YAMAHA Electric Gripper

YRG Series

User's Manual

Ver. 2.00

EUT2127200

E109

Introduction

Thank you for purchasing this electric gripper for YAMAHA robots.

This manual explains the safety precautions, handling, adjustment, inspection, and maintenance work procedures in order to correctly and safely operate the electric gripper at its optimal operation level. Please thoroughly read this manual before installing the electric gripper. After reading this manual, store it in a safe place where all concerned personnel can refer to it immediately.

- This manual and electric gripper should be handled as a set.
- When the electric gripper is relocated, transferred, or sold, please explain a new manager or owner to thoroughly read this manual.
- For electric gripper with specifications other than the standard specifications, if the explanation is not particularly stated in this manual, please refer to the explanation of the standard specifications.
- For details about actual operation of the electric gripper, please refer to the user's manual for the controller to be used.
- For details about YAMAHA robot or controller operations and cautions, please read the user's manual supplied with the robot or controller you are using and follow the instructions stated in such manual.

MEMO

General contents

1. Safety

1.1 Safety

Before using this electric gripper, be sure to follow the safety precautions and instructions to operate the electric gripper safely and correctly.
Also, bear in mind that not all safety items can be listed in detail, so that accurate judgment by the operator or service personnel is essential for operating the robot and controller safely.

Furthermore, please carefully read the user's manual for the robot and/or controller and strictly observe the safety instructions and cautions. Negligence of necessary safety measures or improper handling may cause not only fault or damage to the electric gripper, robot, and/or controller, but also a serious accident including injury of work personnel (installation engineers, operators, and adjustment and inspection engineers) or even death.

This manual classifies safety caution items and operating points into the following levels, along with symbols for signal words "WARNING", "CAUTION" and "NOTE".

WARNING

"WARNING" INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.

CAUTION

"CAUTION" indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or damage to the equipment or software.

NOTE

Explains key points in the operation or helpful operation information.

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

1. Operate or adjust the electric gripper while referring to the printed version of the user's manual (available for an additional fee).
2. Operate or adjust the electric gripper while viewing the CD-ROM version of the user's manual on your computer screen.
3. Operate or adjust the electric gripper 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 installation and operation of the electric gripper, please refer to the applicable laws and regulations. Note that the warning labels and user's manual are intended for the Japanese market. If the electric gripper is exported outside Japan, it is necessary to change warning labels and user's manual to those suitable for a destination country.

1.2 Essential precautions

Particularly important cautions for handling or operating the electric gripper 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 operation of the electric gripper.

- The electric gripper is designed as components for general industrial machinery.
  Only system designers or personnel who have enough knowledge or experience are allowed to select a product model and handle it.
- The compatibility of the electric gripper with the customer's system must be determined and verified at the customer's risk.
- When the electric gripper is incorporated into a system (machine unit or robot), it is absolutely required that the system satisfies applicable laws and regulations related to the safety precautions. Make sure that the system satisfies applicable laws and regulations, and operate the electric gripper in a safe and correct manner in conformity with the laws and regulations.
- The electric gripper is exempted from the application of the compact robot.
- Do not use the electric gripper for applications described below.

  1. Medical units or devices with life-support system or their equivalents
  2. Mechanisms or machine units for movement or transportation of personnel
  3. Important safety components for machine units.

  This product is not designed for applications that require a high level of safety.

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

- Strictly observe the caution to prevent hands or fingers from being pinched or crushed by the movable parts when carrying or teaching the robot or electric gripper.
- Attach the Warning labels supplied with the electric gripper to legible locations near the robot equipped with the electric gripper or the robot.

WARNING

MOVING PARTS CAN PINCH OR CRUSH.
KEEP HANDS AWAY FROM MOVABLE PARTS.

Warning label

(2) Cautions on disposal

CAUTION

- Do not throw this product into a fire. Doing so may cause the product to explode or toxic gas to produce.
- If the product cannot be operated or if the product is no longer used, dispose of it appropriately as industrial waste.

(3) Cautions on use for applications particularly requiring safety

CAUTION

If the customer studies to operate this electric gripper under conditions or in an environment other than those not stated in the product catalog or user's manual or to use it for applications particularly requiring the safety, such as air craft facility, combustion equipment, amusement machinery, inside of the clean room, safety device, or other unit that improper operation may greatly affect other person's life or property, take appropriate safety measures into consideration, such as operation with a sufficient allowance to the rating or performance, or failsafe measures. If such case arises, always contact YAMAHA.

(4) Use of dedicated parts

CAUTION

Be sure to use YAMAHA's dedicated parts for the cables between the gripper main body and controller.

(5) Cautions on storage

CAUTION

- Protect this electric gripper from the direct sunlight or moisture content and take dew condensation preventive measures, and then store the electric gripper in a location with a height of 30 cm or more from the floor level inside a dark cold place.
- Do not apply any vibration or impact to the electric gripper during storage.

(6) Cautions on workpiece removal

CAUTION

- To remove the workpiece with the power turned off, detach the finger and remove the workpiece since the double-cam type incorporates a speed reduction mechanism. If it is attempted to forcibly remove the workpiece or open the finger, this may cause damage to the gripper.
- Remove the workpiece from the gripper before stopping the operation of the electric gripper for an extended period of time. If the electric gripper is stopped with the workpiece kept held for an extended period of time, this may adversely affect movable parts.
- The self-lock is not activated in the single-cam type. You can move the finger manually even with the power turned off.

1.3 Operation

After the installation, adjustment, inspection, maintenance, or repair work of the electric gripper has been carried out, perform the operation checks described below.

(1) Check items before turning on the power to the controller

Before turning on the power to the controller, check the following items.

①Is the electric gripper installed securely and correctly?

②Are the electrical connections to the electric gripper correct?

③Are the connections with auxiliary units correct?

④Are the safety protection measures taken correctly?.

⑤Are the contentions for the installation environment observed strictly?

(2) Check items after turning on the power to the controller

After the power to the controller has been turned on, check the following items from a position outside the safety protection fence.

①Is the start, stop, or mode selection operated correctly as intended?

②Is the electric gripper operated as intended? Is the motion of the electric gripper limited by the software limit?

③Are the signal exchanges with auxiliary units correct?

④Are the teaching and playback functions correct?

⑤Do the safety protection fence and interlock function correctly as intended?

⑥Does the auto operation function correctly?

WARNING

- **WHEN STARTING THE OPERATION OR ADJUSTMENT AFTER THE GRIPPER HAS BEEN INSTALLED IN THE SYSTEM, STRICTLY OBSERVE THE SAFETY MEASURES OF THE SYSTEM. FAILURE TO DO SO MAY CAUSE SERIOUS PERSONAL INJURY.**
- **BEFORE SUPPLYING THE ELECTRIC POWER TO THE PRODUCT OR OPERATING THE PRODUCT, BE SURE TO CONFIRM THE SAFETY IN THE WORKING AREA OF THE PRODUCT. IF THE ELECTRIC POWER IS SUPPLIED CARELESSLY, THE OPERATOR MAY BE IN CONTACT WITH MOVABLE PARTS, CAUSING ELECTRICAL SHOCK OR PERSONAL INJURY.**
- **DO NOT TOUCH CONNECTORS WITH THE ELECTRIC POWER SUPPLIED. ELECTRICAL SHOCK OR MALFUNCTION MAY OTHERWISE RESULT.**
- **DO NOT TOUCH EXPOSED TERMINALS OF THE CONTROLLER. ELECTRICAL SHOCK MAY OTHERWISE RESULT.**
- **DO NOT ALLOW PERSONNEL WHO USE A PACEMAKER TO GET ACCESS TO AN AREA WITHIN 1 M OF THE PRODUCT. THE STRONG MAGNETISM OF THE MAGNET INSIDE THE PRODUCT MAY CAUSE THE PACEMAKER TO MALFUNCTION.**
- **DO NOT SPLASH THE WATER ONTO THE PRODUCT, WASH IT, OR OPERATE IT UNDER THE WATER. PERSONAL INJURY, ELECTRICAL SHOCK, OR FIRE CAUSED BY PRODUCTION MALFUNCTION MAY OTHERWISE RESULT.**
- **DO NOT TOUCH THE PRODUCT DURING OPERATION. DOING SO MAY CAUSE YOUR FINGER TO BE PINCHED OR ENTANGLED INTO OTHER DEVICE, RESULTING IN SERIOUS PERSONAL INJURY.**

- IF A POWER FAILURE OCCURS DURING OPERATION, TURN OFF THE POWER. IF NOT TURNED OFF, THE PRODUCT MAY MOVE SUDDENLY AFTER THE ELECTRIC POWER IS RECOVERED. THIS MAY CAUSE DAMAGE TO THE MACHINE UNIT OR SERIOUS PERSONAL INJURY.
- BEFORE MOVING MOVABLE PARTS OF THE PRODUCT MANUALLY FOR THE DIRECT TEACHING, MAKE SURE THAT THE SERVO IS TURNED OFF. SERIOUS PERSONAL INJURY MAY OTHERWISE RESULT.
- IF UNUSUAL HEAT, SMOKE, OR ODOR IS FOUND IN THE PRODUCT, TURN OFF THE POWER IMMEDIATELY. DAMAGE TO THE PRODUCT OR FIRE MAY OTHERWISE RESULT.
- IF A FATAL ERROR OCCURS IN THE PRODUCT, TURN OFF THE POWER IMMEDIATELY. PERSONAL INJURY, OR DAMAGE OR BREAKAGE OF THE MACHINE UNIT CAUSED BY PRODUCTION MALFUNCTION MAY OTHERWISE RESULT. AFTER THE POWER HAS BEEN TURNED OFF, DO NOT TURN IT ON AGAIN UNLESS THE CAUSE OF THE ERROR IS LOCATED AND REMOVED COMPLETELY.
- TURN ON THE POWER TO THE UNITS FROM THE HOST UNIT IN ORDER. IF NOT, THE PRODUCT MAY MOVE SUDDENLY, CAUSING SERIOUS PERSONAL INJURY OR DAMAGE TO THE MACHINE UNIT.
- DO NOT PUT YOUR FINGER OR ANY OBJECT IN THE OPENING OF THE PRODUCT. FIRE, ELECTRICAL SHOCK, OR SERIOUS PERSONAL INJURY MAY OTHERWISE RESULT.

CAUTION

The motor is heated up and the product surface is hot during operation. Take appropriate measures so that the heat does not adversely affect workpieces around the product.

1.4 Warranty

For information on the warranty period and terms, please contact our distributor where you purchased the product.

■ This warranty does not cover any failure caused by:

1. Installation, wiring, connection to other control devices, operating methods, inspection or maintenance that does not comply with industry standards or instructions specified in the YAMAHA manual;
2. Usage that exceeded the specifications or standard performance shown in the YAMAHA manual;
3. Product usage other than intended by YAMAHA;
4. Storage, operating conditions and utilities that are outside the range specified in the manual;
5. Damage due to improper shipping or shipping methods;
6. Accident or collision damage;
7. Installation of other than genuine YAMAHA parts and/or accessories;
8. Modification to original parts or modifications not conforming to standard specifications designated by YAMAHA, including customizing performed by YAMAHA in compliance with distributor or customer requests;
9. Pollution, salt damage, condensation;
10. Fires or natural disasters such as earthquakes, tsunamis, lightning strikes, wind and flood damage, etc;
11. Breakdown due to causes other than the above that are not the fault or responsibility of YAMAHA;

■ The following cases are not covered under the warranty:

1. Products whose serial number or production date (month & year) cannot be verified.
2. Changes in software or internal data such as programs or points that were created or changed by the customer.
3. Products whose trouble cannot be reproduced or identified by YAMAHA.
4. Products utilized, for example, in radiological equipment, biological test equipment applications or for other purposes whose warranty repairs are judged as hazardous by YAMAHA.

THE WARRANTY STATED HEREIN PROVIDED BY YAMAHA ONLY COVERS DEFECTS IN PRODUCTS AND PARTS SOLD BY YAMAHA TO DISTRIBUTORS UNDER THIS AGREEMENT. ANY AND ALL OTHER WARRANTIES OR LIABILITIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY EXPRESSLY DISCLAIMED BY YAMAHA. MOREOVER, YAMAHA SHALL NOT BE HELD RESPONSIBLE FOR CONSEQUENT OR INDIRECT DAMAGES IN ANY MANNER RELATING TO THE PRODUCT.

Ver.1.00_201205

2. Overview of electric gripper

2.1 Features and functions

This YAMAHA electric gripper for robots is so designed that it achieves highly accurate holding power, position, and speed controls through the closed loop control using the stepping motor and rotary encoder. As a dedicated option board is assembled into the YAMAHA robot controller RCX240 and the electric gripper is set as an auxiliary axis of the robot, the electric gripper can be controlled easily.
Use of a special cam structure ensures lightweight and compact electric gripper main body even with high holding power.

■ Features

● Holding power control

The holding power of the gripper can be set to a desired level ranging from 30 to 100% (in 1% steps).

● Speed control

The movement speed (20 to 100%) or acceleration (1 to 100%) of the gripper can be set to a desired level (in 1% steps).

● Multi-point position control

The positioning points of the gripper can be set freely.

● Easy parameter setup

Both the YAMAHA robot common parameters and the parameters specially designed for the gripper can be used.

● Programming using robot language commands

Control programs for the electric gripper are easily created using YAMAHA robot language commands.

2.2 Product check

(1) Packing box

The robot controller is high precision equipment and is carefully packed in a cardboard box to avoid shocks and vibrations. If a serious damage or dent is found on the package, please contact your YAMAHA sales dealer without unpacking the box.

(2) Unpacking

Make sure that you do not drop the package or give any shock to it during unpacking. After unpacking, carefully check the parts and components listed below.

■ Parts and components

Name		Q'ty	Remark
① Main body	Electric gripper	1	
② Option board	Gripper control board	1	(Note 1)
③ Cables	Robot (for gripper) cable	1	
	Relay cable	1	(Note 2)
④ Accessories	Connector for 24V power supply	1	(Note 3)
	Connector for gripper emergency stop	1	(Note 4)

(Note 1) This board has already been installed in the controller you have purchased.
(Note 2) This cable is intended to connect the electric gripper main body and robot (for gripper) cable.
(Note 3) This connector is intended to connect the gripper control board and DC24V power supply.
(Note 4) This connector is intended to connect the gripper control board and the emergency stop circuit of the electric gripper.

① Electric gripper

② Gripper control board (incorporated into the controller)

③ Cable

• Robot (for gripper) cable

• Relay cable

④ Accessories

• Connector for 24V power supply

• Connector for gripper emergency stop

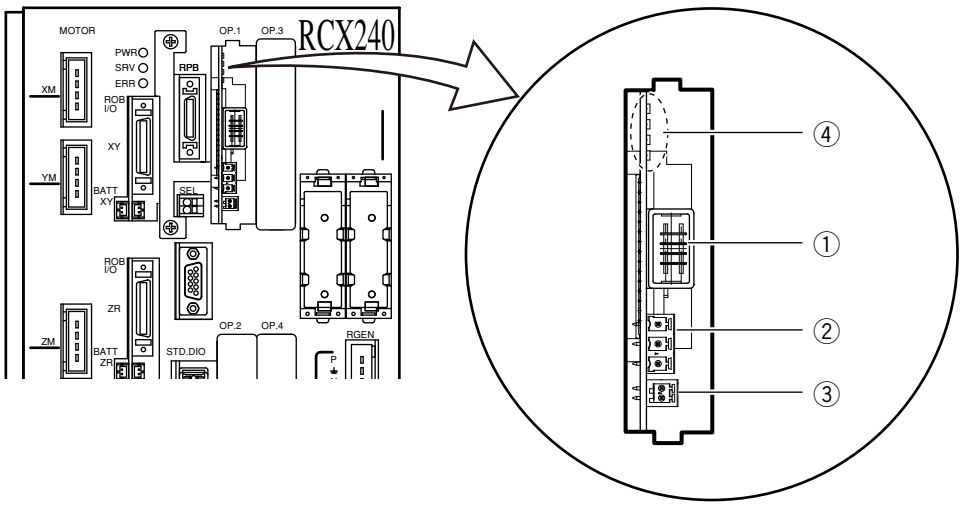
Parts and components shown above are intended for one electric gripper set. Make sure that the components you have received meet the contents of your order. The cable model may vary depending on the cable length. For details, see "3.3.2 Connecting the robot (for gripper) cable and relay cable".

2.3 Part names and functions

This section explains the part names and functions of the gripper control board.
The gripper control board is an option to be assembled into the controller and has already been installed in an optimal slot of the controller before shipment.

■ Part names and functions of gripper control board

Part names and functions



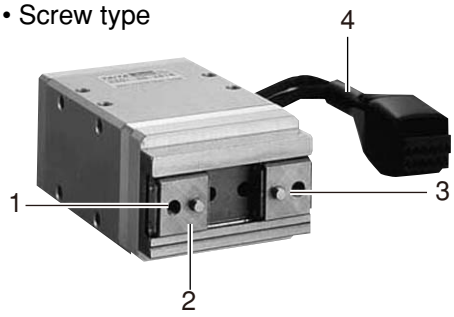
(Figure when viewed from the front of the controller)

	Name	Function
①	ACT	Connector to be connected to the gripper main body.
②	POWER	Board drive power input connector.
③	GE-STOP+ GE-STOP–	Emergency stop input terminal.
④	Status LEDs	Four LEDs show the status of the gripper control board. For details about LED indications, see "4.3 Status LEDs on the gripper control board".

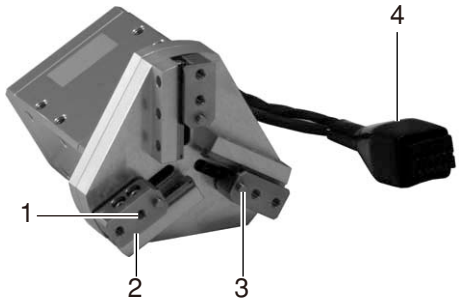
■ Electric gripper main body

Part names and functions

• Screw type



• 3-finger type



1. Finger installation tap hole
2. Guide block (open/close slider)
3. Finger positioning pin
4. Cable

2.4 Installation conditions

Be sure to strictly observe the following environmental conditions when installing the electric gripper.

Items	Specifications
Working temperature	0 to 40°C
Working humidity	35 to 90% RH (no 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.
Vibration	Do not subject to impacts or vibrations.
Working space	Allow sufficient space margin to perform jobs (teaching, inspection, repair, etc.)

WARNING

AVOID INSTALLING THE ELECTRIC GRIPPER IN LOCATIONS WHERE THE AMBIENT CONDITIONS MAY EXCEED THE WORKING TEMPERATURE OR HUMIDITY STATED ABOVE, OR IN ENVIRONMENTS WHERE EXCESSIVE MOISTURE, CORROSIVE GAS, METALLIC POWDER, OR DUST IS PRODUCED. MALFUNCTIONS, FAILURES OR SHORT CIRCUITS MAY OTHERWISE RESULT.

WARNING

- **THIS ELECTRIC GRIPPER DOES NOT COMPLY WITH THE EXPLOSION-PROOF SPECIFICATIONS.**
- **DO NOT USE THE ELECTRIC GRIPPER IN ENVIRONMENTS CONTAINING INFLAMMABLE GAS, DUST OR LIQUIDS.**
  EXPLOSIONS OR FIRE COULD OTHERWISE RESULT.

WARNING

AVOID USING THE ELECTRIC GRIPPER IN LOCATIONS SUBJECT TO ELECTROMAGNETIC INTERFERENCE, ELECTROSTATIC DISCHARGE OR RADIO FREQUENCY INTERFERENCE. MALFUNCTIONS OF THE ELECTRIC GRIPPER MAY OTHERWISE RESULT.

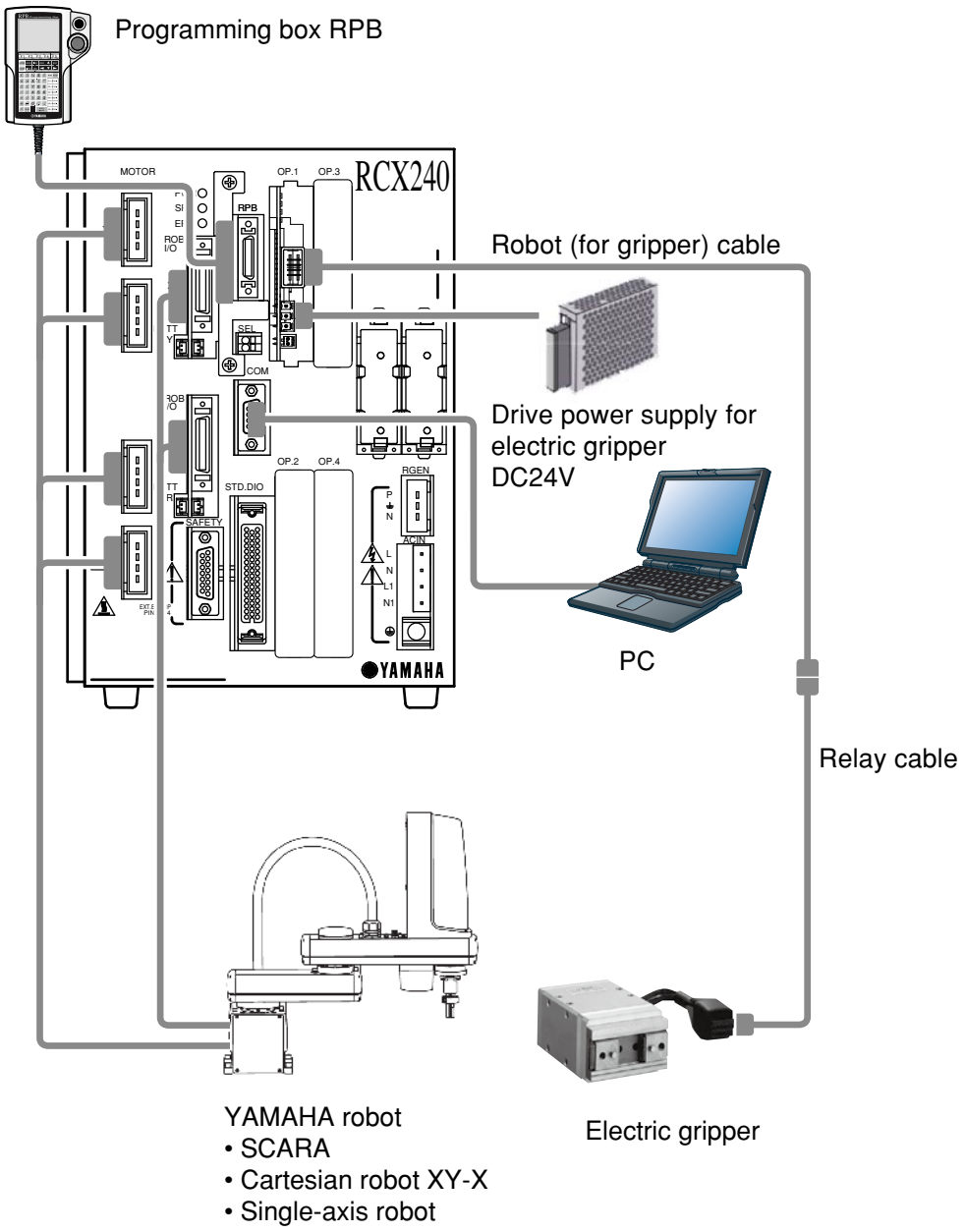
WARNING

DO NOT USE THE ELECTRIC GRIPPER IN LOCATIONS SUBJECT TO EXCESSIVE VIBRATION. GRIPPER MAIN BODY INSTALLATION BOLTS MAY OTHERWISE BECOME LOOSE, CAUSING THE GRIPPER TO FALL DOWN.

2.5 System configuration

Use of YAMAHA electric gripper makes it possible to construct a system configuration shown below.

System configuration illustration



2.6 Preparations for electric gripper use

This section explains the basic preparation procedures until the robot is operated with the YAMAHA electric gripper. For details about how to install or operate the robot main body and robot controller, see relevant manuals published separately.

	Basic procedure	Refer to: (Note 1, Note 2)
Installation, connection and wiring	Install the gripper. — Install the gripper on the robot. Install the finger on the gripper.	This manual 3.1 Installing the electric gripper This manual 3.2 Installing the finger
	Install the controller.	**Chapter 3** 1. Unpacking 11. Precautions for cable routing and installation
	• Make cable and connector connections. • Ground the controller. • Configure an emergency stop circuit.	This manual 3.3 Connection and wiring **Chapter 4** Parallel I/O interface **Chapter 5** SAFETY I/O interface
	When a serial I/O board is added: Set the station number, communication speed, etc. (Setup depends on the serial I/O type.)	See the serial I/O instruction manuals for detailed information.
Power ON	Verify that the wiring and power voltage are correct. Turn on the power and servo.	**Chapter 1** 3. Turning power on and off
	Check that no alarm is issued after turning power on.	**Chapter 3** 12. Checking the robot controller operation
Initial setting	Robot type check — Check that the robot type setting in the controller matches the robot that is actually connected.	**Chapter 7** 1. "SYSTEM" mode (Robot type can be checked on the initial screen in SYSTEM mode.)
	Verify the gripper board. — Verify that the gripper control board is installed in the controller and that it is set valid.	This manual 4.1 Verifying the robot controller settings This manual 4.2 Verifying the gripper control board status
	Parameter initial setting — Set the following parameters to optimize the robot operation. • Tip weight (workpiece weight + tool weight) • Soft limits (movement range) * Before determining soft limit positions by jog movement, return-to-origin must first be complete. * Set the "Axis tip weight" parameter if the robot is set to "MULTI" or has an auxiliary axis.	**Chapter 7** 2.3 Robot parameters • Tip weight **Chapter 7** 2.4 Axis parameters • + Soft limit • – Soft limit • Axis tip weight This manual 6.2 Axis parameter details • + Soft limit • – Soft limit
	*** Always set this parameter when using the robot for the first time. After that, change it as needed.**	
	Absolute reset/ return-to-origin — Perform the absolute reset or return-to-origin to teach the origin position.	[OP] **Chapter 5** 9. Return-to-origin [OP] **Chapter 5** 10.Absolute reset This manual 5.3 Return-to-origin
	*** Always perform absolute reset when using the robot for the first time. After that, reperform it only when the origin position becomes indefinite (return-to-origin incomplete).**	
Data setting	Parameter setting — Set parameters according to the operation conditions.	**Chapter 7** 2. Parameters This manual 6. Parameter settings
	Point data editing — Create or edit point data according to the robot operation.	[OP] **Chapter 5** 3. Displaying and editing point data This manual 7. Gripper point data creation
	Programming — Create programs according to the robot operation.	[OP] **Chapter 5** 4. Displaying, editing and setting pallet definitions [OP] **Chapter 4** 1. "PROGRAM" mode See the programming manual for information about the programming language. This manual 8. Robot language commands
	*** Programming is unnecessary if not using a program such as in operation with I/O commands.**	
Trial operation	Check that the safety devices such as an emergency stop circuit function correctly.	[OP] **Chapter 3** 3. Stopping the program 13. Executing the next step
	Make a trial run using step operation and make adjustment as needed.	
Operation	Start operation.	[OP] **Chapter 3** 2. Automatic operation 7. Changing the automatic movement speed

(Note 1) [OP] "Chapter XX" stated in the "Refer to" field shows a chapter No. in the operation manual for RCX240 controller you need to refer to.

(Note 2) "Chapter XX" stated in the "Refer to" field shows a chapter No. in the user's manual for RCX240 controller you need to refer to.

3. Installation and wiring

WARNING

- **BEFORE STARTING THE INSTALLATION OR ADJUSTMENT WORK, POST A SIGN STATING "UNDER WORK. POWER ON PROHIBITED" TO PREVENT THE POWER FROM BEING TURNED ON UNINTENTIONALLY. IF THE POWER IS TURNED ON UNINTENTIONALLY, THIS MAY CAUSE ELECTRICAL SHOCK OR PERSONAL INJURY DUE TO SUDDEN MOVEMENT OF THE PRODUCT.**
- **BEFORE HANDLING THE PRODUCT, WEAR APPROPRIATE SAFETY GEARS TO ENSURE THE SAFETY.**
- **DO NOT BUMP OR THROW AWAY THE PRODUCT PACKAGE. BE SURE TO HANDLE THE PRODUCT PACKAGE WITH GREAT CARE SO THAT EXCESSIVE IMPACT IS NOT APPLIED TO IT.**
- **DO NOT STAND OR PUT HEAVY OBJECT ON THE PRODUCT PACKAGE SO THAT EXCESSIVE FORCE IS NOT APPLIED TO IT.**
- **AFTER UNPACKED, HOLD THE GRIPPER MAIN BODY TO HANDLE IT. DO NOT HOLD THE CABLE OR CONNECTOR TO TRANSPORT THE ELECTRIC GRIPPER.**

3.1 Installing the electric gripper

Follow the instructions below to secure the electric gripper to the installation plate.
For details about tap hole positions, see "11.3 Electric gripper specifications".

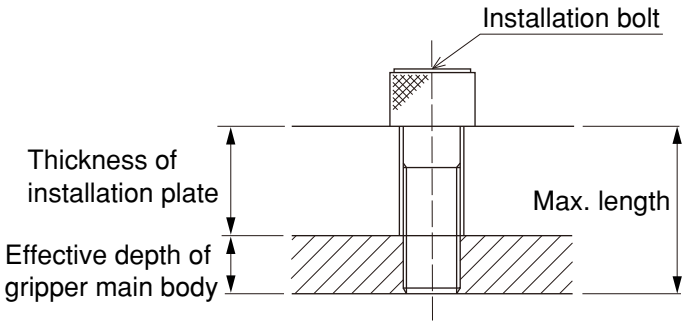
CAUTION

- **Keep an adequate space for the maintenance work when installing the product. If an adequate space is not kept, the daily inspection or maintenance work cannot be performed correctly, causing system stop or product breakage.**
- **When installing the electric gripper, avoid holding the movable part or cable of the product. Product breakage may otherwise result.**

(1) Installation bolt

- Fix the electric gripper securely using installation tap holes at four locations.
- The installation tap hole part is made of aluminum. So, if the installation bolt is tightened at an excessive torque level, this may cause the tap hole to break. Be sure to tighten the bolts at an appropriate torque level.
- The installation tap hole is a through-hole. If a bolt to be screwed-in beyond the effective depth of the gripper main body is used, this may cause damage to parts inside the gripper. Never use a bolt with a screw-in length exceeding the effective depth.
  On the other hand, if the length of the installation bolt is too short, this may cause insufficient clamping force.

Max. length of installation bolt



Effective length and recommended tightening torque

Model name	Tap hole	Effective depth (mm)	Recommended tightening torque (N•m)
YRG-2005SS	M3	3	0.56 to 0.69
YRG-2010S YRG-2005W	M3	6 (5)	0.56 to 0.69
YRG-2815S YRG-2810W	M4	8 (6)	1.35 to 1.65
YRG-4225S YRG-4220W	M5	8, 10, (7.5)	2.7 to 3.3
YRG-2020FS YRG-2020FT	M4	6	1.35 to 1.65
YRG-2840FS YRG-2840FT	M5	7.5	2.7 to 3.3
YRG-2004T	M3	3	0.56 to 0.69
YRG-2013T	M3	6 (5)	0.56 to 0.69
YRG-2820T	M4	8 (6)	1.35 to 1.65
YRG-4230T	M5	8 (7.5)	2.7 to 3.3

A numeric value stated in ( ) shows the effective depth for installation of the electric gripper on the top surface.

WARNING

STRICTLY OBSERVE THE ABOVE INSTRUCTIONS ABOUT INSTALLATION BOLT TO SECURELY FIX THE GRIPPER. FAILURE TO FOLLOW THE INSTRUCTIONS MAY CAUSE THE GRIPPER OR WORKPIECE TO BE LOOSE OR FALLEN DOWN, RESULTING IN EQUIPMENT BREAKAGE OR PERSONAL INJURY.

CAUTION

The recommended tightening torque shows a general value. You should determine an appropriate level by taking the installation bolt you are using and/or the material of the seating surface into consideration.

(2) Positioning pin hole

A positioning pin hole that is aligned with the center axis of the finger is provided on the surface opposite to the finger installation surface.
Use of this positioning pin hole makes it possible to maintain the gripper installation accuracy and installation reproducibility.
(However, the YRG-2005SS and YRG-2004T is excepted.)

Positioning pin hole

NOTE

For details about positioning pin hole position and size of each gripper, see "11.3 Electric gripper specifications".

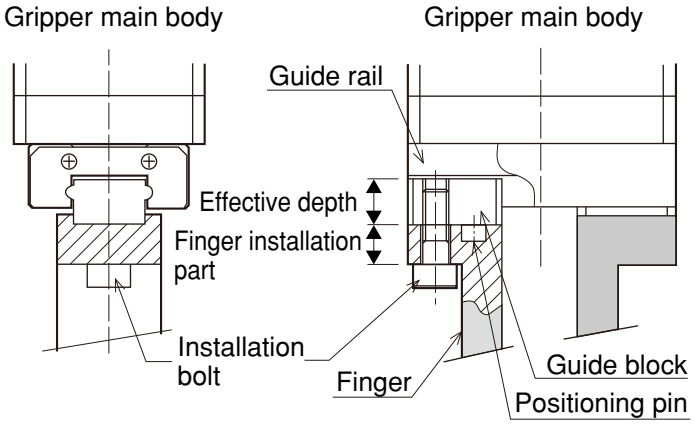
3.2 Installing the finger

Tap holes have been made in the guide block of each electric gripper to install a tool, such as finger. Follow the instructions below to install a tool, such as finger on the electric gripper.
For details about tap hole positions, see "11.3 Electric gripper specifications".

(1) Installation bolt

- When installing the finger, tighten the bolt while holding the finger firmly so that any excessive force or shock is not applied to the guide block.
- The installation tap hole in the guide block is a through-hole. If a bolt to be screwed-in beyond the effective depth of the guide block is used, this may cause the gripper to malfunction or break. Never use a bolt with a screw-in length exceeding the effective depth. On the other hand, if the length of the installation bolt is too short, this may cause insufficient clamping force.

Finger installation bolt



Tap hole and effective depth

Model name	Tap hole	Effective depth (mm)
YRG-2005SS	M2	3.5
YRG-2010S YRG-2005W	M3	5
YRG-2815S YRG-2810W	M4	5
YRG-4225S YRG-4220W	M5	8
YRG-2020FS YRG-2020FT	M3	5
YRG-2840FS YRG-2840FT	M4	7.5
YRG-2004T	M2	4
YRG-2013T	M3	8
YRG-2820T	M3	6
YRG-4230T	M4	8

WARNING

STRICTLY OBSERVE THE ABOVE INSTRUCTIONS ABOUT INSTALLATION BOLT TO SECURELY FIX A TOOL, SUCH AS FINGER. FAILURE TO FOLLOW THE INSTRUCTIONS MAY CAUSE THE FINGER OR WORKPIECE TO BE LOOSE OR FALLEN DOWN, RESULTING IN EQUIPMENT BREAKAGE OR PERSONAL INJURY.

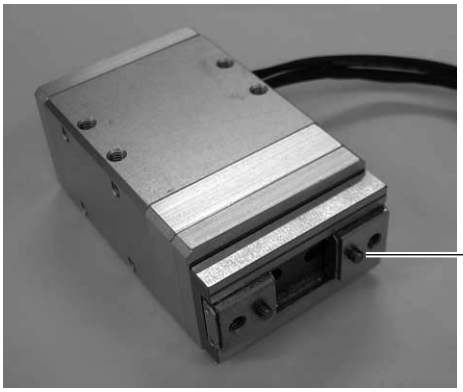
CAUTION

When installing the finger, tighten the installation bolt at a tightening torque level suitable for the finger material.

(2) Positioning pin

Use of positioning pins provided on the guide block makes it possible to maintain the finger installation accuracy and installation reproducibility.

Positioning pin



NOTE

For details about positioning pin position and size of each gripper, see "11.3 Electric gripper specifications".

3.3 Connection and wiring

This section explains the cable connection and wiring necessary to operate and control the electric gripper.

WARNING

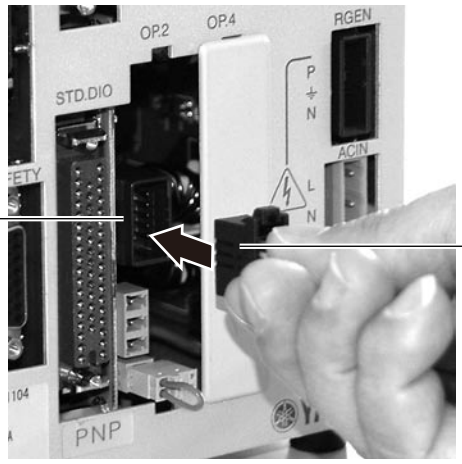
- **AN APPROPRIATE SAFETY CIRCUIT OR DEVICE SHOULD BE SO DESIGNED THAT SYSTEM BREAKAGE OR PERSONAL INJURY DOES NOT OCCUR IF THE PRODUCT STOPS IN CASE OF A SYSTEM TROUBLE, SUCH AS AN EMERGENCY STOP OR A POWER FAILURE.**
- **PERFORM THE PRODUCT WIRING WHILE REFERRING TO THE WIRING PROCEDURES STATED IN THE USER'S MANUAL TO CONNECT ALL CABLES CORRECTLY. CONNECT THE CABLES AND CONNECTORS SECURELY SO THAT ANY CABLE OR CONNECTOR IS NOT LOOSE OR DISCONNECTED. PRODUCT MALFUNCTION OR FIRE MAY OTHERWISE RESULT.**

CAUTION

Before connecting the cables, make sure that the controller and electric gripper are powered off completely. If the cable is connected or disconnected with the power turned on, this may cause the electric gripper to break.

3.3.1 Connecting to the controller (gripper control board)

Connect the 10-pin connector (female) of the robot (for gripper) cable supplied with the electric gripper to the 10-pin connector (male) of the gripper control board installed in the controller. To connect the connector, make the connector orientations matched with each other and insert the connector securely until a click sounds.

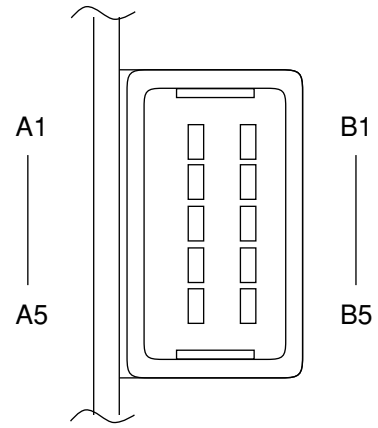


Connector (male) of controller

Connector (female) of connection cable

● **List of controller connector signals**

Terminal No.	Symbol	Function
A1	EA	Encoder signal input A-phase
A2	EZ	Encoder signal input Z-phase
A3	0V	Encoder 0V power output
A4	BN	Motor output B-phase
A5	B	Motor output B-phase
B1	EB	Encoder signal input B-phase
B2	+5V	Encoder +5V power output
B3	SLD	Shielding line
B4	A	Motor output A-phase
B5	AN	Motor output A-phase



Connector for gripper connection
(Controller side)

WARNING

AVOID DAMAGE TO THE ROBOT (FOR GRIPPER) CABLE OR RELAY CABLE. DAMAGED CABLE, EXCESSIVE BENDING, PULLING, WINDING, OR WEDGING MAY CAUSE FIRE, ELECTRICAL SHOCK, OR MALFUNCTION DUE TO EARTH LEAKAGE OR FAULTY CONDUCTING.

CAUTION

The accessory connection cable consists of two harnesses that separate the encoder lines from the motor lines. To connect the electric gripper to the controller, this connection cable should be used.
This cable has excellent flexibility. However, do not store the cable in a movable wiring duct (cable guide, etc.) with a radius of 66 mm or less.

3.3.2 Connecting the robot (for gripper) cable and relay cable

Connect the robot (for gripper) cable and relay cable.
As shown in the table below, the cable model number may vary depending on the cable length. Each cable consists of two harnesses that separate the encoder lines from the motor lines. To connect the connector, make the connector orientations matched with each other and insert the connector securely until a click sounds.

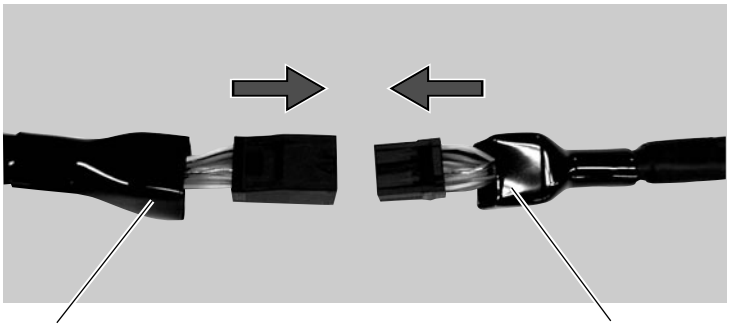
CAUTION

Be sure to adjust the total length of the robot (for gripper) cable and relay cable to 14m or less. If the total length exceeds this level, this may cause malfunction due to noise.

● **Cable model number**

Robot (for gripper) cable model number	Length
KCF-M4751-3	3.5m
KCF-M4751-5	5m
KCF-M4751-A	10m

Relay cable model number	Length
KCF-M4811-1	0.5m
KCF-M4811-2	1m
KCF-M4811-3	1.5m
KCF-M4811-4	2m
KCF-M4811-5	2.5m
KCF-M4811-6	3m
KCF-M4811-7	3.5m
KCF-M4811-8	4m



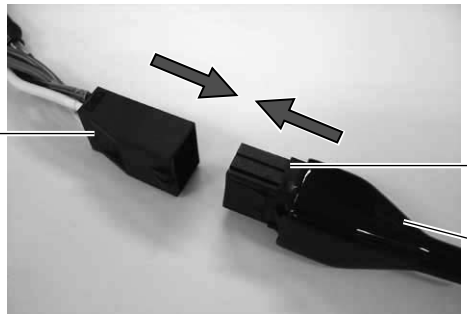
Robot (for gripper) cable　　Relay cable

WARNING

AVOID DAMAGE TO THE ROBOT (FOR GRIPPER) CABLE OR RELAY CABLE. DAMAGED CABLE, EXCESSIVE BENDING, PULLING, WINDING, OR WEDGING MAY CAUSE FIRE, ELECTRICAL SHOCK, OR MALFUNCTION DUE TO EARTH LEAKAGE OR FAULTY CONDUCTING.

3.3.3 Connecting to the electric gripper main body

Connect the connector (male) of the harness that comes from the electric gripper main body to the connector (female) of the relay cable. To connect the connector, make the connector orientations matched with each other and insert the connector securely until a click sounds. After the connection has been complete, put the connector hood.



Connector (female) of relay cable

Connector (male) of electric gripper

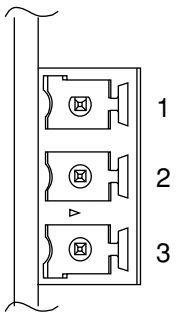
Connector hood

WARNING

AVOID DAMAGE TO THE ROBOT (FOR GRIPPER) CABLE OR RELAY CABLE. DAMAGED CABLE, EXCESSIVE BENDING, PULLING, WINDING, OR WEDGING MAY CAUSE FIRE, ELECTRICAL SHOCK, OR MALFUNCTION DUE TO EARTH LEAKAGE OR FAULTY CONDUCTING.

3.3.4 Wiring to the DC24V power supply

The following shows the terminal layout of the power connector on the controller side (gripper control board).



Power connector
(Controller side)

● **Power connector**

Terminal No.	Connection	Function
1	+24V	Motor power supply, control power supply
2	0V	Power supply 0V
3	FG	Frame ground (terminal for D-grade grounding work)

CAUTION

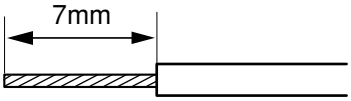
Do not connect the terminals incorrectly. Doing so may cause a malfunction.

(1) Wiring to the power connector

Prepare electric wires to be connected to the DC24V power supply and connect the wires to the power connector supplied with the electric gripper.

● **Length of exposed wire lead**

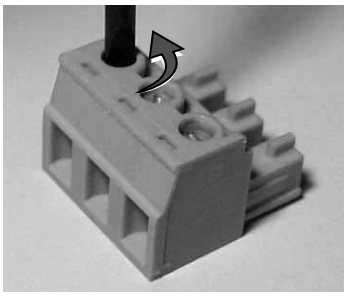
Strip the wire to expose 7 mm of bare lead.



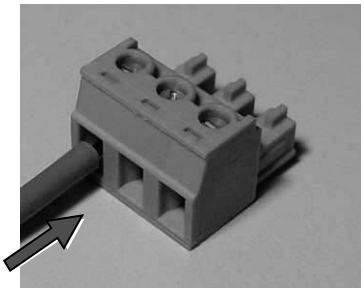
AWG size : 28 to 16

● **Wiring**

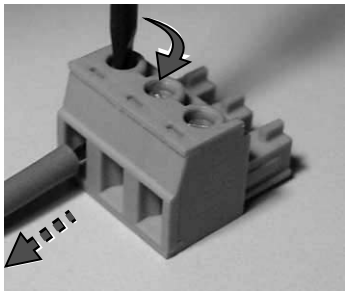
Follow the steps below to insert the wire lead into the opening in the power connector and make sure that the electric wire is not disconnected.



①Loosen the screw on the top with a small flat-blade screwdriver.



②Insert the wire lead stripped into the electric wire insertion port correctly until it is in contact with the far side.



③Loosen the screw on the top with a flat-blade screwdriver. Lightly pull the electric wire to make sure that it is not disconnected.

Tighten the screw on the top of the power connector with tightening torque shown below.

Tightening torque: 0.22 to 0.25N•m

WARNING

CONNECT THE GROUNDING LINE TO THE FRAME GROUND TERMINAL SECURELY TO PREVENT MALFUNCTION CAUSED BY NOISE.

CAUTION

- **Take out the gripper emergency stop connector from the controller and perform the wiring work.**
- **Insert one electric wire into one electric insertion port of the gripper emergency stop connector.**
- **When inserting the electric wire, pay special attention so that frayed wire leads are not in contact with other conductor.**
- **If the electric wire insertion portion deteriorates for some reason, strip the electric wire and connect it again.**

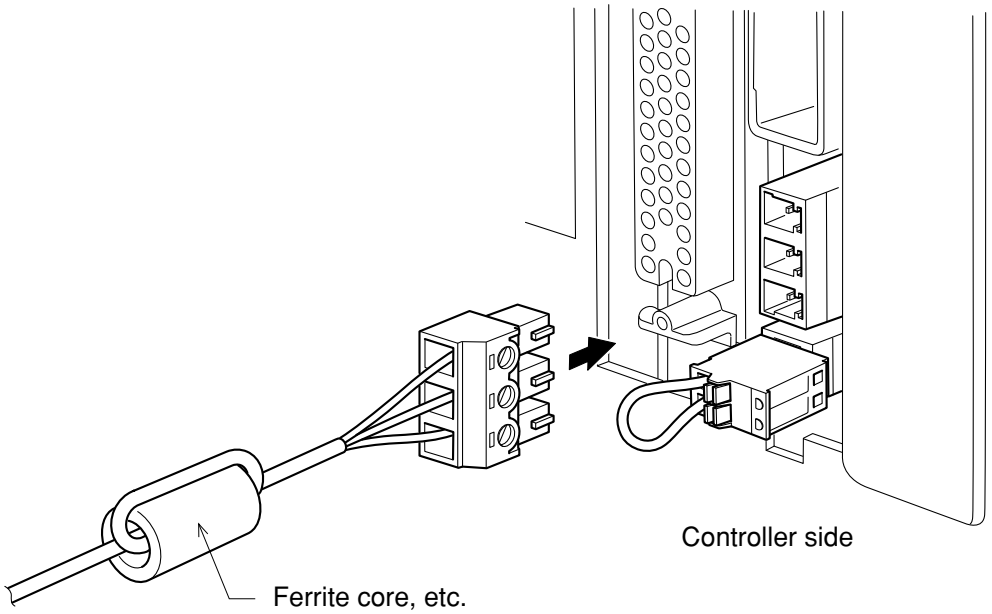
(2) Preventive measures for malfunction caused by noise

If the gripper operation may become unstable due to noise, it is recommended to insert a ferrite core or noise filter into the power supply line.

CAUTION

Locate the ferrite core or noise filter as close to the controller as possible.

Connecting the power connector



3.3.5 Wiring to the gripper emergency stop

An emergency stop input dedicated to the electric gripper is provided on the gripper control board. The customer performs the wiring to this emergency stop input as needed.

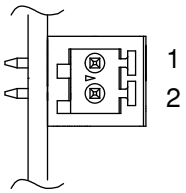
WARNING

- **AN EXTERNAL EMERGENCY STOP CIRCUIT MUST BE CONSTRUCTED SO THAT THE DRIVE POWER CAN BE SHUT DOWN IMMEDIATELY IN CASE OF AN EMERGENCY STOP. INSTALL AN EMERGENCY STOP DEVICE IN A PLACE WHERE ALL CONCERNED PERSONNEL CAN ACTIVATE IT IF ANY DANGER OCCURS DURING OPERATION. PERSONAL INJURY MAY OTHERWISE RESULT.**
- **DO NOT CONSTRUCT A CONTROL SO THAT THE WORKPIECE DROPS IF A POWER FAILURE OCCURS. CONSTRUCT A CONTROL THAT PREVENTS WORKPIECE DROP IF A POWER FAILURE OCCURS IN THE MACHINE UNIT OR IF THE EMERGENCY STOP IS ACTIVATED. PERSONAL INJURY MAY OTHERWISE RESULT.**

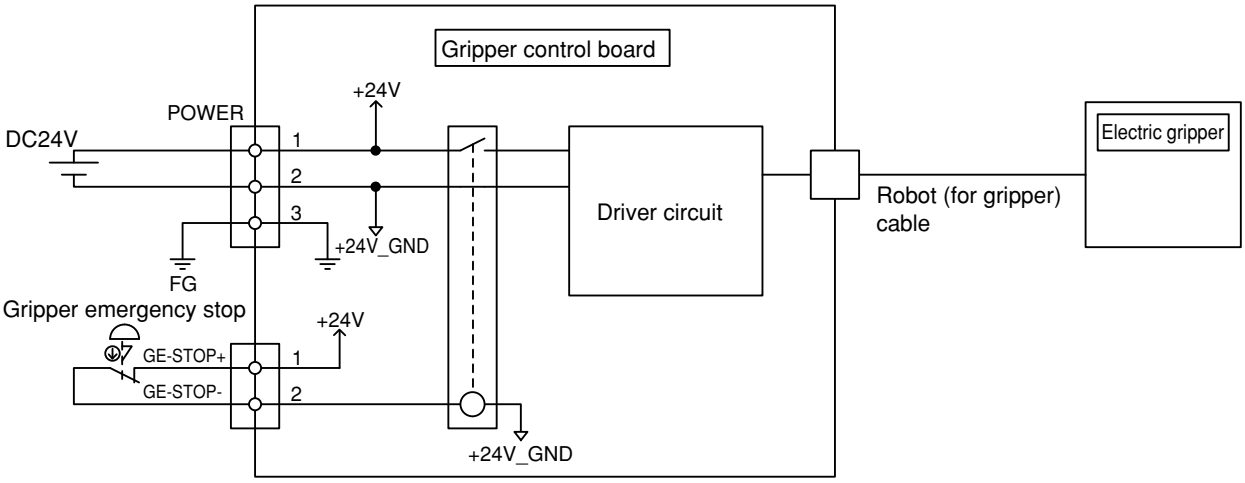
The following describes the terminal pin assignments of the gripper emergency stop connector on the controller side (gripper control board).

● Connector for gripper emergency stop

Terminal No.	Symbol	Function
1	GE-STOP+	Gripper emergency stop input 1
2	GE-STOP-	Gripper emergency stop input 2



Connector for gripper emergency stop
(Controller side)



NC contact status of gripper emergency stop	Electric gripper status
NC contact of the gripper emergency stop is closed (terminal numbers 1 and 2 are short-circuited).	Gripper is put in the emergency stop cancel status.
NC contact of the gripper emergency stop is open (terminal numbers 1 and 2 are open).	Gripper is put in the emergency stop status, the servo of the electric gripper is turned off, and the power to the gripper is shut down.

CAUTION

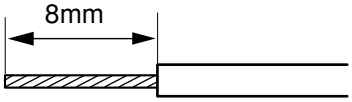
- **The gripper emergency stop is not interlocked with the emergency stop of the controller.**
- **The servo status of the gripper axis can be set using "Gripper servo when E.stop" of other parameters. (For details, see "6.3 Other parameter details".)**

(1) Wiring to the gripper emergency stop connector

Prepare electric wires to be connected to the emergency stop circuit of the electric gripper and connect the wires to the gripper emergency stop connector supplied with the electric gripper.

● Length of exposed wire lead

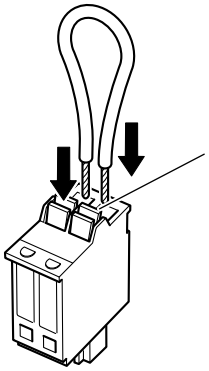
Strip the wire to expose 8 mm of bare lead.



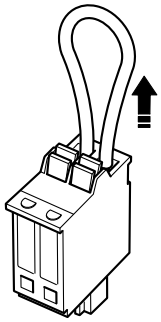
AWG size : 26 to 20

● Wiring

Follow the steps below to insert the wire lead into the opening in the gripper emergency stop connector and make sure that the electric wire is not disconnected.



Insert the wire lead while pushing down the orange portion.



①While pushing down the orange portion, insert the correctly stripped wire lead until it is in contact with the electric wire insertion port.

②When you stop pushing down the orange portion, the wire lead is then connected. For confirmation, lightly pull the wire lead. (At this time, do not pull the wire lead excessively.)

CAUTION

- **Take out the gripper emergency stop connector from the controller and perform the wiring work.**
- **Insert one electric wire into one electric insertion port of the gripper emergency stop connector.**
- **When inserting the electric wire, pay special attention so that frayed wire leads are not in contact with other conductor.**
- **If the electric wire insertion portion deteriorates for some reason, strip the electric wire and connect it again.**

(2) Interlocking with the RCX240 controller

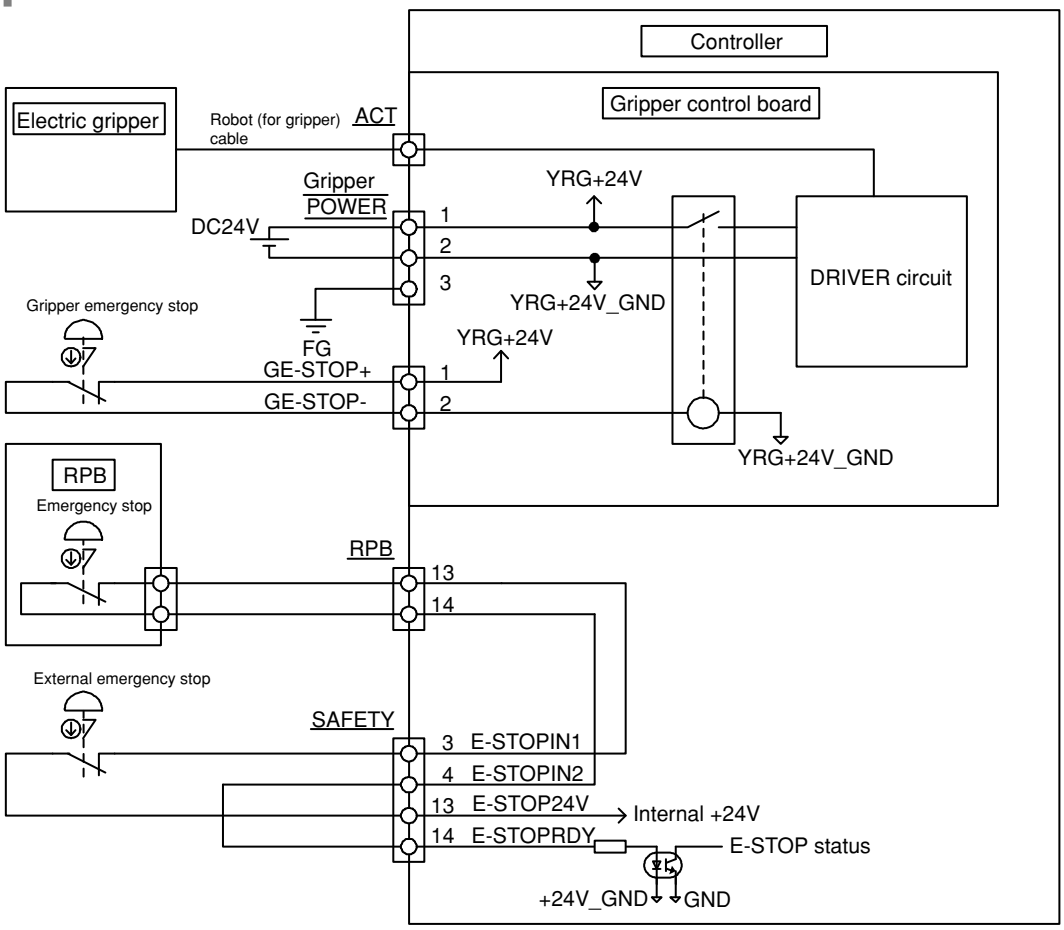
The servo status of the gripper axis when the emergency stop button on the controller is pressed can be set using the "Gripper servo when E.stop" parameter of other parameters. (For details, see "6.3 Other parameter details".)

If the power to the controller and electric gripper is interlocking shut down with the emergency stop, the customer takes safety measures suitable for the customer's system while referring to the circuit examples shown below.

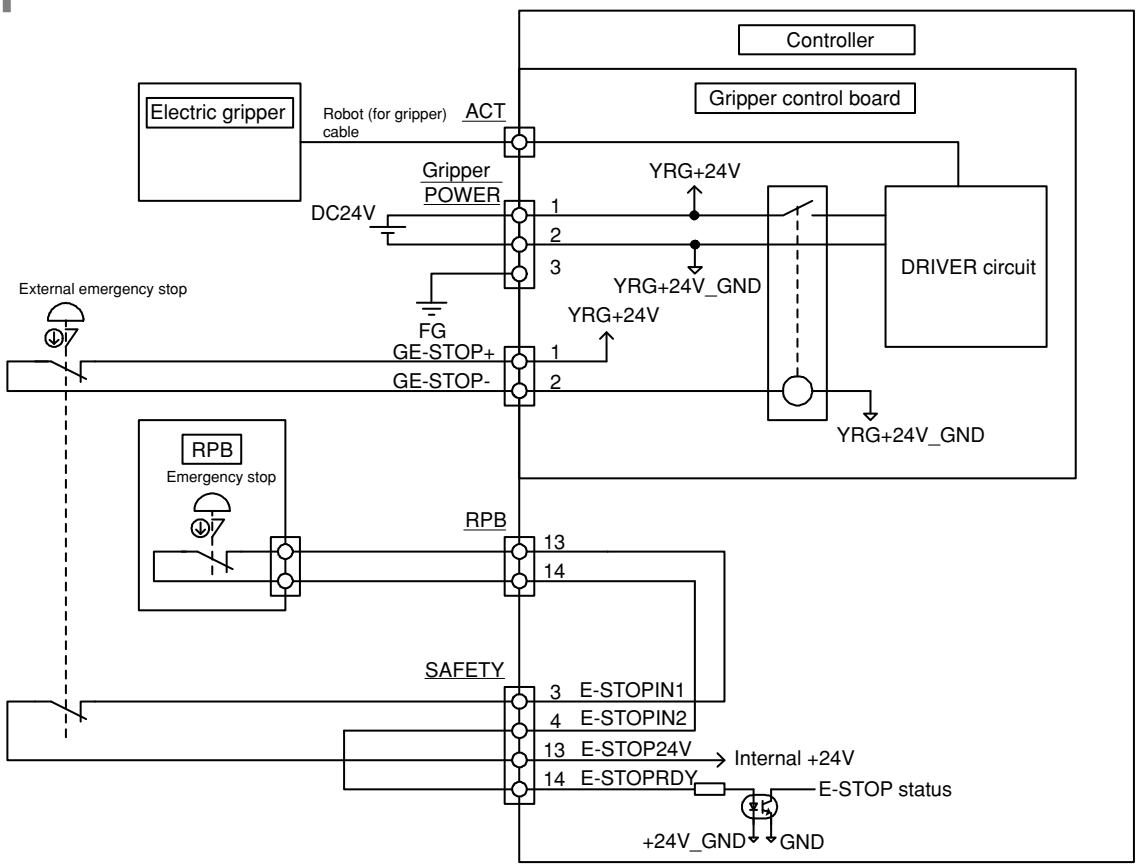
WARNING

- **DO NOT CONFIGURE THE CONTROL THAT ALLOWS THE WORKPIECE TO DROP WHEN STOPPED. TAKE APPROPRIATE WORKPIECE DROP PREVENTION MEASURES WHEN A POWER FAILURE OCCURS IN THE MACHINE UNIT OR THE EMERGENCY STOP IS ACTIVATED.**
- **THOROUGHLY READ THIS USER'S MANUAL, USER'S MANUAL FOR RCX240 CONTROLLER, AND USER'S MANUAL FOR ROBOT WITH GREAT CARE TO TAKE APPROPRIATE SAFETY MEASURES SUITABLE FOR THE CUSTOMER'S SYSTEM.**

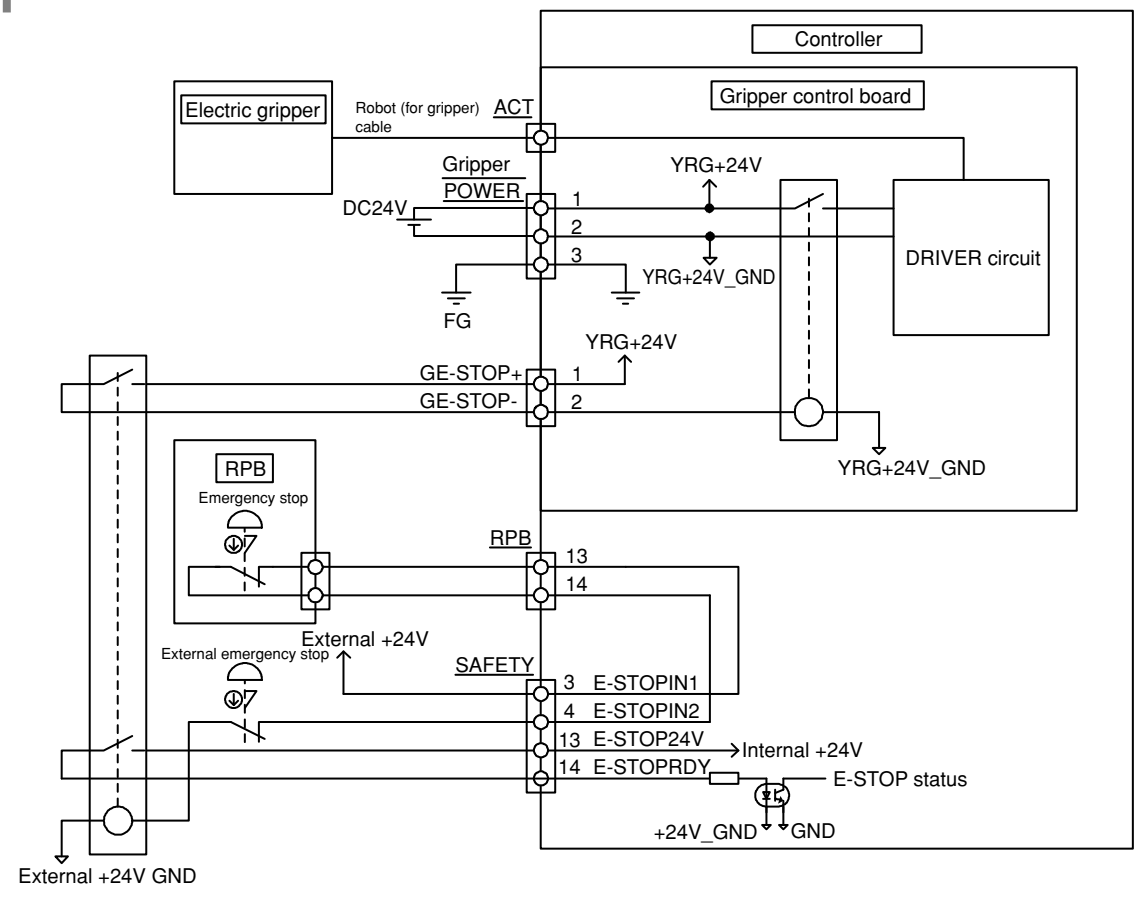
Circuit example 1) Gripper emergency stop is not interlocked with the controller emergency stop and external emergency stop.



Circuit example 2) Gripper emergency stop is not interlocked with the controller emergency stop, but is interlocked with the external emergency stop.



Circuit example 3) Gripper emergency stop is interlocked with the controller emergency stop and external emergency stop.



4. Verification and preparation

4.1 Verifying the robot controller settings

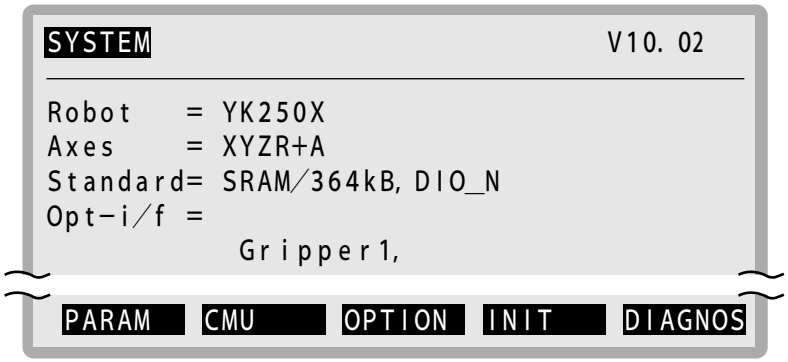
From the RPB programming box (hereafter referred to as "RPB"), you can verify whether or not the gripper control board is installed in the robot controller. To verify the gripper control board, follow the steps below.

Step 1 ***Select the "SYSTEM" mode.***

Step 2 ***Verify that the board name is indicated at the "Opt-i/f" item.***

The gripper control board is installed if "Gripper 1" is indicated at the "Opt-i/f" item.

Example of "SYSTEM" mode screen



TIP

When two gripper control boards are installed, "Gripper 1" and "Gripper 2" are indicated. In a screen example shown above, one gripper is set as an auxiliary axis of the scalar robot YK250X.

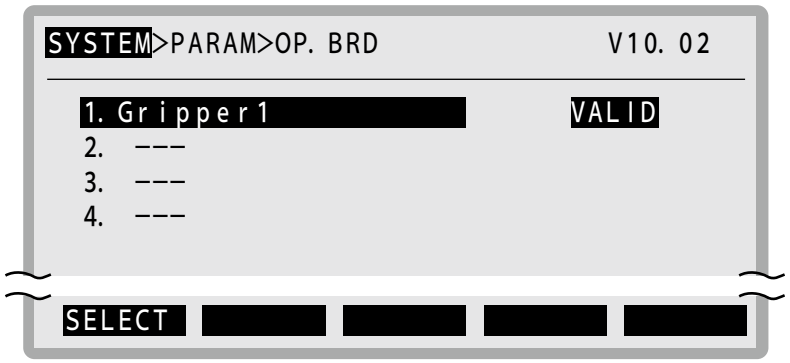
4.2 Verifying the gripper control board status

To operate the electric gripper, it is absolutely necessary that the gripper control board is ready for operation. Verify the gripper control board status with the RPB.

Step 1 *Select the "SYSTEM>PARAM>OP.BRD" mode.*

The list of option boards installed in the robot controller is indicated.

"SYSTEM>PARAM>OP. BRD" mode



Step 2 *Verify that "Gripper 1" is set at "VALID".*

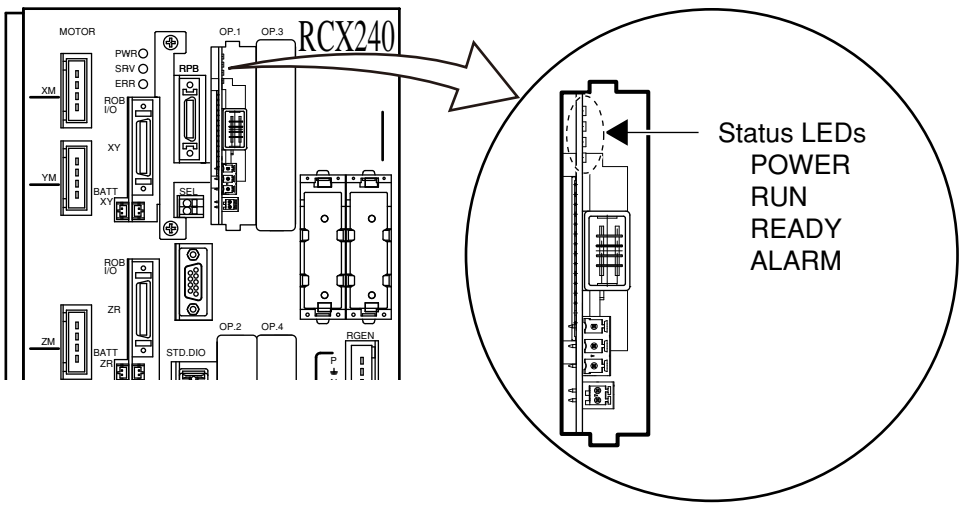
TIP

When two gripper control boards are installed, verify the settings of "Gripper 1" and "Gripper 2".

4.3 Status LEDs on the gripper control board

Four status LEDs are provided at the location on the gripper control board as shown in the figure below. These LEDs show the board status. The meaning of each LED indication is described in the table below.

Status LEDs



(Figure when viewed from the front of the controller)

Functions of status LEDs

LEDs	Function
POWER	Lit (green) when the motor drive power (24V) is turned on.
RUN	Lit (green) when the gripper is in operation.
READY	Lit (yellow) during correct operation.
ALARM	Lit (red) if an alarm occurs.

4.4 Weight parameters

4.4.1 Robot parameters

The tip weight (workpiece weight + tool weight) of the robot is set for the "Tip weight [kg]/WEIGHT" parameter in "kg" units.
At this time, the weight of the electric gripper (see the table below) is also added to the tool weight.

Weight of electric gripper main unit

Electric gripper model	Weight
YRG-2005SS	90g
YRG-2010S	160g
YRG-2815S	300g
YRG-4225S	580g
YRG-2005W	200g
YRG-2810W	350g
YRG-4220W	800g
YRG-2020FS	420g
YRG-2840FS	880g
YRG-2020FT	420g
YRG-2840FT	890g
YRG-2004T	90g
YRG-2013T	190g
YRG-2820T	340g
YRG-4230T	640g

For details about "Tip weight [kg]/WEIGHT" parameter, see the user's manual for robot controller.

4.4.2 Axis parameters

The electric gripper does not use the "Axis tip weight [kg]/AXSTIP" parameter.
So, even when this parameter is changed, the acceleration does not change automatically.

For details about "Axis tip weight [kg]/AXSTIP" parameter, see the user's manual for robot controller.

5. Operation

5.1 Turning the power on and off

This section explains how to turn on and off the power, assuming that the electric gripper has been connected completely according to the instructions stated in "3. Installation and wiring" and the controller operates correctly.

5.1.1 Turning the power on

Step 1 ***Connect the RPB programming box to the controller.***

Connect the RPB connector to the RPB connector terminal (RPB) on the front panel of the controller.

Step 2 ***Supply the power from the DC 24V power connector.***

The "POWER" LED on the gripper control board lights up. (For details, see "4.3 Status LEDs on the gripper control board".)

Step 3 ***Supply the main power (power for motor drive) and control power from the power terminal on the front panel of the controller.***

The "PWR" LED lights up and the "MANUAL" mode screen will appear. (After the "PWR" LED has been lit, it takes a maximum of 5 sec. per gripper for the controller to operate normally. So, when two grippers are used, it takes a maximum of 10 sec.)

NOTE

- If the error message "Parameter destroyed" or "Memory destroyed" appears on the screen when the power is turned on, be sure to initialize the parameters and memory in the "SYSTEM" mode before performing the absolute reset or return-to-origin. For details, see the user's manual for YAMAHA robot controller RCX240.
- If the error message "10.21: Sys. backup battery low voltage" appears when the power is turned on, replace the lithium battery (service life is about 4 years) in the controller.
- After the robot controller has been turned off, wait at least 5 sec. before turning the power on again. If the power is turned on again too quickly after it has been turned off, the controller may not start up correctly.

Step 4 ***Turn on the servo.***

When the SAFE mode setting or serial I/O setting is enabled, the controller always starts with the robot servo turned off. So, be sure to turn on the servo.
For details about how to turn on the servo, see the user's manual for YAMAHA robot controller RCX240.

NOTE

- If the "Servo on when power on" parameter is set at "NO", the controller always starts with the robot servo turned off when power is turned on, regardless of SAFE mode and serial I/O settings. For details, see the user's manual for YAMAHA robot controller RCX240.
- It takes a maximum of 5 sec. per gripper to complete the gripper servo on. So, when two grippers are used, it takes a maximum of 10 sec.

5.1.2 Turning the power off

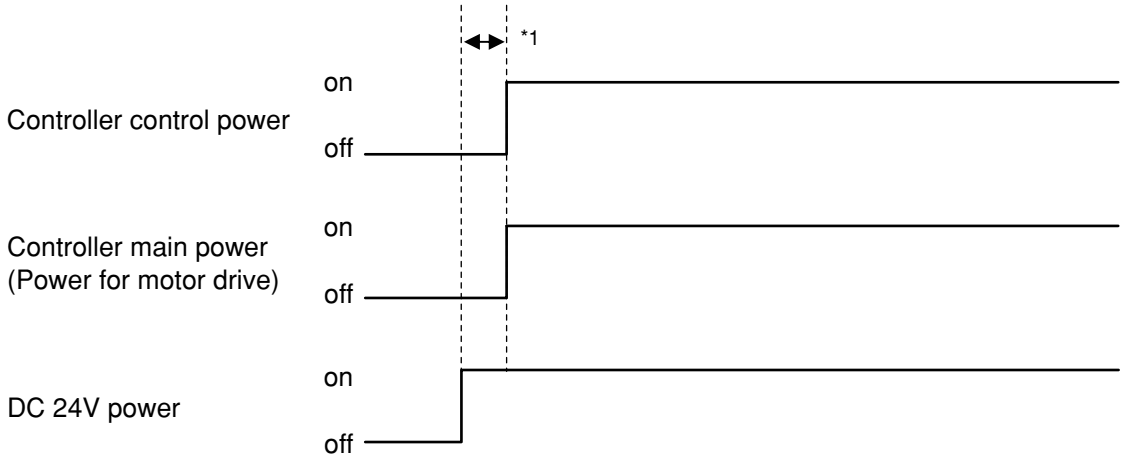
Step1 ***Turn off the main power (power for motor drive) and control power of the controller.***

Step2 ***Turn off the DC 24V power.***

NOTE

Do not turn the power off while the program is running. Doing so may cause internal system data conflict to occur. In this case, when the power is turned on again, the program may not restart correctly.
Before turning the power off, be sure to exit or stop the program.

5.1.3 Power on timing chart



*1 Be sure to turn on the DC 24V power at the same time or before the controller control power and main power are turned on.
It is recommended to turn on the controller control power and main power 100 ms or longer after the DC 24V power has been turned on.

5.2 Manual movement

The robot can be operated with the JOG (manual movement) key. In a similar manner to the robot axis, the electric gripper can also be operated with the JOG (manual movement) key.
The manual movement with the JOG (manual movement) key is described as follows.

WARNING

PRESSING THE JOG KEY WILL MOVE THE ROBOT. TO PREVENT HAZARDS, DO NOT ENTER THE ROBOT OPERATION AREA.

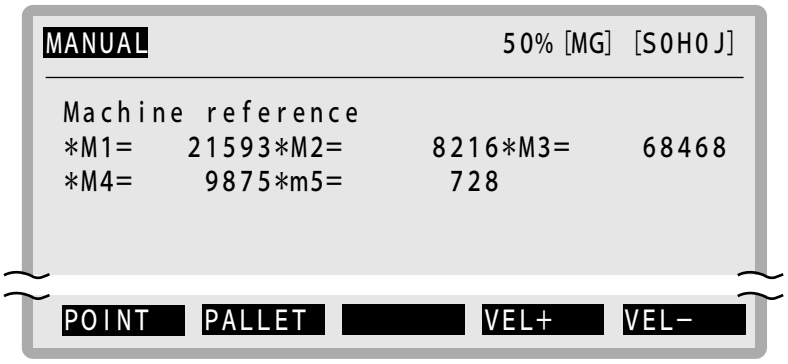
NOTE

- The electric gripper cannot be moved unless the return-to-origin has been completed. Before starting the manual movement, be sure to perform the return-to-origin.
- The movement speed is always 20% when the electric gripper is manually moved continuously, regardless of the RPB speed display. (The maximum movement speed in the "MANUAL" mode is 20% of the movement speed in the "AUTO" mode and the minimum speed of the electric gripper is 20% of the maximum speed.)
- When two robots are set, check the group selection display and perform the manual movement. If the target group is different, press the ROBOT (LOWER + MODE) key to change the target group.
- For details about software limit, see "6.2 Axis parameter details".
- If the current position is displayed in "pulse" units, you can move the servo on axis manually even when the servo on and off axes are mixed.
- If the current position is displayed in "mm" units, you can move the axis only when the servo on is set for all axes.

(1) Current position display in "pulse" units

"J" is shown in the right portion of the RPB screen.

Example of display in "pulse" units (J)



The operation contents may vary depending on the set contents of the "Manual Holding of Gripper" parameter of other parameters as described below. (For details, see "6.3 Other parameter details".)
The "Manual Holding of Gripper" parameter is valid only when the software version is Ver. 10.19 or later. When the software version is earlier than Ver. 10.19, the operation is the same as that with the "Manual Holding of Gripper" parameter set at "INVALID".

1. **"Manual Holding of Gripper" parameter is set at "INVALID".**
   The holding operation of the manual movement becomes invalid.
   In the same manner as the robot axis operation, the manual movement is as follows. Pressing the JOG key will perform the inching operation of the axis corresponding to the key (constant amount movement every time the key is pressed). Holding down the key will continuously move the axis to the software limit position as a target. When the JOG key is released or when the axis reaches the software limit, the axis movement will stop.
   The movement distance with the inching operation is the number of pulses that equals the numeric value of the manual movement speed.

   Example) When the manual movement speed is 20%,
   the inching distance in "pulse" units is 20 pulses.

   When you press the JOG key to move each axis to a position over ± software limit of each axis, the message "2.1: Software limit over" appears and the axis cannot be moved.

2. **"Manual Holding of Gripper" parameter is set at "VALID".**
   The manual movement operation changes to the holding movement.
   In this setting, the electric gripper can hold a workpiece.

   Pressing the JOG key will perform the inching operation of the axis corresponding to the key (constant amount movement every time the key is pressed). Subsequently, holding down the key will continuously move the axis to the software limit position as a target. When the JOG key is released or when the axis reaches the software limit, the axis movement will stop.
   As the manual movement is changed to the holding movement, the movement distance with the inching operation is the number of pulses that equals "numeric value of the manual movement speed + limit width pulse conversion value". Additionally, the inching distance may not be constant due to the conversion accuracy inside the gripper IF board.

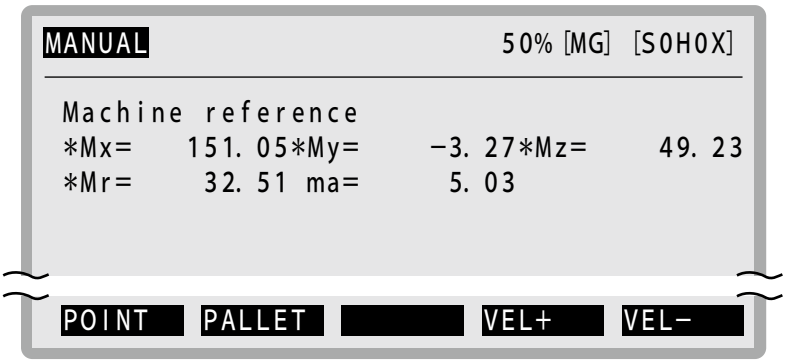
   Example) When the manual movement speed is 100%, the electric gripper model is YRG-2815S, and the limit width is 2.00 mm (189 pulses),
   the inching distance in "pulse" units = 100 + 189 pulses = 289 pulses.

   When you press the JOG key to move each axis to a position over ± software limit of each axis, the message "2.1: Software limit over" appears and the axis cannot be moved.

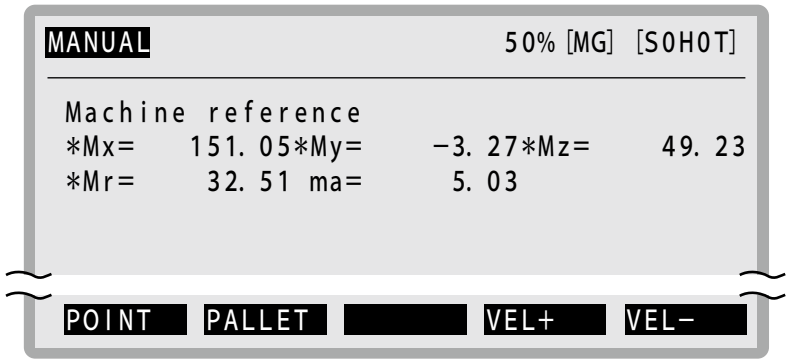
(2) Current position display in "mm" units

"X" is shown in the right portion of the RPB screen. "T" is shown in the "Tool coordinate" mode.

Example of display in "mm" units (X)



Example of display in "mm" units ("Tool coordinate" mode: T)



The operation contents may vary depending on the set contents of the "Manual Holding of Gripper" parameter of other parameters as described below. (For details, see "6.3 Other parameter details".)
The "Manual Holding of Gripper" parameter is valid only when the software version is Ver. 10.19 or later.
When the software version is earlier than Ver. 10.19, the operation is the same as that with the "Manual Holding of Gripper" parameter set at "INVALID".

1. **"Manual Holding of Gripper" parameter is set at "INVALID".**
   The holding operation of the manual movement becomes invalid.
   In the same manner as the robot axis operation, the manual movement is as follows.
   When the JOG key is pressed, the inching operation (constant amount movement every time the key is pressed) is performed first.
   Subsequently, holding down the key will perform the continuous movement. When the JOG key is released or when the axis reaches the software limit, the axis movement will stop.
   The movement distance with the inching operation is "manual movement speed (%) x 0.01 mm".
   The inching distance may not be constant due to the conversion accuracy inside the gripper IF board.

   Example) When the manual movement speed is 20%,
   the inching distance in "mm" units is 0.20 mm.

   When you press the JOG key to move each axis to a position over ± software limit of each axis, the message "2.1: Software limit over" appears and the axis cannot be moved.

2. **"Manual Holding of Gripper" parameter is set at "VALID".**
   The manual movement operation changes to the holding movement.
   In this setting, the electric gripper can hold a workpiece.

   Pressing the JOG key will perform the inching operation of the axis corresponding to the key (constant amount movement every time the key is pressed).
   Subsequently, holding down the key will continuously move the axis to the software limit position as a target. When the JOG key is released or when the axis reaches the software limit, the axis movement will stop.
   As the manual movement is changed to the holding movement, the movement distance with the inching operation becomes "manual movement speed (%) x 0.01 + limit width) mm".
   Additionally, the inching distance may not be constant due to the conversion accuracy inside the gripper IF board.

Example) When the manual movement speed is 20% and the limit width is 2.00 mm, the inching distance in "mm" units = 0.20 + 2.00 mm = 2.20 mm.

When you press the JOG key to move each axis to a position over ± software limit of each axis, the message "2.1: Software limit over" appears and the axis cannot be moved.

5.3 Return-to-origin

Before starting the operation of the robot by turning on the power, it is necessary to perform the return-to-origin. The return-to-origin operation adjusts the position of each robot axis to its mechanical origin position to reset the position data in the controller.
The return-to-origin needs to be performed for the axes with the incremental specifications. Since the gripper axis has the incremental specifications, perform the return-to-origin in either way described in "5.3.2 Overall return-to-origin" or "5.3.3 Gripper return-to-origin".

The parameters related to the return-to-origin are described below. For details about each parameter, see "6. Parameter settings" and each parameter item described in the user's manual for robot controller.

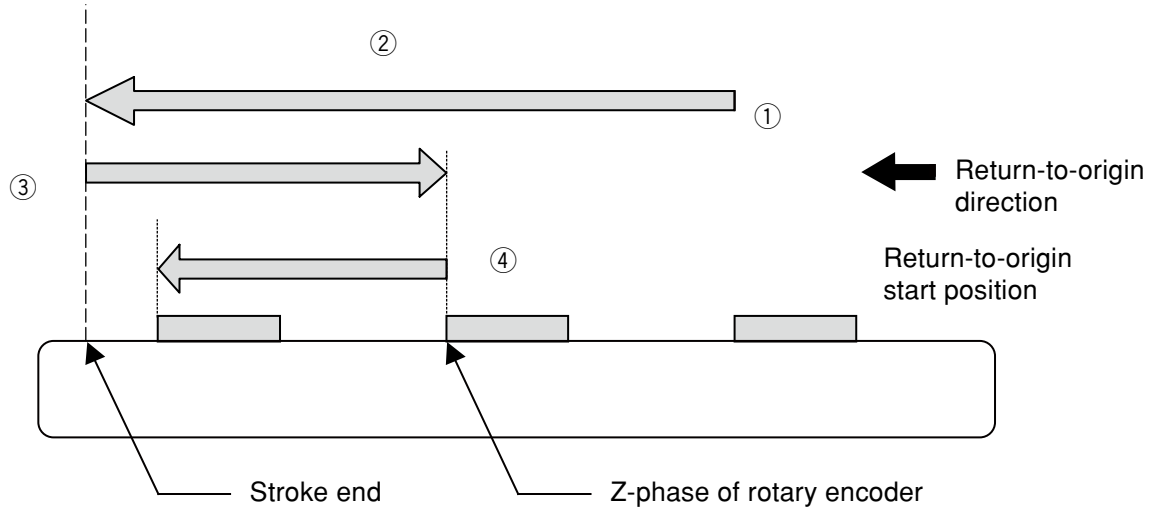
Category	Parameter name	Contents
Robot parameter	Origin sequence	Sets the order of return-to-origin axes. (For details, see the user's manual for robot controller.)
Axis parameter	Origin speed [%] (for Gripper)	Sets the speed of the return-to-origin operation. (For details, see "6. Parameter settings".)
	Origin shift	Sets the offset of the origin position data. (For details, see "6. Parameter settings".)
	Origin method	Sets the return-to-origin method. (For details, see "6. Parameter settings".)
	Origin direction	Sets the direction of the return-to-origin operation. (For details, see "6. Parameter settings".)

5.3.1 Return-to-origin operation

The return-to-origin methods include "stroke end + Z-phase detection" method and "stroke end detection" method.
In the "stroke end + Z-phase detection" method, set the "Origin method" parameter to "SENSOR". In the "stroke end detection" method, set the "Origin method" parameter to "TORQUE".

Each return-to-origin operation is described as follows.
For details about return-to-origin operation, see "5.3.2 Overall return-to-origin" or "5.3.3 Gripper return-to-origin".

(1) Return-to-origin using the "stroke end + Z-phase detection" method



① The return-to-origin can start from any position.
② Upon starting the return-to-origin, the axis starts moving in the return-to-origin direction.
③ After the stroke end has been detected as the guide block has been lightly in contact with the stroke end, the axis moves in the reverse direction until the Z-phase of the rotary encoder is detected.
④ When the Z-phase is detected, the axis moves again in the return-to-origin direction to determine the origin position.

(2) Return-to-origin using the "stroke end detection" method.

① The return-to-origin can start from any position.
② Upon starting the return-to-origin, the axis starts moving in the return-to-origin direction.
③ After the stroke end has been detected as the guide block has been lightly in contact with the stroke end, the axis moves slightly in the reverse direction to determine the origin position.

CAUTION

During stroke end detection, if the guide block interferes with a foreign object or if a load is applied to the guide block during return-to-origin, the stroke end may not be detected correctly and the return-to-origin may be completed at an incorrect position. The "stroke end detection" method is used only when the Z-phase detection operation has a problem during return-to-origin using the "stroke end + Z-phase detection" method.

5.3.2 Overall return-to-origin

The following explains how to perform the return-to-origin of all axes with the incremental specifications including the gripper axis.
For details about return-to-origin operation and related cautions, see the user's manual for the robot controller you are using.

CAUTION

To include the gripper axis in the overall return-to-origin, it is necessary to set the "Include Gripper in Origin" parameter to "YES". (For details, see "6.3 Other parameter details".)

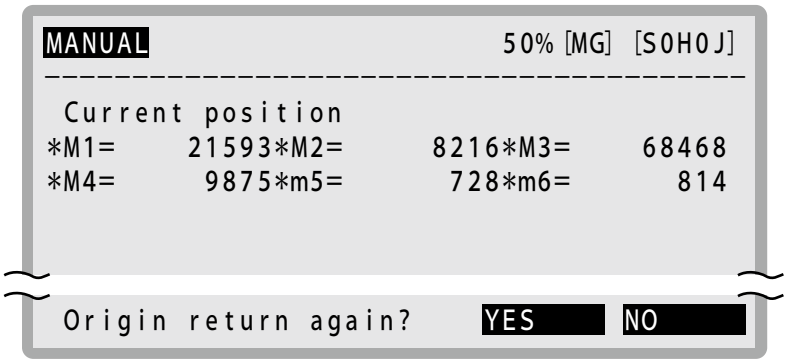
Step 1 *Press the F3 (ORIGIN) key in the "MANUAL" mode.*

The confirmation message will appear on the guide line.

To start the return-to-origin, pres the F4 (YES) key.

To cancel the return-to-origin, press the F5 (NO) key.

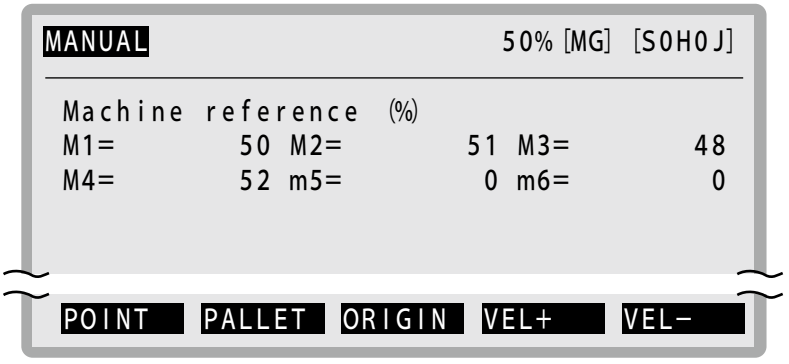
"RETURN-TO-ORIGIN CONFIRMATION" screen



Step 2 *Verify the indication on the screen.*

When all axes are put in the return-to-origin completion status, the message line will change from the dotted line (-----) to the solid line (——). Additionally, the machine reference values for the axes other than the gripper axis are indicated. (Since the gripper axis has no machine reference value, "0" is indicated.)
After that, press the axis movement key, etc. to indicate the current position of each axis on the screen.

"RETURN-TO-ORIGIN COMPLETION" screen



TIP

If the dotted line (----) remains on the message line, this means that there is an axis with the absolute specifications and the absolute reset of this axis is incomplete. If this occurs, perform the absolute reset of the target axis.

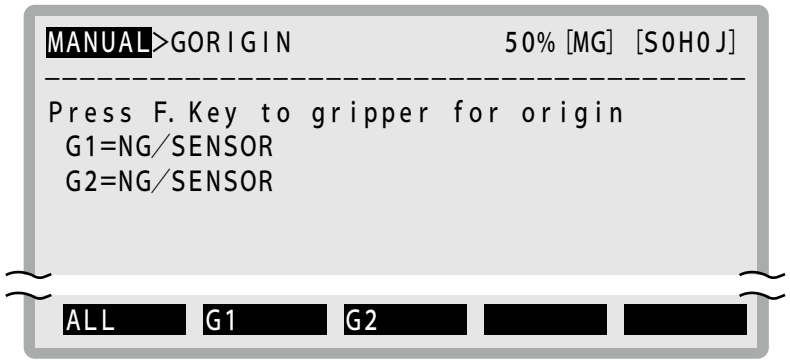
5.3.3 Gripper return-to-origin

The following explains how to perform the return-to-origin of only the gripper axis.

Step 1 ***Select the "MANUAL>GORIGIN" mode.***

Select the "MANUAL" mode and press the F14 *(GORIGIN) key. The "MANUAL>GORIGIN" mode screen will appear. (The figure below shows the screen when two grippers are used.)*

"MANUAL>GORIGIN" mode screen



Step 2 ***Select an axis you want to perform the return-to-origin.***

To start the return-to-origin of the gripper 1, press the F2 *(G1) key. Accordingly, to start the return-to-origin of the gripper 2, press the* F3 *(G2) key.*

When you want to perform the return-to-origin of both the grippers 1 and 2, press the F1 *(ALL) key.*

Step 3 ***Confirm the message and press the*** F4 ***(YES) key.***

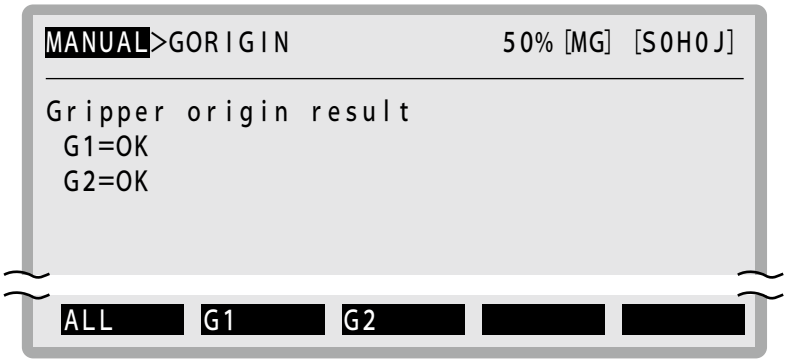
The return-to-origin of the gripper axis you have selected is then started.

"RETURN-TO-ORIGIN CONFIRMATION" screen

Step4 ***Verify that the return-to-origin is complete.***

When "OK" is indicated on the screen, this means that the return-to-origin is complete.

"MANUAL>GORIGIN" mode screen



5.4 Emergency stop

The operation when the emergency stop button on the RPB is pressed may vary depending on the set value of the "Gripper servo when E.stop" parameter as described below. (For details, see "6.3 Other parameter details".)

Make an appropriate setting suitable for the application.

Set value	Function
ON	Only the electric gripper axis remains servo on. Other axes are servo off. When the emergency stop button is pressed, the gripper continues holding the workpiece since the servo is not turned off.
OFF	All axes including the electric gripper axis are servo off.

For details about how to use the emergency stop button on the RPB, see the user's manual for robot controller.

5.5 Status monitor

You can verify the gripper status through the status monitor of the RPB. To verify the gripper status, follow the steps below.

Step 1 *Press the DISPLAY button on the RPB.*

The current input status is indicated in the data area (3rd to 7th lines) on the RPB screen.

Example of input status indication

```
MANUAL                                50% [MG]  [SOHOJ]

DI monitor
 DI0 ()  =&B00000101    DI4 ()  =&B00000000
 DI1 ()  =&B00000010    DI5 ()  =&B00000000
 DI2 ()  =&B00000101    DI6 ()  =&B00000000
 DI3 ()  =&B00000101    DI7 ()  =&B00000000


         DISPLAY KEY -> NEXT PAGE

LOWER + DISPLAY KEY -> PREV PAGE


 POINT   PALLET          VEL+    VEL-
```

Step 2 *Press the DISPLAY key again.*

Every time the DISPLAY key is pressed, the monitor indication is changed sequentially as shown below.

DI monitor → DO monitor → MO monitor → LO/TO monitor → SI monitor → SO monitor → SIW monitor → SOW monitor → Variable monitor → Task monitor → Gripper1 → (Gripper2) → Current monitor → Normal screen

NOTE

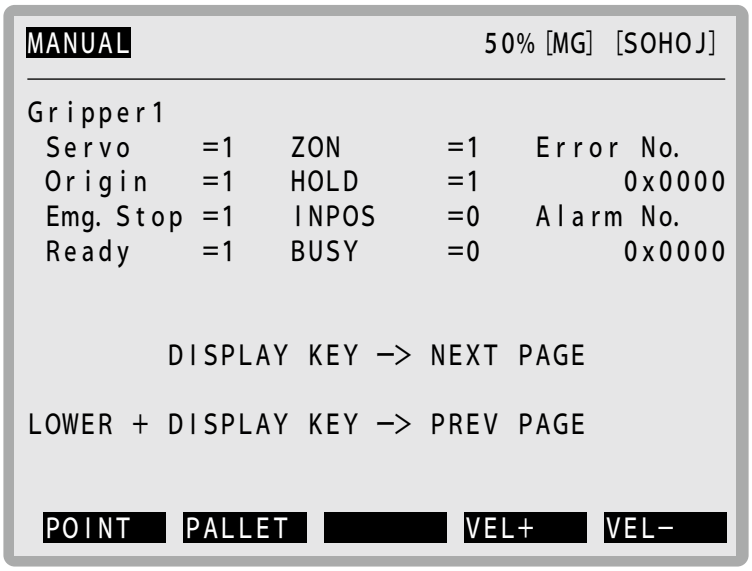
- The status monitor for the Gripper1 and/or Gripper2 is indicated only when the electric gripper options are set.
- Every time the LOWER + DISPLAY keys are pressed, the monitor indication is changed in the reverse order of that shown above.

Step 3 ***Press the DISPLAY key several times until the gripper status monitor is indicated.***

TIP

Pressing the LOWER + DISPLAY keys on the normal screen will indicate the gripper status monitor quickly.

Example of gripper status monitor indication



- **Meaning of each status**

Contents	Servo	Origin	Emg.Stop	Ready	ZON	HOLD	INPOS	BUSY
	Servo status	**Return-to-origin status**	**Emergency stop status**	**READY signal**	**ZON signal**	**HOLD signal**	**INPOS signal**	**BUSY signal**
0	Servo OFF	Incomplete	Emergency stop	Preparing	Beyond area	Release	Beyond area	Complete
1	Servo ON	Complete	Cancel	Correct	Within area	Holding	Within area	Running

  - Ready signal : This signal becomes "1" when the gripper is put in the preparation completion status.
  - ZON signal : This signal becomes "1" when the gripper holds a workpiece within the predetermined area.
  - HOLD signal : This signal becomes "1" when the gripper holds a workpiece.
  - INPOS signal : This signal shows that the gripper reaches the target position after completion of the return-to-origin or positioning operation. The signal also becomes "1" when the gripper reaches the target position without holding of a workpiece by the gripper movement operation command.
  - BUSY signal : This signal becomes "1" during operation of the gripper.

- **Error No.**
  Indicates relevant error No. if an error occurs in the gripper.

- **Alarm No.**
  Indicates relevant alarm No. if an alarm occurs in the gripper.

NOTE

Each status of the gripper can be output to the general-purpose DO/SO when the "G1 status output (DO & SO)" and "G2 status (DO & SO)" parameters are set.

6. Parameter settings

This section explains the parameters used for the electric gripper. There are two kinds of parameters available, parameters to be set for each axis (axis parameters) and common parameters (other parameters).

6.1 Parameter list

■ **Axis parameters**

No.	Name	RPB display	Identifier	Setting range [Default setting]	Unit	Remarks
1	Acceleration coefficient	Accel. coefficient [%]	ACCEL	1 to 100 [100]	%	
2	+ software limit	+Soft limit [pulse]	PLMT+	0 to Robot type [Robot type]	pulse	The upper limit of the setting range may vary depending on the model.
3	- software limit	-Soft limit [pulse]	PLMT-	Robot type to 0 [0]	pulse	The lower limit of the setting range may vary depending on the model.
4	Tolerance	Tolerance [pulse]	TOLE	1 to Robot type [Robot type]	pulse	Positioning completion distance
5	Origin position shift	Origin shift [pulse]	SHIFT	Robot type [0]	pulse	
6	Return-to-origin method	Origin method	ORGSNS	SENSOR : Stroke end and Z signal detection TORQUE : Stroke end detection [SENSOR]	–	
7	Return-to-origin direction	Origin direction	ORGDIR	--- : Open +++ : Close	–	
8	Holding speed	Holding speed [%] (for Gripper)	HLDVEL	Ver.10.18 and later : 20 to 50 In earlier versions : 1 to 100 [Robot type]	%	
9	Return-to-origin speed	Origin speed [%] (for Gripper)	GORGVL	Ver.10.18 and later : 20 to 50 In earlier versions : 1 to 50 [Robot type]	%	
10	Manual holding power	Manual holding power[%] (for Gripper)	GMHLPW	30 to 100 [30]	%	This parameter is supported by controller Ver.10.19 and later.
11	Constant move distance	Const. move dist [mm] (for Gripper)	CMVDST	0.01 to 99.99 [Robot type]	mm	
12	Limit width	Limit width [mm] (for Gripper)	LMTWDH	0.01 to 99.99 [Robot type]	mm	

■ **Other parameters**

No.	Name	RPB display	Identifier	Setting range [Default setting]	Unit	Remarks
1	Gripper servo when emergency stop	Gripper servo when E.stop	GEMGMD	ON, OFF [ON]	–	
2	Include Gripper in Origin	Include Gripper in Origin	GORGMD	NO, YES [YES]	–	
3	Manual Holding of Gripper	Manual Holding of Gripper	GMHLMD	INVALID, VALID [INVALID]	–	This parameter is supported by controller earlier than Ver.10.30.
				INVALID, VALID [VALID]	–	This parameter is supported by controller Ver.10.30 and later.
4	G1 status output	G1 status output(DO & SO)	G1STAT	Off, 2 to 7, 10 to 15 [off]	–	This parameter is supported by controller Ver.10.18 and later.
5	G2 status output	G2 status output(DO & SO)	G2STAT	Off, 2 to 7, 10 to 15 [off]	–	This parameter is supported by controller Ver.10.18 and later.

6.2 Axis parameter details

CAUTION

Set the parameters correctly so that any excessive impact or moment is not applied to the finger during operation. If applied, this may cause damage to the product or service life to be shortened.

1. Accel coefficient [%] /ACCEL

The acceleration for the gripper movement by the movement command is set in the range of 1 to 100%. When the parameters are initialized, "100" is set for this parameter.

NOTE

If the top end swings when the gripper movement is accelerated, decreasing this parameter value will suppress this swinging symptom.

CAUTION

When the acceleration coefficient is decreased, a period of time necessary to stop the gripper in response to the stop command by the STOP key or interlock signal becomes longer. So, do not decrease this acceleration coefficient extremely.

2. +Soft limit [pulse] /PLMT+

3. –Soft limit [pulse] /PLMT-

An area where the gripper axis is able to move is set using the + software limit and - software limit.

Before starting the point teaching or auto operation, make sure that the specified point data is within the software limit range.

The set value of the selected axis is indicated on the 3rd line of the RPB display after its unit has been converted.

CAUTION

- **These parameters are very important since they determine the movable area of the gripper axis. So, it is absolutely necessary to set accurate values.**
- **If the return-to-origin operation is not completed, the JOG operation of the gripper axis cannot be performed.**

NOTE

The set value of the data related to the distance, such as point data, constant movement distance, or limit width parameter is the total of values set for two fingers.

As the electric gripper is operated, two fingers function at the same time. The value of the point data, constant movement distance, or limit width parameter set for one finger is 1/2 of its set value.

Example) When the limit width is set at 2.00 mm:

The limit width for each finger is 1.00 mm. The total of values set for two fingers is 2.00 mm.

4. Tolerance [pulse] /TOLE

A tolerance range of the positioning completion is set for the target position when the movement of the gripper axis is complete. This parameter is set to a value unique to each axis when initialized.

When the gripper axis enters an area specified by the tolerance, this is determined as positioning complete. So, when PTP operation commands are instructed continuously on the program, the positioning completion time can be shortened as this value is made larger.

The set value of the selected axis is indicated on the 3rd line of the RPB display after its unit has been converted.

CAUTION

- **This parameter is very important since it determines the axis behavior near the target position. So, it is absolutely necessary to set an accurate value.**
- **I f the tolerance range was reduced to a drastically small value, then the time needed for robot positioning might vary.**
- **The maximum tolerance value is determined by the motor.**

NOTE

The set value of the data related to the distance, such as point data, constant movement distance, or limit width parameter is the total of values set for two fingers.

As the electric gripper is operated, two fingers function at the same time. The value of the point data, constant movement distance, or limit width parameter set for one finger is 1/2 of its set value.

Example) When the limit width is set at 2.00 mm:
The limit width for each finger is 1.00 mm. The total of values set for two fingers is 2.00 mm.

5. Origin shift [pulse] /SHIFT

The position after completion of the return-to-origin shifts only a value specified by this parameter. When the parameters are initialized, "0" is set for this parameter.

Regardless of the origin shift set value, the current position at completion of the return-to-origin is "0" [pulse].

NOTE

- This parameter is set to correct the deviation amount if the work position deviates for some reason.
- Note that the origin shift parameter setting procedures for the gripper axis are different from those for an axis other than the gripper axis.
- The set value of the data related to the distance, such as point data, constant movement distance, or limit width parameter is the total of values set for two fingers. As the electric gripper is operated, two fingers function at the same time. The value of the point data, constant movement distance, or limit width parameter set for one finger is 1/2 of its set value.

  Example) When the limit width is set at 2.00 mm:
  The limit width for each finger is 1.00 mm. The total of values set for two fingers is 2.00 mm.

CAUTION

- **This parameter is very important since it determines the robot position. So, it is absolutely necessary to set an accurate value. Additionally, change this parameter value only when required.**
- **If this parameter is changed, the gripper enters the return-to-origin incomplete status.**
- **This parameter is valid after the return-to-origin has been complete.**
- **Do not set a value larger than the software limit for the origin shift parameter.**
- **If the origin shift is changed, change also the software limits according to the shift amount.**

  Example) When A pulse is set for the origin shift parameter assuming that + software limit is B pulse and - software limit is C pulse, change each software limit as follows.

  + software limit (B - A) pulse

  - software limit (C - A) pulse

6. Origin method /ORGSNS

This parameter sets a method used for the return-to-origin of the gripper axis.

SENSOR (Sensor method) ...."Stroke end + Z-phase signal detection" method is used for the gripper axis (Default value)

TORQUE (Torque method) ..Origin detection method by mechanical stroke end

MARK (Mark method) .....Torque method is set.

NOTE

When this parameter is set to the "Stroke end + Z-phase signal detection" method, the gripper axis moves backward until the Z-phase signal is detected after the stroke end has been detected.

7. Origin direction /ORGDIR

This parameter sets a direction in which the gripper axis performs the return-to-origin.

"- - -" .... Guide block open direction becomes the return-to-origin direction.
In the manual movement, the guide block open direction is - (negative) direction.

"+++" .... Guide block close direction becomes the return-to-origin direction.
In the manual movement, the guide block close direction is - (negative) direction.

CAUTION

- **YAMAHA can accept no liability from problems arising due to changing the return-to-origin direction without consulting YAMAHA beforehand.**
- **Return-to-origin will be incomplete if this parameter is changed.**

8. Holding speed [%] (for Gripper) /HLDVEL

This parameter sets the speed within the effective holding area in the range of 20 to 50% during absolute position (or relative position) holding movement or holding movement of the gripper axis. (See the figure explaining "Holding speed", "Constant movement distance", and "Limit width" parameters on the following page.)

CAUTION

If a value larger than the maximum speed is set for this parameter, the holding speed equals the maximum speed.

NOTE

For the RCX240 with a software version of earlier than Ver.10.18, the setting range is 1 to 100%.

9. Origin speed [%] (for Gripper) /GORGVL

This parameter sets the return-to-origin speed in the range of 20 to 50%.

NOTE

For the RCX240 with a software version of earlier than Ver.10.18, the setting range is 1 to 50%.

10. Manual holding power [%] (for Gripper) /GMHLPW

This parameter sets the holding power during manual movement in the range of 30 to 100%.

NOTE

- This parameter is valid only when a software version shown below is installed.
  RCX240 Ver.10.19 or later
- For details about holding operation during manual movement, see the "Manual Holding of Gripper" parameter of other parameters.

11. Const. move dist. [mm] (for Gripper) /CMVDST

This parameter sets the constant movement distance during absolute position (or relative position) holding movement or holding movement of the gripper axis. The gripper moves from a position where is the constant movement distance back from the target position (holding position) at the speed specified by the "Holding speed [%] (for Gripper)" parameter. (See the figure explaining "Holding speed", "Constant movement distance", and "Limit width" parameters on the following page.)

NOTE

The set value of the data related to the distance, such as point data, constant movement distance, or limit width parameter is the total of values set for two fingers. As the electric gripper is operated, two fingers function at the same time. The value of the point data, constant movement distance, or limit width parameter set for one finger is 1/2 of its set value.

Example) When the limit width is set at 2.00 mm:
The limit width for each finger is 1.00 mm. The total of values set for two fingers is 2.00 mm.

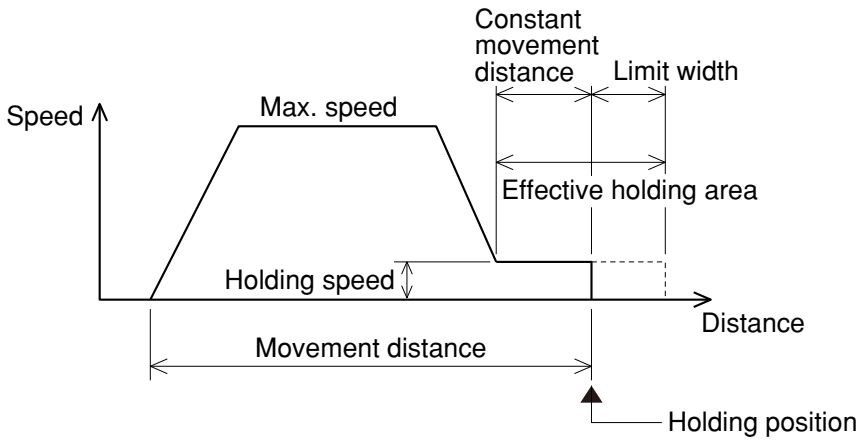
12. Limit width [mm] (for Gripper) /LMTWDH

This parameter sets the limit width during absolute position (or relative position) holding movement or constant speed movement of the holding operation of the gripper axis.
The gripper moves only the limit width at the speed specified by the "Holding speed [%] (for Gripper)" parameter after it has exceeded the target position (holding position). (See the figure explaining "Holding speed", "Constant movement distance", and "Limit width" parameters on the following page.)

NOTE

- If the gripper axis exceeds the effective holding area, it stops at a position of "movement amount + limit width". At this time, the HOLD signal is OFF and the INPOS signal is ON. When the gripper axis stops within the effective holding area, the ZON signal is also ON.
- The set value of the data related to the distance, such as point data, constant movement distance, or limit width parameter is the total of values set for two fingers. As the electric gripper is operated, two fingers function at the same time. The value of the point data, constant movement distance, or limit width parameter set for one finger is 1/2 of its set value.
  Example) When the limit width is set at 2.00 mm:
  The limit width for each finger is 1.00 mm. The total of values set for two fingers is 2.00 mm.

"Holding speed", "Constant movement distance", and "Limit width" parameters



6.3 Other parameter details

1. Gripper servo when E.stop /GEMGMD

This parameter sets the servo status of the gripper axis when the emergency stop button is pressed.

ON..... The servo of the gripper axis does not turn off when the emergency stop button is pressed.
Since the servo does not turn off even when the emergency stop button is pressed, the gripper continues to hold the workpiece.

OFF..... The servo of the gripper axis turns off when the emergency stop button is pressed.

2. Include Gripper in Origin /GORGMD

This parameter sets whether or not the gripper axis is included in the overall robot return-to-origin operation.

NO..... The gripper axis is not included in the return-to-origin that is started by pressing the [F3] (ORIGIN) key in the "MANUAL" mode.

YES ..... The gripper axis is included in the return-to-origin that is started by pressing the [F3] (ORIGIN) key in the "MANUAL" mode.

NOTE

- If there are no axes with the incremental specifications other than the gripper axis when this parameter is set at "NO", the (F3) (ORIGIN) key menu is not indicated in the "MANUAL" mode. At this time, press the (F14) (G ORIGIN) key in the "MANUAL" mode to perform the return-to-origin of the gripper axis.
- This parameter setting is valid even when the return-to-origin (*) is started from a command other than the RPB as described below.
  - * • Return-to-origin by DI14 or DI17
    - Return-to-origin by online command (@ORIGIN, @ORGRTN, or @ORGRTN2)
    - Return-to-origin by robot language (ORIGIN)
    - Return-to-origin by return-to-origin command of IO commands
    - Return-to-origin by return-to-origin command of remote commands

3. Manual Holding of Gripper /GMHLMD

This parameter sets whether or not a workpiece is held during manual movement.

INVALID.. The holding operation is invalid during manual movement.
If the gripper holds a workpiece during manual movement, "26.1: Gripper Over load" occurs and the gripper cannot hold a workpiece.

VALID .... The holding operation is valid during manual movement.
The gripper can hold a workpiece during manual movement.

CAUTION

When this parameter is set to "VALID", the operation mode of the manual movement changes to the holding movement. So, the movement distance during inching operation does not interlock with the manual movement speed (%).
The inching operation with the holding operation set at "INVALID" is the same as the axes other than the electric gripper.
When this parameter is set to "INVALID", the movement distance during inching operation interlocks with the manual movement speed.
For details, see "5.2 Manual movement".

NOTE

- This parameter is valid only when a software version shown below is installed.
  RCX240 Ver.10.19 or later
- The holding power during manual movement can be set using the axis parameter, "Manual holding power (%) (for Gripper)".

4. G1 status output (DO & SO) /G1STAT

5. G2 status output (DO & SO) /G2STAT

These parameters set whether or not the eclectic gripper dedicated signals (status signals) are output to general-purpose DO/SO.
The set values are as follows.

Setting	Meaning
Off (Default value)	The electric gripper status is not output.
2 to 7, 10 to 15	The electric gripper status is output to the DO and SO of the specified port. For example, when "10" is specified, the electric gripper status information is output to DO10() and SO10(). The bit assignments are shown in the table below.

The electric gripper status information is output to a specified port as described in the table below.
For details about each status, see "5.5 Status monitor".

Bit	Signal name	Value	
		0	1
7	Servo status	OFF	ON
6	Return-to-origin status	Incomplete	Complete
5	Emergency stop status	Emergency stop	Cancel
4	READY signal	Preparing	Correct
3	ZON signal	Beyond area	Within area
2	HOLD signal	Release	Holding
1	INPOS signal	Beyond area	Within area
0	BUSY signal	Complete	Running

NOTE

- This parameter is valid only when a software version shown below is installed.
  RCX240 Ver.10.18 or later
- When the same port as the area check output port is specified, a logical OR of the area check information and status information is output.
- When the same port as the error output port is specified, a logical OR of the error and status information is output.
- When the same port as the battery alarm output port is specified, a logical OR of the battery alarm and status information is output.
- When a serial board, such as CC-Link is added to the option board, the status information is also output to SO of the same port as DO.
- When the individual axis return-to-origin option by general-purpose DI/SI (SYSTEM>OPTION>DI.ORG) is used and the same port as the return-to-origin completion output "Done output port (DO & SO)" is specified, the logical OR of the return-to-origin completion output and this status output is output.
  For details, see the user's manual for YAMAHA robot controller RCX240.

7. Gripper point data creation

This section explains how to create positioning point data of the gripper. Since the gripper is controlled as an auxiliary axis of the robot, the point data for the auxiliary axis is set.
For details about how to display or edit the point data, see the user's manual for the robot controller you are using.

NOTE

The set value of the data related to the distance, such as point data, constant movement distance, or limit width parameter is the total of values set for two fingers. As the electric gripper is operated, two fingers function at the same time. The value of the point data, constant movement distance, or limit width parameter set for one finger is 1/2 of its set value.

Example) When the gripper current position is 0.00 mm and the gripper axis moves to the 10.00mm-position using the absolute position movement:
Each finger moves 5.00 mm and the total movement of both fingers is 10.00 mm.

7.1 Point data input and editing

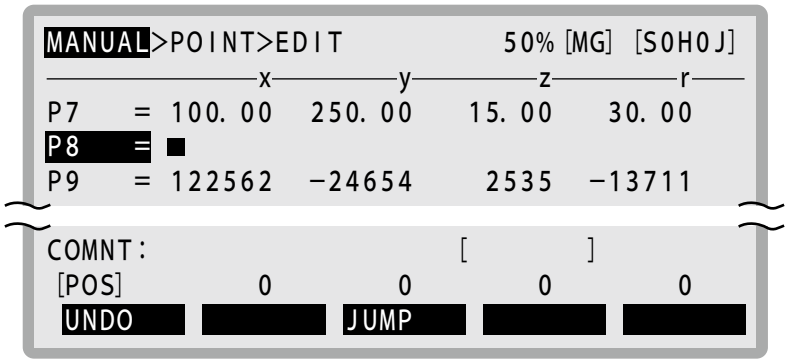
Step1 ***Select the "MANUAL>POINT" mode.***

Step2 ***Use the cursor key (▲/▼) to select a point you want to input or edit.***

Step3 ***Press the F1 (EDIT) key.***

The cursor is indicated at the left end of the data on the point line you have selected.

Editing point data



Step 4 *Enter point data of the axis set as gripper.*

The data, x, y, z, r, a, and b is separated by a space. The data input format is as follows.

- To enter data in units of pulses, enter up to 8-digit integer.
  (When the number of display digits is set to "8" in the "SYSTEM>PARAM" mode, 8-digit data is indicated on the screen.)
- To enter data in units of millimeters, enter a numeric value consisting of 5-digit or less integer and 2-digit or less decimal.
  (When the number of display digits is set to "8" in the "SYSTEM>PARAM" mode, 8-digit data is indicated on the screen.)

NOTE

- "0" (zero) is automatically entered for an axis without data input.
- The error message "Digit number error" appears when the data format is wrong. Enter it in the correct format.

Step 5 *Set the data you have entered.*

Press the ENTER*, cursor up/down key (▲/▼), or page up/down key (⏫/⏬) to set the point data you have entered.*

Press ESC *if you want to cancel the point data input.*

7.2 Point data input by teaching

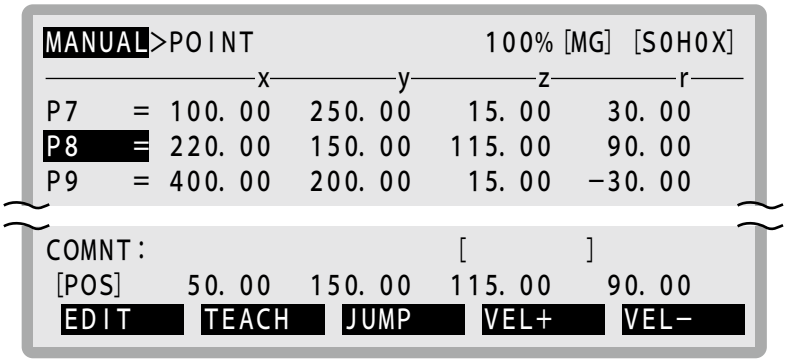
You can take the current gripper position to the point data in the "MANUAL>POINT" mode.

NOTE

Point data teaching cannot be performed when return-to-origin is incomplete. Perform point teaching after performing return-to-origin.

Step 1 *Move the cursor to a point number you want to input data.*

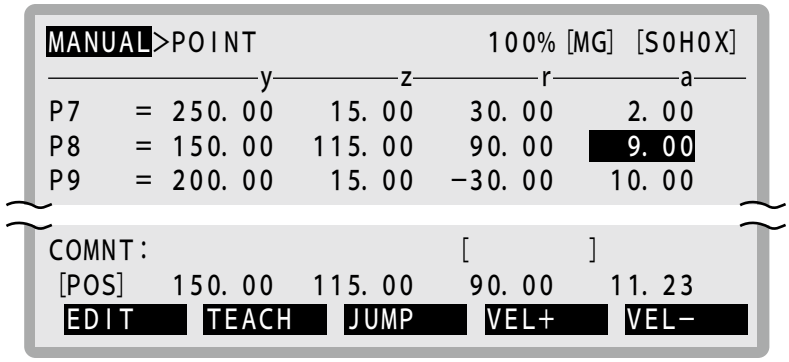
Point data teaching (1)



Step 2 *Select a point for the gripper axis.*

Use the cursor key (▲/▼), or the F14 (AXIS ←) or F15 (AXIS →) key to make the selection so that the point value of the auxiliary axis, to which the gripper axis is assigned, is highlighted. Note that you can specify only a point number when no point data is set.

Point data teaching (2)



Step 3 *Use the JOG key to move the gripper axis.*

The current position "(POS)" on the 14th line of the screen changes as the gripper moves.

Step4 *Press the F2 (TEACH) key when the gripper reaches the target point.*

The current gripper position is taught to the specified point.

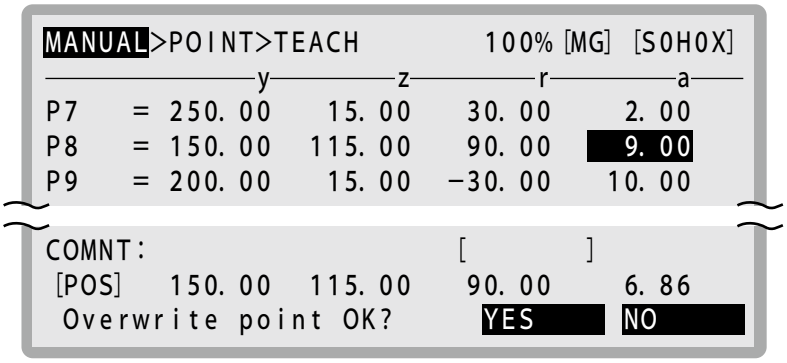
In the teaching by axis, it is necessary to select the same coordinate system as that of the teaching point. So, when the point data is in units of millimeters, the current position must also be in units of millimeters.

If the point data already exists at the specified point, the message, "Overwrite point OK?", will appear on the guide line.

Press F4 *(YES) to perform the teaching.*

Press F5 *(NO) if you want to cancel the teaching input.*

Point data teaching (3)



After teaching, the point data number designation automatically moves to the next line.

7.3 Point data input by direct teaching

As the robot servo is turned off, the point data of a position where you have moved the gripper manually can be taken.

WARNING

- **TO PERFORM THE DIRECT TEACHING IN THE EMERGENCY STOP STATUS, IT IS NECESSARY TO SET THE "GRIPPER SERVO WHEN E.STOP" PARAMETER TO "OFF". (FOR DETAILS, SEE "6.3 OTHER PARAMETER DETAILS".)**
- **BEFORE STARTING THE DIRECT TEACHING, ALWAYS PUT THE EMERGENCY STOP BUTTON IN THE PRESSED STATUS.**

Step1 Put in the emergency stop status.

Press the emergency stop button on the RPB.

Step2 Perform the point teaching in the "MANUAL>POINT" mode.

For details about teaching, see "7.2 Point data input by teaching".
At this time, however, since the JOG key cannot be used, move the gripper manually.

7.4 Point data trace

You can check the point data position you have entered by moving the gripper actually.
Before starting the point data trace, press the F11 (TRACE) key in the "MANUAL>POINT" mode to change to the "AUTO>POINT>TRACE" mode.
After that, use the point trace function to check the point data position.
For details, see the user's manual for the robot controller you are using.

NOTE

- When pressing the F11 (MODIFY) key in the "AUTO>POINT" mode, the mode is returned to the mode hierarchy before trace, "MANUAL>POINT" mode.
- When the "MANUAL>POINT" mode is changed to the "AUTO>POINT" mode, pressing the ESC key will return to the "MANUAL>POINT" mode.

MEMO

8. Robot language commands

This section explains the dedicated robot language commands used for YAMAHA electric gripper. Refer to the YAMAHA Robot Controller RCX Series Programming Manual for robot language information beyond basic items such as the robot language command statement format, variables, and constants. Always refer to the above programming manual when performing programming operations.

8.1 Robot language command list

Language command name	Function / Format
GDRIVE	Moves to an absolute position.
	GDRIVE (<Gripper number>, <Position> | <Point expression>) [, (<Gripper number>, <Position> | <Point expression>)] [, Option]
GDRIVEI	Moves to a relative position.
	GDRIVEI (<Gripper number>, <Movement amount> | <Point expression>) [, (<Gripper number>, <Movement amount> | <Point expression>)] [, Option]
GHOLD	Moves to an absolute position with holding of a workpiece.
	GHOLD (<Gripper number>, <Position> | <Point expression>) [, (<Gripper number>, <Position> | <Point expression>)] [, Option]
GHOLDI	Moves to a relative position with holding of a workpiece
	GHOLDI (<Gripper number>, <Movement amount> | <Point expression>) [, (<Gripper number>, <Movement amount> | <Point expression>)] [, Option]
GOPEN	Moves at a constant speed with holding of a workpiece. (Open)
	GOPEN (<Gripper number>) [, (<Gripper number>)] [, Option]
GCLOSE	Moves at a constant speed with holding of a workpiece. (Close)
	GCLOSE (<Gripper number>) [, (<Gripper number>)] [, Option]
GORIGIN	Returns the gripper axis to its origin.
	GORIGIN [(<Gripper number>)]
GSTATUS	Obtains the status.
	GSTATUS (<Gripper number>)
ORIGIN	Returns to the origin.
	ORIGIN
WHERE	Obtains the current position of the main group (Joint coordinates).
	WHERE
WHERE2	Obtains the current position of the sub group (Joint coordinates).
	WHERE2
WHRXY	Obtains the current position of the main group (Cartesian coordinates).
	WHRXY
WHRXY2	Obtains the current position of the sub group (Cartesian coordinates).
	WHRXY2

NOTE

The gripper number is a serial number starting with "1". If multiple grippers are used, a board with a smaller option slot number set on the gripper control board is "1" and a board with a larger option slot number is "2".

Example: When two gripper control boards are used:

Option slot	Board setting	Gripper number
OP.1	–	–
OP.2	Gripper control board	1
OP.3	–	–
OP.4	Gripper control board	2

8.2 Robot language command details

This section explains each robot language command.

8.2.1 Dedicated commands for gripper axis

GDRIVE

GDRIVE (<Gripper number>, <Position> | <Point expression>) [, (<Gripper number>, <Position> | <Point expression>)] [, Option]

<Gripper number> Range: 1 to 2

Function

This command moves the electric gripper axis to an absolute position.

Explanation

After the operations of all gripper axes specified by <Gripper number> have been complete, the specified gripper axis starts moving. When the gripper axis reaches the target position, the command is terminated. The axis can also be specified by the variable.
When multiple axes are specified, these axes do not reach their target positions at the same time.

Example:

GDRIVE (1, P10)..... Gripper 1 moves from the current position to a position specified by P10.

Point data setting

- **Direct coordinate data input**

Directly specify coordinate data in <Position>.
When the coordinate data is an integer, the movement units are viewed as "pulses". When the coordinate data is a real number containing a decimal point, the units are viewed as "mm". According to these units, the gripper axis will move. When the units are viewed as "mm", the gripper axis moves to the position converted for each axis relative to the 0-pulse position.

Example:

GDRIVE (1, 500)..... Gripper 1 moves from the current position to the 500-pulse position.

GDRIVE (2, 10.0)..... Gripper 2 moves from the current position to the 10.0mm-position.

- **Point definition**

Specify a movement position in <Point expression>. Axis number data, to which the gripper specified by <Gripper number> is assigned, is used.
The gripper moves to the position determined by the units used for the point expression. When the units are viewed as "mm", the gripper axis moves to the position converted for each axis relative to the 0-pulse position.

Example:

GDRIVE (1, P10)..... Gripper 1 moves from the current position to the position specified by P10.

NOTE

The coordinate data specified as movement destination is the total of values set for two fingers.
As the electric gripper is operated, two fingers function at the same time. The coordinate value of the point data set for one finger is 1/2 of its set value.

Example) When the gripper current position is 0.00 mm and the gripper axis moves to the 10.00mm-position using the absolute position movement:
Each finger moves 5.00 mm and the total movement of both fingers is 10.00 mm.

Option types

- **Speed setting**

SPEED S	= <Speed>

Range: 1 to 100 (Unit: %)

Specify a program movement speed in <Speed>. If not specified, the program movement speed uses the current set value. (Default value: 100%. The program movement speed can be set in the range of 1 to 100% by the SPEED statement/SPEED2 statement.)
The movement speed is determined by multiplying the auto movement speed by the program movement speed. This value is limited to 20 to 100%. If the value is less than 20%, it is then set to 20%.
This option is enabled only for the specified GDRIVE statement.
Example:

GDRIVE (1, 5.0), S=30 .....Gripper 1 moves from the current position to the 5.0mm-position with the program speed set at 30%.

GDRIVEI

GDRIVEI (<Gripper number>, <Movement amount>
<Point expression>) [, (<Gripper number>, <Movement amount>
<Point expression>)] [, Option]

<Gripper number> Range: 1 to 2

Function

This command moves the electric gripper axis to a relative position.

Explanation

After the operations of all gripper axes specified by <Gripper number> have been complete, the specified gripper axis starts moving. When the gripper axis reaches the specified movement amount, the command is terminated. The axis can also be specified by the variable. When multiple axes are specified, these axes do not reach their target positions at the same time.
Example:

GDRIVEI (1, P10)..... Gripper 1 moves the movement amount specified by P10 from the current position.

Point data setting

- **Direct coordinate data input**

  Directly specify coordinate data in <Movement amount>.
  When the coordinate data is an integer, the movement units are viewed as "pulses". When the coordinate data is a real number containing a decimal point, the units are viewed as "mm". According to these units, the gripper axis will move. When the units are viewed as "mm", the gripper axis moves the movement amount converted for each axis relative to the 0-pulse position.
  Example:

  GDRIVEI (1, 500)..... Gripper 1 moves from the current position to the +500-pulse position.
  GDRIVEI (2, 10.0)..... Gripper 2 moves from the current position to the +10.0mm-position.

- **Point definition**

  Specify a movement amount in <Point expression>. Axis number data, to which the gripper specified by <Gripper number> is assigned, is used.
  The gripper moves the movement amount by the units used for the point expression. When the units are viewed as "mm", the gripper axis moves the movement amount converted for each axis relative to the 0-pulse position.
  Example:

  GDRIVEI (1, P10)..... Gripper 1 moves the movement amount specified by P10 from the current position.

NOTE

The coordinate data specified as movement destination is the total of values set for two fingers.
As the electric gripper is operated, two fingers function at the same time. The coordinate value of the point data set for one finger is 1/2 of its set value.
Example) When the gripper axis moves to the +10.00mm-position from the current position using the relative position movement:
"+ 5.00 mm" is specified for each finger and the total movement of both fingers is "+ 10.00 mm".

Option types

- **Speed setting**

SPEED S	= <Speed>

Range: 1 to 100 (Unit: %)

Specify a program movement speed in <Speed>. If not specified, the program movement speed uses the current set value. (Default value: 100%. The program movement speed can be set in the range of 1 to 100% by the SPEED statement/SPEED2 statement.)
The movement speed is determined by multiplying the auto movement speed by the program movement speed. This value is limited to 20 to 100%. If the value is less than 20%, it is then set to 20%.
This option is enabled only for the specified GDRIVEI statement.
Example:

GDRIVEI (1, 5.0), S=30 ....Gripper 1 moves from the current position to the +5.0mm-position with the program speed set at 30%.

GHOLD

GHOLD (<Gripper number>, <Position> | <Point expression>) [, (<Gripper number>, <Position> | <Point expression>)] [, Option]

<Gripper number> Range: 1 to 2

Function

This command moves the gripper axis to a position close to the specified position at a trapezoidal acceleration/deceleration and moves it at a holding speed specified by the parameter immediately before holding. In this motion, the holding power can be specified by the command option <Power>.

Explanation

After the operations of all gripper axes specified by <Gripper number> have been complete, the specified gripper starts moving. When it is judged that the gripper reaches the target position or holds a workpiece, the command is terminated. The operation completion conditions can be checked using GSTATUS.

Example:

GHOLD (1, P10)..... Gripper 1 moves from the current position to a position specified by P10.

Point data setting

- **Direct coordinate data input**

Directly specify coordinate data in <Position>.

When the coordinate data is an integer, the movement units are viewed as "pulses". When the coordinate data is a real number containing a decimal point, the units are viewed as "mm". According to these units, the gripper axis will move. When the units are viewed as "mm", the gripper axis moves to the position converted for each axis relative to the 0-pulse position.

Example:

GHOLD (1, 500)..... Gripper 1 moves from the current position to the 500-pulse position.

GHOLD (2, 10.0)..... Gripper 2 moves from the current position to the 10.0mm-position.

- **Point definition**

Specify a movement position in <Point expression>. Axis number data, to which the gripper specified by <Gripper number> is assigned, is used.

The gripper moves to the position determined by the units used for the point expression. When the units are viewed as "mm", the gripper axis moves to the position converted for each axis relative to the 0-pulse position.

Example:

GHOLD (1, P10)..... Gripper 1 moves from the current position to the position specified by P10.

NOTE

- Set a workpiece holding position (target position) so that it does not exceed the value that the limit width is subtracted from the software limit.
- The coordinate data specified as movement destination is the total of values set for two fingers.
  As the electric gripper is operated, two fingers function at the same time. The coordinate value of the point data set for one finger is 1/2 of its set value.
  Example) When the gripper current position is 0.00 mm and the gripper axis moves to the 10.00mm-position using the absolute position movement: Each finger moves 5.00 mm and the total movement of both fingers is 10.00 mm.

Option types

- **Speed setting**

SPEED S	= <Speed>

Range: 1 to 100 (Unit: %)

Specify a program movement speed in <Speed>. If not specified, the program movement speed uses the current set value. (Default value: 100%. The program movement speed can be set in the range of 1 to 100% by the SPEED statement/SPEED2 statement.)
The movement speed is determined by multiplying the auto movement speed by the program movement speed. This value is limited to 20 to 100%. If the value is less than 20%, it is then set to 20%.
This option is enabled only for the specified GHOLD statement.
Example:

GHOLD (1, 5.0), S=30 .....Gripper 1 moves from the current position to the 5.0mm-position with the program speed set at 30%.

- **Power setting**

T = <Power>

Range: 30 to 100 (Unit: %)

Specify a workpiece holding force in <Power>. If not specified, the power becomes 100%.
If a value less than 30% is set in the RCX240 with a software version of Ver. 10.18 or later, the power is then set to 30%.
This option is enabled only for the specified GHOLD statement.
Example:

GHOLD (1, 5.0), T=40 .....Gripper 1 moves from the current position to the 5.0mm-position. The holding power is 40%.

Example:

-software limit = 0.00 mm
+software limit = 14.3 mm
Limit width = 0.4 mm

When the parameters are set as shown above:

GHOLD(1, 0.0) ....."27.32: Gripper Soft limit over" occurs and the operation cannot be performed.

GHOLD(1, 14.3) ....."27.32: Gripper Soft limit over" occurs and the operation cannot be performed

GHOLD(1, 0.4) .....If the gripper does not hold a workpiece, it stops at the 0.0mm-position.

GHOLD(1, 13.9) .....If the gripper does not hold a workpiece, it stops at the 14.3mm-position.

CAUTION

Set an appropriate workpiece holding force (%) for the gripper movement command so that any excessive impact or moment is not applied to the finger during operation. If applied, this may cause damage to the product or service life to be shortened.

GHOLDI

GDRIVEI (<Gripper number>, <Movement amount> | <Point expression>) [, (<Gripper number>, <Movement amount> | <Point expression>)] [, Option]

<Gripper number> Range: 1 to 2

Function

This command moves the gripper axis to a position close to the specified movement amount at a trapezoidal acceleration/deceleration and moves it at a holding speed specified by the parameter immediately before holding. In this motion, the holding power can be specified by the command option <Power>.

Explanation

After the operations of all gripper axes specified by <Gripper number> have been complete, the specified gripper axis starts moving. When it is judged that the gripper reaches the specified movement amount or holds a workpiece, the command is terminated.
The operation completion conditions can be checked using GSTATUS.

Example:

GHOLDI (1, P10)..... Gripper 1 moves the movement amount specified by P10 from the current position.

Point data setting

- **Direct coordinate data input**

  Directly specify coordinate data in <Movement amount>.
  When the coordinate data is an integer, the movement units are viewed as "pulses". When the coordinate data is a real number containing a decimal point, the units are viewed as "mm". According to these units, the gripper axis will move. When the units are viewed as "mm", the gripper axis moves the movement amount converted for each axis relative to the 0-pulse position.

  Example:

  GHOLDI (1, 500)..... Gripper 1 moves from the current position to the +500-pulse position.
  GHOLDI (2, 10.0)..... Gripper 2 moves from the current position to the +10.0mm-position.

- **Point definition**

  Specify a movement amount in <Point expression>. Axis number data, to which the gripper specified by <Gripper number> is assigned, is used.
  The gripper moves the movement amount by the units used for the point expression. When the units are viewed as "mm", the gripper axis moves the movement amount converted for each axis relative to the 0-pulse position.

  Example:

  GHOLDI (1, P10)..... Gripper 1 moves the movement amount specified by P10 from the current position.

NOTE

- Set a workpiece holding position (target position) so that it does not exceed the value that the limit width is subtracted from the software limit.
- The coordinate data specified as movement destination is the total of values set for two fingers.
  As the electric gripper is operated, two fingers function at the same time. The coordinate value of the point data set for one finger is 1/2 of its set value.
  Example) When the gripper axis moves to the +10.00mm-position from the current position using the relative position movement:
  "+ 5.00 mm" is specified for each finger and the total movement of both fingers is "+ 10.00 mm".

Option types

- **Speed setting**

SPEED S	= <Speed>

Range: 1 to 100 (Unit: %)

Specify a program movement speed in <Speed>. If not specified, the program movement speed uses the current set value. (Default value: 100%. The program movement speed can be set in the range of 1 to 100% by the SPEED statement/SPEED2 statement.)
The movement speed is determined by multiplying the auto movement speed by the program movement speed. This value is limited to 20 to 100%. If the value is less than 20%, it is then set to 20%.
This option is enabled only for the specified GHOLDI statement.

Example:

GHOLDI (1, 5.0), S=30 ....Gripper 1 moves from the current position to the 5.0mm-position with the program speed set at 30%.

- **Power setting**

T = <Power>

Range: 30 to 100 (Unit: %)

Specify a workpiece holding force in <Power>. If not specified, the power becomes 100%. If a value less than 30% is set in the RCX240 with a software version of Ver. 10.18 or later, the power is then set to 30%.
This option is enabled only for the specified GHOLDI statement.

Example:

GHOLDI (1, 5.0), T=40 ....Gripper 1 moves from the current position to the 5.0mm-position. The holding power is 40%.

Example:

-software limit = 0.00 mm
+software limit = 14.3 mm
Limit width = 0.4 mm

When the parameters are set as shown above and the gripper current position is "0.00 mm":

GHOLDI (1, 14.3) ....." 27.32: Gripper Soft limit over" occurs and the operation cannot be performed.

GHOLDI (1, 13.9) .....If the gripper does not hold a workpiece, it stops at the 14.3mm-position.

CAUTION

Set an appropriate workpiece holding force (%) for the gripper movement command so that any excessive impact or moment is not applied to the finger during operation. If applied, this may cause damage to the product or service life to be shortened.

GOPEN

GOPEN (<Gripper number>) [, (<Gripper number>)] [, Option]

<Gripper number> Range: 1 to 2

Function

This command moves the gripper axis to the stroke end at a constant speed in the open direction. In this motion, the holding power is specified by the command option <Power>.

Explanation

After the operations of all gripper axes specified by <Gripper number> have been complete, the specified gripper axis starts moving. When it is judged that the gripper reaches the target position or holds a workpiece, the command is terminated.
The operation completion conditions can be checked using GSTATUS.

Example:

GOPEN (1) ..... Gripper 1 moves from the current position in the open direction.

Option types

- **Speed setting**

SPEED S	= <Speed>

Range: 1 to 100 (Unit: %)

Specify a program movement speed in <Speed>. If not specified, the program movement speed uses the current set value. (Default value: 100%. The program movement speed can be set in the range of 1 to 100% by the SPEED statement/SPEED2 statement.)
The movement speed is determined by multiplying the auto movement speed by the program movement speed.
This value is limited as follows.

RCX240

Software version, earlier than Ver.10.18: The multiplication value is limited to 20 to 100%. (If the value is less than 20%, it is set to 20%.)

Software version, Ver.10.18 or later: The multiplication value is limited to 20 to 50%. (If the value is less than 20%, it is set to 20%. If the value is 50% or more, it is set to 50%.)

This option is valid only for the specified GOPEN statement.

Example:

GOPEN (1), S=30 ..... Gripper 1 moves from the current position in the open direction with the program speed set at 30%.

- **Power setting**

T = <Power>

Range: 30 to 100 (Unit: %)

Specify a workpiece holding force in <Power>. If not specified, the power becomes 100%.
If a value less than 30% is set in the RCX240 with a software version of Ver. 10.18 or later, the power is then set to 30%.
This option is enabled only for the specified GOPEN statement.

Example:

GOPEN (1), T=40..... Gripper 1 moves from the current position in the open direction. The holding power is 40%.

CAUTION

Set an appropriate workpiece holding force (%) for the gripper movement command so that any excessive impact or moment is not applied to the finger during operation. If applied, this may cause damage to the product or service life to be shortened.

GCLOSE

GCLOSE (<Gripper number>) [, (<Gripper number>)] [, Option]

<Gripper number> Range: 1 to 2

Function

This command moves the gripper axis to the stroke end at a constant speed in the close direction. In this motion, the holding power is specified by the command option <Power>.

Explanation

After the operations of all gripper axes specified by <Gripper number> have been complete, the specified gripper axis starts moving. When it is judged that the gripper reaches the target position or holds a workpiece, the command is terminated.
The operation completion conditions can be checked using GSTATUS.
Example:

GCLOSE (1)..... Gripper 1 moves from the current position in the close direction.

Option types

- **Speed setting**

SPEED S	= <Speed>

Range: 1 to 100 (Unit: %)

Specify a program movement speed in <Speed>. If not specified, the program movement speed uses the current set value. (Default value: 100%. The program movement speed can be set in the range of 1 to 100% by the SPEED statement/SPEED2 statement.)
The movement speed is determined by multiplying the auto movement speed by the program movement speed.
This value is limited as follows.

RCX240

Software version, earlier than Ver.10.18: The multiplication value is limited to 20 to 100%. (If the value is less than 20%, it is set to 20%.)

Software version, Ver.10.18 or later: The multiplication value is limited to 20 to 50%. (If the value is less than 20%, it is set to 20%. If the value is 50% or more, it is set to 50%.)

This option is valid only for the specified GCLOSE statement.
Example:

GCLOSE (1), S=30 .... Gripper 1 moves from the current position in the close direction with the program speed set at 30%.

- **Power setting**

```
T = <Power>
```

Range: 30 to 100 (Unit: %)

Specify a workpiece holding force in <Power>. If not specified, the power becomes 100%. If a value less than 30% is set in the RCX240 with a software version of Ver. 10.18 or later, the power is then set to 30%.
This option is enabled only for the specified GCLOSE statement.
Example:

GCLOSE (1), T=40 ..... Gripper 1 moves from the current position in the close direction. The holding power is 40%.

CAUTION

Set an appropriate workpiece holding force (%) for the gripper movement command so that any excessive impact or moment is not applied to the finger during operation. If applied, this may cause damage to the product or service life to be shortened.

GORIGIN

```
GORIGIN [(<Gripper number>)]
```

<Gripper number> Range: 1 to 2

Function

This command executes the return-to-origin of the gripper with the specified number or all grippers (all grippers in the main and sub groups). If the command execution is stopped halfway, the return-to-origin is incomplete.
If <Gripper number> is not specified, the return-to-origin of all grippers is executed.
Example:

GORIGIN..... Starts the return-to-origin of all grippers.
GORIGIN (1)..... Starts the return-to-origin of gripper 1

GSTATUS

```
GSTATUS [(<Gripper number>)]
```

<Gripper number> Range: 1 to 2

Function

This command obtains the status information on gripper with the specified number.
The obtained result is a value that each status is assigned to relevant bit. The meaning of each bit is described in the table below. For details about each status, see "5.5 Status monitor".

Meaning	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	Servo status	**Return-to-origin status**	**Emergency stop status**	**READY**	**ZON**	**HOLD**	**INPOS**	**BUSY**
0	Servo OFF	Incomplete	Emergency stop	Preparing	Beyond area	Release	Beyond area	Complete
1	Servo ON	Complete	Cancel	Correct	Within area	Holding	Within area	Running

Example:

● Operation branch after completion of gripper operation

```
GHOLD (1, 10.0) ..... Moves gripper 1 from the current position to the
                      10.0mm-position.
STS% = GSTATUS (1) AND &B110 ..... Obtains the status information on gripper 1.
INP% = STS% AND &B10..... Obtains the status of the INPOS bit.
HLD% = STS% AND &B100 ..... Obtains the status of the HOLD bit.
IF INP% <> 0 THEN ..... Checks the status of the INPOS bit.
    *** Operation completion as the gripper reaches the target position. ***
ELSEIF HLD% <> 0 THEN ..... Checks the status of the HOLD bit.
    *** Operation completion as the gripper holds a workpiece. ***
ENDIF
```

8.2.2 Other commands for gripper axis

ORIGIN

```
ORIGIN
```

Function

This command executes the return-to-origin of the axis with the incremental specifications. The command also executes the absolute search operation for the axis with the semi-absolute specifications. If there is an electric gripper axis, the return-to-origin of the electric gripper can be performed by setting the parameters. If the command execution is stopped halfway, the return-to-origin is incomplete.

When two robots are set, the return-to-origin and absolute search operations of the sub robot group are performed after the return-to-origin and absolute search operations of the main group have been complete.

Example:

ORIGIN ..... Starts the return-to-origin of the axis with the incremental specifications. (For the axis with the semi-absolute specifications, the absolute search operation is performed.)

WHERE/WHERE2

```
WHERE
WHERE2
```

Function

This command reads out the current position of the main/sub group arm in joint coordinates (pulses).

Example:

P10 = WHERE..... Reads the current position of the main group robot and registers it into P10. P10 is defined in joint coordinates (pulses).

P10 = WHERE2..... Reads the current position of the sub group robot and registers it into P10. P10 is defined in joint coordinates (pulses).

WHRXY/WHRXY2

```
WHRXY
WHRXY2
```

Function

This command reads out the current position of the main/sub group arm in Cartesian coordinates (mm or degrees).

Example:

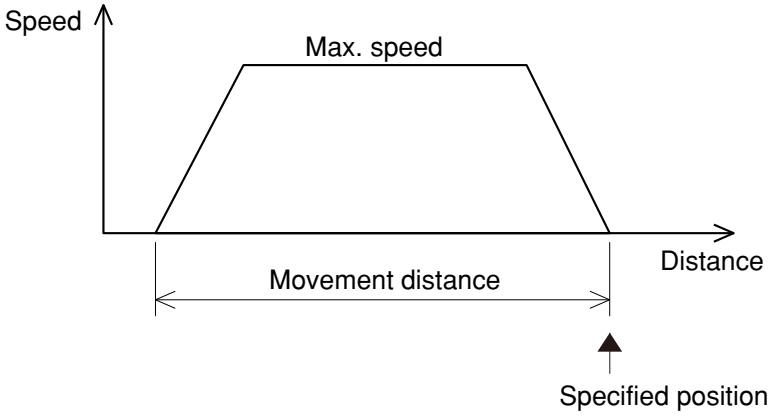
P10 = WHRXY..... Reads the current position of the main group robot and registers it into P10. P10 is defined in Cartesian coordinates (mm, degrees).

P10 = WHRXY2 ..... Reads the current position of the sub group robot and registers it into P10. P10 is defined in Cartesian coordinates (mm, degrees).

8.3 Operation chart of electric gripper

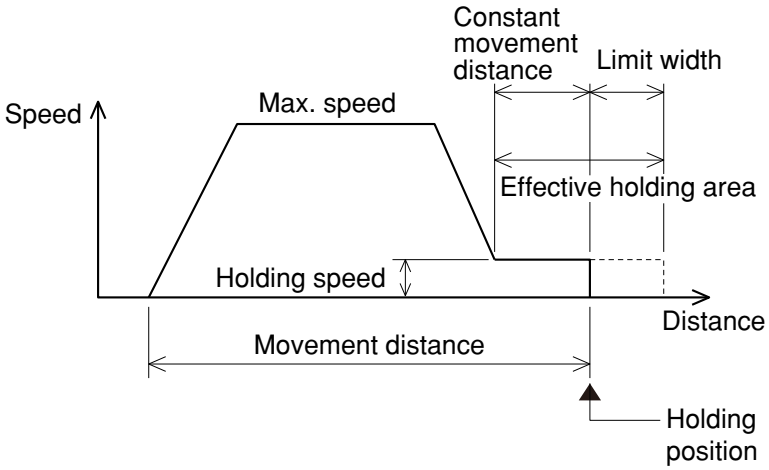
The following shows the operation chart of the movement commands for the electric gripper.

● GDRIVE / GDRIVEI



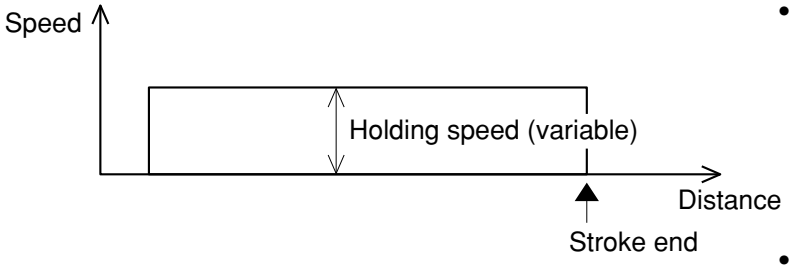
- The gripper moves to the specified position (GDRIVE) or by the specified movement amount (GDRIVEI) using the trapezoidal speed control.
- If the gripper is stopped by an external force during movement to the specified position, relevant alarm occurs.

● GHOLD / GHOLDI



- The gripper moves to a position close to the specified position using the trapezoidal speed control, moves at a constant speed immediately before holding, and holds a workpiece.
- If the gripper holds a workpiece in the area determined by the "limit width" and "constant movement distance" parameters, the HOLD bit and ZON bit turn on.
- If the gripper stops at a position beyond the effective holding area, only the INPOS bit turns on.
- If the gripper holds a workpiece before the effective holding area, only the HOLD bit turns on.

● GOPEN / GCLOSE



- The gripper moves to the stroke end at a constant speed in the open (GOPEN) or close (GCLOSE) direction. When the gripper reaches the stroke end, the INPOS bit turns on.
- If the gripper holds a workpiece during stroke movement, the HOLD bit turns on.

MEMO

9. Troubleshooting

9.1 Error messages

This section explains the gripper error messages. For details about other errors, see the user's manual for the robot controller you are using.

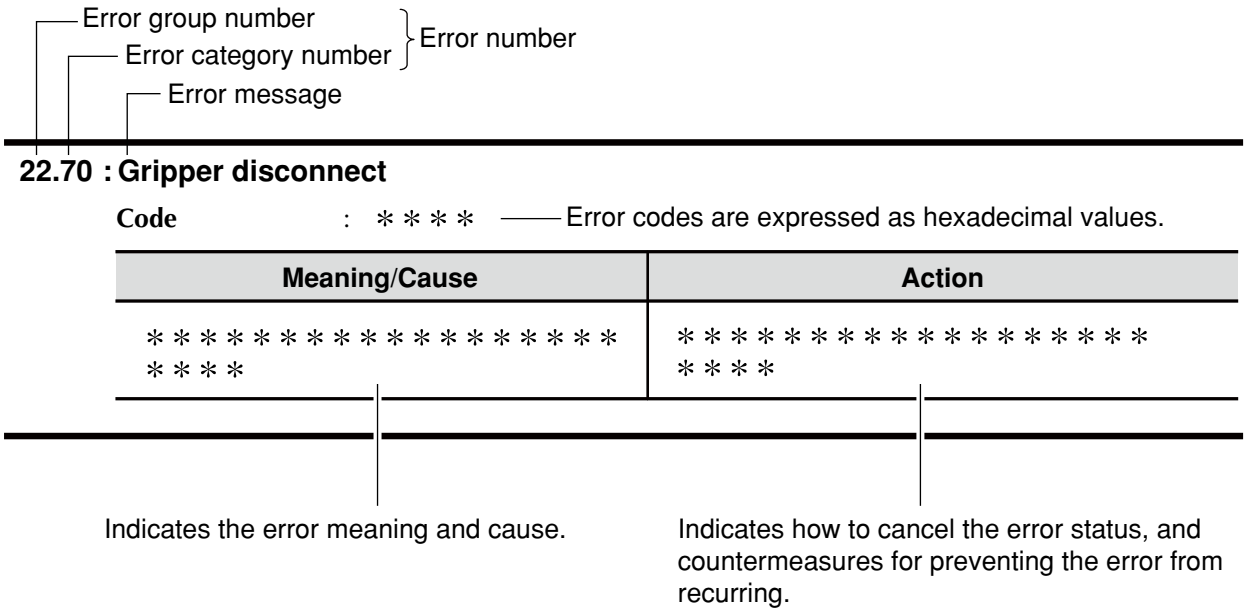
If an error or alarm occurs, relevant error message appears on the message line (2nd line) of the RPB screen. The error messages and their explanations are given below.

NOTE

Please contact your YAMAHA representative if the recommended countermeasures fail to prevent a given error from recurring.

[Error message display format]

Error messages display at the top of the screen.



* In some cases information about the error occurrence location (axis, optional unit, etc.) is inserted at the beginning of the error message.

Error number: [<occurrence location>] Error message

- M …Main group axis number
- S …Sub group axis number
- D …Driver axis number
- OP …Optional unit slot number

For example, the "27.32:m5, Gripper Soft limit over" error message indicates that a "software limit over" occurred in the auxiliary axis 1 (gripper 1) of a main group robot. In the same manner, the "17.4 D2, Overload" error message indicates that an "overload" error occurred at the 2nd axis of the driver unit. Although the axis configuration is normally 1-to-1 as viewed from both the robot and the driver, there are cases (in a dual drive axis system, etc.) where the axis configuration may appear as 1 axis when viewed from the robot, but 2 axes when viewed from the driver.

[26] Alarm messages occurred in electric gripper main body

If an alarm message described in error group number 26 (Alarm message occurred in electric gripper main body) appears, the electric gripper enters the status shown below.

- Return-to-origin incomplete
- Servo off

To recover from the alarm status, follow the steps below.

1. Remove the cause of the alarm.
2. Reset the emergency stop flag.
3. Turn on the servo of all axes.
4. Perform the return-to-origin of the electric gripper, in which the alarm occurred.

[0] Warnings and messages

0.18 : Gripper not included in Origin

Code : &H0012

Meaning/Cause	Action
A gripper axis other than the command target axis was specified for the gripper axis when the other parameter, "Include Gripper in Origin", was set at "NO" and any of the following commands was executed. ① "ORIGIN" command ② "@ORGRTN" command ③ "@ORGRTN2" command	1. Set "Include Gripper in Origin" to "YES". 2. For "@ORGRTN" and "@ORGRTN2" commands, execute an axis other than the gripper axis individually.

[9] Memory errors

9.51 : Gripper origin data destroyed

Code : &H0933

Meaning/Cause	Action
Part or all of the data saved after completion of the return-to-origin of the electric gripper was destroyed.	Perform the return-to-origin of the electric gripper.

[10] System environment and hardware errors

10.17 : Cannot set Gripper

Code : &H0A11

Meaning/Cause	Action
a. It was attempted to set the gripper for the YC-Link set axis. b. It was attempted to set the gripper for the dual drive set axis. c. It was attempted to set the gripper for an axis number exceeding the number of boards installed.	1. Do not set the gripper for such axis. 2. Change the setting axis.

10.18 : Cannot change auxiliary axis

Code : &H0A12

Meaning/Cause	Action
It was attempted to reset the auxiliary axis setting of the gripper set axis.	Do not reset the auxiliary axis setting.

[12] I/O input/output information and option board errors

12.85 : Bad Gripper status setting

Code : &H0C55

Meaning/Cause	Action
The same port number was set for the other parameters "G1 status output (DO & SO)" and "G2 status output (DO & SO)".	Set different port numbers for the other parameters "G1 status output (DO & SO)" and "G2 status output (DO & SO)".

[21] Major software errors

21.15 : System error (Gripper)

Code : &H150F

Meaning/Cause	Action
Software error occurred.	Contact our company with details of this problem.

[22] Major hardware errors

22.70 : Gripper disconnect

Code : &H1646

Meaning/Cause	Action
It was attempted to execute a gripper dedicated robot language command even though the gripper option was not set.	Set the gripper option.

22.71 : Gripper timeout error

Code : &H1647

Meaning/Cause	Action
Execution of the command sent to the gripper control board ended due to timeout.	Contact our company with details of this problem.

22.72 : Gripper cannot get error

Code : &H1648

Meaning/Cause	Action
It was failed to obtain the error that occurred in the gripper main body.	Contact our company with details of this problem.

22.73 : Gripper not initialized

Code : &H1649

Meaning/Cause	Action
The gripper initial setting was not complete.	Execute the initial setting of the gripper axis using the generation.

22.74 : Gripper DC24V power low

Code : &H164A

Meaning/Cause	Action
The DC24V power voltage of the gripper dropped.	Check the DC24V power voltage.

[26] Alarm messages occurred in electric gripper main body (Fatal error)

26.1 : Gripper Over load

Code : &H1A01

Meaning/Cause	Action
The motor overload occurred. a. The motor was faulty.	1. If a symptom, such as excessively heavy motion is found when the motor is moved manually, replace the motor.
b. The parameter was faulty.	2. Initialize the parameters.
c. The capacity of the power line was insufficient.	3. Check the power capacity. If the power capacity is insufficient, adjust the power voltage to its correct range.
d. The friction of the machine main body was large.	4. Check the movable part of the mechanical part for heavy motion. If the motion is excessively heavy, make the readjustment.

26.2 : Gripper Over current

Code : &H1A02

Meaning/Cause	Action
The motor overcurrent occurred. a. The motor cable was short-circuited.	1. Inspect the electric continuity of the motor cable. If any fault is found, replace the motor.
b. The gripper control board was faulty.	2. Replace the gripper control board.
c. The parameter was faulty.	3. Initialize the parameters.

26.3 : Gripper Machine reference over

Code : &H1A03

Meaning/Cause	Action
The encoder Z-phase position deviated from the initial value stored in the controller. a. The gripper main body was replaced. b. The finger with the setting on the origin close side was replaced. c. The CPU board in the RCX240 controller was replaced. d. The CPU software version for the RCX240 controller was changed.	1. Perform the return-to-origin again.
e. Struck an obstacle while returning to the origin point. f. The encoder Z-phase had faulty wiring or malfunctioned.	2. Remove the obstacle and perform the return-to-origin again.
g. The gripper drive section or transmission section malfunctioned.	3. Replace the gripper main body.

26.4 : Gripper Power supply voltage low

Code : &H1A04

Meaning/Cause	Action
The DC power voltage dropped to 80% or less of the rated value.	Check the power capacity. If the power capacity is insufficient, adjust the power voltage to its correct range.

26.6 : Gripper P.E. Counter over

Code : &H1A06

Meaning/Cause	Action
a. Mechanical lock occurred in the gripper drive part. b. The motor cable had faulty wiring or incorrect wiring. c. The parameter was faulty.	1. Check the gripper drive part for mechanical lock. 2. Check the motor and encoder cable connections. 3. Initialize the parameters.

26.7 : Gripper Internal fault

Code : &H1A07

Meaning/Cause	Action
Error occurred inside the gripper control board.	Contact our company with details of this problem.

26.8 : Gripper 24V Power off

Code : &H1A08

Meaning/Cause	Action
a. DC24V power cable was not connected. b. DC24V power was not supplied. c. DC24V power cable had faulty wiring.	1. Check the DC24V power cable connection. 2. Check the DC24V power. 3. Check the DC24V power cable.

26.9 : Gripper System fault 1

Code : &H1A09

Meaning/Cause	Action
The software entered the runaway status due to external noise.	Contact our company with details of this problem.

26.10 : Gripper Feedback error 1

Code : &H1A0A

Meaning/Cause	Action
a. The finger overrun the software limit due to external force. b. The encoder counting was incorrect due to external noise.	1. Turn on the power to check that no external force is applied. After that, perform the return-to-origin. 2. Contact our company with details of this problem.

26.11 : Gripper Feedback error 2

Code : &H1A0B

Meaning/Cause	Action
a. The encoder cable has faulty wiring. b. The guide block was locked.	1. Check the encoder cable connections. 2. Unlock the guide block.

26.12 : Gripper Abnormal voltage

Code : &H1A0C

Meaning/Cause	Action
a. The power voltage increased by regeneration. b. The DC24V power voltage was incorrect.	1. Decrease the duty of the mechanism part. 2. Check the capacity of the DC24V power supply. If the capacity is insufficient, adjust the power voltage to its correct range.

26.13 : Gripper System fault 2

Code : &H1A0D

Meaning/Cause	Action
The software entered the runaway status due to external noise.	Contact our company with details of this problem.

26.14 : Gripper Feedback error 3

Code : &H1A0E

Meaning/Cause	Action
The motor cable had faulty wiring or incorrect wiring.	Check the motor cable connections.

[27] Error messages occurred in electric gripper main body

27.32 : Gripper Soft limit over

Code : &H1B20

Meaning/Cause	Action
The operation position exceeded the software limit set by the parameter.	1. Change the operation position to put it within a software limit area. 2. Change the software limit value. 3. Change the limit width.

27.35 : Gripper Origin incomplete

Code : &H1B23

Meaning/Cause	Action
The return-to-origin was not performed.	Perform the return-to-origin to put the gripper in the return-to-origin completion status.

27.36 : Gripper Servo off

Code : &H1B24

Meaning/Cause	Action
A movement command was executed in the servo off status.	Turn on the servo.

27.37 : Gripper Interlock

Code : &H1B25

Meaning/Cause	Action
It was attempted to execute a program or move an axis in the interlock status.	Reset the interlock and execute the program or move the axis.

27.50 : Gripper Data error

Code : &H1B32

Meaning/Cause	Action
The option data, such as movement command to be sent to the gripper control board exceeded the input range.	Restart the system generation.

27.51 : Gripper type error

Code : &H1B33

Meaning/Cause	Action
It was attempted to initialize with an unspecified actuator type.	Enter a correct value for the gripper axis number.

27.52 : Gripper Internal failure

Code : &H1B34

Meaning/Cause	Action
a. The DC24V power was not turned on. b. An error occurred in the gripper control board.	1. Check the DC24V power. 2. Contact our company with details of this problem.

10. Periodic inspection and maintenance

10.1 Before beginning work

Periodic inspection and maintenance are essential to ensure safe and efficient operation of YAMAHA robots. This chapter describes periodic inspection items and procedures for the electric gripper. Before beginning work, read the precautions below and also in Chapter 1 "Using the Robot Safely" and follow the instructions.

WARNING

IF THE ADJUSTMENT OR INSPECTION PROCEDURE CALLS FOR OPERATION OF THE ELECTRIC GRIPPER, STAY OUT OF THE MOVABLE AREA OF THE ELECTRIC GRIPPER DURING OPERATION. ADDITIONALLY, KEEP WATCHING THE ELECTRIC GRIPPER MOVEMENT AND SURROUNDING AREA SO THAT THE OPERATOR CAN STOP THE OPERATION IMMEDIATELY IF ANY DANGER OCCURS.

WARNING

- **BEFORE STARTING THE ADJUSTMENT OR INSPECTION WITHOUT OPERATION OF THE ELECTRIC GRIPPER, BE SURE TO TURN OFF THE POWER SWITCH ON THE CONTROLLER AND THE SWITCH ON THE EXTERNAL POWER DISTRIBUTION PANEL.**
- **WHEN THE MAINTENANCE OR INSPECTION OF THE ROBOT CONTROLLER IS PERFORMED UNDER YAMAHA'S DIRECTION, START THE WORK 30 MIN. AFTER THE POWER HAS BEEN SHUT DOWN. IF ANY HOT OR HIGH VOLTAGE REMAINING PORTION EXISTS IN THE ROBOT CONTROLLER, THIS MAY CAUSE BURN OR ELECTRICAL SHOCK.**
- **WHEN MAKING ONLY ELECTRICAL INSPECTIONS AND REQUIRING NO MECHANICAL MOVEMENT OF THE ELECTRIC GRIPPER, PRESS THE EMERGENCY STOP BUTTON.**
- **USE ONLY LUBRICANT AND GREASES SPECIFIED BY YAMAHA SALES OFFICE OR REPRESENTATIVE.**
- **USE ONLY PARTS SPECIFIED BY YAMAHA SALES OFFICE OR REPRESENTATIVE. TAKE SUFFICIENT CARE NOT TO ALLOW ANY FOREIGN MATTER TO CONTAMINATE THEM DURING ADJUSTMENT, PARTS REPLACEMENT OR REASSEMBLY.**
- **WHEN ADJUSTMENT OR MAINTENANCE IS COMPLETE, RETIGHTEN THE BOLTS AND SCREWS SECURELY.**
- **POST A SIGN STATING "UNDER ADJUSTMENT/INSPECTION" ON THE ELECTRIC GRIPPER SO THAT OTHER PERSONNEL DO NOT OPERATE ANY SWITCH CARELESSLY. AS NEEDED, INSTALL AN APPROPRIATE SWITCH KEY LOCK MECHANISM OR ASK SOMEONE TO KEEP WATCH.**
- **IF THE ELECTRIC GRIPPER IS INCORPORATED INTO THE SYSTEM (MACHINE UNIT OR ROBOT), STRICTLY OBSERVE THE LAWS AND REGULATIONS RELATED TO THE SAFETY MEASURES OF THE SYSTEM AND PERFORM THE INSPECTION OR MAINTENANCE WORK IN A SAFE MANNER.**
- **DO NOT DISASSEMBLE OR ASSEMBLE PRODUCT PARTS OTHER THAN THOSE SPECIFIED. PERSONAL INJURY, ELECTRICAL SHOCK, OR FIRE MAY OTHERWISE RESULT.**

- DO NOT MODIFY THE ELECTRIC GRIPPER MAIN BODY OR CONTROLLER. IF MODIFIED, NOT ONLY DESIGNATED SPECIFICATIONS ARE NOT SATISFIED, BUT ALSO THE MODIFICATION MAY ADVERSELY AFFECT THE OPERATOR'S SAFETY. ADDITIONALLY, NEVER CUT OR RECONNECT THE PRODUCT CABLE TO EXTEND OR SHORTEN THE CABLE LENGTH. FIRE MAY OTHERWISE RESULT.
- BEFORE STARTING THE MAINTENANCE, INSPECTION, OR REPAIR WORK OF THE PRODUCT, BE SURE TO SHUT DOWN THE ELECTRIC POWER SUPPLY COMPLETELY AND STRICTLY OBSERVE THE CAUTIONS BELOW.
  1. POST A SIGN STATING "UNDER WORK. POWER ON PROHIBITED" AT A LEGIBLE LOCATION TO PREVENT A THIRD PERSON FROM POWERING ON CARELESSLY.
  2. WHEN MULTIPLE WORK PERSONNEL PERFORM THE MAINTENANCE AND INSPECTION WORK, KEEP CLOSE COMMUNICATION AMONG THEM TO CONFIRM THE SAFETY WHEN TURNING ON OR OFF THE POWER OR WHEN MOVING MOVABLE PARTS.
- DO NOT START THE INSPECTION WORK WITHOUT FULLY UNDERSTANDING OF THE WORK CONTENTS. ADDITIONALLY, PERFORM THE INSPECTION AT SPECIFIED INTERVALS. NEGLIGENCE OF THE INSPECTION MAY CAUSE THE SERVICE LIFE OF THE DRIVE PART TO BE SHORTENED, RESULTING IN MALFUNCTIONS. IF ANY TROUBLE IS FOUND DURING THE INSPECTION, IMMEDIATELY STOP THE OPERATION.
- NEVER TOUCH TERMINALS DURING THE INSULATION RESISTANCE TEST. ELECTRICAL SHOCK MAY OTHERWISE RESULT. (SINCE THE ELECTRIC GRIPPER USES THE DC POWER SUPPLY, DO NOT CONDUCT THE WITHSTAND VOLTAGE TEST.)

When applying grease to the electric gripper, 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 GREASE 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 GREASE GETS IN THE EYES, WASH LIBERALLY WITH PURE WATER FOR ABOUT 15 MINUTES AND CONSULT A PHYSICIAN FOR TREATMENT.
- IF 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 PROPER TREATMENT.

10.2 Periodic inspection

10.2.1 Daily inspection

Check the following points on a daily basis, before and after system operation.

Checkpoints	Check items	Notes
Electric gripper main body	• Check for loose bolt. • Check for loose finger mounting.	If any loose part is found, retighten it with a specified torque.
Cables	• Check for scratch or excessive bend. • Check for abrasion. • Check that connectors are connected securely.	If any scratch or abrasion is found, replace the defective cable as needed.
Operation status	• Check for unusual noise, vibration, or unsmooth operation. • Check that the emergency stop functions correctly.	

● **Cleaning**

- Clean the electric gripper with a soft cloth rag that does not scatter thread craps to wipe off the contamination.
- If the electric gripper is contaminated extremely, use neutral detergent. It is prohibited to use solvent to clean the gripper.
- When removing dirt or dust with the air blow, it may enter the inside of the electric gripper. Do not use the air blow for the cleaning work.

10.2.2 Six-month inspection

Take the following precautions when performing 6-month inspection.
Check the following points every 6 months and adjust or replace parts if needed.

Checkpoints	Check items	Notes
linear guide	• If any dust or contamination is found, clean it. After cleaning, apply grease. • If the linear guide movement part is dry or if the grease is insufficient, apply grease. Recommended grease: Multemp PS No. 2 (Kyodo Yushi) or its equivalent (Lithium grease)	See section 10.3 in this Chapter.
Cables	• Check for scratch or excessive bend. • Check for abrasion. • Check that connectors are connected securely.	If any scratch or abrasion is found, replace the defective cable as needed.
Operation status	• Check for unusual noise, vibration, or unsmooth operation. • Check that the emergency stop functions correctly.	

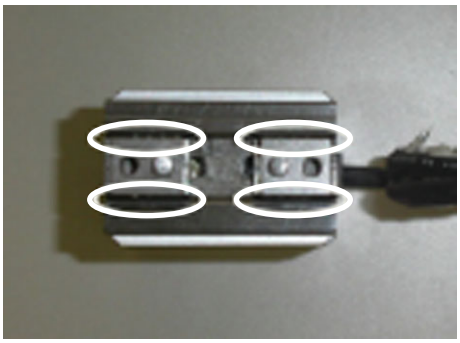
10.3 Applying grease

When applying grease to the linear guide according to periodic inspection, follow the procedure below.

Recommended grease: Multemp PS No. 2 (Kyodo Yushi) or its equivalent (Lithium grease)

1) Make sure that the power to the controller is off.

2) Use a syringe to apply the recommended grease to the clearance between the guide block and guide rail of the finger (ball part at 4 locations).
After the grease has been applied, wipe off excess grease or grease sticking to surrounding parts.



WARNING

- **APPLY AN ADEQUATE AMOUNT OF GREASE TO SPECIFIED LOCATIONS. ELECTRONICS DEVICES, SUCH AS STEPPING MOTOR OR ROTARY ENCODER ARE INCORPORATED INTO THE ELECTRIC GRIPPER MAIN BODY. IF GREASE STICKS TO SUCH DEVICE, NOT ONLY THE ELECTRIC GRIPPER CANNOT BE OPERATED AT ITS MAXIMUM PERFORMANCE LEVEL, BUT ALSO DAMAGE TO THE MACHINE UNIT OR PERSONAL INJURY DUE TO MALFUNCTIONS MAY RESULT.**
- **DO NOT USE SPRAY GREASE. IF USED, GREASE SCATTERS AND MAY STICK TO THE ENCODER.**
- **DO NOT USE SPRAY OIL. IF USED, GREASE FLOWS BY OILY CONTENT, CAUSING LUBRICATION TROUBLE. ADDITIONALLY, OIL ENTERS UNEXPECTED LOCATIONS, CAUSING OPERATION TROUBLE.**
- **NEVER USE FLUOROCHEMICAL GREASE. IF FLUOROCHEMICAL GREASE IS MIXED WITH LITHIUM GREASE, THE LUBRICATION PERFORMANCE LOWERS, CAUSING DAMAGE TO THE ELECTRIC GRIPPER.**

11. Specifications

11.1 Electric gripper basic specifications

Item		Specifications
Basic specifications	Applicable controller	RCX240
	Number of connection grippers	Max. 2 units
Axis control	Control method	PTP motion
	Min. setting unit	0.01mm
	Position indication unit	Pulses, mm (millimeters)
	Speed setting	20 to 100% (in 1% steps, Changeable by the program.)
	Acceleration setting	1 to 100% (in 1% steps, Setting by the acceleration parameter)
Programming	Teaching	MDI (coordinate data input), direct teaching, teaching playback, offline teaching (data input from external unit)

11.2 Gripper control board specifications

Item		Specifications
Axis control	No. of axes	1 axis
	Position detection method	Optical rotary encoder
	Min. setting distance	0.01mm
	Speed setting	Set in the range of 20 to 100% to the max. parameter speed.
Protective alarm		Overcurrent, overload, voltage failure, system failure, position deviation over, feedback error, etc.
LED status indication		POWER (Green), RUN (Green), READY (Yellow), ALARM (Red)
Power supply	Drive power	DC 24V±10% 1.0A Max.

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11.3 Electric gripper specifications

(1) Compact signal cam type : YRG-2005SS

■ Basic specifications

Model name		YRG-2005SS	Unit
Holding power	Max. continuous rating	5	N
	Min. setting	30 (1.5)	% (N)
	Resolution	1 (0.05)	% (N)
Open/close stroke		3.2	mm
Speed	Max. rating	100	mm/sec
	Min. setting	20 (20)	% (mm/sec)
	Resolution	1 (1)	% (mm/sec)
	Holding speed (Max.)	50	%
Repeated positioning accuracy		±0.02	mm
Guide mechanism		Linear guide	
Max. holding weight (Note 4)		0.05	kg
Operating temperature range		0 to +40 (No freezing allowed.)	°C
Operating humidity range		RH35 to 90 (No dew condensation allowed.)	%
Storage temperature		-10 to +60 (No freezing allowed.)	°C
Weight		90	g

Note 1) Design the finger as short and lightweight as possible.

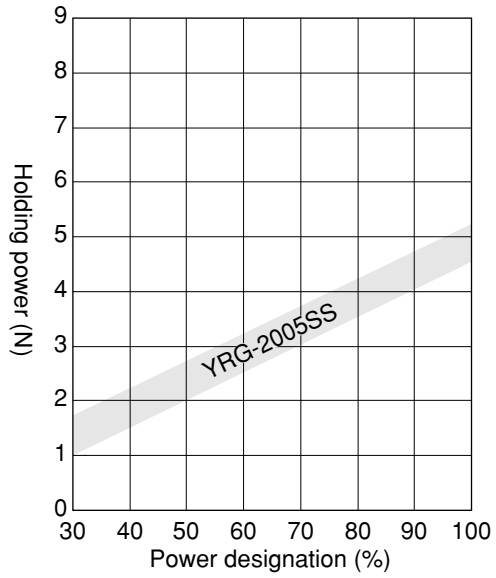
Note 2) Set the parameters and holding power (%) of the holding movement command so that any excessive shock is not applied to the finger during operation.

Note 3) When installing or uninstalling the finger, tighten the bolts while the finger is being held securely so that any excessive force or shock is not applied to the guide block.

Note 4) Design the weight of a workpiece to be held so that it is approximately 1/10 to 1/20 of the holding power. (Consider further allowance when moving and swinging the gripper that keeps holding a workpiece.)

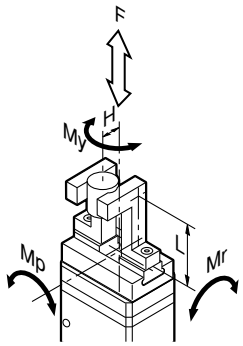
Note 5) Workpiece weight that is able to be held may greatly vary depending on the material, shape, and/or holding surface conditions of the finger.

■ Relationship between holding power and power designation (%)



- The graph stating the relationship between the holding power and power designation (%) is used for your reference. The actual holding power may vary extremely.

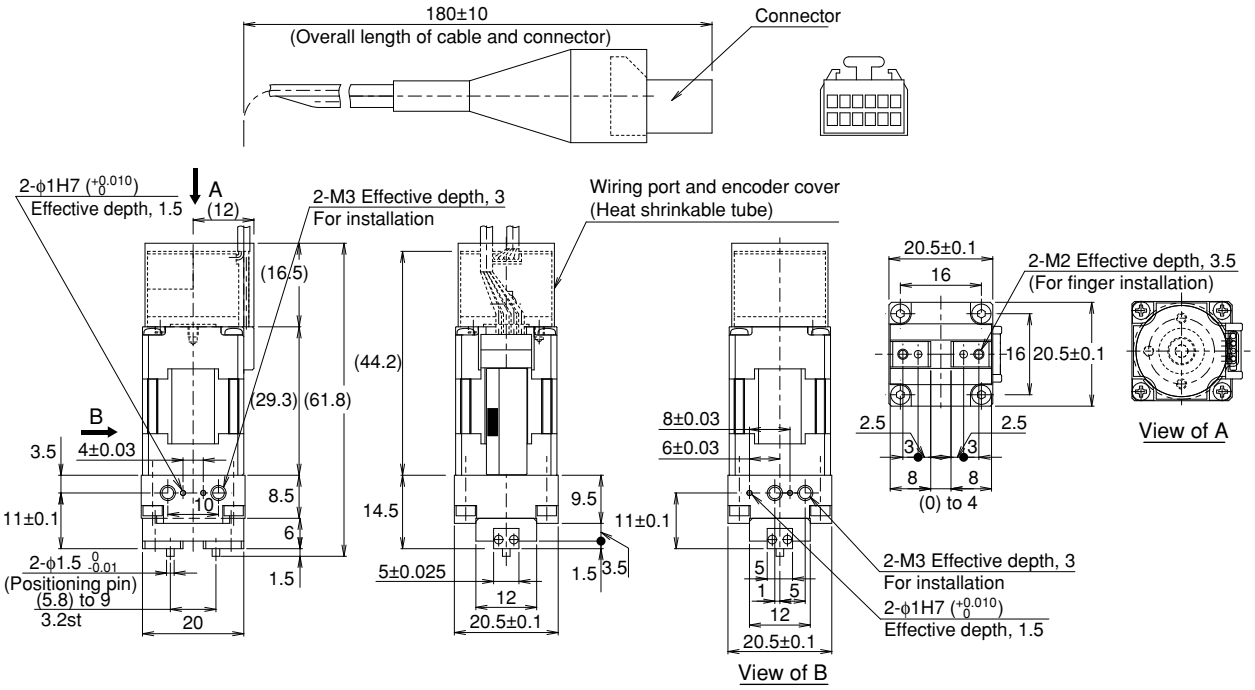
■ Allowable load and load moment



				YRG-2005SS
Guide	Allowable load	F	[N]	12
	Allowable pitching moment	Mp	[N•m]	0.04
	Allowable yawing moment	My	[N•m]	0.04
	Allowable rolling moment	Mr	[N•m]	0.08
Finger	Max. weight (1 pair)		[g]	10
	Max. holding position	L	[mm]	20
	Max. overhang	H	[mm]	20

- Mount the finger so that the allowable load and load moment of the guide do not exceed the values stated in the table above. Additionally, make the adjustment so that the finger weight, holding length (L) from the installation surface to the holding point, and overhang (H) do not exceed the values stated in the table above. Moreover, please contact your YAMAHA sales dealer for further information on combination of L and H.

■ Dimensional outline drawing (Unit: mm)



Note) Avoid extreme winding of the cable and fix the cable securely so that it does not move.
Take appropriate measures so that any excessive force is not applied to the root of the cable.

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(2) Single cam type : YRG-2010S, YRG-2815S, YRG-4225S

■ Basic specifications

Model name		YRG-2010S	YRG-2815S	YRG-4225S	Unit
Holding power	Max. continuous rating	6	22	40	N
	Min. setting	30 (1.8)	30 (6.6)	30 (12)	% (N)
	Resolution	1 (0.06)	1 (0.22)	1 (0.4)	% (N)
Open/close stroke		7.6	14.3	23.5	mm
Speed	Max. rating	100	100	100	mm/sec
	Min. setting	20 (20)	20 (20)	20 (20)	% (mm/sec)
	Resolution	1 (1)	1 (1)	1 (1)	% (mm/sec)
	Holding speed (Max.)	50	50	50	%
Repeated positioning accuracy		±0.02	±0.02	±0.02	mm
Guide mechanism		Linear guide			
Max. holding weight (Note 4)		0.06	0.22	0.4	kg
Operating temperature range		0 to +40			°C
Operating humidity range		RH35 to 90 (No dew condensation allowed.)			%
Storage temperature		–10 to +60			°C
Weight		160	300	580	g

Note 1) Design the finger as short and lightweight as possible.

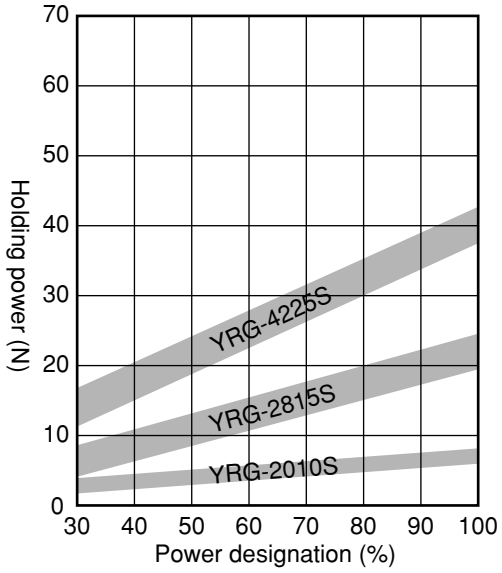
Note 2) Set the parameters and holding power (%) of the holding movement command so that any excessive shock is not applied to the finger during operation.

Note 3) When installing or uninstalling the finger, tighten the bolts while the finger is being held securely so that any excessive force or shock is not applied to the guide block.

Note 4) Design the weight of a workpiece to be held so that it is approximately 1/10 to 1/20 of the holding power. (Consider further allowance when moving and swinging the gripper that keeps holding a workpiece.)

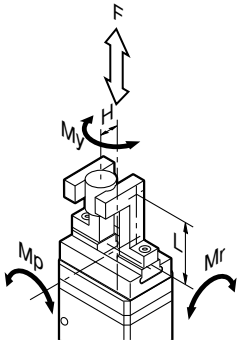
Note 5) Workpiece weight that is able to be held may greatly vary depending on the material, shape, and/or holding surface conditions of the finger.

■ Relationship between holding power and power designation (%)



- The graph stating the relationship between the holding power and power designation (%) is used for your reference. The actual holding power may vary extremely.

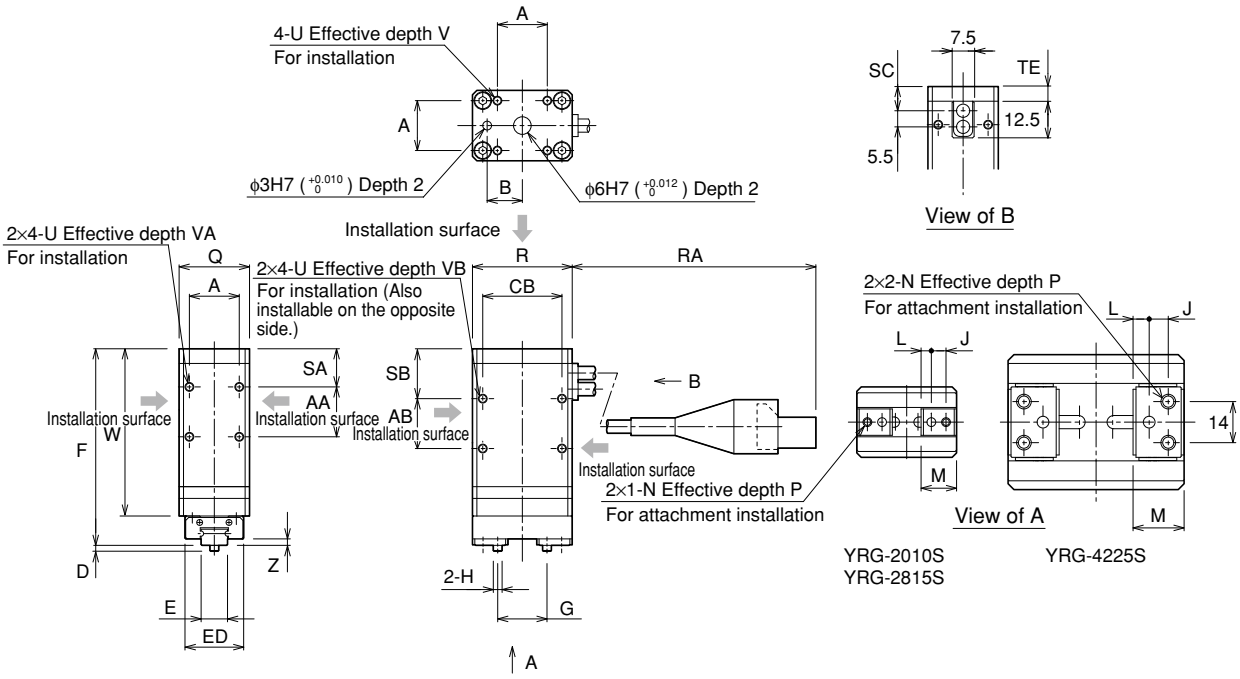
■ Allowable load and load moment



				YRG-2010S	YRG-2815S	YRG-4225S
Guide	Allowable load	F	[N]	450	350	600
	Allowable pitching moment	Mp	[N•m]	0.7	0.5	1.1
	Allowable yawing moment	My	[N•m]	0.8	0.6	1.3
	Allowable rolling moment	Mr	[N•m]	2.3	2.8	8.6
Finger	Max. weight (1 pair)		[g]	15	30	50
	Max. holding position	L	[mm]	20	20	25
	Max. overhang	H	[mm]	20	25	30

- Mount the finger so that the allowable load and load moment of the guide do not exceed the values stated in the table above. Additionally, make the adjustment so that the finger weight, holding length (L) from the installation surface to the holding point, and overhang (H) do not exceed the values stated in the table above. Moreover, please contact your YAMAHA sales dealer for further information on combination of L and H.

■ Dimensional outline drawing (Unit: mm)



Note) Avoid extreme winding of the cable and fix the cable securely so that it does not move.
Take appropriate measures so that any excessive force is not applied to the root of the cable.

● Dimension table

Symbol / Model name	A	AA	AB	B	CB	D	E	ED	F	G	H	J	L
YRG-2010S	17	17	17	12	27	2	$9^{0}_{-0.05}$	20	71	8.4~16	$\phi 3^{0}_{-0.01}$	5	3.5
YRG-2815S	24	24	14	15	38	2	$14^{0}_{-0.05}$	25	78	9.6~23.9	$\phi 3^{0}_{-0.01}$	6	4.3
YRG-4225S	36	25	13	20	50	3	$24^{0}_{-0.05}$	40	86	12~35.5	$\phi 4^{0}_{-0.012}$	6.5	5.5

Symbol / Model name	M	N	P	Q	R	RA	SA	SB	SC	TE	U	V	VA	VB	W	Z
YRG-2010S	12.1	M3	5	24	34	165±10	13	17	8.3	5	M3	5	6	6	61	2.2
YRG-2815S	15	M4	5	32	46	140±10	16	21	9.3	6	M4	6	8	8	69	2
YRG-4225S	17.4	M5	8	46	60	235±10	18	24	10.8	7.5	M5	7.5	8	10	72	3

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(3) Double cam type : YRG-2005W, YRG-2810W, YRG-4220W

■ Basic specifications

Model name		YRG-2005W	YRG-2810W	YRG-4220W	Unit
Holding power	Max. continuous rating	50	150	250	N
	Min. setting	30 (15)	30 (45)	30 (75)	% (N)
	Resolution	1 (0.5)	1 (1.5)	1 (2.5)	% (N)
Open/close stroke		5	10	19.3	mm
Speed	Max. rating	60	60	45	mm/sec
	Min. setting	20 (12)	20 (12)	20 (9)	% (mm/sec)
	Resolution	1 (0.6)	1 (0.7)	1 (0.45)	% (mm/sec)
	Holding speed (Max.)	50	50	50	%
Repeated positioning accuracy		±0.03	±0.03	±0.03	mm
Guide mechanism		Linear guide			
Max. holding weight (Note 4)		0.5	1.5	2.5	kg
Operating temperature range		0 to +40			°C
Operating humidity range		RH35 to 90 (No dew condensation allowed.)			%
Storage temperature		–10 to +60			°C
Weight		200	350	800	g

Note 1) Design the finger as short and lightweight as possible.

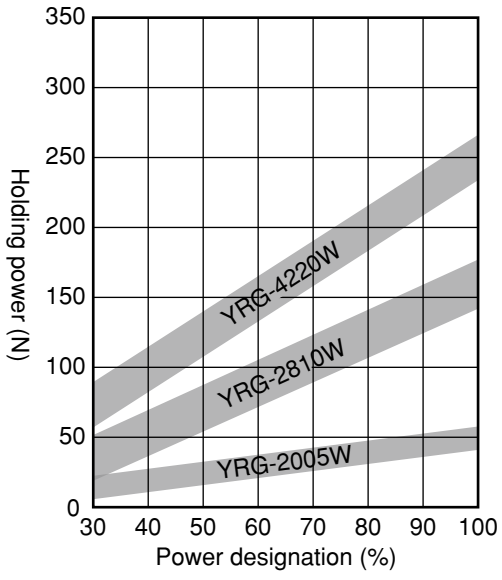
Note 2) Set the parameters and holding power (%) of the holding movement command so that any excessive shock is not applied to the finger during operation.

Note 3) When installing or uninstalling the finger, tighten the bolts while the finger is being held securely so that any excessive force or shock is not applied to the guide block.

Note 4) Design the weight of a workpiece to be held so that it is approximately 1/10 to 1/20 of the holding power. (Consider further allowance when moving and swinging the gripper that keeps holding a workpiece.)

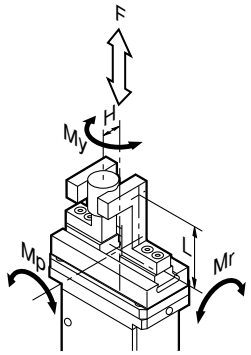
Note 5) Workpiece weight that is able to be held may greatly vary depending on the material, shape, and/or holding surface conditions of the finger.

■ Relationship between holding power and power designation (%)



- The graph stating the relationship between the holding power and power designation (%) is used for your reference. The actual holding power may vary extremely.

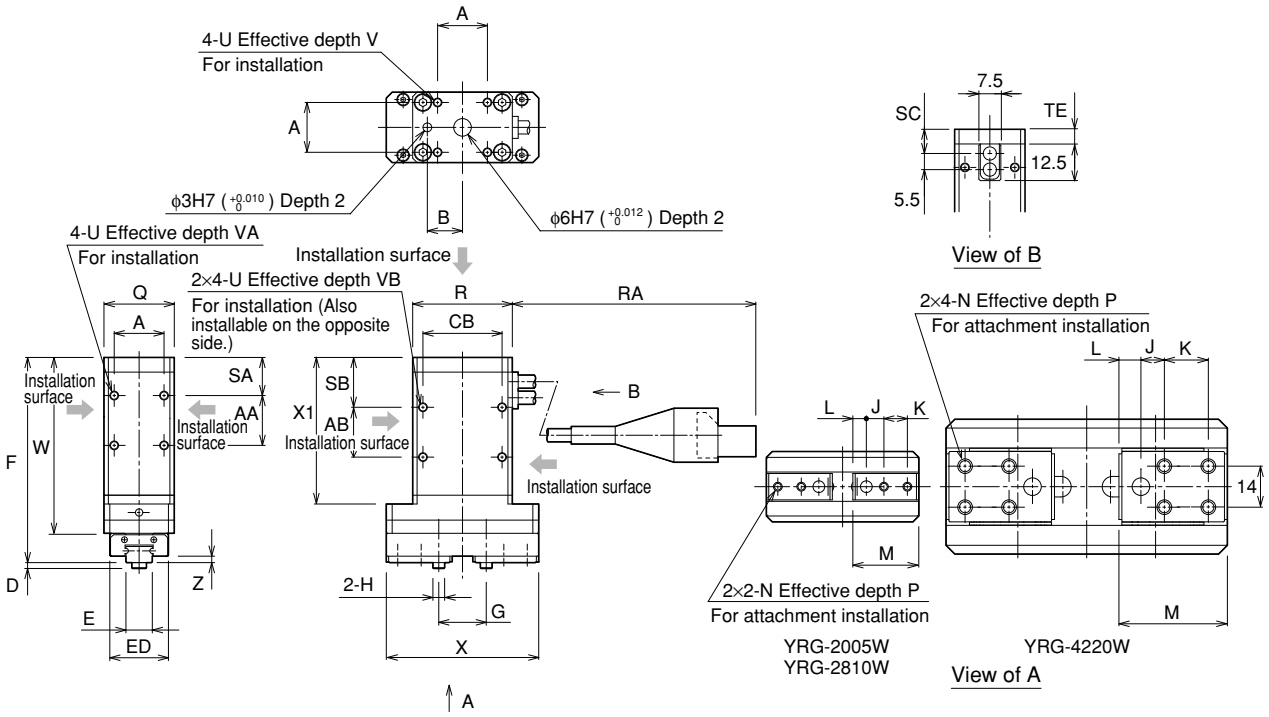
■ Allowable load and load moment



				YRG-2005W	YRG-2810W	YRG-4220W
Guide	Allowable load	F	[N]	1000	1000	2000
	Allowable pitching moment	Mp	[N•m]	6.7	8.1	20.1
	Allowable yawing moment	My	[N•m]	4	4.8	12
	Allowable rolling moment	Mr	[N•m]	5.1	7.8	25.9
Finger	Max. weight (1 pair)		[g]	40	80	200
	Max. holding position	L	[mm]	30	30	50
	Max. overhang	H	[mm]	20	20	30

- Mount the finger so that the allowable load and load moment of the guide do not exceed the values stated in the table above. Additionally, make the adjustment so that the finger weight, holding length (L) from the installation surface to the holding point, and overhang (H) do not exceed the values stated in the table above. Moreover, please contact your YAMAHA sales dealer for further information on combination of L and H.

■ Dimensional outline drawing (Unit: mm)



Note) Avoid extreme winding of the cable and fix the cable securely so that it does not move.
Take appropriate measures so that any excessive force is not applied to the root of the cable.

● Dimension table

Symbol / Model name	A	AA	AB	B	CB	D	E	ED	F	G	H	J	K	L
YRG-2005W	17	17	17	12	27	2	$9^{0}_{-0.05}$	20	74	10.6~15.6	$\phi 4^{0}_{-0.012}$	6	8	4.6
YRG-2810W	24	24	14	15	38	2	$14^{0}_{-0.05}$	25	80	12.6~22.6	$\phi 5^{0}_{-0.012}$	7	10	5.65
YRG-4220W	36	25	13	20	50	3	$24^{0}_{-0.05}$	40	89	17.0~36.3	$\phi 6^{0}_{-0.012}$	8	15	7.5

Symbol / Model name	M	N	P	Q	R	RA	SA	SB	SC	TE	U	V	VA	VB	W	X	X1	Z
YRG-2005W	22.5	M3	5	24	34	165±10	13	17	8.3	5	M3	5	6	6	64	52	54	2.2
YRG-2810W	27.5	M4	5	32	46	140±10	16	21	9.3	6	M4	6	8	8	71	67	61	2
YRG-4220W	37	M5	8	46	60	235±10	18	24	10.8	7.5	M5	7.5	8	10	75	96	62	3

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(4) Screw type strait style : YRG-2020FS, YRG-2840FS

■ Basic specifications

Model name		YRG-2020FS	YRG-2840FS	Unit
Holding power	Max. continuous rating	50	150	N
	Min. setting	30 (15)	30 (45)	% (N)
	Resolution	1 (0.5)	1 (1.5)	% (N)
Open/close stroke		19	38	mm
Speed	Max. rating	50	50	mm/sec
	Min. setting	20 (10)	20 (10)	% (mm/sec)
	Resolution	1 (0.5)	1 (0.5)	% (mm/sec)
	Holding speed (Max.)	50	50	%
Repeated positioning accuracy		±0.01	±0.01	mm
Guide mechanism		Linear guide		
Max. holding weight (Note 4)		10 (0.5)	10 (1.5)	% kg
Operating temperature range		0 to 40		°C
Operating humidity range		RH35 to 90		%
Storage temperature		–10 to 60		°C
Weight		420	880	g

Note 1) Design the finger as short and lightweight as possible.

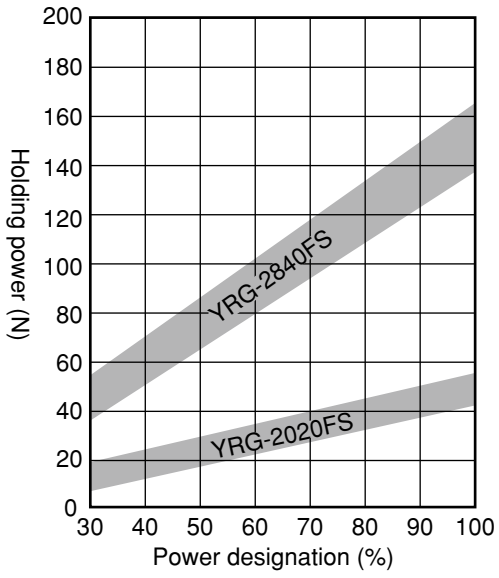
Note 2) Set the parameters and holding power (%) of the holding movement command so that any excessive shock is not applied to the finger during operation.

Note 3) When installing or uninstalling the finger, tighten the bolts while the finger is being held securely so that any excessive force or shock is not applied to the guide block.

Note 4) Design the weight of a workpiece to be held so that it is approximately 1/10 to 1/20 of the holding power. (Consider further allowance when moving and swinging the gripper that keeps holding a workpiece.)

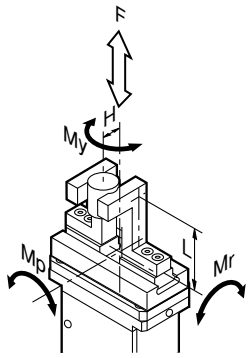
Note 5) Workpiece weight that is able to be held may greatly vary depending on the material, shape, and/or holding surface conditions of the finger.

■ Relationship between holding power and power designation (%)



- The graph stating the relationship between the holding power and power designation (%) is used for your reference. The actual holding power may vary extremely.

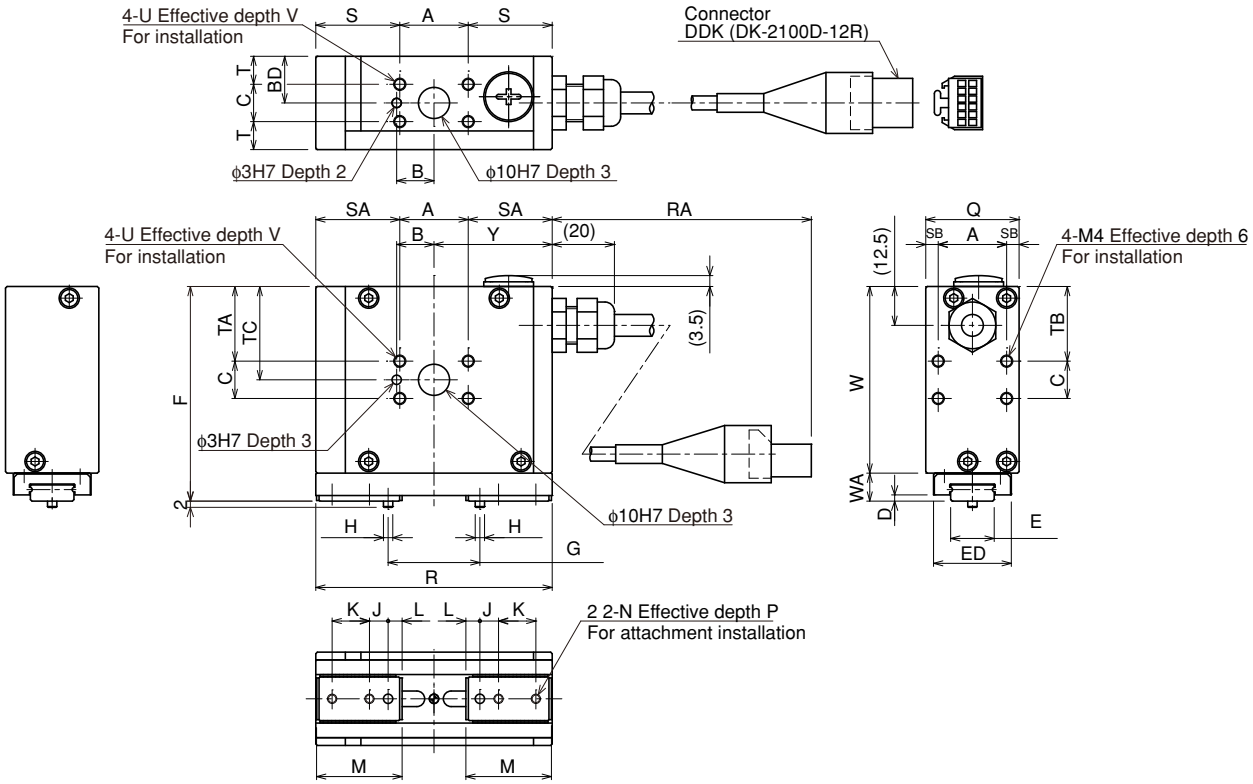
■ Allowable load and load moment



				YRG-2020FS	YRG-2840FS
Guide	Allowable load	F	[N]	1000	1300
	Allowable pitching moment	Mp	[N•m]	3.5	5
	Allowable yawing moment	My	[N•m]	4.2	6
	Allowable rolling moment	Mr	[N•m]	7.3	12.7
Finger	Max. weight (1 pair)		[g]	40	80
	Max. holding position	L	[mm]	30	30
	Max. overhang	H	[mm]	20	20

- Mount the finger so that the allowable load and load moment of the guide do not exceed the values stated in the table above. Additionally, make the adjustment so that the finger weight, holding length (L) from the installation surface to the holding point, and overhang (H) do not exceed the values stated in the table above. Moreover, please contact your YAMAHA sales dealer for further information on combination of L and H.

■ Dimensional outline drawing (Unit: mm)



Note) Avoid extreme winding of the cable and fix the cable securely so that it does not move.
Take appropriate measures so that any excessive force is not applied to the root of the cable.

● Dimension table

Symbol / Model name	A	B	BD	C	D	E	ED	F	G	H	J	K	L	M
YRG-2020FS	22	12	15	12	2	$14^{0}_{-0.05}$	25	69	10.5~29.5	$\phi 3^{0}_{-0.01}$	6	12	4.5	27.5
YRG-2840FS	30	15	20	16	2	$24^{0}_{-0.05}$	30	84	13~51	$\phi 4^{0}_{-0.012}$	8	14	5.5	34.5

Symbol / Model name	N	P	Q	R	RA	S	SA	SB	T	TA	TB	TC	TD	U	V
YRG-2020FS	M3	5	30	76	175±10	27	27	4	9	24	24	30	12.5	M4	6
YRG-2840FS	M4	7.5	40	110	135±10	40	40	5	12	28	28	36	14	M5	7.5

Symbol / Model name	W	WA	Y	Z
YRG-2020FS	60	9	38	2
YRG-2840FS	72	12	55	3

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(5) Screw type "T" style : YRG-2020FT, YRG-2840FT

■ Basic specifications

Model name		YRG-2020FT	YRG-2840FT	Unit
Holding power	Max. continuous rating	50	150	N
	Min. setting	30 (15)	30 (45)	% (N)
	Resolution	1 (0.5)	1 (1.5)	% (N)
Open/close stroke		19	38	mm
Speed	Max. rating	50	50	mm/sec
	Min. setting	20 (10)	20 (10)	% (mm/sec)
	Resolution	1 (0.5)	1 (0.5)	% (mm/sec)
	Holding speed (Max.)	50	50	%
Repeated positioning accuracy		±0.01	±0.01	mm
Guide mechanism		Linear guide		
Max. holding weight (Note 4)		10 (0.5)	10 (1.5)	% kg
Operating temperature range		0 to 40		°C
Operating humidity range		RH35 to 90		%
Storage temperature		–10 to 60		°C
Weight		420	890	g

Note 1) Design the finger as short and lightweight as possible.

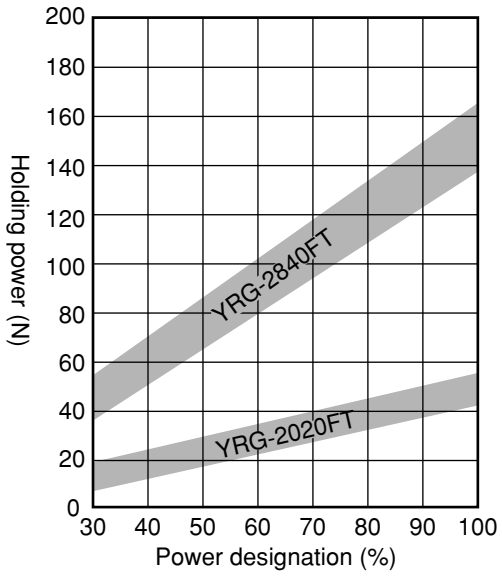
Note 2) Set the parameters and holding power (%) of the holding movement command so that any excessive shock is not applied to the finger during operation.

Note 3) When installing or uninstalling the finger, tighten the bolts while the finger is being held securely so that any excessive force or shock is not applied to the guide block.

Note 4) Design the weight of a workpiece to be held so that it is approximately 1/10 to 1/20 of the holding power. (Consider further allowance when moving and swinging the gripper that keeps holding a workpiece.)

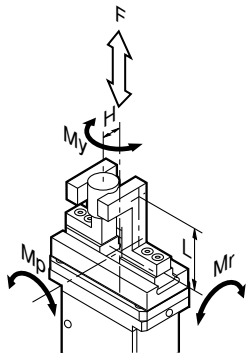
Note 5) Workpiece weight that is able to be held may greatly vary depending on the material, shape, and/or holding surface conditions of the finger.

■ Relationship between holding power and power designation (%)



- The graph stating the relationship between the holding power and power designation (%) is used for your reference. The actual holding power may vary extremely.

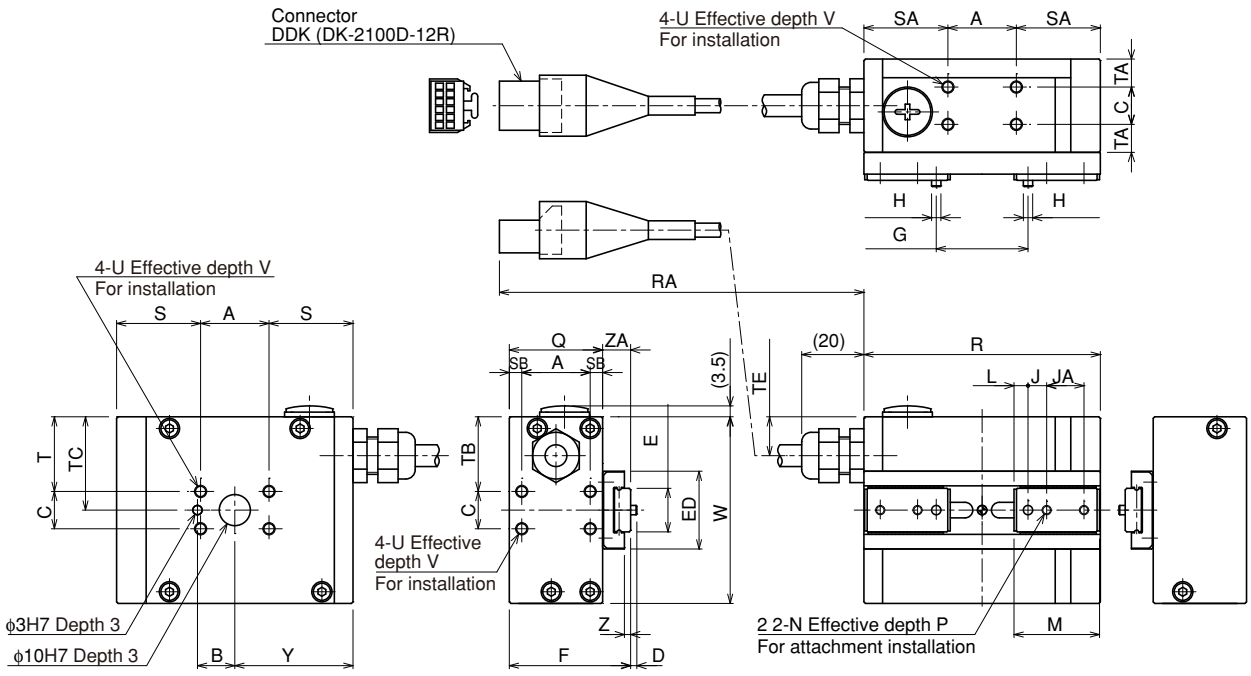
■ Allowable load and load moment



				YRG-2020FT	YRG-2840FT
Guide	Allowable load	F	[N]	1000	1300
	Allowable pitching moment	Mp	[N•m]	3.5	5
	Allowable yawing moment	My	[N•m]	4.2	6
	Allowable rolling moment	Mr	[N•m]	7.3	12.7
Finger	Max. weight (1 pair)		[g]	40	80
	Max. holding position	L	[mm]	30	30
	Max. overhang	H	[mm]	20	20

- Mount the finger so that the allowable load and load moment of the guide do not exceed the values stated in the table above. Additionally, make the adjustment so that the finger weight, holding length (L) from the installation surface to the holding point, and overhang (H) do not exceed the values stated in the table above. Moreover, please contact your YAMAHA sales dealer for further information on combination of L and H.

■ Dimensional outline drawing (Unit: mm)



Note) Avoid extreme winding of the cable and fix the cable securely so that it does not move.
Take appropriate measures so that any excessive force is not applied to the root of the cable.

● Dimension table

Symbol / Model name	A	B	C	D	E	ED	F	G	H	J	JK	K	L	M
YRG-2020FT	22	12	12	2	$14^{0}_{-0.05}$	25	39	10.5~29.5	$\phi 3^{0}_{-0.01}$	6	12	12	4.5	27.5
YRG-2840FT	30	15	16	2	$18^{0}_{-0.05}$	30	52	13~51	$\phi 4^{0}_{-0.012}$	8	14	14	5.5	34.5

Symbol / Model name	N	P	Q	R	RA	S	SA	SB	T	TA	TB	TC	TD	TE	U	V
YRG-2020FT	M3	5	30	76	175±10	27	27	4	24	9	24	30	12.5	12.5	M4	6
YRG-2840FT	M4	7.5	40	110	135±10	40	40	5	28	12	28	36	14	14	M5	7.5

Symbol / Model name	W	Y	Z	ZA
YRG-2020FT	60	38	2	9
YRG-2840FT	72	55	3	12

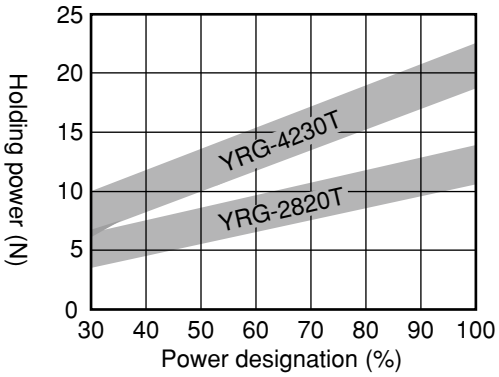
(6) Three fingers type : YRG-2004T, YRG-2013T, YRG-2820T, YRG-4230T

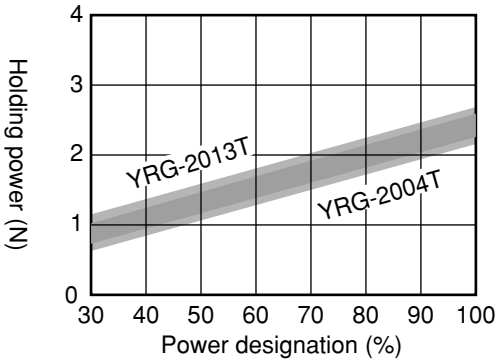
■ Basic specifications

Model name		YRG-2004T	YRG-2013T	YRG-2820T	YRG-4230T	Unit
Holding power	Max. continuous rating	2.5	2	10	20	N
	Min. setting	30 (0.75)	30 (0.6)	30 (3)	30 (6)	% (N)
	Resolution	1 (0.025)	1 (0.02)	1 (0.1)	1 (0.2)	% (N)
Open/close stroke		3.5	13	20	30	mm
Speed	Max. rating	100				mm/sec
	Min. setting	20 (20)				% (mm/sec)
	Resolution	1 (1)	1 (1)	1 (1)	1 (1)	% (mm/sec)
	Holding speed (Max.)	50	50	50	50	%
Repeated positioning accuracy		±0.03				mm
Guide mechanism		Linear guide				
Max. holding weight (Note 4)		10 (0.02)	10 (0.02)	10 (0.1)	10 (0.2)	% (kg)
Operating temperature range		0 to +40				°C
Operating humidity range		RH35 to 90				%
Storage temperature		−10 to +60				°C
Weight		90	190	340	640	g

Note 1) Design the finger as short and lightweight as possible.
Note 2) Set the parameters and holding power (%) of the holding movement command so that any excessive shock is not applied to the finger during operation.
Note 3) When installing or uninstalling the finger, tighten the bolts while the finger is being held securely so that any excessive force or shock is not applied to the guide block.
Note 4) Design the weight of a workpiece to be held so that it is approximately 1/10 to 1/20 of the holding power. (Consider further allowance when moving and swinging the gripper that keeps holding a workpiece.)
Note 5) Workpiece weight that is able to be held may greatly vary depending on the material, shape, and/or holding surface conditions of the finger.

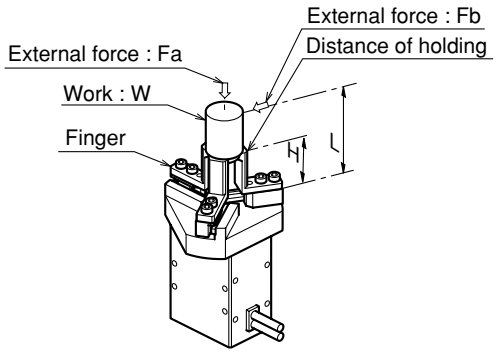
■ Relationship between holding power and power designation (%)





- The graph stating the relationship between the holding power and power designation (%) is used for your reference. The actual holding power may vary extremely.

■ Allowable load and load moment



				YRG-2004T	YRG-2013T	YRG-2820T	YRG-4230T
Finger	Allowable load		[N]	6	20	30	50
	Allowable moment		[N•m]	0.02	0.1	0.2	0.4
	Max. weight (1 pair)		[g]	10	20	30	50
	Max. holding position	L	[mm]	15	20	30	40

- When the external forces Fa and Fb are applied to a potion the distance (L) apart from the finger installation surface, the load (F) and moment (M) are calculated from the formulas shown below.

$F = Fa + W \times g$
$M = Fb \times L$

F : Load [N]
M : Moment [N•m]
L : Distance of point of external force application [m]
Fa : External force [N]
Fb : External force [N]
W : Workpiece weight [Kg]
g : Gravity acceleration [m/s^2]
H : Distance of holding point [m]

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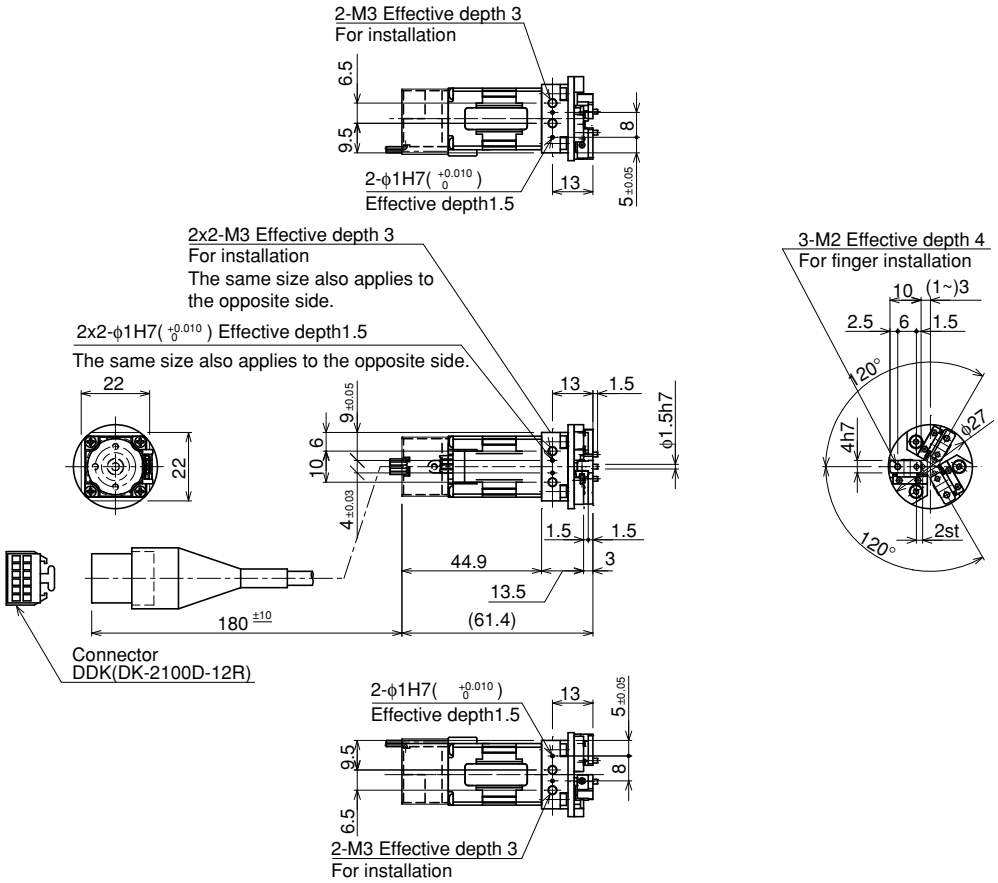
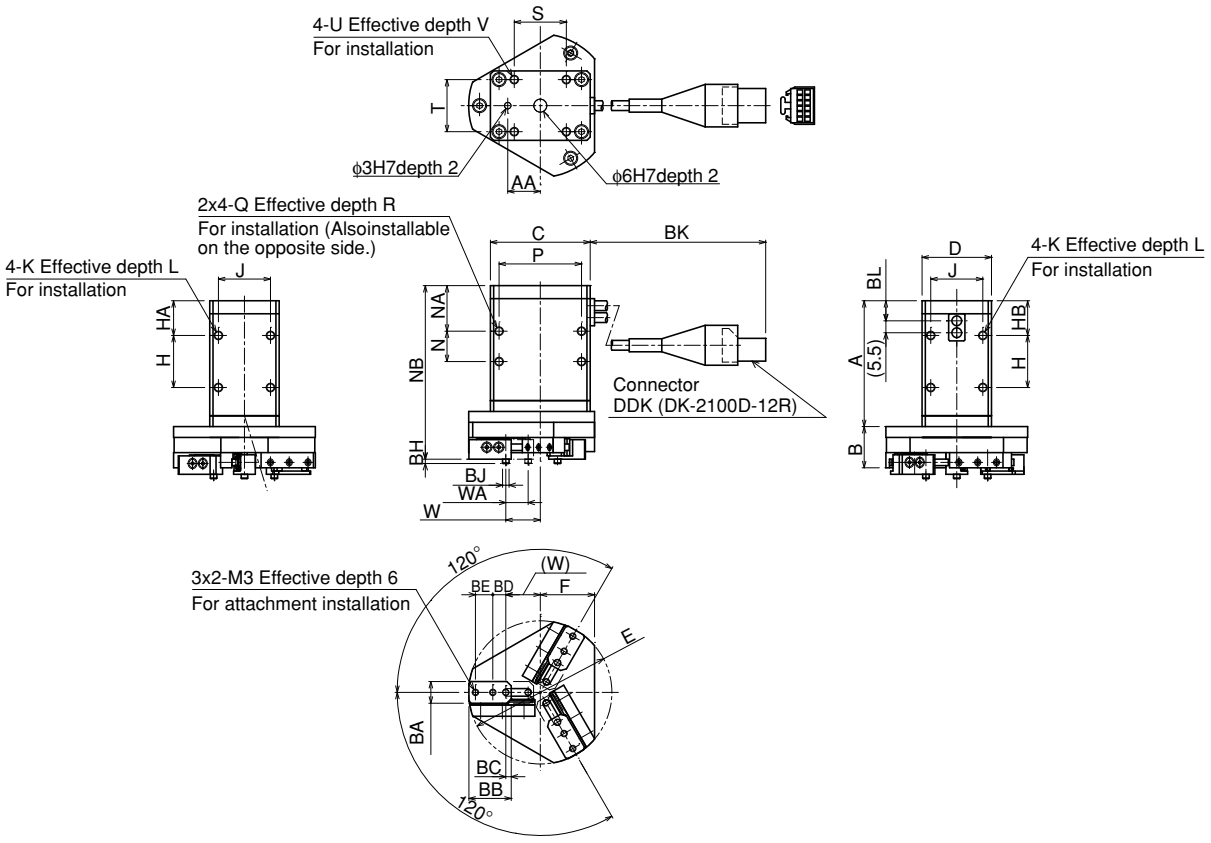
■ Dimensional outline drawing (Unit: mm)



Note) Avoid extreme winding of the cable and fix the cable securely so that it does not move.
Take appropriate measures so that any excessive force is not applied to the root of the cable.

■ Dimensional outline drawing (Unit: mm)



Note) Avoid extreme winding of the cable and fix the cable securely so that it does not move.
Take appropriate measures so that any excessive force is not applied to the root of the cable.

● Dimension table

Symbol / Model name	A	B	C	D	E	F	G	H	HA	HB	J	K	L	M	N	NA
YRG-2013T	50	19	34	24	50	19	42	17	13	13	17	M3	6	38	17	17
YRG-2820T	58	19	46	32	66	25	40	24	16	16	24	M4	8	45	14	21
YRG-4230T	59	29	60	46	86	34	45	25	18	18	36	M5	8	51	13	24

Symbol / Model name	NB	P	Q	R	S	T	U	V	W	WA	AA	BA	BB
YRG-2013T	72	27	M3	6	17	17	M3	5	11.4~4.6	6.8st	12	$10^{0}_{-0.02}$	16
YRG-2820T	80	38	M4	8	24	24	M4	6	15.9~5.6	10.3st	15	$10^{0}_{-0.02}$	19.5
YRG-4230T	88	50	M5	10	36	36	M5	7.5	21.9~6.6	15.3st	20	$14^{0}_{-0.02}$	22.5

Symbol / Model name	BC	BD	BE	BF	BG	BH	BJ	BK	BL
YRG-2013T	2.5	10	***	3X1-M3	8	2	$\phi 3^{0}_{-0.01}$	165±10	8.3
YRG-2820T	2.5	6	8	3X2-M3	6	2	$\phi 3^{0}_{-0.01}$	140±10	9.3
YRG-4230T	2.5	6	10	3X2-M4	8	3	$\phi 4^{0}_{-0.012}$	235±10	10.8

Revision record

Manual version	Issue date	Description
Ver. 1.00	Mar. 2010	
Ver. 1.01	Aug. 2010	"1.2 Essential precautions" and "1.3 Operation" were added, and cautions were added to each chapter. "9. Periodic inspection and maintenance" was added. "3.3.5 Wiring to the gripper emergency stop" was added. Clerical errors were corrected, etc.
Ver. 1.02	Jan. 2011	The warning "(1) Use caution to prevent hands or fingers from being pinched or crushed." was added in "1.2 Essential precautions". The description regarding "Warranty" was changed. "(2) Interlocking with the RCX240 controller" was added in "3.3.5 Wiring to the gripper emergency stop". "4.4 Weight parameters", "5.1 Turning the power on and off", "5.2 Manual movement", and "5.4 Emergency stop" were added. "5.3.1 Return-to-origin operation" was added to "5.3 Return-to-origin". Clerical error corrections, etc.
Ver. 1.03	Dec. 2011	Error messages were added and corrected.
Ver. 2.00	Jul. 2012	New models (YRG-2020FS, YRG-2840FS, YRG-2020FT, YRG-2840FT, YRG-2004T, YRG-2013T, YRG-2820T, and YRG-4230T) were added. The description regarding "Warranty" was changed.

User's Manual

Electric Gripper

YRG Series

Jul. 2012
Ver. 2.00
This manual is based on Ver. 2.00 of Japanese manual.

YAMAHA MOTOR CO., LTD. IM Operations

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Instruction manuals can be downloaded from our company website.
Please use the following for more detailed information.
http://www.yamaha-motor.co.jp/global/industrial/robot/

YAMAHA MOTOR CO., LTD.