

Speed and position sensor

GEL 2432

with sin/cos- or square-wave output, high resolution, rotational or linear measurement

Technical information

Version 2015-11



Measuring scales available separately.

Main features

- ▶ sin/cos signal output 1 V_{pp}
- ▶ Square-wave signal output 5 V TTL / RS422
- ▶ High resolution by internal interpolation of square-wave signal output
- ▶ interpolation factor selectable ex works

Properties

- ▶ Contactless measurement of rotational motion on target wheels with modules 0.5 and 1.0
- ▶ Contactless measurement of linear motion on measuring rods with pitches of 1.0 / 1.6 or 2.0 mm
- ▶ Useable under the most severe conditions
- ▶ Very high degree of protection IP 67, sensor side chemically resistant
- ▶ Fully encapsulated electronics

Fields of application

- ▶ Registering the movement of piston rods on diecasting machines
- ▶ Contactless measurement of speeds and positions on machines and motors

Measuring principle

- ▶ Integrated MR sensors for contactless scanning of a target wheel or rod
- ▶ Sensor signals are internally enhanced and temperature-compensated
- ▶ Frequency range 0 to 200 kHz

Output signals

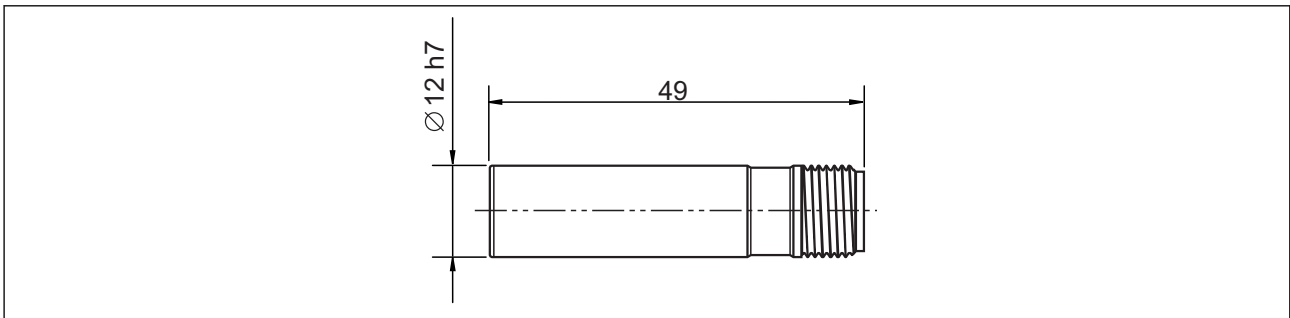
- ▶ Output as square-wave or sinusoidal signals
 - ▶ Power supply is reverse-polarity protected
 - ▶ Outputs are short-circuit proof
- Signal forms:
- Two 90° phase-offset square-wave signals with inverse signals 5 V TTL / RS422
 - Sin/cos-signals 1 V_{pp} with inverse signals
- ▶ Output frequency 0 to 200 kHz
 - ▶ Amplitude regulation (only for sin/cos signal output)

Technical data

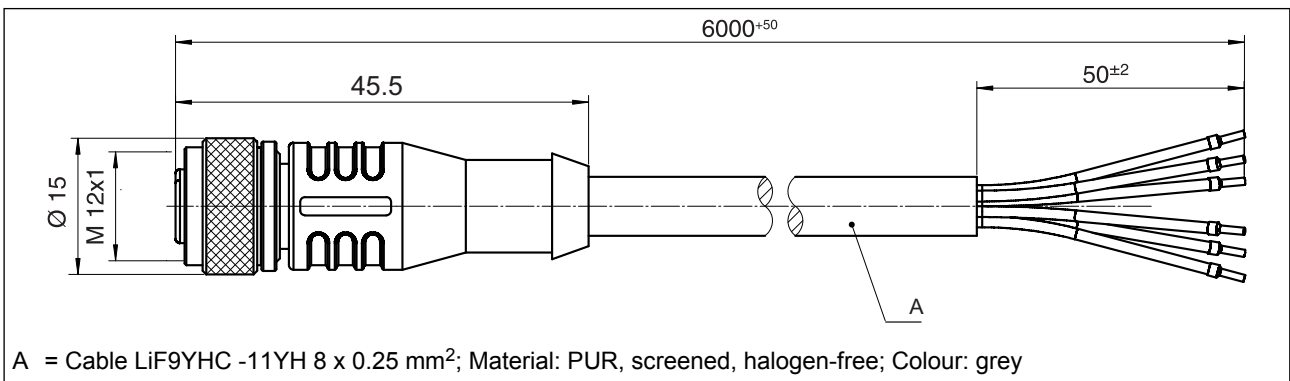
Electrical Data	
Supply voltage V_S (reverse battery protected) • 2432K • 2432T	5 V DC \pm 5% 5 V DC \pm 10%
Power consumption without load	\leq 0.6 W
Measuring frequency	0 to 200 kHz at a line capacity of 5 nF
Max. permissible cable length	100 m, depending on the frequency and cable capacity (test the voltage drop on the power line!)
Output signals • 2432K • 2432T	Two 90° phase-shifted push-pull signals, short-circuit proof Sine/Cosine Rectangle
Output level • 2432K • 2432T	1 V_{pp} +0.1/-0.2 V_{pp} differential signal 5 V TTL
Offset (static) • 2432K • 2432T	< 60 mV —
Amplitude ratio V_{tr1} / V_{tr2}	0.9 to 1.1
Electromagnetic compatibility	EN/IEC 61000-6-1: 2007-10 EN/IEC 61000-6-2: 2006-03 EN/IEC 61000-6-3: 2007-08 EN/IEC 61000-6-4: 2007-09
Insulation stability	500 V, according to EN/IEC 60439-1: 2012-06
Mechanical Data	
Measuring scale	Target wheel or measuring rod made of ferromagnetic steel
Width of the target wheel	Min. 3 mm
Diameter of the measuring rod	Min. 12 mm
Admissible air gap	See the mounting sketches
Working temperature	-20 °C to +85 °C
Operating temperature	-20 °C to +85 °C
Storage temperature	-30 °C to +100 °C
Degree of Protection	IP 67 (with plug being mounted)
Vibration resistance	200 m/s ² , according to EN/IEC 60068-2-6: 2008-10
Shock resistance	2000 m/s ² , according to EN/IEC 60068-2-27: 2010-02
Weight	20 g
Housing	Sensor pipe chemically nickel-plated, sealed by an oil-resistant cap

Dimensional drawings

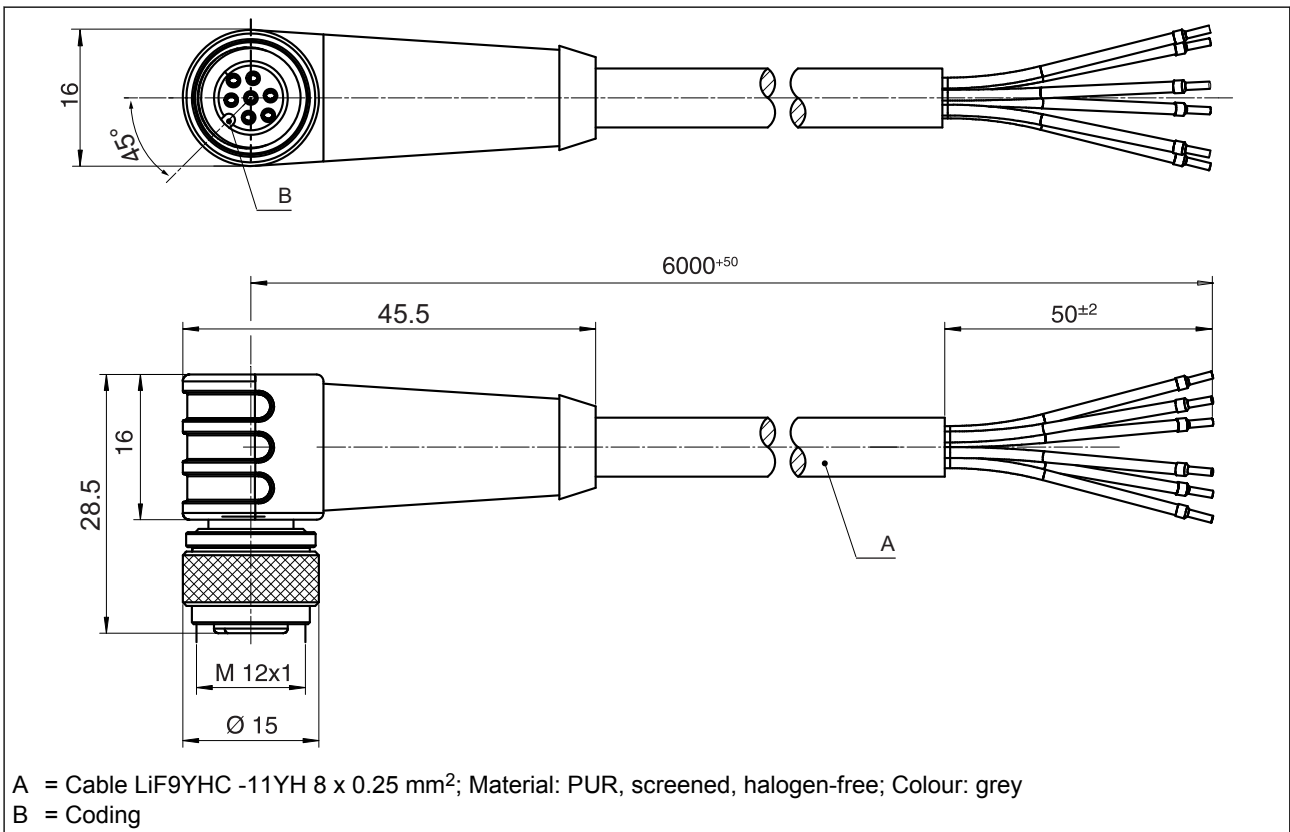
Dimensional drawing GEL 2432



Dimensional drawing GG 600 (Cable with moulded plug, straight outlet)



Dimensional drawings GW 600 (Cable with moulded plug, side outlet)



All dimensions in mm
General tolerance DIN ISO 2768:1991-06 medium

Measuring scales measuring rods

Fields of application

- ▶ Length measurements
- ▶ Scanning measuring rods with pitch 1, 1.6 oder 2 mm

Measuring rods

GEL 2432 series MiniCODERs can be used in combination with measuring scales to determine positions of linear movements (e.g. of piston rods). The measuring scale used is a graduated surface structure that can be applied to any desired ferromagnetic machine elements.

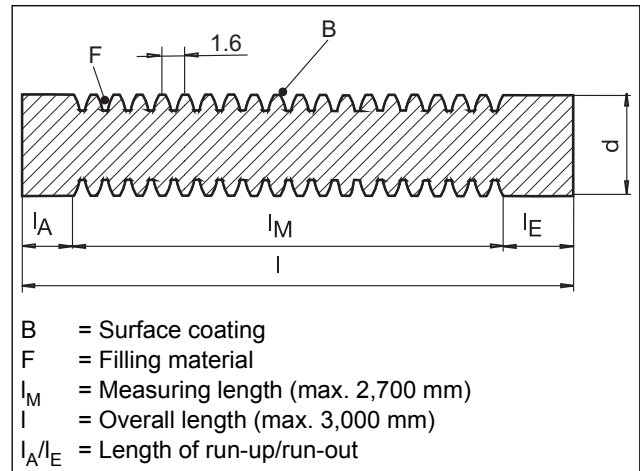
This extremely flexible technology makes it possible to use appropriately manufactured piston rods or other machine elements as measuring scales. In the case of piston rods, a special production process is used to fill the applied graduated structure and this is then covered by a wear-resistant hard chrome plating. Other coating materials can also be used as appropriate for the application.

Lenord + Bauer supplies 1.6 mm pitch measuring rods with various diameters.

Measuring rods receive 0.02 mm hard chrome plating. The diameter is accurate to ISO tolerance h6. The surface hardness is ca. 950 ± 50 HV and the surface quality ca. $Ra = 0.2 \mu\text{m}$.

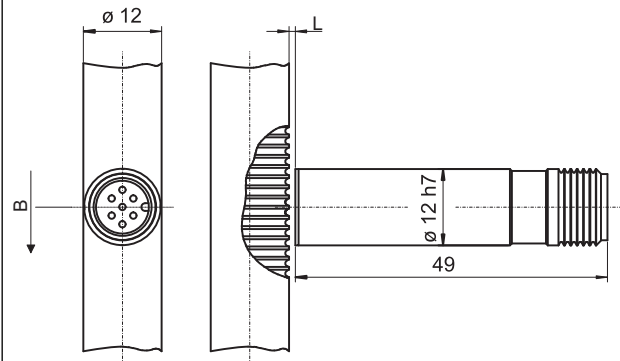
The MiniCODER must be mounted in such a way that the three collinear pins are aligned in the direction of movement of the measuring rod. Observe the position of the plug key in order to establish the counting direction (see the pin layouts for sin/cos or square-wave signal output on [page 6](#)).

- 1) Distance tolerance applies to sin/cos signals with internal regulation and square-wave signals with interpolation factor 1. Higher interpolation factors have a longer distance tolerance.



Assembly drawing GEL 2432

Module [mm]	Pitch [mm]	Air gap L preset measure	Distance tolerance ¹⁾
-	1.0	0.15 mm	± 0.05 mm
-	1.6	0.25 mm	± 0.05 mm
-	2.0	0.30 mm	± 0.05 mm



- B** = Direction of movement
L = Air gap

Type codes for measuring rods

MS	-		
	Pitch p in mm		
	A	p = 1.6	
		Length in mm (max. 2,700 mm)	
	0000	e.g. 0500	
		Diameter in mm (h6)	
	000	012 / 016 / 020 / 025	

Measuring scales Target wheels

Fields of application

- ▶ Measurement of speeds and positions with target wheels
- ▶ Scanning target wheels with module 0.5 or module 1

Target wheels

The type of MiniCODER that is used to detect rotational motion forms a unit with its target wheel. The size of the target wheel, and hence the diameter of the unit thus depend directly on its module and number of teeth. The following formulae are used:

$$z = (d_a / m) - 2$$

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

d_a = external diameter

m = module

z = number of teeth

The MiniCODER must be mounted in such a way that the three collinear pins are aligned in the direction of movement of target wheel. Observe the position of the plug key in order to establish the direction of counting (see the pin layouts for sin/cos or square-wave signal output on [page 6](#)).

Customer-specific target wheel

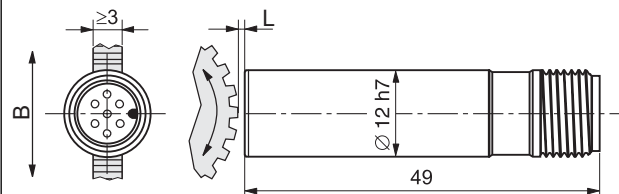
Target wheels can be specially manufactured for individual customers' requirements. Please send us a construction drawing of the desired target wheel (if possible in the form of a DXF file).

1) Distance tolerance applies to sin/cos signals with internal regulation and square-wave signals with interpolation factor 1. Higher interpolation factors have a longer distance tolerance.



Assembly drawing GEL 2432



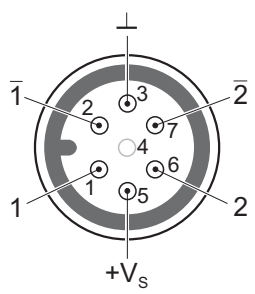
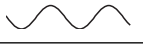





Module [mm]	Pitch [mm]	Air gap L preset measure	Distance tolerance ¹⁾
0.5	-	0.25 mm	± 0.05 mm
1.0	-	0.50 mm	± 0.10 mm



B = Direction of movement

L = Air gap

Pin layouts, EMC information

Lead colour	Pin	Signal/ function				Probe
Green	1	V_{1+}	Track 1			
Yellow	2	V_{1-}	/Track 1			
White	3	0 V	GND	Ground		
Brown	5	$+V_S$	+ 5 V DC	Supply voltage		
Grey	6	V_{2+}	Track 2			
Rose	7	V_{2-}	/Track 2			
Screen	—	Connected to the sensor pipe through the plug.				

Installation instructions

- ▶ Align the MiniCODER **symmetrically** with respect to the measuring scale. Asymmetries lead to measuring errors.
- ▶ Avoid mechanical contact between the measuring scale and the 0.1 mm thick protective layer of the sensor system. **Scratching** this protective layer can cause **complete failure** of the MiniCODER.
- ▶ Do not damage the surface of the toothing. Do not permit any mechanical components to run on this surface.

EMC information

In order to maintain the equipment's certificated electromagnetic compatibility (EMC) you should comply with the following instructions:

- ▶ The screening at the ends of cables should be in contact **over as large a surface as possible**.
- ▶ All unscreened lines should be kept **as short as possible**.
- ▶ Earth connections should be made **as short as possible** and should have a **large cross-section** (low induction earthing strap, ribbon cable).
- ▶ If there are or may be **potential differences** between the earth connections for machinery and electronic components, then appropriate measures must be adopted to ensure that **no equalising current** can flow via the cable screening (e.g. install a large cross-section equipotential line, or use cables with two-fold separated screening, with each screen in contact at only one side).
- ▶ Signal lines and control lines should be routed **separately and away from** power cables.
- ▶ Ensure that external protection measures against surges have been implemented ("Surge") (DIN EN 61000-4-5: 2015-03).

Type code

2432	Signal pattern K Sin/Cos signals 1 V _{PP} T Square-wave signals 5 V TTL / RS 422
	Interpolation factor / amplitude control Signal pattern T only: 1 Multiplier 1 2 Multiplier 2 4 Multiplier 4 8 Multiplier 8 A Multiplier 10 B Multiplier 12 C Multiplier 16 D Multiplier 20 Signal pattern K only: R with internal amplitude control (mandatory)
	Module / pitch 1 Module m = 1.0, diametric pitch D.P = 25.4 (target wheel) 5 Module m = 0.5, diametric pitch D.P = 50.8 (target wheel) A Pitch p = 1.6 (measuring rod) B Pitch p = 2.0 (measuring rod) C Pitch p = 1.0 (measuring rod)
	Connection type 0000 No connecting cable C600 Connecting cable with extruded straight plug (L = 600 cm) D600 Connecting cable with extruded angulate plug (L = 600 cm)

Interpolation factor

A new electronic module enables the sin/cos signals generated by the MiniCODER GEL 2432 to interpolated directly.

For example, users can obtain 5000 square-wave signals from a precision 250-tooth target wheel with the selected interpolation factor D = 20 (higher factors are available on request).

The interpolation is carried out directly at the sensor. The four-flank evaluation facility in the control electronics can deliver an even higher resolution, in the above example 20,000 steps.

Assessories

GEL 212/213 und GEL 214

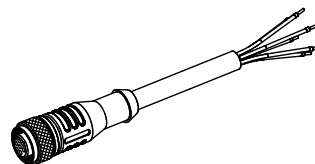
External interpolation electronics to convert sinusoidal signals to square-wave signals.

If you would like any further information about these products, please ask for our separate technical information sheets, or download them as PDF files from our website:

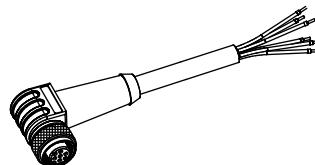
www.lenord.de.



GG 600 Cable with moulded plug, straight, length 600 cm



GW 600 Cable with moulded plug, angled, length 600 cm





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Subject to technical modifications and typographical errors.

