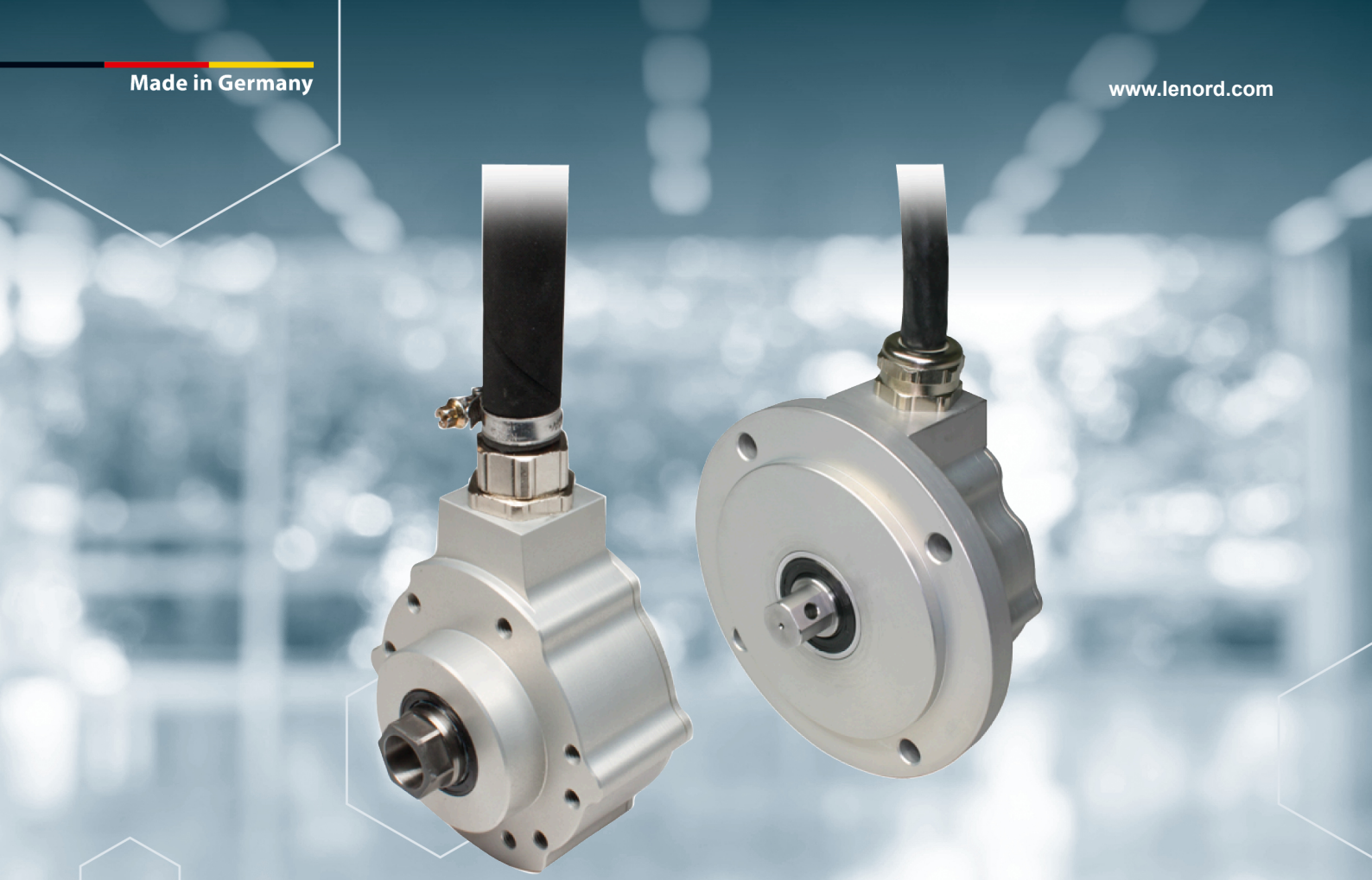
Made in Germany

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Technical Information

GEL 27XX

Multichannel rotary encoder

Rotary encoder with up to 8 channels

D-02T-27xx | Date of issue2025-07-14

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Founding trust.

Motion sensors and integrated drive technology

General

The multichannel rotary encoder was developed specially for the requirements of the rail vehicle industry. It has been designed to provide independent output signals for different control electronics such as motor speed sensing, anti-skid protection, train control and rolling distance measurement. Depending on the requirements, up to eight output channels can be configured.
The measuring scale is of robust construction to withstand extreme impacts and vibrations. The magnetic sensors are resistant to harsh environmental conditions including dirt, oil, humidity or condensation due to changes in temperature. The encoder contains bearings that ensure maintenance-free, durable operation in extremely harsh operating conditions.
Customized assembly with various cables, protective sleeves and plugs is possible for all types.



Properties

- Max. 8 channels
- Max. 3 different pulse numbers
- Voltage or current output
- Various flange shapes for every vehicle type

Advantages

- Solution individually tailored to the specific application, as numerous combinations of channels and pulse numbers are possible
- Thanks to its flexible design, the encoder is not only ideal for new projects, but is also perfectly suited for retrofitting.
- Maintenance-free, durable operation in extremely harsh ambient conditions due to selected bearings and a magnetic measuring system

Field of application

- Rail vehicle industry
  - Traction monitoring
  - Anti-slip protection
  - Anti-skid protection
  - Motor speed

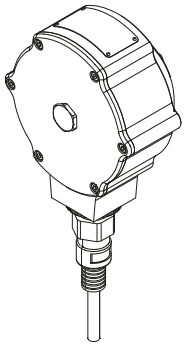
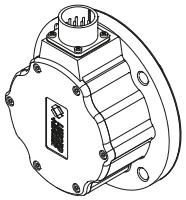
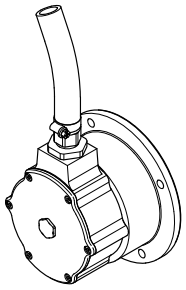
Description

Concept

GEL 27xx rotary encoders are designed for measuring the speed of rotary movements in railroad rolling stock systems. They are designed as an application-specific encoder system and can be mounted on bogies with inside or outside bearings.
All GEL 27xx rotary encoders are manufactured according to drawings or application descriptions. The technical specifications may differ from the stated technical data. The modified specifications and assignment can be found in the customized dimensional drawing.

Rotary encoder types

Types GEL 2710 and 2712 are suitable for bogies with outside bearings. They are flange-mounted on the bearing cover of the wheelset and driven by a coupling disk, for example.
Type GEL 2701 is suitable for bogies with inside bearings. A rotor flange is mounted on the wheel set, on which the rotary encoder can rotate freely. Fixing the cable sleeve in a suitable position, for example, prevents the encoder from rotating.
Various flange shapes and drives are available.

Rotary encoder type	Design sample
Rotary encoder GEL 2701	
Rotary encoder with round flange GEL 2710	
Rotary encoder with adapter flange (bell) GEL 2712	

Customized versions are marked with a Y number, which is appended to the product code (GEL 27xxYxxx).

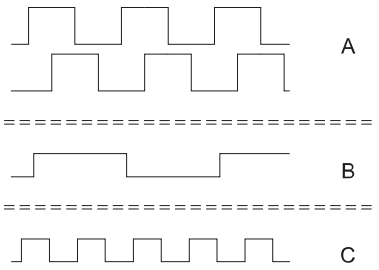
Function

Inside the rotary encoder, there is a metal measuring scale which is connected to the shaft. One or more magnetic sensors scan this measuring scale. Electrical pulses are generated in the sensors due to the rotating measuring scale. The integrated electronics convert these pulses into voltage or current square-wave signals.
The output frequency is proportional to the rotational speed of the axle. The signals are evaluated in the vehicle's electronic control.

Multichannel

The incremental encoder has 1 to 8 output channels. They can be configured as individual channels or in groups with a fixed phase correlation. A typical configuration would be to arrange two sensors electrically offset by 90° for additional detection of direction.
Other arrangements are possible, such as three sensors offset by 120° or a single channel and two sensors offset by 90° as a group.
The channels can all be operated using a shared power supply or, if desired, they can be electrically isolated with different supply voltages from 10 to 30 V DC.
The rotary encoder can supply up to 3 different pulse numbers. These pulse numbers can be freely assigned to the output channels or groups of output channels.

Combination of channels and pulse numbers – Example



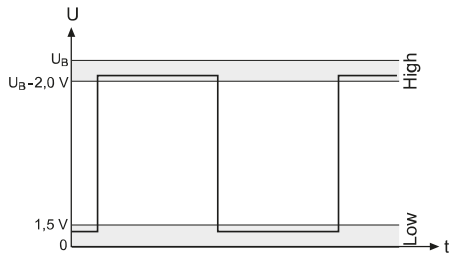
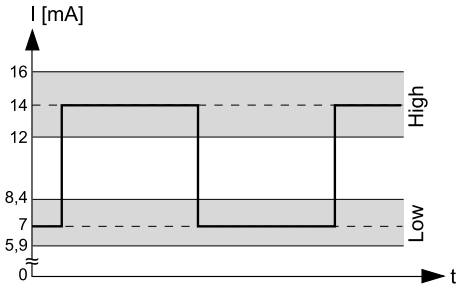
A	2 channels with 90° phase offset 110 pulses per revolution 24 V DC supply voltage	Motor speed
B	1 channel 55 pulses per revolution 15 V DC supply voltage	Anti-skid protection
C	1 channel 200 pulses per revolution 15 V DC supply voltage	Train control

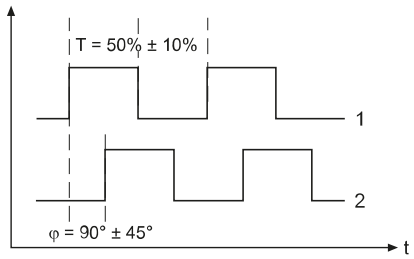
Technical data

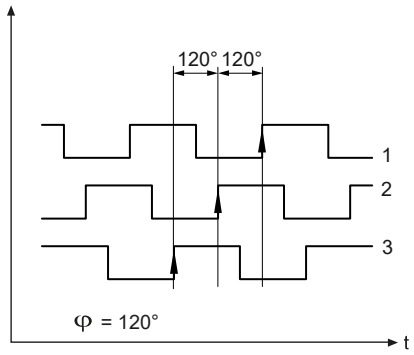
General	
Number of channels:	1 to 8
Phase offset(1)	Standard: 90° electrical others possible (e.g. 120°)
Duty cycle	50 % ± 10 %
Resolution (number of pulses)	200, 110, 100, 80, 55, 12
Electrical data	
Supply voltage U_B(reverse polarity protected)	10 to 30 V DC
Current consumption $I_B$per channel (without load)	≤ 30 mA
Output signal (short-circuit-proof)	Square-wave signals
Output signal level high(2)	≥ U_B- 1.8 V
Output signal level low(2)	≤ 1.5 V
Output current per channel	≤ 20 mA
Frequency range	0 to 25 kHz
Duty cycle	50 % ± 20 %
Phase offset	–
Mechanical data	
Max. permissible rotational speed	5000 r.p.m.
Shaft material	Stainless steel
Housing material	Coated aluminum
Cable cross section	4 × 0.5 mm²
Weight (without cable, without drive) GEL 2701 GEL 2710 GEL 2712	 1400 g 2000 g 2000 g
Environmental tests	
Working and operating temperature	-40 °C to +100 °C
Storage temperature	-40 °C to +105 °C
Degree of protection	IP 67
Dielectric strength	1.5 kV, 50 Hz, 1 min. (EN 50155:2022-06)
Electromagnetic compatibility	Rail vehicles (EN 50121-3-2:2017-11)
Vibration resistance	DIN EN 61373:2011-04 cat. 3
Shock resistance	DIN EN 61373-2011-04 cat. 3
Type test	EN 50155:2022-06 IEC 60571:2012
Atmospheric humidity	100 %
Condensation	permissible
Electrical connection	
Cable, connector, protective sleeve	depending on device type, specification upon request

(1) between two or more channels
(2) depending on output current and temperature

Output signals

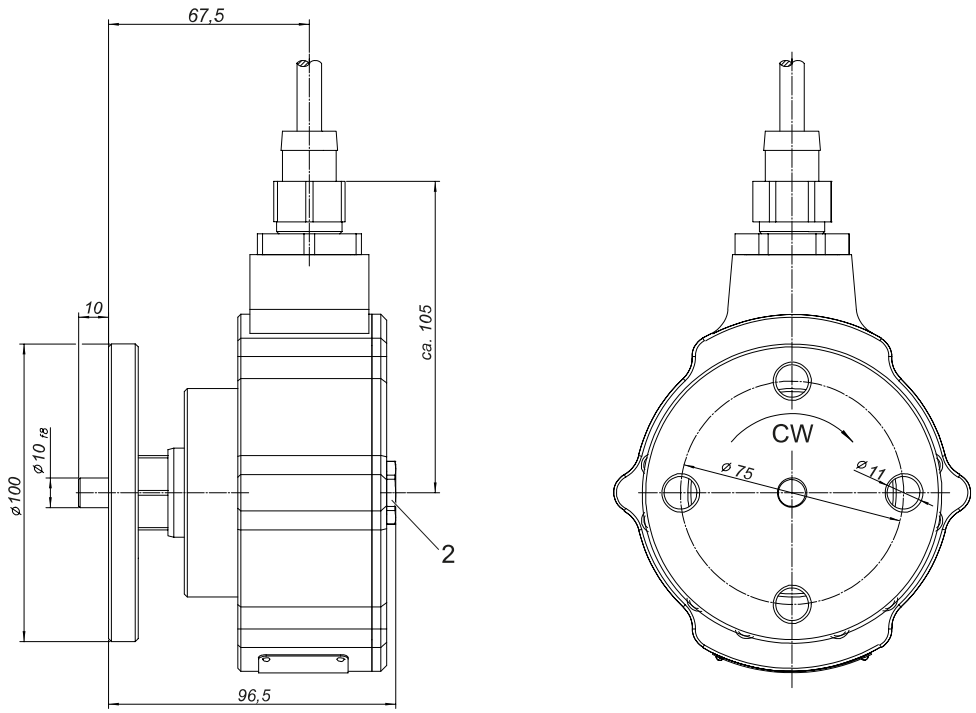
Voltage output	Current output
	

Signal quality	
	T Duty cycle ϕ Phase 1 Channel 1 2 Channel 2

Special signal patterns for safety applications	
	Special signal patterns for safety applications are available upon request: ▪ 3 channels with 120° phase offset

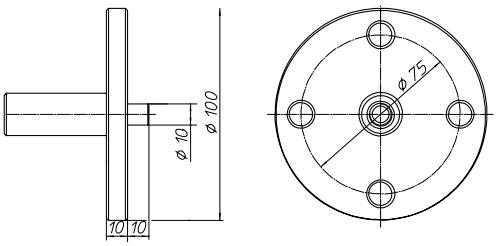
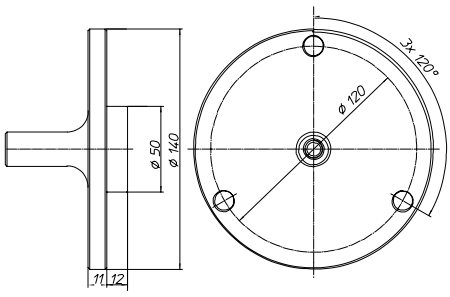
Dimensional drawing

Dimensional drawing GEL 2701 rotary encoder with mounted rotor flange (drive example 1)



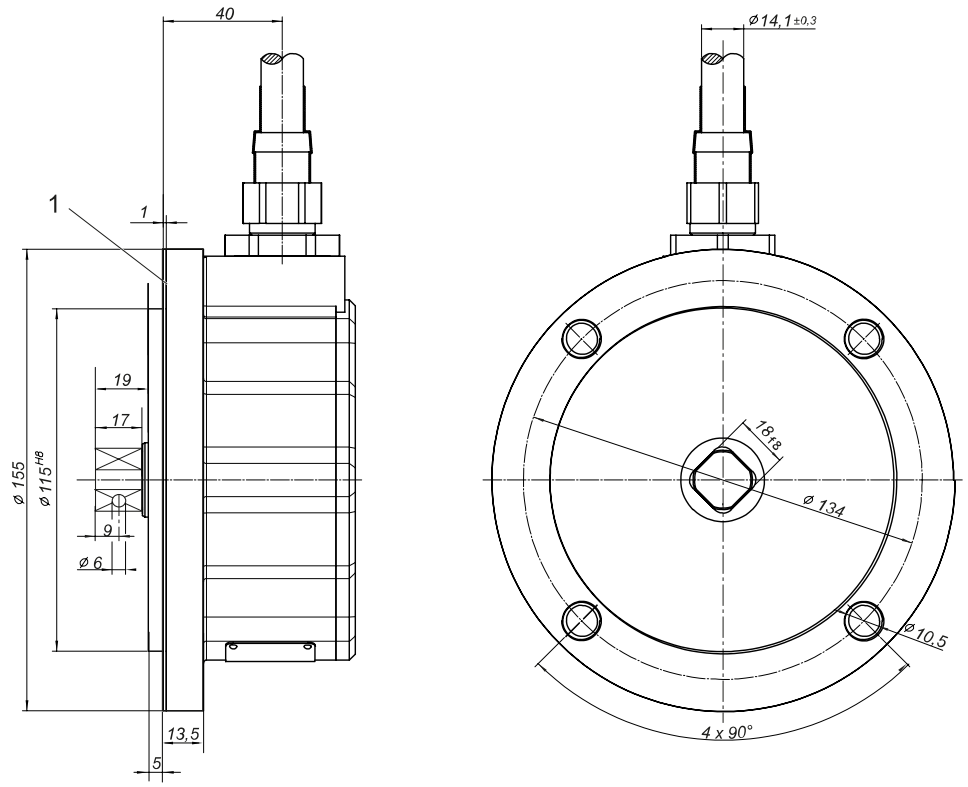
All dimensions in mm
2 Blanking plug, SW 24
CW Direction of rotation of rotor shaft

Torque support is required.

GEL 2701 – drive example 1	GEL 2701 – drive example 2
	

Rotor flanges can be supplied in various dimensions for different applications.

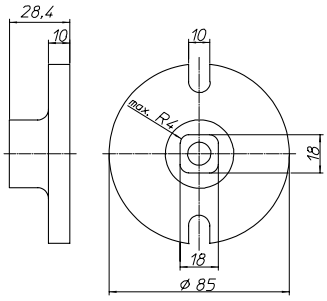
Dimensional drawing rotary encoder with round flange GEL 2710



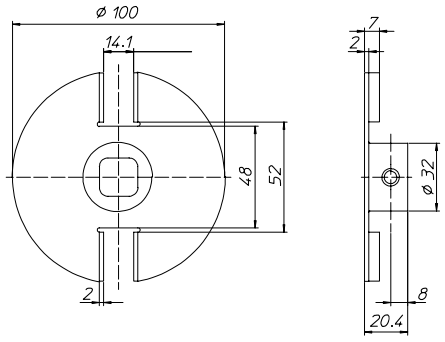
All dimensions in mm

1 Seal, thickness 1 mm

GEL 2710 – drive example 1

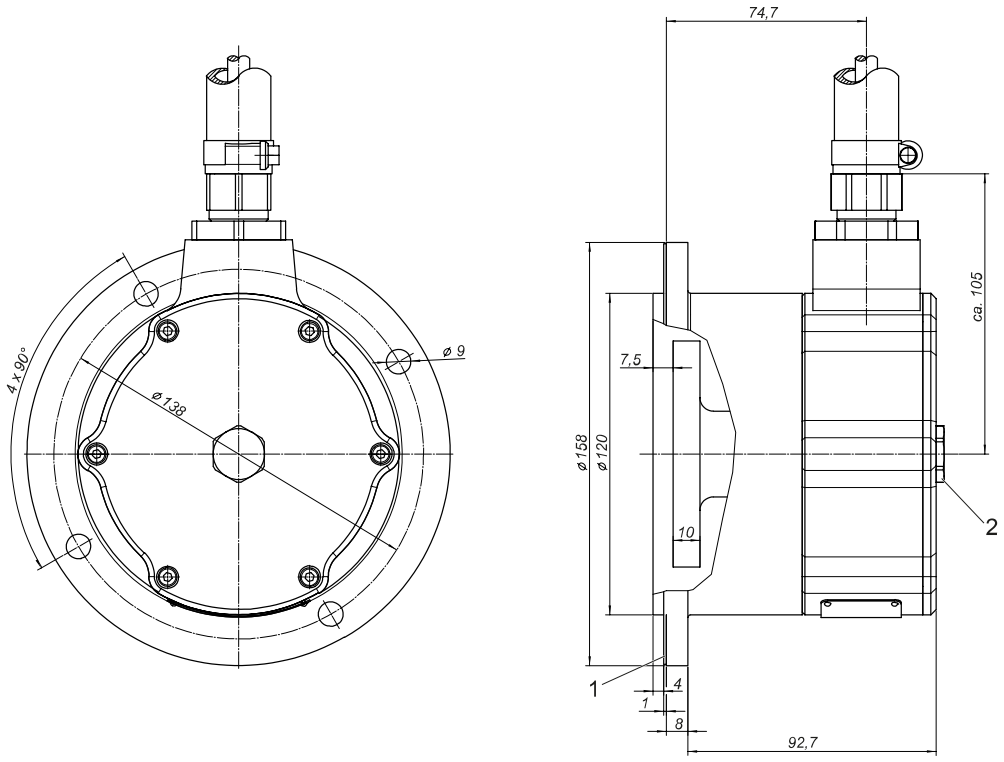


GEL 2710 – drive example 2



Drives can be supplied in various dimensions and designs for different applications.

Dimensional drawing of rotary encoder with adapter flange (bell) GEL 2712

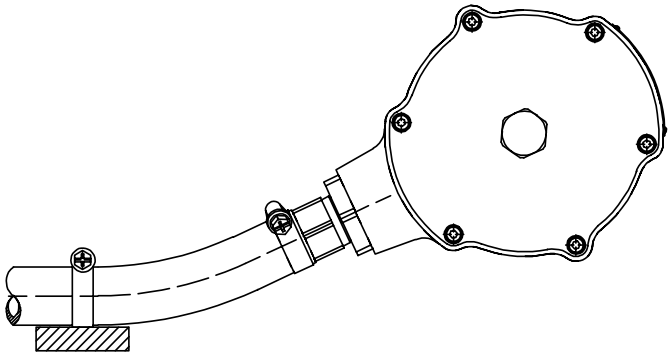


All dimensions in mm

1 Seal, thickness 1 mm

2 Blanking plug, SW 24

Torque support by fixing to the cable sleeve



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