

### 1. KB35 Incremental Optical Encoder (Through shaft)

#### 1.1 Introduction:

KB35 is a compact design with no protection grade through shaft, multiple electrical interfaces and resolutions, compact structure, and simple installation. It is widely used in industrial automation fields such as servo motors.

#### 1.2 Feature:

- Encoder external diameter  $\varnothing 35\text{mm}$ , thickness 17.5mm, diameter of shaft up to  $\varnothing 8\text{mm}$ ;
- Adopt non-contact photoelectric principle;
- Reverse polarity protection;
- Short circuit protection;
- Multiple electrical interfaces available;
- Resolution per turn up to 5000PPR.

#### 1.3 Application:

Servo motor, motor, and other automation control fields.

#### 1.4 Connection:

- Radial socket
- Radial cable (standard length 500mm)

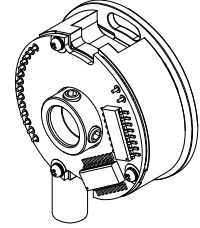
#### 1.5 Protection:

None

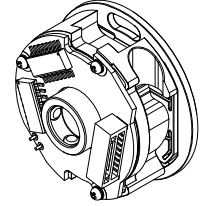
#### 1.6 Weight:

About 60g

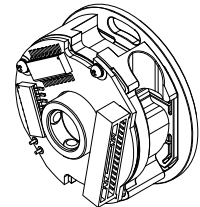
KB35-J



KB35-E

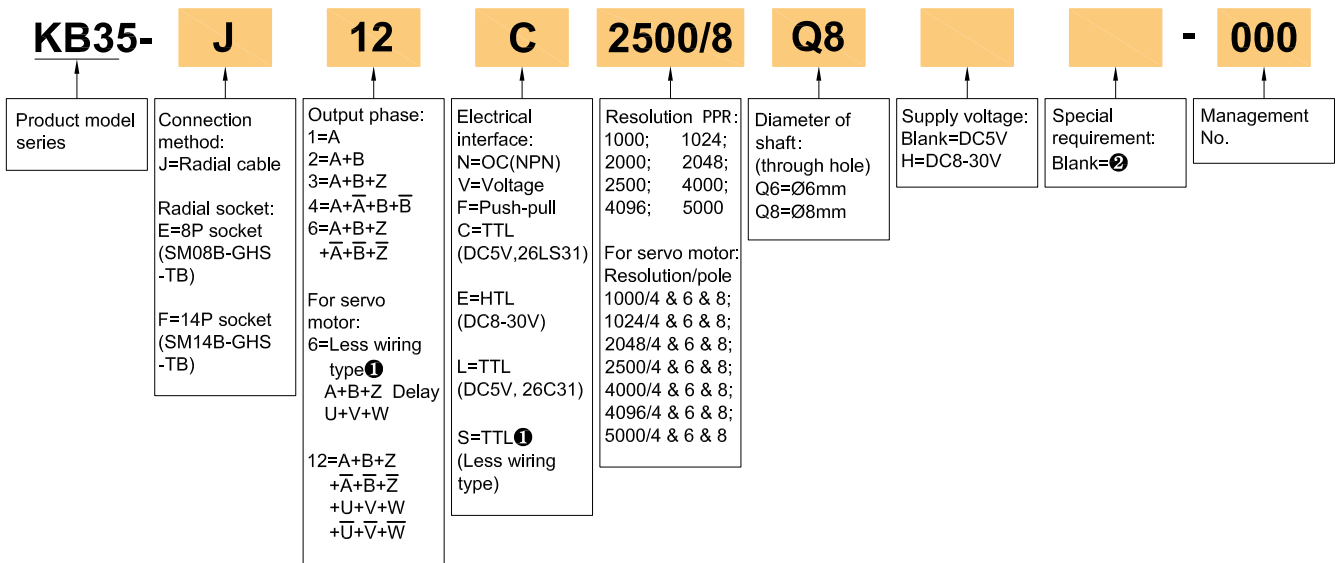


KB35-F



### 2. Model Selection Guide

#### 2.1 Model composition(select parameters)



#### 2.2 Note

- Servo motor-specific less wiring mode with 6 signal wires, A.B.Z.A.B.Z delayed by U.V.W.U.V.W, electrical interface TTL, DC5V.
- 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 Method

#### 3.1 Incremental signal

Electrical interface	Output circuit	Output wave form
<p>OC NPN open collector circuit</p>		<p>a.b.c.d=<math>\frac{I \pm I}{4 \pm 8}</math></p> <p>Phase A is ahead of B by <math>\frac{I \pm I}{4 \pm 8}</math>, viewing from encoder front side, direction is counterclockwise rotation. (See dimensional drawings)</p> <p>CCW direction →</p> <p>Z signal is low level active</p>
<p>Push-pull</p>		<p>a.b.c.d=<math>\frac{I \pm I}{4 \pm 8}</math></p> <p>Phase A is ahead of B by <math>\frac{I \pm I}{4 \pm 8}</math>, viewing from encoder front side, direction is counterclockwise rotation. (See dimensional drawings)</p> <p>CCW direction →</p> <p>Z signal is high level active</p>
<p>Voltage</p>		<p>a.b.c.d=<math>\frac{I \pm I}{4 \pm 8}</math></p> <p>Phase A is ahead of B by <math>\frac{I \pm I}{4 \pm 8}</math>, viewing from encoder front side, direction is counterclockwise rotation. (See dimensional drawings)</p> <p>CCW direction →</p> <p>Z signal is high level active</p>
<p>TTL (DC5V)</p> <p>HTL (DC8-30V)</p>		<p>a.b.c.d=<math>\frac{I \pm I}{4 \pm 8}</math></p> <p>Phase A is ahead of B by <math>\frac{I \pm I}{4 \pm 8}</math>, viewing from encoder front side, direction is counterclockwise rotation. (See dimensional drawings)</p> <p>CCW direction →</p>

3.2 For servo motor(with UVW)

Electrical interface	Output circuit	Output wave form																																																														
<p>TTL (DC5V)</p>																																																																
<p>TTL (DC5V) (Less wiring type)</p>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>26LS31, 26C31 Transmission distance 200m Max</p> <p><b>Symbol signification</b></p> <ul style="list-style-type: none"> <li>★: indicate position of UVW channel</li> <li>☆: position to start counting ABZ channel</li> <li>□: non-using zone</li> <li>HZ: high impedance</li> </ul> </div> <div style="width: 50%;"> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">No.</th> <th rowspan="2">Function Color</th> <th colspan="3">Mode</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>white</td> <td>HZ</td> <td>U</td> <td>A</td> </tr> <tr> <td>2</td> <td>white/black</td> <td>HZ</td> <td><math>\bar{U}</math></td> <td><math>\bar{A}</math></td> </tr> <tr> <td>3</td> <td>green</td> <td>HZ</td> <td>V</td> <td>B</td> </tr> <tr> <td>4</td> <td>green/black</td> <td>HZ</td> <td><math>\bar{V}</math></td> <td><math>\bar{B}</math></td> </tr> <tr> <td>5</td> <td>yellow</td> <td>HZ</td> <td>W</td> <td>Z</td> </tr> <tr> <td>6</td> <td>yellow/black</td> <td>HZ</td> <td><math>\bar{W}</math></td> <td><math>\bar{Z}</math></td> </tr> <tr> <td>7</td> <td>red</td> <td colspan="3">Up</td> </tr> <tr> <td>8</td> <td>black</td> <td colspan="3">Un</td> </tr> <tr> <td>0</td> <td>shielding</td> <td colspan="3">GND</td> </tr> </tbody> </table> </div> </div>	No.	Function Color	Mode			1	2	3	1	white	HZ	U	A	2	white/black	HZ	$\bar{U}$	$\bar{A}$	3	green	HZ	V	B	4	green/black	HZ	$\bar{V}$	$\bar{B}$	5	yellow	HZ	W	Z	6	yellow/black	HZ	$\bar{W}$	$\bar{Z}$	7	red	Up			8	black	Un			0	shielding	GND			<p>Reverse signal not shown</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>pole</th> <th>g.h.j.k.m.n</th> <th>r</th> </tr> </thead> <tbody> <tr> <td>6</td> <td><math>20 \pm 1^\circ</math></td> <td><math>120^\circ</math></td> </tr> <tr> <td>8</td> <td><math>15 \pm 1^\circ</math></td> <td><math>90^\circ</math></td> </tr> </tbody> </table> <p>a.b.c.d = <math>\frac{T}{4} \pm \frac{T}{8}</math>  e = <math>T \pm \frac{T}{2}</math>  f: center of phase Z to rise point of phase U, that is <math>\pm 1^\circ</math></p> <p>CW direction <math>\rightarrow</math></p> <p>Viewed from shaft end when installing. (See dimensional drawings)</p>	pole	g.h.j.k.m.n	r	6	$20 \pm 1^\circ$	$120^\circ$	8	$15 \pm 1^\circ$	$90^\circ$
No.	Function Color			Mode																																																												
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2	white/black	HZ	$\bar{U}$	$\bar{A}$																																																												
3	green	HZ	V	B																																																												
4	green/black	HZ	$\bar{V}$	$\bar{B}$																																																												
5	yellow	HZ	W	Z																																																												
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<p><b>Timing Chart</b></p>																																																																

## 4. Electrical Parameters

Parameter Item	Output type	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			500KHz		800KHz
Output capacity	Output current	Input	≤30mA	Load resistance 2.2K	≤30mA	≤±20mA	≤±50mA
		Output	—		≤10mA		
	Output voltage	"H"	—	—	≥ $\lfloor \frac{\text{Supply voltage}}{2.5} \rfloor$	≥2.5V	≥V <sub>cc</sub> -3 V <sub>bc</sub>
		"L"	≤0.4V	≤0.7V(less than 20mA)	≤0.4V(30mA)	≤0.5V	≤ 1V V <sub>bc</sub>
Load voltage	≤DC30V		—	—			
Rise & Fall time		Less than 2us(cable length: 2m)			Less than 1us(Cable length: 2m)		
Insulation strength		AC500V 60s					
Insulation resistance		10MΩ					
Mark to space ratio		45% to 55%					
Reverse polarity protection		✓					
Short-circuit protection		✓❶					
Phase shift between A & B		90°±10° ( frequency in low speed)					
		90°±20° ( frequency in high speed)					
Delay motion time ❷		—				510±220ms	—
GND		Not connect to encoder					

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

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

## 5. Mechanical Specifications

Diameter of shaft	Ø6mm; Ø8mm(optional)
Starting torque	Less than $5.9 \times 10^{-3} \text{N}\cdot\text{m}$
Inertia moment	Less than $1.5 \times 10^{-6} \text{kg}\cdot\text{m}^2$
Shaft load	Radial 30N; Axial 20N
Slew speed	≤6000 rpm
Bearing Life	$1.5 \times 10^9$ revs at rated load(100000hrs at 2500RPM)
Shell	Aluminium alloy
Weight	about 60g

## 6. Environmental Parameters





Environmental temperature	Operating: $-20 \sim +90^\circ\text{C}$ (repeatable winding cable: $-10^\circ\text{C}$ ); Storage: $-20 \sim +95^\circ\text{C}$
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)	$490\text{m/s}^2$ 11ms three times for X,Y,Z direction individually
Protection	None

## 7. Wiring Table





### 7.1 OC/Voltage/Push-pull (Table 1)

	Incremental signal						Supply voltage	
Socket pin definition	1	2	3	4	5	6	7	8
Wire color	White	/	Green	/	Yellow	/	Red	Black
Function	A	/	B	/	Z	/	Up	OV

### 7.2 TTL/HTL (Table 2)








	Incremental signal						Supply voltage	
Socket pin definition	1	2	3	4	5	6	7	8
Wire color	White	White/BK	Green	Green/BK	Yellow	Yellow/BK	Red	Black
Function	A+	A-	B+	B-	Z+	Z-	Up	OV
Twisted-paired cable								

### 7.3 Less wiring type for servo motor (Table 3)

	Incremental signal						Supply voltage	
Socket pin definition	1	2	3	4	5	6	7	8
Wire color	White	White/BK	Green	Green/BK	Yellow	Yellow/BK	Red	Black
Function	A+ (U+)*	A- (U-)*	B+ (V+)*	B- (V-)*	Z+ (W+)*	Z- (W-)*	Up	OV
Twisted-paired cable								

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

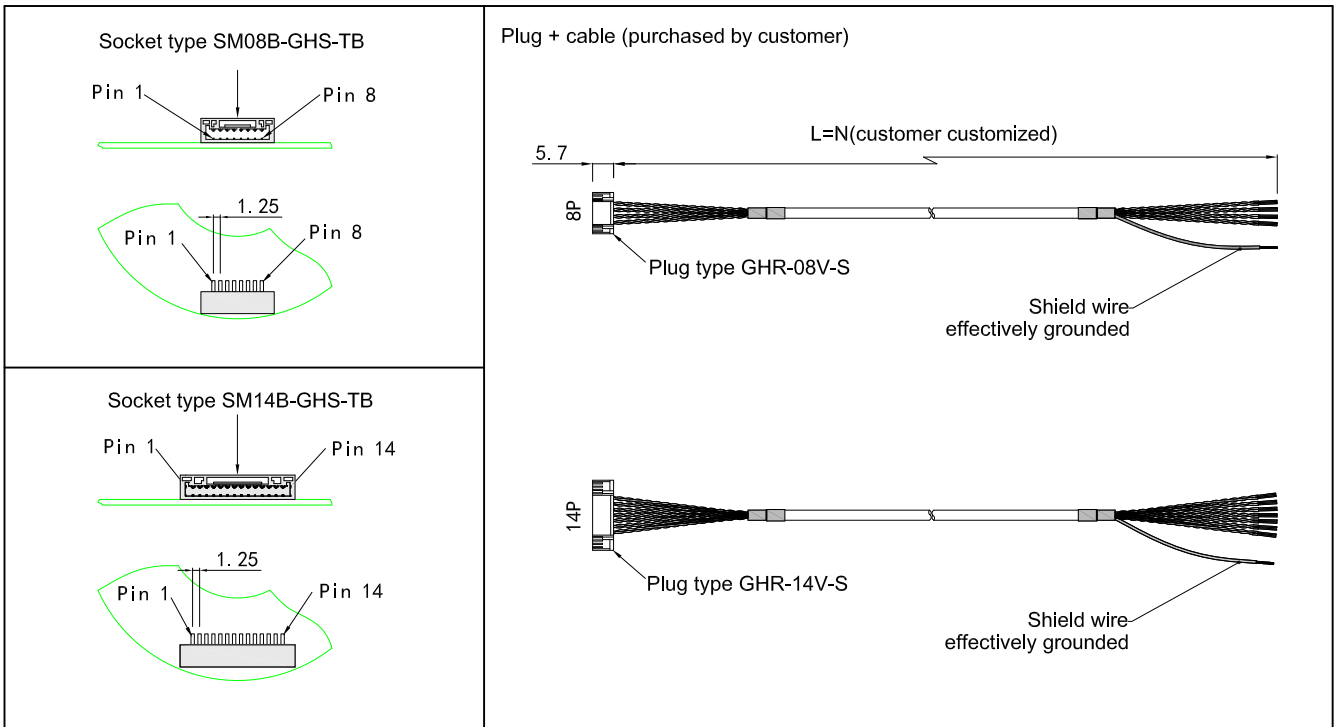
### 7.4 For servo motor (Table 4)

	Incremental signal												Supply voltage	
Socket pin definition	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Wire color	Grey	Grey/Bk	Blue/Bk	Blue	Pink/Bk	Pink	Yellow	Yellow/BK	Green	Green/BK	White	White/BK	Black	Red
Function	V+	V-	U-	U+	W-	W+	Z+	Z-	B+	B-	A+	A-	OV	Up
Twisted-paired cable														

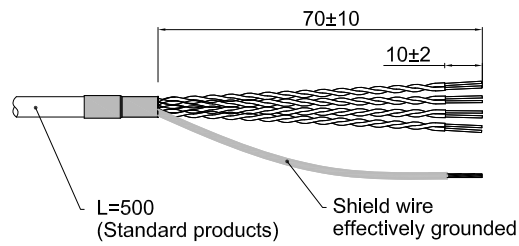
Up=Supply voltage.

Shield wire is not connected to the internal circuit of encoder.

7.5 Socket definition



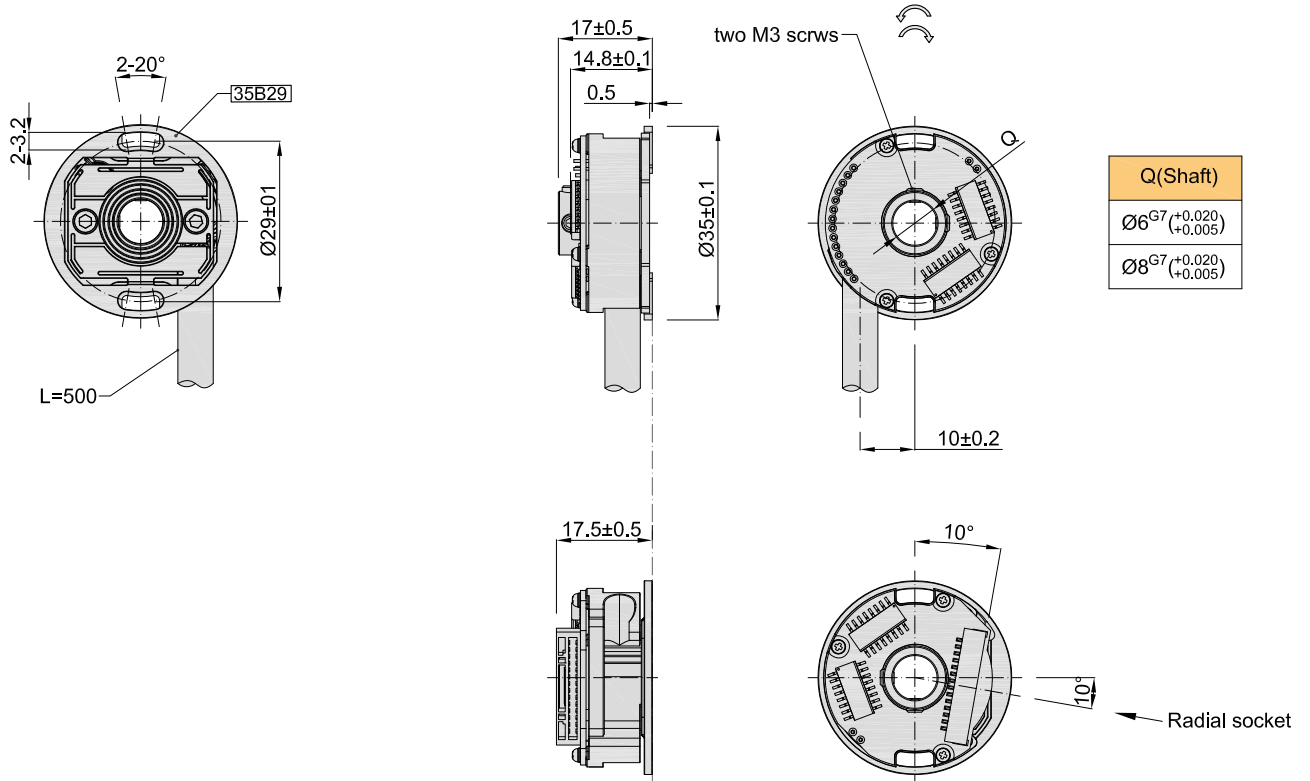
7.6 Radial cable head dimensions drawing



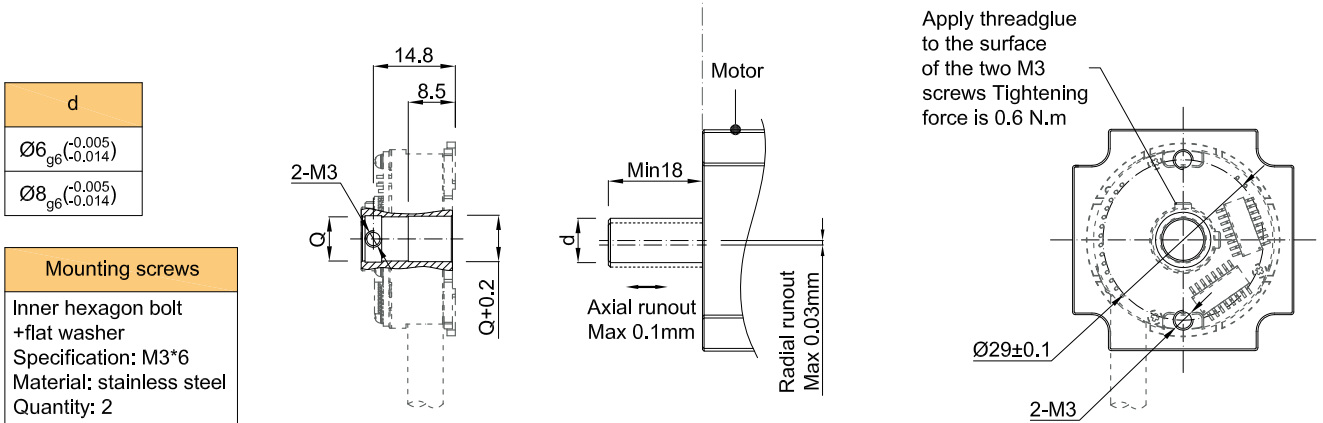
Unit: mm

8. Basic Dimensions

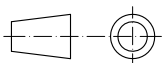
8.1 Dimensions



8.2 Mounting shaft requirements



Unit: mm



↻ = Shaft rotation direction of the incremental signal output  
 ↻ = Shaft rotation direction of servo motor-specific signal output



## 9. Caution

### 9.1 Caution for operation

- The working temperature shall not exceed the storage temperature.
- The working humidity shall not exceed the storage humidity.
- Do not use where the temperature changes dramatically and have fog.
- Do not close to corrosive and flammable gas.
- Keep away from dust, salt and metal powder.
- Keep away from places where you will use water, oil, or medicine.
- Undue vibration and shock will impact the encoder.

### 9.2 Caution for Installation

- Electrical components should not be subjected to excessive pressure, etc., and electrostatic assessment of the installation environment should be conducted.
- Do not close the cable of the motor power to the encoder.
- The FG wire of the motor and mechanical device should be grounded.
- The shielding wire must be effectively grounded since the shielding is not connected to the encoder.

### 9.3 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.