

## 1. KS60 Sin/Cos Optical Encoder (Through hole)

### 1.1 Introduction:

KS60 is a through shaft rugged structural design, the mounting shaft using the clasp clamping method and can output 1024 or 2048 Sin/Cos cycle signals, protection grade IP65, structure is compact, high safety, adapted to high resolution segmentation fields.

### 1.2 Feature:

- Encoder external diameter  $\varnothing 60\text{mm}$ , thickness 40mm, diameter of shaft up to  $\varnothing 15\text{mm}$ , installation using flexible spring plate and shaft buckle clamping method;
- Adopt non-contact photoelectric principle;
- Resolution per turn Sin/Cos period 1024 & 2048;
- Two signal waveforms available (before and after generation);
- Reverse polarity protection;
- Short circuit protection.

### 1.3 Application:

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

### 1.4 Connection:

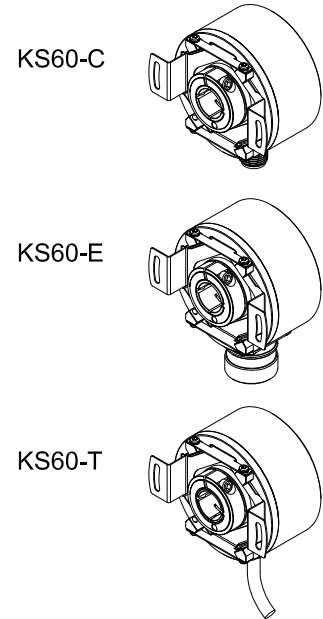
- Radial socket (M12 8pin male socket)
- Radial socket (M23 12pin male socket)
- Radial cable (standard length 1000mm)

### 1.5 Protection:

IP65

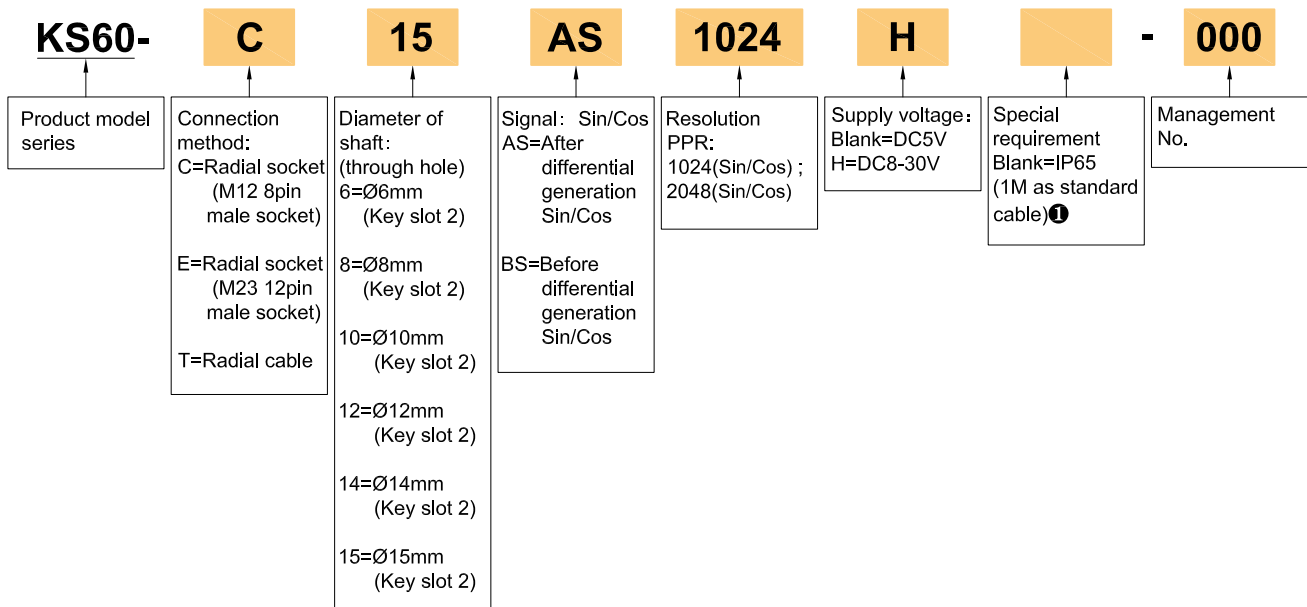
### 1.6 Weight:

About 350g



## 2. Model Selection Guide

### 2.1 Model composition(select parameters)



### 2.2 Note

- ①. IP=65; Cable length 1m, if you need to change the length C+number, max 100m(indicated by C100).

### 3. Technical Parameters

#### 3.1 Performance

Sine/cosine periods per revolution	1024 & 2048
Measuring step	0.3 " For interpolation of the sine/cosine signals with e.g.12 bits <sup>1)</sup>
Initialization time	50ms <sup>2)</sup>
Integral non-linearity	Typ.±45 Winkelsekunden(Loose stator coupling)
Differential non-linearity	±7 Winkelsekunden
Reference signal, number	1
Reference signal, position	90°, electrically,gated with Sinus and Cosinus

<sup>1)</sup> Not safety-related.

<sup>2)</sup> Valid signals can be read thereafter.

#### 3.2 Electrical parameters

Communication Interface	Incremental
Communication interface detail	Sin/Cos
Connection type	M12 8-pin male socket; M23 12-pin male socket; Radial cable (three options available)
Supply voltage	DC4.5V...5.5V; DC8V...30V
Maximum output frequency	≤200 kHz
Load resistance	≥120Ω
Power consumption max.(without load)	≤0,7 W
Power consumption	Without load
Reverse polarity protection	✓
Protection class	IP65
Short-circuit protection	✓ ⓘ

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

3.3 Mechanical parameters

Diameter of shaft	Ø6mm; Ø8mm; Ø10mm; Ø12mm; Ø14mm; Ø15mm available
Shaft material	Stainless steel
Starting torque	≤1.0 Ncm (at 20°C )
Operating torque	≤0.8 Ncm (at 20°C)
Permissible movement static	±0.3mm (radial) ; ±0.5mm (axial)
Permissible movement dynamic	±0.05mm (radial) ; ±0.1mm (axial)
Max.angular acceleration	≤500,000 rad/s <sup>2</sup>
Operating speed	6000min <sup>-1</sup> ❶
Bearing lifetime	3.6x10 <sup>9</sup> ❷
Housing material	Aluminum alloy
Weight	Approx.350g

❶ Allow for self-heating of approx.3.0K per 1000rpm regarding the permissible operating temperature.

❷ On maximum operating speed and temperature.

3.4 Environmental parameters

Shell protection grade	IP65(IEC60529) ❶
Permissible relative humidity	90°,Condensation not permitted
Operating temperature range	-40°C...+95°C
Storage temperature range	-40°C...+95°C
Resistance to shocks	100g, 6ms(EN60068-2-27) ❷
Frequency range of resistance to vibrations	30g, 10Hz...1,000Hz(EN60068-2-6) ❸

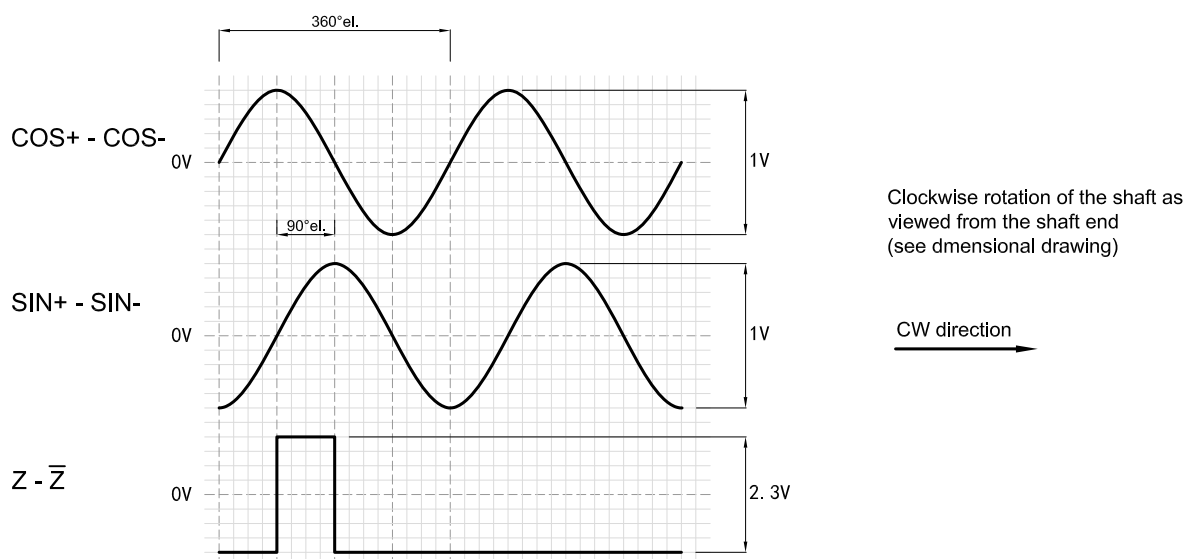
❶ Plug in the matching plug, which has a protection class of at least IP65.

❷ Checked during operation using vector length monitoring.

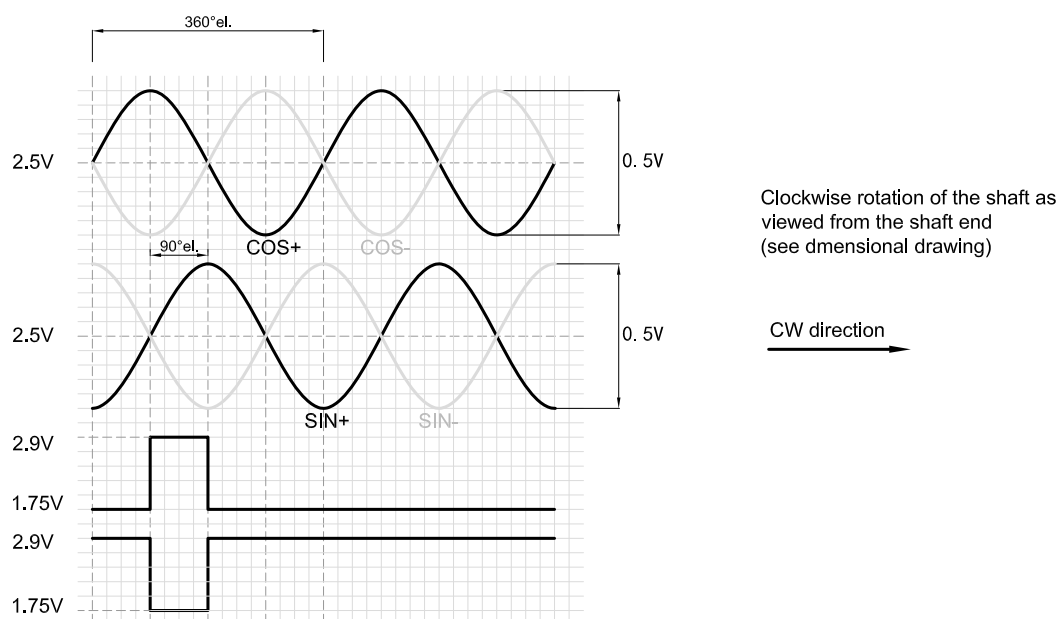
❸ Checked during operation using vector length monitoring, including matching plug.

### 4. Output Wave Form

#### 4.1 Signal SIN/COS after differential generation

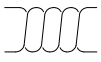
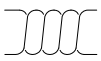
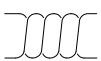
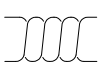


#### 4.2 Signal SIN/COS before differential generation

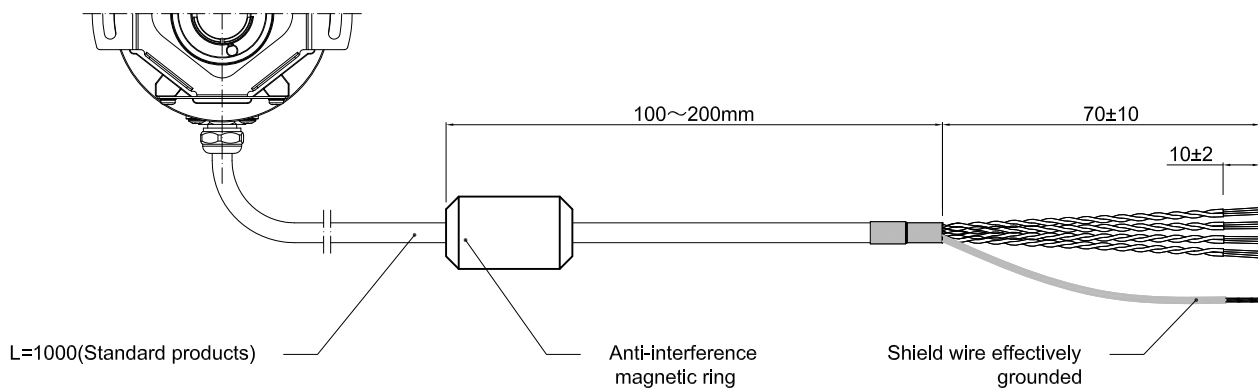


Supply voltage	Signal	Interface signals	Interface signals after differential generation		Interface signals before differential generation	
			Output	Signal offset	Output	Signal offset
DC5V; DC8V...30V	+SIN -SIN +COS -COS	Analog,differential	SIN/COS 1.0 Vss	0V±10%	0.5Vss±20%	2.5V±10%
	Z Z̄	Digital,differential	Low:-1.15V±15%, High:1.15V±15%		Low:1.75V±15%, High:2.9V±15%	

5. Wiring Table

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

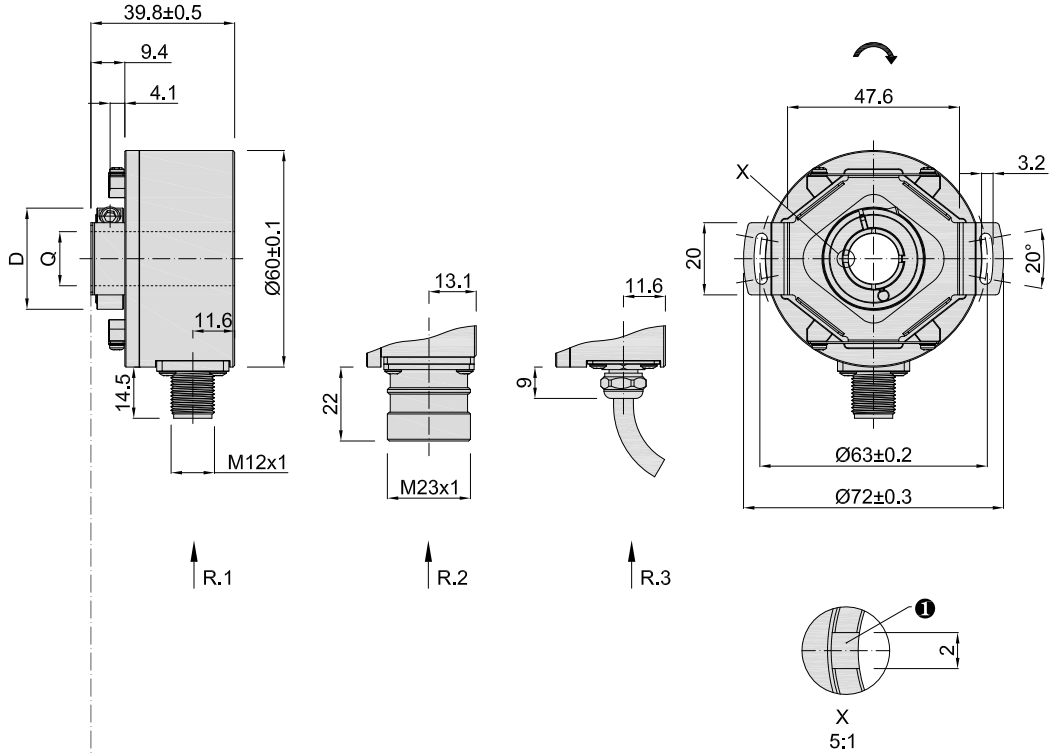
Radial cable wire diagram



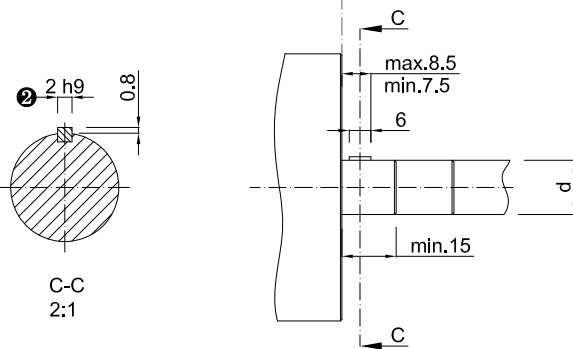
6. Basic Dimensions

6.1 Dimensions

Q(shaft)	D
Ø6 <sup>G7(+0.020/+0.005)</sup>	Ø20
Ø8 <sup>G7(+0.020/+0.005)</sup>	Ø22
Ø10 <sup>G7(+0.020/+0.005)</sup>	Ø24
Ø12 <sup>G7(+0.024/+0.006)</sup>	Ø26
Ø14 <sup>G7(+0.024/+0.006)</sup>	Ø28
Ø15 <sup>G7(+0.024/+0.006)</sup>	Ø28



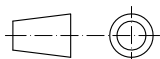
6.2 Mounting shaft requirements



d
Ø6 <sub>g6</sub> <sup>(-0.005/-0.014)</sup>
Ø8 <sub>g6</sub> <sup>(-0.005/-0.014)</sup>
Ø10 <sub>g6</sub> <sup>(-0.005/-0.014)</sup>
Ø12 <sub>g6</sub> <sup>(-0.006/-0.017)</sup>
Ø14 <sub>g6</sub> <sup>(-0.006/-0.017)</sup>
Ø15 <sub>g6</sub> <sup>(-0.006/-0.017)</sup>

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)

- ① = Key slot
- ② = Based on the feather key DIN 6885-A 2x2x6

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.

7. 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	KS60C2C	44400006
	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	KS60C5C	44400007
	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	KS60C1	44400008
	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	KS60C2	44400009
	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	KS60C5	44400010
	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	KS60E1	44400011
	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	KS60E2	44400012
	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	KS60E5	44400013

## 8. Caution

### 8.1 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.

### 8.2 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.

### 8.3 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.