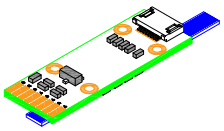
# 1. LS100 Incremental Linear Encoder

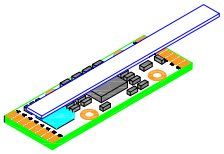
1.1 Introduction：

LS100 is a linear encoder assembly composed of a photoelectric reflective encoder and a linear grating scale. The LED light of the read head is reflected back to the light receiving point on the grating scale to detect different modules on the grating scale, and outputs A and B phase signals of complete sine and cosine waves. The division multiple can be set arbitrarily through the interpolator to achieve high resolution. The division multiple of A and B phases can reach up to 6400 times.

Side A
(read head facing down)



Side B
(read head facing up)



1.2 Feature：

- Encoder overall size is 26.8mm x 9.2mm, total thickness 3.2mm (excluding the grating scale), which realizes a miniaturized ultra-thin component;
- The installation size is 6.6mm x 13mm, fixed with 4 M1.2 x 3mm bolts;
- Adopt non-contact photoelectric reflection principle;
- Maximum electrical accuracy of 0.0125μm;
- The electrical interface uses differential RS422;
- Effective stroke max 150mm.

1.3 Application range：

Micro linear motors, micro-stroke high-precision linear motion control mechanisms, etc.

1.4 Connection：

- With FPC socket, can also direcly solder the leads
- Directly solder the leads on the PCB board (without socket)

1.5 Weight：

About 15g

# 2. Selection Guide

## Model composition (select parameters)

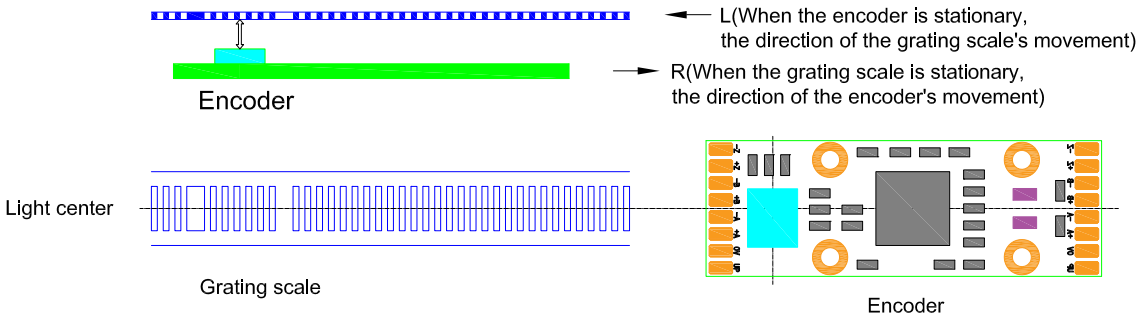
| LS100– | F | 50G | K | | | | | – | 000 |
|---|---|---|---|---|---|---|---|---|---|
| Product series model | Connection method:<br>F=With FPC socket +soldering on PCB board<br>P=Soldering on PCB board (without socket) | Effective stroke distance: Grating<br>10G=10mm(Glass);<br>10M=10mm(Metal);<br>15G=15mm(Glass);<br>15M=15mm(Metal);<br>20G=20mm(Glass);<br>20M=20mm(Metal);<br>25G=25mm(Glass);<br>25M=25mm(Metal);<br>30G=30mm(Glass);<br>30M=30mm(Metal);<br>50G=50mm(Glass);<br>50M=50mm(Metal);<br>100G=100mm(Glass);<br>100M=100mm(Metal);<br>150G=100mm(Glass);<br>150M=100mm(Metal).<br>Recommend glass selection ❶ | Accuracy μm❷<br>A=40<br>B=20<br>C=10<br>D=5<br>E=2.5<br>F=1.6<br>G=1.25<br>H=0.8<br>J=0.625<br>K=0.4<br>L=0.2<br>M=0.1<br>N=0.05<br>P=0.025<br>Q=0.0125 | Electrical interface：<br>Indication=<br>Differential RS-422 | Phase：<br>No indicaton<br>=A/$\overline{A}$/B/$\overline{B}$/Z/$\overline{Z}$ | Supply voltage：<br>Indication=DC5V | Special specifications | Management No. |

❶. It is recommended to select glass, as it offers higher precision that metal and has full material availability. Longer lead times apply for mnetal options, please consult the sales team for details.

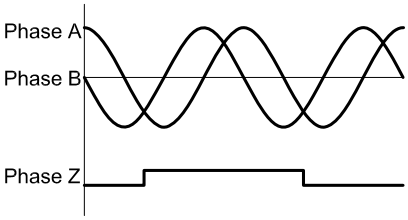
❷. Accuracy refers to the electrical precision of the travel distance of a single pulse.

# 3. Principles

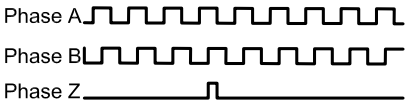
## 3.1 Structural principle



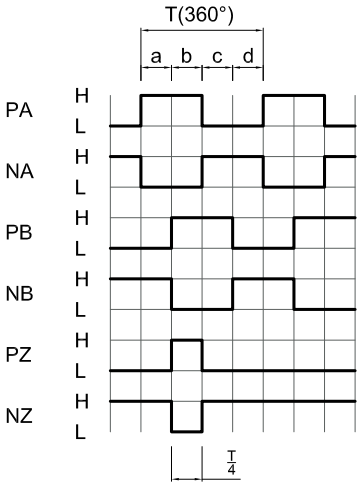

## 3.2 A.B sine and cosine waves and Z index signals output from the encoder read head




## 3. 3 A.B.Z signals output from interpolator




## 3.4 Output waveform(differential RS422)



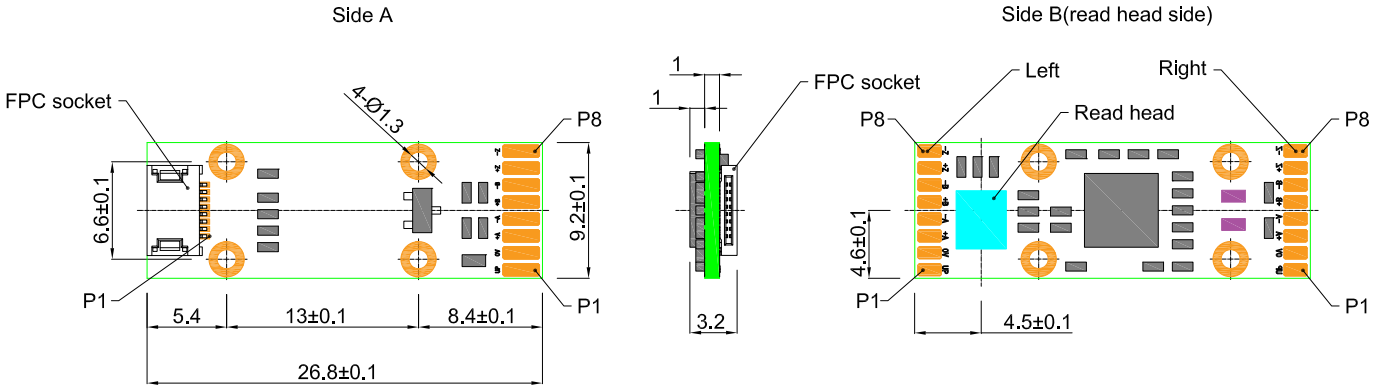

a.b.c.d=$\frac{T}{4}\pm\frac{T}{8}$

When the encoder is stationary and the grating scale is moving to the left or the grating scale is stationary and the encoder is moving to the right, the A phase is $\frac{T}{4}\pm\frac{T}{8}$ phase ahead of the B phase.

# 4. Basic Dimensions

## 4.1 Encoder dimensions

2:1

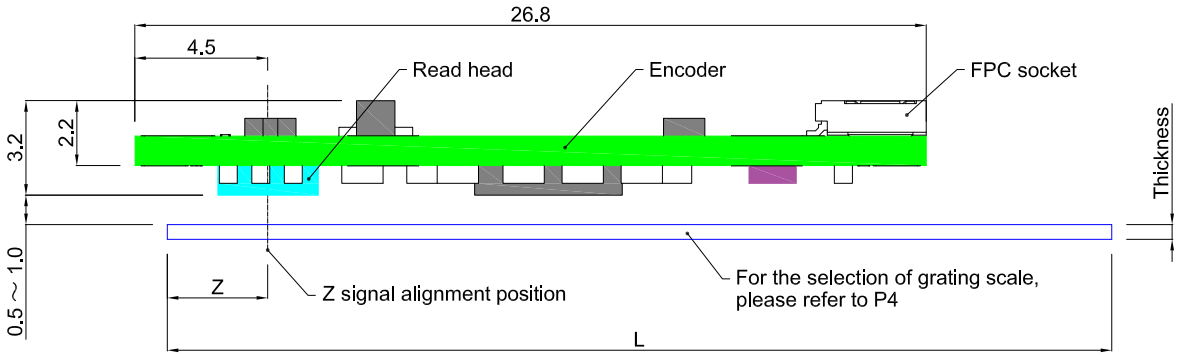



- The A and B sides of the encoder can be signal output welding points.
- The output signal definitions of P1-P8 pads and socket are：

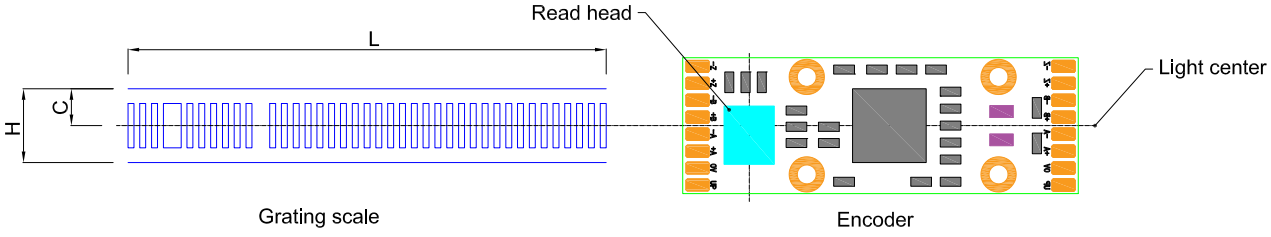
P1=UP；P2=0V；P3=+A；P4=-A；P5=+B；P6=-B；P7=+Z；P8=-Z。

## 4.2 Relative position of encoder and grating scale

4:1

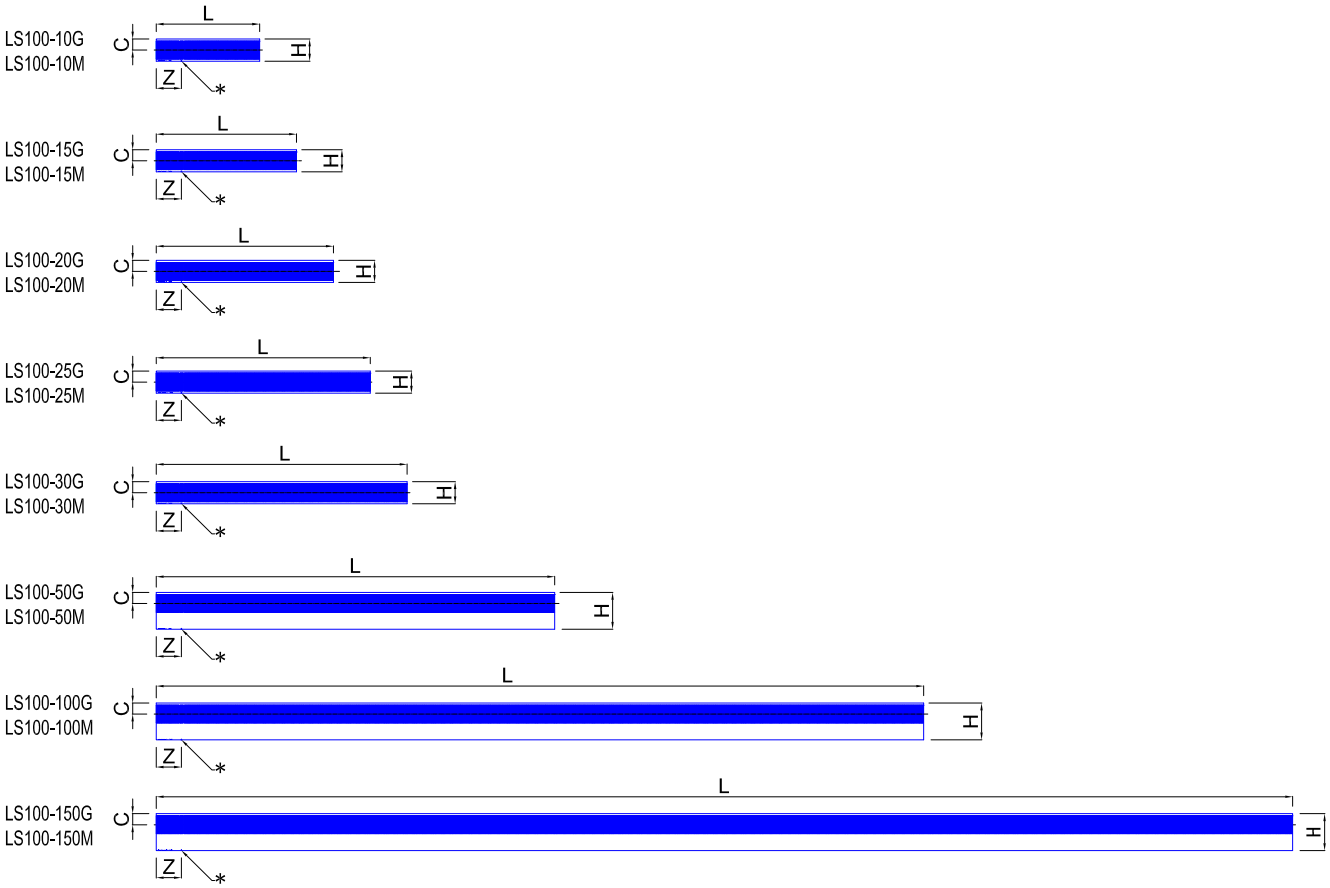



2:1




Unit: mm

4.3 Grating scale size




| Model | Order No. | Effective stroke (mm) | Material | Thickness (mm) | L (mm) | Z (mm) | H (mm) | Light center C(mm) |
|---|---|---|---|---|---|---|---|---|
| LS100-10G | 2600792 | 10 | Glass | 0.5±0.05 | 14±0.05 | 3.4 | $3^{-0.01}_{-0.05}$ | $1.5^{-0.01}_{-0.05}$ |
| LS100-10M | 2800954 | | Stainless steel | 0.2±0.05 | | | | |
| LS100-15G | 2600790 | 15 | Glass | 0.5±0.05 | 19±0.05 | 3.4 | $3^{-0.01}_{-0.05}$ | $1.5^{-0.01}_{-0.05}$ |
| LS100-15M | 2800956 | | Stainless steel | 0.2±0.05 | | | | |
| LS100-20G | 2600788 | 20 | Glass | 0.5±0.05 | 24±0.05 | 3.4 | $3^{-0.01}_{-0.05}$ | $1.5^{-0.01}_{-0.05}$ |
| LS100-20M | 2800958 | | Stainless steel | 0.2±0.05 | | | | |
| LS100-25G | 2600798 | 25 | Glass | 0.5±0.05 | 29±0.05 | 3.4 | $3^{-0.01}_{-0.05}$ | $1.5^{-0.01}_{-0.05}$ |
| LS100-25M | 2800968 | | Stainless steel | 0.2±0.05 | | | | |
| LS100-30G | 2600782B | 30 | Glass | 0.5±0.05 | 34±0.05 | 3.4 | $3^{-0.01}_{-0.05}$ | $1.5^{-0.01}_{-0.05}$ |
| LS100-30M | 2800960 | | Stainless steel | 0.2±0.05 | | | | |
| LS100-50G | 2600796 | 50 | Glass | 1.0±0.05 | 54±0.05 | 3.4 | $5^{-0.01}_{-0.05}$ | $1.5^{-0.01}_{-0.05}$ |
| LS100-50M | 2800962 | | Stainless steel | 0.2±0.05 | | | | |
| LS100-100G | 2600794 | 100 | Glass | 1.0±0.05 | 104±0.05 | 3.4 | $5^{-0.01}_{-0.05}$ | $1.5^{-0.01}_{-0.05}$ |
| LS100-100M | 2800964 | | Stainless steel | 0.2±0.05 | | | | |
| LS100-150G | 2600822 | 150 | Glass | 1.0±0.05 | 154±0.05 | 3.4 | $5^{-0.01}_{-0.05}$ | $1.5^{-0.01}_{-0.05}$ |
| LS100-150M | 2800974 | | Stainless steel | 0.2±0.05 | | | | |

*.Read head alignment position, Z phase mode center position can be changed according to customer requirements, stroke length can also be customized (up to 150mm).

# 5. Basic Specifications

## 5.1 Resolution

| Item | Brief description |
|---|---|
| Method | Photoelectric reflective type |
| Division number setting range | 80μm (2~6400 times) |
| Accuracy | 40μm～0.0125μm |
| Resolution (Number of pluses) | (Effective stroke X 1000) ÷ 80 X (80÷Accuracy) |

## 5.2 Electrical parameters

| Item | | | Output type (differential RS422) parameters |
|---|---|---|---|
| Supply voltage | | | DC5V±5% |
| Current consumption | | | 80mA Max |
| Allowable ripple | | | ≤3%rms |
| Maximum speed | | | 9.6m/s(2 times)～0.12m/s(6400 times) |
| Output capacity | Output current | Input | ≤±10mA |
| | | Output | |
| | Output voltage | “H” | ≥2.4V |
| | | “L” | ≤0.7V |
| | Load voltage | | — |
| Raise and fall time | | | Less than 1us(wire length：2m) |
| Output signal | | | Refer to P2 3.4 |

## 5.3 Mechanical dimensions

| Item | Parameters |
|---|---|
| Overall and installation dimensions | Refer to P3 4.1 |
| Mechanical effective stroke | Refer to P1 2.0 (Refer to P4 4.3 for selecting stroke grating scale) |
| Weight | About 15g |

## 5.4 Environmental parameters

| Item | Parameters |
|---|---|
| Using temperature range | -20～80°C， below 90%RH |
| Storage temperature range | -20～80°C， below 90%RH |

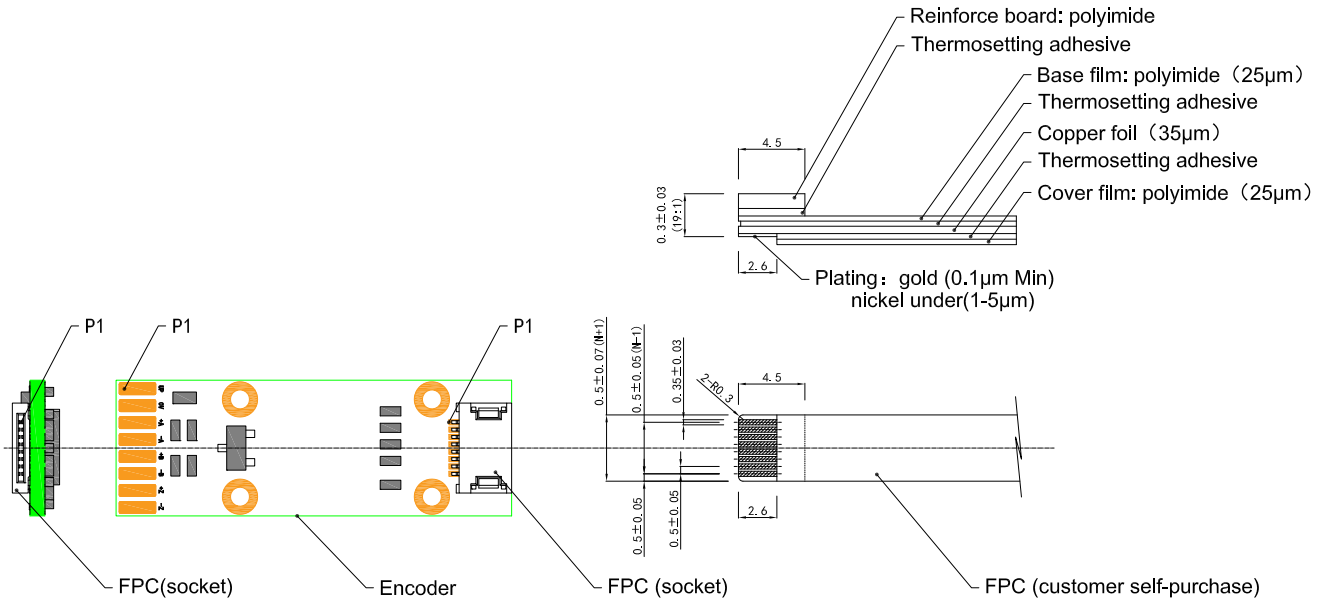
## 6. Wiring

6.1 Wiring table

| Pin No. | Signal | Explanation | Recommended to use twisted pair |
|---|---|---|---|
| 1 | UP | Power supply positive | |
| 2 | 0V | Power supply negative | |
| 3 | A+ | Phase A positive signal output | |
| 4 | A- | Phase A negative signal output | |
| 5 | B+ | Phase B positive signal output | |
| 6 | B- | Phase B negative signal output | |
| 7 | Z+ | Phase Z positive signal output | |
| 8 | Z- | Phase Z negative signal output | |

- Pad position definition refer to P3 4.1

6.2 FPC socket & FPC(purchased by customer)




Unit: mm

# 7. Notes

7.1 About the bonding of the grating scale

For the bonding of the grating scale, due to the different expansion coefficients of the materials, if a harder adhesive is used, the adhesive material is easy to fall off when the temperature changes greatly.

The thermal expansion and contraction of the adhesive material will affect the high-precision positioning of the grating scale.

Therefore, a softer silicone numerical adhesive is recommended: quick-acting adhesive (Super-X8008 black).

7.2 General matters

- For the contents recorded in this manual, some product improvements will be updated without notice.
- For the contents of this manual, if you find any errors, please contact our company directly.


fang@shhxgd.com Tel: 86-21-54613487
We reserve the final interpretation right of this specifications,subject to change without notice .