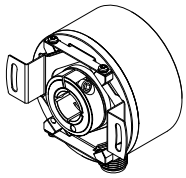
1. K60 Incremental Optical Encoder (Through hole)

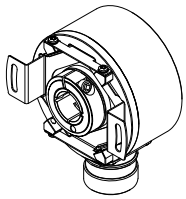
1.1 Introduction:

K60 is a through shaft rugged structural design, the mounting shaft using the clasp clamping method, multiple electrical interfaces and resolutions available, protection grade IP65, the product structure is compact, high safety, suitable for high intensity mechanical movement field.

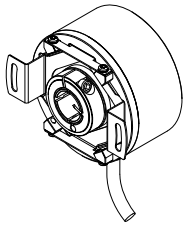
K60-C



K60-E



K60-T



1.2 Feature:

- Encoder external diameter Ø60mm、thickness 40mm、Diameter of shaft up to Ø15mm;
- Adopt non-contact photoelectric principle;
- Reverse polarity protection;
- Short circuit protection;
- Multiple electrical interfaces available;
- Resolution per turn up to 65536PPR.

1.3 Application:

Textile, packaging, motor, elevator, CNC and other automation control fields.

1.4 Connection:

- Radial socket (M12 8pin male socket)
- Radial socket (M23 12pin male socket)
- Radial cable (standard length 1M)

1.5 Protection:

IP65

1.6 Weight:

About 350g

2. Model Selection Guide

2.1 Model composition(select parameters)

K60-	T	6	E	4096	Q15			-	000
Product model series	Connection method: C=Radial socket (M12 8pin male socket) E=Radial socket (M23 12pin male socket) T=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+$\overline{Z}$	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 (DC5V,26LS31) L=TTL (DC5V,26C31) E=HTL (DC8-30V)	Resolution PPR: 9; 20; 50; 60; 66; 100; 200; 250; 300; 360; 400; 450; 500; 512; 600; 720; 750; 800; 900; 1000; 1024; 1200; 1440; 1500; 1800; 2000; 2048; 2400; 2500; 3000; 3600; 4000; 4096; 4800; 5000; 8000; 8192; 10000; 16000; 16384; 20000; 32000; 32768; 40000; 65536	Diameter of shaft: (through hole) Q6=Ø6mm Q8=Ø8mm Q10=Ø10mm Q12=Ø12mm Q14=Ø14mm Q15=Ø15mm	Supply voltage: Blank=DC5V H=DC8-30V	Special requirement: Blank=IP65 (1M as standard for cable) ❸		Management No.

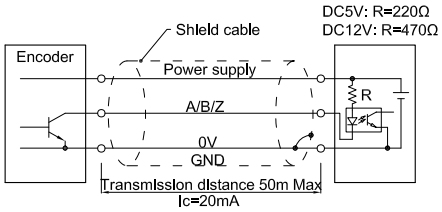
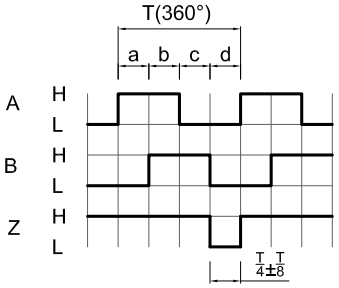
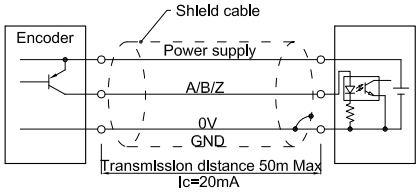
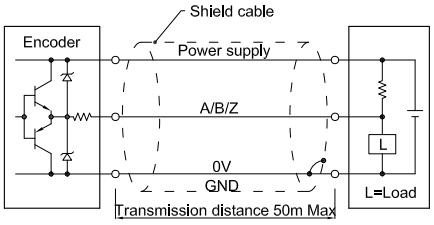
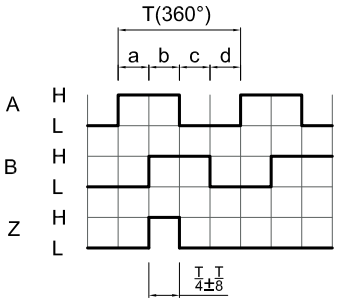
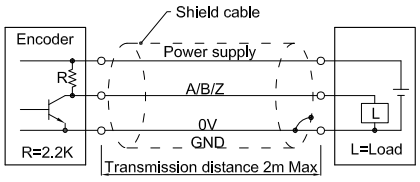
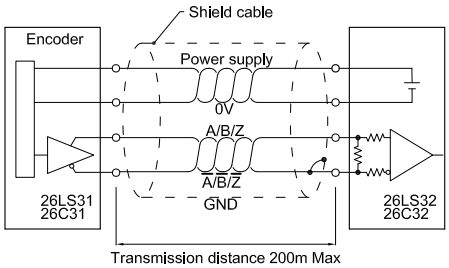
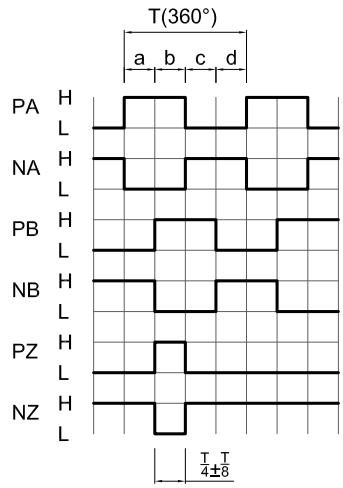
2. 2 Note

❶. Z signal is low level active.

❷. Z signal is high level active.

❸. IP=65；Cable length 1m，if need to change the length C+number，max 100m(indicated by C100), please refer to page 2 for the specific length used for the output circuit.

3. Output Mode

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 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=T/4±T/8 Phase A is ahead of B by T/4±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=T/4±T/8 Phase A is ahead of B by T/4±T/8, viewing from shaft end, direction is clockwise rotation. (See dimensional drawings) CW direction

4. Electrical Parameters

Parameter / Output type / Item			OC	Voltage	Push-pull	TTL	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"	—	—	≥[（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)				
GND			Not connect to encoder				

❶ Short-circuit to another channel or GND(PNP is effective for Up) , permitted for max 30s.

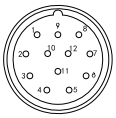
5. Mechanical Specifications

Diameter of shaft	Ø6mm；Ø8mm；Ø10mm；Ø12mm；Ø14mm；Ø15mm available
Shaft material	Stainless steel
Starting torque	Less than 9.8×10^{-3}N·m
Inertia moment	Less than 6.5×10^{-6} kg·m²
Shaft load	Radial 40N; Axial 20N
Slew speed	≤5000 rpm
Bearing Life	$1.5X10^{9}$ revs at rated load(100000hrs at 2500RPM)
Shell	Aluminium alloy
Weight	about 350g

6. Environmental Parameters

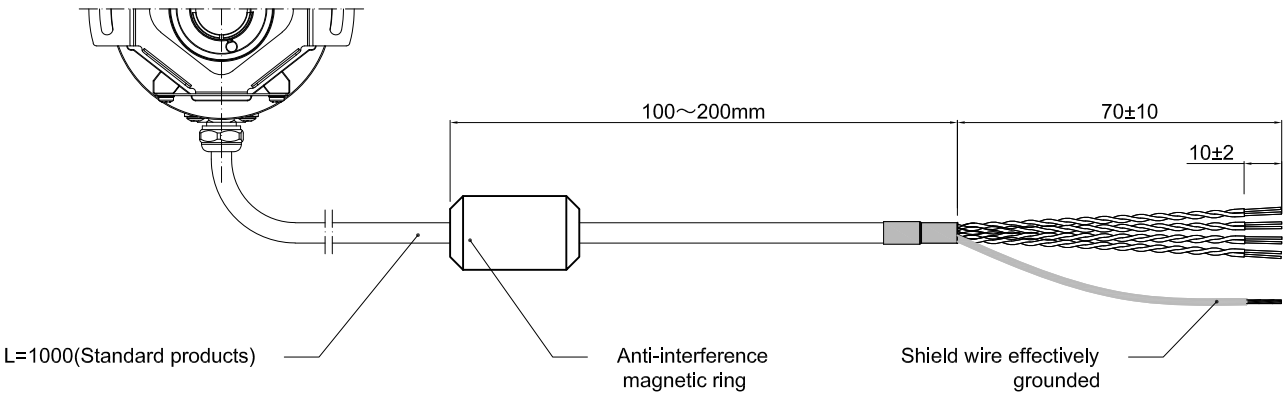
Environmental temperature	Operating:—40～+90°C(repeatable winding cable: -10°C); Storage:—40～+95°C
Environmental humidity	Operating and storage：35～85％RH(noncondensing)
Vibration(Endurance)	Amplitude 0.75mm,5~55Hz,2h for X,Y,Z direction individually
Shock(Endurance)	490m/s² 11ms three times for X,Y,Z direction individually
Protection	IP65

7. Wiring Table


Socket pin definition (M12 8-pin)	Socket pin definition (M23 12-pin)	Wire colors (cable connection)	Signal	Explanation	Twisted wire for differential
1	1	Red	Up	Power positive	
2	2	Black	Un	Power negative	
3	3	White	A	Signal wire	
4	4	White/BK	$\overline{A}$	Signal wire	
5	5	Green	B	Signal wire	
6	6	Green/BK	$\overline{B}$	Signal wire	
7	7	Yellow	Z	Signal wire	
8	8	Yellow/BK	$\overline{Z}$	Signal wire	
-	9	-	N.C.	Unallocated	
-	10	-	N.C.	Unallocated	
-	11	-	N.C.	Unallocated	
-	12	-	N.C.	Unallocated	
GND	GND	GND	GND	No encoder body connected	

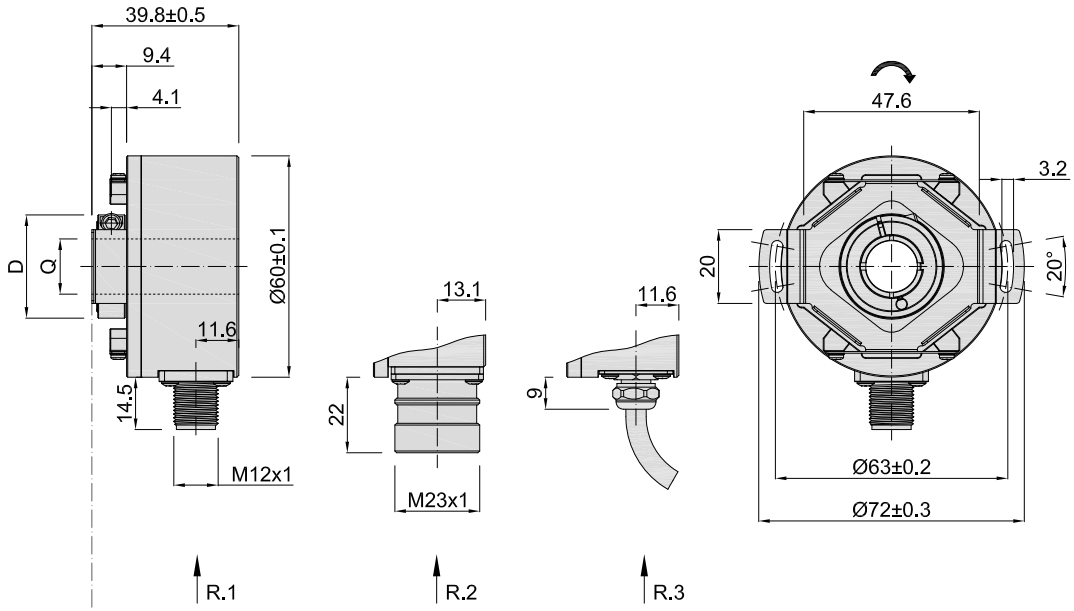
Schematic diagram of radial cable



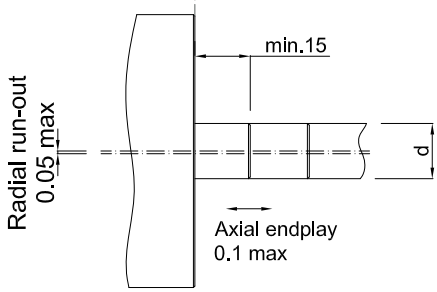
8. Basic Dimensions

8.1 Dimensions

Q(shaft)	D
Ø6$^{G7}_{(+0.005)}^{(+0.020)}$	Ø20
Ø8$^{G7}_{(+0.005)}^{(+0.020)}$	Ø22
Ø10$^{G7}_{(+0.005)}^{(+0.020)}$	Ø24
Ø12$^{G7}_{(+0.006)}^{(+0.024)}$	Ø26
Ø14$^{G7}_{(+0.006)}^{(+0.024)}$	Ø28
Ø15$^{G7}_{(+0.006)}^{(+0.024)}$	Ø28



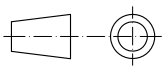
8.2 Mounting shaft requirements



d
Ø6$_{g6}^{(-0.005}_{-0.014)}$
Ø8$_{g6}^{(-0.005}_{-0.014)}$
Ø10$_{g6}^{(-0.005}_{-0.014)}$
Ø12$_{g6}^{(-0.006}_{-0.017)}$
Ø14$_{g6}^{(-0.006}_{-0.017)}$
Ø15$_{g6}^{(-0.006}_{-0.017)}$

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

Unit: mm



= Shaft rotation direction of the signal output
R.1 = Radial socket(M12x1 8pin male socket)
R.2 = Radial socket(M23x1 12pin male socket)
R.3 = Radial cable(standard length 1000)

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. Recommended Accessories

Plug and cable	Brief description	No.	Order No.
	C2C=Connection type head A: M12, 8-pin female straight connector; Connection type head B: M12, 8-pin male straight connector; Cable length: 2M 8-core with shield,halogen-free PUR	K60C2C	44400035
	C5C=Connection type head A: M12, 8-pin female straight connector; Connection type head B: M12, 8-pin male straight connector; Cable length: 5M 8-core with shield,halogen-free PUR	K60C5C	44400036
	C1=Connection type head A: M12, 8-pin female straight connector; Connection type head B: Bare wire end; Cable length: 1M 8-core with shield,halogen-free PUR	K60C1	44400037
	C2=Connection type head A: M12, 8-pin female straight connector; Connection type head B: Bare wire end; Cable length: 2M 8-core with shield,halogen-free PUR	K60C2	44400038
	C5=Connection type head A: M12, 8-pin female straight connector; Connection type head B: Bare wire end; Cable length: 5M 8-core with shield,halogen-free PUR	K60C5	44400039
	E1=Connection type head A: M23, 12-pin female straight connector; Connection type head B: Bare wire end; Cable length: 1M 8-core with shield,halogen-free PUR	K60E1	44400040
	E2=Connection type head A: M23, 12-pin female straight connector; Connection type head B: Bare wire end; Cable length: 2M 8-core with shield,halogen-free PUR	K60E2	44400041
	E5=Connection type head A: M23, 12-pin female straight connector; Connection type head B: Bare wire end; Cable length: 5M 8-core with shield,halogen-free PUR	K60E5	44400042

10. Caution

10.1 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.

10.2 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.

10.3 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.