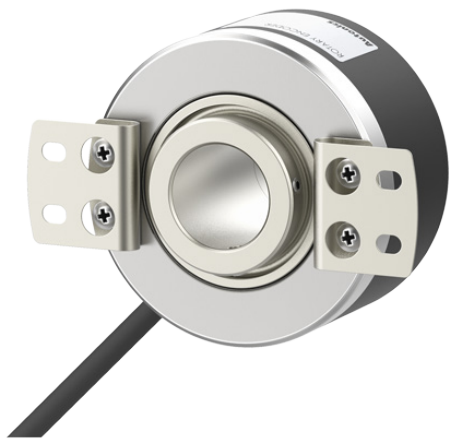
60 mm Diameter Sine Wave Incremental Rotary Encoders



E60-A Series

PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Features

- Ø 60 mm housing, Ø 20 mm hollow shaft
- Analog sine wave operational amplifier (op-amp) output
- Power Supply: 5 VDC⎓ ± 5%

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

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

01. 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 personal injury, economic loss or fire.

02. Do not use the unit in the place where flammable / explosive / corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.
Failure to follow this instruction may result in explosion or fire.

03. Install on a device panel to use.
Failure to follow this instruction may result in fire.

04. Do not connect, repair, or inspect the unit while connected to a power source.
Failure to follow this instruction may result in fire.

05. Check 'Connections' before wiring.
Failure to follow this instruction may result in fire.

06. Do not disassemble or modify the unit.
Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. Use the unit within the rated specifications.
Failure to follow this instruction may result in fire or product damage.

02. Do not short the load.
Failure to follow this instruction may result in fire.

03. 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.

Cautions during Use

- Follow instructions in 'Cautions during Use'.
  Otherwise, It may cause unexpected accidents.
- 5 VDC⎓ 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 supplying power with SMPS, ground the F.G. terminal and connect the noise canceling capacitor between the 0 V and F.G. terminals.
- 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.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000 m
  - Pollution degree 2
  - Installation category II

Cautions during Installation

- Install the unit correctly with the usage environment, location, and the designated specifications.
- When fixing the product with a wrench, tighten under 0.15 N m.
- Do not apply tensile strength over 30 N to the cable.

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

E60 ❶ ❷ - ❸ - ❹ - ❺ - ❻ - ❼

❶ Shaft type
H: Hollow type

❷ Shaft inner diameter
20: Ø 20 mm

❸ Resolution
Number: Refer to resolution in 'Specifications'

❹ Output phase
10: A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$, C, $\overline{C}$, D, $\overline{D}$

❺ Control output
A: Analog sine wave OP Amp. output

❻ Power supply
5: 5 VDC⎓ ±5%

❼ Connection
R: Axial cable type
S: Radial cable type

Product Components

- Product (+ bracket)
- Instruction manual
- Bolt × 4

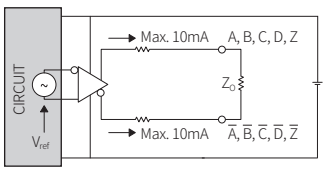
Connections

- Unused wires must be insulated.
- The metal case and shield cable of encoders must be grounded (F.G.).
- Since exclusive driver IC is used for output circuit, be aware of short circuits when wiring each output wires.

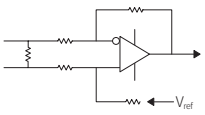
Color	Function	Color	Function
Brown	OUT A	Purple	OUT C
Red	OUT $\overline{A}$	Gray	OUT $\overline{C}$
Orange	OUT B	Pink	OUT D
Yellow	OUT $\overline{B}$	Clear	OUT $\overline{D}$
Green	OUT Z	White	+V
Blue	OUT $\overline{Z}$	Black	GND
—		Shield	F.G.

Inner Circuit

- Output circuits are identical for all output phase.



■ **Received circuit**

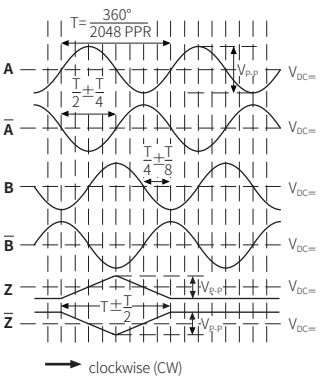


- A, B, Z: Z_O = 120 Ω
  C, D: Z_O = 1 kΩ

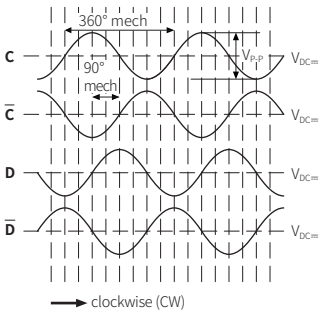
Output Waveform

- The rotation direction is based on facing the shaft, and it is clockwise (CW) when rotating to the right.
- Phase difference between A and B: $\frac{T}{4} \pm \frac{T}{8}$ (T = 1 cycle of A)
- Phase difference between C and D: 90°

■ **A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$ phase**



■ **C, $\overline{C}$, D, $\overline{D}$ phase**



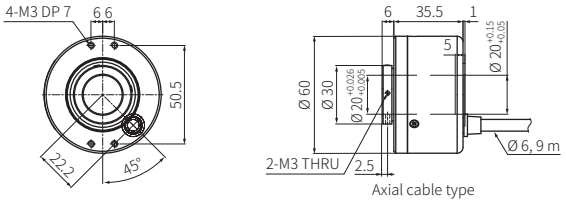
Specifications

Model	E60H20-2048-10-A-5-□
Resolution	2,048 PPR
Control output	Analog sine wave OP Amp. output
Output phase	A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$, C, $\overline{C}$, D, $\overline{D}$
Output current	≤ 10 mA
Output voltage V_{P-P}	0.5 ± 0.1 VDC⎓
DC OFFSET $V_{DC=}$	2.5 ± 0.3 VDC⎓
Max. response frequency	200 kHz
Max. allowable revolution	6,000 rpm
Starting torque	≤ 0.02 N m
Inertia moment	≤ 110 g·cm² (11 × 10^{-6} kg·m²)
Allowable shaft load	Radial: ≤ 5 kgf, Thrust: ≤ 2.5 kgf
Unit weight (packaged)	≈ 720 g (≈ 750 g)
Approval	CE EAC

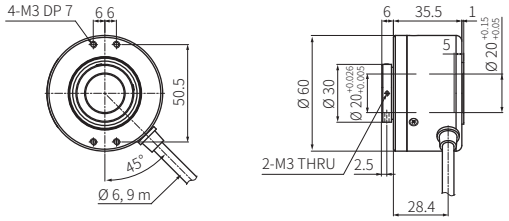
Power supply	5 VDC⎓ ± 5% (ripple P-P: ≤ 5%)
Current consumption	≤ 120 mA (no load)
Insulation resistance	≥ 100 MΩ (500 VDC⎓ megger)
Dielectric strength	Between the charging part and the case: 750 VAC~ 50 / 60 Hz for 1 min.
Vibration	1 mm double amplitude at frequency 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	≤ 100 G
Ambient temp.	-20 to 100 °C, storage: -25 to 100 °C (no freezing or condensation)
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection rating	IP40 (IEC standard)
Connection	Axial / Radial cable type model
Cable spec.	Ø 6 mm, 17-wire, 9 m, shield cable
Wire spec.	AWG28 (0.08 mm, 17-core), insulator diameter: Ø 0.8 mm

Dimensions

• Unit: mm, For the detailed drawings, follow the Autonics website.



Axial cable type



Radial cable type

■ Bracket