Incremental optical encoder

HD20 readhead + stainless-steel tape scale

20 μm scale pitch
Differential TTL output
Compact, non-contact measurement



Designed for precision position feedback

The HD20 series combines a compact readhead with an ultra-thin stainless-steel tape scale for incremental linear position measurement. The corrosion- and wear-resistant scale features durable graduations and an uncoated surface that can be cleaned with a suitable solvent. When the scale is thermally matched to its mounting substrate, separate thermal compensation is not required.

Key features

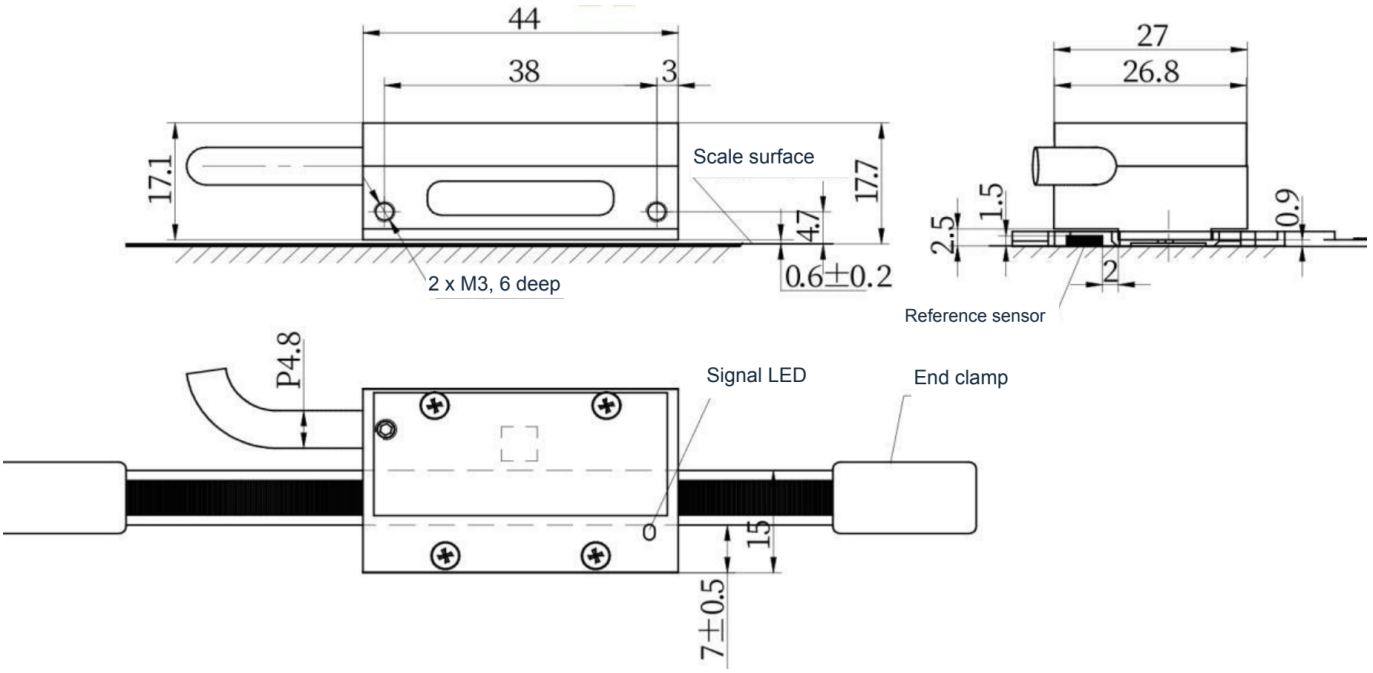
- Compact, lightweight readhead with a highly flexible cable.
- Single-field scanning with low sub-divisional error.
- Selectable reference-mark position with flashing LED indication.
- Automatic gain and balance control.
- Status indicator visible from two directions.
- Optically coated lenses with a large depth of field and improved signal-to-noise ratio.
- Designed for 20 μm-pitch stainless-steel tape scale.

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Technical specifications

Parameter	Specification
Readhead dimensions (L x W x H)	44 x 27 x 17.1 mm
Scale pitch	20 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 15-pin (R); D-sub 9-pin (T)
Scale accuracy grade	±5 µm/m
Scale dimensions	8 mm wide; 0.2 mm thick, including adhesive
Resolution	1 µm, 0.5 µm, 0.1 µm
Sub-divisional error (SDE)	<40 nm
Maximum speed	2.5 m/s; depends on resolution and the counter minimum clock frequency
Reference mark (optional)	Magnetic sensor on the side of the readhead
Unidirectional reference repeatability	1 LSB at speeds ≤20 mm/s
Cable outside diameter	4.7 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.

The source drawing specifies 2 x M3 holes, 6 mm deep. A numerical tightening torque is not given; confirm the torque before installation.

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.

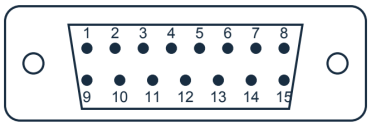
3. Reliably earth and shield the machine structure, such as the linear motor or machine bed, to prevent electrical interference. Route power cables separately from signal cables wherever possible.

4. Provide 5 V DC ±10% at the readhead supply terminals, with a supply capacity of at least 300 mA.

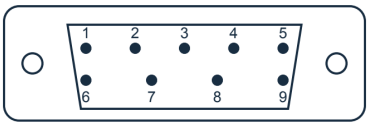
5. Keep the scale clean. Contamination can cause output noise or signal loss. Clean with lint-free wipes and ethanol or isopropyl alcohol.

6. Use the mounting screw engagement and tightening torque specified for the readhead. Incorrect fastening can damage the readhead or leave it insecure.

Connector pin assignments



D-SUB 15



D-SUB 9

Pin numbering follows the original connector drawings. A±, B± and Z± are differential TTL signals.

D-sub 15-pin - R pin assignment

Pin	Function	Pin	Function
1	Not connected	9	Negative limit
2	0 V	10	Positive limit
3	Alarm	11	Alarm+
4	Z-	12	Z+
5	B-	13	B+
6	A-	14	A+
7	+5 V ±10%	15	Not connected
8	Not connected	Shell	Outer shield

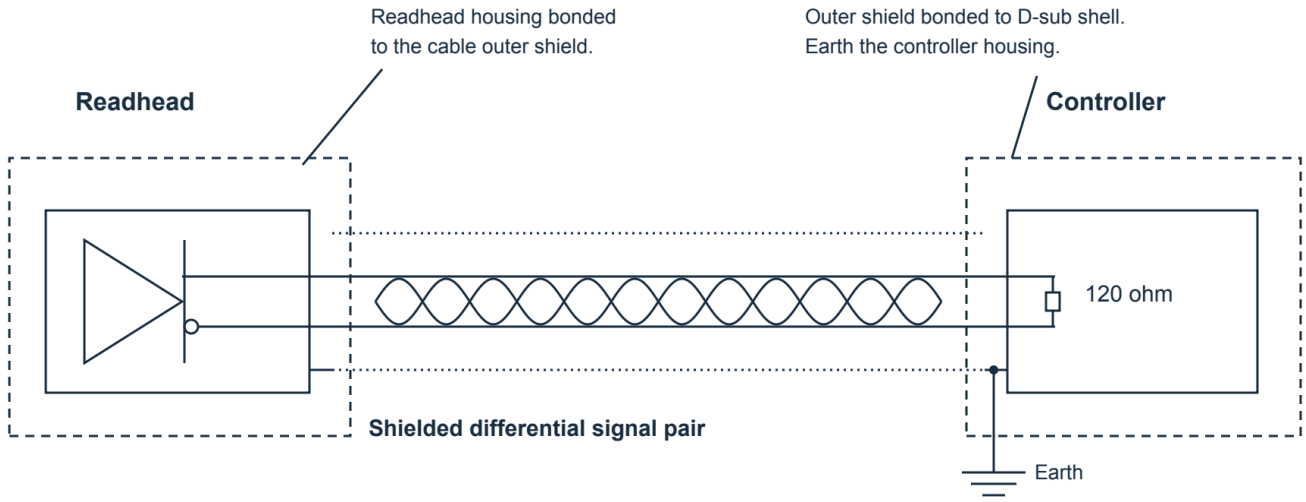
D-sub 9-pin - T pin assignment

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

Pin 3 is labelled "Alarm" in the source; its polarity is not specified. Pin 11 is labelled "Alarm+".

Electrical connection & diagnostics

Differential TTL electrical connection



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

Readhead LED - signal strength

LED state	Indication / action
Steady red	<30%: readhead cannot operate normally. Clean the scale or realign the readhead.
Flashing red / green	<50%: operation is possible. Clean the scale or realign the readhead.
Steady green	≥80%: normal operation.

Thresholds are reproduced from the source. No separate indication is specified for 50% to <80%.