AKS16
Absolute Magnetic Sensing Head

INSTALLATION AND OPERATION INSTRUCTIONS

Safety Instruction

Read these instructions carefully prior to installation and operation.

This manual is intended for professionals who perform the installation and the setup. The assembly of the system requires knowledge of mechatronics and general health and safety regulations. Follow all warnings and instructions for your own safety and the safety of your system.

These operating instructions apply to the incremental magnetic sensing head AKS16 in connection with a magnetic scale for linear or rotary applications.

Risk of electric shock or short circuit!
Incorrect handling of electrical equipment can be fatal or cause damage to property.

Danger to life!
Unauthorized use of the system can be highly dangerous.
The magnetic position sensing heads must not be used in life-saving systems such as airplanes etc.

Risk of pinching
There is a risk of getting pinched between the sensing head and the magnetic tape. This can lead to injury or mechanical damage. Avoid getting with your limbs and tools near the gap between the head and the tape while the measuring system is in motion!

Dangers that may follow
Malfunctions of the measuring system can lead to further risks to the device or the system in which it is embedded. When there is evidence that the measuring system is not working properly, it must be put out of operation and secured against unauthorized use. The prescribed safety regulations must be observed for the use of position sensing heads. In particular, measures must be taken to prevent dangers to people and property in the event of a failure. This includes the installation of additional safety limit switches, emergency stop switches and the observance of the required environmental conditions

Risk of damage for the magnetic layer
Magnetic tapes and sensing heads can be damaged by magnetic fields!
Apply only demagnetized tools for assembly and maintenance!
Improper storage of magnetic tape rolls can lead to magnetic interaction between the layers and thus to a reduction of the measurement accuracy

BOGEN Magnetics GmbH · Potsdamer Straße 12-13 · 14163 Berlin · Germany
Fon +49 (0) 30 81 00 02 - 0 · Fax +49 (0) 30 81 00 02 - 60 · magnetics@bogen-magnetics.com · www.bogen-magnetics.com

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Electromagnetic Compatibility

For the electrical connection it is essential that the electromagnetic compatibility (EMC) is guaranteed.

- System and control cabinet must be connected to the same ground potential.
- Use shielded cables. Connect the cabinet side of the cable shield with protective earth (PE).
- Avoid installing in close proximity to power lines.
- The nominal operating voltage (see datasheet) must be observed even if there is a voltage drop along the supply line!
- Determine the place of installation so that inductive and capacitive interferences cannot affect the sensor. By adequately routing the cable, interferences can be reduced.

Intended Use

The incremental magnetic sensing heads AKS16 are part of a highly accurate measuring system consisting of magnetic scales and sensing heads capable of contactless position detection for linear and rotary applications.

Fields of deployment:
- mechanical engineering
- automation
- medical engineering
- electrical engineering.

The system consists of a sensing head and a linear or rotating magnetic scale and can be incorporated into various electronic systems. It can be configured according to the customer's demands. In combination with a suitable analysis software absolute and relati-ve position and position changes can be measured. In this way it is possible, for instance, to control machi-ne tools, determine torsional forces or detect longitu-dinal expansions.

Fields of Deployment

- capital equipment,
- automation,
- medical engineering,
- electrical engineering.

A measurement solution consists of a sensing head and a linear or rotary magnetic scale and can be incorporated into various electronic systems. It can be configured according to the customer's specifications. In combination with a suitable analysis software absolute and relative position and position changes can be measured. In this way it is possible, for instance, to control machine tools, determine torsional forces or detect longitudinal expansions.

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Function and Properties

The magnetic position sensing heads AKS16 are suitable for non-contact, absolute and incremental position measuring systems. The measuring function is realized by magnetic scanning.

The system has the following features:

- absolute and incremental encoder
- 16 to 18 bit absolute resolution
- 16 bit incremental resolution
- non-contact, quick position measurement
- single piece unit
- no wear from usage
- resistant to dust, cooling lubricant emulsion, oil, etc.
- different diameters and length offered
- radial, axial or linear reading.

Mode of Operation

The sensing head with its sensor is mounted on the machine part whose position is to be measured. The measuring magnetic surface is mounted along the measuring distance. On the magnetic tape alternating magnetic north and south poles are positioned with a regular distance. The magnetic hall sensor cells in the sensing head are scanning the magnetic poles on the tape contact-free.

Permissive Linear and Rotation Speed

Please see AKS16 technical data sheet on our website: www.bogen-magnetics.com

Digital Absolute Output

The sensing head with digital absolute output signal converts the analog signals to an absolute information in BISS-C or SSI.

Digital Incremental Output

The sensing head with digital incremental output signal converts the analogue signals into digital A/B and Z pulses and transmits them to the controller. The two digital signals A and B are electrically phase-shifted by 90°. The sign of the phase shift represents the direction of movement of the sensor. Every change of A or B (rise to fall or vice versa) is a count for the period counter (up/down counter). If signal A is preceding signal B, the counter increases. If signal B is preceding signal A, the counter decreases. The Z pulse appears every time when passing the zero point. The controller thus knows at all times the increment position, without having to query the sensing head periodically (real-time capability). Therefore, after an interruption of the power supply the sensing head can still read its

correct absolute position on the scale.

Assembly and Installation

During assembly utmost cleanliness is required. Device parts have to be degreased thoroughly before gluing. During installation the mounting tolerances and the position of the measuring point have to be observed respectively implemented as stated in the datasheet.

Measurement Options

The AKS16 comes with two measurement options.
- option 1 is a sensing head with parallel orientation of AKS16 chip
- option 2 is a sensing head with perpendicular orientation of AKS16 chip.

Delivery Condition

The AKS16 is supplied with a connector Molex 501568-1207 or with a FFC as an alternative for Molex.

Programming Device

Introduction

Each AKS16 requires a calibration process in assembly. It is recommended that the calibration is performed across the whole working range of the sensing solution.

The calibration process consists of an analog calibration where the different sensors in the sensing head will be optimized for best performance and a nonius calibration where the sensing head is optimized over the scale.

With the AKS16 software and hardware the parameters of an AKS16 sensing head can be changed for a successful calibration. The software sets the sensing head parameters for the correct master-nonius periods (16/15, 32/31, 64/63) and the operating measurement systems (linear, rotary radial, rotary axial).

To calibrate the sensing head you need:

Windows PC

AKS16 programming unit

cable for programming unit

(USB 2.0 type A connector / mini-B connector)

cable (9 pin serial cable / Molex or FFC)

System Requirements

The programming device can be connected to a Windows PC with a USB cable and operated with the dedicated software. The software requires Windows Vista or later (32/64 Bit). Before the programming device (programmer AKS16) can be connected the specific driver must be installed. Copy the software to a local directory on your Windows PC. To install the driver execute the specific program.

- USB_Adapter_00052040_Driver.exe. Connecting the device (for the calibration setup).

- Mount the sensing head correctly per mechanical specifications. It is required to place the sensing head within the allowed mechanical tolerances (maximum displacement), see technical data sheet.

Both status LEDs (green and red) on the AKS16 sensing head will light up now if all devices are mounted correctly. The pictures below show the final stage of all connected cables and the programming device.

Programming Software

Please contact our sales department for software and application notes: sales@bogen-magnetics.com

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Commissioning

Verify general system operation

After mounting the distance measuring system or after replacing the sensing head, verify general system operation as follows:

- recalibrate the sensing head,
- switch on the supply voltage of the sensing head,
- move the sensing head along the entire measurement path or revolution,
- check that all signals are present at the output,
- check if the count direction matches the traversing/revolution direction. If this is not the case please mark the checkbox in the main window of the software.

Maintenance

The functionality of the measuring system and all related components must be reviewed and recorded regularly. For more information and data sheets go to our website www.bogen-magnetics.com

Appendix

Troubleshooting

If there are signs of interference or malfunctioning, the measurement system must be put out of operation and secured against unauthorized use.

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FAQs

Q: Can I connect a sensor after I have chosen my desired sensor parameters?

A: Yes, in case the user wants to choose the parameters first and then calibrate the sensor the software will allow this order.

Q: Can I connect a different sensor after I have calibrated the first sensor?

A: Yes, the software has been developed to perform this scenario. The software will disconnect the sensor automatically after performing a calibration. The user can freely disconnect the cables and reconnect a new sensor if desired.

Q: How can I choose calibration duration?

A: Calibration duration represents a time variable. The duration should cover at least four pole pairs for successful calibration.

Example: If the AKS16 is used with a 1.28 mm Pole Pitch Linear Scale" then four pole pairs are 8 * 1.28 = 10.24 mm. This is the absolute minimum calibration distance. If the sensor is moving along the scale with a speed of 5 mm per second, then the calibration duration is distance / speed = 10.24 / 5 = 2.048 seconds. Thus we choose the nearest bigger calibration duration available in the given parameters, that is 2.1875 seconds.

Q: Can I connect a sensing head for 1.28 mm and 1.5 mm pole pitch with the same programming unit and software?

A: Yes. The software recognizes the different pole pitches and performs the right actions. The programming unit can handle both pole pitches.

Q: Can I connect an AKS16 and AKS17 with the same programming unit/software?

A: The programming unit and the software are able to work with both sensing heads.

Fault / Error Message	Possible cause	Measures
Could not connect the sensor. Failed communication to BiSS master, check the connected interface.	Cables are not connected correctly.	Please check cables connecting adapter and sensor.
	Another program may be using the adapter.	Please close any other application that may use the adapter. If the problem still exists perform a PC restart.
Could not connect the sensor. BiSS communication failed. Check wire connection and power supply.	Another program may be using the adapter.	Please close any other application that may use the adapter. If the problem still exists perform a PC restart.
	Power supply for the adapter is too weak.	Please make sure that the PC can provide enough power on the USB port. If not, you have to provide external power.
	Contacts are poorly shielded.	Use shielded cables and ensure proper contacting.
Install FTDI interface driver.	The adapter driver is not installed.	Please install the driver software corresponding to your adapter. If the problem still exists a restart may be necessary.
Calibration failed, rotation speed is too slow for calibration.	Velocity or duration are not high enough.	Increase velocity or calibration duration.
Calibration failed, rotation speed is too fast for calibration.	Velocity or duration exceed the limits.	Decrease velocity or calibration duration.
Calibration successful but rotation speed is too slow to acquire one complete turn.	A full scale calibration was not performed.	This warning can be ignored when the user is not using the full scale measurement area. Otherwise it is recommended to repeat the calibration with higher velocity or higher duration and cover all the scale.
Calibration failed, invalid calibration data cycle count.	Very noisy environment.	Please make sure that the cables are shielded and that there is no interference in your application.
	The magnetic poles are damaged in some places.	Replace the magnetic nonius scale.
Please check the air gap between the sensor and the magnetic scale. The air gap must be 0.4 mm. Please check X, Y position of the sensor on the magnetic scale or the optimum calibration.	The sensor position is out of tolerance.	Please verify the air gap and X, Y mechanical position of the sensor to match the tolerance discussed in installation tolerance.
Nonius calibration failed. Please reposition the sensor and press ¨Retry¨.	The sensor position is out of tolerance.	Please verify the air gap and X, Y mechanical position of the sensor to match the tolerance discussed in installation tolerance.
	Very noisy environment.	Make sure that the cables are shielded and that there is no interference in your application.
	The magnetic poles of the scale are damaged in some places.	Replace the magnetic nonius scale.
Could not connect the sensor. Unable to detect the slave. Please connect compatible AKS16.	Wrong sensor.	Make sure that the sensor option matches your sensor.
Analog parameters are all 0 and in the error textbox you have the following message: ¨The analog electrical phase error is very big. Please check the current sensor configurations and positions.¨	The sensor is badly positioned. The software and the sensor cannot calibrate this big error.	Reposition the sensor acording to the datasheet.
		Make sure that the master mark on the sensor is aligned with the master track on the ring.
You have good analog calibration but bad nonius calibration.	Wrongly aligned sensor to the ring.	Make sure that the master mark on the sensor is aligned with the master track on the ring.
	Wrong ring size.	Make sure that the ring matches the ¨Size¨ parameter.

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EU Declaration of Conformity

According to EU regulation for Electromagnetic Compatibility 2004/108/EU and European Standard for Electromagnetic Compatibility EN 61326-1:2006 (EMC)

BOGEN Magnetics GmbH

Potsdamer Str. 12-13

14163 BerlinGermany

declares that

Magnetic Sensing Head AKS16, manufactured since 2015,

complies with the above-mentioned regulations and standards.

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