Made in Germany

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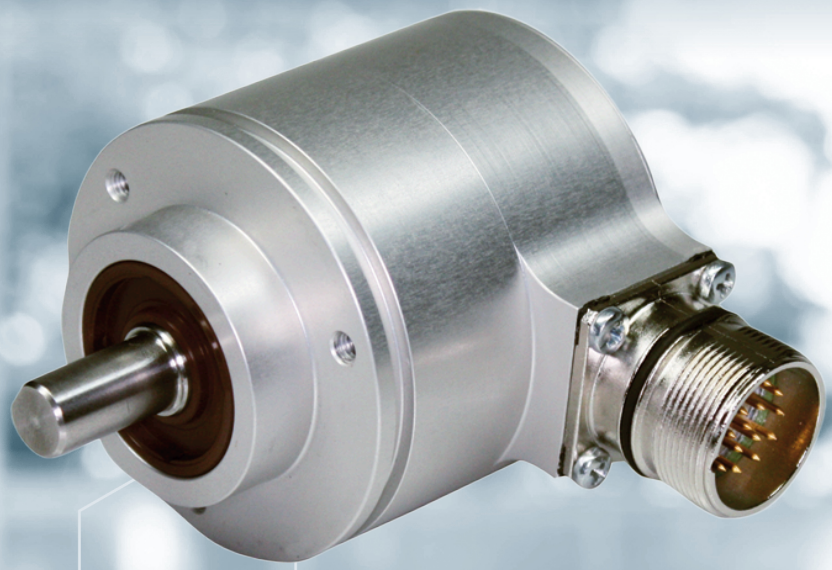

Technical Information

GEL 2037

Magnetic absolute rotary encoder

With heavy-duty flange or target wheel adapter

DS02-2037 | Date of issue 2025-09-15

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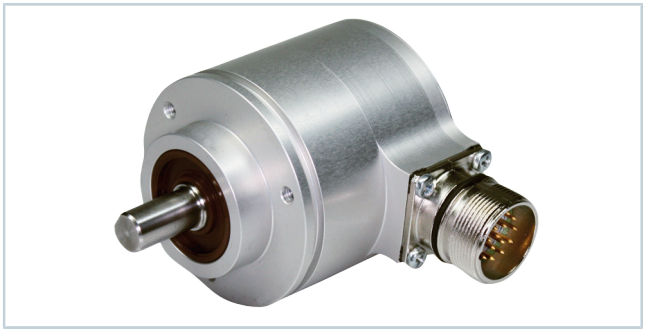
Founding trust.

Motion sensors and integrated drive technology

General

- Multiturn-absolute rotary encoder with resolution of up to 25 bits, compact design
- Magneto-resistive scanning of a diametrical magnet provides clear position values for each angular position via the SSI interface.
- Magnetic scanning is not subject to aging and is insensitive to temperature fluctuations, dirt, or condensation.
- Redundant position signal available through integrated resolver



Properties

- Overall resolution 25 bit
- Absolute accuracy 0.8°
- Output signal SSI or SSI and resolver
- Magnetic gear

Advantages

- Suitable for all standard applications and also for real heavy-duty applications
- Withstands high shock/vibration loads
- Resistant to dirt and oil
- Long-term stable temperature behavior
- Full function with condensation: dew point resistant
- No ageing of the magnetic sensor technology

Field of application

- Construction machinery
- Agricultural machinery
- Food industry
- Wind energy
- Offshore engineering

Description

Design

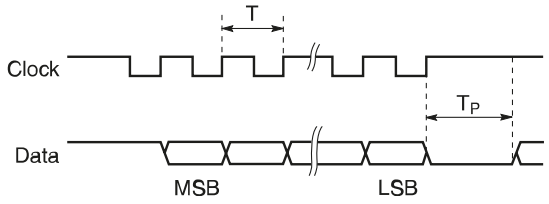
The encoder housing made of anodized aluminum has a flange dimension of 58 mm. The GEL 2037 absolute encoder is suitable for standard and heavy-duty use, is also resistant to aggressive media, and offers a long, maintenance-free service life. The GEL 2037 is available with either a heavy-duty flange or a clamping flange with target wheel adapter. Combining it with a resolver creates a very compact redundant system. The complete galvanic isolation of the resolver from the magnetic absolute rotary encoder ensures true redundancy of the absolute position values.

Sensing principle

The GEL 2037 is based on contactless magnetic scanning of a diametral magnet. Magnetoresistive sensors directly detect the absolute position within one revolution, and a magnetic gear provides the number of revolutions. The GEL 2037 series multiturn absolute rotary encoders provide a unique position value for each angular position with a resolution of up to 25 bits. The singleturn stage works with a resolution of up to 13 bits. The multiturn stage is based on a magnetic gear that stores the number of revolutions in a zero-voltage-proof way. The magnetic absolute rotary encoder provides the position values in binary or Gray code via a fast synchronous serial interface (SSI). The SSI interface transmits the position data at a clock frequency of up to 1 MHz. A minimum clock pulse space of 25 µs must be observed before a new position scan can take place.

Principle of serial data transmission

Gray code (25 bit), RS 422/RS 485 Standard



f	≥ 40 kHz
T	Period duration of the clock signal (= 1/clock frequency)
T_P	Clock pulse space, between the clock sequences, T_P at least 25 µs

Temperature ranges

High-quality, high-precision SMD components are installed in the absolute rotary encoder. Despite careful selection, thermal aging of these components cannot be excluded. The encoder should therefore be operated at a temperature of -40 °C to 85 °C. Operating temperatures from -40 °C to 85 °C are permissible. However a built-in absolute rotary encoder must not exceed this temperature range. The function of the absolute rotary encoder is guaranteed within the permissible operating temperature range (DIN 32878), with the temperature at the encoder housing being decisive. The temperature of the absolute rotary encoder is influenced by the installation situation (heat conductivity, heat radiation), the self-warming of the absolute rotary encoder (bearing friction, electrical power loss), and the ambient temperature. Depending on the operation of the absolute rotary encoder, the operating temperature is higher than the ambient temperature. Depending on the supply voltage, self-warming can be up to 10 °C. At high speeds (> 5000 r.p.m.), self-warming of up to 20 °C can occur as a result of bearing friction. If the absolute rotary encoder is operated within the limits of the permissible specifications, the ambient temperature must be reduced by appropriate measures (cooling) to ensure that the permissible operating temperature range is not exceeded.

Technical data

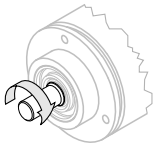
Signal pattern	SD	SR	TD
General			
Repeat accuracy	< 0.01°		
Absolute accuracy (DIN 32876)	0.8°		
Electrical data			
Operating voltage	10 to 30 V (with polarity reversal protection)		5 V ± 5 % (without polarity reversal protection)
Power consumption	400 mW		
Resolution single turn (ST)	8192 steps per revolution (13 bit)		
Multiturn (MT) resolution	4096 steps per revolution (12-bit gear)		
Interfaces	SSI (max. transmission rate 1 MHz)		
Mechanical data			
Moment of inertia of rotor	611.8 x 10^{-6} kgm^2		
Materials	Aluminum, anodized		
Weight	450 g		
Operating speed (limit)	6,000 r.p.m.		
Shaft load (radial/axial)	265 N/100 N at 1000 r.p.m.		
Bearing life	10^5 h at 1000 r.p.m.		
Environmental tests			
Operating temperature range	-40 °C to +85 °C		
Working temperature range	-40 °C to +85 °C		
Storage temperature range	-40 °C to +85 °C		
Degree of protection	IP 67		
Vibration resistance (DIN IEC 600068, Part 2-6)	200 m/s^2, (10 to 2000 Hz		
Shock resistance (DIN IEC 60068, Part 2-27)	2000 m/s^2, 11 ms		
Electromagnetic compatibility	EN 61000-6-1 to 4		
Dielectric strength	Ri > 1 MΩ, at a test voltage of 500 V AC		
Atmospheric humidity	99 %		
Condensation	permissible		

Interfaces

Synchronous serial interface

Direction of rotation (counting direction)
The rotary encoder can output ascending position values when the shaft is rotated clockwise or counterclockwise. The direction of rotation (counting direction) can be changed.

The position values when the shaft is rotated clockwise are:
↑ rising (standard)
↓ falling (reversal)



Cable length

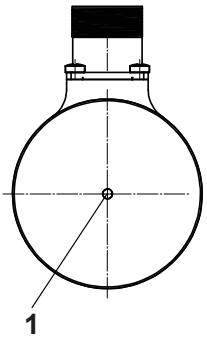
With the SSI protocol, the permissible transmission rate decreases as the cable length increases.
For the signal cables (± CLOCK and ± DATA) a twisted pair and screened cable is recommended.

Cable length [m]	< 50	< 100	< 200	< 400
Clock frequency [kHz]	< 400	< 300	< 200	< 100

PRESET function

The output signals can be set to a PRESET value from each position value. Upon delivery, the encoder is set to half of its maximum resolution. The PRESET is set electronically when the supply voltage U_B is applied to the PRESET input for a short time t > 100 ms (DO NOT apply permanently). Alternatively, a PRESET push button is available, which is located in a recess in the base of the housing (IP 67). The PRESET push button can be pressed using a stylus (t > 100 ms). Other PRESET values are available on request. After activating the PRESET function, the value is immediately available internally, but is only transmitted via SSI after 3 seconds.
The PRESET function and the direction of rotation (SSI) switch at the input pin at a threshold of 2 V.

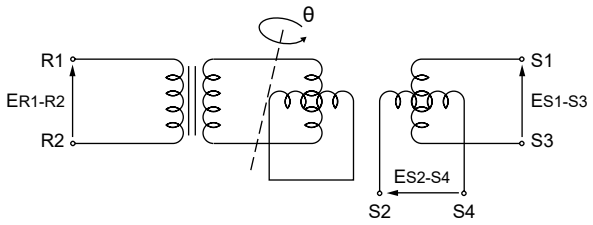
Preset push button



1 Preset push button (IP67)

Resolver

A resolver is integrated in the rotary encoder with SR interface. This provides a redundant position signal within one revolution.

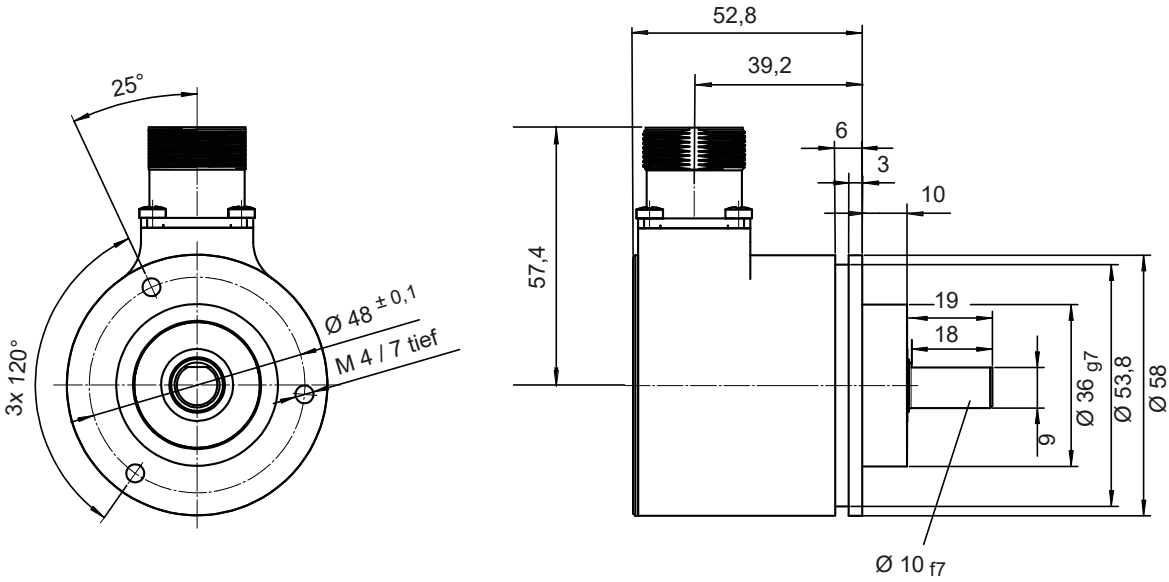


R1, R2 Primary (rotor)
S1 to S4 Secondary (stator)

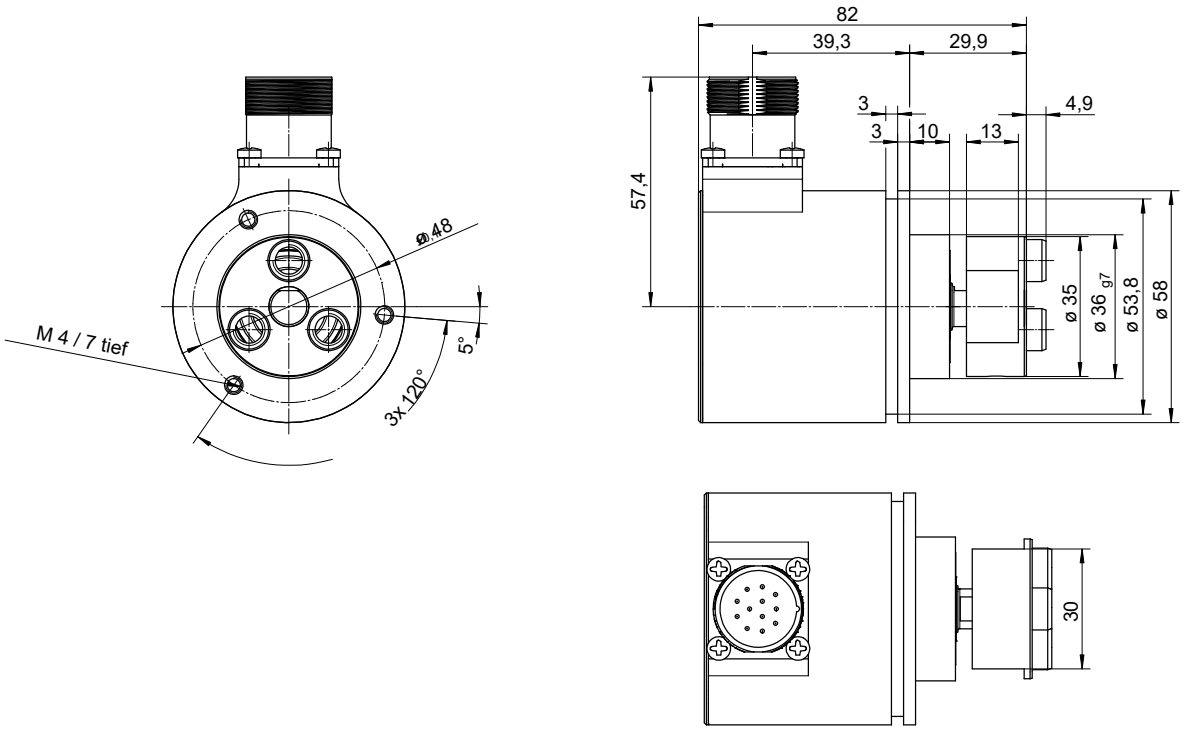
Technical data resolver	
Input voltage	7 V rms
Primary side	E_{R1-R2}= Esin ωt
Secondary side	E_{S1-S3}= KE_{R1-R2}Cos Θ, K = transmission ratio E_{S2-S4}= KE_{R1-R2}Sin Θ
Input frequency	10 kHz (max. permissible deviation ± 5 %)
Transmission ratio	0.5 ± 5 %
Accuracy (measuring error)	± 10'
Zero voltage	max. 20 mV rms
Phase offset	Nom. 0°
Speed ripple	max. 1.5 % at 1500 r.p.m.
Insulation resistance	100 M Ω at 500 V DC
Input current	max. 80 mA

Dimensional drawing

Dimensional drawing GEL 2037 – Heavy-duty flange

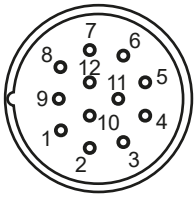


Dimensional drawing GEL 2037 – Clamping flange with target wheel adapter

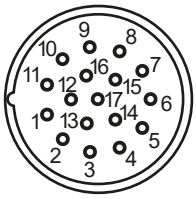
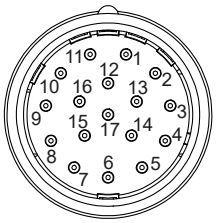


Assignment

Assignment SSI interface (SD, TD)

Connection	PIN	Signal	Description
Connector M23, 12-pin 	1	GND	Weight
	2	Data+	Differential data signal according to RS 485
	3	Clock+	Differential clock signal according to RS 485
	4	Sense-	5 V voltage monitoring (only for TD)
	6	Sense+	5 V voltage monitoring (only for TD)
	7	CW/CCW	Direction of rotation
	8	U_B	Operating voltage: SD: 10 to 30 V (with polarity reversal protection) TD: 5 V ± 5 % (without polarity reversal protection)
	9	PRESET	Electronic adjustment U_B, t > 100 ms
	10	Data-	Differential data signal according to RS 485
	11	Clock-	Differential clock signal according to RS 485

Pin assignment SSI interface with resolver (SR)

Connection	PIN (TE)	PIN (HUM-MEL)	Signal	Description
Connector M23, 17-pin Variant TE (Serial number: <2504XXXXXX) 	1	11	R1	Resolver signal
	2	10	R2	Resolver signal
	3	9	S4	Resolver signal
	4	8	S3	Resolver signal
	5	7	CW/CCW	Direction of rotation
	8	4	Clock-	Differential clock signal according to RS 485
	9	3	Data-	Differential data signal according to RS 485
	10	2	GND	Weight
Connector M23, 17-pin Variant HUMMEL (Serial number: ≥2504XXXXXX) 	11	1	U_B	Operating voltage: 10 to 30 V (with polarity reversal protection)
	12	12	PRESET	Electronic adjustment: U_B, t > 100 ms
	13	16	S2	Resolver signal
	14	15	S1	Resolver signal
	15	14	Clock+	Differential clock signal according to RS 485
	16	13	Data+	Differential data signal according to RS 485

Variant connector:
Variant TE for serial number: <2504XXXXXX
Variant HUMMEL for serial number: ≥2504XXXXXX

Direction of rotation CW/CCW
Standard GND to CW/CCW or unassigned
Reverse U_B to CW/CCW

Type code GEL 2037

2037	Product type								
	Interface **SD** SSI **SR** SSI and Resolver **TD** SSI 5 V								
		Code **B** Binary code **G** Gray code							
			Resolution per revolution **13** 13 bit, 8192 steps per revolution **12** 12 bit, 4096 steps per revolution						
				Number of revolutions **12** 12 bit, 4096 revolutions					
					Flange/Shaft **G** Heavy-duty clamping flange D = 10 mm/L = 20 mm **H** Clamping flange D = 10 mm/L = 20 mm with target wheel adapter				
						Electrical interface **E** 12-pin connector outlet, type M 23, radial **F** 17-pin connector outlet, type M 23, radial (only for SSI+resolver)			
							Connector/Cable **S** Connector		
								IP degree of protection **1** IP 65 **4** IP 67	
									Option **0** No option
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
2037	__	_	__	__	_	_	_	_	_	◀**Product code**

Customized designs

Customized adaptations of mechanical and electrical properties are generally possible.

Accessories

Description	Item number
Metal coupling MK 8, inside diameter: 5 to 12 mm (specify shaft diameter)	MK8
Metal coupling MK 12, inside diameter: 6 to 15 mm (specify shaft diameter)	MK12
Mating connector, M23, 12-pin straight	GG126
Mating connector, M23, 17-pin straight	FS11311

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