

1. K42 Incremental Optical Encoder (Through shaft)

1.1 Introduction:

K42 is a through shaft miniaturized design, variety of electrical interfaces and resolutions, the highest protection grade is IP65, compact, robust and safe, widely used in industrial automations.

1.2 Feature:

- Encoder external diameter $\varnothing 42\text{mm}$, thickness 33mm, diameter of shaft up to $\varnothing 10\text{mm}$, robust and miniaturized;
- Ring locking structure, flexible spring plate installation ($\varnothing 46\text{mm}$);
- Adopt non-contact photoelectric principle;
- Reverse polarity protection;
- Short circuit protection;
- Multiple electrical interfaces available;
- Resolution per turn up to 32768PPR.

1.3 Application:

Servo motor, elevator, motor, packaging machinery, CNC and other automation control fields.

1.4 Connection:

- Radial socket (M12 8pin male socket)
- Cable connection (standard length 1000mm)

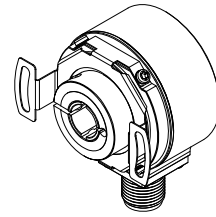
1.5 Protection:

IP50 & IP65

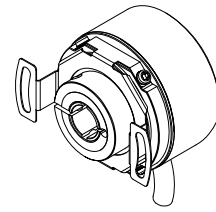
1.6 Weight:

About 150g

K42-C

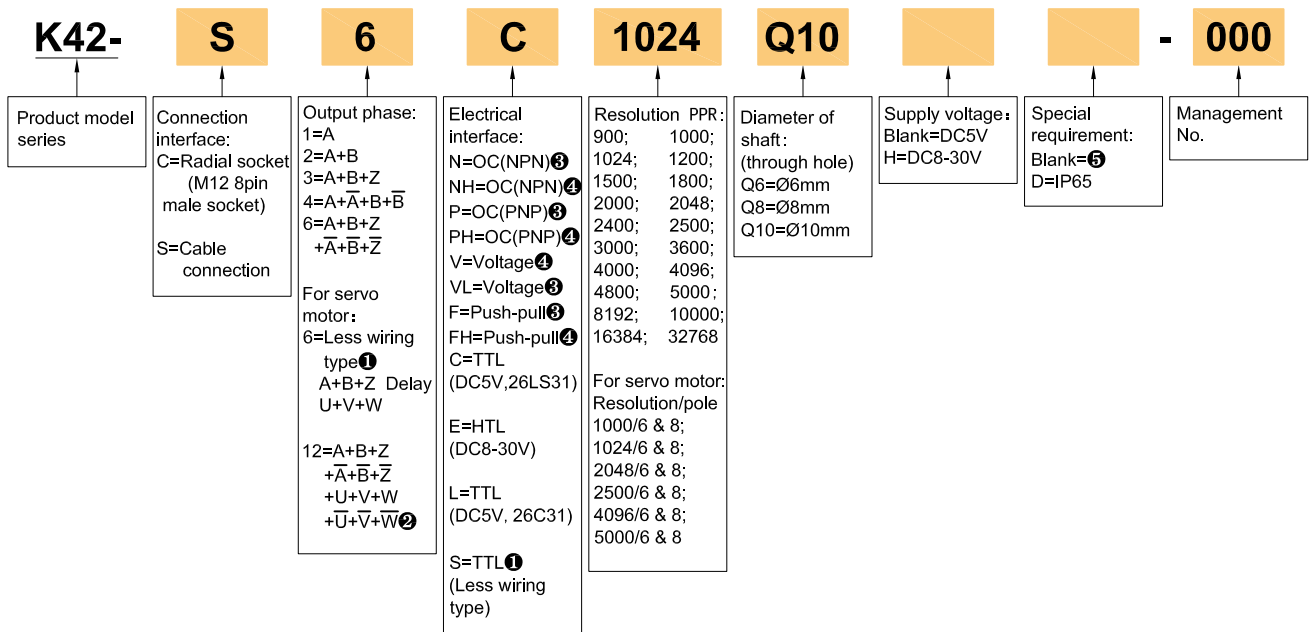


K42-S



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.
- Socket connection not supported.
- Z signal is low level active.
- Z signal is high level active.
- None indicated for the cable length of 1m, 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
OC NPN open collector circuit		<p>a.b.c.d=$\frac{T}{4} \pm 8$</p> <p>Phase A is ahead of B by $\frac{T}{4} \pm 8$, viewing from shaft end, direction is clockwise rotation. (See dimensional drawings)</p> <p>CW direction →</p> <p>Z signal is low level active</p>
OC PNP open collector circuit		<p>a.b.c.d=$\frac{T}{4} \pm 8$</p> <p>Phase A is ahead of B by $\frac{T}{4} \pm 8$, viewing from shaft end, direction is clockwise rotation. (See dimensional drawings)</p> <p>CW direction →</p> <p>Z signal is high level active</p>
Push-pull		<p>a.b.c.d=$\frac{T}{4} \pm 8$</p> <p>Phase A is ahead of B by $\frac{T}{4} \pm 8$, viewing from shaft end, direction is clockwise rotation. (See dimensional drawings)</p> <p>CW direction →</p> <p>Z signal is high level active</p>
Voltage		<p>a.b.c.d=$\frac{T}{4} \pm 8$</p> <p>Phase A is ahead of B by $\frac{T}{4} \pm 8$, viewing from shaft end, direction is clockwise rotation. (See dimensional drawings)</p> <p>CW direction →</p> <p>Z signal is high level active</p>
TTL (DC5V)		<p>a.b.c.d=$\frac{T}{4} \pm 8$</p> <p>Phase A is ahead of B by $\frac{T}{4} \pm 8$, viewing from shaft end, direction is clockwise rotation. (See dimensional drawings)</p> <p>CW direction →</p>
HTL (DC8-30V)		<p>a.b.c.d=$\frac{T}{4} \pm 8$</p> <p>Phase A is ahead of B by $\frac{T}{4} \pm 8$, viewing from shaft end, direction is clockwise rotation. (See dimensional drawings)</p> <p>CW direction →</p>

3.2 For servo motor(with UVW)

Electrical interface	Output circuit	Output wave form																																																														
<p>TTL (DC5V)</p>	<p style="text-align: center;">Transmission distance 200m Max</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>Symbol signification</p> <ul style="list-style-type: none"> ★: indicate position of UVW channel ☆: position to start counting ABZ channel ⊠: non-using zone HZ: high impedance </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>3</td> <td>white</td> <td>HZ</td> <td>U</td> <td>A</td> </tr> <tr> <td>4</td> <td>white/black</td> <td>HZ</td> <td>\bar{U}</td> <td>\bar{A}</td> </tr> <tr> <td>5</td> <td>green</td> <td>HZ</td> <td>V</td> <td>B</td> </tr> <tr> <td>6</td> <td>green/black</td> <td>HZ</td> <td>\bar{V}</td> <td>\bar{B}</td> </tr> <tr> <td>7</td> <td>yellow</td> <td>HZ</td> <td>W</td> <td>Z</td> </tr> <tr> <td>8</td> <td>yellow/black</td> <td>HZ</td> <td>\bar{W}</td> <td>\bar{Z}</td> </tr> <tr> <td>1</td> <td>red</td> <td colspan="3">Up</td> </tr> <tr> <td>2</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	3	white	HZ	U	A	4	white/black	HZ	\bar{U}	\bar{A}	5	green	HZ	V	B	6	green/black	HZ	\bar{V}	\bar{B}	7	yellow	HZ	W	Z	8	yellow/black	HZ	\bar{W}	\bar{Z}	1	red	Up			2	black	Un			0	shielding	GND			<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>$20 \pm 1^\circ$</td> <td>120°</td> </tr> <tr> <td>8</td> <td>$15 \pm 1^\circ$</td> <td>90°</td> </tr> </tbody> </table> <p style="text-align: center;">Reverse signal not shown</p> <p style="text-align: center;">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 $\pm 1^\circ$</p> <p style="text-align: center;">CCW direction \rightarrow</p> <p style="text-align: center;">Viewed from shaft end when installing. (See dimensional drawings)</p>	pole	g.h.j.k.m.n	r	6	$20 \pm 1^\circ$	120°	8	$15 \pm 1^\circ$	90°
No.	Function Color			Mode																																																												
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<p>Timing Chart</p>																																																																

4. Electrical Parameters

Parameter		Output type	OC	Voltage	Push-pull	TTL	TTL (Less wiring type)	HTL
Item								
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			200KHz		300KHz
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 _{cc} -3 V _{DC}
		"L"	≤0.4V	≤0.7V(less than 20mA)	≤0.4V(30mA)	≤0.5V		≤ 1V V _{DC}
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			✓①					
Phase shift between A & B			90°±10° (frequency in low speed)					
			90°±20° (frequency in high speed)					
Delay motion time ②			—				510±220ms	—
GND			Not connect to encoder					

① Short-circuit to another channel or GND permitted for max.30s.

② Phase A,B,Z are back of phase U,V,W when power on.

5. Mechanical Specifications

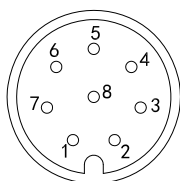
Diameter of shaft	Ø6mm; Ø8mm; Ø10mm (optional)
Starting torque	Less than $9.8 \times 10^{-3} \text{N} \cdot \text{m}$
Inertia moment	Less than $6.5 \times 10^{-6} \text{kg} \cdot \text{m}^2$
Shaft load	Radial 30N; Axial 20N
Slew speed	≤6000 rpm
Bearing Life	1.5×10^9 revs at rated load(100000hrs at 2500RPM)
Shell	Aluminium alloy
Weight	about 150g

6. Environmental Parameters

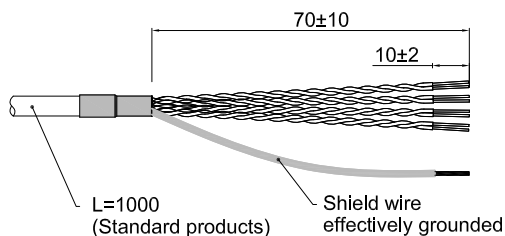
Environmental temperature	Operating: $-40 \sim +95^\circ\text{C}$ (repeatable winding cable: -10°C); Storage: $-40 \sim +95^\circ\text{C}$
Environmental humidity	Operating and storage: 35~85%RH(noncondensing)
Vibration(Endurance)	Amplitude 0.75mm,5~55Hz,2h for X,Y,Z direction individually
Shock(Endurance)	490m/s^2 11ms three times for X,Y,Z direction individually
Protection	IP50 & IP65

7. Wiring Table

M12 8pin male socket
pin distribution diagram



Cable connection



7.1 OC/Voltage/Push-pull (Wiring table for socket connection and cable connection)

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

7.2 TTL/HTL/Less wiring type (Wiring table for socket connection and cable connection)

Socket pin definition	Supply voltage		Incremental signal					
	1	2	3	4	5	6	7	8
Wire color	Red	Black	White	White/BK	Green	Green/BK	Yellow	Yellow/BK
Function	Up	Un	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 Cable connection wiring table for servo motor

Wire color	Supply voltage		Incremental signal											
	Red	Black	White	White/BK	Green	Green/BK	Yellow	Yellow/BK	Blue	Blue/Bk	Grey	Grey/Bk	Pink	Pink/Bk
Function	Up	Un	A+	A-	B+	B-	Z+	Z-	U+	U-	V+	V-	W+	W-
Twisted-paired cable														

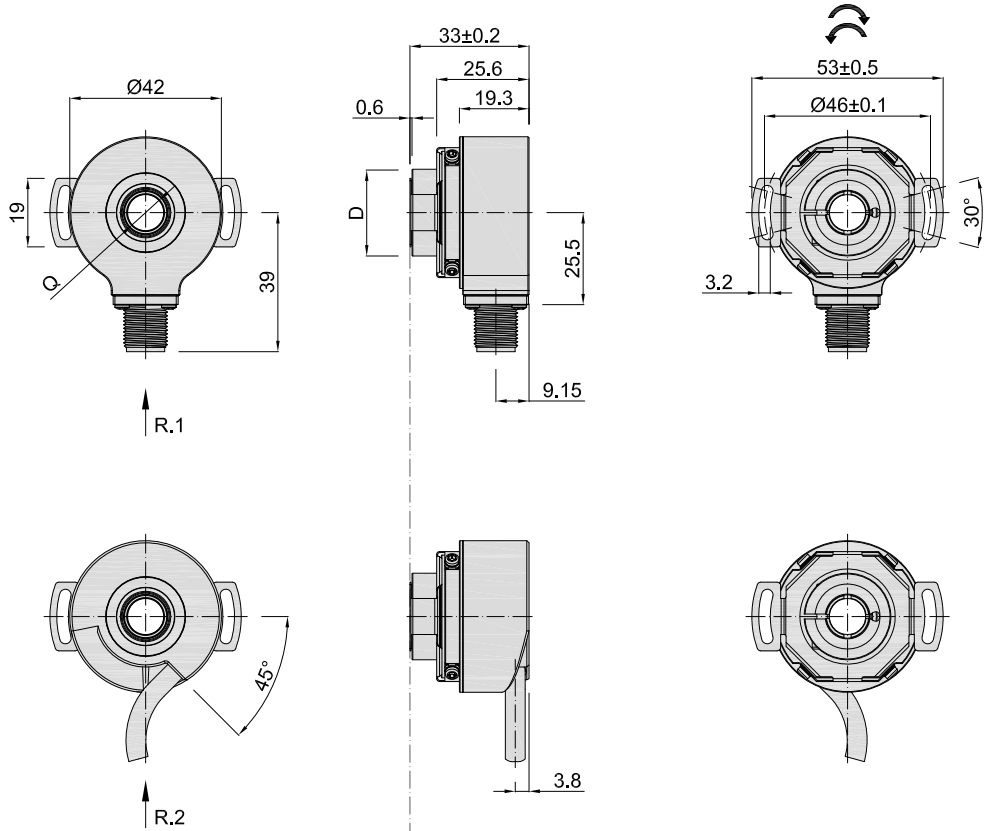
Up=Supply voltage.

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

8. Basic Dimensions

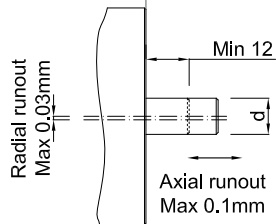
8.1 Dimensions

Q(Shaft)	D
$\varnothing 6^{G7}_{(+0.020/+0.005)}$	$\varnothing 20$
$\varnothing 8^{G7}_{(+0.020/+0.005)}$	$\varnothing 22$
$\varnothing 10^{G7}_{(+0.020/+0.005)}$	$\varnothing 24$



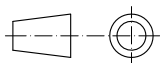
8.2 Mounting shaft requirements

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



d
$\varnothing 6_{g6}^{(-0.005/-0.014)}$
$\varnothing 8_{g6}^{(-0.005/-0.014)}$
$\varnothing 10_{g6}^{(-0.005/-0.014)}$

Unit: mm





- = Shaft rotation direction of the incremental signal output
- = Direction of shaft rotation for servo motor-specific signal output
- R.1 = Radial socket(M12x1 8pin male socket)
- R.2 = 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	K77C2C	44400001
	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	K77C5C	44400002
	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	K77C1	44400003
	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	K77C2	44400004
	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	K77C5	44400005

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.