Shaft Type Ø30mm Incremental Rotary Encoder

▣ Features

- ● Ø30mm of miniature shaft type rotary encoder
- ● Easy installation at narrow space
- ● Low moment of inertia
- ● Power supply: 5VDC, 12-24VDC ±5%
- ● Various output types

⚠ **Please read "Safety Considerations" in the instruction manual before using.**

CE

▣ Ordering Information

| E30S | 4 | — | 3000 | — | 3 | — | N | — | 24 | — | |

Series	Shaft diameter	Pulses/revolution	Output phase	Control output	Power supply	Cable
Ø30mm, shaft type	Ø4mm	100, 200, 360, 500, 1000, 1024, 3000	3: A, B, Z 6: A, A̅, B, B̅, Z, Z̅	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 : axial cable type C: axial cable connector type

※The power of Line driver is only for 5VDC.

▣ Specifications

Item			Shaft type Ø30mm Incremental Rotary Encoder
Resolution (PPR)[1]			100, 200, 360, 500, 1000, 1024, 3000
Electrical specification	Output phase		A, B, Z phase (line driver: A, A̅, B, B̅, Z, Z̅ phase)
	Phase difference of output		Phase difference between A and B: $\frac{T}{4} \pm \frac{T}{8}$ (T=1 cycle 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⎓
		Line driver output	• [Low] - Load current: max. 20mA, residual voltage: max. 0.5VDC⎓ • [High] - Load current: max. -20mA, output voltage: min. 2.5VDC⎓
	Response time (rise/fall)	Totem pole output	Max. 1μs (cable length: 2m, I sink = 20mA)
		NPN open collector output	
		Voltage output	Max. 1μs (5VDC: output resistance 820Ω), Max. 2μs (12-24VDC: output resistance 4.7kΩ) (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		Axial cable type, axial cable connector type
Mechanical specification	Starting torque		Max. 20gf·cm (0.002N·m)
	Moment of inertia		Max. 20g·cm² (2×10⁻⁶ kg·m²)
	Shaft loading		Radial: max. 2kgf, Thrust: max. 1kgf
	Max. allowable revolution[2]		5,000rpm
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. 50G
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 standard)
Cable			Ø5mm, 5-wire (line driver: 8-wire), 2m, Shield cable (AWG24, core diameter: 0.08mm, number of cores: 40, insulator out diameter: Ø1mm)
Accessory			Ø4mm coupling
Approval			CE (except line driver output)
Unit weight			Approx. 80g

※1: Not indicated resolutions are customizable. ※Environment resistance is rated at no freezing or condensation.
※2: Make sure that max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.

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

Moment of inertia (subscripts superscript note): Max. 20g·cm² (2×10⁻⁶ kg·m²)

■ Control Output Diagram

Totem pole output		NPN open collector output		Voltage output		Line driver output	
Rotary encoder circuit	Load connection	Rotary encoder circuit	Load connection	Rotary encoder circuit	Load connection	Rotary encoder circuit	Load connection

Totem pole output: +V, Sink current : max. 30mA, ※1 Load, Output, Source current : max. 10mA, ※2 Load, 0V, Main circuit

NPN open collector output: +V, Load, Output, Sink current : max. 30mA, 0V, Main circuit

Voltage output: +V, Source current : max. 10mA, R, Output, Load, 0V, Main circuit

Line driver output: +V, A phase output, $\overline{A}$ phase output, 0V, Main circuit

● The output circuit of A, B, Z phase are same. (line driver output is A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$)
● Totem pole output type can be used for NPN open collector output type (※1) or Voltage output type (※2).

■ Output Waveform

◎ **Totem pole output /**
NPN open collector output /
Voltage output

A phase, B phase, Z phase, H, L, T, $\frac{T}{2} \pm \frac{T}{4}$, $\frac{T}{4} \pm \frac{T}{8}$, $T \pm \frac{T}{2}$, Clockwise (CW)

◎ **Line driver output**

A phase, $\overline{A}$ phase, B phase, $\overline{B}$ phase, Z phase, $\overline{Z}$ phase, H, L, T, $\frac{T}{2} \pm \frac{T}{4}$, $\frac{T}{4} \pm \frac{T}{8}$, $T \pm \frac{T}{2}$, Clockwise (CW), CW
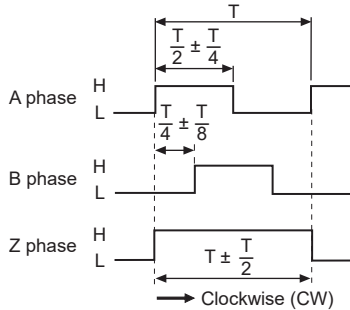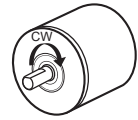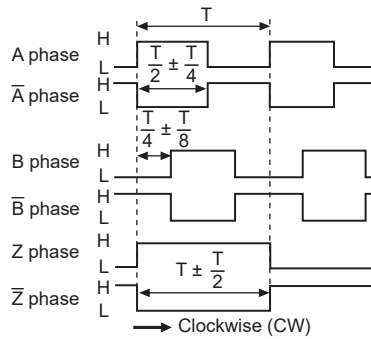
■ Connections

◎ **Axial cable type**

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

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

● **Line driver output**

Black: OUT A
Red: OUT $\overline{A}$
White: OUT B
Gray: OUT $\overline{B}$
Orange: OUT Z
Yellow: OUT $\overline{Z}$
Brown: +V (5VDC ±5%)
Blue: GND (0V)
Shield: F.G.
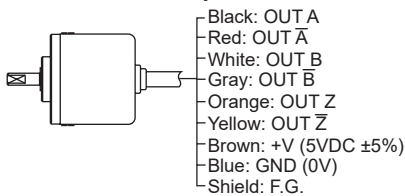
◎ **Axial cable connector type**

● **Totem pole output /**   • **Line driver output**
NPN open collector output /
Voltage output
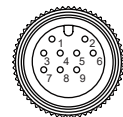
| Totem pole output NPN open collector output Voltage output			Line driver output		
Pin No.	Function	Cable color	Pin No.	Function	Cable color
①	OUT A	Black	①	OUT A	Black
②	OUT B	White	②	OUT $\overline{A}$	Red
③	OUT Z	Orange	③	+V	Brown
④	+V	Brown	④	GND	Blue
⑤	GND	Blue	⑤	OUT B	White
⑥	F.G.	Shield	⑥	OUT $\overline{B}$	Gray
			⑦	OUT Z	Orange
			⑧	OUT $\overline{Z}$	Yellow
			⑨	F.G.	Shield

※F.G. (field ground): It should be grounded separately.

※Unused wires must be insulated.
※The metal case and shield wire of encoder should be grounded (F.G.).
※Do not apply tensile strength over 30N to the cable.

■ Dimensions

◎ Axial cable type
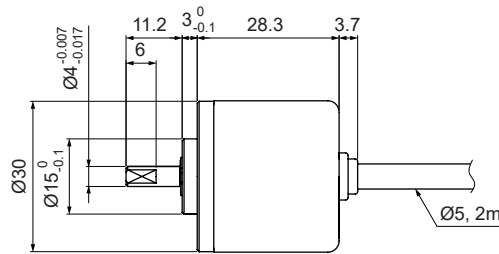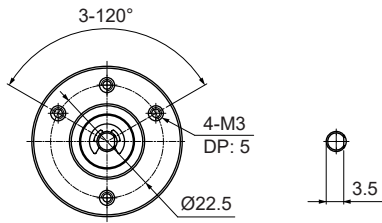
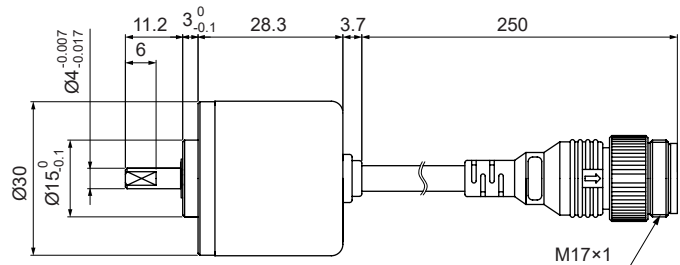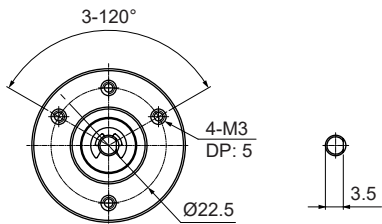| Cable for axial cable type |
|---|
| Ø5, 5-wire (line driver output: 8-wire), 2m, Shield cable |

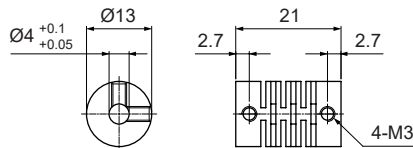### ◎ Axial cable connector type

M17×1

Cable for axial cable connector type
Ø5, 5-wire (line driver output: 8-wire), 250mm, Shield cable

※Connector cable is sold separately and refer to the 'Connectors, Connector Cables, Sensor Distribution Boxes, Sockets' section.

◎ Coupling (E30S)

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

※It must not use larger shaft loading than specification.
※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 0.15N·m of torque.
※When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit.
※For parallel misalignment, angular misalignment, end-play terms, refer to the "Glossary" section of Technical Description.
※For flexible coupling (ERB series) information, refer to the ERB series section.

SENSORS

CONTROLLERS

MOTION DEVICES

SOFTWARE

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) LiDAR

(D) Door/Area Sensors

(E) Vision Sensors

(F) Proximity Sensors

(G) Pressure Sensors

(H) Rotary Encoders

(I) Connectors/ Connector Cables/ Sensor Distribution Boxes/ Sockets