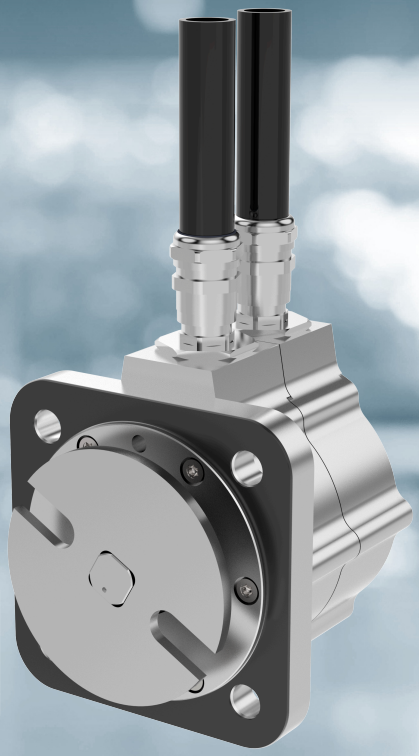
Made in Germany

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Technical Information

GEL 2740

Customized Axle Encoder

with Cold Movement Detection

D-02T-2740 | Date of issue 2025-07-14

LENORD +BAUER

Finding solutions. Founding trust.

Motion sensors and integrated drive technology

General

- Customized encoder system for assembly on axle tips
- Combination of cold movement detection and incremental encoder
- Magnetic cold movement detection (CMD)
- Screened magnetic-incremental rotary encoder system
- For assembly on bogies with outside bearings



Properties

- Resolution of rotary encoder: 80 pulses per revolution (others upon request)
- Degree of protection (overall system): IP66, IP67
- Housing material: Aluminum, coated

Advantages

- Cold movement detection monitors wheel axle movements in de-energized state
- Energy self-sufficient, no battery required
- Maintenance-free, durable operation in extremely harsh ambient conditions due to the magnetic measuring system

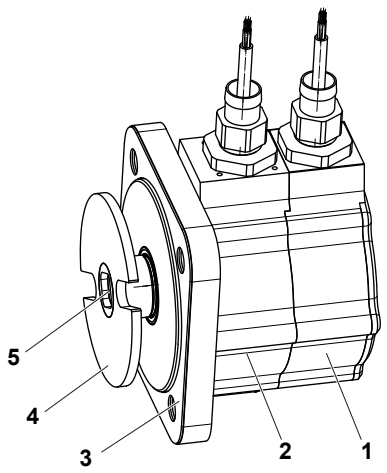
Field of application

- Rail vehicle industry

Description

Product construction

The axle encoders in the GEL 2740 series are application-specific encoder systems and are intended for use in rail vehicles.
The encoder for cold movement detection [1] forms the basic system module. This can be extended by an independently operating incremental encoder [2]. The system is mounted on the bearing cover of the wheel set via the flange [3]. The drive [4] is provided by a coupling disk, for example, which is connected to the wheel axle.
Connection to an electronic control unit is needed for power supply and signal evaluation.

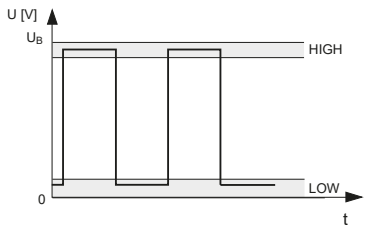


1	Basic module: Encoder for cold movement detection (V0)
2	Extension: Incremental encoder (V1, V2, V3)
3	Flange
4	Drive (here coupling disk)

The customized versions are marked with a Y number, which is appended to the product code (GEL 2740Yxxx)

Incremental encoder

A ferromagnetic measuring scale that is connected to the axle via the drive is located inside the magnetic-incremental rotary encoder. One or more magnetic sensors scan the rotating measuring scale. This generates electrical pulses in the sensors. The integrated electronics convert these into voltage square-wave signals.

Signal level:	
	HIGH ≥ U_B- 2.0 V LOW < 2.0 V

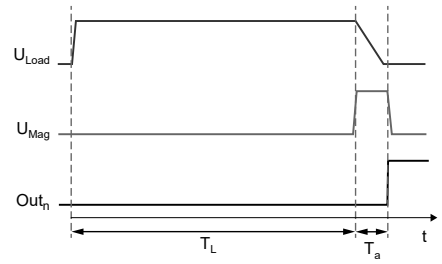
The output frequency is proportional to the rotational speed of the axle.

Encoders for cold movement detection

The encoder detects the wheel axle movement in de-energized state. It operates in energy self-sufficient mode. The sensor system consists of four detectors (D1-D4) arranged in a circle and a switching element that rotates with the wheel axle. When the switching element passes, it triggers a status change in the respective detector. The current status of the detectors can be read out via the outputs (Out1-4) as soon as the encoder is powered up again.

To ensure fault-free operation, the internal energy storage unit must be sufficiently charged via the input U_{Load}.
The detectors must also be activated by a signal from the control unit at input U_{Mag}.
Charging and activation should take place consecutively.

Time sequence of charging and activation



T_L Minimum charging time (depending on the charging voltage)
T_a Activation time (time until the detectors switch over) ≥ 6 ms

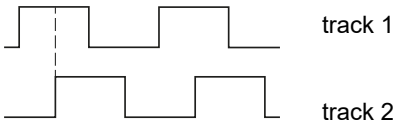
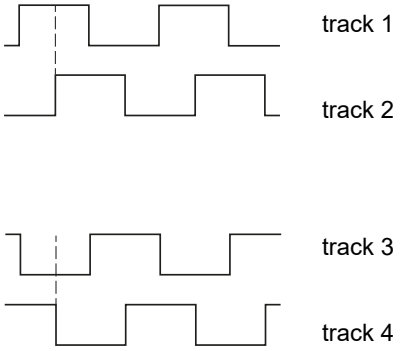
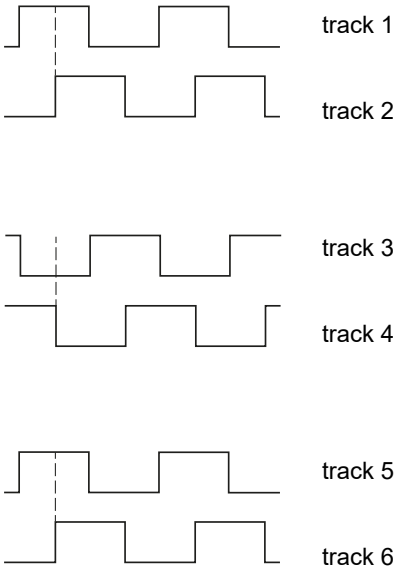
To charge the energy storage unit, for the time T_L the supply voltage U_B at input U_{Load}. To activate the detectors, U_B must be present for the duration T_a at input U_{Mag}. The Outn outputs are then set from low to high. This corresponds to the “not moved” condition. If the switching element rotates past a detector, it changes to “moved” condition.

The “not moved” condition lasts for at least 180 days if it is not reset by moving the wheel axle. The prerequisite for this is that no magnetic interference fields > 20 kA/m are applied to the encoder housing.

Minimum charging time depending on the charging voltage											
Charging voltage U_{Load}[V]	10	12	14	16	18	20	22	24	26	28	30
Minimum charging time T_L[ms]	500	270	180	130	110	95	80	70	63	57	52

Encoder types

Outputs

Encoder type	CMD	Incremental encoder	Pulse diagram for direction of rotation “forward” Other signal pattern upon request
2740V0	Out1; Out2; Out3 Out4	-	
2740V1	Out1; Out2; Out3 Out4	2 channels 90° Phase offset	
2740V2	Out1; Out2; Out3 Out4	2 x 2 channels 90° phase offset	
2740V3	Out1; Out2; Out3 Out4	3 x 2 channels 90° phase offset	

Cable assignment CMD (2740V0)

Function	Core number
U_B	1
GND	2
U_{Load}	3
U_{Mag}	4
Out1	5
Out2	6
Out3	7
Out4	8

Cable assignment incremental encoder

Function	Core color		
	2740V1/2 channels	2740V2/4 channels	2740V3/6 channels
System 1			
U_B	red	red	red
GND	blue	blue	blue
track 1	yellow	yellow	yellow
track 2	white	white	white
System 2			
U_B	-	pink	pink
GND	-	gray	gray
track 3	-	green	green
track 4	-	brown	brown
System 3			
U_B	-	-	red-blue
GND	-	-	pink-blue
track 5	-	-	black
track 6	-	-	violet

Technical data

Customized sensor

	2740V0	2740V1	2740V2	2740V3
General data				
Measuring systems	CMD	CMD + incremental encoder up to 3 × 2 channels possible		
Incremental encoder	-	2 channels	2 x 2 channels	3 x 2 channels
Output	-	Voltage		
Phase offset	-	90°		
Resolution (number of pulses)	-	80 pulses per revolution(1)		
Mechanical data				
Degree of protection	IP66, IP67			
Max. permissible rotational speed	5000 r.p.m.-1			
Shaft material	Stainless steel			
Housing material	Aluminum, coated			
Weight (without cable, without drive)	2000 g	3667 g		
Environmental tests				
Working and operating temperature	-40 °C to +100 °C			
Storage temperature	-40 °C to +105 °C			
Vibration resistance	DIN EN 61373:2011-04 cat. 3			
Shock resistance	DIN EN 61373:2011-04 cat. 3			
Electromagnetic compatibility	DIN EN 50121-3-2:2017-11			
Dielectric strength	500 V AC/750 V DC (DIN EN 50155:2022-06)			
Type test	DIN EN 50155:2022-06			
Max. relative air humidity	98 %, condensation possible			
Fire protection(2)	Hazard level HL2 (R22)/HL3 (R23), as per DIN EN 45545-2:2020-10			
Max. installation altitude above sea level	≤ 2000 m, as per DIN EN 61010-1:2020-03			

(1) other number of pulses upon request
(2) depending on the application-specific connector configuration

Technical data – Incremental encoder

Electrical data	
Supply voltage U_B(reverse polarity protected)	10 to 30 V DC
Screen connection	capacitive
Current consumption $I_B$per channel (without load)	≤ 30 mA
Output signal (short-circuit-proof, push-pull power amplifier)	Square-wave signals
Frequency range	0 to 20 kHz
Output signal level high	≥ U_B- 2.0 V
Output signal level low	≤ 2.0 V
Frequency range	0 to 25 kHz
Duty cycle	50 % ± 20 %
Mechanical data	
Cable data	halogen-free, screened(1)
Cable diameter	8.0 ± 0.3 mm
Cable cross section	12 × 0.34 mm²
Minimum bending radius static	120 mm
Cable protection	
Type	Metal protective sleeve
Material	Steel galvanized; sheath: thermoplastic polyurethane
Outside diameter	21.1 mm
Minimum bending radius static	120 mm

(1) Specification upon request

Technical Data – Cold Movement Detection

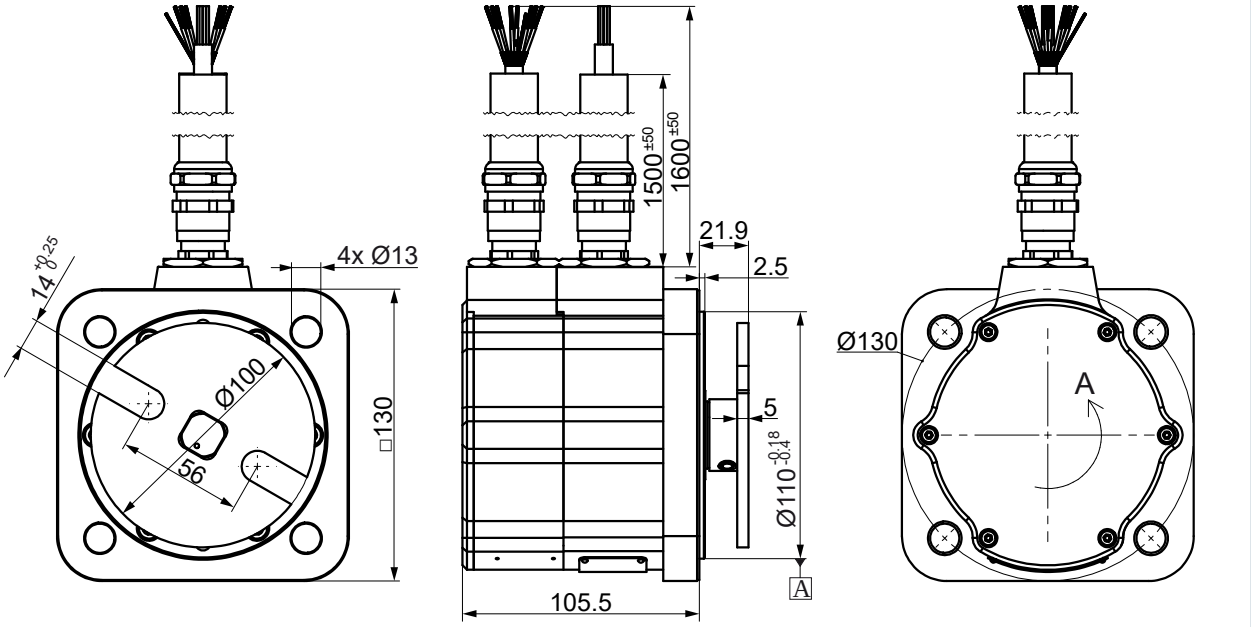
General data	
Outputs	Out1; Out2; Out3; Out4
Inputs	U_{B_Mag}; U_{B_Load}
Electrical data	
Supply voltage U_B(reverse polarity protected)	10 to 30 V DC
Screen connection	capacitive
Max. current (in U_{Load})	≤ 180 mA
Current consumption (without load)	in reading mode < 35 mA
Minimum charging time T_L	70 ms (at one charging voltage of 24 V)
Activation time T_a	≥ 6 ms
Output signal level high	≥ U_B- 2.0 V
Output signal level low	≤ 2.0 V
Mechanical data	
Cable data	halogen-free, screened(1)
Cable diameter	10.5 ± 0.4 mm
Cable cross section	8 × 0.5 mm²
Minimum bending radius static	120 mm
Cable protection	
Type	Metal protective sleeve
Material	Steel galvanized; sheath: thermoplastic polyurethane
Outside diameter	21.1 mm
Minimum bending radius static	120 mm

(1) Specification upon request

Dimensional drawing, accessories

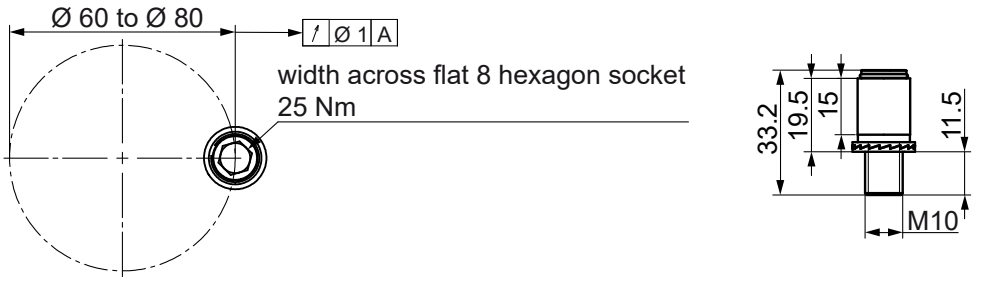
GEL 2740

All dimensions in mm, general tolerance DIN ISO 2768 – mK



A = direction of rotation “forward”

Accessories

Item no.	Designation	Information about assembling
BG3391	Driver	

Europe

Germany

Lenord, Bauer & Co. GmbH
Dohlenstrasse 32
46145 Oberhausen
Tel. +49(0) 208 9963 0
E-Mail info@lenord.de
www.lenord.de

Italy

Lenord+Bauer Italia S.r.l.
Via Gustavo Fara, 26
20124 Milano
Tel. +39 340 1047184
E-Mail salesitaly@lenord.com
www.lenord.com

North America

USA

Lenord+Bauer USA Inc.
32000 Northwestern Highway, Suite 150
Farmington Hills, MI 48334
Tel. +1 248 4467003
orders@lenord.com
E-Mail Info-us@lenord.com
www.lenord.com

Asia

China

Lenord+Bauer Automation Technology (Shanghai) Co.
Block 42, Room 302, No.1000,
Jinhai Road, 201206 Shanghai
Tel. +86 21 50398270
E-Mail Info@lenord.cn
www.lenord.cn

India

Lenord+Bauer India Private Limited
registered office at 417 Golden Square
Prime Serviced Office, Davanam Sarovar
Portico Suites, Hosur Main Road,
Bengaluru, Karnataka 560068
Tel. +919901516814
E-Mail info@lenord.co.in
www.lenord.co.in

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