Autonics

ROTARY ENCODER(INCREMENTAL TYPE)
ENA/ENC SERIES
INSTRUCTION MANUAL

CE

ENA **ENC**

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

ENA	5000	2		N		24

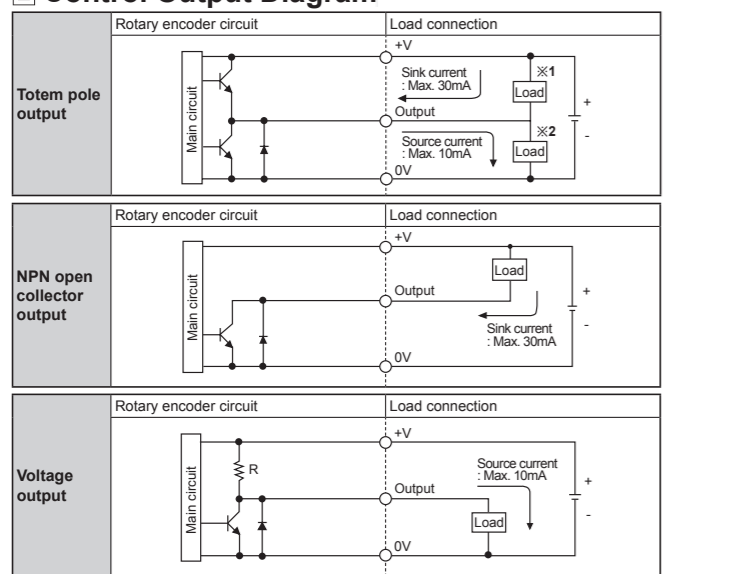|				
Series	Pulses/Revolution	Output phase	Control output	Power supply
Side-mounting shaft type (external diameter of shaft: Ø10mm)	See resolution	2: A, B 3: A, B, Z	T: Totem Pole output N: NPN open collector output V: Voltage output	5: 5VDC ±5% 24: 12-24VDC ±5%

ENC	1		1		N		24	

Series	Output phase	Min. measuring unit	Control output	Power supply	Cable
Wheel type	1: A, B	1: 1mm 4: 0.01yd 2: 1cm 5: 0.1yd 3: 1m 6: 1yd	T: Totem Pole output N: NPN open collector output V: Voltage output	5: 5VDC ±5% 24: 12-24VDC ±5%	No mark: Axial cable type C: Axial cable connector type(※)

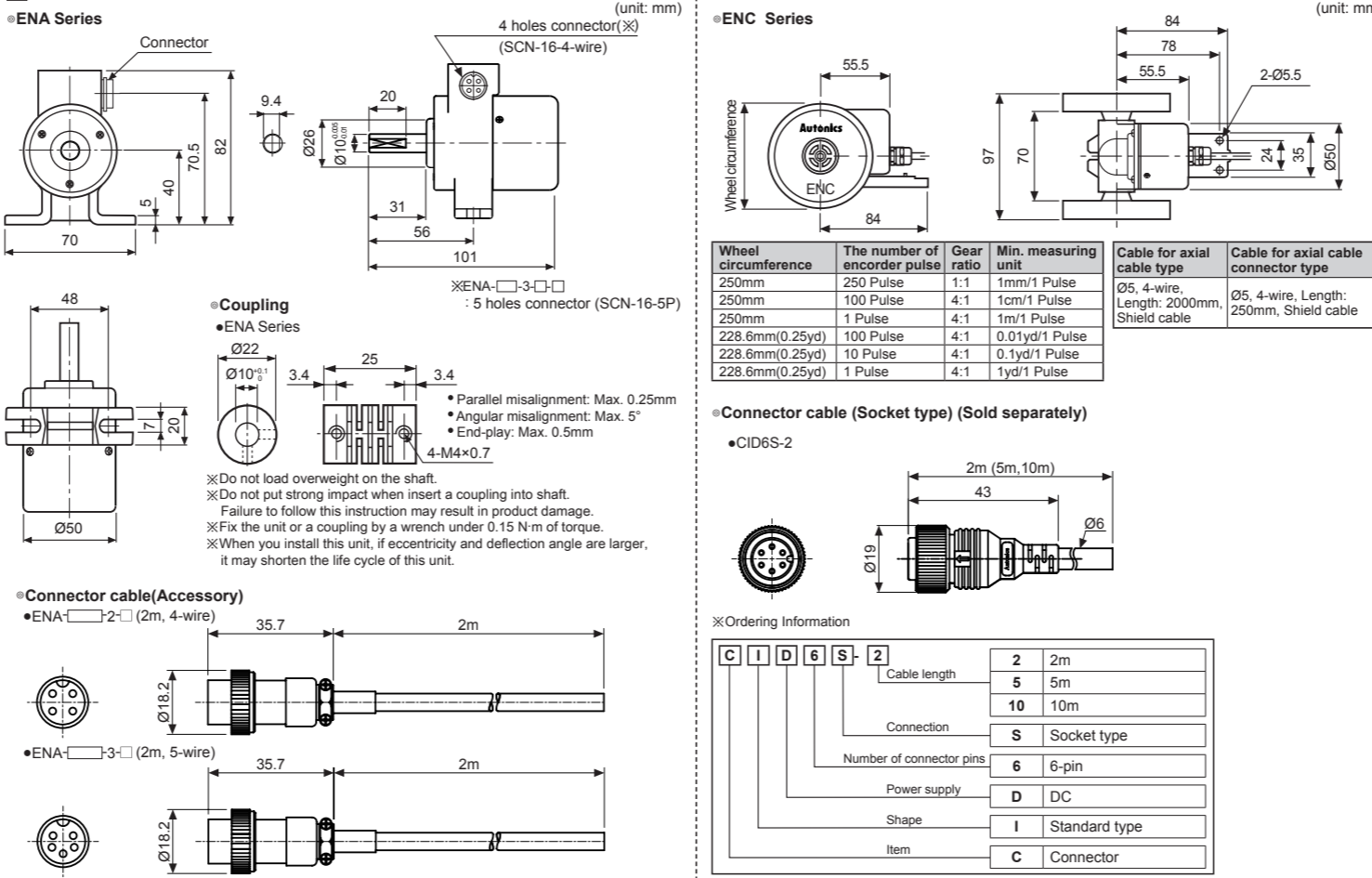※Cable length: 250mm

■ Control Output Diagram

	Rotary encoder circuit	Load connection
Totem pole output	Main circuit	+V Sink current : Max. 30mA ※1 Load Output Source current : Max. 10mA ※2 Load 0V
NPN open collector output	Main circuit	+V Output Load Sink current : Max. 30mA 0V
Voltage output	Main circuit R	+V Output Load Source current : Max. 10mA 0V

※All output circuits of A, B, Z phase are the same.
※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).**
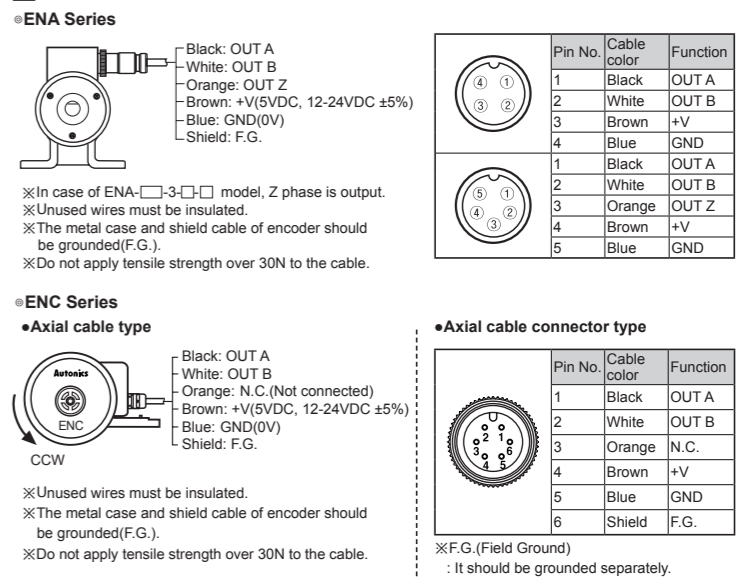
■ Specifications

Item			Side-mounting shaft type of incremental rotary encoder	Wheel type of incremental rotary encoder
Model		Totem pole output	ENA-□-□-T-□	ENC-1-□-T-□-□
		NPN open collector output	ENA-□-□-N-□	ENC-1-□-N-□-□
		Voltage output	ENA-□-□-V-□	ENC-1-□-V-□-□
Resolution(PPR)※1			*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	1mm/Pulse, 1cm/Pulse, 1m/Pulse, 0.01yd/Pulse, 0.1yd/Pulse, 1yd/Pulse
Output phase			ENA-□-2-□-□ : A, B phase	A, B phase
			ENA-□-3-□-□ : A, B, Z phase	
Electrical specification	Phase difference of output		Output between A and B phase: $\frac{T}{4} \pm \frac{T}{8}$ (T= 1cycle of A phase)	
	Control output	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=	
	Response time (rise/fall)	Totem pole output	Max. 1µs (Cable length:2m, I sink = 20mA)	
		NPN open collector output		
		Voltage output		
	Max. Response frequency		300kHz	180kHz
	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)	
	Insulation resistance		Min. 100MΩ(at 500VDC megger between all terminals and case)	
	Dielectric strength		750VAC 50/60Hz for 1 minute(Between all termials and case)	
Mechanical specification	Connection		Radial connector type	Axial cable type, Axial cable connector type
	Starting torque		Max. 70gf·cm(0.007N·m)	Dependent on the coefficient of friction
	Moment of inertia		Max. 80g·cm²(8×10⁻⁶kg·m²)	—
	Shaft loading		Radial 10kgf, Thrust: 2.5kgf	
	Max. allowable revolution※2		5000rpm	
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. 75G	
Environment	Ambient temperature		-10 to 70℃, Storage: -25 to 85℃	
	Ambient humidity		35 to 85%RH, Storage: 35 to 90%RH	
Protection structure			IP50(IEC Standards)	
Cable			●ENA-□-2-□-□. ENC: Ø5mm, 4-wire, Length: 2m, Shield cable (AWG 24, Core wire diameter: 0.08mm, Number of cores: 40, Insulator out diameter: Ø1mm) ●ENA-□-3-□-□: Ø5mm, 5-wire, Length: 2m, Shield cable (AWG 24, Core wire diameter: 0.08mm, Number of cores: 40, Insulator out diameter: Ø1mm)	
Accessory			Ø10mm coupling, Connector cable	—
Approval			CE	
Unit weight			Approx. 345g	Approx. 494g

※1: '*' pulse is only for A, B phase.
※2: Make sure that Max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.

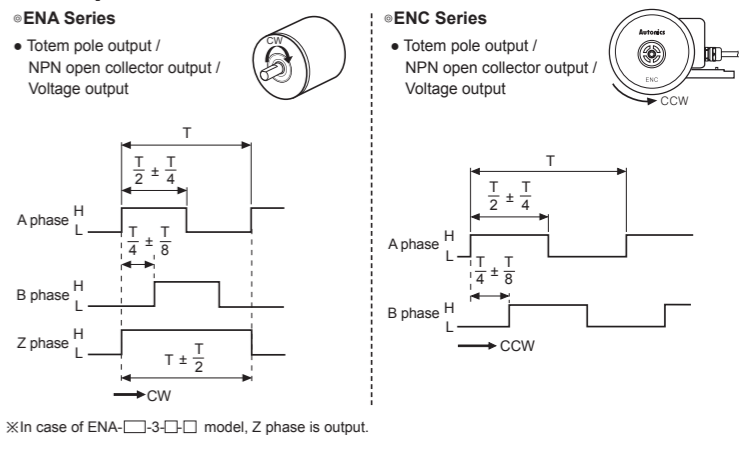$$[\text{Max. response revolution(rpm)} = \frac{\text{Max. response frequency}}{\text{Resolution}} \times 60 \text{ sec}]$$

※Environment resistance is rated at no freezing or condensation.

■ Dimensions

(unit: mm)

●ENA Series

Connector

4 holes connector(※)
(SCN-16-4-wire)

9.4 · 20 · Ø26 · Ø10 · 70.5 · 82 · 40 · 5 · 31 · 56 · 101 · 70

※ENA-□-3-□-□ : 5 holes connector (SCN-16-5P)

48 · Ø50 · 7 · 20

●Coupling

●ENA Series

Ø22 · Ø10 · 3.4 · 25 · 3.4 · 4-M4×0.7

• Parallel misalignment: Max. 0.25mm
• Angular misalignment: Max. 5°
• End-play: Max. 0.5mm

※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.
※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.

●Connector cable(Accessory)

●ENA-□-2-□ (2m, 4-wire)
35.7 · 2m · Ø18.2

●ENA-□-3-□ (2m, 5-wire)
35.7 · 2m · Ø18.2

●ENC Series

(unit: mm)

84 · 78 · 55.5 · 55.5 · Autonics ENC · 2-Ø5.5 · 97 · 70 · 24 · 35 · Ø50 · 84

Wheel circumference	The number of encoder pulse	Gear ratio	Min. measuring unit	Cable for axial cable type	Cable for axial cable connector type
250mm	250 Pulse	1:1	1mm/1 Pulse	Ø5, 4-wire, Length: 2000mm, Shield cable	Ø5, 4-wire, Length: 250mm, Shield cable
250mm	100 Pulse	4:1	1cm/1 Pulse		
250mm	1 Pulse	4:1	1m/1 Pulse		
228.6mm(0.25yd)	100 Pulse	4:1	0.01yd/1 Pulse		
228.6mm(0.25yd)	10 Pulse	4:1	0.1yd/1 Pulse		
228.6mm(0.25yd)	1 Pulse	4:1	1yd/1 Pulse		

●Connector cable (Socket type) (Sold separately)

●CID6S-2
2m (5m,10m) · 43 · Ø19 · Ø6

※Ordering Information

C	I	D	6	S	-	2		

Cable length	2	2m
	5	5m
	10	10m
Connection	S	Socket type
Number of connector pins	6	6-pin
Power supply	D	DC
Shape	I	Standard type
Item	C	Connector

■ Connections

●ENA Series

Black: OUT A
White: OUT B
Orange: OUT Z
Brown: +V(5VDC, 12-24VDC ±5%)
Blue: GND(0V)
Shield: F.G.

Pin No	Cable color	Function
1	Black	OUT A
2	White	OUT B
3	Brown	+V
4	Blue	GND

Pin No	Cable color	Function
1	Black	OUT A
2	White	OUT B
3	Orange	OUT Z
4	Brown	+V
5	Blue	GND

※In case of ENA-□-3-□-□ model, Z phase is 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 on the cable.

●ENC Series

●Axial cable type

Black: OUT A
White: OUT B
Orange: N.C.(Not connected)
Brown: +V(5VDC, 12-24VDC ±5%)
Blue: GND(0V)
Shield: F.G.

CCW

※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.

●Axial cable connector type

Pin No	Cable color	Function
1	Black	OUT A
2	White	OUT B
3	Orange	N.C.
4	Brown	+V
5	Blue	GND
6	Shield	F.G.

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

■ Output Waveforms

●ENA Series

● Totem pole output / NPN open collector output / Voltage output

CW

T · $\frac{T}{2} \pm \frac{T}{4}$ · $\frac{T}{4} \pm \frac{T}{8}$

A phase H/L
B phase H/L
Z phase H/L · $T \pm \frac{T}{2}$

●ENC Series

● Totem pole output / NPN open collector output / Voltage output

CCW

T · $\frac{T}{2} \pm \frac{T}{4}$ · $\frac{T}{4} \pm \frac{T}{8}$

A phase H/L
B phase H/L

※In case of ENA-□-3-□-□ model, Z phase is output.

■ Caution during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. 5VDC, 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
3. 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.
4. Ground the shield wire to the F.G. terminal.
5. When using switching mode power supply, frame ground (F.G.) terminal of power supply should be grounded.
6. Wire as short as possible and keep away from high voltage lines or power lines, to prevent inductive noise.
7. 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.
8. This unit may be used in the following environments.
①Indoors (in the environment condition rated in 'Specifications')
②Altitude max. 2,000m
③Pollution degree 2
④Installation 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
■ SSRs/Power Controllers
■ Counters
■ Timers
■ Panel Meters
■ Tachometer/Pulse (Rate) Meters
■ Display Units
■ Sensor Controllers

Autonics Corporation

http://www.autonics.com

DRW171375AA