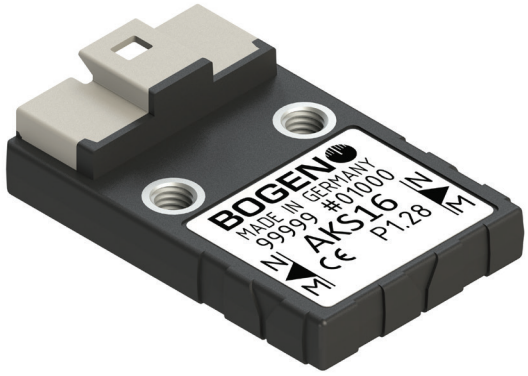
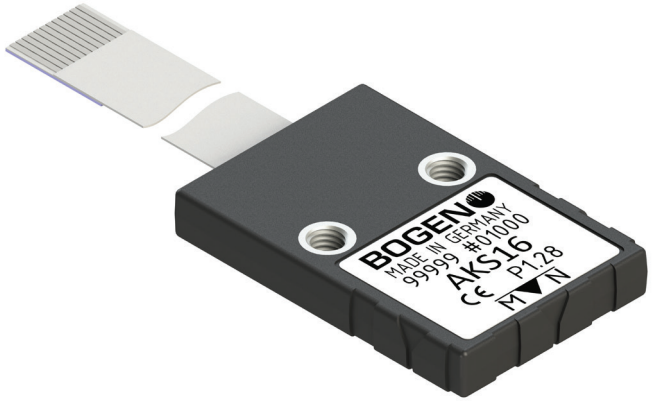
Magnetics that count

BOGEN

Measuring

Positioning





AKS16
Absolute Magnetic Encoder

- Rotary applications
- Linear applications
- Absolute measuring

Features

- 18 to 20 Bit absolute resolution
- 18 Bit incremental resolution
- Small dimensions for space-saving implementation
- Resistant against contamination, vibrations, temperature, fluctuations, humidity
- No wear from usage
- Corresponding scales in various diameters and lengths

Motion control with AKS16: accurate - robust - flexible

With the AKS16 and the corresponding scales BOGEN offers cost-efficient absolute magnetic measurement solutions for all industrial applications where movements have to be measured. The AKS16 can be used for linear measurements up to 256 mm in length and rotary measurements - radial and axial - up to 79 mm in diameter. The encoder provides both BISS-C or SSI as output plus incremental signal output in parallel. With a resolution of 18-20 bits this hollow shaft encoder surpasses typical shaft end applications many times over. With dimensions of 24.2 mm or 28 mm in length, 16 mm width and a height of 6.6 mm (Molex version) or 3.4 mm (FFC version) the AKS16 is very compact. The protection class IP67 allows the implementation even in harsh environment.

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Features

Absolute resolution *	18 Bit/19 Bit/20 Bit
Commutation signal	For 1 to 16 pole pairs (UVW)
Rotation speed	Resolution 18 Bit: up to 24,000 rpm Resolution 19 Bit: up to 12,000 rpm Resolution 20 Bit: up to 6,000 rpm
Optimal distance: magnetic target ⟷ sensing head	pole pitch distance 1.28 mm 0.4 mm 1.50 mm 0.5 mm 2.00 mm 0.6 mm
Supply voltage	5 V ± 5 %
Maximum output load	50 mA per Channel
Energy consumption (without load)	<60 mA ± 5 % (UB = 5,0 V)
Operating temperature	-20 to +60 °C
Storage temperature	-40 to +80 °C
Protection class	IP67 (with FFC connector)
ABZ Incremental resolution	4 and 262144 in steps of four based on pole pitch
Weight	ca. 2.4 g
Pole pitch	1.28 mm, 1.50 mm or 2.00 mm
Maximum torsional moment of threaded inserts	0.25 Nm
Lifetime of the encoder	100,000 hours

Output Signals ABZ

Signals / Inverted signals	A, /A, B, /B, Z, /Z
Signal amplitude (without load)	RS422 (± 5 V)
Phase shift A and B	90° ± 10° electrical
Signal period length Z	90°

Output Signals UVW

Signals / Inverted signals	U, /U, V, /V, W, /W
Signal amplitude (without load)	RS422 (± 5 V)

Output Signals STEP

Signals / Inverted signals	STEP, DIR, NCLR
Signal amplitude (without load)	RS422 (± 5 V)

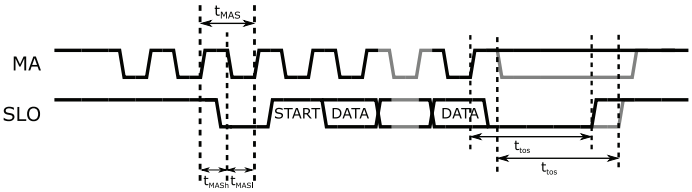
Output Signals CW/CCW

Signals / Inverted signals	CW, CCW, NCLR
Signal amplitude (without load)	RS422 (± 5 V)

Signals BISS

Signals	Clock (MA+, MA-)
	Data (SLO+, SLO-)
Signal amplitude (without load)	RS422 (± 5 V)
Protocol	BISS-C BP3 encoder profile
Multiturn	output possible
Timeout [ttos]	150-380 ns
Permissible clock period [tMAS]	100 ns up to 2 * timeout
Clock signal hi level duration [tMASh]	50 ns up to timeout
Clock signal lo level duration [tMASl]	50 ns

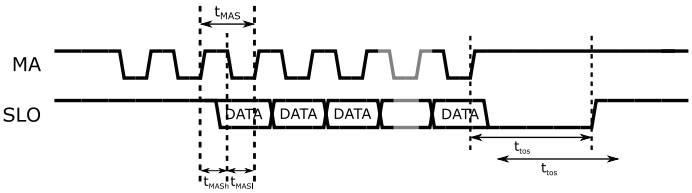
Timing Diagram BISS



Signals SSI

Signals	Clock (MA+, MA-)
	Data (SLO+, SLO-)
Signal amplitude (without load)	RS422 (± 5 V)
Multiturn	output possible
Timeout [ttos]	375-605 ns
Permissible clock period [tMAS]	250 ns up to 2 * timeout
Clock signal hi level duration [tMASh]	125 ns up to timeout
Clock signal lo level duration [tMASl]	125 ns

Timing Diagram SSI



Error and Warning Bit

Error Bit low - LED lights up red	-Bad alignment of sensor and scale -Mechanical shift
Warning bit low	-Movement speed to high -Magnetic field not strong enough

Follow standard ESD precautions!

Turn power off before connecting the sensor.

Do not touch the electrical pins without static protection such as a grounded wrist strap.

* Resolution depends on the diameter/length of the scale

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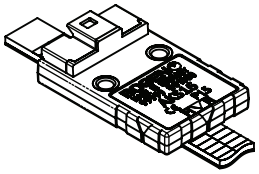
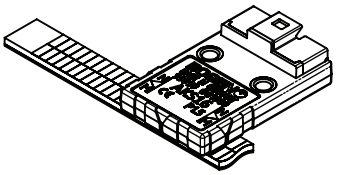
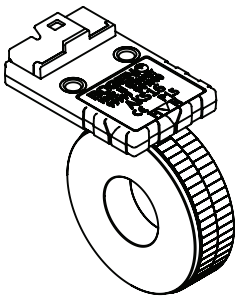
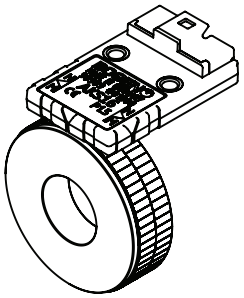
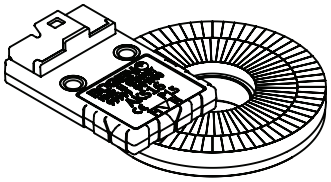
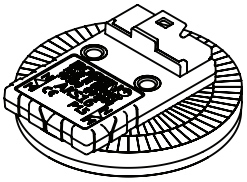
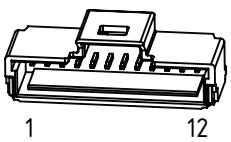
Orientation Options for 1.28, 1.50 and 2.00 mm (1.50 mm shown for reference)

	Orientation option 1 (parallel)	Orientation option 2 (perpendicular)
Linear scale		
Rotary scale Radial		
Rotary scale Axial		

Pin Assignment

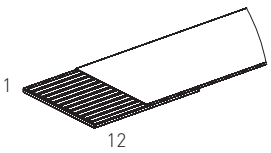
Pin No.	Output signals depending on selected interface incremental (D-Parameter)			
	D2 - ABZ	D3 - UVW	D4 - STEP	D5 - CW/CCW
1	/Z	/W	/NCLR	/NCLR
2	Z	W	NCLR	NCLR
3	/B	/V	DIR	/CCW
4	SLO-	SLO-	SLO-	SLO-
5	SLO+	SLO+	SLO+	SLO+
6	V-	V-	V-	V-
7	V+	V+	V+	V+
8	MA-	MA-	MA-	MA-
9	MA+	MA+	MA+	MA+
10	B	V	DIR	CCW
11	/A	/U	/STEP	/CW
12	A	U	STEP	CW

Connector C1



Molex 501568-1207
(12 pin male connector)
Mating cycles: 30

Connector C3



FFC (12 pin, 0.5 mm pitch)
Mating cycles: 20

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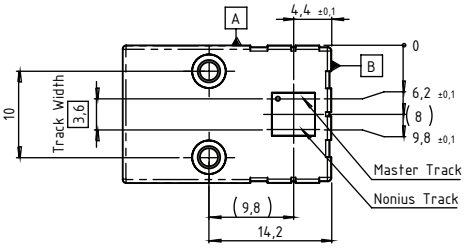
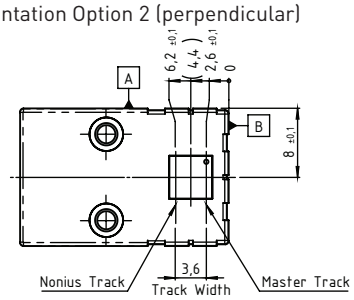
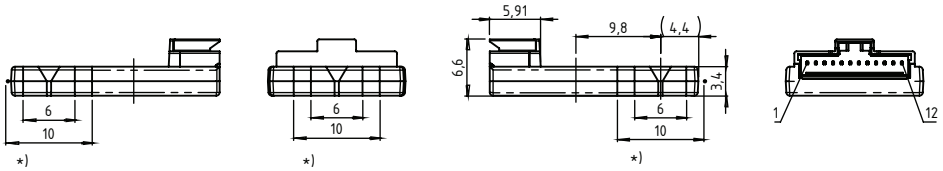
Dimensions Molex for 1.28 and 1.50 mm

Orientation Option 1 (parallel)

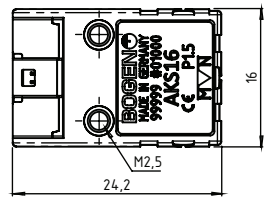


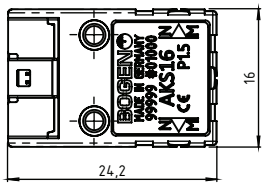
Orientation Option 2 (perpendicular)

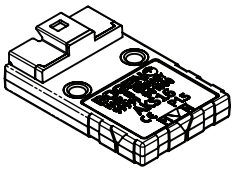


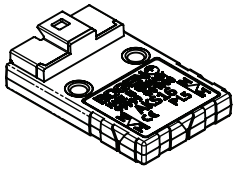


*) Installation marks for scale widths 6 mm and 10 mm

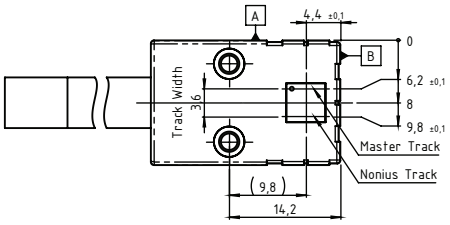


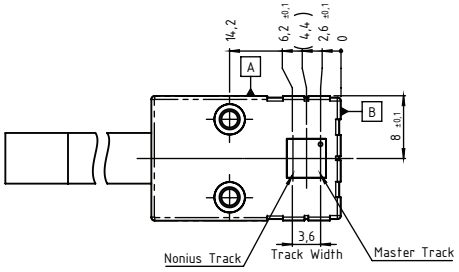


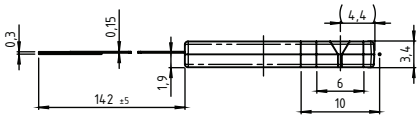


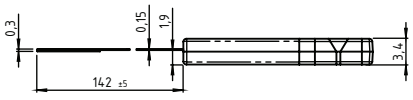


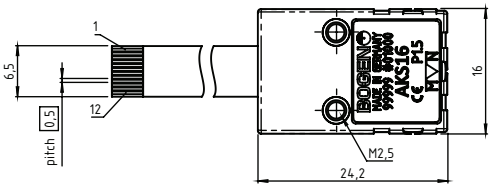
Dimensions FFC for 1.28 and 1.50 mm

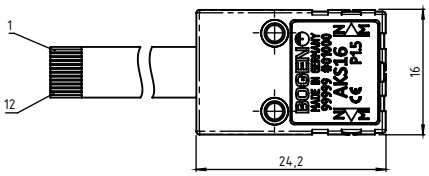


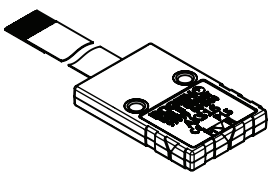


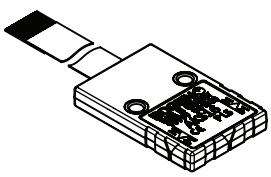












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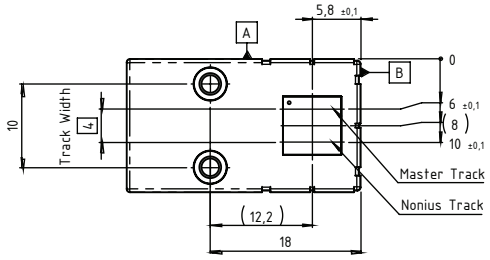
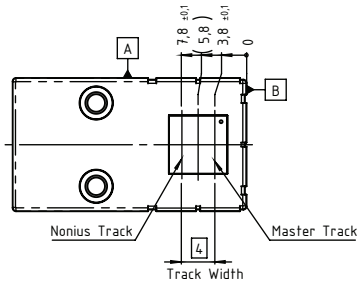
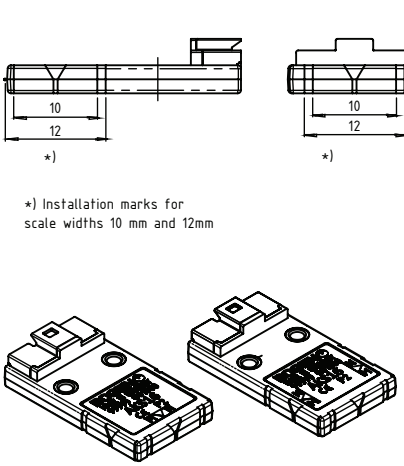
Dimensions Molex for 2.00 mm

Orientation Option 1 (parallel)



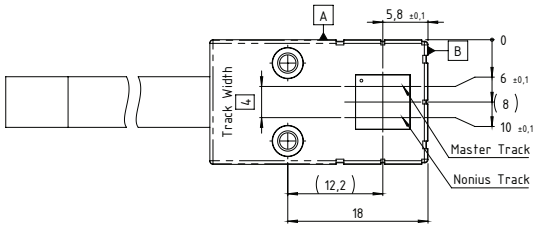
Orientation Option 2 (perpendicular)

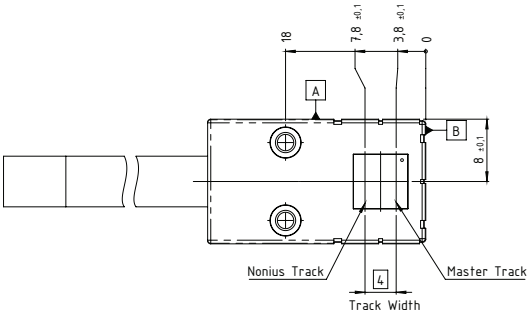


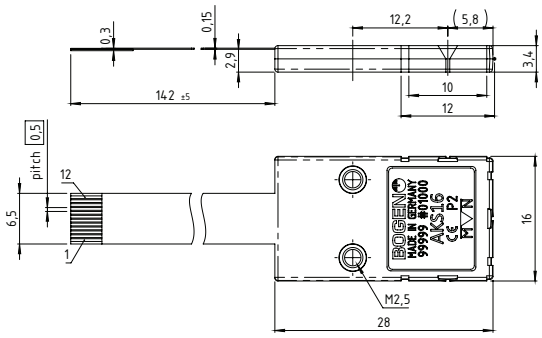


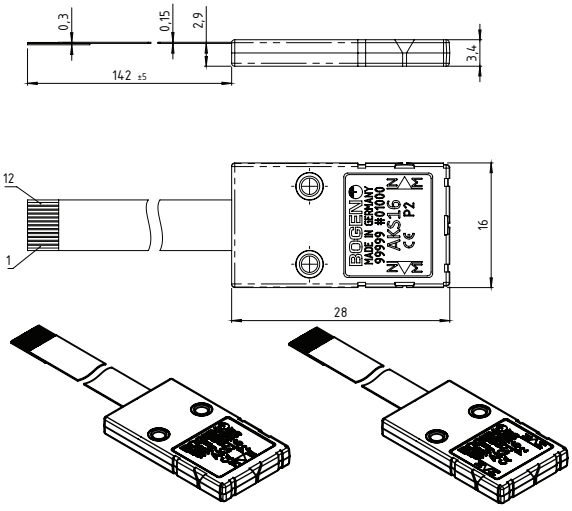
*) Installation marks for scale widths 10 mm and 12mm

Dimensions FFC for 2.00 mm









Note: Not mentioned dimensions are equivalent to specification of dimensions Molex.

Calibration

Each unit needs to be calibrated in final assembly with a nonius scale. For the calibration, the scale needs to be moved over the whole measuring length. For calibration, the programming unit including cables and the BOGEN software will be needed. A PC is required for the calibration. The use of non BOGEN approved software may result in lesser performance or operation of the encoder!

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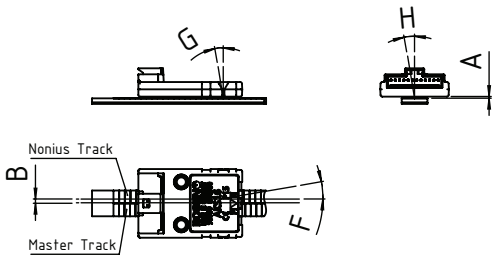
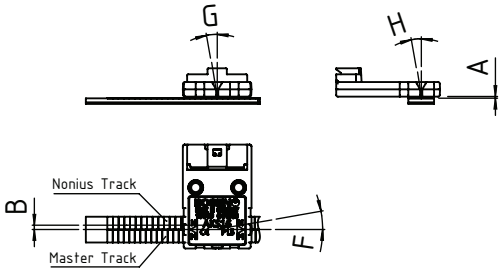
Installation Tolerances for 1.28, 1.50 and 2.00 mm (1.50 mm shown for reference)

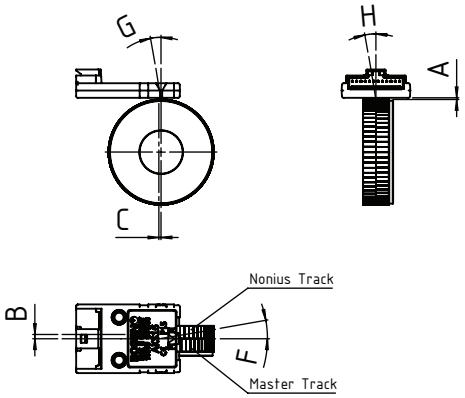
Linear Scale
Orientation Option 1 (Parallel)



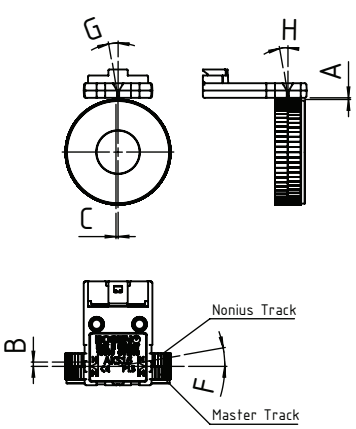
Linear Scale
Orientation Option 2 (Perpendicular)



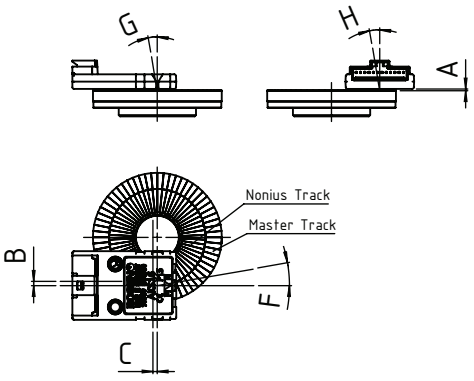
Rotary Radial Scale
Orientation Option 1 (Parallel)



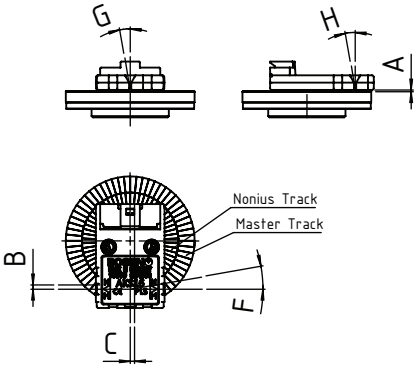
Rotary Radial Scale
Orientation Option 2 (Perpendicular)



Rotary Axial Scale
Orientation Option 1 (Parallel)



Rotary Axial Scale
Orientation Option 2 (Perpendicular)



Assembly Values and Tolerances

A [mm]	for 1.28 mm pole pitch: 0.4 mm ± 0.05 for 1.50 mm pole pitch: 0.5 mm ± 0.05 for 2.00 mm pole pitch: 0.6 mm ± 0.05
B [mm]	± 0.5
C [mm]	±0.5
F [°]	±1
G [°]	±1
H [°]	±1

Note:
- For tolerance purposes the bracket for mounting the AKS16 should have adjustment options.
- Maximum eccentricity of rotary scale must be < 0.06 mm.
- The installation tolerance is the same for both orientation options

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Order Code

Parameters

AKS16 -	O	P	C

			Code [1]	Explanation [1]
Parameters	O	Orientation Option	**O1**	**Parallel**
			O2	Perpendicular
	P	Pole Pitch [mm]	**P1.28**	**1.28 mm**
			P1.50	1.50 mm
			P2.00	2.00 mm
	C	Connector	**C1**	**Molex 12 pin**
			C3.142	FFC 12 pin, 0.5 mm pitch, length 142 mm [2]

[1] standard parameters are bold
[2] other lengths on request

Ordering Example

AKS16-O1P1.28C1	AKS16 Magnetic Sensing Head, orientation option parallel, 1.28 mm pole pitch, connector Molex 12 pin
AKS16-O2P1.28C1	AKS16 Magnetic Sensing Head, orientation option perpendicular, 1.28 mm pole pitch, connector Molex 12 pin
AKS16-O1P1.28C3.142	AKS16 Magnetic Sensing Head, orientation option parallel, 1.28 mm pole pitch, connector, 12 pin FFC, 0.5 mm pole pitch, length 142 mm

Parameters to be programmed by Customer [3]

		Code [4]	Explanation [4]
Parameters	Size	Z1	16/15 Nonius
		Z2	**32/31 Nonius**
		Z3	64/63 Nonius
	Interface Absolute	**A1**	**BISS**
		A2	SSI
	Interface Incremental	D1	None (on request)
		D2.<C>	**ABZ (<C> counts of scale, value between 4 and 262144 in steps of 4, default is 16384)**
		D3	BLDC motor commutation (UVW) (on request)
		D4	Step / direction (on request)
		D5	CW / CCW Incremental (on request)

[3] Parameters have to be set by customer before calibration. Programmable with the programming unit (order no. 00055040).
[4] Preset parameters are bold.

Corresponding Linear and Rotary Magnetic Scales

BOGEN offers a comprehensive scope of standard and tailor-made scales in a variety of sizes and accuracy classes. For more information on our standard linear and rotary magnetic scales, please refer to our dedicated datasheets. For your special requests, please click here to contact our application engineers.

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