

# Autonics

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

### INSTRUCTION MANUAL



Thank you for choosing our Autonics product.  
Please read the following safety considerations before use.

#### ■ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.

※⚠ symbol represents caution due to special circumstances in which hazards may occur.

**Warning** Failure to follow these instructions may result in serious injury or death.

**Caution** Failure to follow these instructions may result in personal injury or product damage.

#### ⚠ Warning

1. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)

Failure to follow this instruction may result in fire, personal injury, or economic loss.

2. Install on a device panel to use.

Failure to follow this instruction may result in fire.

3. Do not connect, repair, or inspect the unit while connected to a power source.

Failure to follow this instruction may result in fire.

4. Check 'Connections' before wiring.

Failure to follow this instruction may result in fire.

5. Do not disassemble or modify the unit.

Failure to follow this instruction may result in fire.

#### ⚠ Caution

1. Use the unit within the rated specifications.

Failure to follow this instruction may result in fire or product damage.

2. Do not short the load.

Failure to follow this instruction may result in product damage by fire.

3. Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.

Failure to follow this instruction may result in fire or explosion.

4. Do not use the unit near the place where there is the equipment which generates strong magnetic force or high frequency noise and strong alkaline, strong acidic exists.

Failure to follow this instruction may result in product damage.

#### ■ Ordering Information

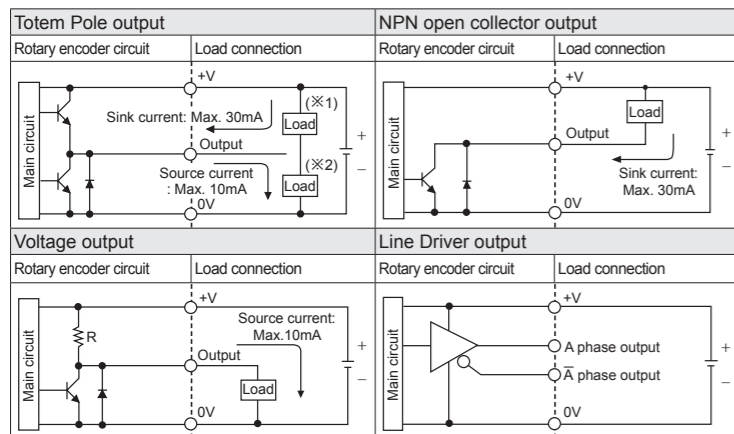
E40S - 6 - 5000 - 3 - N - 24

Series	Shaft diameter	Pulses / Revolution	Output phase	Output	Power supply	Cable
E40S	∅6mm	*1,2,5,10,12,15,20,23,25,30,35,40,45,50	2: A, B	T: Totem pole output	5: 5VDC ±5% 24: 12-24VDC ±5%	No mark Radial cable type C(※) Radial cable connector type
	∅8mm	60,75,100,120,125,150 192,200,240,250,256	3: A, B, Z			
E40H E40HB	∅6mm	300,360,400,500,512	4: A, Ā, B, B̄	N: NPN open collector output	5: 5VDC ±5% 24: 12-24VDC ±5%	No mark Radial cable type C(※) Radial cable connector type
	∅8mm	600,800,1000,1024,1200,1500,1800,2000,2048	6: A, Ā, B, B̄, Z, Z̄	V: Voltage output		
E80H	∅30mm	60,100,360,500	3: A, B, Z	L: Line Driver output	5: 5VDC ±5% 24: 12-24VDC ±5%	No mark Radial cable type C(※) Radial cable connector type
	∅32mm	512,1024,3200	6: A, Ā, B, B̄, Z, Z̄			

※ \* indicates the standard specification of diameters.

※ 1, 2, 5, 12 PPR are output A, B phase only. (But Line Driver output A, Ā, B, B̄ phase)

#### ■ Control Output Diagram



※ The output circuit of A, B, Z phase are the same. (Line Driver output is A, Ā, B, B̄, Z, Z̄ 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.

※ Be sure to follow cautions written in the instruction manual, and the technical descriptions (catalog, homepage).

#### ■ Specifications

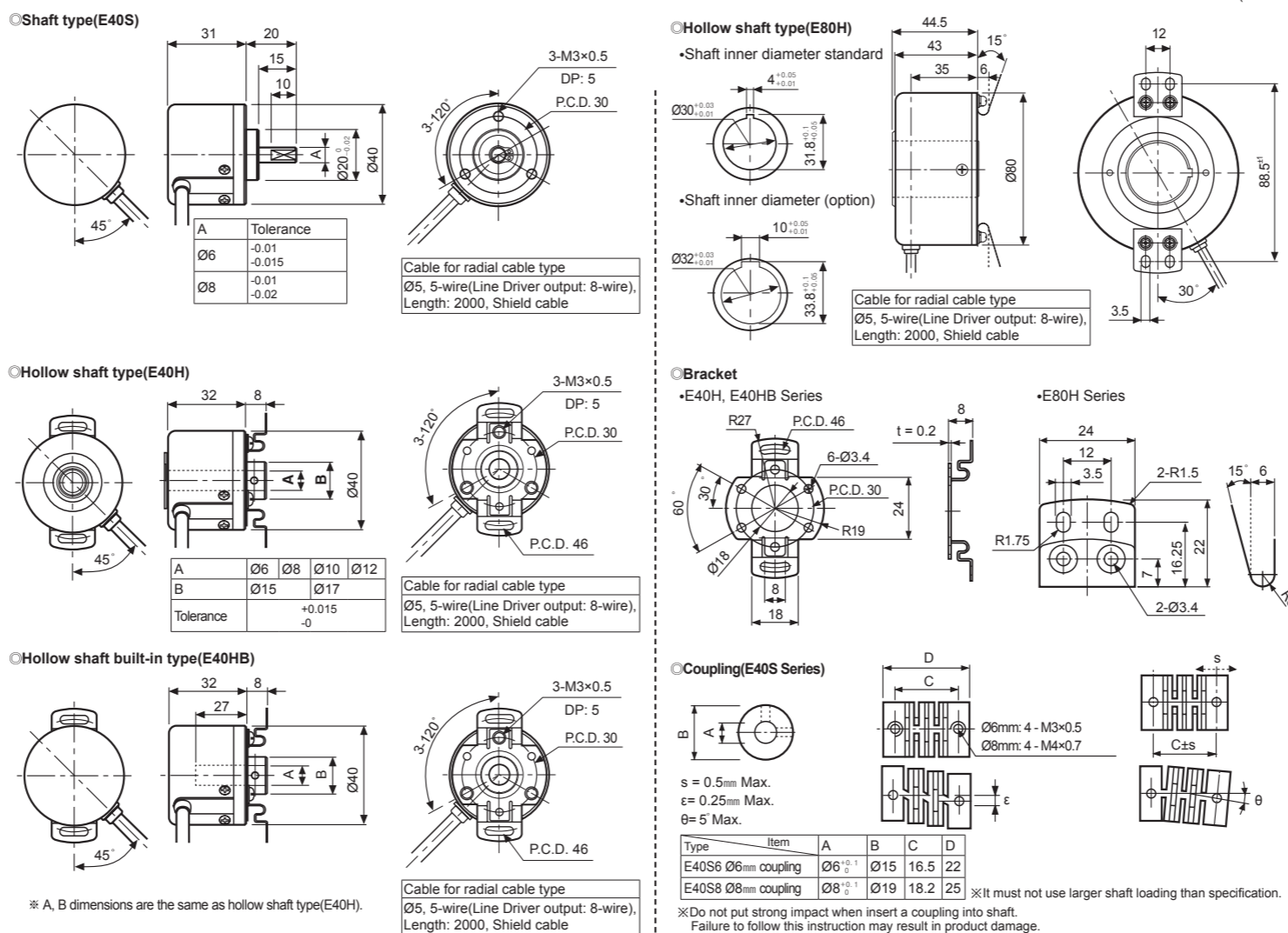
Model	Incremental Rotary encoder	∅40mm Shaft type	∅40mm Hollow shaft type	∅40mm Hollow shaft Built-in type	∅80mm Hollow shaft type
Totem Pole output	E40S	□□□□□□□□	E40H	□□□□□□□□	E80H
NPN open collector output	E40S	□□□□□□□□	E40H	□□□□□□□□	E80H
Voltage output	E40S	□□□□□□□□	E40H	□□□□□□□□	E80H
Line Driver output	E40S	□□□□□□□□	E40H	□□□□□□□□	E80H
Resolution(PPR)	*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 <sup>※1</sup>	A, B, Z phase(Line Driver output: A, Ā, B, B̄, Z, Z̄ phase)				
Phase difference between output	Output between A and B phase: $\frac{T}{4} \pm \frac{T}{8}$ (T = 1 cycle of A phase)				
Electrical specification	Control 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=			
	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 ⇒ 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=			
Mechanical specification	Response time(Rise/Fall)	Max. 1μs (Cable length: 2m, I sink=20mA)			
	Line Driver output	Max. 0.5μs (Cable length: 2m, I sink=20mA)			
	Max. Response frequency	300kHz			
	Power supply	• 5VDC= ±5%(Ripple P-P: Max. 5%)      • 12-24VDC= ±5%(Ripple P-P: Max. 5%) Max. 80mA (disconnection of the load), Line Driver output: Max. 50mA(disconnection of the load)			
Current consumption	Min. 100μA(at 500VDC megger between all terminals and case)				
Insulation resistance	750VAC 50/60Hz for 1 minute(Between all terminals and case)				
Dielectric strength	Radial cable type, Radial cable connector type				
Connection	Starting torque Shaft Type: Max. 40gf·cm(0.004N·m), Hollow Type: Max. 50gf·cm(0.005N·m)				
Mechanical specification	Moment of inertia	Max. 40g·cm <sup>2</sup> (4×10 <sup>-6</sup> kg·m <sup>2</sup> )			
	Shaft loading	Radial: 2kgf, Thrust: 1kgf			
	Max. allowable revolution <sup>※2</sup>	5,000rpm			
	Vibration	1.5mm amplitude at frequency of 10 to 55Hz(for 1 min.) in each X, Y, Z direction for 2 hours			
Shock	Max. 50G				
Environment	Ambient temp.	-10 to 70 °C, Storage: -25 to 85 °C			
	Ambient humi.	35 to 85% RH, Storage: 35 to 90%RH			
Protection structure	IP50(IEC Standards)				
Cable	∅5mm, 5-wire, Length: 2m, Shield cable(Line Driver output: ∅5mm, 8-wire) (AWG 24, Core wire diameter: 0.08mm, No. of core wire: 40, Insulator out diameter: ∅1mm)				
Accessory	∅6mm coupling(Standard), ∅8mm coupling(Optional), Bracket				
Approval	CE (Except for Line Driver output)				
Unit weight	Approx. 120g				

※1: 1, 2, 5, 12 PPR are output A, B phase only. (But Line Driver output: A, Ā, B, B̄ phase)

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

※Environment resistance is rated at no freezing or condensation.

#### ■ Dimensions



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

※ Do not put strong impact when insert a coupling into shaft. Failure to follow this instruction may result in product damage.

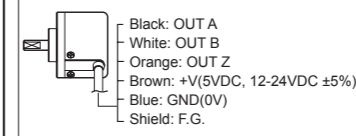
※ Fix the unit or a coupling by a wrench under 0.15 N·m of torque.

※ When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit.

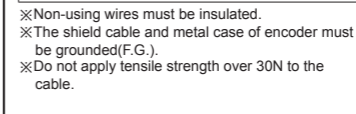
#### ■ Connections

##### ○ Radial cable type

- Totem Pole output
- NPN open collector output
- Voltage output



- Line Driver output



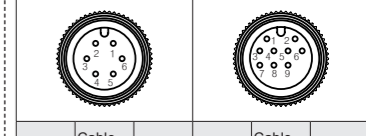
※ Non-using wires must be insulated.

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

※ Do not apply tensile strength over 30N to the cable.

##### ○ Radial cable connector type

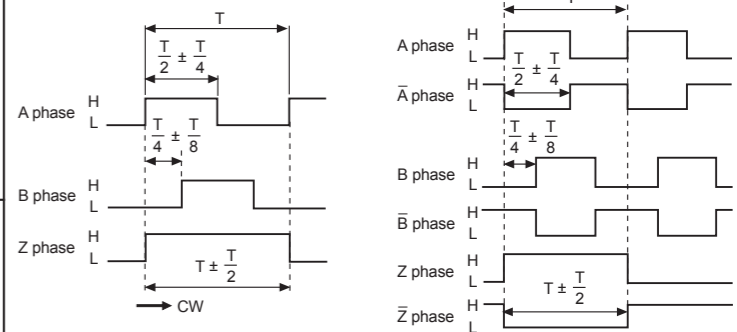
- Totem Pole output
- NPN open collector output
- Voltage output
- Line Driver output



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 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



#### ■ Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- 5VDC, 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- For using the unit with the equipment which generates noise (switching regulator, inverter, servo motor, etc.), ground the shield wire to the F.G. terminal.
- Ground the shield wire to the F.G. terminal.
- When using switching mode power supply, frame ground (F.G.) terminal of power supply should be grounded.
- Wire as short as possible and keep away from high voltage lines or power lines, to prevent inductive noise.
- For Line driver unit, use the twisted pair wire which is attached seal and use the receiver for RS-422A communication.
- Check the wire type and response frequency when extending wire because of distortion of waveform or residual voltage increment etc by line resistance or capacity between lines.
- This unit may be used in the following environments.
  - ① Indoors (the environment condition range is per "cautions")
  - ② Altitude max. 2,000m
  - ③ Pollution degree 2
  - ④ Installation category II

#### ■ Major Products

- Photoelectric sensors
- Fiber Optic Sensors
- Door Sensors
- Door Side Sensors
- Area Sensors
- Proximity Sensors
- Pressure Sensors
- Rotary Encoders
- Connector/Sockets
- 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<sub>2</sub>, Nd: YAG)
- Laser Welding/Cutting System
- Temperature Controllers
- Torque Sensors
- SRs/Power Controllers
- Counters
- Timers
- Infrared Motion Detectors
- Pulse Rate Meters
- Display Units
- Sensor Controllers

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