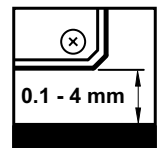
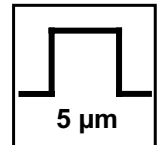


LM15 linear magnetic encoder system



The LM15 is a contactless high-speed linear magnetic encoder designed for use in harsh environments.

The LM15 features a compact sealed readhead that rides at up to 4 mm from the self-adhesive magnetic strip scale, which brings up to 100 m travel.

Simple to install, the LM15 features an integral set-up LED on the readhead, wide installation tolerances and an applicator tool for the adhesive-backed magnetic scale. A bidirectional reference is provided that can be actuated by a preset mark integrated within the scale or periodically every 5 mm.

The encoders come in digital output variants and offer a range of customer selectable resolutions including 5 µm, 10 µm, 25 µm, 50 µm, 125 µm and 625 µm. The LM15 is capable of velocities up to 50 m/s; even at 25 µm

resolution it is capable of more than 42 m/s.

Engineered for extreme service, the solid-state LM15 linear encoders operate from -20 °C to +85 °C, have water-proof sealing to IP68 and are highly resistant to shock, vibrations and pressure. The robust magnetic scale is also resistant to a range of chemicals commonly found in industry.

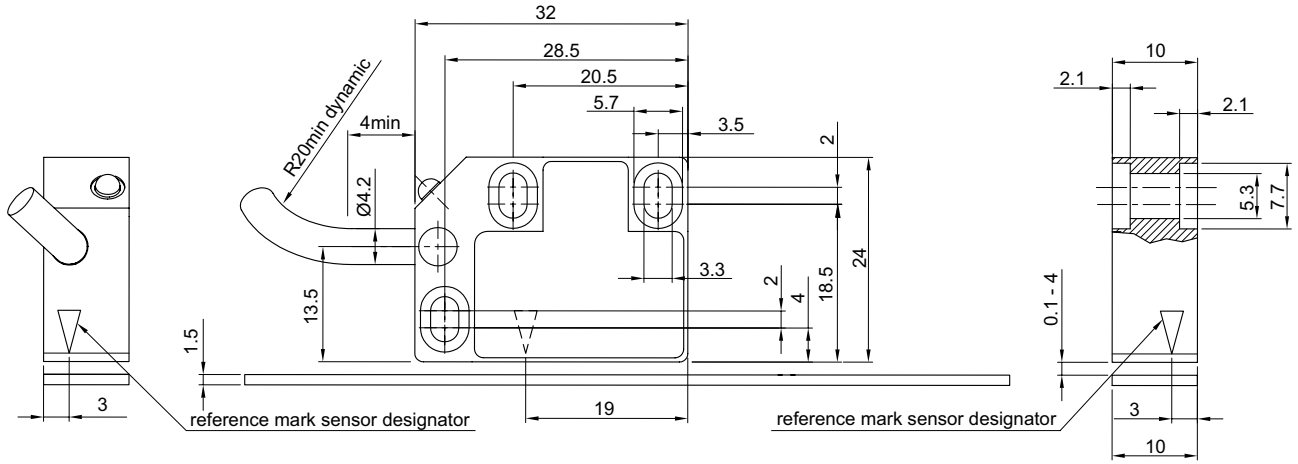
The non-contact, frictionless design eliminates wear while reducing hysteresis giving precision at high speeds and accelerations.

The LM15 encoders bring reliable solutions to tough, hard-working applications including woodworking, stone-cutting, sawing, metalworking, textiles, printing, packaging, plastics processing, automation and assembly systems, laser/flame/water-jet cutting, electronic assembly equipment etc.

- Easy to install with wide installation tolerances
- Ride height from 0.1 mm to 4 mm
- Resolutions from 625 µm to 5 µm
- High speed operation
- Excellent dirt immunity
- Integral set-up LED
- Axis lengths of up to 100 m
- High reliability from proven non-contact sensing technology
- Industry standard digital outputs
- Bidirectional reference mark

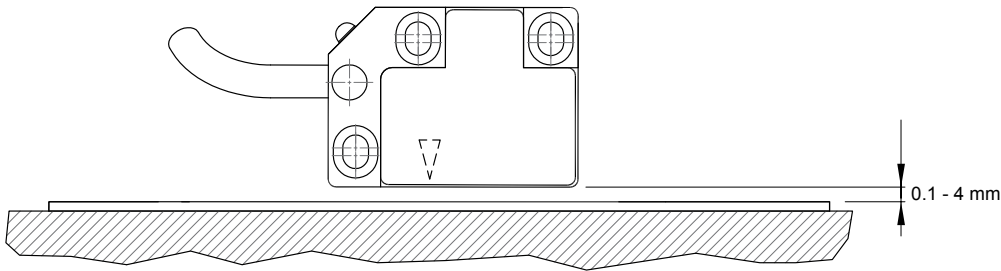
LM15 dimensions

Dimensions and tolerances in mm.

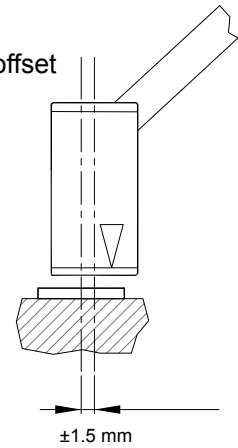


LM15 installation tolerances

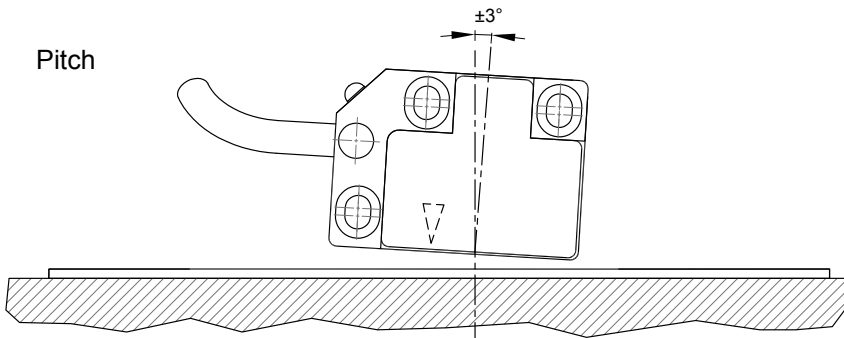
Ride height



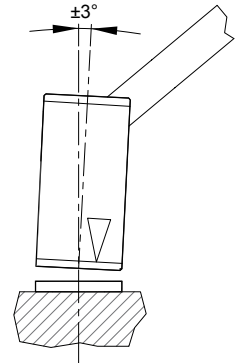
Lateral offset



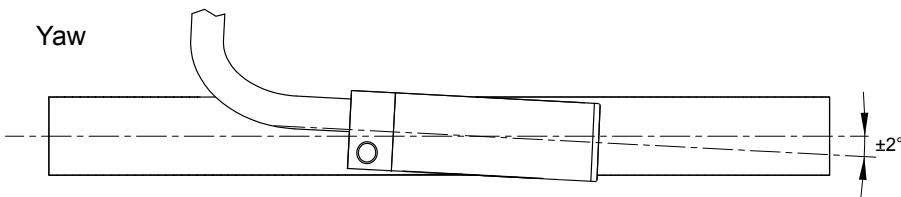
Pitch



Roll



Yaw



LM15 technical specifications

System data							
Maximum measuring length	100 m (longer lengths available by special requirements)						
Pole length	5 mm						
Available resolution for digital outputs	5 µm, 10 µm, 25 µm, 50 µm, 125 µm and 625 µm						
Maximum speed	Resolution (µm)	Interpolation factor	Maximum speed (m/s)				
	5	1000	8.45	2.11	1.06	0.50	0.26
	10	500	16.91	4.23	2.11	1.01	0.52
	25	200	42.27	10.57	5.28	2.50	1.29
	50	100	42.27	10.57	5.28	2.50	1.29
	125	40	26.42	6.60	3.30	1.57	0.81
	625	8	50.00	50.00	50.00	50.00	32.20
	Edge separation (µs)		0.12	0.50	1	2	4
Count frequency (kHz)		8333	2000	1000	500	250	
Sensor/magnetic scale gap	With or without periodic reference: 0.1 mm to 4 mm						
Error band	±100 µm at 20 °C						
Linear expansion coefficient	~ 17 × 10 ⁻⁶ /K						
Repeatability	Better than unit of resolution for movement in the same direction						
Hysteresis*	< 5 µm up to 1 mm ride height < 15 µm up to 2 mm ride height < 80 µm up to 4 mm ride height						
Sub divisional error	±12.5 µm for < 1 mm ride height (to ensure SDE remains under ±12.5 µm order option 01 that provides alarm and red LED at 1 mm ride height) ±15 µm for 2 mm ride height ±20 µm for 4 mm ride height						
Electrical data							
Power supply	4.7 V to 7 V – reverse polarity protected; voltage on readhead						
Power consumption (without any load)	< 30 mA						
Voltage drop over cable	13 mV/m – without load						
	54 mV/m – with 120 Ω load						
Output signals	Digital – Open Collector NPN, Differential RS422, short circuit protected						
Mechanical data							
Cable	8 wire cable						
Mass	Readhead (1 m cable, no connector) 56.4 g, Magnetic scale (1 m) 60 g, Cover foil (1 m) 3.5 g						
Environmental conditions							
Temperature	Operating -10 °C to +80 °C (cable under non-dynamic conditions: -20 °C to +85 °C)						
	Storage -40 °C to +85 °C						
Environmental sealing	IP68 (according to IEC 60529)						
EMC Immunity	IEC 61000-6-2 (particularly: ESD: IEC 61000-4-2; EM fields: IEC 61000-4-3; Burst: IEC 61000-4-4; Surge: IEC 61000-4-5; Conducted disturbances: IEC 61000-4-6; Power frequency magnet fields: IEC 61000-4-8; Pulse magnetic fields: IEC 61000-4-9)						
EMC Interference	IEC 61000-6-4 (for industrial, scientific and medical equipment: IEC 55011)						
Vibrations (55 Hz to 2000 Hz)	300 m/s ² (IEC 60068-2-6)						
Shocks (11 ms)	300 m/s ² (IEC 60068-2-27)						

* Repeatable, and can be measured and compensated once installed

LM15IB – Digital output signals, Open Collector NPN

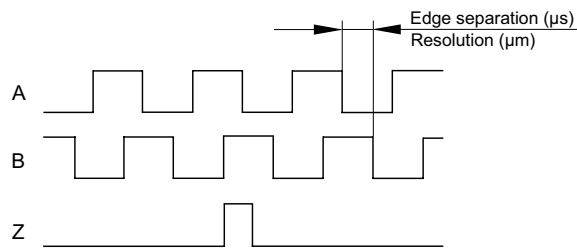
Square wave output

Power supply voltage	4.7 V to 30 V – reverse polarity protected; voltage on readhead *
Power consumption	30 mA
Output signals	A, B
Reference signal	1 or more square-wave pulses Z
Maximum load	20 mA
Cable	max. 10 m

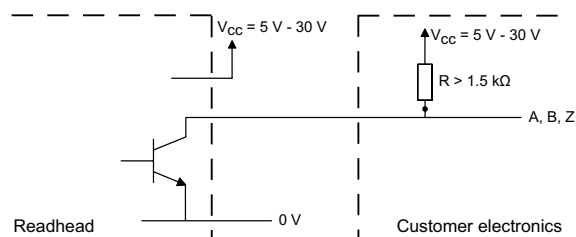
* Please consider voltage drop over cable.

NOTE: Set-up LED in the case of poor signal strenght is flashing red.

Timing diagram



Recommended signal termination



LM15IC – Digital output signals, RS422

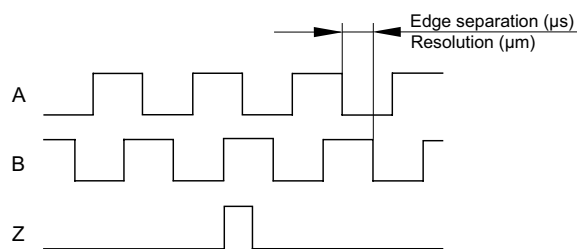
Square wave differential line driver to RS422

Power supply voltage	4.7 V to 7 V – reverse polarity protected; voltage on readhead *
Output signals	2 square-wave signals A, B and their inverted signals A-, B-
Reference signals	1 or more square-wave pulse Z and its inverted pulse Z-
Signal level	Differential line driver to EIA standard RS422: $U_H \geq 2.5 \text{ V}$ at $-I_H = 20 \text{ mA}$ $U_L \leq 0.5 \text{ V}$ at $I_L = 20 \text{ mA}$
Permissible load	$Z_0 \geq 100 \Omega$ between associated outputs $I_L \leq 20 \text{ mA}$ max. load per output Capacitive load $\leq 1000 \text{ pF}$ Outputs are protected against short circuit to 0 V and to +5 V
Alarm	High impedance on output lines A, B, A-, B-
Switching time (10 to 90 %)	t_+ , $t_- < 30 \text{ ns}$ (with 1 m cable and recommended input circuit)
Cable length	max. 100 m

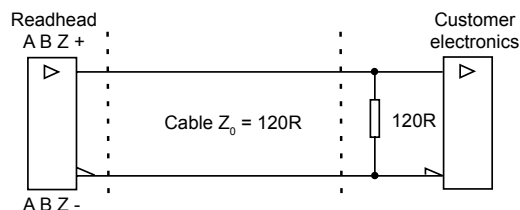
* Please consider voltage drop over cable.

Timing diagram

Complementary signals not shown

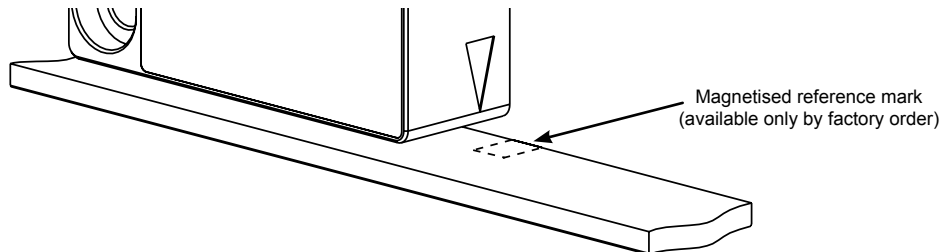


Recommended signal termination



Reference mark

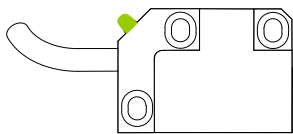
- 1) **Selected at point of order.** The LM15 readhead and MS15 scale should be ordered with required reference mark options. The cover foil if used can be installed over the magnetised reference mark.



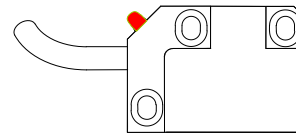
- 2) **Every 5 mm.** The repeatable bidirectional reference signal can be provided every 5 mm. The LM15 readhead should be ordered with this specific mode activated only.

Set-up LED

After the installation of the magnetic scale (see LM10 installation guide) the readhead can be easily adjusted on the machine using the set-up LED indicator.



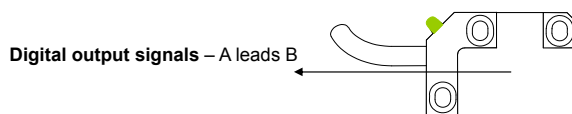
Green LED = good signal strength / set-up



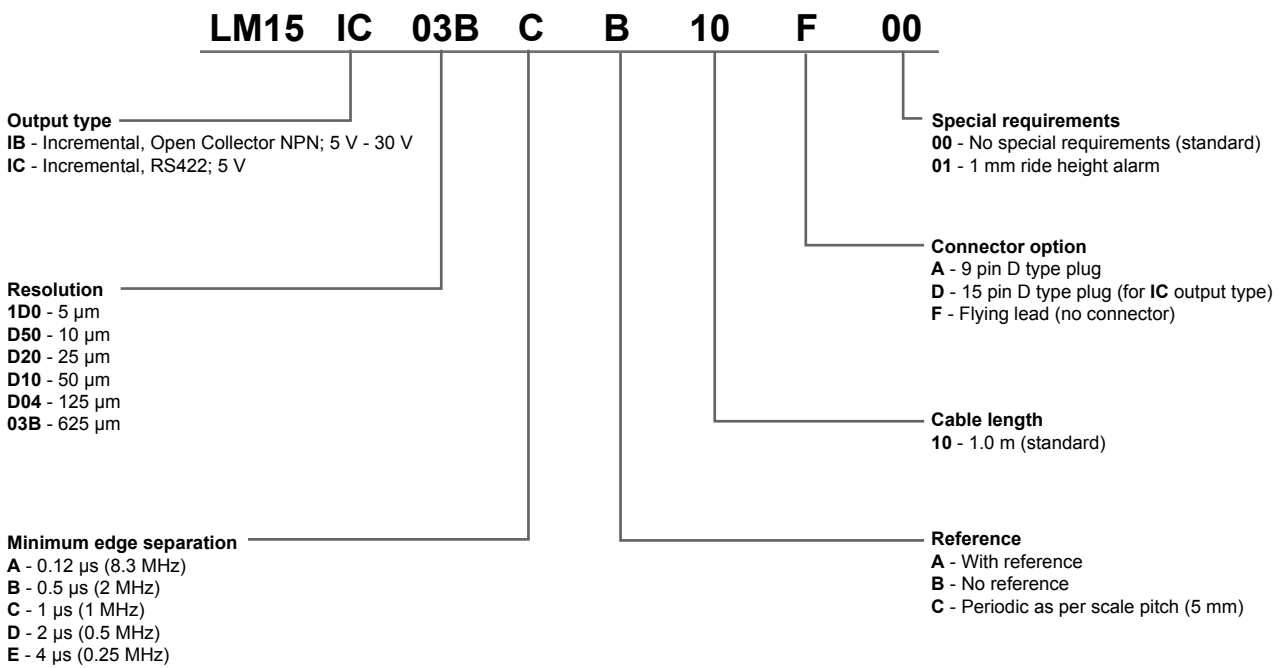
Red LED = poor signal strength – adjustment required
A, B, A-, B- outputs become high impedance

NOTE: IB output type: LED flashes red.

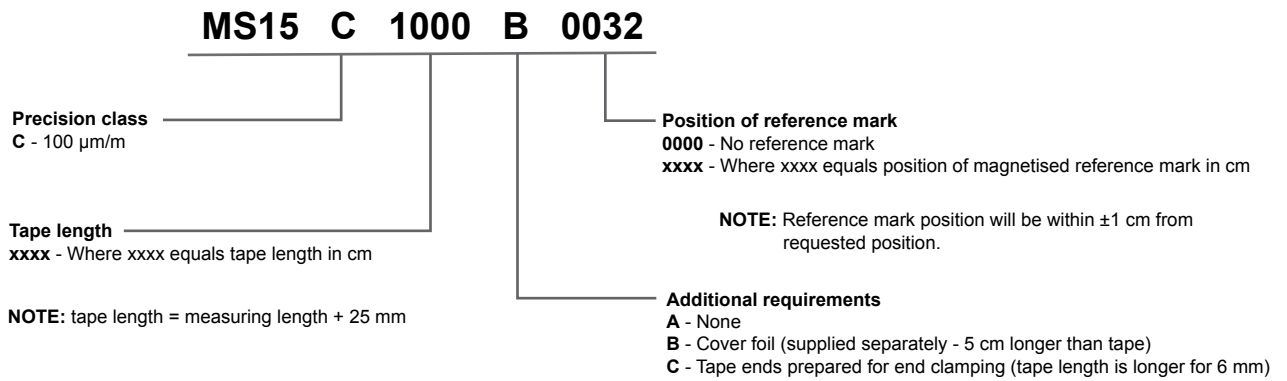
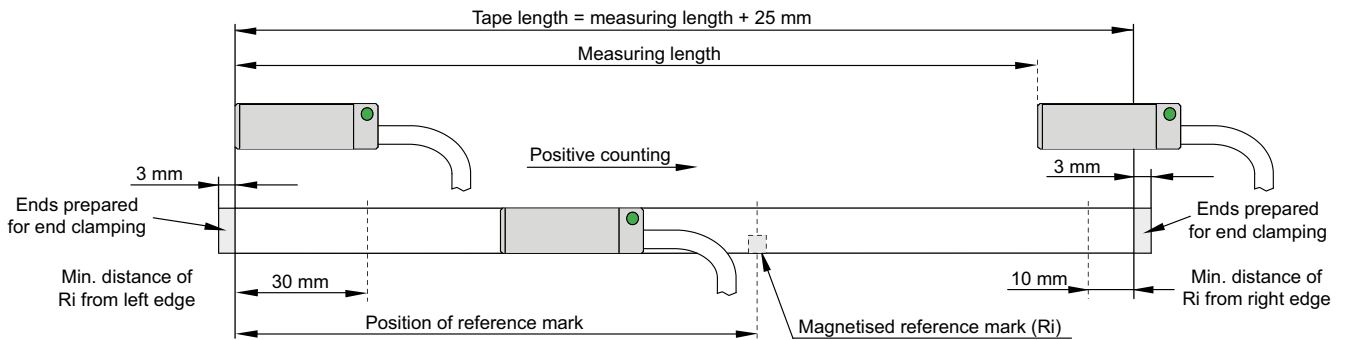
Positive direction



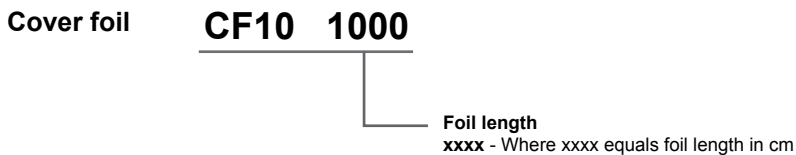
LM15 readhead part numbering



Magnetic scale part numbering



Accessories part numbering



Applicator tool for magnetic scale and cover foil **LM10ASC00**

End clamp kit (2 clamps + 2 screws) **LM10ECL00**

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Document issues

Issue	Date	Page	Corrections made
1	8. 4. 2009	-	New document

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