MagLine | Magnetic length and angle measurement systems, speed measuring technology

Magline Product Overview
MagLine Micro
MagLine Basic
MagLine Macro
MagLine Roto
Inclinometers
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1963</td>
<td>Dr.-Ing. Günther Wandres founded SIKO GmbH.</td>
</tr>
<tr>
<td>1980</td>
<td>A milestone on the way to a global market: establishment of the subsidiary SIKO Products in the USA.</td>
</tr>
<tr>
<td>1982</td>
<td>Introduction of the magnetic measuring principle.</td>
</tr>
<tr>
<td>1983</td>
<td>Start of magnetic tape production.</td>
</tr>
<tr>
<td>1992</td>
<td>Introduction / development of the magnetic compact sensors (MSK).</td>
</tr>
<tr>
<td>1993</td>
<td>Introduction / development of magnetic, absolute length measurement (NSA/MBA).</td>
</tr>
<tr>
<td>1995</td>
<td>Introduction / development of the unique “Mag-Line” product range and brand label.</td>
</tr>
<tr>
<td>1996</td>
<td>Introduction / development of the first linear encoders for direct drives.</td>
</tr>
<tr>
<td>1999</td>
<td>Introduction of the magnetic measuring principle.</td>
</tr>
</tbody>
</table>
2003 and 2005 Foundation of subsidiaries in Switzerland, Italy and China.

2006 Introduction / development of the first high-resolution absolute sensor.

2008 Introduction of the patented compact sensor solution with 20 mm reading distance.

2013 Foundation of the Singapore affiliate.

2015 Introduction of the magnetic measurement principle with certified safety function.

2016 Introduction of the pluggable compact sensors MSC500.

2017 Introduction Industry 4.0 sensors LEC100 and LEC200 for drive technology, handling systems and robotics.

MagLine Product Overview

- MagLine Micro
- MagLine Basic
- MagLine Macro
- MagLine Roto
- Inclinometers

Focus on Sectors

Service

Contact
From the idea to the solution

The MagLine product line follows the idea of replacing measurement systems based on encoders with rack-and-pinion by a contactless system based on a magnetic principle.

To date, four product groups cover the whole scope of industrial measurement tasks. System accuracy, resolution and tape reading distance are major distinguishing features. The magnetic SIKO technology of MagLine is the first choice wherever precision, reproducibility and robustness of the measurement processes are demanded.

The focus of application is on the acquisition of linear and radial positions, angle values, and rotational speeds.

Benefits:

- Absolutely wear-free technology
- Resistant to dust, shavings, humidity, oil, grease, etc.
- Robust against shock and vibration
- No measurement errors caused by transmission errors or backlash
- High system accuracy and reproducibility
- Easy handling and assembly
- Nearly maintenance-free

The magnetic measurement principle

A permanently mounted magnetic tape (also called scale) is the core element of magnetic linear measurement. A magnetic sensor fastened on the movable part of the relevant machine scans this tape contactlessly. The sensor converts the measurement values acquired into digital or analog signals via an integrated electronic unit. These signals are available for a variety of devices including translation modules, superordinate controls (PLC) or displays connected on-site.

The actual magnetic measurement process results from magnetoresistance. SIKO encodes the magnetic tapes in specially developed processes. The resulting tape encoding enables incremental or absolute measuring procedures with different levels of resolution.
Incremental systems

In the incremental system, the magnetic tape is magnetized with north and south poles at uniform periods with the pole length among others determining maximum resolution and system accuracy. When the sensor is moved over the tape, the periods generate the path information which is processed in the form of digital square-wave signals (counting pulses) or analogous sine/cosine signals. Counting of the pulses permits a statement concerning the distance traveled.

In an incremental system, at least absolute reference is required – the so-called reference point. This point serves for realignment of the system and can be stored as additional information on the magnetic tape. This reference point in an incremental system is important because the actual position value is lost as a rule after power interruption (e.g. after system shutdown and restart) or when the sensor position has changed.

A system with no buffer battery will require a new reference travel. Battery-buffered systems are regarded as quasi-absolute systems.

Absolute systems

By contrast, no reference travel is required at all for linear measurements with absolutely coded magnetic tapes. The flexible plastic tape has been magnetized with a specific absolute Code.

Commissioning is via one-time calibration of the system. No buffer battery is required owing to the absolute coding of the tape because the actual position value will be available at any position immediately after starting the system.

A change of position even in the de-energized state will not influence the correctness of the measured value displayed since the position is stored absolutely on any place in the coded magnetic tape. Likewise, no reference travel is required when the sensor is lifted from the tape e.g. for maintenance purposes.

MagLine benefits ...

... mainly the branches of industry that put high requirements on repeat accuracy of linear or rotative measuring processes under adverse ambient conditions, including ...

- Wood, metal and plastic working
- Stone working
- Medical technology
- Direct drives
- Warehouse technology
- Stage and studio technology
- Speed recording
- Window construction
- Mobile Automation
- Renewable energies
Profile
This high-resolution feedback system is especially designed for precise, highly dynamic processes with special measurement requirements in the μm range.

Features:
- Measurement lengths up to 100 m
- Freely selectable parameters
- Sensors with or without integrated translation module
- System for incremental or absolute acquisition of measured values
- Primary application: linear and rotational guide and drive technologies
- Interfaces with real-time signal output
- High precision for exact determination of position and optimum control quality

Specifications of MagLine Micro
- Resolution 0.2 ... 5 μm
- System accuracy ±10 μm
- Repeat accuracy ±1 μm
- Sensor-tape gap up to 0.4 mm

Advantages:
- Highest resolution
- Incremental/absolute
- Economical
- Small and compact

e.g. pick-and-place linear drives with dowel drill stations, parquet production, blown film packaging ...
Use of micro systems in the production of printed circuit boards.

The Micro systems reliably realize highly precise acquisition of measured values and positions even under particularly demanding ambient conditions.

### Combinations

<table>
<thead>
<tr>
<th>Measuring method</th>
<th>Scale</th>
<th>Magnetic sensor</th>
<th>Interface</th>
<th>Downstream electronic unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental</td>
<td>MB100/1</td>
<td>LES100/1</td>
<td>analog</td>
<td>drive/controller *</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSK1000</td>
<td>digital</td>
<td>PLC, counter*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MS100/1</td>
<td>direct connection</td>
<td>MA100/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LEC100</td>
<td>analog, digital</td>
<td>drive/control*, PLC, counter*</td>
</tr>
<tr>
<td>Absolute</td>
<td>MBA111</td>
<td>MSA111C</td>
<td>SSI, analog</td>
<td>drive/control *</td>
</tr>
<tr>
<td></td>
<td>MBA213</td>
<td>MSA213C</td>
<td>SSI, Biss, IO-Link, analog</td>
<td>drive/control *</td>
</tr>
</tbody>
</table>

*Customer’s downstream electronic unit*
On duty: Incremental and absolute position acquisition by means of Basic systems. The combination with compatible electronic equipment enables the connection to control units or direct display on-site.

Profile
Proven and technically sophisticated, the Basic product series offers a particularly wide range of components which are geared to each other. The economical solutions offer a variety of individual applications, which fulfill all standard requirements regarding measurement accuracy.

Features:
- Measurement lengths infinite
- Sensors with or without integrated translation module
- System for incremental / absolute acquisition of measured values
- Complete systems with sensor and connected display

Specifications of MagLine Basic
- Resolution 1 ... 100 µm
- System accuracy ±25 µm
- Repeat accuracy ±5 µm
- Sensor-tape gap up to 2.5 mm

Advantages:
- Versatile system
- Easily customizable
- Ideal in serial use
- Uncomplicated retrofitting

On duty: Incremental and absolute position acquisition by means of Basic systems. The combination with compatible electronic equipment enables the connection to control units or direct display on-site.
### Combinations

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<th>Interface</th>
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</thead>
<tbody>
<tr>
<td>Incremental</td>
<td>MB320/1</td>
<td>MSK320</td>
<td>digital</td>
<td>PLC, counter*</td>
</tr>
<tr>
<td></td>
<td>MB500/1</td>
<td>MSE500</td>
<td>digital</td>
<td>PLC, counter*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MS500H</td>
<td>direct connection</td>
<td>MAS03/2 (MagScale)</td>
</tr>
<tr>
<td>Absolute</td>
<td>MBA501</td>
<td>MSA501</td>
<td>SSI, digital, CANopen</td>
<td>PLC, controller*</td>
</tr>
<tr>
<td></td>
<td>MBA</td>
<td>MSA</td>
<td>Direct connection</td>
<td>MAS05</td>
</tr>
</tbody>
</table>

*eCustomer’s downstream electronic unit

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Direct display of measured values with a vertical panel saw... ...or adjustment of the length stop...

e.g. CT patient beds, frame saws, stone cutting...

MagLine Basic
**Profile**

Specially designed for very long measurement distances, MagLine Macro enables safe position detection with millimeter accuracy and interplay of many flexible units.

**Features:**
- Measurement lengths infinite
- Height differences in the measuring length can be compensated for thanks to a reading gap of up to 20 mm
- System for incremental acquisition of measured values
- Particularly suitable for extended measuring lengths, as for example in storage or conveyor applications

**Specifications of MagLine Macro**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>0.25 … 2 mm</td>
</tr>
<tr>
<td>System accuracy</td>
<td>±1 mm</td>
</tr>
<tr>
<td>Repeat accuracy</td>
<td>±1 mm</td>
</tr>
<tr>
<td>Sensor-tape gap</td>
<td>up to 20 mm</td>
</tr>
</tbody>
</table>

**Advantages:**
- High resolution with very extended measuring lengths
- High protection class (IP67)
- Large mounting tolerances are admissible

The small and compact design of scale and associated sensors is the basis for simple and unobtrusive integration into nearly any guide unit.

e.g. stone cutting, forklifts, waste and scrap presses ...
### Combinations

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</thead>
<tbody>
<tr>
<td>Incremental</td>
<td>MB2000, MB4000</td>
<td>MSK2000, MSK4000</td>
<td>digital</td>
<td>PLC, counter*</td>
</tr>
</tbody>
</table>

*Customer’s downstream electronic unit
**Profile**

The open system of the Roto series is the ideal alternative to conventional optical rotary encoder systems – especially for exact revolution or angle measurement under extreme conditions.

**Features:**
- Acquisition of measurement values under difficult ambient conditions
- Particularly durable, since high mechanical stress is not transferred to the measuring system
- Typical areas of application include speed measurement or angle measurement, e.g., on rotary tables

<table>
<thead>
<tr>
<th>MagLine Roto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution 100 ... 200,000 pulses/revolution</td>
</tr>
<tr>
<td>System accuracy ±0.05°</td>
</tr>
<tr>
<td>Repeat accuracy ±1 increment</td>
</tr>
<tr>
<td>Sensor-ring gap up to 2 mm</td>
</tr>
</tbody>
</table>

**Advantages:**
- High service reliability
- Long service life
- High protection class (IP67)
- Flexible, customer-specific ring solutions

Use in the elevator technology for measuring speeds.
Extremely robust and designed for direct angle and speed recording – the typical applications of MagLine Roto benefit from the contactless magnetic measuring method in several aspects.

### Combinations

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</thead>
<tbody>
<tr>
<td>Incremental</td>
<td>MR320, MBR320</td>
<td>MSK320</td>
<td>digital</td>
<td>PLC, counter*</td>
</tr>
<tr>
<td></td>
<td>MBR200, MR200</td>
<td>MSK210</td>
<td>digital</td>
<td>PLC, counter*</td>
</tr>
<tr>
<td></td>
<td>MBR500, MR500</td>
<td>MSC500</td>
<td>digital</td>
<td>PLC, controller*</td>
</tr>
<tr>
<td>Absolute</td>
<td>MBR500, MR500</td>
<td>ASAS10H</td>
<td>SSL, analog, digital</td>
<td>PLC, controller*</td>
</tr>
<tr>
<td></td>
<td>MRA501</td>
<td>MSAC501</td>
<td>SSL, digital</td>
<td>PLC, controller*</td>
</tr>
</tbody>
</table>

*Customer’s downstream electronic unit

e.g. speed measurement, elevator technology, tube bending technology ...
Profile

Inclinations with respect to the earth’s center can be measured most easily by means of SIKO inclinometers.

The SIKO inclinometers all work according to the modern principle of MEMS technology (Micro-Electronic-Mechanical System). With this measuring principle, a series of electrodes are housed in a hermetically sealed ASIC chip. The capacitive voltage between the electrodes is then measured.

Recording can be done either as a single axis (0 ... 0.1° or ±0.1°) or as a double axis (±80 °) with a system accuracy of ±0.1° and a resolution of 0.01°.

The measured data is output directly as analog (0 ... 10 Volt or 4 ... 20 mA) or digital (RS232) values or via CANopen. When using the CANopen interface, a bus operation is also possible for up to 127 participants.

SIKO inclinometers, however, have further advantages such as being able to program various parameters freely (e.g., filters, rotating direction, the zero point) via the RS232 or CANopen or limiting the measured area via the ‘teach-in-function’ in the client application (For example, 45° ... 180 °).

It is possible to set the zero point of the encoder on-site in the application via a separate PIN (teach-in-function).

Additional advantages are the easy installation of the encoder onto the surface to be measured (by means of simple screwing) as well as a high IP protective class. All encoders are protected for submersion in water for a long period (IP68) or with high pressure/steam jet cleaning (IP69k).

Whether medical technology, mobile automation or renewable energies – inclinometers cover a wide range of applications.

Features:
- Resolution: max. 0.01°
- System accuracy: ±0.1° or ±0.5°
- Repeat accuracy: ±0.02°

Advantages:
- High protection classes IP68 and IP69K
- Robust mechanical design
- Truly-absolute measurement

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e.g. medical and laboratory technologies, mobile automation, dancer rolls

Inclinometers
Sensors for easy acquisition of tilts
### Combinations

<table>
<thead>
<tr>
<th>Measuring method</th>
<th>Sensor</th>
<th>Interface</th>
<th>Downstream electronic unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>absolute</td>
<td>IK360</td>
<td>CANopen, digital</td>
<td>PLC, PC</td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image" alt="CANopen" /></td>
<td></td>
</tr>
<tr>
<td>IK360L</td>
<td>CANopen, digital</td>
<td>PLC, PC</td>
<td></td>
</tr>
<tr>
<td></td>
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<td><img src="image" alt="CANopen" /></td>
<td></td>
</tr>
</tbody>
</table>
SIKO sensors have been used in the area of motor feedback for decades. Applications include:

- Real-time recording of motor feedback on linear motors
- Warrantee of optimum control quality on torque motors
- Synchronization of the feed motors of two axes on gantry drives
- Speed an angle measurement in robotics
- Speed an angle measurement even under extreme conditions (e.g. in the oil bath)

MagLine sensors in medical engineering

Based on our long-standing experience we offer our customers from medical engineering, analytical and laboratory technologies precise length, angle and speed measurement technologies for:

- Tomographs and X-ray apparatuses
- Surgical tables and patient benches
- Laboratory and analytical technologies
- Robotics
- Rehabilitation machines
MagLine sensors in glass working

For the glass industry, SIKO provides highly precise and high-resolution incremental and absolute measurement technologies for:

- One- and double-sided glass grinding machines
- Glass cutting tables
- Water jet cutting machines
- Rotative water jet cutting heads

MagLine sensors in stone working

In the area of stone working, SIKO can score with long years of experience in measuring length and angle positions on:

- Stone band and buzz saws
- Edge-polishing machines
- Machining centers in the area of stone working
- Transport and handling systems
Sales / personal contact
Our sales team and our international sales partners would be pleased to answer your enquiries. Contact us at Phone +49 7661 394-0

Web site with download area
PDF data and program routines for our programmable devices are available via the SIKO homepage. At www.siko-global.com you can find:
- Data sheets
- Catalogues
- User information
- Manuals
- GSD and EDS files
- 3D design files
- Product movies
- Directory of sales partners

Technical support
Our technical support team provides you with assistance and first-hand information.
Phone +49 7661 394-457
E-mail: support@siko-global.com

SIKO auf Youtube
In our SIKO Youtube channel you will find helpful tutorials, expert videos or insider tips for our products.
www.youtube.com/sikoglobal

Advantages include:
- Native and neutral data formats, suitable for your CAD system
- Preview function and direct download
- Full-text search
- 24 h access to product catalogue
- Versatile display options
- Free service

3D models for mechanical engineering
We offer design engineers true-to-size, reduced-detail 3D data via the Cadenas platform. This allows configuration of attributes which define the contours of the SIKO device. After registering via our product pages on the internet, there is 24-hour on-line access to this service: www.siko-global.com

Cadenas PARTcommunity...
Do you want to contact an agency near you?
Visit our website www.siko-global.com, and go to the „Contact“ menu item to access all the latest contact data of our agencies.