1. S16 Incremental Optical Encoder (Soild Shaft)

1.1 Introduction:
S16 is a micro-miniature solid shaft optical encoder with compact structure and high reliability, differential circuit output， which is commonly used in small equipment and space-constrained industrial automation fields.

S16-J

1.2 Feature：
• Encoder external diameter Ø16mm, various shaft diameter available Ø2mm, Ø3mm, Ø4mm;
• Adopt non-contact photoelectric principle;
• Reverse polarity & output short circuit protection；
• Resolution per turn up to 11520PPR.

S16-L

1.3 Application：
Bill counting machines, printers, micro motors, small instruments and other automation control fields.

1.4 Connection：
• Radial cable(standard length 0.5M);
• Axial cable(standard length 0.5M);
• Radial alignment+plug(standard length 0.5M).

S16- PE

1.5 Protection：
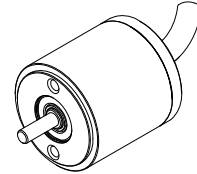• Radial alignment+plug (IP50);
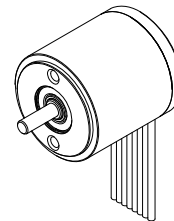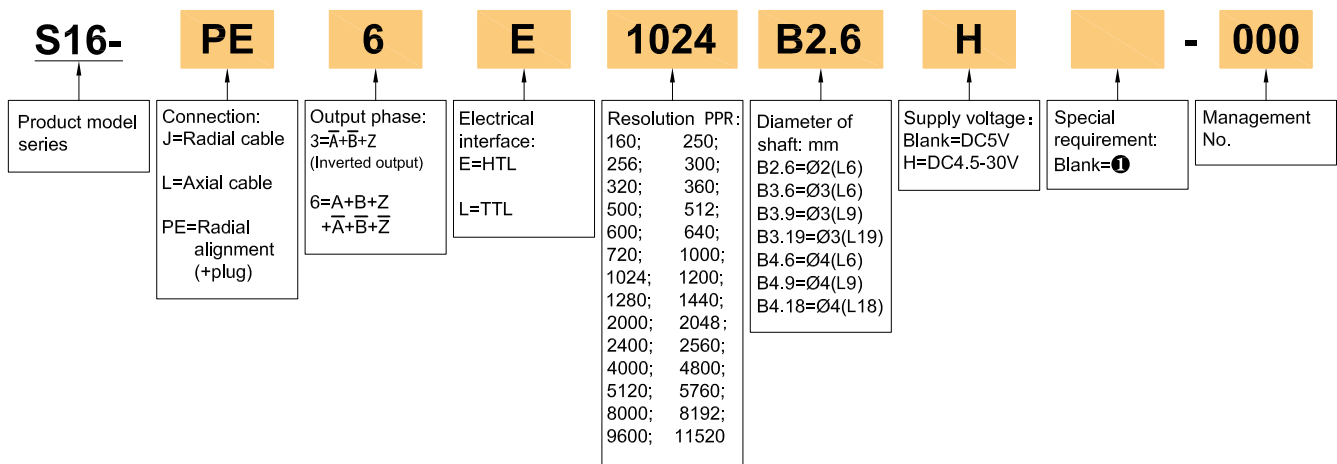• Radial & axial cable (IP65).

1.6 Weight：
About 16g.

2. Model Selection Guide

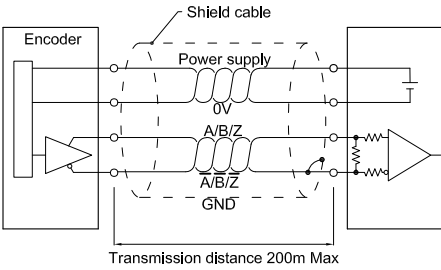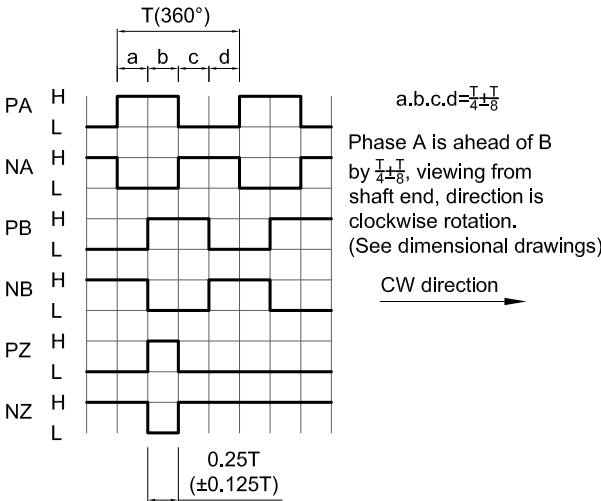2.1 Model composition(select parameters)

S16-	PE	6	E	1024	B2.6	H		- 000

| Product model series | Connection: J=Radial cable L=Axial cable PE=Radial alignment (+plug) | Output phase: 3=$\overline{A}$+$\overline{B}$+Z (Inverted output) 6=A+B+Z +$\overline{A}$+$\overline{B}$+$\overline{Z}$ | Electrical interface: E=HTL L=TTL | Resolution PPR: 160;   250; 256;   300; 320;   360; 500;   512; 600;   640; 720;   1000; 1024;   1200; 1280;   1440; 2000;   2048; 2400;   2560; 4000;   4800; 5120;   5760; 8000;   8192; 9600;   11520 | Diameter of shaft: mm B2.6=Ø2(L6) B3.6=Ø3(L6) B3.9=Ø3(L9) B3.19=Ø3(L19) B4.6=Ø4(L6) B4.9=Ø4(L9) B4.18=Ø4(L18) | Supply voltage： Blank=DC5V H=DC4.5-30V | Special requirement: Blank=❶ | Management No. |

2.2 Note
❶. None indicated for IP50 and cable length of 0.5M, if need to change the length C+number, the longest is 50M (expressed by C50). For the specific length of use, pls refer to page 2 of the provision of output circuit.

3. Output Mode

Electrical interface	Output circuit	Output wave form
HTL (DC4.5-30V) TTL (DC5V)	Encoder Shield cable Power supply 0V A/B/Z A/B/Z GND Transmission distance 200m Max	T(360°) a b c d PA H L NA H L PB H L NB H L PZ H L NZ H L $a.b.c.d=\frac{T}{4}\pm\frac{T}{8}$ Phase A is ahead of B by $\frac{T}{4}\pm\frac{T}{8}$, viewing from shaft end, direction is clockwise rotation. (See dimensional drawings) CW direction 0.25T (±0.125T)

4．Electrical Parameter

Parameter \ Output type Item			TTL	HTL
Supply voltage			DC5V±5%	DC4.5V-30V±5%
Consumption current			100mA Max	
Allowable ripple			≤3%rms	
Top response frequency			300KHz	500KHz
Output capacity	Output current	Input	≤±20mA	
		Output		
	Output voltage	"H"	≥2.5V	≥Vcc-3 V_{DC}
		"L"	≤0.5V	≤ 1V V_{DC}
Rise & Fall time			Less than 1us(Cable length：2m)	
Accuracy			±0.8 arc-min	
Reverse polarity protection			✔	
Short-circuit protection			—	✔❶
Mark to space ratio			45% to 55%	
Phase shift between A & B			90°±10° (frequency in low speed)	
			90°±20° (frequency in high speed)	
GND			Not connect to encoder	

❶ Short-circuit to another channel, permitted for max 30s.

5．Mechanical Specification

Diameter of shaft	Ø2mm, Ø3mm, Ø4mm available (Stainless steel material)
Starting torque	＜0.005Nm at 25℃
Inertia moment	Less than $0.3×10^{-6}$ kg·m²
Shaft load	Radial 2N；Axial 2N
Allowable max speed	＜12000 rpm （Shaft speed）
Bearing Life	＞$1.9x10^{10}$ revolutions at rated load
Shell	Aluminium alloy
Weight	About 16g

## 6．Environmental Parameter

Environmental temperature	Operating:－20～+80°C；Storage:－20～+85°C
Environmental humidity	Operating and storage：35～95％RH(noncondensing)
Vibration(Endurance)	10~2000Hz/10G
Shock(Endurance)	100G 11ms
Protection of shell	Alignment IP50 ；cable IP65

7. Wiring Table

7.1 TTL & HTL (cable connection table)

	Supply voltage		Incremental signal					
Wire color	Red	Black	White	White/BK	Green	Green/BK	Yellow	Yellow/BK
Function	Up	0V	A+	A-	B+	B-	Z+	Z-
Twisted-paired cable								

Up=Supply voltage.
Shield wire is not connected to the internal circuit of encoder.

70±10

10±2

L=500
(Standard products)

Shield wire
effectively grounded
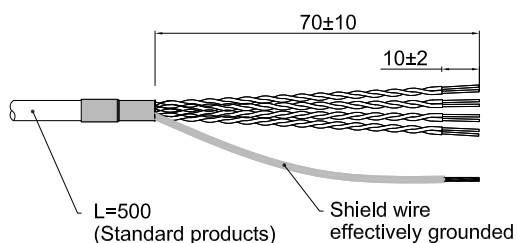
7.2 TTL & HTL (Alignment + plug connection table)

Plug definiton		Connector model number: CEI PN:9203-2721-10								
	1	2	3	4	5	6	7	8	9	10
Differential output	NC	Up	0V	NC	A	A-	B	B-	Z-	Z
Inverted output	A-	NC	NC	NC	NC	0V	NC	B-	Up	Z

Up=Supply voltage.
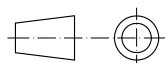Shield wire is not connected to the internal circuit of encoder.

Pin 10
Pin 9
Pin 1
Pin 2

0.5/1.0/2.0m
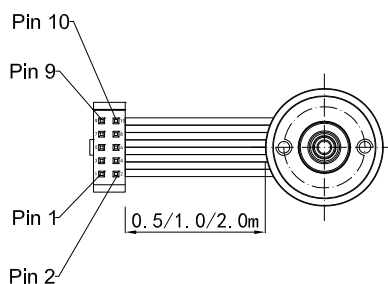
Unit: mm

8．Basic Dimension

8.1 S16-J

Shaft	d	H
B2.6	$\phi 2^{-0.006}_{-0.016}$	6
B3.6	$\phi 3^{-0.006}_{-0.016}$	6
B3.9	$\phi 3^{-0.006}_{-0.016}$	9
B3.19	$\phi 3^{-0.006}_{-0.016}$	19
B4.6	$\phi 4^{-0.006}_{-0.016}$	6
B4.9	$\phi 4^{-0.006}_{-0.016}$	9
B4.18	$\phi 4^{-0.006}_{-0.016}$	18

18.8±0.2
0.6±0.05
L
$\phi 16^{-0.01}_{-0.05}$
$\phi 14h7$
d
2-M2*4
$\phi 11±0.1$
2
L=500(standard product)
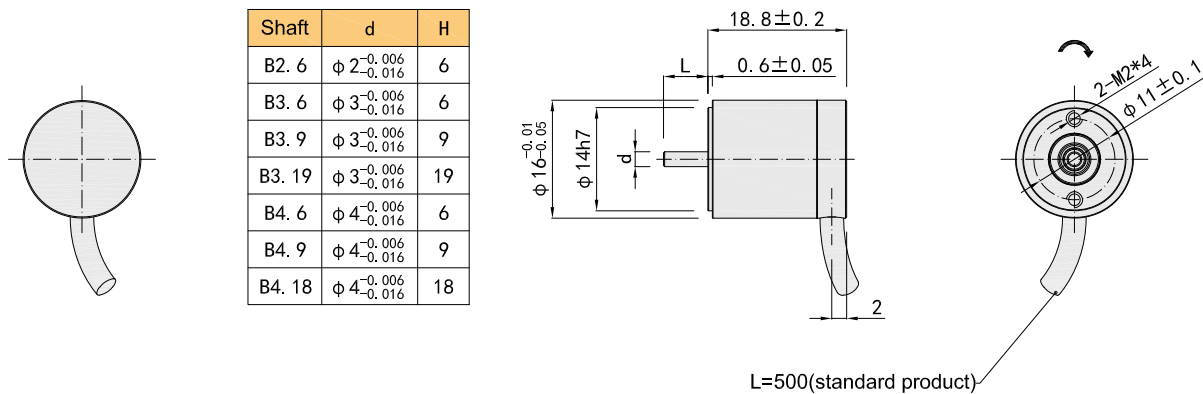
8.2 S16-L (other dimensions are the same as S16-J)

19.8±0.2
3
L=500(standard product)
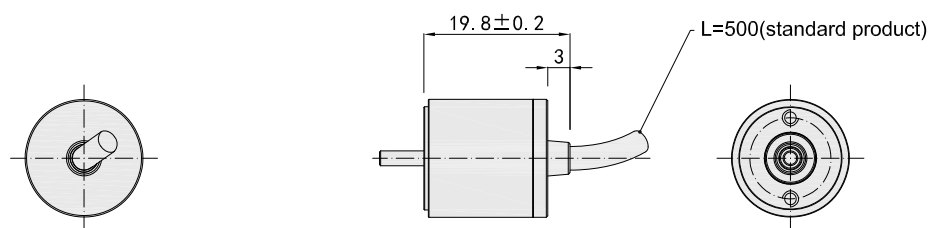
8.3 S16-PE (other dimensions are the same as S16-J)

16.8±0.2
2
0.5/1.0/2.0m
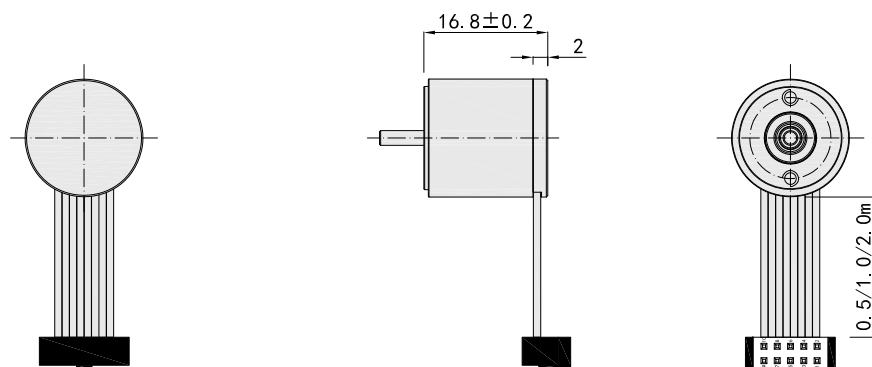
Unit: mm

= Shaft rotation direction of the incremental signal output

9. Caution

9.1 About vibration
Vibration act on encoder always cause wrong pulse, so we should pay attention to working place.More pulse per revolution, narrower groovy spacing of grating, more effect to encoder by vibration, when rev is low or stop, vibration act on shaft or main body would cause grating vibrating, so encoder might make wrong pulse.

9.2 Caution for wiring
• Use the encoder under the specified supply voltage. Please note that the supply voltage range may
  drop due to the wiring length.
• Do not put the encoder wiring and other power lines through the same duct, and do not use them by bundling in parallel.
• Please use twisted pair wires for the signal and power wires of encoder.
• Please do not apply excessive force to the cable of encoder, or it will may be damaged.

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