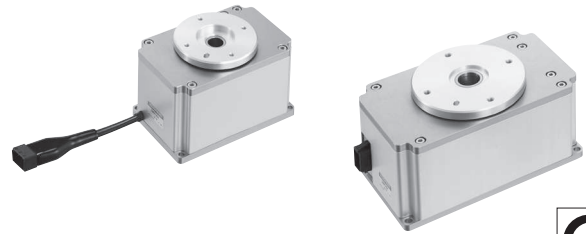


Electric rotary actuator



Specifications

Main unit basic specifications

Item	Type	EWHRT1A	EWHRT3A	EWHRT5A	EWHRT10A	EWHRT20A	EWHRT40A	EWHRT60A
Motor		Two phase stepping motor						
Maximum torque	N·m [in·lbf]	0.1 [0.9]	0.25 [2.2]	0.5 [4.4]	1.0 [8.9]	2.0 [17.7]	4.0 [35.4]	6.0 [53.1]
Repeated positioning precision ^{*2}	°	±0.02						
Angle detection		Optical encoder (with origin point)						
Maximum load inertia ^{*3}	kg·m ² [lb·ft ²]	3.0 x 10 ⁻⁴ [2.21x10 ⁻⁴]	1.0 x 10 ⁻³ [0.74x10 ⁻³]	3.0 x 10 ⁻³ [2.21x10 ⁻³]	2.0 x 10 ⁻³ [1.48x10 ⁻³]	2.0 x 10 ⁻² [1.48x10 ⁻²]	5.0 x 10 ⁻² [3.69x10 ⁻²]	1.0 x 10 ⁻¹ [0.74x10 ⁻¹]
Minimum operation time ^{*4}	(90° load free)	s	0.2	0.1	0.2	0.12	0.2	0.3
	(90° 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 [°F]	0 to 40 [32 to 104]						
Allowable thrust load	N	100			200		400	
Allowable radial load	N	100			200		400	
Allowable moment	N·m [in·lbf]	2.5 [22.1]			5.5 [48.7]		10.0 [88.5]	
Mass ^{*5}	kg [lb]	0.3 [0.661]	0.34 (0.4) [0.750 (0.882)]	0.8 (0.9) [1.764 (1.984)]		2.0 (2.3) [4.409 (5.071)]	2.2 (2.5) [4.850 (5.512)]	
Applicable controllers		EWHC-RS,EWHCP-RS		EWHC-RA,EWHCP-RA				

*1 EWHRT40A and EWHRT60A are the type where the cable does not protrude from the main unit (the connector is built into the side of the main unit).

*2 The repeated positioning precision for pulsation.

*3 The workpiece mass moment of inertia must be at or below the maximum load inertia.

*4 The value when there is no load torque.

*5 Values in parentheses are the mass with brake.

● See pages 45 and 46 for the controller specifications.

Order Codes

EWHRT **A** - - - - -

Elewave electric rotary actuator

Size

- 1 : Torque 0.1 N·m [0.9 in·lbf]
- 3 : Torque 0.25 N·m [2.2 in·lbf]
- 5 : Torque 0.5 N·m [4.4 in·lbf]
- 10 : Torque 1.0 N·m [8.9 in·lbf]
- 20 : Torque 2.0 N·m [17.7 in·lbf]
- 40 : Torque 4.0 N·m [35.4 in·lbf]
- 60 : Torque 6.0 N·m [53.1 in·lbf]

Brake

Not specified: Without brake
B: With brake^{*1}

Controller type

Not specified: Without controller
C: With EWHC-RA or EWHC-RS (point input type)
CP: With EWHCP-RA or EWHCP-RS (pulse array input type)

Cable length (relay cable)

Not specified: Without cable
3L: 3 m [9.843 ft.]
5L: 5 m [16.404 ft.]

DIN rail mounting plate

Not specified: Without mounting plate
DP: With mounting plate (cannot be selected without controller)

*1 There is no EWHRT1A with brake.

Additional parts

Point input type controller

- [Accessories]
- Power cable
 - I/O cable

EWHC - RA -



DIN rail mounting plate
Not specified: Without mounting plate
DP: With mounting plate

EWHC - RS - (for EWHRT1A)



DIN rail mounting plate
Not specified: Without mounting plate
DP: With mounting plate

Pulse array input type controller

- [Accessories]
- Power cable
 - I/O cable
 - Pulse array input cable
 - Conversion cable for pulse array input connector

EWHCP - RA -



DIN rail mounting plate
Not specified: Without mounting plate
DP: With mounting plate

EWHCP - RS - (for EWHRT1A)



DIN rail mounting plate
Not specified: Without mounting plate
DP: With mounting plate

DIN rail mounting plate

EW2DP



Cable (relay cable)^{*2}

*2 Robot cable

EWHKA -



Cable length
3L: 3 m [9.843 ft.]
5L: 5 m [16.404 ft.]

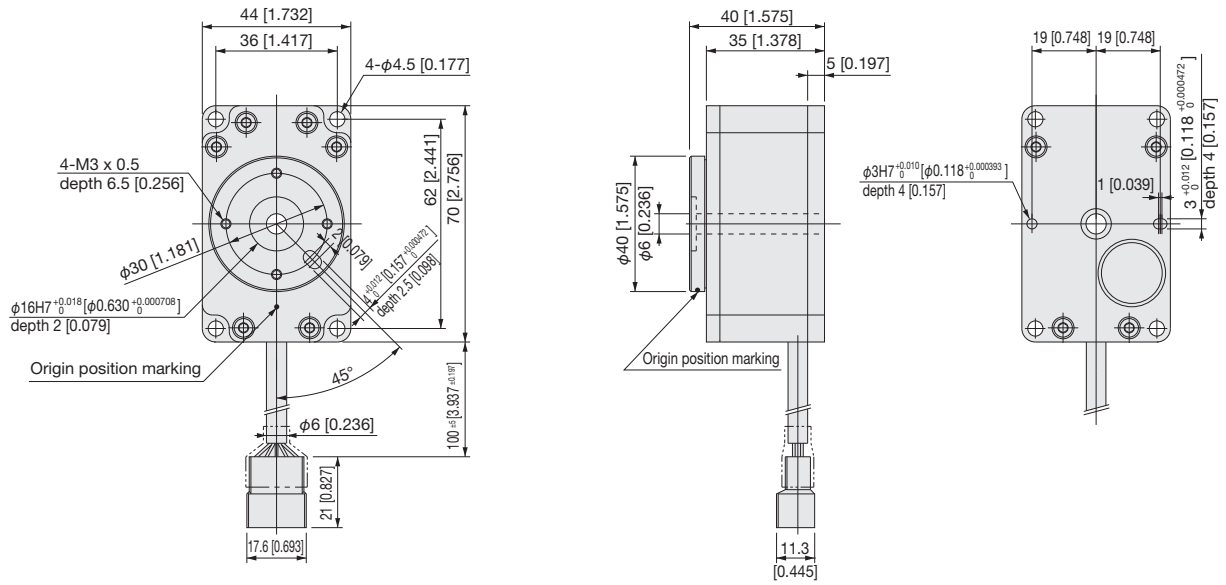
Teaching^{*3} box

EWHTB



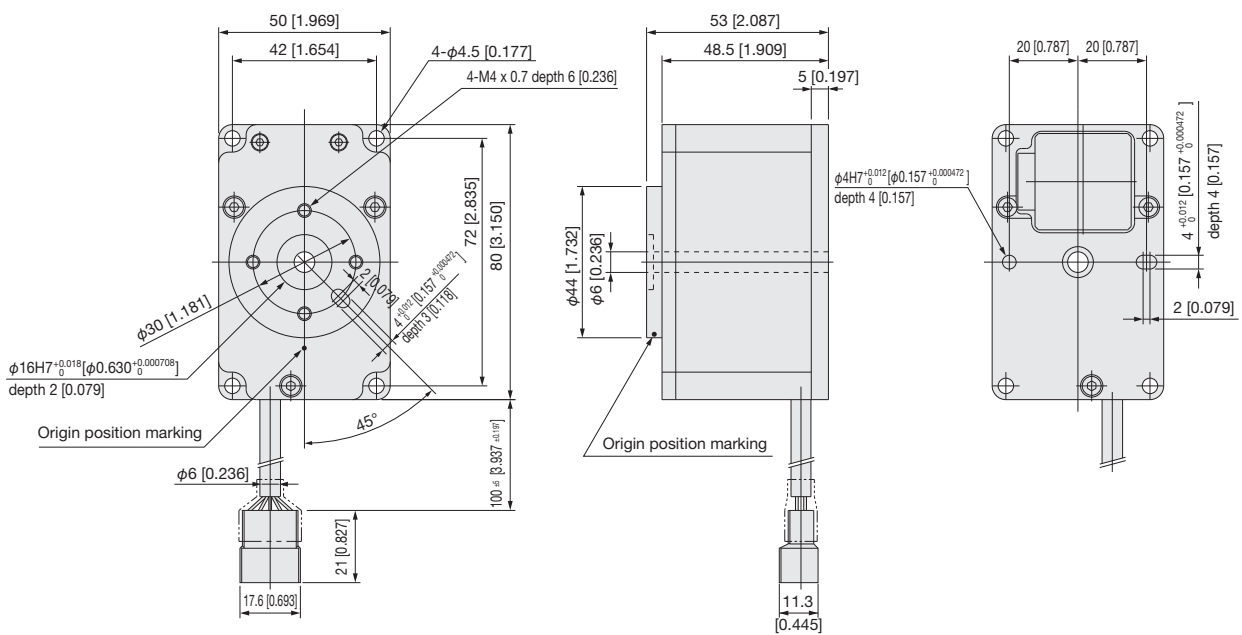
*3 See page 59 for the specifications and dimensions.

EWHRT1A



*The origin position of the table is when the slot of the locating dowel pin is in the position indicated in the figure above.

**EWHRT3A
EWHRT5A**



*The origin position of the table is when the slot of the locating dowel pin is in the position indicated in the figure above.

EW2H

EW2HL

EWHA A

EWHA H

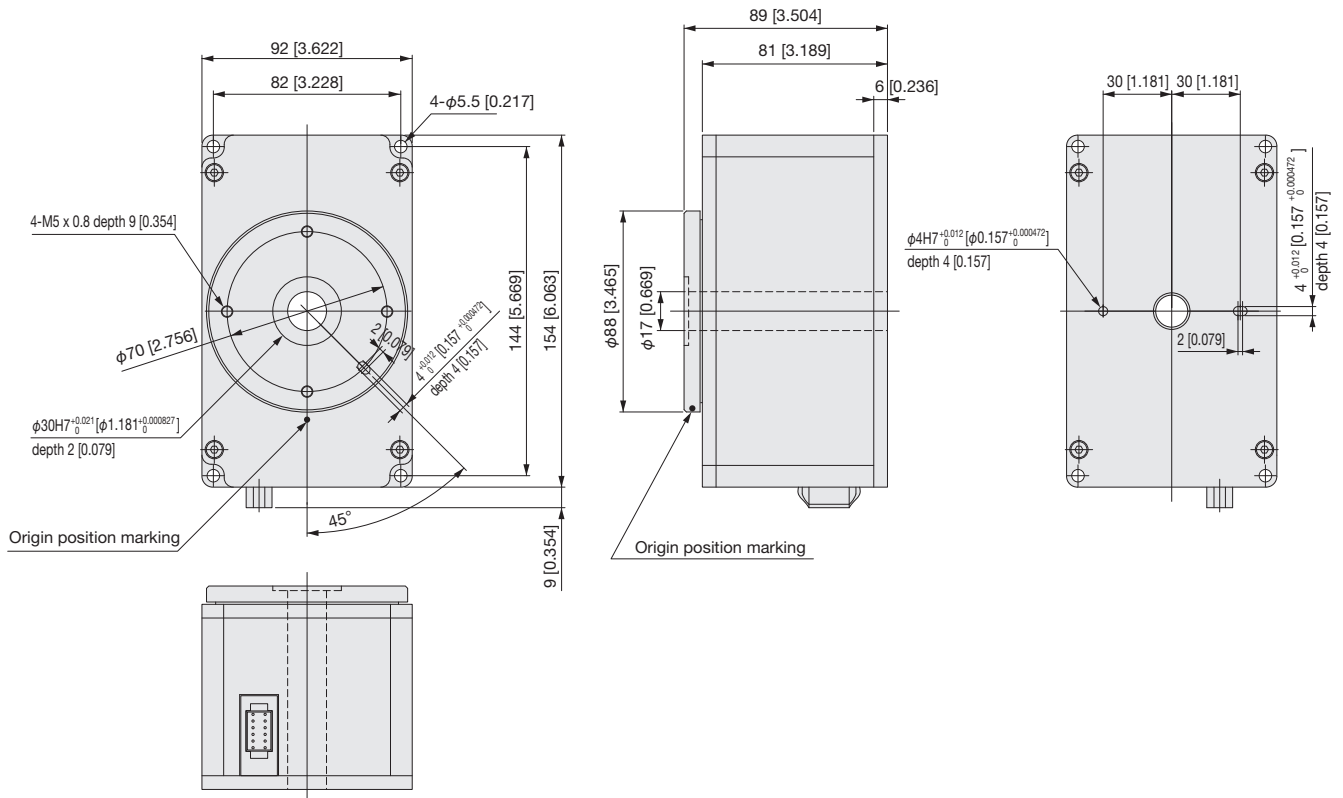
EWHRT

EWM5

Material

Electric rotary actuator dimensions mm [in.]

EWHRT60A



*The origin position of the table is when the slot of the locating dowel pin is in the position indicated in the figure above.

EW2H

EW2HL

EWHA A

EWHA H

EWHRT

EWM5

Material

Controller

Point input type



Specifications

Item	Type	EWHC-RA,EWHC-RS
Axis control	Motor drive system	Microstep drive
	Control method	Closed loop control ^{*1}
	Operating method	PTP
	Origin detection method	Encoder Z phase
	Position detection method	Encoder A/B phase output
	Minimum setting distance (angle)	0.01°
	Acceleration setting	1 to 100 % (automatically set by load inertia)
	Point setting	64 points
	Point input method	Numeric input, teaching input, direct teaching
External input/output	Point setting input	6 point (POS0~POS5) photocoupler receptor 5 mA TYP/point
	Control input	3 point (ORG, START, STOP) photocoupler receptor 5 mA TYP/point
	Control output	3 point (RDY, BUSY, INPOS) 30 mA Max./point
	Error detection output	Overload, wiring disconnection, data error, system error
	External communication	RS232C 1 ch (computer, TB communication)
	Motor drive output	Dedicated cable (with F.G.)
	Encoder input	Dedicated cable (shielded)
General specifications	Mass	0.2 kg [0.441 lb]
	Power supply	DC 24 V±10 % 1.6 A Max. (motor, I/O power supply shared) ^{*2}
	Operating temperature	0 to 40 °C [32 to 104°F]
	Operating humidity	35 to 85 % RH (without condensation)
	Storage temperature	-10 to 65 °C [14 to 149°F]
	Backup	Setting conditions retained in EEPROM
	Noise resistance	IEC61000-4-4 level 3
	Accessories	I/O cable, power cable

*1 Missed step detection is performed via a rotary encoder.

*2 The maximum consumption current value differs according to the actuator. See the table below.

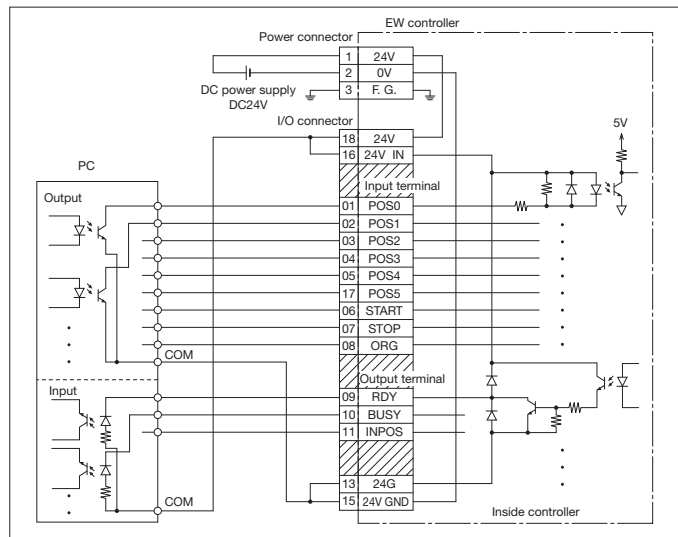
Maximum consumption current (electric rotary actuator)

(A)

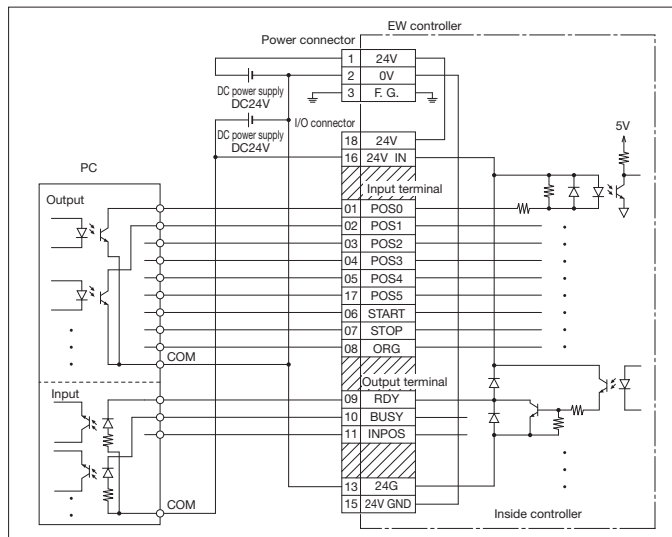
Model	EWHRT1A	EWHRT3A	EWHRT5A	EWHRT10A	EWHRT20A	EWHRT40A	EWHRT60A
Standard	0.6		1.0				1.3
With brake	-		1.0				1.6

Controller Wiring Method

1. When using the internal power supply of the controller (electric rotary actuator)



2. When not using the internal power supply of the controller (electric rotary actuator)



Controller

Pulse array input type



EW2H

EW2HL

EWHA □ A

EWHA □ H

EWHRT

EWM5

Material

Specifications

Item	Type	EWHCP-RA, EWHCP-RS	
Axis control	Motor drive system	Microstep drive	
	Control method	Closed loop control ^{*1}	
	Operating method	Position control via pulse array input	
	Origin detection method	Encoder Z phase	
	Position detection method	Encoder A/B phase output	
	Pulse array input method	Differential line driver/open collector	
	Maximum input pulse frequency ^{*2}	Max. 200 kpps (differential line driver)/Max 60 kpps (open collector)	
Pulse array input instruction format		CW/CCW, pulse/code (positive/negative logic available)	
External input/output	Control input	6 points (alarm reset, clear counter, brake release, servo ON, pulse input prohibited/origin return stopped, origin return) 5 mA TYP./point	
	Control output	4 points (preparations complete, pulse input reception available, positioning complete, zone output) 30 mA Max./point	
	Error detection output	Overload, data error, system error	
	External communication	RS232C 1 ch (computer, TB communication)	
	Motor drive output	Dedicated cable (with F.G.)	
	Encoder input	Dedicated cable (shielded)	
	Pulse array input	Dedicated cable (twisted pair cable)	
General specifications	Mass	0.2 kg [0.441 lb]	
	Power supply	DC 24 V±10 % 1.6A Max. (motor, I/O power supply shared) ^{*3}	
	Operating temperature	0 to 40 °C [32 to 104°F]	
	Operating humidity	35 to 85 % RH (without condensation)	
	Storage temperature	-10 to 65 °C [14 to 149°F]	
	Backup	Setting conditions retained in EEPROM	
	Noise resistance	IEC61000-4-4 level 3	
	Accessories		I/O cable, power cable, pulse array input cable ^{*4} , conversion cable for pulse array input connector x 2 ^{*5}

*1 Missed step detection and force control when gripping are performed via a rotary encoder.

*2 The actual maximum input pulse count is regulated by the maximum speed of each actuator.

*3 The maximum consumption current value differs according to the actuator. See the table below.

*4 The length of the pulse array input cable is 1 m [3.281 ft.].

*5 Note that the method for connecting the pulse array input cable differs for the differential line driver input and open collector input (see the instruction manual for details).

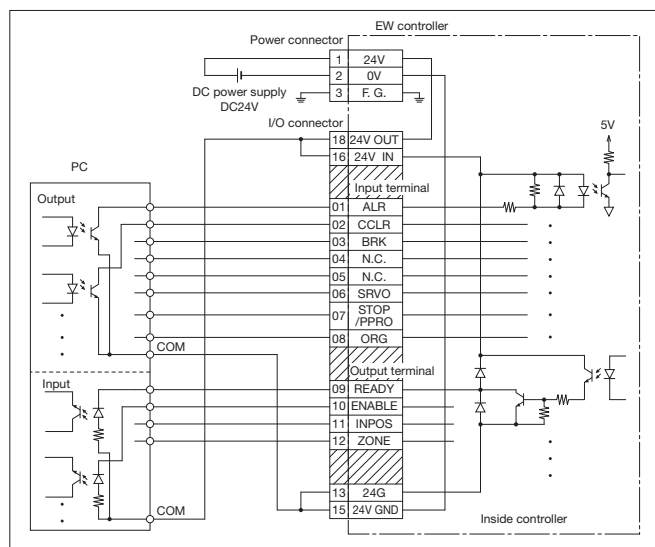
Maximum consumption current (electric rotary actuator)

(A)

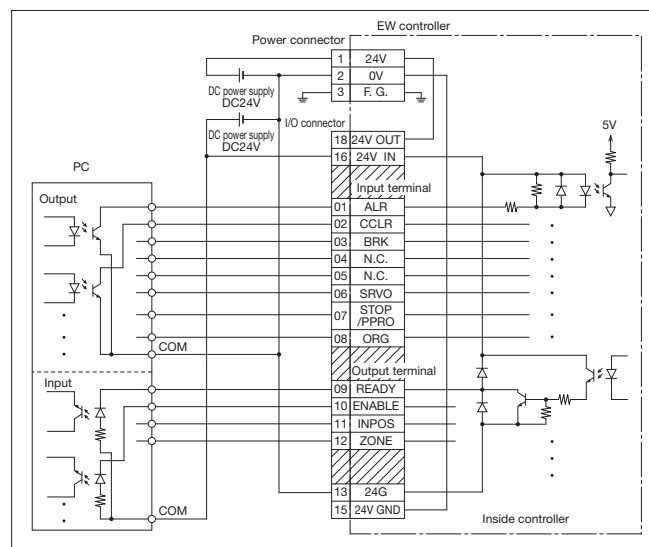
Model	EWHRT1A	EWHRT3A	EWHRT5A	EWHRT10A	EWHRT20A	EWHRT40A	EWHRT60A
Standard	0.6		1.0			1.3	
With brake	—		1.0			1.6	

Controller Wiring Method

1. When using the internal power supply of the controller (electric rotary actuator)



2. When not using the internal power supply of the controller (electric rotary actuator)



Controller dimensions mm [in.]

(point input type)

EWHC- □ - □

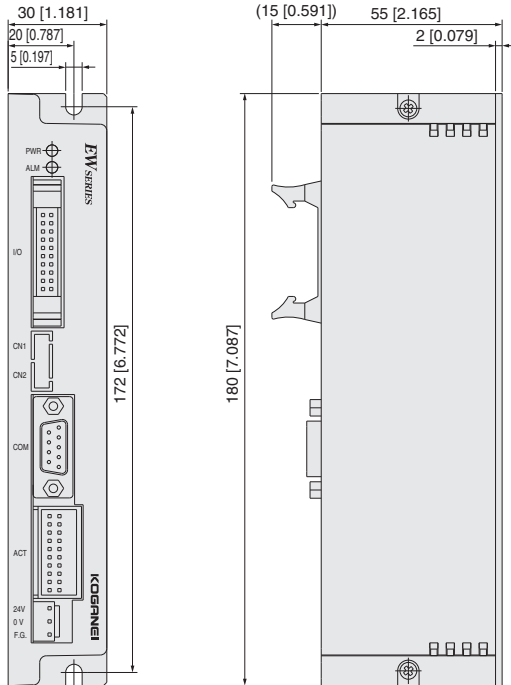
DIN rail mounting plate
Not specified: Without

DP: With (cannot be selected without controller)

Applicable main units

RA : For EWHRT3A, 5A, 10A, 20A, 40A, 60A

RS : For EWHRT1A



(pulse array input type)

EWHCP- □ - □

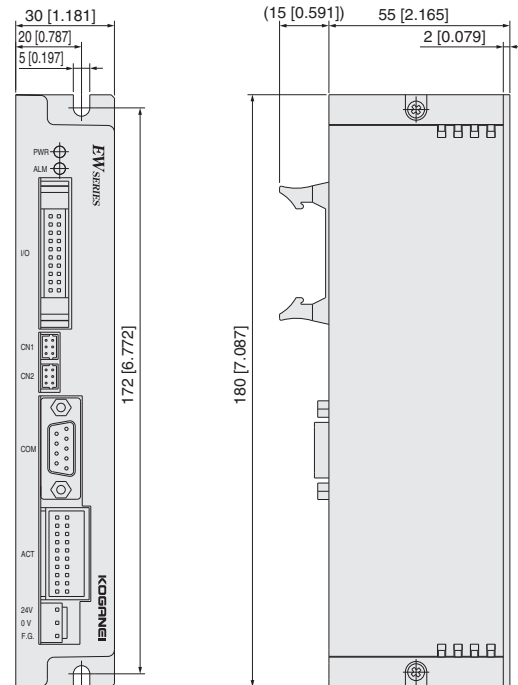
DIN rail mounting plate
Not specified: Without

DP: With (cannot be selected without controller)

Applicable main units

RA : For EWHRT3A, 5A, 10A, 20A, 40A, 60A

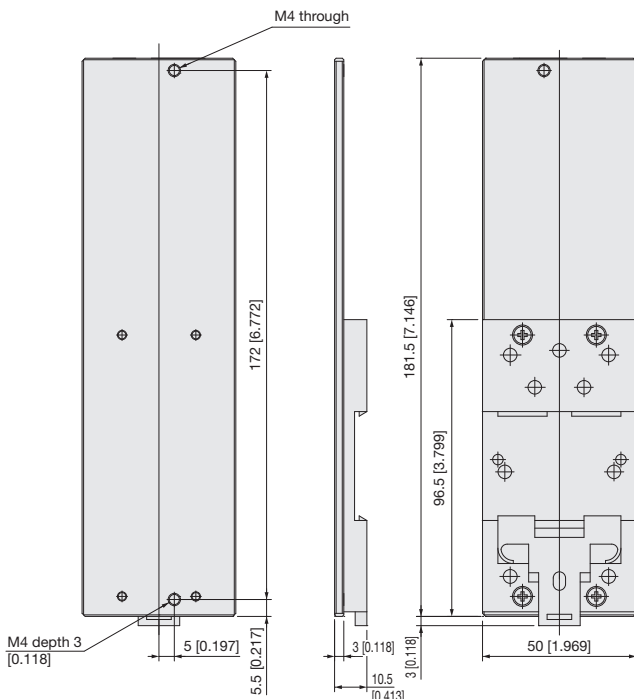
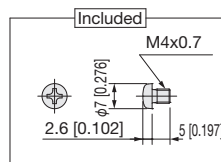
RS : For EWHRT1A



Controller dimensions mm [in.]

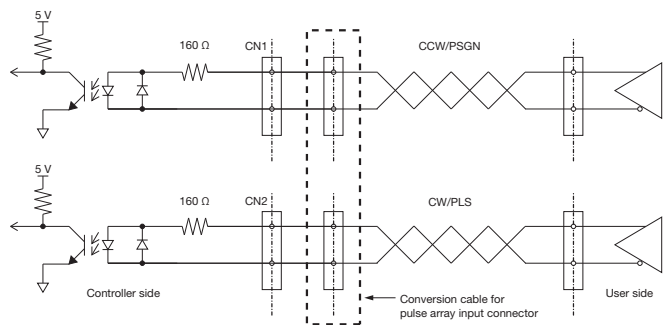
● DIN rail mounting plate

EW2DP

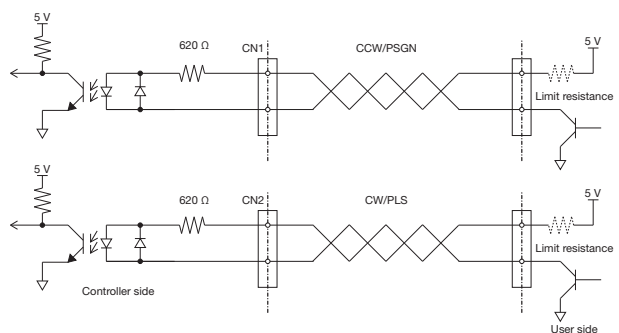


Controller wiring method (pulse array input type)

● Differential line driver input circuit



● Open collector input circuit



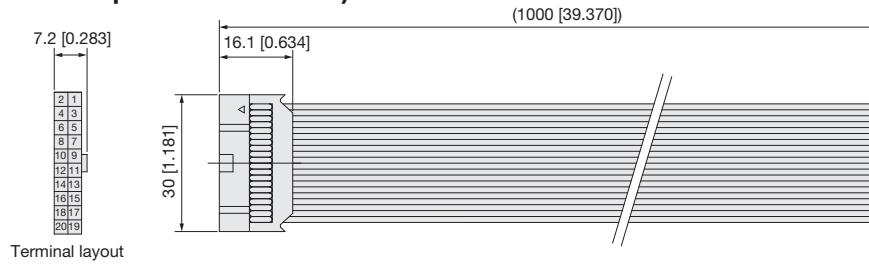
[Caution] When applying voltage of 5.5 V or higher, add current limit resistance (10 mA or less).

Controller dimensions mm [in.]

● Controller included

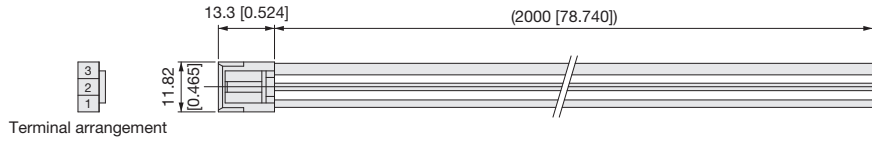
- I/O cable (type: product equivalent to EW2KI)

EW2KI



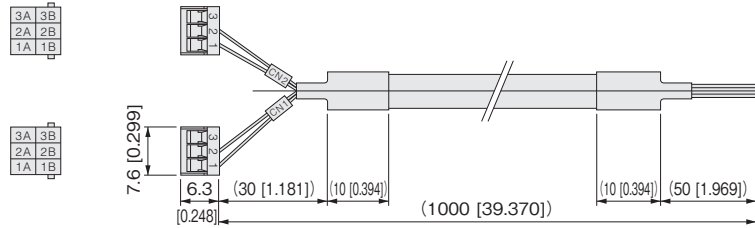
- Power cable (type: product equivalent to EW2KP)

EW2KP



- Pulse array input cable (pulse array input type controller only)

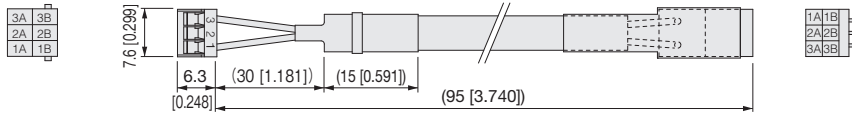
EWHKY



● Conversion cable for pulse array input connector (pulse array input type controller only)

*Make sure to use this conversion cable when the pulse array input signal is a differential line driver.

EWHKC

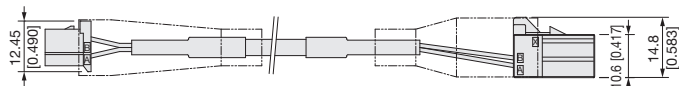
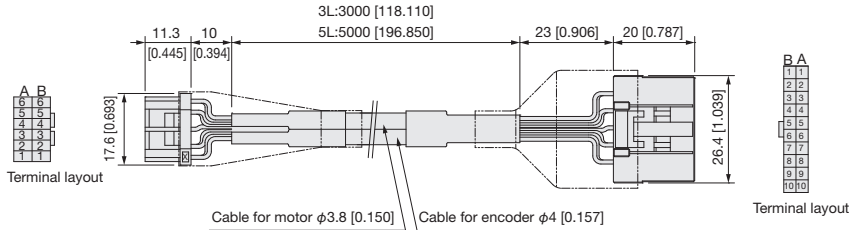


● Cable

- Relay cable (robot cable)

EWHKA-

3L: 3 m [9.843 ft.]
5L: 5 m [16.404 ft.]
3L:3000 [118.110]
5L:5000 [196.850]



Main unit side connector

No.	Parts	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

Controller side connector

No.	Parts	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

Selection guidelines

● Electric rotary actuator

● When securing a workpiece to the table of the electric rotary actuator using a bolt, etc., do so with the table or workpiece retained.

● Duty limitation

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

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

● Load torque and speed limitation

When using the table installed in the vertical direction, design the workpiece so that load torque will not be applied where possible. When load torque is applied, ensure that it is at or below 60 % of the maximum torque of the actuator.



When load torque is applied, use the speed setting within the following limits.

Load ratio (%)	20	40	60
Speed setting (%)	50 or below	33 or below	25 or below

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

● Example of calculating mass moment of inertia



The workpiece mass moment of inertia must be at or below the maximum load inertia.

1. When there is disk shaped load on the rotation axis

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

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

I : Mass moment of inertia about the rotation axis (kg-m^2)

d : Disk outer diameter (m)

m : Mass (kg)

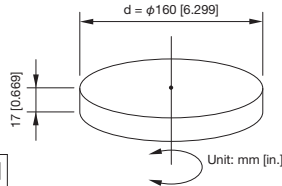
d = 0.16 (m)

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

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

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

$$= 3.0 \times 10^{-3} \text{ (kg-m}^2\text{)} [2.213 \times 10^{-3} \text{ (bf-ft-sec}^2\text{)}]$$



The maximum load inertia of the EWHRT5A.

2. For cuboid load offset from the rotation 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 : Mass moment of inertia about the rotation axis (kg-m^2)

a, b : Side length (m)

L : Offset from rotation axis and load center (m)

m : Mass (kg)

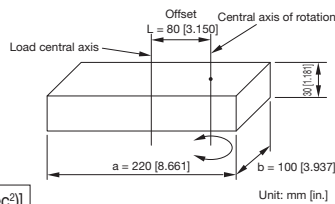
$$m = 0.22 \times 0.1 \times 0.03 \times 2.7 \times 10^3$$

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

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

$$= \frac{1.78}{12} (0.22^2 + 0.1^2) + (1.78 \times 0.08^2)$$

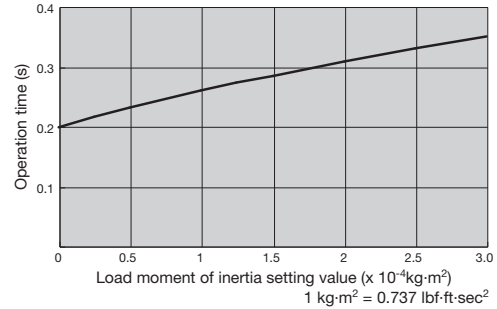
$$= 2.0 \times 10^{-2} \text{ (kg-m}^2\text{)} [1.475 \times 10^{-2} \text{ (bf-ft-sec}^2\text{)}]$$



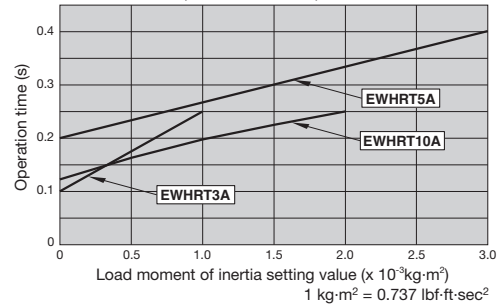
The maximum load inertia of the EWHRT20A.

● Operation time (operation angle 90°)

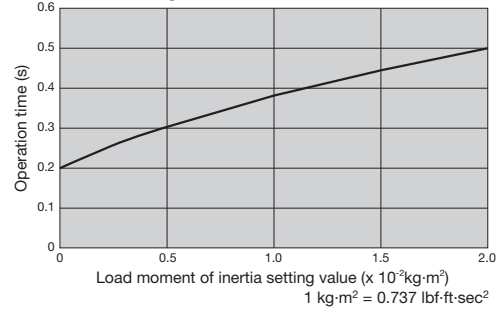
EWHRT1A



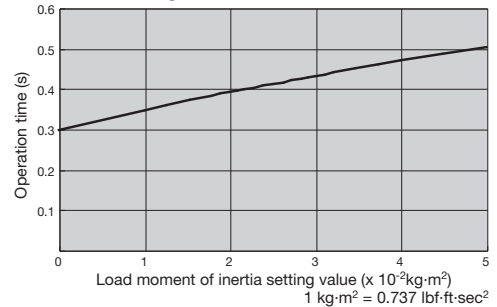
EWHRT3A, EWHRT5A, EWHRT10A



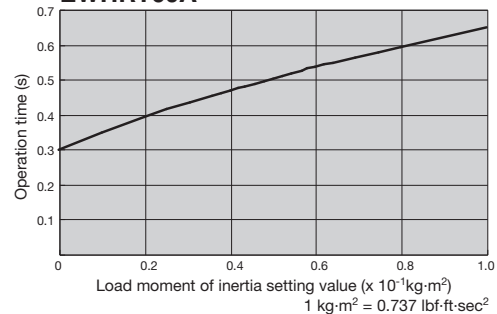
EWHRT20A



EWHRT40A



EWHRT60A

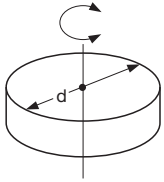


Remarks: At maximum speed and maximum acceleration (when there is no load torque)

Selection guidelines

- Electric rotary actuator
- Mass moment of inertia calculation diagrams
[When the rotation axis passes the workpiece]

Disk

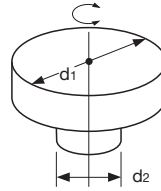


- Diameter d (m)
- Mass m (kg)

■ Mass moment of inertia I (kg·m²)

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

Stepped disk

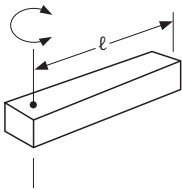


- Diameter d₁ (m)
- Diameter d₂ (m)
- Mass d₁ part m₁ (kg)
- Mass d₂ part m₂ (kg)

■ Mass moment of inertia I (kg·m²)

$$I = \frac{1}{8} (m_1 d_1^2 + m_2 d_2^2)$$

Bar (center of rotation at edge)

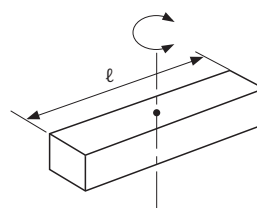


- Bar length l (m)
- Mass m (kg)

■ Mass moment of inertia I (kg·m²)

$$I = \frac{m l^2}{3}$$

Bar (center of rotation at center of gravity)

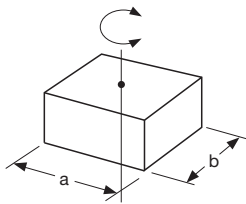


- Bar length l (m)
- Mass m (kg)

■ Mass moment of inertia I (kg·m²)

$$I = \frac{m l^2}{12}$$

Rectangular parallelepiped



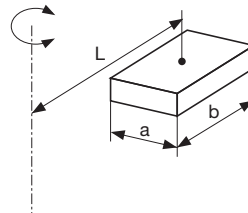
- Side length a (m)
- Side length b (m)
- Mass m (kg)

■ Mass moment of inertia I (kg·m²)

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

[When the rotation axis is offset from the workpiece]

Rectangular parallelepiped

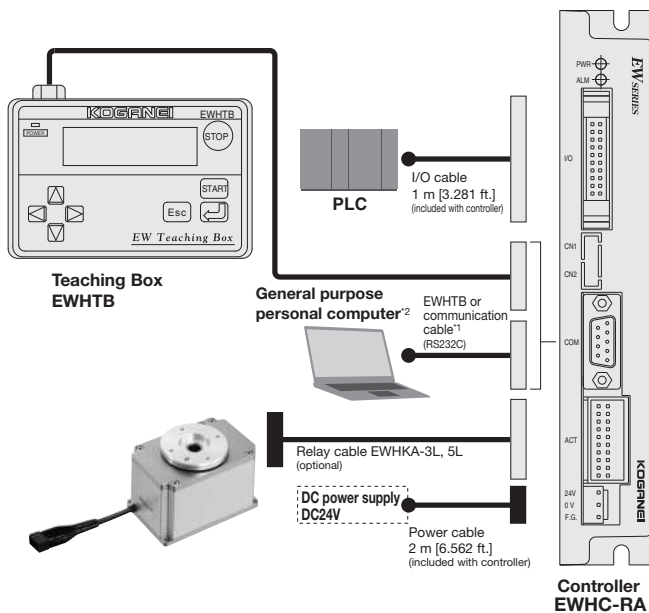


- Side length a (m)
- Side length b (m)
- Distance from the rotation axis to the load center L (m)
- Mass m (kg)

■ Mass moment of inertia I (kg·m²)

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

● System configuration (example)



*1 RS232C cable (for reference)

Specifications: D-sub 9 pin (female) ↔ D-sub 9 pin (female)/cross cable
Type: C232R-ECO915 (1.5 m [4.921 ft.])/C232R-ECO930 (3.0 m [9.842 ft.])
Manufacturer: Elecom Co., Ltd.

The communication cable must be provided by the customer.

*2 The support software for setting the controller can be downloaded from the KOGANEI website free of charge.