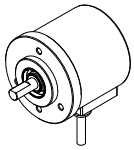
# 1. S65 Incremental Optical Encoder (Solid shaft)

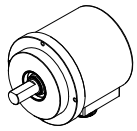
1.1 Introduction：

S65 is a solid shaft housing design, various of electrical interfaces and resolutions available, four mounting flanges and collar sizes, highest protection grade IP65, compact product structure, high safety, suitable for high intensity mechanical movement fields.

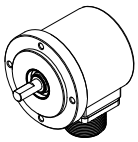
S65-A



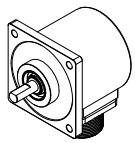
S65-B



S65-C



S65-D



1.2 Feature：

- Encoder external diameter Ø61mm、thickness 56-60mm、diameter of shaft of Ø8mm、Ø10mm available;
- Four sizes of mounting flanges available;
- Adopt non-contact photoelectric principle;
- Resolution up to 48000PPR;
- Reverse polarity protection;
- Short circuit protection

1.3 Application：

Motor,elevator,textile,packaging,CNC and other automation control fields.

1.4 Connection：

- Radial cable (Standard length 1M)
- Radial socket (M18/M28 male socket)

1.5 Protection：

IP65 (Max)

1.6 Weight：

S65-A(About 350g); S65-B(About 370g); S65-C(About 450g); S65-D(About 370g)

# 2. Model Selection Guide

Model composition(select parameters)

| S65- | A | 8 | T | 6 | E | 2048 | H | D | - | 000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Product model series | Mounting flange:<br>❶. A/B/C/D | Diameter of shaft:<br>(Solid shaft)<br>8=Ø8mm<br>10=Ø10mm | Connection method:<br>T=Radial cable<br><br>Radial socket:<br>C=M18-9P<br>D=M18-7P<br>E=M28-10P | Output phase:<br>2=A+B<br>3=A+B+Z<br>4=A+$\overline{A}$+B+$\overline{B}$<br>6=A+$\overline{A}$+B+$\overline{B}$+Z+$\overline{Z}$ | Electrical interface:<br>N=OC(NPN) ❷<br>NH=OC(NPN) ❸<br>P=OC(PNP)❷<br>PH=OC(PNP)❸<br>V=Voltage ❸<br>VL=Voltage❷<br>F=Push-pull❷<br>FH=Push-pull❸<br>C=TTL<br>(26LS31)<br><br>L=TTL<br>(26C31)<br><br>R=TTL<br>(RS422)<br><br>E=HTL<br>(DC8-30V) | Resolution PPR:<br>9; 20; 50;<br>60; 66; 100;<br>200; 250; 300;<br>360; 400; 450;<br>500; 512; 600;<br>720; 750; 800;<br>900; 1000;<br>1024; 1200;<br>1440; 1500;<br>1800; 2000;<br>2048; 2400;<br>2500; 2880;<br>3000; 3600;<br>4000; 4096;<br>4800; 5000;<br>5760; 6000;<br>8000; 8192;<br>10000; 11520;<br>12000; 16000;<br>16384; 20000;<br>23040; 24000;<br>32000; 32768;<br>40000; 46080;<br>48000 | Supply voltage:<br>Blank=DC5V<br>H=DC8-30V | Special requirement:<br>Blank=❹<br>D=IP65 | | Management No. |

Mounting flange：

❶. A=Clamping flange，collar Ø36mm，4-M4 PCDØ48mm;
B=Clamping flange，collar Ø50mm，4-M3 PCDØ62mm;
C=Clamping flange，collar Ø50mm，4-M4 PCDØ60mm;
D=Square flange，□52.5mmX52.5mm(4-Ø5.3)。

Zero level signal：

❷. Z signal is low level active.

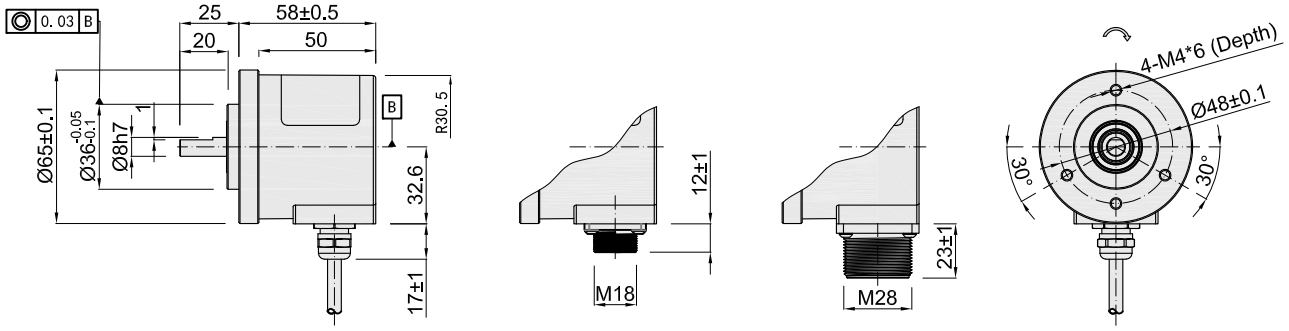
❸. Z signal is high level active.

Special requirement：

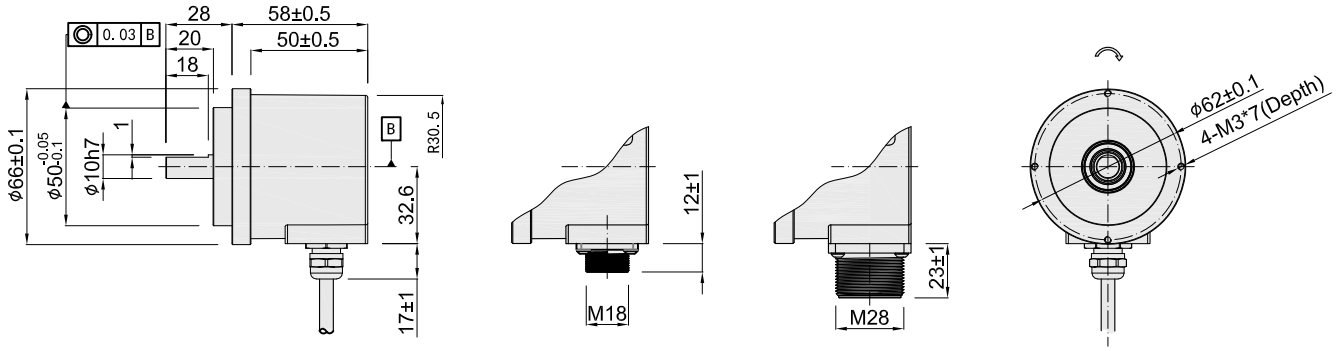
❹. None indicated for IP50 and cable length 1m，if need to change the length C+number，max 100m(indicated by C100).
For the specific length of use, pls refer to page 3 of the provision of output circuit.

## 3. Basic Dimensions

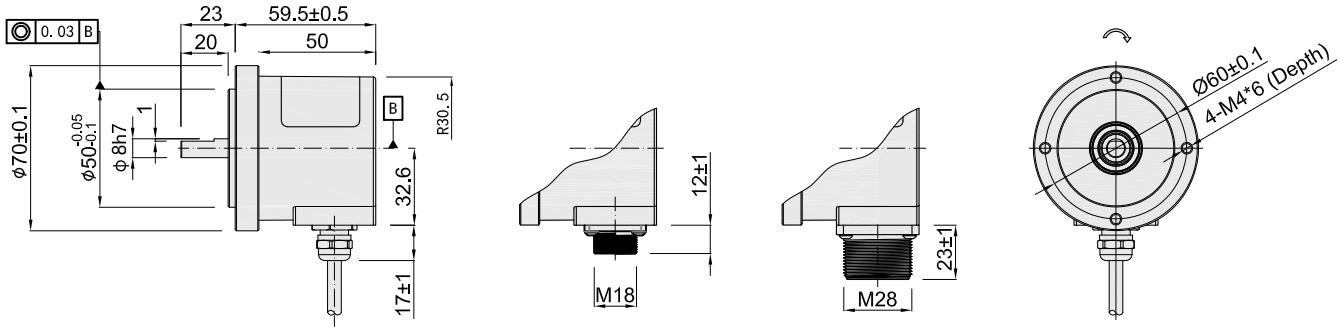
### 3.1 S65-A (Basic dimensions)



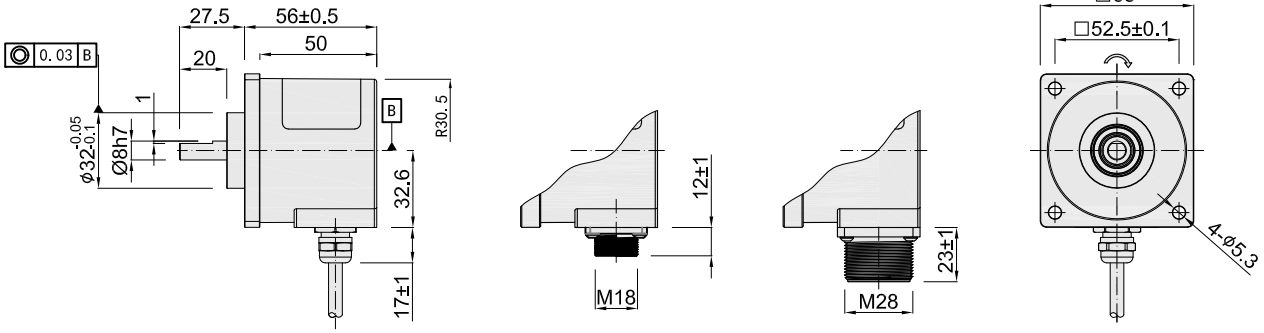

### 3.2 S65-B (Basic dimensions)




### 3.3 S65-C (Basic dimensions)



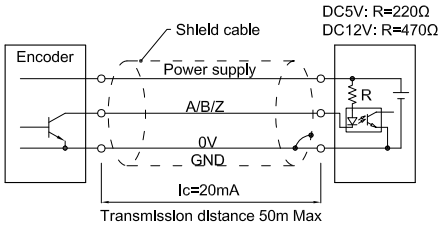
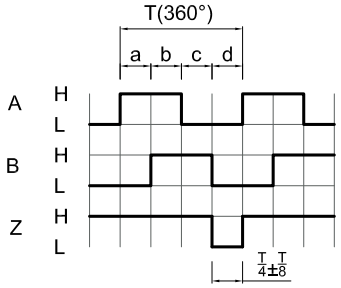
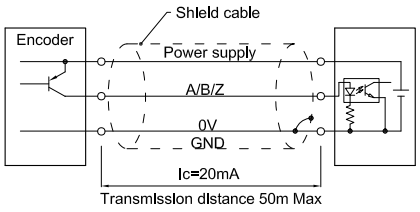
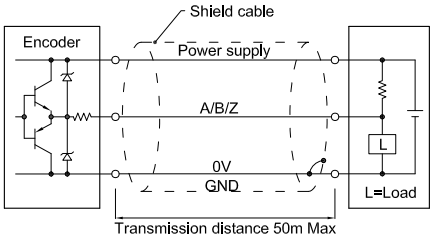
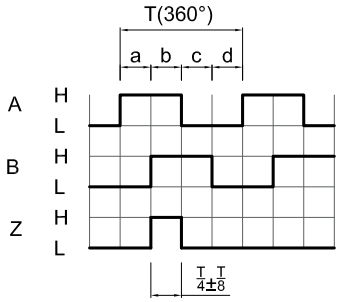
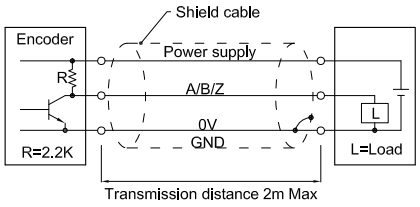
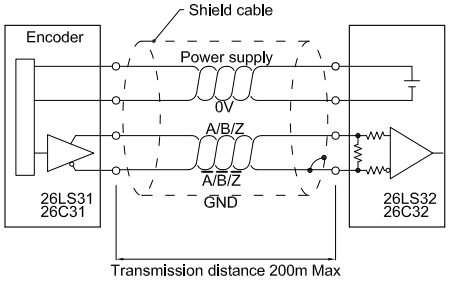
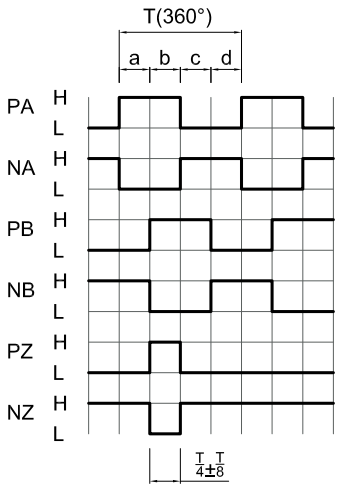

### 3.4 S65-D (Basic dimensions)




Unit：mm

= Direction of shaft rotation for signal output

## 4. Output Mode

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

## 5. 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 | | | 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) | | | | |
| GND | | | Not connect to encoder | | | | |

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

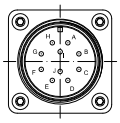
## 6. Mechanical Specifications

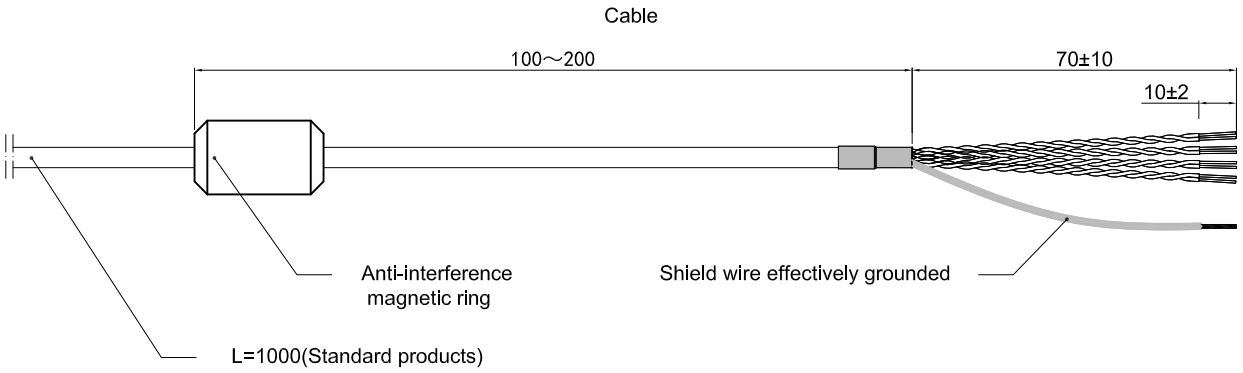
| | |
|---|---|
| Diameter of shaft | Ø8mm & Ø10mm (D type, stainless steel material) |
| Starting torque | Less than $5\times10^{-3}$N·m |
| Inertia moment | Less than $3\times10^{-6}$ kg·m² |
| Shaft load | Radial 40N; Axial 20N |
| Slew speed | ≤6000 rpm(IP50); ≤4000 rpm(IP65) |
| Bearing Life | $1.5X10^{9}$ revs at rated load(100000hrs at 2500RPM) |
| Shell | Aluminium alloy |
| Weight | S65-A( About 350g); S65-B(About 370g); S65-C(About 450g); S65-D(About 370g) |

## 7. Environmental Parameters

| | |
|---|---|
| Environmental temperature | Operating:－20～+90°C(repeatable winding cable: -10°C); Storage:－25～+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 | IP50 & IP65 |

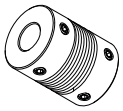
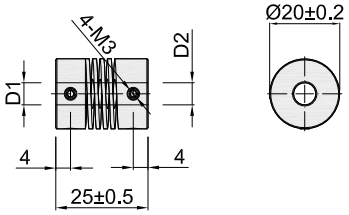
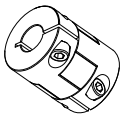
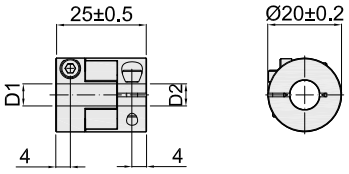
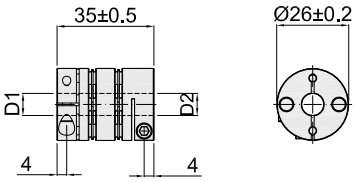
## 8. Wiring Table

|  |  |  |  | | | |
|---|---|---|---|---|---|---|
| Socket pin definition (M18 9-pin male socket) | Socket pin definition (M18 7-pin male socket) | Socket pin definition (M28 10-pin male socket) | Wire colors (cable connection) | Signal | Explanation | Differential twisted pair |
| 1 | 1 | J | Red | Up | Power positive |  |
| 2 | 2 | I | Black | Un | Power negative | |
| 3 | 3 | A | White | A | Signal wire |  |
| 6 | - | B | White/BK | $\overline{A}$ | Signal wire | |
| 4 | 4 | C | Green | B | Signal wire |  |
| 7 | - | D | Green/BK | $\overline{B}$ | Signal wire | |
| 5 | 5 | E | Yellow | Z | Signal wire |  |
| 8 | - | F | Yellow/BK | $\overline{Z}$ | Signal wire | |
| 9 | 6 | G | - | - | | |
| - | 7 | H | - | - | | |
| GND | No encoder body connected | | | | | |

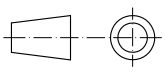



Unit: mm

## 9. Recommended Accessories

| Coupler | Dimensions | D1 | D2 | Model | Order No. |
|---|---|---|---|---|---|
| Spring coupling: H series  |   | Ø6$^{G8}$ | Ø8$^{G8}$ | 6H8 | 08700022 |
| | | Ø8$^{G8}$ | Ø8$^{G8}$ | 8H8 | 08700023 |
| | | Ø8$^{G8}$ | Ø10$^{G8}$ | 8H10 | 08700007 |
| Cross type: M series  |   Main body material: aluminum alloy | Ø6$^{G8}$ | Ø8$^{G8}$ | 6M8 | 08700038 |
| | | Ø8$^{G8}$ | Ø8$^{G8}$ | 8M8 | 08700039 |
| | | Ø8$^{G8}$ | Ø10$^{G8}$ | 8M10 | 08700040 |
| Diaphragm type: W series  |   Main body material: aluminum alloy | Ø6$^{G8}$ | Ø8$^{G8}$ | 6W8 | 08700042 |
| | | Ø8$^{G8}$ | Ø8$^{G8}$ | 8W8 | 08700043 |
| | | Ø8$^{G8}$ | Ø10$^{G8}$ | 8W10 | 08700044 |

Unit: mm



# 10. Caution

10. 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.

10. 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.