

MISUMI SINGLE-AXIS ROBOT

# RSC Series

User's Manual

Clean type

RS1C / RS2C / RS3C  
RSH1C / RSH2C / RSH3C



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## Introduction

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# Using the Robot Safely

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# 1 Safety information

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To ensure correct and safe use of MISUMI industrial robots, carefully read this manual and make yourself well acquainted with the contents. FOLLOW THE WARNINGS, CAUTIONS AND INSTRUCTIONS included in this manual. Failure to take necessary safety measures or mishandling due to not following the instructions in this manual may result in trouble or damage to the robot and injury to personnel (robot operator or service personnel) including fatal accidents.

Warning symbols and signal words used in this manual are classified as explained below. Make sure that you fully understand the meaning of each symbol and comply with the instructions.



## **DANGER**

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**FAILURE TO FOLLOW DANGER INSTRUCTIONS WILL RESULT IN SEVERE INJURY OR DEATH TO THE ROBOT OPERATOR, BYSTANDERS OR PERSONS INSPECTING OR REPAIRING THE ROBOT.**

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## **WARNING**

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**FAILURE TO FOLLOW WARNING INSTRUCTIONS COULD RESULT IN SEVERE INJURY OR DEATH TO THE ROBOT OPERATOR, BYSTANDERS OR PERSONS INSPECTING OR REPAIRING THE ROBOT.**

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## **CAUTION**

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**Failure to follow CAUTION instructions may result in injury to the robot operator, bystanders or persons inspecting or repairing the robot, or damage to the robot and/or robot controller.**

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## **NOTE**

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Explains the key point in the operation in a simple and clear manner.

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## **Reference**

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Gives useful information related to the robot operation.

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Refer to the user's manual by any of the following methods to operate or adjust the robot safely and correctly.

1. Operate or adjust the robot while referring to the printed version of the user's manual (available for an additional fee).
2. Operate or adjust the robot while viewing the CD-ROM version of the user's manual on your computer screen.
3. Operate or adjust the robot while referring to a printout of the necessary pages from the CD-ROM version of the user's manual.

*It is not possible to list all safety items in detail within the limited space of this manual. So it is essential that the user have a full knowledge of basic safety rules and also that the operator makes correct judgments on safety procedures during operation. For specific safety information and standards, refer to the applicable local regulations and comply with the instructions. Warning labels attached to the robots are written in English, Japanese, Chinese and Korean. This manual is available in English or Japanese. If the robots are to be exported to a country where other languages are spoken, the language for warning labels and manual must be changed.*

- \* Cautions regarding the official language of EU countries  
For equipment that will be installed in EU countries, the language used for the user's manuals, CE declarations, and operation screen characters is English only. Warning labels only have pictograms or else include warning messages in English. In the latter case, messages in Japanese or other languages might be added.

## 2 Essential precautions

Particularly important cautions for handling or operating the robot are described below. In addition, precautions during installation, operation, inspection and maintenance are also provided in each chapter. Be sure to comply with these instructions to ensure safe use of the robot.

### (1) Observe the following cautions during automatic operation.

- Install a safeguard (safety enclosure) to keep any person from entering within the movement range of the robot and suffering injury due to being struck by moving parts.
- Install a safety interlock that triggers emergency stop when the door or panel is opened.
- Install a safety enclosure so that no one can enter inside except from doors or panels equipped with safety interlocks.
- Warning labels 1 are supplied with the robot and should be affixed to conspicuous spots on doors or panels of the safety enclosure.

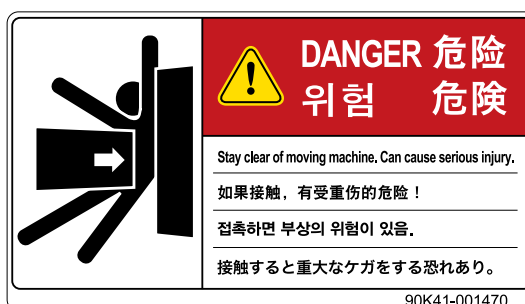


#### DANGER

SERIOUS INJURY MAY RESULT FROM CONTACT WITH A MOVING ROBOT.

- KEEP OUTSIDE OF THE ROBOT SAFETY ENCLOSURE DURING OPERATION.
- PRESS THE EMERGENCY STOP BUTTON BEFORE ENTERING THE SAFETY ENCLOSURE.

#### Warning label 1



### (2) Use caution to prevent hands or fingers from being pinched or crushed.

- Warning label 2 is affixed to the robot.
- Use caution to prevent hands or fingers from being pinched or crushed by the moving parts when carrying the robot or during teaching.



#### WARNING

MOVING PARTS CAN PINCH OR CRUSH HANDS.

KEEP HANDS AWAY FROM THE MOVABLE PARTS OF THE ROBOT.

## Warning label 2



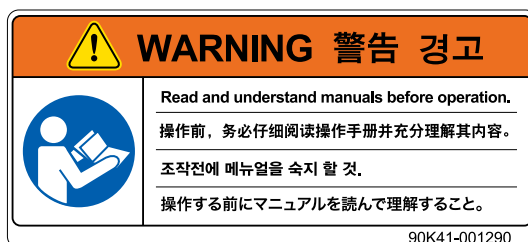
## (3) Follow the instructions on warning labels and in this manual.

- Be sure to read the warning labels and this manual carefully and make sure you thoroughly understand their contents before attempting installation and operation of the robot.
- Before starting robot operation, be sure to reread the procedures and cautions relating to your work as well as descriptions in this chapter (Chapter 1, "Using the Robot Safely").
- Never install, adjust, inspect or service the robot in any manner that does not comply with the instructions in this manual.
- Warning labels 3 are supplied with the robot and should be affixed to the robot or conspicuous spots near the robot.

**WARNING**

**IMPROPER INSTALLATION OR OPERATION MAY CAUSE SERIOUS INJURY.  
BEFORE INSTALLING OR OPERATING THE ROBOT, READ THE MANUAL AND  
INSTRUCTIONS ON THE WARNING LABELS AND UNDERSTAND THE CONTENTS.**

## Warning label 3



(4) Do not remove, alter or stain the warning labels.



**WARNING**

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IF WARNING LABELS ARE REMOVED OR DIFFICULT TO SEE, THEN ESSENTIAL PRECAUTIONS MIGHT NOT BE TAKEN, RESULTING IN ACCIDENTS.

- DO NOT REMOVE, ALTER OR STAIN THE WARNING LABELS ON THE ROBOT.
  - DO NOT ALLOW THE WARNING LABELS TO BE HIDDEN BY DEVICES INSTALLED ONTO THE ROBOT BY THE USER.
  - PROVIDE PROPER LIGHTING SO THAT THE SYMBOLS AND INSTRUCTIONS ON THE WARNING LABELS CAN BE CLEARLY SEEN EVEN FROM OUTSIDE THE SAFETY ENCLOSURE.
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(5) Do not use the robot in environments containing inflammable gas, etc.



**WARNING**

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- THIS ROBOT WAS NOT DESIGNED FOR OPERATION IN ENVIRONMENTS WHERE INFLAMMABLE OR EXPLOSIVE SUBSTANCES ARE PRESENT.
  - DO NOT USE THE ROBOT IN ENVIRONMENTS CONTAINING INFLAMMABLE GAS, DUST OR LIQUIDS. EXPLOSIONS OR FIRE MIGHT OTHERWISE RESULT.
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(6) Do not use the robot in locations possibly subject to electromagnetic interference, etc.



**WARNING**

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AVOID USING THE ROBOT IN LOCATIONS SUBJECT TO ELECTROMAGNETIC INTERFERENCE, ELECTROSTATIC DISCHARGE OR RADIO FREQUENCY INTERFERENCE. MALFUNCTIONS MIGHT OTHERWISE OCCUR.

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(7) Use caution when releasing the brake of a vertical use robot.



**WARNING**

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THE VERTICAL AXIS WILL SLIDE DOWNWARD WHEN THE BRAKE IS RELEASED, CAUSING A HAZARDOUS SITUATION. TAKE ADEQUATE SAFETY MEASURES IN CONSIDERATION BY TAKING THE WEIGHT AND SHAPE INTO ACCOUNT.

- BEFORE RELEASING THE BRAKE AFTER PRESSING THE EMERGENCY STOP BUTTON, PLACE A SUPPORT UNDER THE VERTICAL AXIS SO THAT IT WILL NOT SLIDE DOWN.
  - BE CAREFUL NOT TO LET YOUR BODY GET CAUGHT BETWEEN THE VERTICAL AXIS AND THE INSTALLATION BASE WHEN PERFORMING TASKS (DIRECT TEACHING, ETC.) WITH THE BRAKE RELEASED.
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-

(8) Provide safety measures for end effector (gripper, etc.).



**WARNING**

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- END EFFECTORS MUST BE DESIGNED AND MANUFACTURED SO THAT THEY CREATE NO HAZARDS (FOR EXAMPLE, A WORKPIECE THAT COMES LOOSE) EVEN IF POWER (ELECTRICITY, AIR PRESSURE, ETC.) IS SHUT OFF OR POWER FLUCTUATIONS OCCUR.
  - IF THERE IS A POSSIBLE DANGER THAT THE OBJECT GRIPPED BY THE END EFFECTOR MAY FLY OFF OR DROP, THEN PROVIDE APPROPRIATE SAFETY PROTECTION TAKING INTO ACCOUNT THE OBJECT SIZE, WEIGHT, TEMPERATURE AND CHEMICAL PROPERTIES.
- 

(9) Use caution when removing the motor. (Vertical use robots)



**WARNING**

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- THE VERTICAL AXIS WILL SLIDE DOWN WHEN THE MOTOR IS RELEASED, CAUSING A HAZARDOUS SITUATION.
- TURN OFF THE ROBOT CONTROLLER AND PROP UP THE VERTICAL AXIS WITH A SUPPORT STAND BEFORE REMOVING THE MOTOR.
  - BE CAREFUL NOT TO LET YOUR BODY GET CAUGHT BETWEEN THE VERTICAL AXIS PARTS AND INSTALLATION BASE.
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(10) Be careful not to touch the motor and peripheral parts when hot.



**WARNING**

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The motor and speed reduction gear casing are extremely hot after automatic operation, so burns may occur if these are touched. Before handling these parts during inspection or servicing, turn off the controller, wait for a while and check that the parts have cooled.

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(11) Take the following safety precautions during inspection of controller.



**WARNING**

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- WHEN YOU NEED TO TOUCH THE TERMINALS OR CONNECTORS ON THE OUTSIDE OF THE CONTROLLER DURING INSPECTION, ALWAYS FIRST TURN OFF THE CONTROLLER POWER SWITCH AND ALSO THE POWER SOURCE IN ORDER TO PREVENT POSSIBLE ELECTRICAL SHOCK.
  - NEVER TOUCH ANY INTERNAL PARTS OF THE CONTROLLER.
  - REFER TO THE "C21/C22 ROBOT CONTROLLER USER'S MANUAL" FOR PRECAUTIONS ON HANDLING THE CONTROLLER.
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(12) Consult us for corrective action when the robot is damaged or malfunctions occur.



**WARNING**

IF ANY PART OF THE ROBOT IS DAMAGED OR ANY MALFUNCTION OCCURS, CONTINUING THE OPERATION MAY BE VERY DANGEROUS. PLEASE CONSULT YOUR MISUMI SALES OFFICE OR DEALER FOR CORRECTIVE ACTION.

Damage or Trouble	Possible Danger
Damage to machine harness or robot cable	Electrical shock, malfunction of robot
Damage to exterior of robot	Flying outwards of damaged parts during robot operation
Abnormal operation of robot (positioning error, excessive vibration, etc.)	Malfunction of robot
Z-axis brake trouble	Dropping of load

(13) Protective bonding



**WARNING**

BE SURE TO GROUND THE ROBOT AND CONTROLLER TO PREVENT ELECTRICAL SHOCK.

(14) Be sure to make correct parameter settings.



**CAUTION**

The robot must be operated with correct tolerable moment of inertia and acceleration coefficients according to the manipulator tip mass and moment of inertia. If these are not correct, drive unit service life may end prematurely, and damage to robot parts or residual vibration during positioning may result.

(15) Follow the specified procedures when installing, adjusting or inspecting the robot.



**WARNING**

ALWAYS FOLLOW THE SPECIFIED PROCEDURES WHEN INSTALLING, ADJUSTING OR INSPECTING THE ROBOT. NEVER ATTEMPT ANY PROCEDURE NOT DESCRIBED IN THIS MANUAL.

(16) Do not attempt any repair, parts replacement and modification.



**WARNING**

DO NOT ATTEMPT ANY REPAIR, PARTS REPLACEMENT AND MODIFICATION UNLESS DESCRIBED IN THIS MANUAL. THESE WORKS REQUIRE TECHNICAL KNOWLEDGE AND SKILL, AND MAY ALSO INVOLVE WORK HAZARDS.

**(17) Location for installing the controller and the Handy Terminal**

The robot controller and the Handy Terminal must be installed at a location that is outside the robot safety enclosure yet where it is easy to operate and view robot movement.

**(18) Protect electrical wiring and hydraulic/pneumatic hoses as needed.**

Install a cover or similar item to protect the electrical wiring and hydraulic/pneumatic hoses from possible damage.

**(19) Install an operation status light.**

Install an operation status light (signal light tower, etc.) at an easy-to-see position so the operator will know whether the robot is merely stopped or is in emergency-error stop.

**(20) Clean work tools, etc.**

Work tools such as welding guns and paint nozzles which are mounted in the robot arm will preferably be cleaned automatically.

**(21) Provide adequate lighting.**

Make sure to provide enough lighting to ensure safety during work.

**(22) Prevent the gripped object from flying outwards.**

If the object or workpiece gripped by the robot might fly outward or drop and create a hazard to the operator, then protective equipment should be installed by taking the size, weight, temperature and chemical properties of the object into account.

**(23) Draw up "work instructions" and make sure the operator learns them well.**

Decide on "work instructions" for the following items in cases where personnel must work within the robot safety enclosure to perform teaching, maintenance or inspection tasks. Make sure the workers completely understand these "work instructions".

- (1) Robot operating procedures needed for tasks such as startup procedures and handling switches
- (2) Robot speeds used during tasks such as teaching
- (3) Methods for workers to signal each other when two or more workers perform tasks
- (4) Steps that the worker should take when a problem or emergency occurs
- (5) Steps to take after the robot has come to a stop when the emergency stop device was triggered, including checks for cancelling the problem or error state and safety checks in order to restart the robot.
- (6) In cases other than above, the following actions should be taken as needed to prevent hazardous situations due to sudden or unexpected robot operation or faulty robot operation, as listed below.
  1. Show a display on the operator panel



2. Ensure the safety of workers performing tasks within the robot safety enclosure
3. Clearly specify position and posture during work  
Position and posture where worker can constantly check robot movements and immediately move to avoid trouble if an error/problem occurs
4. Install noise prevention measures
5. Use methods for signaling operators of related equipment
6. Use methods to decide that an error has occurred and identify the type of error

Implement the "work instructions" according to the type of robot, installation location, and type of work task.

When drawing up the "work instructions", make an effort to include opinions from the workers involved, equipment manufacture's technicians, and workplace safety consultants, etc.

#### **(24) Display a sign on operation panel during work**

Display an easy to understand sign or message on the Handy Terminal or operation panel during the job task, to prevent anyone other than the operators for that job task from mistakenly operating a start or selector switch. If needed, take other measures such as locking the cover on the operation panel.

#### **(25) Make daily and periodic inspections.**

- (1) Always make sure that daily and periodic inspections are performed, and make a pre-work check to ensure there are no problems with the robot or related equipment. If a problem or abnormality is found, then promptly repair it or take other measures as necessary.
- (2) When you make periodic inspections or repairs, make a record and store it for at least 3 years.

## **3 Industrial robot operating and maintenance personnel**

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Operators or persons who handle the robot such as for teaching, movement check, inspection, adjustment, and repair must receive appropriate training and also have the skills needed to perform the job correctly and safely. They must read the user's manual carefully to understand its contents before attempting the robot operation.

Tasks related to industrial robots (teaching, movement check, inspection, adjustment, repair, etc.) must be performed by qualified persons who meet requirements established by local regulations and safety standards for industrial robots.

## 4 Robot protective functions

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### (1) Overload detection

This function detects an overload applied to the motor and shuts off the servo power.

### (2) Abnormal temperature detection

This detects an abnormal temperature rise in the controller driver and shuts off the servo power.

The following measures should be taken when an error (overload error, abnormal temperature error) occurs.

1. Reduce the speed.
2. Insert a "stop period" in the operation.
3. Reduce the acceleration coefficient.

### (3) Soft limits

Soft limits can be set on each axis to limit the working envelope in manual operation after return-to-origin and during automatic operation.

Note: The working envelope is the area limited by soft limits.



#### **WARNING**

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**SOFT LIMIT FUNCTION IS NOT INTENDED TO PROTECT THE HUMAN BODY. TO RESTRICT THE ROBOT MOVEMENT RANGE TO PROTECT THE HUMAN BODY, USE THE MECHANICAL STOPPERS INSTALLED IN THE ROBOT (OR AVAILABLE AS OPTIONS).**

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### (4) Mechanical stoppers

The mechanical stoppers prevent axis motion from exceeding the movement range when the servo power is shut off by an emergency stop or by a protective function during high-speed robot movement.

Note: The movement range is the area limited by mechanical stoppers.



#### **WARNING**

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**AXIS MOVEMENT DOES NOT STOP IMMEDIATELY AFTER THE SERVO POWER SUPPLY IS SHUT OFF BY EMERGENCY STOP OR OTHER PROTECTIVE FUNCTIONS, SO USE CAUTION.**

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#### **CAUTION**

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**If the robot moving at high speed collides with a mechanical stopper installed in the robot (or available as option), the robot may be damaged.**

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### (5) Vertical axis brake

An electromagnetic brake is installed on the vertical use robot to prevent the vertical axis from sliding down when servo power is turned off. This brake is working when the controller is off or the vertical axis servo power is off even when the controller is on.

The vertical axis brake can be released with the Handy Terminal when the controller power is turned on.



#### WARNING

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THE VERTICAL AXIS WILL SLIDE DOWNWARD WHEN THE BRAKE IS RELEASED, CAUSING A HAZARDOUS SITUATION. TAKE ADEQUATE SAFETY MEASURES IN CONSIDERATION BY TAKING THE WEIGHT AND SHAPE INTO ACCOUNT.

- BEFORE RELEASING THE BRAKE AFTER PRESSING THE EMERGENCY STOP BUTTON, PLACE A SUPPORT UNDER THE VERTICAL AXIS SO THAT IT WILL NOT SLIDE DOWN.
  - BE CAREFUL NOT TO LET YOUR BODY GET CAUGHT BETWEEN THE VERTICAL AXIS AND THE INSTALLATION BASE WHEN PERFORMING TASKS (DIRECT TEACHING, ETC.) WITH THE BRAKE RELEASED.
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## 5 Safety measures for the system

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Since the robot is commonly used in conjunction with an automated system, dangerous situations are more likely to occur from the automated system than from the robot itself. Accordingly, appropriate safety measures must be taken on the part of the system manufacturer according to the individual system. The system manufacturer should provide a proper instruction manual for safe, correct operation and servicing of the system.

## 6 Trial operation

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After making installations, adjustments, inspections, or maintenance or repairs to the robot, make a trial run using the following procedures.

- (1) **If a safety enclosure has not yet been provided right after installation of the robot, rope off or chain off around the movement area of the manipulator in place of the safety enclosure, and observe the following points.**
  1. Use sturdy, stable posts which will not fall over easily.
  2. The rope or chain should be easily visible by everyone around the robot.
  3. Place a sign to keep the operator or other personnel from entering the movement range of the manipulator.

**(2) Check the following points before turning on the controller.**

1. Is the robot securely and correctly installed?
2. Are the electrical connections to the robot correct?
3. Are items such as air pressure correctly supplied?
4. Is the robot correctly connected to peripheral equipment?
5. Have safety measures (safety enclosure, etc.) been taken?
6. Does the installation environment meet the specified standards.

**(3) After the controller is turned on, check the following points from outside the safety enclosure.**

1. Does the robot start and stop as intended? Can the operation mode be selected correctly?
2. Does each axis move as intended within the soft limits?
3. Does the end effector move as intended?
4. Are the signal transmissions to the end effector and peripheral equipment correct?
5. Does emergency stop work?
6. Are the teaching and playback functions normal?
7. Are the safety enclosure and interlock working as intended?
8. Does the robot move correctly during automatic operation?

## 7 Work within the safety enclosure

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**(1) Work within the safety enclosure**

When work is required inside the safety enclosure, always turn off the controller and place a sign indicating that the robot is being adjusted or serviced in order to keep any other person from touching the controller switch or operation panel, except for the following cases.

- 1) Soft limit settings
- 2) Teaching

For item 1), follow the precautions and procedure for each section. To perform item 2), refer to the description in (2) below.

**(2) Teaching**

When performing teaching within the safety enclosure, comply with the instructions listed below.

- 1) Check or perform the following points from outside the safety enclosure.
  1. Make sure that no hazards are present within the safety enclosure by a visual check.
  2. Check that the Handy Terminal is operating normally.

3. Check that no failures are found in the robot.
  4. Check that emergency stop works correctly.
  5. Select teaching mode and prohibit automatic operation.
- 2) Never enter the movement range of the manipulator while within the safety enclosure.

## 8 Automatic operation

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Automatic operation described here includes all operations in AUTO mode.

**(1) Check the following before starting automatic operation.**

1. No one is within the safety enclosure.
2. The Handy Terminal and tools, etc., are in their prescribed positions.
3. The alarm or error lamps on the robot and peripheral equipment do not flash.
4. The safety enclosure is securely installed with safety interlocks actuated.

**(2) Observe the following during automatic operation or in cases where an error occurs.**

- 1) After automatic operation has started, check the operation status and signal light to ensure that the robot is in automatic operation.
- 2) Never enter the safety enclosure during automatic operation.
- 3) If an error occurs in the robot or peripheral equipment, observe the following procedure before entering the safety enclosure.
  1. Press the emergency stop button to set the robot to emergency stop.
  2. Place a sign on the start switch, indicating that the robot is being inspected in order to keep any other person from touching the start switch and restarting the robot.

## 9 Warranty

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The MISUMI robot and/or related product you have purchased are warranted against defects or malfunctions as described below.

**Warranty description** : This warranty conforms to the "warranty description" listed at the end of the MISUMI "FA Mechanical Standard Components" catalog.

**Warranty Period** : The warranty period ends when any of the following applies:  
(1) After one year has elapsed from the date of installation  
(2) After 2,400 hours of operation

# Introduction

## Contents

Introduction

i

Before using RSH1C/RSH2C/RSH3C series (Be sure to read the following notes.) ii





# Introduction

The MISUMI SINGLE AXIS ROBOT RSC series are family of single-axis industrial robots that offer improved ease of use, resistance to environmental conditions, and maintenance workability. A wide variety of product lineup allows you to select the desired robot model that best matches your application.

This manual describes the safety measures, handling, adjustment and maintenance of RSC series robots for correct, safe and effective use. Be sure to read this manual carefully before installing the robot. Even after you have read this manual, keep it in a safe and convenient place for future reference.

- This manual should be used with the robot and considered an integral part of it.  
When the robot is moved, transferred or sold, send this manual to the new user along with the robot. Be sure to explain to the new user the need to read through this manual.
- Specifications of robot models other than standard models may be omitted in this manual if they are common to those of standard models. In this case, refer to the specifications of standard models.
- For details on specific operation of the robot, refer to the separate user's manual for the robot controller being used.

The manual describes the robots listed below.

Type name	Model name
RSC Series	RS1C/RS2C/RS3C
RSHC Series	RSH1C/RSH2C/RSH3C



## WARNING

**THE ADJUSTMENT AND MAINTENANCE WORK WITH THE COVER REMOVED NEEDS THE SPECIAL KNOWLEDGE AND SKILL. IF UNSKILLED WORK PERSON PERFORMS SUCH WORK, THIS MAY INVOLVE RISK. THESE TASKS MUST BE PERFORMED ONLY BY PERSONS WHO MEET REQUIREMENTS ESTABLISHED BY LOCAL REGULATIONS AND SAFETY STANDARDS FOR INDUSTRIAL ROBOTS.**

## NOTES

- The contents of this manual are subject to change without prior notice.
- While every effort has been made to ensure the contents of this manual are correct, please contact us if you find any part of this manual to be unclear, confusing or inaccurate.

# Before using RSH1C/RSH2C/RSH3C series (Be sure to read the following notes.)

Thanks for your purchasing the single-axis robot RSH1C/RSH2C/RSH3C series.  
Before using this robot, read the following notes and set the origin position.

The RSH1C/RSH2C/RSH3C single-axis robots use an incremental type or absolute type position detector. The absolute type does not require an origin search (return-to-origin) after turning the controller power back on. However, when the controller power is turned on in the following cases, return-to-origin must be performed just the very first time.

1. When robot cable was first connected after delivery from MISUMI.
2. When robot cable was disconnected from the controller and then reconnected.
3. When no absolute battery is connected.
4. When a motor or cable was replaced.

In such cases described above, any of the following errors occurs immediately after the controller power has been turned on, but this is not a malfunction. The controller will operate normally by restarting.

82 ENCODER ERROR  
83 ABS. ENCODER ERR.  
8A ABS. BATTERY ERR.  
8B ABS. COUNT ERROR  
8D ABS. OVERFLOW ERR.  
...etc.

## ■ Setting the origin position

Set the origin position while referring to the following section in the robot controller user's manual.

See "6.2 Origin search (return-to-origin)" in "6. Operating the robot" of the "H1 Operation Guide" section.



### CAUTION

**Changing the origin position to the opposite side of the initial position may cause a position shift or robot breakdowns, so use caution.**

**Avoid changing the origin detection method since it is dangerous in some cases. If the origin position must be changed, please consult your distributor.**

# Chapter 1

## Installation and connections

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# 1. Checking the product

After unpacking, make sure that all components and accessories are included (as specified in your order). Also check the product for any damage on the exterior which might have occurred during transportation. If there are any missing parts or damage due to transportation, please notify your distributor immediately.



## WARNING

**WHEN UN PACKING, CAREFULLY HOLD THE ROBOT NOT TO DROP IT. IF THE ROBOT FALLS, SERIOUS INJURY MAY OCCUR OR THE ROBOT MAY BE DAMAGED.**



## CAUTION

**Make sure that the product you have received is that you ordered. If an incorrect product is installed, this may cause personal injury or damage.**

## 2. Precautions

### 2.1 Cautions common to all models

#### 1. Use the robot within the maximum operable stroke.

If the robot is used with a stroke exceeding the maximum stroke, this may cause the main unit to break. For details about maximum strokes, see the specifications of each robot.

#### 2. When the robot is reciprocated repeatedly by micro stroke, perform the full stroke operation at least once a day or once every 1,000 reciprocations. Failure to do so may cause grease run-out.

#### 3. Do not apply any excessive external force or impact force to the robot during operation.

Doing so may cause the main unit to break. Each part including the motor is manufactured with a precise tolerance. So, even a slight deformation or positional deviation may cause malfunction.



## WARNING

- **BE SURE TO CAREFULLY READ THE MANUALS (THIS MANUAL AND CONTROLLER: C1/C21/C22 USER'S MANUAL).**  
NEVER ATTEMPT TO PERFORM HANDLING NOT STATED IN THE MANUAL OR OPERATION BEYOND THE SPECIFICATION RANGE. OTHERWISE, THIS MAY CAUSE BREAKAGE OR MALFUNCTION. YAMAHA SHALL NOT BE HELD RESPONSIBLE FOR ANY DEFECT ARISING FROM ANY OPERATION NOT STATED IN THE MANUAL OR BEYOND THE SPECIFICATION RANGE.
- **THE ROBOT HAS A POTENTIAL HAZARD THAT IT PERFORMS AN IMPACT OPERATION AT A SPEED EXCEEDING THE SETTING IF THE FORCE CHANGES AS THE MACHINE SLIDING PART IS PRIED.**  
SUCH OPERATION MAY CAUSE PERSONAL INJURY, SUCH AS YOUR HAND OR FOOT GET CAUGHT IN OR DAMAGE TO THE MACHINE. SO, MAKE THE ADJUSTMENT SO THAT THE MACHINE PERFORMS THE MOTION SMOOTHLY AND DESIGN THE ROBOT SO THAT ANY PERSONAL INJURY DOES NOT OCCUR.
- **INSTALL AN APPROPRIATE PROTECTIVE COVER IN A PORTION WHERE IS HAZARD TO THE HUMAN BODY.**  
IF ANY OBJECT TO BE DRIVEN AND ROBOT MOVABLE PART ARE PARTICULARLY HAZARD TO THE HUMAN BODY, DESIGN THE STRUCTURE SO THAT NO HUMAN BODY IS IN CONTACT WITH SUCH PARTS.
- **MAKE THE CONNECTIONS FIRMLY SO THAT THE ROBOT SECURED PORTION OR CONNECTION PORTION DOES NOT BECOME LOOSE.**  
IN PARTICULAR, WHEN THE OPERATION FREQUENCY IS HIGH OR WHEN THE ROBOT IS USED IN A PLACE WHERE MANY VIBRATIONS EXIST, USE SECURE CONNECTION METHODS.
- **TAKE THE POSSIBILITY OF DRIVE POWER SOURCE FAILURE INTO CONSIDERATION .**  
TAKE APPROPRIATE MEASURES SO THAT THE HUMAN BODY OR EQUIPMENT IS NOT DAMAGED EVEN WHEN A FAILURE OCCURS IN THE DRIVE POWER SOURCE.
- **TAKE THE BEHAVIOR IN CASE OF AN EQUIPMENT EMERGENCY STOP INTO CONSIDERATION.**  
DESIGN THE EQUIPMENT SO THAT THE ROBOT MOTION DOES NOT CAUSE DAMAGE TO THE HUMAN BODY, UNIT, AND EQUIPMENT EVEN WHEN THE MACHINE STOPS AS THE EMERGENCY STOP OF THE EQUIPMENT IS ACTIVATED OR THE SAFETY DEVICE IS ACTIVATED IN CASE OF A SYSTEM FAILURE, SUCH AS POWER FAILURE.
- **TAKE THE BEHAVIOR WHEN RESTARTING THE EQUIPMENT AFTER EMERGENCY STOP OR ERROR STOP INTO CONSIDERATION.**  
DESIGN THE EQUIPMENT SO THAT RESTARTING THE EQUIPMENT WILL NOT CAUSE DAMAGE TO THE HUMAN BODY OR EQUIPMENT.

#### 4. Perform the following inspections before starting the operation.

- a) Check the electric power cables and signal cables for damage.
- b) Check the power and signal cable connectors for play or looseness.
- c) Check the installation portions for play or looseness.
- d) Check for operation failure.
- e) Check the emergency stop of the equipment.

#### 5. When multiple personnel perform the work, determine the work procedures, communication signs, actions to be taken in case of a failure, and restoring procedures from failure state before starting the work, and assign a person other than work personnel who supervises the work.

#### 6. The actual speed may not satisfy the set speed depending on the load and resistance conditions. When selecting a robot model, check the selection method and specifications.

#### 7. Do not apply any load, impact, or resistance other than the transfer load during return-to-origin. Otherwise, the origin position may deviate when the push return-toorigin is used.

#### 8. Do not remove the nameplate.

#### 9. Check the robot operation at a low speed. After checking that there is no problem, operate the robot at a specified speed.

**WARNING**

IF ANY NOISE OR VIBRATION IS FOUND, IMMEDIATELY STOP THE OPERATION.

IF ANY NOISE OR VIBRATION OCCURS, THE PRODUCT INSTALLATION MAY BE FAULTY. IF THE OPERATION CONTINUES, THE EQUIPMENT MAY BE BROKEN.

## 2.2 The "Emergency Stop" stopping distance (RS1C/RS2C/RS3C)

The maximum stopping distance is 195mm (RS3C: payload of 6kg, operation speed of 1m/sec) when the "emergency stop" button is pressed, or when power to the controller is shut off.

## 3. Moving the robot

### 3.1 Moving the robot with hoist or cart

Using a hoist, carrying cart (dolly) or forklift is recommended for moving a single-axis robot or controller. Use sufficient caution when moving robot models with a long stroke or designed for large payload, since they are heavy.



#### WARNING

SERIOUS INJURY MAY OCCUR IF THE ROBOT FALLS AND PINS SOMEONE UNDER IT.

- USE A HOIST AND ROPE WITH CARRYING CAPACITY STRONG ENOUGH TO SUPPORT THE ROBOT WEIGHT.
- MAKE SURE THE ROPE STAYS SECURELY ON THE HOIST HOOK.
- REMOVE ALL LOADS ATTACHED TO THE ROBOT MANIPULATOR END. IF ANY LOAD IS STILL ATTACHED, THE ROBOT BALANCE MIGHT SHIFT WHILE BEING CARRIED, AND THE ROBOT TOPPLE OVER CAUSING ACCIDENTS.
- ALWAYS WEAR A SAFETY HELMET, SHOES AND GLOVES DURING WORK.
- WHEN MOVING THE ROBOT BY EQUIPMENT SUCH AS A FORKLIFT THAT REQUIRES A LICENSE, ONLY PROPERLY QUALIFIED PERSONNEL MAY OPERATE SUCH EQUIPMENT. THE EQUIPMENT AND TOOLS USED FOR MOVING THE ROBOT SHOULD BE SERVICED DAILY.

### 3.2 Moving the robot by work personnel

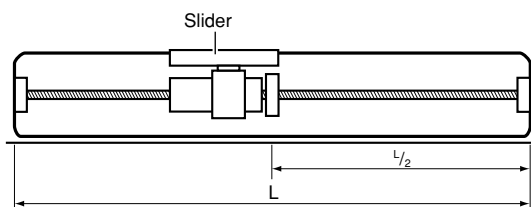
Always use two people to carry the robot unit. Each person should grip the robot unit near one end from the lower side and carry with the load well balanced. Carry with the robot facing upward (slider side upwards).



#### WARNING

ALWAYS OBSERVE THE FOLLOWING PRECAUTIONS WHEN CARRYING THE ROBOT.

- REMOVE ANY AND ALL OBJECTS SUCH AS HANDS AND GRIPPERS ATTACHED TO THE ROBOT SLIDER BEFORE MOVING THE ROBOT. THE SLIDER WILL LOSE BALANCE IF MOVED WITH OBJECTS STILL ATTACHED AND CAUSE INJURIES.
- KEEP THE ROBOT BALANCED AND DON'T LET IT TILT WHILE MOVING IT. IF THE ROBOT TILTS, THE SLIDER MAY MOVE UNDER ITS OWN WEIGHT CAUSING SERIOUS INJURIES SUCH AS CRUSHED FINGERS.
- MOVE THE SLIDER SO THAT BALL NUT SECTION IS POSITIONED IN THE NEAR CENTER OF THE ROBOT BEFORE CARRYING THE ROBOT. FAILURE TO DO SO MAY CAUSE THE BALL SCREW TO SWING OR VIBRATE LARGELY WHILE CARRYING THE ROBOT.



- NEVER ATTEMPT TO HOLD THE ROBOT IN ANY OF THE FOLLOWING MANNERS .  
(NEVER TRY THIS WHEN MOVING!)
  - DO NOT CARRY BY HOLDING THE SLIDER.
  - DO NOT CARRY BY GRIPPING THE END COVER.
  - DO NOT CARRY BY HOLDING THE CABLE.
  - DO NOT CARRY BY HOLDING THE UPPER COVER.



#### CAUTION

- When moving or carrying the robot by hand, avoid placing your hand or fingers on the shutter at the top of the robot. Pressing down on the shutter, even by a little force, may cause the shutter to warp or deform, resulting in a premature life end of the related parts.
- Wear safety shoes and gloves before starting the work.

## 4. Installation environments

Be sure to install the robot in the following environments.

Items	Specifications
	RS1C / RS2C / RS3C / RSH1C / RSH2C / RSH3C
Allowable ambient temperature	0 to 40 °C
Allowable ambient humidity	35 to 85% RH (non condensation)
Altitude	0 to 1000 meters above sea level
Ambient environments	Avoid installing near water, cutting water, oil, dust, metallic chips and organic solvent. Avoid installation near corrosive gas and corrosive materials. Avoid installation in atmosphere containing inflammable gas, dust and liquid. Avoid installation near objects causing electromagnetic interference, electrostatic discharge and radio frequency interference. The environment must be free of coolant.
Vibration	Do not subject to impacts or vibrations.
Working space	Allow sufficient space margin to perform jobs (teaching, inspection, repair, etc.)

For detailed information on how to install the robot controller, refer to the separate "C1/C21/C22 User's Manual".



### WARNING

AVOID USING THE ROBOT IN THE FOLLOWING ATMOSPHERE WHERE;

1. A LARGE AMOUNT OF DUST OR DIRT EXISTS OR CUTTING CHIPS ENTER EASILY.
2. THE AMBIENT TEMPERATURE EXCEEDS THE ALLOWABLE AMBIENT TEMPERATURE OF EACH MODEL.
3. THE AMBIENT HUMIDITY EXCEEDS THE ALLOWABLE AMBIENT RELATIVE HUMIDITY OF EACH MODEL.
4. CORROSIVE GAS, FLAMMABLE GAS, SEAWATER, WATER, OR STEAM EXISTS OR STICKS.
5. STRONG MAGNETIC FIELD OR STRONG ELECTRIC FIELD IS GENERATED.
6. VIBRATION OR SHOCK TRANSMITS DIRECTLY.
7. A LARGE AMOUNT OF DUST EXISTS, OR WATER DROPLETS OR OIL DROPS SPLASH.
8. THE ROBOT IS EXPOSED TO THE DIRECT SUNLIGHT (ULTRAVIOLET RAY).



### WARNING

- DO NOT USE THE ROBOT IN AN ENVIRONMENT WHERE THE FLUID, SUCH AS CUTTING OIL DIRECTLY SPLASHES ONTO IT.

IF THE ROBOT IS USED IN AN ENVIRONMENT WHERE THE CUTTING OIL, COOLANT, OR OIL MIST STICKS TO IT, THIS MAY CAUSE MALFUNCTION OR SLIDING RESISTANCE TO INCREASE.

- INSTALL A COVER, ETC. WHEN THE ROBOT IS USED IN A PLACE WHERE FOREIGN OBJECTS, SUCH AS DUST, DIRT, CUTTING CHIP, AND SPATTER DIRECTLY SPLASH TO IT.

OTHERWISE, RATTLE MAY OCCUR OR SLIDING RESISTANCE MAY INCREASE.

- BLOCK THE SUNLIGHT IN A PLACE WHERE THE ROBOT IS EXPOSED TO THE DIRECT SUNLIGHT.
- BLOCK THE HEAT SOURCE WHEN IT EXISTS AROUND THE ROBOT.

IF THE HEAT SOURCE EXISTS AROUND THE ROBOT, THE TEMPERATURE OF THE ROBOT INCREASES BY THE RADIANT HEAT. THE OPERATING TEMPERATURE INCREASES AND EXCEEDS THE ALLOWABLE AMBIENT TEMPERATURE. SO, BLOCK THE HEAT SOURCE WITH AN APPROPRIATE COVER.

- IT MAY BE PROMOTED TO DECREASE THE GREASE BASE OIL ACCORDING TO THE EXTERNAL ENVIRONMENT AND OPERATING CONDITIONS. THIS MAY LOWER THE LUBRICATION PERFORMANCE OR MAY ADVERSELY AFFECT THE SERVICE LIFE OF THE ROBOT.





#### WARNING

---

- AVOID INSTALLING THE ROBOT IN LOCATIONS WHERE THE AMBIENT CONDITIONS MAY EXCEED THE ALLOWABLE TEMPERATURE OR HUMIDITY, OR IN ENVIRONMENTS WHERE EXCESSIVE MOISTURE, CORROSIVE GASES, METALLIC POWDER OR DUST ARE GENERATED. MALFUNCTIONS, FAILURES OR SHORT CIRCUITS MAY OTHERWISE RESULT.
  - THIS ROBOT WAS NOT DESIGNED FOR OPERATION IN ENVIRONMENTS WHERE INFLAMMABLE OR EXPLOSIVE SUBSTANCES ARE PRESENT.
  - DO NOT USE THE ROBOT IN ENVIRONMENTS CONTAINING INFLAMMABLE GAS, DUST OR LIQUIDS. EXPLOSIONS OR FIRE COULD OTHERWISE RESULT.
  - AVOID USING THE ROBOT IN LOCATIONS SUBJECT TO ELECTROMAGNETIC INTERFERENCE, ELECTROSTATIC DISCHARGE OR RADIO FREQUENCY INTERFERENCE. MALFUNCTIONS MAY OTHERWISE OCCUR.
  - DO NOT USE THE ROBOT IN LOCATIONS SUBJECT TO EXCESSIVE VIBRATION. ROBOT INSTALLATION BOLTS MAY OTHERWISE BECOME LOOSE CAUSING THE MANIPULATOR TO FALL OVER.
-

## 5. Installation base

To mount the robot, use an installation base that satisfies the following conditions.

1. The installation base is subjected to a great deal of stress while the robot is in operation. Prepare a sufficiently rigid and stable installation base, taking into account the robot weight including the end effector (gripper) and workpiece.



### WARNING

IF THE INSTALLATION BASE IS NOT SUFFICIENTLY RIGID AND STABLE, VIBRATION (RESONANCE) MAY OCCUR DURING OPERATION, CAUSING ADVERSE EFFECTS ON THE ROBOT WORK.

2. The installation base surface must be machined within a flatness of  $\pm 0.05\text{mm}/500\text{mm}$ .

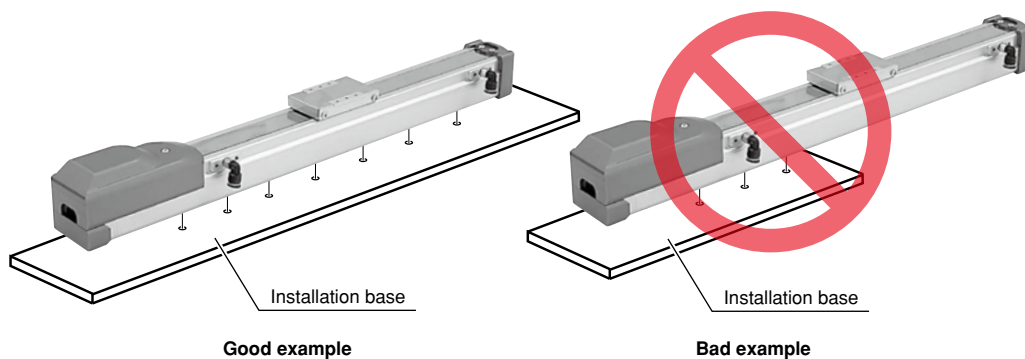


### CAUTION

The robot positioning accuracy and service life might decrease if the installation surface precision is insufficient.

3. Use an installation base of sufficient size to match the robot body so that the robot can be installed with the specified number of bolts. Avoid installing the robot with less than the specified number of bolts or installing the robot closer to one end as shown at the lower right.

### Example of installation base



63102-BM-00



### WARNING

WHEN INSTALLING THE ROBOT, ALWAYS USE ALL THE MOUNTING HOLES DRILLED IN THE BOTTOM OF THE ROBOT. WHEN INSTALLING THE RSD2/RSDG2 OR RSD3/RSDG3, ALWAYS USE THE SPECIFIED NUMBER OF BOLTS. USING LESS THAN THE SPECIFIED NUMBER OF BOLTS TO INSTALL THE ROBOT MAY CAUSE VIBRATION AND POOR POSITIONING ACCURACY. THIS MAY ALSO RESULT IN POSITIONING ERRORS AND REDUCED SERVICE LIFE IN THE WORST CASES.



### NOTE

Positions of robot mounting holes differ according to the stroke length of each robot. For details, see the external view and dimensions stated in "1. Robot specifications" of Chapter 5.

## 6. Installing the robot



### WARNING

THE INSTALLATION WORK WITH THE COVER REMOVED NEEDS THE SPECIAL KNOWLEDGE AND SKILL. IF UNSKILLED WORK PERSON PERFORMS SUCH WORK, THIS MAY INVOLVE RISK. THESE TASKS MUST BE PERFORMED ONLY BY PERSONS WHO MEET REQUIREMENTS ESTABLISHED BY LOCAL REGULATIONS AND SAFETY STANDARDS FOR INDUSTRIAL ROBOTS.



### WARNING

- BEFORE INSTALLING THE ROBOT, ALWAYS MAKE SURE THAT THE ROBOT CONTROLLER IS NOT CONNECTED TO THE ROBOT OR THE POWER TO THE CONTROLLER IS OFF. SERIOUS ACCIDENTS MAY OCCUR IF THE ROBOT STARTS TO OPERATE DURING INSTALLATION.
- BE SURE TO USE THE BOLTS OF THE SPECIFIED SIZE AND LENGTH AND TIGHTEN THEM SECURELY TO THE CORRECT TORQUE IN THE CORRECT POSITIONS. FAILURE TO FOLLOW THIS INSTRUCTION MAY CAUSE ROBOT VIBRATIONS, POSITION ERRORS AND SERIOUS ACCIDENTS. DO NOT USE A BOLT LONGER THAN THE SPECIFIED LENGTH SINCE IT MAY INTERFERE WITH THE INTERNAL PARTS OF THE ROBOT AND CAUSE MALFUNCTIONS.



### CAUTION

- Be sure to wear gloves before starting the work. If you touch any steel material portion directly by your bare hand, this may cause rust.
- Do not pull the motor cable. Doing so might cause faulty wiring.
- The robot frame is made of aluminum so be careful not to damage the screw threads when tightening the bolt.



### CAUTION

- To keep the cleanliness, clean the robot surface with alcohol to remove the dust or dirt sticking to the surface.
- Use the suction hoses to suck the air from the inside of the robot.

## 6.1 RS1C/RS2C/RS3C

Drill holes into the surface of the installation base as shown in the figure below, and secure the robot with the prescribed bolts which are inserted from the installation base's bottom face. The bolts and tightening torques are shown below.



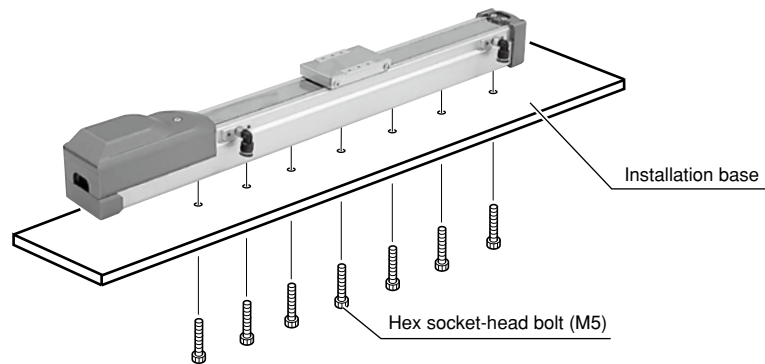
### NOTE

For details about hole and bolt machining dimensions and positions of the robot installation base surface, see the external view and dimensions stated in "1. Robot specifications" of Chapter 5.

### ■ RS1C

Robot	Installation bolt	Tightening torque
RS1C	Hex socket-head bolt (M5), Strength: 8.8T Length: Installation base thickness + 8mm (maximum)	60 to 90kgf•cm

### Installing the RS1C

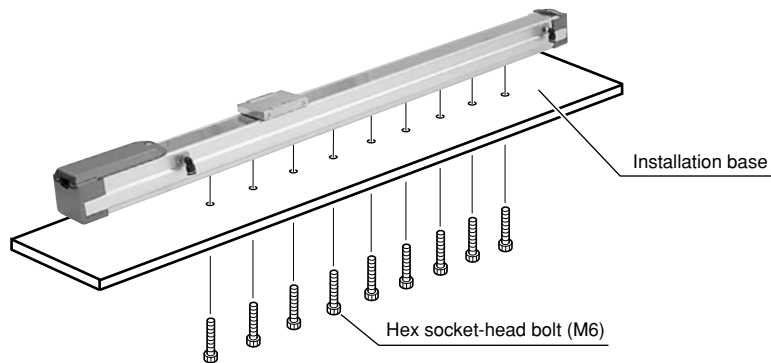


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### ■ RS2C/RS3C

Robot	Installation bolt	Tightening torque
RS2C/RS3C	Hex socket-head bolt (M6), Strength: 8.8T Length: Installation base thickness + 8mm (maximum)	100 to 130kgf•cm

### Installing the RS2C/RS3C



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## 6.2 RSH1C/RSH2C/RSH3C

Drill holes into the surface of the installation base as shown in the figure below, and secure the robot with the prescribed bolts which are inserted from the installation base's bottom face. The bolts and tightening torques are shown below.

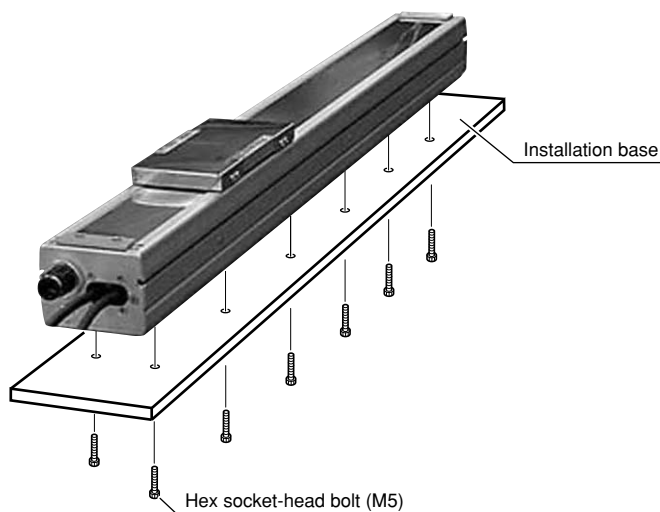


**NOTE**

For details about hole and bolt machining dimensions and positions of the robot installation base surface, see the external view and dimensions stated in "1. Robot specifications" of Chapter 5.

Robot	Installation bolt	Tightening torque
RSH1C/RSH2C/RSH3C	Hex socket-head bolt (M5), Strength: 8.8T Length: Installation base thickness + 9mm (maximum)	60 to 90kgf•cm

### Installing the RSH1C/RSH2C/RSH3C



63105-BM-00

### Protective bonding



**WARNING**

**ALWAYS GROUND THE ROBOT AND CONTROLLER UNIT TO PREVENT ELECTRICAL SHOCK.**

Always use the ground terminal (M4 screw) on the robot unit to make ground connection. The ground terminal location is shown below.



**CAUTION**

- A secure ground connection (less than 100-ohm resistance to ground) is recommended.
- Use electrical wire thicker than AWG14 (2mm<sup>2</sup>) as the ground wire.



**WARNING**

**ALWAYS TURN OFF THE POWER TO THE CONTROLLER BEFORE MAKING THE GROUND CONNECTION.**

Provide a terminal marked "PE" as the protective conductor for the entire system, and connect it to an external protective conductor. Also securely connect the ground terminal on the robot frame to the protective conductor.

### Grounding



(417-IEC-5019)

63106-BM-00

# 7. Connections

## 7.1 Connecting the robot to the controller

Follow the steps below to connect the robot cables of the robot main body to the mating connectors on the controller. For details about connection connectors on the controller side, see the C1/C21/C22 User's Manual.



**WARNING**

- BEFORE CONNECTING THE CABLES, CHECK THAT THERE ARE NO BENDS OR BREAKS IN THE ROBOT CABLE CONNECTOR PINS AND THAT THE CABLES ARE NOT DAMAGED. CONTACT FAILURE MAY CAUSE ROBOT MALFUNCTIONS.
- ALWAYS MAKE SURE THAT THE POWER TO THE ROBOT CONTROLLER IS OFF BEFORE CONNECTING THE ROBOT CABLES TO THE CONTROLLER.



**WARNING**

- IF ANY CONNECTOR IS CONNECTED INCOMPLETELY AND ANY PIN HAS FAULTY CONTACT, THE ROBOT MAY MALFUNCTION, LEADING TO HAZARDOUS SITUATION. BEFORE TURNING ON THE CONTROLLER POWER, MAKE SURE THAT EACH CONNECTOR IS CONNECTED SECURELY.
- TAKE APPROPRIATE MEASURES SO THAT NO LOAD IS APPLIED TO THE CONNECTOR EVEN WHEN THE ROBOT CABLE IS STRETCHED.



**WARNING**

- ARRANGE THE ROBOT CABLES SO THAT THEY DO NOT HINDER THE ROBOT OPERATION. ADDITIONALLY, DO NOT USE AN AREA WHERE ANY ROBOT CABLE INTERFERES WITH THE LOAD ATTACHED TO THE ROBOT TIP AS WORK AREA. IF ANY CABLE INTERFERES WITH THE ROBOT MOVABLE PART, THIS MAY CAUSE THE ROBOT TO MALFUNCTION, LEADING TO HAZARDOUS SITUATION.
- ARRANGE THE ROBOT CABLES SO THAT THE CONNECTED CABLES DO NOT HINDER A WORK PERSON. IF A WORK PERSON STUMBLES OVER ANY ROBOT CABLE AND FALLS DOWN, THIS MAY CAUSE PERSONAL INJURY.



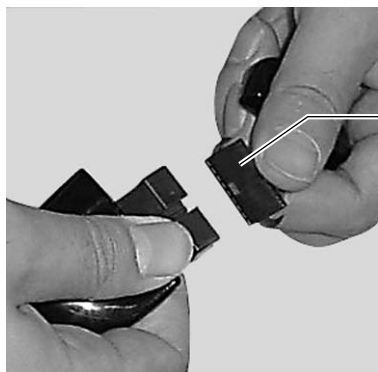
**CAUTION**

- After connecting the relay connectors on the robot cables, fit the connector hoods together securely.
- The standard robot cables are not movable cables. So, connect the cables so that the motor power cable and signal cable connectors of the robot cables do not move.

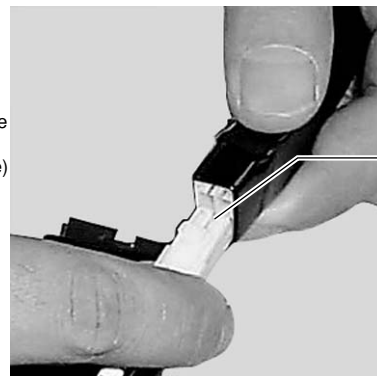
■ Connections

**Step 1** Connect the robot cables (motor and signal wires) to the mating connectors coming out from the robot.

Connecting the power cable and signal cable



Robot cable connector (signal wire)

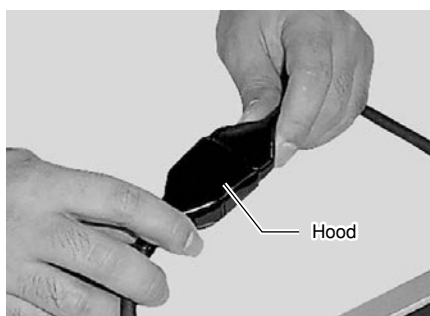


Robot cable connector (motor wire)

63114-BM-00

**Step 2** After making the connections, fit the connector hoods together securely.

Connecting the hoods

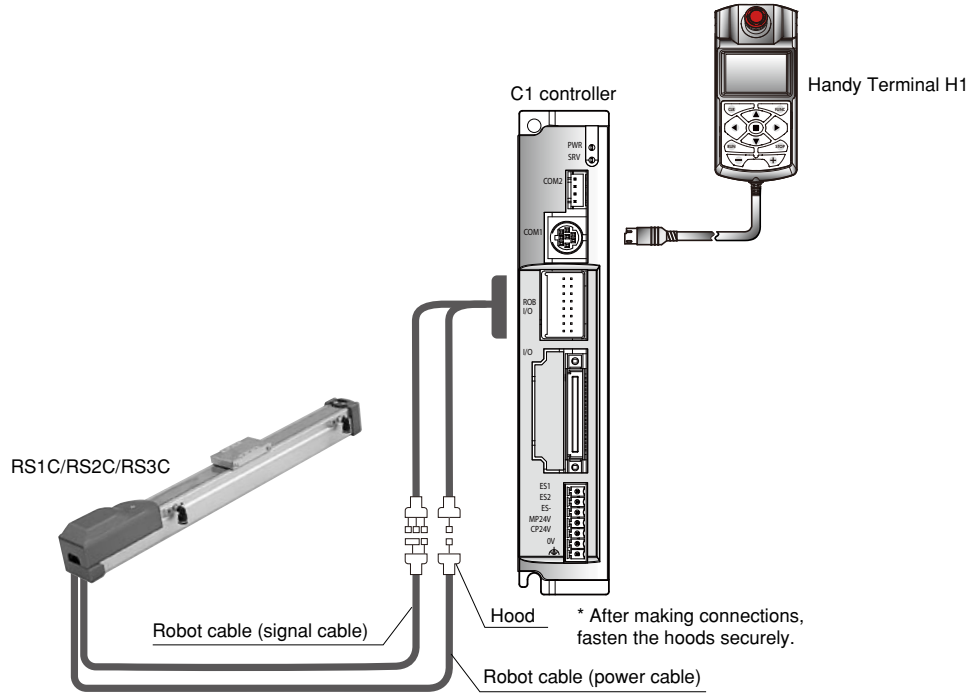


Hood

## 7.2 Robot cable connections

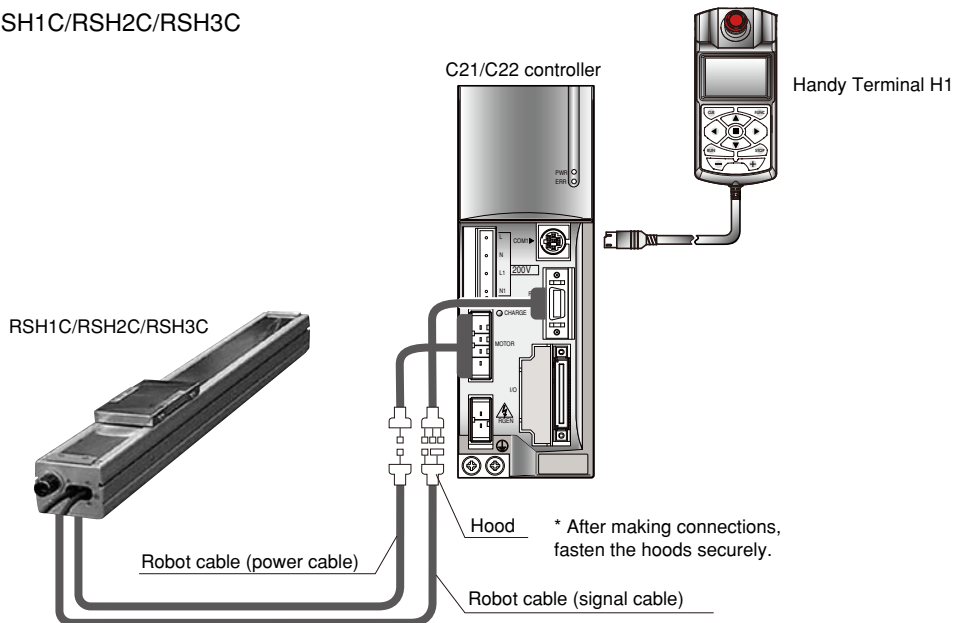
### Robot cable connections

RS1C/RS2C/RS3C



### Robot cable connections

RSH1C/RSH2C/RSH3C

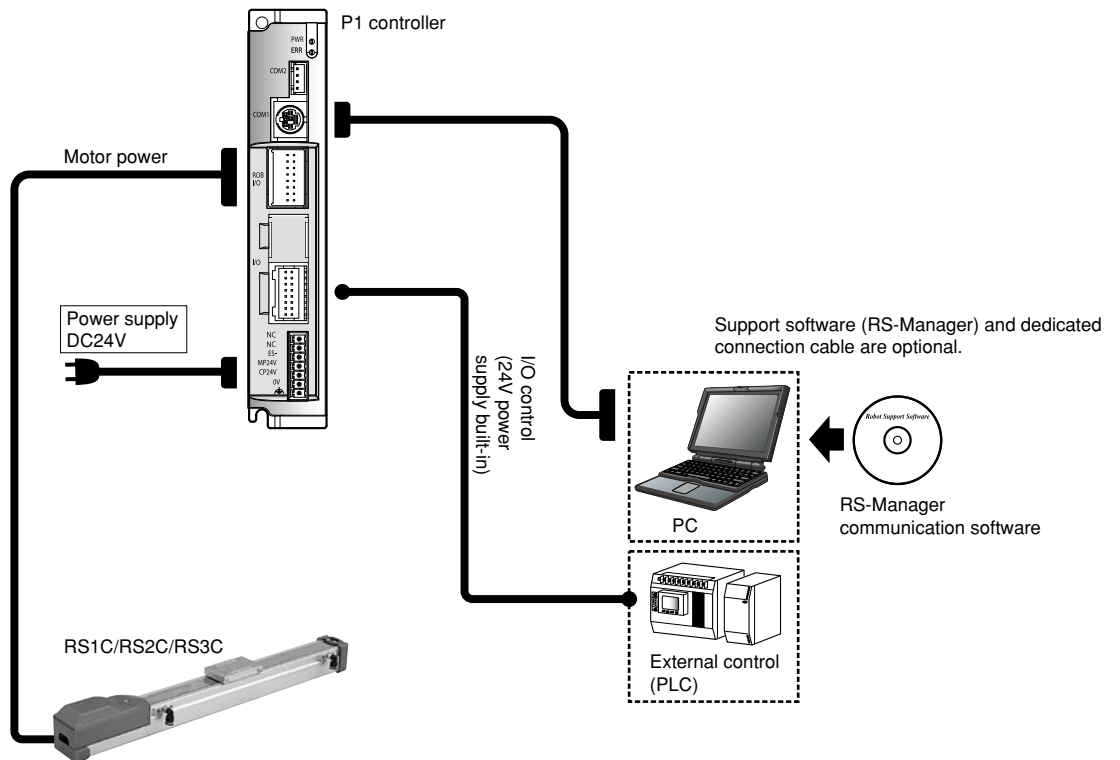
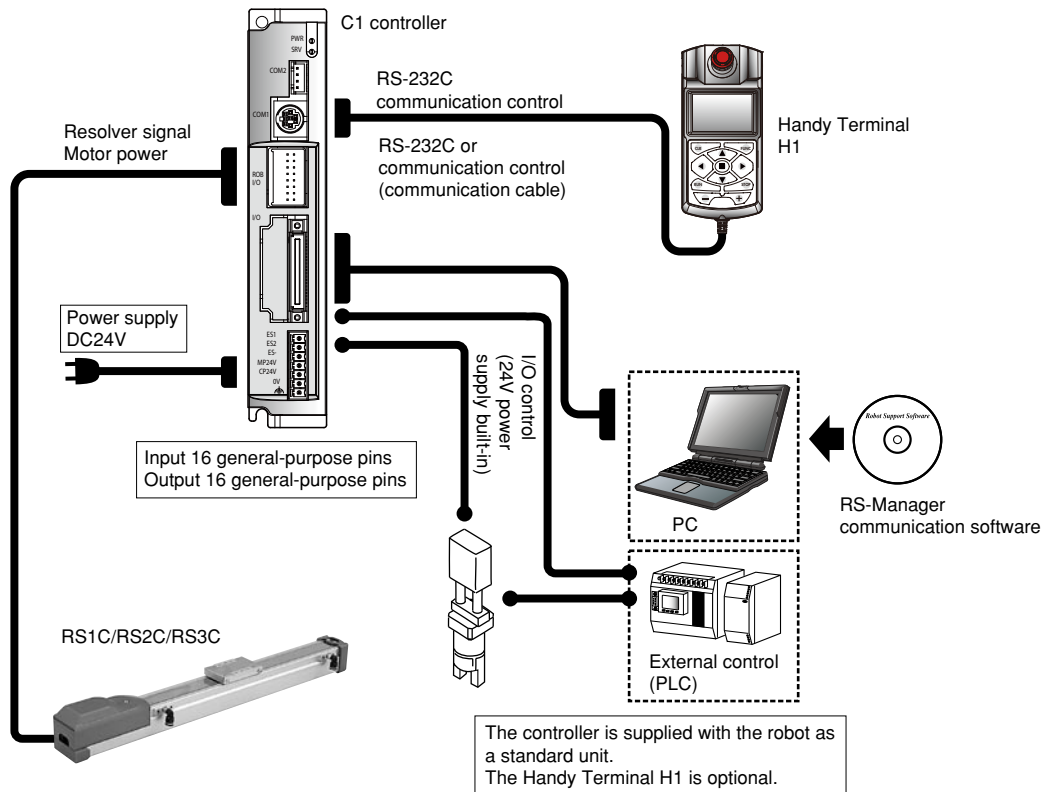


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## 7.3 Robot system configuration drawing

### Robot system configuration drawing

RS1C/RS2C/RS3C

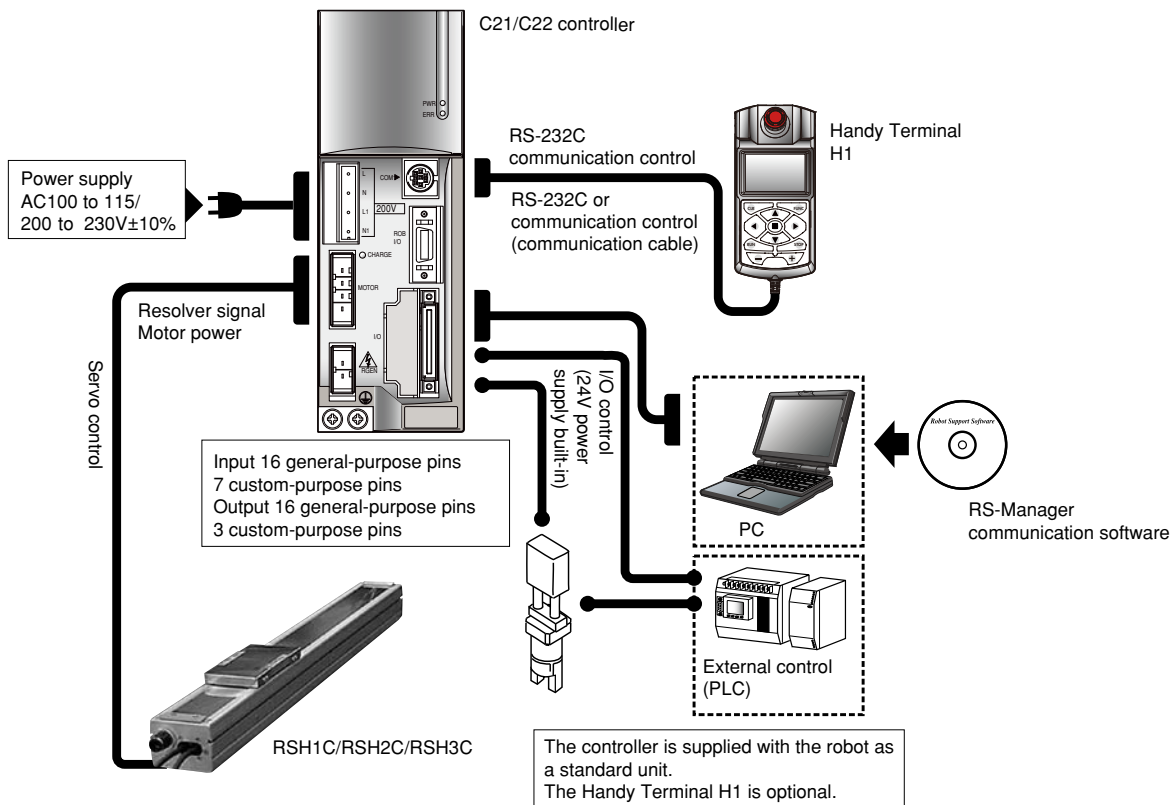


63108-BM-00



Robot system configuration drawing

RSH1C/RSH2C/RSH3C



63109-BM-00

7.4 Suction hoses connection

MISUMI single-axis robot clean type RSC series are designed to connect to an air unit that suctions air inside the robot to maintain cleanliness. When using the robot in a clean room, adjust the suction air to the specified flow rate.

Suction hose

Model No.	Hose diameter	Number of hoses	Lead	Speed[mm/sec]	Suction rate[Nℓ/min]*1
RS1C/RS2C/RS3C	φ6	2	Lead 20	1000	80
			Lead 12	600	50
			Lead 6	300	30
			Lead 2	100	15
RSH1C/RSH2C/RSH3C	φ10	1	—*2	1000	90
				800	80
				500	60
				250	40
				100	30

\*1 The required suction rate may vary depending on the operating condition or operating environment. However, it is recommended to set the upper limit from the values described above.

However, when the operation speed to be used is predetermined and it is known that the speed is not changed after starting the robot operation, it is possible to set the suction rate while referring to the table above. At this time, refer to the suction rate at a speed faster than the operating speed to be used.

\*2 For the lead length, refer to the effective stroke table stated in "1. Robot specifications" of Chapter 5.



CAUTION

- Avoid excessive bends in the air hoses. Lay out the air hoses to keep the hose length to the air unit as short as possible. Too long of a hose may prevent obtaining the specified suction flow rate.
- Mounting the robot on an installation base with a width larger than the robot width allows obtaining cleanliness more effectively.



NOTE

When the hose with as large tubing outside diameter as possible is used from the suction source, an effective flow rate is obtained.

# 8. Setting the operating conditions

## 8.1 Payload

Optimal acceleration is automatically determined by setting the controller payload parameter. Set the total weight of the workpiece and the end effectors such as grippers attached to the robot slider in the payload parameter as shown below.



### CAUTION

Be sure to enter an accurate value when making this setting, since a mistake will cause troubles such as vibration or a shorter machine service life span.

#### ■ To set the payload parameter

Use the following method when setting the payload parameter on the C21/C22 controller. For how to set the parameter, refer to the "H1 Operation Guide" section in the "C21/C22 Controller User's Manual".

**Step 1** Connect the Handy Terminal to the controller and turn on the power to the controller.

The main menu screen appears as shown below.

64101-BM-00

**Step 1** Main menu screen

Menu	NRM [01]
Point	
Operation	
Parameter	
Monitor	
Run mode	
Connection	
Terminal	

**Step 2** On the main menu screen, select "Parameter".

The "Parameter" menu screen opens showing selectable menu items.

64102-BM-00

**Step 3** Servo parameter

Parameter	NRM [01]
Run parameter	
I/O parameter	
Option parameter	
Servo parameter	



Servo parameter	NRM [01]
Payload 1	10 Kg
Max. accel. 1	3.50 m/s <sup>2</sup>
Payload 2	10 Kg
Max. accel. 2	3.50 m/s <sup>2</sup>

**Step 4** Move the cursor to "Payload 1" and press **■**. ▶ **Step 4** Selection "Payload 1"

The selected parameter can now be changed.

64103-BM-00

Servo parameter		NRM [01]
Payload 1	10	Kg
Max. accel. 1		3.50 m/s <sup>2</sup>
Payload 2		10 Kg
Max. accel. 2		3.50 m/s <sup>2</sup>

**Step 5** Change the parameter value.

**Step 6** Press **■** to enable the change.

Use the same procedure to change "Payload 2" if needed.

**Step 7** Press [CLR].

This returns to the "Parameter" menu screen.

## 8.2 Maximum speed setting

In operation of a single-axis robot with a long stroke ball screw, resonance of the ball screw may occur. In this case, the maximum speed must be reduced to an appropriate level.

Refer to Chapter 5, "1. Robot specifications" for information on how to set the maximum speed according to the stroke length.

If the maximum speed does not reach a hazardous level, reducing the speed is unnecessary even when the robot has a long stroke axis.



### CAUTION

Do not operate the robot if the ball screw is vibrating. The ball screw may otherwise wear out prematurely.

## 8.3 Duty

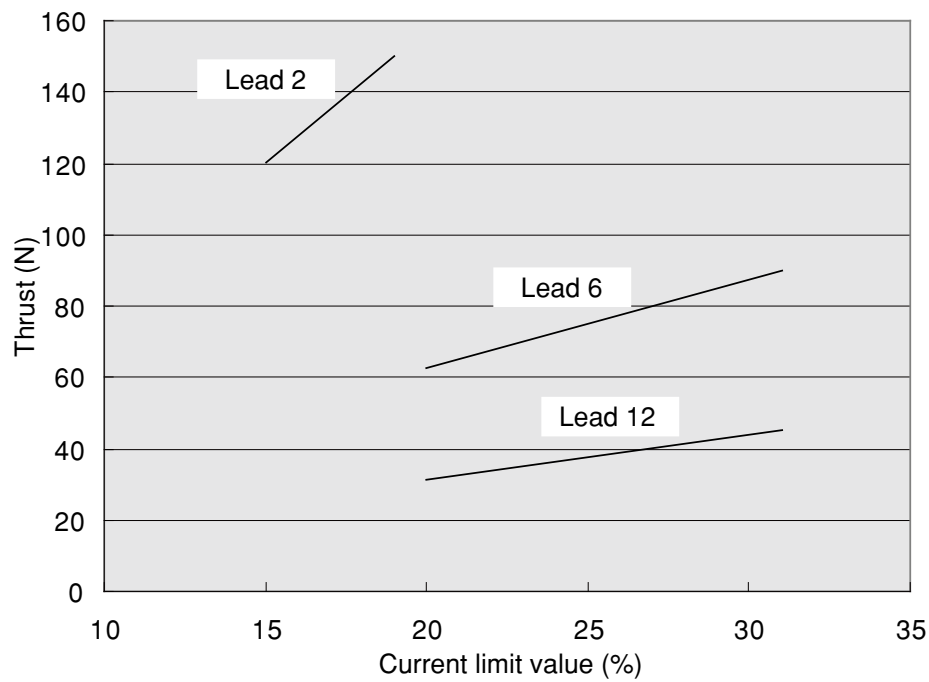
To achieve maximum service life for the MISUMI single-axis robots, it is recommended to operate the robot within the allowable duty (50%). The duty is calculated as follows:

$$\text{Duty (\%)} = \frac{\text{Operation time}}{\text{Operation time} + \text{Non-operation time}} \times 100$$

If the robot duty is too high, an error such as "overload" or "overheat" may occur. In this case, increase the stop time to reduce the duty.

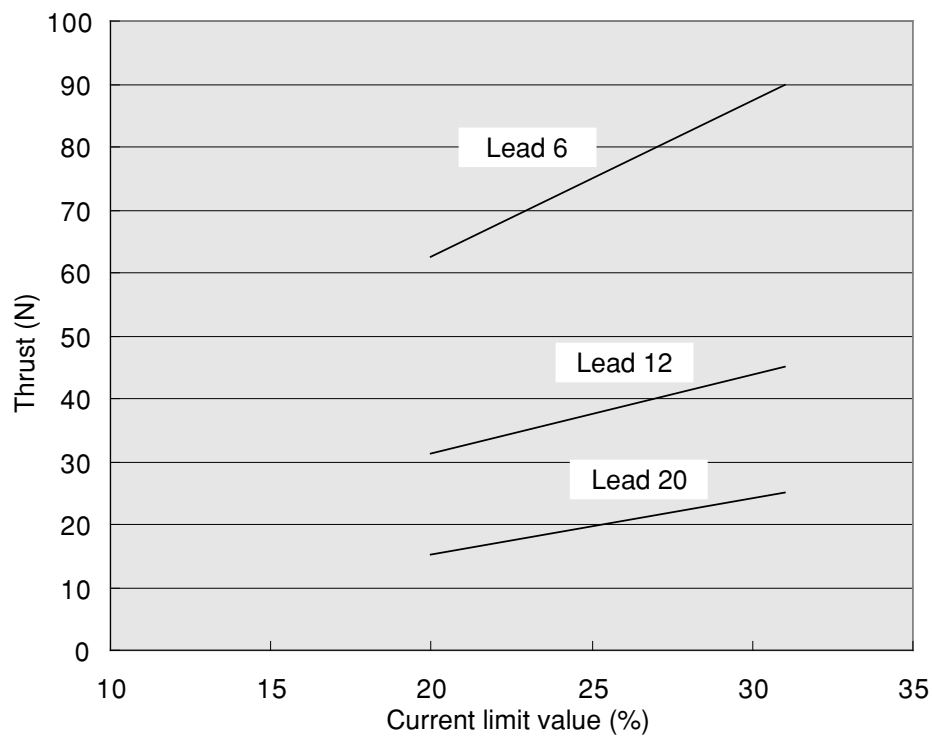
## 8.4 Push force vs. current limit value during stop (RS1C/RS2C/RS3C)

### ■ RS1C push thrust



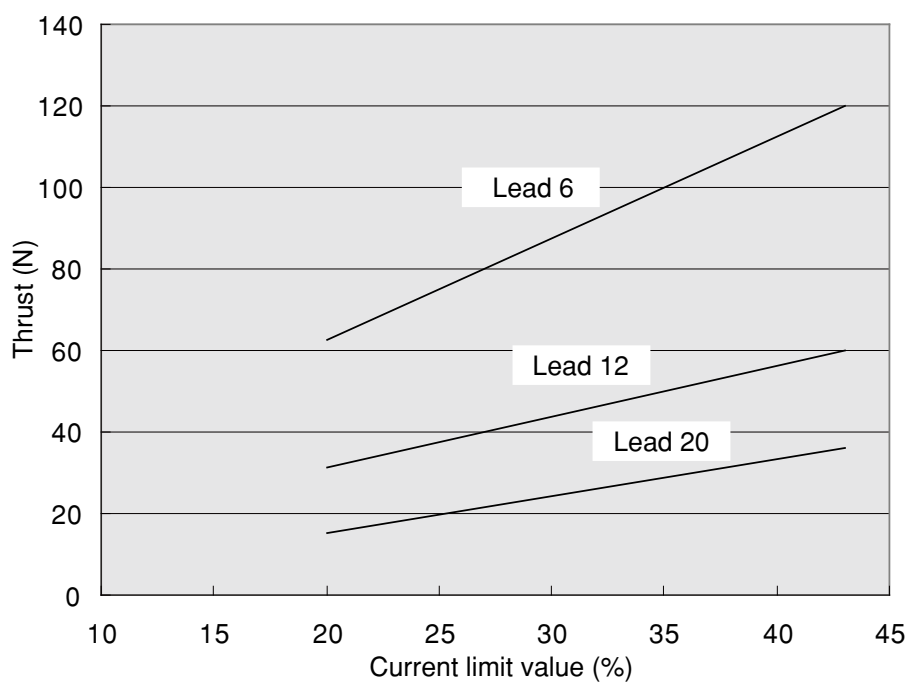
63111-BM-00

### ■ RS2C push thrust



63112-BM-00

## ■ RS3C push thrust



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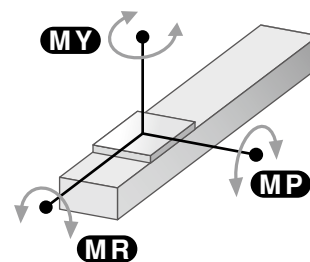
The values in the above graph are not a guarantee of the push force accuracy during stop. Use these values for reference.

- If the push force is too small or the push speed is too low, the push operation may become unstable so use caution.
- Up to 20mm/s can be set for the speed during pushing. However, it is recommended to set the speed during pushing to a level of 10mm/s or less by taking the shock during pushing or load stability into consideration.
- The sliding resistance, tool weight, or pushing position may affect the pushing load. So, when an accurate pushing load is required, it is absolutely necessary to actually measure and check the pushing load under conditions to be used.
- Determine an offset amount and thrust so that the pushing moment will be smaller than the allowable static load of each model.
- The values shown in the above graphs are for horizontal use robots. For vertical use robots, the push force values vary according to the weight of the tool and workpiece.

## ■ Static loading moment

(Unit: N•m)

Model	MY	MP	MR
RS1C	16	19	17
RS2C	25	33	30
RS3C	32	38	34



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# Chapter 2

## Periodic inspection

### Contents

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# 1. Before beginning work

Periodic inspection and maintenance are essential to ensure safe and efficient operation of robots. Before beginning the work, thoroughly read the safety precautions described below and "Using the Robot Safely" to strictly observe the instructions.

## ■ Safety precautions



### DANGER

IF THE INSPECTION OR MAINTENANCE PROCEDURE CALLS FOR OPERATION OF THE ROBOT, STAY OUT OF THE WORKING AREA OF THE ROBOT DURING OPERATION. KEEP WATCHING THE ROBOT MOVEMENT AND SURROUNDING AREA SO THAT THE OPERATOR CAN PRESS THE EMERGENCY STOP BUTTON IF ANY DANGER OCCURS.



### WARNING

- THE ADJUSTMENT AND MAINTENANCE WORK WITH THE COVER REMOVED NEEDS THE SPECIAL KNOWLEDGE AND SKILL. IF UNSKILLED WORK PERSON PERFORMS SUCH WORK, THIS MAY INVOLVE RISK. THESE TASKS MUST BE PERFORMED ONLY BY PERSONS WHO MEET REQUIREMENTS ESTABLISHED BY LOCAL REGULATIONS AND SAFETY STANDARDS FOR INDUSTRIAL ROBOTS.
- THE ADJUSTMENT AND MAINTENANCE WORK WITH THE COVER REMOVED NEEDS THE SPECIAL KNOWLEDGE AND SKILL. IF UNSKILLED WORK PERSON PERFORMS SUCH WORK, THIS MAY INVOLVE RISK. ONLY QUALIFIED ENGINEERS WHO HAVE THE SKILL AND LICENSE IN ACCORDANCE WITH THE LAWS AND REGULATIONS IN EACH COUNTRY ARE ALLOWED TO CARRY OUT THE ADJUSTMENT AND MAINTENANCE WORK WHILE REFERRING TO THIS MANUAL.
- WHEN THE ROBOT DOES NOT NEED TO BE OPERATED DURING ADJUSTMENT OR MAINTENANCE, ALWAYS TURN OFF THE CONTROLLER AND THE EXTERNAL SWITCH BOARD.
- WHEN YOU NEED TO TOUCH THE TERMINALS OR CONNECTORS ON THE OUTSIDE OF THE CONTROLLER DURING INSPECTION, ALWAYS FIRST TURN OFF THE CONTROLLER POWER SWITCH AND ALSO THE POWER SOURCE IN ORDER TO PREVENT POSSIBLE ELECTRICAL SHOCK.
- NEVER TOUCH INTERNAL PARTS OF THE CONTROLLER.
- WHEN ONLY MAKING ELECTRICAL INSPECTIONS AND REQUIRING NO MECHANICAL MOVEMENT OF THE ROBOT, KEEP THE EMERGENCY STOP BUTTON PRESSED.
- BE CAREFUL NOT TO NEGLECT TIGHTENING SCREWS OR BOLTS. IF ANY COVER IS NOT SECURED FIRMLY, THIS MAY CAUSE NOISE, COVER DROPPING AND FLYING, HAND ENTANGLEMENT IN DRIVE UNIT DURING TEACHING, OR BURN DUE TO HAND IN CONTACT WITH HOT SURFACE. SO, BE SURE TO TIGHTEN ALL THE SCREWS AND BOLTS SECURELY.
- BE SURE TO USE THE LUBRICANT SPECIFIED BY YOUR DISTRIBUTOR.
- BE SURE TO USE THE PARTS SPECIFIED BY YOUR DISTRIBUTOR WHEN REPLACING PARTS. TAKE SUFFICIENT CARE NOT TO ALLOW ANY FOREIGN MATTER TO CONTAMINATE THEM DURING ADJUSTMENT, PARTS REPLACEMENT OR REASSEMBLY.
- DO NOT MODIFY ANY PARTS ON THE ROBOT OR CONTROLLER. MODIFICATION MAY RESULT IN UNSATISFACTORY SPECIFICATIONS OR THREATEN OPERATOR SAFETY.
- WHEN ADJUSTMENT OR MAINTENANCE IS COMPLETE, RETIGHTEN THE BOLTS AND SCREWS SECURELY.
- PLACE A SIGN INDICATING THE ROBOT IS BEING ADJURED OR INSPECTED TO KEEP OTHERS FROM OPERATING THE CONTROLLER POWER SWITCH, PROGRAMMING BOX, HANDY TERMINAL, OR OPERATION PANEL. WHEN NECESSARY, INSTALL AN APPROPRIATE SWITCH KEY LOCK MECHANISM OR ARRANGE A WATCHER.



### CAUTION

- Never attempt to perform inspection, adjustment, repair, or part replacement work of the robot and controller other than those described in this manual. Such work requires special knowledge and may involve risk.
- Before starting each adjustment work, thoroughly read this Chapter to fully understand its contents.
- If the safeguard enclosure is not prepared immediately after the installation work, stretch a rope or chain around the robot movable area to use this area as a safeguard enclosure. Additionally, strictly observe the following cautions.
  1. Columns should not move easily.
  2. Rope or chain is legible from surroundings.
  3. Post a sign stating "ENTRY PROHIBITED UNDER WORK" to prevent work personal other than those in charge of robot adjustment work from entering the robot movable area.
- When checking the operation after completion of the adjustment, see "6 Trial operation" in "Using the Robot Safely".
- Be sure to wear safety gloves before starting the installation work. If you touch any steel material part by bare hand, this may cause rust.
- Be careful not to drop any screw or bolt during cover removal work.
- For details about cautions on controller, see the User's Manual for controller.

## 2. Periodic inspection

### 2.1 Daily inspection

The following is an inspection list that must be performed every day before and after operating the robot.

#### ■ Inspection to be performed with the controller turned off

**Step 1** Turn off the controller.

**Step 2** Place a sign indicating the robot is being adjusted.

Place a sign indicating the robot is being inspected, to keep others from operating the controller switch.

**Step 3** Perform the daily inspection.

Enter the safety enclosure and check the following points.

Checkpoints	Procedure	Remarks
Cables	Check for damage, dent and excessively tight bends.	<ul style="list-style-type: none"><li>• Make the adjustment so that any stress is not applied to the cables.</li><li>• If any damage is found, replace the defective cable according to the conditions.</li></ul>
Shutter	<ul style="list-style-type: none"><li>• Check for scratches, dents, and excessively tight bends.</li><li>• Check for flow-up (clearance).</li><li>• Check the shutter top surface for contamination (*1).</li></ul>	See "1. Adjusting shutter looseness" in Chapter 3. When the shutter replacement is needed, contact your distributor.
Ball screw, bearing	Check for unusual vibration or noise.	If any trouble is found, contact your distributor.
Motor	Check for unusual vibration and noise, and for abnormal temperature rise.	Check with the load factor monitor that the load factor is 100% or less. (*2)

\*1: According to the robot working conditions, stripe marks caused by contamination may be produced on the shutter top surface close to the stop point. If this occurs, clean the shutter top surface with a cloth rag moistened with alcohol cleaning agent. If this trouble occurs frequently, contact your distributor.

\*2: Some robot controller models cannot monitor the load factor.

#### ■ Inspection to be performed with the controller turned on



#### WARNING

THE ROBOT CONTROLLER MUST BE INSTALLED OUTSIDE THE SAFETY ENCLOSURE, TO PREVENT A HAZARDOUS SITUATION IN WHICH YOU OR ANYONE ENTER THE SAFETY ENCLOSURE TO INSPECT THE CONTROLLER WHILE IT IS TURNED ON.

**Step 1** Turn on the controller.

Check that no one is inside the safety enclosure, and then turn on the controller.

**Step 2** Place a sign indicating the robot is being adjusted.

Place a sign indicating the robot is being inspected, to keep others from operating the controller, programming box or operation panel.

**Step 3** Perform the daily inspection.

Check the following points from outside the safety enclosure.

Checkpoint	Procedure	Remarks
Safety enclosure	Check if the safety enclosure is in place. Check if emergency stop is triggered when the door is opened. Check if warning labels are affixed at the entrance and clearly visible.	
Emergency stop device	Press the emergency stop button to check if it works.	
Robot movement	Check for abnormal movement and excessive vibration and noise.	If any abnormal operation is found, contact your distributor.
Z-axis brake operation *	Check if the brake works to stop the Z-axis from dropping more than 3mm from the stationary point.	If any abnormal operation is found, contact your distributor.

\* Visually check the Z-axis movement when you press the emergency stop button from outside the safety enclosure and also when you turn off the controller.

## ■ Adjustment



### WARNING

- AFTER INSPECTION, IF YOU NOTICE ANY ADJUSTMENT IS NEEDED, FIRST TURN OFF THE CONTROLLER AND THEN ENTER THE SAFETY ENCLOSURE TO PERFORM THE NECESSARY WORK.
- AFTER THE ADJUSTMENT WORK HAS BEEN COMPLETED, INSPECT THE CHECKPOINTS STATED IN "DAILY INSPECTION" IN THIS SECTION.
- IF THE REPAIR OR PART REPLACEMENT OF THE ROBOT OR CONTROLLER IS REQUIRED, CONTACT YOUR DISTRIBUTOR.

## 2.2 Three-month inspection

Take the following precautions when performing 3-month inspection.



### WARNING

WHEN THE BRAKE OF THE VERTICAL AXIS IS RELEASED, THE SLIDER AXIS MAY DROP, LEADING TO HAZARDOUS SITUATION. WHEN APPLYING THE GREASE TO THE VERTICAL AXIS PARTS, DO NOT RELEASE THE BRAKE.

**Step 1** Turn off the controller.

**Step 2** Place a sign indicating the robot is being adjusted.

Place a sign indicating the robot is being inspected, to keep others from operating the controller switch.

**Step 3** Perform the daily inspection.

Enter the safety enclosure and check the following points.

Checkpoint	Procedure	Remarks
Manipulator bolts and screws (Only for major bolts and screws exposed externally)	Check for looseness and tighten if necessary. (*1)	
Ball screw, Linear guide	<ul style="list-style-type: none"> <li>• Check for dirt or grime. If dirt or grime is found, clean the part. Apply grease after cleaning.</li> <li>• Apply grease if the items checked are dry or do not have enough grease.</li> </ul> <b>RS1C/2C/3C</b> Alvania No.2 (Showa Shell) Daphne Eponex No.2 (Idemitsu) <b>RSH1C/2C/3C</b> LG-2 (NSK)	See "3. Applying the grease" in this Chapter.
Shutter	<ul style="list-style-type: none"> <li>• Check for looseness.</li> <li>• Check for flow-up (clearance).</li> </ul>	See "1. Adjusting shutter looseness" in Chapter 3.
Coupling	Check if the bolts are loose. Tighten if necessary.	

### \*1: Bolt tightening torque

Bolt size	Tightening torque (kgfcm)	Tightening torque (Nm)
M3 button head bolt	14	1.4
M3	20	2.0
M4	46	4.5
M5	92	9.0
M6	156	15.3
M8	380	37
M10	720	71
M12	1310	128



### CAUTION

If the grease recommended is not used, this may cause the service life of the ball screw or linear guide to shorten.

## 2.3 Six-month inspection

Take the following precautions when performing 6-month inspection.



### WARNING

WHEN THE BRAKE OF THE VERTICAL AXIS IS RELEASED, THE SLIDER AXIS MAY DROP, LEADING TO HAZARDOUS SITUATION. WHEN APPLYING THE GREASE TO THE VERTICAL AXIS PARTS, DO NOT RELEASE THE BRAKE.

**Step 1** Turn off the controller.

**Step 2** Place a sign indicating the robot is being adjusted.

Place a sign showing that the robot is being inspected, to keep others from operating the controller switch.

**Step 3** Perform the daily inspection.

Enter the safety enclosure and check the following points.

Checkpoint	Procedure	Remarks
Major bolts and screws on exterior of robot main unit	Check for looseness and tighten if necessary. (*1)	
Ball screw and linear guide	<ul style="list-style-type: none"> <li>Check for looseness in the ball screw and linear guide. Tighten if necessary.</li> <li>Check for vibration during operation. Tighten drive section, and X and Y axis installation bolts if necessary.</li> <li>Check for wear and backlash. If any abnormality is found, contact your distributor.</li> </ul>	If problem is not solved or wear and backlash are found, please contact your distributor.
Controller	<ul style="list-style-type: none"> <li>Check for loose terminals.</li> <li>Check for loose connectors.</li> </ul>	
Application of grease to ball screw/nut and linear guide	Apply Alvania No.2 (Showa Shell) or Daphne Eponex No.2 (Idemitsu), etc. to the ball screw nut and linear guide every 6 months.	See "3. Applying the grease" in this Chapter.
Shutter	<ul style="list-style-type: none"> <li>Check for looseness.</li> <li>Check for flow-up (clearance).</li> </ul>	See "1. Adjusting shutter looseness" in Chapter 3.
Coupling	Check if the bolts are loose. Tighten if necessary.	

\*1: Bolt tightening torque

Bolt size	Tightening torque (kgfcm)	Tightening torque (Nm)
M3 button head bolt	14	1.4
M3	20	2.0
M4	46	4.5
M5	92	9.0
M6	156	15.3
M8	380	37
M10	720	71
M12	1310	128



### CAUTION

If the grease recommended is not used, this may cause the service life of the ball screw or linear guide to shorten.

## 2.4 Three-year inspection

Inspect the following points once every three years, and contact us if any problem is found.

Set an earlier inspection interval if parts are subject to long-term or frequent usage.

Checkpoint	Procedure	Remarks
Ball screw nut sections and linear guides	Check for wear and looseness in the ball screw, nut and linear guide.	If any abnormality is found, contact your distributor.

## 3. Applying the grease

To apply the grease in accordance with the periodic inspection, follow the steps below. Before applying the grease, thoroughly read the cautions stated in "Using the Robot Safely" and "1. Before beginning work" in this Chapter to strictly observe the instructions.

When applying grease to the ball screws and linear guide, take the following precautions.



### WARNING

#### PRECAUTIONS WHEN HANDLING GREASE:

- INFLAMMATION MAY OCCUR IF THIS GETS IN THE EYES.  
BEFORE HANDLING THE GREASE, WEAR YOUR SAFETY GOGGLES TO ENSURE THE GREASE WILL NOT COME IN CONTACT WITH THE EYES.
- INFLAMMATION MAY OCCUR IF THE GREASE COMES INTO CONTACT WITH SKIN. BE SURE TO WEAR PROTECTIVE GLOVES TO PREVENT CONTACT WITH SKIN.
- DO NOT TAKE ORALLY OR EAT. (EATING WILL CAUSE DIARRHEA AND VOMITING.)
- HANDS AND FINGERS MIGHT BE CUT WHEN OPENING THE CONTAINER, SO USE PROTECTIVE GLOVES.
- KEEP OUT OF THE REACH OF CHILDREN.
- DO NOT HEAT THE GREASE OR PLACE NEAR AN OPEN FLAME SINCE THIS COULD LEAD TO SPARKS AND FIRES.

#### EMERGENCY TREATMENT:

- IF THIS GREASE GETS IN THE EYES, WASH LIBERALLY WITH PURE WATER FOR ABOUT 15 MINUTES AND CONSULT A PHYSICIAN FOR TREATMENT.
- IF THIS GREASE COMES IN CONTACT WITH THE SKIN, WASH AWAY COMPLETELY WITH SOAP AND WATER.
- IF TAKEN INTERNALLY, DO NOT INDUCE VOMITING BUT PROMPTLY CONSULT A PHYSICIAN FOR TREATMENT.



### WARNING

#### DISPOSING OF GREASE AND THE CONTAINER:

- PROPER DISPOSAL IS COMPULSORY UNDER FEDERAL, STATE AND LOCAL REGULATIONS. TAKE APPROPRIATE MEASURES IN COMPLIANCE WITH LEGAL REGULATIONS.
- DO NOT PRESSURIZE THE EMPTY CONTAINER. PRESSURIZING MAY CAUSE THE CONTAINER TO RUPTURE.
- DO NOT ATTEMPT TO WELD, HEAT UP, DRILL HOLES OR CUT THIS CONTAINER. THIS MIGHT CAUSE THE CONTAINER TO EXPLODE AND THE REMAINING MATERIALS INSIDE IT TO IGNITE.



### WARNING

WHEN THE BRAKE OF THE VERTICAL AXIS IS RELEASED, THE SLIDER AXIS MAY DROP, LEADING TO HAZARDOUS SITUATION. WHEN APPLYING THE GREASE TO THE VERTICAL AXIS PARTS, DO NOT RELEASE THE BRAKE.



### CAUTION

Be sure to wear safety gloves before starting the work. If you touch any steel material part by bare hand, this may cause rust.

## 3.1 RS1C/RS2C/RS3C

To apply the grease to the ball screws and linear guide in accordance with the periodic inspection, follow the steps below.

Prepare the tools necessary for the work.

- Phillips screwdriver
- Brush (for grease application)

**Step 1** Turn off the controller power.

**Step 2** Place a sign indicating the robot is being adjusted.

Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.

**Step 3** Enter the safety enclosure.

**Step 4** Remove the cover.

Remove the robot's end cover, then pull off the side cover.

**Step 5** Wipe off the contaminated grease.

First, wipe off the contaminated grease with a clean cloth rag wound on the stick.



### CAUTION

Do not put your finger in the slider movement range to prevent your finger from being caught in if the slider is moved by hand accidentally.

**Step 6** Apply the grease.

Use the brush to evenly and thinly apply an adequate amount of grease to the ball screw or linear guide so that it does not scatter surroundings.

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**Step 7** Spread the grease.

Move the slider back and forth to spread the grease.



### CAUTION

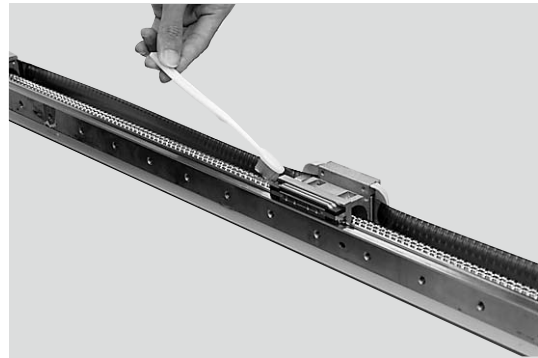
When the robot is mounted vertically, go outside the safety enclosure once. Check that no one is inside the safety enclosure, and then turn on the controller power. After that, slowly move the slider two or three times in the manual mode and turn off the controller power. Enter the safety enclosure again and continue the work.

**Step 8** Wipe off the excess grease.

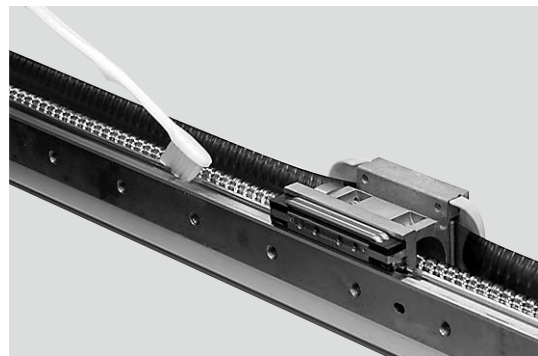
Finally, wipe off the excess grease with a clean cloth rag.

**Step 9** Reattach the side cover to its original position.

▶ **Step 6** Applying grease to the ball screw



▶ **Step 6** Applying grease to the linear guide



### 3.2 RSH1C/RSH2C/RSH3C

Prepare the tools necessary for the work.

- Phillips screwdriver
- Grease gun
- Brush (for grease application)



**CAUTION**

- Select a grease gun suitable for the purchased cartridge grease.
- Tip nozzle,  $\phi 10$  (inside diameter,  $\phi 7$ )

**Step 1** Turn off the controller power.

**Step 2** Place a sign indicating the robot is being adjusted.

Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.

**Step 3** Enter the safety enclosure.

Apply grease by either of the following methods.

■ Ball screw

**Step 4** Remove the shutter clamping plate mounting screws (two locations) from one side.

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**Step 5** Turn over the shutter from the side where the mounting screws have been removed.



**CAUTION**

When turning over the shutter, carefully handle it so that the shutter surface is not scratched.

**Step 6** Wipe off the contaminated grease.

Wipe off the contaminated grease with a clean cloth rag.



**CAUTION**

Do not put your finger in the slider movement range to prevent your finger from being caught in if the slider is moved by hand accidentally.

**Step 7** Apply the grease.

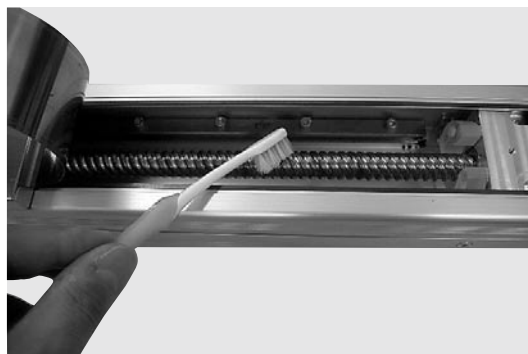
Use the brush to evenly and thinly apply the grease to the roots of the ball screw threads.

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▶ **Step 4** Removing the shutter mounting screws



▶ **Step 7** Applying the grease to the ball screw.



## ■ Linear guide

There are two kinds of methods to apply the grease to the linear guide as described below.

- (1) Remove the end cover and apply the grease.
- (2) Turn over the shutter and apply the grease.

### (1) Remove the end cover and apply the grease.

#### **Step 4** Remove the end cover mounting screws.

Remove the two end cover mounting screws from the non-motor side.

#### **Step 5** Remove the end cover.

#### **Step 6** Wipe off the contaminated grease.

Wipe off the contaminated grease with a clean cloth rag.

#### **Step 7** Apply the grease.

Use the grease gun to apply the grease to the grease nipples (two locations) on the left and right of the ball guide bearing.

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### (2) Turn over the shutter and apply the grease.

#### **Step 4** Remove the shutter clamping plate mounting screws.

Remove the shutter clamping plate mounting screws (two locations) from the non-motor side.

#### **Step 5** Turn over the shutter.

Turn over the shutter from the side where the mounting screws have been removed.



#### CAUTION

When turning over the shutter, carefully handle it so that the shutter surface is not scratched.

#### **Step 6** Wipe off the contaminated grease.

Wipe off the contaminated grease with a clean cloth rag.

#### **Step 7** Apply the grease.

Use the grease gun to apply the grease to the grease nipples (two locations) on the left and right of the ball guide bearing.

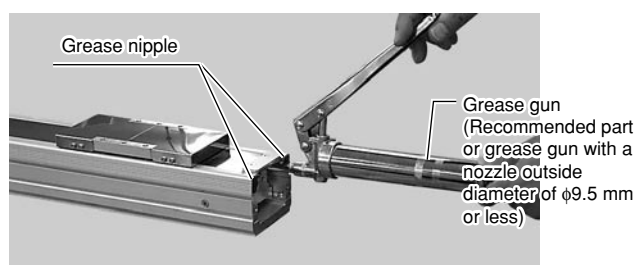
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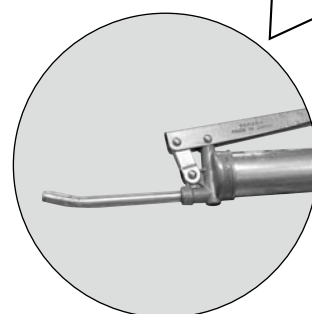
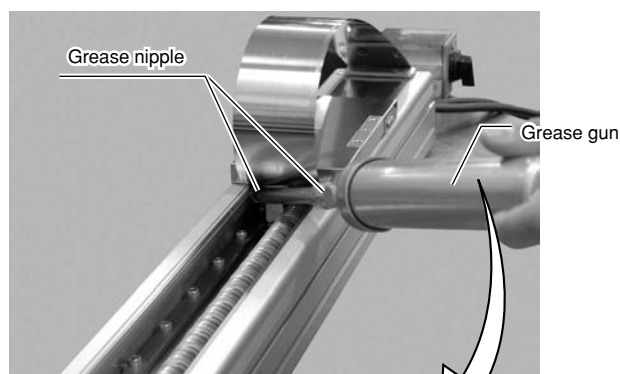
#### NOTE

For this grease application method, use the grease gun with a sharp tip.

### ▶ **Step 7** Applying the grease to the linear guide



### ▶ **Step 7** Applying the grease to the linear guide





**Step 8 Spread the grease.**

Move the slider back and forth to spread the grease.

**CAUTION**

When the robot is mounted vertically, go outside the safety enclosure once. Check that no one is inside the safety enclosure, and then turn on the controller power. After that, slowly move the slider two or three times in the manual mode and turn off the controller power. Enter the safety enclosure again and continue the work.

**Step 9 Wipe off the excess grease.**

Finally, wipe off the excess grease with a clean cloth rag.

**Step 10 Reattach the shutter to its original position.****NOTE**

For details about how to adjust the shutter, see "1. Adjusting shutter looseness" in Chapter 3.



# Chapter 3 Adjustment

## Contents

<b>1. Adjusting shutter looseness</b>	<b>3-1</b>
1.1 RS1C/RS2C/RS3C	3-1
1.2 RSH1C/RSH2C/RSH3C	3-2



# 1. Adjusting shutter looseness

The shutter may elongate with continued use. In such cases, adjust as follows.



## CAUTION

- Be sure to wear safety gloves before starting the work. If you touch any steel material part by bare hand, this may cause rust.
- When the robot is installed vertically, slowly move the robot at a JOG speed to check the position where the shutter becomes loose mostly before entering the safety enclosure.

## 1.1 RS1C/RS2C/RS3C

Prepare the tools necessary for the work.

- Phillips screwdriver

**Step 1** Turn off the controller power.

**Step 2** Place a sign indicating the robot is being adjusted.

Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.

**Step 3** Enter the safety enclosure.

**Step 4** Slightly loosen the screws (2 locations) which secure the shutter at the end cover side. (Do not remove them.)

Remove the four screws on the sides of the top cover (2 each on each side), then remove the plates.



## CAUTION

At this time, do not remove the screws.

63301-BM-00

**Step 5** Secure the shutter.

While stretching the shutter by fingers, tighten the screws to secure the shutter so that it does not become loose.



## CAUTION

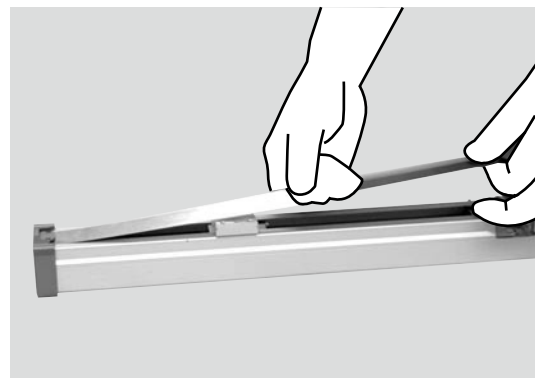
Do not press down on the shutter with excessive force. Pressing down hard on the shutter may cause the shutter to warp.

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**Step 4** Loosening the shutter mounting screws



**Step 5** Securing the shutter.



## 1.2 RSH1C/RSH2C/RSH3C

Prepare the tools necessary for the work.

- Phillips screwdriver



### CAUTION

When the robot is installed vertically, slowly move the robot at a JOG speed to check the position where the shutter becomes loose mostly before entering the safety enclosure.

### Step 1 Turn off the controller power.

Stop the air suction from the robot main body and turn off the controller power.

### Step 2 Place a sign indicating the robot is being adjusted.

Place a sign indicating the robot is being adjusted, to keep others from operating the controller or operation panel.

### Step 3 Enter the safety enclosure.

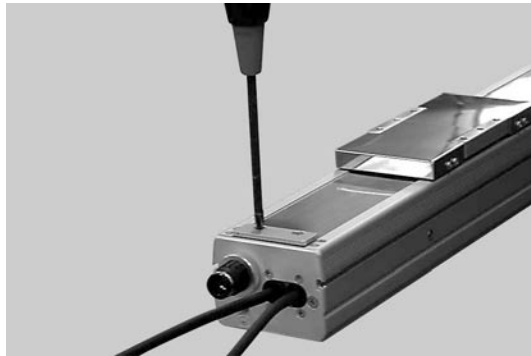
### Step 4 Check the position where the shutter is loosest.

Move the slider back and forth by hand to check the position where the shutter is loosest.

### Step 5 Loosen the screw lightly.

Loosen the two shutter clamping plate mounting screws from the side where the shutter becomes loose. (At this time, do not remove the screws.)

#### Loosening the shutter mounting screws



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### Step 6 Secure the shutter.

While pushing the shutter lightly by fingers, tighten the mounting screws.



### CAUTION

Do not press down on the shutter with excessive force. Pressing down hard on the shutter may cause the shutter to warp.



### NOTE

Be sure to tighten the two screws securing the plate uniformly and gradually so that the shutter does not float up.

### Step 7 Check the shutter status.

Move the slider back and forth two or three times by hand to check that the shutter does not float up or swing left or right.



### NOTE

If any trouble is found, repeat Steps 5 and 6.

# Chapter 4 Troubleshooting

## Contents

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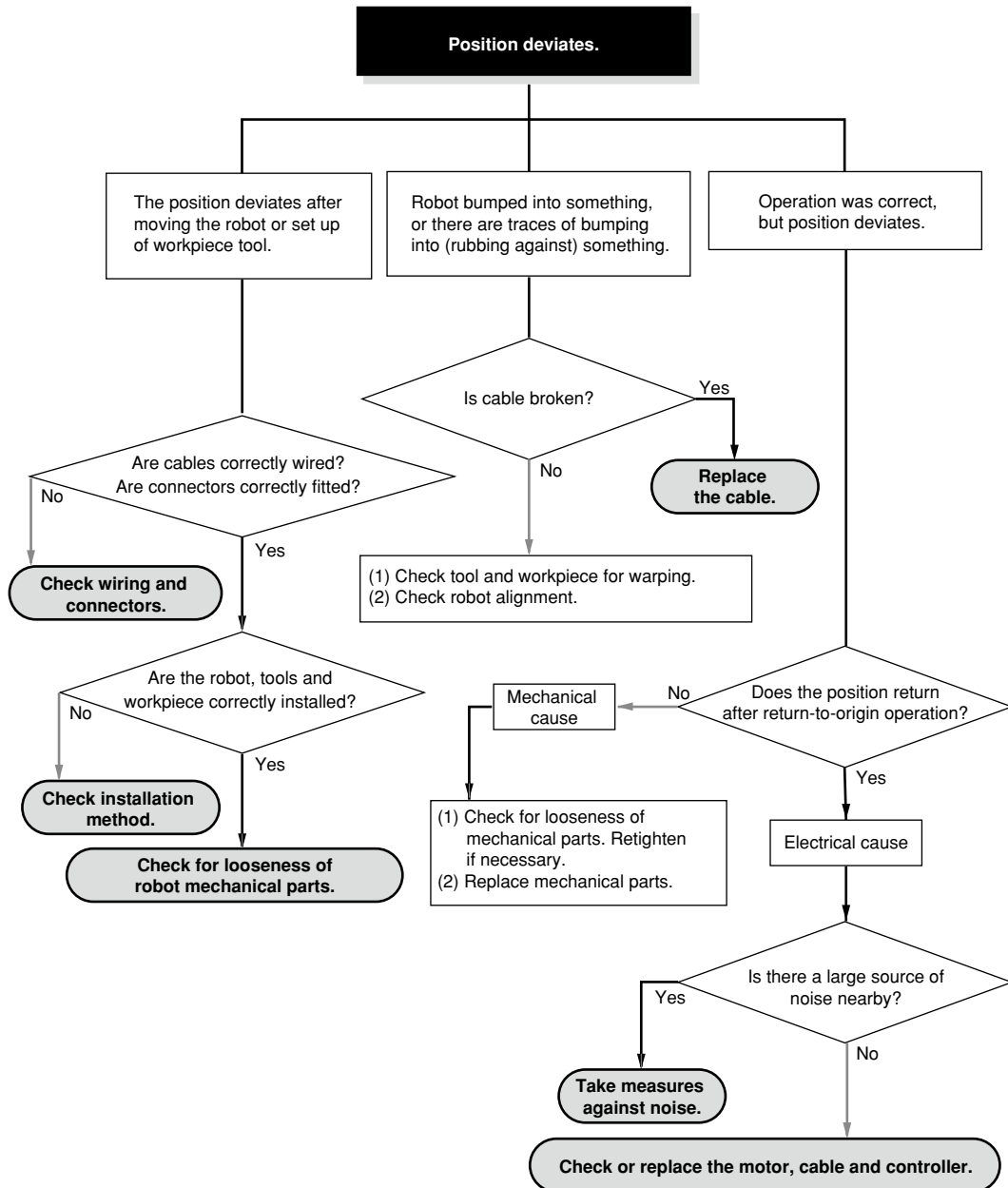


# 1. If you suspect trouble

If an error such as a positioning error or feedback error occurs, check the following points to find the solution before you determine the robot or controller has malfunctioned. If the trouble still exists even after checking these points, please contact your distributor with a detailed description of the trouble.

## 1.1 Positioning error

### Positioning error



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# Chapter 5 Specifications

## Contents

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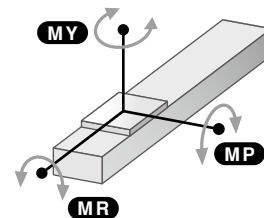
# 1. Robot specifications

## 1.1 RSIC

### ■ Specifications

Motor	☐ 42 Step motor		
Resolution (Pulse/rotation)	20480		
Repeatability(mm) <sup>Note 1</sup>	±0.02		
Deceleration mechanism	Ball screw φ8(Class C10)		
Maximum motor torque (N·m)	0.27		
Ball screw lead (mm)	2	6	12
Maximum speed (mm/sec)	100	300	600
Maximum payload (kg)	Horizontal	6	4
	Vertical	4	2
Max. pressing force (N)	150	90	45
Stroke (mm)	50 to 400 (50 pitch)		
Overall length (mm)	Horizontal	Stroke+216	
	Vertical	Stroke+261	
Maximum dimensions of cross section of main unit (mm)	W49×H59		
Cable length (m)	Standard: 1 Option: 3, 5, 10		
Controller	C1		
Pulse Train Driver	P1		
Degree of cleanliness <sup>Note 2</sup>	CLASS 10		

### ■ Static loading moment



MY	MP	MR
16	19	17

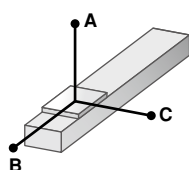
(Unit : N·m)

Note 1. Positioning repeatability in one direction.

Note 2. Per 1cf (0.1μm base), when suction blower is used.

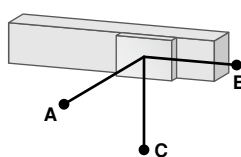
■ Allowable overhang <sup>Note.</sup> Distance from center of slider top to center of gravity of object being carried at a guide service life of 10,000km.  
<sup>Note.</sup> Stroke is 400mm when calculating the service life.

#### Horizontal installation



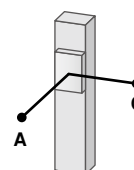
		A	B	C
Lead 12	1kg	807	218	292
	2kg	667	107	152
Lead 6	2kg	687	116	169
	3kg	556	76	112
	4kg	567	56	84
Lead 2	4kg	869	61	92
	6kg	863	40	60

#### Wall installation



		A	B	C
Lead 12	1kg	274	204	776
	2kg	133	93	611
Lead 6	2kg	149	102	656
	3kg	92	62	516
	4kg	63	43	507
Lead 2	4kg	72	48	829
	6kg	39	26	789

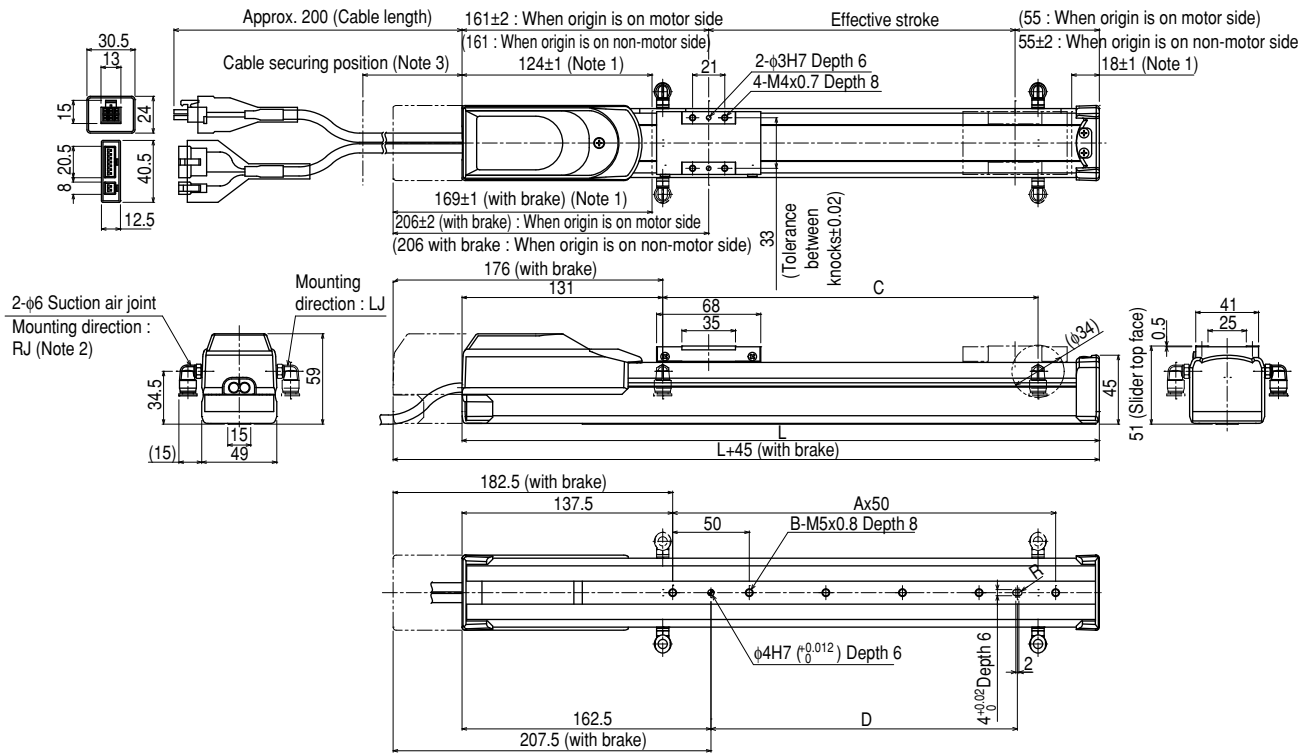
#### Vertical installation



		A	C
Lead 12	0.5kg	407	408
	1kg	204	204
Lead 6	1kg	223	223
	2kg	107	107
Lead 2	2kg	118	118
	4kg	53	53

(Unit : mm)

## ■ Dimensions



63505-BM-00

Note 1. Distance from both ends to the mechanical stopper.

Note 2. Secure the cable with a tie-band 100mm or less from unit's end face to prevent the cable from being subjected to excessive loads.

Note 3. Minimum bend radius of motor cable is R30.

Note 4. Weight of models with no brake. The weight of brake-attached models is 0.2kg heavier than the models with no brake shown in the table.

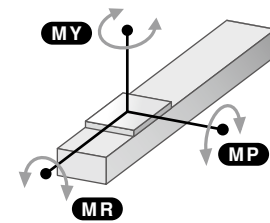
Effective stroke	50	100	150	200	250	300	350	400
L	266	316	366	416	466	516	566	616
A	2	3	4	5	6	7	8	9
B	3	4	5	6	7	8	9	10
C	50	100	150	200	250	300	350	400
Weight (kg) <sup>Note 4</sup>	1.5	1.6	1.7	1.8	2.0	2.1	2.2	2.3

# 1.2 RS2C

## Specifications

Motor	☐ 42 Step motor			
Resolution (Pulse/rotation)	20480			
Repeatability(mm) <sup>Note 1</sup>	±0.02			
Deceleration mechanism	Ball screw φ12(Class C10)			
Maximum motor torque (N·m)	0.27			
Ball screw lead (mm)	6	12	20	
Maximum speed (mm/sec) <sup>Note 2</sup>	300	600	1000	
Maximum payload (kg)	Horizontal	10	6	4
	Vertical	2	1	-
Max. pressing force (N)	90	45	27	
Stroke (mm)	50 to 800 (50 pitch)			
Overall length (mm)	Horizontal	Stroke+230		
	Vertical	Stroke+270		
Maximum dimensions of cross section of main unit (mm)	W55×H56			
Cable length (m)	Standard: 1 Option: 3, 5, 10			
Controller	C1			
Pulse Train Driver	P1			
Degree of cleanliness <sup>Note 3</sup>	CLASS 10			

## Static loading moment



MY	MP	MR
25	33	30

(Unit : N·m)

Note 1. Positioning repeatability in one direction.

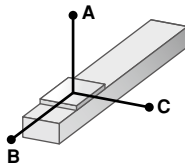
Note 2. If the stroke exceeds 600mm, resonance may occur in the ball screw depending on the operation area (critical speed). If this occurs, make the adjustment to decrease the operation speed based on the max. speed stated in the table shown at the lower portion of the drawing.

Note 3. Per 1cf (0.1µm base), when suction blower is used.

## Allowable overhang

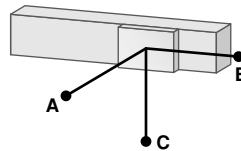
Note. Distance from center of slider top to center of gravity of object being carried at a guide service life of 10,000km.  
Note. Stroke is 600mm when calculating the service life.

### Horizontal installation



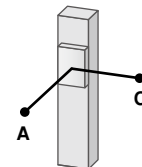
		A	B	C
Lead 20	2kg	413	139	218
	4kg	334	67	120
Lead 12	4kg	347	72	139
	6kg	335	47	95
Lead 6	4kg	503	78	165
	8kg	332	37	79
	10kg	344	29	62

### Wall installation



		A	B	C
Lead 20	2kg	192	123	372
	4kg	92	51	265
Lead 12	4kg	109	57	300
	6kg	63	31	263
Lead 6	4kg	134	63	496
	6kg	76	35	377
	8kg	47	22	355

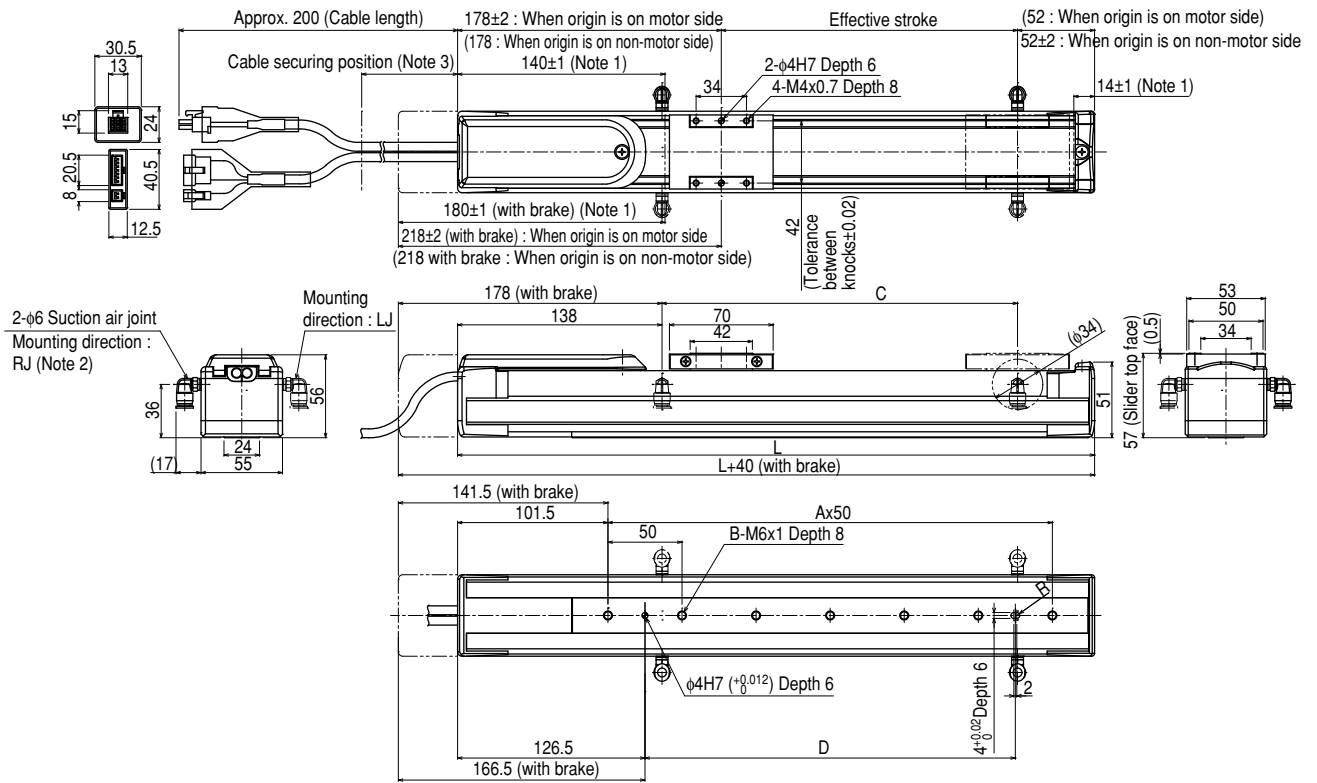
### Vertical installation



		A	C
Lead 12	0.5kg	578	579
	1kg	286	286
Lead 6	1kg	312	312
	2kg	148	148

(Unit : mm)

## ■ Dimensions



63506-BM-00

Note 1. Distance from both ends to the mechanical stopper.

Note 2. Secure the cable with a tie-band 100mm or less from unit's end face to prevent the cable from being subjected to excessive loads.

Note 3. Minimum bend radius of motor cable is R30.

Note 4. Weight of models with no brake. The weight of brake-attached models is 0.2kg heavier than the models with no brake shown in the table.

Note 5. When the stroke is longer than 600mm, resonance of the ball screw may occur depending on the operation conditions (critical speed).

In this case, reduce the speed setting on the program by referring to the maximum speeds shown in the table below.

Effective stroke	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
L	280	330	380	430	480	530	580	630	680	730	780	830	880	930	980	1030
A	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
B	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
C	100	150	200	250	300	350	400	450	500	500	500	500	500	500	500	500
Weight (kg) <sup>Note 4</sup>	2.1	2.3	2.5	2.7	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0
Maximum speed (mm/sec) <sup>Note 5</sup>	Lead 20	1000											933	833	733	633
	Lead 12	600											560	500	440	380
	Lead 6	300											280	250	220	190
	Speed setting	-											93%	83%	73%	63%

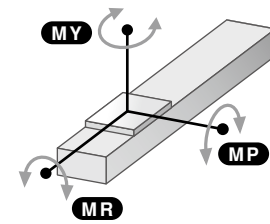


# 1.3 RS3C

## ■ Specifications

<b>Motor</b>		☐ 42 Step motor		
<b>Resolution (Pulse/rotation)</b>		20480		
<b>Repeatability(mm)</b> <sup>Note 1</sup>		±0.02		
<b>Deceleration mechanism</b>		Ball screw φ12(Class C10)		
<b>Maximum motor torque (N·m)</b>		0.47		
<b>Ball screw lead (mm)</b>		6	12	20
<b>Maximum speed (mm/sec)</b> <sup>Note 2</sup>	<b>Horizontal</b>	300	600	1000
	<b>Vertical</b>	250	500	—
<b>Maximum payload (kg)</b>	<b>Horizontal</b>	12	8	6
	<b>Vertical</b>	4	2	—
<b>Max. pressing force (N)</b>		120	60	36
<b>Stroke (mm)</b>		50 to 800 (50 pitch)		
<b>Overall length (mm)</b>	<b>Horizontal</b>	Stroke+286		
	<b>Vertical</b>	Stroke+306		
<b>Maximum dimensions of cross section of main unit (mm)</b>		W55×H56		
<b>Cable length (m)</b>		Standard: 1 Option: 3, 5, 10		
<b>Controller</b>		C1		
<b>Pulse Train Driver</b>		P1		
<b>Degree of cleanliness</b> <sup>Note 3</sup>		CLASS 10		

## ■ Static loading moment



MY	MP	MR
32	38	34

(Unit : N·m)

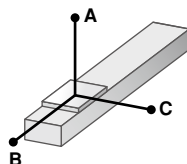
Note 1. Positioning repeatability in one direction.

Note 2. If the stroke exceeds 600mm, resonance may occur in the ball screw depending on the operation area (critical speed). If this occurs, make the adjustment to decrease the operation speed based on the max. speed stated in the table shown at the lower portion of the drawing.

Note 3. Per 1cf (0.1µm base), when suction blower is used.

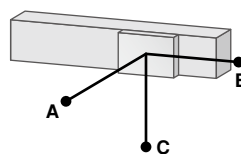
■ **Allowable overhang** Note. Distance from center of slider top to center of gravity of object being carried at a guide service life of 10,000km. Note. Stroke is 600mm when calculating the service life.

### Horizontal installation



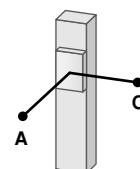
		A	B	C
Lead 20	2kg	599	225	291
	4kg	366	109	148
	6kg	352	71	104
Lead 12	4kg	500	118	179
	6kg	399	76	118
	8kg	403	56	88
Lead 6	6kg	573	83	136
	8kg	480	61	100
	10kg	442	47	78
	12kg	465	39	64

### Wall installation



		A	B	C
Lead 20	2kg	262	203	554
	4kg	118	88	309
	6kg	71	49	262
Lead 12	4kg	146	96	449
	6kg	85	55	334
	8kg	55	34	305
Lead 6	6kg	101	62	519
	8kg	64	39	413
	10kg	43	26	355
	12kg	28	17	338

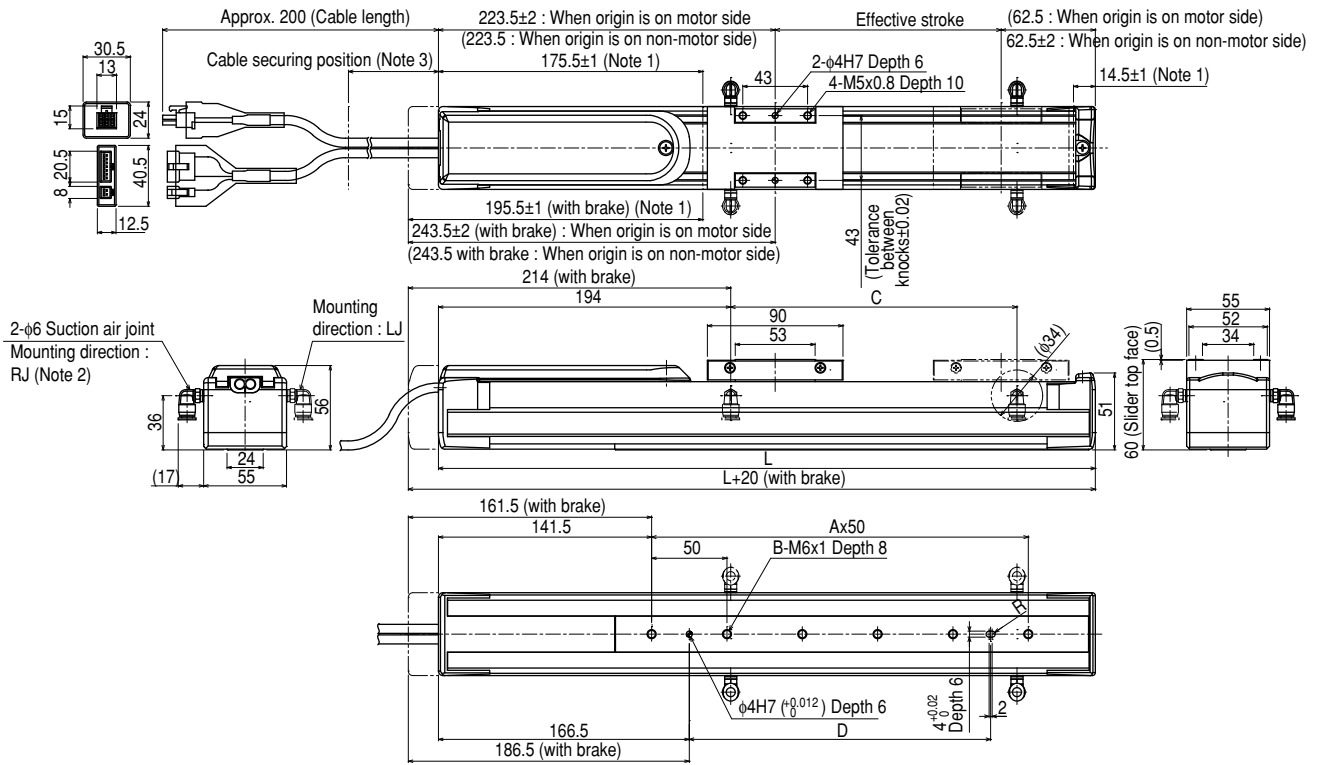
### Vertical installation



		A	C
Lead 12	1kg	458	459
	2kg	224	224
Lead 6	2kg	244	245
	4kg	113	113

(Unit : mm)

## ■ Dimensions



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Note 1. Distance from both ends to the mechanical stopper.

Note 2. Secure the cable with a tie-band 100mm or less from unit's end face to prevent the cable from being subjected to excessive loads.

Note 3. Minimum bend radius of motor cable is R30.

Note 4. Weight of models with no brake. The weight of brake-attached models is 0.2kg heavier than the models with no brake shown in the table.

Note 5. When the stroke is longer than 600mm, resonance of the ball screw may occur depending on the operation conditions (critical speed).

In this case, reduce the speed setting on the program by referring to the maximum speeds shown in the table below.

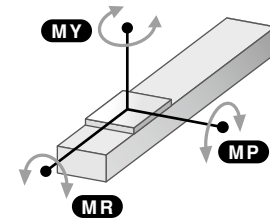
Effective stroke	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	
L	336	386	436	486	536	586	636	686	736	786	836	886	936	986	1036	1086	
A	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
B	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
C	100	150	200	250	300	350	400	450	500	500	500	500	500	500	500	500	
Weight (kg) <sup>Note 4</sup>	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.5	4.7	4.9	5.1	5.3	
Maximum speed (mm/sec) <sup>Note 5</sup>	Lead 20	1000											933	833	733	633	
	Lead 12 (Horizontal)	600											560	500	440	380	
	Lead 12 (Vertical)	500											440				380
	Lead 6 (Horizontal)	300											280	250	220	190	
	Lead 6 (Vertical)	250											220				190
	Speed setting	-											93%	83%	73%	63%	

# 1.4 RSH1C

## ■ Specifications

AC servo motor output (W)		100		
Repeatability(mm) <sup>Note 1</sup>		±0.02		
Position detector		Resolvers <sup>Note 2</sup>		
Resolution (Pulse/rotation)		16384		
Deceleration mechanism		Ball screw φ12 (Class C10)		
Ball screw lead (mm)		20	12	6
Maximum speed (mm/sec) <sup>Note 3</sup>		1000	720	360
Maximum payload (kg)	Horizontal	12	20	40
	Vertical	-	4	8
Rated thrust (N)		84	141	283
Stroke (mm)		150 to 800 (50mm pitch)		
Linear guide type		4 rows of circular arc grooves × 1 rail		
Overall length (mm)	Horizontal	Stroke+320		
	Vertical	Stroke+355		
Maximum dimensions of cross section of main unit (mm)		W80×H75		
Cable length (m)		Standard: 3.5 / Option: 5,10		
Controller		C21, C22		
Degree of cleanliness <sup>Note 4</sup>		CLASS10		
Intake air (Nℓ/min) <sup>Note 5</sup>		30 to 90		

## ■ Static loading moment



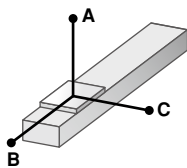
MY	MP	MR
70	95	110

(Unit: N·m)

- Note 1. Positioning repeatability in one direction.
- Note 2. Position detectors (resolvers) are common to incremental and absolute specifications. If the controller has a backup function then it will be absolute specifications.
- Note 3. If the stroke exceeds 550mm, resonance may occur in the ball screw depending on the operation area (critical speed). If this occurs, make the adjustment to decrease the operation speed based on the max. speed stated in the table shown at the lower portion of the drawing.
- Note 4. Per 1cf (0.1μm base), when suction blower is used.
- Note 5. The necessary intake amount varies depending on the use conditions and environment.

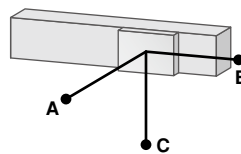
- Allowable overhang <sup>Note</sup>. Distance from center of slider top to center of gravity of object being carried at a guide service life of 10,000km.
- <sup>Note</sup>. Stroke is 600mm when calculating the service life.

### Horizontal installation



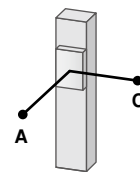
		A	B	C
Lead 20	5kg	245	85	146
	10kg	131	39	69
	12kg	115	31	57
Lead 12	5kg	364	92	192
	10kg	207	43	92
	15kg	144	26	41
	20kg	112	18	40
Lead 6	10kg	406	47	124
	20kg	225	20	54
	30kg	162	11	31
	40kg	168	7	20

### Wall installation



		A	B	C
Lead 20	5kg	121	71	211
	10kg	42	24	88
	12kg	29	16	66
Lead 12	5kg	164	78	328
	10kg	62	29	158
	15kg	26	12	83
	20kg	7	4	32
Lead 6	10kg	87	33	353
	20kg	18	6	127
	30kg	0	0	0
	40kg	0	0	0

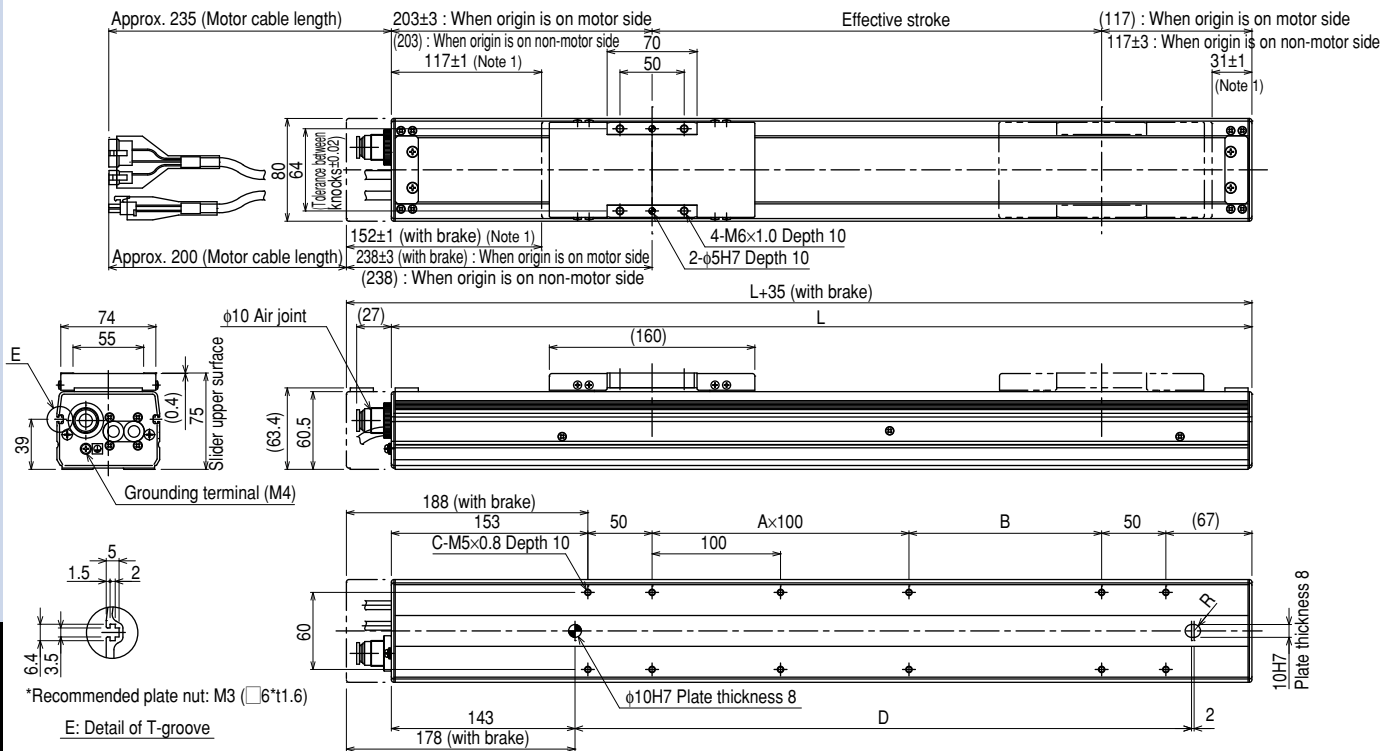
### Vertical installation



		A	C
Lead 12	1kg	440	442
	2kg	207	209
	3kg	130	132
	4kg	91	92
Lead 6	2kg	237	238
	4kg	106	96
	6kg	62	62
	8kg	34	40

(Unit: mm)

## ■ Dimensions



63508-BM-00

Note 1. Distance from both ends to the mechanical stopper.

Note 2. Minimum bend radius of motor cable is R50.

Note 3. Weight of models with no brake. The weight of brake-attached models is 0.3kg heavier than the models with no brake shown in the table.

Effective stroke	150	200	250	300	350	400	450	500	550	600	650	700	750	800	
L	470	520	570	620	670	720	770	820	870	920	970	1020	1070	1120	
A	0	1	1	2	2	3	3	4	4	5	5	6	6	7	
B	150	100	150	100	150	100	150	100	150	100	150	100	150	100	
C	8	10	10	12	12	14	14	16	16	18	18	20	20	22	
D	280	330	380	430	480	530	580	630	680	730	780	830	880	930	
Weight (kg) <sup>Note 3</sup>	3.6	3.9	4.1	4.4	4.7	5.0	5.3	5.6	5.9	6.2	6.4	6.7	7.0	7.3	
Maximum speed (mm/sec) <sup>Note 4</sup>	Lead 20	1000										950	800	700	650
	Speed setting	-										95%	80%	70%	65%
	Lead 12	720								648	540	468	432	360	
	Lead 6	360								324	270	234	216	180	
Speed setting	-									90%	75%	65%	60%	50%	

Note 4. When the stroke is longer than 550mm, resonance of the ball screw may occur depending on the operation conditions (critical speed).

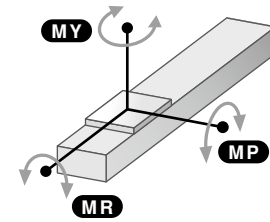
In this case, reduce the speed setting on the program by referring to the maximum speeds shown in the table above.

# 1.5 RSH2C

## Specifications

AC servo motor output (W)		100		
Repeatability(mm) <sup>Note 1</sup>		±0.01		
Position detector		Resolvers <sup>Note 2</sup>		
Resolution (Pulse/rotation)		16384		
Deceleration mechanism		Ball screw φ15 (Class C7)		
Ball screw lead (mm)		20	10	5
Maximum speed (mm/sec) <sup>Note 3</sup>		1000	600	300
Maximum payload (kg)	Horizontal	20	40	50
	Vertical	4	8	16
Rated thrust (N)		84	169	339
Stroke (mm)		150 to 1050 (50mm pitch)		
Linear guide type		4 rows of circular arc grooves × 1 rail		
Overall length (mm)	Horizontal	Stroke+325		
	Vertical	Stroke+360		
Maximum dimensions of cross section of main unit (mm)		W80×H75		
Cable length (m)		Standard: 3.5 / Option: 5,10		
Controller		C21, C22		
Degree of cleanliness <sup>Note 4</sup>		CLASS10		
Intake air (Nℓ/min) <sup>Note 5</sup>		30 to 90		

## Static loading moment



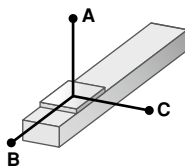
MY	MP	MR
70	95	110

(Unit: N·m)

- Note 1. Positioning repeatability in one direction.
- Note 2. Position detectors (resolvers) are common to incremental and absolute specifications. If the controller has a backup function then it will be absolute specifications.
- Note 3. If the stroke exceeds 650mm, resonance may occur in the ball screw depending on the operation area (critical speed). If this occurs, make the adjustment to decrease the operation speed based on the max. speed stated in the table shown at the lower portion of the drawing.
- Note 4. Per 1cf (0.1μm base), when suction blower is used.
- Note 5. The necessary intake amount varies depending on the use conditions and environment.

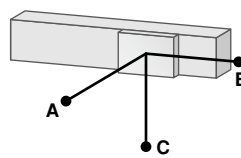
- Allowable overhang <sup>Note</sup>. Distance from center of slider top to center of gravity of object being carried at a guide service life of 10,000km. <sup>Note</sup>. Stroke is 600mm when calculating the service life.

### Horizontal installation



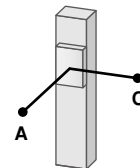
		A	B	C
Lead 20	5kg	259	122	179
	10kg	149	55	89
	15kg	100	33	56
	20kg	95	22	41
Lead 10	10kg	251	61	130
	20kg	127	25	55
	30kg	90	14	31
	40kg	69	8	18
Lead 5	20kg	256	29	76
	30kg	188	16	43
	40kg	96	10	28
	50kg	33	6	18

### Wall installation



		A	B	C
Lead 20	5kg	147	100	220
	10kg	53	32	97
	15kg	17	10	39
	20kg	0	0	0
Lead 10	10kg	87	41	197
	20kg	10	4	37
	30kg	0	0	0
	40kg	0	0	0
Lead 5	20kg	24	9	152
	30kg	0	0	0
	40kg	0	0	0
	50kg	0	0	0

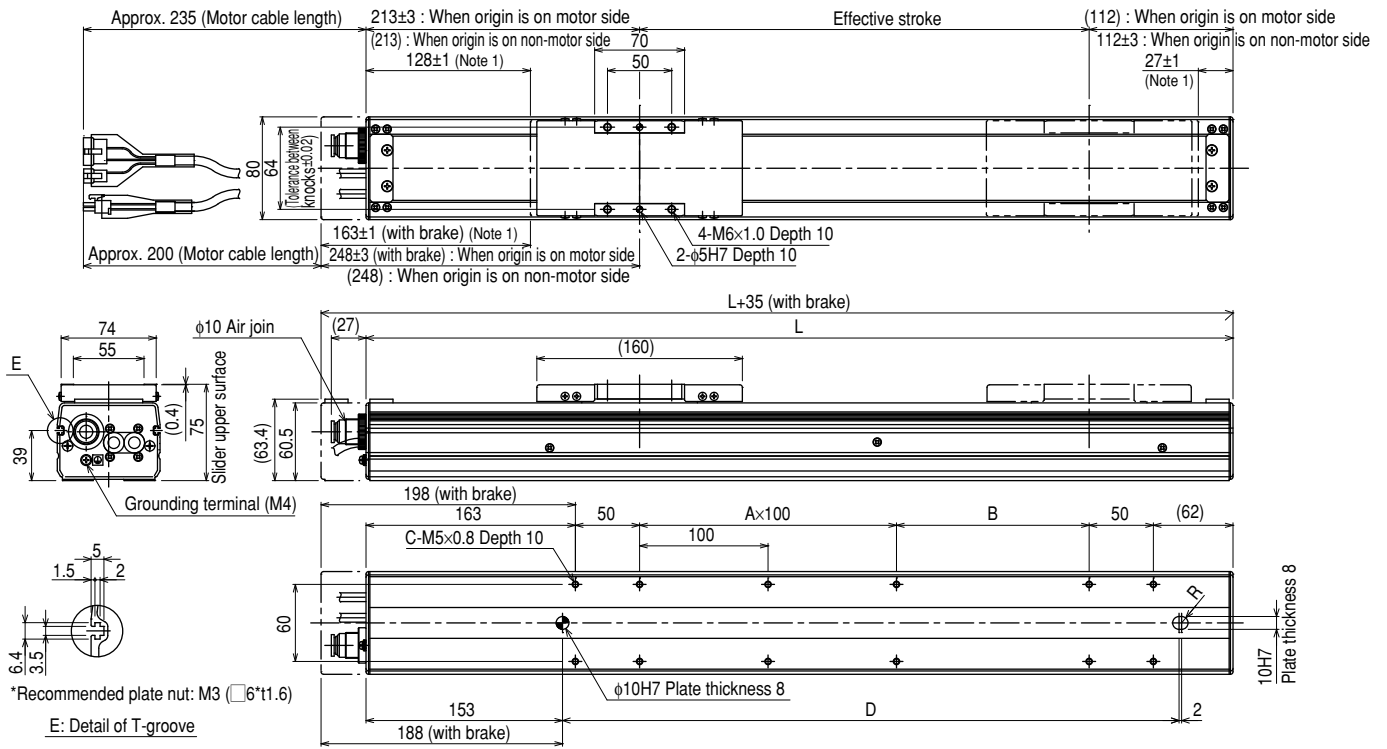
### Vertical installation



		A	C
Lead 20	2kg	255	260
	4kg	111	115
Lead 10	2kg	300	302
	4kg	131	133
	6kg	75	77
Lead 5	8kg	47	49
	5kg	113	114
	10kg	37	38
	15kg	12	12
	16kg	9	9

(Unit: mm)

## ■ Dimensions



63509-BM-00

Note 1. Distance from both ends to the mechanical stopper.

Note 2. Minimum bend radius of motor cable is R50.

Note 3. Weight of models with no brake. The weight of brake-attached models is 0.3kg heavier than the models with no brake shown in the table.

Effective stroke	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	
L	475	525	575	625	675	725	775	825	875	925	975	1025	1075	1125	1175	1225	1275	1325	1375	
A	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	
B	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	
C	8	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	
D	280	330	380	430	480	530	580	630	680	730	780	830	880	930	980	1030	1080	1130	1180	
Weight (kg) <sup>Note 3</sup>	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6.0	6.4	6.7	7.0	7.3	7.6	7.9	8.2	8.5	8.8	9.2	9.5	
Maximum speed (mm/sec) <sup>Note 4</sup>	Lead 20	1000											900	800	700	650	600	550	500	
	Speed setting	-											90%	80%	70%	65%	60%	55%	50%	
	Lead 10	600											510	450	390	360	330	300	270	240
	Lead 5	300											255	225	195	180	165	150	135	120
Speed setting	-											85%	75%	65%	60%	55%	50%	45%	40%	

Note 4. When the stroke is longer than 650mm, resonance of the ball screw may occur depending on the operation conditions (critical speed).

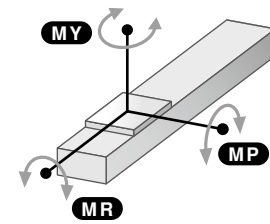
In this case, reduce the speed setting on the program by referring to the maximum speeds shown in the table above.

# 1.6 RSH3C

## Specifications

AC servo motor output (W)		100		
Repeatability(mm) <sup>Note 1</sup>		±0.01		
Position detector		Resolvers <sup>Note 2</sup>		
Resolution (Pulse/rotation)		16384		
Deceleration mechanism		Ball screw φ15 (Class C7)		
Ball screw lead (mm)		20	10	5
Maximum speed (mm/sec) <sup>Note 3</sup>		1000	600	300
Maximum payload (kg)	Horizontal	30	60	80
Rated thrust (N)		84	169	339
Stroke (mm)		150 to 1050 (50mm pitch)		
Linear guide type		4 rows of circular arc grooves × 1 rail		
Overall length (mm)		Stroke+389		
Maximum dimensions of cross section of main unit (mm)		W80×H75		
Cable length (m)		Standard: 3.5 / Option: 5, 10		
Controller		C21, C22		
Degree of cleanliness <sup>Note 4</sup>		CLASS10		
Intake air (Nℓ/min) <sup>Note 5</sup>		30 to 90		

## Static loading moment



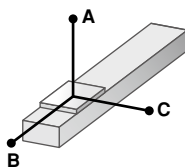
MY	MP	MR
128	163	143

(Unit: N·m)

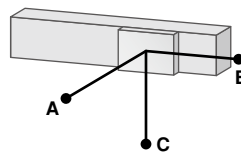
- Note 1. Positioning repeatability in one direction.
- Note 2. Position detectors (resolvers) are common to incremental and absolute specifications. If the controller has a backup function then it will be absolute specifications.
- Note 3. If the stroke exceeds 600mm, resonance may occur in the ball screw depending on the operation area (critical speed). If this occurs, make the adjustment to decrease the operation speed based on the max. speed stated in the table shown at the lower portion of the drawing.
- Note 4. Per 1cf (0.1μm base), when suction blower is used.
- Note 5. The necessary intake amount varies depending on the use conditions and environment.

- Allowable overhang <sup>Note</sup>. Distance from center of slider top to center of gravity of object being carried at a guide service life of 10,000km. <sup>Note</sup>. Stroke is 600mm when calculating the service life.

### Horizontal installation



### Wall installation

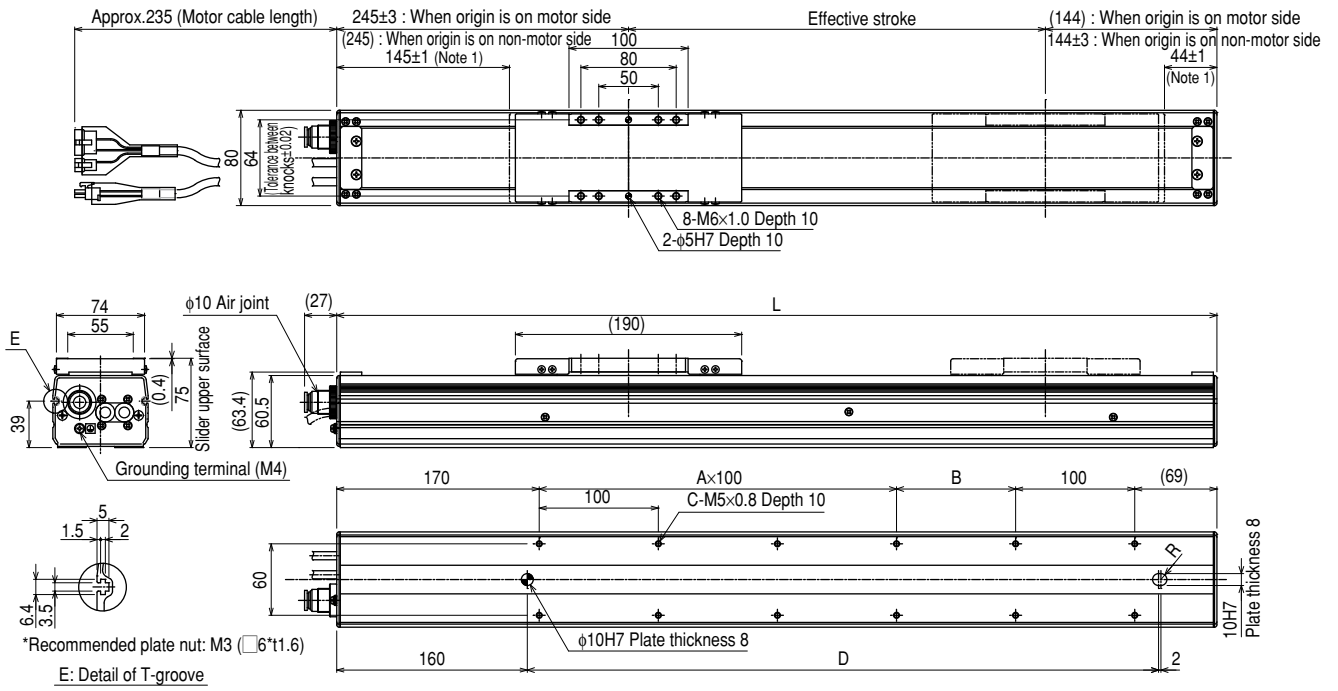


		A	B	C
Lead 20	10kg	687	274	200
	20kg	401	125	92
	30kg	338	76	57
Lead 10	20kg	622	137	111
	40kg	472	57	47
	60kg	375	30	25
Lead 5	20kg	1087	148	127
	40kg	844	63	54
	60kg	707	34	29
	80kg	594	20	17

		A	B	C
Lead 20	10kg	163	225	617
	20kg	56	76	302
	30kg	20	27	182
Lead 10	20kg	74	90	517
	40kg	8	11	196
	60kg	-	-	-
Lead 5	20kg	89	104	974
	40kg	15	18	505
	60kg	-	-	-
	80kg	-	-	-

(Unit: mm)

## ■ Dimensions



63510-BM-00

Note 1. Distance from both ends to the mechanical stopper.

Note 2. Minimum bend radius of motor cable is R50.

Effective stroke	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	
L	539	589	639	689	739	789	839	889	939	989	1039	1089	1139	1189	1239	1289	1339	1389	1439	
A	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	
B	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	150	100	
C	8	8	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	
D	330	380	430	480	530	580	630	680	730	780	830	880	930	980	1030	1080	1130	1180	1230	
Weight (kg)	4.7	5.0	5.3	5.6	5.9	6.2	6.6	6.9	7.2	7.5	7.8	8.1	8.4	8.7	9.0	9.3	9.7	10.0	10.3	
Maximum speed (mm/sec) Note 3	Lead 20	1000										900	800	700	650	600	550	500	450	
	Speed setting	-										90%	80%	70%	65%	60%	55%	50%	45%	
	Lead 10	600										510	450	390	360	330	300	270	240	210
	Lead 5	300										255	225	195	180	165	150	135	120	105
Speed setting	-										85%	75%	65%	60%	55%	50%	45%	40%	35%	

Note 3. When the stroke is longer than 600mm, resonance of the ball screw may occur depending on the operation conditions (critical speed). In this case, reduce the speed setting on the program by referring to the maximum speeds shown in the table above.



## 1.7 About noise level

The maximum sound pressure level is as follows when the RSC series robot moves at its maximum speed. (Maximum sound pressure level is measured in accordance with EN 292-2.)

Type	Maximum speed	Maximum sound pressure level
RS1C/RS2C/RS3C	1000 mm/s	70 dB or less

## 2. Motor specifications

### 2.1 Motor termination

#### 2.1.1 Motor termination (RS1C/RS2C/RS3C)

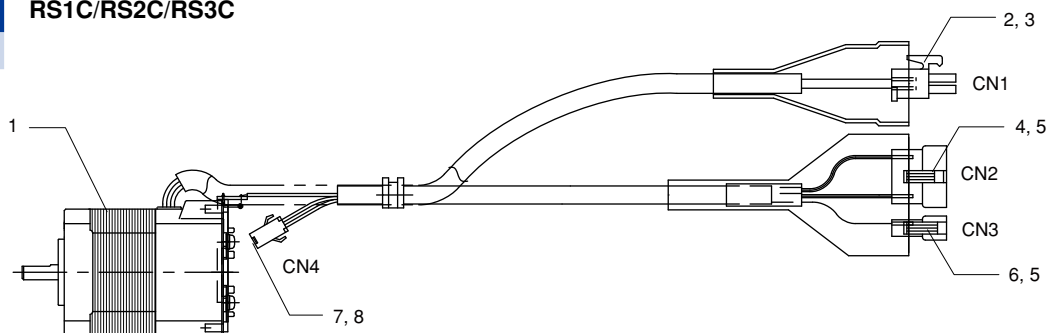
##### ■ Connector specifications

No.	Parts	Type No.	Maker	Qty	Notes
1	Motor			1	
2	Plug housing	176274-1	AMP	1	CN1 (6 poles)
3	Receptacle	175155-1 or 175151-1	AMP	6	CN1
4	Receptacle housing	SMR-07V-B	JST	1	CN2 (7 poles)
5	Pin contact	BYM-001T-P0.6 or SYM-001T-P0.6	JST	9	CN2, CN3
6	Receptacle housing	SMR-02V-B	JST	2	CN3 (2 poles)
7	Plug housing	SMP-02V-BC	JST	1	CN4 (2 poles)
8	Socket contact	BHF-001T-0.8BS or SHF-001T-0.8BS	JST	2	CN4

##### ■ Connector wiring

Connector	Pin No.	Signal	Wire Color	Connection	
CN1	1	A+	Black		Motor wire
	2	B+	Red		
	3	ACOM	Yellow		
	4	BCOM	White		
	5	A-	Green		
	6	B-	Blue		
CN2	1	S2	Blue		Signal wire
	2	S4	Orange		
	3	S1	Green		
	4	S3	Brown		
	5	R1	Gray		
	6	R2	Red		
	7	Drain wire	Transparent shrinkable tube		
CN3	1	BK+	Black		Brake wire CN4
	2	BK-	Yellow		

##### RS1C/RS2C/RS3C



63514-BM-00

## 2.1.2 AC servo motor termination (RSH1C/RSH2C/RSH3C)

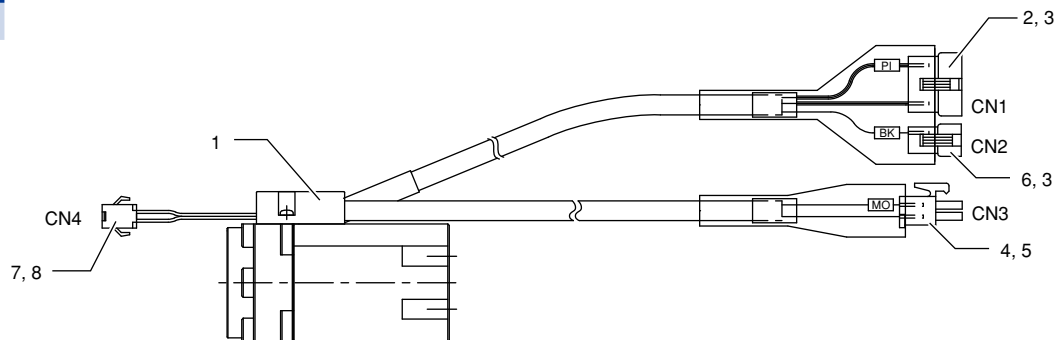
### ■ Connector specifications

No.	Parts	Type No.	Maker	Qty	Notes
1	Servo motor			1	
2	Receptacle housing	SMR-07V-B	JST	1	CN1 (7 poles)
3	Pin contact	SYM-001T-P0.6	JST	9	CN1, CN2
4	Receptacle housing	176273-1	AMP	1	CN3 (4 poles)
5	Receptacle	175156-2	AMP	4	CN3
6	Receptacle housing	SMR-02V-B	JST	1	CN2 (2 poles)
7	Plug housing	SMP-02V-BC	JST	1	CN4 (2 poles)
8	Socket contact	SHF-001T-0.8BS	JST	2	CN4

### ■ Connector wiring

Connector	Pin No.	Signal	Wire Color	Connection	
CN1	1	S2	Yellow		Motor
	2	S4	Blue		
	3	S1	Red		
	4	S3	Black		
	5	R1	White		
	6	R2	Green		
	7	Shield	Grey (Heat shrinkable tube)		
CN2	1	BK	Brown		CN4 1
	2	BK	Grey		CN4 2
CN3	1	U	Red		Motor
	2	V	White		
	3	W	Black		
	4	PE	Yellow/Green		

### RSH1C/RSH2C/RSH3C



63516-BM-00

## 2.2 Brake cable specifications

### 2.2.1 RS1C/RS2C/RS3C

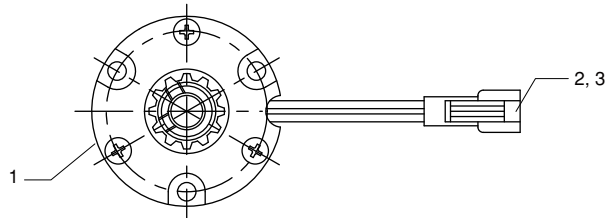
#### ■ Connector specifications

No.	Parts	Type No.	Maker	Qty	Notes
1	Brake parts			1	
2	Receptacle housing	SMR-02V-B	JST	1	2 poles
3	Pin contact	BYM-001T-P0.6 or SYM-001T-P0.6	JST	2	Manual tool: YC-12

#### ■ Connector wiring

Pin No.	Signal	Wire Color	Connection	
1	BK	Yellow		1
2	BK	Yellow		2

RS1C/RS2C/RS3C



63518-BM-00

### 2.2.2 RSH1C/RSH2C/RSH3C

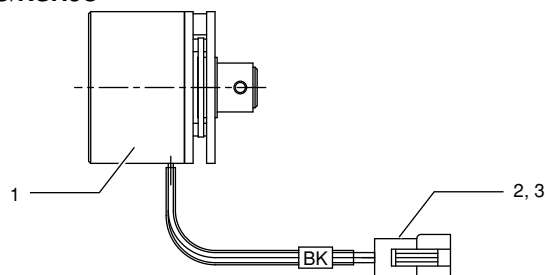
#### ■ Connector specifications

No.	Parts	Type No.	Maker	Qty	Notes
1	Brake parts			1	
2	Receptacle housing	SMR-02V-B	JST	1	CN1
3	Pin contact	SYM-001T-P0.6	JST	2	CN1

#### ■ Connector wiring

Connector	PIN	Signal	Wire Color	Connection	
CN1	1	BK	Yellow	BK	1
	2	BK	Yellow		2

RSH1C/RSH2C/RSH3C

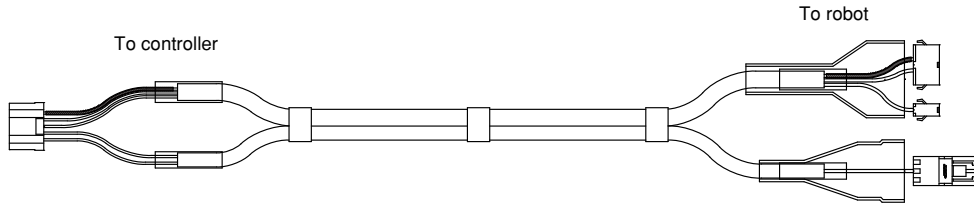


63520-BM-00

# 3. Robot cables

## 3.1 RS1C/RS2C/RS3C

### RS1C/RS2C/RS3C



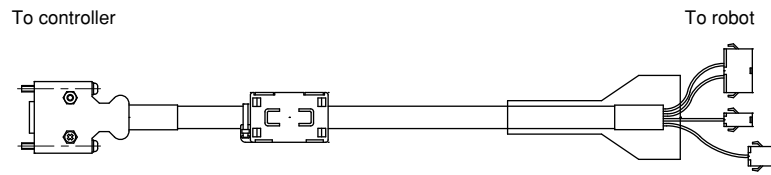
61521-BM-00

Parts	Signal	PIN	Connection	PIN	Parts	Wire	
Controller CN1	D.G	4A		7	Resolver	Drain wire	
	S2	1A		1		0.15sq	Blue
	S4	1B		2		Orange	
	S1	2A		3		Green	
	S3	2B		4		Brown	
	R1	3A		5		Grey	
	R2	3B		6		Red	
	BK+	5A		1	Brake	Black	
BK-	5B	2	Yellow				
				1	Motor	0.3sq	White 1
				2		White 2	
				3		White 3	
				4		White 4	
				5		White 5	
				6		White 6	

## 3.2 RSH1C/RSH2C/RSH3C

### ■ Signal cable

#### RSH1C/RSH2C/RSH3C



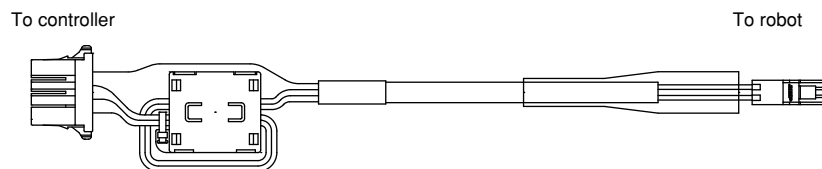
63523-BM-00

Parts	Signal	PIN	Connection	PIN	Parts	Wire	
Controller CN1	S2	1		1	Resolver: P	0.3sq	Blue (Red)
	S4	2		2			Orange (White)
	S1	3		3			Green
	S3	4		4			Brown (White)
	R1	5		5			Grey (Yellow)
	R2	6		6			Red (White)
	FG	7		7			
							Drain wire Grey (Heat shrinkable tube)
	BK+	13		1	Brake: BK		Black (Blue)
	BK-	14		2			Yellow (White)
	ORG	12		2	ORG		Pink (Purple)
	24V	11		1			White (Blue)
	GND24	10		3			Blue Red (Brown)

\* The wire colors in ( ) show the flexing cable.

### ■ Power cable

#### RSH1C/RSH2C/RSH3C



63525-BM-00

Parts	Signal	PIN	Connection	PIN	Parts	Wire	
Motor wire	FG	1		4	Motor: M	0.75sq	Gray
	U	2		1			Red
	V	4		2			White
	W	3		3			Black



## Revision record

Manual version	Issue date	Description
Ver. 1.00	Apr. 2014	First edition

## User's Manual

Single-axis Robot

# RSC Series

Clean type

Apr. 2014

Ver. 1.00

This manual is based on Ver. 1.00 of Japanese manual.

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