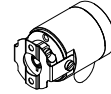## 1. K16 Incremental Encoder (Hollow Shaft Blind Hole)

1.1 Introduction:
K16 is a micro-miniature through shaft optical incremental encoder with compact structure and high reliability, differential circuit output，which is commonly used in small equipment and space-constrained industrial automation fields.
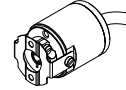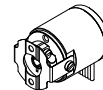
K16-J

K16-L

K16-PE

1.2 Feature:
• Encoder external diameter Ø16mm, shaft diameter up to Ø3mm;
• Encoder is locked with the motor shaft in a buckle-type manner, which makes installation easy and reliable;
• Reverse polarity & output short circuit protection；
• Resolution per turn up to 11520PPR.

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);
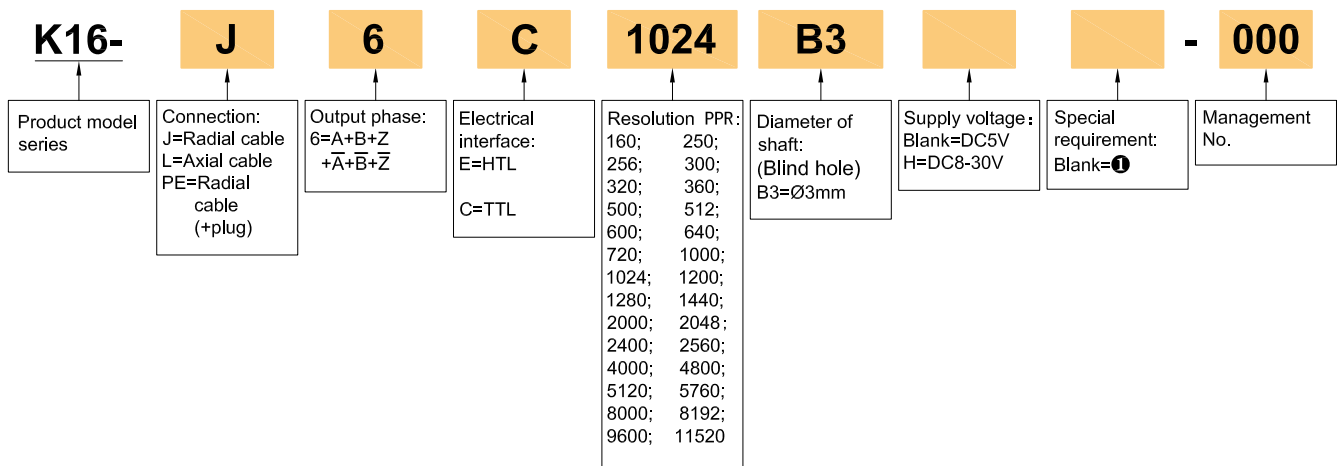• Radial alignment+plug(standard length 0.5M).

1.5 Protection:
IP50

1.6 Weight:
About 20g.

2. Model Selection Guide

2.1 Model composition(select parameters)

K16-	J	6	C	1024	B3			- 000

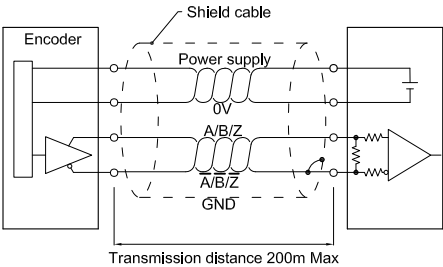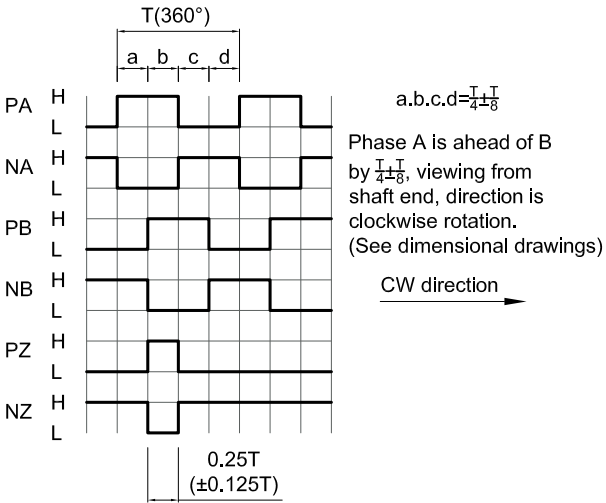| Product model series | Connection: J=Radial cable L=Axial cable PE=Radial cable (+plug) | Output phase: 6=A+B+Z +$\overline{A}$+$\overline{B}$+$\overline{Z}$ | Electrical interface: E=HTL C=TTL | Resolution PPR: 160;   250; 256;   300; 320;   360; 500;   512; 600;   640; 720;   1000; 1024;   1200; 1280;   1440; 2000;   2048; 2400;   2560; 4000;   4800; 5120;   5760; 8000;   8192; 9600;   11520 | Diameter of shaft: (Blind hole) B3=Ø3mm | Supply voltage： Blank=DC5V H=DC8-30V | Special requirement: Blank=❶ | Management No. |

2.2 Note
❶. None indicated for IP50, the standard product cable length is 0.5M.
If you need to change the length, C+number, the max length is 10M (indicated by C10). Please consult with sales for specific needs.

3. Output Mode

Electrical interface	Output circuit	Output wave form
HTL (DC8-30V) TTL (DC5V)		

Transmission distance 200m Max

T(360°)

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 / Output	≤±20mA	
Output capacity — Output voltage — "H"	≥2.5V	≥Vcc-3 V_{DC}
Output capacity — Output voltage — "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)	
Phase shift between A & B	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	Ø3mm (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	＜6000 rpm （Shaft speed）
Bearing life	＞$1.9x10^{10}$ revolutions at rated load
Shell	Aluminium alloy
Weight	About 20g

## 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	IP50

7. Wiring Table

7.1 TTL & HTL (cable connection table)

Wire color	Supply voltage		Incremental signal					
	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
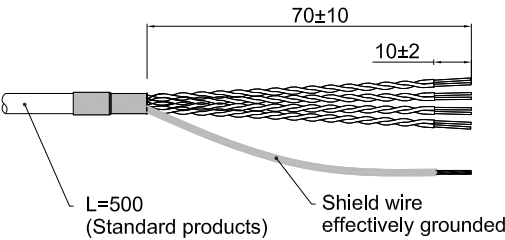
7.2 TTL & HTL (Alignment + plug connection table)

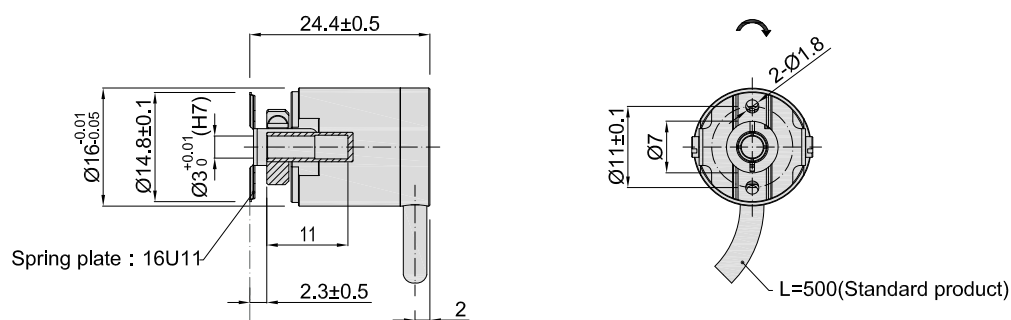| Plug definiton	Connector model number：CEI PN：9203-2721-10									
	1	2	3	4	5	6	7	8	9	10
Function	NC	Up	0V	NC	A	A-	B	B-	Z-	Z

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
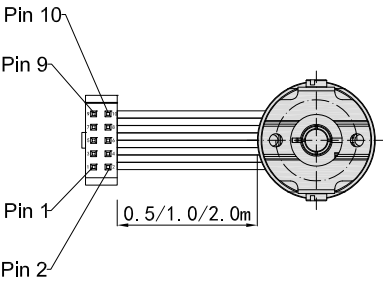
Unit: mm

8．Basic Dimension

8.1 K16-J

24.4±0.5

$\varnothing16^{-0.01}_{-0.05}$ $\varnothing14.8±0.1$ $\varnothing3^{+0.01}_{0}$ (H7)

Spring plate：16U11

11

2.3±0.5   2

$\varnothing11±0.1$ $\varnothing7$ 2-$\varnothing1.8$

L=500(Standard product)

8.2 K16-L
(other dimensions are the same as K16-J)

25.4±0.5   3

7.1±0.1
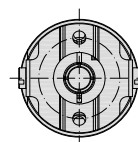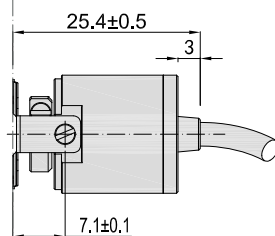
8.3 K16-PE
(other dimensions are the same as K16-J)

22.4±0.5   2
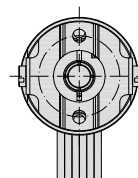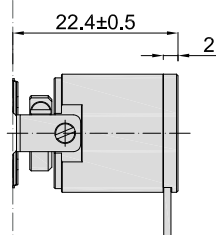
8.4 Specification for mounting shaft

2-M1.6(L4)

$\varnothing11±0.05$

Radial runout
Max 0.03

Max12

Min 6

$\varnothing3^{-0.006}_{-0.016}$(f7)

Axial runout
Max 0.05
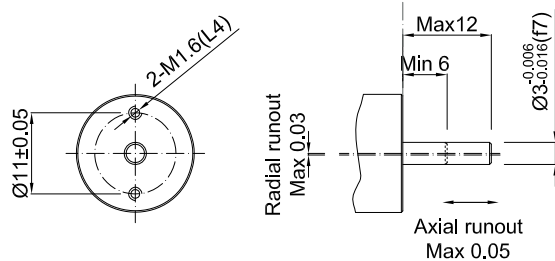
Mounting screws
Slotted bolted + flat washers Specification:M1.6*3 Material：stainless steel Quantity：2

Unit: mm
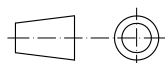
= Shaft rotation direction of the incremental signal output

9．Installation Diagram

Installation steps：
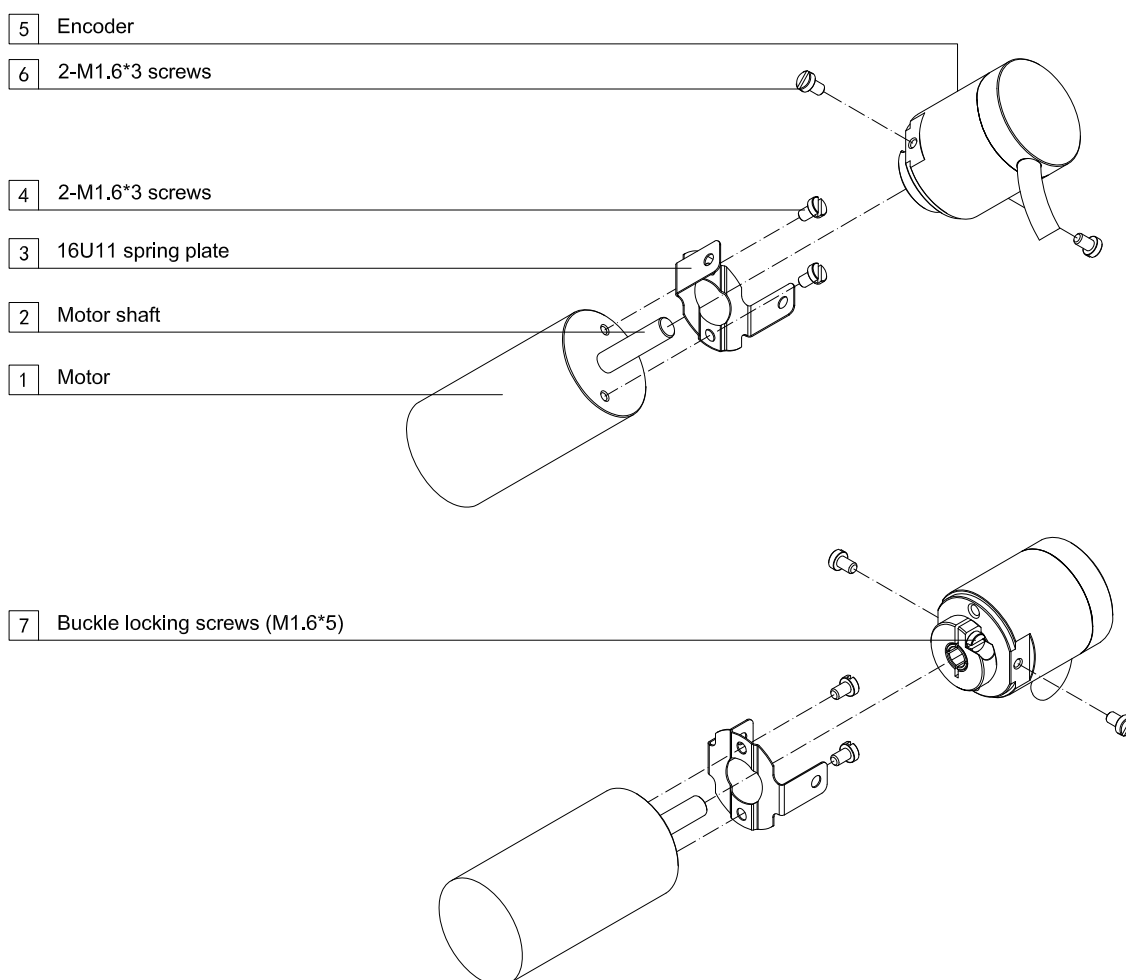1．First, install the spring plate（3）on the motor and tighen the two screws（4）(note that the center of the spring plate is basically concentric with the motor shaft).
2．Put the encoder on the motor shaft, align the two screw holes on the side of the encoder with the two holes on the spring plate, and then tighten the two screws （6）.
3．Finally, tighten the locking screw（7）.
4．It is recommended to apply thread glue to all screws before use．

| 5 | Encoder |
| 6 | 2-M1.6*3 screws |

4	2-M1.6*3 screws
3	16U11 spring plate
2	Motor shaft
1	Motor

| 7 | Buckle locking screws (M1.6*5) |

10. Caution

10.1 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.

10.2 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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