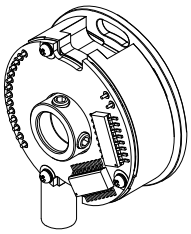
1. KB35 Incremental Optical Encoder (Through shaft)

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.

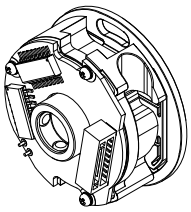
KB35-J



1.2 Feature:

- Encoder external diameter Ø35mm、thickness 17.5mm、diameter of shaft up to Ø8mm;
- Adopt non-contact photoelectric principle;
- Reverse polarity protection;
- Short circuit protection;
- Multiple electrical interfaces available;
- Resolution per turn up to 5000PPR.

KB35-E



1.3 Application:

Servo motor, motor, and other automation control fields.

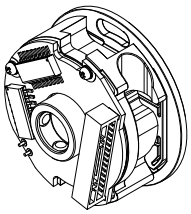
1.4 Connection:

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

1.5 Protection:

None

KB35-F



1.6 Weight:

About 60g

2. Model Selection Guide

2.1 Model composition(select parameters)

KB35-	J	12	C	2500/8	Q8			-	000
Product model series	Connection method: J=Radial cable Radial socket: E=8P socket (SM08B-GHS-TB) F=14P socket (SM14B-GHS-TB)	Output phase: 1=A 2=A+B 3=A+B+Z 4=A+$\overline{A}$+B+$\overline{B}$ 6=A+B+Z +$\overline{A}$+$\overline{B}$+$\overline{Z}$ For servo motor: 6=Less wiring type A+B+Z Delay U+V+W 12=A+B+Z +$\overline{A}$+$\overline{B}$+$\overline{Z}$ +U+V+W +$\overline{U}$+$\overline{V}$+$\overline{W}$	Electrical interface: N=OC(NPN)❶ V=Voltage❷ F=Push-pull C=TTL (DC5V,26LS31) E=HTL (DC8-30V) L=TTL (DC5V, 26C31) S=TTL (Less wiring type)	Resolution PPR: 1000; 1024; 2000; 2048; 2500; 4000; 4096; 5000 For servo motor: Resolution/pole 1000/4 & 6 & 8; 1024/4 & 6 & 8; 2048/4 & 6 & 8; 2500/4 & 6 & 8; 4000/4 & 6 & 8; 4096/4 & 6 & 8; 5000/4 & 6 & 8	Diameter of shaft: (through hole) Q6=Ø6mm Q8=Ø8mm	Supply voltage: Blank=DC5V H=DC8-30V	Special requirement: Blank=❸	Management No.

2. 2 Note

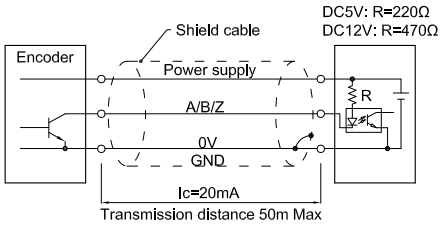
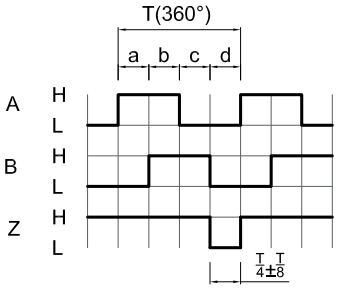
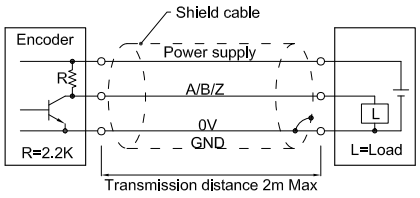
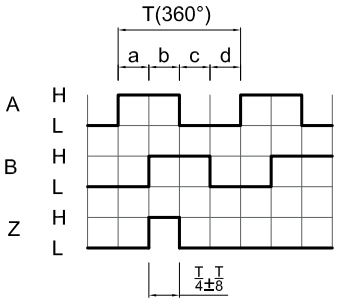
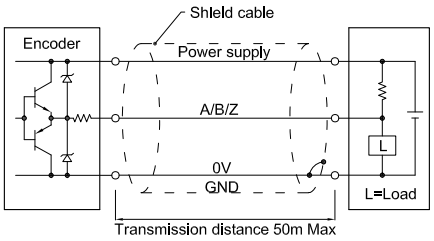
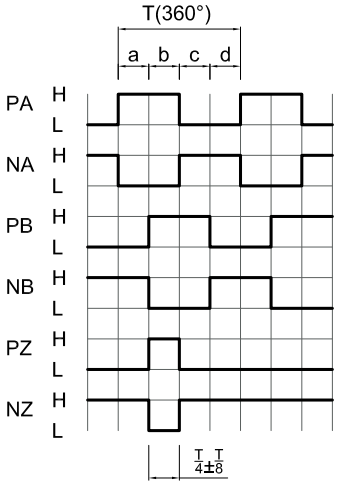
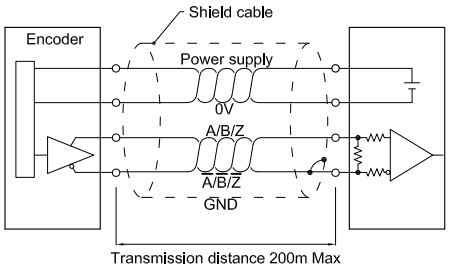
❶. Z signal is low level active.

❷. Z signal is high level active.

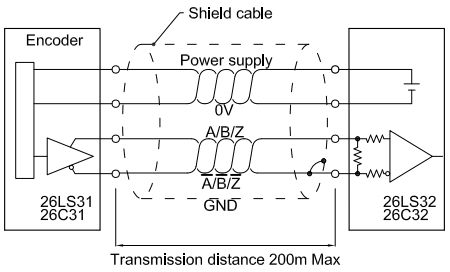
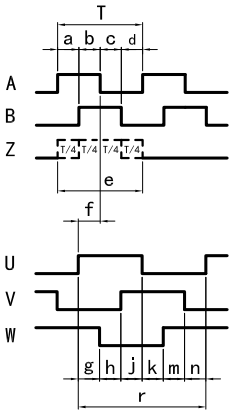
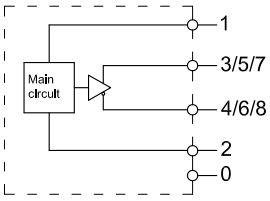
❸. cable length is 0.5M, if need to change the length C+number, the longest is 100M (expressed by C100).
For the specific length of use, pls refer to page P2 -P3 of the provision of output circuit.

3. Output Method

3.1 Incremental signal

Electrical interface	Output circuit	Output wave form
OC NPN open collector circuit		 a.b.c.d=T/4±T/8 Phase A is ahead of B by T/4±T/8, viewing from encoder front side, direction is counterclockwise rotation. (See dimensional drawings) CCW direction Z signal is low level active
Voltage		 a.b.c.d=T/4±T/8 Phase A is ahead of B by T/4±T/8, viewing from encoder front side, direction is counterclockwise rotation. (See dimensional drawings) CCW direction Z signal is high level active
Push-pull		 a.b.c.d=T/4±T/8 Phase A is ahead of B by T/4±T/8, viewing from encoder front side, direction is clockwise rotation. (See dimensional drawings) CW direction
TTL (DC5V) HTL (DC8-30V)		

3.2 For servo motor(with UVW）

Electrical interface	Output circuit	Output wave form
TTL (DC5V)		
TTL (DC5V) (Less wiring type)		Reverse signal not shown

26LS31, 26C31
Transmission distance 200m Max

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

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

Symbol signification

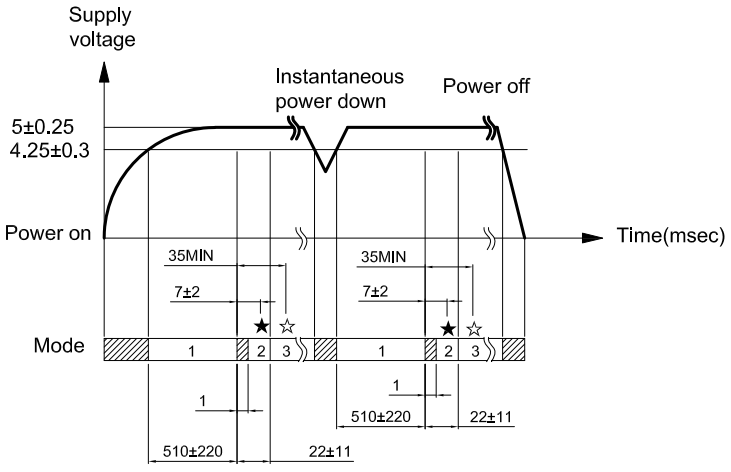
★: indicate position of UVW channel
☆: position to start counting ABZ channel
▨: non-using zone
HZ: high impedance

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,that is ±1°

CW direction →

Viewed from shaft end when installing.
(See dimensional drawings)

Timing Chart



4. Electrical Parameters

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			300KHz		500KHz
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 VDC
		"L"	≤0.4V	≤0.7V(less than 20mA)	≤0.4V(30mA)	≤0.5V		≤ 1V VDC
	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 5.9×10^{-3}N·m
Inertia moment	Less than 1.5×10^{-6} kg·m²
Shaft load	Radial 30N; Axial 20N
Slew speed	≤6000 rpm
Bearing Life	$1.5X10^{9}$ revs at rated load(100000hrs at 2500RPM)
Shell	Aluminium alloy
Weight	about 60g

6. Environmental Parameters

Environmental temperature	Operating:—20～+90°C(repeatable winding cable: -10°C); Storage:—20～+95°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	None

7. Wiring Table

7.1 OC / Voltage（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 / Push-pull（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.

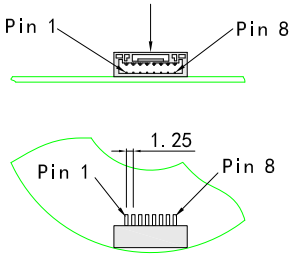
7.4 For servo motor（Table 4）

	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														

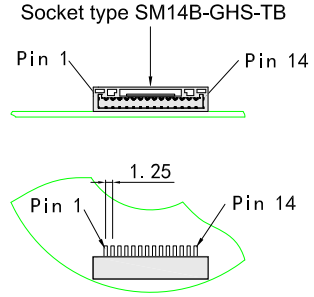
Up=Supply voltage.
Shield wire is not connected to the internal circuit of encoder.

7.5 Socket definition

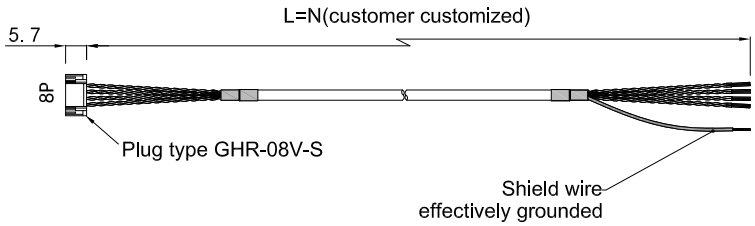
Socket type SM08B-GHS-TB

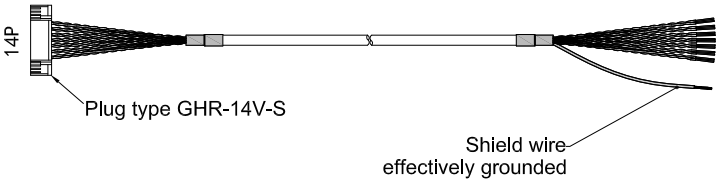


Socket type SM14B-GHS-TB

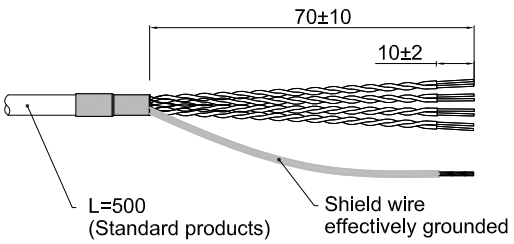


Plug + cable (purchased by customer)





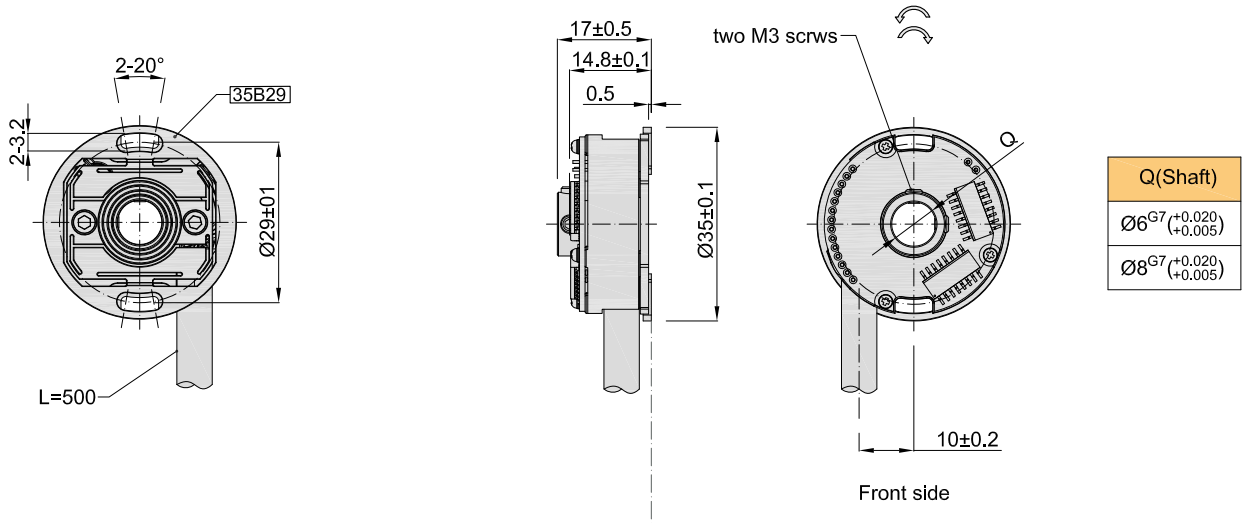
7.6 Radial cable head dimensions drawing



Unit: mm

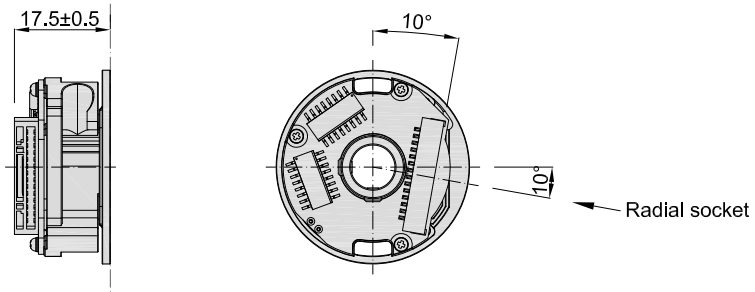
8. Basic Dimensions

8.1 KB35-J



Q(Shaft)
$Ø6^{G7}_{(+0.005)}^{(+0.020)}$
$Ø8^{G7}_{(+0.005)}^{(+0.020)}$

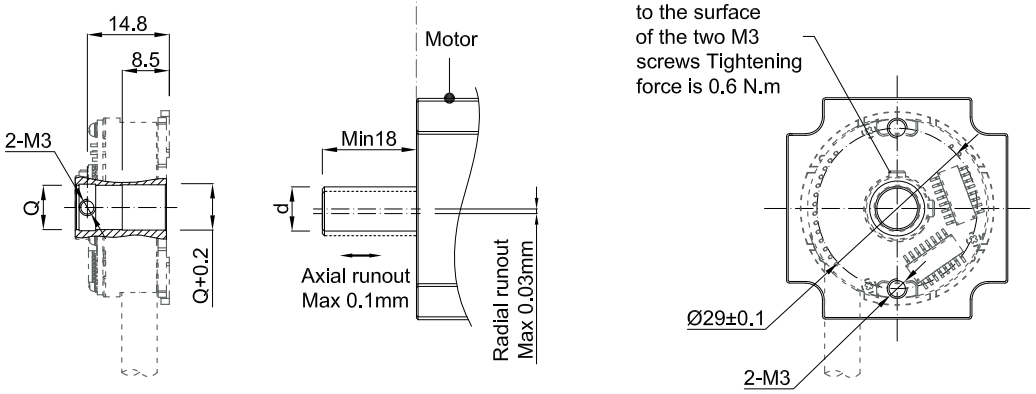
8.2 KB35-E & F



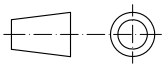
8.3 Mounting shaft requirements

d
$Ø6_{g6}^{(-0.005)}_{(-0.014)}$
$Ø8_{g6}^{(-0.005)}_{(-0.014)}$

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



Unit: mm



↶ = Shaft rotate direction of OC & V signal output
↷ = Shaft rotate direction of incremental TTL & HTL 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.

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