

KOGANEI



ELEWAVE SERIES ELECTRIC HAND

Point input type controller

OWNER'S MANUAL Ver.2.0

[Main Units]

EWHA12A

EWHA24A

EWHA36A

EWHA6H

EWHA12H

EWHA24H

EWHA36H

[Controller]

EWHC-NH

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Chapter 1 Safety Precautions

Thank you for purchasing the Elewave Series Electric Hand.

This OWNER'S MANUAL describes the features and how to operate this product.

Please read the manual carefully and use the product in a correct manner.

1-1 Safety

Always observe the safety instructions and precautions listed in this manual. Neglect of necessary safety measures or improper handling could result in product breakdown or damage, or in accidents that lead to injury to the user (person to set up, operator, or person to adjust or check, etc.).

1-2 Precautions

- (1) Precaution for automatic operations
 - To prevent injury, install an interlock device to prevent the operator from touching the moving parts of the Electric Hand.
- (2) Precaution against pinched fingers, etc.
 - Be careful to prevent fingers, etc., from being pinched by the Electric Hand's moving parts during transportation, teaching, or during operation.
- (3) Operation not allowed in ambient atmospheres containing flammable gases, etc.
 - The Electric Hand is not an explosion-proof specification. Do not use in ambient atmospheres containing flammable gases, flammable dust, or flammable liquids, etc. It could result in ignitions or explosions.
- (4) Operation not allowed in locations subject to electromagnetic interference, etc.
 - Do not use in locations subject to electromagnetic interferences, static electric discharges, or radio frequency interferences. It could result in erratic operations.
- (5) Safety measures for tooling (such as fingers, etc.)
 - Design and manufacture the tooling to prevent the occurrence of dangerous situations (such as workpieces to pop out or fall) due to cut-off or fluctuation of the power supply (electrical power, air pressure, etc.).
 - If there is a danger that items held by the tooling could pop out or fall, take appropriate safety measures taking into consideration the size, mass, temperature, and chemical properties of the items.
- (6) Precautions for controller checks
 - To prevent electric shock when touching the outside terminal and connector of the controller during controller checks, etc., always switch off the controller power and turn off the power supply.
 - Never touch the inside of the controller.
- (7) Response to a damaged or defective Electric Hand
 - If any of the damage or defects listed below have been found, continuing use of the Electric Hand is dangerous. Immediately stop the operation and contact us.

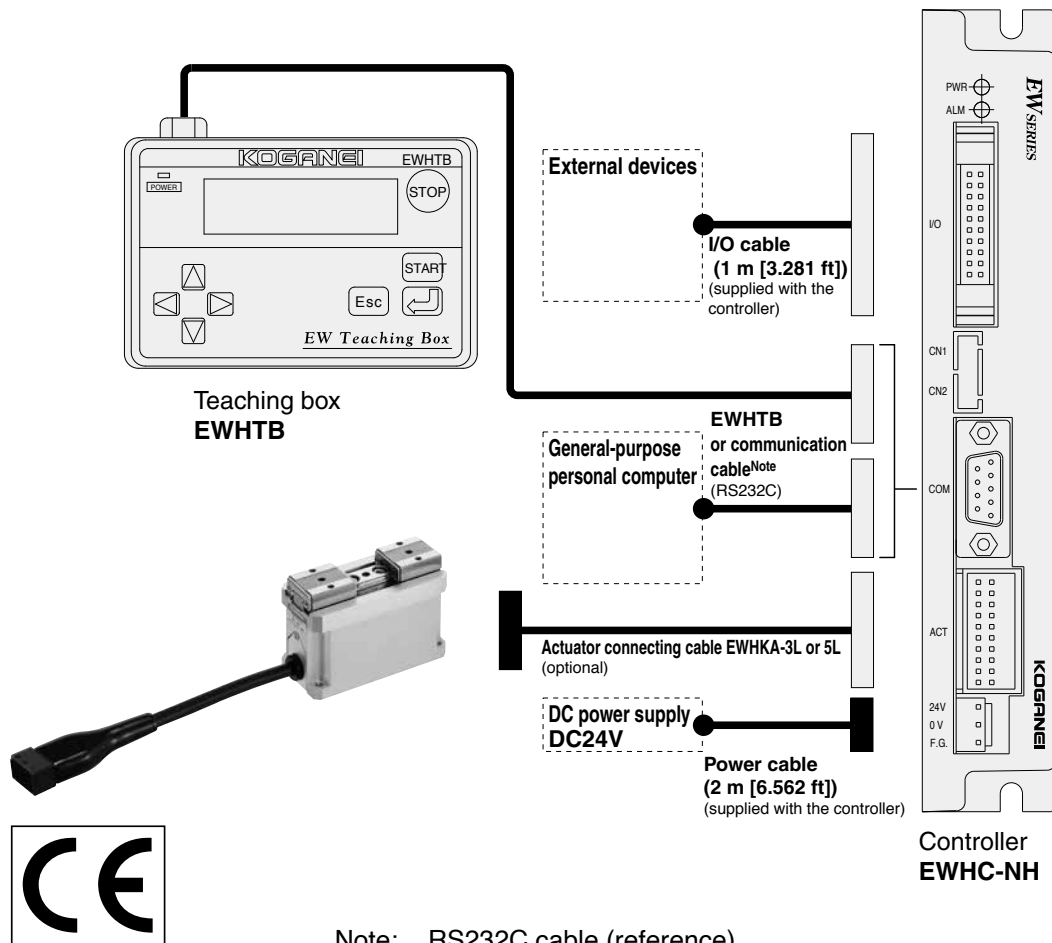
Description of damage or defect	Type of danger
Damage to machine harness or motor wiring	Electric shock, Electric Hand's erratic operation
Damage to outer components of Electric Hand	Damaged parts flying off during Electric Hand's operation
Abnormal operation of Electric Hand (position deviation, vibrations, etc.)	Electric Hand's erratic operation

- (8) Precaution for contact with high-temperature portions of the motor or controller
 - The motor and controller will be very hot in some areas after automatic operations, and touching those areas may cause burns. For checks, etc., first cut the power to the controller, wait for the areas to cool down, confirm the cooled temperature, and then handle those areas.
- (9) Protective ground
 - Always ground the controller to protect it against electric shock.

Chapter 2 System Configuration

2-1 Entire system configuration

The Electric Hand consists of the following major components.



Note: RS232C cable (reference)
 Specifications: D-sub 9 pin ↔ D-sub 9 pin and cross cable
 Model: C06N-09FS-09FS-CROSS
 Manufacturer: Misumi Corp.
 Regarding the communication cable, please purchase it separately.

2-2 Options and accessories

- When Option -C (with controller EWHC-NH) is selected, the controller EWHC-NH and the following accessories are packaged together with the main unit. Please check that they are included with your unit at the time of unpacking.
 - Power cable (1 piece)
 - I/O cable (1 piece)
- When Option -3L or -5L (the cable connecting the Electric Hand main unit and the controller) is selected, the cable (-3L: cable length 3 m [9.843 ft], -5L: cable length 5 m [16.404 ft]) is included in the package. Please check that it is included with your unit at the time of unpacking.

2-3 Setting up for operation

	Procedures	Reference section
Installation and connection	Installation	3-2 4-2
	↓	
	Wiring	Connect the power supply, controller, actuator, and personal computer or teaching box. 4-1 4-2
Settings	↓	
	Power supply on	4-2
	↓	
	Actuator number setting	Set the specified actuator type number. ^{Note} 4-4
	↓	
	Parameter changes	Set the parameter data in accordance with the operating conditions. 4-8
Operations	↓	
	Point data entry	Enter point data suitable for the operation. 4-5
	↓	
	Test operations	Check that it operates normally. 4-3
	↓	
	Main operations	Use the set point data and START signal to run the desired operation. For continuous operations, use a programmable controller or other external devices to control operations. 4-3

Note: When you purchase the actuator and controller as a set, the controller's actuator number is set to the specified actuator number at the time of shipping.

Type	Actuator No.
EWHA12A	84
EWHA24A	85
EWHA36A	86
EWHA6H	87
EWHA12H	88
EWHA24H	89
EWHA36H	90

Note: Be sure to set the actuator number for the connected model of actuator.

Chapter 3 Main Unit

3-1 Handling main unit

3-1-1 Precautions

- (1) Do not apply repeated bending or tensile force to the lead wire. Moreover, never grab the lead wire to carry the main unit. It could cause a broken wire.
- (2) Do not apply external force to the lever or finger when it is installed to hold a workpiece.
Applying excessive external force could cause damage to parts.
- (3) Restrictions on operation
The stepping motor could cause a rise in temperature under certain operating conditions.
Use the Electric Hand within the operating temperature range.
Use of the Electric Hand in conditions exceeding the operation limits could result in damage or in burning of the motor.
- (4) Operating sound
Some operating conditions such as operating speed or gripping fingers could cause the operating sound to be higher, but this is not a fault.
- (5) Use the main unit and the controller in locations where there is little dust and dirt. Using them in locations where there are large amounts of dirt and dust create the risk of abnormal operation.

3-2 Mounting

3-2-1 Mounting the main unit

- (1) The mounting surface should be flat. Twisting or bending during the mounting could result in defective operation or degraded performance.
- (2) Avoid scratching or denting the mounting surface of the main unit, because this could cause a detrimental effect on mounting accuracy.
- (3) In cases where screws may be loosened due to shocks or vibrations, consider taking the screw loosening preventive measures.
- (4) To secure the main unit in place, use tapped holes, or locating holes, as described below.
When mounting the main unit, always use screws that are shorter than the thread depth, and tighten to within the allowable torque range.

	Mounting position	Screw size	Thread depth	Maximum tightening torque
			mm [in]	N·m [in·lbf]
EWHA12A	Side surface	M4	4 [0.157]	1.50 [1.106]
	Bottom			
EWHA24A EWHA36A	Bottom		6 [0.236]	
EWHA6H	Side surface	M3	3 [0.118]	0.63 [0.465]
	Bottom		6 [0.236]	
EWHA12H	Side surface	M4	4 [0.157]	1.50 [1.106]
	Bottom		10 [0.394]	
EWHA24H	Side surface	M5	5 [0.197]	3.00 [2.213]
	Bottom	M4	10 [0.394]	1.50 [1.106]
EWHA36H	Side surface	M5	5 [0.197]	3.00 [2.213]
	Bottom	M4	10 [0.394]	1.50 [1.106]

3-2-2 Mounting a workpiece (fingers)

- (1) When mounting the workpiece (fingers), always use screws that are shorter than the thread depth. Using a screw longer than the thread depth could cause defective operations.
- (2) When fastening screws for mounting the workpiece (fingers), tighten the screws within the allowable torque range.

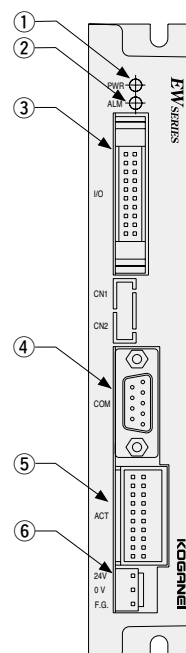
	Screw size	Thread depth	Maximum tightening torque
		mm [in]	N·m [in·lbf]
EWHA12A	M2.5	3 [0.118]	0.36 [0.266]
EWHA24A	M3	3 [0.118]	0.63 [0.465]
EWHA36A			
EWHA6H	M2	3 [0.118]	0.176 [0.13]
EWHA12H	M2.5	2.5 [0.098]	0.36 [0.266]
EWHA24H	M3	3.5 [0.138]	0.63 [0.465]
EWHA36H			

- (3) When mounting a workpiece, use a wrench to secure the workpiece or table, and then position the guide so it is not subject to moment.

Chapter 4 Controller

4-1 Appearance and functions

- ① POWER LED
Lights up when the power supply is turned on.
- ② ALARM LED
Displays the controller state. (See the table below.)
- ③ I/O connector
Use the supplied I/O cable for connecting to sensor switches or an external programmable controller, etc.
- ④ COM connector
This is the connector for connecting to the RS-232C terminal on a personal computer, or the teaching box, etc.
- ⑤ ACT connector
This is the connector for connecting to the main unit.
- ⑥ Power connector
Connects the supplied power cable to supply 24VDC.



4-2 Installation and connection to external devices

4-2-1 Controller installation

(1) Installation

Use M4 screws onto the 5 mm [0.197 in] U-groove on the back of the controller to secure it in place against an object with good thermal conductivity.

(2) Installation environment

- Install in locations with an ambient temperature of 0 to 40°C [0 to 104°F], humidity of 35 to 85%, and no condensation.
- Install providing adequate space around the controller (20 mm [0.787 in] or more) with good ventilation.
- Avoid installing locations subject to corrosive gases including sulfuric acid and hydrochloric acid, and in ambient atmospheres containing flammable gases or liquids, etc.
- Install in locations that are almost free of dust and particulates.
- Avoid installing in locations subject to metal chips, oil, or water from other equipment.
- Avoid installing in locations subject to electromagnetic or electrostatic noises.
- Install in locations that are free from large vibrations.

4-2-2 Connecting the power supply

(1) Power supply

- Connect the power cable to the power supply with a capacity of 24VDC \pm 10% and 1.0A or more.
- Connector: B3PS-VH (JST Mfg. Co., Ltd.)

The connector pin number table

No.	Signal name	Wire color	Description
1	24V	Red	Power supply
2	0V	Blue	
3	F.G	Green	Ground

Description	LED state
Alarm occurs	Lights up
Error occurs	Quick blinking (ON: 0.25s, OFF: 0.25s)
Origin return not completed	Slow blinking (ON: 0.5s, OFF: 1.5s)
Normal	Not lit

Caution: Supply of an unstable power voltage to the controller will cause alarm shutdowns or abnormal operations. Take adequate care, therefore, in selecting a 24V power supply. Ensure a power supply with good stability as possible.

(2) Power supply connection method

- Use the supplied power cable for connecting to the power supply. Pay particular attention to the wire polarity to prevent mis-wiring when connecting wires. Wrong connections could result in fire or other dangerous conditions.

Caution: The EWHC-NH controller does not have a power switch and an emergency stop function. Always install an appropriate power cut-off (insulation) device for the machinery or equipment as an overall system.

Danger: Before wiring to the controller, always turn off the power to the whole machinery or equipment to avoid the danger of electric shock.

(3) Insulation resistance/Dielectric strength test

Never conduct an insulation resistance test or dielectric strength test on the controller.

4-2-3 Grounding work

- Always perform grounding work to prevent electric shock to the human body in case of electric leakage, and to prevent defective equipment operation due to electrical noise.
- We strongly recommend Type 3 grounding (grounding resistance of 100Ω or less) or better.
- For the controller's ground terminal, use the power cable's F.G. wire.

4-2-4 Connecting the communication unit to an RS-232C interface equipment

- The EWHC-NH can be connected to the equipment with RS-232C interface used in a personal computer, etc.
- For connection to a personal computer, etc., connect the RS-232C connector (9 pins) of the dedicated cable to the controller connector.

4-2-5 Connecting to the actuator

Connect the actuator connecting cable to the ACT connector on the front of the controller. Turn off the power supply before performing the connection. Ensure that the actuator connecting cable is firmly inserted into the connector.

No.	Signal name	Description	No.	Signal name	Description
A1	A+	Motor output A+	B1	B+	Motor output B+
A2	A-	Motor output A-	B2	B-	Motor output B-
A3	FG	Frame ground	B3	N.C.	N.C.
A4	COM1 (24V)	COM 24V	B4	COM2 (24V)	COM 24V
A5	N.C.	N.C.	B5	N.C.	N.C.
A6	FG	Frame ground	B6	GND 5V	Ground (5V)
A7	DV+	Encoder power supply+	B7	DV- (GND 5V)	Encoder power supply-
A8	EA+	Encoder signal A+	B8	EA-	Encoder signal A-
A9	EB+	Encoder signal B+	B9	EB-	Encoder signal B-
A10	EC+	Encoder signal C+	B10	EC-	Encoder signal C-

4-2-6 Connecting the I/O connector

Connect the I/O connector to a programmable controller or other external devices.

4-3 I/O interface

4-3-1 I/O connector signal table

No.	Wire color	Signal name	Description	No.	Wire color	Signal name	Description
01	Brown	POS0	Point setting	02	Red	POS1	Point setting
03	Orange	POS2	Point setting	04	Yellow	POS3	Point setting
05	Green	POS4	Point setting	06	Blue	START	Start signal
07	Purple	STOP	Stop signal	08	Gray	ORG	Return to origin signal
09	White	RDY	Preparation completed output	10	Black	BUSY	Command execution in progress output
11	Brown	INPOS	Positioning completed output	12	Red	HOLD	Gripping completed output
13	Orange	24G	Negative common	14	Yellow	24G	Negative common
15	Green	24V GND	Ground	16	Blue	24V IN	24V input
17	Purple	POS5	Point setting	18	Gray	24V	+ 24V
19	White	FG	Frame ground	20	Black	FG	Frame ground

4-3-2 Details of input signals

Input signals consist of 9 custom command inputs.

○ Custom command inputs

Custom command inputs are the inputs to control from a programmable controller or other external devices. To accept the START and ORG inputs, the READY and BUSY signals must be set as follows.

■ READY output : ON

■ BUSY output : OFF

■ STOP input : OFF

The START and ORG inputs are accepted when the OFF state is switched to the ON state (the moment when the contact closes).

Whether the controller has accepted the command or not can be confirmed by monitoring the BUSY output.

■ START

From the current position, the tooling moves by the data of the point No. specified from POS0 to POS5.

Caution: To execute START, it is necessary to confirm the entry states of POS0 to POS5.

■ ORG

Executes return to origin in the direction of the origin return specified in the parameters. It is always necessary to execute return to origin after the power is turned on.

Caution: When the actuator unit was changed in use, first perform initialization of the origin position data (INIT ORG), and then execute return to origin. (See P.27.)

■ STOP

This is an input to stop the actuator's movement temporarily.

Turning this input ON (closing the contact) while the actuator is in operation, or while it is executing return to origin, will temporarily stop the actuator's movement. While this is in the ON state (the contact is a closed state), no custom command from I/O, no program from a personal computer, or no return to origin command can be executed.

■ POS0 ~ POS5

These are inputs for connecting to output circuits of the programmable controller or other devices, and for specifying the point No.

Examples of point specification

Point No. \ POS No.	POS5 (2 ⁵)	POS4 (2 ⁴)	POS3 (2 ³)	POS2 (2 ²)	POS1 (2 ¹)	POS0 (2 ⁰)
P0	OFF	OFF	OFF	OFF	OFF	OFF
P1	OFF	OFF	OFF	OFF	OFF	ON
P3	OFF	OFF	OFF	OFF	ON	ON
P7	OFF	OFF	OFF	ON	ON	ON
P15	OFF	OFF	ON	ON	ON	ON
P31	OFF	ON	ON	ON	ON	ON
P63	ON	ON	ON	ON	ON	ON

4-3-3 Details of output signals

Output signals are 4 signals, READY, BUSY, INPOS, and HOLD.

ON and OFF refer to the turning on and off of the output transistor.

○ Custom outputs

These outputs are for signal interaction with a programmable controller, etc.

■ Preparation completed output (READY)

When the controller system is operating normally, this output is set to ON. If an alarm has issued, this output is set to OFF and the motor enters a free state.

■ Command execution in progress output (BUSY)

This signal is set to ON when a custom command is being executed or when a command from a personal computer is being executed. This signal goes ON whenever a custom command input is accepted. As a result, when the BUSY signal is ON, the controller cannot accept another custom command input or a command from a personal computer.

Caution: Always turn off custom commands when BUSY is ON. Leaving input ON will prevent BUSY from switching to OFF even after execution of a command is completed.

■ Positioning operation completed output (INPOS)

This signal goes OFF whenever a custom command input is accepted, and comes ON when the positioning operation execution process has been completed normally, or when the size detecting function is set. If an error occurs during execution, or if STOP has been input, the signal remains unchanged in the OFF state.

■ Gripping operation completed output (HOLD)

When a custom command input is accepted, this signal temporarily turns OFF, and comes ON when the gripping operation execution process has been completed normally. If an error occurs during execution, or if STOP has been input, the signal remains unchanged in the OFF state.

4-3-4 Input/output circuits

Here describes the input/output circuit specifications and examples of connections. Refer to the examples when connecting to a programmable controller or other external devices.

(1) Input/output circuit specifications

○ Input power supply

Input voltage: 24V±10%

○ Input circuit

Insulation method: Photocoupler insulation

Input response: 30ms or less

Input current: 5mA/24VDC

Input sensitivity: ON current Min. 3mA
OFF current Max. 1mA

○ Output circuit

Insulation method: Photocoupler insulation between the internal circuit and output transistor

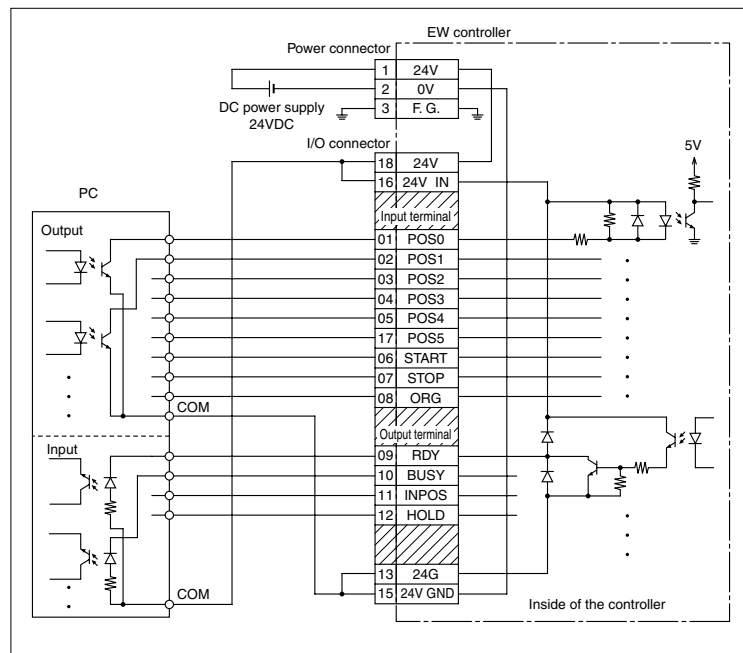
Output terminals: NPN open collector output for all output common terminals (0V side)

Output response: 1ms or less

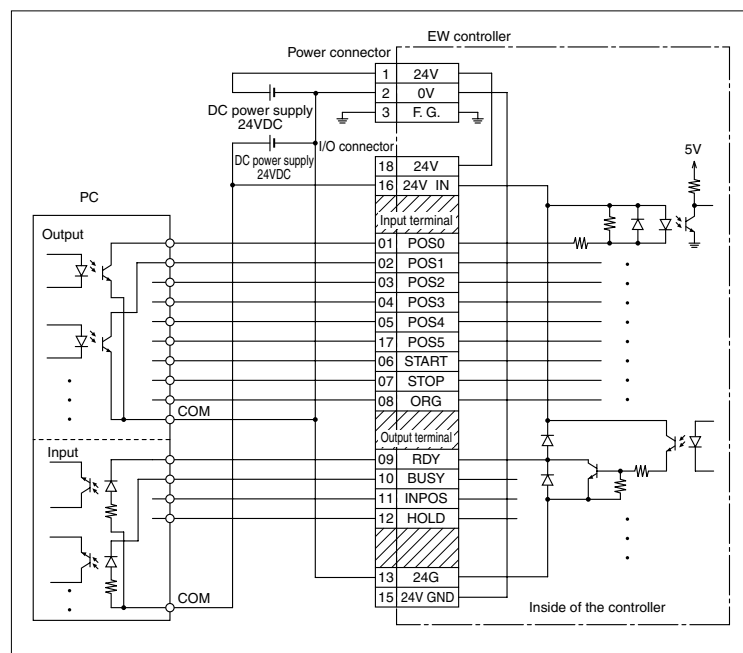
Maximum output current: 30mA/24VDC per 1 output

Residual ON voltage: 1.5V or less

(2) Wiring system when using the controller's internal power supply



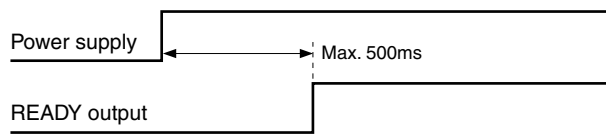
(3) Wiring system when using another power supply in place of the controller's internal power supply



4-3-5 Timing chart

(1) When the power is turned on

Normal condition



Alarmed condition



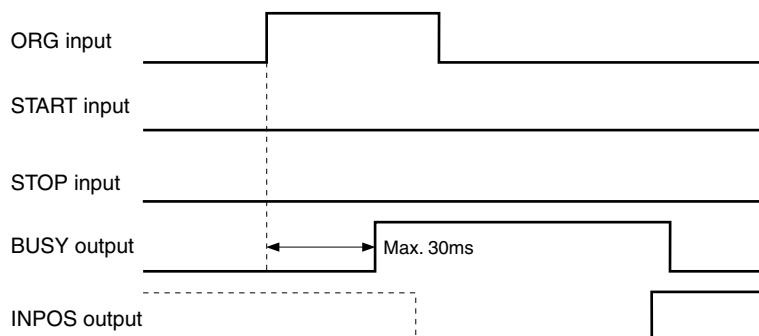
Before inputting a custom command, check that the READY output is turned ON after the power has been supplied.

When the READY output remains OFF after the specified time has elapsed following the power turning on, it means that an alarmed condition has occurred.

(2) Execution of custom command

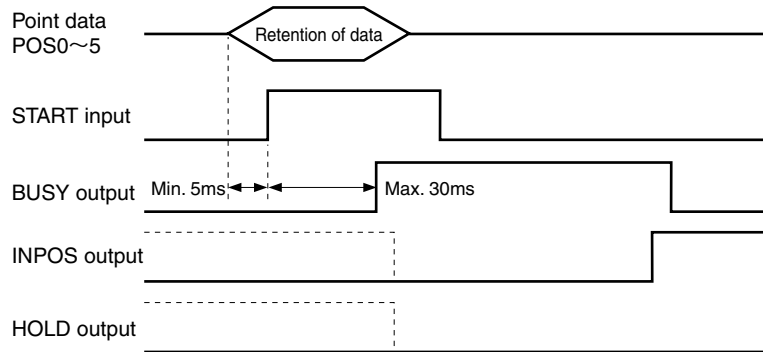
- When a custom command is received, the BUSY output turns ON. The BUSY output turning off means the command has ended normally.
- Always use pulse inputs for custom commands. Leaving input in the ON state will prevent BUSY from turning OFF even after execution of a command has been completed.

1. When returning to origin



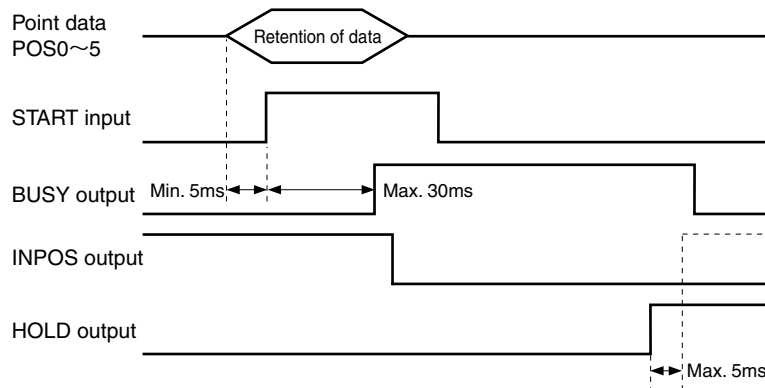
- ① After ORG input is turned ON, the BUSY output is turned ON.
- ② After confirming that BUSY output has turned ON, the ORG input is turned OFF (contact is opened).
- ③ Waits until BUSY output is turned OFF.
- ④ When BUSY output is turned OFF, INPOS output is ON, and this means that the operation has ended normally.

2. Positioning mode, for A, I



- ① Input point data in POS0 to POS5. Maintain this input state until BUSY output turns ON. (Changing the input state too early could cause mis-recognition of data.)
- ② Introduce a delay of at least 5ms, then input START input.
- ③ At the rise of a custom command input, BUSY output turns ON.
- ④ Check that BUSY output is ON, and then set the custom command input to OFF (open the contact).
After this, the point data can be freely changed.
- ⑤ Wait until BUSY output turns OFF.
- ⑥ When BUSY output turns OFF, INPOS output is ON, and this means that the operation has ended normally.

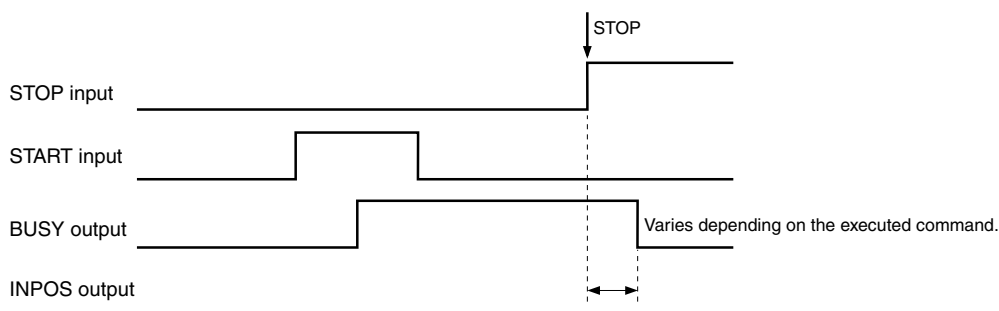
3. Gripping mode, for U, C, O



- ① Input point data in POS0 to POS5. Maintain this input state until BUSY output turns ON. (Changing the input state too early could cause mis-recognition of data.)
- ② Introduce a delay of at least 5ms, and then input START input.
- ③ At the rise of a custom command input, BUSY output turns ON.
- ④ Check that BUSY output is ON, and then set the custom command input to OFF (open the contact).
After this, the point data can be freely changed.
- ⑤ Wait until BUSY output turns OFF.
- ⑥ When BUSY output turns OFF, HOLD output is ON, and this means that the operation has ended normally.

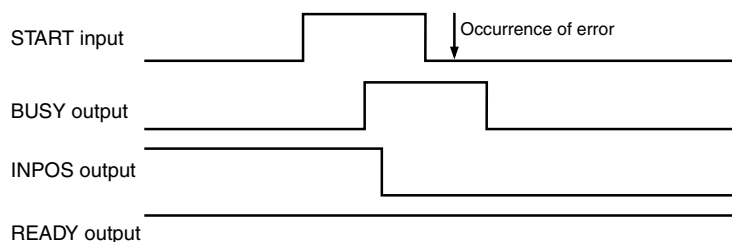
* When the size detecting function is effective, and the workpiece is gripped within the setting range, INPOS output turns ON within 5ms after HOLD output turns ON.

4. When STOP is input



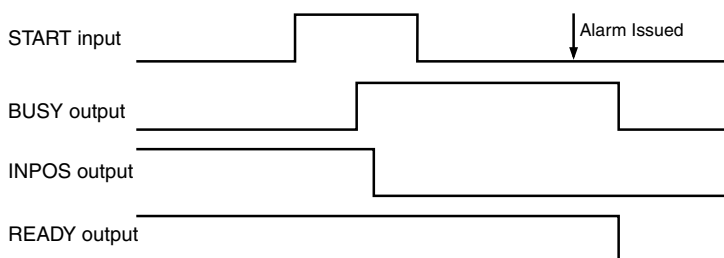
When inputting STOP input during execution of a command, BUSY output turns OFF. The READY output remains unchanged.

5. When an error has occurred



■ With the READY output is in the ON state, the BUSY, INPOS, and HOLD outputs are in the OFF state.

6. When an alarm is issued



■ The READY, BUSY, INPOS, and HOLD outputs all turn OFF.

4-4 Actuator number setting

Set the actuator No. using the number in the below table in accordance with the actuator type.

Type	Actuator No.
EWHA12A	84
EWHA24A	85
EWHA36A	86
EWHA6H	87
EWHA12H	88
EWHA24H	89
EWHA36H	90

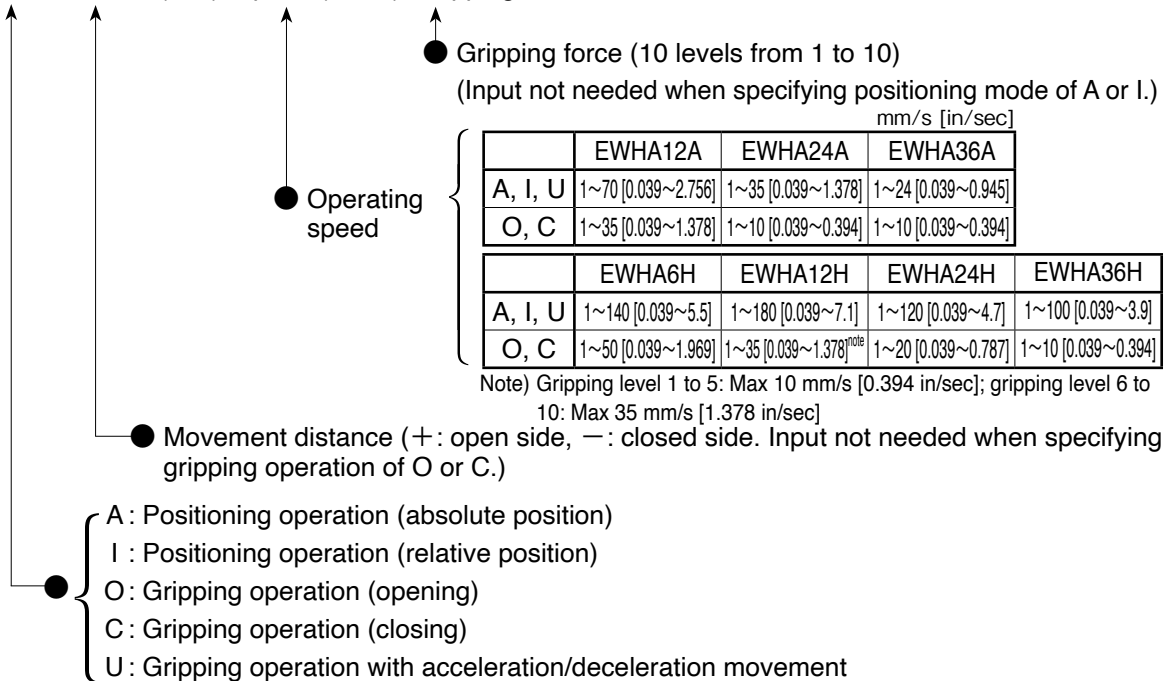
Actuator number setting method (Use either of the following 2 methods for the setting.)

1. Using the communication command @INIT PRM (See P. 27.)
2. Using the initialization command in the support software to initialize parameters
(For details, see the support software Owner's Manual.)

Note: When you purchase the actuator and controller as a set, the controller's actuator number is set to the specified actuator number when shipping.

4-5 Point data specifications

P0 = Mode, Position (mm), Speed (mm/s), Gripping level



4-5-1 Point setting method

Point editing is performed via the RS232C port, on either a personal computer or the teaching box. For the communication parameters and cable specifications, see section “4-7 Communication with a personal computer” on P. 19.

To perform point editing, use either general purpose communication software or dedicated support software.

For the support software instructions, see the separately available support software Ownes' Manual. For the teaching box instructions, see the separately available teaching box Ownes' Manual.

Use the communication command @WRITE PNT to edit.

@WRITE PNT

Personal computer side

@WRITE PNT c/r l/f

P0 = A, -7.00, 50 c/r l/f

P1 = I, 3.00, 50 c/r l/f

P2 = C, 35, 10 c/r l/f

^Z

Controller side

READY c/r l/f

OK c/r l/f

After editing, use the communication command @READ PNT to check the point data.

Transmission example

@READ PNT c/r l/f

Response

P0 = A, - 7.00, 50 c/r l/f

P1 = I, 3.00, 50 c/r l/f

P2 = C, 35, 10 c/r l/f

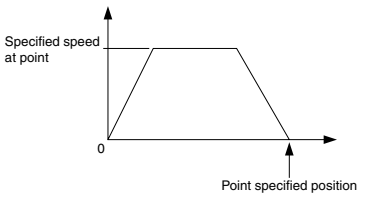
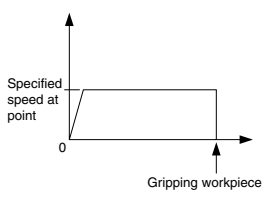
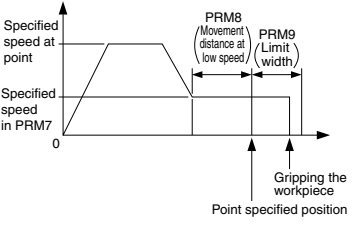
P5 = O, 20, 5 c/r l/f

P6 = U, -2.00, 35, 8 c/r l/f

OK c/r l/f

All the data that was input is read.

● Electric hand operation mode

Mode	Positioning		Gripping ^{Note}		Gripping with acceleration/deceleration movement
	Moves to the specified point with acceleration/deceleration, and then stops.		Operates at constant speed, and grips at the set force.		Performs gripping operation during acceleration/deceleration movement.
Setting value	A	I	C	O	U
Description	Moves to the specified point position in the coordinate system where the origin is 0.	Moves from the current position to the point specified position.	Operates to closing side.	Operates to opening side.	Moves to the specified point, and performs gripping operation at the speed set in PRM7 from the distance forward the point set in PRM8.
Operation pattern					
Remark	—		—		Suitable for soft gripping with high cycle operation

Caution: Gripping mode changes from C to O, and O to C cannot be performed.

4-6 How to use the size detecting function

4-6-1 When using an actual workpiece for size detecting range setting

Procedure	Communication command	Remark
① Execute return to origin.	@ORG	
② Place the minimum sample in place, and set the dimensions.	@GMIN C(O), speed, gripping force	Use HOLD ON to save the gripping position in PRM32.
③ Execute return to origin.	@ORG	
④ Place the maximum sample in place, and set the dimensions.	@GMAX C(O), speed, gripping force	Use HOLD ON to save the gripping position in PRM31.
⑤ Activate the size detecting function.	@WRITE PRM PRM33 = 1	PRM33 = 0 deactivates the size detecting function.

- With the above settings, the size detecting function activates from the next gripping operation (in O, C, and U modes).
(A and I modes are not covered by the function.)
- Use communication commands to specify the gripping direction at settings. (C: Closing direction, O: Opening direction)
- When the workpiece is gripped, HOLD turns ON, and satisfying the below,
Minimum sample dimension < Gripping dimension < Maximum sample dimension
INPOS turns ON, while at all other times INPOS remains in the OFF state.

Caution 1: When the minimum sample dimension = maximum sample dimension, or when the minimum sample dimension > maximum sample dimension, the size detecting function becomes invalid.

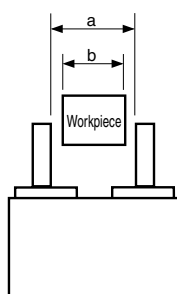
Caution 2: Set the value of PRM31 and PRM32 to be the same sign (+ or -). (When either of the two is 0, or when they are of opposite sign, the size detecting function becomes invalid.)

4-6-2 When using direct input for size detecting function setting

Procedure	Example of communication command	Remark
① Input the gripping position when gripping the minimum sample.	@WRITE PRM PRM32 = -500 ^Z	The gripping position of the minimum sample is assumed to be -5 mm [-0.197 in].
② Input the gripping position when gripping the maximum sample.	@WRITE PRM PRM31 = -450 ^Z	The gripping position of the maximum sample is assumed to be -4.5 mm [-0.177 in].
③ Activate the size detecting function.	@WRITE PRM PRM33 = 1 ^Z	PRM33 = 0 deactivates the size detecting function.

Caution: The values written in PRM31 and 32 are not workpiece dimensions. Instead, they are the gripped positions when gripping the workpiece. Input values based on calculations of the workpiece dimensions and the distance between fingers after executing return to origin, or input values based on the confirmed movement distance when gripping the workpiece (at @?POS).

[Method for calculation of the movement distance]



a: Distance between fingers after executing return to origin
b: Workpiece dimension

Gripping position = $-(a - b) / 2$

* In closing, the gripping position gives a negative value.

Caution: Regarding how to use the support software and teaching box, see the Owner's Manual for each.

4-7 Communication with personal computer

4-7-1 Communication parameter specifications

Make the communication parameter settings for a personal computer and other external devices in the following manner. Regarding how to make settings, see the instruction manual for each device.

■ Transmission rate	9600 bps	
■ Data bit length	8 bits	
■ Stop bit length	1 bit	
■ Parity check	On	
■ Parity setting	Odd parity (ODD)	
■ Control method (X parameter)	XON/XOFF software control method (Effective)	
■ Communication method	Full duplex	
■ Synchronous method	Asynchronous method	
■ Return key transmission	CR/LF code	
■ CR code reception	CR/LF reception	Return + line feed
	CR reception	Return

Setting method for Hyperterminal, as standard with Windows 95 to Windows XP* and later.

* Windows is the registered trademark of the U.S. Microsoft Corp.

1. Double-click on Hyperterm.exe.



2. Type a name, select an icon, and click "OK".



3. For the connection method, select "COM1" and click "OK".



4. Set the port and click "OK".



5. Click the "File", "Properties", and select "ASCII Setup", and then add a check mark as shown in the figure at right, and click "OK".



6. When starting up for the second time or later, double-click on the icon of the newly created file.



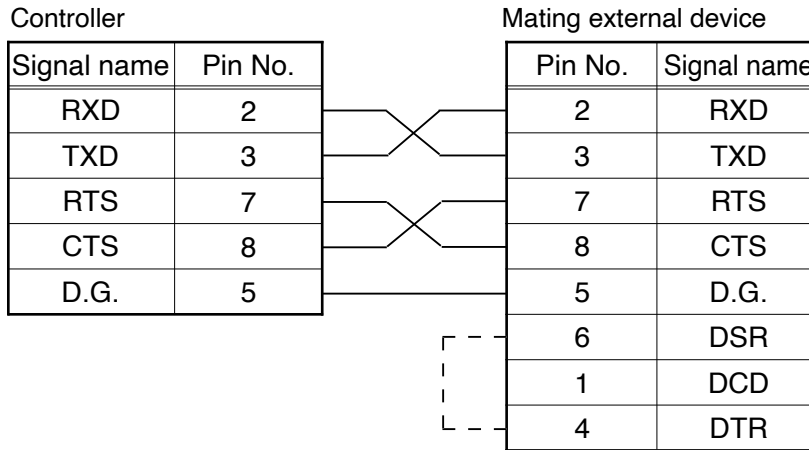
Note: If you want to input commands on Windows 7 or later, do the operations in the "Free Command Transmission Window" of the support software.

4-7-2 Communication cable

Applicable connector model

Applicable connector part No.: XM2D-0901 (OMRON-made) or equivalent products

Applicable connector cover part No.: XM2S-0911 (OMRON-made) or equivalent products



4-7-3 Communication commands

To facilitate communication with external devices, communication commands are as standard.

Communication commands are divided into the following 4 categories.

1. Robot language
2. Data handling
3. Utilities
4. Special codes

With the exception of the special codes, the format for communication commands is as follows.

@<Operation code>[<Operand 1>][,<Operand 2>][,<Operand 3>][,<Operand 4>]c/r l/f

- Basically, communication commands are executed by sending 1 line that begins with the start code '@' (=40H) and ends with the code c/r (=0DH) l/f (=0AH) to the controller. The special codes, however, do not require the start code and c/r l/f.
- Communication commands are composed of operation codes and operands. Depending on the command, either no operand is used or up to a maximum of 4 operands are used. The brackets [] refer to items that can be omitted.
- The character codes used are the JIS8 level codes (ASCII codes with katakana characters added). Input characters can be either capital letters or lower case letters.
- At least 1 space must be inserted between the operation code and the operand.
- Items with the < > mark (angle brackets) in the operand should be specified by you. Check the details of each communication command, and enter appropriate data. (See sub-section "4-7-4 List of communication commands" on P. 21.)
- When entering 2 or more operands, insert a comma "," between them.

4-7-4 List of communication commands

Classification	Command	Operand 1	Operand 2	Operand 3	Command description
Actuator operation	ORG				Returns to origin
	MOVD	Coordinate value (mm)	Speed (mm/s)		Executes coordinate specified movement
	MOVH	Coordinate value (mm)	Speed (mm/s)	Force	Executes coordinate specified gripping operation
	MOVP	Point No.			Moves to the specified point
	GMIN	Gripping direction	Speed (mm/s)	Force	Setting of minimum sample gripping position for the size detecting function
	GMAX	Gripping direction	Speed (mm/s)	Force	Setting of maximum sample gripping position for the size detecting function
	X +				(+) movement by specified distance
	X-				(-) movement by specified distance
	XINC				(+) movement at constant speed
	XDEC				(-) movement at constant speed
	SRVO	Switch			Energizes motor
Data handling	?POS				Reads current position
	?PNO				Reads current point No.
	?PRM	Parameter No.			Reads specified parameter
	?P	Point No.			Reads specified point data
	?ORG				Confirms return to origin
	?SRVO				Confirms motor energized state
	?VER				Reads version number
	READ	PNT			Reads all point data
		PRM			Reads all parameters
		DIO			Reads I/O states
		ERR			Reads error history records
	WRITE	PNT			Writes all point data
		PRM			Writes all parameters
	PDEL	Point No.	Number of points		Deletes point data
Utility	INIT	PNT			Initializes all point data
		PRM	Actuator No.		Initializes all parameters
		ERR			Initializes error history
		ORG			Initializes origin position data

Classification	Code	Command description
Special code	^C(=03H)	Interrupts ORG, XINC, XDEC
	^Z (=1AH)	Ends data transmission

Classification	Response	Description
Response from the controller	OK	Normal completion of operation
	NG	Error occurred
		Contents of error at the next line (within 20 characters)
	STOP	Stop command Stopped cause at the next line (within 20 characters)
	READY	Completion of writing preparation

4-7-5 Details of communication commands

(1) @ORG

Function	Execute return to origin.
Format	@ORG c/r l/f
Transmission example	@ORG c/r l/f
Response	OK c/r l/f

(2) @MOVD

Function	Performs positioning to the specified position (absolute position of origin reference) at the specified speed (speed on one side of the moving part).
Format	@MOVD position, speed c/r l/f
Transmission example 1	@MOVD 3.5, 35c/r l/f
Response	OK c/r l/f
Explanation	Moves at speed of 35 mm/s [1.378 in/sec] to the 3.5 mm [0.138 in] position from the origin.
Transmission example 2	@MOVD 11,20 c/r l/f
Response	NG c/r l/f 23: Data error c/r l/f
Explanation	Data beyond the limit of the software cannot be entered.

(3) @MOVH

Function	Performs gripping operation at the specified speed (speed on one side of the moving part) and gripping force in direction to the specified position (absolute position of origin reference). (Mode U operation, see P. 17.)
Format	@MOVH position, speed, force c/r l/f
Transmission example 1	@MOVH 3.5, 35, 6 c/r l/f
Response	OK c/r l/f
Explanation	This command performs the gripping operation to the 3.5 mm [0.138 in] position from the origin at 35 mm/s [1.378 in/sec] speed with a gripping force of 6.
Transmission example 2	@MOVH 3.5, 30, 6 c/r l/f
Response	NG c/r l/f 64: Stop limit c/r l/f
Explanation	This means that the gripping was unable to be performed.

(4) @MOVP

Function	Operates by using the specified POS No. data.
Format	@MOVP point No. c/r l/f
Transmission example 1	@MOVP 2 c/r l/f
Response	OK c/r l/f
Explanation	Performs operation specified at POS2.
Transmission example 2	@MOVP 12 c/r l/f
Response	NG c/r l/f 52: No point data c/r l/f
Explanation	No data at the point specified by POS12, causing an error.

(5) @GMIN (@GMAX)

Function	Sets the gripping position for the minimum sample (maximumsample) when using the size detecting function.
Format	@GMIN gripping direction, speed, gripping force c/r l/f
Transmission example	@GMIN C, 35, 10 c/r l/f
Response 1	OK c/r l/f
Explanation 1	This means normal gripping, and setting complete.
Response 2	NG c/r l/f 64: Stop limit c/r l/f
Explanation 2	This means that the unit was unable to grip, and the setting failed.


(6) @X+ (@X-)

Function	Moves by only the specified distance to (+) side “opening direction” ((-) side “closing direction”) at the speed shown below. Movement distance = PRM25/100 [mm] Moving speed = PRM24 [mm/s]
Format	@X+ c/r l/f
Transmission example	@X+ c/r l/f
Response	OK c/r l/f

(7) @XINC (@XDEC)

Function	Moves continuously at the speed shown in the following equation to (+) side “opening direction” ((-) side “closing direction”). Stops when ^C is input or the tooling reaches the software limit. Moving speed = PRM24 [mm/s]
Format	@XINC c/r l/f
Transmission example	@XINC c/r l/f
Response 1	STOP c/r l/f 63: Stop command c/r l/f
Response 2	STOP c/r l/f 64: Stop limit c/r l/f

(8) @SRVO

Function	Commands either for energizing the motor, or for de-energizing the motor.
Format	@SRVO switch c/r l/f 
Transmission example	@SRVO 1 c/r l/f
Response	OK c/r l/f

(9) @?VER

Function	Checks the controller software version No.
Format	@?VER c/r l/f
Transmission example	@?VER c/r l/f
Response	1.01 c/r l/f OK c/r l/f

(10) @?POS

Function	Reads the current position.
Format	@?POS c/r l/f
Transmission example	@?POS c/r l/f
Response	5.67 c/r l/f Current position is 5.67 mm [0.223 in] from the origin. OK c/r l/f

(11) @?PNO

Function	Reads the current point No.
Format	@?PNO c/r l/f
Transmission example	@?PNO c/r l/f
Response	2 c/r l/f Point No. is 2. OK c/r l/f

(12) @?PRM

Function	Reads the specified parameter.
Format	@?PRM parameter No. c/r l/f
Transmission example	@?PRM 25 c/r l/f
Response	100 c/r l/f OK c/r l/f

(13) @?P

Function	Reads the specified point data.
Format	@?P point No. c/r l/f
Transmission example	@?P 10 c/r l/f
Response	A, 5.00, 35 c/r l/f Absolute position of 5 mm [0.197 in], speed of 35 mm/s [1.378 in/sec] OK c/r l/f
Explanation	For the contents of the response data, see P.16.

(14) @?ORG

Function	Confirms whether return to origin has been completed or not.
Format	@?ORG c/r l/f
Transmission example	@?ORG c/r l/f
Response 1	0 c/r l/f Return to origin not completed OK c/r l/f
Response 2	1 c/r l/f Return to origin completed OK c/r l/f

(15) @?SRVO

Function	Can confirm the motor energized state.
Format	@?SRVO c/r l/f
Transmission example	@?SRVO c/r l/f
Response 1	0 c/r l/f De-energized state OK c/r l/f
Response 2	1 c/r l/f Energized state OK c/r l/f

(16) @READ PNT

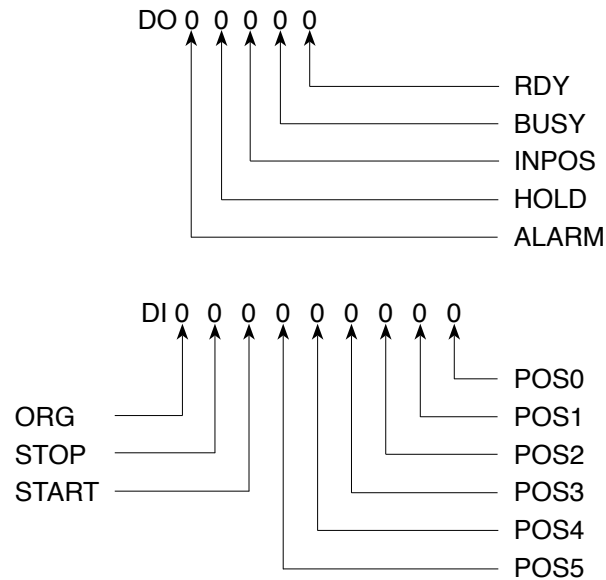
Function	Reads all point data.
Format	@READ PNT c/r l/f
Transmission example	@READ PNT c/r l/f
Response	P0 = A, 6.00, 15, 0 c/r l/f P1 = U, 3.00, 35, 8 c/r l/f P2 = A, 6.00, 5, 0 c/r l/f P5 = C, 20, 5 c/r l/f OK c/r l/f Reads all data that has been entered.
Explanation	For the contents of the response data, see P.16.

(17) @READ PRM

Function	Reads all parameter data.
Format	@READ PRM c/r l/f
Transmission example	@READ PRM c/r l/f
Response	PRM0 = 84 c/r l/f PRM1 = 20 c/r l/f PRM2 = -700 c/r l/f . . PRM63 = 1 c/r l/f OK c/r l/f

(18) @READ DIO

Function	Reads custom input/output status.
Format	@READ DIO c/r l/f
Transmission example	@READ DIO c/r l/f
Response	DO 00000 c/r l/f DI 000000000 c/r l/f OK c/r l/f
Explanation	Contents of response data are shown below.



(19) @READ ERR

Function	Reads error history records. (Up to the latest 16 records. The latest record is displayed in the bottom line.)	
Format	@READ ERR c/r l/f	
Transmission example	@READ ERR c/f l/f	
Response	32: Origin return not completed c/r l/f 01: Overload c/r l/f 03: Overheat c/r l/f OK c/r l/f	

(20) @WRITE PNT

Function	Writes point data.	
Format	@WRITE PNT c/r l/f	
Transmission example	Personal computer side	Controller side
	@WRITE PNT c/r l/f	
		READY c/r l/f
	P0 = A, 6.00, 35 c/r l/f	
	P1 = U, 3.00, 15, 8 c/r l/f	
	^Z	
		OK c/r l/f
Explanation	For the data format, see P.16.	

(21) @WRITE PRM

Function	Writes parameters.	
Format	@WRITE PRM c/r l/f	
Transmission example	Personal computer side	Controller side
	@WRITE PRM c/r l/f	
		READY c/r l/f
	PRM1 = 10 c/r l/f	
	PRM2 = -600 c/r l/f	
	^Z	
		OK c/r l/f
	Sends the only data that requires changes.	

(22) @PDEL

Function	Deletes point data from the specified "Point No." by the number shown as "number of points."	
Format	@PDEL, point No., number of points c/r l/f	
Transmission example	@PDEL 10, 5 c/r l/f	
Response	OK c/r l/f	

(23) @INIT PNT

Function	Deletes all point data.
Format	@INIT PNT c/r l/f
Transmission example	@INIT PNT c/r l/f
Response	OK c/r l/f

(24) @INIT PRM

Function Resets parameters to their initial values.
 Format @INIT PRM actuator No. c/r l/f
 Transmission example @INIT PRM 84 c/r l/f
 Response OK c/r l/f

- * The first 2 digits in the serial No. on the actuator unit are the actuator No.
 Check the actuator No. on the actuator unit, and then initialize the parameters.
 When executing INIT PRM, the origin position data is also initialized.

Type	Actuator No.
EWHA12A	84
EWHA24A	85
EWHA36A	86
EWHA6H	87
EWHA12H	88
EWHA24H	89
EWHA36H	90

(25) @INIT ORG

Function Initializes the origin position data. Execute this command when the actuator unit was replaced during use.
 Format @INIT ORG c/r l/f
 Transmission example @INIT ORG c/r l/f
 Response OK c/r l/f

(26) @INIT ERR

Function Deletes all error history.
 Format @INIT ERR c/r l/f
 Transmission example @INIT ERR c/r l/f
 Response OK c/r l/f

4-8 Parameters

The controller does not have any potentiometer, dip switch, or any other hardware adjustment mechanism.

Instead, it uses parameters that can easily be set through a personal computer.

This section describes how to change and set the parameters, and gives details of each parameter.

Safety

Because software is used to detect motor overload and other abnormalities, the controller parameters must be set correctly to match the connected actuator.

When the controller was shipped with the actuator as a set, the controller parameters had already been initialized to match the then shipped actuator, but in any case other than that, first set the actuator No. in accordance with the using actuator before operating the controller. If any problem is found, please contact us.

Caution:

Changing parameters other than those described in this manual could result in fatal damage or defects in the actuator and controller.

4-8-1 Parameter setting method

Parameter editing is performed via the RS232C port on the personal computer. For communication parameters and cable specifications, see section "4-7 Communication with a personal computer" on P. 19.

The editing parameter is carried out by using general-purpose communication software or dedicated support software.

For instructions of the software, see the separately available support software Owners' Manual.

Parameter edit commands

@WRITE PRM

Function	Writes parameters.	
Format	@WRITE PRM c/r l/f	
Transmission example	Personal computer side	Controller side
	@WRITE PRM c/r l/f	READY c/r l/f
	PRM1 = 10 c/r l/f	
	PRM2 = -600 c/r l/f	
	^Z	
		OK c/r l/f
	Sends the only data that requires changes.	

After editing, read and check the parameter data.

@READ PRM

Function	Reads all parameter data.
Format	@READ PRM c/r l/f
Transmission example	@READ PRM c/r l/f
Response	PRM0 = 84 c/r l/f
	PRM1 = 20 c/r l/f
	PRM2 = -700 c/r l/f
	.
	.
	PRM63 = 1 c/r l/f
	OK c/r l/f

4-8-2 Explanation of parameters

- PRM0: Actuator No.
Displays the actuator No. This parameter is only for reading.
- PRM1: (+) software limit
Sets the (+) side actuator movement range. (Only effective in the A, I, C, or O operation mode.)
For safety, always set a suitable value.
Input range 0 ~ 9999 (×0.01mm)
Initial value 20
- PRM2: (–)software limit
Sets the (–) side actuator movement range. (Only effective in the A, I, C, or O operation mode.)
For safety, always set a suitable value.
Input range – 9999 ~ 0 (×0.01mm)
Initial value
- | Actuator No. | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
|---------------|------|-------|-------|------|-------|-------|-------|
| Initial value | –700 | –1000 | –1000 | –700 | –1100 | –1300 | –1300 |
- PRM4: Acceleration
Sets the acceleration. When lower acceleration is required, change this parameter.
Input range 1 ~ 100 (%)
Initial value 100
- PRM5: Origin return direction
Sets the origin return direction. Normally, selecting 0 sets the origin return on the opening side, and selecting 1 sets the origin return on the closing side.
Input range 0, 1
Meaning 0: Opening side 1: Closing side
Initial value 0
- PRM7: Gripping speed
Sets the gripping speed in the U mode. The speed is for one side of the moving part.
Input range
- | Actuator No. | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------------------------|-----------------------|-----------------------|
| Input range
(mm/s [in/sec]) | 1~35
[0.039~1.378] | 1~10
[0.039~0.394] | 1~10
[0.039~0.394] | 1~50
[0.039~1.969] | 1~35 ^{Note}
[0.039~1.378] | 1~20
[0.039~0.787] | 1~10
[0.039~0.394] |
- Note: The maximum speed for gripping levels 1 to 5 is 10 mm/s [0.394 in/sec].
Initial value 10 [0.394]
- PRM8: Low-speed movement distance
Sets the distance at low-speed movement from the position forward of the point specified in the U mode. (See P. 17.)
Input range 1 ~ 9999 (×0.01mm)
Initial value 200
- PRM9: Limit width
Sets the range where gripping is performed from the position specified in the U mode. (See P. 17.)
When the movement distance exceeds the limit width during gripping operation, an alarm is issued.
Input range 1 ~ 9999 (×0.01mm)
Initial value 200
- PRM10: Origin return speed
Sets the speed when executing return to origin. The speed is for one side of the moving part.
Input range 1 ~ 15 [0.039 ~ 0.591] (mm/s [in/sec])
Initial value 5 [0.197]
- PRM22: Selecting English or Japanese
Sets the language used for response messages in the communication.
Input range 0, 1
Meaning 0: English 1: Japanese
Initial value 1

- PRM24:** Moving speed when teaching
Parameter for specifying the speed during movement by the communication command @X+, @X-, @XINC, or @XDEC.
This is also used during teaching playback for point. The speed is for one side of the moving part.
Input range 1 ~ 15 [0.039 ~ 0.591] (mm/s [in/sec])
Initial value 5 [0.197]
- PRM25:** Movement distance when teaching
Sets the movement distance with the communication commands @X+ and @X-.
Input range 1 ~ 9999 (x0.01 mm)
Initial value 10
- PRM26:** Gripping force during teaching movement
Sets the gripping force during movement by the communication command @X+, @X-, @XINC, or @XDEC.
Input range 1 ~ 10
Initial value 5
- PRM30:** Maximum speed
Sets the maximum speed when the communication commands (@MOVD, or @MOVH), or the custom command (START) is being executed. The speed is for one side of the moving part.
Input range 1 ~ 100 (%)
Initial value 100
- Maximum speed during execution = $\frac{\text{Command setting speed} \times \text{PRM30}}{100}$ (mm/s)
- PRM31:** Maximum sample gripping position
Sets the gripping position when gripping a maximum sample on use of the size detecting function. (Initial value: 0)
- (X0.01mm)
- | Actuator No. | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
|--------------|----------|------------|------------|----------|------------|------------|------------|
| Input range | -700~700 | -1000~1000 | -1000~1000 | -700~700 | -1100~1100 | -1300~1300 | -1300~1300 |
- PRM32:** Minimum sample gripping position
Sets the gripping position when gripping a minimum sample on use of the size detecting function. (Initial value: 0)
- (X0.01mm)
- | Actuator No. | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
|--------------|----------|------------|------------|----------|------------|------------|------------|
| Input range | -700~700 | -1000~1000 | -1000~1000 | -700~700 | -1100~1100 | -1300~1300 | -1300~1300 |
- PRM33:** Size detecting function
Switches between enabling/disabling the size detecting function.
Input range 0, 1
Meaning 0: Function disabled 1: Function enabled
Initial value 0
- PRM35:** Origin shift distance
This sets the virtual origin. Always execute return to origin after settings. When executing return to origin, the Electric Hand temporarily returns to its mechanical origin and moves to the value set for the origin shift distance to complete return to origin. and its position becomes 0. For example, if an unwanted position shift occurred, it is ordinarily necessary to perform re-teaching for all point data. However, by setting this parameter to the value of the position shift amount, the operator can quickly correct the point data while eliminating the time required for re-teaching.
Input range -32768 ~ 32767 (x0.01mm)
Initial value 0
- PRM36:** Origin shift speed
Sets the speed for origin shift. The speed setting is for one side of the moving part.
Input range 1 ~ 15 [0.039 ~ 0.591] (mm/s [in/sec])
Initial value 5 [0.197]

4-9 Message list

4-9-1 Error messages

(1) Command error

Error No.	Item	Description
21	Message	illegal type
	Cause	Erroneous command
	Remedy	Use the correct command.
23	Message	data error
	Cause	Error in the numerical data
	Remedy	Correct the data.
24	Message	Overrun error
	Cause	Error in the transferred data
	Remedy	Send the correct command
25	Message	Framing error
	Cause	Error in the transferred data
	Remedy	Send the correct command

(2) Operation error

Error No.	Item	Description
31	Message	running
	Cause	Another command is already being executed, and the command cannot be accepted.
	Remedy	Wait until the current command finishes before inputting the new command.
32	Message	origin incomplete
	Cause	Command cannot be executed because the origin return has not been completed.
	Remedy	Execute origin return.
34	Message	servo off
	Cause	Command cannot be executed because the motor is in a free (servo off) state.
	Remedy	Return the motor to normal.
35	Message	can't execute
	Cause	The parameter is against the operation command.
	Remedy	Change the parameter or point data.
37	Message	too long
	Cause	The position to be moved is over the software limit.
	Remedy	Change the point data.

(3) System error

Error No.	Item	Description
52	Message	no point data
	Cause	No data has been registered at the specified point No.
	Remedy	Register the point data.
53	Message	no actuator type
	Cause	Setting error in actuator No.
	Remedy	Check the actuator No., and try the initialization again.
56	Message	Data protect
	Cause	Attempted to write to a parameter that is write-protected
	Remedy	Writing is allowed only to parameters that are write-enabled
57	Message	No parameter
	Cause	Attempted to read a parameter number that is not registered
	Remedy	Read a registered parameter number
58	Message	Data save in progress
	Cause	Attempt to perform another write operation while writing to non-volatile memory
	Remedy	Wait until writing to non-volatile memory is complete before writing

(4) Stop message

Error No.	Item	Description
61	Message	stop command
	Meaning	Execution has stopped due to the stop command.
63	Message	stop on
	Meaning	Execution has stopped due to the entry of a STOP input from I/O.
64	Message	limit stop
	Meaning	Stops at the limit position.

Chapter 5 Troubleshooting

5-1 If a problem occurs

When informing Koganei of a trouble, please provide as detailed information as possible about the following items.

Item	Description (Example)
What?	Controller model Actuator model Power supply
When?	Time of purchase (serial No.) Period of use, conditions of operation Did it happen when the power was turned on, or 1 hour after the power was turned on?
Under what conditions?	During operation The position of the Electric Hand'tooling when the problem occurred
What happened?	Actuator does not move. Alarm is issued.
How frequently?	All the time About once an hour It cannot be reproduced.

5-2 Remedy for alarm

When the READY output is OFF, an alarm is assumed to have been issued. In addition, when an alarm is issued, the ALM LED on the front of the controller lights up.

When an alarm has been issued, turn the power off once, and then turn on the power supply again after first eliminating the trouble causing the alarm.

5-3 Alarm specifications

The transmission format for an alarm message is as follows.

```
<Alarm No.>: <Alarm message> c/r l/f
```

When confirming the alarm contents

To confirm the contents of the alarm, connect to a personal computer using a communication cable, and then enter @READ ERR command. (See P. 26.)

5-3-1 Alarm message list

Alarm No.	Alarm message	Meaning	Probable cause	Remedy
01	overload	<ul style="list-style-type: none"> Excessive load Cable disconnection 	1) Problem with the application 2) Motor and/or encoder cable' broken wire or defective connection 3) Mechanical lock 4) Gripping at over the grip range in the U mode 5) Too much friction in the actuator unit	1) Reduce the acceleration. 2) Check the cable continuity. 3) Check whether or not the moving part of the actuator is in mechanical lock. 4) Recheck the point data, low speed movement distance, and limit width. 5) Check whether or not the friction resistance of the moving part of the actuator is too high, and adjust correctly.
03	overheat	Temperature rise in the circuitry	1) Overcurrent 2) Short circuit in cables	Check cables.
04 ^{Note}	Power supply voltage drop	Power supply (24 VDC) input voltage is too low	Setting mistake for power supply voltage value Power supply is unstable	Raise the power supply voltage Use a stable power supply
05	voltage over	Excessive input voltage	Power supply	Reduce the power supply voltage.
06	disconnection	<ul style="list-style-type: none"> Excessive load during return to origin Cable disconnection 	1) Motor and/or encoder cable' broken wire or defective connection 2) Mechanical lock	1) Check the cable continuity. 2) Check whether or not the moving part of the actuator is in mechanical lock.
08	point data error	Point data has been damaged.	Power supply was turned off while writing data.	Turn on the power supply again, and perform initialization for the point data.
09	param data error	Parameter data has been damaged.	Power supply was turned off while writing data.	Turn on the power supply again, and perform initialization for the parameter data.

Note: The Alarm No. 4 power supply voltage drop, as well as when the power (24 VDC) is turned off normally, may output an alarm message. Furthermore, it is not recorded in the error history.

Chapter 6 Specifications

6-1 Basic specifications of the main unit

Item	Model	EWHA12A	EWHA24A	EWHA36A	EWHA6H	EWHA12H	EWHA24H	EWHA36H
Motor		2-phase stepping motor						
Maximum speed (when in one-sided positioning mode) mm/s [in/sec]		70 [2.756]	35 [1.378]	24 [0.945]	140 [5.5]	180 [7.1]	120 [4.7]	100 [3.9]
Maximum speed (when in one-sided gripping mode) mm/s [in/sec]		35 [1.378]	10 [0.394]	10 [0.394]	50 [1.969]	35(10) ^{Note1} [1.378(0.394)]	20 [0.787]	10 [0.394]
Minimum speed (one side) mm/s [in/sec]		1 [0.039]						
Maximum gripping force ^{Note2} N [lbf]		12~17 [2.698~3.822]	22~35 [4.946~7.868]	33~47 [7.419~10.566]	5~9 [1.124~2.023]	11~16 [2.473~3.597]	22~32 [4.946~7.194]	34~46 [7.644~10.341]
Operating temperature range °C [°F]		0~40 [0~104]						
Open/closed stroke mm [in]		14 [0.551] (One side 7 mm [0.276 in])	20 [0.787] (One side 10 mm [0.394 in])		14 [0.551] (One side 7 mm [0.276 in])	22 [0.866] (One side 11 mm [0.433 in])	26 [1.024] (One side 13 mm [0.512 in])	
Repeatability mm [in]		±0.03	±0.05		±0.03		±0.05	
Maximum payload (both sides) kg [lb]		0.3 [0.661]	0.5 [1.102]		0.2 [0.441]	0.3 [0.661]	0.5 [1.102]	
Mass kg [lb]		0.17 [0.375]	0.26 [0.573]		0.15 [0.331]	0.29 [0.639]	0.35 [0.772]	0.36 [0.794]
Applicable controller		EWHC-NH						

Note 1: The maximum speed for gripping levels 1 to 5 is 10 mm/sec [0.394 in/sec] for EWHA12H only.

2: For details of the gripping force, see the graphs on P.41.

6-2 Basic specifications of the controller

Item \ Model	EWHC-NH
Axis control	Motor drive method
	Microstep drive
	Control method
	Closed loop control ^{Note1}
	Operating method
	PTP, force control
	Origin detection method
	Detection at the stroke end
	Position detection method
External input/output	Encoder A, B phase output
	Minimum setting distance
	0.01mm
	Acceleration setting
	1 ~ 100%
	Point setting
	64 points
	Point input method
	Numeric input, teaching input, direct teaching
General specifications	Point setting input
	6 inputs, photocoupler reception, 5mA TYP/1 input
	Control input
	3 inputs (ORG, START, STOP) photocoupler reception, 5mA TYP/1 input
	Control output
	4 outputs (READY, BUSY, HOLD, INPOS), 30mA MAX./1 output
	Abnormality detection output
	Overload, disconnection, incorrect data, system abnormality
	External communications
	RS232C 1ch (Communication with personal computer or teaching box)
	Motor drive output
	Dedicated cable (with F.G.)
	Encoder input
	Dedicated cable (with shield)
	Mass
	0.2 kg [0.441 lb]
	Power supply
	24VDC±10%, 1.0A MAX. (Motor and I/O share the same power supply.) ^{Note2}
	Operating temperature
	0 ~ 40°C [0 ~ 104°F]
	Operating humidity
	35 ~ 85%RH (no condensation)
	Storage temperature
	-10 ~ 65°C [-50 ~ 149°F]
	Back-up
	EEPROM used to maintain setting conditions
	Noise resistance
	IEC61000 -4-4 level 3
	Accessories
	I/O cable, power cable

Note 1: Control of the force when gripping and step out detection through a rotary encoder (force control for EWHC-NH only).

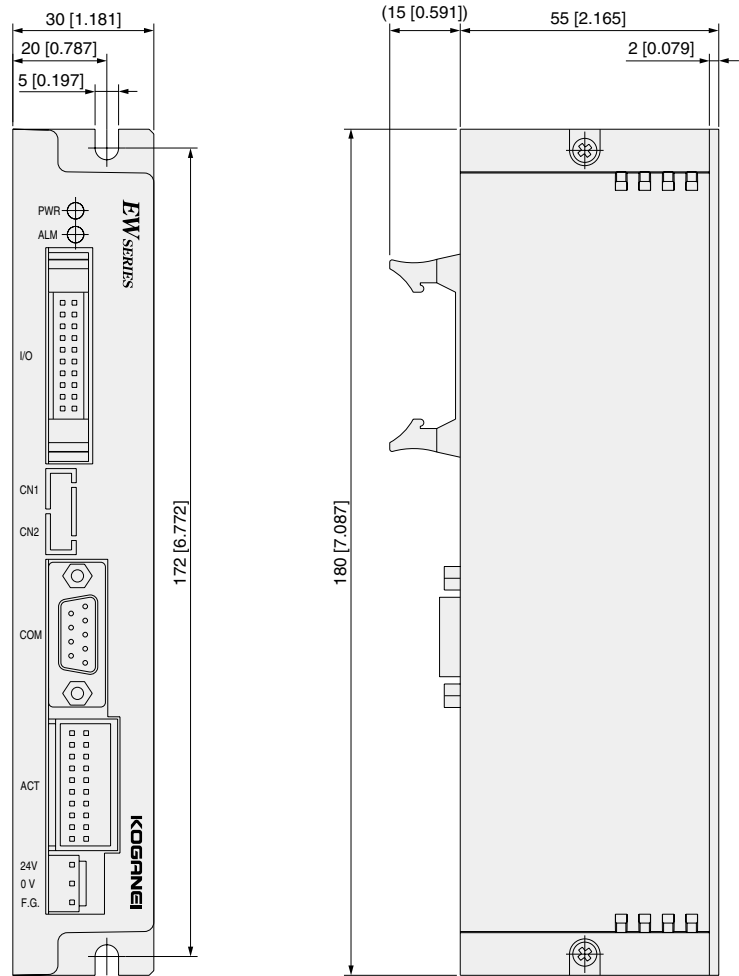
2: Maximum consumed current varies depending on the actuator. See the following table.

Maximum consumed current (electric hand)

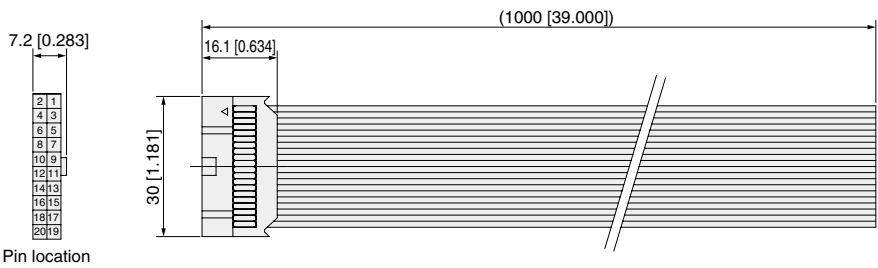
(A)

Model	EWHA12A	EWHA24A	EWHA36A	EWHA6H	EWHA12H	EWHA24H	EWHA36H
Maximum consumed current	0.6				1.0		

7-2 Controller

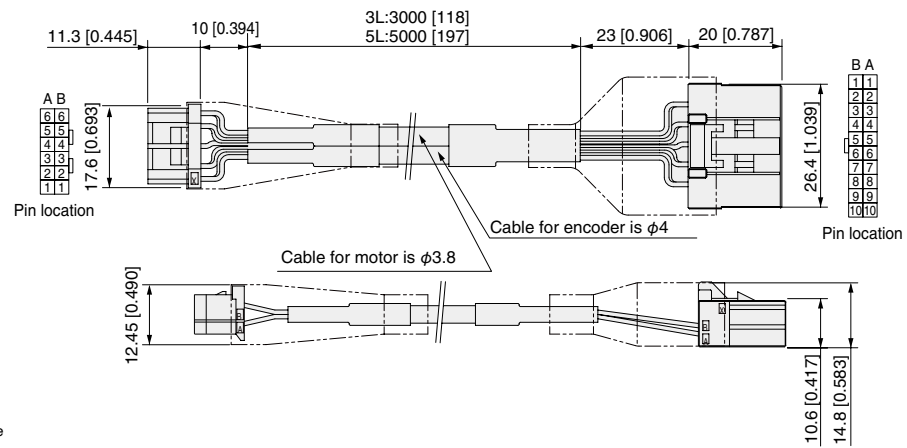


I/O cable supplied with the controller



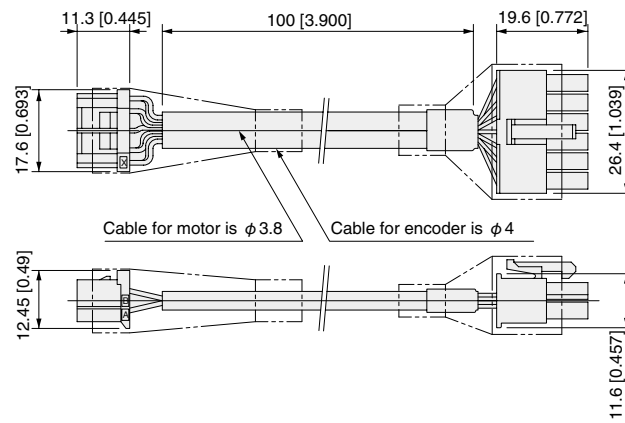
- Relay cable

EWHKA- ☐



- Conversion cable^{Note}

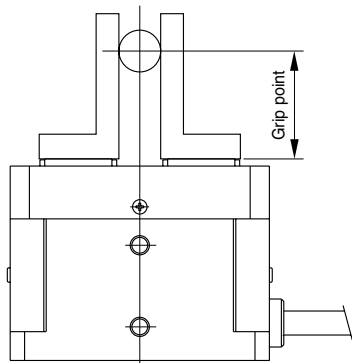
EWTK



Note: Conversion cable is to be connected to the EWHA ☐ A and the EWHK- ☐ (old cable).

Chapter 8 Technical Data

8-1 Limits on gripping force at grip points



* Set the gripping force at the grip points within the range shown in the graph at right.

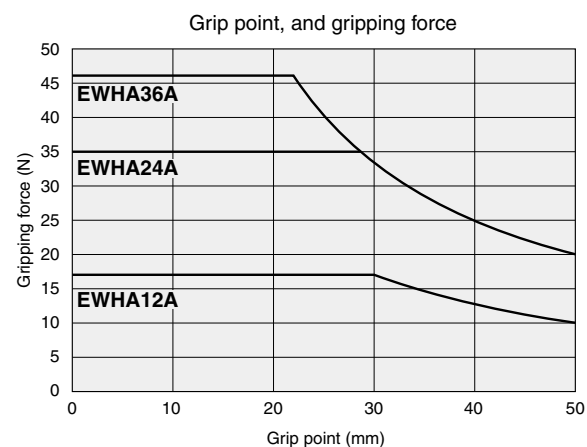
Allowable moment

- EWHA12A: 0.51 N·m [4.514 in·lbf]
- EWHA24A,36A: 1.0 N·m [8.851 in·lbf]
- EWHA6H: 0.26 N·m [2.301 in·lbf]
- EWHA12H: 0.57 N·m [5.045 in·lbf]
- EWHA24H,36H: 0.9 N·m [7.966 in·lbf]

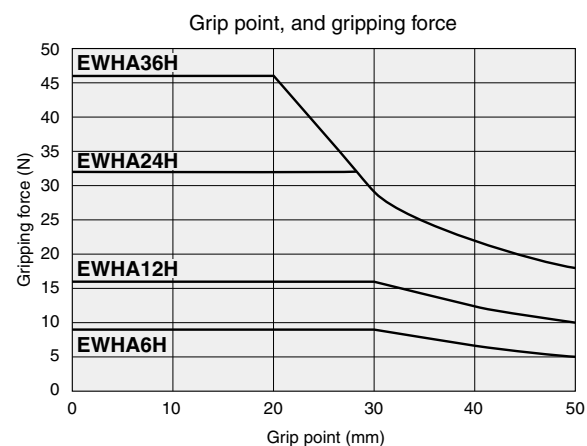
[Standard type]

1mm = 0.039 in

1N = 0.225 lbf



[High-speed type]



8-2 Range of gripping force

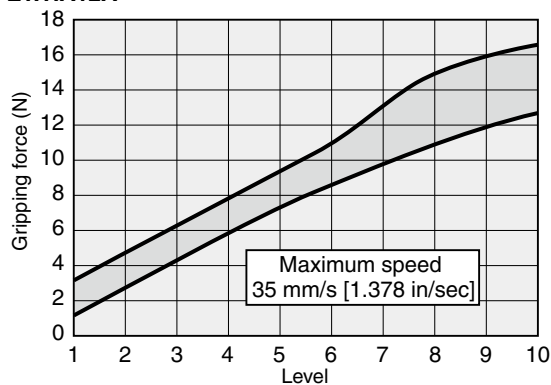
Forces are generated within the range shown in the graphs below at each set level.

Note that the gripping force repeatability at the same position is 5% or less.

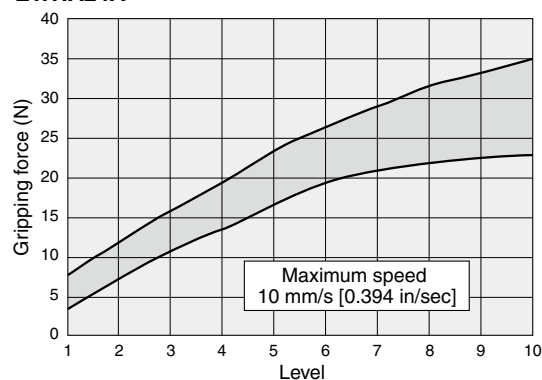
1N = 0.225 lbf

[Standard type]

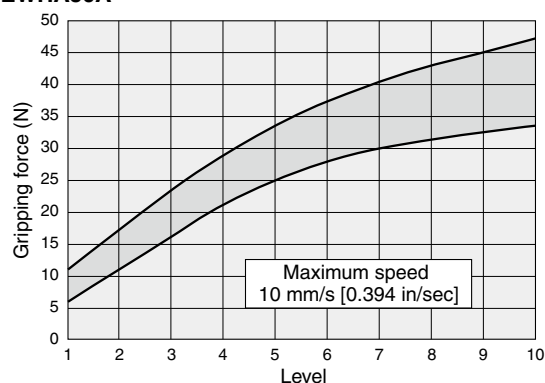
EWHA12A



EWHA24A

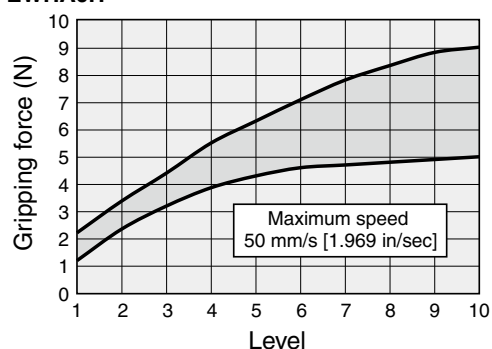


EWHA36A

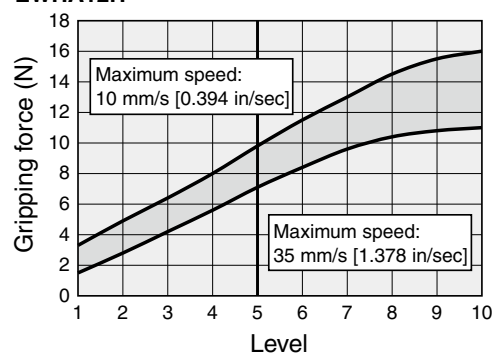


[High-speed type]

EWHA6H

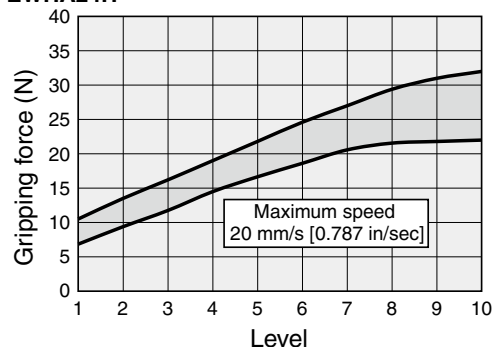


EWHA12H

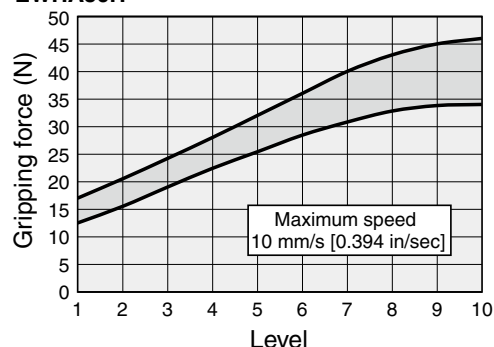


* The maximum speed up to level 5 is 10 mm/s [0.394 in/sec].

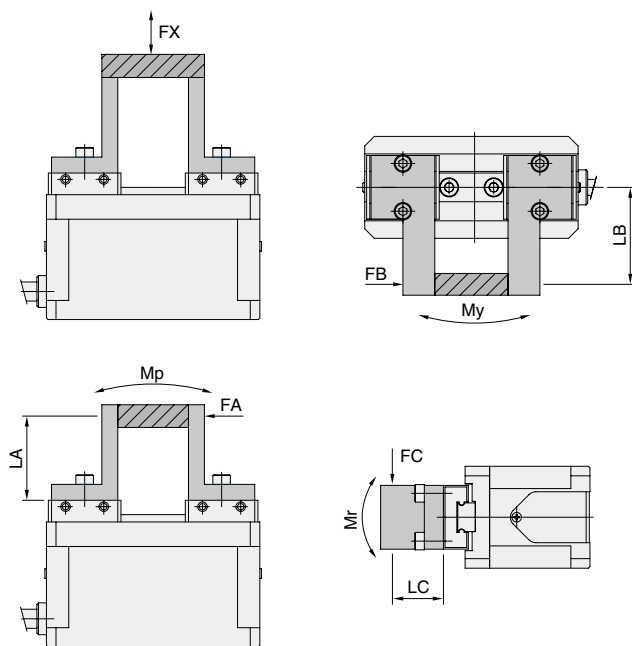
EWHA24H



EWHA36H



8-3 Allowable load and allowable moment



- $M_p = F_A \times L_A$ (N·m)
- $M_y = F_B \times L_B$ (N·m)
- $M_r = F_C \times L_C$ (N·m)

[Standard type]

Load and moment Model	FX N [lbf]	Mp N·m [in·lbf]	My N·m [in·lbf]	Mr N·m [in·lbf]
EWHA12A	40 [8.992]	0.51 [4.514]	0.3 [2.655]	0.6 [5.311]
EWHA24A EWHA36A	120 [27.0]	1.0 [8.851]	1.0 [8.851]	2.0 [17.702]

[High-speed type]

Load and moment Model	FX N [lbf]	Mp N·m [in·lbf]	My N·m [in·lbf]	Mr N·m [in·lbf]
EWHA6H	59 [13.264]	0.26 [2.301]	0.26 [2.301]	0.46 [4.071]
EWHA12H	118 [26.5]	0.57 [5.045]	0.48 [4.248]	1.29 [11.418]
EWHA24H EWHA36H	154 [34.6]	0.9 [7.966]	0.75 [6.638]	2.16 [19.118]

Revision History

Ver.2.0

Changed main unit models and relay cable models in line with changes to main unit connector specifications, on all pages. Changed dimensions in diagram of main unit.

Added main unit models.

Corrected dimensions of positioning pin hole for EWHA24H and EWHA36H on page 37.

Added CE compliance mark.

Corrected power supply and current values in 4-2-2 (1) on page 7.

Corrected wiring dimensions in (3) on page 12.

Corrected typographical error in 4-5 on page 16.

Corrected main unit dimensions on page 36.

Corrected main unit dimensions on page 37.

Changed external view of relay cable on page 39.

Corrected models on page 42.

General specifications of 「Controller Basic Specifications」 Noise resistance revised on page 35.

If you have questions about the contents of this manual, or
about other technical issues, please consult the OVERSEAS DEPARTMENT
at the address and telephone number shown below.

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ELEWAVE SERIES ELECTRIC HAND

With point input type controller
OWNER'S MANUAL

Aug. 2022 Ver.2.0 X435045

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