

LM13 magnetic ring encoder system



The LM13 is a contactless high-speed magnetic ring encoder designed for use in harsh environments.

The LM13 features a compact sealed readhead that rides at up to 1.5 mm from the ring's surface. Simple to install, the LM13 features an integral set-up LED on the readhead and wide installation tolerances.

Engineered for extreme service, the solid-state LM13 encoder operates from -10 °C to +80 °C, has water-proof sealing to IP68 and is highly resistant to shock, vibrations and pressure. The robust magnetic ring is also resistant to a range of chemicals commonly found in industry.

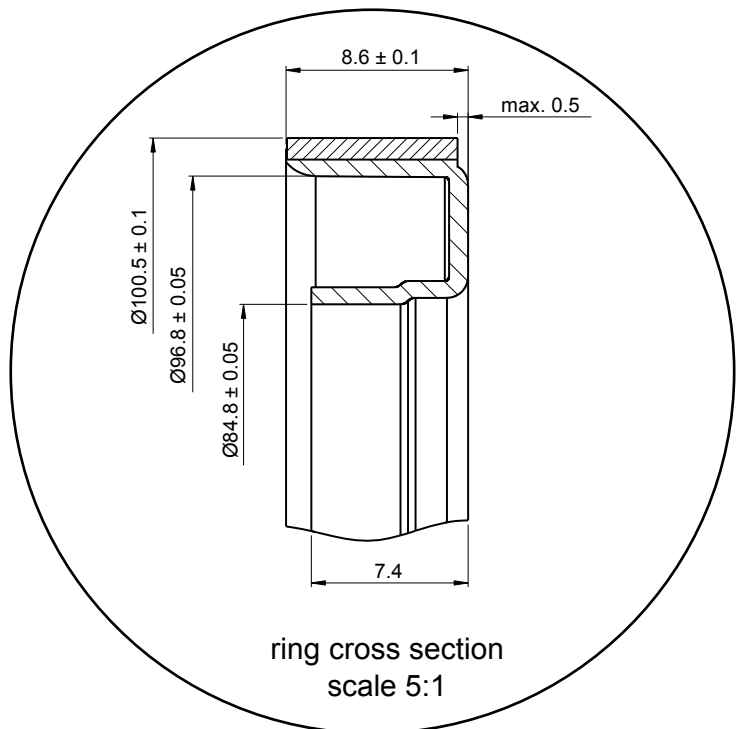
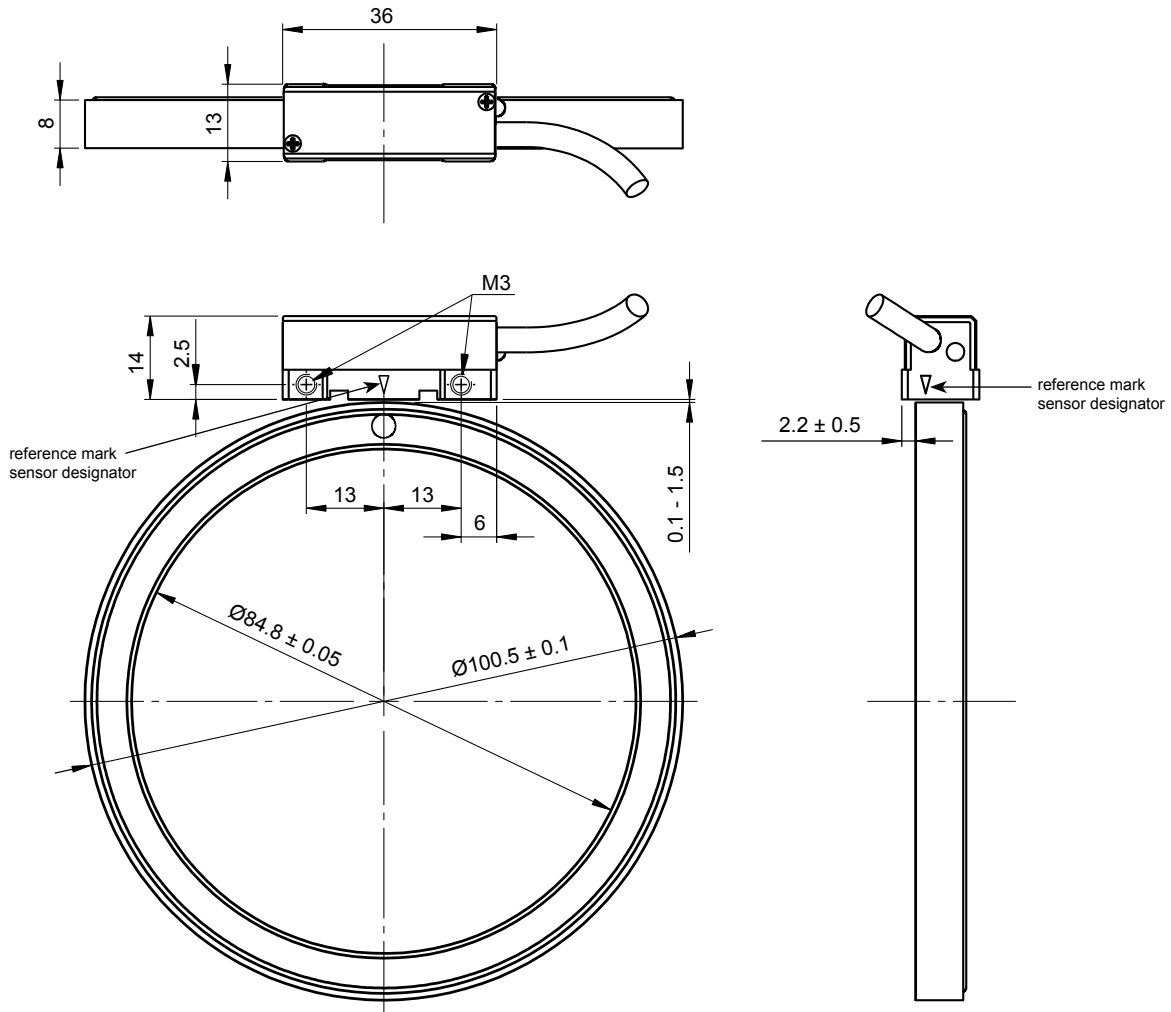
The non-contact, frictionless design eliminates wear while reducing hysteresis giving precision at high speeds and accelerations.

The LM13 encoders brings 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.

- Resolutions from 1,280 to 327,680 counts per revolution
- High speed operation to 25,000 revolutions per minute
- Excellent dirt immunity
- Integral set-up LED
- High reliability from proven non-contact sensing technology
- Industry standard digital outputs

LM13 dimensions

Dimensions and tolerances in mm.



LM13 technical specifications

System data							
Pole length	2.25° (approx. 2 mm)						
Available resolutions and maximum velocity	Resolution (counts per revolution)	Interpolation factor	Maximum velocity (revolutions per minute)				
	327,680	2,048	759	191	95	45	23
	320,000	2,000	780	195	98	46	24
	256,000	1,600	975	244	122	58	30
	163,840	1,024	1,521	378	190	91	46
	160,000	1,000	1,560	390	195	93	48
	128,000	800	1,950	486	244	116	59
	81,920	512	3,045	759	293	181	93
	80,000	500	3,120	780	390	186	95
	64,000	400	3,900	975	486	232	119
	51,200	320	4,875	1,218	609	290	149
	40,960	256	6,093	1,521	759	360	186
	32,000	200	7,800	1,950	975	462	238
	25,600	160	4,875	1,218	609	303	149
	20,480	128	12,186	3,045	1,521	723	369
	16,000	100	7,800	1,950	975	462	238
	12,800	80	4,875	1,218	609	303	149
	10,240	64	24,375	6,093	3,045	1,449	741
	6,400	40	4,875	1,218	609	290	149
	5,120	32	25,000*	12,186	6,093	2,901	1,485
2,560	16	25,000*	24,375	12,186	5,802	2,970	
1,280	8	25,000*	25,000*	24,375	11,607	5,943	
Edge separation (µs)			0.12	0.50	1	2	4
Count frequency (kHz)			8333	2000	1000	500	250
Sensor/magnetic ring gap	0.1 to 1.5 mm						
Repeatability	Better than unit of resolution						
Hysteresis *	< 3 µm up to 0.2 mm ride height						
Sub divisional error	±14 arc sec for < 0.7 mm ride height		(to ensure SDE remains under ±14 arc sec order option 01 that provides alarm and red LED at 0.7 mm ride height)				
	±30 arc sec for 1 mm ride height ±61 arc sec for 1.5 mm ride height						
Electrical data							
Power supply	4.6 V to 7 V – reverse polarity protected **						
Power consumption (without any load)	< 30 mA for digital output type						
Voltage drop over cable	13 mV/m – without load						
	54 mV/m – with 120 Ω load						
Output signals	Digital – Differential RS422, short circuit protected						
Cable	PUR high flexible cable, drag-chain compatible, double-shielded 8 × 0.05 mm ² ; durability: 20 million cycles at 20 mm bend radius						
Environmental conditions							
Temperature	Readhead	Operating	-10 °C to +80 °C (cable under non-dynamic conditions: -20 °C to +85 °C)				
		Storage	-40 °C to +85 °C				
	Ring	Operating and storage	-40 °C to +120 °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)						

* Limited by mechanics of ring.

* Repeatable, and can be measured and compensated once installed.

** On readhead with 1 m cable; for longer cables please consider voltage drop on cable (13 mV/m without load, 54 mV/m with 120 Ω load per channel pair).

Digital output signals

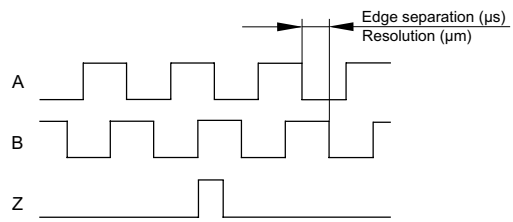
Square wave differential line driver to EIA RS422

Power supply voltage	4.6 V to 7 V * Reverse polarity protection
Incremental signals	2 square-wave signals A, B and their inverted signals A-, B-
Reference mark signal	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	Double shielded PUR cable; max. 100 m

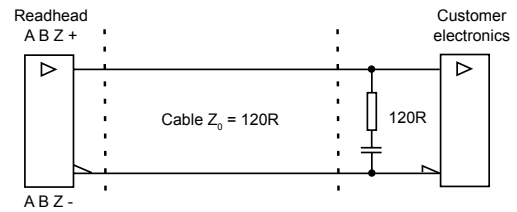
* On readhead with 1 m cable; for longer cables please consider voltage drop on cable (13 mV/m without load, 54 mV/m with 120 Ω load per channel pair)

Timing diagram

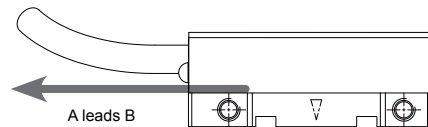
Complementary signals not shown



Recommended signal termination

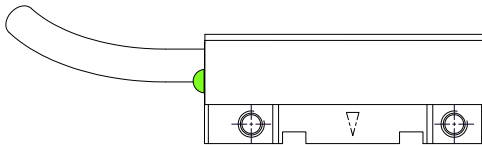


Positive direction

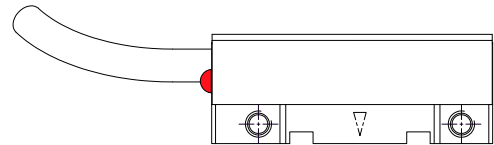


Set-up LED

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

Programming

Readheads can be ordered preset to the required resolution or provided so that they can be programmed as needed on the machine to the chosen resolution. This programming is carried out by connecting the readhead to a computer via a programming interface.

LM13 readhead part numbering

LM13 magnetic ring encoder system

=

Readhead



Readhead part number
eg LM13IC10DBA10F00

+

Ring



Ring ordering number
eg MN00134

LM13 IC 10D B A 10 F 00

Output type

IC - Incremental, RS422; 5 V power supply

Resolution

11B - 327,680 cpr	D50 - 80,000 cpr	D10 - 16,000 cpr
2D0 - 320,000 cpr	D40 - 64,000 cpr	D08 - 12,800 cpr
1D6 - 256,000 cpr	D32 - 51,200 cpr	06B - 10,240 cpr
10B - 163,840 cpr	08B - 40,960 cpr	D04 - 6,400 cpr
1D0 - 160,000 cpr	D20 - 32,000 cpr	05B - 5,120 cpr
D80 - 128,000 cpr	D16 - 25,600 cpr	04B - 2,560 cpr
09B - 81,920 cpr	07B - 20,480 cpr	03B - 1,280 cpr
PRG - Programmable from 327,680 cpr to 1,280 cpr (preset to 320,000 cpr)		

Minimum edge separation

A - 0.12 μ s (8.3 MHz) *
B - 0.5 μ s (2 MHz)
C - 1 μ s (1 MHz)
D - 2 μ s (0.5 MHz)
E - 4 μ s (0.25 MHz)

Special requirements

00 - No special requirements (standard)
01 - 0.7 mm ride height alarm

Connector option

A - 9 pin D type plug
D - 15 pin D type plug (for IC output type)
F - Flying lead (no connector)
H - 15 pin high density D type plug

Cable length

10 - 1.0 m (standard)

Reference

A - With reference
B - No reference
C - Periodic as per ring pitch (every 2.25°)

* Default for PRG option.

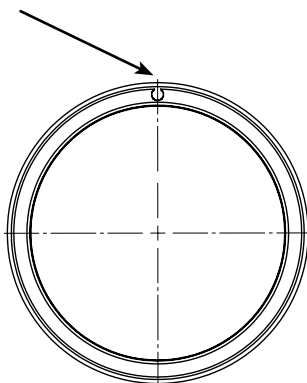
100.5 mm diameter ring part number

MN00134

100.5 mm diameter ring with reference mark part number

MN00147

Position of reference mark



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Document issues

Issue	Date	Page	Corrections made
1	6. 1. 2009	-	New document
2	19. 6. 2009	5	Added connector option H
3	16. 9. 2009	4	Positive direction image added

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