

General

- The measuring system comprises a MiniCODER and a target wheel for attachment to machine shafts.
- Target wheels must be ordered separately.
- The MiniCODER scans the target wheel with magnetoresistive sensors without contact and detects the direction of rotation, speed and position.

Properties

- Output signal level
1 V_{pp} Differential signal (sin/cos) or TTL/RS422
- Rectangular differential reference signal (optional)
- Selection of interpolation factors to increase the number of pulses per revolution possible (TTL/RS422)
- Recording of temperature and speed histogram and automatic calibration possible
- Frequency range of 0 to 200 kHz ⁽¹⁾ (sin/cos) or 0 to 500 kHz ⁽¹⁾ (TTL/RS422)
- Operating and storage temperature range
-40 °C to +120 °C [-40 °F to 248 °F]
- Degree of protection IP 68
- Certificate **Safety integrated** (signal pattern K)



MiniCODER with axial cable outlet

Advantages

- Maintenance-free electronics
- Wear-free mechanics
- Low temperature drift and high signal quality
- Highest interference immunity due to completely screened metal housing
- With mobile service unit fast commissioning of the parameterizable MiniCODER in the assembled state without opening the spindle
- High design flexibility due to customized manufacture of target wheels

Field of application

- Machine tools
 - HSC spindles (High Speed Cutting)
 - Screw spindles in vacuum pumps
 - Turning, grinding, and milling machines
- Test benches and motors (hybrid drives, torque motors)

⁽¹⁾ With cable capacitance of 5 nF

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 micro system technology and are fully encapsulated, making them particularly insensitive to shocks and vibrations.

Measuring system

The measuring system comprises a MiniCODER and a target wheel. The system does not require dedicated bearings, as the target wheel is mounted directly on the machine shaft.

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 rotating machine shaft.

The target wheel is made of ferromagnetic material and must be ordered separately.

The MiniCODER has a magnetic field that is changed by the rotating target wheel. 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 machine shaft.

A defined air gap between target wheel and MiniCODER is required for contactless measurement. To facilitate assembly, a corresponding distance gauge is included with the MiniCODER.

Reference mark

The MiniCODER can determine the machine shaft position by detecting a reference mark.

Output is as a rectangular differential reference signal (reference track N).

The MiniCODER evaluates the following reference marks: Groove (**M**), lug (**N**), tooth (**Z**).

Module

Selectable modules: 0.3 / 0.5 .



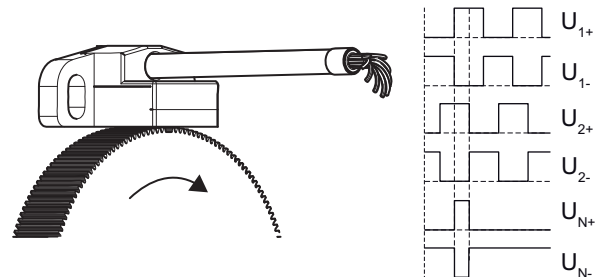
The MiniCODER must be ordered to match the design of the reference mark and to match the module of the target wheel.

Signal pattern

Signal pattern D, 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.



U_{N+} Reference signal (reference track N)



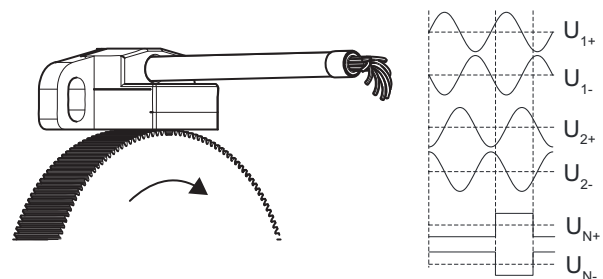
Signal pattern D:

The MiniCODER records and stores the total operating time. This can be read out using the GEL 211CS0 mobile service unit.

Signal pattern K

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

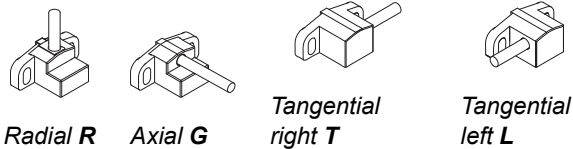
The signal sequences depend on the direction of rotation.



U_{N+} Reference signal (reference track N) optional

Cable outlet MiniCODER

The MiniCODER is available with the following cable outlets:



Optional extras for signal pattern D, T

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

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.

Optional extras for signal pattern K

Parameterizable (P)

The MiniCODER can be tested and configured with the GEL 211CS0 mobile service unit.

Parameterizing the MiniCODER via the connector

- Setting the sin/cos amplitudes without mechanical readjustment of the air gap
- Elimination of offset and amplitude errors to compensate for mounting tolerances
- Definition of 7 speed ranges for activating the speed histogram in the MiniCODER
- Entering a spindle serial number (assigning the drive)

In addition, various data is stored in the MiniCODER and can be read:

- Speed histogram for analyzing the drive operating conditions
- Number of run-ups
- Minimum/maximum temperature of the MiniCODER
- Item number and serial number of the MiniCODER
- Total operating time and time since last configuration

Not parameterizable, with internal amplitude control (M)

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

Not parameterizable (S)

Technical data

Technical data measuring system

	GEL 2444_3	GEL 2444_5
Target wheel		
Material	Ferromagnetic steel	
Target wheel width	10 mm [0.39 inch]	
Reference mark	Groove (M), lug (N), tooth(Z)	
Module m ⁽¹⁾	0.3	0.5
Geometric data		
Nominal air gap	0.15 mm ± 0.02 mm [5.91 mil ±0.79 mil]	0.20 mm ± 0.03 mm [7.87 mil ±1.18 mil]

⁽¹⁾ Other modules upon request

Technical data GEL 2444

Electrical data	
Supply voltage U_B (polarity reversal protected, overvoltage protected)	5 V DC $\pm$ 5 %
Output signal • GEL 2444D • GEL 2444K • GEL 2444T	Two square-wave signals phase-shifted by 90° and their inverse signals, short-circuit-proof Reference signal Two sinusoidal signals phase-shifted by 90° and their inverse signals, short-circuit-proof Reference signal Two square-wave signals phase-shifted by 90° and their inverse signals, short-circuit-proof Reference signal
Output signal level • GEL 2444D • GEL 2444K • GEL 2444T	TTL/RS422 1 V _{pp} Differential signal TTL/RS422
Output frequency • GEL 2444D • GEL 2444K • GEL 2444T	0 to 500 kHz ⁽¹⁾ 0 to 200 kHz ⁽¹⁾ 0 to 500 kHz ⁽¹⁾
Power consumption without load	≤ 0.3 W
Mechanical data	
Housing material	Zinc die casting
Weight	30 g [1.06 oz]
Cable data (cable design –)	
Cable structure (number of cores× core cross-section)	9× 0.15 mm ² [25 AWG]
Cable diameter	5 mm [0.20 in]
Minimum bending radius	25 mm [0.98 in]
Maximum permissible cable length	100 m [328.08 ft] ⁽²⁾
Ambient data	
Working temperature range	-30 °C to +85 °C [-22 °F to 185 °F]
Operating and storage temperature range	-40 °C to +120 °C [-40 °F to 248 °F]
Degree of protection at the cable outlet of the MiniCODER housing ⁽³⁾	IP 68
Dielectric strength	500 V AC / 1 min
Electromagnetic compatibility	Electromagnetic emission DIN EN 61000-6-4; DIN EN 61000-6-3 Electromagnetic immunity DIN EN 61000-6-2; DIN EN 61000-6-1
Vibration resistance	200 m/s ² [656.17 ft/s ²], according to EN 60068-2-6
Shock resistance	2000 m/s ² [2187.23 yd/s ²], according to EN 60068-2-27
MTTF FIT	5,000,000 h at 55 °C [131 °F] 204 × 10 ⁻⁹ h ⁻¹ at 55 °C [131 °F]
Approvals	
European Economic Area	Conformity in accordance with EMC Directive 2014/30/EU CE

⁽¹⁾ With cable capacitance of 5 nF

⁽²⁾ Consider voltage drop on the power supply cable.

⁽³⁾ Specification of the degree of protection for the connectors of the connection types **J**, **M**, **N**, **U**, **Z**: upon request

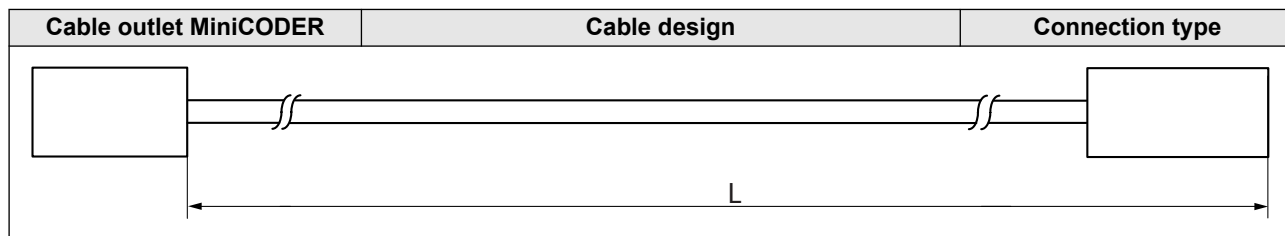
Electrical connection

L = Cable length



The following applies to standard MiniCODER models:

- The connection cable screen is connected to the MiniCODER housing.
- In the case of metalized connectors, the connection cable screen is connected to the connector housing.
- In the case of plastic connectors, the connection cable screen is connected to a connector pin.



Cable outlets MiniCODER

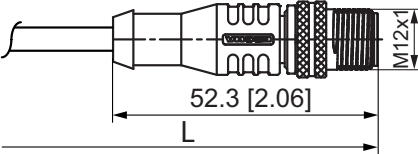
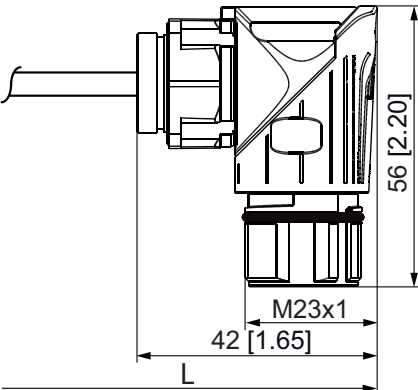
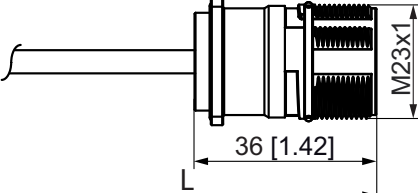
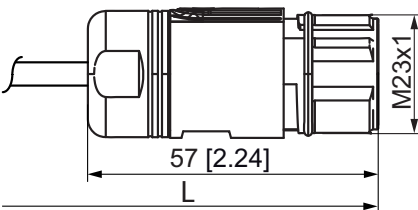
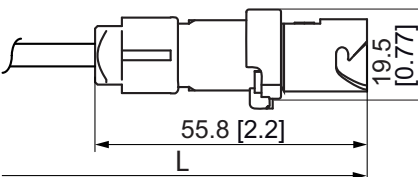
Cable outlet MiniCODER			
R (radial)	G (axial)	L (tangential left)	T (tangential right)

Cable design for temperature sensors

Cable design	
— (without temperature sensor cable)	
M) 2-core temperature sensor cable, 2 m [78.74 in] in length Cable data — TEFLON cable $2 \times 0.14 \text{ mm}^2$ [26 AWG] — Outside diameter: $2.8 \text{ mm} \pm 0.1 \text{ mm}$ [110.24 mil $\pm$ 3.94 mil] — Minimum bending radius: 20 mm [0.79 in]	
N: 4-core temperature sensor cable, 2 m [78.74 in] in length Cable data — ETFE cable $4 \times 0.14 \text{ mm}^2$ [26 AWG] — Outside diameter: $3.5 \text{ mm} \pm 0.2 \text{ mm}$ [137.8 mil $\pm$ 7.87 mil] — Minimum bending radius: 7 mm [0.28 in]	
P: 6-core temperature sensor cable, 2 m [78.74 in] in length Cable data — ETFE cable $6 \times 0.14 \text{ mm}^2$ [26 AWG] — Outside diameter: $3.5 \text{ mm} \pm 0.2 \text{ mm}$ [137.8 mil $\pm$ 7.87 mil] — Minimum bending radius: 7 mm [0.28 in]	

Electrical connection

Connection types

Connection type	Notes
J (12-pin male connector)	 Not available with temperature sensor cable! Available cable lengths: 030/050/250/600
K¹⁾ (flying lead)	 Not available with temperature sensor cable! Available cable lengths: 030/050/150/250/600
M (17-pin panel-mounting socket, angled with male contacts)	 EMC screening, strain relief and sealing, IP 67 (plugged)
N (17-pin panel-mounting socket with male contacts)	 EMC screening, strain relief and sealing, IP 67 (plugged)
P (10-pin female connector)	 Not available with temperature sensor cable! Cable length available accurate to the centimeter!
U (12-pin coupling with male contacts)	 Not available with temperature sensor cable!
Z (10-pin male connector)	 Not available with temperature sensor cable! Available cable lengths: 120/200/250

¹⁾ The delivery takes place with connected test connector from Lenord+Bauer.

All dimensions in millimeters [inch]

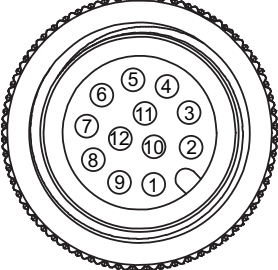
Electrical connection

Assignments



With long power supply cables, the voltage drop across the cables can be so great that it impairs the function of the MiniCODER. Ensure that an external sense control is provided for long power supply cables!

Connection type J

12-pin male connector (plug-in view)	Pin	Signal/Function	
	1	U_{1+}	Signal track 1
	2	U_{1-}	Inverse signal track 1
	3	U_{N+}	Signal reference track N
	4	0 V	GND
	5	U_B	+5 V supply voltage
	6	U_{2+}	Signal track 2
	7	U_{2-}	Inverse signal track 2
	8	U_{N-}	Inverse signal reference track N
	9	unallocated	
	10	U_{Sense}	5 V Sense
	11	unallocated	
	12	unallocated	

Connection type K

Flying lead (10-pin female connector ¹⁾) (plug-in view)	Pin	Core color	Signal/Function	
	1	red	U_B	+5 V supply voltage
	2	white	U_{1+}	Signal track 1
	3	brown	U_{1-}	Inverse signal track 1
	4	pink	U_{2+}	Signal track 2
	5	black	U_{2-}	Inverse signal track 2
	6	green	U_{Sense}	5 V Sense
	7	gray	U_{N+}	Signal reference track N
	8	yellow	U_{N-}	Inverse signal reference track N
	9	blue	0 V	GND
	10	unallocated		

¹⁾ The delivery takes place with connected test connector from Lenord+Bauer.



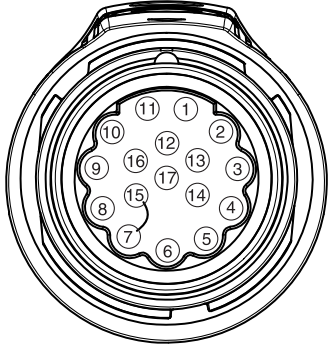
In the case of MiniCODERs without a reference mark, the yellow and gray wires carry voltage. When connecting the cable, a short circuit in these wires can damage the MiniCODER. Insulate the wires or connect them to U_B via resistors ($> 2 \text{ k}\Omega$) or 0 V.



If a mobile service unit is to be used for the function test, the test connector must not be removed!

Electrical connection

Connection types M and N

17-pin panel-mounting socket with male contacts (plug-in view)	Pin	Signal/Function	
	1	U_{1+}	Signal track 1
	2	U_{1-}	Inverse signal track 1
	3	U_{N+}	Signal reference track N
	4 – 6	unallocated ¹⁾	
	7	0 V	GND
	8	unallocated ¹⁾	
	9	unallocated ¹⁾	
	10	U_B	+5 V supply voltage
	11	U_{2+}	Signal track 2
	12	U_{2-}	Inverse signal track 2
	13	U_{N-}	Inverse signal reference track N
	14	unallocated ¹⁾	
	15	0 V	GND (bridge Pin 7)
	16	U_{Sense}	5 V Sense
	17	unallocated	

¹⁾ Reserved for temperature sensor

Connection types M and N: Additional assignments when connecting a temperature sensor cable

17-pin panel-mounting socket with male contacts	Core color	Pin	Signal/Function
2-core temperature sensor cable (cable design M)	brown	8	Temp +
	blue	9	Temp –
4-core temperature sensor cable (cable design N)	brown	8	Temp1+
	white	9	Temp1 –
	green	4	Temp2+
	pink	14	Temp2 –
6-core temperature sensor cable (cable design P)	brown	8	Temp1+
	white	9	Temp1 –
	gray	6	Temp2+
	yellow	5	Temp2 –
	green	4	Temp3+
	pink	14	Temp3 –

Electrical connection

Connection type P

10-pin female connector (plug-in view)	Pin	Signal/Function	
	1	U_B	+5 V supply voltage
	2	U_{1+}	Signal track 1
	3	U_{1-}	Inverse signal track 1
	4	U_{2+}	Signal track 2
	5	U_{2-}	Inverse signal track 2
	6	U_{Sense}	5 V Sense
	7	U_{N+}	Signal reference track N
	8	U_{N-}	Inverse signal reference track N
	9	0 V	GND
	10	unallocated	

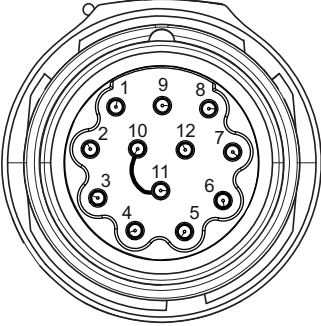


In the case of MiniCODERs without a reference mark, the yellow and gray wires carry voltage. When connecting the cable, a short circuit in these wires can damage the MiniCODER. Insulate the wires or connect them to U_B via resistors ($> 2 \text{ k}\Omega$) or 0 V.

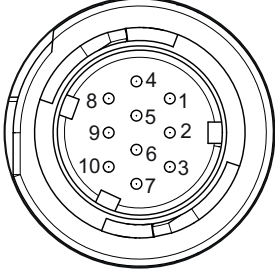


If a mobile service unit is to be used for the function test, the test connector must not be removed!

Connection type U

12-pin coupling with male contacts (plug-in view)	Pin	Signal/Function	
	1	U_{2-}	Inverse signal track 2
	2	U_{Sense}	5 V Sense
	3	U_{N+}	Signal reference track N
	4	U_{N-}	Inverse signal reference track N
	5	U_{1+}	Signal track 1
	6	U_{1-}	Inverse signal track 1
	7	unallocated	
	8	U_{2+}	Signal track 2
	9	unallocated	
	10	0 V	GND
	11	0 V	GND (bridge Pin 10)
	12	U_B	+5 V supply voltage

Connection type Z

10-pin male connector (plug-in view)	Pin	Signal/Function	
	1	U_{2+}	Signal track 2
	2	U_{2-}	Inverse signal track 2
	3	Screen	
	4	U_B	+5 V supply voltage
	5	U_{1+}	Signal track 1
	6	U_{1-}	Inverse signal track 1
	7	0 V	GND
	8	U_{N+}	Signal reference track N
	9	U_{N-}	Inverse signal reference track N
	10	unallocated	



Sense control not possible!

Instructions for correct assembly of your own connector on the MiniCODER connection cable

- The screen of the connection cable must not be connected to the "0 V" signal.
- The cable screen must also be connected to the connector for short cables (< 30 cm [11.81 in]).
- Ensure that no foreign objects or liquids can penetrate the cable in order to prevent damage to the MiniCODER.

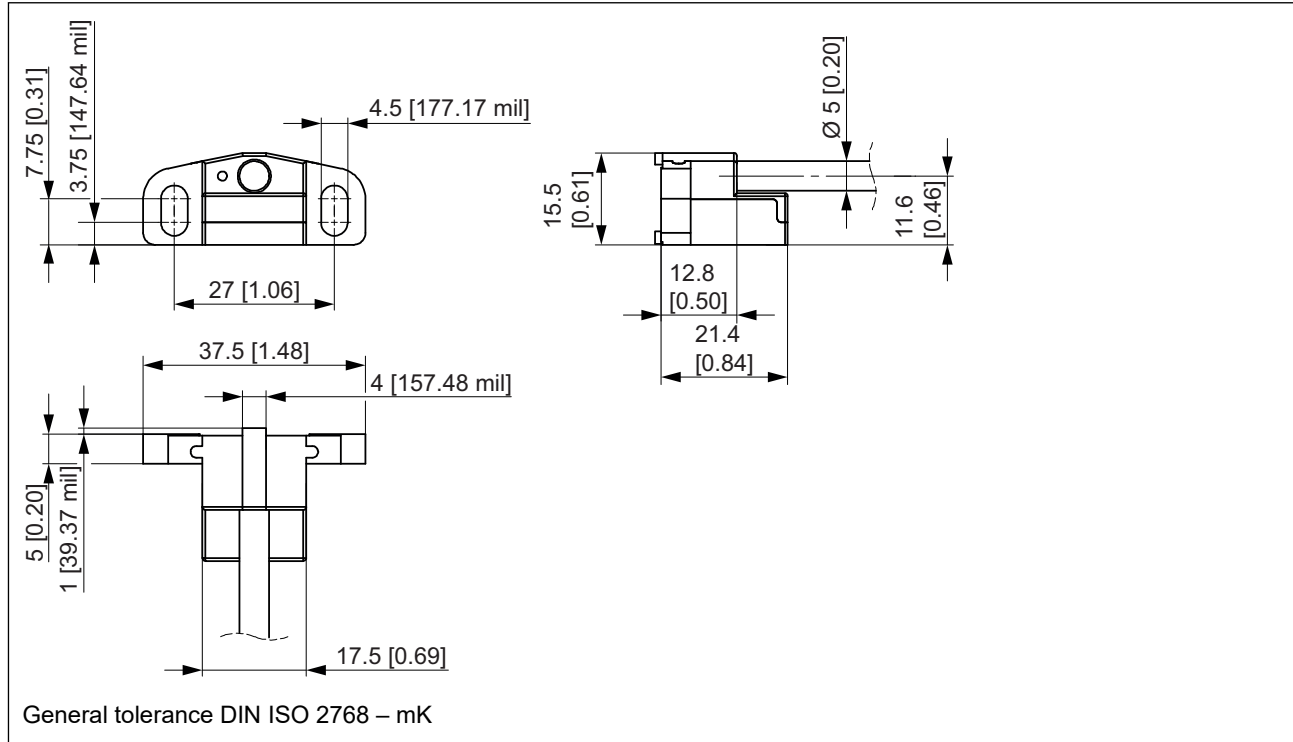


Should the electromagnetic environment require special screening concepts, Lenord+Bauer offers support based on extensive knowledge and experience in integrating the MiniCODER into the screening concept of the application.

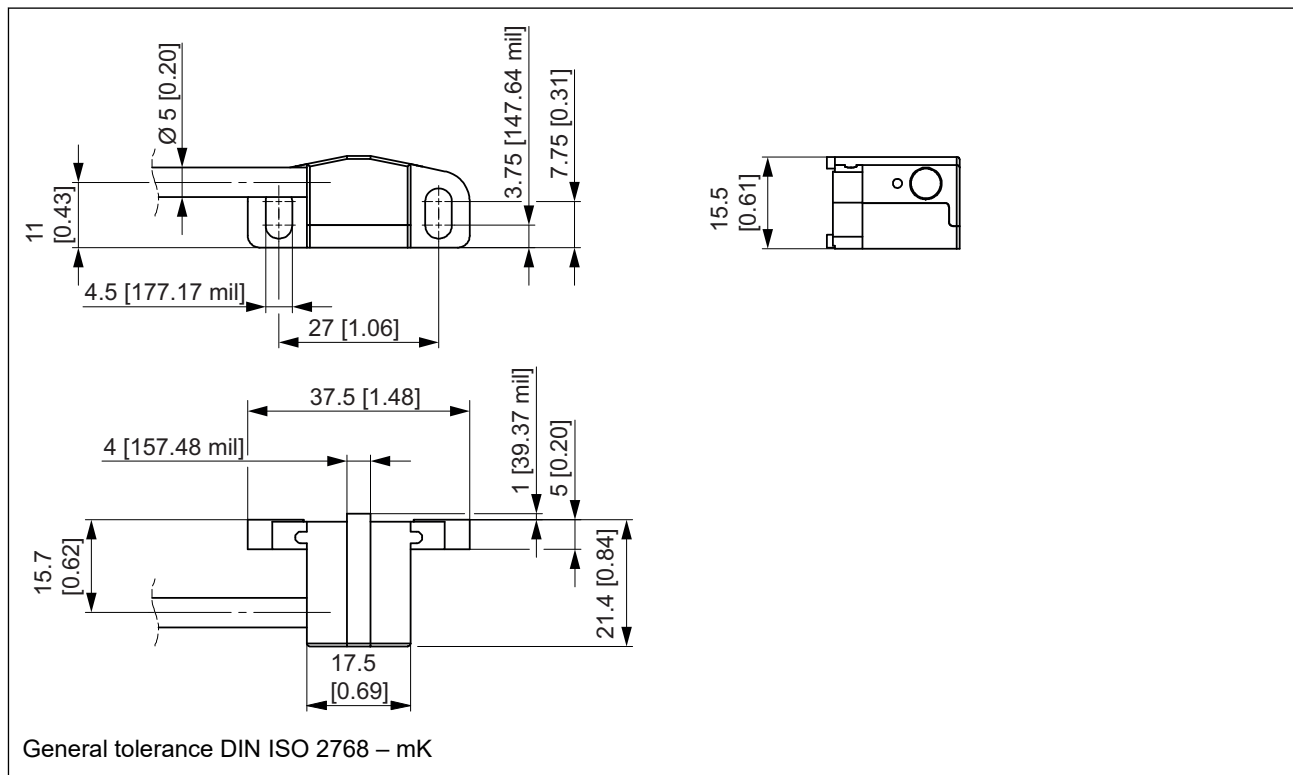
Dimensional drawings

All dimensions in millimeters [inch]

Dimensional drawing cable outlet MiniCODER (G) — axial

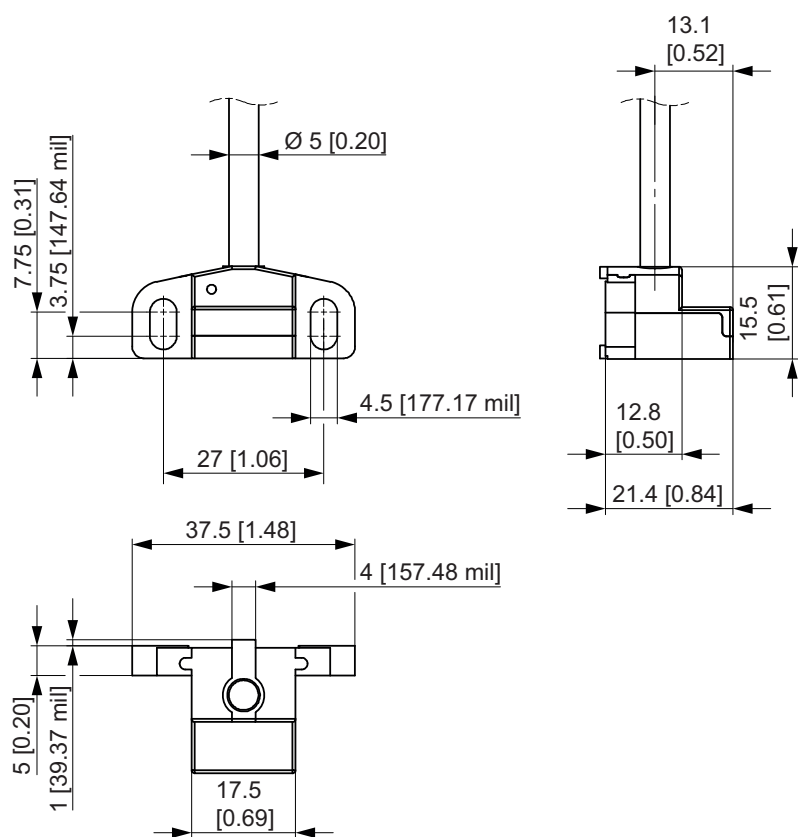


Dimensional drawing cable outlet MiniCODER (L) — Tangential, cable outlet left



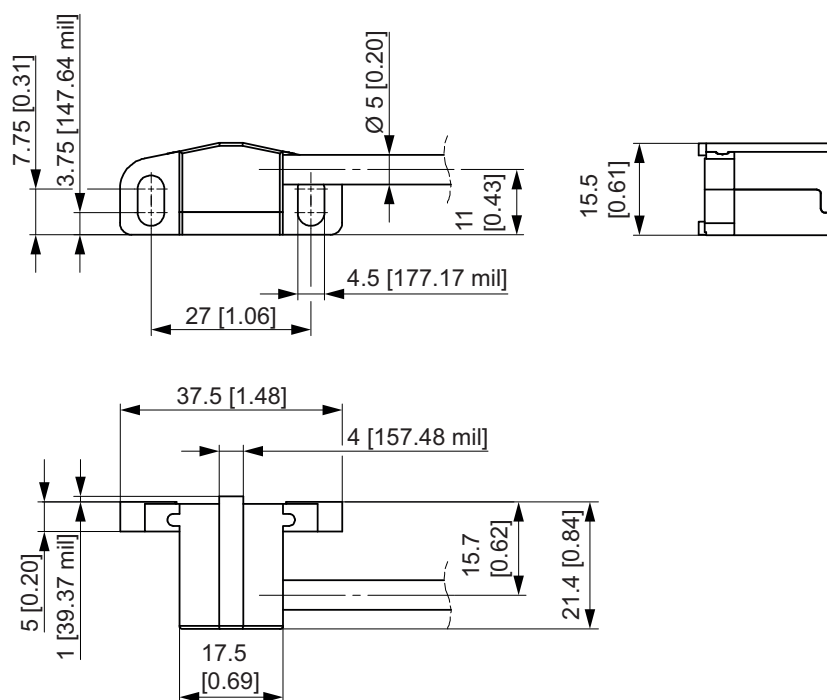
Dimensional drawings

Dimensional drawing cable outlet MiniCODER (R) — radial



General tolerance DIN ISO 2768 – mK

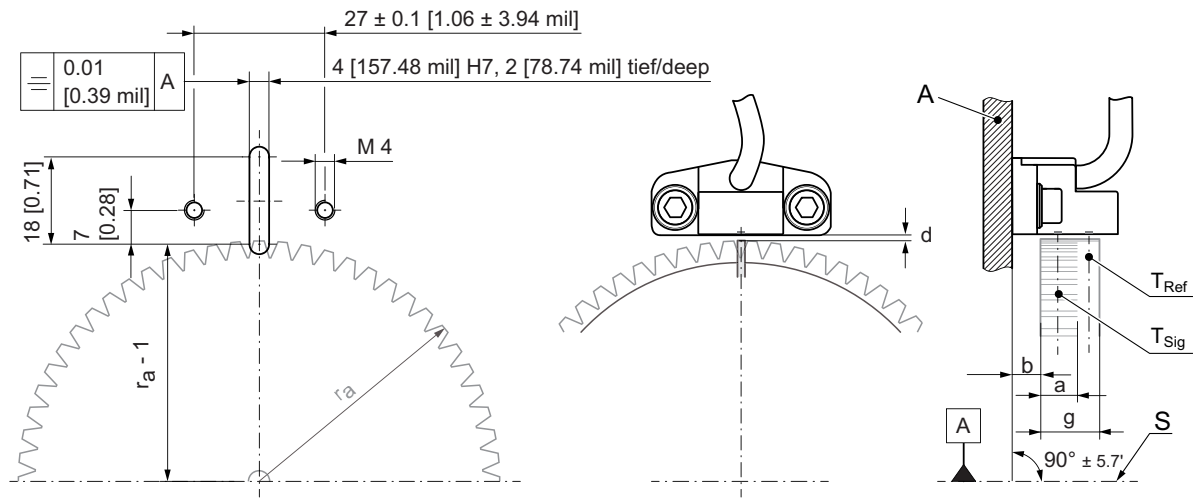
Dimensional drawing cable outlet MiniCODER (T) — Tangential, cable outlet right



General tolerance DIN ISO 2768 – mK

Hole pattern and installation dimensions, air gap table

Hole pattern and installation dimensions



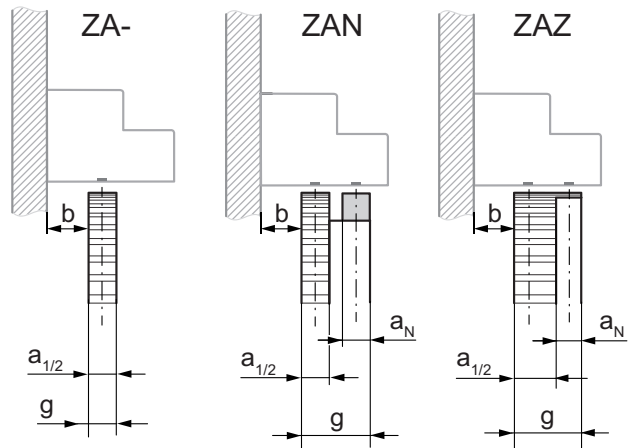
All dimensions in millimeters [inch]

- a Width of the signal track (depending on the target wheel)
- b Distance from mounting surface to target wheel: depending on the target wheel geometry (for example, width of signal track)
- d Air gap: depending on the module (see air gap table)
- g Target wheel width
- $r_a = d_a/2$ (with d_a = target wheel tip circle diameter)
- A Mounting fixture
- S Center line machine shaft/target wheel
- T_{Ref} Reference track
- T_{Sig} Signal track

Installation dimensions for standard target wheels

Di- men- sion	ZA-	ZAN	ZAZ
g	10 [0.39]	10 [0.39]	10 [0.39]
$a_{1/2}$	10 [0.39]	4 [157.48 mil]	6 [0.24]
a_N	-	4 [157.48 mil]	4 [157.48 mil]
b	7.5 ± 0.5 [0.3 ± 19.69 mil]	7.5 ± 0.5 [0.3 ± 19.69 mil]	7.5 ± 0.5 [0.3 ± 19.69 mil]

General tolerance DIN ISO 2768 – mK



Air gap table

Type	Module m	Nominal air gap d
3	0.3	0.15 mm ± 0.02 mm [5.91 mil ± 0.79 mil]
5	0.5	0.20 mm ± 0.03 mm [7.87 mil ± 1.18 mil]

To facilitate assembly, a corresponding distance gauge is included with the MiniCODER.

Type code GEL 2444

Signal pattern									
D Square-wave signals TTL / RS422, speed histogram									
K Sin/Cos signals 1 V _{pp}									
T Square-wave signals TTL / RS422									
Reference mark									
– without									
M Groove									
N Lug									
Z Tooth on tooth									
Optional extras									
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									
G Interpolation factor 32									
M Not parameterizable, with internal amplitude control									
P Parameterizable									
S Not parameterizable									
Cable outlet MiniCODER									
G Axial									
L Tangential, cable outlet left									
R Radial									
T Tangential, cable outlet right									
Module m⁽¹⁾									
3 0.3									
5 0.5									
Connection type									
J 12-pin male connector (only available as cable length 030/050/250/600)									
K Flying lead ⁽²⁾ (only available as cable length 030 / 050 / 150 / 250 / 600)									
M 17-pin panel-mounting socket, angled with male contacts									
N 17-pin panel-mounting socket with male contacts									
P Test connector (10-pin female connector), cable length can be selected accurate to the centimeter									
U 12-pin coupling with male contacts									
Z 10-pin male connector (only available as cable length 120/200/250)									
Cable length L⁽³⁾									
030 0.3 m [11.81 in]									
050 0.5 m [19.69 in]									
120 1.2 m [47.24 in]									
150 1.5 m [59.06 in]									
200 2.0 m [78.74 in]									
250 2.5 m [98.43 in]									
600 6.0 m [236.22 in]									
Cable design for temperature sensor, 2 m [78,74 in]									
– Without temperature sensor cable									
M With 2-core temperature sensor cable (only for connection type M, N)									
N With 4-core temperature sensor cable (only for connection type M, N)									
P With 6-core temperature sensor cable (only for connection type M, N)									
2444	–	–	–	–	–	–	–	–	–



If you have any questions, please contact our Customer Support team (e-mail: support@lenord.de) or one of our company locations (→ [page 24](#)).
 Technical information on MiniCODERs with other signal patterns is available online at www.lenord.com or can be requested from our support team (support@lenord.de).

⁽¹⁾ Other modules upon request

⁽²⁾ The delivery takes place with connected test connector from Lenord+Bauer.

⁽³⁾ Other cable lengths upon request; maximum cable length: 6.0 m [236.22 in]

Type code restrictions

Signal pattern, optional extras and reference mark

Signal pattern	Reference mark	Optional extras	Note
D	M/N/Z	1/2/4/8/A/B/C/D/G	Interpolation factor
K	—/M/N/Z	M	Not parameterizable, with internal amplitude control
	—/M/N/Z	S	Not parameterizable
	—/M/N/Z	P	parameterizable
T	—/M/N/Z	1/2/4/8/A/B/C/D/G	Interpolation factor

Function overview mobile service unit GEL 211CS0

GEL 2444			Functions GEL 211CS0		
Signal pattern	Reference mark	Optional extras	Signal optimization	Signal verification	Rotational speed histogram
K	M/N/Z	P	yes	yes	yes
K	—	P	yes	yes	no
K	—/M/N/Z	M/S	no	yes	no
T	—/M/N/Z	1/2/4/8/A/B/C/D/G	no	no	no
D	M/N/Z	1/2/4/8/A/B/C/D/G	no	no	yes

Error detection has a major impact on the availability of safety functions. As no error detection is integrated in the sensor, this must be implemented by the control system.



Overall system safety

The safety of the drive train and the machine can only be assessed by the machine manufacturer in accordance with the relevant directives, standards, and safety regulations.

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.

PFH_d⁽³⁾

Performance level or SIL level does not refer to the reliability of subcomponents, but rather to the availability of safety functions.

The MTTF_d values of the sensors are also included in these calculations.

Characteristics depending on temperature

Operating temperature	FIT [10 ⁻⁹ h ⁻¹] ⁽⁴⁾	MTTF [h] ⁽²⁾
85 °C [185 °F]	1611	620732
75 °C [167 °F]	805	1242236
65 °C [149 °F]	402	2487562
55 °C [131 °F]	204	5000000
45 °C [113 °F]	105	9523810

Safety Integrated

MiniCODERs with sin/cos signals (signal pattern **K**) are tested by the IFA in conjunction with Siemens Sinumerik control systems in accordance with Safety Integrated.

IFA assessment

(IFA Test Report no. 2013 23874):

"The sensor is capable of providing two independent speed readings. Thanks to error detection in Sinumerik controllers, only one sensor must be used for safety applications."

Control systems of other manufacturers

For control systems with safety functions from other manufacturers, error detection must be performed in the control system, as with Sinumerik:

- Errors in the encoder function are detected by monitoring the differential sin/cos signals in the downstream control system. To this end, the amplitudes, frequency, offset, or phase of the sin/cos signals should be checked for plausibility.
- Mechanical slip or loosening of the target wheel from the shaft during operation or when stationary should be prevented, for example by means of a form-fit connection.

Some measures for error detection by controllers when using sinusoidal sensor signals are listed in DIN EN 61800-5-2 Table 16 for variable speed electric power drive systems.

(1) Mean time to failure "dangerous"

(2) Mean time to failure

(3) Probability of dangerous failure per hour

(4) Failure in time; failure rate, meaning failures every 10⁹ hours

Explanations about the target wheel

Target wheels

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.

Standard target wheels

Standard target wheels are available at short notice ex factory. Specifications and designs see "Technical information ZAx/ZFx (DS51-ZAx/ZFx)".

Customized target wheels

Customized target wheels are manufactured individually according to customer requirements. Please send a design drawing of your target wheel to info@lenord.de.

Reference marks

The MiniCODER can detect reference marks of the groove, lug or tooth form. The detected reference signal can be used to reference the position. This is required, for example, for automatic changing of a tool on a milling or grinding spindle.

Selection of the reference mark is determined by the size and rotational speed of the target wheel used, as both affect the forces acting on the reference mark. For new designs, we recommend using a target wheel with reference mark variant "Z".

Reference mark N – lug

A metal lug integrated in the target wheel, whose position is exactly between two teeth, is detected. The lug must be made of ferromagnetic material and must not protrude beyond the tip circle of the target wheel. Due to the forces acting on the reference lug, the use of this variant is only permissible in a very limited rotational speed range.

Reference mark M – groove

The MiniCODER detects a reference groove whose position is between two teeth. For technical reasons, this target wheel is assembled from two parts.

Reference mark Z – tooth on tooth

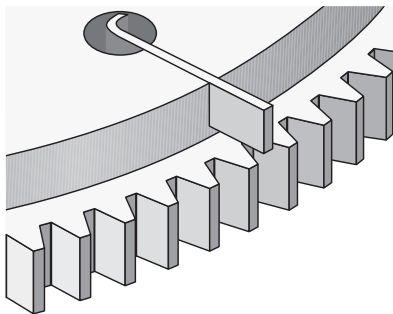
These target wheels are made from a single piece.

Module

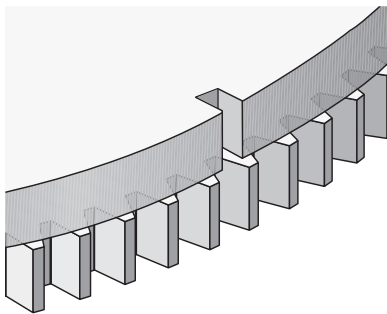
The module is a toothing dimension for target wheels and describes the relationship between the number of teeth and the pitch diameter of the target wheel. For the same number of teeth, the smaller the module, the smaller the outside diameter.



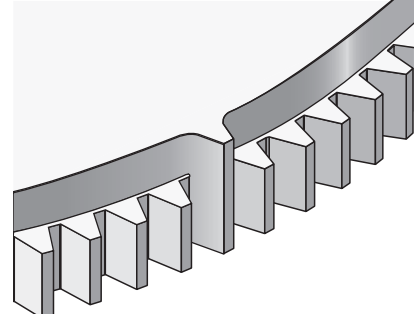
The MiniCODER must be ordered to match the design of the reference mark and to match the module of the target wheel.



N = reference mark – lug



M = reference mark – groove



Z = reference mark – tooth
Standard target wheel

Mobile service unit GEL 211CS04_2M

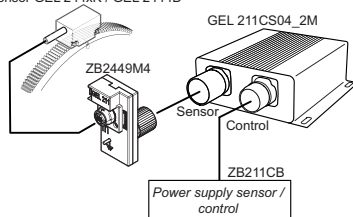


- Testing of Lenord+Bauer sensors with sin/cos output 1 V_{pp}, for example MiniCODER
- Transferring data to mobile devices (for example, tablet or PC) via WLAN or Ethernet
- Visualization of data in web browser, independent of operating system
- Use to check signals for compliance with adjustable tolerance presets
 - sin/cos signals (amplitude, offset, phase offset)
 - Reference signal (amplitude, offset, position and width)
 - Target wheel (damage, concentricity, toothing quality)
- Setting and saving different tolerance presets
- Used for parameterizing the MiniCODER
 - Automatic adjustment of sin/cos signals
 - Configuring/reading out the operating hours meter (speed histogram)
 - Storing the 7 configured speed ranges of the operating hours meter in a data record; Multiple data records can be stored in the GEL 211

Accessories ⁽¹⁾

Item no.:	Designation:
PK211C-244XK-E	Parameterization kit (Ethernet), comprising: ▪ Mobile service unit GEL 211CS04E2M ▪ Sensor connection cable GG211 ▪ Power supply unit 5 V, ZB211CB ▪ Operating instructions D-71B-211CS0 or D-53B-211CS0 ▪ Case, XW1303
PK211C-244XK-W	Parameterization kit (WLAN), comprising: ▪ Mobile service unit GEL 211CS04W2M ▪ Sensor connection cable GG211 ▪ Power supply unit 5 V, ZB211CB ▪ Operating instructions D-71B-211CS0 or D-53B-211CS0 ▪ Case, XW1303
GEL SDA10	Precision-Box for GEL 2444K or 2449K ⁽²⁾
GG211-JAE	Adapter cable mobile service unit – MiniCODER with connection type Z
GG211-12POL-M23	Adapter cable mobile service unit — MiniCODER with connection type U
GG211-17POL-M23	Adapter cable mobile service unit – Precision-Box GEL SDA10

Sensor GEL 244xK / GEL 2444D

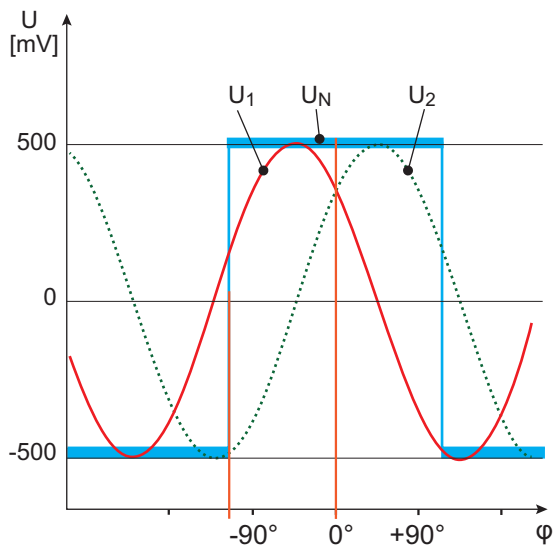


GEL 211CS04_2M: Connectivity

- (1) Sensors with signal pattern **T** cannot be analyzed with the mobile service unit.
 (2) For more information on the Precision-Box, see T1 GEL SDA10.

Information about the rectangular reference signal

A higher level control system evaluates the zero crossings of the rising and falling edges of the reference signal to determine the width and position of the reference signal.



$$\begin{aligned}U_1 &= U_{1+} - U_{1-} \\U_2 &= U_{2+} - U_{2-} \\U_N &= U_{N+} - U_{N-}\end{aligned}$$

The rectangular reference signal depends on

- the width and shape of the reference mark
- the position of the reference mark in relation to the teeth of the signal track
- the target wheel module

The following applies to the rectangular reference signal:

- The amplitude level of the reference signal is independent of the air gap and is, ideally, set at +500 mV.
- The offset level of the open-circuit voltage is fixed at -500 mV to achieve a high signal-to-noise ratio.

The reference signal complies with the standard specification for reference signals when using a 1- V_{pp} interface.



If you have any questions, please contact our Customer Support team (e-mail: support@lenord.de) or one of our company locations (→ [page 24](#)).

Your notes

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