ESSTMAGS Product Datasheet

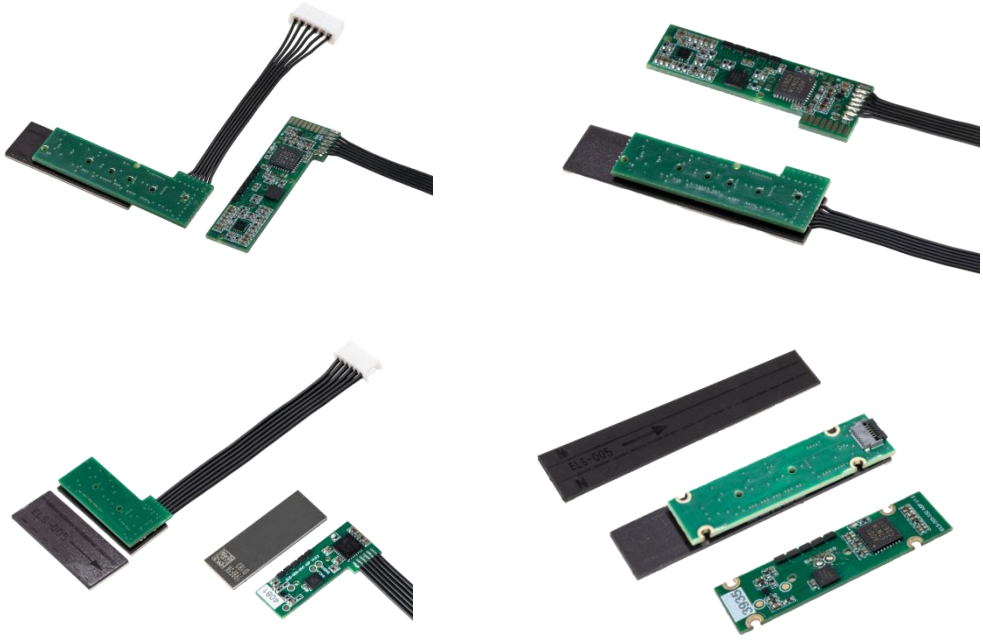
Magnetic linear position encoder

Product series: ELS-005

Product part number:
ELS-005-A-010N-G
ELS-005-B-030N-G
ELS-005-C-010N-G
ELS-005-D-030N-G

Version: 1.6.3

Date: 2026-11-20



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1. Description

The ELS-005 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.

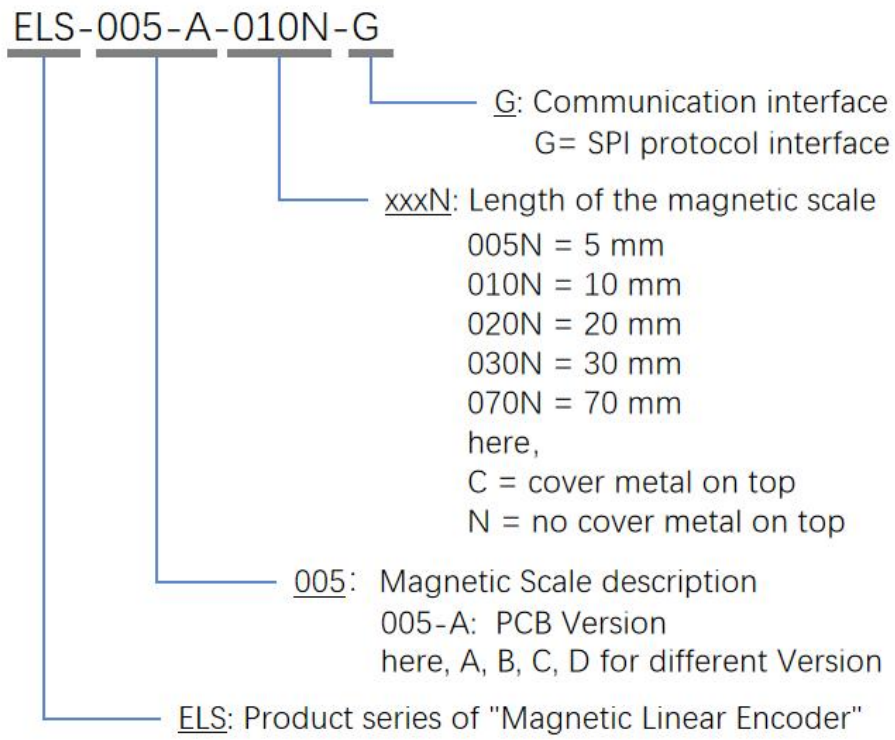
The ELS-005 series products have the following features:

- magnetic scale width: 10 mm
- Absolute Position Detection
- Magnetic pole width: 1.0 mm
- Effective resolution: 0.1 μm
- Repeatability: ±1.0 μm
- Absolute accuracy: ±30 μm
- SPI interface

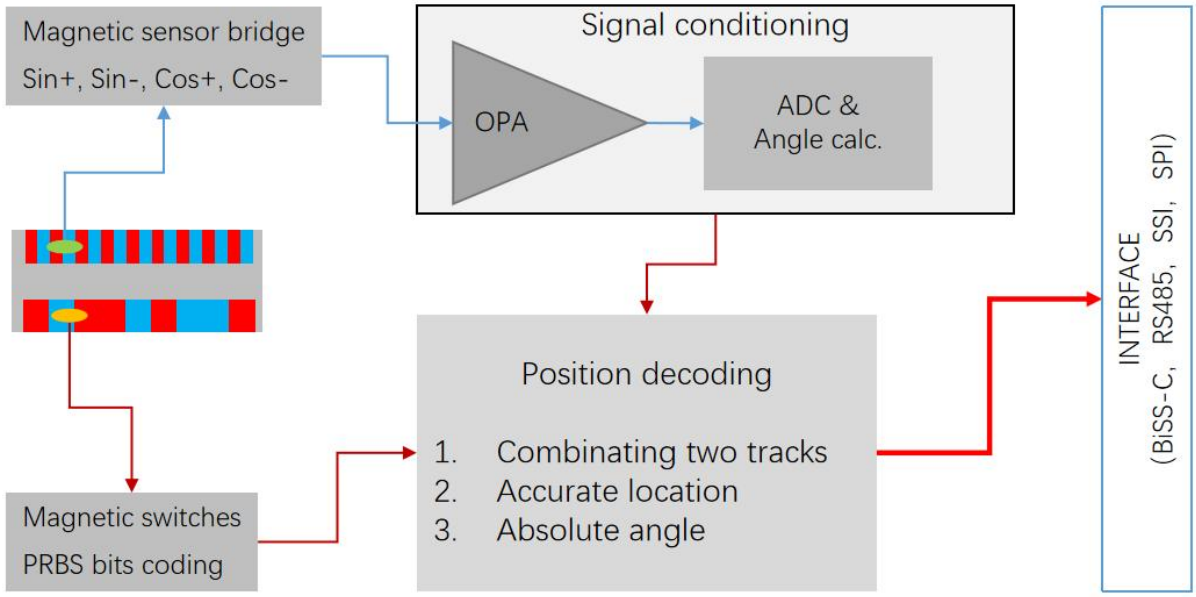
2. Typical Applications

- Small electric cylinder
- Linear actuator
- Precision stroke detection

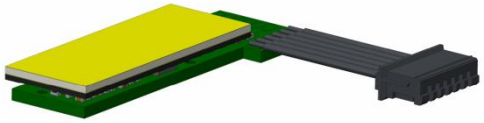
3. Product part number



4. Product Schematic Diagram



5. ELS-005-A Dimensions and Installation

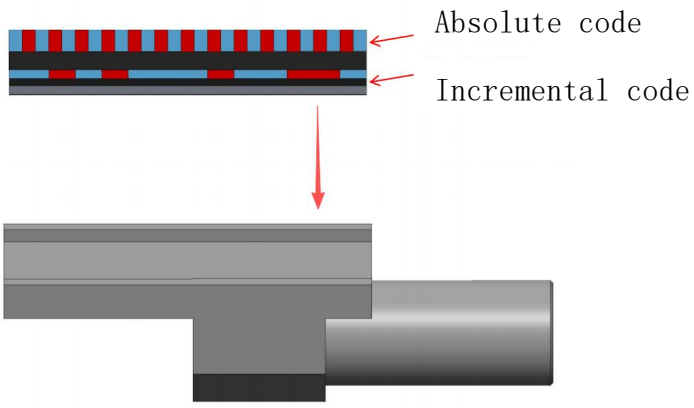


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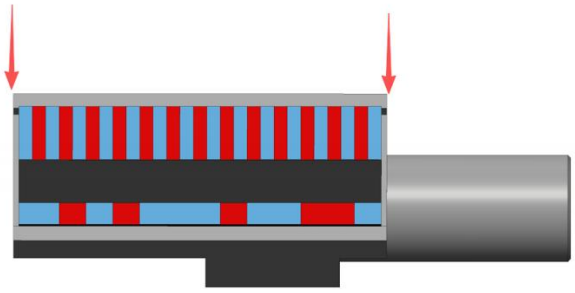
1	5V
2	GND
3	SPI_CS
4	SPI_MOSI
5	SPI_MISO
6	SPI_SCK

Material : Fit UL94V-0 & RoHS requirements ;
General tolerance : ±0.5
Unit :mm

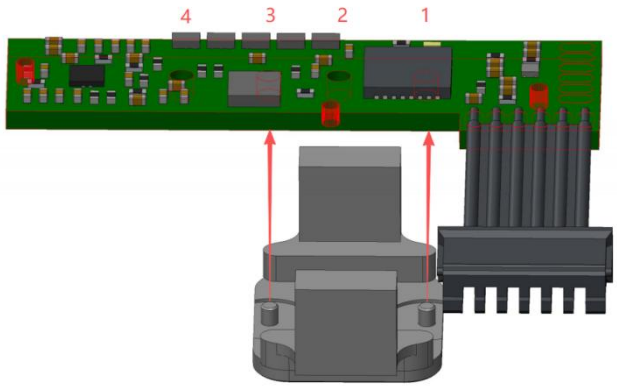
6. ELS-005-A Installation Instructions



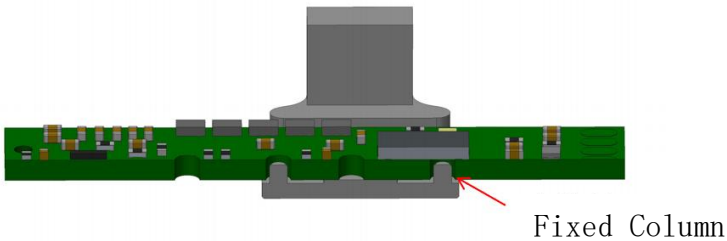
The magnetic scale shall be fixed onto the magnetic scale bracket with adhesive in accordance with the direction shown in the drawing.



The magnetic scale shall be positioned in the middle of the bracket, and shall not extend beyond the bracket at either end.

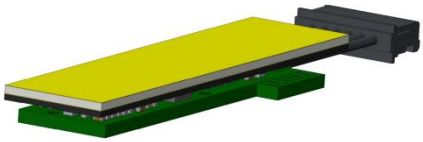


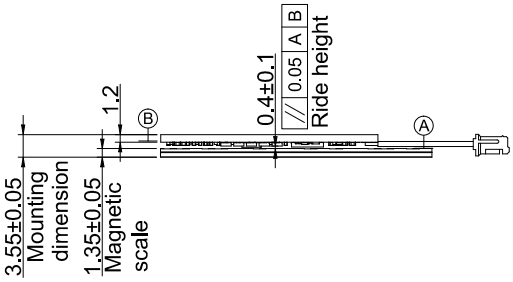
The positioning holes of the PCBA fixing plate correspond to positioning holes 1 and 3 of the PCBA.



The height of the positioning posts on the positioning bracket shall be less than 0.9 mm.

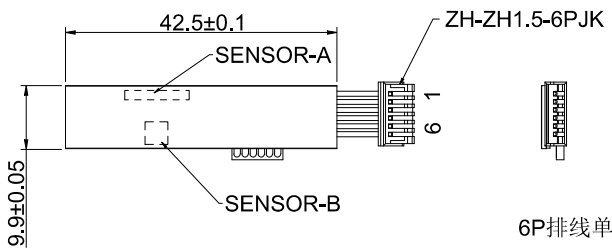
7. ELS-005-B Dimensions and Installation

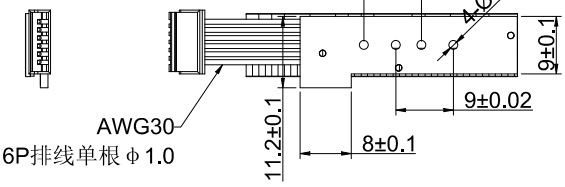


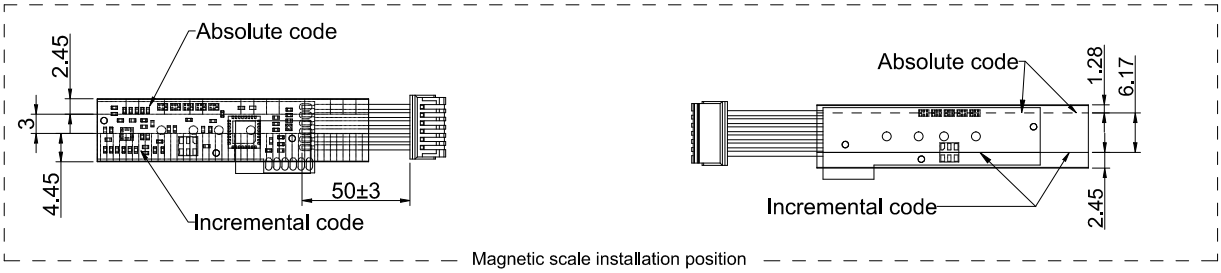


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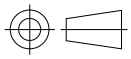
1	5V
2	GND
3	SPI_CS
4	SPI_MOSI
5	SPI_MISO
6	SPI_SCK



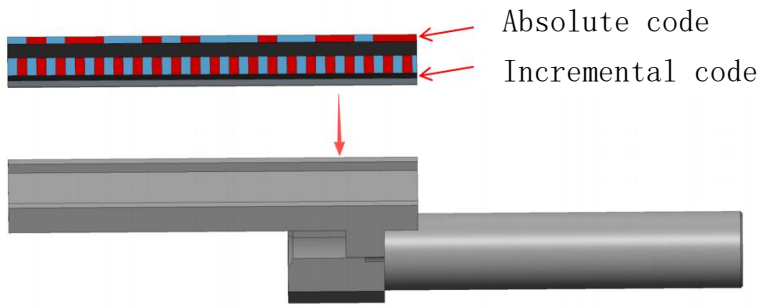




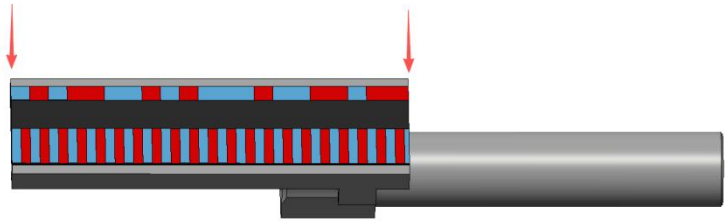
Material : Fit UL94V-0 & RoHS requirements ;
General tolerance : ±0.5
Unit :mm



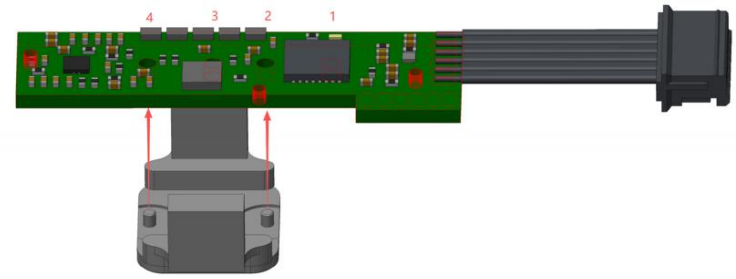
8. ELS-005-B Installation Instructions



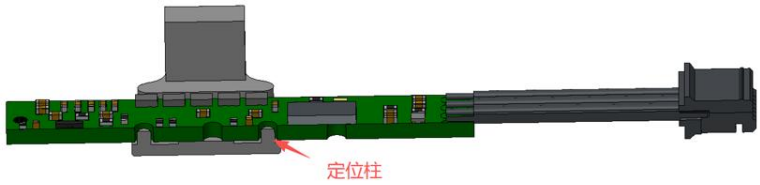
The incremental code magnetic scale shall be fixed the magnetic scale bracket with adhesive in accordance with the direction shown in the drawing.



The magnetic scale shall be positioned in the middle of the bracket, and shall not extend beyond the bracket at either end.

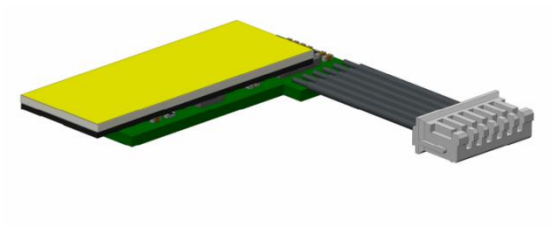


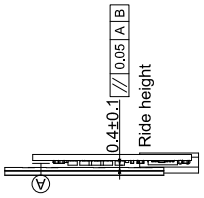
The positioning holes of the PCBA fixing plate correspond to positioning holes 1 and 3 of the PCBA.

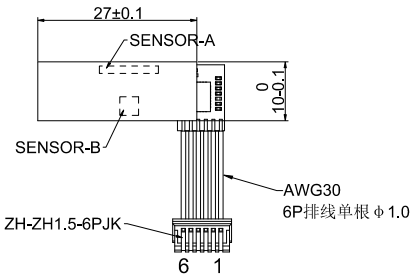


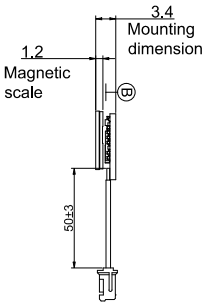
The height of the positioning posts on the positioning bracket shall be less than 0.9 mm.

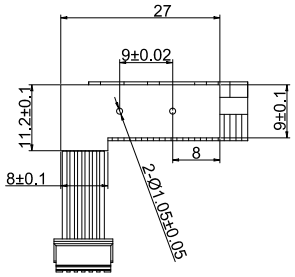
9. ELS-005-C PCB Dimension

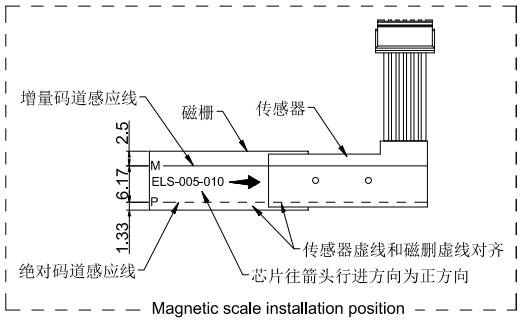








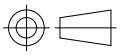


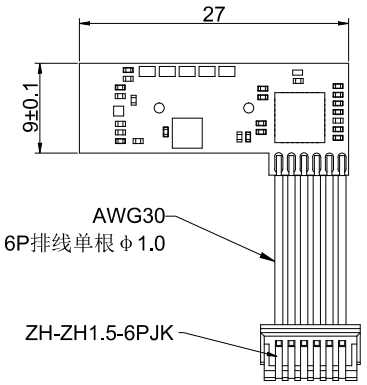


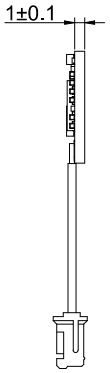
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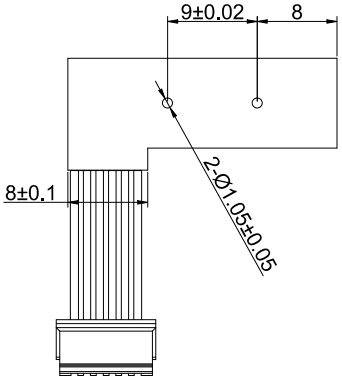
1	5V
2	GND
3	SPI_CS
4	SPI_MOSI
5	SPI_MISO
6	SPI_SCK

Material : Fit UL94V-0 & RoHS requirements ;
General tolerance : ±0.5
Unit :mm

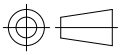




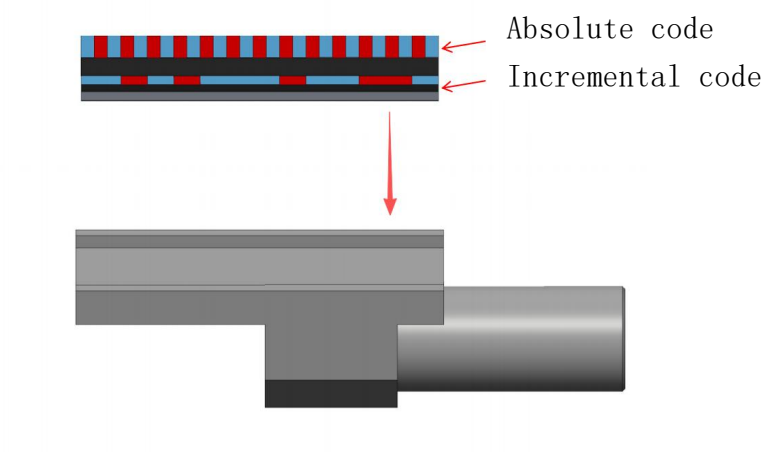




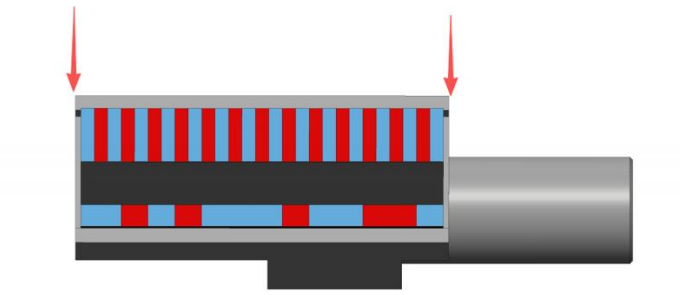
Material : Fit UL94V-0 & RoHS requirements ;
General tolerance : ±0.5
Unit :mm



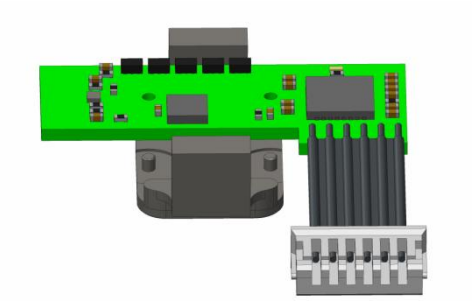
10. ELS-005-C Installation Instructions



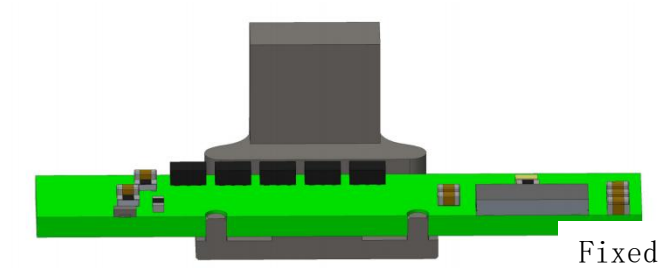
The magnetic scale shall be fixed onto the magnetic scale bracket with adhesive in accordance with the direction shown in the drawing.



The magnetic scale shall be positioned in the middle of the bracket, and shall not extend beyond the bracket at either end.

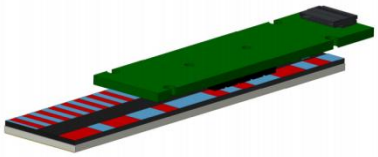


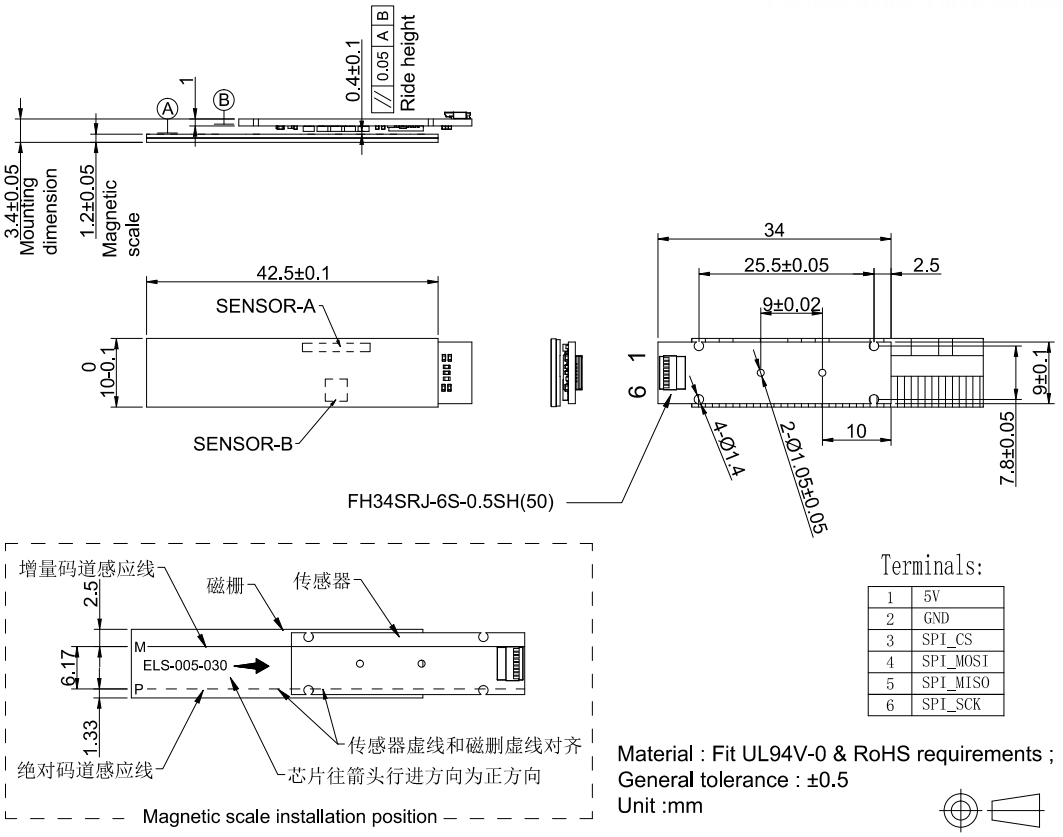
The positioning holes of the PCBA fixing plate correspond to positioning holes 1 and 3 of the PCBA.



The height of the positioning posts on the positioning bracket shall be less than 0.9 mm.

11. ELS-005-D PCB Dimension

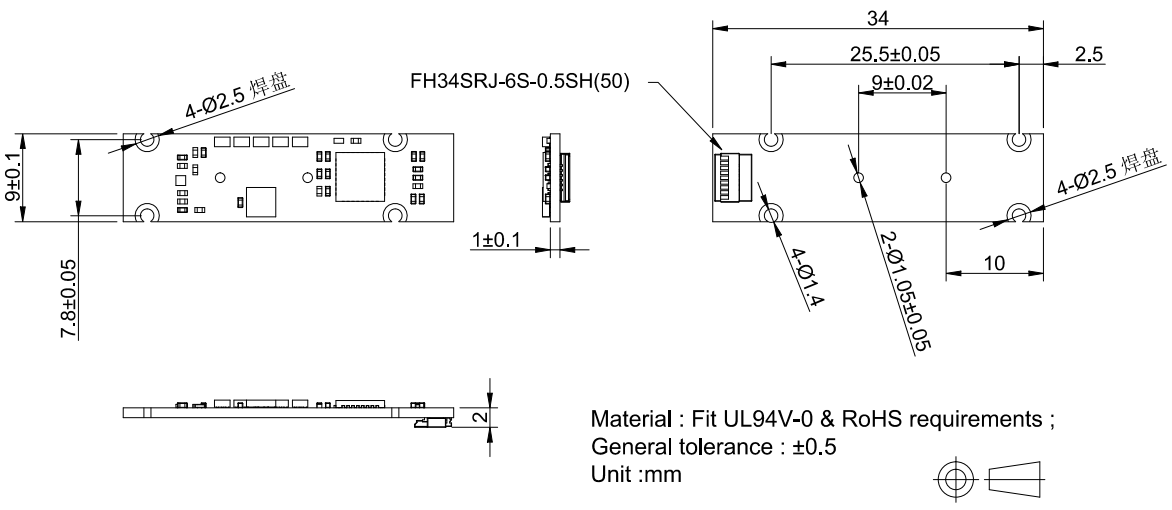




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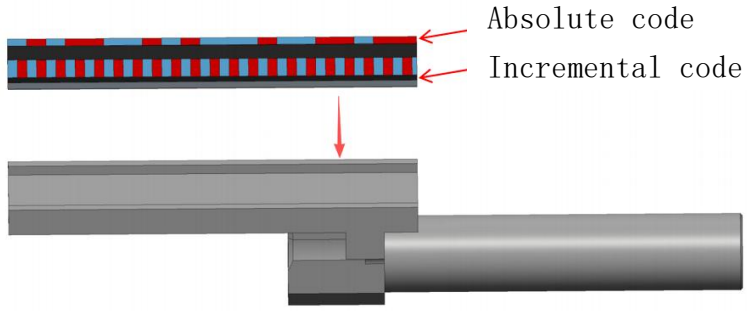
1	5V
2	GND
3	SPI_CS
4	SPI_MOSI
5	SPI_MISO
6	SPI_SCK

Material : Fit UL94V-0 & RoHS requirements ;
General tolerance : ±0.5
Unit :mm

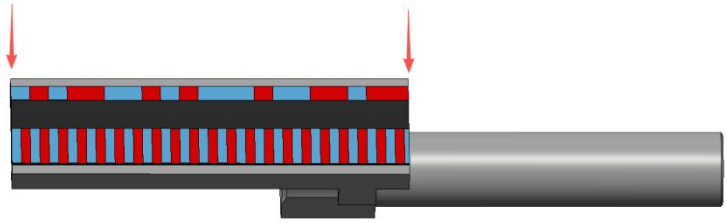


Material : Fit UL94V-0 & RoHS requirements ;
General tolerance : ±0.5
Unit :mm

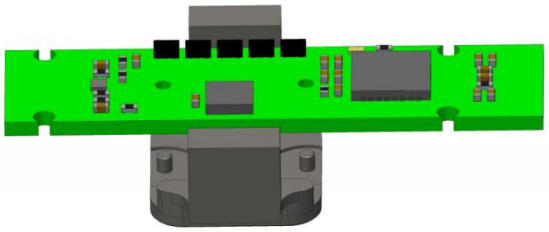
12. ELS-005-D Installation Instructions



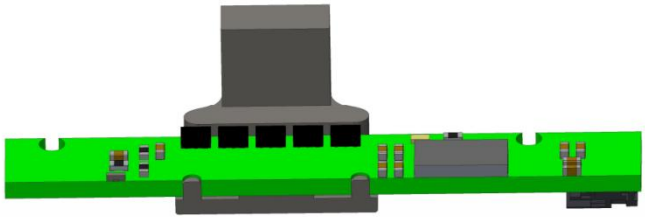
The magnetic scale shall be fixed onto the magnetic scale bracket with adhesive in accordance with the direction shown in the drawing.



The magnetic scale shall be positioned in the middle of the bracket, and shall not extend beyond the bracket at either end.



The positioning holes of the PCBA fixing plate correspond to positioning holes 1 and 3 of the PCBA.



The height of the positioning posts on the positioning bracket shall be less than 0.9 mm.

13. Electrical characteristic

13.1 Environmental parameter

Operating and storage temperature	–40 °C to +85 °C
Humidity	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)

13.2 General parameter

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

13.3 System parameter

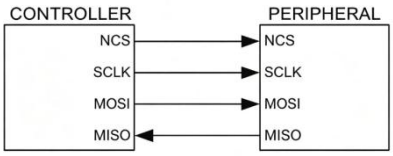
Parameter	Unit	Min	Typ	Max	Comment
Measuring range	mm			10	ELS-005-A-010N-G ELS-005-C-010N-G
				30	ELS-005-B-030N-G ELS-005-D-030N-G
Effective resolution	μm		0.1		2mm=65536
Repeatability	μm		±1.0		Bidirectional 3 cycles
Absolute position error	μm			30	
Refresh rate	kHz		18		
Speed	mm/s			1000	

14. SPI protocol interface

The Serial Peripheral Interface (SPI) bus is a four-wire bidirectional synchronous serial communication interface, typically used for short distance communication. It operates in full duplex mode, where master (controller) selects the slave with NCS line, generates clock signal on SCK line, sends command over MOSI line and receives data over MISO line.

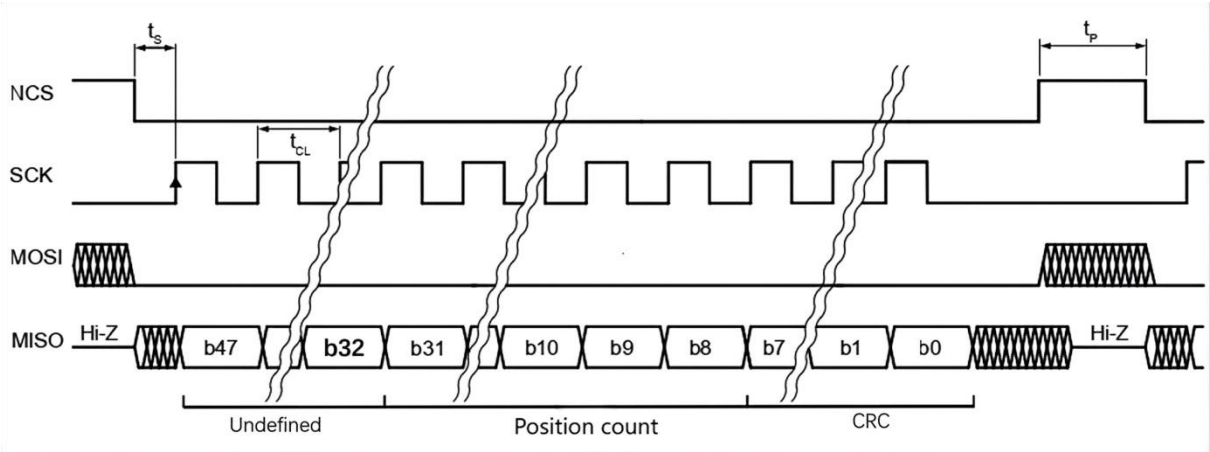
All data signals are 3.3 V LVTTL. Inputs are 5 V tolerant. The maximum current sourced or sunk from signal lines should not exceed 5 mA. Single-ended signals should be as short as possible, especially when high frequencies are used.

Signal termination: 100 Ω resistors are added in series with all SPI signals.



Signal	Description
NCS	Active low. NCS line is used for synchronization between master and slave devices. During communication it must be held low. Idle is high. When NCS is high, MISO line is in high-Z mode. This allows connection of multiple slaves in paralel, sharing all lines except NCS. Encoder position data is latched on falling edge of NCS signal.
SCK	Serial clock. Shifts out the data on rising edge.
MOSI	Master output Slave input. Command from the controller to encoder. If only position data is requested, this signal should always be zero. It can be tied to GND.
MISO	Master input Slave output. Data is output on rising edge on SCK after NCS low. When NCS is high, MISO line is in high-Z mode.

14.1 SPI timing diagram



The controller starts the communication by setting the NCS signal low. At the same time the encoder position is latched. A delay of tS is required to allow the encoder to prepare the data which is then shifted to MISO output on rising edges of clock signal SCK.

Encoder Position and General Status data is transmitted, followed by CRC (inverted) of the entire data packet.

14.2 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 μs	
Pause time	t_p	5 μs	

14.3 Encoder position data structure

bits	description
b47 : b40	Undefined
b39 : b32	bit47-bit40: Reserved bit39-bit32: error When err indication=1 1)bit32=1: The vertical distance between the encoder sensing area and the magnetic stripe is too large; 2)bit33=1: The vertical distance between the encoder sensing area and the magnetic stripe is too short; 3)bit34=1: PRBS error 4)bit35=1: ia_th error 5)Bit36=1: PGA error
b31 : b8	Encoder position + zero padding bits – Left aligned, MSB first.
b7 : b0	CRC: Checksum = XOR of all preceding 5 bytes

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