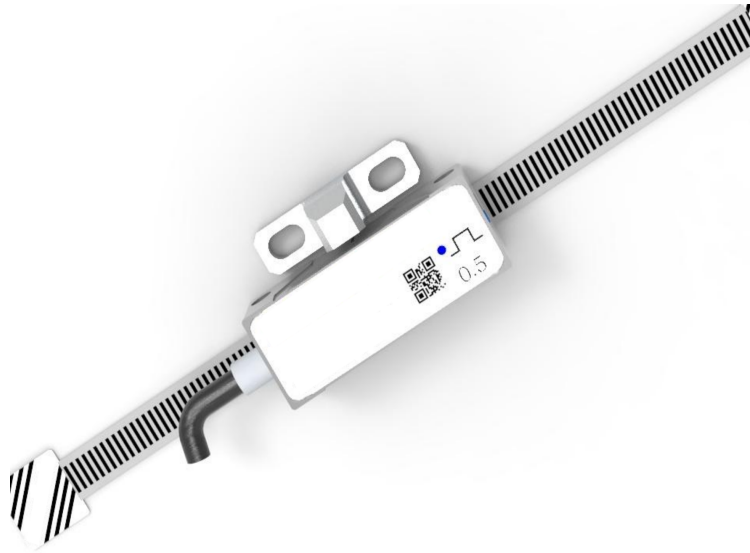


Incremental optical encoder

LS40 readhead + stainless-steel tape scale



Designed for precision position feedback

The LS40 series is a compact optical encoder system for high-dynamic-performance precision motion systems. Single-field scanning and low-latency interpolation provide responsive position feedback. Its ultra-thin LS-series stainless-steel scale has durable graduations and a solvent-cleanable, uncoated surface. When the scale is thermally matched to its mounting substrate, separate thermal compensation is not required.

Key features

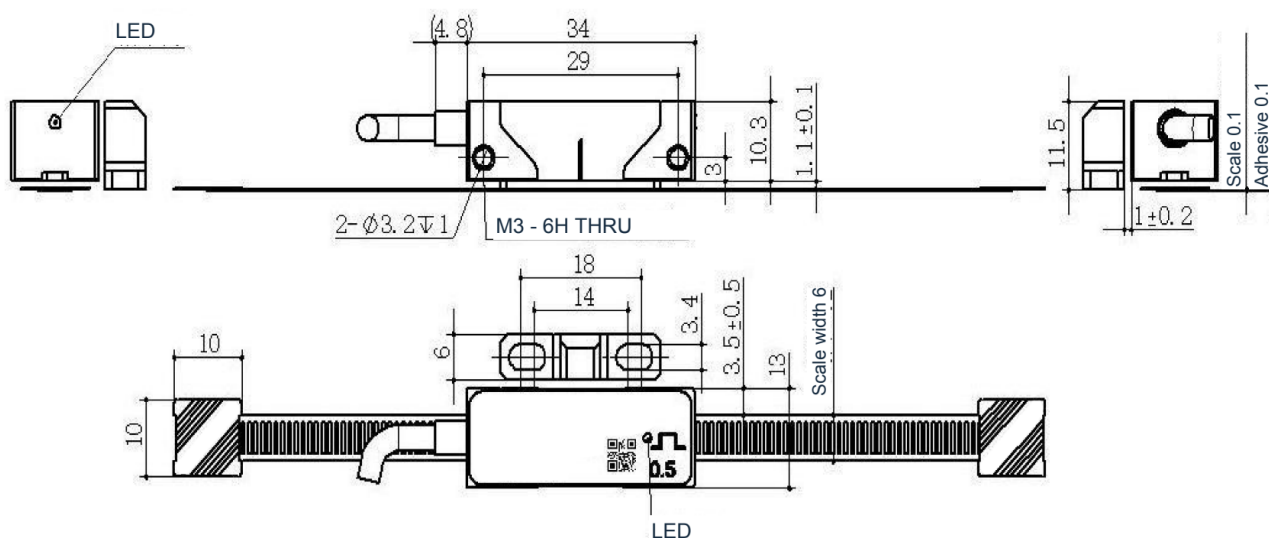
- Small, compact and lightweight readhead.
- Single-field scanning, low sub-divisional error and low-latency interpolation.
- Selectable reference-mark position with flashing indication; automatic gain / balance control.
- Highly flexible cable and a status LED visible from two directions.
- Optically coated lenses for improved signal-to-noise performance.
- Uncoated scale surface for resistance to scratching and contamination.
- 40 µm-pitch stainless-steel tape scale.

English edition based on source manual V1.3.

Technical specifications

Parameter	Specification
Readhead dimensions (L x W x H)	34 x 13 x 10.3 mm
Scale pitch	40 µm
Mass	Readhead: 10 g; cable: 18 g/m
Supply	5 V DC ±10%, 300 mA with 120-ohm loads on A, B and Z
Output	Differential TTL; optional reference-mark signal
Connector options	D-sub 9-pin male; M or T pin assignment
Scale accuracy grade	±10 µm/m
Scale dimensions	6 mm wide; 0.2 mm thick, including adhesive
Resolution	1 µm, 0.5 µm
Sub-divisional error (SDE)	<80 nm
Maximum speed	2.5 m/s
Reference mark (optional)	Magnetic sensor on the side of the readhead
Unidirectional reference repeatability	1 LSB at speeds ≤20 mm/s
Cable outside diameter	3.4 mm ±0.2 mm
Cable flex life	20 million cycles with a bend radius greater than 25 mm
Operating temperature	0 °C to +70 °C
Storage temperature	-20 °C to +70 °C
Vibration	55-2000 Hz; maximum 100 m/s², three axes
Ingress protection	IP40

Installation dimensions & guidance



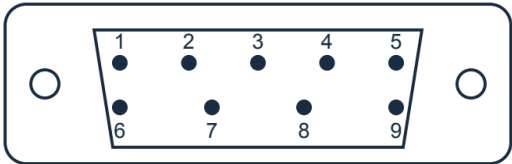
All dimensions are in millimetres. Original dimension lines and numerical values are retained.

Mounting: minimum thread engagement 5 mm; tightening torque 0.25-0.4 N·m.

Installation precautions

1. Use the dedicated scale installation tool. Do not apply the scale by hand.
2. Allow at least 24 hours after bonding before accuracy calibration so that mounting stresses can settle. Allow longer at lower temperatures.
3. Reliably earth and shield the machine structure, such as the linear motor or machine bed, to prevent electrical interference. Route power cables separately from signal cables wherever possible.
4. Provide 5 V DC $\pm 10\%$ at the readhead supply terminals, with a supply capacity of at least 300 mA.
5. Keep the scale clean. Contamination can cause output noise or signal loss. Clean with lint-free wipes and ethanol or isopropyl alcohol.
6. Secure the readhead with at least 5 mm thread engagement and a tightening torque of 0.25-0.4 N·m. Incorrect fastening can damage the readhead or leave it insecure.

Connector pin assignments



D-SUB 9

Pin numbering follows the original connector drawing. Select the correct M or T connector version before wiring.

D-sub 9-pin - M pin assignment

Pin	Function	Pin	Function
1	0 V	6	A-
2	A+	7	Z-
3	Z+	8	B-
4	B+	9	Not connected
5	+5 V $\pm$ 10%	Shell	Outer shield

D-sub 9-pin - T pin assignment

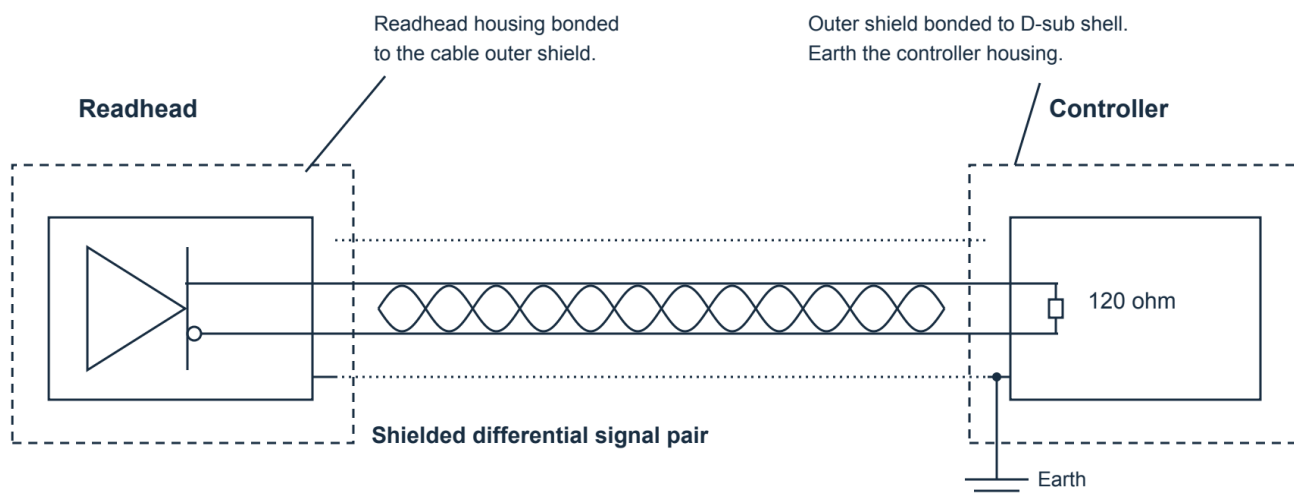
Pin	Function	Pin	Function
1	A-	6	A+
2	0 V	7	+5 V $\pm$ 10%
3	B-	8	B+
4	Not connected	9	Z+
5	Z-	Shell	Outer shield

Important: M and T versions have different pin assignments. Do not interchange them without checking every connection.

A+, A-, B+, B-, Z+ and Z- are differential TTL signal connections. The connector shell is connected to the cable outer shield.

Electrical connection & diagnostics

Differential TTL electrical connection



The readhead housing is bonded to the cable outer shield. The outer shield is bonded to the D-sub connector shell; connect the controller housing to protective earth as shown. The differential receiver termination shown is 120 ohm.

Readhead LED - signal strength

LED state	Indication / action
Steady red	Signal <30%: the readhead cannot operate normally. Clean the scale or realign the readhead.
Steady yellow	Signal <50%: operation is possible. Clean the scale or realign the readhead.
Steady green	Signal <80%: operation is possible.
Steady blue	Signal $\geq 80\%$: normal operation.
LED off	Reference-mark crossing.

The threshold wording follows the original manual. The red, yellow and green entries state upper limits only; separate lower limits are not specified.

Ordering information

LS40 readhead

LS-	D40	M	10
------------	------------	----------	-----------

Code field	Selection
Series	LS - LS40 readhead series
Output / interpolation	D40: 40x interpolation, 1 µm resolution D80: 80x interpolation, 0.5 µm resolution
Connector pin assignment	M: D-sub 9-pin, M pin assignment T: D-sub 9-pin, T pin assignment
Cable length	10: 1 m (standard) 30: 3 m Whole-metre custom lengths only; maximum 3 m

Example shown: LS-D40M10. Select the required 9-pin assignment and cable length when ordering.

LS40 tape scale

LS-	40000
------------	--------------

Item	Ordering detail
Format	LS- followed by the scale length in millimetres
Length range	Minimum 50 mm (5 cm); maximum order length 40 m
Example	LS-40000: 40,000 mm (40 m)
Scale installation tool	LS-400-IT6

Specify the complete readhead code, connector pin assignment, cable length and scale length when placing an order.