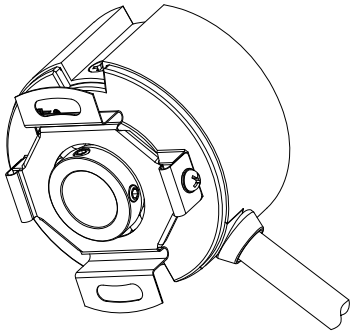
1. KZ48 Incremental Optical Encoder (Hollow taper shaft)



1.1 Introduction:
K48 is a general economic encoder, compact and miniaturized, commonly used in servo motors and industrial automations.

1.2 Feature:
- Encoder external diameter Ø48mm、thickness 34mm、Hollow taper shaft Ø9mm;
- Adopt non-contact photoelectric principle;
- Reverse polarity protection;
- Short circuit protection;
- Multiple electrical interfaces available;
- Resolution per turn up to 10000PPR.

1.3 Application:
Servo motors and other automation control fields.

1.4 Connection:
- Radial cable (length 0.5M)

1.5 Protection:
IP40

1.6 Weight:
about 140g

2. Model Selection Guide

2.1 Model composition(select parameters)

KZ48- | **J** | **12** | **C** | **2500/8** | | | | **-** **000**

- **KZ48-**: Product model series
- **J**: Connection method: J=Radial cable
- **12**: Output phase:
  1=A
  2=A+B
  3=A+B+Z (See table 1 for wiring)
  4=A+$\overline{A}$+B+$\overline{B}$
  6=A+B+Z +$\overline{A}$+$\overline{B}$+$\overline{Z}$ (See table 2 for wiring)
  For servo motor:
  6=Less wiring type (See table 3 for wiring)
  12=A/$\overline{A}$/B/$\overline{B}$/Z/$\overline{Z}$/U/$\overline{U}$/V/$\overline{V}$/W/$\overline{W}$ (See table 4 for wiring)
- **C**: Electrical interface:
  N=OC(NPN)❶
  NH=OC(NPN)❷
  P=OC(PNP)❶
  PH=OC(PNP)❷
  V=Voltage❷
  VL=Voltage❶
  F=Push-pull❶
  FH=Push-pull❷
  C=TTL (26LS31)
  E=HTL
  L=TTL (26C31)
  S=TTL(Less wiring type)
- **2500/8**: Resolution PPR:
  50; 60;
  100; 200;
  250; 256;
  300; 360;
  500; 512;
  600; 720;
  1000; 1800;
  2000; 2048;
  2500; 3600;
  4000; 4096;
  5000; 7200;
  8192; 10000
  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: Blank= shaft hole diameter Ø9mm depth 15mm (taper 1:10)
- Supply voltage: Blank=DC5V H=DC8-30V
- Special requirement: Blank=❸
- Management No.

2. 2 Note

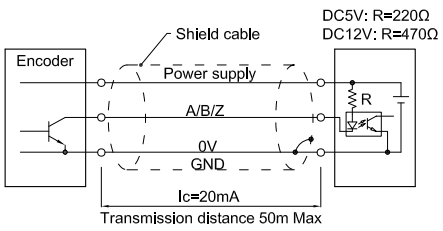
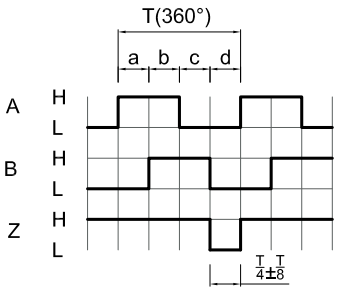
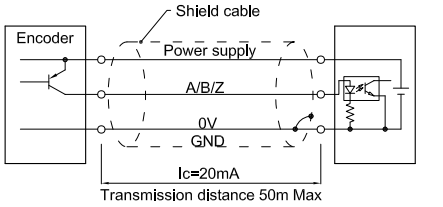
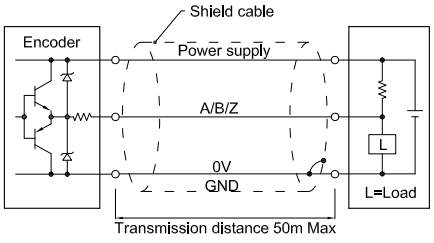
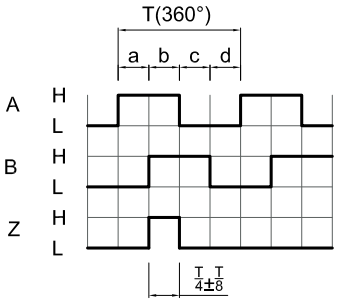
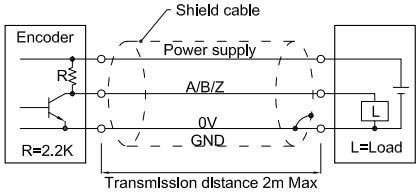
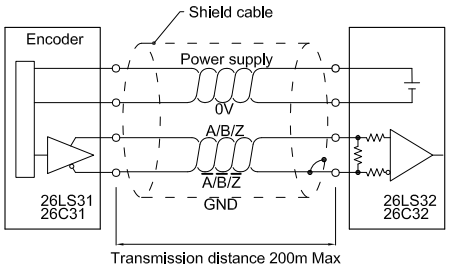
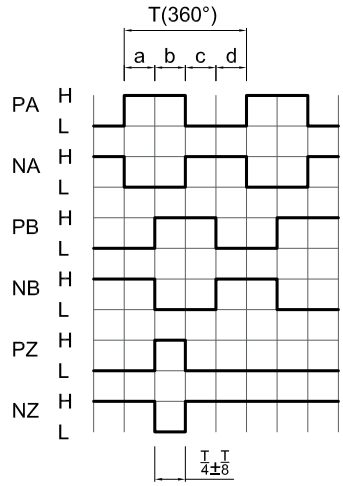
❶. Z signal is low level active.

❷. Z signal is high level active.

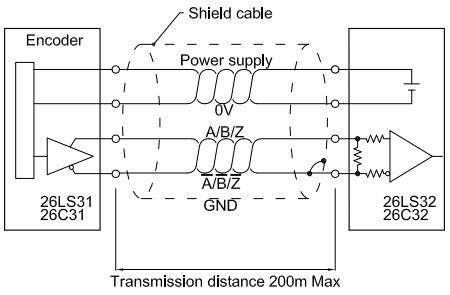
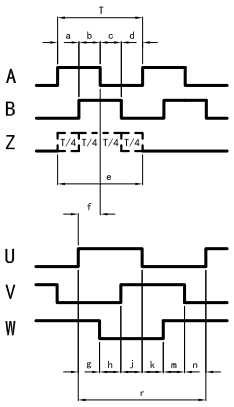
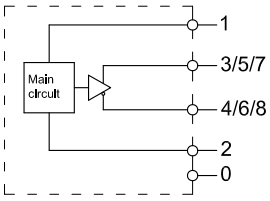
❸. None indicated for IP40 and cable length of 0.5M, if need to change the length C+number, the longest is 100M (expressed by C100). For the specific length of use, pls refer to page 2 and page 3 of the provision of output circuit.

3. Output Mode

3.1 Incremental signal

Electrical interface	Output circuit	Output wave form
OC NPN open collector circuit		 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
OC PNP open collector circuit		
Push-pull		 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
Voltage		
TTL (DC5V) HTL (DC8-30V)		 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

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
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	OV		
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=$\frac{T}{4}\pm\frac{T}{8}$

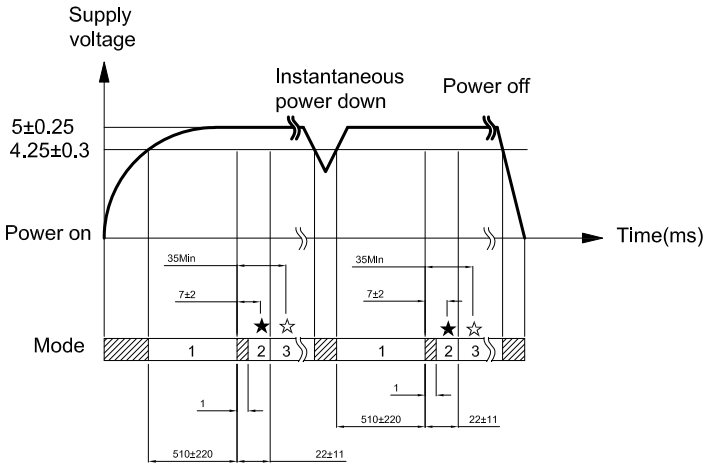
e=$T\pm\frac{T}{2}$

f: center of phase Z to rise point of phase U,that is ±1°

CCW 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)		≤100ns
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	Ø9mm depth 15mm (taper 1:10)
Starting torque	Less than 9.8×10^{-3}N·m
Inertia moment	Less than 6.5×10^{-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)
Material	Base: Die cast aluminum; Cover: PVC
Weight	about 140g

6. Environmental Parameters

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	IP40

7. Wiring Table

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								

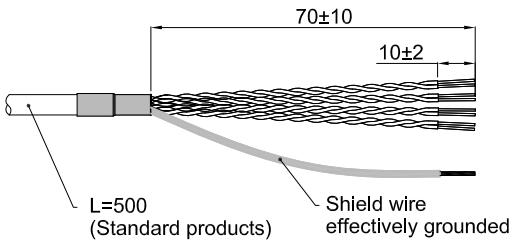
* For the functional status in less wiring mode, refer to the functional mode wiring table for output circuit on page3.

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														

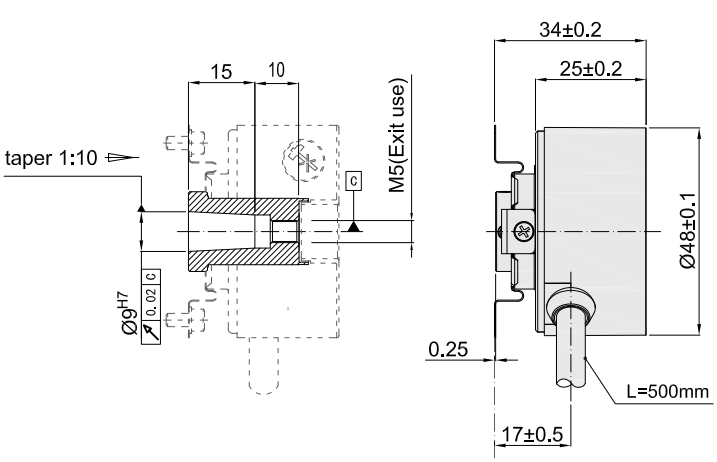
Up=Supply voltage.
Shield wire is not connected to the internal circuit of encoder.

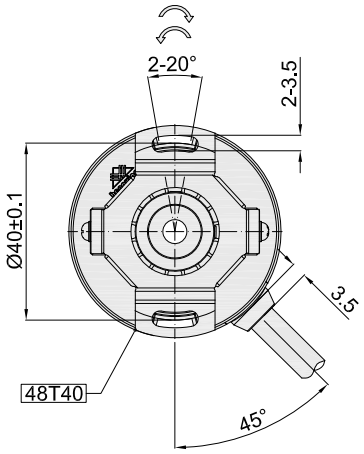
Cable connection



8. Basic Dimensions

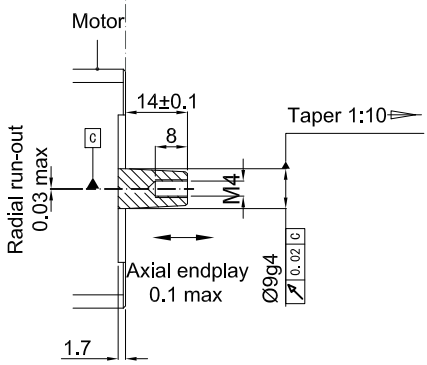
8.1 Dimensions

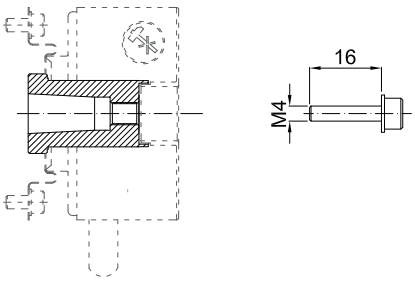




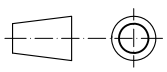
8.2 Mounting shaft requirements

Mounting screws
Inner hexagon bolt +flat washer Specification: M3*6 Material: stainless steel Quantity: 2 Inner hexagon bolt Specification: M4*16 Material: stainless steel Quantity: 1





Unit：mm



= Direction of shaft rotation for incremental signal output

= Direction of shaft rotation for servo motor-specific signal output

48T40 = Install spring plate

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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