Incremental encoder

Encoder with stainless steel housing 1.4305

GEL 2010

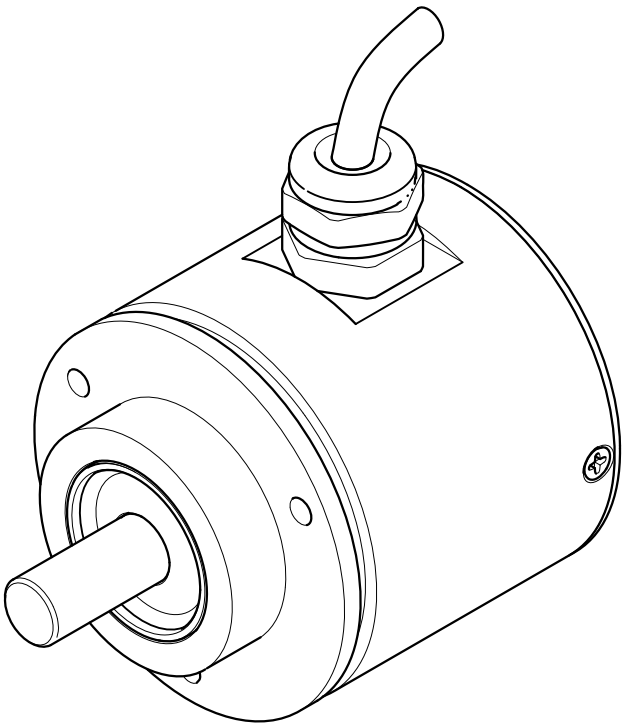
Operating Instructions

– Translation –



Prior to all work on the device: Read these instructions!

Keep for later reference!



D-02B-2010S (V1.2) - 2021-01

LENORD +BAUER

To improve our product documentation continuously we need your assistance.

Please do not hesitate to send us your

- suggestions
- points of criticism
- error notes

to the e-mail address webmaster@lenord.de using “Dokumentation” as reference.

Thank you very much in advance!

Right to technical changes and errors reserved.

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1 About these Operating Instructions

1.1 About these operating instructions

This document is part of the product and describe how to use it safely.

- ▶ Please read this document carefully before you begin assembly.
- ▶ Keep this document for the entire service life of the product.
- ▶ Make sure that this document is available to personnel at all times.
- ▶ Pass this document on to each subsequent owner or user of the product.
- ▶ Insert all additions received from the manufacturer.
- ▶ To avoid property damage or malfunctions, read and observe the specifications provided in this document.

1.2 Validity

These Operating Instructions apply to the standard design of the product. This includes all types that are n o t marked with a **Y** behind the product number in the type code.

A product marked with Y is a customised design with a special assembly and/or modified technical specifications. Depending on the customised modification, additional or other documents may be valid.

1.3 Target group

These instructions are intended for electrical specialists and mechanics who are authorised to mount and electrically connect devices and systems, to put them into operation, and to label them under the terms of safety-related standards, as well as machinery operators and manufacturers.

1.4 Revised versions

Date	Version	What's new?
2010-09	1.0	First edition
2010-11	1.1	Type code changed
2021-01	1.2	Mounting accessories changed

1.5 Abbreviations and glossary

AC	Alternating current
DC	Direct current
EGB	German for ESD
ESD	Electrostatic sensitive devices
EMC	Electromagnetic compatibility
HTL	High-transistor logic, for devices with an operating voltage > 5 V DC

TTL	Transistor-transistor logic, for devices with an operating voltage of 5 V ± 5%

1.6 Symbols, marks and notes

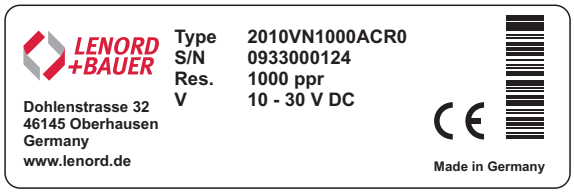
The following symbols, marks and notes are used in these operating instructions to enable you to recognise certain information more quickly:

⚠CAUTION	**Indication of a dangerous situation.** Failure to observe this warning may result in minor injury.
NOTICE	Notes on how to avoid material damage
ⓘ	Important information for understanding or optimising procedures
►	Step to be carried out
→ page 6	Page reference to another part of these operating instructions

2 Identification of the encoder

2.1 Rating plate

The following information is provided on the encoder:



Type Type of the associated encoder according to type coding
S/N Serial number
Res. Pulse count per rotation
V Supply voltage

2.2 Type code

	Signal pattern					
	TN Signal pattern TN					
	VN Signal pattern VN					
	XN Signal pattern XN					
		Impulse numbers				
		_ _ _ _ Impulse numbers per revolution				
			Flange / Shaft			
			A Clamping flange 10 x 20 mm shaft			
				Electrical interface		
				B 1 m cable, open cable end		
				C 3 m cable, open cable end		
				D 5 m cable, open cable end		
				E 10 m cable, open cable end		
					Position outlet	
					R Radial	
						Option
						0 None option
2010	_ _	_ _ _ _	_	_	_	_

A product marked with Y is a customised design with a special assembly and/or modified technical specifications. .

2.3 Scope of delivery

The following components are included in the scope of delivery:

- Incremental encoder with connection cable
- These operating instructions

NOTICE Further accessories are required for mounting. Check wether all the mounting accessories required are available.

2.4 Mounting accessories

Item no.	**Article**
MK 8	Metal coupling (stainless steel)
MK 12	Metal coupling (flexible, steel)
MKF 8	Flange coupling, 42 mm flange diameter
MKF 12	Flange coupling, 48 mm flange diameter

3 Safety instructions

3.1 Designated use

The encoder GEL 2010 is intended solely for measurement tasks in the industrial and commercial sectors. It is installed in a system and must be connected to special evaluation electronics, contained, for example in a position control unit or an electronic counter.

All other uses shall be deemed incorrect.

3.2 Notes for operators and manufacturers

Personnel training

The following requirements must be met:

- ▶ Assembly, operation, maintenance and removal tasks are performed by trained and qualified skilled personnel or are checked by a responsible specialist.
- ▶ Personnel has received training in electromagnetic compatibility and in handling electrostatic-sensitive devices.
- ▶ Provide personnel with all applicable accident prevention and safety regulations.
- ▶ Make sure that personnel is familiar with all applicable accident prevention and safety regulations.

3.3 Changes and modifications

Improper changes or modifications can damage the product.

NOTICE Do not make any changes or modifications to the product, with the exception of the tasks described in these instructions.

3.4 Rotating parts

⚠CAUTION **Risk of injury due to rotating shafts**

Hair and clothing can become entagled on rotating shafts. Prior to all work on the encoder, switch off the power supply for the drive shaft and secure the supply against switching back on!

3.5 Instructions for preventing damage or malfunctions

The encoder is of a very robust design. Nevertheless, it can be damaged by incorrect mechanical loading. Mechanical damage can quickly result in the failure of the measuring system.

3.5.1 Handling the encoder

- ▶ Do not hit or step on the housing or the shaft.
- ▶ Do not open the encoder or disassemble it.
- ▶ Only mount the encoder as described in these operating instructions.
- ▶ Keep the shaft load as low as possible to obtain an adequate bearings life.

3.5.2 Shaft stresses

The encoder shaft is mounted without play on bearings.

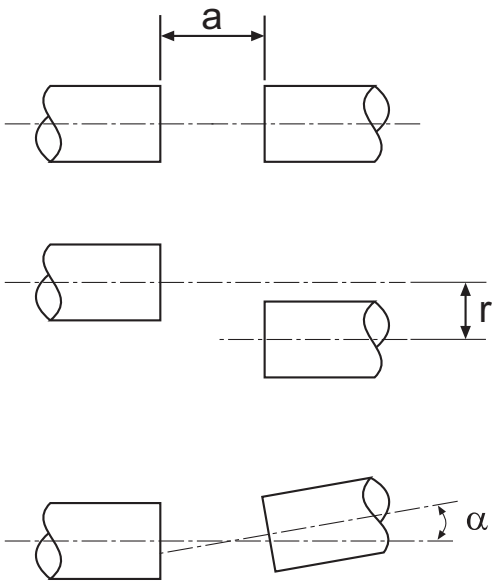
The bearings are subjected to reactive forces by rigid mounting of the encoder on the drive shaft. This leads to permanent stress being placed on the bearings.

NOTICE Ensure that the maximum shaft load values are not exceeded (see Technical data → page 20p.p.).

▶ Only connect the encoder with the drive shaft using a flexible coupling (see Mounting accessories → page 8).

3.5.3 Offset of shaft ends

Misalignment in the form of radial, axial or angular offset, for example, often occurs between the drive shaft and encoder shaft due to the effects of temperature. These can shorten the lifetime of the encoder and coupling, and provoke measurement errors.



a Axial offset
r Radial offset
α Angular offset

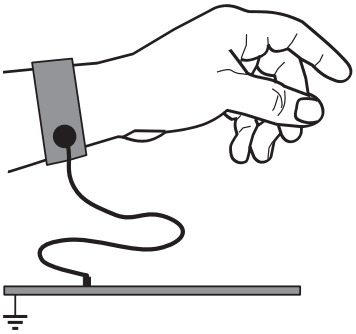
▶ Ensure that any axial, radial or angular offsets that occur during operation do not exceed their permitted values.

Pay attention to the manufacturer's data on the axial, radial and angular offset on the coupling.

3.5.4 Electrostatic discharge

Electrostatic discharge can irreparably damage the electronic components.

NOTICE Touch the connector pins and connecting wires only if your body is suitable earthed, e. g. via an ESD armband.



3.5.5 Cable routing

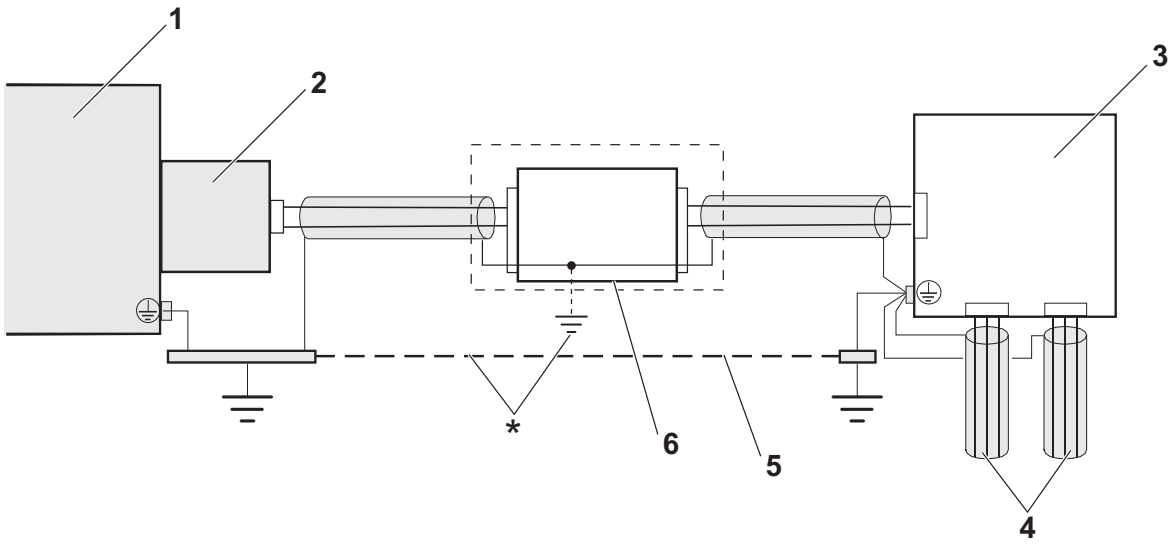
The connection cable may be damaged if bent excessively.

NOTICE Pay attention to the minimum bending radius (see Technical data → page 20 pp).

3.6 Instructions on electromagnetic compatibility

To improve the electromagnetic environment, please observe the following installation instructions:

- ▶ Only use connectors with a metal housing or a housing made of metallised plastic, as well as screended cables.
- ▶ If foreseen in the screening concept, connect the screen to the connector housing.
- ▶ Connect the screen using large area connections.
- ▶ Keep all unscreened lines as short as possible.
- ▶ Design the earth connections with a large cross-section (e. g. using a low inductance earth strap or flat conductor) and keep them short.
- ▶ If there are potential differences between machine earth connections and electronic earth connections, ensure no equalising currents can flow over the cable screen. For this purpose, e.g. lay an equipotential bonding cable with a large cross-section or use cable with separate double screening. In case of cables with separate double screening, only connect the screens at one end.



1 Machine
2 GEL 2010
3 Evaluation electronics
4 Control cables
5 Equipotential bonding cable (only in case of extreme interference)
6 Optional: level-pulse converter or line driver
* Only in case of extreme interference or long cables

▶ The encoder is part of a machine or system. Integrate the equaipotential bonding for the encoder into the overall screening concept.

▶ Lay the signal cables and control cables physically separate from the power cables. If this configuration is not possible, use screened twisted pair cables and/or lay the encoder cable in a steel conduit.

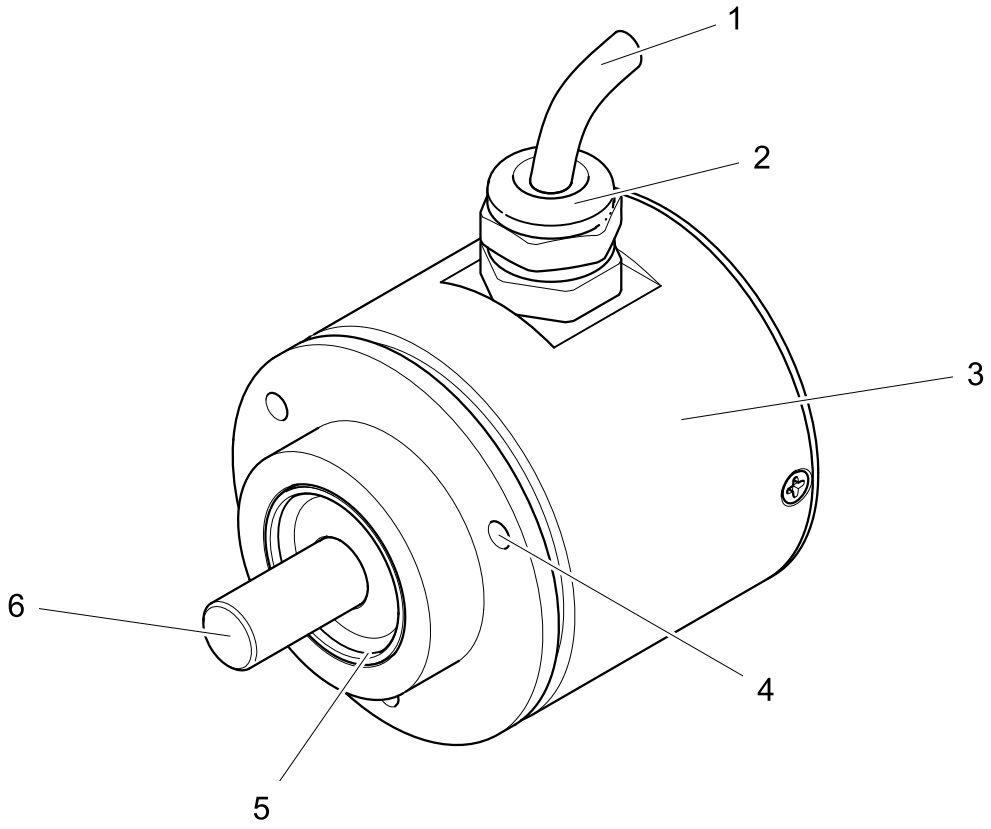
▶ Ensure that external protection measures against surges have been implemented (EN 61000-4-5).

4 Description

Task

The encoder measures rotational movement or positions on machines and vehicles contactlessly.

Setup



1 Connection cable
2 Cable gland
3 Encoder
4 Mounting holes
5 Shaft sealing ring
6 Encoder shaft

Function

The encoder (3) is mounted on the provided mounting (e.g., a mounting bracket) using three screws. The mounting holes (4) are produced with M4 inner threading.

The shaft (6) of the encoder is connected with the drive shaft using a suitable flexible coupling. The sealing ring (5) seals the housing.

The integrated electronics are supplied with power via the connection cable (1). The cable gland (2) fixes the connection cable to the housing and seals the encoder.

The sensory unit is located in the encoder housing. It comprises a diametral magnet inserted in the encoder shaft and magneto-resistive (MR) sensors. The diametral

magnet rotates with the encoder shaft and the MR sensors detect the change in the magnetic field.

The integrated electronics convert the magnetic field changes to two-channel voltage square-wave signals that are forwarded through the connection cable to the separate evaluation electronic circuit.

The signal patterns VN and XN have HTL levels, while the pattern TN has TTL levels.

The power supply for the encoder, the evaluation of the number of pulses and the establishment of the control loop require separate electronics.

5 Mounting

The encoder is mounted in the following steps:

1. Checking mounting
2. Mounting encoder
3. Laying cables
4. Connecting electrically
5. Checking function

Tools and supplies (not included in the scope of delivery):

- Torque wrench
- 1 suitable flexible coupling
- Mounting accessories

5.1 Checking mounting

You will find all information data required on the dimensional drawings (see 9.2, → page 20).

▶ Check whether the mounting has been prepared for fitting the encoder.

▶ Ensure that any axial, radial or angular offsets that occur during operation do not exceed their permitted values.

5.2 Mounting the encoder

⚠CAUTION

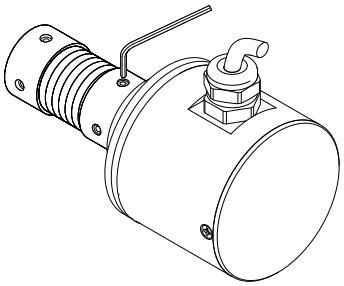
Risk of injury due to rotating shafts
Hair and clothing can become entagled on rotating shafts. Prior to all work on the encoder, switch off the power supply for the drive shaft and secure the supply against switching back on!

NOTICE

– Only touch the connector pins and connecting wires when wearing a suitable grounding device, such as an ESD wristband to avoid damaging the electronic components due to electrostatic discharge.

– Pay attention to the manufacturer’s data on the axial, radial and angular offset on the coupling.

▶ Connect a suitable flexible coupling with the drive shaft and tighten the headless screws on the encoder side.

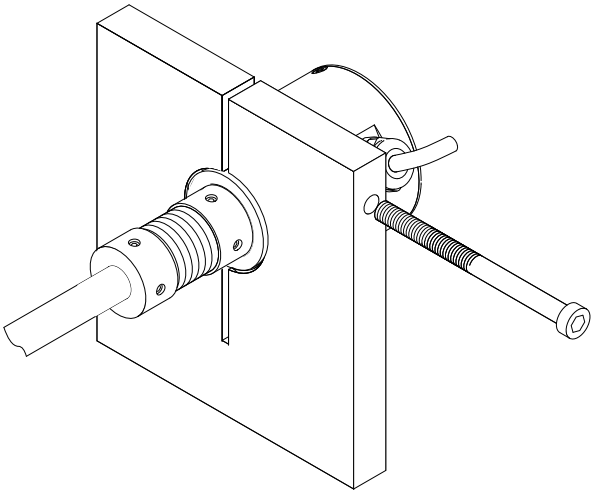


There are different ways of fastening the encoder. Three different methods of fastening are described as examples below.

5.2.1 Mounting the encoder with a clamping device

Mounting accessories: clamping device, including screw

▶ Insert the encoder with the mounted coupling into the clamping device and place the coupling on the drive shaft.



▶ Secure the encoder with a screw to the clamping device and tighten it.

▶ Tighten the headless screws for the coupling on the drive side.

5.3 Laying the cable

NOTICE Pay attention to the minimum bending radius (see Technical data → page 20 pp).

▶ Observe the EMC instructions while laying the cables (→ page 11).

6 Connection

6.1 Connection assignment

The connection depends on the type of encoder:

Signal	Open cable end Cable colour	Description
V_S	red	Supply voltage
GND	blue	Ground
N	pink	Reference signal
/N	grey	Reference signal, inverted
2	yellow	Channel 2
/2	green	Channel 2, inverted
1	white	Channel 1
/1	brown	Channel 1, inverted

6.2 Connecting and testing the encoder

▶ Check whether all cables are laid.

▶ Connect the encoder correctly in accordance with the connection assignment (→ page 17).

▶ Connect a suitable instrument,e. g.an oscilloscope.

▶ Turn the drive shaft slowly and observe the output signal on the measuring instrument.

If the encoder is working correctly, you will see a square-wave signal (see section 9.3 → page 21).

7 Removal and disposal

7.1 Removing the encoder

NOTICE

If a fully functional encoder is to be removed, for example for retrofitting, please note the following:

– Only touch the connector pins and connecting wires when wearing a suitable grounding device, such as an ESD wristband to avoid damaging the electronic components due to electrostatic discharge.

▶ Disconnect the encoder.

▶ Release the connection cable.

▶ Unscrew the headless screws for the coupling on the drive side.

▶ Depending on the mounting method: loosen and remove the mounting screws.

▶ Remove the encoder with the coupling from the drive shaft.

7.2 Disposal

▶ Dispose of a faulty encoder in accordance with regional regulations for electrical and electronic devices.

8 Maintenance and faults

8.1 Maintenance

The encoder does not contain any parts in need of maintenance. Do not try to repair the encoder yourself. Any repairs necessary are only allowed to be undertaken by LENORD + BAUER or specifically authorised representative.

When?	What?
Encoder faulty	▶ Replace the encoder.
Regularly	▶ Check the encoder for damage. ▶ Clean the encoder (see below).
As necessary	▶ Replace the mating connector (not included in the delivery). Take into account that you will need to shorten the connection cable during this process.

Cleaning the encoder

NOTICE

To avoid damaging the encoder, please pay attention to the following:

– Do not use a high pressure cleaner.

– If the connection has been disconnected, prevent water, dirt or other substances entering the open parts.

▶ Clean the encoder with water or a non-corrosive cleaning agent.

8.2 Faults

Fault	Possible causes	Remedy
No or a very low output signal	Electrical connection faulty	▶ Check all electrical connections between the encoder and the power supply, as well as the evaluation electronics for correctness and secure contact, and ensure they are dry.
	Drive shaft and encoder shaft not firmly connected	▶ Check the mechanical connection between drive shaft and encoder shaft.

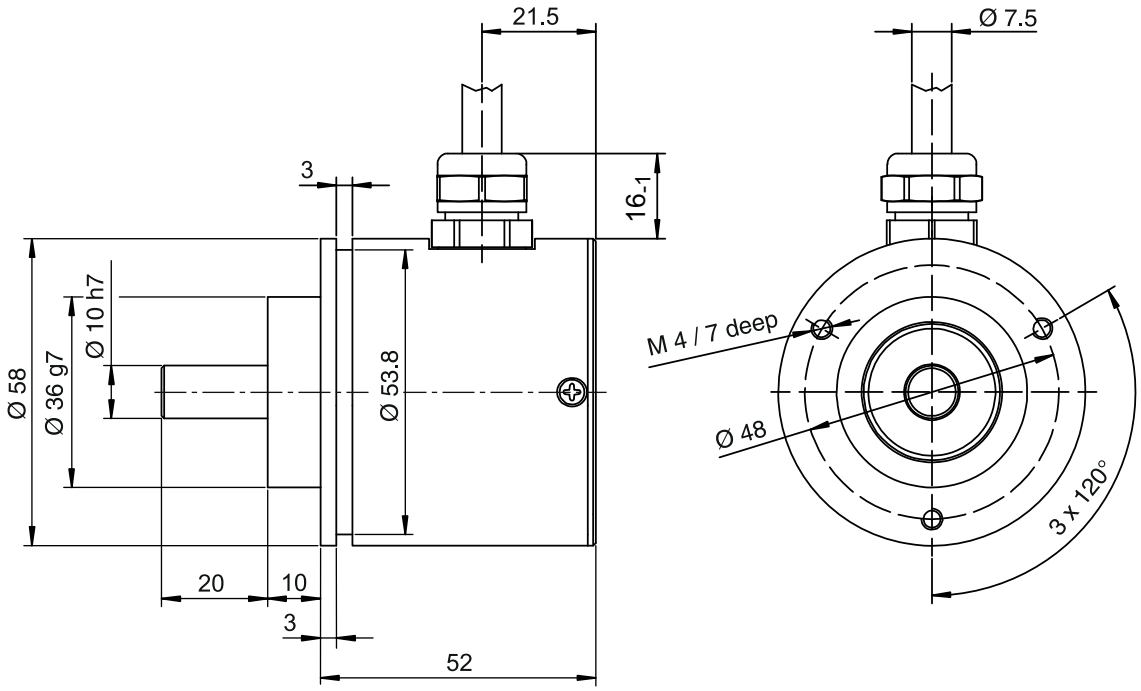
9 Appendix

9.1 Technical data

Realizable pulse numbers

2, 4, 8, 16, 20, 32, 40, 50, 64, 80, 100, 128, 160, 200, 250, 256, 400, 500, 512, 800, 1000, 1024

9.2 Dimensional drawing



All dimensions in mm

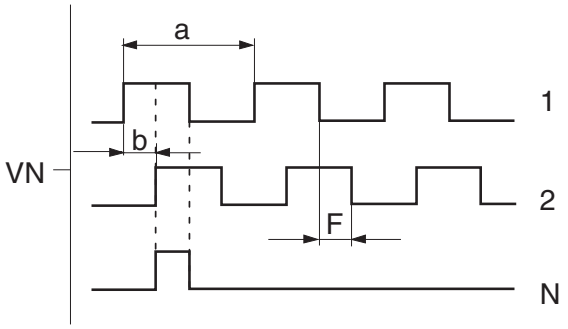
9.3 Output signals

9.3.1 Signal patterns

Signal pattern VN

The signal pattern "V" refers to two tracks with square-wave signals shifted by 90°. A reference signal of a defined length is output once per revolution on the third track N.

	V_S	V_{out}
VN	10 to 30 V DC	HTL

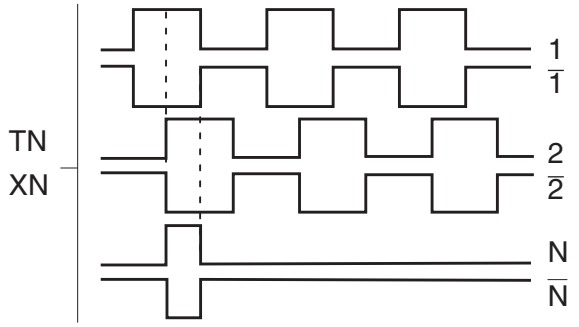


a 360° electrical
b 90° phase offset
F edge spacing*)

Signal patterns TN, XN

The two pulse outputs and the neutral signal are also output as inverse signals.

	V_S	V_{out}
TN	+ 5 V DC ± 5 %	TTL
XN	10 to 30 V DC	HTL



Key

V_S= Supply voltage

V_{out}= Signal voltage

Signal pattern shown for clockwise rotation (for view of the encoder shaft)

*) for an output frequency of 200 kHz, the edge spacing F is longer than 0.6 µs

9.3.2 Signal levels

The signal patterns VN and XN have HTL levels, the signal pattern TN has TTL levels (for the output voltage, refer to Technical data, → page 20). All outputs have a push-pull end stage and are always protected against short-circuits.

9.4 Manufacturer's declaration

You will find the manufacturer's declaration as per the EMC Directive 2004/108/EG in the internet at www.lenord.de.