

Autonics ROTARY ENCODER (INCREMENTAL TYPE) E60H 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

- 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.
- Install on a device panel to use.**
Failure to follow this instruction may result in fire.
- Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire.
- Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.
- Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire.

⚠ Caution

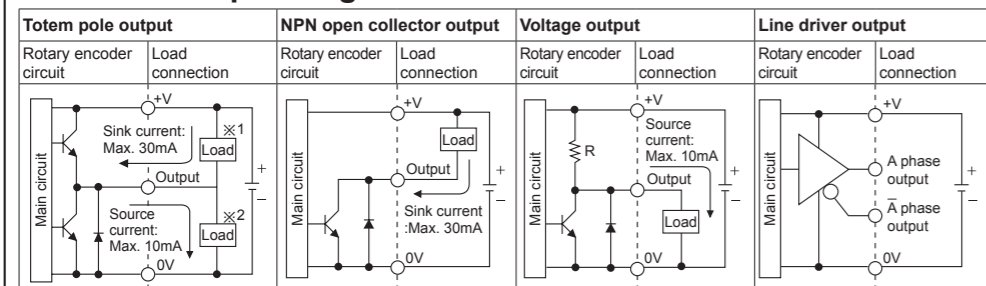
- Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- Do not short the load.**
Failure to follow this instruction may result in product damage by fire.
- Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
Failure to follow this instruction may result in fire or explosion.
- 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

E60H	20	8192	3	N	24	
Series	Shaft inner diameter	Pulses/Revolution	Output phase	Control output	Power supply	Cable
Diameter Ø60mm, hollow shaft type	Ø20mm	100, 1024, 5000, 8192	3: A, B, Z 6: A, Ā, B, B̄, Z, Z̄	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: Radial cable type C: Radial cable connector type (※)

※ Cable length : 250mm

■ Control Output Diagram



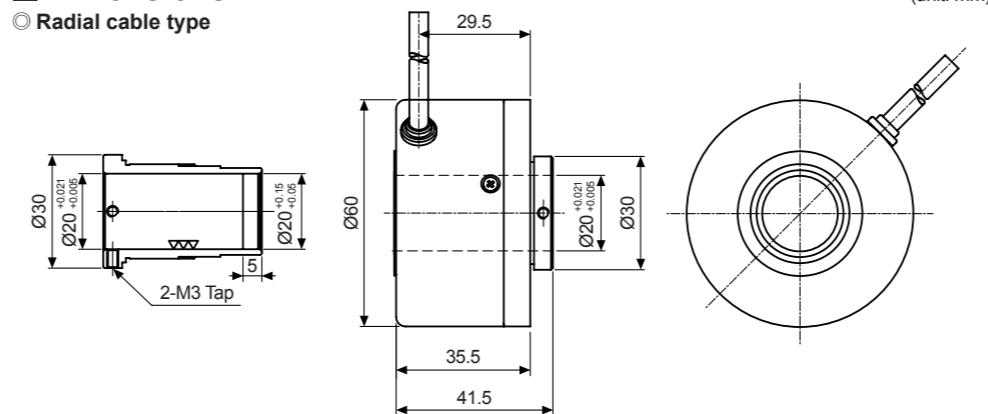
※ All output circuits of A, B, Z phase are same. (line driver output is A, Ā, B, B̄, Z, Z̄)
※ Totem pole output type can be used for NPN open collector output type (※1) or voltage output type (※2).
※ The above specifications are subject to change and some models may be discontinued without notice.
※ Be sure to follow cautions written in the instruction manual, and the technical descriptions (catalog, homepage).

■ Specifications

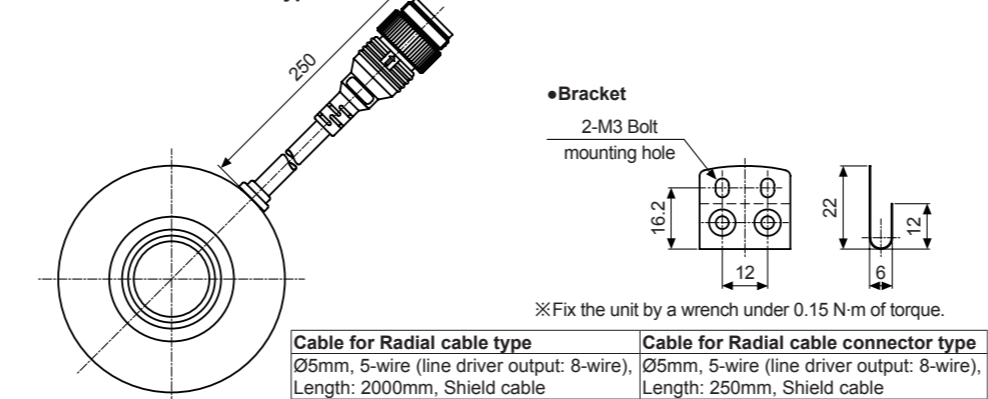
Item	Diameter Ø60mm hollow shaft type of incremental rotary encoder	
Model	Totem pole output	E60H20-□-3-T-□
	NPN open collector output	E60H20-□-3-N-□
	Voltage output	E60H20-□-3-V-□
	Line driver output	E60H20-□-6-L-□
Resolution (PPR) ^{※1}	100, 1024, 5000, 8192	
Output phase	A, B, Z phase (line driver output: A, Ā, B, B̄, Z, Z̄ phase)	
Phase difference of output	Phase difference between A and B: $\frac{T}{4} \pm \frac{T}{8}$ (T=1 cycle of A phase)	
Electrical specification	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=
	NPN open collector output	Load current: Max. 30mA, Residual voltage: Max. 0.4VDC=
	Voltage output	Load current: Max. 10mA, Residual voltage: Max. 0.4VDC= •[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=
	Line driver output	•[Low] - Load current: Max. 30mA, Residual voltage: Max. 0.4VDC= •[High] - Load current: Max. 10mA, 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. 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%)	
Current consumption	Max. 80mA (disconnection of the load), Line driver output: Max. 50mA (disconnection of the load)	
Insulation resistance	Over. 100MΩ (at 500VDC megger between all terminals and case)	
Dielectric strength	750VAC 50/60Hz for 1 minute (between all terminals and case)	
Connection	Radial cable type, Radial cable connector type	
Mechanical specification	Starting torque	Max. 150gf·cm (0.0147 N·m)
	Moment of inertia	Max. 110g·cm ² (11×10 ⁻⁸ kg·m ²)
	Shaft loading	Radial: 5kgf, Thrust: 2.5kgf
	Max. allowable revolution ^{※2}	6,000rpm
Vibration	1.5mm amplitude at frequency of 10 to 55Hz (for 1 min.) in each X, Y, Z direction for 2 hours	
Shock	Approx. Max. 100G	
Environment	Ambient temperature	-10 to 70°C, Storage: -25 to 85°C
	Ambient humidity	35 to 85%RH, Storage: 35 to 90%RH
Protection structure	IP50 (IEC standards)	
Cable	Ø5mm, 5-wire, Length: 2m, Shield cable (line driver output: Ø5mm, 8-wire) (AWG24, Core diameter: 0.08mm, Number of cores: 40, Insulator out diameter: Ø1mm)	
Accessory	Bracket: 2	
Approval	CE (except line driver output)	
Weight ^{※3}	Approx. 397g (approx. 330g)	

※1: Not indicated resolutions are customizable.
※2: Make sure that Max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.
[Max. response revolution (rpm) = $\frac{\text{Max. response frequency}}{\text{Resolution}} \times 60 \text{ sec.}$]
※3: The weight includes packaging. The weight in parenthesis is for unit only.
※ Environment resistance is rated at no freezing or condensation.

■ Dimensions



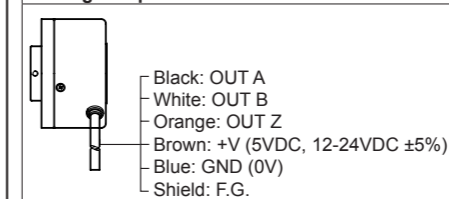
○ Radial cable connector type



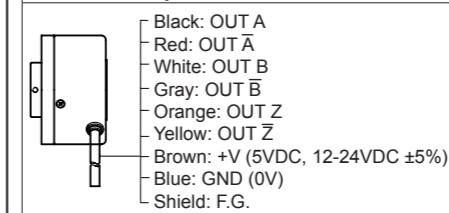
■ Connections

○ Radial cable type

- Totem pole output
- NPN open collector output
- Voltage output



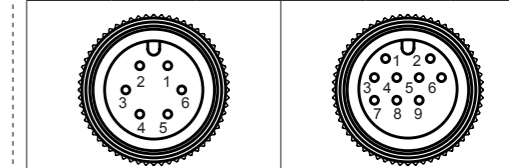
• Line driver output



※ Unused wires must be insulated.
※ The metal case and shield cable of encoder should 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

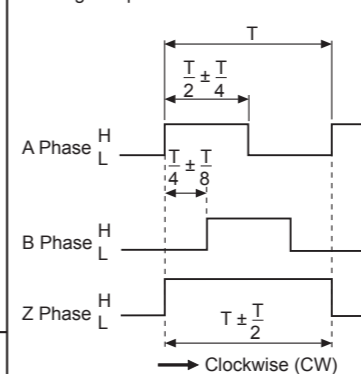


Pin No.	Function	Cable color	Pin No.	Function	Cable color
1	OUT A	Black	1	OUT A	Black
2	OUT B	White	2	OUT Ā	Red
3	OUT Z	Orange	3	+V	Brown
4	+V	Brown	4	GND	Blue
5	GND	Blue	5	OUT B̄	White
6	F.G.	Shield	6	OUT B	Gray
			7	OUT Z̄	Orange
			8	OUT Z	Yellow
			9	F.G.	Shield

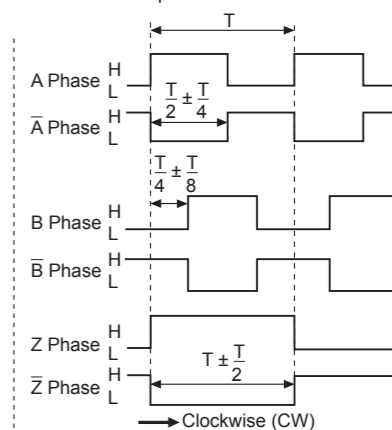
※ F.G. (Field Ground): It should be grounded separately.

■ Output Waveforms

- 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.
- 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 (in the environment condition rated in 'Specifications')
 - 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, Co₂, Nd: YAG)
- Laser Welding/Cutting System
- Temperature Controllers
- Temperature/Humidity Transducers
- SSR/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometer/Pulse (Rate) Meters
- Display Units
- Sensor Controllers

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