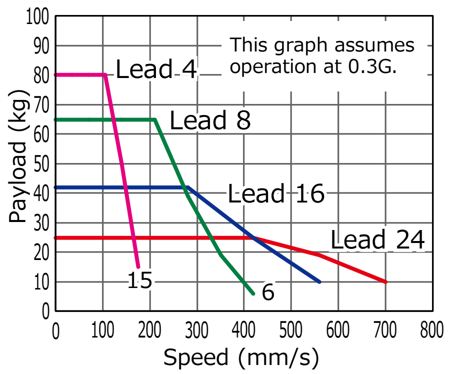


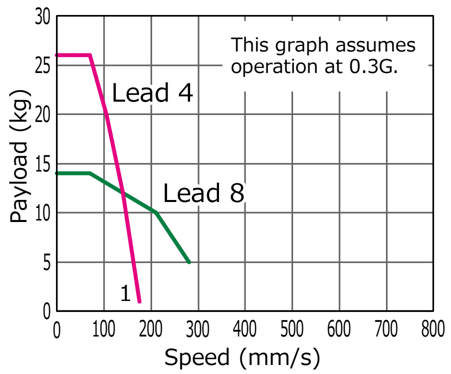
WSA12C



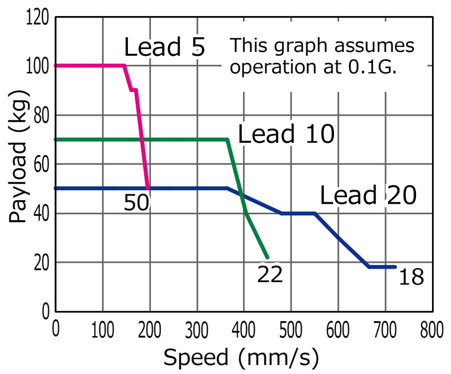


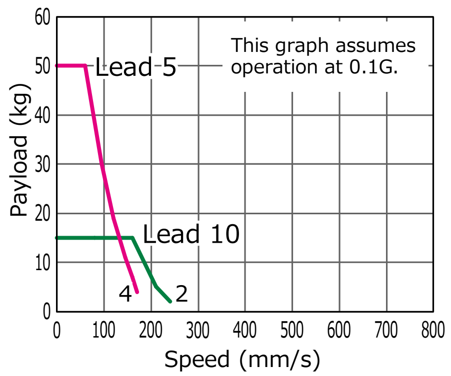
WSA14C





WSA16C





Appendix

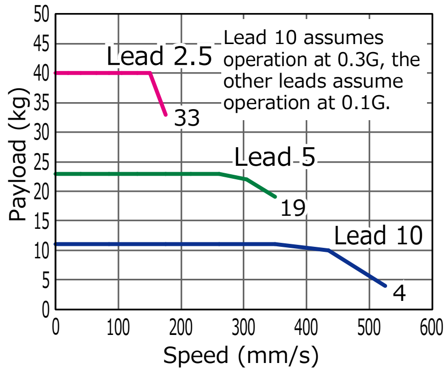
Chapter 1 Connectable Actuators

RCP6W dust-proof/splash-proof rod type (high-output enabled)

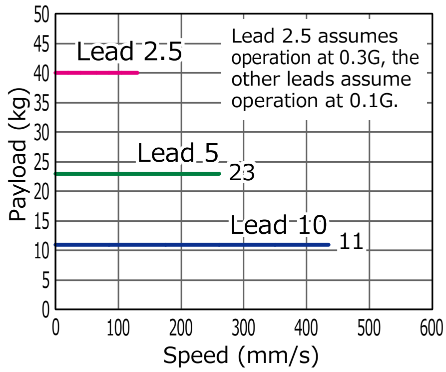
RA4C

Horizontal mount

When ambient temperature exceeds 5°C

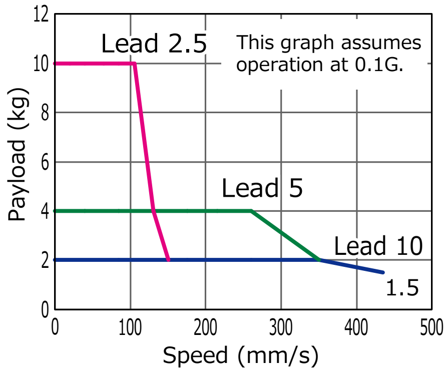


When ambient temperature is 5°C or below

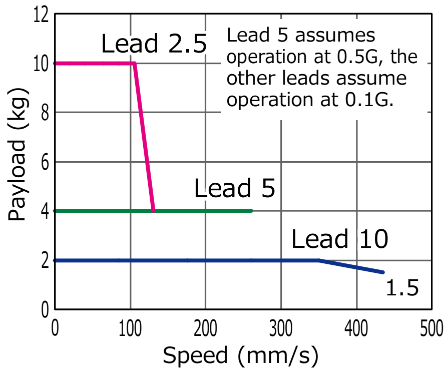


Vertical mount

When ambient temperature exceeds 5°C



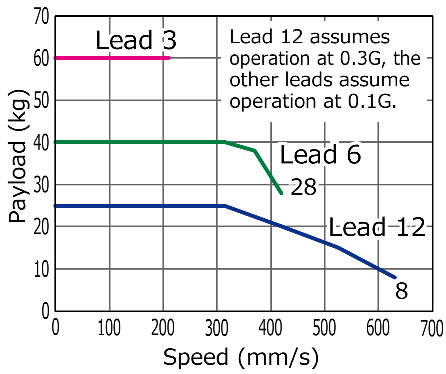
When ambient temperature is 5°C or below



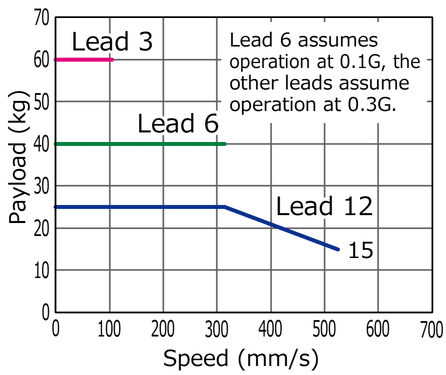
RA6C

Horizontal mount

When ambient temperature exceeds 5°C

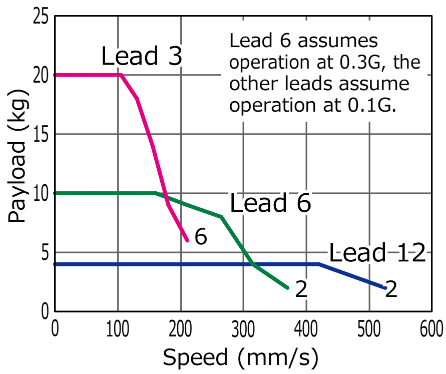


When ambient temperature is 5°C or below

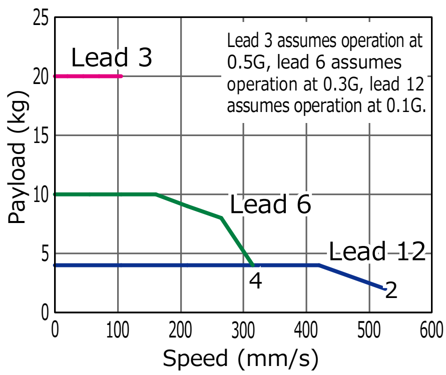


Vertical mount

When ambient temperature exceeds 5°C



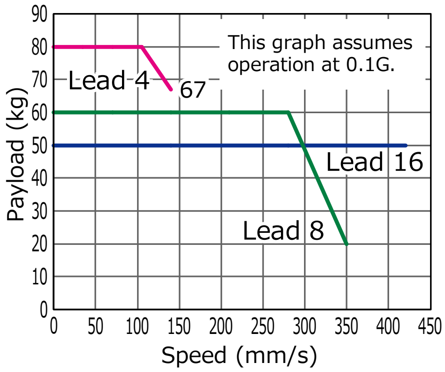
When ambient temperature is 5°C or below



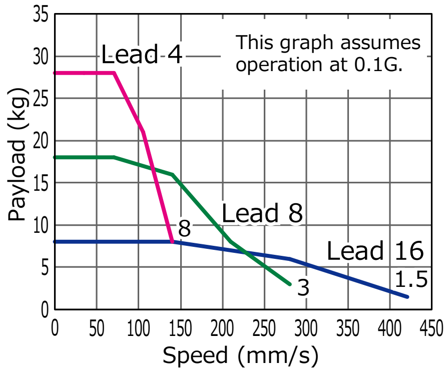
RCP6W dust-proof/splash-proof rod type (high-output enabled)

Horizontal mount	Vertical mount

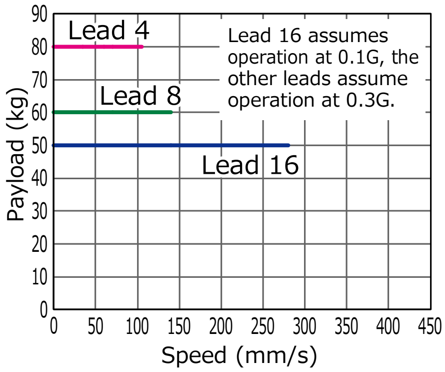
When ambient temperature exceeds 5°C



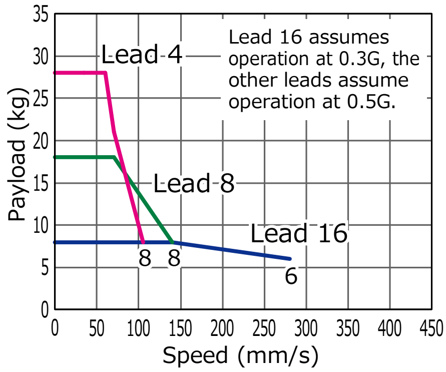
When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below



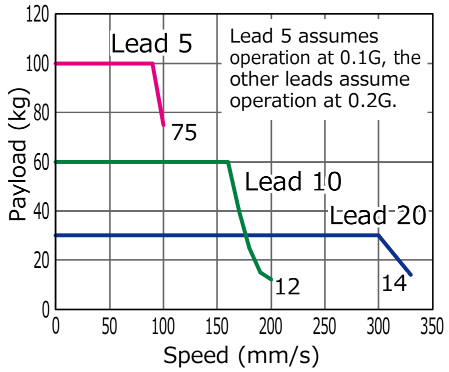
When ambient temperature is 5°C or below



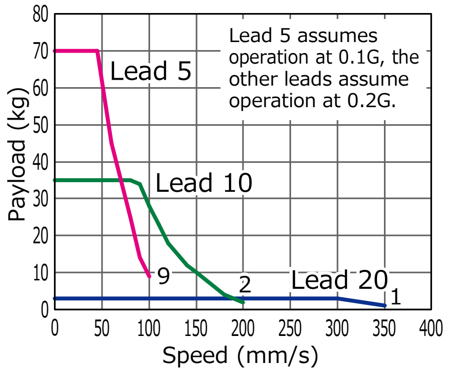
RCP6W dust-proof/splash-proof rod type

Horizontal mount	Vertical mount

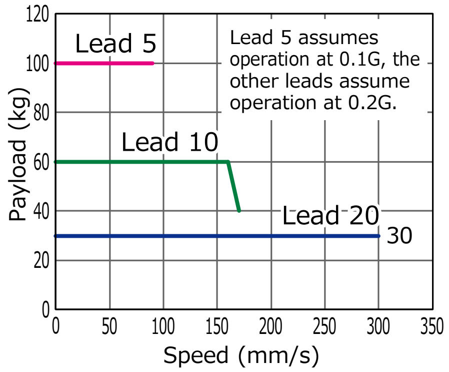
When ambient temperature exceeds 5°C



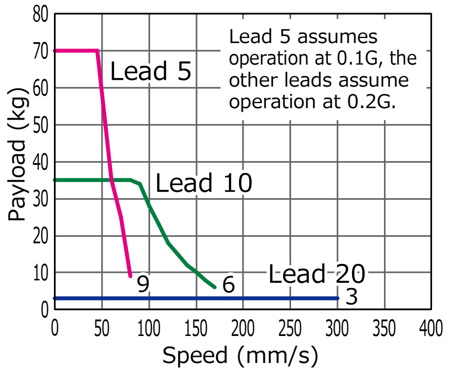
When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below



When ambient temperature is 5°C or below

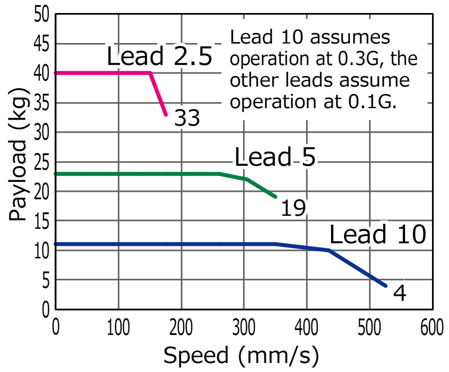


RCP6W dust-proof/splash-proof rod type (high-output enabled)

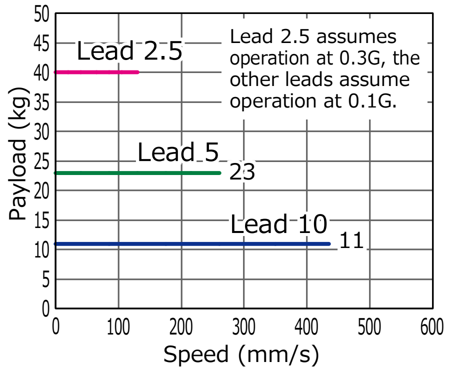
RA4R

Horizontal mount

When ambient temperature exceeds 5°C

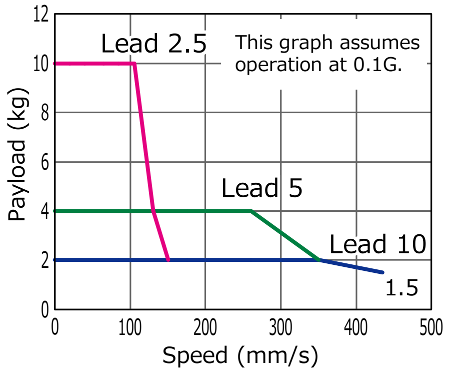


When ambient temperature is 5°C or below

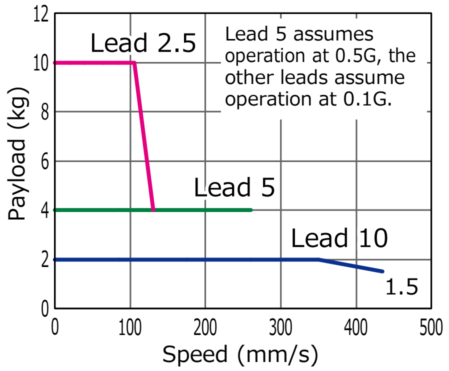


Vertical mount

When ambient temperature exceeds 5°C



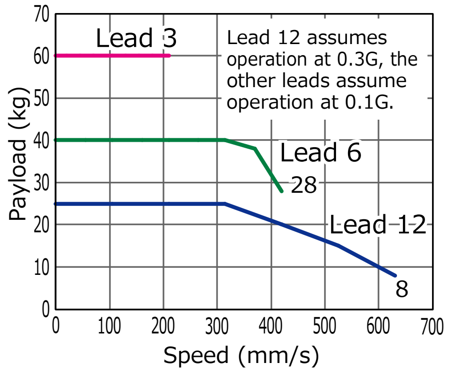
When ambient temperature is 5°C or below



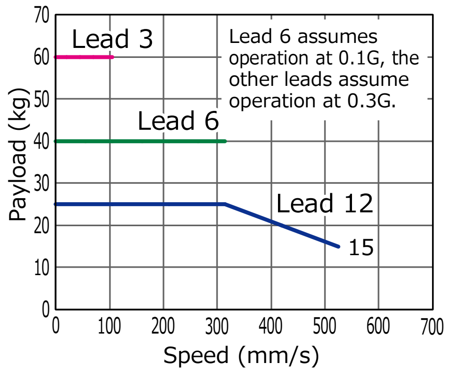
RA6R

Horizontal mount

When ambient temperature exceeds 5°C

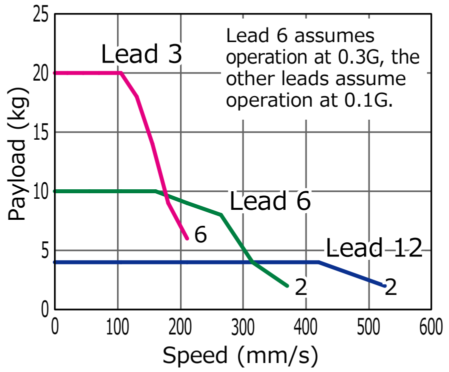


When ambient temperature is 5°C or below

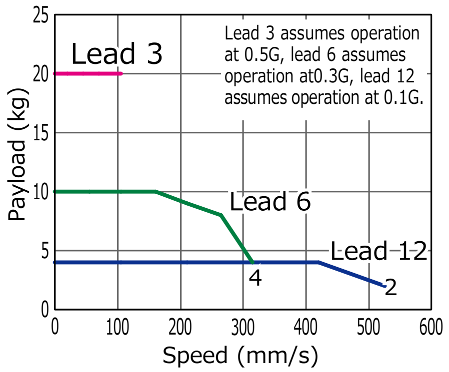


Vertical mount

When ambient temperature exceeds 5°C



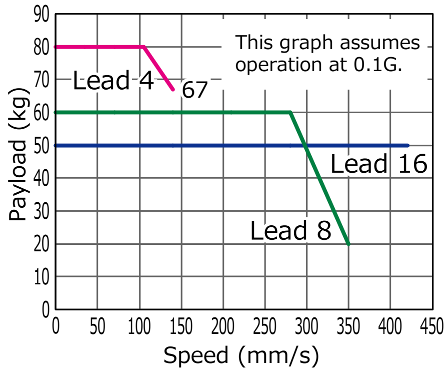
When ambient temperature is 5°C or below



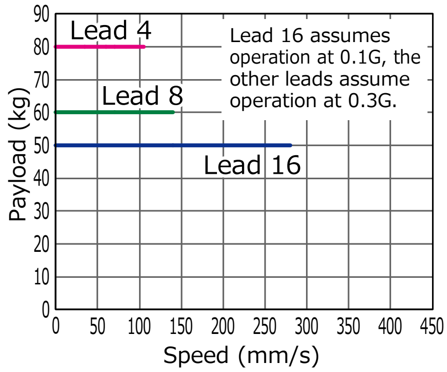
RCP6W dust-proof/splash-proof rod type (high-output enabled)

Horizontal mount

When ambient temperature exceeds 5°C

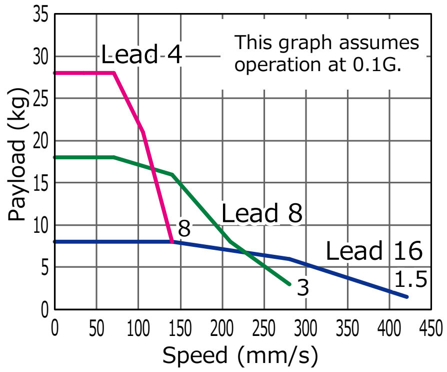


When ambient temperature is 5°C or below

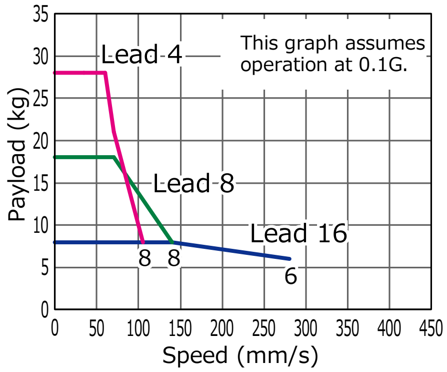


Vertical mount

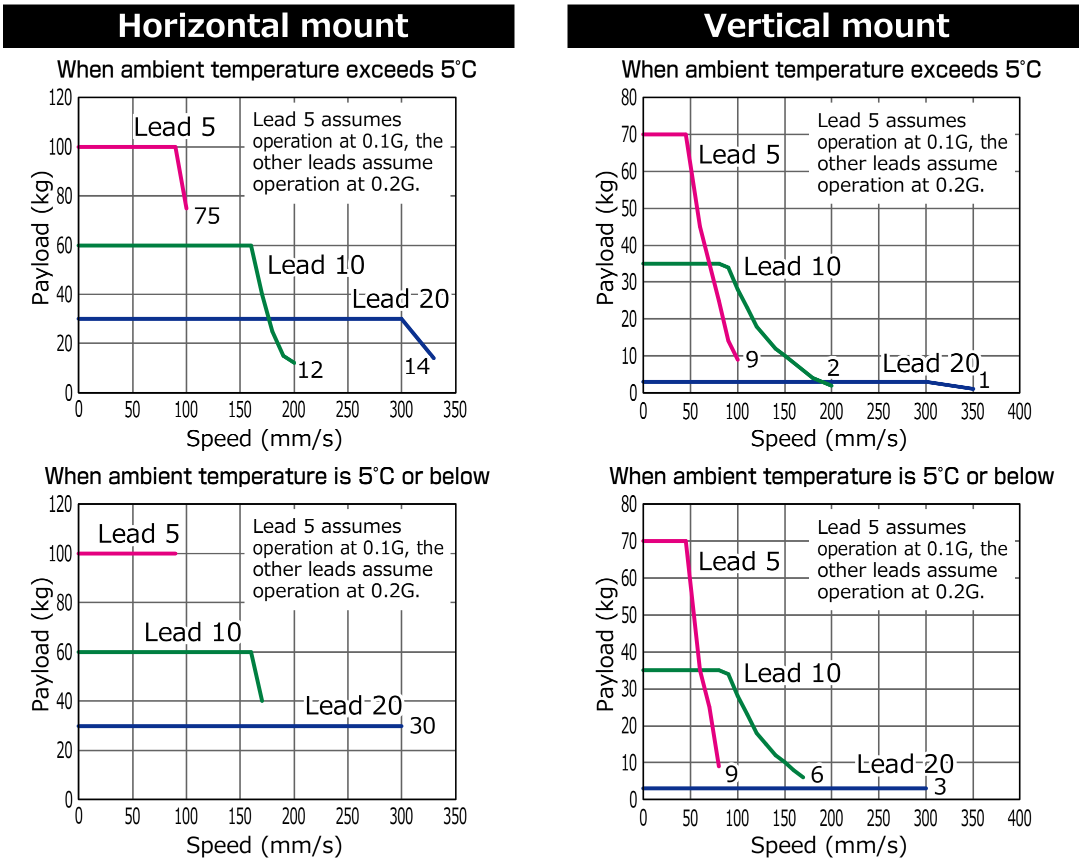
When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below



RCP6W dust-proof/splash-proof rod type



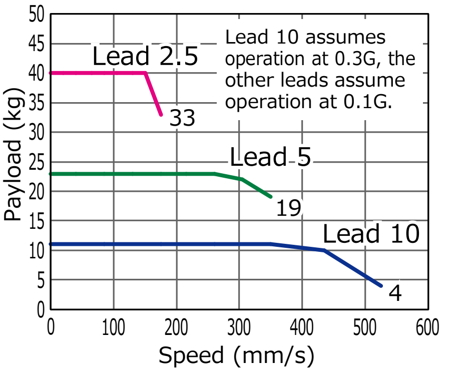
RA8R

RCP6W dust-proof/splash-proof radial cylinder type (high-output enabled)

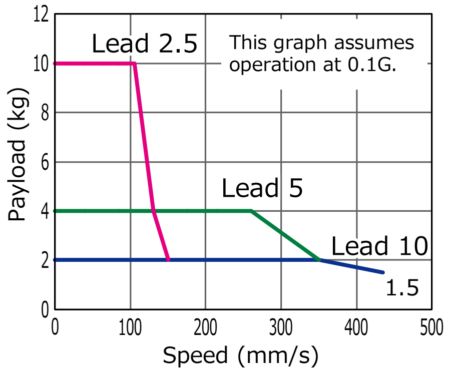
Horizontal mount	Vertical mount

RRA4C

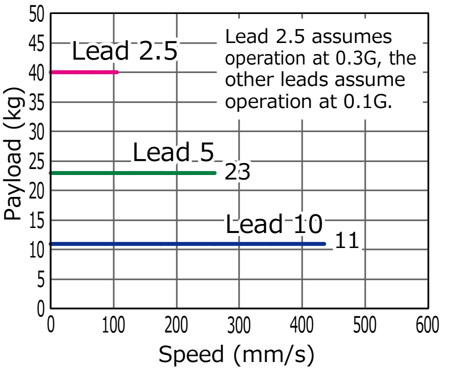
When ambient temperature exceeds 5°C (Horizontal mount)



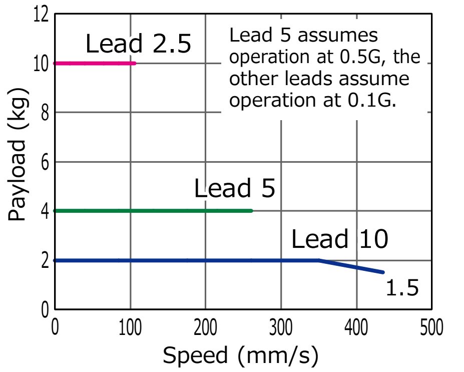
When ambient temperature exceeds 5°C (Vertical mount)



When ambient temperature is 5°C or below (Horizontal mount)

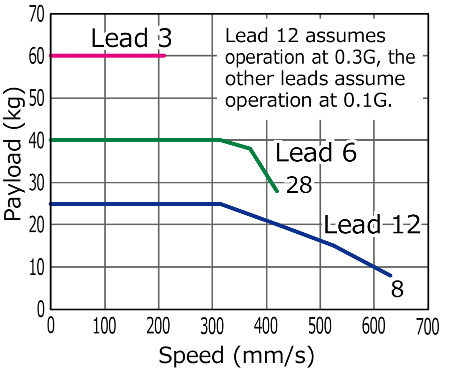


When ambient temperature is 5°C or below (Vertical mount)

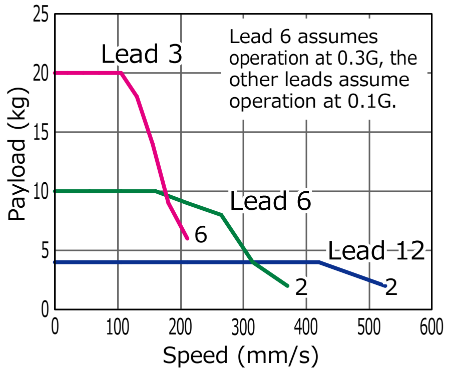


RRA6C

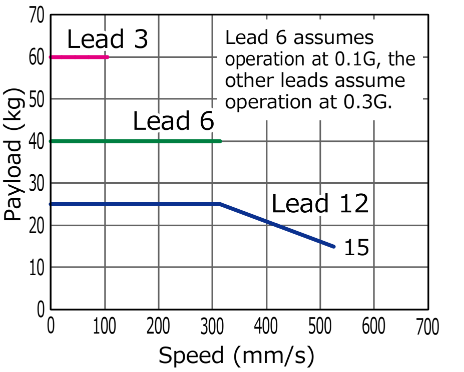
When ambient temperature exceeds 5°C (Horizontal mount)



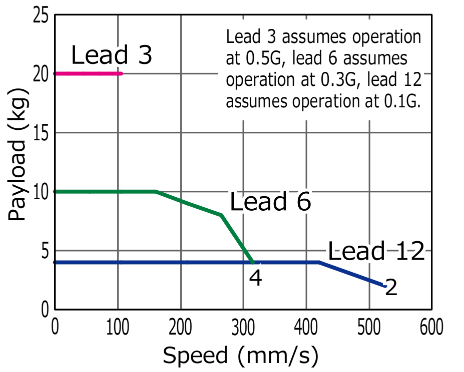
When ambient temperature exceeds 5°C (Vertical mount)



When ambient temperature is 5°C or below (Horizontal mount)



When ambient temperature is 5°C or below (Vertical mount)

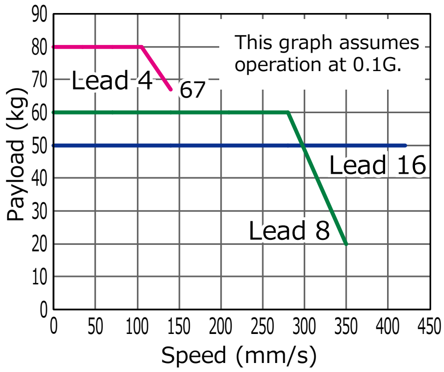


RCP6W dust-proof/splash-proof radial cylinder type (high-output enabled)

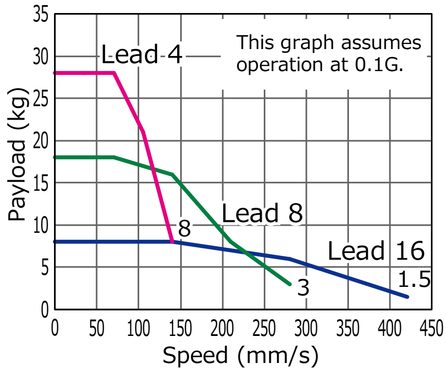
RRA7C

Horizontal mount	Vertical mount

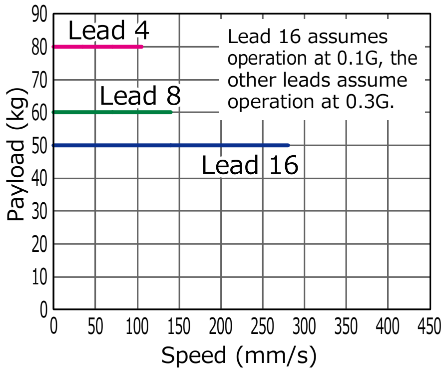
When ambient temperature exceeds 5°C



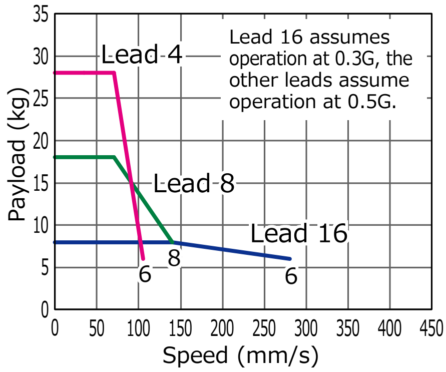
When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below



When ambient temperature is 5°C or below



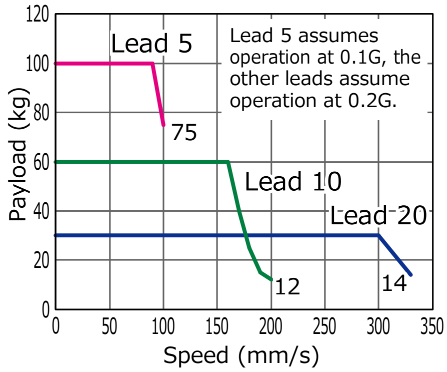
Appendix

Chapter 1 Connectable Actuators

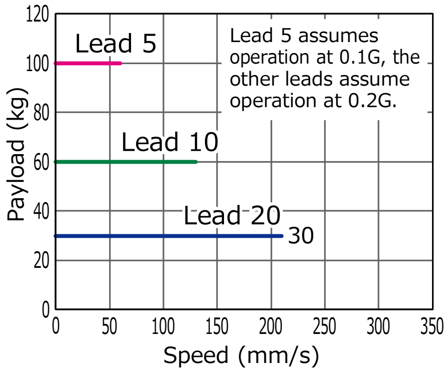
RCP6W dust-proof/splash-proof radial cylinder type

Horizontal mount

When ambient temperature exceeds 5°C

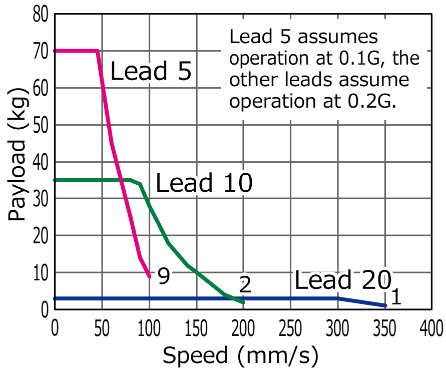


When ambient temperature is 5°C or below

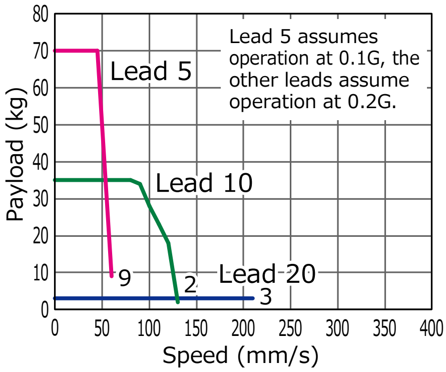


Vertical mount

When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below

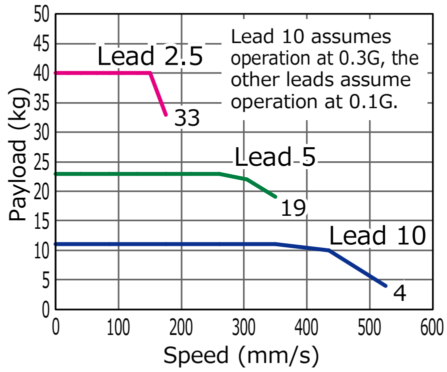


RCP6W dust-proof/splash-proof radial cylinder type (high-output enabled)

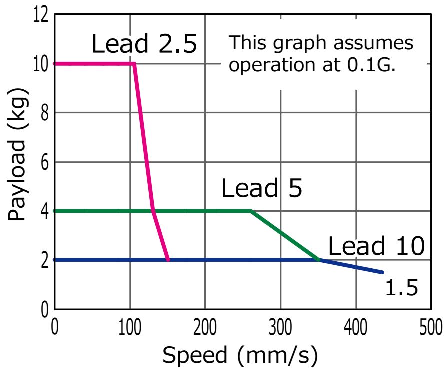
Horizontal mount	Vertical mount

RRA4R

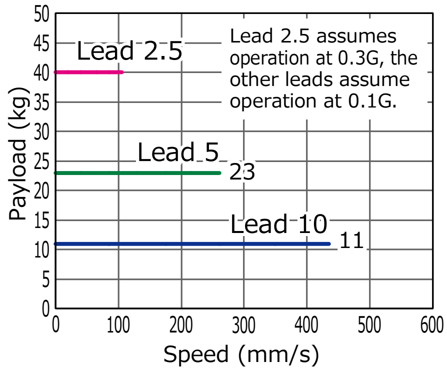
When ambient temperature exceeds 5°C



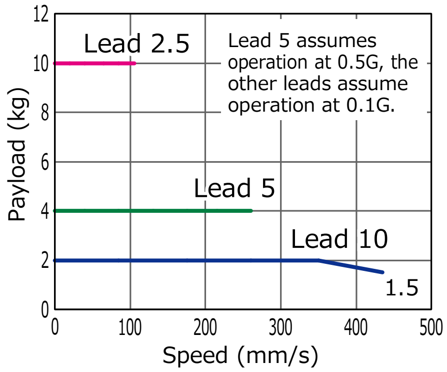
When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below

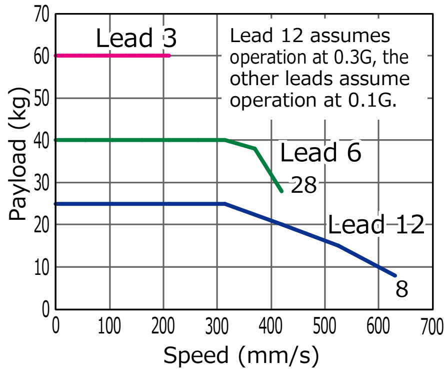


When ambient temperature is 5°C or below

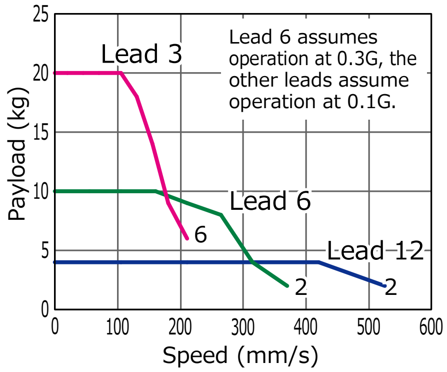


RRA6R

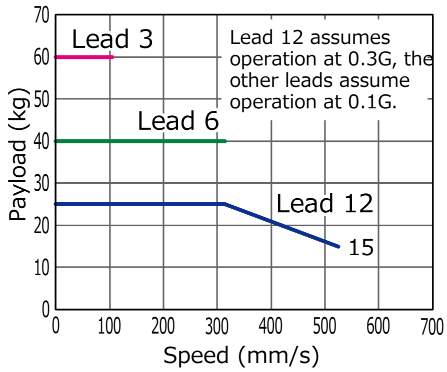
When ambient temperature exceeds 5°C



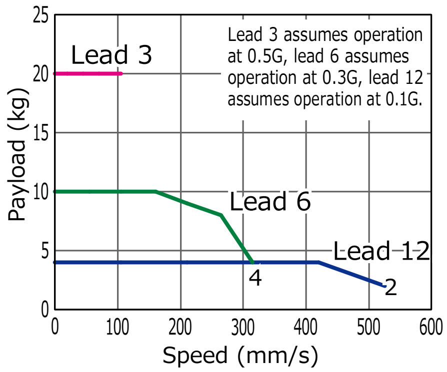
When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below



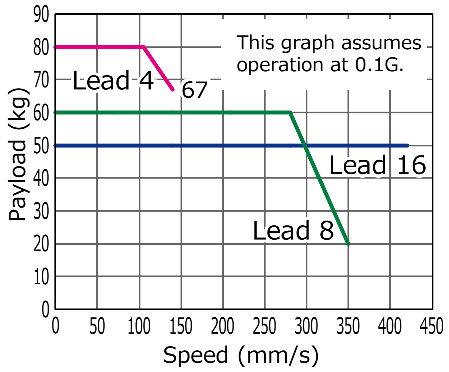
When ambient temperature is 5°C or below



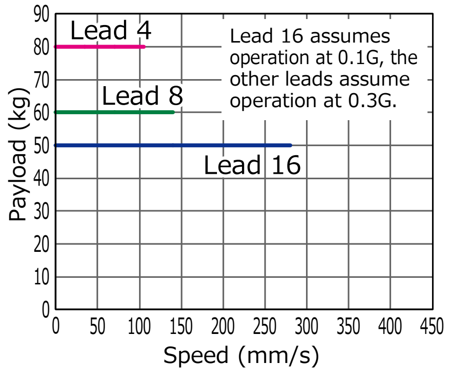
RCP6W dust-proof/splash-proof radial cylinder type (high-output enabled)

Horizontal mount

When ambient temperature exceeds 5°C

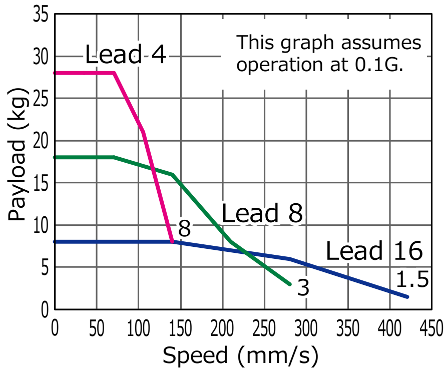


When ambient temperature is 5°C or below

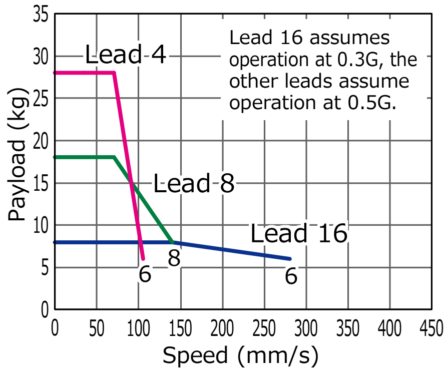


Vertical mount

When ambient temperature exceeds 5°C

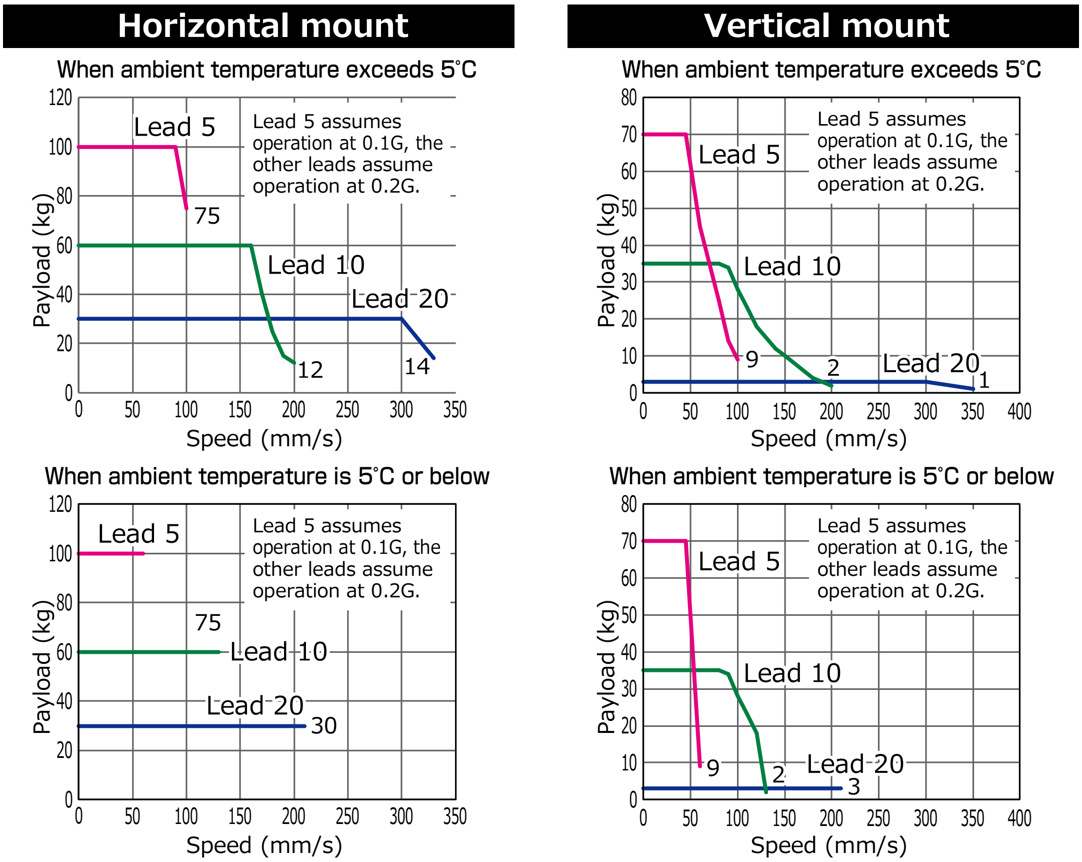


When ambient temperature is 5°C or below



RCP6W dust-proof/splash-proof radial cylinder type

RRA8R



Appendix

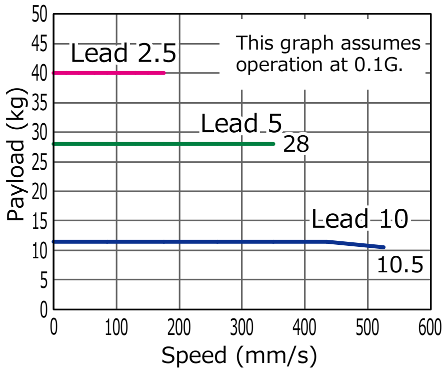
Chapter 1 Connectable Actuators

RCP6W dust-proof/splash-proof wide radial cylinder type (high-output enabled)

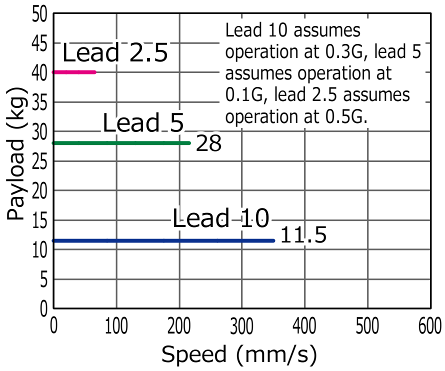
WRA10C

Horizontal mount

When ambient temperature exceeds 5°C

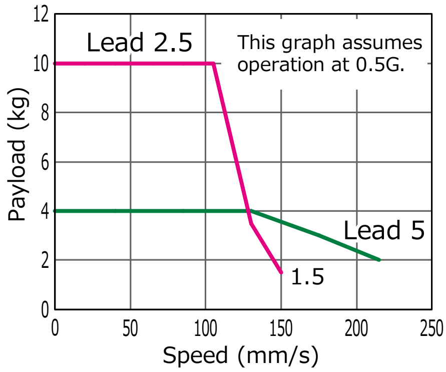


When ambient temperature is 5°C or below

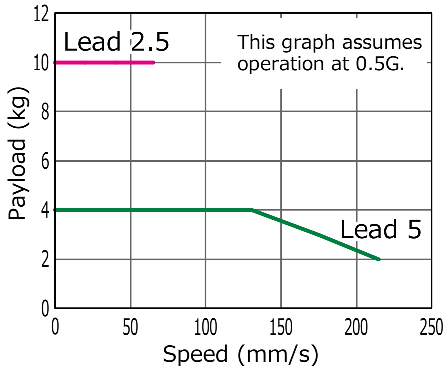


Vertical mount

When ambient temperature exceeds 5°C



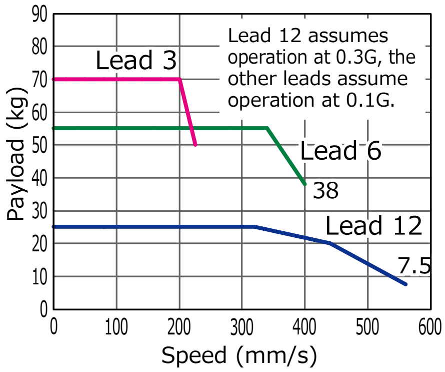
When ambient temperature is 5°C or below



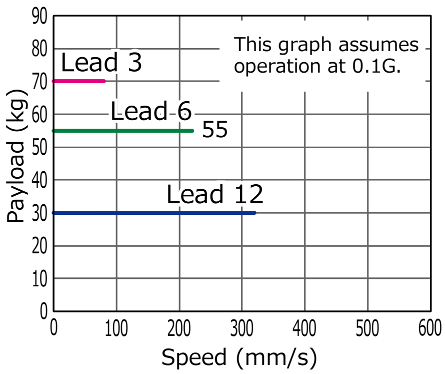
WRA12C

Horizontal mount

When ambient temperature exceeds 5°C

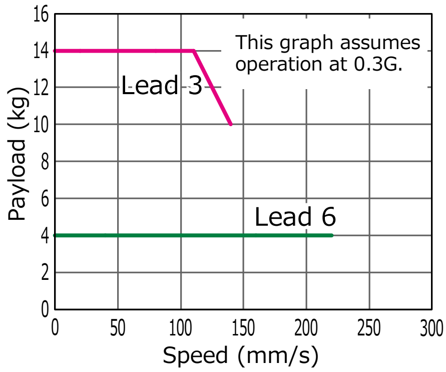


When ambient temperature is 5°C or below

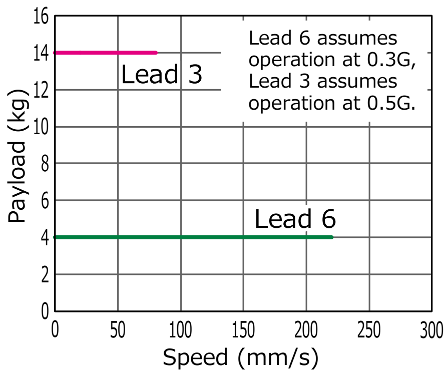


Vertical mount

When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below

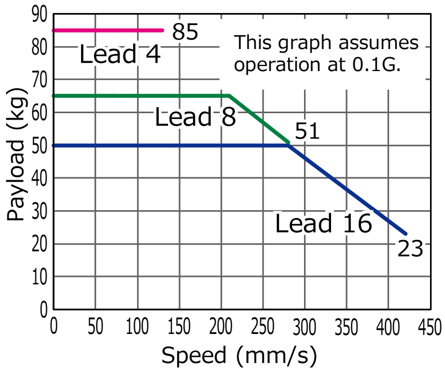


RCP6W dust-proof/splash-proof wide radial cylinder type (high-output enabled)

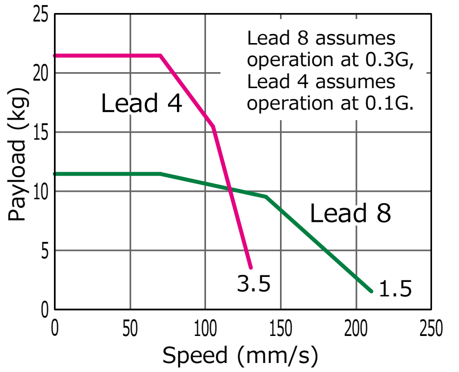
WRA14C

Horizontal mount	Vertical mount

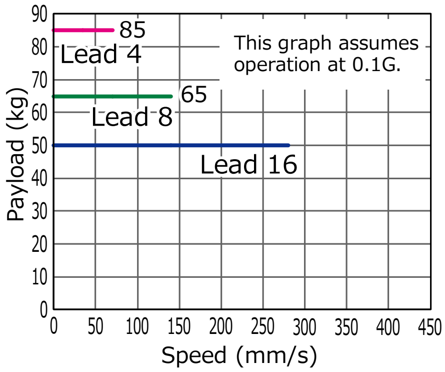
When ambient temperature exceeds 5°C



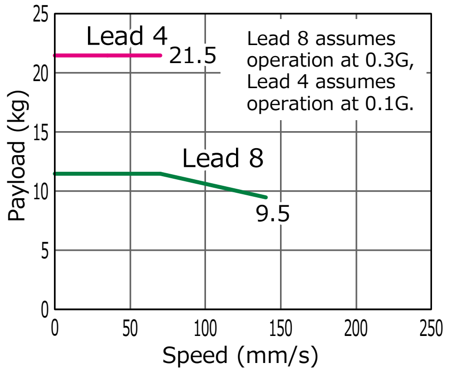
When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below



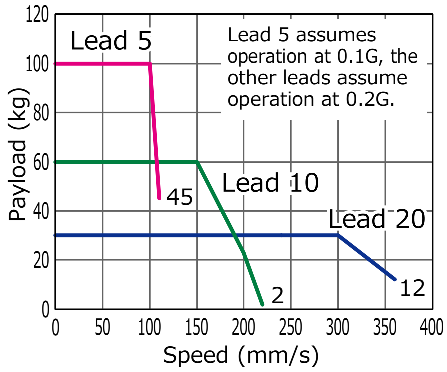
When ambient temperature is 5°C or below



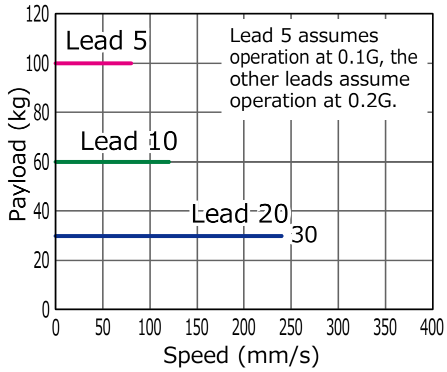
RCP6W dust-proof/splash-proof wide radial cylinder type

Horizontal mount

When ambient temperature exceeds 5°C

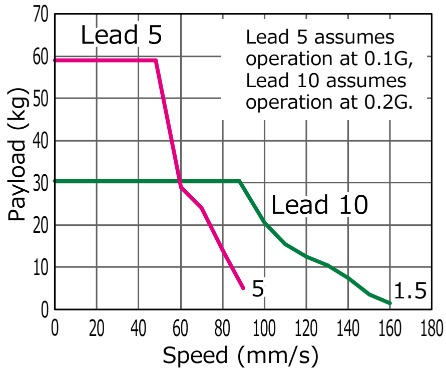


When ambient temperature is 5°C or below

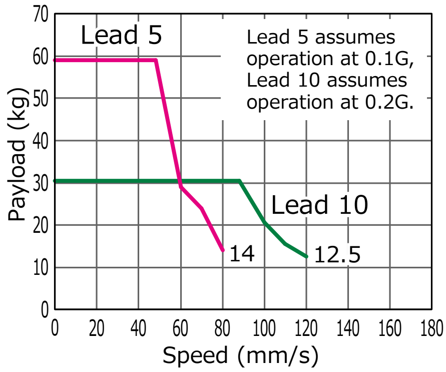


Vertical mount

When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below



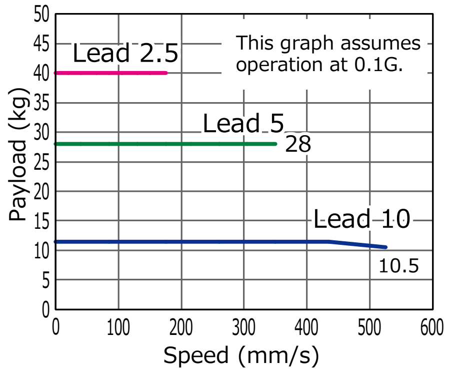
WRA16C

RCP6W dust-proof/splash-proof wide radial cylinder type (high-output enabled)

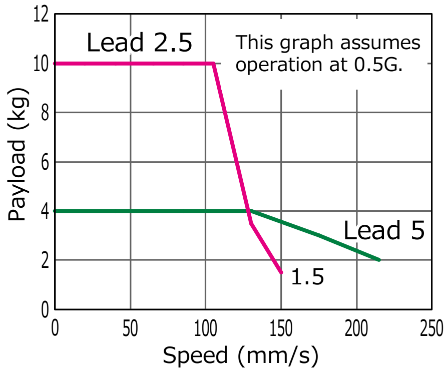
	Horizontal mount	Vertical mount

WRA10R

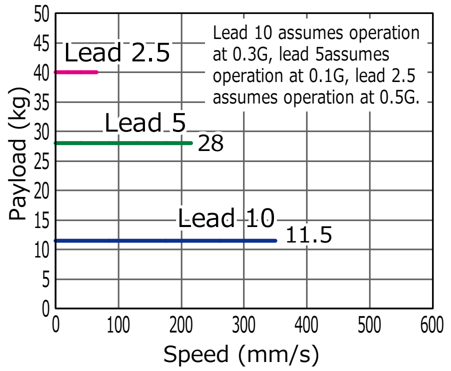
When ambient temperature exceeds 5°C



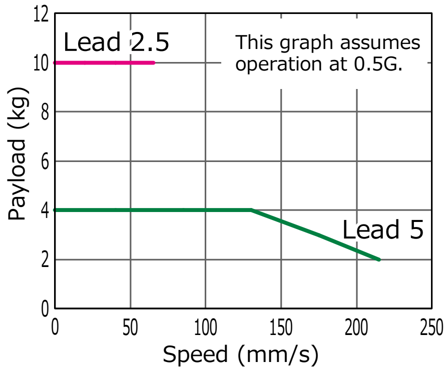
When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below

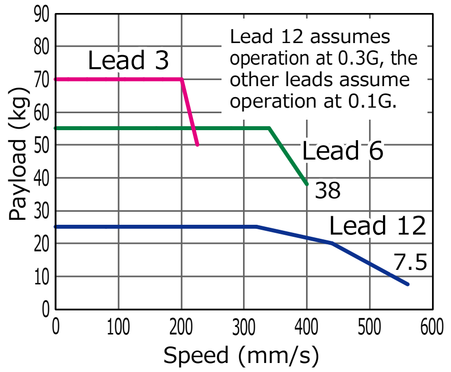


When ambient temperature is 5°C or below

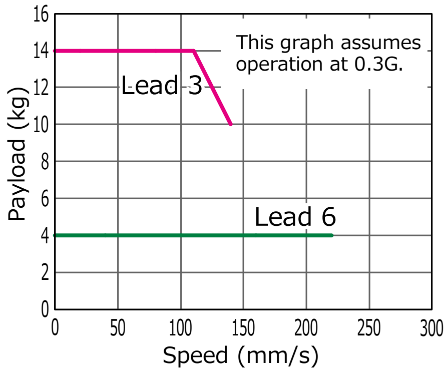


WRA12R

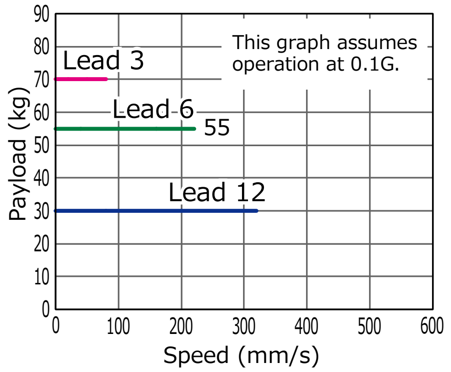
When ambient temperature exceeds 5°C



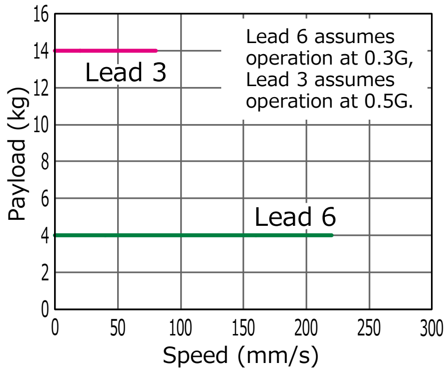
When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below



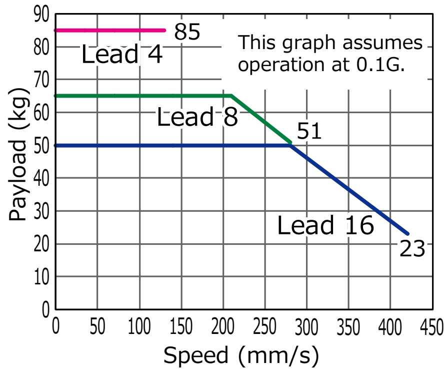
When ambient temperature is 5°C or below



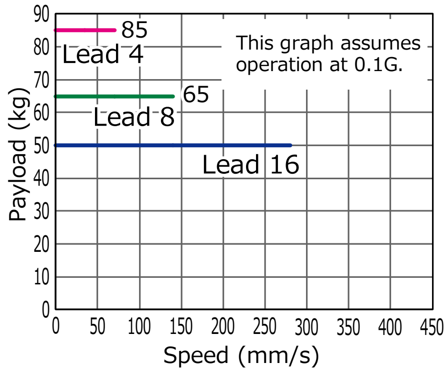
RCP6W dust-proof/splash-proof wide radial cylinder type (high-output enabled)

Horizontal mount

When ambient temperature exceeds 5°C

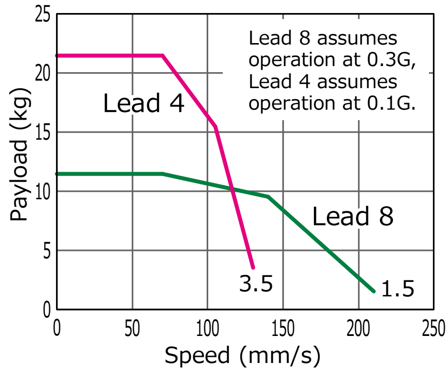


When ambient temperature is 5°C or below

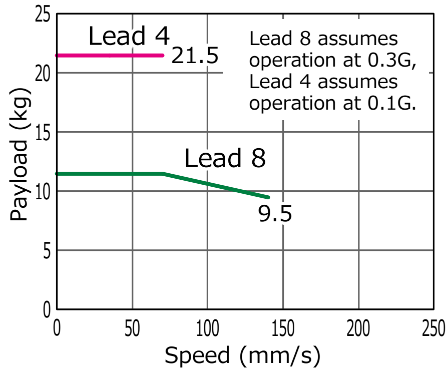


Vertical mount

When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below

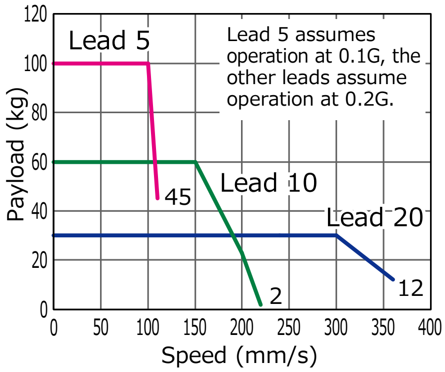


RCP6W dust-proof/splash-proof wide radial cylinder type

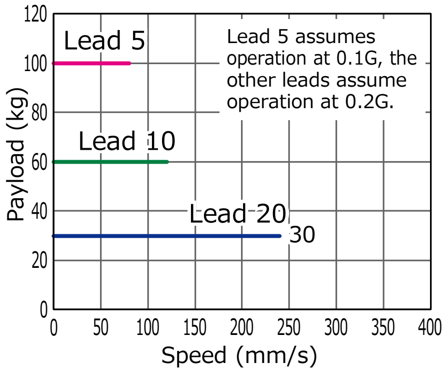
WRA16R

Horizontal mount

When ambient temperature exceeds 5°C

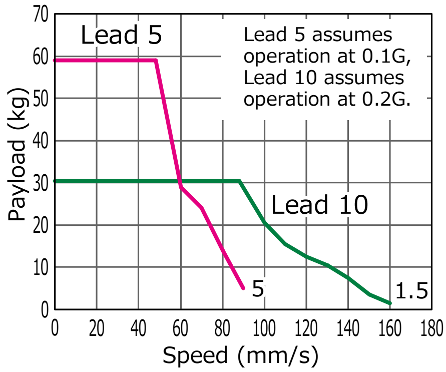


When ambient temperature is 5°C or below

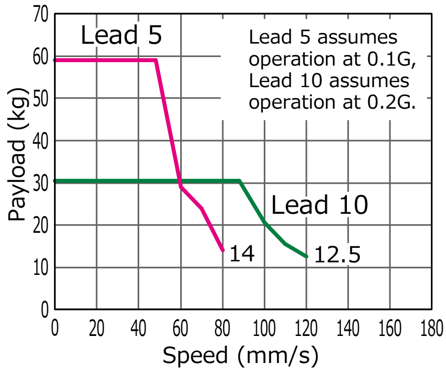


Vertical mount

When ambient temperature exceeds 5°C



When ambient temperature is 5°C or below



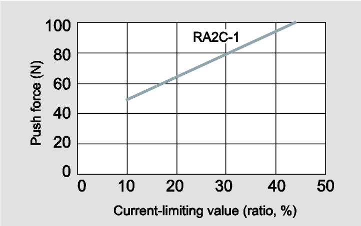
Push force and current limit value

Caution

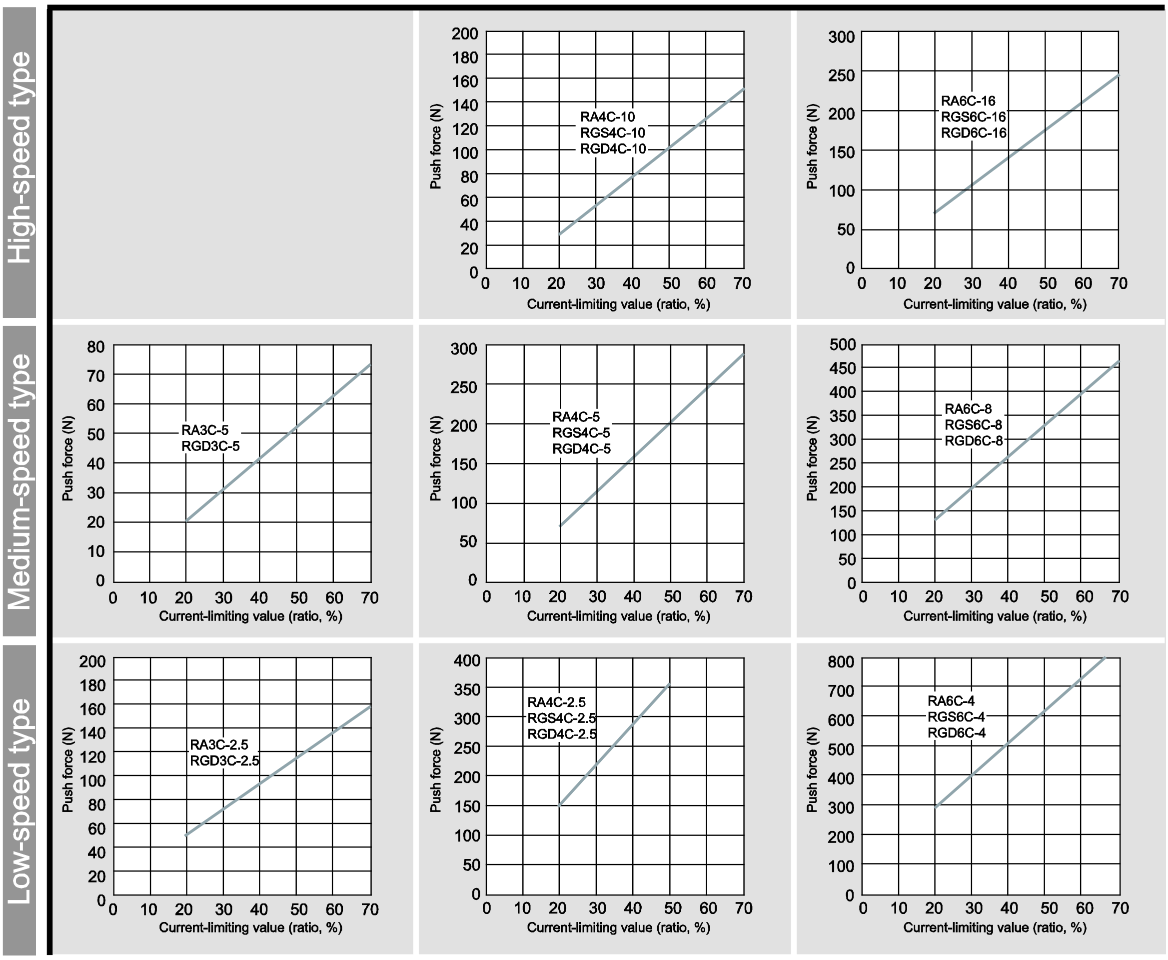
- The correlation of the push force and the current limit value is the rated push speed (in the setting at delivery) and is a reference value.
- Use the actuator with the setting above the minimum push force value. The push force will be unstable if it is below the minimum push force value.
- If the positioning speed setting in the operation condition is made lower than the push speed, the push speed will follow that speed, thus failing to produce the expected push force.

RCP2 Series | Rod Type

RA2C Type

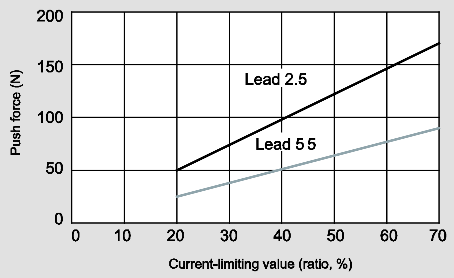


RA3C/RGD3C | RA4C/RGS4C/RGD4C | RA6C/RGS6C/RGD6C



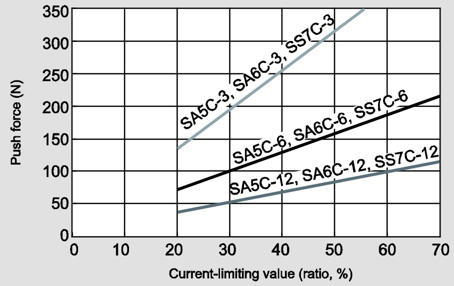
RCP2 Series Short Type

SRA4R/SRGS4R/SRGD4R

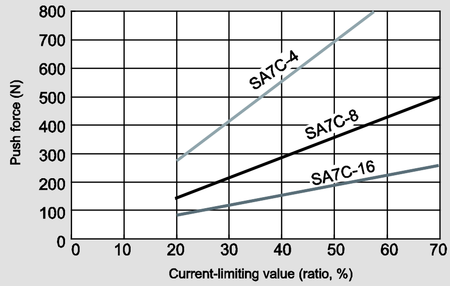


RCP2 Series Slider Type

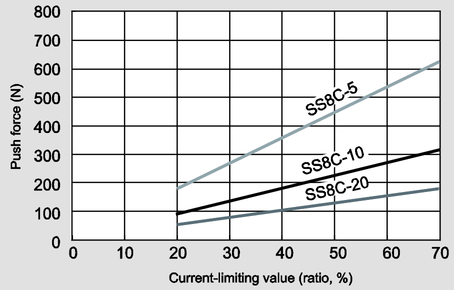
SA5C/SA6C/SS7C Type



SA7C Type



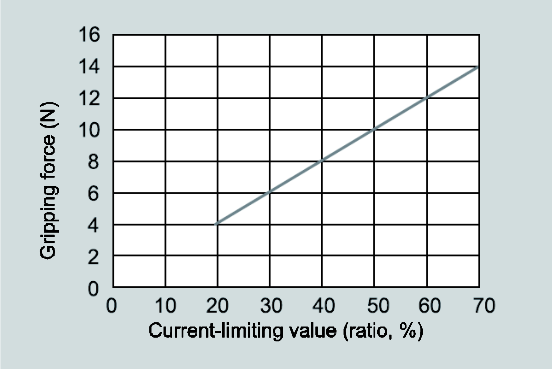
SS8C Type



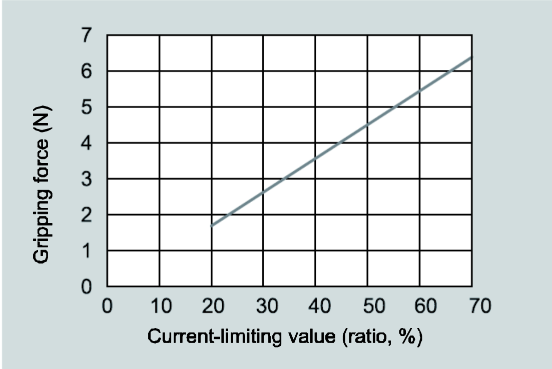
(Note) RCP2-SA7C/SA7R and RCP2CR-SA7C/SA7R cannot be connected.

RCP2 Series | **Gripper**

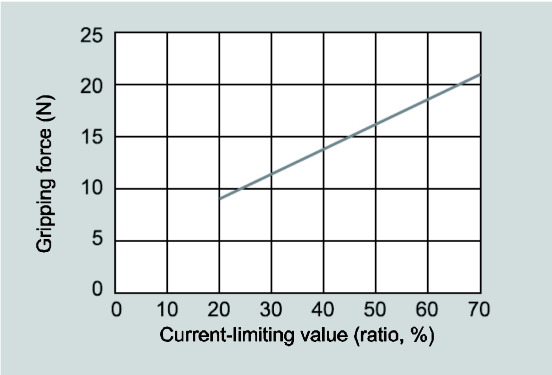
GRSS



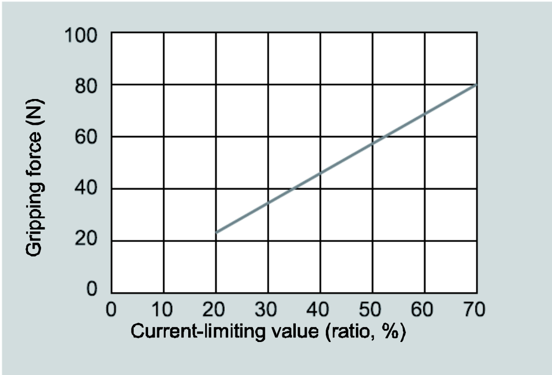
GRLS



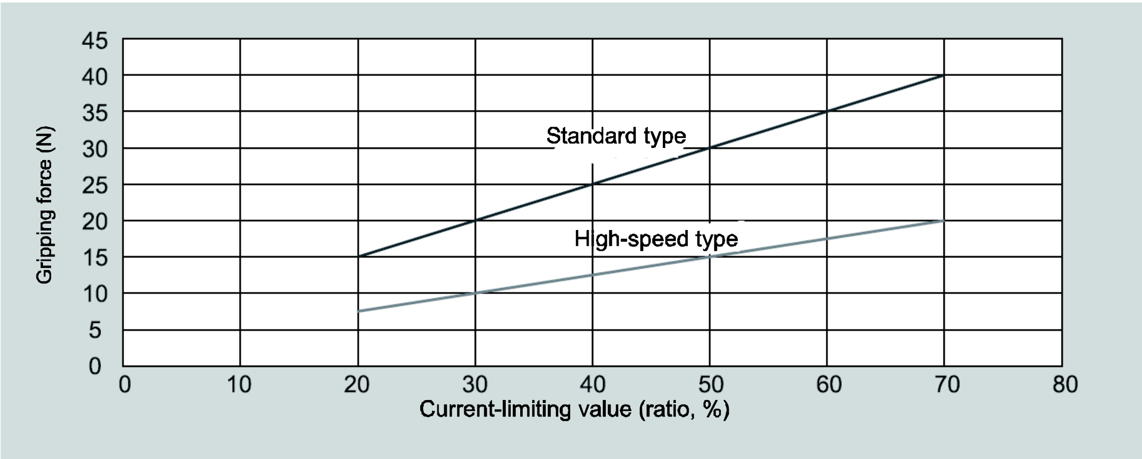
GRS



GRM

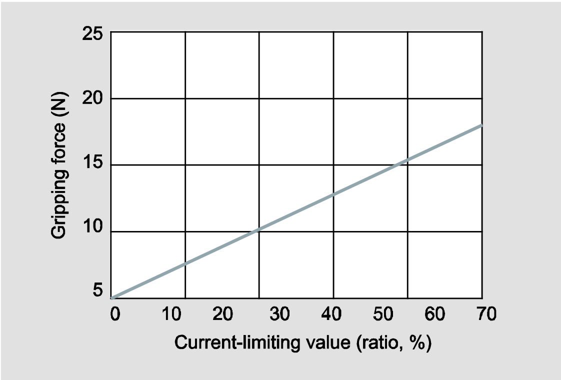


GRST

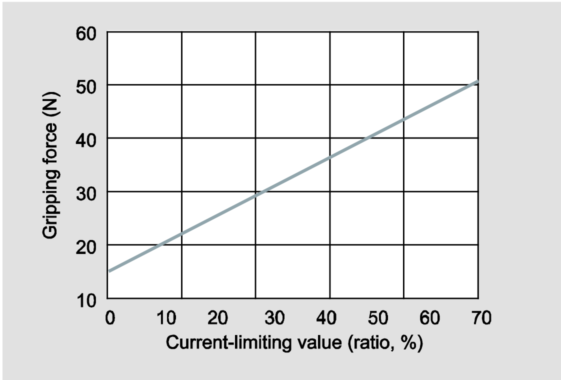


RCP2 Series 3-finger Gripper

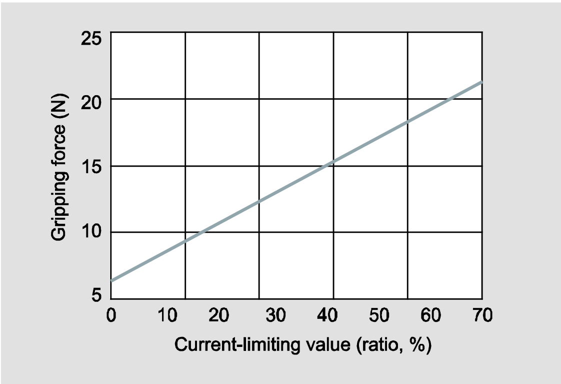
GR3LS



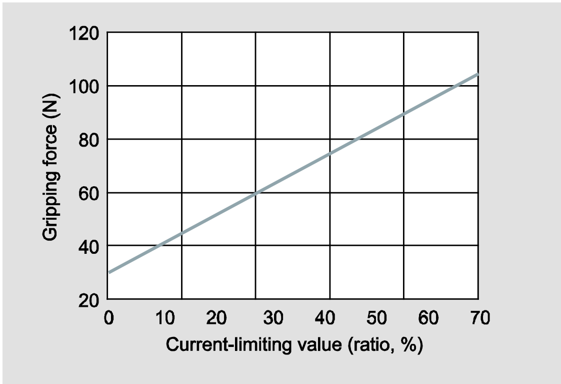
GR3LM



GR3SS

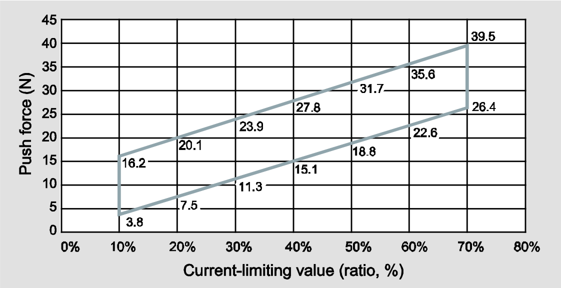


GR3SM

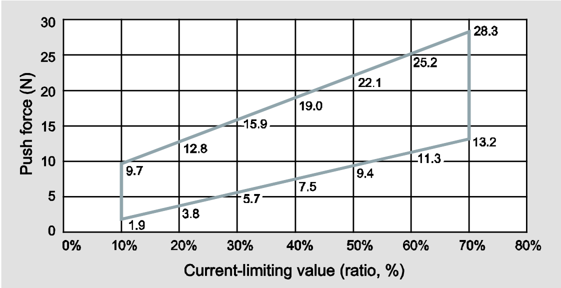


RCP3 Series | Slim, Compact Rod Type | * Inside the red box is the specification value

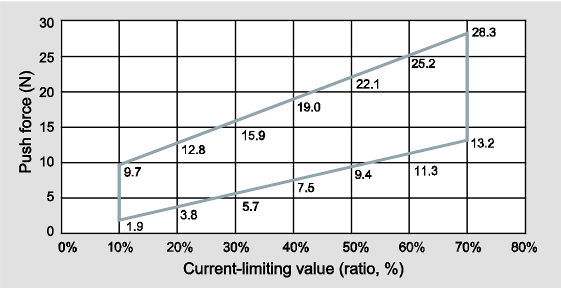
RA2AC/RA2AR Lead 1



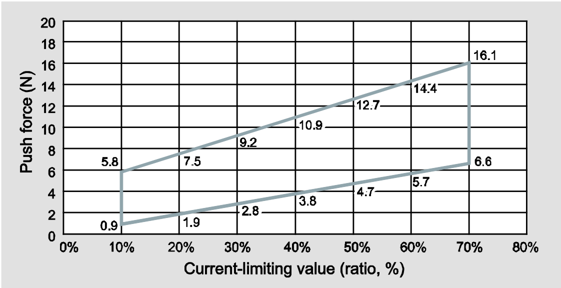
RA2BC/RA2BR Lead 2



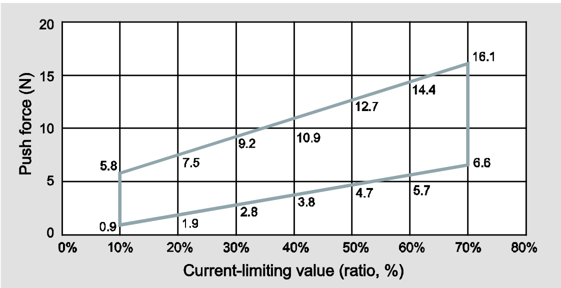
RA2AC/RA2AR Lead 2



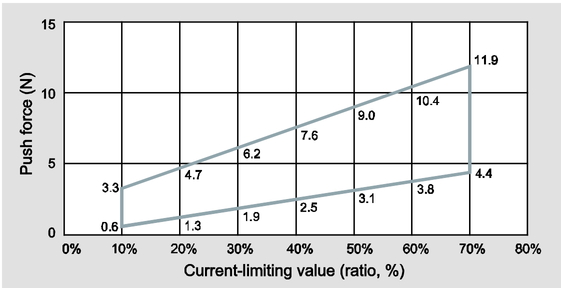
RA2BC/RA2BR Lead 4



RA2AC/RA2AR Lead 4

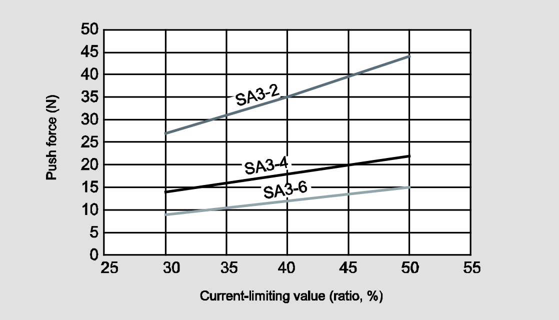


RA2BC/RA2BR Lead 6

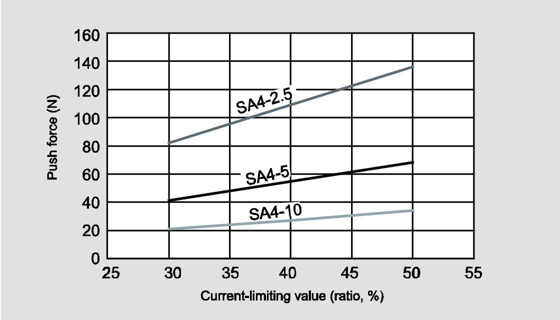


RCP3 Series Slider Type

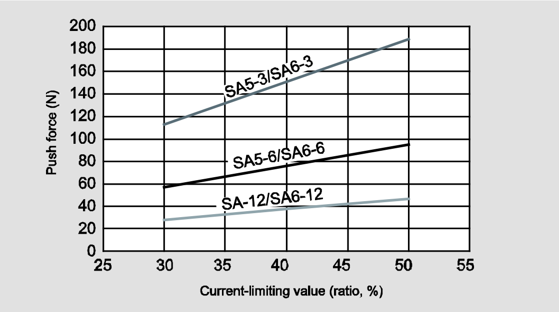
SA3C Type



SA4C Type

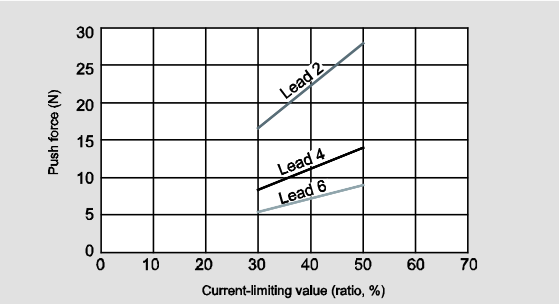


SA5C/SA6C Type

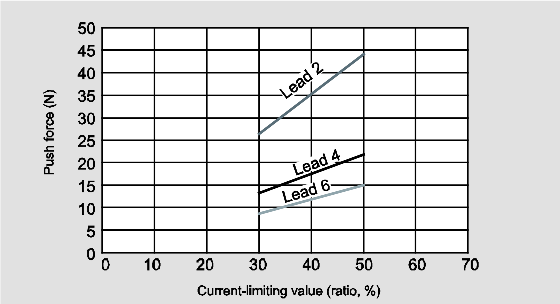


RCP3 Series Slim, Compact Table Type

TA3C/TA3R Type

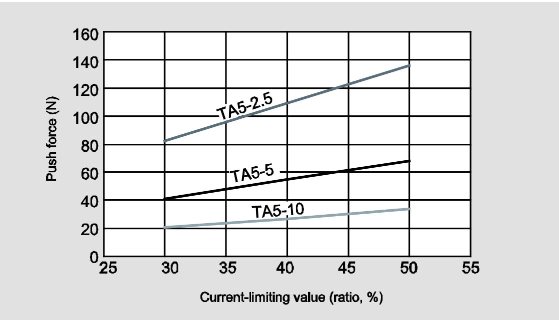


TA4C/TA4R Type

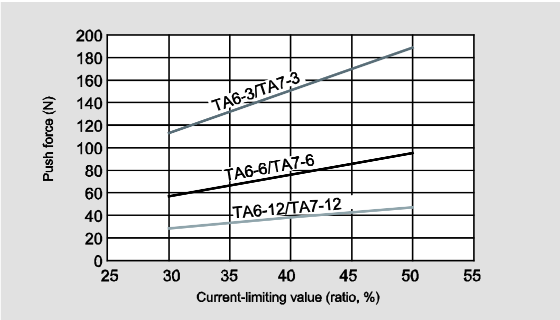


RCP3 Series Table Type

TA5C Type

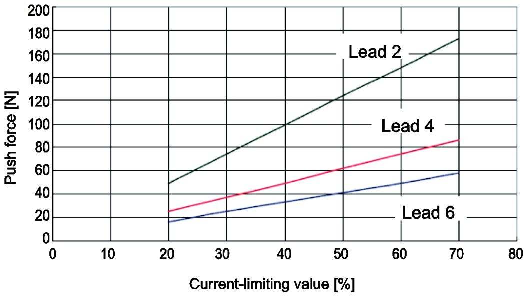


TA6C/TA7C Type

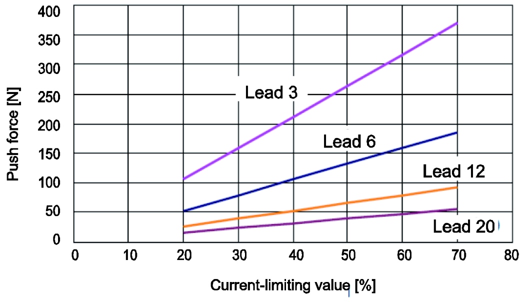


RCP4 Series Slider Type

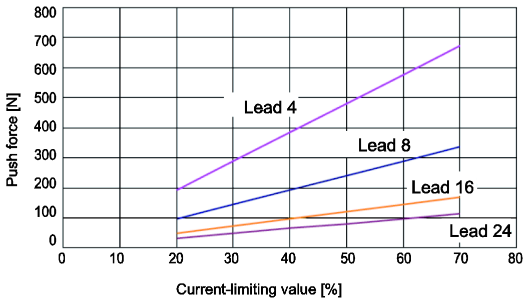
SA3C Type



SA5C/SA6C/SA5R/SA6R Type

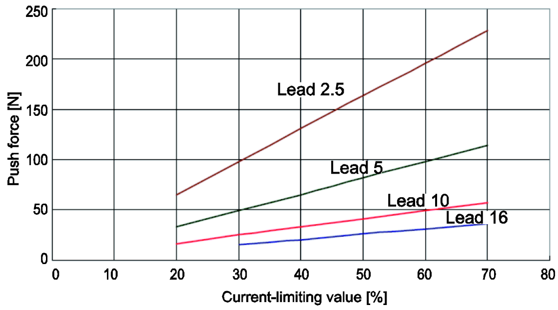


SA7C/SA7R Type

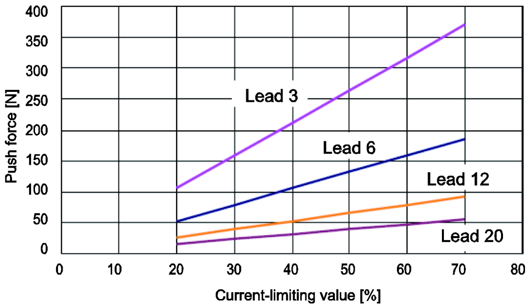


RCP4 Series Rod Type

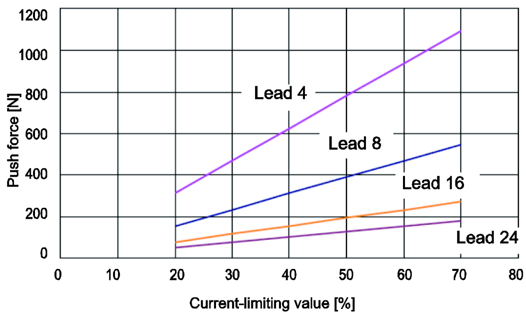
RA3C Type



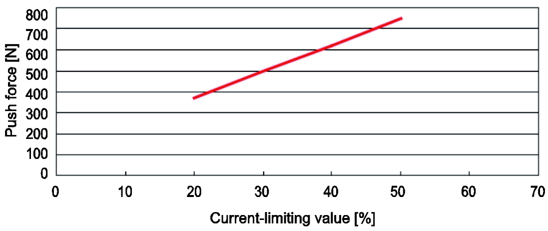
SA5C/RA5R Type



SA6C/SA6R Type

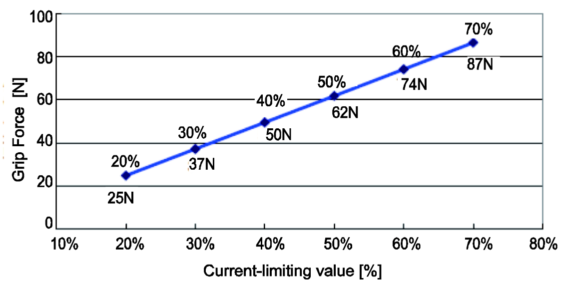


SA5C Type (42SP Motor)

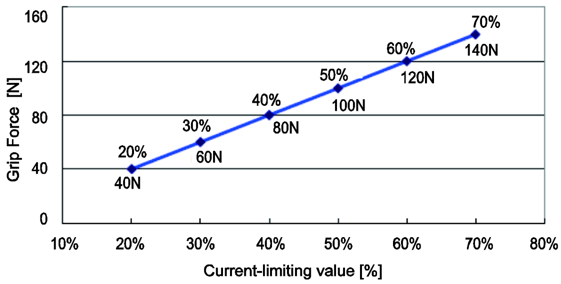


RCP4 Series Gripper Type

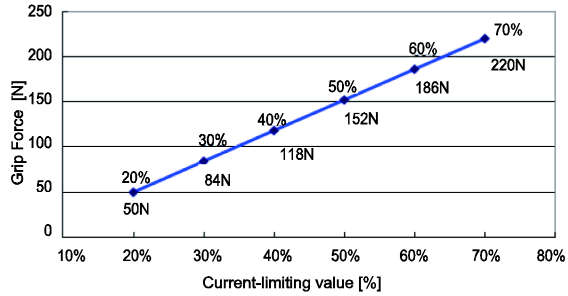
GRSML Type



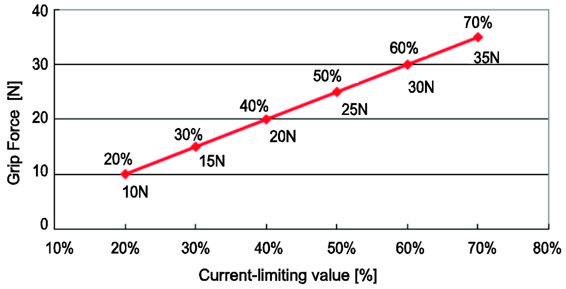
GRSLL Type



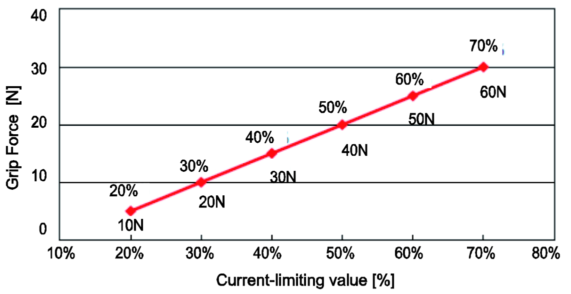
GRSWL Type



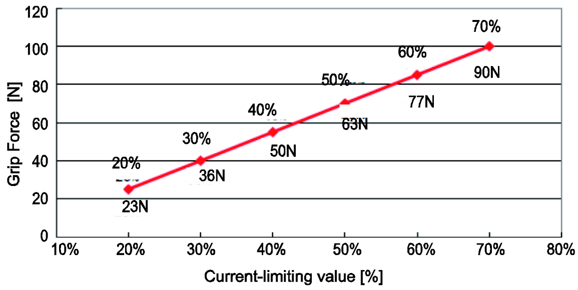
GRLM Type



GRLL Type

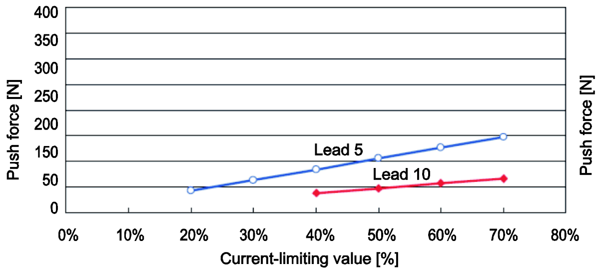


GRLW Type

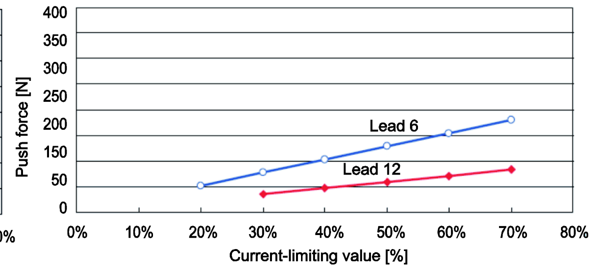


RCP4W Series Slider Type

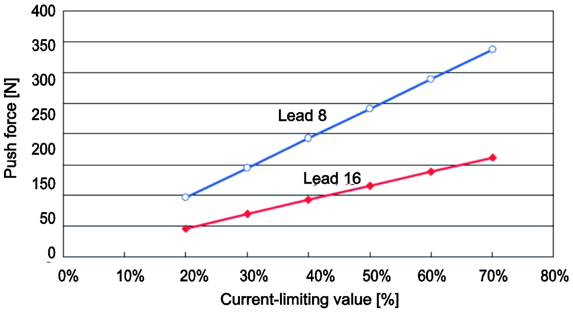
SA5C Type



SA6C Type



SA7C Type

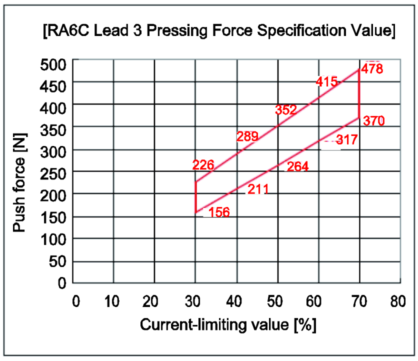


Chapter 1 Connectable Actuators

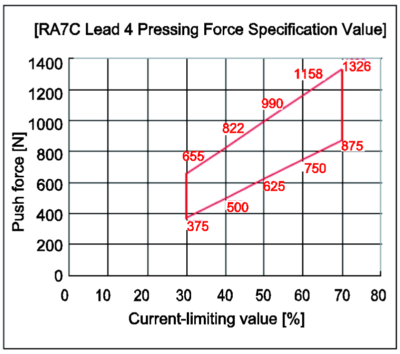
Appendix

RCP4W Series Rod Type

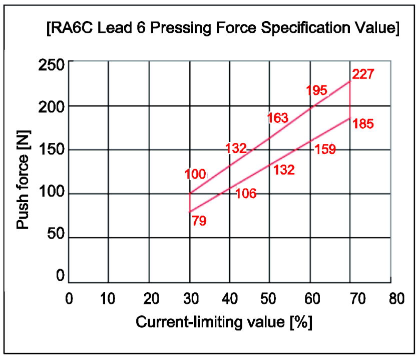
RA6C Lead 3



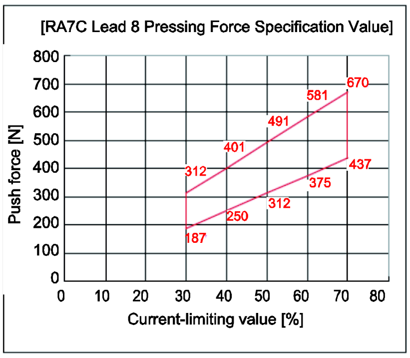
RA7C Lead 4



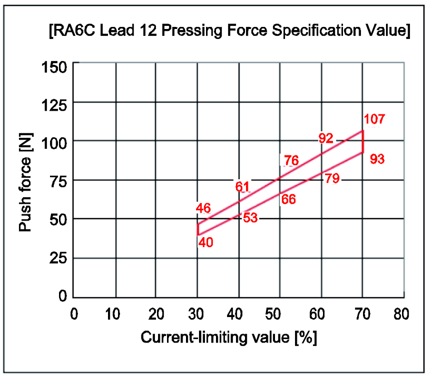
RA6C Lead 6



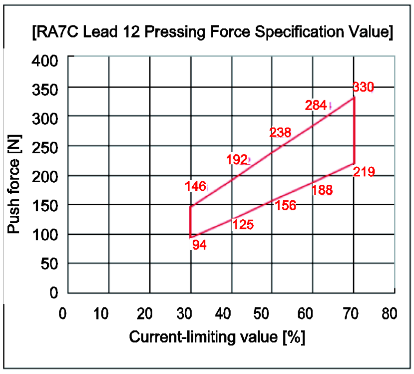
RA7C Lead 8



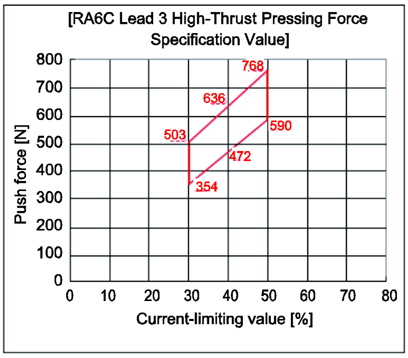
RA6C Lead 12



RA7C Lead 12

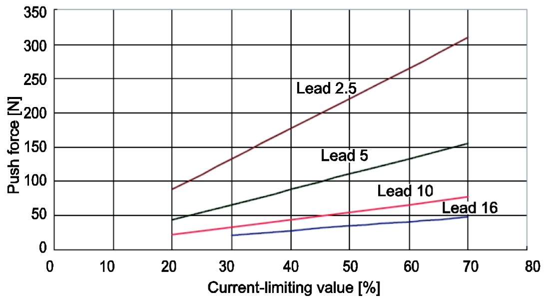


RA6C Lead 3 (High-Thrust Type : 42SP)

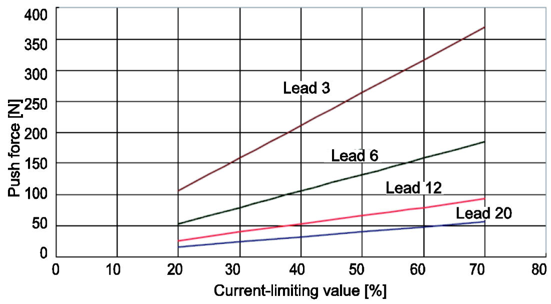


RCP5 Series Slider Type

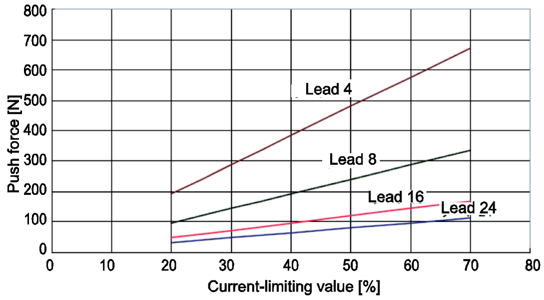
SA4C Type



SA6C Type

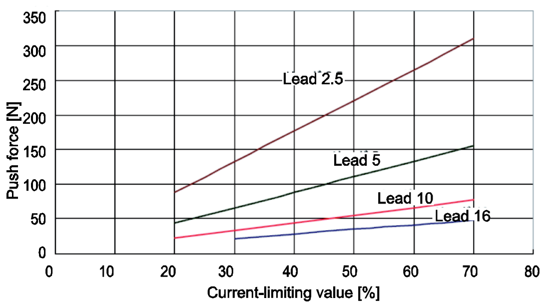


SA7C Type

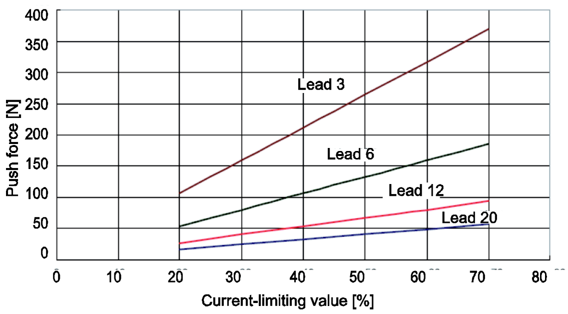


RCP5 Series Rod Type

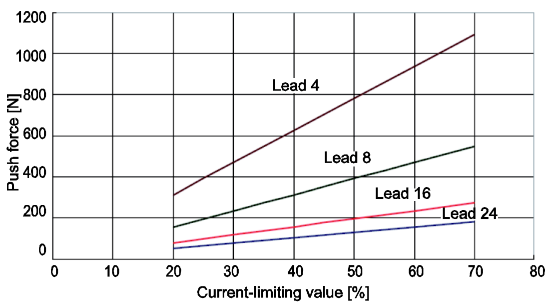
RA4C Type



RA6C Type

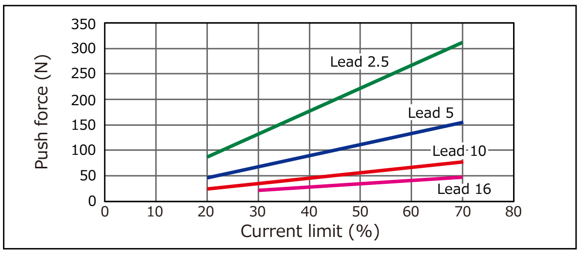


RA7C Type



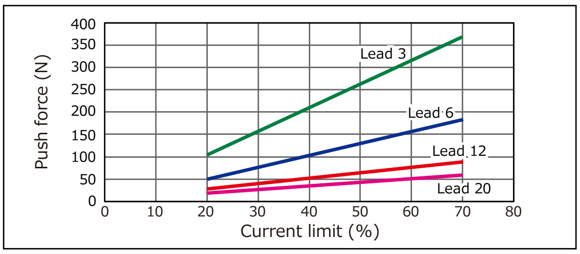
RCP6 Series Slider Type/Rod Type * Includes RCP6CR/RCP6W

SA4/RA4/RRA4/TA4 Type



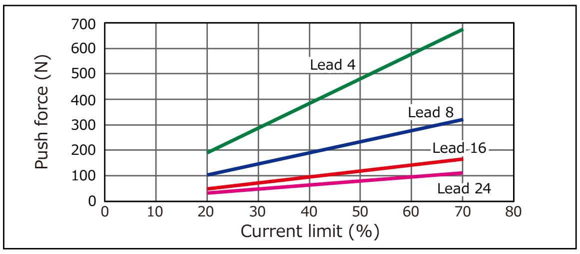
* RCP6W push motion is from 30% or more of the current limit.

SA6/RA6/RRA6/TA6 Type

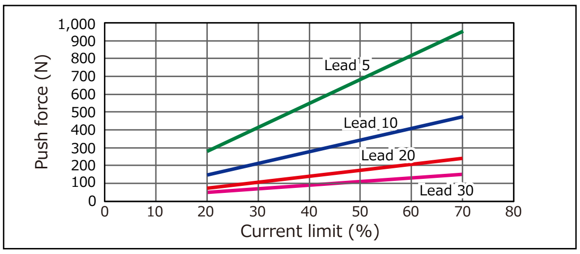


* RCP6W push motion is from 30% or more of the current limit.

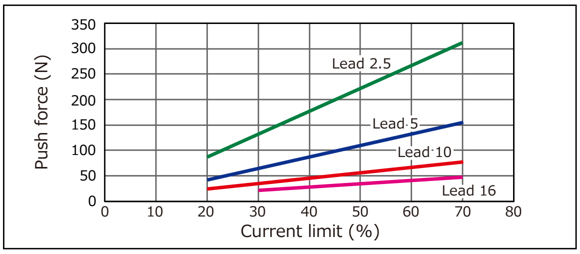
SA7/TA7/WSA14 Type



SA8 Type

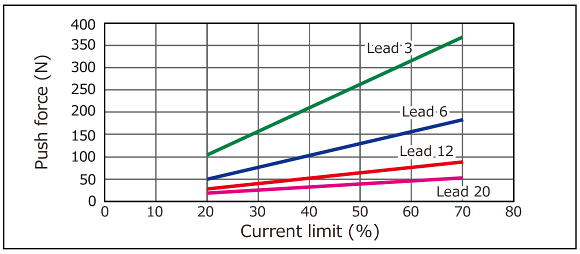


WSA10/WRA10 Type



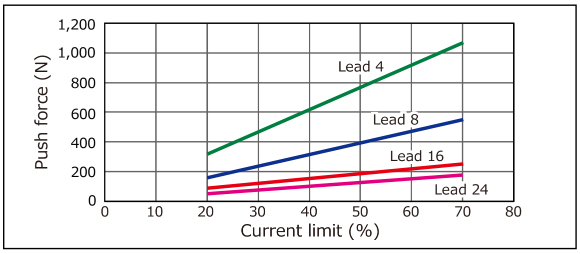
* RCP6W push motion is from 30% or more of the current limit.

WSA12/WRA12 Type



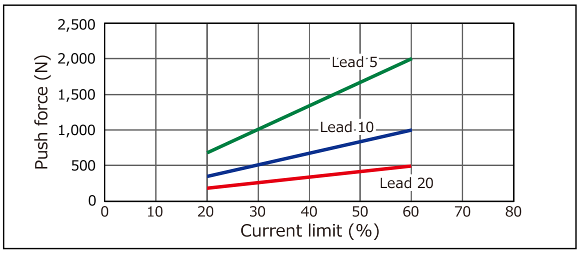
* RCP6W push motion is from 30% or more of the current limit.

RA7/RRA7/WRA14 Type



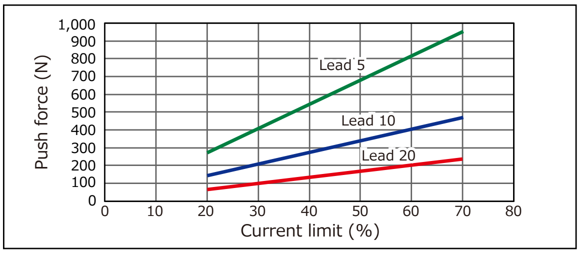
* RCP6W push motion is from 30% or more of the current limit.

RA8/RRA8/WRA16 Type



* RCP6W push motion is from 30% or more of the current limit.

WSA16 Type



1.3 List of Actuators That Support Information Management Function

Stepper motor specification actuators

[RCP6 Series]

RCP6-SA4C-WA	RCP6-WSA10C-WA	RCP6-TA4C-WA	RCP6-TA4R-WA
RCP6-SA6C-WA	RCP6-WSA12C-WA	RCP6-TA6C-WA	RCP6-TA6R-WA
RCP6-SA7C-WA	RCP6-WSA14C-WA	RCP6-TA7C-WA	RCP6-TA7R-WA
RCP6-SA8C-WA	RCP6-WSA16C-WA		
		RCP6-TA4C-WA-DB	RCP6-TA4R-WA-DB
RCP6-SA4R-WA	RCP6-WSA10R-WA	RCP6-TA6C-WA-DB	RCP6-TA6R-WA-DB
RCP6-SA6R-WA	RCP6-WSA12R-WA	RCP6-TA7C-WA-DB	RCP6-TA7R-WA-DB
RCP6-SA7R-WA	RCP6-WSA14R-WA		
RCP6-SA8R-WA	RCP6-WSA16R-WA		
RCP6-RA4C-WA	RCP6-RRA4C-WA	RCP6-WRA10C-WA	
RCP6-RA6C-WA	RCP6-RRA6C-WA	RCP6-WRA12C-WA	
RCP6-RA7C-WA	RCP6-RRA7C-WA	RCP6-WRA14C-WA	
RCP6-RA8C-WA	RCP6-RRA8C-WA	RCP6-WRA16C-WA	
RCP6-RA4R-WA	RCP6-RRA4R-WA	RCP6-WRA10R-WA	
RCP6-RA6R-WA	RCP6-RRA6R-WA	RCP6-WRA12R-WA	
RCP6-RA7R-WA	RCP6-RRA7R-WA	RCP6-WRA14R-WA	
RCP6-RA8R-WA	RCP6-RRA8R-WA	RCP6-WRA16R-WA	
RCP6CR-SA4C-WA	RCP6W-RA4C-WA	RCP6W-RRA4C-WA	RCP6W-WRA10C-WA
RCP6CR-SA6C-WA	RCP6W-RA6C-WA	RCP6W-RRA6C-WA	RCP6W-WRA12C-WA
RCP6CR-SA7C-WA	RCP6W-RA7C-WA	RCP6W-RRA7C-WA	RCP6W-WRA14C-WA
RCP6CR-SA8C-WA	RCP6W-RA8C-WA	RCP6W-RRA8C-WA	RCP6W-WRA16C-WA
RCP6CR-WSA10C-WA	RCP6W-RA4R-WA	RCP6W-RRA4R-WA	RCP6W-WRA10R-WA
RCP6CR-WSA12C-WA	RCP6W-RA6R-WA	RCP6W-RRA6R-WA	RCP6W-WRA12R-WA
RCP6CR-WSA14C-WA	RCP6W-RA7R-WA	RCP6W-RRA7R-WA	RCP6W-WRA14R-WA
RCP6CR-WSA16C-WA	RCP6W-RA8R-WA	RCP6W-RRA8R-WA	RCP6W-WRA16R-WA
RCP6-GRT7A-WA			
RCP6-GRT7B-WA			

AC servo motor specification actuators

[RCA Series]

RCA-SA4C-WA	RCA-SA4R-WA	RCACR-SA4C-WA
RCA-SA5C-WA	RCA-SA5R-WA	RCACR-SA5C-WA
RCA-SA6C-WA	RCA-SA6R-WA	RCACR-SA6C-WA

[RCS2 Series]

RCS2-SA4C-WA	RCS2-RA5C-WA-60	RCS2CR-SA4C-WA
RCS2-SA5C-WA	RCS2-RA5C-WA-100	RCS2CR-SA5C-WA
RCS2-SA6C-WA	RCS2-RA5R-WA-60	RCS2CR-SA6C-WA
RCS2-SA7C-WA	RCS2-RGS5C-WA-60	RCS2CR-SA7C-WA
	RCS2-RGS5C-WA-100	
RCS2-SA4R-WA	RCS2-RGD5C-WA-60	
RCS2-SA5R-WA	RCS2-RGD5C-WA-100	
RCS2-SA6R-WA		
RCS2-SA7R-WA	RCS2-RA13R-WA	

[RCS3 Series]

RCS3-SA8C-WA-100	RCS3P-SA8C-WA-100	RCS3-RA4R-WA	RCS3CR-SA8C-WA-100
RCS3-SA8C-WA-150	RCS3P-SA8C-WA-150	RCS3-RA6R-WA	RCS3CR-SA8C-WA-150
RCS3-SA8R-WA-100	RCS3P-SA8R-WA-100	RCS3-RA7R-WA	RCS3CR-SS8C-WA-100
RCS3-SA8R-WA-150	RCS3P-SA8R-WA-150	RCS3-RA8R-WA	RCS3CR-SS8C-WA-150
RCS3-SS8C-WA-100	RCS3P-SS8C-WA-100	RCS3-RA10R-WA	
RCS3-SS8C-WA-150	RCS3P-SS8C-WA-150	RCS3-RA15R-WA	RCS3PCR-SA8C-WA-100
RCS3-SS8R-WA-100	RCS3P-SS8R-WA-100	RCS3-RA20R-WA	RCS3PCR-SA8C-WA-150
RCS3-SS8R-WA-150	RCS3P-SS8R-WA-150		RCS3PCR-SS8C-WA-100
			RCS3PCR-SS8C-WA-150

[RCS4 Series]

RCS4-SA4C-WA
RCS4-SA6C-WA
RCS4-SA7C-WA
RCS4-SA8C-WA

RCS4-WSA10C-WA
RCS4-WSA12C-WA
RCS4-WSA14C-WA
RCS4-WSA16C-WA

RCS4-TA4C-WA
RCS4-TA6C-WA
RCS4-TA7C-WA

RCS4-TA4R-WA
RCS4-TA6R-WA
RCS4-TA7R-WA

RCS4-SA4R-WA
RCS4-SA6R-WA
RCS4-SA7R-WA
RCS4-SA8R-WA

RCS4-WSA10R-WA
RCS4-WSA12R-WA
RCS4-WSA14R-WA
RCS4-WSA16R-WA

RCS4-RA4C-WA
RCS4-RA6C-WA
RCS4-RA7C-WA
RCS4-RA8C-WA

RCS4-RRA4C-WA
RCS4-RRA6C-WA
RCS4-RRA7C-WA
RCS4-RRA8C-WA

RCS4-WRA10C-WA
RCS4-WRA12C-WA
RCS4-WRA14C-WA
RCS4-WRA16C-WA

RCS4-RA4R-WA
RCS4-RA6R-WA
RCS4-RA7R-WA
RCS4-RA8R-WA

RCS4-RRA4R-WA
RCS4-RRA6R-WA
RCS4-RRA7R-WA
RCS4-RRA8R-WA

RCS4-WRA10R-WA
RCS4-WRA12R-WA
RCS4-WRA14R-WA
RCS4-WRA16R-WA

RCS4CR-SA4C-WA
RCS4CR-SA6C-WA
RCS4CR-SA7C-WA
RCS4CR-SA8C-WA

RCS4CR-WSA10C-WA
RCS4CR-WSA12C-WA
RCS4CR-WSA14C-WA
RCS4CR-WSA16C-WA

[ISB Series]

ISB-SXM-WA-60
ISB-SXM-WA-100
ISB-SXL-WA-60
ISB-SXL-WA-100

ISPB-SXM-WA-60
ISPB-SXL-WA-60

ISB-MXM-WA-100
ISB-MXM-WA-200
ISB-MXM-WA-400
ISB-MXMX-WA-200
ISB-MXMX-WA-400
ISB-MXL-WA-100
ISB-MXL-WA-200
ISB-MXL-WA-400

ISPB-MXM-WA-100
ISPB-MXM-WA-200
ISPB-MXMX-WA-200
ISPB-MXL-WA-100
ISPB-MXL-WA-200

ISB-LXM-WA-200
ISB-LXM-WA-400
ISB-LXMX-WA-200
ISB-LXMX-WA-400
ISB-LXL-WA-200
ISB-LXL-WA-400
ISB-LXUWX-WA-200
ISB-LXUWX-WA-400

ISPB-LXM-WA-200
ISPB-LXM-WA-400
ISPB-LXMX-WA-200
ISPB-LXMX-WA-400
ISPB-LXL-WA-200
ISPB-LXL-WA-400
ISPB-LXUWX-WA-200
ISPB-LXUWX-WA-400

ISDB-S-WA-60
ISDB-S-WA-100
ISDB-M-WA-100
ISDB-M-WA-200
ISDB-M-WA-400
ISDB-MX-WA-200
ISDB-MX-WA-400
ISDB-L-WA-200
ISDB-L-WA-400
ISDB-LX-WA-200
ISDB-LX-WA-400

ISPDB-S-WA-60
ISPDB-M-WA-100
ISPDB-M-WA-200
ISPDB-MX-WA-200
ISPDB-L-WA-200
ISPDB-L-WA-400
ISPDB-LX-WA-200
ISPDB-LX-WA-400

ISDBCR-S-WA-60
ISDBCR-M-WA-100
ISDBCR-M-WA-200
ISDBCR-MX-WA-200
ISDBCR-L-WA-200
ISDBCR-L-WA-400
ISDBCR-LX-WA-200
ISDBCR-LX-WA-400

ISPDBCR-S-WA-60
ISPDBCR-M-WA-100
ISPDBCR-M-WA-200
ISPDBCR-MX-WA-200
ISPDBCR-L-WA-200
ISPDBCR-L-WA-400
ISPDBCR-LX-WA-200
ISPDBCR-LX-WA-400

Revision history

Revision date	Revised content
2018.04	First Edition
2018.05	Edition 1B ・Drive source cutoff issues reviewed (Specifications Section 2-8, 3-11, 3-41; Startup Section 4-62) ・Actuator connection cable issues reviewed (Specifications Section 2-29 to 31, 5-2, 5-4; Startup Section 3-2, 3-4) ・Periodic inspection items changed (Maintenance Section 1-3) ・Errata corrected
2018.07	Edition 1C ・Added maximum number of connectable axes (Specification Section 1-1, 1-2, 1-6, 2-6, 2-20, 3-1, 3-62, 4-47) ・Described supported standards for CC-Link IE (Intro-12, Specification Section 1-1, 3-1, 3-2) ・Corrected errata (Intro-19, Specification Section 2-10, 3-40; Startup Section 4-61)

Manual No.: ME0384-1C (July 2018)

IAI
Quality and Innovation

IAI Corporation

Head Office: 577-1 Obane Shimizu-ku Shizuoka City Shizuoka 424-0103, Japan
TEL +81-54-364-5105 FAX +81-54-364-2589
website: www.iai-robot.co.jp/

Technical Support available in USA, Europe and China

IAI America, Inc.

US Headquarters: 2690 W. 237th Street, Torrance, CA 90505
TEL (310) 891-6015 FAX (310) 891-0815
Chicago Office: 110 East State Parkway, Schaumburg, IL 60173
TEL (847) 908-1400 FAX (847) 908-1399
Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066
TEL (678) 354-9470 FAX (678) 354-9471
website: www.intelligentactuator.com

IAI Industrieroboter GmbH

Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany
TEL 06196-88950 FAX 06196-889524

IAI (Shanghai) Co., Ltd.

SHANGHAI JIAHUA BUSINESS CENTER A8-303, 808, Hongqiao Rd. Shanghai 200030, China
TEL 021-6448-4753 FAX 021-6448-3992
website: www.iai-robot.com

IAI Robot (Thailand) Co., Ltd.

825, PhairojKijja Tower 7th Floor, Bangna-Trad RD., Bangna, Bangna, Bangkok 10260, Thailand
TEL +66-2-361-4458 FAX +66-2-361-4456

18.07.000