

# ENP Series

## Diameter ø60mm Shaft type Absolute Rotary encoder

### ■ Features

- 12-24VDC power supply of 360 division
- Allows to measure absolute variable angle with BCD code
- Strong against external impact
- Memorizing the absolute position when power is cut off

### ■ Applications

Precision numerical control machine for industrial plant

**⚠ Please read "Caution for your safety" in operation manual before using.**



### ■ Ordering information

ENP	-	1	-	1	-	1	-	R	-	360	-	P
Series	Output code	Output	Power supply	Revolution direction	Revolution/1 Pulse	control output						
Diameter ø60mm shaft type (External shaft diameter: ø10mm)	1 : BCD Code	0 : Negative logic 1 : Positive logic	0 : 5VDC ±5% 1 : 12-24VDC ±5%	F: Output value increase at CW direction R: Output value increase at CCW direction	006 : 6-division 008 : 8-division 012 : 12-division	016 : 16-division 024 : 24-division 360 : 360-division	P: PNP open collector output N: NPN open collector output					

### ■ Specifications

Item		Diameter ø60mm shaft type of absolute rotary encoder						
Model	PNP open collector output	ENP-111□-006-P	ENP-111□-008-P	ENP-111□-012-P	ENP-111□-016-P	ENP-111□-024-P	ENP-111□-360-P	
	NPN open collector output	ENP-111□-006-N	ENP-101□-008-N	ENP-101□-012-N	ENP-101□-016-N	ENP-101□-024-N	ENP-101□-360-N	
Resolution		6-division	8-division	12-division	16-division	24-division	360-division	
Electrical specification	Output phase	TP(Timing Pulse) : 2bit TS(Signal Pulse) : 4bit(BCD, EP)	TP(Timing Pulse) : 2bit TS(Signal Pulse) : 5bit(BCD, EP)	TP(Timing Pulse) : 2bit TS(Signal Pulse) : 6bit(BCD, EP)	TP(Timing Pulse) : 2bit TS(Signal Pulse) : 6bit(BCD, EP)	TP(Timing Pulse) : 2bit TS(Signal Pulse) : 7bit(BCD, EP)	TS(Signal Pulse) : 10bit(BCD)	
	Output of phase differences	TP1: 53° ±30' TP2: 15° ±30' P: 60° ±30' TS: 56° ±30'	TP1: 39° ±30' TP2: 15° ±30' P: 45° ±30' TS: 42° ±30'	TP1: 3° ±30' TP2: 15° ±30' P: 30° ±30' TS: 26° ±30'	TP1: 2° ±30' TP2: 11.25° ±30' P: 22.5° ±30' TS: 19.5° ±30'	TP1: 8° ±30' TP2: 3° ±30' P: 15° ±30' TS: 11° ±30'	TS: 1° ±30'	
	Control output	PNP open collector output	Output voltage: Min. (Power supply-1.5V)VDC, Load current: Max. 32mA					
		NPN open collector output	Load current: Max. 32mA, Residual voltage: Max. 1VDC					
	Response time (Rise/Fall)	PNP open collector output	Ton=800ns, Toff=Max. 800ns(Cable length: 1m, I sink=32mA)					
		NPN open collector output	Ton=800ns, Toff=Max. 800ns(Cable length: 1m, I sink=32mA)					
	Max. Response frequency		20kHz					
	Power supply		• 5VDC ±5%(Ripple P-P : Max. 5%) • 12-24VDC ±5%(Ripple P-P : Max. 5%)					
	Current consumption		Max. 100mA(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 terminals and case)						
Connection		Cable type						
Mechanical specification	Starting torque	Max. 500gf·cm(0.05N·m)						
	Moment of inertia	Max. 300g·cm <sup>2</sup> (3×10-5kg·m <sup>2</sup> )						
	Shaft loading	Radial: 10kgf, Thrust: 2.5kgf						
	Mechanical revolution <sup>※1</sup>	3,600rpm						
Vibration		1.5mm amplitude or 300m/s <sup>2</sup> at frequency of 10 to 55Hz(for 1 min.) in each of X, Y, Z directions for 2 hours						
Shock		Approx. Max. 75G						
Environ-ment	Ambient temperature	-10 to 70°C, storage: -25 to 85°C						
	Ambient humidity	35 to 85%RH, storage: 35 to 90%RH						
Protection		IP50(IEC standard)						
Cable		ø8, 12-wire, Length: 1m, Double shield cable (AWG24, Core diameter: 0.08mm, Number of cores: 40, Insulator diameter: ø1)						
Accessory		Mounting bracket, coupling						
Weight <sup>※2</sup>		Approx. 478g(approx. 400g)						

※1: Make sure that. Max response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.

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

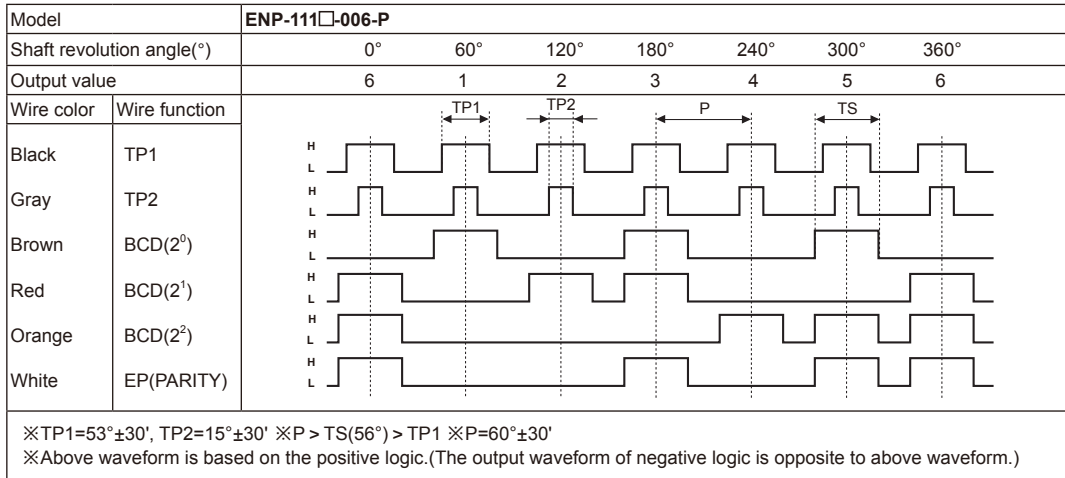
※2: The weight with packaging and the weight in parentheses is only unit weight.

※Environment resistance is rated at no freezing or condensation.

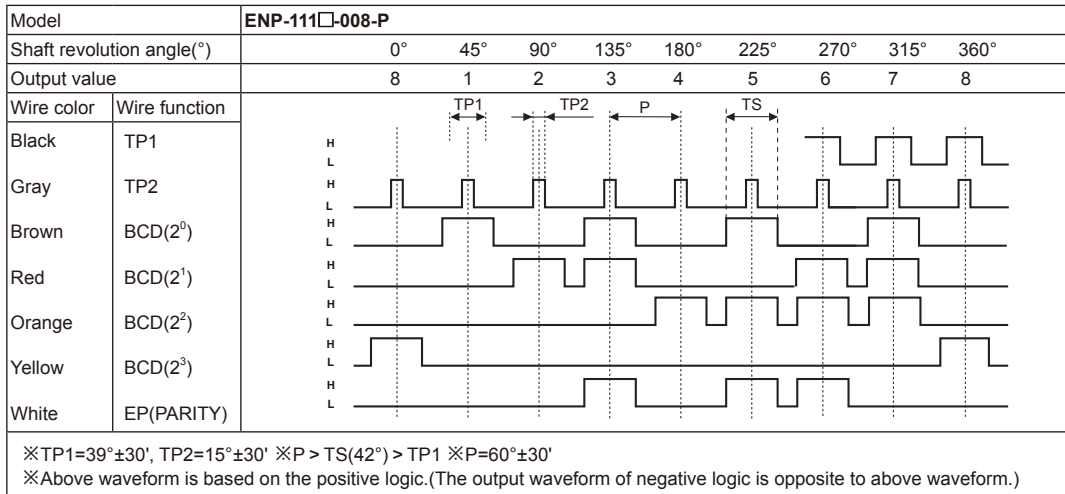
# ø60mm Shaft Absolute type

## Output waveform

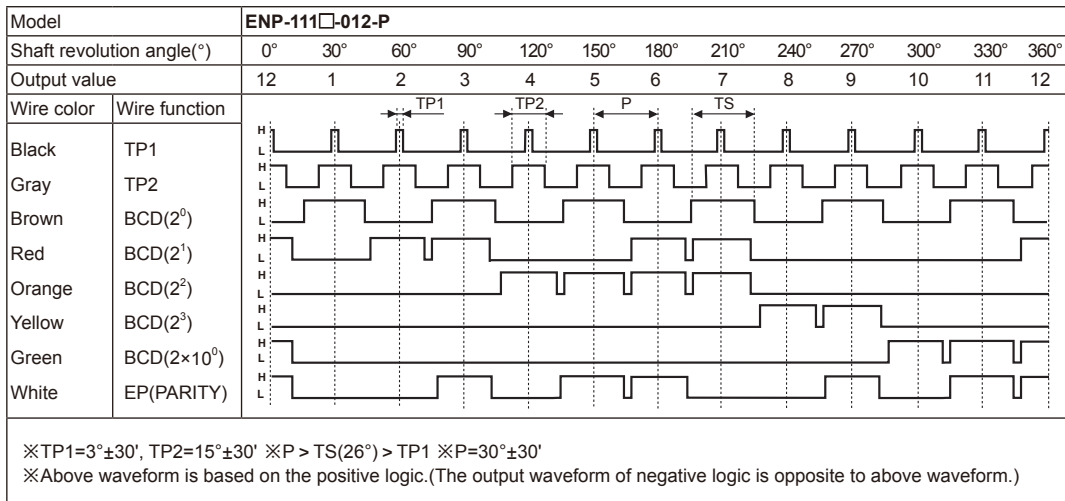
### • 6-division



### • 8-division



### • 12-division



(A) Photo electric sensor

(B) Fiber optic sensor

(C) Door/Area sensor

(D) Proximity sensor

(E) Pressure sensor

(F) Rotary encoder

(G) Connector/Socket

(H) Temp. controller

(I) SSR/ Power controller

(J) Counter

(K) Timer

(L) Panel meter

(M) Tacho/ Speed/ Pulse meter

(N) Display unit

(O) Sensor controller

(P) Switching mode power supply

(Q) Stepper motor& Driver&Controller

(R) Graphic/ Logic panel

(S) Field network device

(T) Software

(U) Other

# ENP Series

## Output waveform

### • 16-division

Model		ENP-111□-016-P																
Shaft revolution angle(°)		0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°	360°
Output value		16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Wire color	Wire function																	
Black	TP1																	
Gray	TP2																	
Brown	BCD(2 <sup>0</sup> )																	
Red	BCD(2 <sup>1</sup> )																	
Orange	BCD(2 <sup>2</sup> )																	
Yellow	BCD(2 <sup>3</sup> )																	
Green	BCD(2×10 <sup>0</sup> )																	
White	EP(PARITY)																	
<p>※TP1=2°±30', TP2=11.25°±30' ※P &gt; TS(19.5°) &gt; TP1 ※P=22.5°±30'</p> <p>※Above waveform is based on the positive logic.(The output waveform of negative logic is opposite to above waveform.)</p>																		

### • 24-division

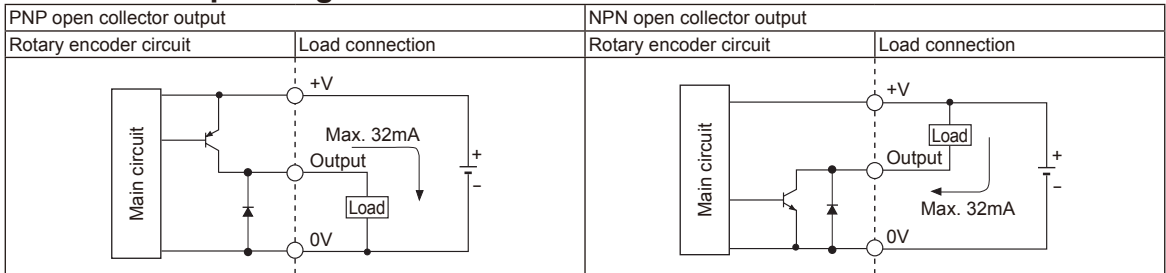
Model		ENP-111□-024-P																								
Shaft revolution angle(°)		0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°	195°	210°	225°	240°	255°	270°	285°	300°	315°	330°	345°	360°
Output value		24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Wire color	Wire function																									
Black	TP1																									
Gray	TP2																									
Brown	BCD(2 <sup>0</sup> )																									
Red	BCD(2 <sup>1</sup> )																									
Orange	BCD(2 <sup>2</sup> )																									
Yellow	BCD(2 <sup>3</sup> )																									
Green	BCD(2 <sup>0</sup> ×10)																									
Blue	BCD(2 <sup>1</sup> ×10)																									
White	EP(PARITY)																									
<p>※TP1=8°±30', TP2=3°±30' ※P &gt; TS(11°) &gt; TP1 ※P=15°±30'</p> <p>※Above waveform is based on the positive logic.(The output waveform of negative logic is opposite to above waveform.)</p>																										

### • 360-division

Model		ENP-11□□-360-P																																			
Shaft revolution angle(°)		0°	1°	2°	3°	4°	5°	.....	198°	199°	200°	201°	202°	.....	356°	357°	358°	359°	360°																		
Output value		0	1	2	3	4	5	.....	198	199	200	201	200	.....	356	357	358	359	0																		
Wire color	Wire function																																				
Black	BCD(2 <sup>0</sup> )																																				
Brown	BCD(2 <sup>1</sup> )																																				
Red	BCD(2 <sup>2</sup> )																																				
Orange	BCD(2 <sup>3</sup> )																																				
Yellow	BCD(2 <sup>0</sup> ×10)																																				
Green	BCD(2 <sup>1</sup> ×10)																																				
Blue	BCD(2 <sup>2</sup> ×10)																																				
Violet	BCD(2 <sup>3</sup> ×10)																																				
Gray	BCD(2 <sup>0</sup> ×100)																																				
White	BCD(2 <sup>1</sup> ×100)																																				
<p>※TS=1°±30'</p> <p>※Above waveform is based on the positive logic.(The output waveform of negative logic is opposite to above waveform.)</p>																																					

# ø60mm Shaft Absolute type

## Control output diagram



※Output circuit of each output signal is same.

## Connections

Resolution		6-division	8-division	12-division	16-division	24-division	360-division	
Power wire	White ※ <sup>1</sup>	+V						
	Black ※ <sup>1</sup>	GND(0V)						
	Shield wire	F.G.						
Output wire	Black	TP1 ※ <sup>2</sup>					2 <sup>0</sup>	
	Brown	2 <sup>0</sup>	2 <sup>0</sup>	2 <sup>0</sup>	2 <sup>0</sup>	2 <sup>0</sup>	2 <sup>1</sup>	
	Red	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>1</sup>	2 <sup>2</sup>	
	Orange	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>2</sup>	2 <sup>3</sup>	
	Yellow	N-C	N-C	2 <sup>3</sup>	2 <sup>3</sup>	2 <sup>3</sup>	2 <sup>0</sup> ×10	
	Green	N-C	N-C	2 <sup>0</sup> ×10	2 <sup>0</sup> ×10	2 <sup>0</sup> ×10	2 <sup>1</sup> ×10	
	Blue	N-C	N-C	N-C	N-C	2 <sup>1</sup> ×10	2 <sup>2</sup> ×10	
	Purple	N-C	N-C	N-C	N-C	N-C	2 <sup>3</sup> ×10	
	Gray	TP2 ※ <sup>2</sup>						2 <sup>0</sup> ×100
	White	EP(PARITY) ※ <sup>3</sup>						2 <sup>1</sup> ×100
	Shield wire	F.G.						

※<sup>1</sup>: Insulator external diameter is ø1.5mm.

※<sup>2</sup>: TP1/TP2: Because low resolution model has long output signal period, this signal for enable is easy to determine signal recognition point about output.

※<sup>3</sup>: EP: Parity signal. It outputs odd parity.

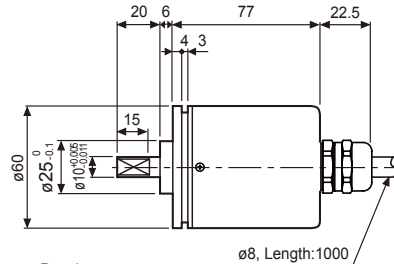
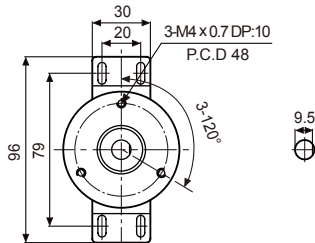
※Unused wire must be insulated.

※Encoder case and shield wire must be grounded.

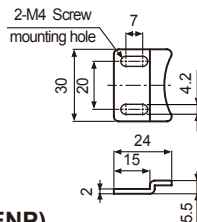
※N-C: Not connected.

※Output cable must not be short-circuited, because Driver IC is used in output circuit.

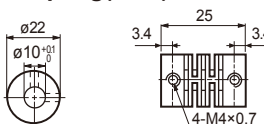
## Dimensions



### Bracket



### Coupling(ENP)

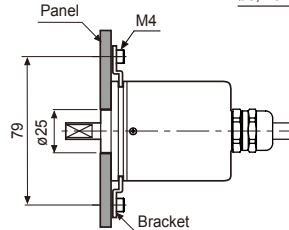


• Parallel misalignment : Max. 0.25mm

• Angular misalignment: Max. 5°

• End-play: Max. 0.5mm

※For parallel misalignment, angular misalignment, end-play terms, refer to the F-78 page.



※When mounting the coupling to encoder shaft, if there is big eccentricity or declination between rotating encoder shaft and mate shaft, it may shorten life cycle of the encoder or the coupling.

※Do not load overweight on the shaft.

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(B) Fiber optic sensor

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