

Precision Encoder

GEL 295

- with sine-wave output
- for extremely harsh environments

SENSORLINE

LENORD+BAUER

Technical information

version 10.03



General information

- extremely robust encoder for measuring the rotational movements of machines and vehicles
- magnetic non-contact scanning of an integrated measuring gear wheel
- depending on the tooth number on the gear different pulse numbers can be realised
- high EMC compatibility and interference immunity
- very high temperature range from -40°C to 120°C
- high resistance against formation of dew, splash water and condensed water
- very high degree of protection - IP 67 - and chemical resistance
- vibration resistance up to 20 g

Fields of application

- rail vehicle industry
 - traction control
 - electronic anti-slip protection
 - anti-slide protection
 - engine speed determination
- machine and engine construction
- heavy industry
- metallurgical industry
- composting plant
- sewage treatment plants

Output signals

- waveforms:
 - two sine-wave signals, with 90° phase separation, and their inverse signals (temperature compensated)
 - option: reference pulse (track N)
- output signals can be interpolated externally

Design

- especially robust design in a stainless steel casing
- sensory mechanism fully embedded in the connector casing
- encoder with fixed shaft (diameter of 16 mm) or with integrated patented hollow shaft coupling (diameter of 20 mm)
- connector output
- many special design forms, e.g. cable output with flexible tubing and special connectors can be supplied on request

Concept

Concept

The GEL 295 encoder has been designed as a modular system and consists of a casing component and a sensor component.

- The casing component can be supplied with two different flange and shaft types.
- The sensor component consists of a fully encapsulated sensor for scanning a measuring gear wheel which is installed in the casing.

If you order a complete encoder with the sensor incorporated, you only have to state the requested pulse number. We shall then select the necessary module and the number of teeth required for the toothed wheel.

The output signals can be evaluated by the system control electronics. Alternatively, the Lenord + Bauer interpolation electronic type GEL 214 can be used to convert the output signals to multiple square waves if required. See separate technical information GEL 214.

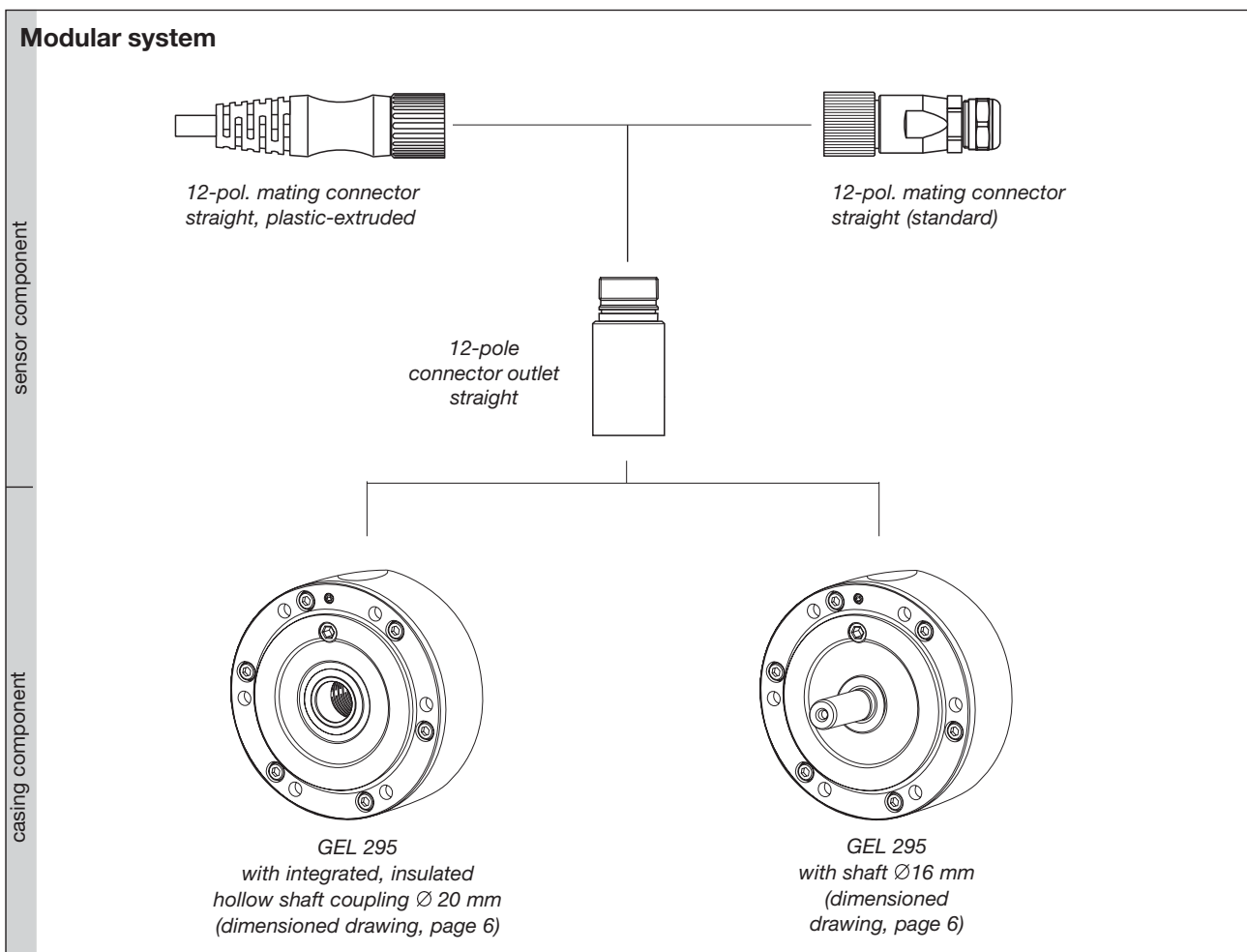
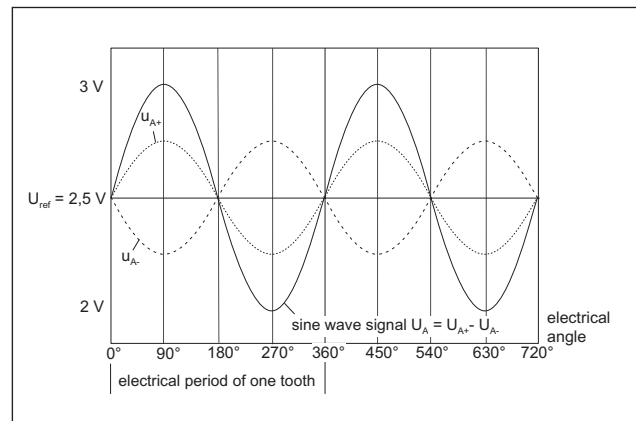
Signal pattern K, KN

$\hat{u} = 250 \text{ mV}$
 u_{N+}, u_{N-} = reference pulse

$$\left. \begin{aligned} u_{A+}(t) &= U_B/2 + \hat{u} \cdot \sin(2\pi f_e \cdot t) \\ u_{A-}(t) &= U_B/2 - \hat{u} \cdot \sin(2\pi f_e \cdot t) \\ u_{B+}(t) &= U_B/2 \mp \hat{u} \cdot \cos(2\pi f_e \cdot t) \\ u_{B-}(t) &= U_B/2 \pm \hat{u} \cdot \cos(2\pi f_e \cdot t) \end{aligned} \right\} x)$$

*) dependent on the sense of rotation

x) its difference is equivalent to a voltage of $1 V_{SS}$



Technical data

supply voltage U_B	5 V DC \pm 5 %
power consumption without load	\leq 1 W (signal pattern, K); \leq 1.3 W (signal pattern, KN)
output level for signal patterns K, KN (short-circuit-proof)	500 mV _{pp} per track = 1 V _{pp} as differential signal
output signals	two sine-wave signals, 90° phase separated, and their inverse signals option: reference signal
speed range	0 ... 6000 min ⁻¹
precision (short-wave, transformer and tooth forming error)	360° x 0.006 / pulse number
precision (long-wave, radial run-out)	\pm 0.015°
max. permissible cable length	100 m (observe voltage drop via supply line!)
connection	12-pole male connector
operating temperature range	-30 °C ... +85 °C
ambient and storage temperature range	-40 °C ... +120 °C
protection class	IP 67 (the degree of protection on the part of the hollow shaft corresponds to that of the engine or gear unit to which it is attached).
electromagnetic compatibility EU Directive EMV 89/336/EWG	EN 50081-1 and -2, EN 50082 -1 and EN 61000-6-2 rail vehicles ENV 50121-4
screening	screen potential on encoder housing option: sensor isolated from encoder casing
insulation strength VDE 0113 (13.1), DIN 57660 part 500	500 V
vibration protection (EN 50155)	200 m/s ²
shock protection (IEC 68-T2-27)	2000 m/s ²
admissible coupling offset axial lateral	\pm 1.0 mm \pm 0.2 mm
bearing life at an radial load of (with shaft)	100 N = 21 000 · 10 ⁶ revolutions 200 N = 15 000 · 10 ⁶ revolutions 250 N = 7 500 · 10 ⁶ revolutions
bearing life at an axial load of (with integrated hollow shaft coupling)	50 N = 130 400 · 10 ⁶ revolutions 75 N = 43 200 · 10 ⁶ revolutions 150 N = 7 200 · 10 ⁶ revolutions
housing type	stainless steel, X12CrMoS17 - 1.4104
weight	approx. 3 kg

EMC assembly instructions, Mounting instruction

EMC assembly instructions

To avoid influencing the certified electromagnetic compatibility (EMC) the following assembly instructions must be observed:

- The screenings at both **cable ends** must have **large-surface** contact. The cable screen is connected to the sensor housing. If an encoder with insulated sensor element is concerned, the cable screen is internally connected with the sensor housing, however, there is no electrical connection with the external housing.
- Keep all unscreened lines **as short as possible**.
- Provide for earth connections being **as short as possible** and having a **large cross-section** (e.g. low-inductance metal-alloy tape, flat-band conductor).
- Should there be any **potential difference** between the earth connection of the machine and the electronics, appropriate measures must be taken to ensure that **no compensating currents** can flow through the cable screening (e.g. lay a potential equalization line with large cross-section (see below) or use a cable with separated duplex screening – each screen being connected at one side only).
- Signal and control lines must be laid away from electric power cables.
- The power supply must agree with installation class 0 or 1 according to point B.3 of the EN61000-4-5 from 1995.

Mounting instructions

General

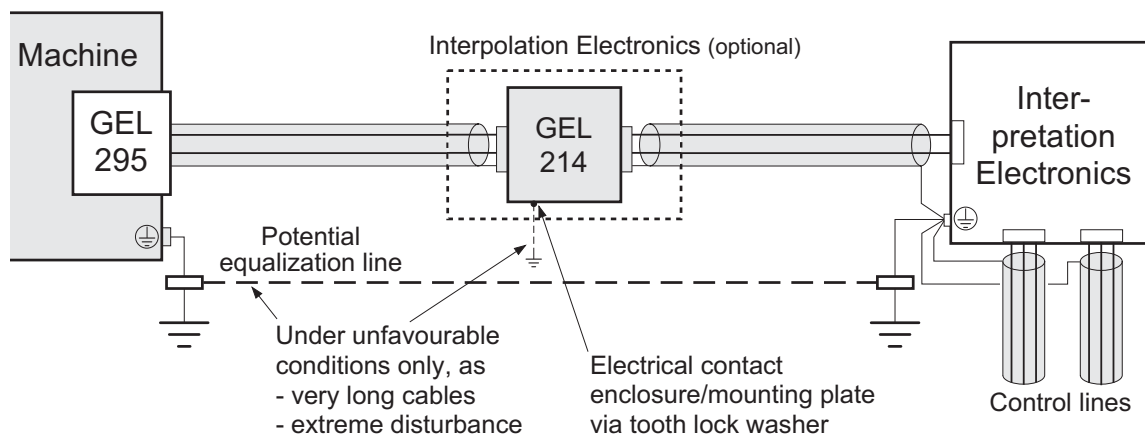
- In environments of application with fine dust and water, the fine thread of the connector should be additionally protected with a suitable shrinkable plastic tube. Subsequent disassembly is facilitated thereby.
- Take permissible radial run-out between encoder shaft and drive shaft into account.
- Maximum tightening torque with respect to encoder mounting: 10 Nm

GEL 295 with shaft (16 mm diameter)

Connect encoder through appropriate flexible coupling with drive shaft. Appropriate couplings, for example, the KK 14 or MK 12 types are set out in the data sheet "Encoder accessories". Please request separately.

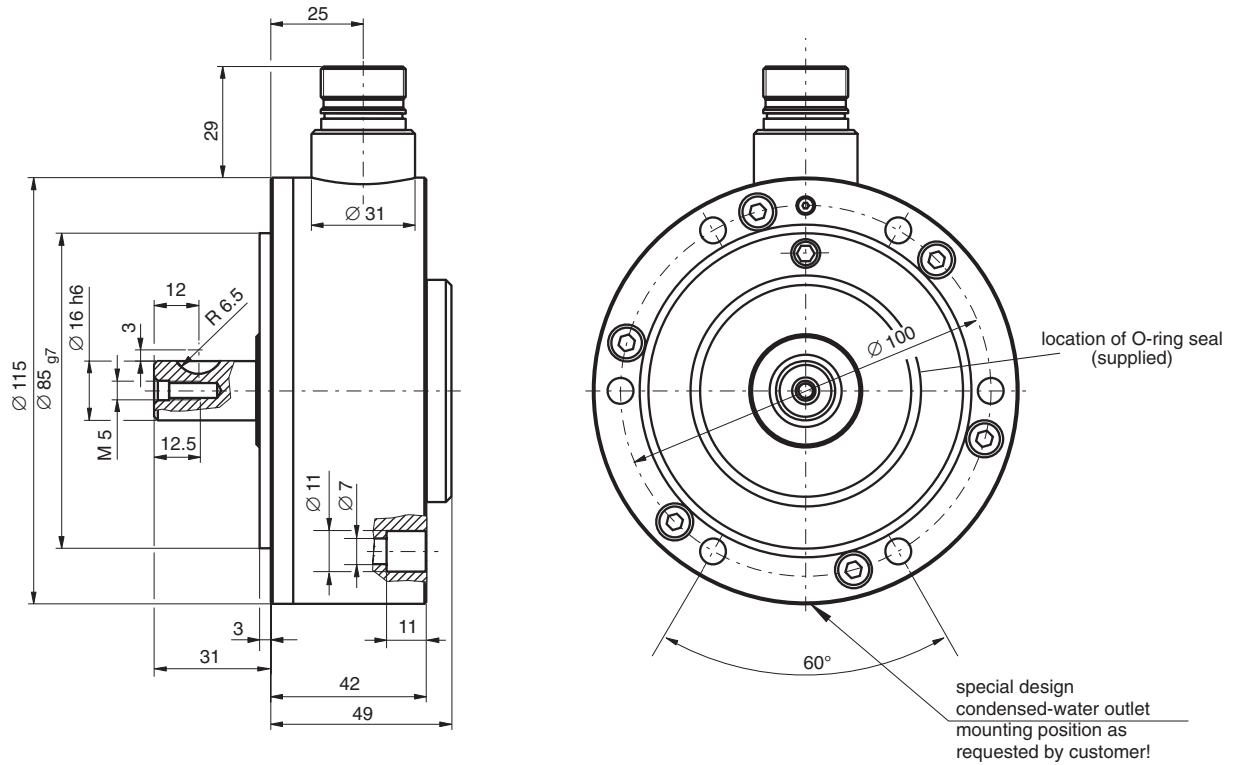
PLEASE NOTE: The degree of axial offset between the shaft ends directly influences the degree of the phase displacement. In particular, this must be taken into account for systems with high pulse numbers.

General earthing principle

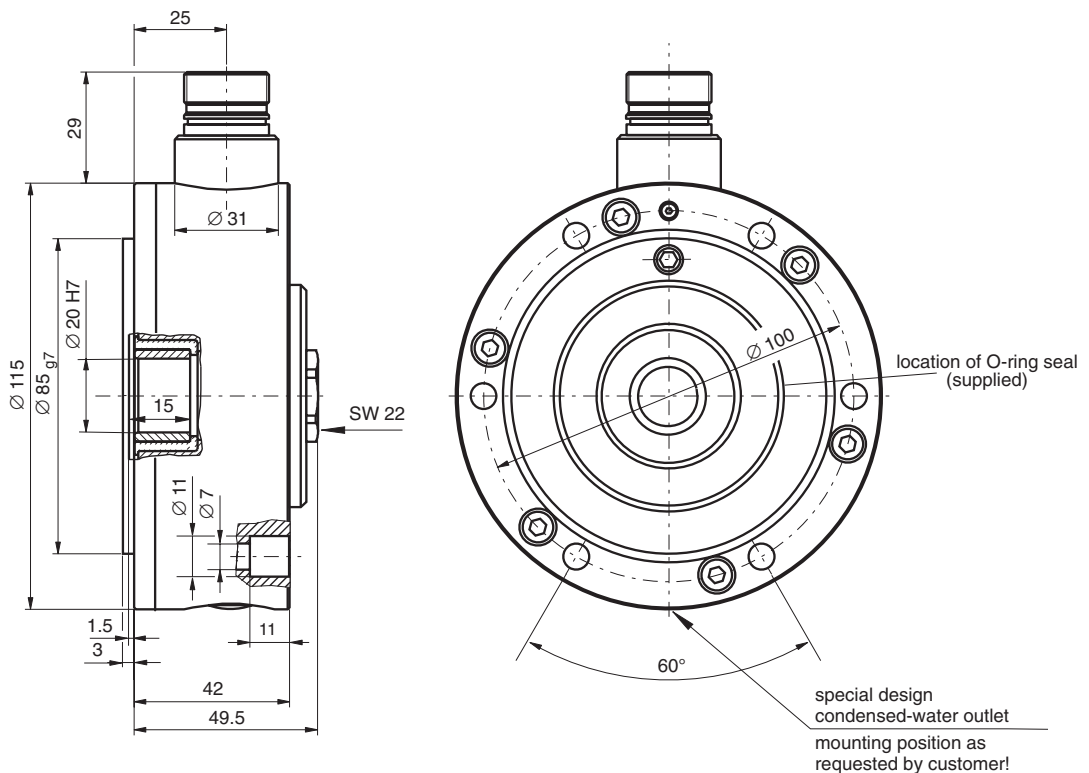


Dimensioned drawing

GEL 295 with shaft (16-mm diameter)

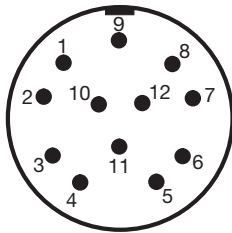


GEL 295 with integrated, insulated hollow shaft coupling (20-mm diameter)



Pin layout, Type code

Pin layout



Connector Pin	Function	Mating connector with plastic-extruded cable (cable colour)
1	track 2	black
2	U_B - sense ¹⁾	green
3	track N	violet
4	track N	yellow
5	track 1	white
6	track 1	brown
7	n. c.	grey
8	track 2	pink
9	n. c.	grey/pink
10	0 V GND	blue
11	GND-sense ¹⁾	red/blue
12	U_B	red

¹⁾ When the sense function is not utilised we recommend the use of the free conductors for additional voltage supply.

n. c. = internally not connected

Type code

	K- KN	Signal pattern			
		sine-wave signal			
		sine-wave signal and analogue reference signal			
		000	Possible pulse numbers from 075 to 256 for encoders with shaft of 16 mm from 116 to 152 and from 195 to 256 for encoder with hollow shaft 20 mm		
			Shaft design		
			0 20 mm with integrated hollow shaft coupling, insulated		
			2 16 mm shaft		
			Mating connector		
			- without mating connector		
			0 straight 12-pole mating connector (standard)		
			D straight 12-pole mating connector with 5 m, plastic-extruded twelve-core cable		
			S special design on request		
			Design		
			- standard		
			S special version		
295	--	00 ----	D --		

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