

KOGANEI



ELEWAVE SERIES
ELECTRIC ROTARY ACTUATOR
Pulse train input type controller

OWNER'S MANUAL Ver.1.0

[Main Units]

EWHRT1A

EWHRT3A

EWHRT5A

EWHRT10A

EWHRT20A

EWHRT40A

EWHRT60A

[Controllers]

EWHCP-RS

EWHCP-RA

Contents

Chapter 1 Safety Precautions

1-1 Safety	2
1-2 Precautions	2

Chapter 2 System Configuration

2-1 Overview	3
2-2 Entire system configuration	3
2-3 Options and Accessories	4
2-4 Setting up for operation	5

Chapter 3 Main Unit

3-1 Handling main unit	6
3-1-1 Precautions	6
3-2 Mounting	
3-2-1 Mounting the main unit	6
3-2-2 Mounting a workpiece	7

Chapter 4 Controller

4-1 Appearance and functions	8
4-2 Installation and connection to external equipment	9
4-2-1 Controller installation	9
4-2-2 Grounding	9
4-3 Installation	9
4-3-1 The connector pin number table	9
4-3-2 Power source connection method	9
4-4 Connecting to the actuator	10
4-4-1 Input/Output signal list	10
4-5 I/O interface	10
4-5-1 Input/output circuits	10
4-5-2 Input/output circuits	12
4-5-3 Input signal details	12
4-5-4 Output signal details	14
4-6 Connection of Pulse train input	16
4-6-1 Input signal list	16
4-6-2 Input circuit details	16
4-6-3 CW, CCW Direction definition	18
4-6-4 Input command form	19
4-7 Communication with personal computer	20
4-7-1 Communication parameter specifications	20
4-7-2 Communication cable	21
4-7-3 Communication commands	21
4-7-4 List of communication commands	22
4-7-5 Details of communication commands	23
4-8 Parameters	29
4-8-1 Parameter setting method	29
4-8-2 Parameter list	30
4-8-3 Explanation of parameters	30
4-9 Other Functions	32
4-9-1 Zone output function	32

Chapter 5 Operation

5-1 Setting parameters required for minimum operation	35
5-2 Positioning mode	37
5-2-1 Positioning Mode Overview	37
5-2-2 Time Sequence	37
5-2-3 Maximum Speed, Acceleration/Deceleration Maximum Value	40
5-3 Error message list	42
5-4 Stop message list	42

Chapter 6 Troubleshooting

6-1 If a problem occurs	43
6-2 Countermeasures against alarm	43
6-3 Alarm specifications	43
6-3-1 Alarm message list	44

Chapter 7 Specifications

7-1 Basic specifications of main unit	45
7-2 Basic specifications of controller	46

Chapter 8 Outline Drawings

8-1 Main unit	47
8-2 Controller	50

Chapter 9 Technical Data

9-1 Selection procedure	52
9-2 Calculation examples for moment of inertia	53

Chapter 1 Safety Precautions

Thank you for purchasing the Elewave Series Electric Rotary Actuator. 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 procedures 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 operation
 - To prevent injury, install an interlock device to prevent the operator from touching the moving parts of the Electric Rotary Actuator.
- (2) Precaution against pinched fingers, etc.
 - Be careful to prevent fingers, etc., from being pinched by the Electric Rotary Actuator's moving parts during transportation, teaching, or operation.
- (3) Operation not allowed in ambient atmospheres containing flammable gases, etc.
 - The Electric Rotary Actuator 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 magnetic interference, etc.
 - Do not use in locations subject to magnetic interferences, static electric discharges, or radio frequency interference. It could result in erratic operation.
- (5) Precautions for controller check
 - To prevent electric shock when touching the outside terminal and connector of the controller during controller checks, etc., always switch off the controller power source and cut off the power supply.
 - Never touch the inside of the controller.
- (6) Response to a damaged or defective Electric Rotary Actuator
 - If any of the damage or defects listed below have been found, continuing use of the Electric Rotary Actuator is dangerous. Immediately stop operation and contact us.

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

- (7) Precaution for contact with high-temperature portions of 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.
- (8) Protective grounding
 - Always ground the controller to protect it against electric shocks.
- (9) Pulse train input signal line
 - In order to prevent malfunction caused by noise, do not bundle the main circuit line and the signal line in the same duct, or together.
 - Do not relay the pulse train input cable. This may become a cause of malfunction due to noise.

Remark: The cable length is 1m (standard attachment). 1m and above are special products.

Ordering model 3m : EWHK-3W
 5m : EWHK-4W
 10m : EWHK-5W

Chapter 2 System Configuration

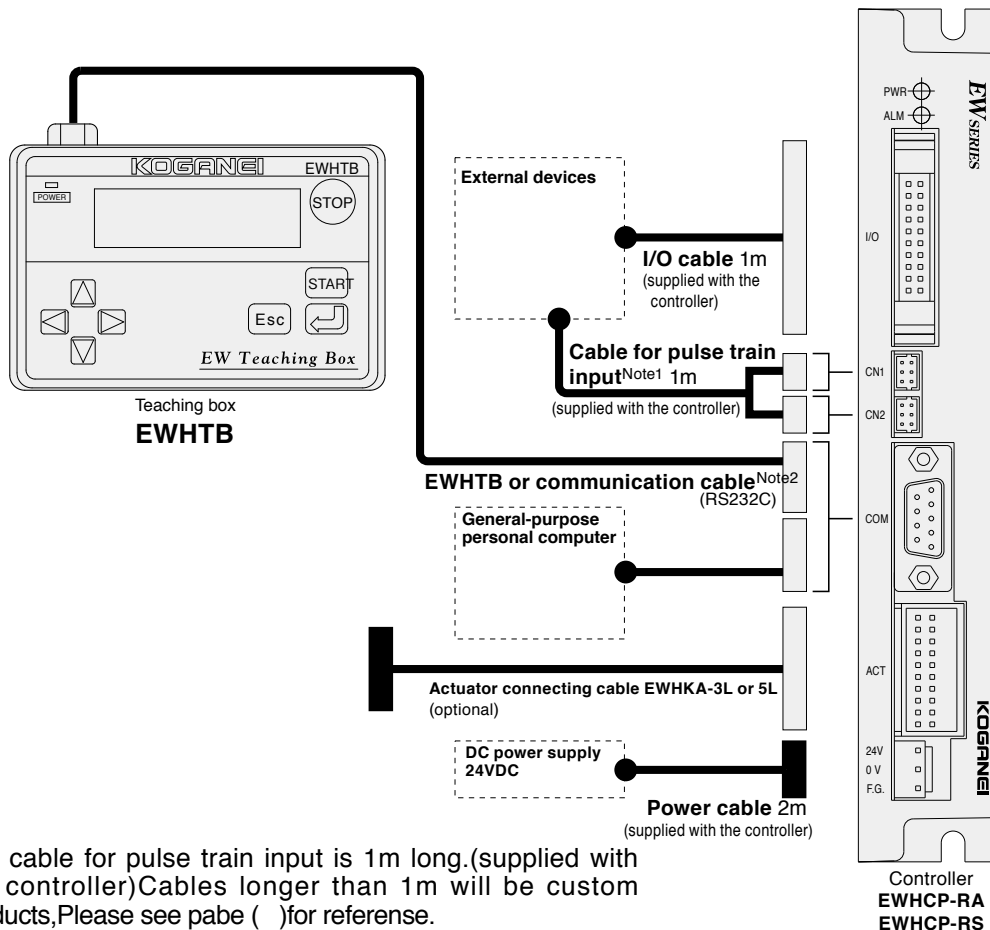
2-1 Overview

With the pulse train input type controller, the main unit actuator (electric rotary actuator) can be signal controlled by pulse train input from the host PC.

Functions include Zone output function, Pulse train input magnification function, etc.

2-2 Entire system configuration

The electric rotary actuator consists of the following main devices.



Note1: The cable for pulse train input is 1m long.(supplied with the controller)Cables longer than 1m will be custom products,Please see pabe ()for reference.

Note2: RS232C cable(reference)
Specifications:D-sub 9 pin (female)↔D-sub 9 pin (female) andcross cable

Manufacturer:Elecom Co.,LTD.

The communication cable must be prepared by the customer.

[Precaution]

- ① If the connector of the pulse train input cable CN1, CN2 are oppositely connected, the motor will rotate in the opposite direction. Also, it may not operate depending on the status of parameter No. 38 (see page 19). Always connect CN1 to CN1 and CN2 to CN2.
- ② When the pulse train input signal is a differential line driver, use the attached conversion cable for the pulse train input connector. Otherwise, it may not operate (Connect white-blue, blue line cables to CN1 side, and white-green, green line cables to CN2 side.)
- ② When the pulse train input signal is an open collector, do not use the attached conversion cable for the pulse train input connector. If the product is used, it may cause the controller to fail or shorten product life.

2-3 Options and Accessories

1. When option-CP (with controller) is selected, the controller and the following accessories are included in the package. Please confirm when purchased.

For the controller type,

In case of EWHRT1A-CP, controller type is EWHCP-RS

for EWHRT3A-CP, 5A-CP, 10A-CP, 20A-CP, 40A-CP, 60A-CP, controller type EWHCP-RA

Power cable (1 pc.)

I/O cable (1 pc.)

Pulse train input cable (1 pc.)

Conversion cable for pulse train input connector (2 pcs.)

2. When the option is 3L, -5L (Relay cable for connecting the electric rotary actuator main unit to the controller) is selected, a cable (-3L : Cable length 3m, -5L : Cable length 5m) is included in the package. Please confirm when purchased.

2-4 Setting up for operation

	<u>Procedure</u>		<u>Reference Information</u>
Installation and connection	Installation	Install the main unit.	3-2
		Install the controller.	4-2
↓			
	Connections	Connect the power supply,controller, actuator,PC,or teaching box.	4-3 4-4 4-5 4-6 4-7
↓			
Turning on the power	Turning on the power	Supply 24VDC	4-3
↓			
Setting	Setting the acuator number	Set the correct actuator number . ^{Note}	4-7 5-1
↓			
	Changing parameters	Configure parameter data in accordance with your usage condition.	4-8 5-1
↓			
Run	Test runs	Verify that the unit operates properly.	5-2
↓			
Operation	Operation	Input pulse train signal,from external devices such as programmable controllers.	5-2

NOTE: If the actuator and controller are purchased as a set, the actuator is shipped with a pre-set specified actuator number.

Actuator model	Actuator number
EWHRT1A	50
EWHRT3A	61
EWHRT5A	62
EWHRT10A	63
EWHRT20A	64
EWHRT1A	65
EWHRT1A	66

* Be sure to set with the actuator number, of the connected actuator model.

Chapter 3 Main Unit

3-1 Handling main unit

3-1-1 Precautions

- (1) Do not apply repeated bending stress or tensile force to the lead wires. Moreover, never grab the lead wire to move the main unit. Applying repeated bending stress or tensile force to the lead wire could cause it to break wire.
- (2) Always limit the moment of inertia of the workpiece to less than the maximum load inertia. Exceeding the allowable value could result in defective operation, damage to components, or reduced operating life.
- (3) When mounting the table in a vertical direction, design the workpiece so that it will not exert excessive load torque. Limit the load torque to 60% or less of the actuator's maximum torque.

Note: When a load torque exists, limit the speed settings as shown below.

Load ratio (%)	20	40	60
Speed setting (%)	Max. 50	Max. 33	Max. 25

$$\text{Load ratio (\%)} = \frac{\text{Load torque}}{\text{Maximum torque}} \times 100 (\%)$$

- (4) Limit duty to 50% or less.

$$\text{Duty} = \frac{\text{Operating time}}{\text{Operating time} + \text{Down time}} \times 100 (\%)$$

- (5) Do not apply excessive force to the plastic cover on the side of the main unit. It could lead to defective operation or damage to components.
- (6) In the without-brake type (standard specification), the table moves freely when the power is shut off. When restraining the table movement is required, either select the with-brake option, or mount an external stopper to secure the table in place.
However, there is no brake on EWHRT1A.

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 also could have a detrimental effect on flatness.
- (3) To secure the main unit in place, use the through holes on the bottom.

3-2-2 Mounting a workpiece

- (1) When mounting the workpiece, always use screws that are shorter than the thread depth. Using a screw longer than the thread depth will interfere with the main unit, preventing normal operation.
- (2) Tighten the screw for mounting the workpiece within the allowable torque range.

Actuator model	Mounting position	Screw size	Thread depth (mm)	Maximum tightening torque (N · m)
EWHRT1A	Workpiece	M3	6.5	0.63
EWHRT3A,5A,10A,20A	Workpiece	M4	6	1.50
EWHRT40A,60A	Workpiece	M5	9	3.00

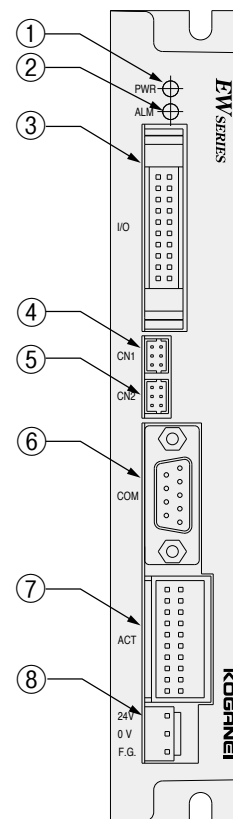
Note: When using screws, etc., to secure the workpiece to the table, hold either the table or the workpiece to perform the operation.

- (3) When the table is in the origin position, the marker on the side of the table is in the position shown in the diagram. When mounting the workpiece, first check the marker position to install. Note, however, that the origin position and the mounting hole position are not aligned. Before adjusting the origin position, mount the workpiece and execute origin return.

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 condition.
(See the table at below right.)
- ③ I/O connector
Use the supplied I/O cable for connecting to sensor switches or an external programmable controller, etc.
- ④ CN1 connector
This connector is used to connect the supplied pulse train input cable, and input the pulse train from an external device.
(CCW direction pulse or sign signal)
- ⑤ CN2 connector
This connector is used to connect the supplied pulse train input cable and input the pulse train from an external device.
(CW direction pulse or drive pulse)
- ⑥ COM connector
This is the connector for connecting to the RS-232C terminal on a personal computer, Teaching box, etc.
- ⑦ ACT connector
This is the connector for connecting to the main unit.
- ⑧ Power connector
Connects the supplied power cable to supply 24VDC.



Content	ALARM LED state
When Power ON	When PRM43=0 Flasing When PRM43=1 OFF ^{Note1}
Origin Incomplete	Flasing ^{Note2}
Normal	OFF
Alarm generated	ON
When Alarm Reset is input, after alarm is generated. → Origin Incomplete state	Flasing

Note1: According to Parameter No.43 (Motor Excitation) the status of ALARM LED changes.

Note2: The flashing times are: ON:0. 5s, OFF:1. 5s.

4-2 Installation and connection to external equipment

4-2-1 Controller installation

(1) Installation

Use M4 screws onto the 5mm U-groove on the back of the controller to secure the controller in place against an object with good thermoconductivity.

(2) Installation environment

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

4-2-2 Grounding

- Always carry out grounding to prevent electric shock to the human body, and malfunction of equipment caused by noise, in case of electric leakage.
- D class grounding (grounding resistance 100Ω or below) is strongly recommended.
- Use the F.G. wire of the power cable, for the ground terminal of the controller.

4-3 Insta

4-3-1 The connector pin number table

- For DC24V $\pm 10\%$ EWHCP-RA, connect the power cable to a power supply with a capacitance of 1. 6A or more. For EWHCP-RS, connect the power cable to a power supply with a capacitance of 0. 6A or more.
- Connector: B 3PS-VH (JST Mfg. Co., Ltd.)

Power

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

Caution:

Supply of an unstable power voltage to the controller will cause alarm shutdowns or abnormal operation. Use adequate care, therefore, in selecting a 24V power supply. Ensure a stable power supply as possible.

4-3-2 Power source connection method

- Use the supplied power cable for connecting the power source. Connect the polarity correctly to prevent mis-wiring. Wrong connections could result in fire or other dangerous conditions.

Caution:

The EWHC-R, EWHCP-RS 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.

Caution:

Never conduct insulation resistance tests or dielectric strength tests on the controller.

Danger:

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

4-4 Connecting to the actuator

4-4-1 Input/Output signal list

Connect the connecting cable to the ACT connector, on the front side of the controller. Connect when the power is off. Surely push the connecting cable, in to the connector.

ACT

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	BRK	Brake signal
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 –

4-5 I/O interface

4-5-1 Input/output circuits

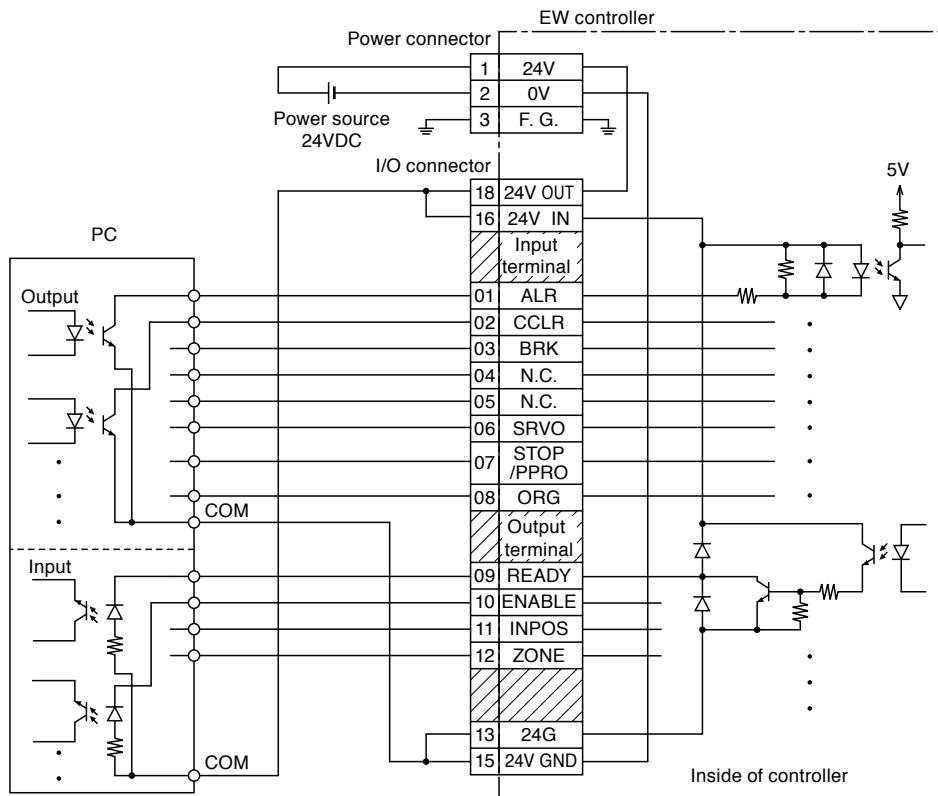
Here describes the input/output circuit specifications and an example of connections.

Refer to this example when connecting to the programmable controller or other external equipment.

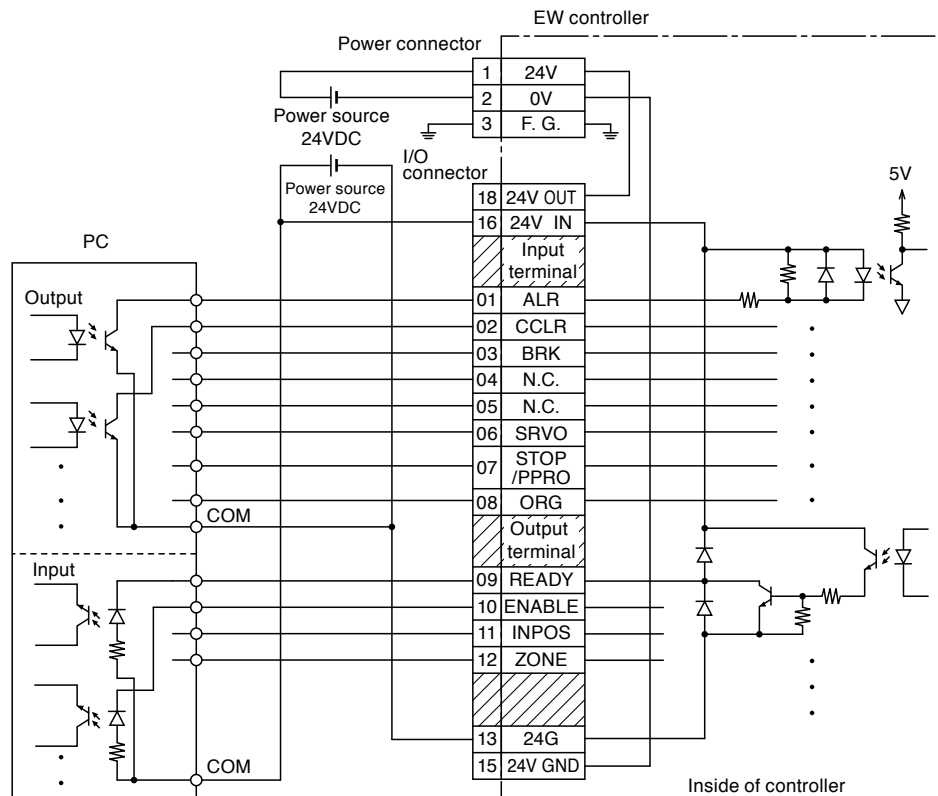
(1) Input/output circuit specifications

- Input power supply Input voltage: 24V±10%
- Input circuits
 - Insulation method: Photocoupler insulation
 - Input response: 30ms or less
 - Input current: 5mA/24VDC
 - Input sensitivity: ON current Min. 3mA
OFF current Max. 1mA
- Output circuits
 - Insulation method: Photocoupler insulation between internal circuits 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 output
 - Residual ON voltage: 1.5V or less

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



(3) Wiring method when a separate power supply is used without using the controller's internal power supply



4-5-2 Input/output circuits

I/O

No.	Wire Color	I/O	Signal name	Discription	No.	Wire Color	I/O	Signal name	Discription
01	Brown	IN	ALR	Alarm reset	02	Red	IN	CCLR	Counter clear
03	Oreng	IN	BRK	Break off	04	Yellow	—	—	N.C.
05	Green			N.C.	06	Blue	IN	SEVO	Servo ON
07	Purple	IN	STOP/PPRO	Return to Position of origin stop./Pulse train input prohibited.	08	Gray	IN	ORG	Return to Position of origin
09	White	OUT	READY	Ready(Alarm)	10	Black	OUT	ENABLE	Pulse train input acceptable
11	Brown	OUT	INPOS	In position	12	Red	OUT	ZONE	Zone output
13	Oreng		24G	— Common	14	Yellow		24G	— Common
15	Green		24V GRD	Ground	16	Blue	IN	24V IN	24V Input
17	Purple	—	—	N.C.	18	Gray	OUT	24V OUT	24V Output
19	White		F.G.	Frame ground	20	Black		F.G.	Frame ground

Note: Do not connect terminals which are N.C.

4-5-3 Input signal details

There are six dedicated instruction inputs as input signals. The dedicated instruction input, is an input signal for controlling from an external device, such as programmable controllers

[Input signal details]

Pin No.1	ALR	Alarm reset
----------	-----	-------------

Description

Enters when an alarm occurs (READY turns OFF, and ALARM LED turns ON). When input is accepted, READY will be ON, and ALARM LED will be flashing (origin not finished).

Note that this will be disabled if ALR is ON, before the alarm is generated. This is valid only on the rising edge of the signal. Be sure to input after eliminating the cause of the alarm.

Pin No.2	CCLR	Counter clear
----------	------	---------------

Description

When an input is received, the counter in the controller (encoder count, excitation count, deviation count) will be reset. Note that this function is disabled when the power is turned on, and when CCLR is ON. This is valid only on the rising edge of the signal.

Pin No.3	BRK	Brake release
----------	-----	---------------

Description

When the input is received, the brake of the actuator is released. If BRK is ON when the power is turned on, this will be disabled. This is valid only on the rising edge of the signal. In addition, brake release is enabled only when the motor is not excited. Input when you want to move the actuator manually, after turning on the power, turning servo ON, and before returning to the position of origin.

Pin No.6	SRVO	Servo ON
----------	------	----------

Description

When the input is accepted, the actuator is energized. When the servo is turned ON, ENABLE signal turns ON, and pulse train input can be accepted. Note that this function is disabled when the power is turned on and SRVO is turned ON. This is valid only on the rising edge of the signal. When servo is ON, the excitation counter and encoder counter are cleared.

Pin No.7	STOP/PPRO	Stop Return to Origin / Prohibit Pulse train Input
----------	-----------	--

Description

The input specifications differ depending on the status.

Status during return to origin: STOP

Other conditions: PPRO

STOP

If an input is received during return to origin, this will stop return to origin.

The actuator is de-energized, and ALARM LED will start flashing. Note that if a ORG is entered while STOP is ON, the ORG input disabled.

[Precaution] During STOP input, other I/O or serial commands cannot be accepted.

PPRO

When an input is accepted, the controller disables pulse train input

(While PPRO is ON, ENABLE is OFF, and pulse train input is prohibited). While the actuator is stopped and the PPRO is ON, the actuator will not operate, even if pulse is input.

[Precaution] If PPRO is turned ON while the actuator is operating, a step-out may occur. Avoid usage during actuator operation.

Pin No.8	ORG	Return to Origin
----------	-----	------------------

Description

When the input is accepted, the actuator starts return to origin, toward the direction specified in Parameter No.5 Return to Origin Direction.

When the return is completed successfully, ENABLE signal turns ON, and pulse train input can be accepted. Note that this function is disabled when the power is turned on, and when ORG is turned ON. This is valid only on the rising edge of the signal.

4-5-4 Output signal details

There are 4 output signals, READY,ENABLE,INPOS,ZONE.
ON,OFF means the ON,OFF of the transistor.

[Output signal details]

Pin No.9	READY	REDY(alarm)
----------	-------	-------------

Description

This output will be ON when the controller is operating properly.

Output will be OFF when an alarm is generated,and the motor will be non-excitation state.

Pin No.10	ENABLE	Pulse train input acceptable
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Description

When the controller is able to accept pulse train input,this output is ON.

The actuator will not move,even pulse is input,when this is OFF.The terms to turn OFF is,during return to position of origin stop/pulse train input prohibited is ON,transit stop command by com.command Ctrl + C,and when alarm is generated.

Pin No.11	INPOS	In position
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Description

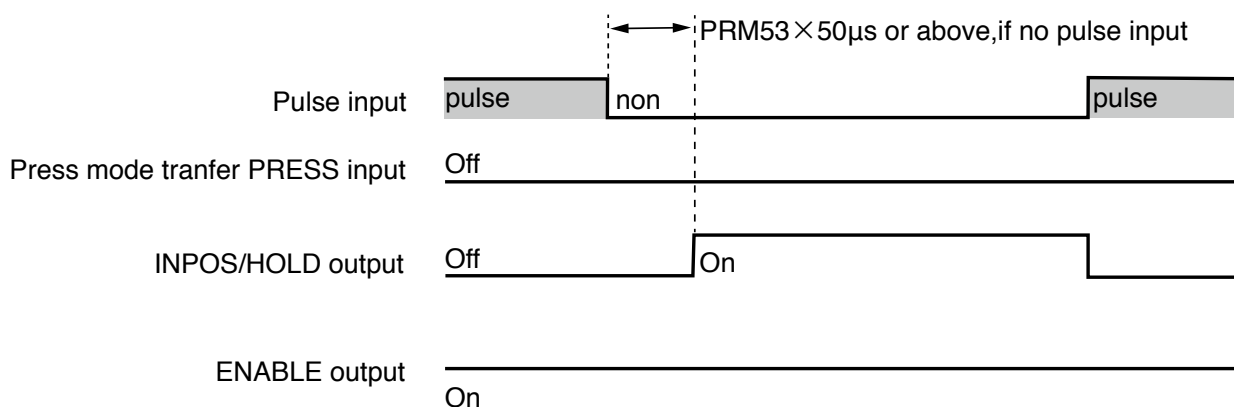
INPOS output will be ON, when There is no pulse input,during the set time of parameter No.53 INPOS output time.

Caution:If parameter No.39 (Pulse train input magnification) is too large.

INPOS output may turn ON during low-speed transit.

Caution:Accuracy is $\pm 2\text{ms}$.

Time sequence

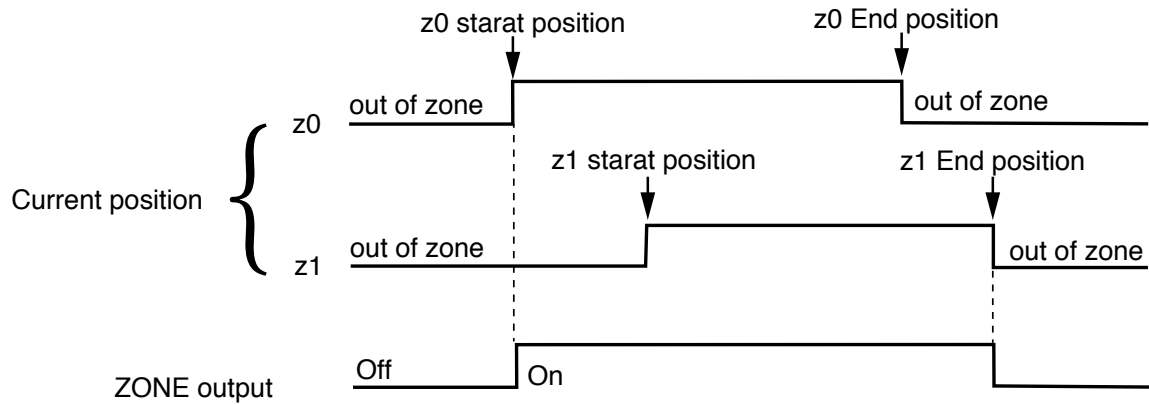


Pin No.12	ZONE	Zone output
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Description

ZONE output will be ON, when the current location of the actuator is moving and is within the location data range, which is memorized in the controller by 2 points of location data.

Refer to 4-9 「Other functions」 (P.32) for details.

Time sequence

4-6 Connection of Pulse train input

4-6-1 Input signal list

CN1

No.	Wire color	Signal name	Description	No.	Wire color	Signal name	Description
1A	White blue	CCW — / PSGN — <small>Note2</small>	Command pulse input — (CCWpulse/Operation direction)	1B	—	—	N.C.
2A	—	—	N.C.	2B <small>Note1</small>	blue	CCW + /PSGN +	Command pulse input + (CCWpulse/Operation direction)
3A <small>Note1</small>	blue	CCW + /PSGN +	Command pulse input + (CCWpulse/Operation direction)	3B	—	—	N.C.

CN2

No.	Wire color	Signal name	Description	No.	Wire color	Signal name	Description
1A	White green	CW — /PLS — <small>Note2</small>	Command pulse input — (CCWpulse/Operation direction)	1B	—	—	N.C.
2A	—	—	N.C.	2B <small>Note1</small>	Green	CW + /PLS + <small>Note2</small>	Command pulse input + (CCWpulse/Operation direction)
3A <small>Note1</small>	blue	CW + /PLS + <small>Note2</small>	Command pulse input + (CCWpulse/Operation direction)	3B	—	—	N.C.

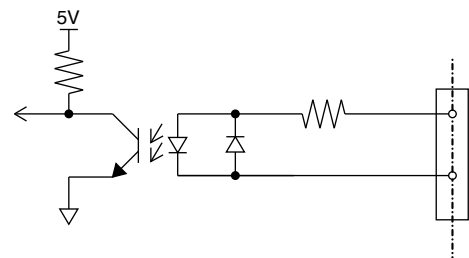
Caution: Do not connect to N.C.

Note1 : For differential line drivers use 3A, for Open collectors use 2B.

2 : Signal names will be changed, depending on contents of Parameter No.38 input command.

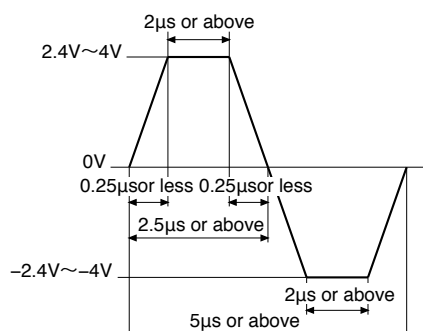
4-6-2 Input circuit details

- Input power
Differential line driver : Input voltage $\pm 2.4 \sim 4V$
Open collector : Input voltage $4 \sim 5.5V$
- Input Specifications
Isolation method : Photocoupler isolation
Input current : 7.0 mA MAX/5.5 V
- Input signal ratings
Maximum input frequency : Differential line driver 200kpps Note
Open collector 60kpps Note
Pulse duty : 50% or less

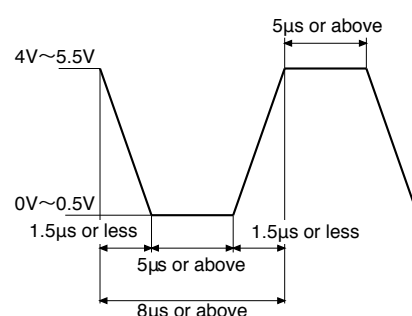


NOTE: The maximum input frequency is limited by the maximum speed of the main actuator unit.
Use the product at or below the actuator specification.

Input signal:

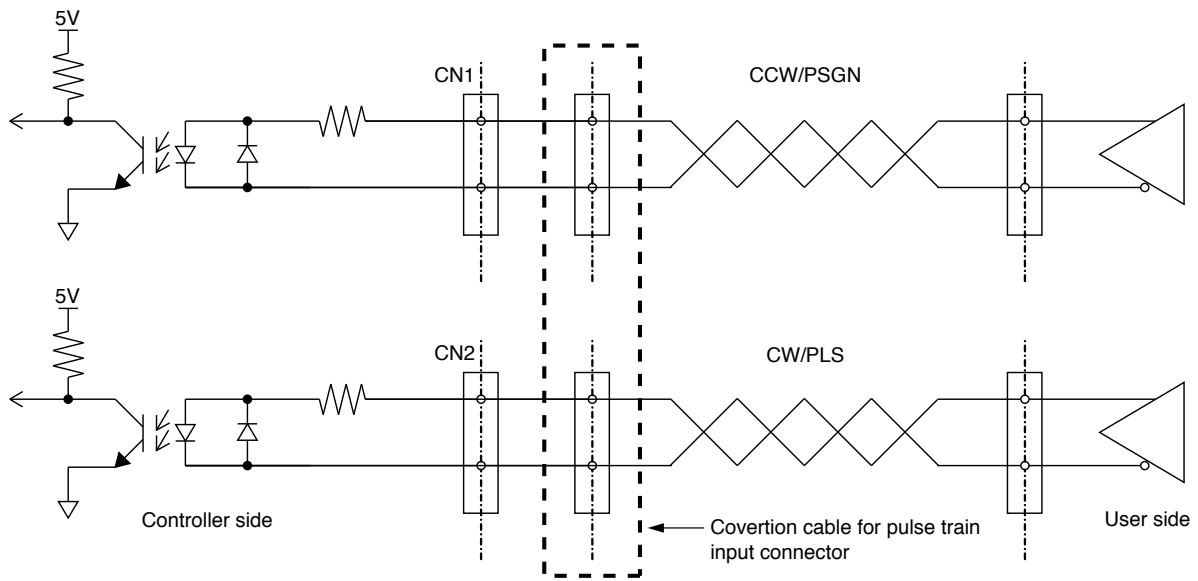


Differential Line Driver Input Signal Specifications

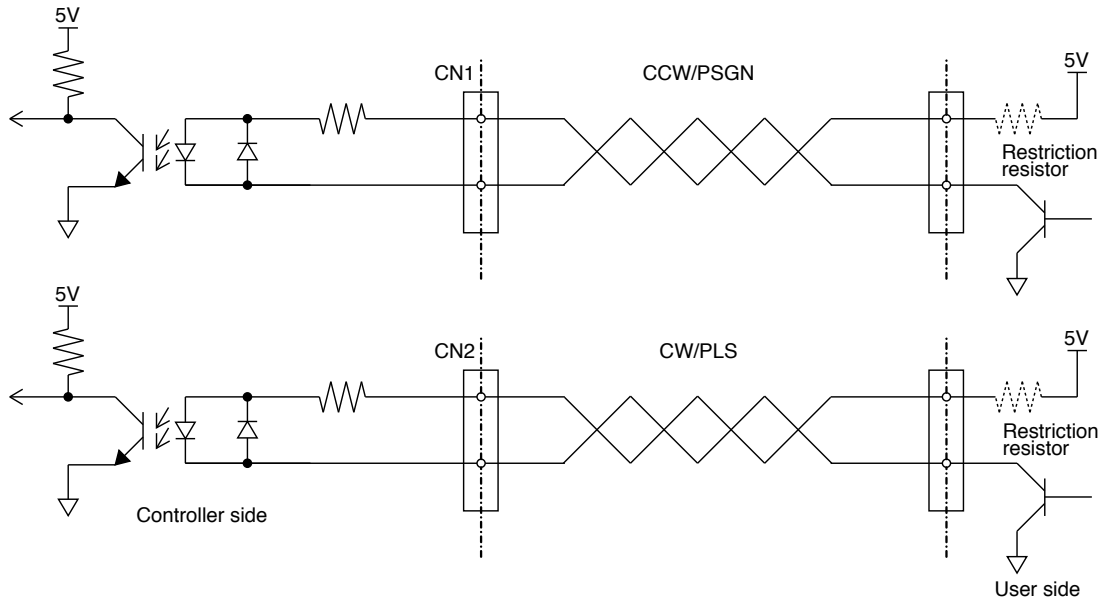


Open Collector Input Signal Specifications

○ Input circuit



Differential line driver input circuit

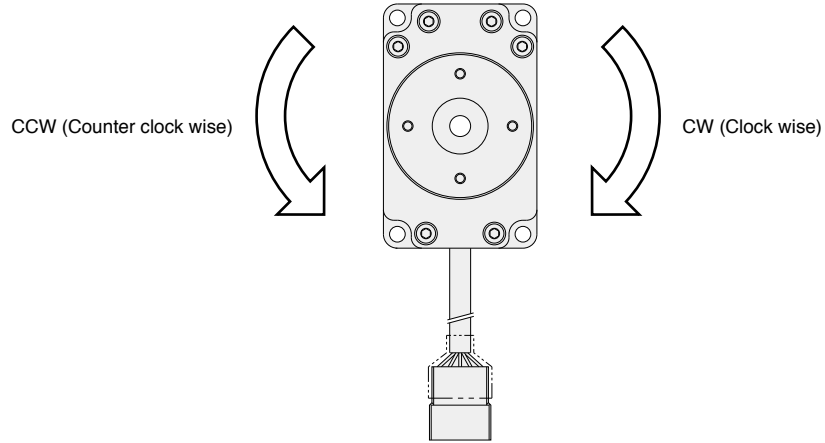


Caution:When applying voltage 5.5V or above, use a current restriction resistor (10mA or below).

Open collector input circuit



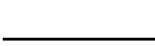



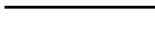



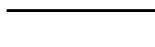




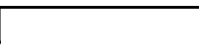
4-6-3 CW, CCW Direction definition

This defines the advancing direction according to the input pulse. Refer to the image below.



4-6-4 Input command form

Select the command pulse train type/command pulse logic (positive logic/negative logic) according to the setting of parameter No. 38. The initial setting is PRM38=1.

Command pulse train form	Positive/Negative theory	PRM38 setting	Input terminal	CW direction	CCW direction
CW/CCW System	Positive	1	CW+/CW-		
			CCW+/CCW-		
	Negative	2	CW+/CW-		
			CCW+/CCW-		
Pulse/Coding System	Positive	3	PLS+/PLS-		
			PSGN+/PSGN-		
	Negative	4	PLS+/PLS-		
			PSGN+/PSGN-		

4-7 Communication with personal computer

4-7-1 Communication parameter specifications

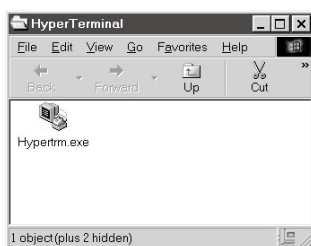
Set the communication parameter settings for a personal computer and other external equipment in the following manner. For the setting methods, see the User's Manual for each machine.

■ Transmission rate	9600bps
■ Data bit length	8 bits
■ Stop bit length	1 bit
■ Parity check	On
■ Parity setting	Odd parity
■ 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	For CR/LF reception Return + line feed

Setting method for Hyperterminal, as standard with Windows95* and later.

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

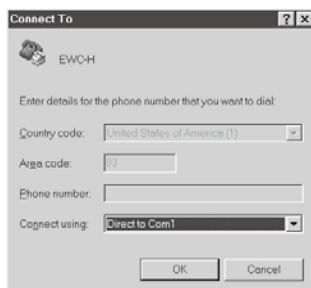
1. Double-click on Hyperterm.exe.



2. Enter name, select icon and click "OK."



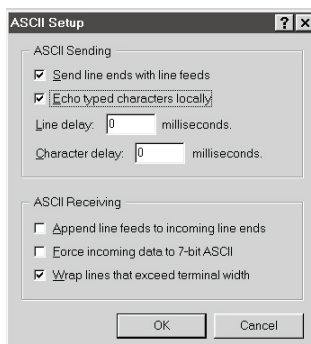
3. For the connection method, select "Direct to Com1" and click "OK."



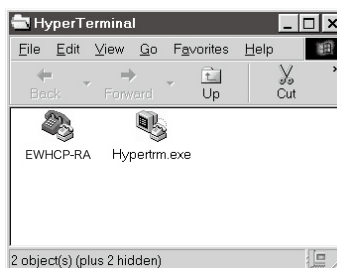
4. Set the port and click "OK."



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



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



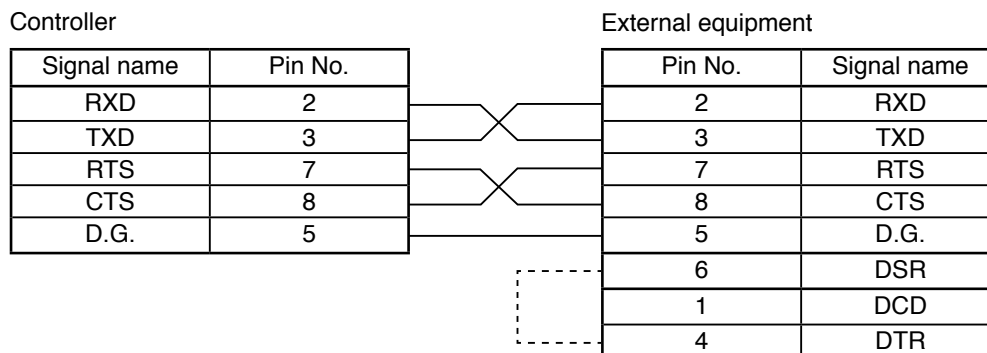
Note : When saving the file on Windows XP or later version, save after disconnecting the Hyper terminal.

4-7-2 Communication cable

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 easy communication with external equipment, 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>]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 or 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 3 operands are used.
The brackets [] refer to items that can be omitted.
- The character codes used are the JIS8 unit-system codes (ASCII codes with katakana characters added).
- 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 the user. Check the details of each communication command, and enter the appropriate data. (See sub-section 4-6-4, "List of communication commands" on p.22.)
- When entering 2 or more operands, insert a comma (,) between them.

4-7-4 List of communication commands

Classification	Command	Operand 1	Operand 2	Command description
Actuator operation	@ORG	—	—	Returns to origin
	@SERVO	0 : Excitation OFF 1 : Excitation ON	—	Motor excitation ON/OFF
	@BRK	0 : Break off 1 : Break on	—	Brake switching
	@?BRK	—	—	Checking the brake status
	@ALR	—	—	Alarm reset
	@CCLR	—	—	Counter reset
Data handling	@?PRM	0 ~ 63 (Parameter No.)	—	Parameter reading
	@?Z	0 ~ 3 (Zone position data No.)	—	For the zone position data Reading
	@?POS	—	—	Read current position
	@?ORG	—	—	Checking completion of home return
	@?SRVO	—	—	Check motor excitation status
	@?VER	—	—	Version check
	@?ERR	—	—	Error log display
	@READ	ZON	—	Reading of all zone position data
		PRIM	—	Read all parameters
		DIO	—	Read I/O status
		ERR	—	Read all error history
	@WRITE	ZON	—	Zone position data write
		PRM	—	Parameter write
	@ZDEL	0 ~ 3(Start No.)	max 4.(Number of points)	Zone position data erase
Utilities	@INIT	ZON	—	Zone position data initialization
		PRM	Actuator No.	Parameter Default
		ERR	—	Error history initialization
		ORG	—	Initialization of origin position data
	@ORGC	—	—	Changing the origin Position Data

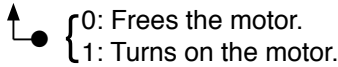
Classification	Function	Code	Command description
Special codes	Stop return to position / Pulse train input prohibited	^C (=03H)	<ul style="list-style-type: none"> During origin return, origin return is interrupted. In other conditions, pulse train input is prohibited and the actuator does not move. Sending Switches to "Pulse train input prohibited" ↔ "Pulse train input enabled" for each signal.
	Data transmit end	^Z (=1AH)	This bit notifies the controller of completion of sending data at the time of WRITE instruction.

Classification	Response	Description
Response from controller	OK	Normal completion of operation
	NG	Occurrence of error Content of error at next line (in 20 characters or less)
	STOP	Stop command Reason for stop at next line (in 20 characters or less)
	READY	Completion of writing preparation

4-7-5 Details of communication commands**(1) @ORG**

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

(2) @SRVO

Function	Commands either for turning on the motor and performing feedback control, or for turning off the motor.
Format	@SRVO switch c/r l/f 
Transmission example	@SRVO 1 c/r l/f
Response	OK c/r l/f

(3) @?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

(4) @?POS

Function	Reads the current position. (Resolution of 0.45°)
Format	@?POS c/r l/f
Transmission example	@?POS c/r l/f
Response	5.85 c/r l/f • • • • • •Current position is 5.85° from origin. OK c/r l/f

(5) @?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

(6) @?Z

Function	Reads the specified zone position data.
Form	@?Z ZONE POSITION DATA NUMBER c/r l/f
Transmission example	@?Z 3 c/r l/f
Response	Z3 = 15.00, 25.00 c/r l/f OK c/r l/f

(7) **@?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

(8) **@?SRVO**

Function	Can confirm the motor turning on state.
Format	@?SRVO c/r l/f
Transmission example	@?SRVO c/r l/f
Response	1 0 c/r l/f •State of motor turning off OK c/r l/f
Response 2	1 c/r l/f •Motor turned on OK c/r l/f

(9) **@READ ZON**

Function	Batch read of zone position data.
Form	@READ ZON c/r l/f
Transmission example	@READ ZON c/r l/f
Response	Z0 = 5.00, 7.00 c/r l/f Z3 = 30.00, 35.00 c/r l/f OK c/r l/f

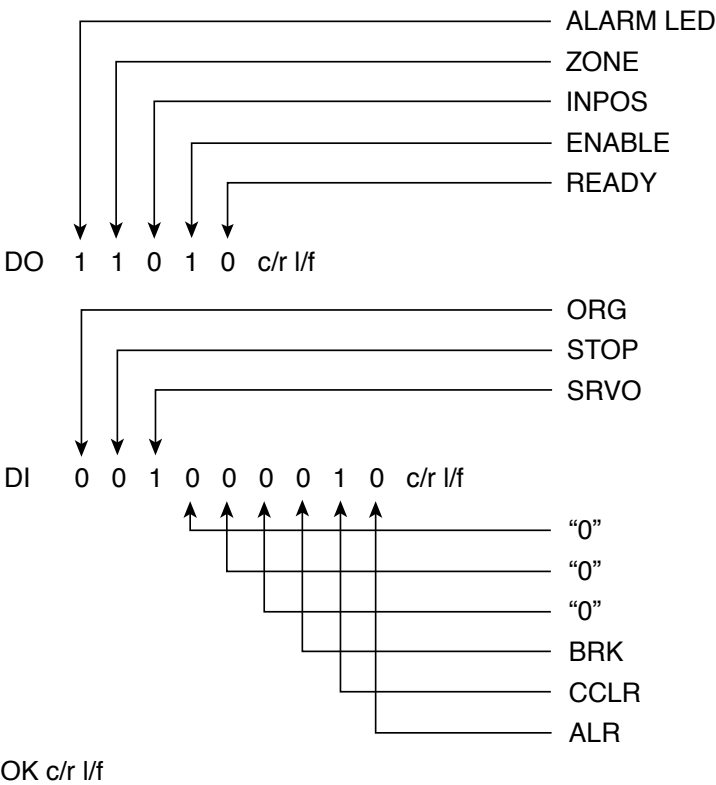
(10) **@READ PRM**

Function	Data of all parameters of the function is read.
Format	@READ PRM c/r l/f
Transmission example	@READ PRM c/r l/f
Response	PRM0=50 c/r l/f PRM1=0 c/r l/f PRM2=0 c/r l/f PRM3=300 c/r l/f . . PRM63=2 c/r l/f OK c/r l/f

(11) @READ DIO

Function
Format
Transmission example
Response

Reads custom input/output states.
@READ DIO c/r l/f
@READ DIO c/r l/f



(12) @READ ERR

Function
Format
Transmission example
Response

Reads error history records. (Up to the latest 16 records.)
@READ ERR c/r l/f
@READ ERR c/f l/f
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

(13) **@WRITE ZON**

Function	Writes the zone position data.	
Form	@WRITE ZON c/r l/f	
Transmission example	Personal computer side	Controller Side
	@WRITE ZON c/r l/f	READY c/r l/f
	Z0 = 2, 3 c/r l/f	
	Z1 = 5.5, 7.75 c/r l/f	
	:	
	Z3 = 9.25, 10 c/r l/f	
	^Z	OK c/r l/f

(14) **@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
	PRM5=1 c/r l/f	
	PRM10=3 c/r l/f	
	:	
	PRM38=2 c/r l/f	
	^Z	OK c/r l/f
	Sends only data that require changes.	

(15) **@ZDEL**

Function	Deletes the zone position data.
Format	@ZDEL starting number, deletion count c/r l/f
Transmission example	@ZDEL 0, 2 c/r l/f
Response	OK c/r l/f
Description	Zone position data is up to 3. This cannot be exceeded.

(16) **@INIT ZON**

Function	This initializes (erases) the zone position data.
Format	@INIT ZON c/r l/f
Transmission example	@INIT ZON c/r l/f
Response	OK c/r l/f

(17) @INIT PRM

Function

Form

Transmission example

Response

Description

Resets parameters to the initial values.

@INIT PRM Actuator No. c/r l/f

@INIT PRM 50 c/r l/f

OK c/r l/f

Check the actuator number on the actuator body and initialize the parameters.

When @INIT PRM is performed, the position of origin data is also initialized.

Type	Actuator No.
EWHRT1A	50
EWHRT3A	61
EWHRT5A	62
EWHRT10A	63
EWHRT20A	64
EWHRT40A	65
EWHRT60A	66

If the actuator number changes due to parameter initialization, also initialize the zone position data (@INIT ZON).

(18) @INIT ERR

Function

Format

Transmission example

Response

Delete all error history.

@INIT ERR c/r l/f

@INIT ERR c/r l/f

OK c/r l/f

(19) @INIT ORG

Function

Format

Transmission example

Response

Initializes the position of origin data. Perform this when the actuator body is replaced during use.

@INIT ORG c/r l/f

@INIT ORG c/r l/f

OK c/r l/f

(20) @ORGC

Function

Format

Transmission example

Response

Changes the origin position data.

Perform when the controller is changed, or when returned position of origin is dislocated by initialization of the position of origin, during use.

@ORGC c/r l/f

@ORGC c/r l/f

OK c/r l/f

(21) @BRK

Function


Format

Transmission example

Response

Switches the brake on and off. (Brake is off during normal operation.)

@BRK switch c/r l/f



0: Brake is OFF
1: Brake is ON

@BRK 1 c/r l/f

OK c/r l/f

(22) **@?BRK**

Function	Reads the state of the brake.
Format	@?BRK c/r l/f
Transmission example	@?BRK c/r l/f
Response 1	0 c/r l/f... Brakes are released.
	OK c/r l/f
Response 2	1 c/r l/f... Brakes are active.
	OK c/r l/f

(23) **@?ERR**

Function	Reads the latest error history.
Format	@?ERR c/r l/f
Transmission example	@?ERR c/r l/f
Response	32: origin incomplete c/r l/f
	OK c/r l/f

(24) **@CCLR**

Function	Clears the motor excitation counter, and encoder counter to eliminate deviation.
Format	@CCLR c/r l/f
Transmission example	@CCLR c/r l/f
Response	OK c/r l/f

(25) **@ALR**

Function	Used to cancel the alarm.
Format	@ALR c/r l/f
Transmission example	@ALR c/r l/f
Response	OK c/r l/f

4-8 Parameters

The controller does not have any potentiometer, dip switches, or any other hardware adjustment mechanism. Instead, it uses parameters that can easily be set through a personal computer. This section explains 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.

Before using the Electric Rotary Actuator, set the actuator No. according to the actuator model. If any problem is found, please contact us.

Note:

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

4-8-1 Parameter setting method

Parameter editing is performed via the RS232C port on the personal computer or the teaching box. For communication parameters and cable specifications, see Section 4-7, "Communication with personal computer" on p.20.

Editing parameter is carried out by using general communications software or custom support software.

For handling the support software, see the separately available support software User's Manual.

For the teaching box, see the separately available teaching box User's 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

PRM4=100 c/r l/f

PRM5=1 c/r l/f

^Z

OK c/r l/f

Sends only data that require 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=60 c/r l/f

PRM1=10 c/r l/f

PRM2=0 c/r l/f

:

PRM63=0 c/r l/f

OK c/r l/f

4-8-2 Parameter list

No.	Name	Input range	Initial value						
0	Actuator No.	50,61 ~ 66	50	61	62	63	64	65	66
4	Acceleration	1 ~ 100(%)	100	100	100	100	100	100	100
5	Return to positon of origin direction	0 : CW, 1 : CCW	1	1	1	1	1	1	1
10	Return to positon of origin speed	EWHRT1A : 50 (×0.01rps) EWHRT3A,5A,10A,20A, 40A,60A : 1 ~ 50 (×0.01rps)	50	10	10	10	10	10	10
22	Switch between English and Japanese	0: English, 1: Japanese	1	1	1	1	1	1	1
35	Position of origin shift	-32768 ~ 32767 (×0.01°)	0	0	0	0	0	0	0
36	Position of origin shift speed	EWHRT1A : 50 ~ 100(×0.01rps) EWHRT3A,5A,10A,20A, 40A,60A : 1 ~ 100 (×0.01rps)	50	10	10	10	10	10	10
38	Input command form	1: Pulse train CW/CCW (Positive Logic) 2: Pulse Train CW/CCW (Negative Logic) 3: Pulse/sign (Positive logic) 4: Pulse/sign (Negative logic)	1	1	1	1	1	1	1
39	Pulse train input magnification	1 ~ 8	1	1	1	1	1	1	1
43	Motor excitation method	0: Motor excitation OFF at power ON 1: Motor excitation ON at power ON	0	0	0	0	0	0	0
53	INPOS duration	100 ~ 1999 (×50μs)	1000	1000	1000	1000	1000	1000	1000

4-8-3 Explanation of parameters

PRM0: Actuator No.

Displays the actuator No. This parameter is only for reading.

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.

Input range 0,1
Meaning 0 : CW 1 : CCW
Initial value 1

PRM10: ORIG speed

Set the speed when returning to positon of origin.

	EWHRT1A	EWHRT3A, 5A, 10A, 20A, 40A, 60A
Input range	50	1 ~ 50
Initial value	50	10

PRM22: Selecting English or Japanese

Sets the language used for response messages in communications.

Input range 0,1
Meaning 0: English 1: Japanese
Initial value 1

PRM35: Origin shift

The current position when return to origin is completed and which is expressed by coordinate value will be shifted by this amount of parameter value. While the coordinate value of the origin return completed position is normally 0, if for some reason the origin position needs to be shifted to a specific value, change this parameter. 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 reteaching.

Input range $-32768 \sim 32767 (\times 0.01^\circ)$
Initial value 0

PRM36: Origin shift speed

Sets the speed for origin shift.

	EWHRT1A	EWHRT3A, 5A, 10A, 20A, 40A, 60A
Input range	50 ~ 100	1 ~ 100
Initial value	50	10

PRM38: Input command type

Set the command pulse train form (for details, see 4-6-4 "Input command form" (page 19)).

Input range 1 ~ 4
Initial value 1

PRM39: Pulse Train Input magnification

Set the magnification of pulse train input.

Input range 1 ~ 8
Initial value 1

PRM43: Motor excitation method

Sets whether to energize the motor when the power is turned on.

When set to "1", the servo is automatically turned on after the power is turned on.

Pulse train input can be accepted immediately.

Input range 0, 1
Meaning 0: Motor excitation OFF when power is on
 1: Motor excitation ON at power on
Initial value 0

PRM53: INPOS Output times

Set INPOS outputting time at positioning completion output.

INPOS will be output, when the pulse is not input again, until the period set in PRM53, after the pulse train input stops.

Input range 100 ~ 1999 ($\times 50\mu\text{s}$)
Initial value 1000 (50ms)

Caution: The accuracy is $\pm 2\text{ms}$.

4-9 Other Functions

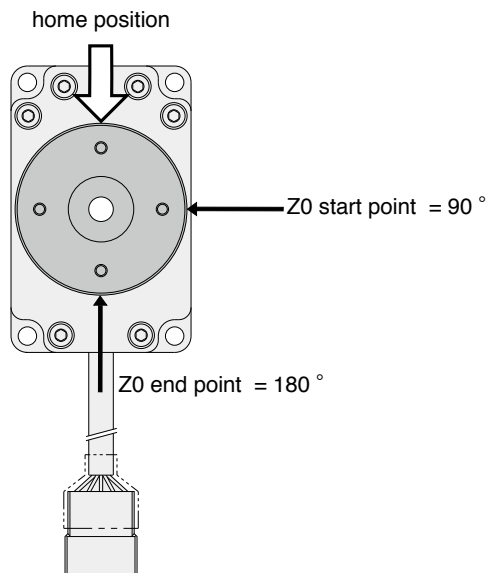
4-9-1 Zone output function

Function

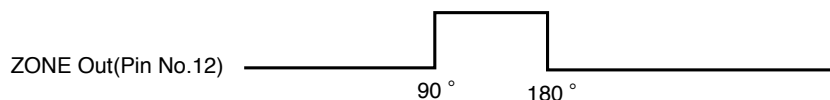
Memorize the position data of two points in the controller, and when operating the actuator, while it is within position data range, ZONE output will be ON. Max. 4 positions (Z0 to Z3) can be determined for the zone range. The setting range is $0.00^{\circ} \sim 360.00^{\circ}$. Negative input is not possible.

Ex) When Z0 (Starting point 90° Ending point of 180°) is defined as a zone range.

Z0 = 90.00, 180.00



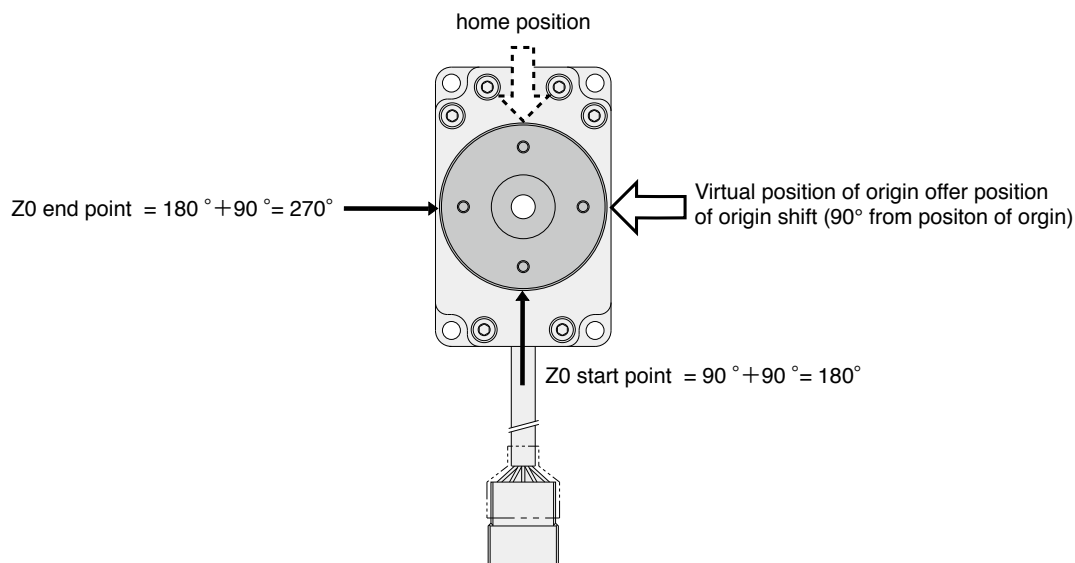
When the actuator moves within the Z0 (90° to 180°)



If the home position is shifted, the zone range will also be shifted by the amount corresponding to the home position shift.

Ex) When the home position is shifted by 90° . (Z0 start point 90° , Z0 end point 180°)

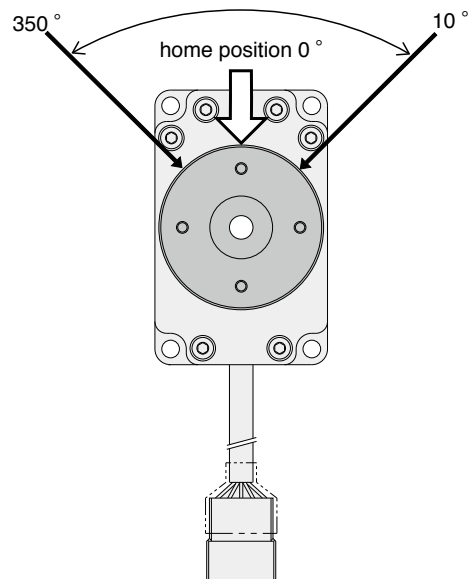
Z0 = 90.00, 180.00



When the actuator moves within the Z0 (180° to 270°)



When crossing 0°(Position of Origin) in zone output,set two zone ranges.
 Ex) Zone output for 350°~10°.



For zone output for 350°~10°,set as below

Z0 = 0, 10

Z1 = 350,360

When the actuator moves within the range of Z0(0°~10°),Z1(350°~360°).



Setting method

Zone position data will be valid from the point when 「@WRITE ZON (Zone position data write)」 (P.26) is accepted, and 「READY」 is returned. This will be invalid by inputting 「@」.

Description

Z < Zone position data No. > = < Start position >, < End position > < c/r1/f >
 * Input ^ (Control -) Z [EOF] to end.

Rules

- (a) The Zone position data No. will continue after "Z" (small character is acceptable).
 No's are from 0~3.
- (b) '=' will come next
- (c) <Start position>: This is the starting position of zone output. Decimal points after the second decimal will be ignored.
- (d) Split the next data with 「, (2CH)」.
- (e) <End position>: This is the ending position of zone output. Decimal points after the second decimal will be ignored.
- (f) Lastly, < c/r1/f > will continue.

【Caution】 The following is the input rule for the starting position and ending position, 「Starting position < Ending position(Absolute value)」. Input range is 0~360.00. Minus is unable to input.

【Caution】 Data abbreviation

**For starting and ending position, the last "0" after the decimal points are able to abbreviate.
 Also if the last two digits are 00, it is possible to abbreviate to the decimal point.**

Transmit example

@WRITE ZON c/r l/f After receiving READY

(Ex.1) Zone position data No.=0, Start position = 10.5°, End position=15.5°
 Z0 = 10.5,15.5 c/r l/f

(Ex.2) Zone position data No.=3, Start position= 55.25°, End position = 60°
 Z3 = 55.25, 60 c/r l/f

Response

^ (Control -) Z [EOF] After transmit of (End write mode)
 OK c/r l/f

**【Caution】 Zone output judgement is, Zone set value to Number of pulse.
 The last digit of the number of pulses will be rounded off.**

(Ex.) EWHRT40A, If Parameter No.39 = 1, number of pulse to move 10 [°] is,
 Number of pulse = movement ÷ movement per 1 pulse ÷ PRM39

$$= 10 [°] \div \{(360 [°] / 12800 [p]) / 14\} \div 1$$

$$= 4977.8$$
 (Refer to Chapter 5, 5-13 (P.36) for details of number of pulse.)
 When set to Z0 = 0.00, 10.00, zone output will be ON between the pulse of 0~4978.

Chapter 5 Operation

5-1 Setting parameters required for minimum operation

For parameter setting, see 4-8-1 "Parameter Setting Method" (page 29).

① Setting of actuator number

When the power of the controller is turned on, or when the actuator is changed, set the actuator number according to the actuator model, as shown in the below table.

Actuator setting method (Please set by one of the following methods)

1. Use the communication command @INIT PRM (see page 27 (17)).
2. Initialize the parameters using the support software and teaching pendant.
(For details, refer to the respective instruction manuals.)

However, if the actuator and controller are purchased as a set, they will be shipped according to the actuator type beforehand, so there is no need for setting.

Type	Actuator No.
EWHRT1A	50
EWHRT3A	61
EWHRT5A	62
EWHRT10A	63
EWHRT20A	64
EWHRT40A	65
EWHRT60A	66

Caution1: Always set the actuator number of the connected actuator model.

Caution2: When the actuator number is changed, initialize the zone position data (@INIT ZON).

② Parameter No.38: Input command form

4-6-4 Set 1 to 4 referring to "Input command form" (page 19).

The initial value is "1".

- | | |
|----------------------|----------------|
| 1: CW/CCW method | positive logic |
| 2: CW/CCW method | negative logic |
| 3: Pulse/Signed | positive Logic |
| 4: Pulse/sign system | negative logic |

③ Parameter No.39: Pulse train input magnification

The number of pulses to be actually input is calculated by the controller, and the movement amount per pulse can be changed according to the magnification. The initial value is "1".

1: 1x	5: 5x
2: 2x	6: 6x
3: 3x	7: 7x
4: 4x	8: 8x

Type	Actuator No.	the movement amount per pulse(PRM39=1) [°]
EWHRT1A	50	(360°/3072p) /9
EWHRT3A	61	(360°/12800p) /5.5
EWHRT5A	62	(360°/12800p) /12
EWHRT10A	63	(360°/12800p) /5.5
EWHRT20A	64	(360°/12800p) /12
EWHRT40A	65	(360°/12800p) /14
EWHRT60A	66	(360°/12800p) /14

Note: (360°/3072p) (360°/12800p) is the amount of movement per motor pulse, and 9, 5.5, 12, 14 is the gear ratio of the main unit.

(ex.) When the actuator model is EWHRT40A and parameter No. 39 = 1,

The number of pulses for moving 180 [°],

Number of pulses = Travel distance ÷ Travel distance per pulse ÷ PRM39

$$= 180[°] \div \{(360[°] / 12800[p]) / 14\} \div 1$$

$$= 89600[p]$$

④ Parameter No.43: Motor excitation method

When using only the pulse train input function without using the I/O input/output function with an external device, set to "1".

0: Motor excitation OFF when power is on

1: Motor excitation ON when power is on

When turned to 0, at the time the power is turned on, the motor excitation is OFF, READY is ON, and ENABLE is turned OFF, and Pulse train input is not accepted. Pulse train input can be accepted by servo ON or return to position of origin.

Servo ON and return to origin can be performed by I/O input & output.

When set to 1, the motor is excited when the power is turned on, and pulse train input can be accepted.

The position where the actuator is stopping, will be the position of origin.

Set this when using pulse train input for return to position of origin, etc.

(I/O inputs/outputs Input 6 points • Output 4 points can be used.)

For other parameters, see 4-8 "Parameters" (p. 29).

5-2 Positioning mode

5-2-1 Positioning Mode Overview

The actuator moves according to the pulse train input from the host PC, etc.

[Travel distance per pulse]

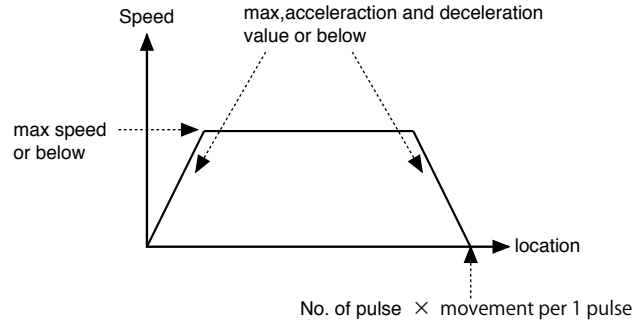
"Travel distance per pulse of each actuator" x "Parameter No.39 Pulse train input magnification".

[Speed, acceleration/deceleration, starting speed]

5-2-3 Control by referring to "Maximum speed and acceleration/deceleration maximum value" (p. 40).

The starting speed should be set to 0 [mm/s] before starting operation.

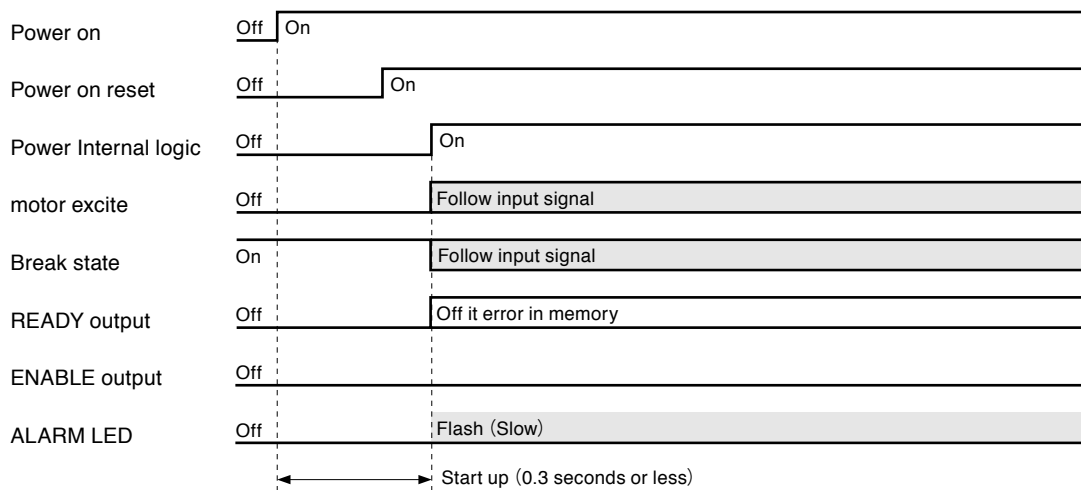
[Operation pattern]



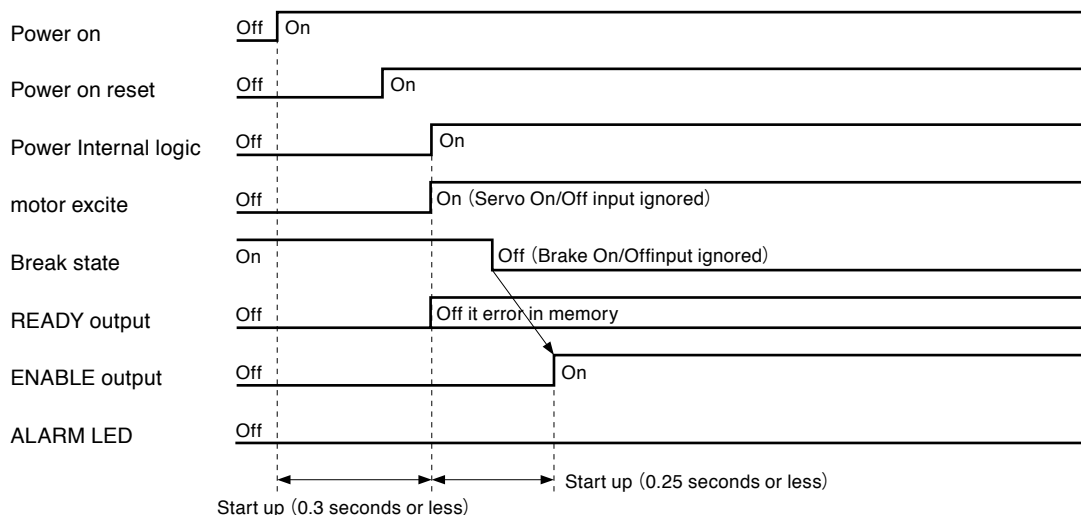
5-2-2 Time Sequence

(1) When the power is turned on

●When the power is turned on (PRM43=0)



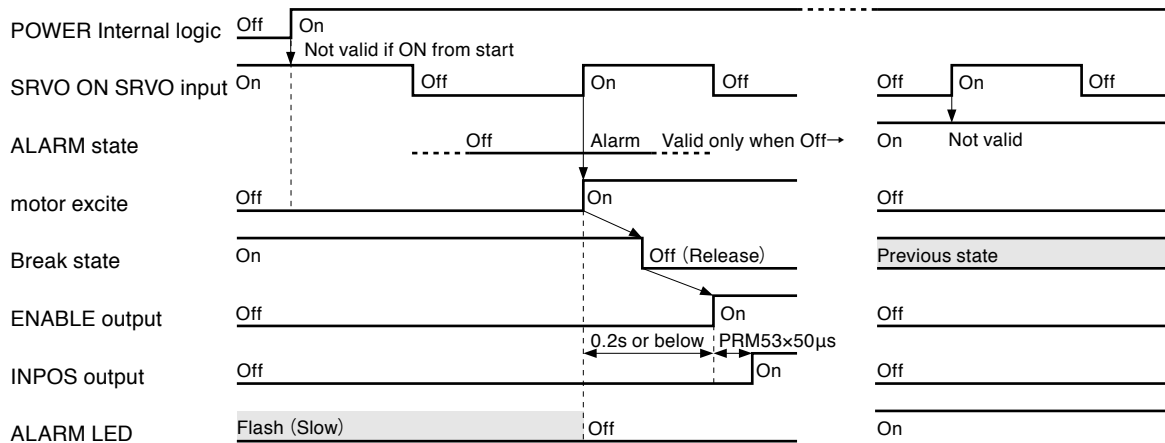
●When the power is turned on (PRM43=1)



When Parameter No.43 (Motor Excitation Method) is 0, enter the dedicated input after confirming that READY output is turned ON, after the power is turned ON.

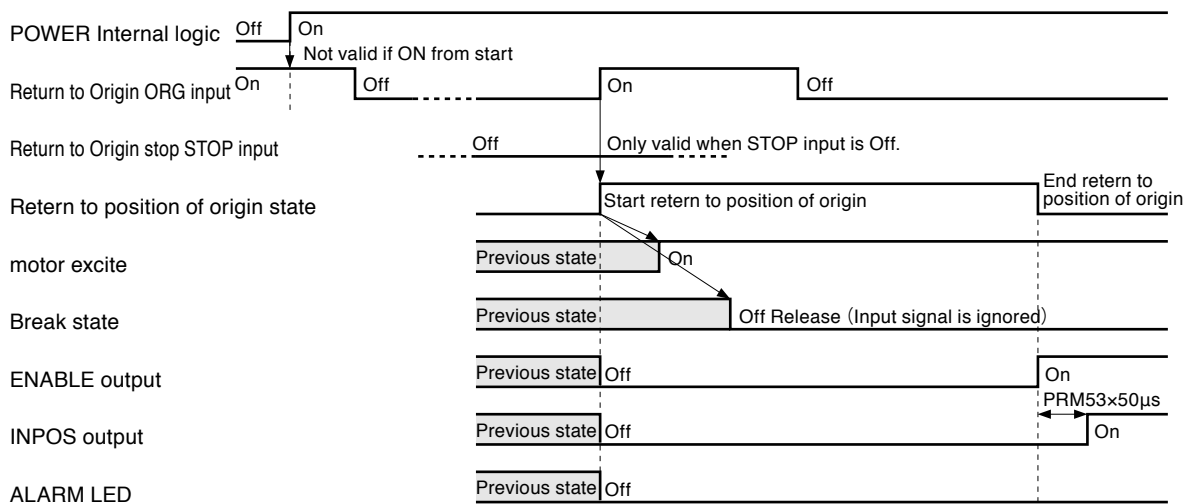
When Parameter No.43 (Motor excitation method) is 1, the motor is excited when the power is turned on, and pulse train input can be accepted. If READY is OFF, even after the specified time has elapsed after the power is turned on, it means that an alarm has occurred.

(2) Servo ON



Turn on the power and enter SRVO after the specified time. The motor is energized and ENABLE output turns ON, and pulse train input can become acceptable. Enter the pulse after confirming that ENABLE output is turned ON. SRVO input is disabled when an alarm is present. It is also disabled when the power is turned on.

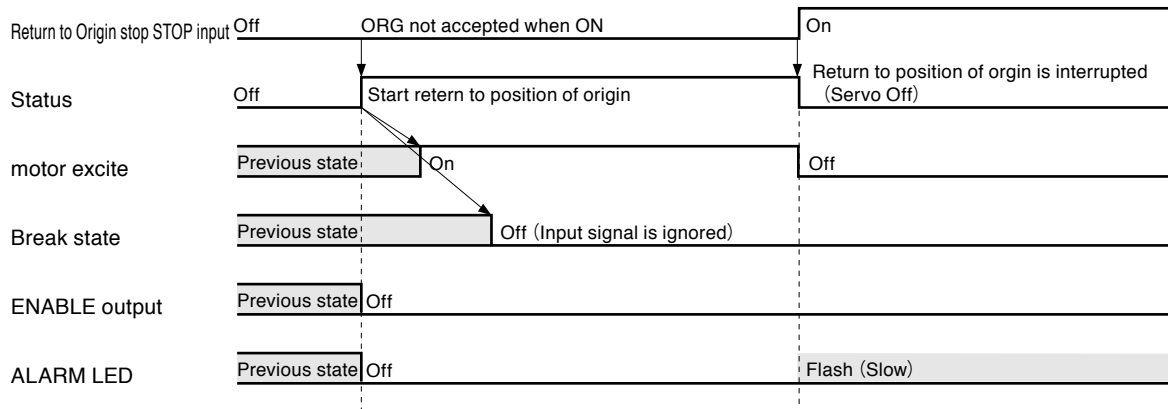
(3) Return to Origin



Note : 09: Acceptance is prohibited in the case of the alarm of parameter data error,
11: Zone data error.

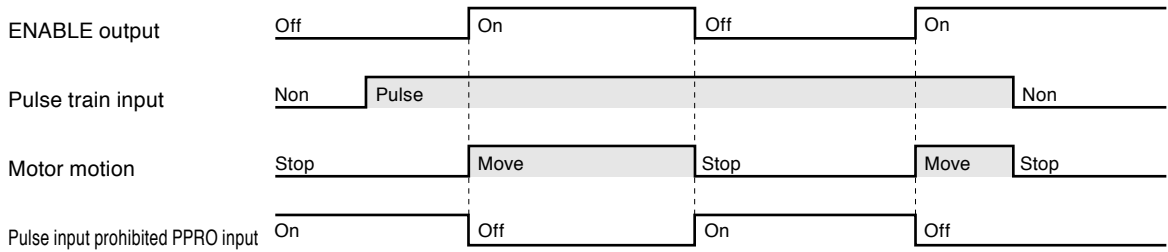
Enter ORG after turning on the power, and specified time has passed. After the motor is excited and return to position of origin is complete, ENABLE is turned ON and the pulse train can be accepted. Enter the pulse after confirming that ENABLE output is turned ON.

(4) Interruption of home return



During return to position of origin, if STOP is input, return to position of origin is interrupted and the servo-off and ALARM LED are set to flashing status.

(5) Pulse train input

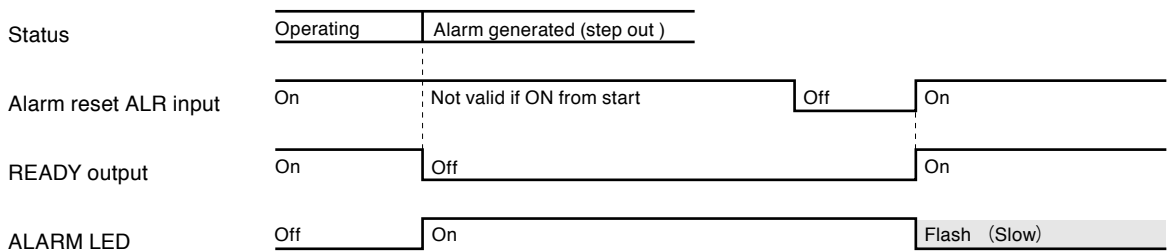


When ENABLE is ON, the actuator is activated when a pulse is input.

When the pulse train input prohibit PPRO is ON, ENABLE output turns OFF and the actuator does not operate even if a pulse is input.

CAUTION:Turning on PPRO while the actuator is operating may cause the actuator to step out.
Avoid use during operation.

(6) Alarm occurrence



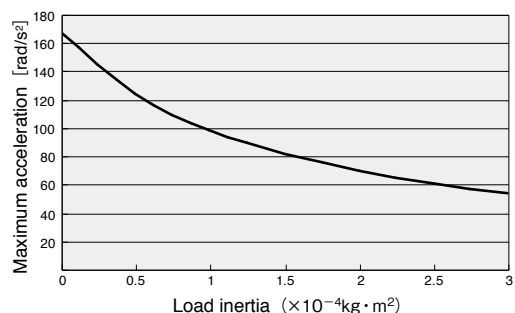
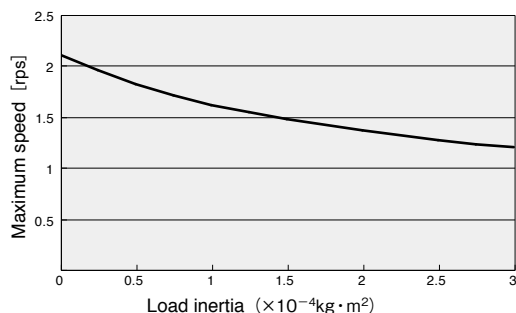
When an alarm occurs, READY, ENABLE is turns OFF. ALARM LED turns on.

When the alarm reset ALR is turned ON, READY output is turned ON and the servo is turned off.

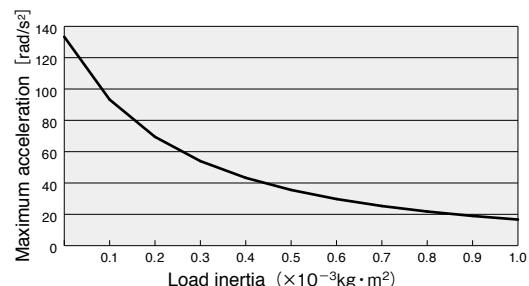
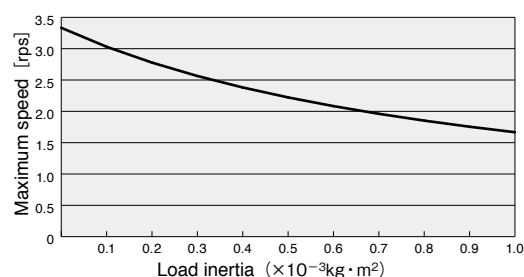
If Parameter No.43 Motor Excitation Method is "1" and I/O is not connected, turn the power off, and then on again.

5-2-3 Maximum Speed, Acceleration/Deceleration Maximum Value

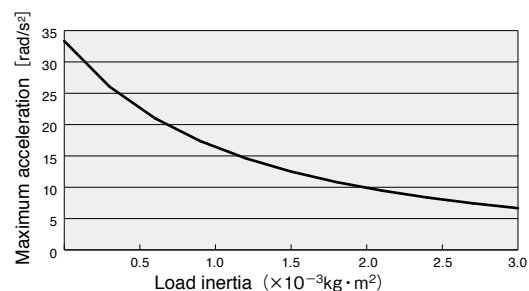
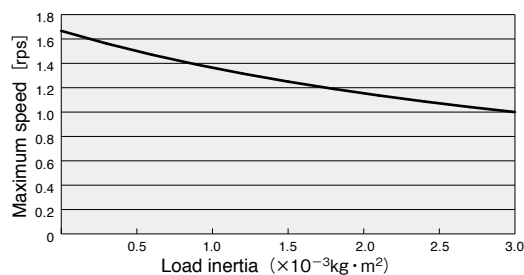
● EWHRT1A



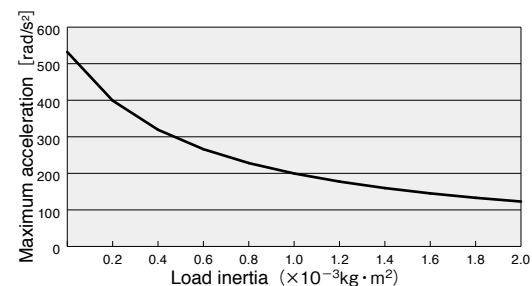
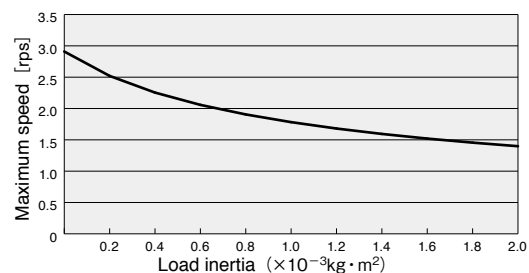
● EWHRT3A



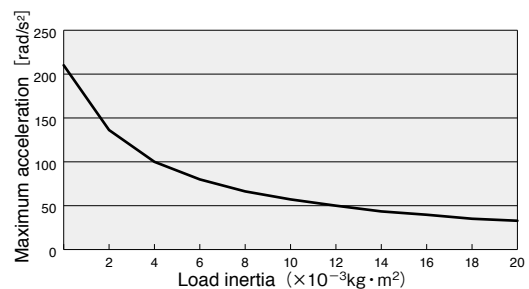
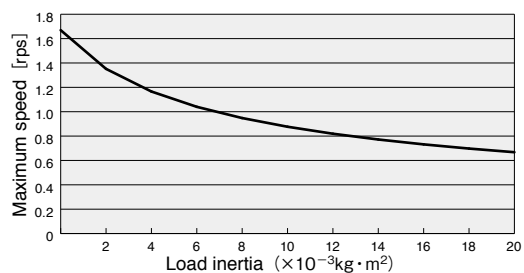
● EWHRT5A



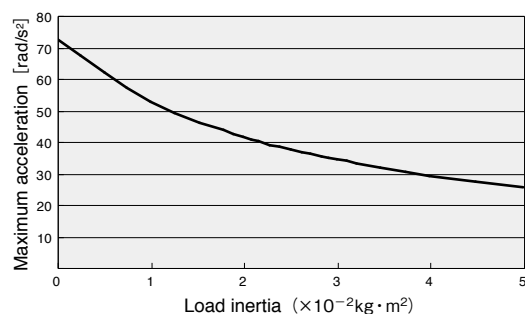
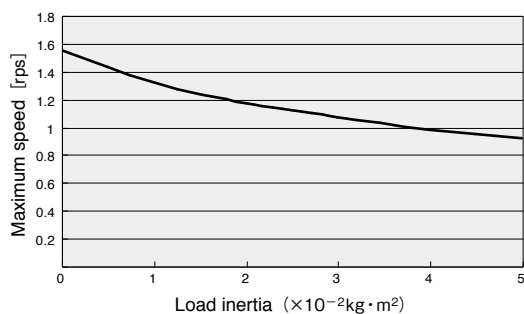
● EWHRT10A



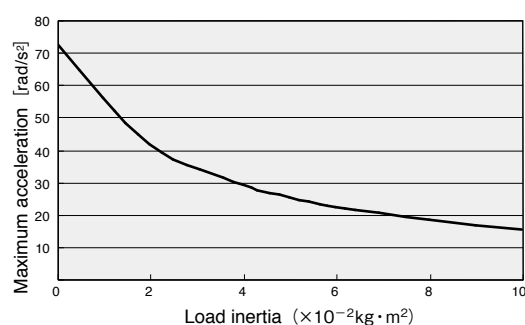
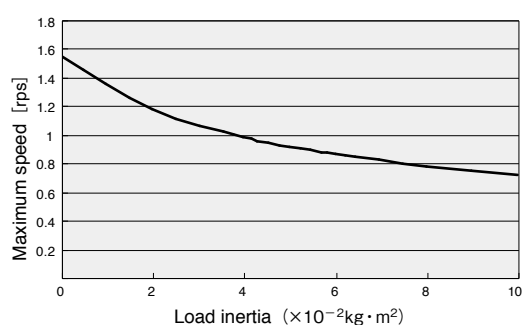
● EWHRT20A



● EWHRT40A



● EWHRT60A



CAUTION: Set EWHRT1A so that the velocity is at least 0.5rps.

Remark: For details of the maximum speed and acceleration/deceleration, refer to the support software.

● How to calculate pulse speed

(ex.) When EWHRT40A, PRM39 = 1, to rotate at 1 [rps] = $360^\circ/\text{s}$,

$$\text{Pulse Speed} = \text{Rotation Speed} \div \text{Travel per Pulse} \div \text{PRM39}$$

$$= 360[^\circ/\text{s}] \div \{(360[^\circ] / 12800[\text{p}]) / 14\} \div 1$$

$$= 179200[\text{p/s}]$$

● How to calculate pulse rate

(ex.) When EWHRT40A, PRM39 = 1, the pulse rate for moving the pulse at $30 [\text{rad/s}^2] = 30 \times 360/2\pi [^\circ/\text{s}^2]$,

$$\text{Pulse rate} = \text{Acceleration} \div \text{Travel distance per pulse} \div \text{PRM39}$$

$$= 30 \times 360 / 2 \pi [^\circ/\text{s}^2] \div \{(360[^\circ] / 12800[\text{p}]) / 14\} \div 1$$

$$= 855617.0[\text{p/s}^2] \div 856[\text{p/s/ms}]$$

5-3 Error message list

(1) Command error

Error No.	Item	Description
21	Message	illegal type
	Cause	Erroneous command
	Solution	Use the correct command.
23	Message	data error
	Cause	Error in the numerical data
	Solution	Correct the data.

(2) Operation error

Error No.	Item	Description
35	Message	can't execute
	Meaning	The setting is impossible to execute.
41	Message	Alarm on
	Meaning	Since the alarm is in progress, acceptance is prohibited.
66	Message	Pulse Enable
	Meaning	Pulse input can be accepted
67	Message	Pulse disable
	Meaning	Pulse input cannot be accepted

(2) System error

Error No.	Item	Description
53	Message	no actuator type
	Cause	Error in actuator No. setting.
	Solution	Set the actuator No. at the corresponding type, and try the initialization again.
54	Message	No zone data
	Cause	No data is registered in the specified zone position data number.
	Solution	Register zone position data
56	Message	Data Protection
	Cause	The protected parameters have been rewritten.
	Solution	The data protected cannot be rewritten.
57	Message	No parameter
	Cause	An attempt was made to rewrite a parameter number that is not registered in the parameter.
	Solution	Rewrite with the number registered in the parameter.
58	Message	Saving data
	Cause	Overwriting was performed while data was being saved to memory
	Solution	Proceed after saving the data in memory

5-4 Stop message list

● Stop message

Error No.	Item	Description
61	Message	stop command
	Meaning	Due to stop command, execution has stopped.
63	Message	stop on
	Meaning	Due to entry of STOP input from I/O, execution has stopped.

Chapter 6 Troubleshooting

6-1 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 When the actuator-table reached a specific location
What happened?	Actuator does not move. Alarm is output.
How frequently?	All the time About once an hour Can not be reproduced.

6-2 Countermeasures against alarm

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

When an alarm has been issued, first fix the trouble causing the alarm and then turn on the power supply. This action turns off the alarm.

6-3 Alarm specifications

The transmission format for an alarm message is as follows.

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

Checking the alarm content

To check the content of the alarm, use a communication cable to connect to a personal computer, and enter the @READ ERR command. (See p.25.)

6-3-1 Alarm message list

Alarm No.	Alarm message	Meaning	Probable cause	Countermeasure
01	over load	<ul style="list-style-type: none"> ●Excessive load ●Cable disconnected 	1) Too large inertia 2) Motor cable's broken wire or defective connection	1) Reduce the acceleration. 2) Check the cable continuity.
03	over heat	Rise in circuit temperature	1) Overcurrent 2) Shorted cable	Inspect the cable.
05	power supply over	Excessively high input voltage	Power supply	Reduce power supply voltage.
06	disconnection	<ul style="list-style-type: none"> ●Excessive load ●Cable broken wire 	1) Motor cable's broken wire or defective connection 2) Mechanical interference due to an obstacle, etc.	1) Inspect the cable continuity. 2) Check mechanical interference.
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 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 parameter data.
11	zone data error	Zone position data is damaged	The power was turned off while writing data.	Turn on the power again and perform the initial processing of the zone position data.

Chapter 7 Specifications

7-1 Basic specifications of main unit

Item	Model	EWHRT1A	EWHRT3A	EWHRT5A	EWHRT10A	EWHRT20A	EWHRT40A	EWHRT60A
Motor		2-phase stepping motor						
Maximum torque	N•m	0.1	0.25	0.5	1.0	2.0	4.0	6.0
Repeatability ^{Note2}		±0.02°						
Angle detection		Optical encoder						
Maximum load inertia ^{Note3}	kg•m ²	3.0×10 ^{−4}	1.0×10 ^{−3}	3.0×10 ^{−3}	2.0×10 ^{−3}	2.0×10 ^{−2}	5.0×10 ^{−2}	1.0×10 ^{−1}
Minimum operating time ^{Note4}	(90°, at no load) s	0.2	0.1	0.2	0.12	0.2	0.3	
	(90°, at maximum load) s	0.35	0.25	0.4	0.25	0.5		0.65
Minimum speed	rps	0.5	0.01					
Operating temperature range	°C	0 ~ 40						
Allowable thrust load	N	100			200		400	
Allowable radial load	N	100			200		400	
Allowable moment	N•m	2.5			5.5		10.0	
Mass ^{Note5}	kg	0.3	0.34(0.4)		0.8(0.9)		2.0(2.3)	2.2(2.5)
Applicable controller		EWHC-RS,EWHCP-RS		EWHC-RA.EWHCP-RA				

Notes: 1. **EWHRT40A, EWHRT60A** do not come with cables connected to the main body .(Connectors are built-in to the side of body)

2.Repeatability at one-way swing.

3.The workpiece moment of inertia should always be at or below the maximum load inertia.

4. Values are for no load torque.

5. Figures in parentheses show the mass with-brake .

7-2 Basic specifications of controller

● Pulse train input type

Item	Model	EWHCP-RA,EWHCP-RS
Axis control	Motor drive method	Microstep drive
	Control method	Closed loop control ^{Note1}
	Operating method	Location control by pulse train input
	Origin detection method	Encoder Z phase
	Location detection method	Encoder A, B phase output
	Pulse train input method	Differential line driver / Open collector
	Max input pulse frequency ^{Note2}	Max.200kpps (Differential line driver) / Max.60kpps (Open collector)
	Pulse train input command form	CW/CCW, Pulse/Symbol (Each accept Positive and Negative logic)
External input/output	Control input	6 points (Alarm reset, Counter clear, Break unlock, Servo ON, Pulse input prohibited,/ Stop return to position of origin) 5Ma TYP/1point
	Control output	4 points (Ready, Pulse input acceptable, Positioning complete, Zone output) 30mA MAX.1/ point
	Abnormality detection output	Overload, Data error, System error.
	External communications	RS232C 1ch (Communication with personal computer and Teaching Box)
	Motor drive output	Dedicated cable (with F.G.)
	Encoder input	Dedicated cable (with shield)
General specifications	Pulse train input	Dedicated cable (Twist pair wire)
	Mass	0.2kg
	Power supply	24VDC±10% 1.6A MAX. (Motor and I/O share the same power supply) ^{Note3}
	Operating temperature	0 ~ 40°C
	Operating humidity	35 ~ 85% RH(no condensation)
	Storage temperature	- 10 ~ 65°C
	Back-up	EEPROM used to maintain setting conditions
	Noise resistance	IEC61000 – 4-4 level 3
Accessories		I/O cable,Power cable,Cable for pulse train input ^{Note4} ,Conversion cable for pulse train input cooector 2pcs ^{Note5}

Notes: 1.This detects step outs by the rotary encoder, and force control when gripping.

2.The actual max. input pulse number is regulated by the max. speed of each actuator.

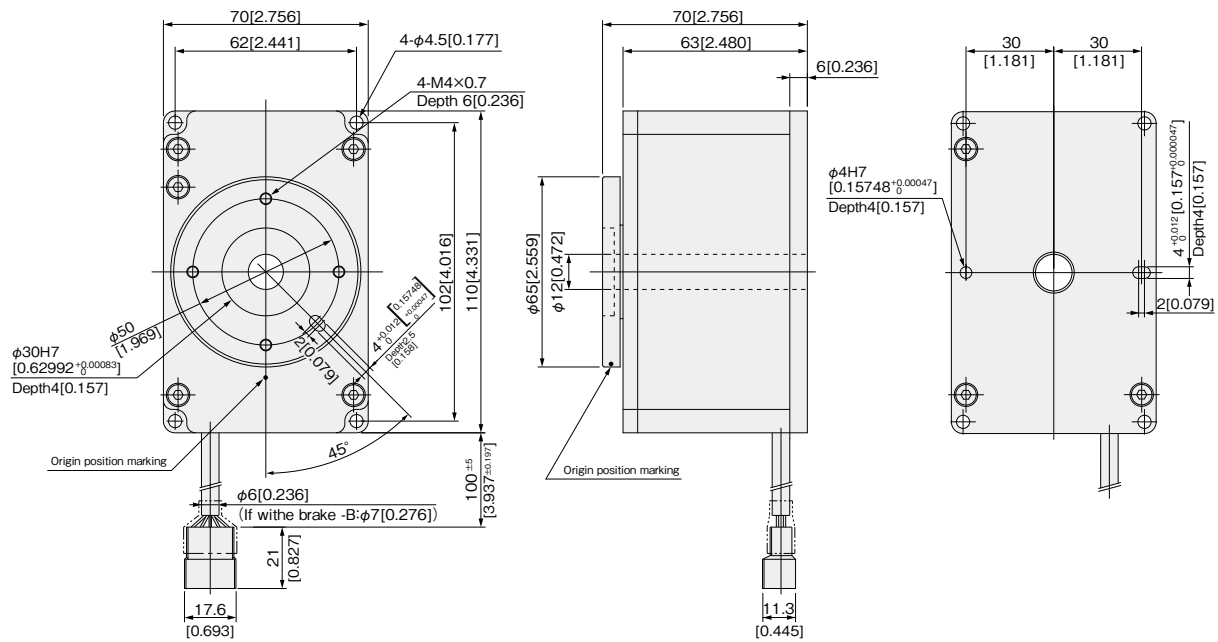
3.The max. consumption current value differs depending on the actuator. Refer to the table below.

4.The cable length of the pulse train input is 1m.

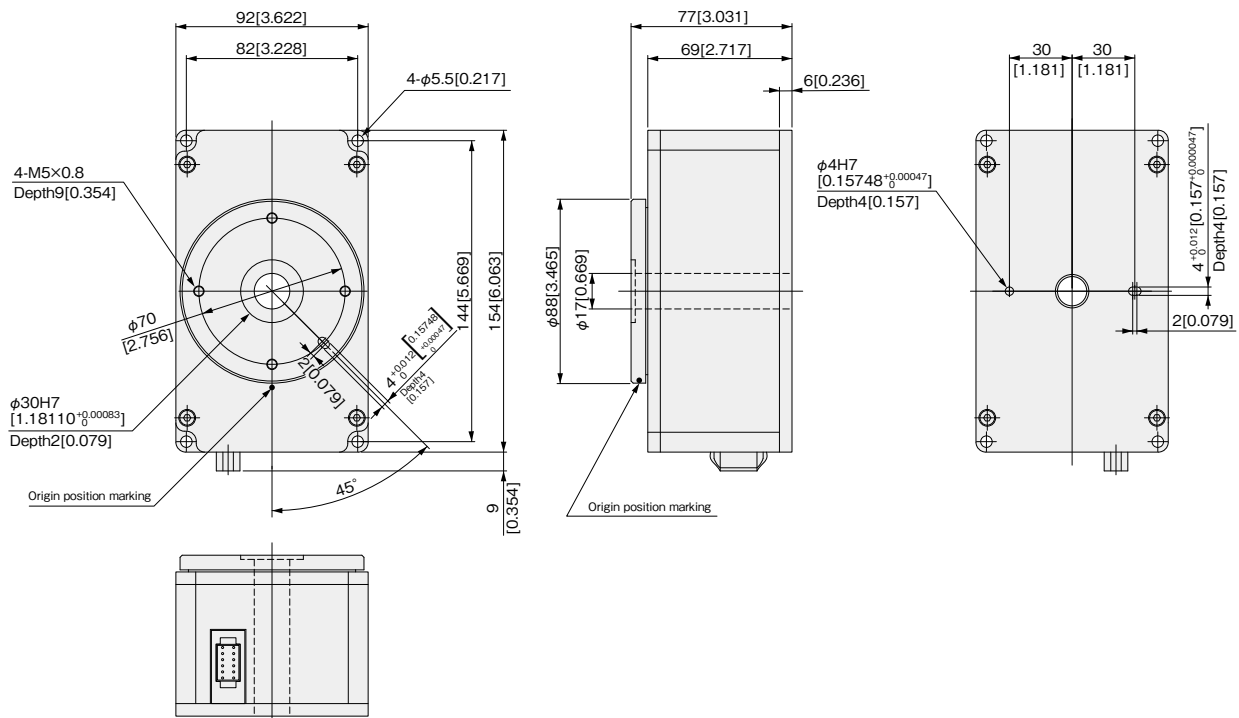
5.The connection method of the pulse train input cable differs if it is for a differential line driver, or an open collector. (See page ** for details)

EWHRT10A
EWHRT20A

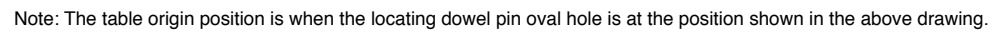
Unit:mm[in.]



Note: The table origin position is when the locating dowel pin oval hole is at the position shown in the above drawing.

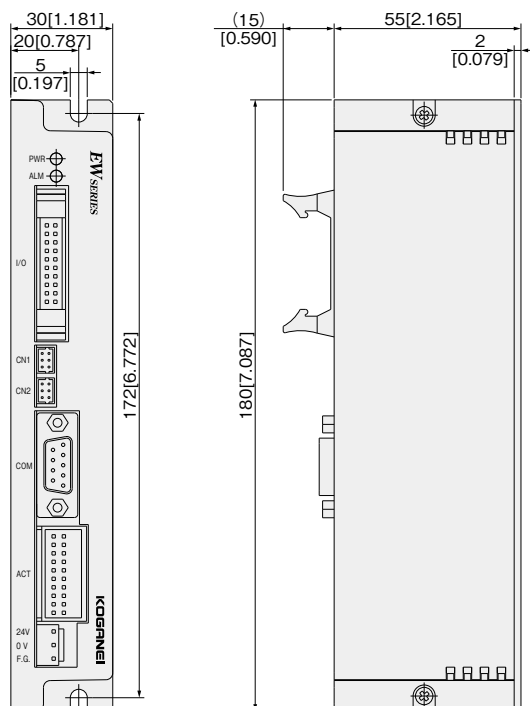
EWHRT40A


Note: The table origin position is when the locating dowel pin oval hole is at the position shown in the above drawing.

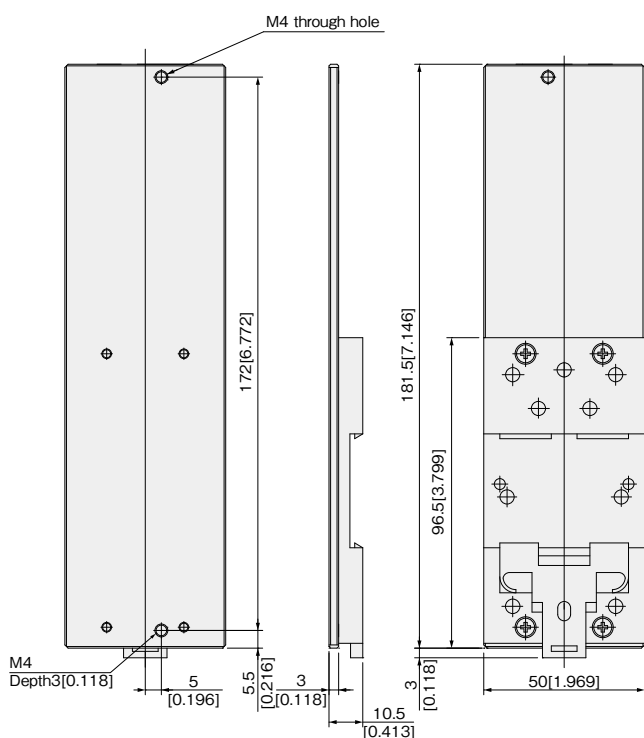
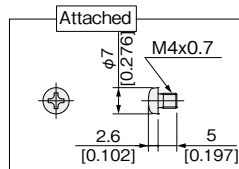


8-2 Controller

● Pulse train input type

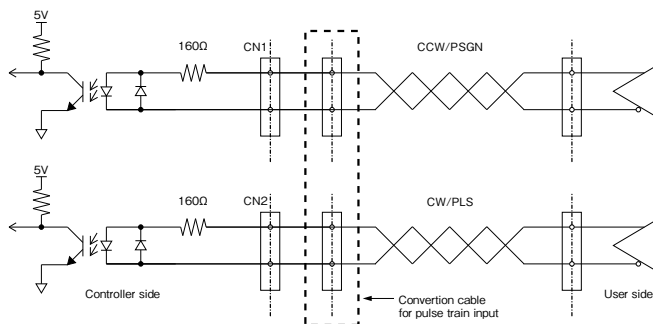


● DIN rail mounting plate EW2DP

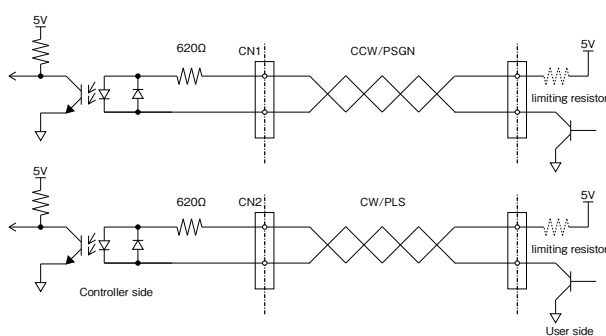


Controller wiring method (Pulse train input type)

● Differential line driver(input circuit)



● Open collector(input circuit)

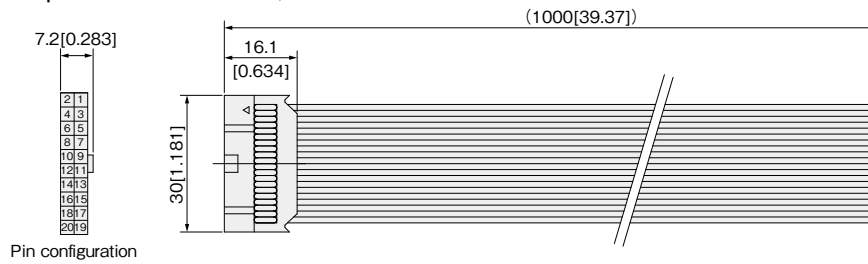


[Attention] When applying voltage 5.5V or above use current limiting resistor.(10mA or below)

● Controller Accessories

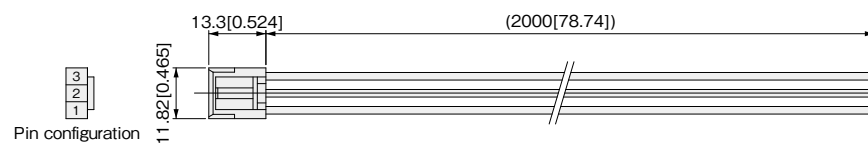
- I/O cable (Model : Equivallent to EW2KI)

EW2KI



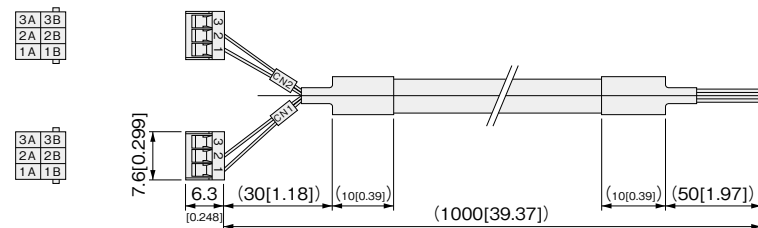
- Power cable (Model : Equivallent to EW2KP)

EW2KP



- Pulse train input cable (For Pulse Train Input Type Controller only)

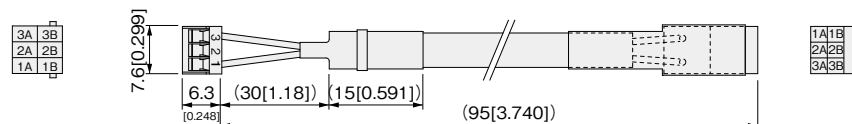
EWHKY



● Conversion cable for Pulse train input Connector (For Pulse Train Input Type Controllers only)

Note : Be sure to use this conversion cable when the pulse train input signals are in the differential line driver method.

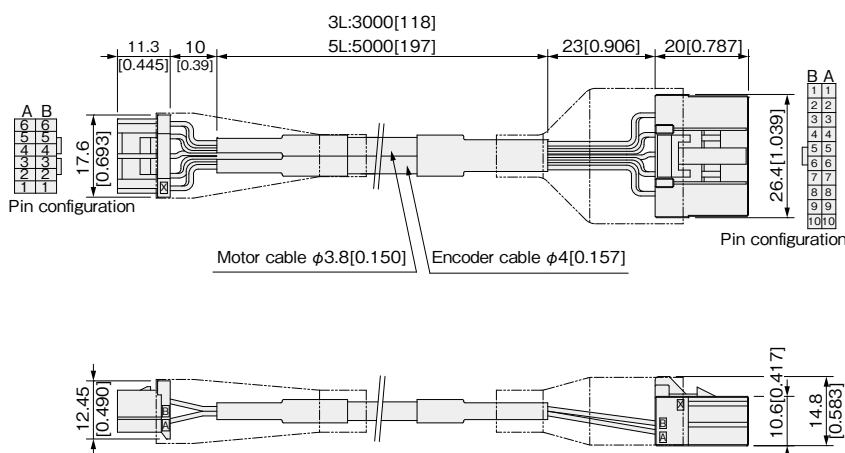
EWHKC



● Cable (Additional Part)

- Connecting cable (Robot Cable)

EWHKA-□



Connector on main unit side

No.	Name	Color
A1	F.G.	Brown
A2	A +	Red
A3	A -	Yellow
A4	B +	Green
A5	B -	White
A6	BRK	Black
B1	Shield	
B2	GND	Red
B3	5V	Yellow
B4	EA	Green
B5	EB	White
B6	EC	Black

Connector on controller side

No.	Name	Color
A1	A +	Red
B1	B +	Green
A2	A -	Yellow
B2	B -	White
A3	F.G.	Brown
B3	BRK	Black
A4	COM1	—
B4	COM2	—
A5		—
B5		—
A6	F.G.	—
B6	GND 5V	—
A7	DV +	Yellow
B7	DV -	Red
A8	EA +	—
B8	EA -	Green
A9	EB +	—
B9	EB -	White
A10	EC +	—
B10	EC -	Black

Chapter 9 Technical Data

9-1 Selection procedure

●Electric Rotary Actuators

- When using screws to secure a workpiece to the electric rotary actuator table, be sure to hold either the table or the workpiece during tightening.

●Duty cycle limits

Use the electric rotary actuator with a duty cycle of 50% or less.

$$\text{Duty cycle} = \frac{\text{Operating time}}{\text{Operating time} + \text{Down time}} \times 100 (\%)$$

●Limits on load torque and speed

When mounting the product on the table in a vertical position, design the workpiece so that it will not exert load torque as much as possible. Limit the load torque to 60% or less of the actuator's maximum torque.

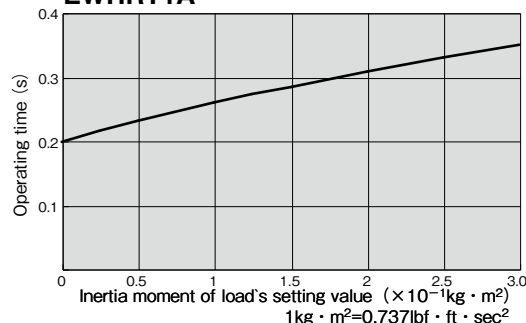
Caution: When a load torque is applied, limit the speed settings as shown below.

Load ratio(%)	20	40	60
Speed setting(%)	Max.50	Max.33	Max.25

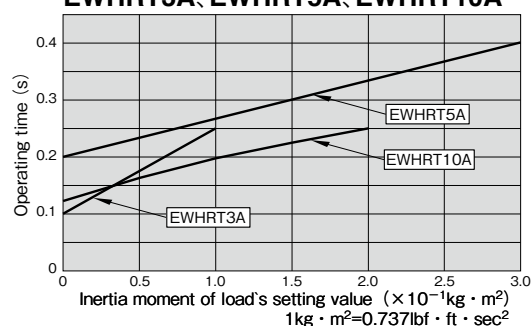
$$\text{Load ratio} = \frac{\text{Load torque}}{\text{Maximum torque}} \times 100 (\%)$$

●Operating time (operating angle 90°)

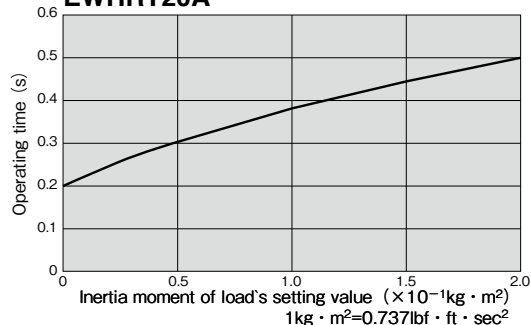
EWHRT1A



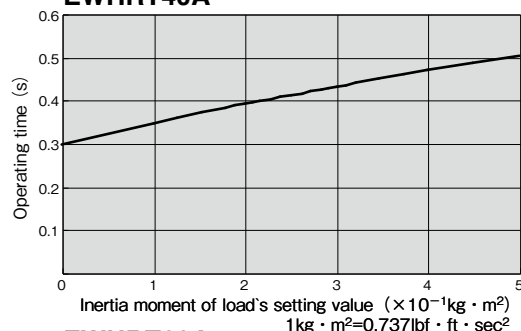
EWHRT3A, EWHRT5A, EWHRT10A



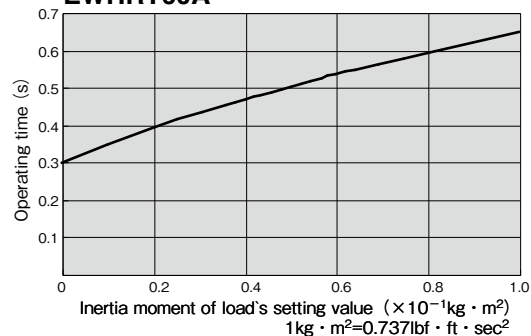
EWHRT20A



EWHRT40A



EWHRT60A



Remark: Graphs obtained at the maximum speed and the maximum acceleration (when no load torque is applied)

9-2 Calculation examples for moment of inertia

Note: Moment of inertia of the workpiece should always be at or below the maximum load inertia.

1. Disk-shaped load around rotating axis

Load material: Aluminum alloy (density $2.7 \times 10^3 \text{ kg/m}^3$)

$$I = \frac{md^2}{8}$$

I : Moment of inertia around rotating axis ($\text{kg} \cdot \text{m}^2$)

d : Disk diameter (m)

m : Mass (kg)

$d = 0.16 \text{ (m)}$

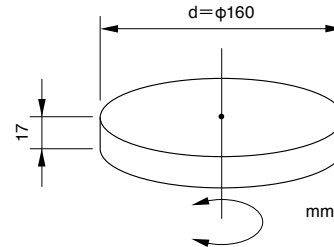
$$m = \frac{\pi \times 0.16^2}{4} \times 0.017 \times 2.7 \times 10^3$$

$$= 0.92(\text{kg})$$

$$I = \frac{0.92 \times 0.16^2}{8}$$

$$= 3.0 \times 10^{-3} \text{ (kg} \cdot \text{m}^2\text{)}$$

This is the maximum load inertia for **EWHRT5A**.



2. Rectangular load offset from rotating axis

Load material: Aluminum alloy (density $2.7 \times 10^3 \text{ kg/m}^3$)

$$I = \frac{m}{12} (a^2 + b^2) + mL^2$$

I : Moment of inertia around rotating axis ($\text{kg} \cdot \text{m}^2$)

a, b : Length of side (m)

L : Offset distance from rotating axis to the center of load (m)

m : Mass (kg)

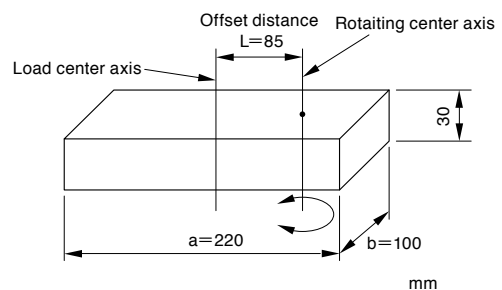
$$m = 0.22 \times 0.1 \times 0.03 \times 2.7 \times 10^3$$

$$= 1.78(\text{kg})$$

$$I = \frac{m}{12} (a^2 + b^2) + mL^2$$

$$= 2.0 \times 10^{-2} \text{ (kg} \cdot \text{m}^2\text{)}$$

This is the maximum load inertia for **EWHRT20A**.



For general precautions for the Elewave series,
refer to "Safety Precautions" and "Handling Instructions
and Precautions" on our website or product catalog before use.

Contact the Technical Service Center below
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**ELEWAVE SERIES
ELECTRIC ROTARY ACTUATOR
Pulse train input type controller
OWNER'S MANUAL**

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