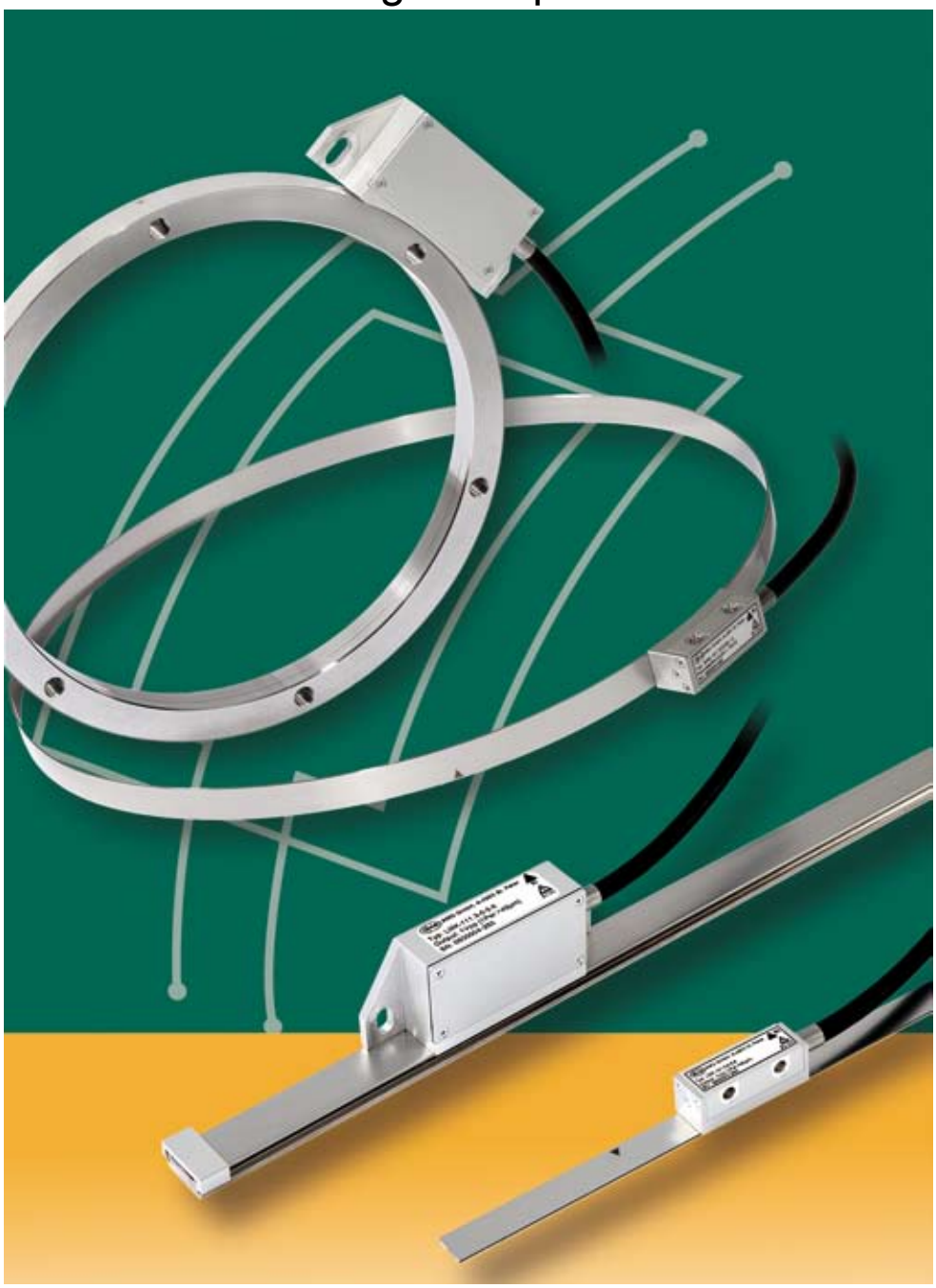
AMO GmbH

Product overview:

Incremental & Absolute LENGTH- AND ANGLE MEASURING SYSTEMS based on the AMOSIN® – Inductive Measuring Principle



The company

AMO GmbH was established as a company in 1994. The initial development phase of our inductive length and angle measuring systems were completed after one year and product introduction began.

AMO began work on the second generation inductive encoders, making advances for higher accuracies and product miniaturization.

The result was the first **AMOSIN®** series of length and angle measuring systems which have been and proven to be very successful and well received in the marketplace. With this development we advanced into the “high end signal sub-division” which allowed us to offer resolutions and accuracies that had previously only be achievable with opto-electronic encoder systems.

The substantial growth of the company required additional manufacturing space and the company moved into a new and larger building in autumn 2007.

As the company has grown, we now have subsidiaries in Germany, USA and Italy, and have established a large dealer network in other industrialized countries.


qualityaustria

CERTIFICATE

Quality Austria Training, Certification and Evaluation Ltd. awards this Quality Austria Certificate to the following organisation(s):

AMO Automatisierung Messtechnik Optik GmbH
A-4963 St. Peter/Hart, Nöfing 4

This Quality Austria Certificate confirms the application and further development of an effective

QUALITY MANAGEMENT SYSTEM
complying with the requirements of standard
ISO 9001:2000

Registration No.: 03948/0
Date of initial issue: 15 October 2004
Valid until: 14 October 2010

The validity of the Quality Austria Certificate will be maintained via annual surveillance audits and three yearly renewal audits.

Vienna, 9 January 2008

Quality Austria Training, Certification and Evaluation Ltd.

TR Ing. Viktor Seitschek, BOARD
Konrad Scheiber, General Manager


IQNet

CERTIFICATE

AMO
Automatisierung Messtechnik Optik GmbH
A-4963 St. Peter/Hart, Nöfing 4

QUALITY MANAGEMENT SYSTEM

ISO 9001:2000

René Wasmer, President of IQNet
Viktor Seitschek, BOARD of Quality Austria

We are certified according to the Quality Management sytem DIN EN ISO 9001:2008 since 2005 to maintain and verify our high quality standards.

Our customers around the world are very satisfied as we achieve on-time deliveries with our products having very good reliability and high quality, and also our “know-how” to customize our products to so that our encoders are integrated into the existing machine design, rather than having to re-design their machines to fit a standard encoder.

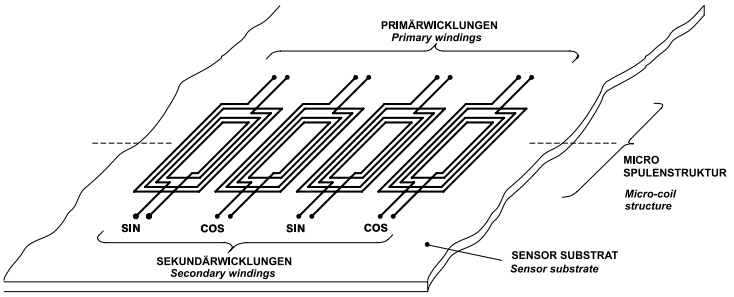
Our inductive encoder products have an IP 67 rating that is insensitive against contamination over the complete range of products. This allows design engineers to place encoders in the ideal location on a machine – close to where the machine operations are performed, independent of the fluids and dust or dirt.

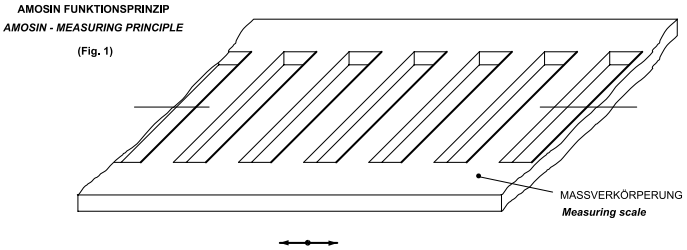
AMOSIN® - Measuring principle

The **AMOSIN®** measuring systems function on a patented purely inductive principle.

The measuring scale is a stainless-steel tape onto which a high precise periodical graduation of variable reluctance has been etched using photo-lithographic techniques.

A coil structure, with a number of coils aligned in the direction of measurement, is implemented on a substrate using micro-multi-layer technology.





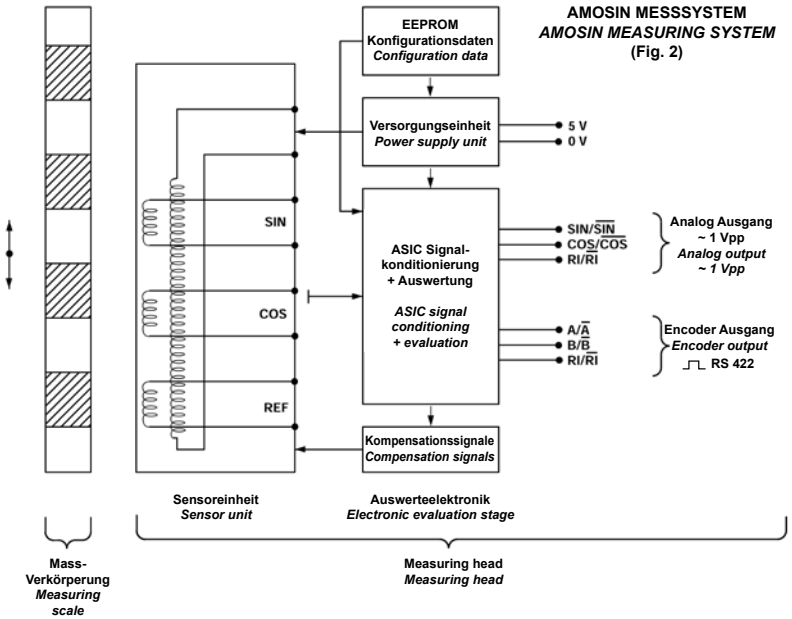
The relative angular movement in the direction of measurement between the sensor structure (in the scanning head) and the measuring scale periodically changes the mutual inductance of the individual coils, generating two sinusoidal signals with a 90° phase difference.

The extremely accurate signal, and its immunity to environmental influences, has the effect that, after conditioning of the signal in the evaluation electronics deviations of no more than 0.1% from the ideal sinusoidal form (harmonic content) remains. This allows high interpolation factors (further levels of sub-dividing) to be carried out in the course of signal digitisation. This can either be done in the measuring system itself, or in the subsequent electronics (CNC etc.).

An important feature is that using the patented **AMOSIN®** measuring principle does not give rise to any measurement hysteresis (machine backlash error). In contrast to magnetic systems, the high-frequency alternating field suppresses any hysteresis in the material.

The evaluation electronics provides an incremental output either as a sinusoidal or as a square wave signal.
The 1Vpp sinusoidal signal is available with period length down to 20 µm. This is equivalent to 32768 signal periods/ revolution on a rotary system with a diameter 163mm for example. Alternatively a TTL square wave output with resolution down to 0.125 µm can be used.

In addition to the periodic quadrature signals (A, B and their inverted) a reference signal is output for the determination of absolute position. This signal is generated from a single, multiple or distance coded pattern of reference marks integrated into the measuring tape and does not require any additional parts.



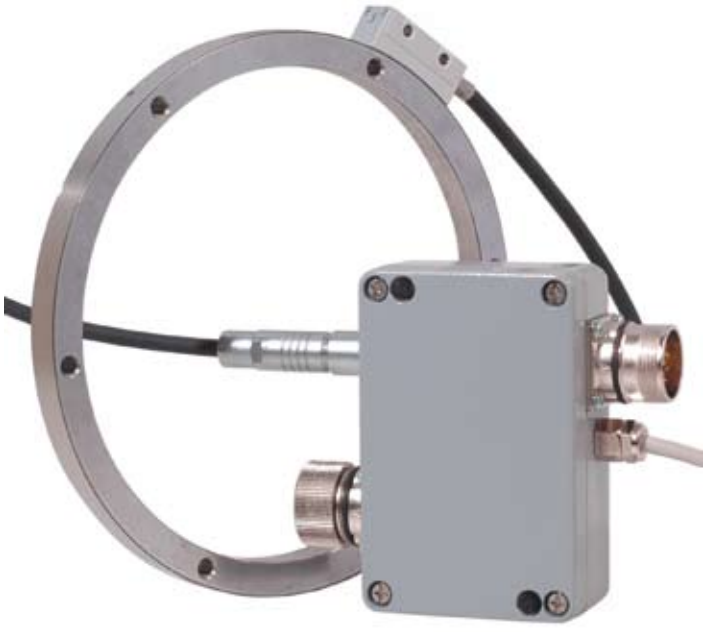
AMOSIN® - angle measuring systems

AMOSIN® angle measuring systems can be applied to a wide range of applications due to the pure inductive scanning principle and the robust IP 67 rating.

Almost any diameter from about 80 mm up to several meters can be manufactured in a short time.
Our encoders can be supplied for not only high speed applications for spindles but also for extremely high accuracies for rotary tables and swivelling axes.

... easy integration, for almost every diameter!

Powerful machining spindles and direct drives can use our encoders in purely a rotary velocity operating mode as well as in an interpolated mode for multiple axis machining.
One great benefit of this measuring system is that it can be used in the adjacent to the bearings of the rotating axis, since the system has a high protection level - IP 67, which permits operation even in an oil bath, such as in the spindle box.
A stable press-fit steel measuring tape ring scale provides the foundation for a flexible design and allows a wide range of ring scale diameters.
Adding a ring scale to a rotating shaft or spindle offers compact integration of the inductive measuring system, leading to stiffer and space-saving designs, with lower masses and therefore lower moments of inertia.



... to have brains, for highest accuracy!

The patented CHS model, which is a unique angle measuring system with self-calibration functionality, achieves very high accuracy on rotary axis. Accuracy errors related to mechanical installation, disc eccentricity and bearing run-out are removed in an economical way. The MHS version is a dual encoder head system that eliminates eccentricities “real time”.

The integration of the AMO non-contact encoder ring scale directly onto the rotating part, very close to the bearing and without a mechanical coupling is the best solution for precision positioning and high accuracy.

The mechanical flexibility of the **AMOSIN®** angle measuring systems permits designers to simplify and improve the integration of a rotary measuring system.

Exacting requirements regarding design, signal quality, reliability and robustness are met with **AMOSIN®**.

AMOSIN® - length measuring systems

Open non-contact, and guided inductive linear encoder systems are available for any measuring length. With the inductive scanning principle, exceptionally high speed operation, and bi-directional repeatability of one encoder count, the **AMOSIN®** length measuring systems can be used in an exceptionally wide range of applications from precision measurement instruments, to high-dynamic linear motor applications, to the harshest applications in machine tools, where **robustness along with precision** are required.

Reference marks are integrated on the measuring tape, and can be supplied with a single, multiple, or distance coded patterns.

The purely inductive scanning allows for the high protection class IP67 where the operation of the systems is not affected by contamination and pollutants in the form of dust, smoke, or liquids. Optical encoders require a complicated mechanical encapsulating enclosure, and also commonly incorporate air purging to protect the optical scale - neither which are necessary with the **AMOSIN®** encoders. Particularly noteworthy is the insensitivity from magnetic interference as there are no magnetic components in the purely inductive scanning and a completely different technology than magnetic encoders.

... on the one hand small and dynamic!

Miniature encoder heads with narrow 10mm width measuring tape make integration in space-limited applications easy. The lightweight head and high resolution of the linear encoder system meet the demands in terms of precision and servo control performance that is required when used in conjunction with direct drives.
The high robustness of the systems is ideal for the reliable operation of linear motors.

... on the other hand robust and precise!

Machine construction places the highest demand on the precision and reliability of measuring systems. Machine precision, in the range of micrometers, is hard to achieve in the very dirty environment found in machine tool operation.

In particular, our guided, encapsulated inductive length measuring systems satisfy exactly these demands, even when the length to be measured is extremely long.

The LMI-310 series consists of individual rail sections up to 4 m long that can be combined for measuring lengths up to 30 meters.

The individual rail sections have a groove on the top, into which a continuous steel measuring tape is laid with a locking “snap cover” holding the scale tape in place. Alignment pins and clamps, including a tightening/stretching mechanism, allow the measuring tape to be fastened securely, which would permit multiple assembly/dismantling to be carried out without significant time and effort.

The linear guideway measuring carriage contains the sensing head, which guides the inductive sensor precisely over the integrated measuring tape. The carriage wipers protect not only the guiding elements as well as the inductive scanning sensor. The LMI-310 measuring system is commonly used for machine tools and on linear axes with long travel paths. IP 67 rating insures the encoder is not impaired or affected from oil or coolant.

AMOSIN® - Absolute measuring systems

AMO offers a broad range of absolute measuring system products covered by several AMO patents, based on our proven and successful AMOSIN® pure inductive measuring principle.

Our linear and rotary scales are produced incorporating two highly accurate grating tracks - one incremental and the other a coded absolute pattern, using a precision etched photo-lithographic process. The encoder head incorporates a micro coil array sensor along with analog and digital evaluation electronics.

For both the linear and rotary systems, the absolute position value is acquired in real time. Several types of serial interfaces are available, including SSI, BiSS/C, and CNC control protocols. As an option, the system electronics can also deliver 1 Vpp SINE / COSINE signals at 40µm pitch.
The basic pitch period of the incremental graduation is 1000µm.

The new ABSYS absolute encoders include all of the unique inductive encoder features that our incremental encoders have for harsh environments, such as very wide operating temperature envelope, ability to operate in high shock, vibration, and electromagnetic environments, but yet offer high accuracy, high resolution, and high speed. Additional data for our encoders can be found in the AMOSIN® brochures (see www.amo-gmbh.com).

Linear measuring lengths up to 32 meters, and standard ring scale size from 80 mm up to 652 mm diameter are available. Measuring rings with other diameters up to 10m on request.

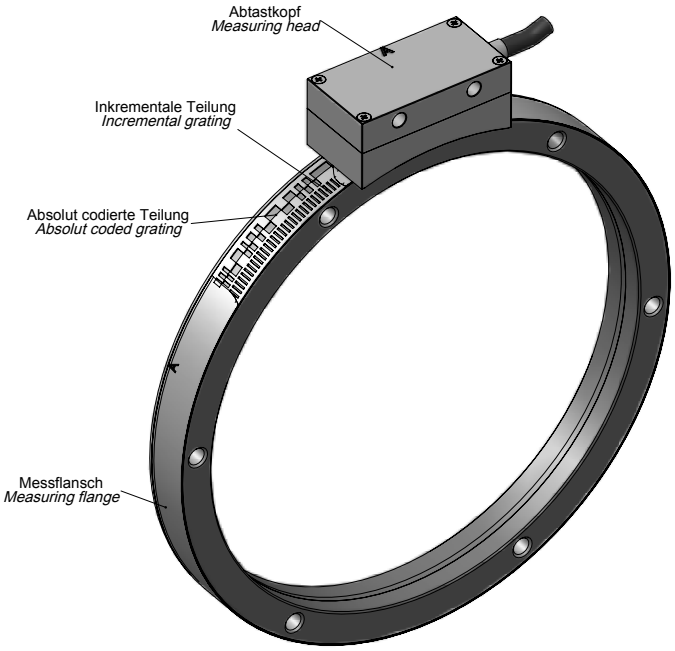
For technical reasons, sometimes for economic reasons, machine operators want to avoid a reference travel for zero determination of the sensor. In modern direct drive, linear motors or linear actuators are therefore increasingly absolute measuring systems used. These have compared to the predominantly incremental system the described advantage.
The always present information about the position of the axis and the direct uptake of processing, without reference travel has advantages in productivity, while improving plant safety. The absolute-measuring systems provide resolutions less than 1 micrometer. The position is placed in the desired resolution over the interface to the absolute control.

Absolute Angle measuring systems

Absolute AMOSIN-angle measurement systems are available for both inside and outside scanning, based on our inductive measuring principle.

WMFA / WMRA - Measuring Flange with Ring Scale or Ring Scale

Standard diameters from 80mm to 652mm are currently available with non-standard sizes possible. Measurement accuracy available in classes as follows: ±3µm, ±5µm or ±10µm arc length.



WMKA - Encoder Head

Our encoder heads have a high degree of protection IP 67 rating with immunity to contamination. Available system resolutions: 1 or 0.25 µm arc length.

Absolute interfaces are available:

- SSI + 1Vpp
- BiSS / C
- Fanuc interface
- Drive CLiQ (in preparation)

Typical Applications

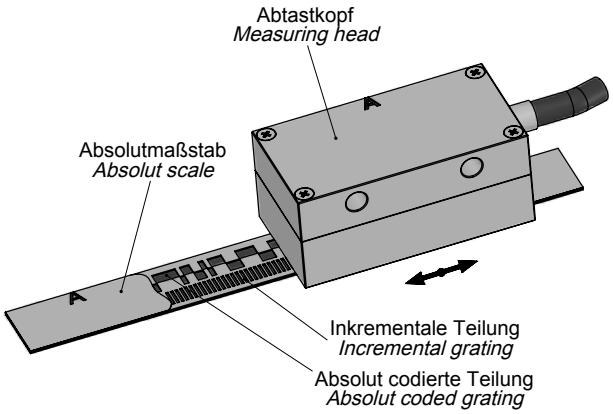
- Direct Drive Torque Motors
- Rotary and Tilt axes (Pan and Tilt Camera and/or Azimuth and Elevation)
- Rotary Tables

Absolute Linear measuring system

Absolute AMOSIN linear measuring systems are based on the inductive measuring principle.

LMBA - Linear Measuring Scale

Measuring scale tapes can be supplied in any length up to 30 meters, with an absolute accuracy of ± 10 µm/m, ± 5 µm/m or ± 3 µm/m after linear compensation.



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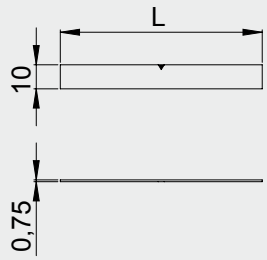
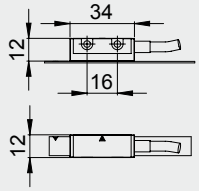
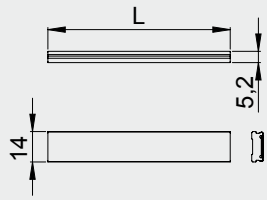
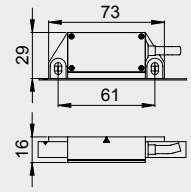
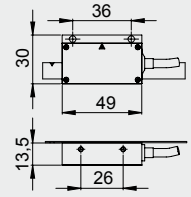
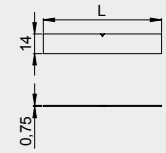
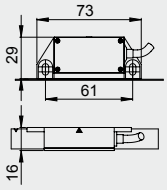
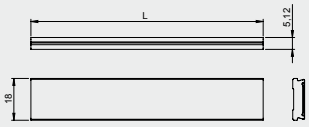
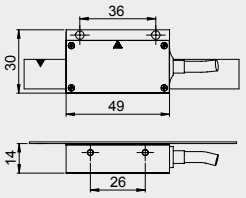
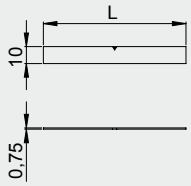
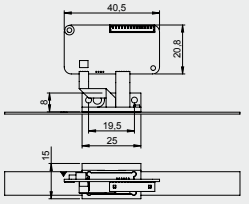
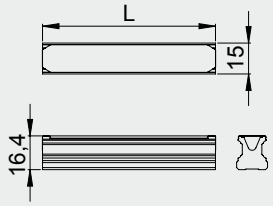
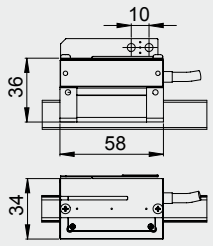
- Fanuc interface
- Drive CLiQ (in preparation)

AMOSIN® - length measuring systems

Open, non-guided AMOSIN®- length measuring systems

System type	Scale type		Measuring head	
	Mechanical dimensions	Accuracy	Type	Mechanical dimensions
LMI-100 **LMI-1050**	Type LMB-100 	± 3 µm / m No limitation in measuring length	**LMK-100** **LMK-1050** Miniature measuring head with electronics integrated in connector	
LMI-110 **LMI-1150**	Type LMB-400 		**LMK-110** **LMK-1150** With integrated electronics	
			LMKF-110 **LMKF-1150** With integrated electronics	
LMI-130	Type LMB-130 	± 5 µm / m No limitation in measuring length	**LMK-130** With integrated electronics	
	Type LMB-430 		**LMKF-130** With integrated electronics	
Kit Encoder **LKK**		± 3 µm / m	**LKK-100**	

Guided AMOSIN®-length measuring system

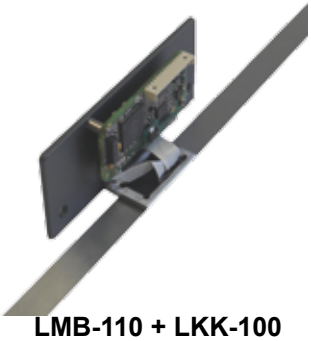
LMI-310	Type LMF-310 	± 3 µm / m No limitation in measuring length	**LMK-310** **LMK-3150** With integrated electronics	

Resolution		Max. speed	Typical application
1Vpp	TTL		
1000 µm to 20 µm	250 µm to 0.125 µm	10 m/s	**LMI-100** **LMI-110** Sheet metal working machines, SMT-pick and place machines
1000 µm to 20 µm	250 µm to 0.125 µm	10 m/s	**LMI-1050** **LMI-1150** High-end machines in connection with direct drives
3000 µm to 120 µm	750 µm to 0.75 µm	30 m/s	**LMI-130** Handling systems in connection with direct drives
1000 µm to 40 µm	250 µm to 0,25 µm	10 m/s	**LKK-100** Application with limited mounting space in Handling sytems Measuring equipment Electronic production equipment
1000 µm to 20 µm	250 µm to 0.125 µm	3 m/s	**LMI-310** Machine tool, Mechanical press brake **LMI-3150** High-end machine tool

LMB-100 + LMK-100

LMB-110 + LMK-110

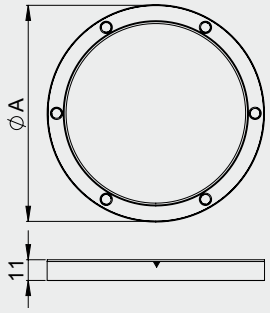
LMB-410 + LMKF-110

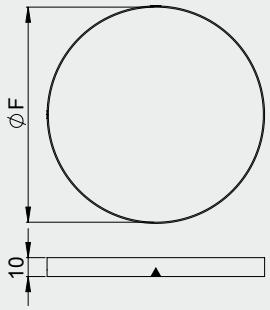


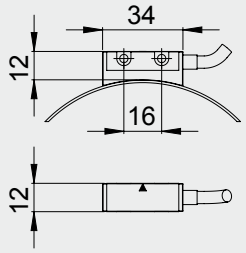
LMB-110 + LKK-100

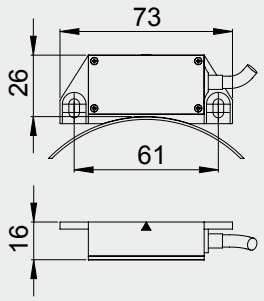
LMF-310 + LMK-310

AMOSIN® - angle measuring systems for outside scanning

<table>
<tr><th rowspan="2">System type</th><th colspan="3">Scale type</th><th colspan="2">Measuring head</th></tr>
<tr><th>Mechanical dimensions</th><th>Diameter</th><th>Accuracy</th><th>Type</th><th>Mechanical dimensions</th></tr>
<tr><td>WMI-100
WMI-1050</td><td rowspan="2">Type WMF
 

Type WMR
 
</td><td rowspan="2">81.27 mm
115.07 mm
163.54 mm
229.78 mm
287.08 mm
326.55 mm</td><td rowspan="2">± 15“
± 10“
± 7.5“
± 5.4“
± 4.3“
± 3.8“</td><td>WMK-100
WMK-1050

Miniature measuring head with electronics integrated in connector</td><td> 
</td></tr>
<tr><td>WMI-200
WMI-2050</td><td>WMK-200
WMK-2050

With integrated electronics</td><td> 
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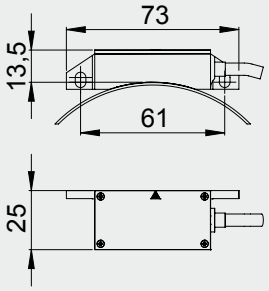
<tr><td></td><td colspan="2">Other diameters on request

Multiple head scanning system MHS or CHS provides up to 4 times higher accuracy</td><td>WMKF-200
WMKF-2050

With integrated electronics</td><td> 
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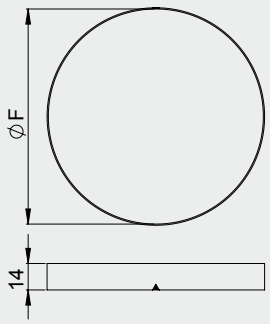
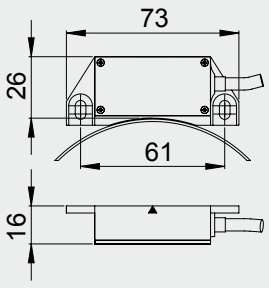
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>WMI-300</td><td>Type WMF
 
</td><td rowspan="2">81.27 mm
115.07 mm
163.54 mm
229.78 mm
287.08 mm
326.55 mm</td><td rowspan="2">± 25“
± 18“
± 12“
± 9“
± 7“
± 6“</td><td>WMK-300

With integrated electronics</td><td> 
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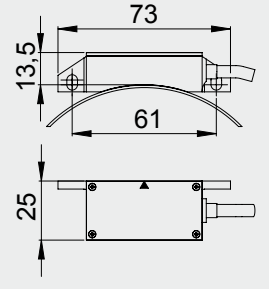
Multiple head scanning system MHS or CHS provides up to 4 times higher accuracy</td><td>WMKF-300

With integrated electronics</td><td> 
</td></tr>
</table>

	Resolution		Max. electrical speed	Typical application
	1Vpp	TTL		
	1000 µm to 20 µm	250 µm to 0.125 µm	23000 rpm	**WMI-100** **WMI-200** C-axis on milling machines, Spindles with less construction size, Swiveling axis
	1000 µm to 20 µm	250 µm to 0.125 µm	23000 rpm	**WMI-1050** **WMI-2050** High-end machines in connection with direct drives
	3000 µm to 120 µm	750 µm to 0.75 µm	70000 rpm	**WMI-300** Rotary axis with big diameter, Spindle applications

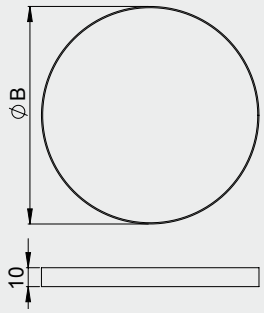
WMF-100 + WMK-100

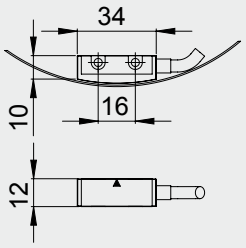
WMR-100 + WMK-100

WMF-100 + WMK-200

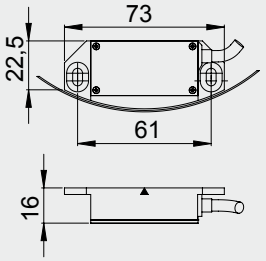
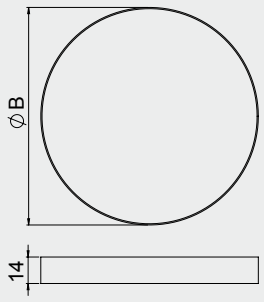
WMF-100 + CHS

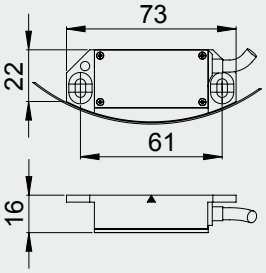
AMOSIN® - angle measuring systems for inside scanning

<table>
<tr><th rowspan="2">System type</th><th colspan="3">Scale type</th><th colspan="2">Measuring head</th></tr>
<tr><th>Mechanical dimensions</th><th>Diameter</th><th>Accuracy</th><th>Type</th><th>Mechanical dimensions</th></tr>
<tr><td>WMI-110
WMI-1150</td><td rowspan="2">Type WMR
 
</td><td>163.70 mm
229.85 mm
287.14 mm
326.62 mm
459.01 mm
652.54 mm</td><td>± 7.5“
± 5.4“
± 4.3“
± 3.8“
± 2.7“
± 1.9“</td><td>WMK-110
WMK-1150

Miniature measuring head with electronics integrated in connector</td><td> 
</td></tr>
<tr><td>WMI-210
WMI-2150</td><td colspan="2">Other diameters on request

Multiple head scanning system MHS or CHS provides up to 4 times higher accuracy</td><td>WMK-210
WMK-2150

With integrated electronics</td><td> 
</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>WMI-310</td><td>Type WMR
 
</td><td>163.06 mm
229.91 mm
287.14 mm
326.30 mm
459.01 mm
489.52 mm</td><td>± 12“
± 9“
± 7“
± 6“
± 4.5“
± 4“</td><td>WMK-310

With integrated electronics</td><td> 
</td></tr>
<tr><td></td><td colspan="2">Other diameters on request

Multiple head scanning system MHS or CHS provides up to 4 times higher accuracy</td><td></td><td></td></tr>
</table>

	Resolution		Max. electrical speed	Typical application
	1Vpp	TTL		
	1000 µm to 20 µm	250 µm to 0.125 µm	23000 rpm	**WMI-110** **WMI-210** C-axis on milling machines, Spindles with less construction size, Swiveling axis, External rotor motor
	1000 µm to 20 µm	250 µm to 0.125 µm	23000 rpm	**WMI-1150** **WMI-2150** High-end machines in connection with direct drives, External rotor motor
	3000 µm to 120 µm	750 µm to 0.75 µm	70000 rpm	**WMI-310** Rotary axis with big diameter, Spindle applications

WMR-110 + WMK-110

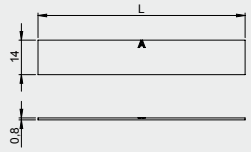
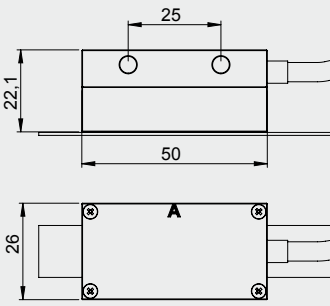
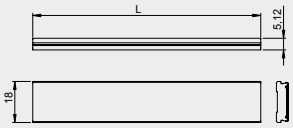
WMR-110 + WMK-210

WMR-310 + WMK-310

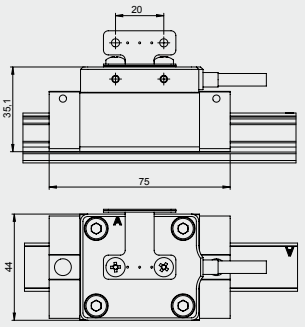
Absolute AMOSIN® - Length and Angle Measuring Systems

System type	Scale type		Measuring head	
	Mechanical dimensions	Accuracy	Type	Mechanical dimensions

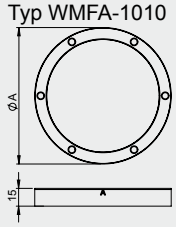
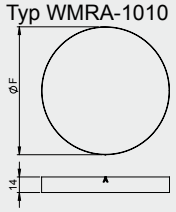
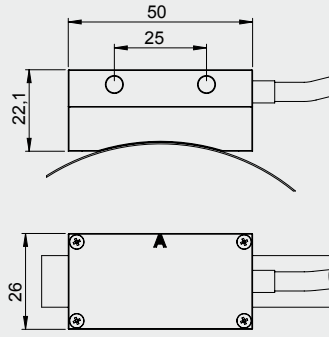
Absolute non-guided AMOSIN® Length Measuring System

LMIA-1110x	Typ LMBA-1110/2110 	± 3 µm / m Measuring Length till max. 9,2m	**LMKA-1110x**	
LMIA-2110x	Typ LMBA-1410/2410 	± 3 µm / m Measuring Length till max. 32m	**LMKA-2110x**	

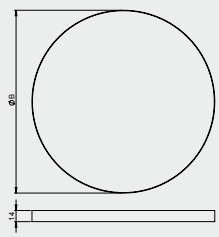
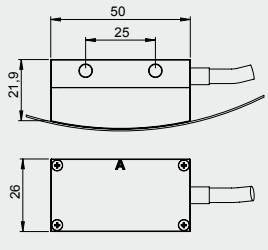
Absolute guided AMOSIN® Length Measuring System

LMIA-1310x	Typ LMFA-1310/2310 	± 3 µm / m Measuring Length till max. 9,2m	**LMKA-1310x**	
LMIA-2310x		± 3 µm / m Measuring Length till max. 32m	**LMKA-2310x**	

Absolute AMOSIN® Angle Measuring System for outside scanning

WMIA-2010x	Typ WMFA-1010  Typ WMRA-1010 	**Diameter** / **Accuracy** 81,95 mm ± 15“ 115,12 mm ± 10“ 163,54 mm ± 7,5“ 229,78 mm ± 5,4“ 287,08 mm ± 4,3“ 326,55 mm ± 3,8“ 652,58 mm ± 1,9“ Other diameters on request	**WMKA-2010x**	

Absolute AMOSIN® Angle Measuring System for inside scanning

WMIA-2110x	Typ WMRA-1110 	**Diameter** / **Accuracy** 326,55 mm ± 3,8“ 458,99 mm ± 2,7“ 573,61 mm ± 2,2“ 652,58 mm ± 1,9“ Other diameters on request	**WMKA-2110x**	

	Resolution		Max. electrical speed	Typical application
	Inkremental 1Vss	Absolut SSI,Biss/C,FANUC, DriveCLiQ		
	1000 µm to 40 µm	1µm 0,25 µm	2,5 m/s [0,25µm] to 10 m/s [1µm]	Sheet metal working machines, SMT-pick and place machines, High-end machines in connection with direct drives, Handling systems in connection with direct drives
	1000 µm to 40 µm	1µm 0,25 µm	2,5 m/s [0,25µm] to 5 m/s [1µm]	Machine tool, Mechanical press brake
	1000 µm to 32µm	1µm 0,25 µm	14.000 U/min	High-end machines in connection with direct drives
	1000 µm to 32µm	1µm 0,25 µm	3500 U/min	High-end machines in connection with direct drives, External rotor motor

LMKA-1110x / LMBA-1110

LMKA-1310x / LMFA-1310

WMKA-2010x / WMRA-1010

WMKA-2110x / WMRA-1110

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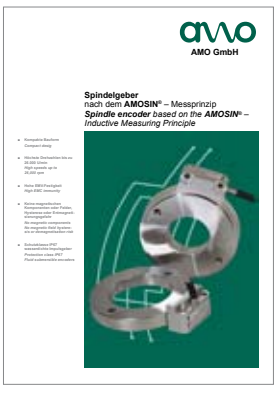
Please look at www.amo-gmbh.com

Additional information brochures:

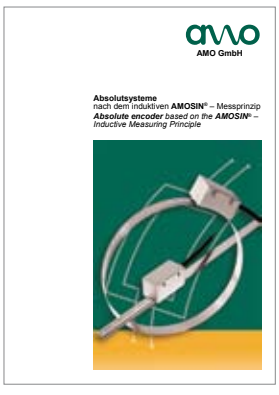
Linear encoder

Rotary encoder

Spindle encoder



Absolute encoder



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