

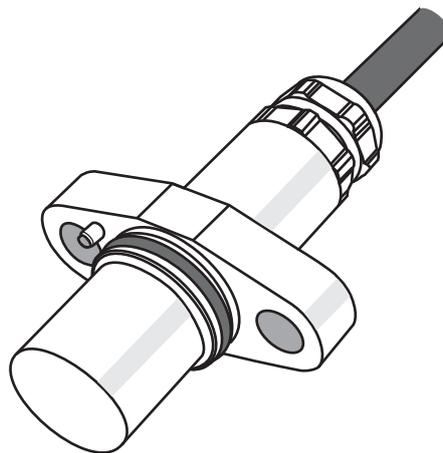
Dual Channel Speed Sensor

▶ **GEL 2475**

Sensor optional with current or voltage output (standstill monitoring voltage)



Operating Instructions



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

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1 About these Operating Instructions

1.1 General information

These operating instructions are part of the product and describe how to use it safely.

- ▶ Please read the operating instructions carefully before you begin assembly.
- ▶ Keep the operating instructions for the entire service life of the product.
- ▶ Make sure that the operating instructions are available to personnel at all times.
- ▶ Pass the operating instructions 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 these Operating instructions.

1.2 Validity

These operating instructions apply to the standard design of the product. This includes all types that are not marked with a Y behind the product number in the type code (see section 2.2 → page 8).

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 operating 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?
2009-08-24	1.0	First edition with new layout
2009-09-10	1.1	Cabel type for signal patterns D- and DL changed; connection assignment revised

1.5 Abbreviations and glossary

AC Alternating Current

Channel The output signals in these operating instructions are labelled as channel 1 and channel 2, and are synonyms for track 1 and track 2 or track A and track B.

DC	Direct Current
D.P.	Diametric Pitch; characteristic of a toothed wheel which is used here for generating the count pulses Definition: $DP = N / PD_i = (N + 2) / OD_i$ with N = number of teeth, PD_i = pitch diameter in inches, OD_i = outside diameter in inches Conversion: $DP = 25.4 / M$
ESD	Electrostatic Sensitive Devices
EMC	Electromagnetic Compatibility
Idle voltage	Standstill monitoring voltage: Constant voltage of 7 V DC, supplied by a 2475xM type sensor as soon as the measuring scale turns so slowly that the measuring frequency drops below 1 Hz
Measuring scale	General term for target wheel, toothed rack or slotted disk This guide describes the target wheel in more detail. Comments contained in this document also apply to other measuring scales.
Module	Module (m); as DP but based on metric rating Definition: $m = 25.4 / DP = CP_m / \pi = OD_m / (N + 2)$ with CP_m = circular pitch (tooth period) in mm, OD_m = outside diameter in mm, N = number of teeth $m = 25.4 / DP$

1.6 Symbols, marks and warnings

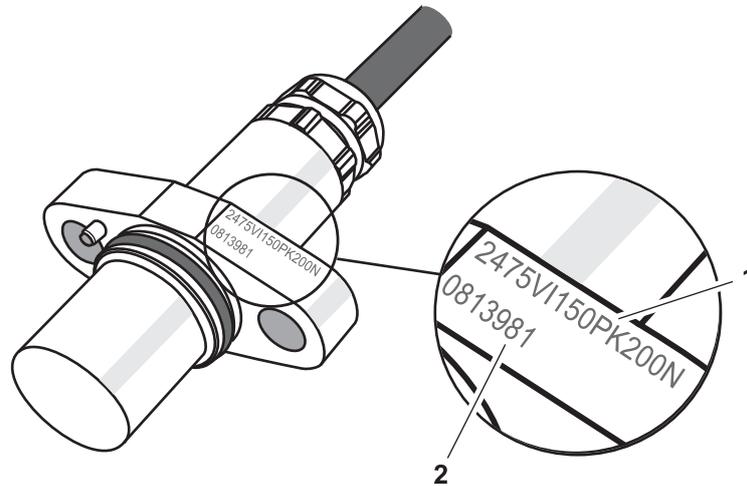
Symbols and marks are used in these Operating Instructions to enable you to recognize certain information more quickly.

- NOTICE** Indicates a property damage message or addresses practises not related to personal safety
-  Important information for understanding or optimizing procedures.
-  Indicates an action to be performed
- [→ page 6](#) Cross-reference to another part of these Operating Instructions

2 Identification of the speed sensor

2.1 ID plate

The following information is engraved on the speed sensor:



- 1 Type code (cf. next paragraph)
- 2 Serial number

2.2 Type code

2475	Signal pattern		
	S	1-channel square-wave signals	
	V	2-channel square-wave signals shifted by 90°	
	X	2-channel square-wave signals shifted by 90° and their inversed signals	
	D	2-channel square-wave signals shifted by 90°, galvanically separated	
	H	2-channel square-wave signals shifted by 90° and their inversed signals, galvanically separated	
	Signal output		
	-	Voltage	
	I	Current (with signal patterns V and D only)	
	L	Voltage, with reduced current consumption (with signal patterns D and H only)	
M	Standstill monitoring voltage 7 V (with signal patterns V and D only)		
Module M			
100	Module 1.00		
125	Module 1.25		
150	Module 1.50		
.			
.			
.			
350	Module 3.50		
Cable screening			
L	Connected to sensor housing		
P	Not connected to sensor housing		
Cable outlet			
K	Cable gland		
W	Flexible conduit fitting		
G	Hose fitting		
Cable length L			
xxx	Cable length in cm		
Costumising			
N	Standard version		
S	Special version		

2.3 Scope of delivery

Delivery scope includes the following components:

- Speed sensor with connection cable and protective cap fitted, packed in a protective ESD bag
- This manual

3 How to avoid property damage or malfunctions

3.1 Correct use

The speed sensor is intended solely for measurement tasks in the industrial and commercial sector. 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

- ▶ Make sure that the following requirements are 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 Modifications and conversions

Unauthorised modifications or conversions may damage the product.

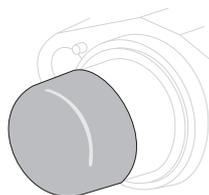
NOTICE Do not make any modifications or conversions to the product, with the exception of activities described in these operating instructions.

3.4 Sources of hazards

The speed sensor is a sensitive measuring instrument because the active, magnetic sensor element is located directly beneath the measuring surface. Mechanical damage can quickly cause the measurement system to fail.

3.4.1 Protective cap

The speed sensor is supplied with a protective cap to prevent damage to the sensitive measuring surface.



- ▶ Only remove the protective cap directly before installation.
- ▶ Keep the protective cap in a safe place for future use.

- ▶ If you are removing the speed sensor for future use, fit the protective cap immediately after removal.

3.4.2 Measuring surface

The speed sensor is highly magnetic on its measuring surfaces. When it is brought close to metal objects, it can quickly make contact with them. For example, the measuring surface could be damaged if it touches the target wheel or as a result of other mechanical impact.

NOTICE Ensure that the measuring surface does not come in contact with other objects.

3.4.3 Air gap between measuring surface and target wheel

If the air gap, which means the clearance between the measuring surface and the target wheel is too great, the measurement signal can be lost.

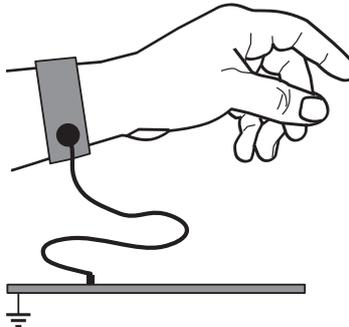
If the air gap is too small, the measuring surface may come in contact with the target wheel if this runs out of round.

- ▶ Ensure that the air gap between the measuring surface and the target wheel is **within the permissible range** (see table → [page 16](#)).

3.4.4 Electrostatic discharge

Electrostatic discharge can destroy the electronic components.

NOTICE Only touch the connector pins and connecting wires when wearing a suitable grounding device, such as an ESD wristband:



3.4.5 Screwed cable gland

The screwed cable gland protects the sensor from moisture and dust. Opening this connection may result in malfunctioning of the measuring electronics.

NOTICE Do not unscrew the screwed cable gland.

3.4.6 Cable duct

The connector cable can be damaged if it is bent too sharply.

NOTICE Please note the minimum bend radius (see [Technical data](#) → [page 24f](#)).

3.4.7 Dirt

The accumulation of ferromagnetic particles between the measuring surface and the teeth of the measuring scale may mean that the speed sensor cannot clearly read the change from tooth to gap.

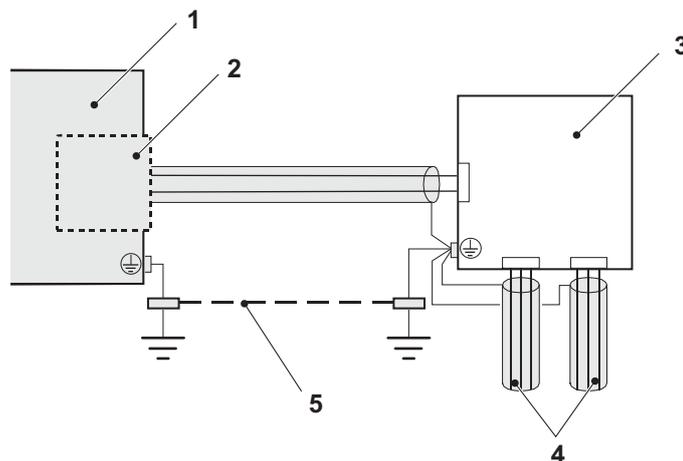
- ▶ Check the speed sensor regularly for dirt, and clean it if necessary (see → [page 22](#)).

3.5 Notes on electromagnetic compatibility

To improve the electromagnetic environment please observe the following installation advice:

- ▶ Only use connectors with a metal housing or with a housing made from metallised plastic and shielded cables.
- ▶ Place the shielding on the connector housing if included in the shielding concept.
- ▶ Spread the shielding wide.
- ▶ Keep all unshielded lines as short as possible.
- ▶ Use large diameter grounding connections (for example, as a low induction ground strap or ribbon conductor) and keep them short.
- ▶ If there are potential differences between machine and electronic ground straps, make sure that no equalising currents can flow via the cable shielding. For this purpose, lay a large diameter voltage equalising cable or use cables with separate two-ply shielding.

With cables with separate two-ply shielding, spread the shielding on one side only.



- 1 Machine
- 2 GEL 2475
- 3 Evaluation electronics
- 4 Control lines
- 5 Voltage equalising cable (only in the case of extreme levels of interference)

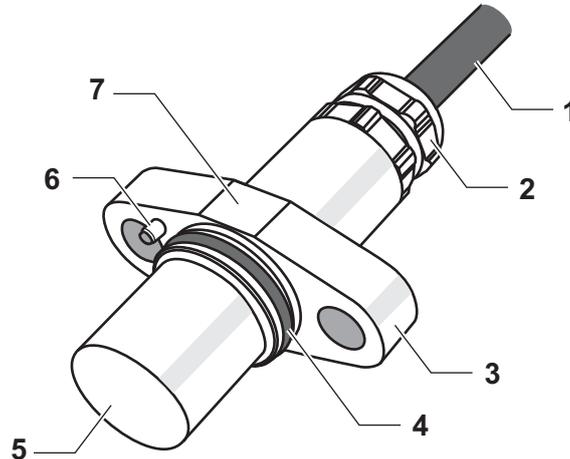
- ▶ The speed sensor is part of a machine or machinery; include the voltage equalisation for the sensor in the overall shielding concept.
- ▶ Lay signal and control lines separately from the power cables. If this is not possible, use pairs of twisted and shielded wires and/or lay the encoder line in an iron pipe.
- ▶ Make sure that surge protective measures have been carried out externally (EN 61000-4-5).

4 Description

Task

The speed sensor is intended for measuring the speed of rotary movements without making contact.

Parts



- 1 Connector Cable
- 2 Screwed cable gland
- 3 Flange
- 4 Sealing ring
- 5 Measuring surface (here: with protective cap removed)
- 6 Index pin
- 7 Visible surface

Function

The speed sensor is attached to the corresponding mounting device with the flange (3). The sealing ring (4) seals the mounting device. The speed sensor is equipped with an index pin (6), which determines the mounting position of the speed sensor in the mounting device. The flange of speed sensor is flattened on one side, this so-called visible surface (7) facilitates the determination of the mounting position.

The integrated electronics are supplied with power by means of the connection cable (1). The screwed cable gland (2) attaches the connection cable to the speed sensor and seals the speed sensor.

The sensor system is located behind the measuring surface (5). The permanent magnetic field integrated in the speed sensor is changed by the rotating target wheel. The sensor system of the speed sensor records the change in the magnetic field and the integrated electronics transform these changes to one channel or dual channel square-wave signals. All signals are forwarded to the separate electronics via the connection cable.

The number of pulses corresponds precisely to the number of teeth on the target wheel.

The types 2475x- and 2475x**M** provide voltage output signals, type 2475x**I** provides current output signals.

Type 2475x**M**... also provides a fixed voltage for detecting standstill as soon as the frequency of the measuring signal drops below 1 Hz.

The power supply for the speed sensor, the evaluation of the pulses and the establishment of the control circuit requires separate electronics.

5 Mounting

The speed sensor is mounted in the following steps, which are described in the next paragraphs:

1. Checking the mounting device
2. Securing the speed sensor
3. Laying the cables
4. Connecting the speed sensor
5. Checking the function

5.1 Checking the mounting device

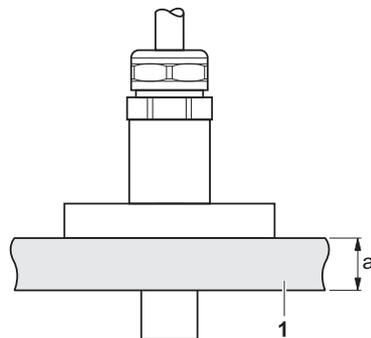
- i** The speed sensor is equipped with an index pin, which determines the mounting position of the speed sensor in the mounting device.

All necessary dimensions are shown in the scale and assembly drawing in section 10.2 and 10.3 (→ [page 27f](#)).

- Verify that all necessary bores in the mounting device have been carried out in accordance with the drilling plan (see [Assembly drawing](#) → [page 28](#)).

If minimal phase shift is requested, observe the tolerance instruction for the bore hole of the index pin indicated in the drilling plan.

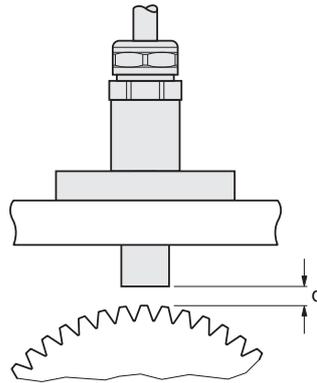
- For proper sealing of the speed sensor, verify that the wall thickness of the mounting device is at least 5 mm.



1 Mounting device

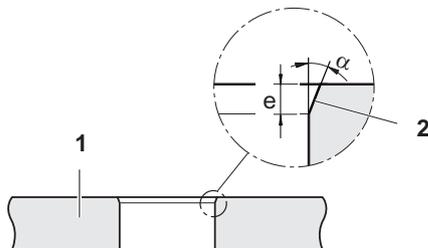
a Wall thickness

- For proper functioning, verify that the air gap between the measuring surface and the target wheel will be within the permissible range:



Module (m)	D.P.	Permissible air gap d for Signal pattern		
		D-, H-, S-, V-, X-, DI, VI	DL, HL	DM, VM
1.0	25.4	0.2 to 1.4 mm	0.2 to 0.9 mm	
1.5	16.9	0.2 to 1.8 mm	0.2 to 1.5 mm	
2.0	12.7	0.2 to 2.2 mm	0.2 to 2.0 mm	0.2 to 2.2 mm
2.5	10.2	0.2 to 2.8 mm	0.2 to 2.2 mm	
3.5	7.3	0.2 to 3.0 mm	0.2 to 2.8 mm	

- Bevel the bore for mounting in the mounting device to avoid damaging the sealing ring and to aid insertion of the sensor.



- 1 Mounting device
- 2 Beveling
 $e = 1.5 \text{ mm}$;
 $\alpha = 15^\circ$

5.2 Securing the speed sensor

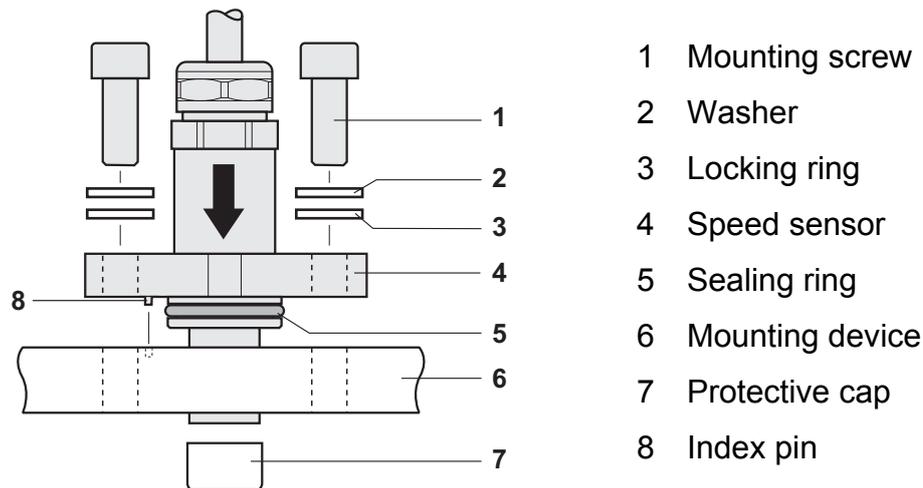
Required tools and supplies (not included in the scope of delivery):

- Torque wrench
- 2 mounting screws M8 x 20 EN 4762, washers and locking rings
- All-purpose grease
- Sealant for mounting screws if feed-through holes are used for mounting (recommended: Loctite 542).

NOTICE

Note the following to avoid damaging the speed sensor:

- Ensure that the measuring surface does not come in contact with other objects.
- 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.



- ▶ Grease the sealing ring.
- ▶ If feed-through holes are used for the mounting screws: Seal the screws with sealant.
- ▶ Remove the protective cap.
- ▶ Insert the speed sensor carefully into the mounting device so that the locating pin slides into the prepared bore hole.
- ▶ **NOTICE** Properly tighten the sensor to avoid damage or malfunction.
- ▶ Secure the speed sensor with 2 mounting screws, washers and locking rings.
- ▶ Tighten both screws with a maximum torque of 25 Nm.

5.3 Laying the cable

NOTICE

Note the minimum bend radius listed in the [Technical data](#) (→ page 24f) to avoid damaging the cable if bent too sharp.

- ▶ Lay the cable while taking the notes on electromagnetic compatibility into account (→ page 11).

6 Connection

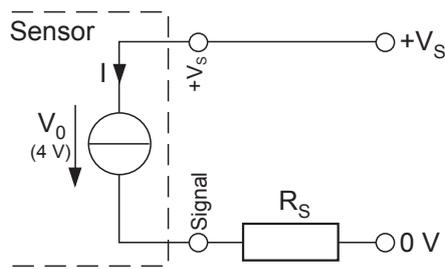
6.1 Connector assignment

The connection depends on the type of speed sensor:

Signal	Denotation of cores/wire colors for signal patterns and outputs						
	D-		H-		S-	V-	X-
Channel 1	ye		ye		ye	ye	ye
Channel 2		wh		wh	wh	wh	wh
Channel $\bar{1}$			bk				bk
Channel $\bar{2}$				br			br
GND (0 V)	bl	gr	bl	gr	bl	bl	bl
+V _S (10 ... 30 V DC)	rd	pi	rd	pi	rd	rd	rd
Cable/ screens	1 / 1		1 / 1		1 / 1	1 / 1	1 / 1
bk = black, bl =blue, br = brown, gn = green, gr = grey, or = orange, pi = pink, rd = red, vi = violet, wh = white, ye = yellow							

Signal										
	DI		VI	DL		HL		DM		VM
Channel 1	bl		bl	ye		ye		wh		bl
Channel 2		gn	gn		wh		wh		gn	wh
Channel $\bar{1}$						bk				
Channel $\bar{2}$							br			
GND (0 V)				bl	gr	bl	gr	bk	vi	gn
+V _S (10 ... 30 V DC)				rd	pi	rd	pi			
+V _S (10 ... 20 V DC)	rd	ye	rd					rd	or	or
Cable/ screens	1 / 1		1 / 1	1 / 1		1 / 1		2 / 2		1 / 1
bk = black, bl =blue, br = brown, gn = green, gr = grey, or = orange, pi = pink, rd = red, vi = violet, wh = white, ye = yellow										

Measuring resistor with current output



The measuring resistor R_L to be connected at the current output may not exceed a particular value. The following relationship exists:

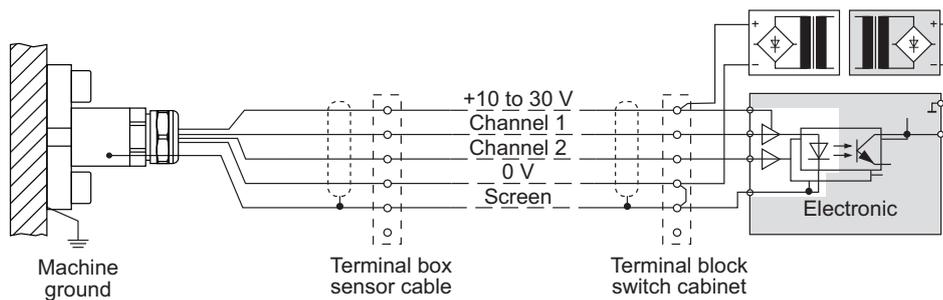
$$R_{L,max} = (V_S - 4 V) / I_{max} \quad \text{with } V_S = 10 \text{ to } 20 \text{ VDC and } I_{max} = 16 \text{ mA}$$

Example for $V_S = 15 \text{ V}$: $R_{L,max} = 11 \text{ V} / 16 \text{ mA} = 690 \Omega$

6.2 Examples of power supplies

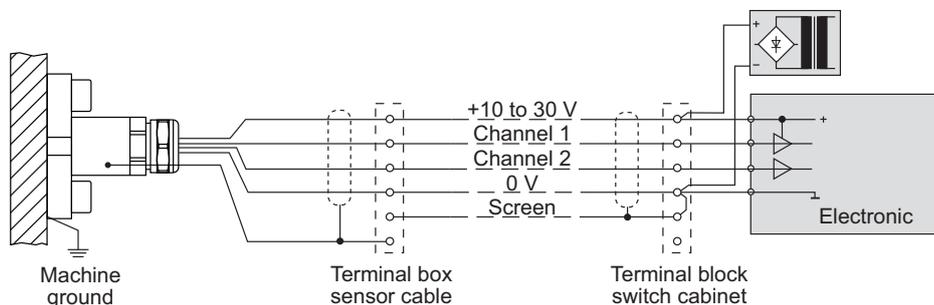
6.2.1 Speed sensor with voltage output (GEL 2475V-xxxL...)

1. The power supplies of the speed sensor, the evaluation electronics and the signal input are galvanically isolated



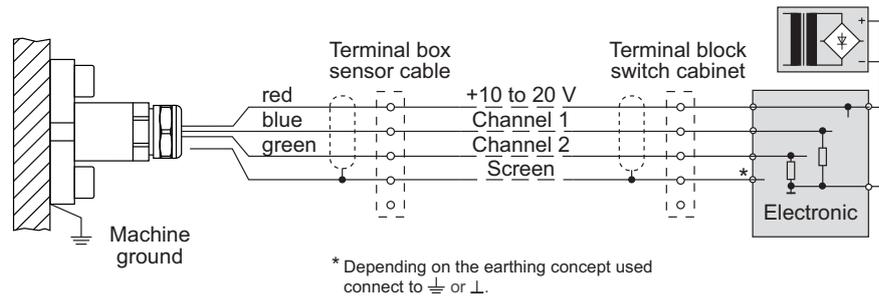
2. Shared power supply for the speed sensor and the evaluation electronics

The signal input is not galvanically isolated, and the shielding is not attached throughout.

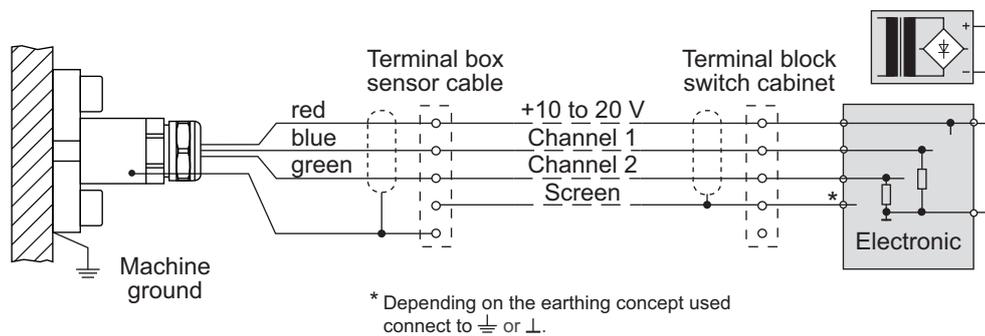


6.2.2 Speed sensor with current output (GEL 2475VI...)

1. The shielding is **not** connected to the sensor casing (GEL 2475VIxxxP...).



2. The shielding is connected to the sensor casing but the shielding is not attached throughout. (GEL 2475VIxxxL...).



6.3 Connecting and testing the speed sensor

- ▶ Check that all cables have been laid correctly.
- ▶ Connect the speed sensor in accordance with the connection assignment shown in section 6.1 (→ page 18).
- ▶ Connect a suitable measuring instrument, for example an oscilloscope.
- ▶ Turn the measuring wheel slowly and observe the output signal on the measuring device.

If the speed sensor is working correctly, you will see a perfect square-wave signal as shown in the diagrams in section 10.4 (→ page 29).

7 Removal and Disposal

7.1 Removing the sensor

NOTICE

If the sensor is to be removed for any reason, i.e. relocation of equipment:

- Ensure that the measuring surface does not come in contact with other objects.
 - 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 speed sensor.
 - ▶ Release the sensor cable.
 - ▶ Loosen and remove the two mounting screws that fix the sensor in the mounting device.
 - ▶ Remove the sensor
 - ▶ If the sensor is still to be used: Attach the protective cap to the sensor.
- i** If the original protective cap is no longer available, make sure that comparable protection is provided for the measuring surface.

7.2 Disposal

- ▶ Faulty speed sensors should be disposed of in accordance with regional regulations for electrical and electronic devices.

8 Maintenance

The speed sensor contains no moving parts and is therefore largely maintenance-free.

When?	What?
Speed sensor faulty	▶ Replace the speed sensor.
Regularly	▶ Check the speed sensor for damage. ▶ Clean the speed sensor (see below).
As necessary	▶ Change the connector (not included in the delivery scope). Remember that you need to shorten the connection cable.

Cleaning the speed sensor

NOTICE

To avoid damaging the speed sensor:

- Never use a high-pressure cleaner.
 - Avoid allowing water, dirt or other substances to enter the open parts when the connector has been detached.
- ▶ Clean the speed sensor with water or a non-corrosive commercial cleaning agent.

9 Faults

Fault	Possible causes	Remedy
Output signal is non-existent	Electrical connection faulty	<ul style="list-style-type: none"> ▶ Check that all electrical connections between the speed sensor and the power supply and evaluation electronics are correct and that the contacts are secure and dry.
	Wrong air gap between measuring surface and measuring wheel	<ul style="list-style-type: none"> ▶ Check that the required value is met in all (climatic) conditions, valid for one full rotation of the wheel. ▶ Use a torque wrench to check that the mounting screws on the sensor flange are tightened with a torque of 25 Nm.
	Measuring surface and measuring wheel damaged	<ul style="list-style-type: none"> ▶ Replace the damaged component. ▶ Determine the cause of the damage and remedy it.
	Assignment of pulse and direction interchanged. (for signal pattern S only)	<ul style="list-style-type: none"> ▶ Check the connections of pulse and direction and interchange them if necessary.
Counting direction is not correct (for signal patterns V, X, D, H)	Assignment of channels interchanged	<ul style="list-style-type: none"> ▶ Check the connections of channel signals and interchange them if necessary.
	Mounting position of the sensor does not correspond with the sense of rotation of the target wheel.	<ul style="list-style-type: none"> ▶ Check that the mounting position of the sensors (index pin) and the sense of rotation of the target wheel correspond with the assembly drawing (→ page 28). Otherwise, remove the sensor and complete boring in accordance with the assembly drawing.

10 Appendix

10.1 Technical data

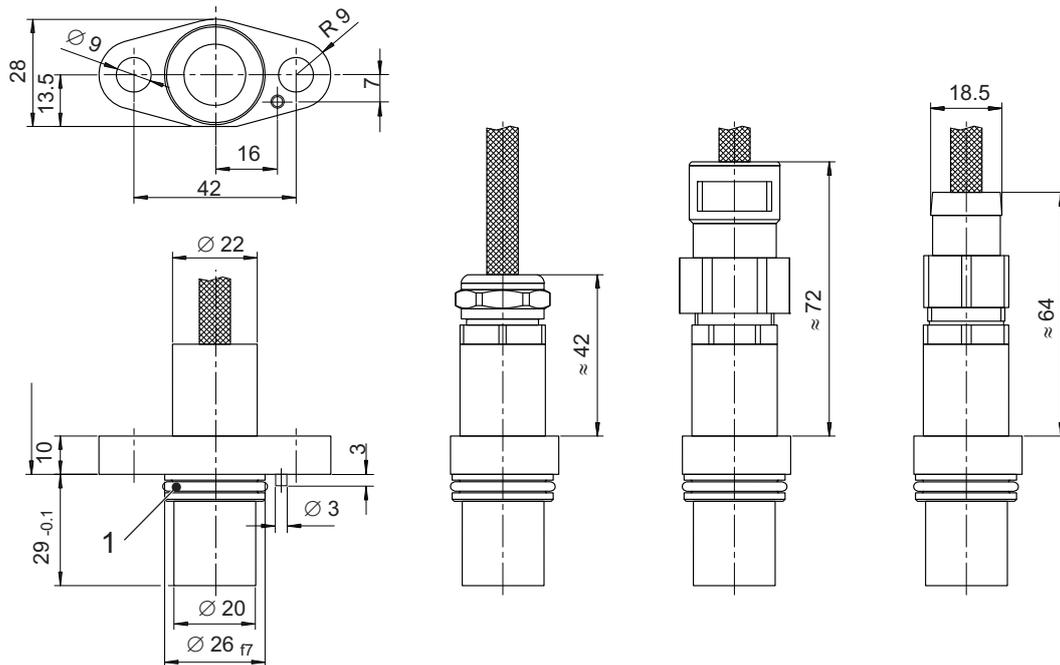
Electrical Data	
Supply voltage V_S <ul style="list-style-type: none"> • D-, H-, S-, V-, X- • DI, VI • DL, HL • DM, VM 	reverse battery protected 10 to 30 V DC 10 to 20 V DC 10 to 30 V DC 10 to 20 V DC
Current consumption per channel I_S (no load) <ul style="list-style-type: none"> • D-, H- • S-, V-, X- • DI, VI, DL, HL, DM, VM 	< 30 mA ≤ 30 mA < 12 mA
Output signal (short circuit-proof)	Square-wave signals
Output signal level high ⁽¹⁾ <ul style="list-style-type: none"> • D-, H-, DL, HL • S-, V-, X- • DI, VI • DM, VM 	$\geq V_S - 1.8$ V $\geq V_S - 1.0$ V ≥ 14 mA $\geq V_S - 1.8$ V
Output signal level low ⁽¹⁾ <ul style="list-style-type: none"> • D-, H-, DL, HL • S-, V-, X- • DI, VI • DM, VM 	≤ 1.5 V ≤ 1.0 V typ. 7 mA ≤ 1.5 V
Output current per channel <ul style="list-style-type: none"> • D-, H-, S-, V-, X- • DI, VI • DL, HL • DM, VM 	≤ 20 mA ≤ 16 mA ≤ 10 mA ≤ 15 mA
Input frequency at target wheel <ul style="list-style-type: none"> • D-, H-, S-, V-, X-, DI, VI • DL, HL • DM, VM 	0 to 25 kHz 0.004 to 20 kHz 0.001 to 8kHz
Output frequency <ul style="list-style-type: none"> • D-, H-, S-, V-, X-, DI, VI • DL, HL • DM, VM 	0 to 25 kHz 0.004 to 20 kHz 0.001 to 8kHz
Duty cycle (depends on measuring scale and air gap) <ul style="list-style-type: none"> • D-, H-, S-, V-, X-, DI, VI • DL, HL, DM, VM 	50% \pm 5% 50% \pm 10%

⁽¹⁾ Output signal level depends on output current and temperature

Electrical Data	
Phase shift • D-, H- • S- • V-, X-, DI, VI, DL, HL, DM, VM	typ. 90° – typ. 90°
Slew rate (2 m cable) • D-, H-, S-, V-, X- • DI, VI • DL, HL, DM, VM	$\geq 10 \text{ V} / \mu\text{s}$ $\geq 6 \text{ V} / \mu\text{s}; R_B = 560 \Omega$ $\geq 4 \text{ V} / \mu\text{s}$
Electromagnetic compatibility	Rail vehicles (EN 50121-3-2) Industrial applications (EN 61000-6-1 to 4)
Isolation strength	500 V AC (EN 60439–1)
Mechanical Data	
Module m of target wheel • D-, H-, S-, V-, X-, DI, VI, DL, HL • DM, VM	1.00 / 1.25 / 1.50 / 1.75 / 2.00 / 2.25 / 2.50 / 3.50 2.0
Permissible air gap (for module m)	
m = 1.00 (D.P. = 25.4) • D-, H-, S-, V-, X-, DI, VI • DL, HL • DM, VM	0.2 to 1.4 mm 0.2 to 0.9 mm –
m = 1.50 (D.P. = 16.93) • D-, H-, S-, V-, X-, DI, VI • DL, HL • DM, VM	0.2 to 1.8 mm 0.2 to 1.5 mm –
m = 2.00 (D.P. = 12.7) • D-, H-, S-, V-, X-, DI, VI • DL, HL • DM, VM	0.2 to 2.2 mm 0.2 to 2.0 mm 0.2 to 2.2 mm
m = 2.50 (D.P. = 10.16) • D-, H-, S-, V-, X-, DI, VI • DL, HL • DM, VM	0.2 to 2.8 mm 0.2 to 2.2 mm –
m = 3.50 (D.P. = 7.3) • D-, H-, S-, V-, X-, DI, VI • DL, HL • DM, VM	0.2 to 3.0 mm 0.2 to 2.5 mm –
Width of target wheel	$\geq 10 \text{ mm}$ (smaller ones upon request)
Form of target wheel	Involute gear as per DIN 867, rectangular gear 1:1 or slotted disk (on request)
Material of target wheel	Ferromagnetic steel

Mechanical Data	
Operating and ambient temperature • D-, H-, S-, V-, X-, DI, VI, DL, HL • DM, VM	-40 °C to +120 °C -40 °C to +85 °C
Storage temperature	-40 °C to +120 °C
Protection class	IP 68
Vibration resistance	EN 61373 Cat. 3
Shock resistance	EN 61373 Cat. 3
Type test	EN 50155
Housing material of sensor	Stainless steel
Weight of sensor (2 m cable)	650 g
Electrical connection	
Cable	Cable halogen free and screened (specification on request), cable outlet straight or on the side
Cable length	≤ 100 m
Cable diameter • D-, H- • S-, V-, X- • DI, VI • DL, HL • DM • VM	8.0 mm 8.2 mm 8.3 mm 8.0 mm 6.3 mm 7.1 mm
Cable cross section • D-, H- • S-, V-, X- • DI, VI • DL, HL • DM • VM	12 x 0.34 mm ² 6 x 1.0 mm ² 4 x 1.0 mm ² 12 x 0.34 mm ² 2 x 3 x 0.5 mm ² 4 x 0.5 mm ²
Cable type • D-, H- • S-, V-, X- • DI, VI • DL, HL • DM • VM	LK1076 LK1069 LK10741 LK1076 LK1083/LK1084 LK1081
Bending radius static / dynamic • D-, H-, S-, V-, X- • DI, VI • DL, HL • DM • VM	24 mm / 41 mm 25 mm / 42 mm 24 mm / 41 mm 19 mm / 32 mm 21 mm / 36 mm

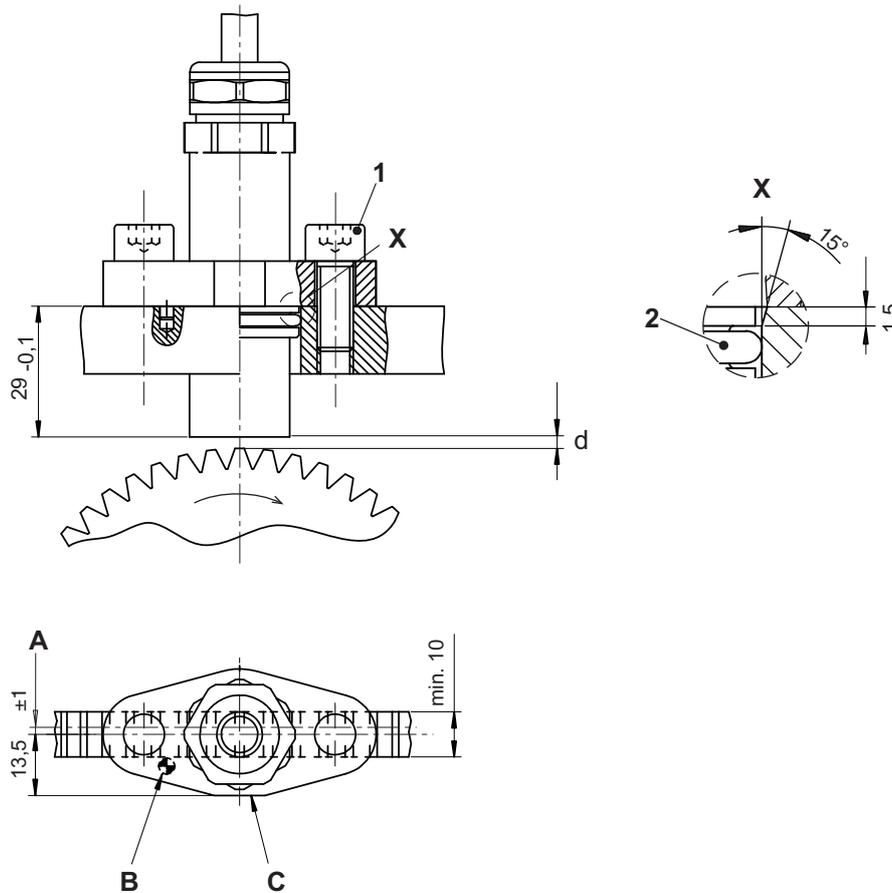
10.2 Scale drawing



all dimensions stated in mm (\approx approximate dimension) general tolerance DIN ISO 2768 medium

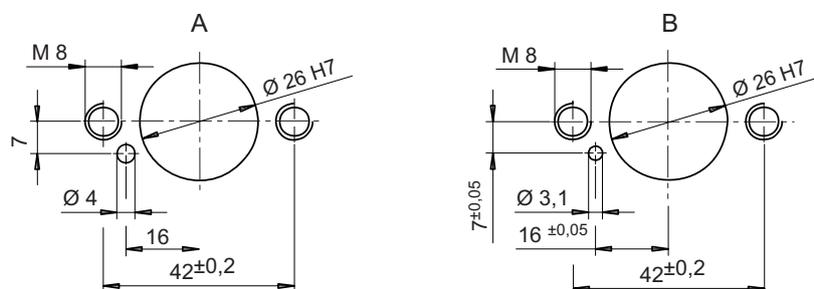
- A Screwed cable gland M20 x 1.5
- B Flexible conduit connection with nominal width of 12 mm
- C Hose connector piece with nominal width of 18 mm
- I Cable length
- 1 Sealing ring 21 x 2.5 mm, NBR

10.3 Assembly drawing



- | | | | |
|---|------------------------|---|--|
| A | Axial offset | 1 | Mounting screw
(recommended: M8 x 20 EN 4762) |
| B | Location pin | 2 | Sealing ring 21 x 2.5 mm, NBR |
| X | Beveled insertion edge | d | Permissible air gap (see table → page 16) |

Drilling plan (top view)

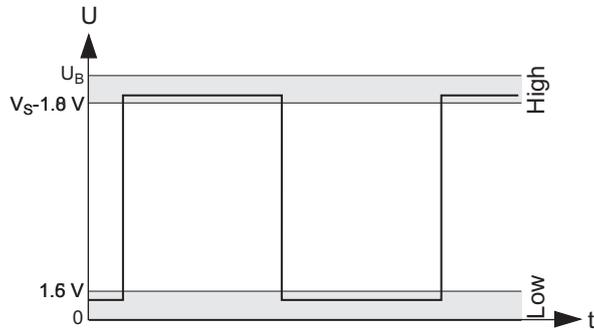


- A Drilling plan (standard mounting)
 B Drilling plan for min. phase shift

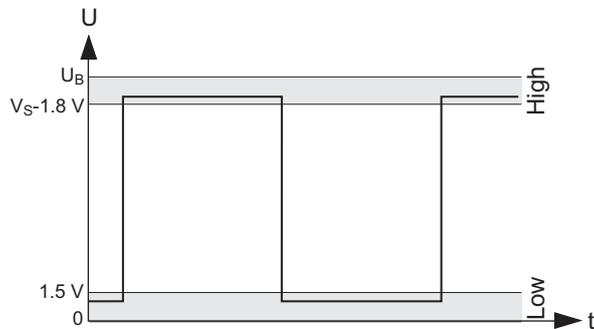
10.4 Output signals

10.4.1 Signal level

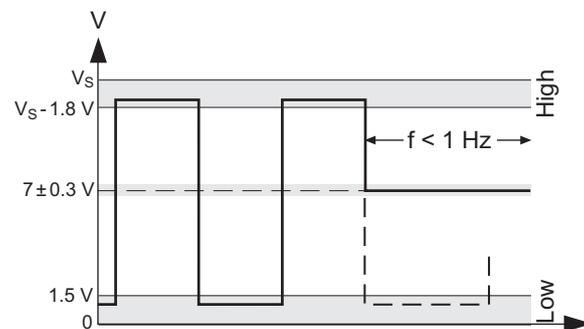
Signal level at voltage output (signal pattern S-, V-, X-)



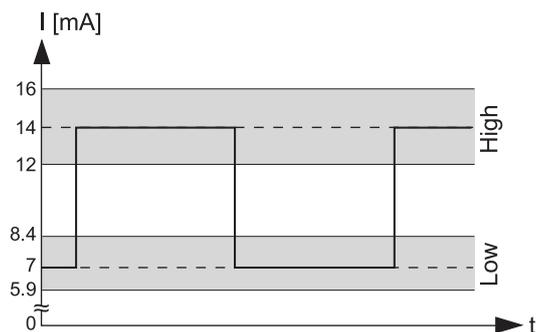
Signal level at voltage output (signal pattern D-, H-, DL, HL)



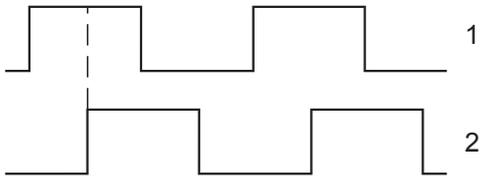
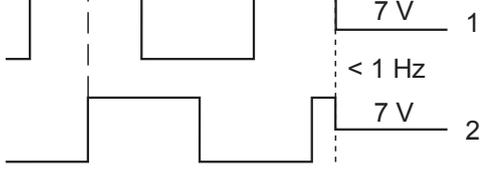
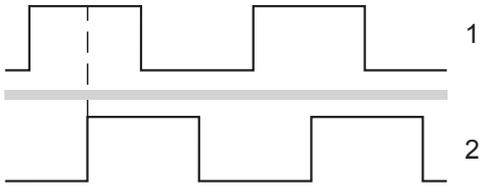
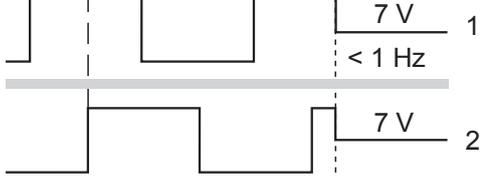
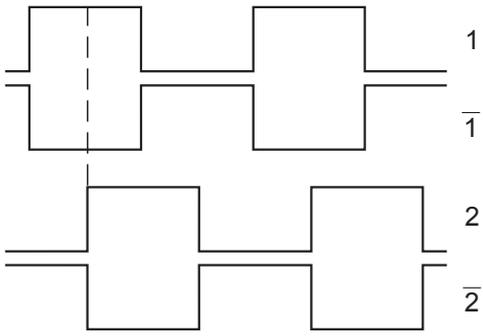
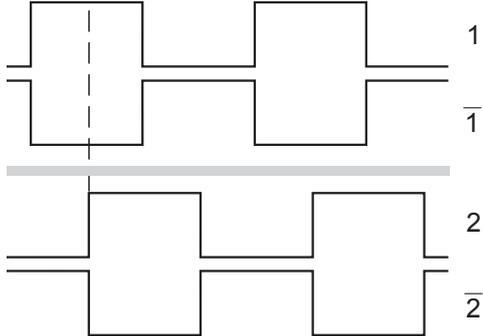
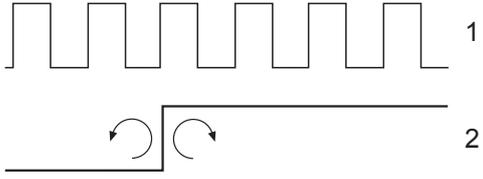
Signal level at voltage output (signal pattern DM, VM)



Signal level at current output (signal pattern DI, VI)



10.4.2 Signal pattern

<p>V- (V_S: 10 ... 30 V DC) VI (V_S: 10 ... 20 V DC)</p> 	<p>VM (V_S: 10 ... 20 V DC)</p> 
<p>D-;DL (V_S: 2x 10 ... 30 V DC) DI (V_S: 2x 10 ... 20 V DC)</p> 	<p>DM (V_S: 2x 10 ... 20 V DC)</p> 
<p>X- (V_S: 10 ... 30 V DC)</p> 	<p>H-;HL (V_S: 2x 10 ... 30 V DC)</p> 
<p>S- (V_S: 10 ... 30 V DC)</p> 	<p>Description</p> <ul style="list-style-type: none"> x- = voltage output xl = current output xL = voltage output (with reduced current consumption) xM = voltage output (standstill monitoring voltage) 1, 2 = channel 1, channel 2 1̄, 2̄ = inverse channels ■ = galvanically separated V_S = supply voltage

10.5 Manufacturer's declaration

The manufacturer's declaration in accordance with EMC directive 2004/108/EG can be found on the Internet at www.lenord.de.

