Made in Germany

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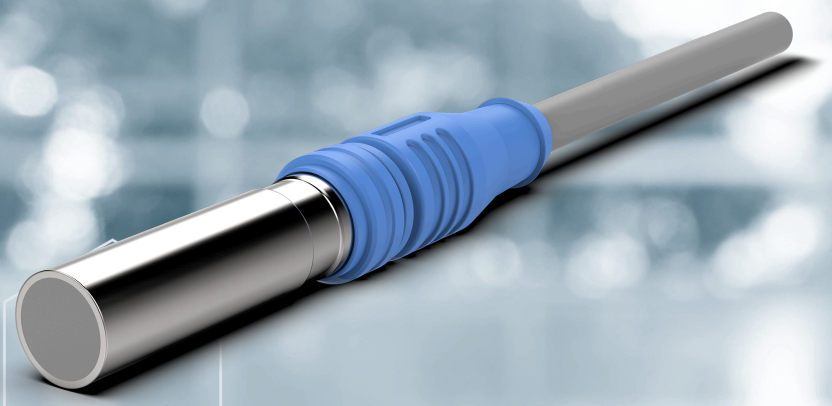

Technical Information

GEL 2432

MiniCODER bearing-free rotary encoder

Speed and position sensor with Sin/Cos or TTL interface

D-51T-2432 | Date of issue 2026-06-15

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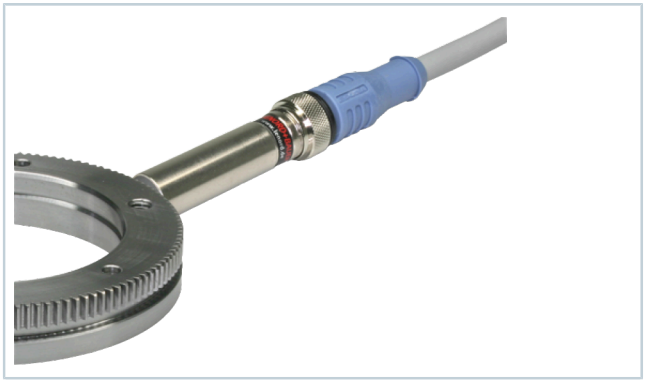
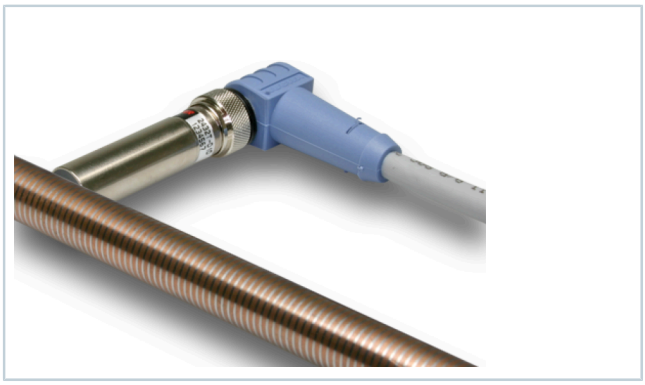
Motion sensors and integrated drive technology

Overview

General

- Contactless magnetic scanning for maximum service life
- Compact design fits into the tightest installation spaces and withstands the most challenging ambient conditions
- Output as sin/cos or TTL signal
- Sin/Cos signals with amplitude control
- High resolution through internal interpolation with square-wave signal output (interpolation factor selectable when ordering)





Properties

- Contactless measurement of rotary movements on target wheels with modules 0.5 and 1.0
- Contactless measurement of linear movements on measuring rods with pitch 1.0 / 1.6 or 2.0 mm
- Maintenance-free electronics and wear-free mechanics
- Low temperature drift and high signal quality
- Full encapsulation of electronics
- Contactless scanning of target wheels
- Degree of protection IP67, chemical resistance on measuring side
- Frequency range up to 200 kHz

Advantages

- Measurement of rotary and linear movements possible
- No mechanical wear and tear
- High measurement stability and low error tolerances
- High interference immunity
- Reliable operation even in case of extreme temperature fluctuations
- Simple integration into confined installation spaces
- High shock and vibration resistance
- Resistant to environmental factors

Fields of application

- Detection of piston movement on die casting machines
- Contactless speed and position measurement on machines and motors

Description

Product construction

MiniCODERs are intended for contactless measurement of rotational or linear movements mainly in machines, gear units, motors or high-speed spindles. They are manufactured using the latest microsystem technology and are fully encapsulated, making them particularly insensitive to shocks and vibrations.

Measuring system

The measuring system comprises a MiniCODER and a measuring scale.

The measuring system works without contact and is wear-free with maintenance-free electrical parts. It detects the direction of rotation, rotational speed and position of a measuring scale.

The measuring scale must be made of ferromagnetic material.

The MiniCODER has a magnetic field that is changed by the rotating measuring scale. The sensor detects the magnetic field change and the integrated electronics convert this into corresponding output signals. External evaluation electronics can read in the output signals and determine the direction of rotation, rotational speed and position of the measuring scale.

A defined air gap between measuring scale and MiniCODER is required for contactless measurement.

Module

Selectable modules/pitches:

- Modules: m = 0.5 / 1.0
- Pitch: p = 1.0 mm / 1.6 mm / 2.0 mm

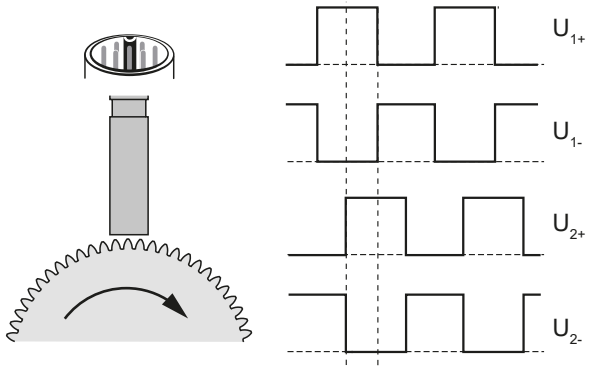
The MiniCODER must be ordered to match the module or the pitch of the measuring scale.

Signal pattern

Signal pattern T

The output signals are two square-wave signals phase-shifted by 90° for detection of direction (tracks 1 and 2) and their inverse signals.

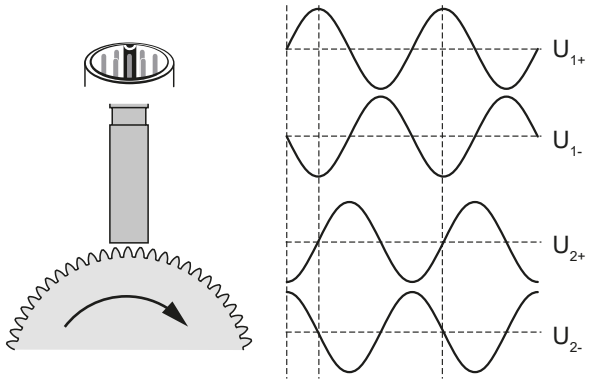
The signal sequences depend on the direction of rotation.



Signal pattern K

The output signals are two sinusoidal signals phase-shifted by 90° for detection of direction (tracks 1 and 2) and their inverse signals

The signal sequences depend on the direction of rotation.



Optional extras for signal pattern T

Interpolation factor (1/2/4/8/A/B/C/D)

Interpolation takes place directly in the MiniCODER.

When using a target wheel with 250 teeth and an interpolation factor of 20, the MiniCODER generates 5000 square-wave signals.

In addition, in the example quoted above, the resolution can be increased to 20,000 steps with the 4-edge evaluation in the evaluation electronics.

Optional extras for signal pattern K

With internal amplitude control (R)

The MiniCODER compensates for fluctuations in the sin/cos amplitudes when the air gap and temperature change.

Technical data

GEL 2432

Signal pattern	K	T
Electrical data		
Supply voltage U_B (reverse polarity protected)	5 V DC ± 5 %	5 V DC ± 10 %
Output signals	Two push-pull signals phase-shifted by 90°, short-circuit-proof	
	Sin/Cos	Rectangle
Output signal level	1 V_{pp} +0.1/-0.2 V_{pp} Differential signal	5 V TTL
Output frequency	0 to 200 kHz(1)	
Power consumption without load	≤ 0.6 W	
Offset (static)	< 60 mV	–
Amplitude synchronism U_{Sp1}/U_{Sp2}	0.9 to 1.1	–
Mechanical data		
Housing material	Sensor tube: Stainless steel 1.4305 Cap: PPS, oil-resistant	
Weight	20 g [0.71 oz]	
Cable data		
Maximum permissible cable length	100 m [328.08 ft], depending on frequency and cable capacitance(2)	
Ambient data		
Working temperature range	-20 °C to +85 °C [-4 °F to 185 °F]	
Operating temperature range	-20 °C to +85 °C [-4 °F to 185 °F]	
Storage temperature range	-30 °C to +100 °C [-22 °F to 212 °F]	
Degree of protection	IP67 (with mounted connector)	
Dielectric strength	500 V, as per EN 60439– 1	
Electromagnetic compatibility	EN 61000–6–1 EN 61000–6–2 EN 61000–6–3 EN 61000–6–4	
Vibration resistance	200 m/s² [656.17 ft/s²], according to DIN EN 60068– 2–6	
Shock resistance	2000 m/s² [2187.23 ft/s²], according to DIN EN 60068– 2–27	

(1) With cable capacitance of 5 nF
(2) Consider voltage drop on the power supply cable!

$MTTF_d$ (1)
It is assumed that only 50 % of hardware failures in electronic components are dangerous failures. $MTTF_d$ values can therefore typically be taken as twice the MTTF value (2) . (Sources: EN ISO 13849-1:2008 (D); Annex C, Section 5.2 Semiconductors; EN 61800-5-2:2007, Annex B, Section 3.1.3 Number of safe failures). The expected operating temperature must be taken into account.

Characteristic depending on temperature	
Operating temperature	MTTF in h(2)
55 °C [131 °F]	1,568,040

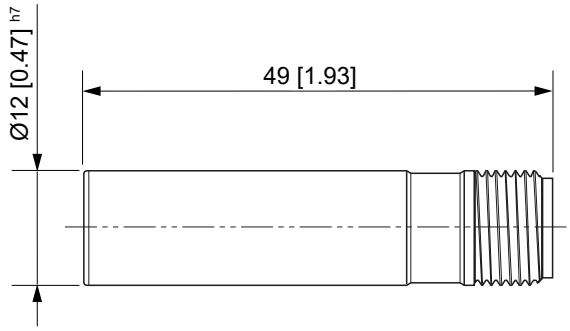
(1) Mean time to failure “dangerous”
(2) Mean time to failure

Measuring system

Measuring scale	Target wheel or measuring rod
Material	Ferromagnetic steel
Target wheel width	≥ 3 mm [0.12 in]
Measuring rod diameter	≥ 12 mm [0.47 in]
Nominal air gap	See assembly sketches in the chapter *„Installation instructions and EMC notes“, page 7*

Dimensional drawing and assignment

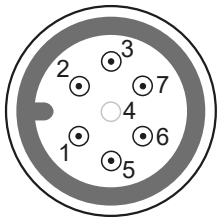
Dimensional drawing



All dimensions in millimeters [inch]; general tolerance DIN ISO 2768- mK

Assignment

7-pin connector



Male contact
(plug-in view)

Pin designation	Core color	Signal identifier	Function
1	green	U_{1+}	Signal track 1
2	yellow	U_{1-}	Inverse signal track 1
3	white	0 V	GND
4	-	Unallocated	
5	brown	U_B	+5 V supply voltage
6	gray	U_{2+}	Signal track 2
7	pink	U_{2-}	Inverse signal track 2
-	Screen	Connected to the sensor tube via the connector	

Installation instructions and EMC notes

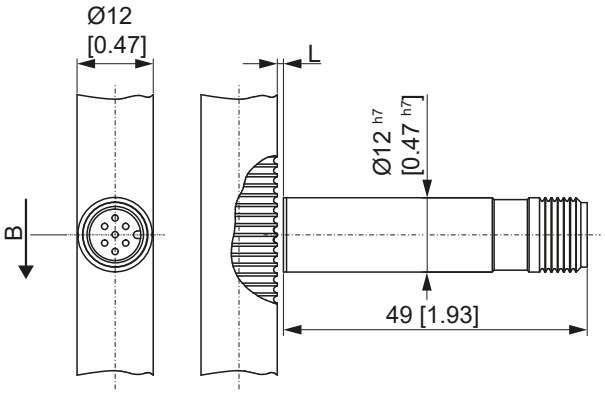
Installation instructions

- Align the MiniCODER symmetrically to the measuring scale. Asymmetry results in measuring errors.
- Avoid mechanical contact between the measuring scale and the 0.1 mm [39.37 mil] thick protective layer of the scanning system. Scratching the protective coating can cause the MiniCODER to fail completely.
- Do not damage the toothing surface. Do not allow any mechanical components to come into contact with the toothing surface.

When installing the MiniCODER, the three pins, which are arranged in a row, must face in the direction of travel of the measuring scale. Note that the position of the plastic tab in the connector determines the counting direction (see assignment).

Assembly with measuring rod

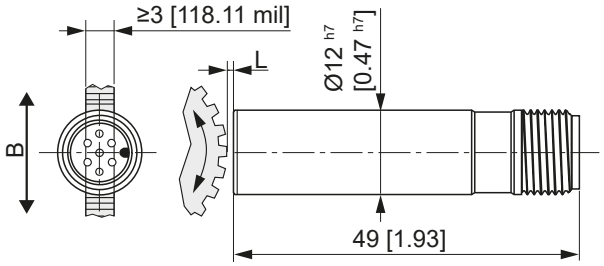
Module m	Pitch p in mm	Nominal air gap	
		Preset measure Air gap L	Distance tolerance
-	1.0	0.15 mm [5.91 mil]	± 0.05 mm [1.97 mil]
-	1.6	0.25 mm [9.84 mil]	± 0.05 mm [1.97 mil]
-	2.0	0.30 mm [11.81 mil]	± 0.05 mm [1.97 mil]



B Moving direction
L Air gap

Assembly with target wheel

Module m	Pitch p in mm	Nominal air gap	
		Preset measure Air gap L	Distance tolerance
0.5	-	0.25 mm [9.84 mil]	± 0.05 mm [1.97 mil]
1.0	-	0.50 mm [19.69 mil]	± 0.10 mm [3.94 mil]



B Moving direction
L Air gap

EMC notes

To improve the electromagnetic environment, observe the following installation instructions:

- Place the screen over a large surface area.
- Keep unscreened cables as short as possible.
- Perform the ground connections with a large cross section (for example, as a low inductance ground strap or a flat conductor) and keep them short.
- If there are potential differences between the machine and electronic ground connections, make sure that no equalization currents can be transferred via the cable screen. For this purpose, lay an equipotential bonding cable with a large cross section, for example, or use a cable with separate double screening. In the case of cables with separate double screening, connnect each of the screens on one side only.
- Lay the signal and control cables physically separate from the power cables. If this is not possible, use twisted pair and screened cables or lay the cable in a steel conduit.
- Implement external protective measures against surge voltages (EN 61000-4-5).

Distance tolerance applies to sin/cos signal with internal amplitude control and to square-wave signal with interpolation factor 1. With higher interpolation factors, the distance tolerance decreases.

Measuring scales

Measuring rod

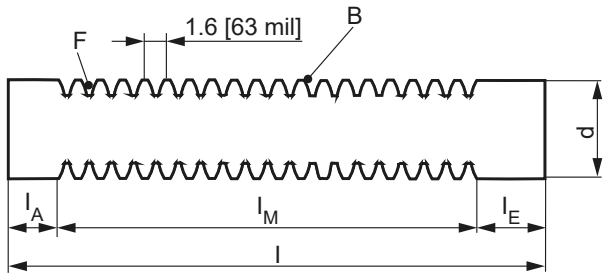
Application area

- Length measuring
- Scanning of measuring rods with pitch 1 mm / 1.6 mm / 2 mm

For position detection of linear movements, MiniCODERs from the GEL 2432 series scan a measuring scale. A pitch structure that can be applied to any ferromagnetic machine components serves as a measuring scale.

Ferromagnetic racks or piston rods can be used as measuring rods. To protect them from contamination, they are coated with a hard chrome layer, for example (the pitch structure is then filled with copper, for example).

Measuring rod



B Surface coating
F Filling material
l_M Measured length: maximum 2700 mm [106.30 in]
l Total length: maximum 3000 mm [118.11 in]
l_A/l_E Start-up/run-out length

Target wheel

Application area

- Speed and position measurement with target wheels
- Scanning of target wheels with module 0.5 or module 1

For the detection of rotary movements, MiniCODERs form a unit together with target wheels. The target wheel size and thus the diameter depend directly on the module and the number of teeth.

The following applies:

$$z = (d_a / m) - 2$$
$$d_a = m \cdot (z+2)$$

d_a Outside diameter
m Module
z Number of teeth

Customized target wheels

Customized target wheels are manufactured individually according to customer requirements. Please send a design drawing of your target wheel (if possible in PDF format) to info@lenord.de.

Type code

2432	**Product type**					
	Signal pattern					
	K	Sin/Cos signals 1 V_{pp}				
	T	Square-wave signals 5 V TTL / RS 422				
		Reference mark				
		-	Without			
			Interpolation factor (1) **/Amplitude control**			
			Only with signal pattern **T**:			
			1	Interpolation factor 1		
			2	Interpolation factor 2		
			4	Interpolation factor 4		
			8	Interpolation factor 8		
			A	Interpolation factor 10		
			B	Interpolation factor 12		
			C	Interpolation factor 16		
			D	Interpolation factor 20		
			Only with signal pattern **K**:			
			R	With internal amplitude control (mandatory)		
				Module/Pitch		
				1	Module m = 1.0 (target wheel)	
				5	Module m = 0.5 (target wheel)	
				A	Pitch p = 1.6 (measuring rod)	
				B	Pitch p = 2.0 (measuring rod) (2)	
				C	Pitch p = 1.0 (measuring rod)	
					Connection type	
					0000	Without connection cable
					C600	Connection cable with molded connector, straight, Length: 600 cm [236.22 in]
					D600	Connection cable with molded connector, 90° angled, Length: 600 cm [236.22 in]
▼	▼	▼	▼	▼	▼	
2432	_	_	_	_	_ _ _ _	**◄ Product code**

(1) Higher interpolation factors: upon request

(2) Not available with signal pattern K.

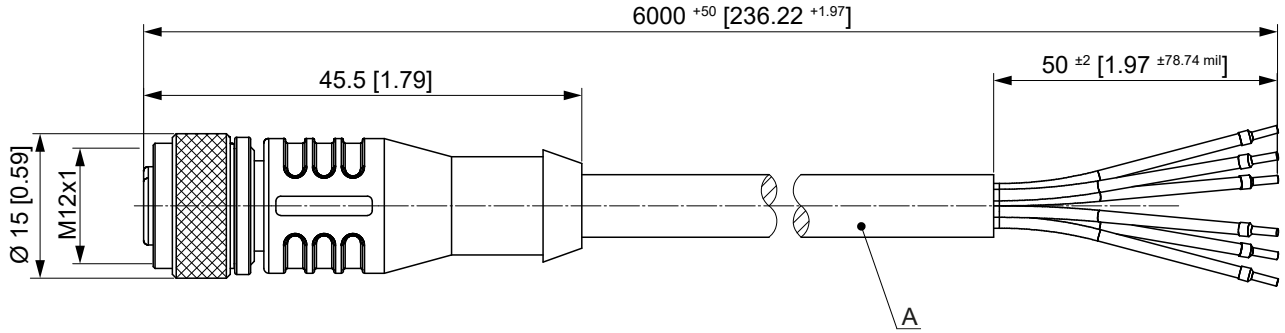
Accessories

Item number	Description	
Type code	GEL 214	External interpolation electronics for converting sinusoidal signals into square-wave signals For more information see separate Technical information GEL 214
BK1180	GG 600	Connection cable with molded connector, straight, Length 600 cm [236.22 in]
BK1181	GW 600	Connection cable with molded connector, 90° angled, Length 600 cm [236.22 in]

Dimensional drawings

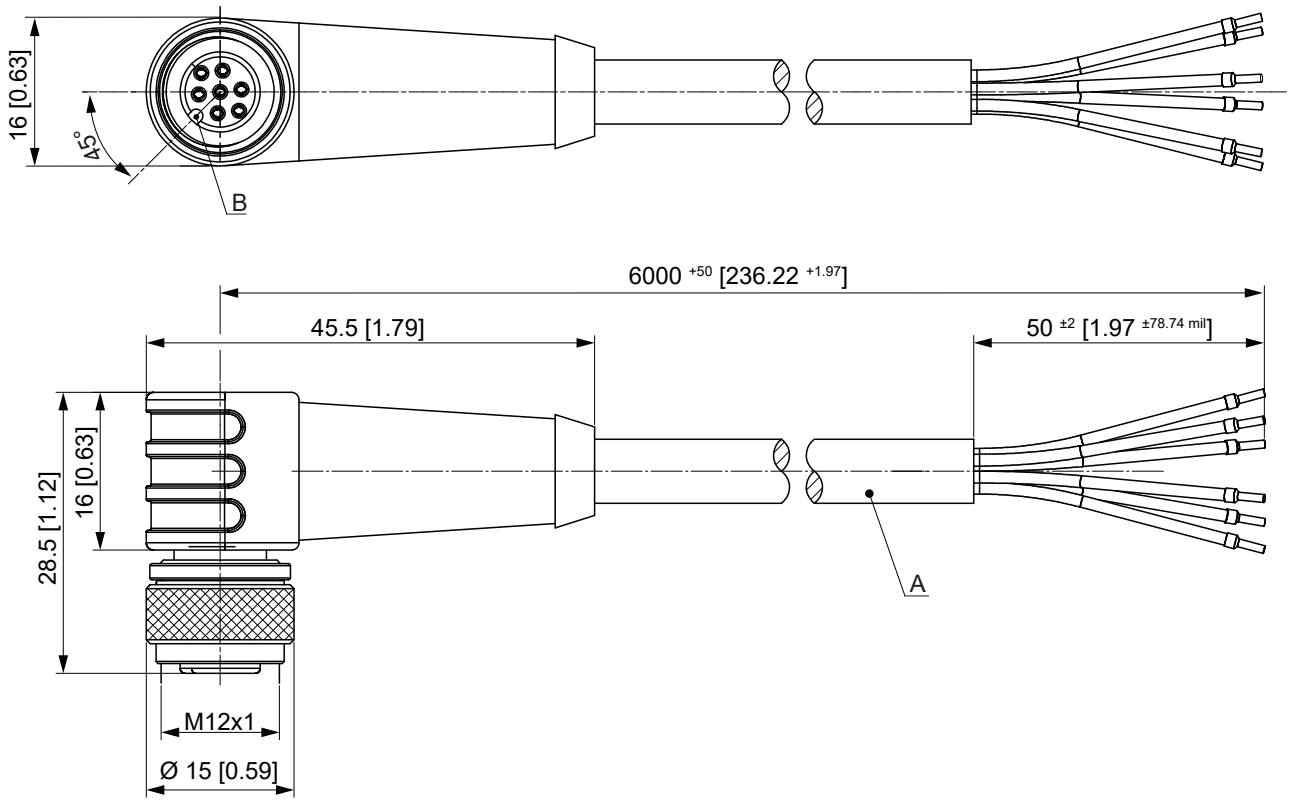
All dimensions in millimeters [inch]

GG 600: Connection cable with molded connector, straight



A Wire LiF9YHC -11YH 8 x 0.25 mm² [24 AWG]; material: PUR, screened, halogen-free; Color: grey

GW 600: Connection cable with molded connector, 90° angled



A Wire LiF9YHC -11YH 8 x 0.25 mm² [24 AWG]; material: PUR, screened, halogen-free; Color: grey
B Coding

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