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LMSI

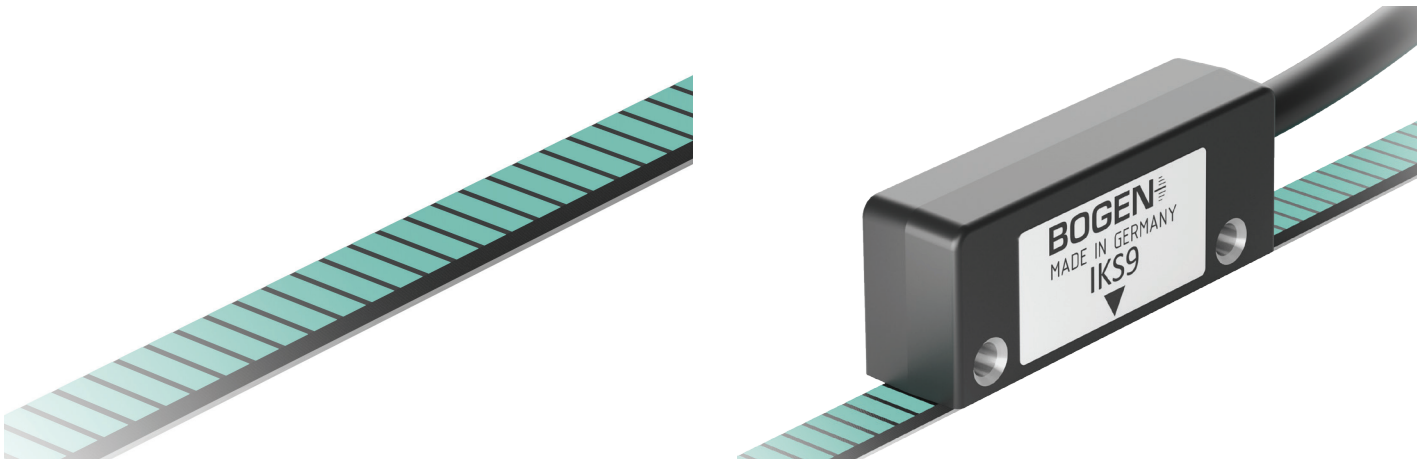
Linear Magnetic Scales Incremental

Linear Magnetic Scales (LMS) are the basis for highly accurate incremental and absolute magnetic measurement systems. They can be encoded with one or multiple tracks, with or without reference. The magnetization process, developed and patented by BOGEN, writes the magnetic poles with an exceeding accuracy referring to width and position. LMS is resistant against environmental influences like production residues, utilities, vibrations and other. The operating temperature ranges from - 40°C up to + 100 °C. Accuracy classes up to $\pm 3 \mu\text{m}$ ensure magnetic scale solutions for a great number of customer applications, such as automation technology, robotics, mechanical and electrical engineering.

Absolute
Incremental
Measuring

Linear
Applications

Counting
Controlling



Features and Benefits

- one or multiple track magnetization
- with or without reference
- highly accurate encoded pole pairs
- different accuracy classes available
- resistant to contamination, vibrations, temperature fluctuations, humidity
- no wear from usage
- customized variants on demand

Characteristics

Linear Magnetic Scales

accuracy class	$\pm 3 \mu\text{m}$, $\pm 10 \mu\text{m}$, $\pm 20 \mu\text{m}$, $\pm 40 \mu\text{m}$, $\pm 100 \mu\text{m}$		
material	magnetic tape: elastomer filled with ferrite carrier tape: stainless steel		
width [mm]	5, 6, 8, 10, 12, 15, 20, 25 ± 0.2 (others on request)		
thickness [mm]	0.5 to 1.66 (depending on scale setup)		
pole pitch [mm]	any pole pitches in 0.01 increments (e.g. 0.5 ; 1; 1.2; 2; 2.5; 2.54; 3; 3.2; 4; 5)		
magnetic flux density	pole pitch	magnetic flux	distance
	1 mm	20mT $\pm 10/-7$ mT	0.4 mm
	2 mm	30mT $\pm 10/-10$ mT	0.7 mm
	2.54 mm	30mT $\pm 10/-12$ mT	0.8 mm
	5 mm	30mT $\pm 10/-15$ mT	1.4 mm
operating temperature	- 40 °C to + 100 °C max.		
expansion coefficient	$\sim 16 \times 10^{-6}/\text{K}$		
minimum bending radius [mm]	65		
length on reel	25 m, 50 m (others on request)		
length in pieces	on request		
end processing for pieces	multiple hole combinations and angle cuts possible (on request)		

Adhesive Tape

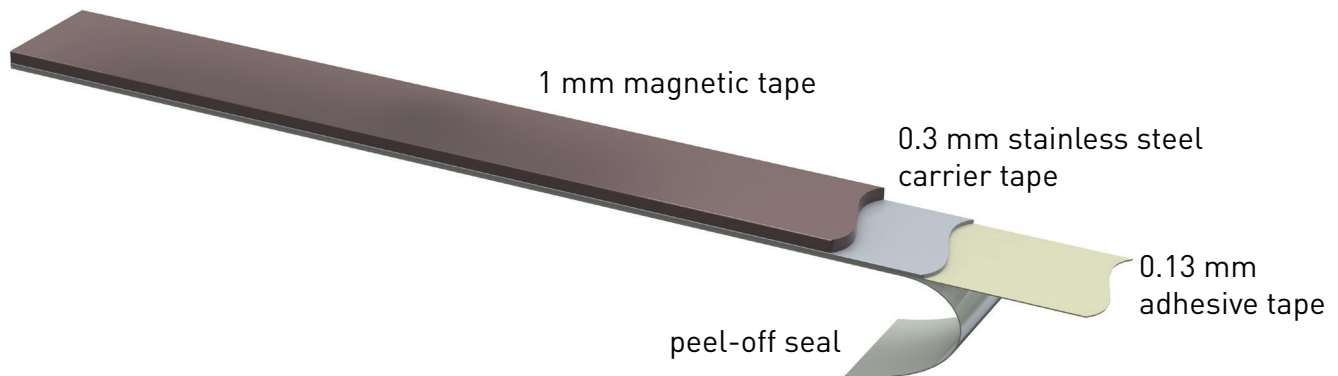
material	double-sided acrylic adhesive tape
width [mm]	4.5, 7, 9, 11, 14, 19, 24, others on request
thickness [mm]	0.13

Cover Tape (optional accessory)

material	cover tape: stainless steel, non magnetic adhesive tape: acrylic adhesive tape
width [mm]	5 ± 0.2
	8 ± 0.2
	10 ± 0.2
	12 ± 0.2
	20 ± 0.2
thickness [mm]	0.23 total thickness (0.1 mm stainless steel tape + 0.13 mm adhesive tape)
length on reel [m]	50

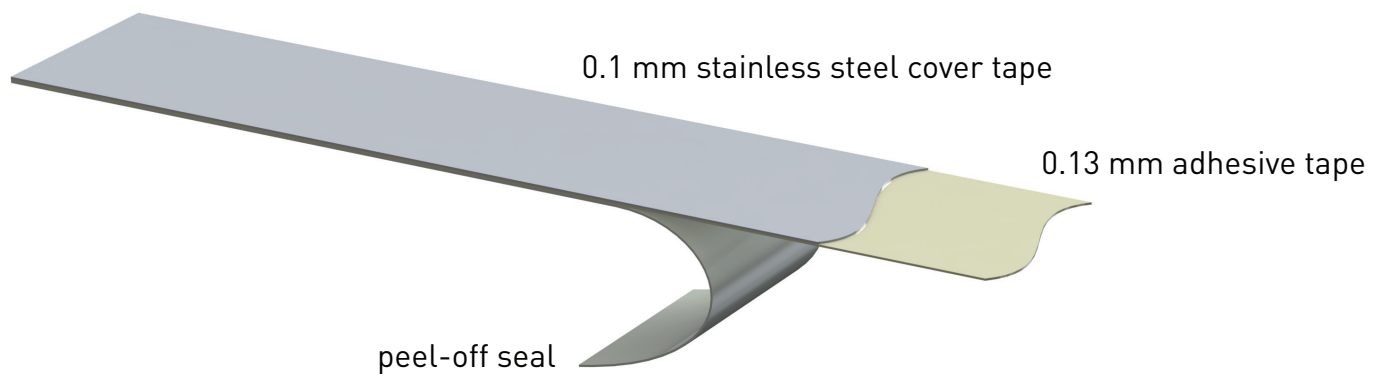
Dimensions

Magnetic Scale*



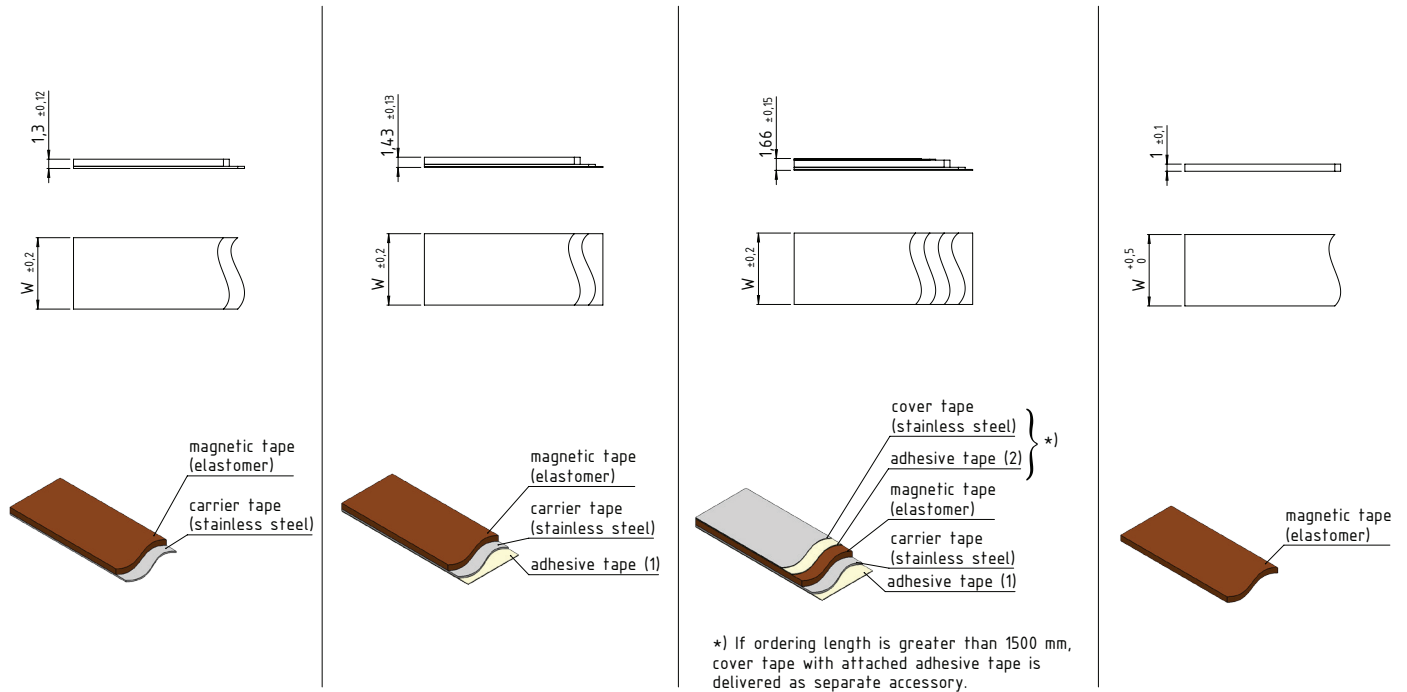
*) standard parameters, other dimensions please refer to following page

Cover Tape (optional accessory)



Due to mechanical characteristics of individual parts and applied manufacturing processes, the top surface of the magnetic component may show minimal surface changes. This has no negative impact on functionality.

Scale Dimensions with Standard Layer Stackup



Scale Dimensions with Optional Layer Stackup ⁽¹⁾

For individual scale setups following layer dimensions can be used

magnetic tape	0.5 mm or 1.0 mm
carrier tape	0.1 mm or 0.3 mm
adhesive tape	0.13 mm , 0.212 mm or 0.050 mm
cover tape	0.076 mm, 0.1 mm , 0.15 mm

⁽¹⁾ standard parameters in bold

Length

Linear magnetic scales cut in pieces or supplied on reel.

Marking ⁽²⁾

The marking distance is 250 mm and builds up as follows:

accuracy class	pole pitch [μm]	year/week	reel no.	magnetic strip counter (optional)
A20.	2000.	1605.	19	marking every 250 mm
A20.	2000.	1608.	19	012 (marking one time per magnetic strip)

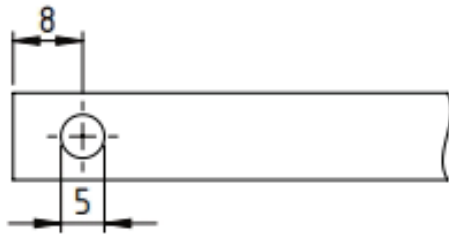
⁽²⁾ The magnetic strip counter indicates the number of remaining strips on the reel. The strip is marked only once per length.

Optional Accessories

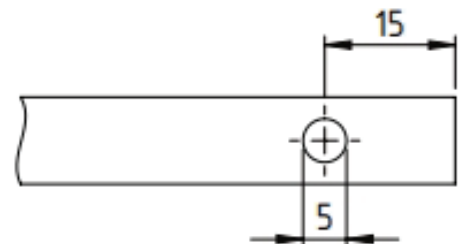
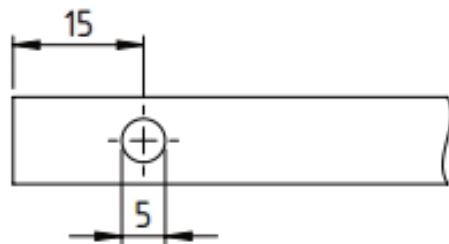
- Extruded Aluminum Profile (please contact our application engineers for the right profile for your LMS)
- Scale Applicator (for easy and precise installation of the scale)

Standard Mounting Holes

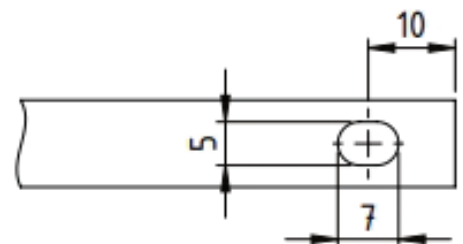
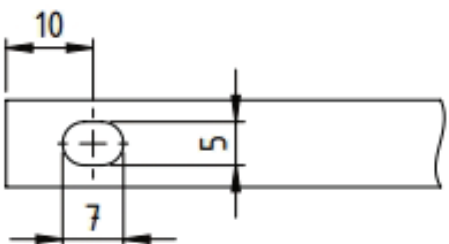
Option 1



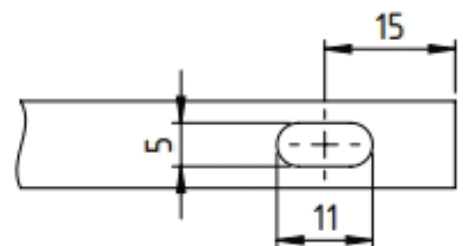
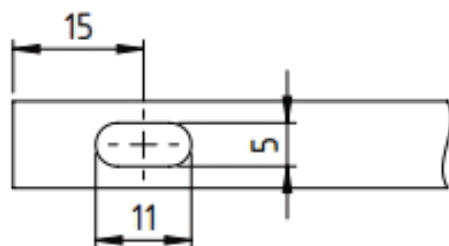
Option 2



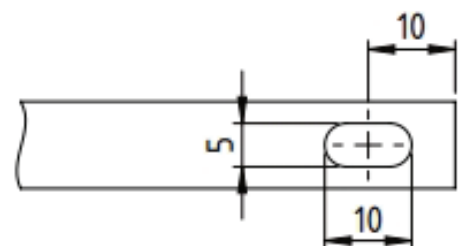
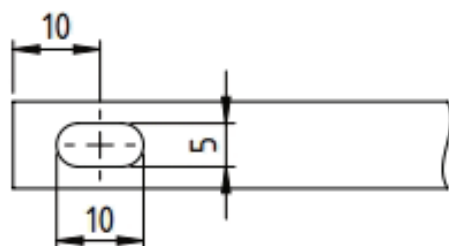
Option 3



Option 4



Option 5



Order Code

LMS - N - P - L - W - H - A - C - K - T - EB

			code	explanation ⁽¹⁾
	N	number of tracks		one track
			2	two tracks
			...	number of tracks (up to nine)
	P	track parameters ⁽²⁾	I ...	one incremental track and its pole pitch ⁽³⁾
			I ... - Z	one incremental track and its pole pitch ⁽³⁾ , one reference track
			I ... - I ...	two incremental tracks and their pole pitches ⁽³⁾
	L	length	L ...	piece, length in mm ⁽⁴⁾
	W	width (mm)	W5	5 mm
			W6	6 mm
			W8	8 mm
			W8-10	8 mm Elastomer (only for P95-05 extrusion) 10 mm stainless steel carrier tape (only for P95-05 extrusion)
			W10	10 mm
			W12	12 mm
			W15	15 mm
			W20	20 mm
			W25	25 mm
	H	scale height (mm)		1 mm magnetic tape, 0.3 mm carrier tape
			H1-0.1	1 mm magnetic tape, 0.1 mm carrier tape
			H0.5-0.3	0.5 mm magnetic tape, 0.3 mm carrier tape
			H0.5-0.1	0.5 mm magnetic tape, 0.1 mm carrier tape
	A	accuracy class	A03	± 3 µm/m (only delivered up to piece length 2300 mm)
			A10	± 10 µm/m (only delivered up to piece length 2300 mm)
			A20	± 20 µm/m
			A40	± 40 µm/m
			A100	± 100 µm/m
	C	cover tape		without cover tape
			C	equipped with cover tape (only delivered up to piece length 1500 mm)
	K	adhesive tape		without adhesive tape
			K	equipped with adhesive tape
	T	text imprint		with BOGEN text imprint
			T0	without text imprint
			T2	with customer specific text imprint (on request)
	EB	mounting holes ⁽⁵⁾		without mounting holes
			1	please see drawings on the previous page
			2	
			3	
			4	
			5	

⁽¹⁾ standard parameters are bold

⁽²⁾ for absolute track and other options than listed please contact our sales team

⁽³⁾ standard pole pitches: 0.5 mm, 1 mm, 2 mm, 2.54 mm, 5 mm

⁽⁴⁾ length of scale: measuring length (specified accuracy class guaranteed) + 5 mm at each end (specified accuracy class cannot be guaranteed)

⁽⁵⁾ for other options than listed please contact our application engineers

Ordering Example

LMS2-I1-Z-L2200-W10-A3-K-EB2	linear magnetic scale, 2 tracks, one incremental track with pole pitch 1 mm, one reference track, length 2.200 mm, width 10 mm, width of scale encoded completely, height magnetic tape 1 mm and height carrier tape 0.3 mm, accuracy $\pm 3 \mu\text{m/m}$, without cover tape, with adhesive tape, with standard text imprint, mounting holes option 2
LMS-I10-L48000-W8-A100-K-T2	linear magnetic scale, one track, incremental track with 10 mm pole pitch, length 48,000 mm, width 8 mm, width of scale encoded completely, height magnetic tape 1 mm and height carrier tape 0.3 mm, accuracy $\pm 100 \mu\text{m/m}$, without cover tape, with adhesive tape, customer specific text imprint

Customization

Linear scales can be customized beyond these listed settings with different pole patterns including irregular patterns, different tracks and other options. Please contact BOGEN's application engineers with your requests.

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Handling of Magnetic Scales

Magnetic scales have been magnetized with a magnetic pattern that can be changed by various influences. Therefore, some precautions must be taken to maintain the quality of the magnetic pattern permanently.

- Remove all strong magnets near the magnetic scales - the stronger the magnet, the higher the risk of damage.
- Keep strong magnets, even for short moments, away from the magnetic scales - the farther away the lower the effect on the scale.
- Make sure that no contact can occur during assembly between the magnetic scales and strong permanent magnets or electromagnets.
- Avoid all materials between the scale and, for example, a magnetic brake, being magnetic.
- When storing, supplying and picking parts, make sure that the magnetic scales are not transported with other magnets in a stacked or contiguous manner. These include e.g. magnets for linear drives and possibly permanent magnets for electric motors.
- Store the scales without additional load from other parts or material and avoid mechanical damage to the elastomer surfaces.
- Remove all tools with magnetic properties from the assembly area, e.g. screwdriver with black tips (typical sign for magnets),
- Do not use magnet holders or handling magnets for the magnetic scales.
- Do not use lamps with a magnetic base near the magnetic scales.
- Avoid possible inductance caused by high voltage power lines near magnetic scales.
- Do not store magnetic scales touching with the scale sides, as this may cause magnetic interference. At high accuracies, a distance of at least one pole length between the scales must be observed.
- Linear scales with steel band may not be bent. The material is optimized for linear use.