60 mm Diameter Absolute Single-Turn Rotary Encoders (Optical)

ENP Series

INSTRUCTION MANUAL

TCD210033AA

Autonics

Thank you for choosing our Autonics product.

Read and understand the instruction manual and manual thoroughly before using the product.

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

Keep this instruction manual in a place where you can find easily.

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

Follow Autonics website for the latest information.

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- A 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.)
- ailure 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.

re 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. ailure 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. ailure to follow this instruction may result in fire or product damage.
- 02. Do not short the load.
- ailure 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==, 12 24 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.
- · Do not load overweight on the shaft.
- Do not put strong impact when insert a coupling into shaft.
- Failure to follow this instruction may result in product damage.
- \bullet When fixing the product or coupling with a wrench, tighten under 0.15 N m.
- If the coupling error (parallel misalignment, angular misalignment) between the shaft increases while installation, the life cycle of the coupling and the encoder can be
- Do not apply tensile strength over 30 N to the cable.

Ordering Information

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

ENP	-	1	0	0	8	-	0	-	6

A Resolution

G Control output

N: NPN open collector output

P: PNP open collector output

Number: Refer to resolution in 'Output

Phase / Output Angle'

① Output type 0: Negative logic

1: Positive logic

Power supply 0:5 VDC== ±5%

1: 12 - 24 VDC== ±5%

 Rotating direction F: Increase output when the rotating direction is clockwise base on facing the shaft

R: Increase output when the rotating direction is counter-clockwise base on facing the shaft

Product Components

• Product

· Instruction manual

- Bolt × 4
- Coupling $\times 1$
 - Bracket × 2

Connections

- · Unused wires must be insulated.
- The metal case and shield cable of encoders must be grounded (F.G.).
- F.G. (Frame Ground) must be grounded separately.
- Since exclusive driver IC is used for output circuit, be aware of short circuits when wiring each output wires.
- N · C· not connected

Color Eunction Bofor

■ 6/8/12/16/24 division

■ 360 division

COLOI	runction	Reier
White	+V	Power
Black	GND	(F.G.
Shield	F.G.	: signal shield)
Black	TP1	
Brown	2°	
Red	2 ¹	
Orange	2 ²	
Yellow	2 ³	
Green	$2^{\circ} \times 10$	
Blue	$2^{1} \times 10$	
Purple	N·C	
Gray	TP2	
White	EP	
Shield	F.G.	Signal shield

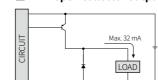
Color	Function	Refer
White	+V	Power
Black	GND	(F.G.
Shield	F.G.	: signal shield)
Black	2º	
Brown	2 ¹	
Red	2 ²	
Orange	2 ³	
Yellow	$2^{\circ} \times 10$	
Green	$2^{1} \times 10$	
Blue	$2^2 \times 10$	
Purple	$2^3 \times 10$	
Gray	$2^{0} \times 10^{2}$	
White	$2^1 \times 10^2$	
Shield	F.G.	Signal shield
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Inner Circuit

- The output circuit is identical for each output bit.
- Be aware of circuit break in case of overload or short beyond the specifications.

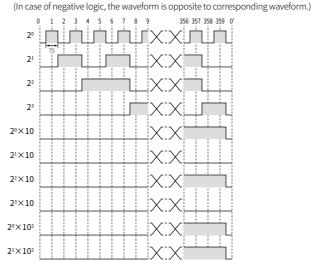
LOAD

■ NPN open collector output ■ PNP open collector output



Output Waveform

• Following waveform is based on the positive logic.



Specifications Model ENP-1□□□-□-N ENP-1 ----P Pecalution ≤ 360 divisio Output code BCD code NPN open collector output PNP open collector output Control output ≤ 32 mA Inflow current Residual voltage Outflow current \leq 32 mA Output voltage ≥ (power supply - 1.5) VDC= **Response speed** $T_{ON} \le 800 \text{ nsec}, T_{OFF} \le 800 \text{ nsec}$ Max. response freq. Max. allowable 3,600 rpm Starting torque $\leq 0.05 \, \text{N m}$ $\leq 300 \,\mathrm{g} \cdot \mathrm{cm}^2 \,(3 \times 10^{-5} \,\mathrm{kg} \cdot \mathrm{m}^2)$ Inertia moment Allowable shaft load Radial: 10 kgf, Thrust: 2.5 kgf Unit weight ≠ 400 g (≈ 478 g) (packaged) Approval EHE

- 01) Refer to resolution in 'Output Phase / Output Angle'
- 02) Based on cable length: 1 m, I sink = 32 mA
- 03) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution [max. response revolution (rpm) = $\frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$]

Power supply	5 VDC= \pm 5% (ripple P-P: \leq 5%) / 12 - 24 VDC= \pm 5% (ripple P-P: \leq 5%) model	
Current consumption	\leq 100 mA (no load)	
Insulation resistance	Between all terminals and case: $\geq 100~\text{M}\Omega$ (500 VDC== megger)	
Dielectric strength	Between all terminals and case: 750 VAC \sim 50 / 60 Hz for 1 minute	
Vibration	1mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours	
Shock	≲75G	
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)	
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)	
Protection rating	IP50 (IEC standard)	
Connection	Axial cable type	
Cable spec.	Ø 8 mm, 12-wire, 1 m, double shield cable	
Wire spec.	AWG24 (0.08 mm, 40-core), insulator diameter - power wire: Ø 1.5 mm, signal wire: Ø 1 mm	

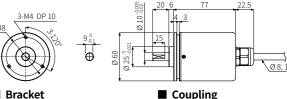
Output Phase / Output Angle

- TP = Timing Pulse
- TS = Signal Pulse
- EP = Even Parity

Resolution	BCD Code
360	TS: 1° ±30' (10 bit)
24	TP1: 8° ±30' (2 bit) TP2: 3° ±30' (2 bit) TS: 11° ±30' (7 bit) EP: 15° ±30' (1 bit)
16	TP1: 2° ±30' (2 bit) TP2: 11.25° ±30' (2 bit) TS: 19.5° ±30' (6 bit) EP: 22.5° ±30' (1 bit)
12	TP1: 3° ±30' (2 bit) TP2: 15° ±30' (2 bit) TS: 26° ±30' (6 bit) EP: 30° ±30' (1 bit)
8	TP1: 39° ±30' (2 bit) TP2: 15° ±30' (2 bit) TS: 42° ±30' (5 bit) EP: 45° ±30' (1 bit)
6	TP1: 53° ±30' (2 bit) TP2: 15° ±30' (2 bit) TS: 56° ±30' (4 bit) EP: 60° ±30' (1 bit)

Dimensions

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



Bracket







- Parallel misalignment: ≤ 0.25 mn
- Angular misalignment: ≤ 5°
 End-play: ≤ 0.5 mm