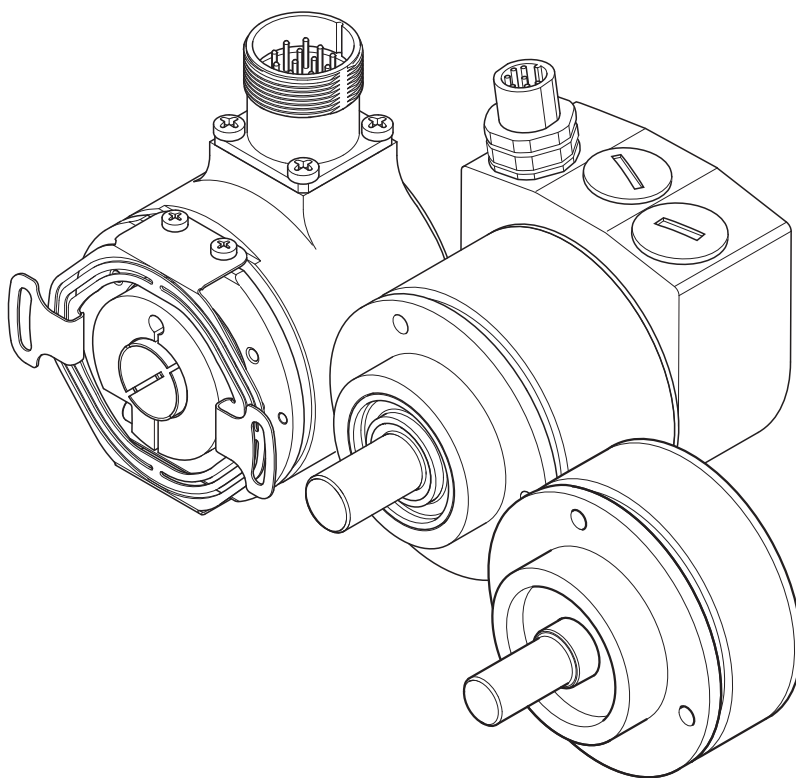


Absolute encoders
▶ **GEL 2x Analog+SSI**
with analogue or SSI output

Reference



Device manufacturer and publisher:

Lenord, Bauer & Co. GmbH
Dohlenstraße 32
46145 Oberhausen • Deutschland
Phone: +49 208 9963-0 • Fax: +49 208 676292
Internet: www.lenord.de • E-Mail: info@lenord.de

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1 General

This description is valid for the following absolute encoders with an analogue output (Ax) or a SSI output (Sx, Tx):

- GEL 235 AN..., GEL 235 SB..., GEL 235 SG..., GEL 235 TB..., GEL 235 TG...
- GEL 2351 A..., GEL 2351 C...
- GEL 2352 SB..., GEL 2352 SG...,
- GEL 2035 SD..., GEL 2035 SR...
- GEL 2037 SD..., GEL 2037 SR..., GEL 2037 TD...

It is intended for technicians who are already familiar with the functionality of the absolute encoders.

Information on functions, handling and specifications of the absolute encoders is provided in the accompanying documents and data sheets in the download area of www.lenord.de.

 Abbreviations:

The type specification **2x** covers the absolute encoders listed above.

The term **encoder** is used as a synonym for absolute (rotary) encoder.

ST and **MT** mean single turn and multiturn.

V_S: Supply voltage

2 Analogue interface

With these encoders (mainly ST types), the position value is output either as a voltage of 0–10 V or as a current of 4–20 mA; signal output: AOUT/AGND.

The load resistance on the current output is calculated as: $R_L \leq (V_S - 4 \text{ V}) / 20 \text{ mA}$.

2.1 Measured value adaptation

Counting direction

The encoder can output increasing position values with the shaft rotating either clockwise or counter clockwise. The desired counting direction can be adjusted by means of the CW/CCW input.

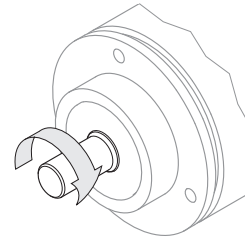
Position values with clockwise rotation of the shaft

Standard:

GND on CW/CCW or not connected: Increasing \uparrow

Inversion:

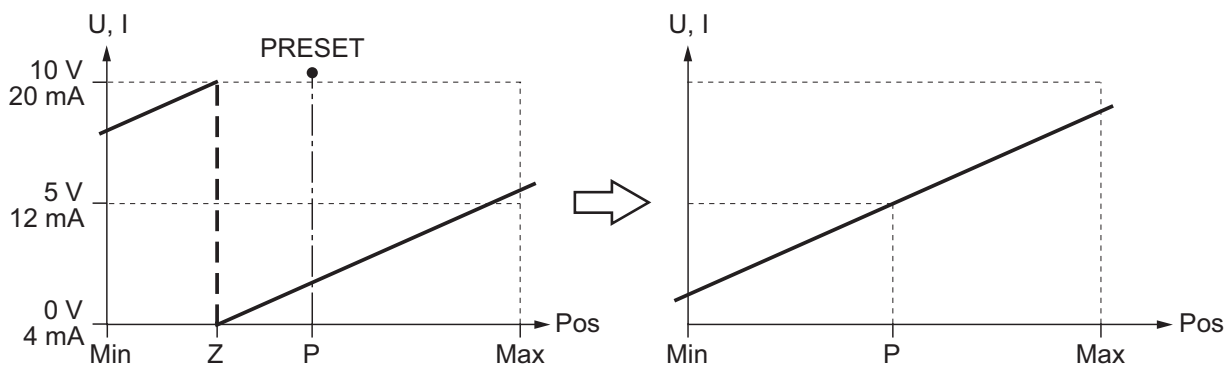
V_S on CW/CCW: Decreasing \downarrow



PRESET

By means of the PRESET function the actual position is set to the centre of the measuring range (5 V or 12 mA) and saved permanently until a new PRESET procedure is triggered.

Example:



Pos Position of the machine axis

Min, Max Working range of the machine (arbitrary determination)

P PRESET position

Z Zero position of the encoder

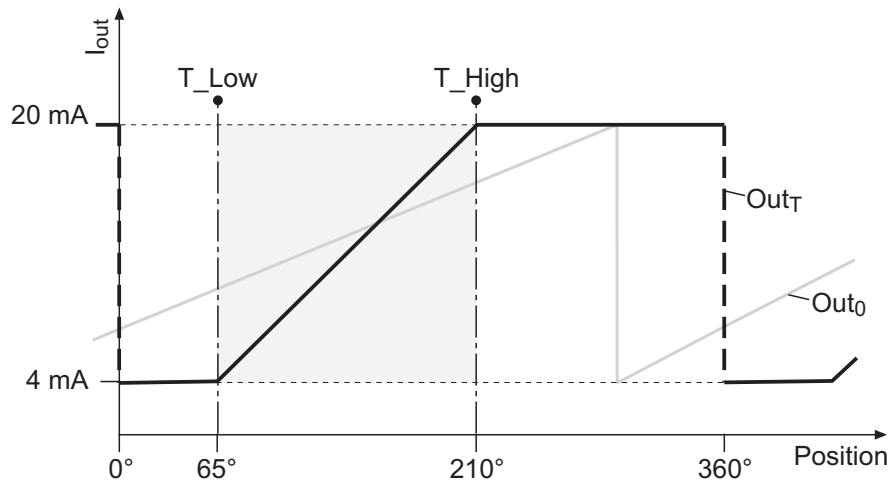
Teach-In

By means of this function the measuring range of the encoder can be restricted to achieve a higher resolution.

Procedure:

- ▶ Turn machine axis into the position for the lower working range limit.
- ▶ Apply $+V_S$ to T_Low input for at least 0.1 s.
- ▶ Turn machine axis into the position for the upper working range limit.
- ▶ Apply $+V_S$ to T_High input for at least 0.1 s.

Example for a ST encoder with current output:



Out_0 , Out_T Output signal graph before (index 0) or after (index T) the adaptation via the teach-in signals; the desired working range is shaded in grey, the degree specification on the x-axis is selected arbitrarily


I_{out} Output signal 4–20 mA

T_Low, T_High Positions in which the teach-in signal with the same designation is set

The output signal graph is now compressed between the two teach-in points along the position axis. This setting is saved permanently until a new teach-in procedure is triggered.

2.2 Connection

8-pole connector M12 (1)

Pin	Signal	Connector socket
1	GND	 <p>Male, connection side view</p>
2	PRESET (2)	
3	T_Low (2)	
4	T_High (2)	
5	AOUT	
6	AGND	
7	V_S	
8	CW/CCW (2)	

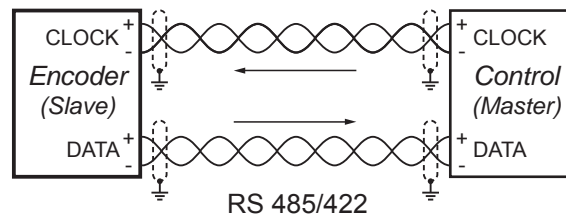
(1) GEL 235: interface cover; GEL 2351: rear side

(2) Depending on type and ordered functionality of the encoder

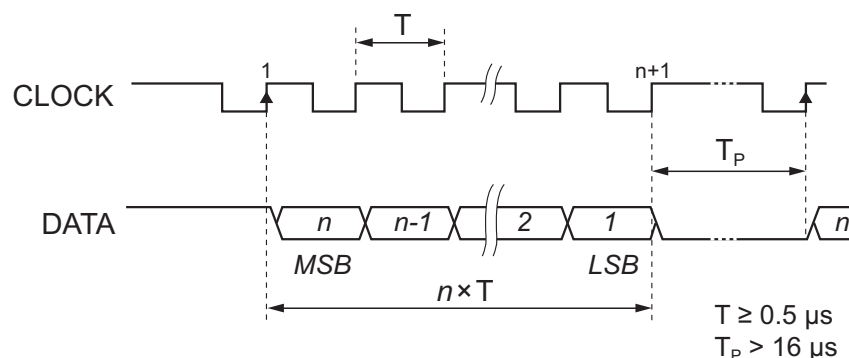
3 SSI (Synchronous serial interface)

With SSI encoders the position value is serially transmitted to the SSI controller in binary or grey code. The controller has to provide the necessary clock pulses for the transmission.

The physical platform of the transmission is a RS485/422 interface. For the galvanic isolation of the inputs and outputs, opto-couplers are used. Due to the twisted and screened line pairs for the clock and data signals, an efficient protection against parasitic errors is achieved.



With the serial data transmission, the most significant bit (MSB) of the actual position is sent first of all, i.e. with the first ascending edge of the clock sequence. Usually, this is the 12th or 13th bit with ST encoders (resolution: 4096 or 80192 steps), or the 25th bit with MT encoders (8192 or 4096 turns). Between two position requests there must be a clock pause (T_P) of at least 16 μs .



Die maximum clock rate is 2 MHz. But this value is only valid for a very short transmission distance. With longer distances, the following values should not be exceeded:

Cable length up to	50 m	100 m	200 m	400 m
Max. clock rate.	400 kHz	300 kHz	200 kHz	100 kHz

3.1 Measuring value adaptation

Count direction

Function as for analogue interface ([→ page 6](#)).

PRESET

By means of the PRESET function the actual position is set to the centre of the measuring range and saved permanently until a new PRESET procedure is triggered.

With ST encoders, that means the half of definition range. With MT encoders, the actual position is set to the half number of revolutions with ST part = 0.

Procedure:


- ▶ Turn the machine axis to the desired PRESET position.
- ▶ Apply supply voltage $+V_S$ to the PRESET input of the connector for at least 0.1 s.

For encoders with optional PRESET button:

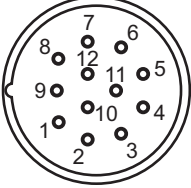
- ▶ Depress the button through the opening in the rear side with a dull point (e.g. a match).
- i** GEL 2035 MT only: This procedure is also used for putting an encoder in the sleep mode to save battery power. The encoder must be disconnected from the power supply to do so; the PRESET signal voltage may vary between 3 and 30 VDC.

3.2 Connections

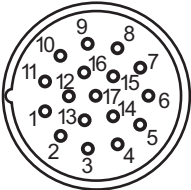
8-pole connector M12

Pin	Signal	Connector socket
1	GND	 <p>Male, connection side view</p>
2	PRESET	
3	DATA-	
4	DATA+	
5	CLOCK-	
6	CLOCK+	
7	V_S	
8	CW/CCW	

12-pole connector M23

Pin	Signal	Connector socket
1	GND	 <p>Male, connection side view</p>
2	DATA+	
3	CLOCK+	
4	SIN- (1)	
5	SIN+ (1)	
6	COS- (1)	
7	COS+	
8	V _S	
9	PRESET	
10	DATA-	
11	CLOCK-	
12	CW/CCW (1)	

17-pole connector M23

Pin	Signal	Connector socket
1	R1 (2)	 <p>Male, connection side view</p>
2	R2 (2)	
3	S4 (2)	
4	S3 (2)	
5		
6		
7		
8	CLOCK-	
9	DATA-	
10	GND	
11	V _S	
12	PRESET	
13	S2 (2)	
14	S1 (2)	
15	CLOCK+	
16	DATA+	
17		

(1) Depending on type and ordered functionality of the encoder

(2) Resolver