1. K35 Incremental Optical Encoder (Blind shaft)

1.1 Introduction:
K35 is a blind shaft miniaturized encoder, compact,
robust and safe, and is commonly used in servo motors
and industrial automations.

1.2 Feature:
• Encoder external diameter Ø35mm、thickness 35mm、
  diameter of shaft up to Ø10mm;
• Adopt non-contact photoelectric principle;
• Reverse polarity protection;
• Short circuit protection;
• Multiple electrical interfaces available;
• Resolution per turn up to 32768PPR.

1.3 Application:
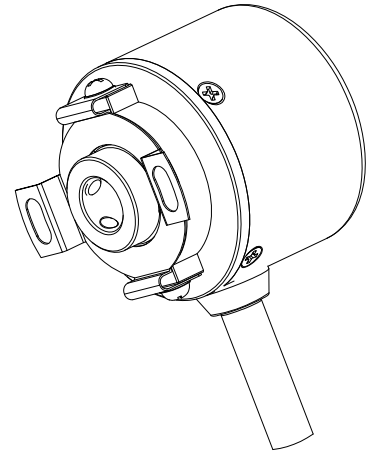Motor, elevator, CNC and other automation control fields.

1.4 Connection:
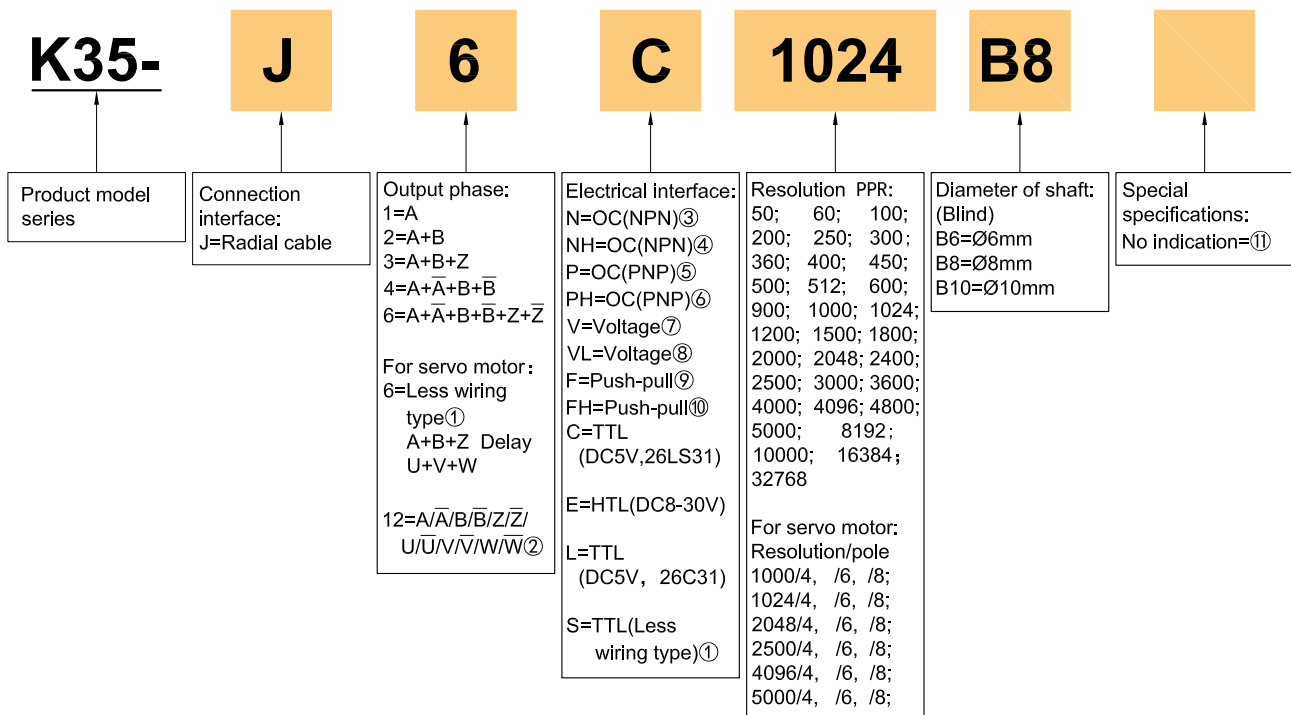• Radial cable (length 500mm)

1.5 Protection:
IP50

1.6 Weight:
about 100g

2. Model Selection Guide

2.1 Model composition(select parameters)

K35-   J   6   C   1024   B8

| Product model series | Connection interface: J=Radial cable | Output phase: 1=A 2=A+B 3=A+B+Z 4=A+$\overline{A}$+B+$\overline{B}$ 6=A+$\overline{A}$+B+$\overline{B}$+Z+$\overline{Z}$ For servo motor： 6=Less wiring type① A+B+Z Delay U+V+W 12=A/$\overline{A}$/B/$\overline{B}$/Z/$\overline{Z}$/ U/$\overline{U}$/V/$\overline{V}$/W/$\overline{W}$② | Electrical interface: N=OC(NPN)③ NH=OC(NPN)④ P=OC(PNP)⑤ PH=OC(PNP)⑥ V=Voltage⑦ VL=Voltage⑧ F=Push-pull⑨ FH=Push-pull⑩ C=TTL (DC5V,26LS31) E=HTL(DC8-30V) L=TTL (DC5V，26C31) S=TTL(Less wiring type)① | Resolution PPR: 50; 60; 100; 200; 250; 300; 360; 400; 450; 500; 512; 600; 900; 1000; 1024; 1200; 1500; 1800; 2000; 2048; 2400; 2500; 3000; 3600; 4000; 4096; 4800; 5000; 8192; 10000; 16384; 32768 For servo motor: Resolution/pole 1000/4, /6, /8; 1024/4, /6, /8; 2048/4, /6, /8; 2500/4, /6, /8; 4096/4, /6, /8; 5000/4, /6, /8; | Diameter of shaft: (Blind) B6=Ø6mm B8=Ø8mm B10=Ø10mm | Special specifications: No indication=⑪ |

2.2 Note

①. Servo motor-specific less wiring mode with 6 signal wires，A.B.Z.$\overline{A}$.$\overline{B}$.$\overline{Z}$ delayed by U.V.W.$\overline{U}$.$\overline{V}$.$\overline{W}$，electrical interface TTL，DC5V.

②. Servo motor-specific with 12 signal wires, A.B.Z.$\overline{A}$.$\overline{B}$.$\overline{Z}$.U.V.W.$\overline{U}$.$\overline{V}$.$\overline{W}$, electrical interface TTL，DC5V.

③⑤⑧⑨. Resolution selection is recommended to be below 5000ppr, Z signal is low level active.

④⑥⑦⑩. Resolution selection is recommended to be below 5000ppr, Z signal is high level active.

⑪. None indicated for the cable length of 0.5m, if need to change the length C+number, the longest is 100m (expressed by C100).
    For the specific length of use, pls refer to page 2 and 3 of the provision of output circuit.

3. Output mode

3.1 Incremental signal

Electrical interface	Output circuit	Output wave form
OC NPN open collector circuit	Encoder — Shield cable — Power supply — A/B/Z — 0V — GND. DC5V: R=220Ω, DC12V: R=470Ω. Transmission distance 50m Max, Ic=20mA	T(360°), a b c d. A H/L, B H/L, Z 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 →. Z signal is low level active. $\frac{T}{4}\pm\frac{T}{8}$
OC PNP open collector circuit	Encoder — Shield cable — Power supply — A/B/Z — 0V — GND. Transmission distance 50m Max, Ic=20mA	
Push-pull	Encoder — Shield cable — Power supply — A/B/Z — 0V — GND. L=Load. Transmission distance 50m Max	T(360°), a b c d. A H/L, B H/L, Z 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 →. Z signal is high level active. $\frac{T}{4}\pm\frac{T}{8}$
Voltage	Encoder — Shield cable — Power supply — R — A/B/Z — 0V — GND. R=2.2K, L=Load. Transmission distance 2m Max	
TTL (DC5V) / **HTL (DC8-30V)**	Encoder — Shield cable — Power supply — 0V — A/B/Z — A/B/Z — GND. 26LS31 26C31 / 26LS32 26C32. 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 →. $\frac{T}{4}\pm\frac{T}{8}$

3.2 For servo motor(with UVW）

Electrical interface	Output circuit	Output wave form
TTL (DC5V)	Encoder / Shield cable / Power supply / 0V / A/B/Z / A/B/Z / GND / 26LS31 26C31 / 26LS32 26C32 / Transmission distance 200m Max	(see waveform figure)
TTL (DC5V) (Less wiring type)	(see circuit figure)	(see table)

Output circuit (Less wiring type):

Main circuit — 1, 3/5/7, 4/6/8, 2, 0

26LS31, 26C31
Transmission distance 200m Max

Symbol signification

★：indicate position of UVW channel
☆：position to start counting ABZ channel
▨：non-using zone
HZ：high impedance

No.	Function	Mode		
	Color	1	2	3
3	white	HZ	U	A
4	white/black	HZ	$\overline{U}$	$\overline{A}$
5	green	HZ	V	B
6	green/black	HZ	$\overline{V}$	$\overline{B}$
7	yellow	HZ	W	Z
8	yellow/black	HZ	$\overline{W}$	$\overline{Z}$
1	red	DC+5V		
2	black	0V		
0	shielding	GND		

Reverse signal not shown

pole	g.h.j.k.m.n	r
4	30±1°	180°
6	20±1°	120°
8	15±1°	90°

$a.b.c.d = \frac{T}{4} \pm \frac{T}{8}$
$e = T \pm \frac{T}{2}$
f: center of phase Z to rise point of phase U ±1°

CCW direction ⟶

Counterclockwise rotation as viewed from the shaft end. (See dimensional drawings)

Timing Chart

Supply voltage

5±0.25
4.25±0.3

Voltage transient down   Power off

Power on

Time(ms)

35MIN   35MIN
7±2   7±2
★ ☆   ★ ☆

Mode   1 2 3   1 2 3

1   1
510±220   22±11   510±220   22±11

4. Electrical Characteristics

Parameter / Output type / Item			OC	Voltage	Push-pull	TTL	TTL (Less wiring type)	HTL
Supply voltage			DC+5V±5%；DC8V-30V±5%			DC+5V±5%		DC8-30V±5%
Consumption current			100mA Max			120mA Max		
Allowable ripple			≤3%rms					
Top response frequency			100KHz			200KHz		300KHz
Output capacity	Output current	Input	≤30mA	Load resistance 2.2K	≤30mA	≤±20mA		≤±50mA
		Output	—		≤10mA			
	Output voltage	"H"	—	—	≥[（Supply voltage) -2.5V]	≥2.5V		≥Vcc-3 V$_{DC}$
		"L"	≤0.4V	≤0.7V(less than 20mA)	≤0.4V(30mA)	≤0.5V		≤ 1V V$_{DC}$
	Load voltage		≤DC30V	—		—		
Rise & Fall time			Less than 2us(cable length：2m)			Less than 1us(Cable length：2m)		≤100ns
Insulation strength			AC500V 60s					
Insulation resistance			10MΩ					
Mark to space ratio			45% to 55%					
Reverse polarity protection			✔					
Short-circuit protection			—		✔①			
Phase shift between A & B			90°±10° (frequency in low speed)					
			90°±20° (frequency in high speed)					
Delay motion time ②			—				510±220ms	—
GND			Not connect to encoder					

① Short-circuit to another channel or GND permitted for max.30s.

② Phase A.B.Z are back of phase U.V.W when power on.

5. Mechanical Characteristics

Diameter of shaft	Ø6mm; Ø8mm; Ø10mm (optional)
Starting torque	Less than $5.9×10^{-3}$N·m
Inertia moment	Less than $1×10^{-6}$ kg·m²
Shaft load	Radial 30N; Axial 20N
Slew speed	≤5000 rpm
Bearing Life	$1.5X10^{9}$ revs at rated load(100000hrs at 2500RPM)
Shell	Aluminium alloy
Weight	about 100g

6. Environmental Specifications

Environmental temperature	Operating：－20～+85°C(repeatable winding cable：－10°C); Storage:－20～+90°C
Environmental humidity	Operating and storage：35～85％RH(noncondensing)
Vibration(Endurance)	Amplitude 0.75mm,5~55Hz,2h for X,Y,Z direction individually
Shock(Endurance)	490m/s² 11ms three times for X,Y,Z direction individually
Protection	IP50

7. Wiring table

Cable connection

70±10

10±2

L=500
(Standard products)

Shield wire
effectively grounded
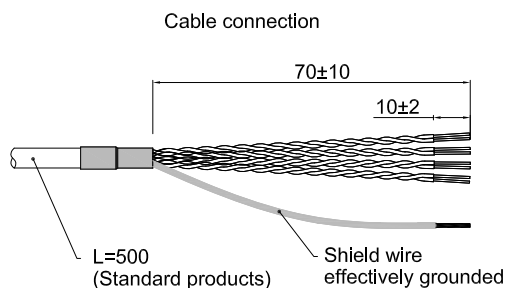
7.1 OC/Voltage/Push-pull (Table 1)

	Supply voltage		Incremental signal		
Wire color	Red	Black	White	Green	Yellow
Function	Up	0V	A	B	Z

7.2 TTL/HTL/Less wiring type (Table 2)

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

* For the functional status in less wiring mode, refer to the functional mode wiring table for output circuit on page3.

7.3 For servo motor （Table 3）

|	Supply voltage		Incremental signal											
Wire color	Red	Black	White	White/BK	Green	Green/BK	Yellow	Yellow/BK	Blue	Blue/Bk	Grey	Grey/Bk	Pink	Pink/Bk
Function	Up	0V	A+	A-	B+	B-	Z+	Z-	U+	U-	V+	V-	W+	W-
Twisted-paired cable			〰	〰	〰	〰	〰	〰	〰	〰	〰	〰	〰	〰

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

8. Basic Dimensions

8.1 Dimensions

B(Blind shaft)	D
$\varnothing 6^{G7}{\binom{+0.020}{+0.005}}$	$\varnothing 14$
$\varnothing 8^{G7}{\binom{+0.020}{+0.005}}$	
$\varnothing 10^{G7}{\binom{+0.020}{+0.005}}$	$\varnothing 16$
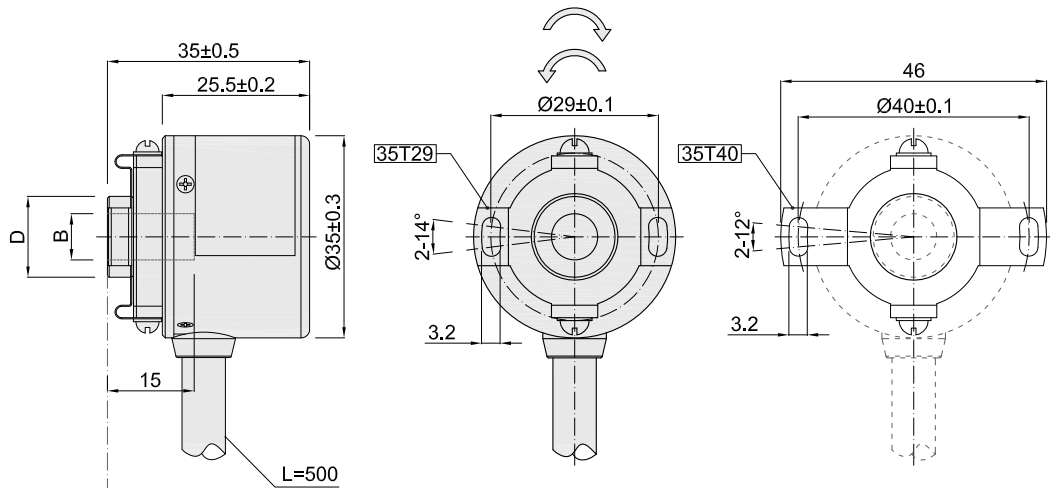
8.2 Mounting shaft requirements

d
$\varnothing 6_{g6}{\binom{-0.005}{-0.014}}$
$\varnothing 8_{g6}{\binom{-0.005}{-0.014}}$
$\varnothing 10_{g6}{\binom{-0.005}{-0.014}}$
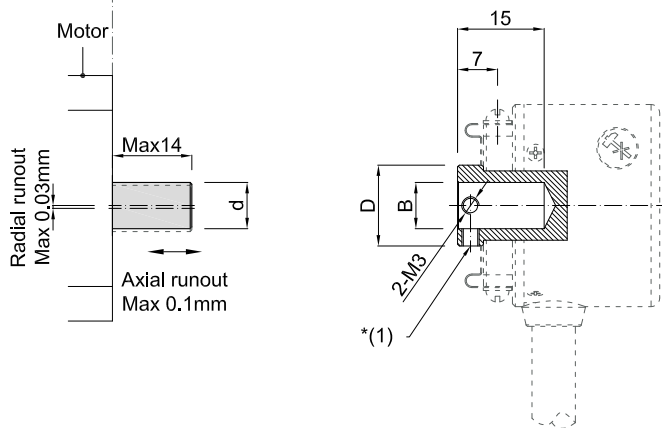
Mounting screws

Inner hexagon bolt
+flat washer
Specification: M3*6
Material: stainless steel
Quantity: 2

Unit: mm
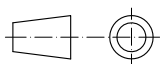
= Direction of shaft rotation for incremental signal output

= Direction of shaft rotation for
   servo motor-specific signal output
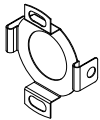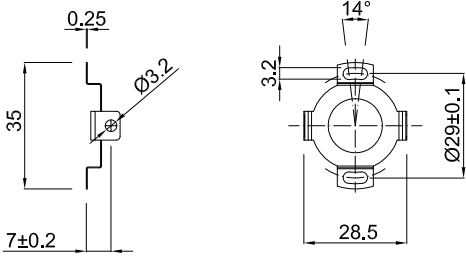
35T29 = Mounting spring plate (standard)

35T40 = Mounting spring plate (optional)

*(1) = Two M3*3 top screws coated with thread
        adhesive and tighten, the recommended
        tightening force is 0.6 N.m.

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．Accessory (Spring plate options)

35T29 (Standard)		0.25　Ø3.2 35　7±0.2 14°　3.2　Ø29±0.1　28.5
35T40 (Optional)		0.25　Ø3.2 46　7±0.2 12°　3.2　Ø40±0.1　28.5