Autonics

ROTARY ENCODER(INCREMENTAL TYPE)
E40S/E40H/E40HB/E80H SERIES

M A N U A L

CE E40S E40H E40HB E80H

Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

▣ Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;
⚠ **Warning** Serious injury may result if instructions are not followed.
⚠ **Caution** Product may be damaged, or injury may result if instructions are not followed.

※The following is an explanation of the symbols used in the operation manual.
⚠ : Injury or danger may occur under special conditions.

⚠Warning

1. **In case of using this unit with machinery(Medical equipment, vehicle, train, airplane, combustion apparatus, entertainment processing equipment, conveyor, elevator or safety device etc.), it is required to install fail-safe device, or contact us for information on type required.**
   It may cause serious human injury or a fire, property.

⚠Caution

1. **Do not drop water or oil on this unit.**
   It may cause damage or miscontrol due to malfunction.
2. **Please observe voltage rating.**
   It may shorten the life cycle or damage to the product.
3. **Please check the polarity of power and wrong wiring.**
   It may result in damage to this unit.
4. **Do not short circuit the load.**
   It may result in damage to this unit.

▣ Outline

This unit is very useful to control position and speed by converting revolution value of shaft into number of pulse as an optical incremental Encoder.

▣ Ordering information

E40S - 6 - 5000 - 3 - N - 24 - ☐

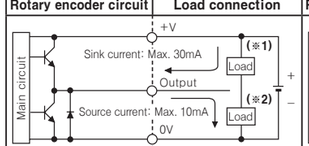
Series	Shaft diameter	Pulse / 1Revolution	Output phase	Output	Power supply	Cable
E40S	* ϕ6mm ϕ8mm	*1,*2,*5,10,*12,15,20, 23,25,30,35,40,45,50,	2: A, B 3: A, B, Z 4: A, $\overline{A}$, B, $\overline{B}$ 6: A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$	T: Totem pole output N: NPN open collector output V: Voltage output L: Line Driver output	5: 5VDC ±5% 24: 12-24VDC ±5%	No mark: Normal type (※)C: Cable outgoing connector type
E40H E40HB	Inside diameter ϕ6mm * ϕ8mm ϕ10mm ϕ12mm	60,75,100,120,125,150 192,200,240,250,256, 300,360,400,500,512, 600,800,1000,1024,1200, 1500,1800,2000,2048, 2500,3000,3600,5000				
E80H	* ϕ30mm ϕ32mm	60,100,360,500 512,1024,3200	3: A, B, Z 6: A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$			

※ " * " indicates the standard specification of diameters.
※ 1, 2, 5, 12 P/R are output A, B phase only.(But Line Driver output A, $\overline{A}$, B, $\overline{B}$ phase)
※Cable length: 250mm

▣ Control output diagram

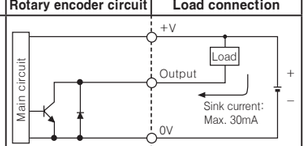
Totem Pole output

Rotary encoder circuit / Load connection



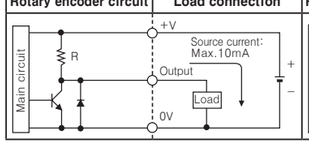
NPN open collector output

Rotary encoder circuit / Load connection



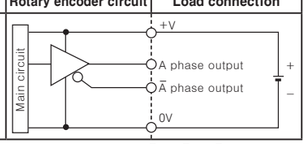
Voltage output

Rotary encoder circuit / Load connection



Line Driver output

Rotary encoder circuit / Load connection



※ The output circuit of A, B, Z phase are the same.(Line Driver output is A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$ phase)
※ Totem Pole output can be used for NPN open collector type(※1) or voltage output type(※2).

※ The above specification are subject to change without notice.

▣ Specifications

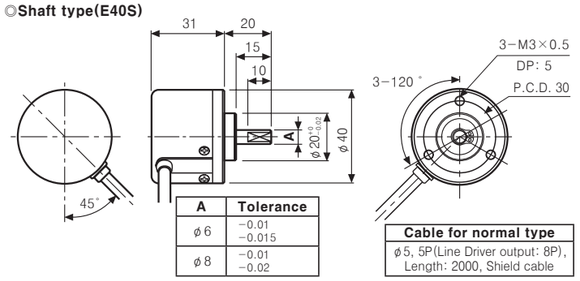
Incremental Rotary encoder		ϕ 40mm Shaft type	ϕ40mm Hollow shaft type	ϕ40mm Hollow shaft Built- in type	ϕ80mm Hollow shaft type
Model	Totem Pole output	E40S☐-☐-☐-T-☐	E40H☐-☐-☐-T-☐	E40HB☐-☐-☐-T-☐	E80H☐-☐-☐-T-☐
	NPN open collector output	E40S☐-☐-☐-N-☐	E40H☐-☐-☐-N-☐	E40HB☐-☐-☐-N-☐	E80H☐-☐-☐-N-☐
	Voltage output	E40S☐-☐-☐-V-☐	E40H☐-☐-☐-V-☐	E40HB☐-☐-☐-V-☐	E80H☐-☐-☐-V-☐
	Line Driver output	E40S☐-☐-☐-L-☐	E40H☐-☐-☐-L-☐	E40HB☐-☐-☐-L-☐	E80H☐-☐-☐-L-☐
Resolution(P/R)		*1, *2, *5, 10, *12, 15, 20, 23, 25, 30, 35, 40, 45, 50, 60, 75, 100, 120, 125, 150, 192, 200, 240, 250, 256, 300, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 5000 (Not indicated type is available to customize)		60, 100, 360, 500, 512, 1024, 3200
Output phase(※1)		(※1) A, B, Z phase(Line Driver output: A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$ phase)			
Electrical specification	Phase difference between output	Output between A and B phase: $\frac{T}{4} \pm \frac{T}{8}$ (T= 1cycle of A phase)			
	Control output: Totem Pole output	•Low ☞ Load current: Max. 30mA, Residual voltage: Max. 0.4VDC •High ☞ Load current: Max. 10mA, Output voltage(Power voltage 5VDC): Min.(Power voltage-2.0)VDC, Output voltage(Power voltage 12-24VDC): Min. (Power voltage-3.0)VDC			
	Control output: NPN open collector output	Load current: Max. 30mA, Residual voltage: Max. 0.4VDC			
	Control output: Voltage output	Load current: Max. 10mA, Residual voltage: Max. 0.4VDC			
	Control output: Line Driver output	•Low ☞ Load current: Max. 20mA, Residual voltage: Max. 0.5VDC •High ☞ Load current: Max. -20mA, Output voltage(Power voltage 5VDC): Min. 2.5VDC, Output voltage(Power voltage 12-24VDC): Min. (Power voltage-3.0)VDC			
	Response time(Rise/Fall): Totem Pole output	Max. 1㎲ (Cable length: 2m, I sink=20mA)			
	Response time(Rise/Fall): NPN open collector output				
	Response time(Rise/Fall): Voltage output				
	Response time(Rise/Fall): Line Driver output	Max. 0.5㎲ (Cable length: 2m, I sink=20mA)			
	Max. Response frequency	300㎑			200㎑
	Power supply	• 5VDC ±5%(Ripple P-P: Max. 5%) • 12-24VDC ±5%(Ripple P-P: Max. 5%)			
	Current consumption	Max. 80mA (disconnection of the load), Line Driver output: Max. 50mA(disconnection of the load)			
	Insulation resistance	Min. 100MΩ(at 500VDC megger between all terminals and case)			
	Dielectric strength	750VAC 50/60㎐ for 1 minute(Between all termials and case)			
	Connection	Cable outgoing type, 250mm Cable outgoing connector type			
Mechanical specification	Starting torque	Shaft Type: Max. 40gf·cm(0.004N·m), Hollow Type: Max. 50gf·cm(0.005N·m)			Max. 200gf·cm(0.02N·m)
	Moment of inertia	Max. 40g·cm²(4×10⁻⁶kg·m²)			Max. 800g·cm²(8×10⁻⁵kg·m²)
	Shaft loading	Radial: 2kgf, Thrust: 1kgf			Radial: 5kgf, Thrust: 2.5kgf
	Max. allowable revolution(※2)	5,000rpm			3,600rpm
Vibration		1.5㎜ amplitude at frequency of 10~55㎐ (for 1 min.) in each X, Y, Z direction for 2 hours			
Shock		Max. 50G			Max. 75G
Environment	Ambient temperature	-10 ~70℃, Storage: -25 ~ 85℃			
	Ambient humidity	35 ~ 85% RH, Storage: 35 ~ 90%RH			
Protection		IP50(IEC Standards)			
Cable		ϕ5mm, 5P, Length: 2m, Shield cable(Line Driver output: ϕ5mm, 8P) (AWG 24, Core wire diameter: 0.08mm, No. of core wire: 40, Insulator out diameter: ϕ1mm)			
Accessory		ϕ6mm coupling(Standard), ϕ8mm coupling(Option)	Bracket		
Approval		CE (Except for Line Driver output)			
Unit weight		Approx. 120g			Approx. 560g

※ **1**: 1, 2, 5, 12 P/R are output A, B phase only.(But Line Driver output: A, $\overline{A}$, B, $\overline{B}$ phase)
※ **2**: Max. allowable revolution≥ Max. response revolution [Max. response revolution(rpm) = $\frac{\text{Max. response frequency}}{\text{Resolution}} \times 60$ sec.] Please select the resolution to make lower max. revolution than max. allowable revolution.
※ Environment resistance is rated at no freezing or condensation.

▣ Dimensions

(Unit:mm)

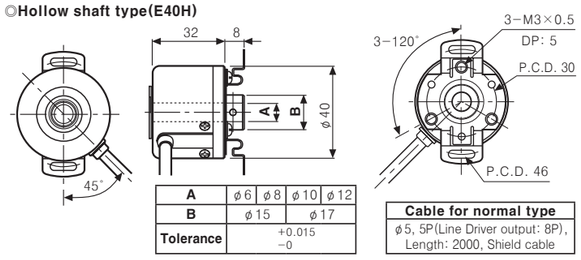
◎Shaft type(E40S)



A	Tolerance
ϕ6	-0.01 -0.015
ϕ8	-0.01 -0.02

Cable for normal type
ϕ5, 5P(Line Driver output: 8P), Length: 2000, Shield cable

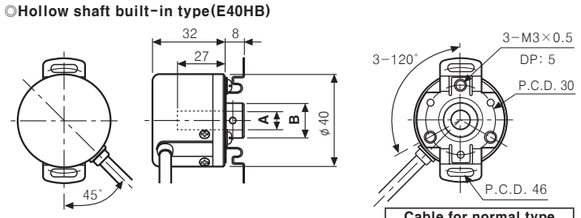
◎Hollow shaft type(E40H)



A	ϕ6	ϕ8	ϕ10	ϕ12
B	ϕ15		ϕ17	
Tolerance	+0.015 -0			

Cable for normal type
ϕ5, 5P(Line Driver output: 8P), Length: 2000, Shield cable

◎Hollow shaft built-in type(E40HB)

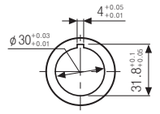


※ A, B dimensions are the same as hollow shaft type(E40H).

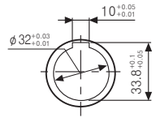
Cable for normal type
ϕ5, 5P(Line Driver output: 8P), Length: 2000, Shield cable

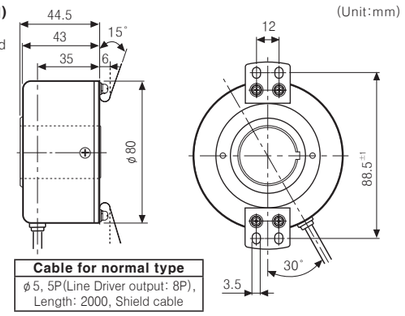
◎Hollow shaft type(E80H)

●Shaft inner diameter standard



●Shaft inner diameter(Option)

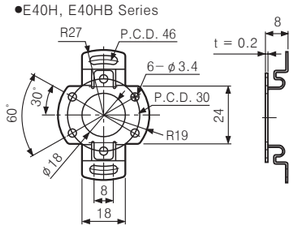




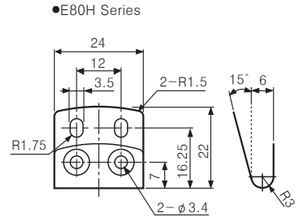
Cable for normal type
ϕ5, 5P(Line Driver output: 8P), Length: 2000, Shield cable

◎Bracket

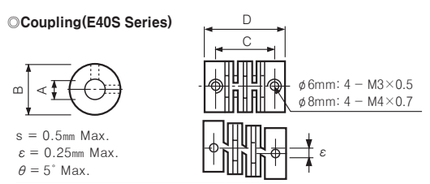
●E40H, E40HB Series



●E80H Series



◎Coupling(E40S Series)



Type \ Item	A	B	C	D
E40S6 ϕ6㎜ coupling	ϕ6 +0.1 0	ϕ15	16.5	22
E40S8 ϕ8㎜ coupling	ϕ8 +0.1 0	ϕ19	18.2	25

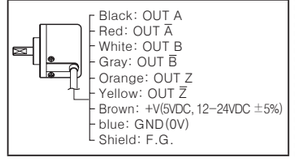
- When combine the coupling to encoder shaft, if there is big eccentricity or bend between rotating encoder shaft and mate shaft, it will make the life cycle of encoder and coupling shorten.
- It must not use larger shaft loading than specification.

▣ Connections

◎Normal type

• Totem Pole output
• NPN open collector output
• Voltage output

• Line Driver output



※ Non-using wires must be insulated.
※ The shield cable and metal case of encoder must be grounded(F.G.).

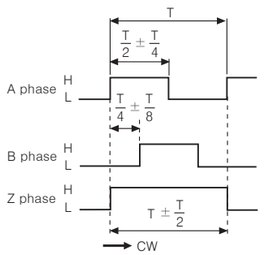
◎Cable outgoing connector type

• Totem Pole output • NPN open collector ouput • Voltage output	• Line Driver output

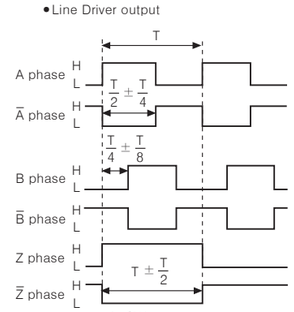
Pin No.	Cable color	Function	Pin No.	Cable color	Function
1	Black	OUT A	1	Black	OUT A
2	White	OUT B	2	Red	OUT Ā
3	Orange	OUT Z	3	Brown	+V
4	Brown	+V	4	Blue	GND
5	Blue	GND	5	White	OUT B
6	Shield	F.G.	6	Gray	OUT B̄
			7	Orange	OUT Z
			8	Yellow	OUT Z̄
			9	Shield	F.G.

▣ Output waveform

●Totem Pole output / NPN open collector output / Voltage output



●Line Driver output



※ CW(Clockwise): In a view of Shaft.

▣ Caution for using

1. Installation
① This unit is consisted of precision components. Therefore please treat this product carefully.
② When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit.

2. Environment
Please do not use this unit with below environment, it results in malfunction.
① Place where this unit or component may be damaged by strong vibration or impact.
② Place where there are lots of flammable or corrosive gases.
③ Place where strong magnet field or electric noise are occurred.
④ Place where there is beyond of rating temperature or humidity
⑤ Place where strong acids or alkali near by.
⑥ Place where there is the direct ray of the sun.

3. Vibration and Impact
① When the strong impact loads on this unit, the error pulse may occur as if the slit is revolving.
② Therefore please fix bracket firmly when mount this unit, because Rotary encoder with high resolution can be easily affected by impact.

4. Wire connection
① Do not apply a tensile strength in excess of 30N to the cable.
② When a high voltage or power line pass near by the encoder cable, be sure to wire the encoder cable in separated conduit to prevent malfunction.
③ When extend the cable, please use it after checking the cable and response frequency due to increment of residual voltage or distortion of waveform can be easily occurred.
(Preferable shortest distance for operating)
④ Shield wire must be connected to F.G. terminal.

※It may cause malfunction if above instructions are not followed.

▣ Major products

- Proximity sensors
- Area sensors
- Photoelectric sensors
- Fiber optic sensors
- Door/Door side sensors
- Counters
- Timers
- Display units
- Panel meters
- Pressure sensors
- Rotary encoders
- Power controllers
- Sensor controllers
- Graphic/Logic panels
- Temperature controllers
- Tachometer/Pulse(Rate) meters
- Temperature/Humidity transducers
- Switching power supplies
- Stepping motors/drivers/motion controllers
- Field network devices
- Laser marking system(CO_2, Nd:YAG)
- Laser welding/soldering system