Wheel Type Incremental Rotary Encoders

ENC Series

INSTRUCTION MANUAL

TCD210030AD

Autonics

Thank you for choosing our Autonics product.
Be sure to read and fully understand the instruction manual and other manuals before using the product.
For your safety, read and follow the safety precautions, warnings, cautions, and handling instructions listed in the instruction manual, other manuals, and the Autonics website.
Keep this document in a location where it can be easily accessed.

Visit the Autonics website (www.autonics.com or QR code) for the latest information. Manuals, CAD files, certifications, software, etc. are available. The dimensions, specifications, certifications, etc. are subject to change without notice for product improvement. Certain models may be discontinued without notice.

Safety Precautions

- 'Safety Precautions' are provided to ensure safe and proper use of the product and to prevent accidents or hazards. Please make sure to follow them carefully.
- ⚠ symbol indicates a caution, warning of potential hazards under certain conditions.

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

01. **Fail-safe device must be installed when using the product in applications that may cause serious injuries or property loss. (E.g. nuclear control systems, medical equipment, ships, vehicles, railroads, aircraft, combustion devices, safety devices, security systems, disaster prevention devices, etc.)**
    Failure to do so may result in personal injury, property loss or fire.
02. **Do not use or store the product in environments containing flammable, explosive, or corrosive gases, or in places exposed to high humidity, direct sunlight, radiant heat, vibration, shock, or salt.**
    Failure to do so may result in explosion or fire.
03. **Install the product on a device panel before use.**
    Failure to do so may result in fire.
04. **Do not connect, repair, or inspect the product while connected to a power source.**
    Failure to do so may result in fire.
05. **Check the connection diagram before wiring.**
    Failure to do so may result in fire.
06. **Do not make any unauthorized modifications to the product.**
    Failure to do so may result in fire.

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

01. **Use the product within its rated specifications and performance limits.**
    Failure to do so may result in fire or product damage.
02. **Do not short-circuit the load.**
    Failure to do so may result in fire.
03. **Do not use the product near devices that generate strong magnetic fields or electrical noise, or in environments with strong alkaline or acidic substances.**
    Failure to do so may result in product damage.

Cautions During Use

- Make sure to follow the instructions in 'Cautions During Use'.
  Failure to do so may result in unexpected accidents.
- Power input should be supplied from an isolated and limited voltage/current source, or from a Class 2 or SELV power supply..
- When using noise-generating devices (e.g. switching regulators, inverters, servo motors, etc.), ground the shielded wire to F.G.
- Ground the shielded wire to F.G.
- When supplying power with an SMPS, ground the F.G. terminal and connect a noise suppression capacitor between the 0 V and F.G. terminals.
- To prevent surges and inductive noise, separate the wiring from high-voltage and power lines, and keep wiring lengths as short as possible.
- When extending wiring, check the cable type and response frequency, as line resistance and line-to-line capacitance may cause increased residual voltage or waveform distortion.
- This product may be used in the following environmental conditions.
  - Indoors (within rated environmental performance specifications)
  - Altitude: up to 2,000 m
  - Pollution Degree 2
  - Installation Category II

Cautions During Installation

- Install the product within the rated specifications in recommended usage environments.
- After securing the product and cable, do not pull with a force exceeding 30N.

Ordering Information

For reference only. The actual product does not support all combinations.
To check all supported models, please refer to the Autonics website.

ENC - ❶ - ❷ - ❸ - ❹ - ❺

❶ Output phase
1: A, B

❷ Min. measuring unit
1: 1 mm
2: 1 cm
3: 1 m
4: 0.01 yd
5: 0.1 yd
6: 1 yd

❸ Control output
T: Totem-pole output
N: NPN open collector output
V: Voltage output

❹ Power supply
5: 5 VDC ±5%
24: 12 - 24 VDC ±5%

❺ Connection
No mark: Axial cable type
C: Axial cable connector type

Product Components

- Product
- Instruction manual

Sold Separately

- M17 connector cable: CID6S-□

Connections

- Unused wires must be insulated.
- The metal case and shielded wire of encoders must be grounded (F.G.).
- F.G. (Frame Ground) must be grounded separately.

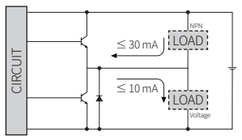
Pin	Color	Function	Pin	Color	Function
1	Black	OUT A	4	Brown	+V
2	White	OUT B	5	Blue	GND
3	Orange	—	6	Shield	F.G.

● M17 6-pin layout

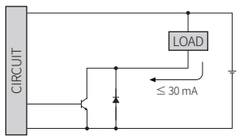
Circuit Diagram

- Output circuits are identical for all output phases.

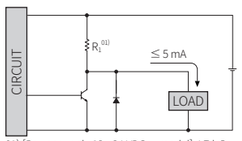
■ Totem-Pole Output



■ NPN Open Collector Output



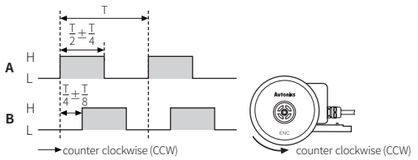
■ Voltage Output



01) [Power supply 12 - 24 VDC⎓ model] 4.7 kΩ
[Power supply 5 VDC⎓ model] 820 Ω

Output Waveform

- Phase difference between A and B: $\frac{T}{4} \pm \frac{T}{8}$ (T = 1 cycle of A)



Specifications

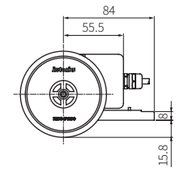
Model	ENC-1-□-T-□-□	ENC-1-□-N-□-□	ENC-1-□-V-□-□
Min. measuring unit [/pulse]	1 mm / 1 cm / 1 m / 0.01 yd / 0.1 yd / 1 yd models		
Control output	Totem-pole output	NPN open collector output	Voltage output
Output phase	A, B	A, B	A, B
Sink current	≤ 30 mA	≤ 30 mA	-
Residual voltage	≤ 0.4 VDC⎓	≤ 0.4 VDC⎓	≤ 0.4 VDC⎓
Source current	≤ 10 mA	-	≤ 5 mA
Output voltage (5 VDC⎓)	≥ (V_{CC} - 2.0) VDC⎓	-	≤ $(\frac{R_L}{R_L + R_1} \times V_{CC})$ VDC⎓ 01)
Output voltage (12 - 24 VDC⎓)	≥ (V_{CC} - 3.0) VDC⎓	-	
Response speed 02)	≤ 1 μs		
Max. response freq.	180 kHz		
Max. allowable revolution 03)	5,000 rpm		
Starting torque	Dependent on the coefficient of friction		
Unit weight	≈ 494 g		
Certification	CE UK EAC	CE UK EAC	CE UK EAC

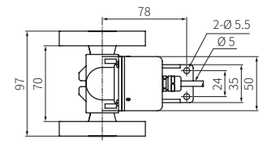
01) The output voltage varies depending on load resistance (R_L = load resistance).
02) Based on cable length: 2 m, I sink: 20 mA
03) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution
[max. response revolution (rpm) = $\frac{\text{max. response frequency}}{\text{resolution}} \times 60$ sec]

Power supply	5 VDC⎓ ± 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC⎓ ± 5% (ripple P-P: ≤ 5%) models
Current consumption	≤ 80 mA (no load)
Insulation resistance	≥ 100 MΩ (500 VDC⎓ megger)
Dielectric strength	Between charging part and case: 750 VAC~ 50 / 60 Hz for 1 min.
Vibration resistance	1 mm double amplitude at frequency 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock resistance	≤ 75 G
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection rating	IP50 (IEC standard)
Connection	Axial cable type / cable connector type models
Cable specification	Ø 5 mm, 4-wire, shielded cable cable type: 2 m, cable connector type: 250 mm
Wire specification	AWG24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm
Connector specification	M17 6-pin plug type

Dimensions

- Unit: mm (Refer to the CAD files from the Autonics website for exact dimensions)
- Cable type shown as reference.
  Refer to 'Specifications' for detailed specifications of cable, wire and connector.





Axial cable type

■ **Min. Measuring Unit and Wheel Circumference**

Min. measuring unit [/pulse]	Revolution wheel circumference	Pulse / 1 rotation of the encoder 01)	Gear ratio
1 mm	250 mm	250	1 : 1
1 cm		100	4 : 1
1 m		1	4 : 1
0.01 yd	228.6 mm (0.25 yd)	100	4 : 1
0.1 yd		10	4 : 1
1 yd		1	4 : 1

01) For gear ratio 4 : 1 models, when the side wheels rotate 4 times, the encoder rotates once.

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