

AKS16 Absolute Magnetic Sensing Head

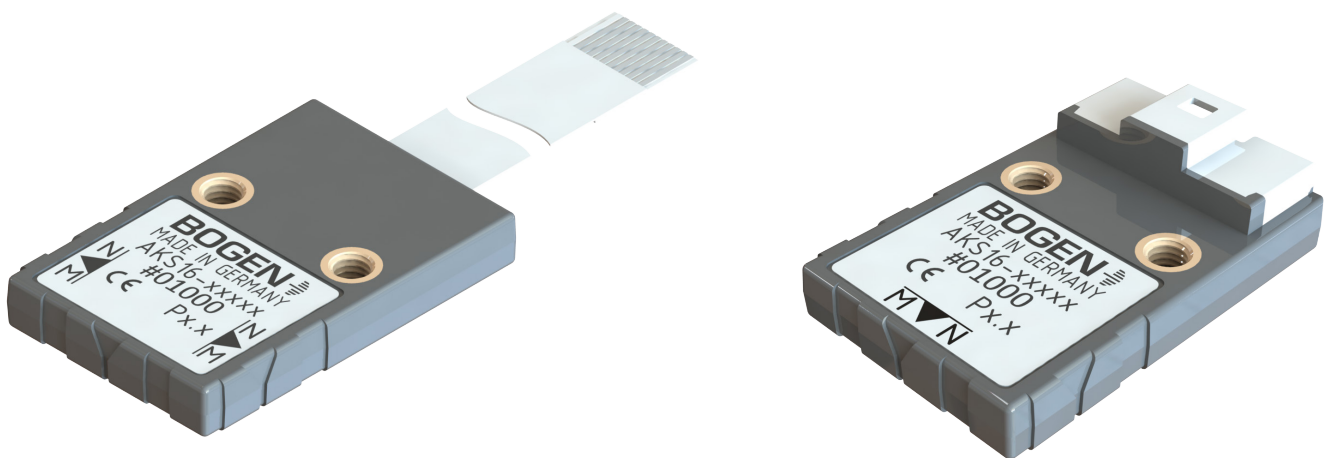
With the AKS16 and associated scales, BOGEN offers cost-efficient absolute magnetic measuring solutions for all industrial applications where movements have to be measured. AKS16 can be used for linear measurements up to 256 mm in length and for rotary measurements - radial and axial - from 11 mm up to 86 mm in diameter. The sensing head offers BISS-C or SSI as output as well as a parallel incremental signal output. With a linear resolution of up to 156 nm and a rotary resolution of up to 20 bit, this hollow shaft encoder outperforms typical shaft end applications many times over.

With dimensions of 24.2 mm length (1.28 mm and 1.50 mm pole pitch version) and 28 mm length (2 mm pole pitch version), 16 mm width and a height of 6.6 mm (Molex version) or 3.4 mm (FFC version), AKS16 is very compact. IP67 protection class enables use even in harsh environments.

Absolute
Measuring

Rotary
Linear
Applications

ALWAYS
ABSOLUTE



Features and Benefits

- 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

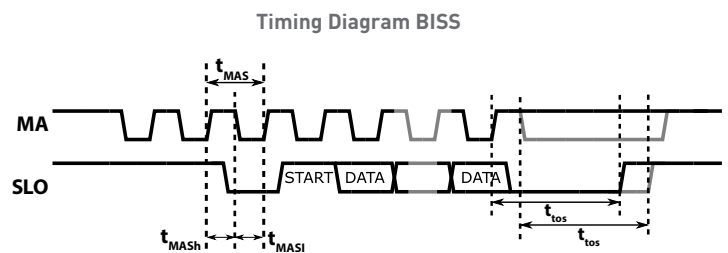
Features

absolute resolution*	18 bit/19 Bit/20 Bit	
commutation signal	value between 1 and 16 pole pairs (UVW)	
rotation speed	resolution	rotation speed
	18 bit	up to 24,000 rpm
	19 bit	up to 12,000 rpm
linear speed	20 bit	up to 6,000 rpm
	pole pitch	linear speed
	1.28 mm	17 m/s
optimal distance:magnetic target ←→ sensing head	1.5 mm	20 m/s
	2.0 mm	25 m/s
	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 % (V+ = 5.0 V)	
operating temperature	- 40 to + 100 °C	
storage temperature	- 40 to + 80 °C	
protection class	IP67 (with FFC connector)	
output signals	ABZ, UZW, STEP, CW/CCW	
signal levels	RS422 (± 5 V)	
ABZ incremental resolution	value between 4 and 262144 in steps of four; ABZ signal length Z: 90°	
weight	ca. 2.4 g	
pole pitch	1.28 mm, 1.50 mm or 2.00 mm	

* resolution depends on the diameter/length of the scale

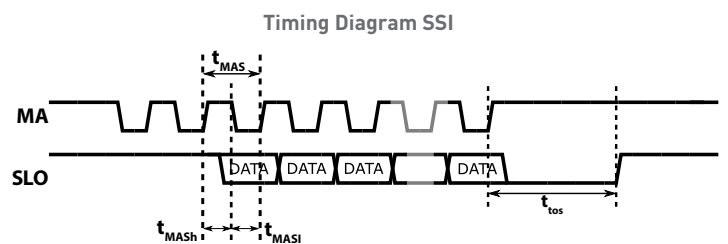
Signals BISS

signals	clock (MA+, MA-) data (SLO+, SLO-)
protocol	BISS-C BP3 encoder profile
multiturn	on special request; please contact our sales staff
timeout t_{tos}	150-380 ns
permissible clock period t_{MAS}	up to 5 MHz (200 ns)
clock signal hi level duration t_{MASH}	100 ns up to timeout
clock signal lo level duration t_{MASI}	100 ns



Signals SSI

signals	clock (MA+, MA-) data (SLO+, SLO-)
multiturn	in special request; please contact our sales staff
timeout t_{tos}	375-605 ns
permissible clock period t_{MAS}	up to 4 MHz (250 ns)
clock signal hi level duration t_{MASH}	125 ns up to timeout
clock signal lo level duration t_{MASI}	125 ns



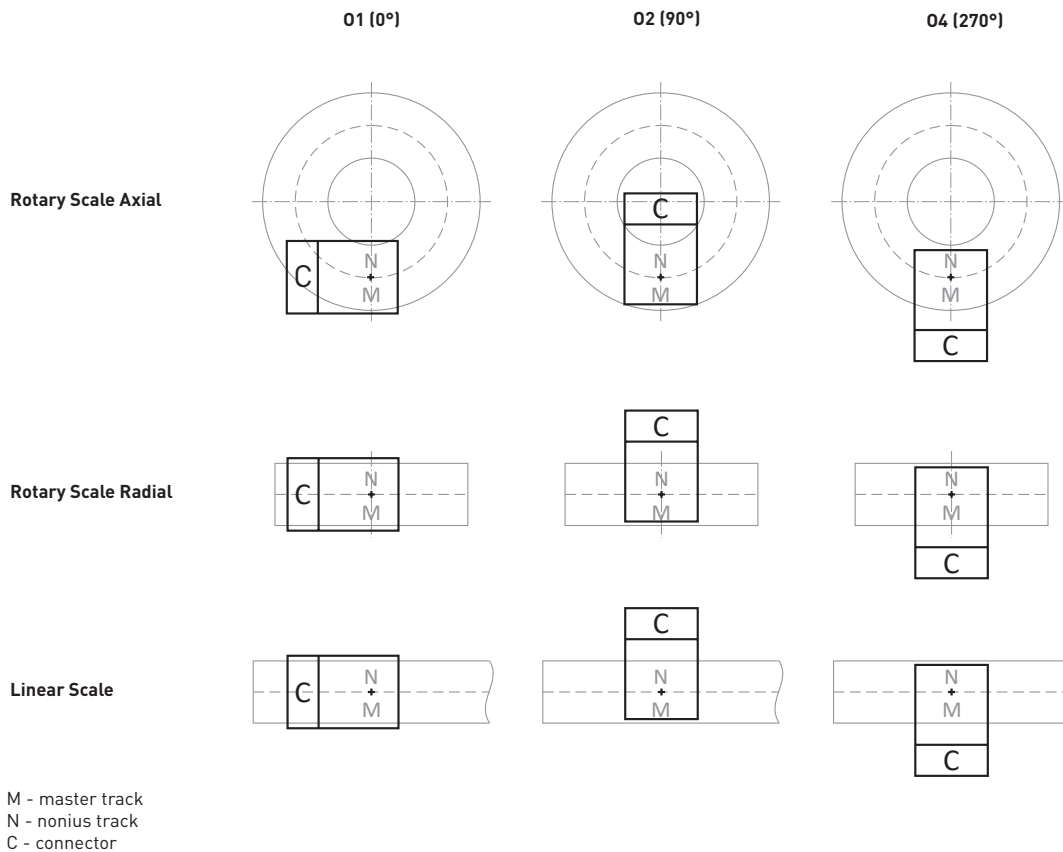
Error and Warning Bit

error bit low - LED lights up red	<ul style="list-style-type: none"> • bad alignment of sensor and scale • mechanical shift
warning bit low	<ul style="list-style-type: none"> • 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

Orientation Options

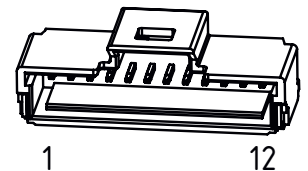


Pin Assignment

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

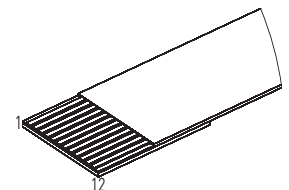
connector C1

Molex 501568-1207
12 pin male connector
mating cycles: 30

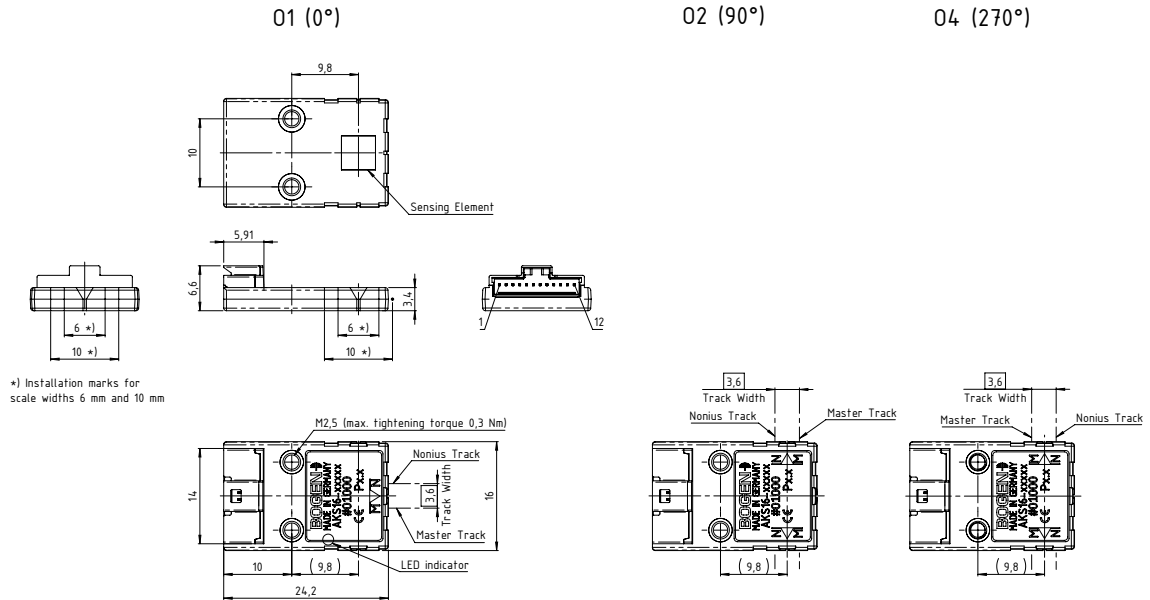


connector C3

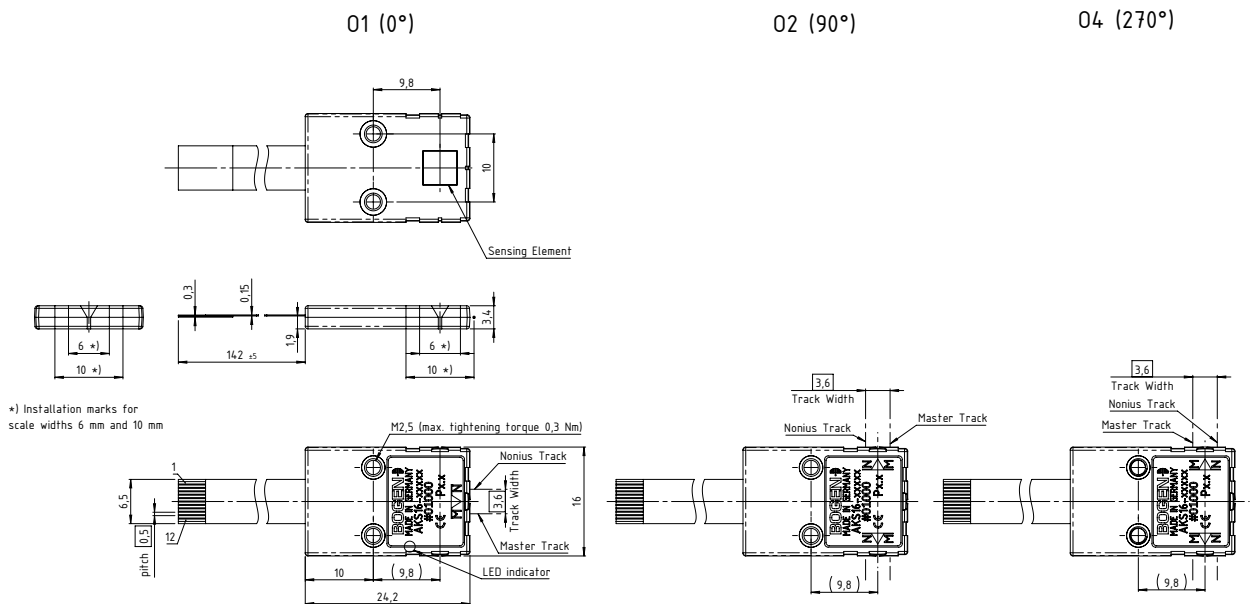
FFC (12 pin, 0.5 mm pitch)
mating cycles: 20



Dimensions for C1 (1.28 and 1.50 mm Pole Pitch, Molex Connector)



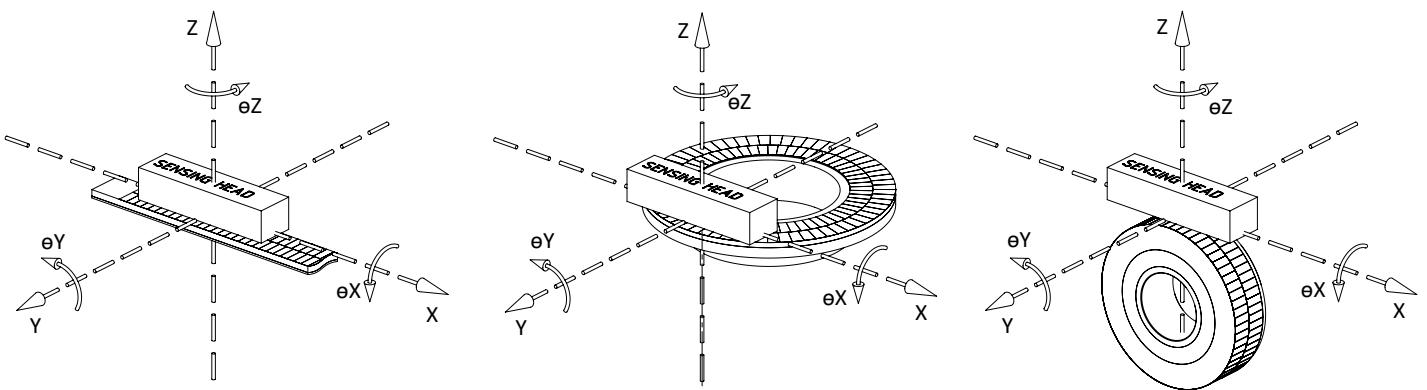
Dimensions for C3 (1.28 and 1.50 mm Pole Pitch, FFC Connector)



Calibration

Each AKS16 requires a calibration process in the final assembled state. It is recommended that the calibration is performed across the whole working range/measuring length of the magnetic scale. The calibration process consists of an analogue calibration, where the different sensors in the sensing head are being optimized for best performance and a nonius calibration where the sensing head is optimized over the scale/measuring length. With the programming software and hardware the parameters of an AKS16 sensing head can be adapted for a successful calibration. The software sets the sensing head parameters for the correct master-nonius periods (16/15, 32/31, 64/63), the operating measurement systems (linear, rotary radial, rotary axial) and the interface absolute and incremental.

Installation Tolerances



Assembly Values and Tolerances

Z [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
Y [mm]	± 0.5
X [mm]	± 0.5
θ_Z [°]	± 1
θ_Y [°]	± 1
θ_X [°]	± 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

Order Code

AKS16 - O - P - C - H

			code ⁽¹⁾	explanation ⁽¹⁾
parameter	O	orientation option	O1	angular position to the scale: 0°
			O2	angular position to the scale: 90°
			O4	angular position to the scale: 270°
	P	pole pitch	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⁾
	H	interface	H0⁽³⁾	without linedriver
			H1	with linedriver

⁽¹⁾ standard parameters are bold

⁽²⁾ standard length, other lengths on request

⁽³⁾ for this linedriver option only absolute interfaces are available

Ordering examples

AKS16-01-P1.28-C1 - H0	AKS16 Magnetic Sensing Head, orientation option parallel, 1.28 mm pole pitch, connector Molex 12 pin, without linedriver
AKS16-02-P1.28-C1 - H1	AKS16 Magnetic Sensing Head, orientation option perpendicular, 1.28 mm pole pitch, connector Molex 12 pin, with linedriver
AKS16-01-P1.28-C3.142 - H0	AKS16 Magnetic Sensing Head, orientation option parallel, 1.28 mm pole pitch, connector, 12 pin FFC, 0.5 mm pole pitch, length 142 mm, without linedriver

Customer-Programmable Parameters ⁽⁴⁾

			code ⁽⁵⁾	explanation ⁽⁵⁾				
parameters	Z	size		pole pairs	resolution single turn	max. measuring length pole pitch:1.28 mm linear resolution: 156 nm	max. measuring length pole pitch:1.50 mm linear resolution: 183 nm	max. measuring length pole pitch:2.00 mm linear resolution: 244 nm
			Z1	16/15	18 bit	40,96 mm	48 mm	64 mm
			Z2	32/31	19 bit	81,92 mm	96 mm	128 mm
			Z3	64/63	20 bit	163,84 mm	192 mm	256 mm
	A	absolute interface	A1	BiSS				
			A2	SSI				
	D	incremental interface	D1	none (available for linedriver options H0 and H1)				
			D2 <C>	ABZ [<C> counts of scale, value between 4 and 262144 in steps of 4, default is 16384] (available for linedriver option H1 only)				
			D3	BLDC motor commutation (UVW) (on request, available for linedriver option H1 only)				
			D4	step / direction (on request, available for linedriver option H1 only)				
			D5	CW / CCW incremental (on request, available for linedriver option H1 only)				

⁽⁴⁾ parameters have to be set by customer before calibration; programmable with programming unit (order no. 55040); must be ordered separately.

⁽⁵⁾ preset parameters are bold

Ordering Examples

AKS16-01-P1.5-C1-H0-Z1-A2-D1	AKS16 Magnetic Sensing Head, orientation option parallel, 1.5 mm pole pitch, connector Molex 12 pin, without linedriver, 16/15 nonius, SSI, no incremental interface
AKS16-01-P1.5-C1-H1-Z2-A1-D2.16384	AKS16 Magnetic Sensing Head, orientation option parallel, 1.50 mm pole pitch, connector Molex 12 pin, with linedriver, 32/31 nonius, BiSS, ABZ 16384 steps

Required Accessories

	programming unit [AKSZ-00004]*	programming unit [AKSZ-00002]**
for AKS16 with C1 connector	X	
for AKS16 with C3 connector		X

*) Consists of: programming adapter/box [AKSZ-00001], USB cable [LTKP-00032], Adapter cable from AKS to programming box [LTKP-00063], BOGEN magnetic viewer [MARK-00001]

***) Consists of programming adapter/box [AKSZ-00001], USB cable [LTKP-00032], FFC-adapter PCB/board [LPBG-00033], BOGEN magnetic viewer [MARK-00001]

Optional Accessories

	cable assembly [LTKP-00082]	cable assembly [LTKP-00083]
for AKS16 with C1 connector	length: 1 m connector 1: Molex PICO-CLASP 501330-1200 connector 2: flying leads	length: 3 m connector 1: Molex PICO-CLASP 501330-1200 connector 2: flying leads

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.

