



AMO GmbH

Product overview:

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

- Inductive encoders comparable to optical encoders in both, accuracy and resolution
- No magnetic components, no magnetic fields, hysteresis or demagnetisation risk
- Protection class IP67
Fluid submersible encoders



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.



We are certified according to the Quality Management system 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.

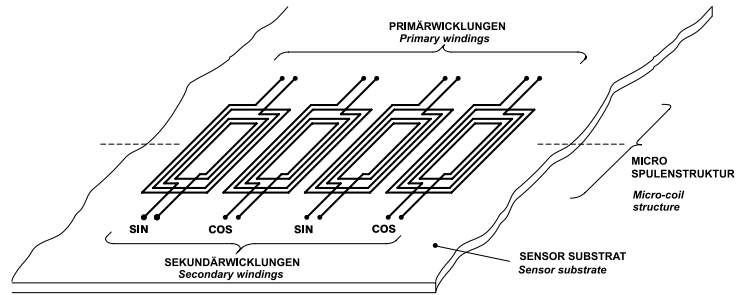
The relative angular movement in the direction of measurement between the sensor structure (in the scanning head) and the measuring scale periodically changes the mutual inductance of the individual coils, generating two sinusoidal signals with a 90° phase difference.

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.).

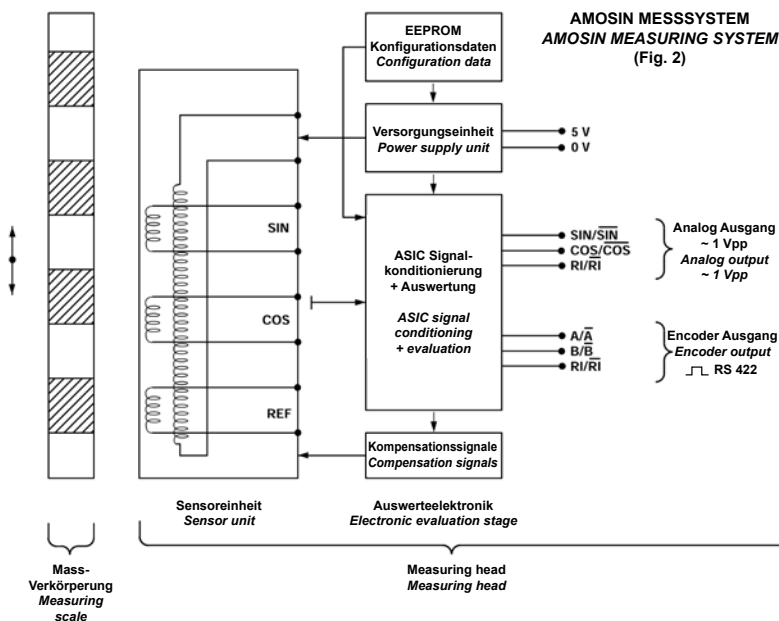
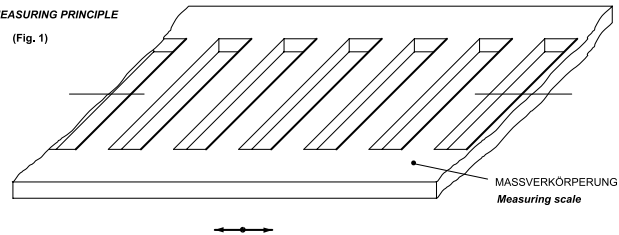
An important feature is that using the patented **AMOSIN®** measuring principle does not give rise to any measurement hysteresis (machine backlash error). In contrast to magnetic systems, the high-frequency alternating field suppresses any hysteresis in the material.

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 FUNKTIONSPRINZIP
AMOSIN - MEASURING PRINCIPLE
(Fig. 1)



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.

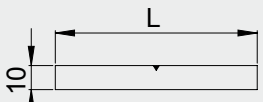
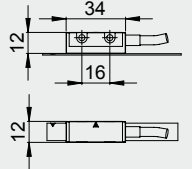
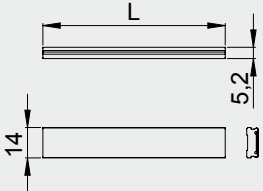
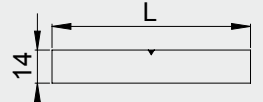
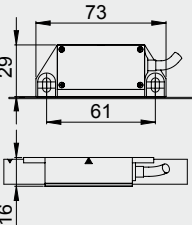
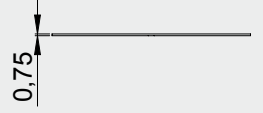
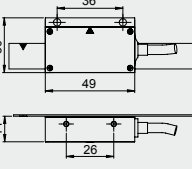
The LMI-310 series consists of individual rail sections up to 4 m long that can be combined for measuring lengths up to 30 meters.

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.

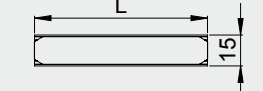

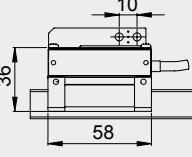
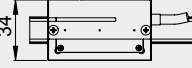
The linear guideway measuring carriage contains the sensing head, which guides the inductive sensor precisely over the integrated measuring tape. The carriage wipers protect not only the guiding elements as well as the inductive scanning sensor. The LMI-310 measuring system is commonly used for machine 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® - 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	LMI-100 LMI-1050 Miniature measuring head with electronics integrated in connector	
	Type LMB-400 			LMI-110 LMI-1150 With integrated electronics
LMI-130	Type LMB-130 	± 5 µm / m No limitation in measuring length	LMI-130 With integrated electronics	
				LMKF-110 LMKF-1150 With integrated electronics
			LMKF-130 With integrated electronics	

Guided AMOSIN®-length measuring system

LMI-310	Type LMF-310  	± 3 µm / m No limitation in measuring length	LMI-310 LMI-310 LMI-3150 With integrated electronics	 
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			Typical application
Resolution		Max. speed	
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	
3000 μm to 120 μm	750 μm to 0.75 μm	30 m/s	LMI-130 Handling systems in connection with direct drives



LMB-100 + LMK-100



LMB-110 + LMK-110



LMB-410 + LMKF-110

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
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LMF-310 + LMK-310

AMOSIN® - angle measuring systems for outside scanning

System type	Scale type			Measuring head	
	Mechanical dimensions	Diameter	Accuracy	Type	Mechanical dimensions
WMI-100 WMI-1050	Type WMF 	81.27 mm 115.07 mm 163.54 mm 229.78 mm 287.08 mm 326.55 mm	$\pm 15''$ $\pm 10''$ $\pm 7.5''$ $\pm 5.4''$ $\pm 4.3''$ $\pm 3.8''$	WMK-100 WMK-1050 Miniature measuring head with electronics integrated in connector	
	Type WMR 			Other diameters on request Multiple head scanning system MHS or CHS provides up to 4 times higher accuracy	WMK-200 WMK-2050 With integrated electronics
				WMKF-200 WMKF-2050 With integrated electronics	
WMI-300	Type WMF 	81.27 mm 115.07 mm 163.54 mm 229.78 mm 287.08 mm 326.55 mm	$\pm 25''$ $\pm 18''$ $\pm 12''$ $\pm 9''$ $\pm 7''$ $\pm 6''$	WMK-300 With integrated electronics	
				Other diameters on request Multiple head scanning system MHS or CHS provides up to 4 times higher accuracy	WMKF-300 With integrated electronics

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



WMF-100 + WMK-100



WMR-100 + WMK-100

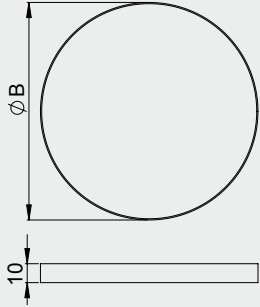
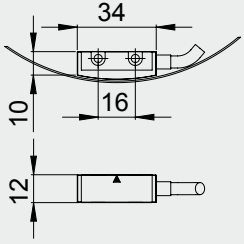
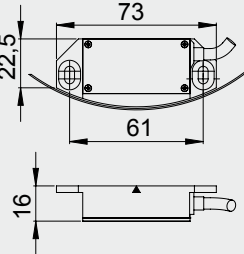
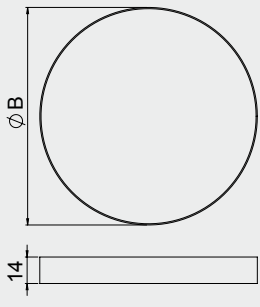
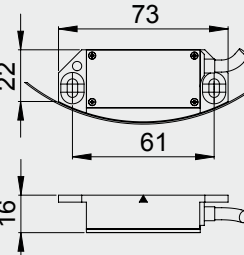


WMF-100 + WMK-200



WMF-100 + CHS

AMOSIN® - angle measuring systems for inside scanning

System type	Scale type			Measuring head	
	Mechanical dimensions	Diameter	Accuracy	Type	Mechanical dimensions
WMI-110 WMI-1150	Type WMR 	163.70 mm 229.85 mm 287.14 mm 326.62 mm 459.01 mm 652.54 mm	$\pm 7.5''$ $\pm 5.4''$ $\pm 4.3''$ $\pm 3.8''$ $\pm 2.7''$ $\pm 1.9''$	WMK-110 WMK-1150 Miniature measuring head with electronics integrated in connector	
WMI-210 WMI-2150		Other diameters on request Multiple head scanning system MHS or CHS provides up to 4 times higher accuracy	WMK-210 WMK-2150 With integrated electronics		
WMI-310	Type WMR 	163.06 mm 229.91 mm 287.14 mm 326.30 mm 459.01 mm 489.52 mm	$\pm 12''$ $\pm 9''$ $\pm 7''$ $\pm 6''$ $\pm 4.5''$ $\pm 4''$	WMK-310 With integrated electronics	
		Other diameters on request Multiple head scanning system MHS or CHS provides up to 4 times higher accuracy			

			Max. electrical speed	Typical application	
Resolution		1Vpp			TTL
1Vpp	TTL				
1000 μm to 20 μm	250 μm to 0.125 μm	23000 rev/min	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 rev/min	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 rev/min	WMI-310 Rotary axis with big diameter, Spindle applications		



WMR-110 + WMK-110



WMR-110 + WMK-210



WMR-310 + WMK-310

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