Data sheet
LMA10D01_02
Issue 2, 22nd April 2014

LMA10 absolute magnetic encoder system

LMA10 is an absolute magnetic linear encoder system which has been designed for motion control applications as a position and velocity control loop feedback element.

The encoder system is highly reliable due to contactless absolute measuring principle, built-in safety algorithms and high quality materials/components used.

The measuring standard is a magnetic scale which consists of a stainless steel substrate with an elasto-ferrite layer.

The elasto-ferrite layer is magnetised with two tracks. The incremental track is magnetised with 2 mm long (alternating south and north) poles and the absolute track is magnetised by a pseudo random binary sequence (PRBS) absolute code with 13 bit length. The elasto-ferrite layer is immune to chemicals commonly found in industry.

The readhead includes Hall sensor arrays for PRBS track reading, an AMR sensor for incremental track reading, interpolation electronics and custom logic circuitry. The data from the Hall arrays and interpolator are processed in the logic circuitry using special algorithms to determine the absolute position.

The electronic design provides extremely short response and recovery times, which consequently make it ideal for applications with highly dynamic control loops.

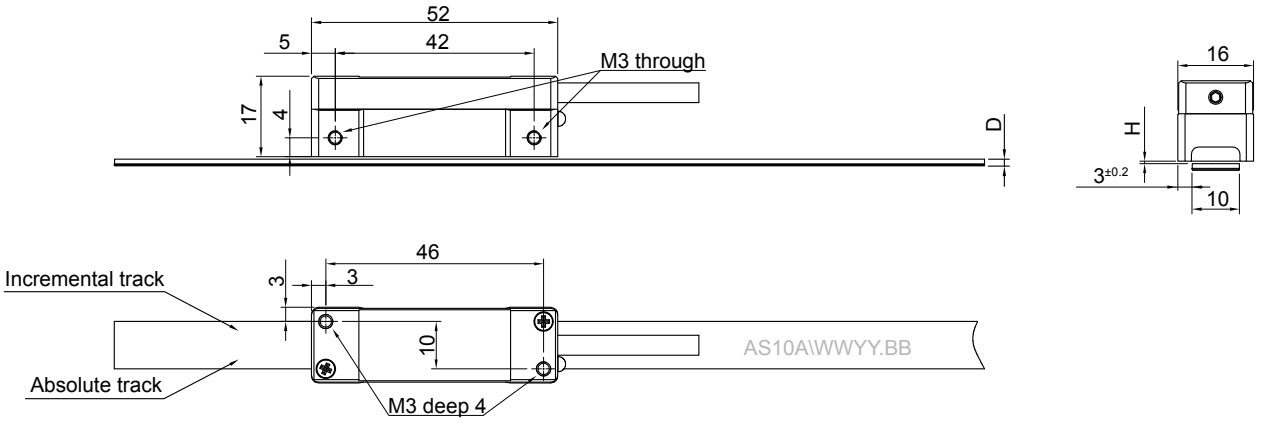
Diagnostic information is available through a serial communication channel and status LED.

If a failure is diagnosed, the encoder needs to be switched off and then switched on again in order to resume functionality.

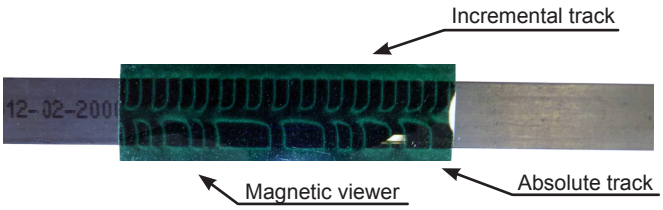
- **True absolute system**
- **Suitable for highly dynamic control loops**
- **Small footprint**
- **High accuracy**
- **Resolution to 0.244 µm**
- **Lengths up to 16.2 m**
- **Speeds up to 7 m/s at 0.977 µm resolution**
- **Integral status LED**
- **BiSS-C unidirectional communication protocol**
- **Simple and fast installation**
- **Robust measuring principle**
- **Excellent degree of protection to IP68**

LMA10 dimensions

Dimensions and tolerance in mm.

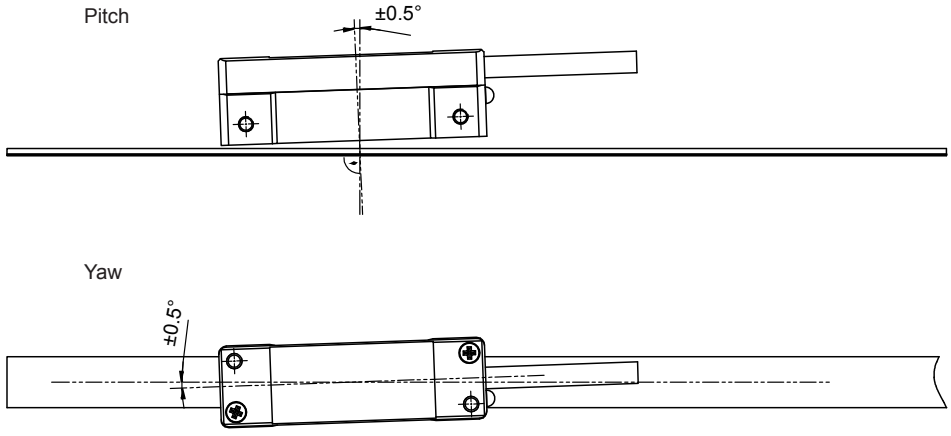


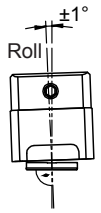
NOTE: Orientation of readhead relative to AS10 magnetic tape should be according to drawing. As reference use surface print on AS10 tape or use magnetic viewer (see image below).



	Magnetic scale thickness (D)	Ride height (H)
With back-adhesion tape (option A)	$1.5^{\pm 0.15}$	0.1 - 0.6
With back-adhesion tape, with cover foil (option B)	$1.6^{\pm 0.15}$	0.1 - 0.5
No back-adhesion tape (option I)	$1.3^{\pm 0.15}$	0.1 - 0.6
No back-adhesion tape, with cover foil (option N)	$1.4^{\pm 0.15}$	0.1 - 0.5

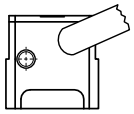
LMA10 installation tolerances





Lateral offset

Status LEDs



LED	Communication	Status
Green	Yes	Valid position data
Green flashing	No	Valid position data
Orange	Yes	Valid position data, > 80 % of max. speed
Orange flashing	No	Valid position data, > 80 % of max. speed
Red	Yes	**Invalid** position data
Red flashing	No	**Invalid** position data

LMA10 technical specifications

System data				
Incremental pole length	2 mm			
Maximum scale measuring length	16.332 m			
System accuracy	±40 µm/m			
Short range accuracy	< ±10 µm/10 mm (see diagram 3)			
Hysteresis	< 2 µm (0.1 mm ride height) (see diagram 1)			
Repeatability	Unit of resolution			
Available resolutions	0.244 µm	0.488 µm	0.976 µm	1.953 µm
Maximum traverse velocity	1.75 m/s	3.5 m/s	7 m/s	14 m/s
Maximum velocity during power on	0.5 m/s			
Electrical data				
Power supply	5 V ± 5 % (voltage on readhead) Consider voltage drop over cable (see diagram 2)			
Set-up time after switch-on	< 250 ms			
Power consumption (without load)	< 150 mA			
Mechanical data				
Mass	Readhead (with 1 m cable, no connector) 41 g, magnetic scale 60 g/m			
Cable	PUR high flexible cable, drag-chain compatible, double-shielded 8 × 0.05 mm^2; durability: 20 million cycles at 20 mm bend radius at whole temperature range			
Environmental data				
Temperature	Operating	0 °C to +55 °C		
	Storage	-20 °C to +85 °C		
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)			
Humidity	100 % (condensation permitted)			
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 magnetic fields: IEC 61000-4-8; Pulse magnetic fields: IEC 61000-4-9)			
EMC Emission	IEC 61000-6-4 (for industrial, scientific and medical equipment: IEC 55011)			
Environmental sealing	IP68 (according to IEC 60529)			

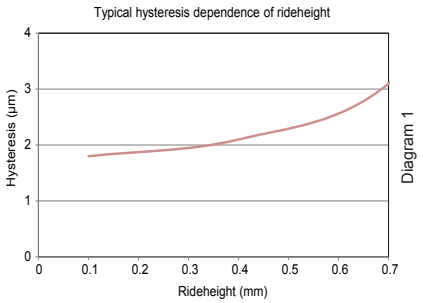


Diagram 1

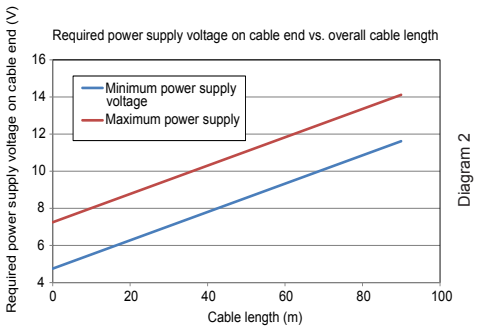


Diagram 2

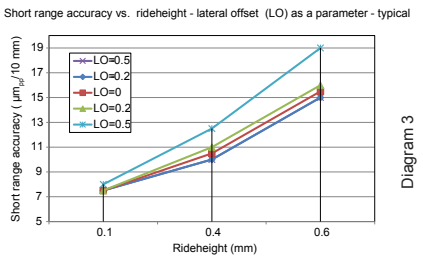
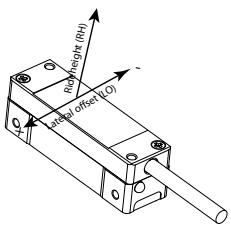


Diagram 3



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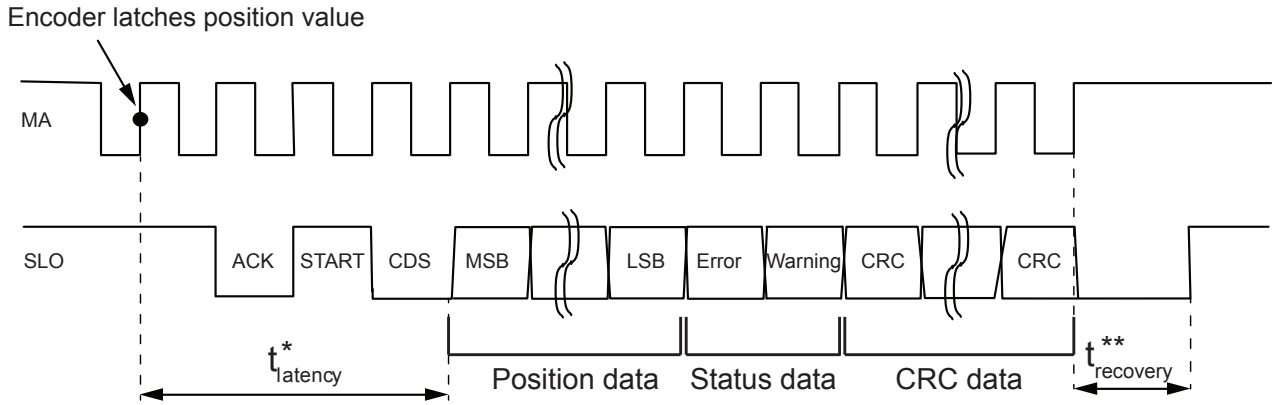
LMA10 communication protocol – BiSS-C unidirectional

Type of interface	BiSS-C unidirectional (point to point)
Signal level	RS422
Maximum MA frequency	5 MHz
Length of position data	26 bit LSB= (2000 µm)/2^13 ≈ 0.244 µm
Length of status data	2 bit
Length of CRC	6 bit (inverted bit output – polynomial 0×43)
Position data encoding	Pure binary
Latency time *	0.8 µs at 5 MHz MA frequency; otherwise 4 MA clock periods
Recovery time **	≥5 µs

Timing diagram

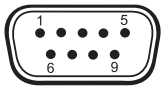


Status data

bit	Type	"H" ("L" at special option 03)	"L"("H" at special option 03)	Possible reason for failure
E	Alarm	Invalid position data	OK	Movement too fast, demagnetisation, sensing distance too high, orientation of readhead and scale
W	Warning	Valid position data, close to overspeed	OK	Current velocity is >80 % of maximum traverse velocity

Connections

9 pin D type plug



Pin	Colour	Signal
1	Internal shield	
2	Pink	MA+
3	Blue	MA-
4	Green	n.c.
5	Brown	+5 V
6	Grey	SLO+
7	Red	SLO-
8	Yellow	n.c.
9	White	0 V
Case	Outer shield	

LMA10 readhead part numbering

LMA10 DC 13B 10 A 00

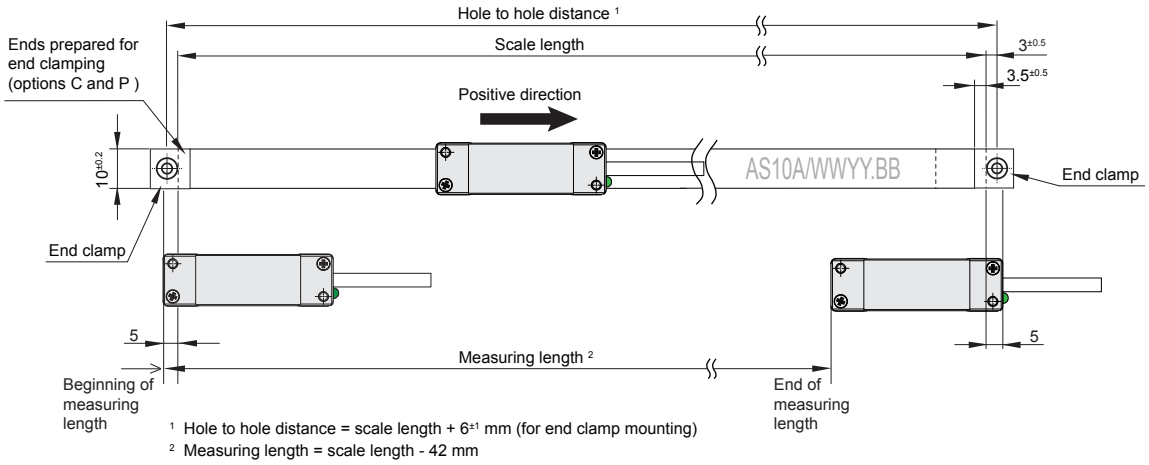
Output type
DC - BiSS-C communication protocol

Resolution
13B - $2/2^{13}$ mm (~ 0.244 µm)
12B - $2/2^{12}$ mm (~ 0.488 µm)
11B - $2/2^{11}$ mm (~ 0.977 µm)
10B - $2/2^{10}$ mm (~ 1.953 µm)

Special requirements
00 - No special requirements (standard)
03 - LOW active status bits

Connector option
A - 9 pin D type plug
F - Flying lead (no connector)

Cable length
10 - 1.0 m (standard)



1 Hole to hole distance = scale length + $6^{\pm 1}$ mm (for end clamp mounting)
2 Measuring length = scale length - 42 mm

AS10 magnetic scale part numbering

AS 10 A 01000 A 00

Scale width
10 - 10 mm width

Scale length
xxxxx - Where xxxxx equals scale length in mm

Special requirements
00 - No special requirements (standard)

Options
A - No cover foil
B - Cover foil supplied (separately - 5 cm longer than tape)
C - No cover foil, ends prepared for end clamping
I - No back-adhesion tape
N - No back-adhesion tape, with cover foil
P - No back-adhesion tape, ends prepared for end clamping
G - Track system; sides prepared for insertion into track system
H - Track system; sides prepared for insertion into track system, with cover foil

Accessories part numbering

Cover foil **CF 10 1000**

Foil width
10 - 10 mm width
08 - 08 mm width (CF for track system option **G**)

Foil length
xxxx - Where xxxx equals foil length in cm

Applicator tool for magnetic scale and cover foil	**LMA10ASC00**
End clamp kit (2 clamps + 2 screws)	**LM10ECL00**
Magnetic viewer	**MM0001**

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Document issues

Issue	Date	Page	Corrections made
1	6. 5. 2013	-	New document
2	22. 4. 2014	3,5	Added new graphs, new special requirement and new data in technical specifications

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