ESSTMAGS Product Datasheet

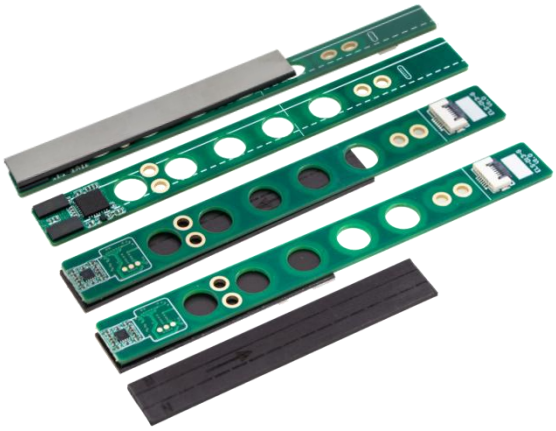
Magnetic linear position encoder

Product series: ELS-013

Product part number: ELS-013-R1-G

Version: 1.0.3

Date: 2026-11-25



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1. Description

The ELS-013 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.

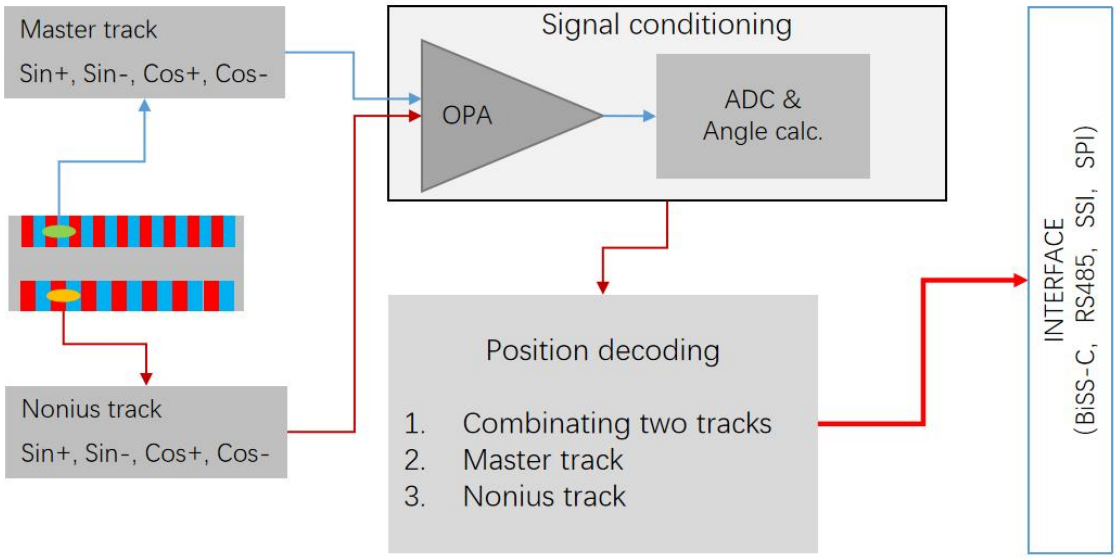
The ELS-013 series products have the following features:

- magnetic scale width: 40 mm , 60 mm
- Absolute Position Detection
- Effective resolution: 0.2 μm
- Repeatability: ±1.5 μm
- Absolute accuracy: ±30 μm
- SPI interface

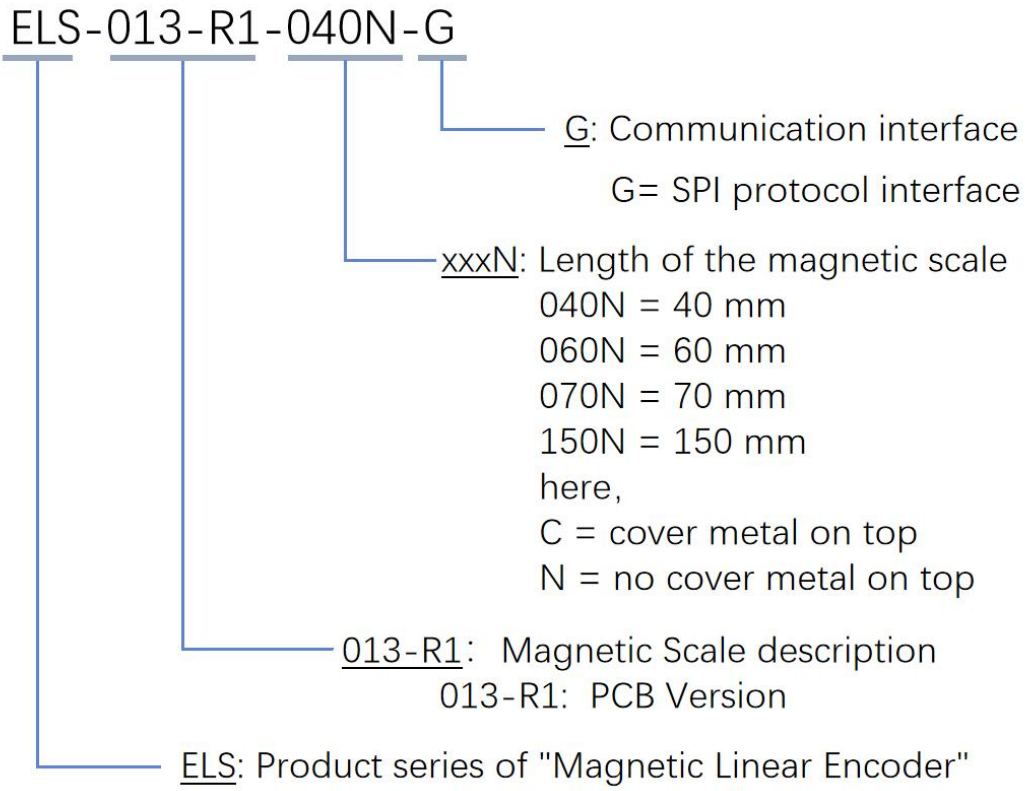
2. Typical Applications

- Small electric cylinder
- Linear actuator
- Precision stroke detection

3. Product Schematic Diagram

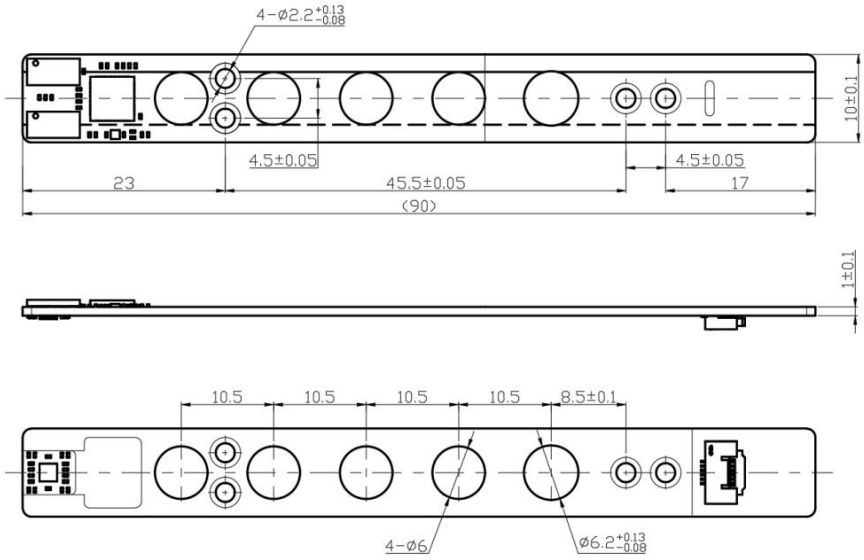


4. Product part number

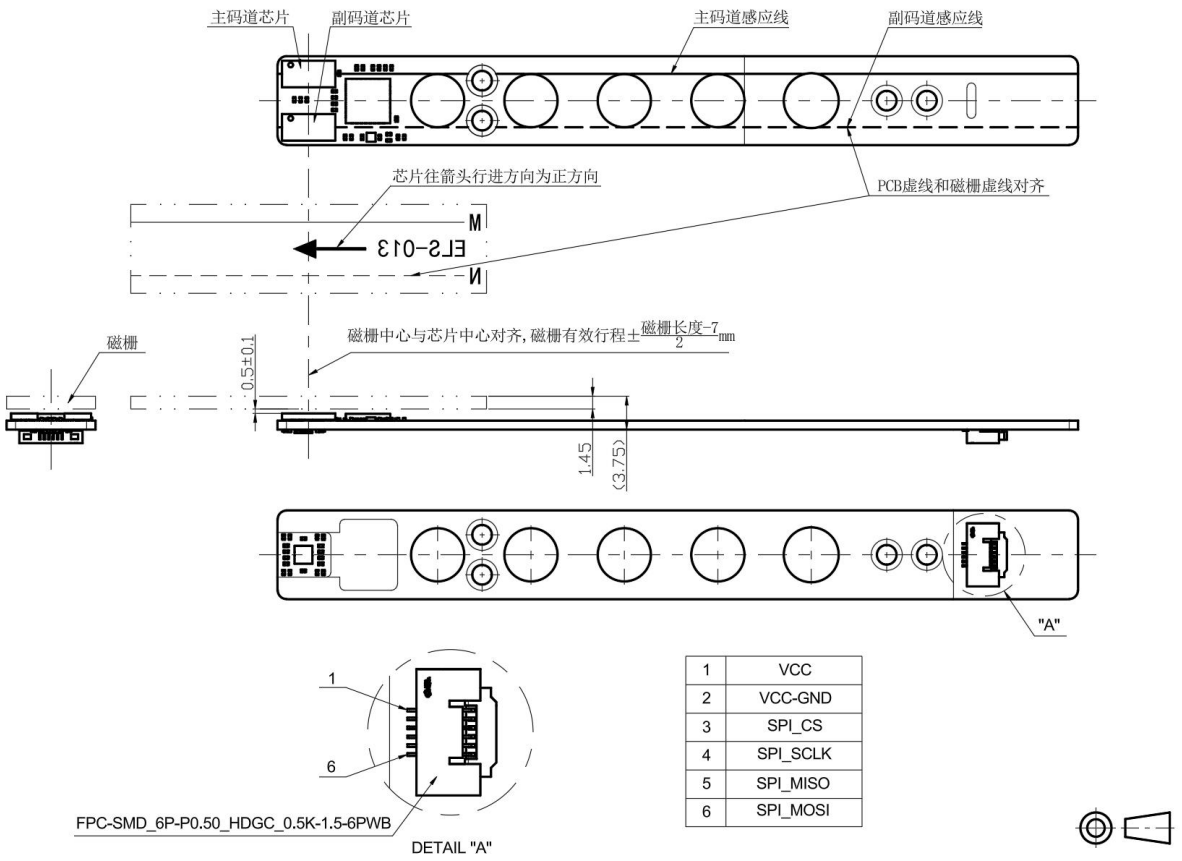


5. ELS-013-R1-G Dimensions

ELS-013-R1-G



6. ELS-013-R1-G Assembly Drawing

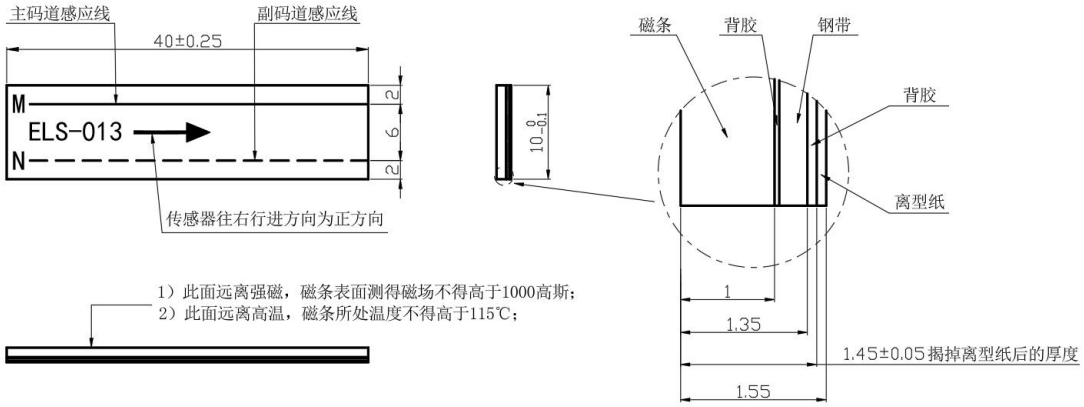


1	VCC
2	VCC-GND
3	SPI_CS
4	SPI_SCLK
5	SPI_MISO
6	SPI_MOSI

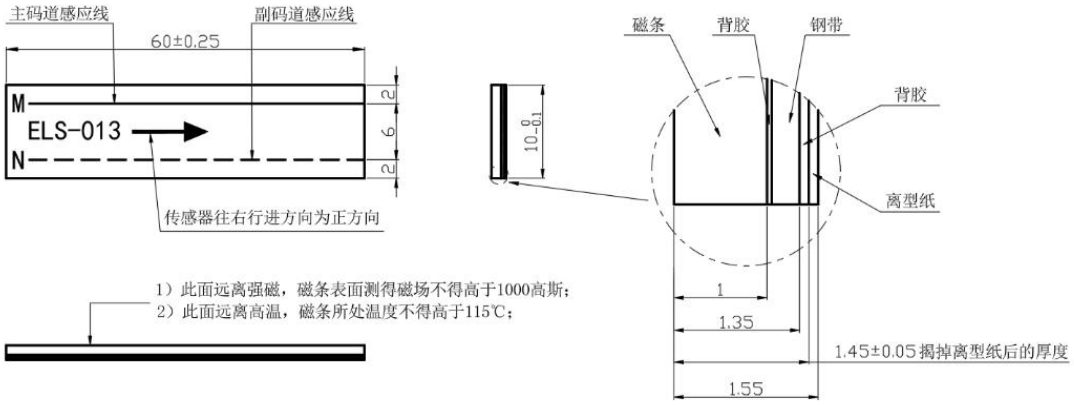
7. Magnetic scale dimensions

ELS-013-R1-040N-G	40mm，pitch=1.5mm，Corresponding TMR Chip: A-1500
ELS-013-R1-060N-G	60mm，pitch=1.5mm，Corresponding TMR Chip: A-1500

Magnetic scale for ELS-013-R1-040N-G



Magnetic scale for ELS-013-R1-060N-G



8. Electrical characteristic

8.1 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)

8.2 General parameter

Supply voltage	4.75 V~5.25 V
SPI voltage	converted from 5V to 3.3V
Current	100 mA ~ 150 mA（Supply voltage：5V）
Connector	6-pin
Start-up time	100 ms
ESD (HBM)	±2 kV

8.3 System parameter

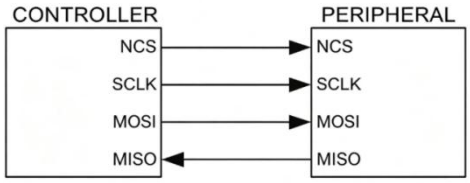
Parameter	Unit	Min	Typ	Max	Comment
Measuring range	mm			40	ELS-013-R1-040N-G
				60	ELS-013-R1-060N-G
effective resolution	μm		0.2		
Repeatability	μm		±1.5		Bidirectional 3 cycles
Absolute position error	μm			30	
Refresh rate	kHz		18		
Speed	mm/s			1000	

9. 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.

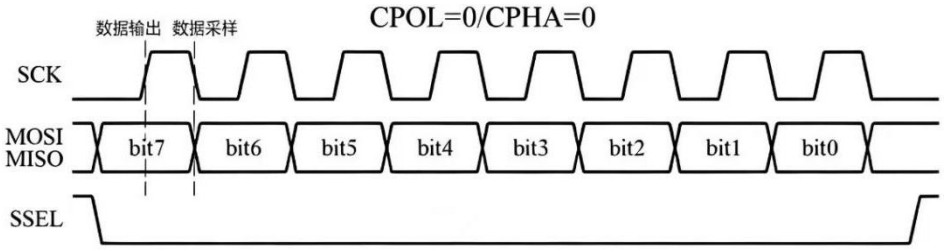
All data signals are 3.3 V LVTTL. Inputs are 5 V tolerant. The maximum current sourced or sunk from signal lines should not exceed 5 mA. Single-ended signals should be as short as possible, especially when high frequencies are used.

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.
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.

9.1 SPI timing diagram



1、Adopt SPI MODE 0 communication mode; the host sends out 48 SCLK pulses fixedly.

2、Checksum: XOR of all preceding bytes.

9.2 Encoder position data structure

bits	description
b47 : b32	Undefined
b31 : b8	Encoder position
b7 : b0	CRC , Checksum = XOR of all preceding bytes

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