

Autonics

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

M A N U A L



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.

Warning 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.

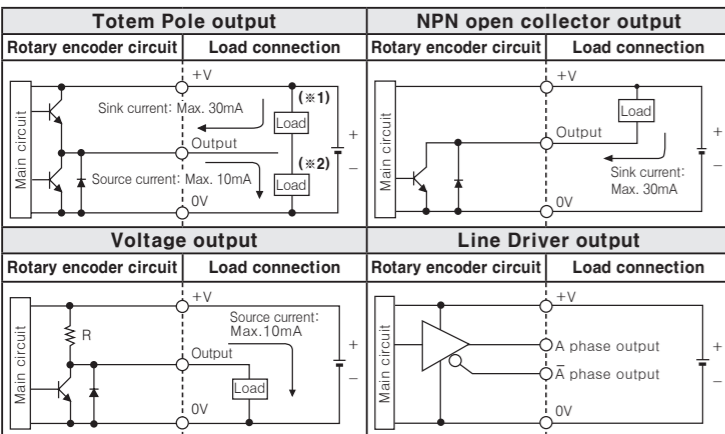
Ordering information

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, 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	2: A, B 3: A, B, Z 4: A, \bar{A} , B, \bar{B} 6: A, \bar{A} , B, \bar{B} , Z, \bar{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	*φ6mm φ8mm φ10mm φ12mm	300, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 5000	3: A, B, Z 6: A, \bar{A} , B, \bar{B} , Z, \bar{Z}			
E80H	*φ30mm φ32mm	60, 100, 360, 500, 512, 1024, 3200	3: A, B, Z 6: A, \bar{A} , B, \bar{B} , Z, \bar{Z}			

* * * indicates the standard specification of diameters.

* 1, 2, 5, 12 P/R are output A, B phase only. (But Line Driver output A, \bar{A} , B, \bar{B} phase)

Control output diagram



* The output circuit of A, B, Z phase are the same. (Line Driver output is A, \bar{A} , B, \bar{B} , Z, \bar{Z} phase)

* Totem Pole output can be used for NPN open collector type(*1) or voltage output type(*2).

* The above specifications are subject to change and some models may be discontinued without notice.

Specifications

Incremental Rotary encoder	φ40mm Shaft type	φ40mm Hollow shaft type	φ40mm Hollow shaft Built-in type	φ80mm Hollow shaft type
Model	Totem Pole output: E40S□□□□□□□□□□ NPN open collector output: E40S□□□□□□□□□□ Voltage output: E40S□□□□□□□□□□ Line Driver output: E40S□□□□□□□□□□	E40H□□□□□□□□□□ E40H□□□□□□□□□□ E40H□□□□□□□□□□ E40H□□□□□□□□□□	E40HB□□□□□□□□□□ E40HB□□□□□□□□□□ E40HB□□□□□□□□□□ E40HB□□□□□□□□□□	E80H□□□□□□□□□□ E80H□□□□□□□□□□ E80H□□□□□□□□□□ E80H□□□□□□□□□□
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, \bar{A} , B, \bar{B} , Z, \bar{Z} phase)			
Electrical specification	Phase difference between output: Output between A and B phase: $\frac{T}{4} \pm \frac{T}{8}$ (T = 1 cycle of A phase) Control output: Totem Pole output: •Low \Rightarrow Load current: Max. 30mA, Residual voltage: Max. 0.4VDC •High \Rightarrow 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 NPN open collector output: Load current: Max. 30mA, Residual voltage: Max. 0.4VDC Voltage output: Load current: Max. 10mA, Residual voltage: Max. 0.4VDC Line Driver output: •Low \Rightarrow Load current: Max. 20mA, Residual voltage: Max. 0.5VDC •High \Rightarrow 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. 1μs (Cable length: 2m, I sink=20mA) NPN open collector output: Max. 1μs (Cable length: 2m, I sink=20mA) Voltage output: Max. 0.5μs (Cable length: 2m, I sink=20mA) Line Driver output: Max. 0.5μs (Cable length: 2m, I sink=20mA) Max. Response frequency: 300kHz / 200kHz 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 50/60Hz for 1 minute (Between all terminals 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-cm ² (4×10 ⁻⁶ kg-m ²) / Max. 800g-cm ² (8×10 ⁻⁶ kg-m ²) Shaft loading: Radial: 2kgf, Thrust: 1kgf / Radial: 5kgf, Thrust: 2.5kgf Max. allowable revolution(*2): 5,000rpm / 3,600rpm Vibration: 1.5mm amplitude at frequency of 10~55Hz (for 1 min.) in each X, Y, Z direction for 2 hours Shock: Max. 50G / Max. 75G Environment: Ambient temperature: -10 ~ 70°C, Storage: -25 ~ 85°C 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(Optional) / Bracket Approval: CE (Except for Line Driver output) Unit weight: Approx. 120g / Approx. 560g			

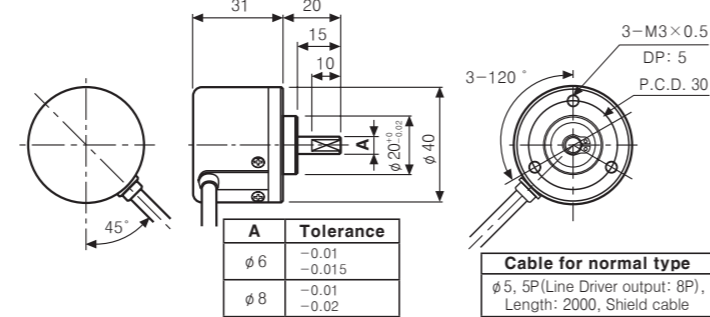
* 1: 1, 2, 5, 12 P/R are output A, B phase only. (But Line Driver output: A, \bar{A} , B, \bar{B} phase)

* 2: Max. allowable revolution \geq Max. response revolution [Max. response revolution (rpm) = $\frac{\text{Max. response frequency} \times 60 \text{ sec.}}{\text{Resolution}}$] Please select the resolution to make lower max. revolution than max. allowable revolution.

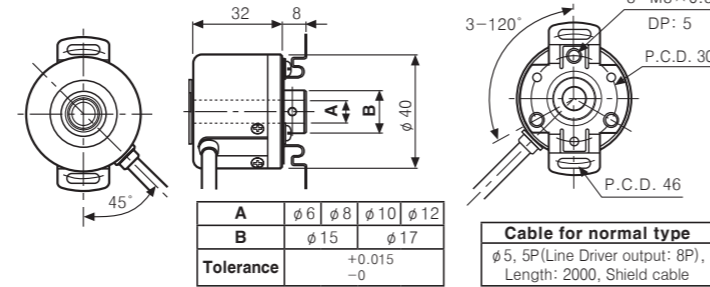
* Environment resistance is rated at no freezing or condensation.

Dimensions

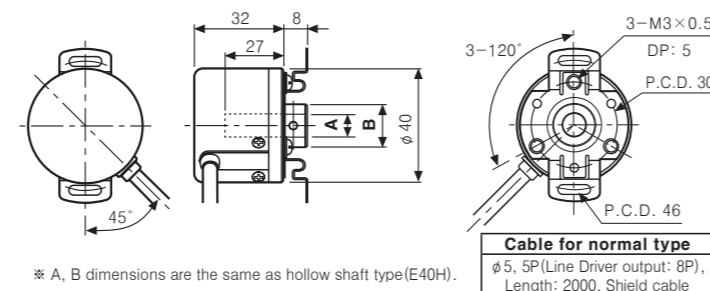
Shaft type(E40S)



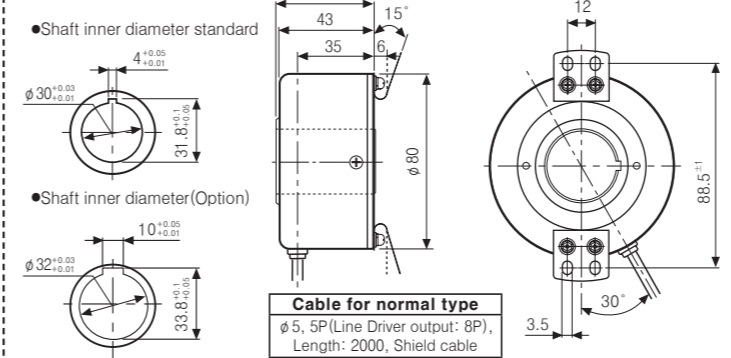
Hollow shaft type(E40H)



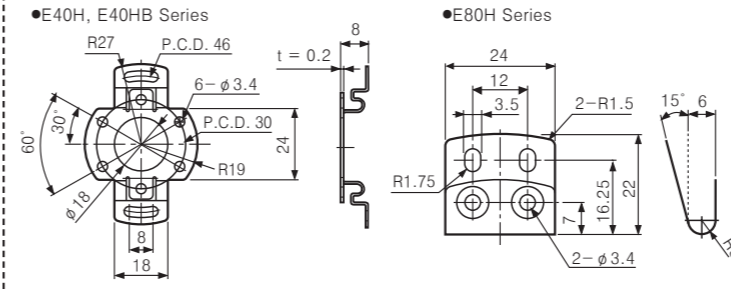
Hollow shaft built-in type(E40HB)



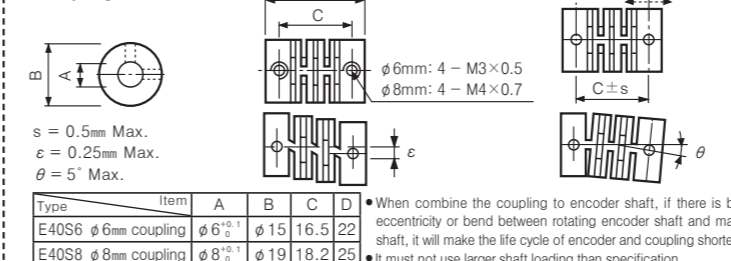
Hollow shaft type(E80H)



Bracket

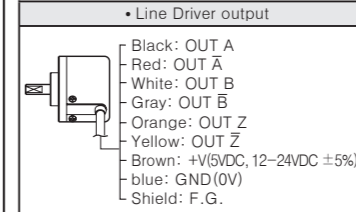
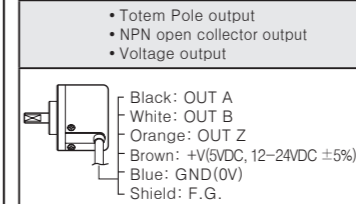


Coupling(E40S Series)



Connections

Normal type



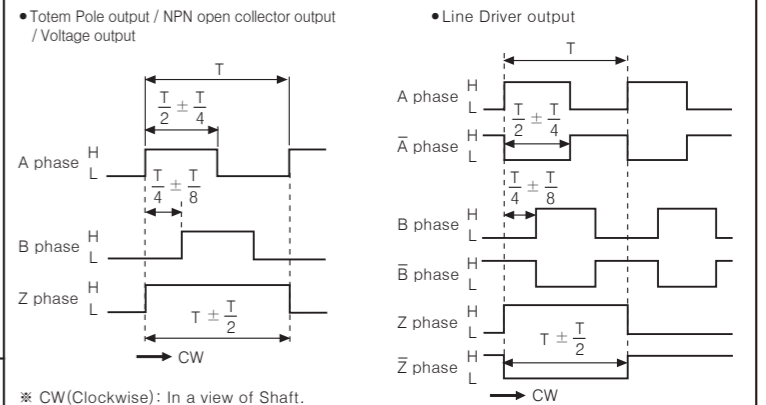
* Non-using wires must be insulated.

* The shield cable and metal case of encoder must be grounded(F.G.).

Cable outgoing connector type

• Totem Pole output • NPN open collector output • 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 \bar{A}
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 \bar{B}
			7	Orange	OUT Z
			8	Yellow	OUT \bar{Z}
			9	Shield	F.G.

Output waveform



* CW(Clockwise): In a view of Shaft.

Caution for using

- Installation**
 - This unit is consisted of precision components. Therefore please treat this product carefully.
 - When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit.
- Environment**
 - Please do not use this unit with below environment, it results in malfunction.
 - Place where this unit or component may be damaged by strong vibration or impact.
 - Place where there are lots of flammable or corrosive gases.
 - Place where strong magnet field or electric noise are occurred.
 - Place where there is beyond of rating temperature or humidity
 - Place where strong acids or alkali near by.
 - Place where there is the direct ray of the sun.
- Vibration and Impact**
 - When the strong impact loads on this unit, the error pulse may occur as if the slit is revolving.
 - Therefore please fix bracket firmly when mount this unit, because Rotary encoder with high resolution can be easily affected by impact.
- Wire connection**
 - Do not apply a tensile strength in excess of 30N to the cable.
 - 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.
 - 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)
 - Shield wire must be connected to F.G. terminal.

Major products

Photoelectric Sensors ■ Temperature Controllers
Fiber Optic Sensors ■ Temperature/Humidity Transducers
Door Sensors ■ SSRs/Power Controllers
Door Side Sensors ■ Counters
Area Sensors ■ Timers
Proximity Sensors ■ Panel Meters
Pressure Sensors ■ Tachometers/Pulse(Rate) Meters
Rotary Encoders ■ Display Units
Connector/Sockets ■ Sensor Controllers
Switching Mode Power Supplies
Control Switches/Lamps/Buzzers
I/O Terminal Blocks & Cables
Stepper Motors/Drivers/Motion Controllers
Graphic/Logic Panels
Field Network Devices
Laser Marking System(Fiber, Co., Nd:Yag)
Laser Welding/Soldering System

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