

Magnetic linear position encoder

Product series: ELS-004x-R1

Product part number: ELS-004-R1

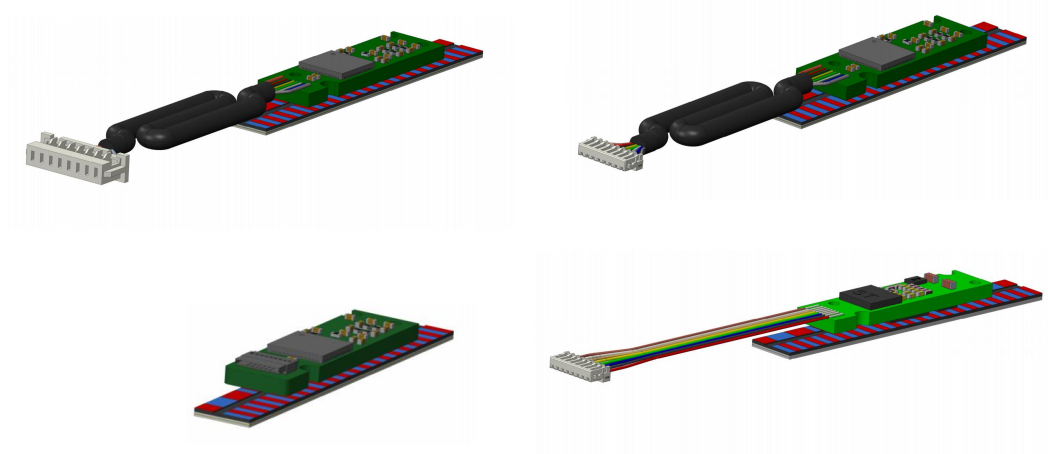
ELS-004X-R1

ELS-004Y-R1

ELS-004Z-R1

Version: 1.5.6

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1. Description

The ELS-004x-R1 series products are absolute linear position detection magnetic encoders. The sensors can be used in motion control systems to detect system displacement and speed.

The sensors use a non-contact detection method based on magnetic induction technology. The magnetic scale has two magnetic tracks (incremental and absolute magnetic tracks).

The sensors have built-in signal processing circuits, and the position information is output as a digital signal in SPI format.

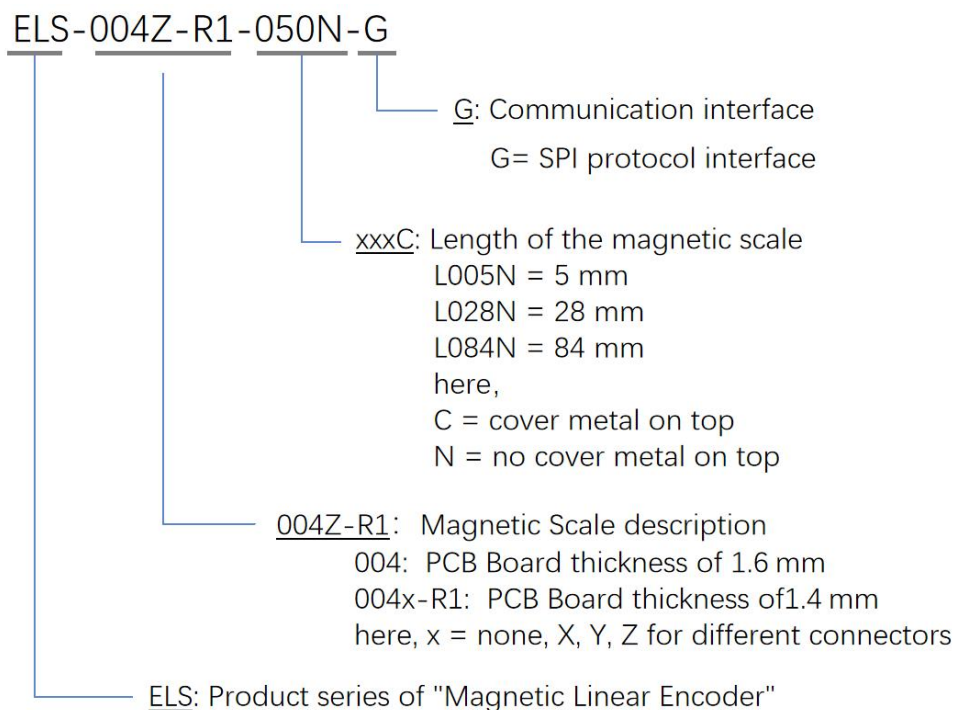
The ELS-004x-R1 series products have the following features:

- Magnetic scale width: 6 mm
- Magnetic pole length: 1.0 mm
- Absolute Position Detection
- Effective resolution: 0.4 μm
- Repeatability: $\pm 1.0 \mu\text{m}$
- Absolute accuracy: $\pm 30 \mu\text{m}$
- SPI interface

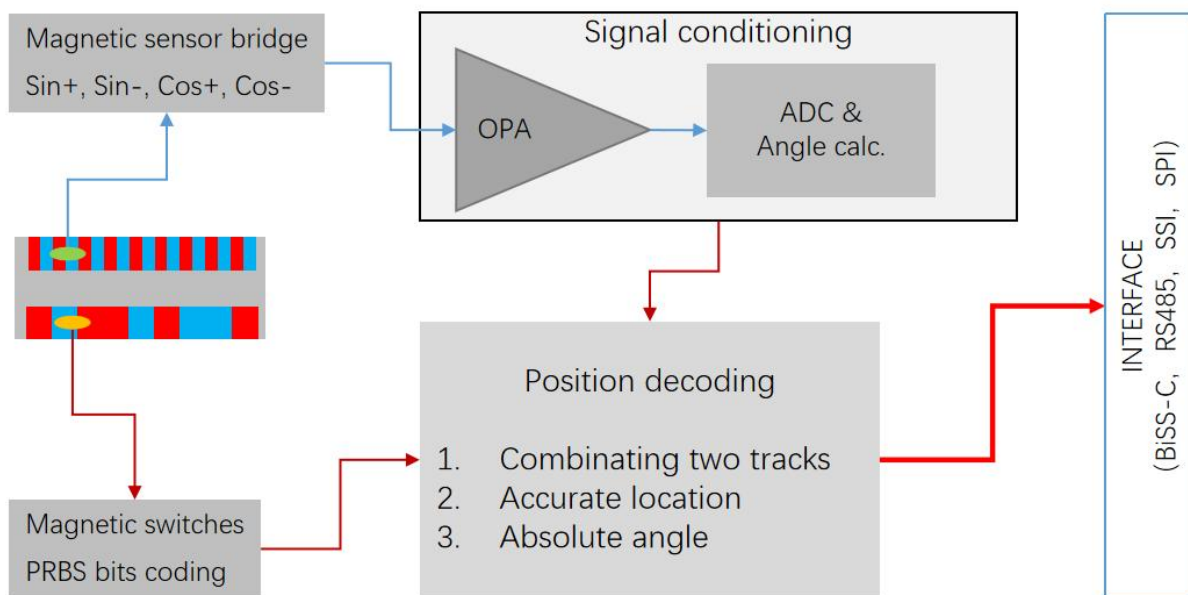
2. Typical Applications

- Small electric cylinder
- High precision gripper
- Precision travel detection

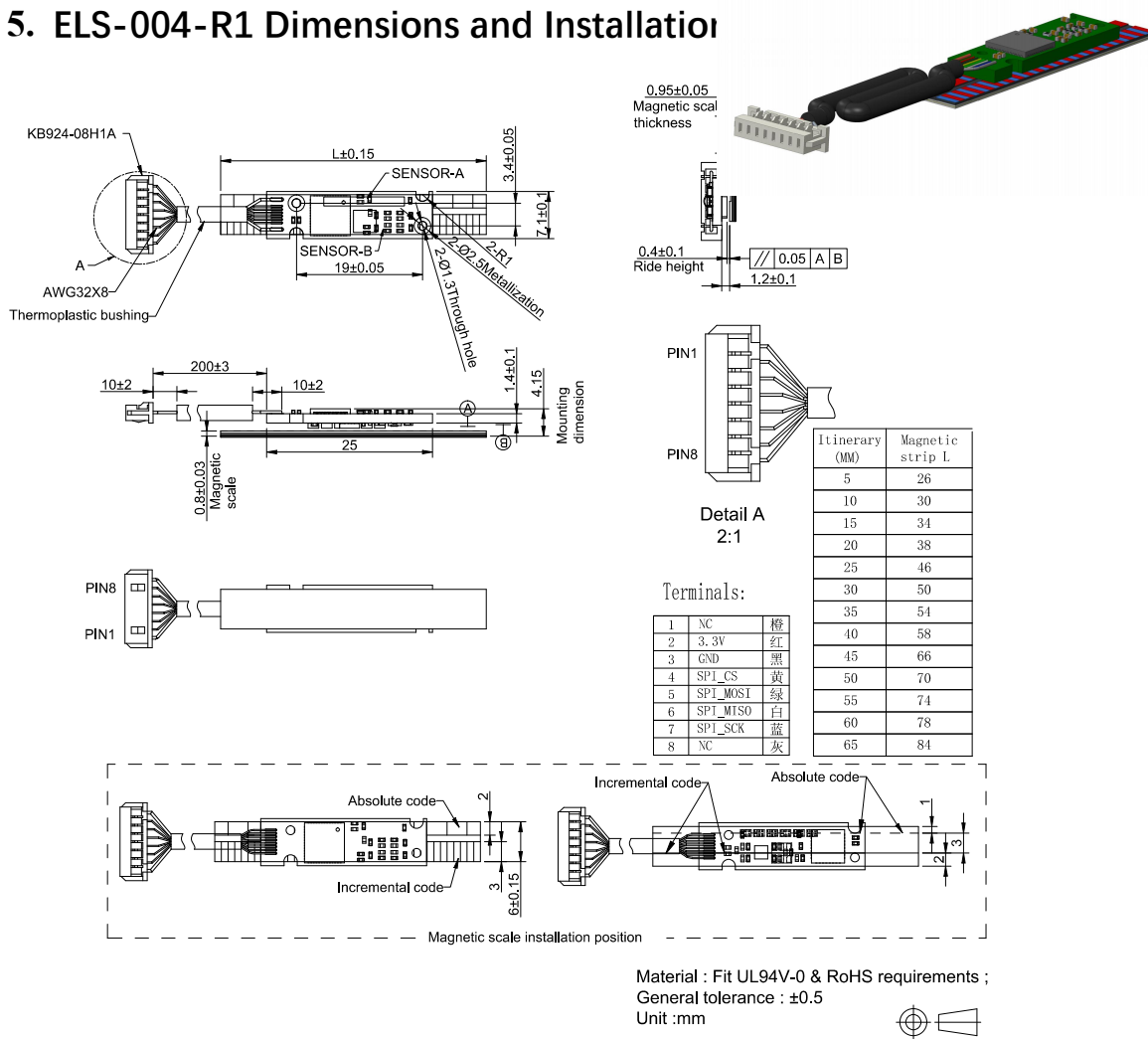
3. Product part number



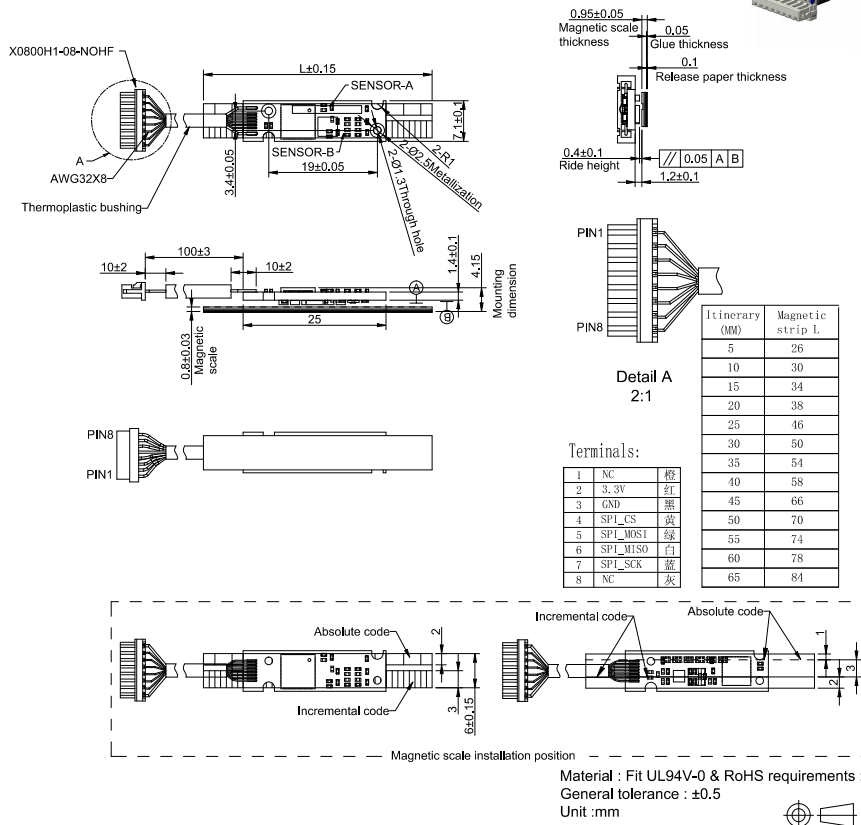
4. Product Schematic Diagram



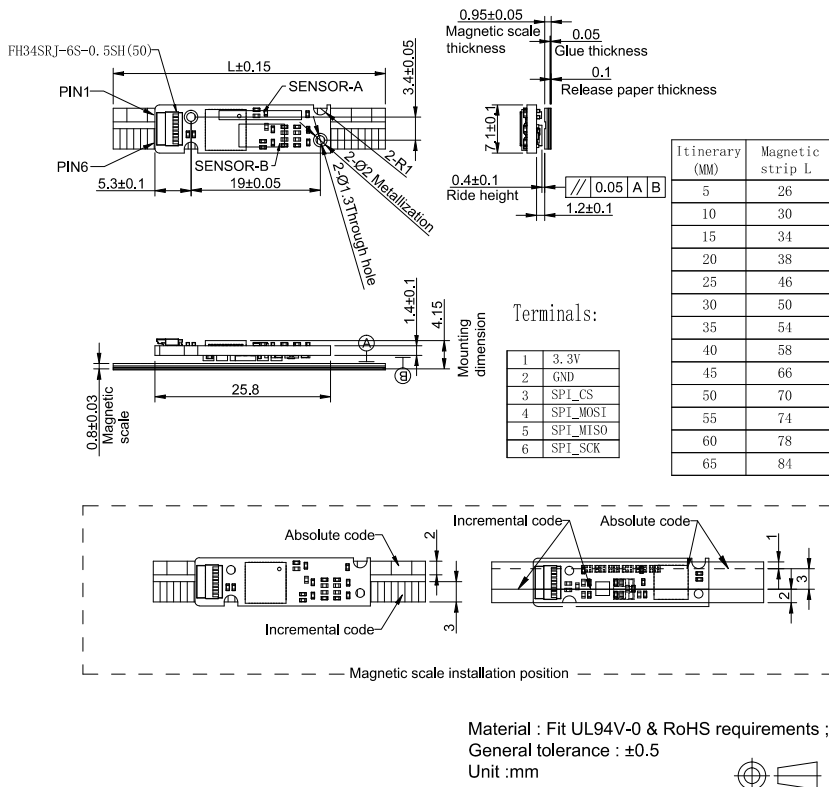
5. ELS-004-R1 Dimensions and Installation



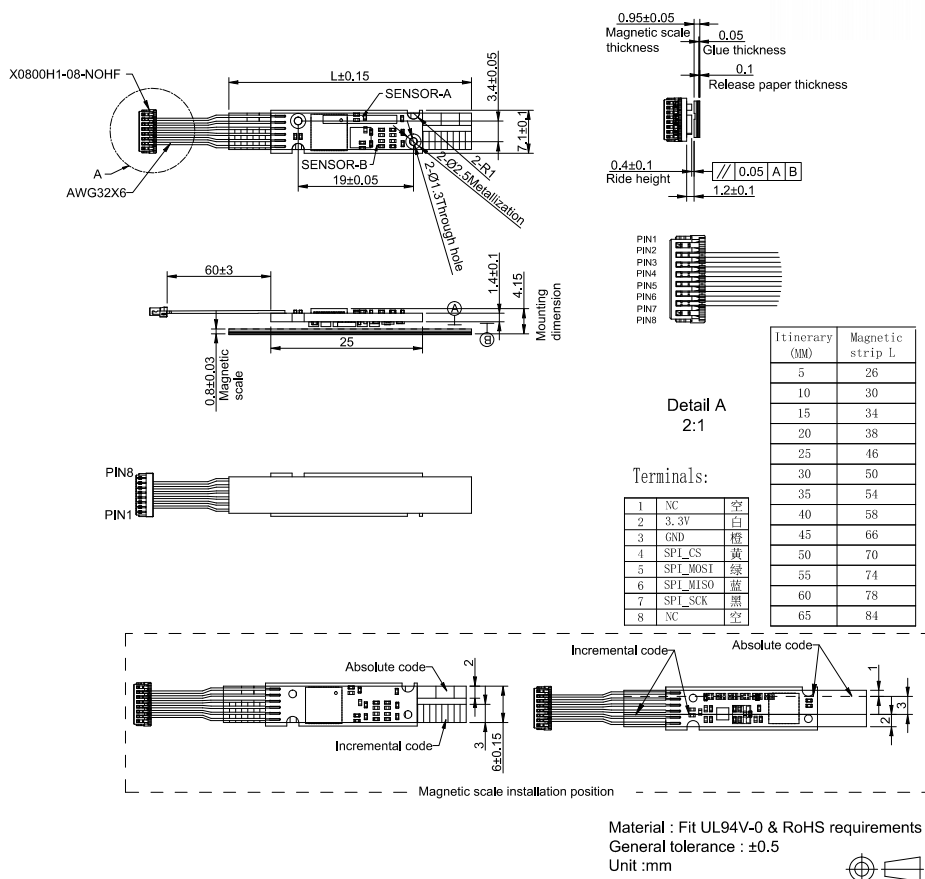
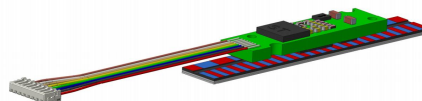
6. ELS-004X-R1 Dimensions and Installatio



7. ELS-004Y-R1 Dimensions and Installation



8. ELS-004Z-R1 Dimensions and Installation



9. Electrical characteristic

9.1 General parameter

Operating and storage temperature	–40 °C to +85 °C
Humanity	70%
External magnetic field (thickness direction)	±100 mT
External magnetic field (moving direction)	±5 mT
External magnetic field (width direction)	+5 mT (no negative field allowed)
Shock (dependent on installation)	100 g
Vibration (dependent on installation)	80 g

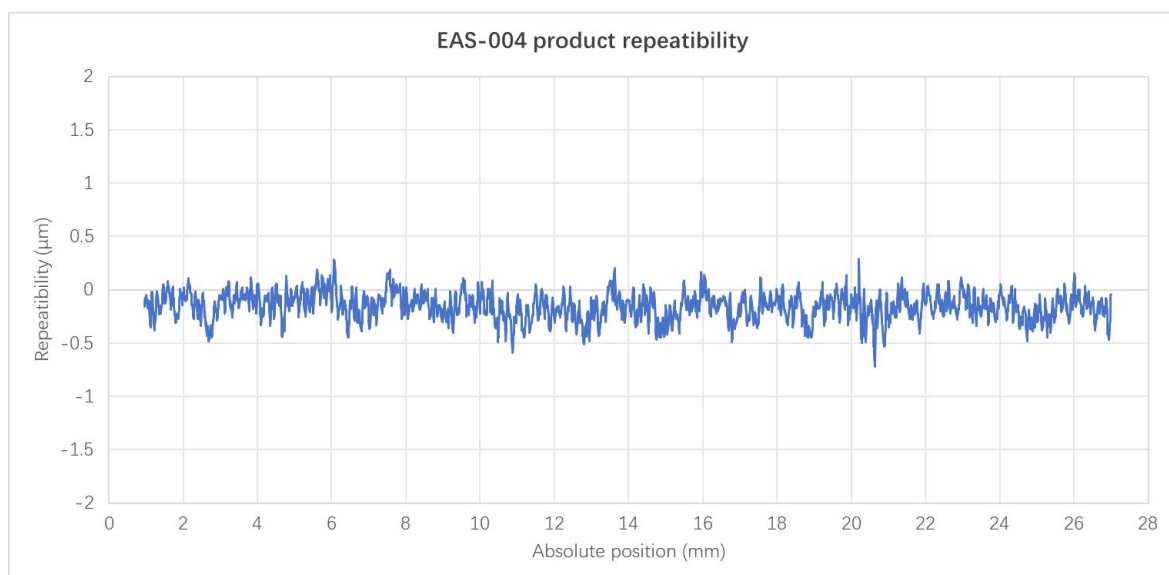
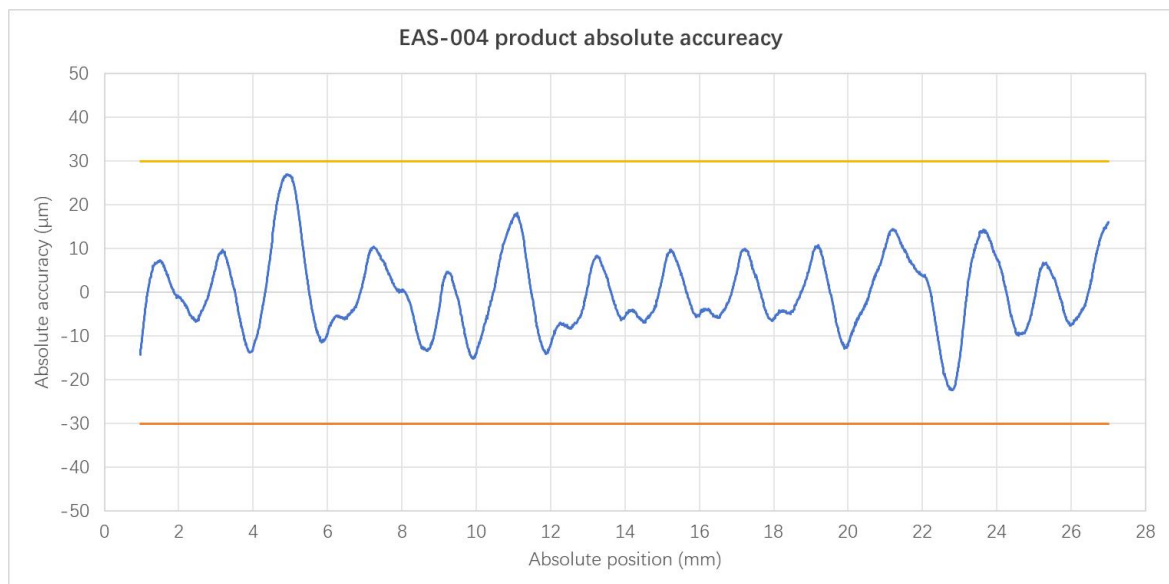
9.2 Environmental parameter

Supply voltage	3.3 V
Current	100 mA ~ 150 mA
Connector	6-pin
Start-up time	100 ms
ESD (HBM)	±2 kV

9.3 System parameter

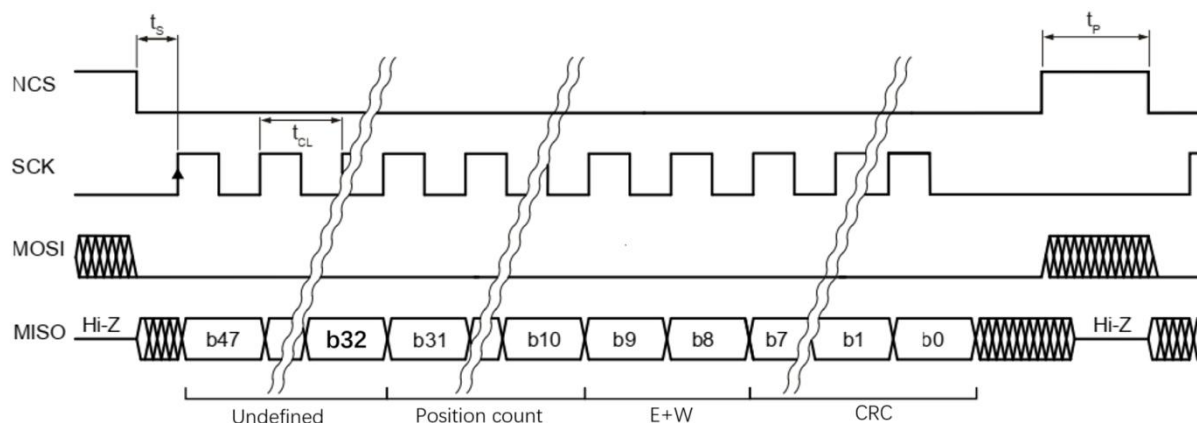
Parameter	Unit	Min	Typ	Max	Comment
Measuring range	mm			65	
Effective resolution	μm		0.4		
Repeatability	μm		± 1.0		Bidirectional 3 cycles
Absolute position error	μm			30	
Refresh rate	kHz		18		
Speed	mm/s			1000	

10. Accuracy measurement



11. SPI Communication

SPI timing diagram



① Using SPI MODE0 communication, the host computer sends a fixed 48 SCLKs;

② BIT47~BIT40: Reserved

③ BIT39~BIT32: Encoder err information

When err indication=1

1) err information =0x00: The encoder did not find a rough position when powered on, and it is necessary to check whether the PCBA magnetic induction area exceeds the magnetic stripe range;

2) err information =0x01: The vertical distance between the encoder sensing area and the magnetic stripe is too large;

3) err information =0x02: The vertical distance between the encoder sensing area and the magnetic stripe is too short;

④ BIT31~BIT10 Encoder data bits

⑤ BIT9: Encoder err indication : If the flag is equal to 1, it indicates that a fault has occurred, otherwise it has not occurred

⑥ BIT8: Reserved

⑦ BIT7~BIT0: CRC check bits, XOR value of the previous 5 bytes

Communication parameters

Parameter	Symbol	Min	Max
Clock period	t_{CL}	250 ns	
Clock frequency	f_{CL}		4 MHz
Time after NCS low to first SCK rising edge	t_s	10 μ s	
Pause time	t_p	5 μ s	

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