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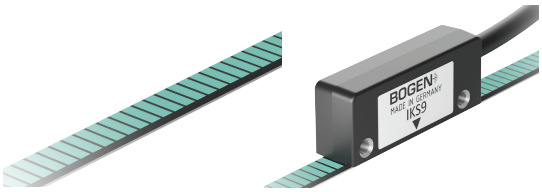
BOGEN

LMS
Linear Magnetic Scales

Absolute Incremental Measuring

Linear Applications

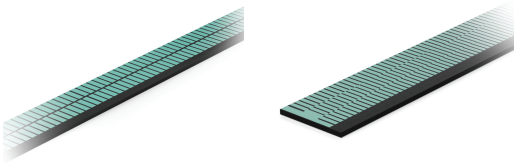
Counting and Controlling Tasks



LMSI
Linear Magnetic Scales Incremental

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



LMSN
Linear Magnetic Scale Nonius

Features and Benefits

- different accuracies available on demand
- two or three track magnetization
- different scale geometries
- customizable for many applications
- no wear during operation
- non-contact measurement
- resistant to dust, cooling lubricant emulsion, oil, etc.

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LMSI

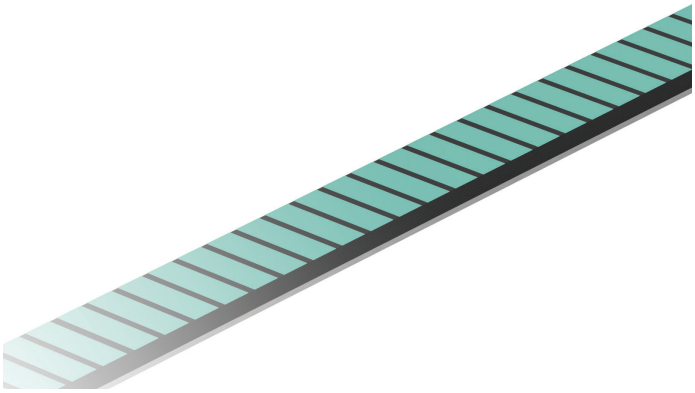
Linear Magnetic Scales Incremental

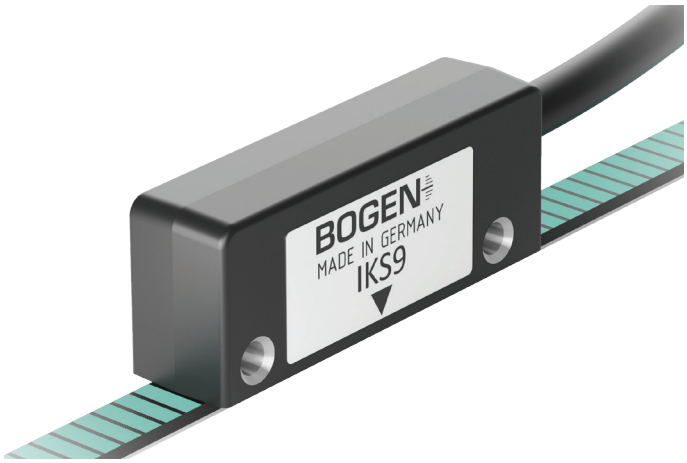
Absolute Incremental Measuring

Linear Applications

Counting Controlling

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 - 20°C up to + 100 °C. Accuracy classes up to ± 3 µm ensure magnetic scale solutions for a great number of customer applications, such as automation technology, robotics, mechanical and electrical engineering.





Features and Benefits

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

LMSI rev 3.1 (2022/04/21)

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Characteristics

Linear Magnetic Scales

accuracy class	± 3 µm, ± 10 µm, ± 20 µm, ± 40 µm, ± 100 µm
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 +10/-7 mT 0.4 mm 2 mm 30mT +10/-10 mT 0.7 mm 2.54 mm 30mT +10/-12 mT 0.8 mm 5 mm 30mT +10/-15 mT 1.4 mm
operating temperature	-20°C to +100°C max.
expansion coefficient	~ 16 x 10-6/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

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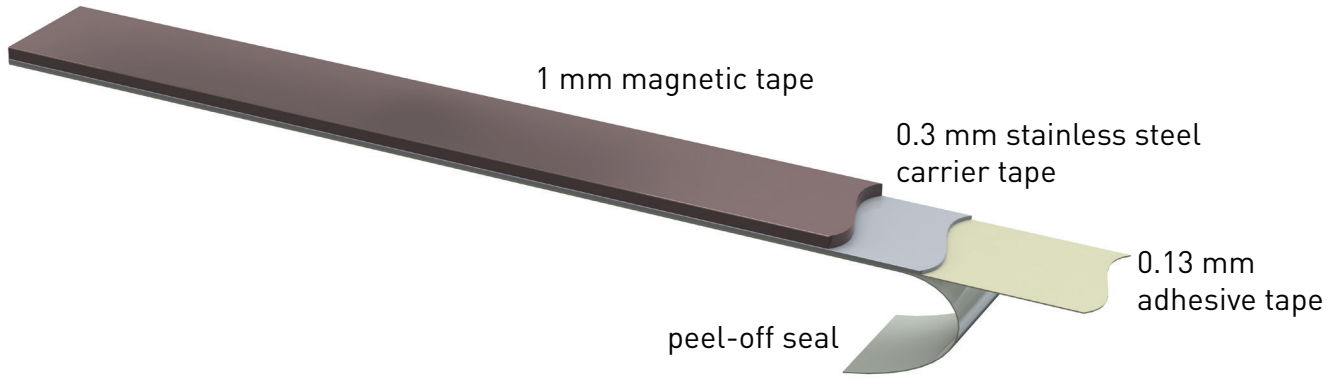
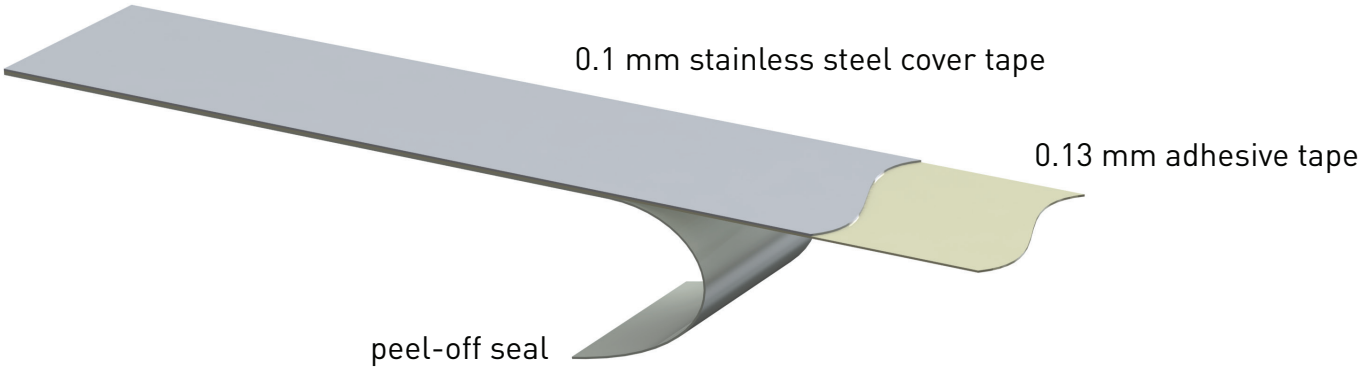
Dimensions

Magnetic Scale*



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

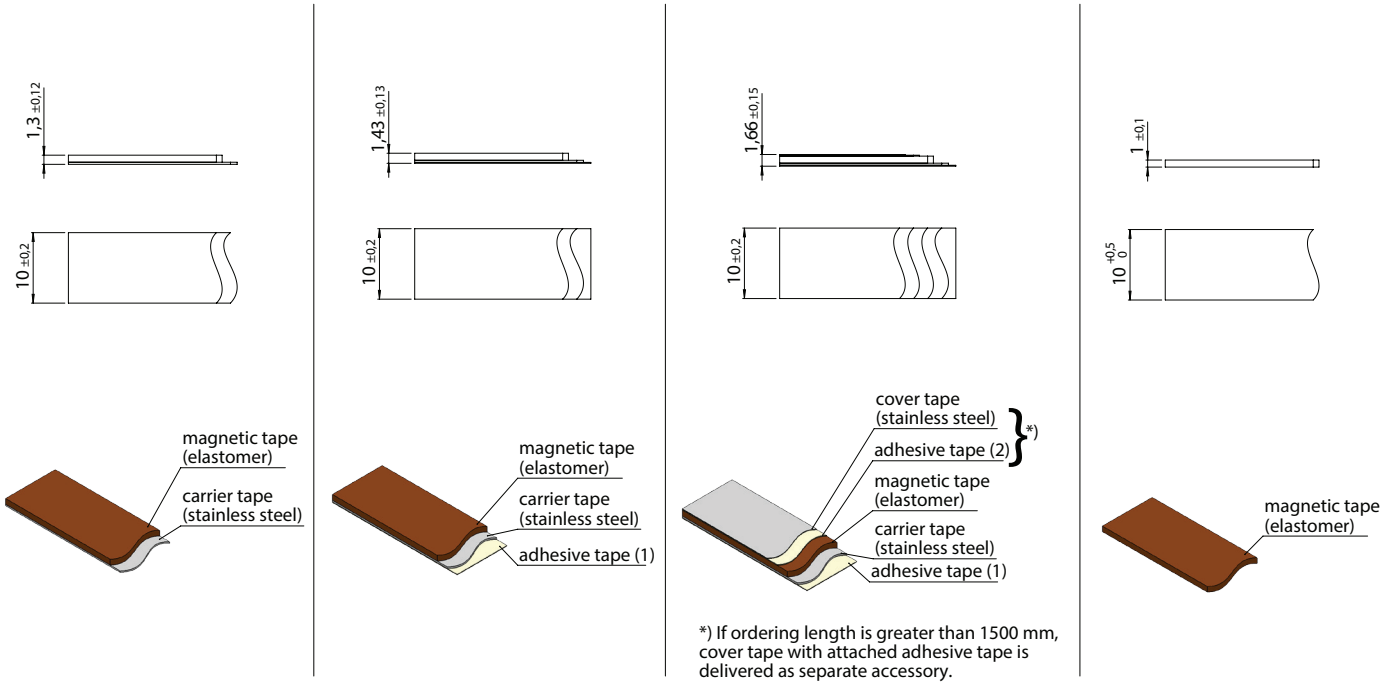
Cover Tape (optional accessory)



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.

LMSI rev 3.1 (2022/04/21)

Scale Dimensions with Standard Layer Stackup



*) If ordering length is greater than 1500 mm, cover tape with attached adhesive tape is delivered as separate accessory.

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)

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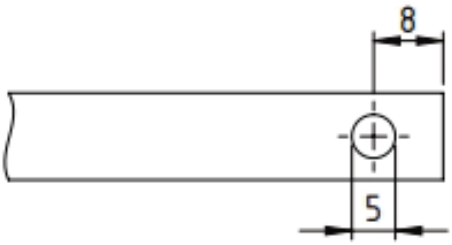
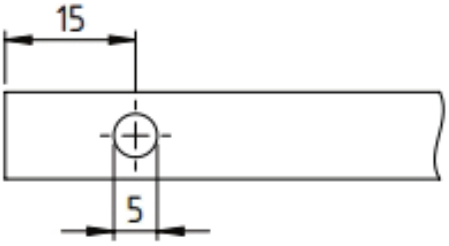
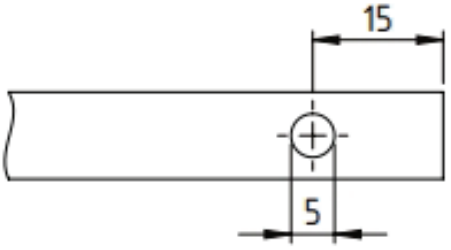
Standard Mounting Holes

Option 1

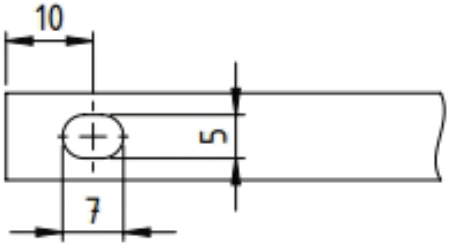


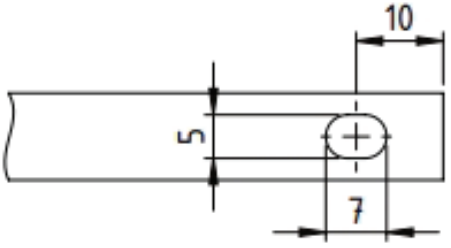
Option 2



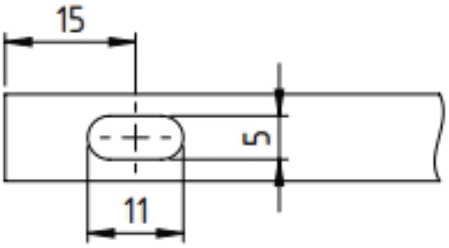


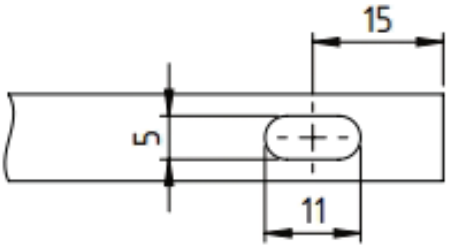
Option 3





Option 4





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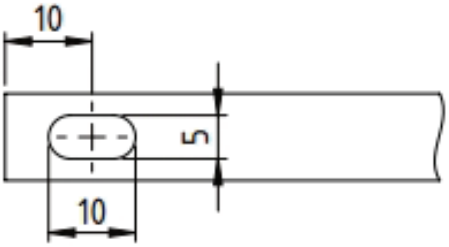

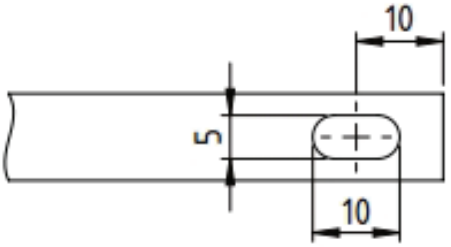

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Order Code

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 nonius scale: measuring length + 5 mm non-magnetized scale at each end; measuring length = number of poles x pole pitch; all other scales: length = measuring length

[5] for other options than listed please contact our application engineers

LMSI rev 3.1 (2022/04/21)

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 ± 3 µm/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 ± 100 µm/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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LMSN

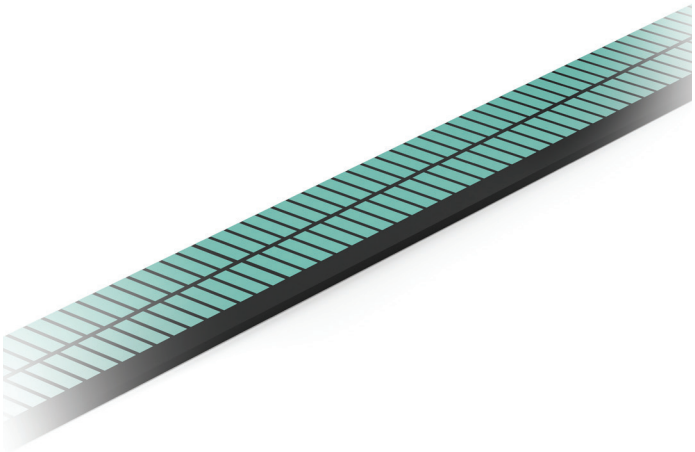
Linear Magnetic Scale Nonius

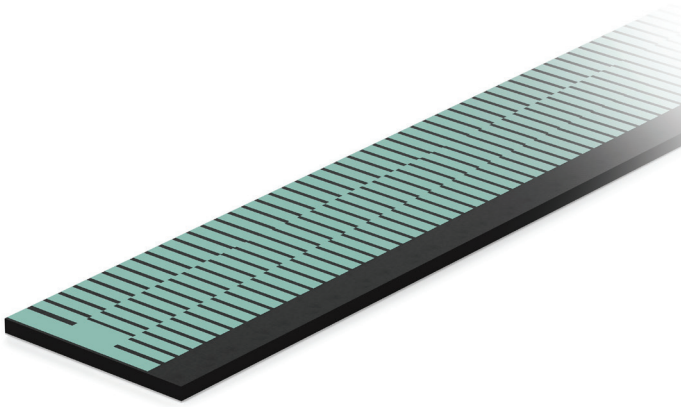
Absolute Measuring

Linear Applications

Counting and Controlling Tasks

BOGEN produces magnetic scales for a large variety of different applications. Linear Magnetic Nonius Scales can be encoded two or three tracks. Using different accuracy classes scales can be tailored to your requirements. Perfect fit for IC-MU series encoder chip from IC-Haus.





Features and Benefits

- different accuracies available on demand
- two or three track magnetization
- different scale geometries
- customizable for many applications
- no wear during operation
- non-contact measurement
- resistant to dust, cooling lubricant emulsion, oil, etc.

LMSN rev 3.0 (2022/05/24)

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Characteristics

Linear Magnetic Scale

accuracy class	± 3 µm, ± 10 µm, ± 20 µm
material	magnetic tape: elastomer filled with ferrite; carrier tape: stainless steel
width [mm]	standard: 6, 8, 10 3-track: 12, 15
thickness [mm]	0.5 to 1.66 (depending on scale setup)
pole pitch [mm]	standard for IC-MU: 1.28; 1.5 ; 2.0
magnetic flux of amplitude	dependant on pole pitch
operating temperature	- 20 °C to + 100 °C max.
expansion coefficient	~ 17 x 10-6/K
minimum bending radius [mm]	65
length in pieces	see „Scale Dimensions" next page
mounting holes for pieces	multiple hole combinations and angle cuts possible (on request, see below)

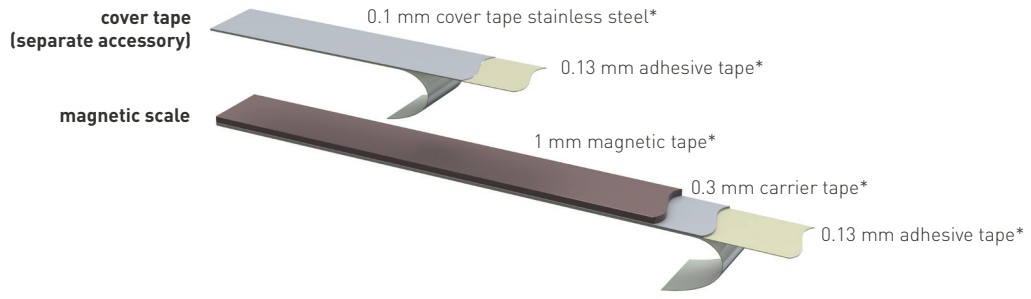
Adhesive Tape (optional)

material	double-sided acrylic adhesive tape
width [mm}	1 mm narrower than width of elastomer tape
thicknes [mm]	standard: 0.13 (see more options in table "optional stackup" on page 3)

Cover Tape (separate accessory)

material	cover tape: non-magnetic stainless steel; adhesive tape: acrylic adhesive tape
thickness [mm]	standard: 0.23 total thickness (0.1 mm stainless steel tape + 0.13 mm adhesive tape) (see more options in table "optional stackup" on page 3)

Standard Layer Stack-Up

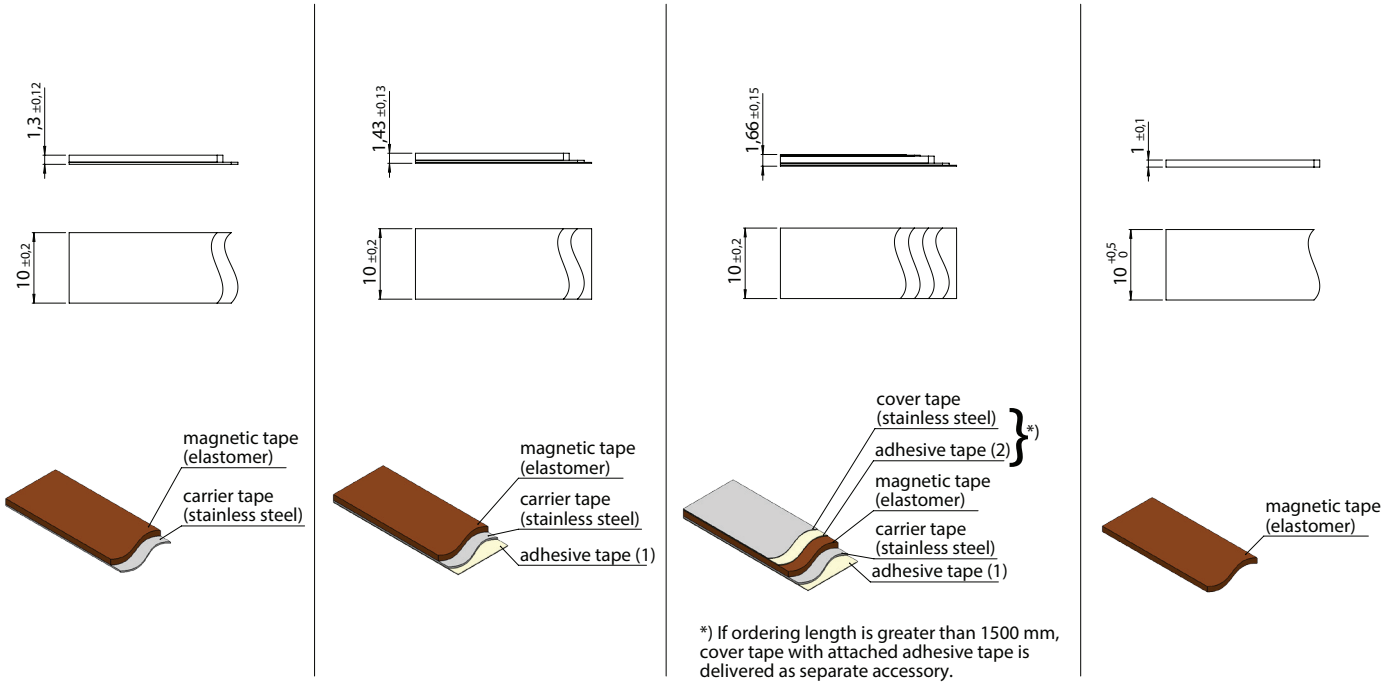


* standard parameters (others, please see order code)

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

LMSN rev 3.0 (2022/05/24)

Scale Dimensions with Standard Layer Stack-Up



*) If ordering length is greater than 1500 mm, cover tape with attached adhesive tape is delivered as separate accessory.

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 master track # pole pairs	year/ calendar week	reel no. (or number of pieces	master and nonius track position as indicated by arrows
2-track nonius tape	A20	N1.28 - 32	2244	01	M↓ N↑
3-track nonius tape	A20	N1.28	2244	01	S↑ M → N↓

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

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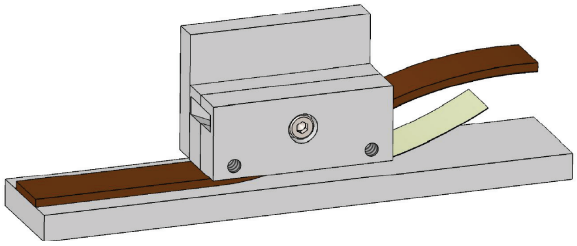
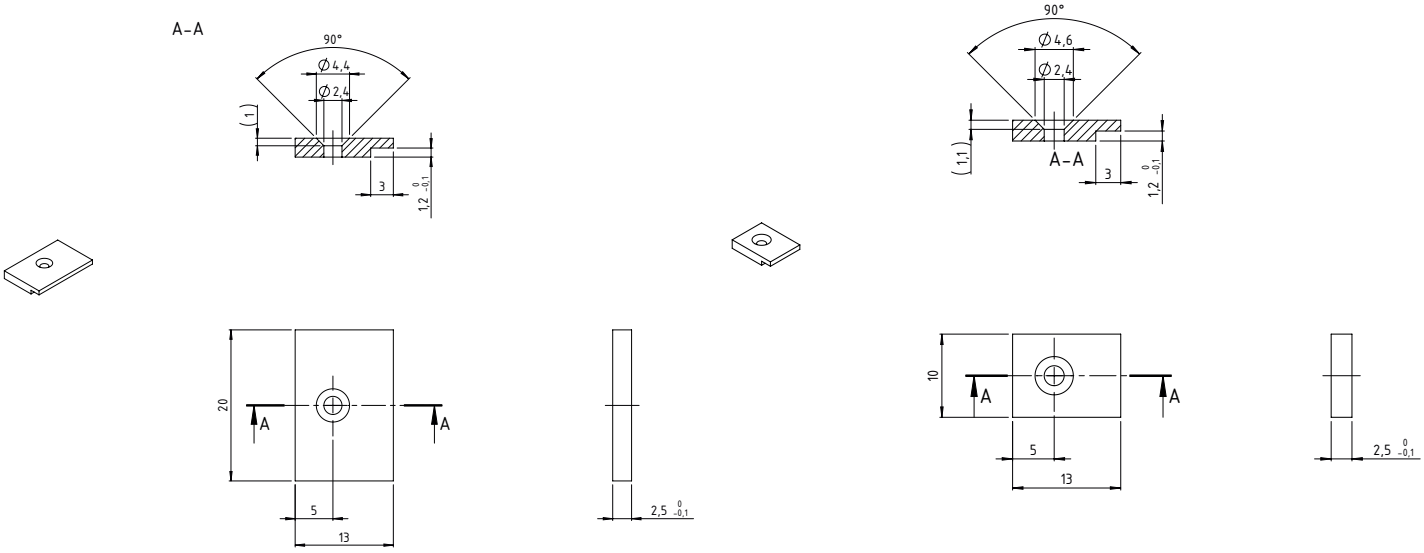
Optional Accessories

• 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)



• Clamps for Scale Ends



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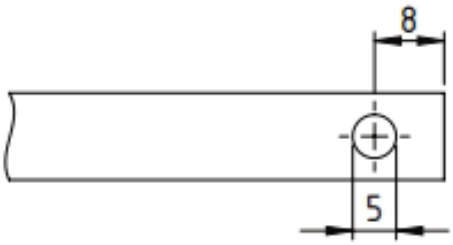
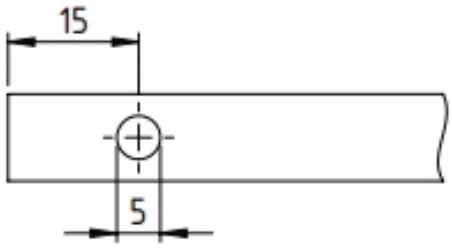
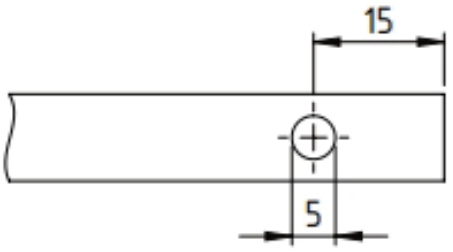
Standard Mounting Holes

Option 1

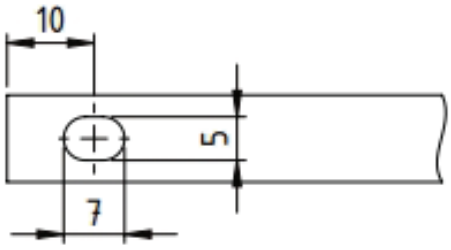


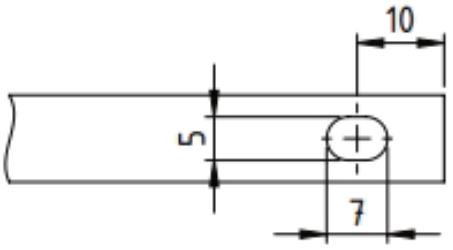
Option 2



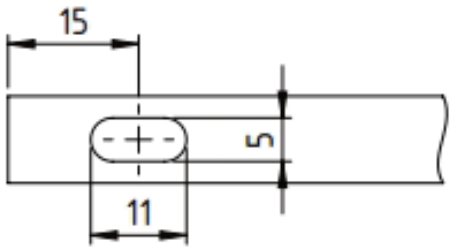


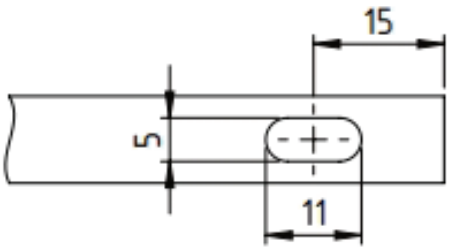
Option 3



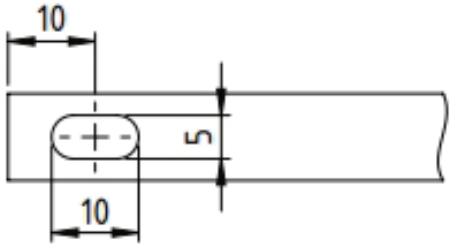


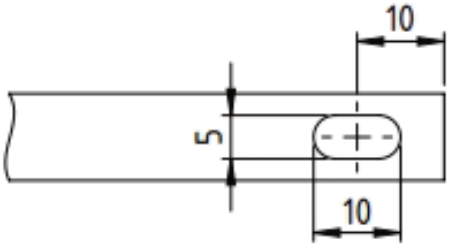
Option 4





Option 5





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Order Code

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

			code	explanation [1]
			2	two tracks
			...	number of tracks (up to nine)
	P	**track parameters**	N1.28	pole length 1.28 MM (for IC-HaUs chip IC-MU)
			N...	master pole length of nonius code
	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
	C	**cover tape**		**without cover tape**
			C	equipped with cover tape (only delivered up to piece length of 2300 mm, otherwise delivered seperately)
	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

[4] length of nonius scale: measuring length with specified accuracy class + additional 5 poles at both ends recommended

[5] for other options than listed please contact our application engineers

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Ordering Example

LMS2-N1.28-16-L16-W6-A03-K-T2	number of tracks: 2 track1: Nonius ~1.37 mm pole pitch, 15 pole pairs S-start pole, 3 mm track width track2: Master 1.28 mm pole pitch, 16 pole pairs N-start pole, 3 mm track width accuracy class: ± 03 µm/m total width: 6 mm total height: 1.43 mm total length: 16 mm (shortened Nonius) usable measuring length: 3 mm without cover tape with adhesive tape with customized imprint: M -> (arrow is pointing towards master track)
LMS3-N1.5-1024-L1700-W12-A03-K	number of tracks: 3 track1: Segment ~1.55 mm pole pitch, 992 pole pairs S-start pole, 3.5 mm track width track2: Master 1.5 mm pole pitch, 1024 pole pairs N-start pole, 5 mm track width track3: Nonius ~1.5 mm pole pitch, 1023 pole pairs S-start pole, 3.5 mm track width accuracy class: ± 03 µm/m total width: 12 mm total height: 1.43 mm total length: 1700 mm (shortened Nonius) usable measuring length: 1685 mm without cover tape with adhesive tape with BOGEN standard imprint

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