Made in Germany

www.lenord.com



Technical Information

GEL 2478

Incremental bearing-free rotary encoder

1-/2-channel Hall effect rotational speed and position sensor with ATEX certification

D-51T-2478EX | Date of issue2026-09-14

LENORD +BAUER

Finding solutions.
Founding trust.

Motion sensors and integrated drive technology

General

- Maintenance and wear-free rotational speed and position sensor using magnetic scanning
- Scanning of measuring scale (for example, ferromagnetic target wheels or piston rods)
- Reliable detection of high speeds to creeping (0 Hz to 20 kHz)
- Robust and compact stainless steel housing for use in harsh and confined applications

ATEX certification for use in potentially explosive atmospheres

II 2G Ex ib IIB T4 Gb BVS 07 ATEX E 030
IECEx BVS 15.0034

Properties

- ATEX certification for use in potentially explosive atmospheres
- Incremental measuring 1-/2-channel speed sensor based on the magnetic sensing principle
- Contactless measurement of rotary or linear movements
- Extremely robust stainless steel housing with a sensor tube diameter of 22 mm
- Target wheel with module 1.0 to 3.5 or measuring rod with 4.0 mm pitch as measuring scale
- High EMC immunity for interference-free signal transmission in challenging industrial environments
- Highest product quality with optional certification according to DNV and many other standards

Advantages

- Optimized lifecycle cost
- Maintenance and wear-free
- ATEX approval
- Compact and extremely robust design
- Simple integration
- Easy to assemble
- High signal quality
- Suitable for safety applications

Field of application

- Rotational speed measurement at gears, gear wheels and rollers
- Position measurement at piston rod
- Rotational speed and position detection in potentially explosive atmospheres

Do you have specific requirements regarding the flange shape, tube length, number of channels, cable protection, cable outlet, connector assembly, or the EMC design? Please contact us. Our experts can create the optimal solution for your application from an extensive modular system and will be happy to advise you on the most cost-effective custom adaptation.

support@lenord.de or +49(0)208 9963-215



Target wheels are available separately



Measuring rods are available separately

Technical data

Electrical data	
Supply voltage U_B (reverse polarity protected)	10 to 28 V DC with ATEX 10 to 30 V DC without ATEX
Current consumption I_B (without load)	≤45 mA
Output signal (short-circuit-proof)	Square-wave signals
Output signal level High(1)	≥ U_B - 1.8 V
Output signal level Low(1)	≤ 0.5 V
Output current per channel	≤ 10 mA
Frequency range	0 to 20 kHz
Duty cycle	50 % ± 10 %(2)
Phase offset	typ. 90°
Slew rate (2 m cable)	≥ 10 V/µs
Electromagnetic compatibility	Rail vehicles (EN 50121-3-2) Industrial applications (EN 61000-6-1 to 6-4)
Dielectric strength	500 V AC (EN 61439-1)
Mechanical data	
Module m target wheel	1.00 to 3.50
Permissible air gap (for Module m / Pitch p)	See air gap table
Target wheel width	≥ 10 mm (smaller upon request)
Target wheel tooth form	Involute gear teeth as per DIN 867, square gear teeth 1:1 or slotted disk (upon request)
Target wheel material	Ferromagnetic steel
Working and operating temperature	-40 °C to +85 °C with ATEX -40 °C to +120 °C without ATEX
Storage temperature	-40 °C to +120 °C
Degree of protection(3)	IP 68
Vibration resistance	50 m/s² (EN 60068-2-6)
Shock resistance	100 m/s² (EN 60068-2-27)
Housing material sensor	Stainless steel (1.4305)
Weight sensor (2 m cable, without mating connector)	approx. 500 g
Resistance	< 5 bar (sensor tube completely closed up to the flange)

(1) depending on output current and temperature
(2) applies to operation with nominal air gap and toothing as per DIN 867
(3) Degree of protection on the cable outlet side depends on cable gland or cable protection

Electrical connection	
Connection	PUR or silicone cable, screen connected to the housing on the encoder side
Maximum cable length	≤ 100 m
Cable LK10691	
Cable material(1)	PUR sheath, halogen-free and screened
Cable diameter	8.1 ± 0.3 mm
Cable cross section	6 × 1.0 mm²
Bending radius static/dynamic	24 mm/41 mm
Cable LK10581	
Cable material(1)	Silicone sheath, halogen-free and screened
Cable diameter	9.2 ± 0.4 mm
Cable cross section	6 × 0.75 mm²
Bending radius static/dynamic	69 mm/138 mm

(1) Specification upon request

Pin Assignment, Dimensional Drawing

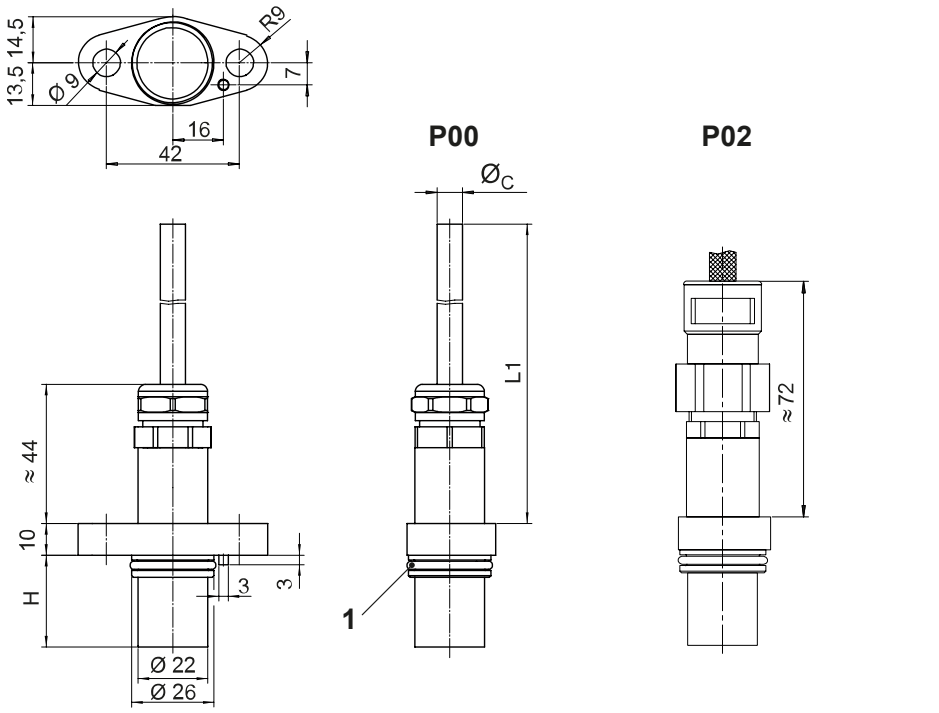
Pin Assignment

Signal Pattern		E-	F-	V-	X-
Function		PUR Cable / Silicone Cable			
Track 1	1	yellow / 6	yellow / 6	yellow / 6	yellow / 6
Track 2	2			white / 3	white / 3
Track 1 inverted	$\overline{1}$		black / 5		black / 5
Track 2 inverted	$\overline{2}$				brown / 2
GND (0 V)		blue / 4	blue / 4	blue / 4	blue / 4
+ U_B *		red / 1	red / 1	red / 1	red / 1

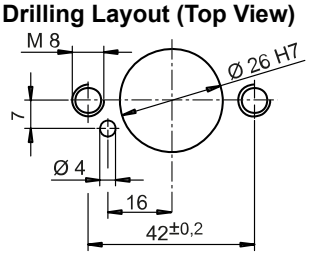
* + U_B = 10 ... 28 V DC with EX certification
+ U_B = 10 ... 30 V DC without EX certification

Dimensional Drawing

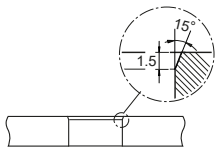
All dimensions in mm; general tolerance DIN ISO 2768 mK



Drilling Layout (Top View)



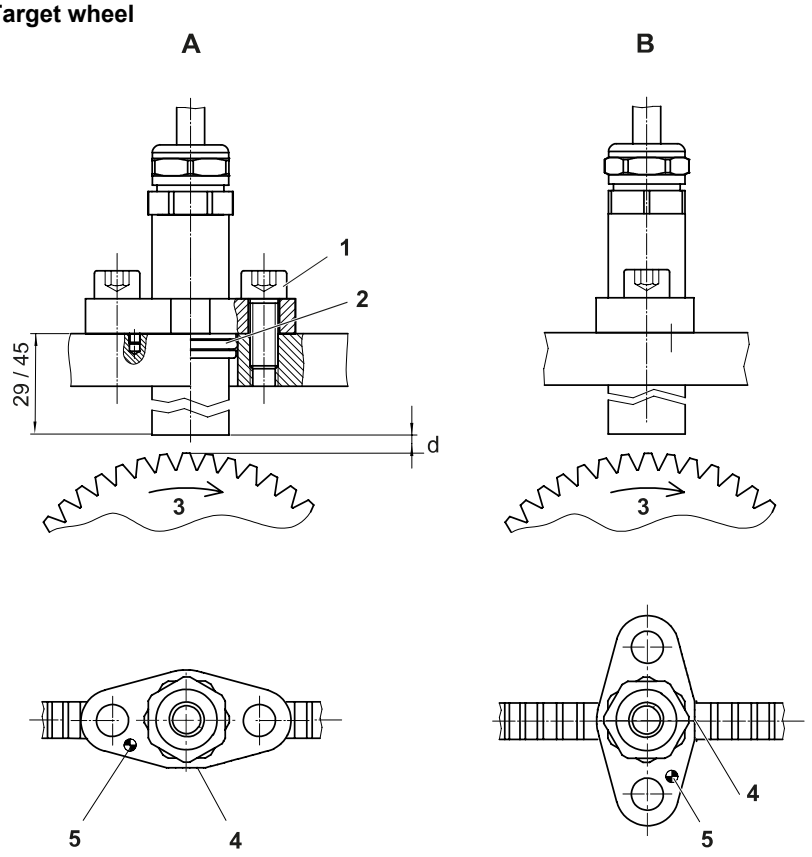
Provide a chamfer



1	O-ring, 21 x 2.5 mm, NBR
P00	Without cable protection (according to Type Code)
P02	Corrugated tube NW12 (as per Type Code)
L1	Cable length
H	Sensor tube length (according to Type Code): **K** = 29–$0_{.1}$ mm **L** = 45–$0_{.1}$ mm
$Ø_C$	Cable diameter depending on cable type: **S** = silicone 9.2 ± 0.4 mm **N** = PUR 8.1 ± 0.3 mm

Installation Diagram

Target wheel

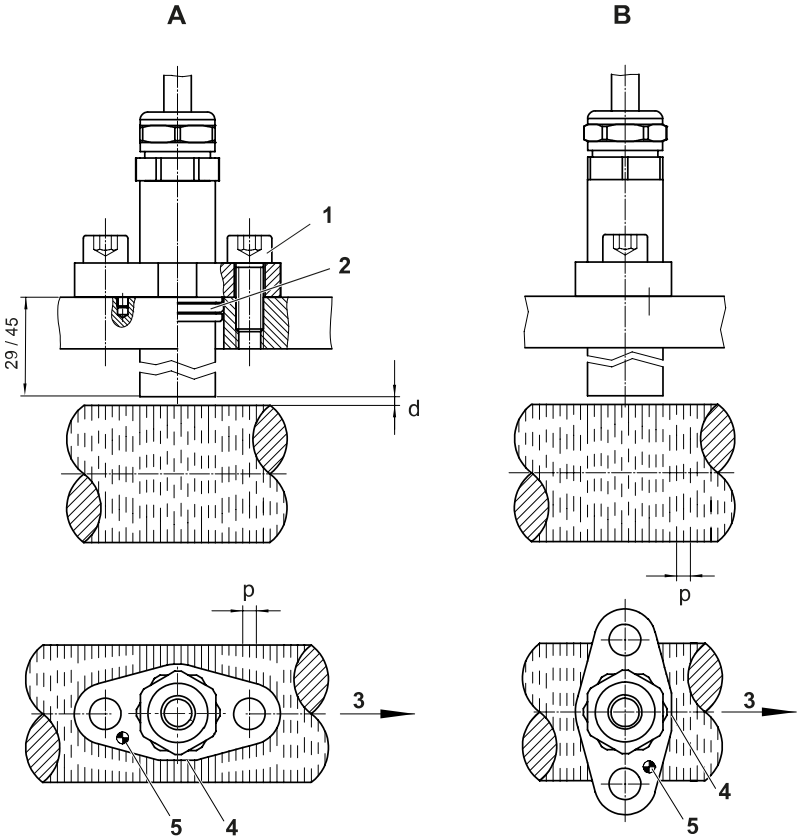


A Installation position 0°
B Installation position 90°
d Permissible air gap (see air gap table)
p Pitch (p = 4 mm)
1 Mounting screw (recommended: M8 x 20, EN ISO 4762)
3 Forward rotation direction
4 Visible surface
5 Index pin

Air Gap Table – Target wheel

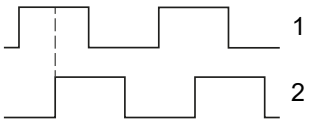
Module m	Permissible air gap d
1.0	0.2 … 1.4 mm
1.5	0.2 … 1.8 mm
2.0	0.2 … 2.2 mm
2.5	0.2 … 2.8 mm
3.5	0.2 … 3.0 mm

Measuring rod

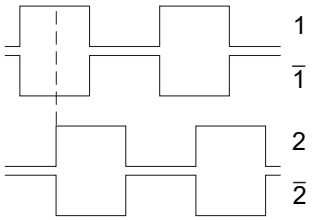


Signal for forward rotation

Signal Pattern V



Signal Pattern X



Air Gap Table – Rack

Pitch p	Permissible air gap d
4.0	0.2 … 1.0 mm

Safety Description

Operation in a Potentially Explosive Area

The following must be observed when operating the ATEX-certified sensor GEL 2478EX in a potentially explosive atmosphere:

The maximum electrical and mechanical limits specified in the Technical Data must not be exceeded. **The safety specifications** listed below apply to the GEL 2478 sensor.

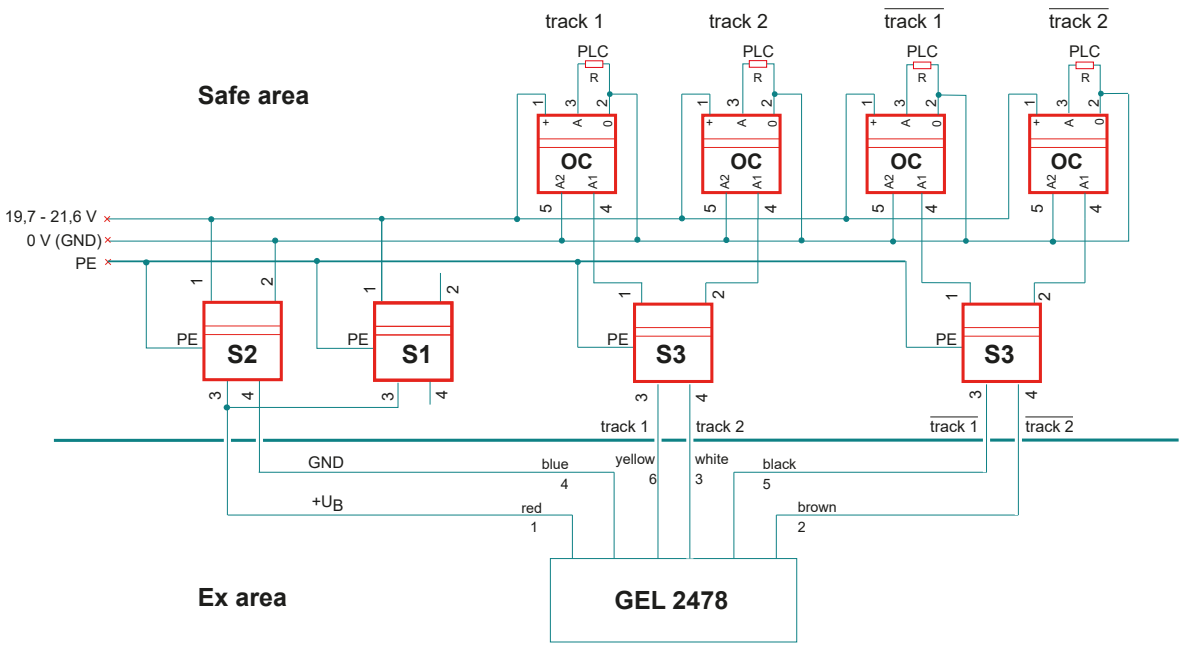
The sensor may only be operated within the specified working temperature range of -40°C to +85°C. The maximum cable length from the power supply input to the GEL 2478 sensor, as well as from the sensor to the external evaluation unit, must not be exceeded. The connection and installation of the safety barriers must only be performed by certified personnel authorized to install explosion-hazard-relevant assemblies. The cables and housing of the GEL 2478 sensor must not be damaged. If these components are damaged, installation is not permitted.

Safety Technical Parameters	
Type of protection	II 2G Ex ib IIB T4 Gb
IECEx Certificate	IECEx BVS 15.0034
ATEX Test Number	BVS 07 ATEX E 030
Voltage U_i	≤ 28 V
Current I_i	≤ 250 mA
Power P_i	≤ 1000 mW
Internal inductance L_i	0 mH
Internal capacitance C_i	450 nF
Cable characteristics	
Inductance per 100 m of cable length L_C	0.018 mH / 100 m
Capacitance / 100 m cable length C_C	18 nF / 100 m

Example of a Safety Circuit

A possible safety circuit for the GEL 2478 sensor using safety barriers is shown below as an example. The safety barriers and optocouplers are not included with the GEL 2478 sensor.

Wiring diagram for safety barriers and optocouplers



OC optocouplers: 4 × solid-state relay terminal block DEK-OE-5DC/24DC/100KHZ - 2964270 (Manufacturer: PHOENIX CONTACT Deutschland GmbH, Blomberg)
S1 Safety barrier for sensor power supply: 9002/13–280–093–001 (Manufacturer: R. Stahl AG, Waldenberg, Germany)
S2 Safety barrier for sensor power supply: 9002/13–280–110–001 (Manufacturer: R. Stahl AG, Waldenberg, Germany)
S3 Safety barrier for output signals: 2 × 9002/11–120–024–001 (Manufacturer: R. Stahl AG, Waldenberg, Germany)

A safety barrier with a resistance of 160 Ω is required to limit the supply voltage of the GEL 2478 Speed Sensor. Since this is not available, two safety barriers, S1 and S2, are connected in parallel. The safety barriers limit the current flowing into the Ex circuit to a maximum of 119 mA and the voltage to a maximum of 28 V.

The output signals of the GEL 2478 sensor are connected to the safety barriers S3. These barriers limit the current to 12 mA and the voltage to a maximum of 12 V in the event of a fault. The output signals from the safety barriers S3 are each routed to an optocoupler. The optocouplers are used to convert the output signal back to a signal level that can be evaluated by the PLC.

Technical Data of the Safety Barriers

No.	Associated equipment		Manufacturer	U_o [V]	I_o [mA]	P_o [mW]	L_o [mH]	C_o [nF]	ExGroup
	Designation	Type							
S1	Safety barrier	9002/13-280-093-001	R. Stahl AG	28	93	651	13	636	IIB
S2	Safety barrier	9002/13-280-110-001	R. Stahl AG	28	110	770	9	635	IIB
S3	Safety barrier	9002/11-120-024-001	R. Stahl AG	12	24	70	230	7100	IIB

Type Test Certificate

3. Addendum to the Type Test Certificate (Page 1 of 3)

1 **EU-Baumusterprüfbescheinigung Nachtrag 3**

Umstellung auf die Richtlinie 2014/34/EU

2 **Geräte zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen Richtlinie 2014/34/EU**

3 Nr. der EU-Baumusterprüfbescheinigung: **BVS 07 ATEX E 030**

4 Produkt: **Impulsgeber Typ GEL 2478*Z*********

5 Hersteller: **Lenord, Bauer & Co. GmbH**

6 Anschrift: **Dohlenstraße 32, 46145 Oberhausen, Deutschland**

7 Dieser Nachtrag erweitert die EG-Baumusterprüfbescheinigung Nr. BVS 07 ATEX E 030 um Produkte, die gemäß der Spezifikation in der Anlage der Bescheinigung festgelegt, entwickelt und konstruiert wurden. Die Ergänzungen sind in der Anlage zu diesem Zertifikat und in der zugehörigen Dokumentation festgelegt.

8 Die Zertifizierungsstelle der DEKRA Testing and Certification GmbH, benannte Stelle Nr. 0158 gemäß Artikel 17 der Richtlinie 2014/34/EU des Europäischen Parlaments und des Rates vom 26. Februar 2014, bescheinigt, dass das Produkt die wesentlichen Gesundheits- und Sicherheitsanforderungen für die Konzeption und den Bau von Produkten zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie erfüllt.
Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfprotokoll BVS PP 07.2021 EU niedergelegt.

9 Die wesentlichen Gesundheits- und Sicherheitsanforderungen werden erfüllt unter Berücksichtigung von:

EN IEC 60079-0:2018	**Allgemeine Anforderungen**
EN 60079-11:2012	**Eigensicherheit „i“**

10 Falls das Zeichen „X“ hinter der Bescheinigungsnummer steht, wird in der Anlage zu dieser Bescheinigung auf besondere Bedingungen für die sichere Anwendung des Produktes hingewiesen.

11 Diese EU-Baumusterprüfbescheinigung bezieht sich nur auf den Entwurf und Bau der beschriebenen Produkte.
Für den Herstellungsprozess und die Abgabe der Produkte sind weitere Anforderungen der Richtlinie zu erfüllen, die nicht durch diese Bescheinigung abgedeckt sind.

12 Die Kennzeichnung des Produktes muss die folgenden Angaben enthalten:

II 2G Ex ib IIB T4 Gb

DEKRA Testing and Certification GmbH
Bochum, 13.10.2021

Geschäftsführer

Dieses Zertifikat darf nur vollständig und unverändert weiterverbreitet werden.

DEKRA Testing and Certification GmbH, Handwerkstraße 15, 70565 Stuttgart
Zertifizierungsstelle: Dinnendahlstraße 9, 44809 Bochum
Telefon +49.234.3696-400, Fax +49.234.3696-401, DTC-Certification-body@dekra.com

Addendum to the Type Test Certificate (Page 2 of 3)

13 **Anlage zur**

14 **EU-Baumusterprüfbescheinigung**

BVS 07 ATEX E 030
Nachtrag 3

15 **Beschreibung des Produktes**

15.1 **Gegenstand und Typ**

Impulsgeber Typ GEL 2478*Z*********

Anstelle der *** werden in der vollständigen Benennung Buchstaben und Ziffern eingefügt, die unterschiedliche Varianten (Signalmuster, Sensorrohrlänge, Einbaulage, Kabellänge) kennzeichnen; diese Variationen haben keinen Einfluss auf den Explosionsschutz.

15.2 **Beschreibung**

Mit diesem Nachtrag wird das Zertifikat auf die Richtlinie 2014/34/EU umgestellt.
(Erläuterung: Gemäß Artikel 41 der Richtlinie 2014/34/EU kann auf EG-Baumusterprüfbescheinigungen für Richtlinie 94/9/EG, die vor dem Stichtag für die Richtlinie 2014/34/EU (20.04.2016) ausgestellt wurden, so verwiesen werden, als ob diese gemäß Richtlinie 2014/34/EU ausgestellt wurden. Nachträge und neue Ausfertigungen dieser Bescheinigungen können die Originalnummern der Bescheinigungen, die vor dem 20.04.2016 vergeben wurden, beibehalten.)

Grund des Nachtrags

- Umstellung auf die Richtlinie 2014/34/EU
- Das Gerät wurde nach den aktuellen Normenfassungen geprüft.
- Eine alternative Vergussmasse kann verwendet werden.

Beschreibung des Produkts

Der Impulsgeber dient zur berührungslosen Messung von Rotations- und Linearbewegungen. Der Impulsgeber besteht aus einem Metallgehäuse, in dem die elektronische Schaltung vollständig vergossen untergebracht ist. Der elektrische Anschluss erfolgt über eine bis zu 100 m lange Anschlussleitung.

15.3 **Kenngrößen**

Spannung	U_i	DC 28	V
Stromstärke	I_i	250	mA
Leistung	P_i	1	W
Innere Kapazität	C_i	480	nF
Innere Induktivität	L_i	vernachlässigbar	
Umgebungstemperaturbereich	T_a	-40 °C bis +85 °C	

16 **Prüfprotokoll**

BVS PP 07.2021 EU, Stand 13.10.2021

Dieses Zertifikat darf nur vollständig und unverändert weiterverbreitet werden.

DEKRA Testing and Certification GmbH, Handwerkstraße 15, 70565 Stuttgart
Zertifizierungsstelle: Dinnendahlstraße 9, 44809 Bochum
Telefon +49.234.3696-400, Fax +49.234.3696-401, DTC-Certification-body@dekra.com

Addendum to the Type Test Certificate (Page 3 of 3)

17 **Besondere Bedingungen für die Verwendung**

Keine

18 **Wesentliche Gesundheits- und Sicherheitsanforderungen**

Die wesentlichen Gesundheits- und Sicherheitsanforderungen sind durch die unter Abschnitt 9 gelisteten Normen abgedeckt.

19 **Zeichnungen und Unterlagen**

Die Zeichnungen und Unterlagen sind in dem vertraulichen Prüfprotokoll gelistet.

DEKRA Testing and Certification GmbH, Handwerkstraße 15, 70565 Stuttgart
Zertifizierungsstelle: Dinnendahlstraße 9, 44809 Bochum
Telefon +49.234.3696-400, Fax +49.234.3696-401, DTC-Certification-body@dekra.com

IECEx Certificate

Issue No. 1 (Page 1 of 4)

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification System for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	**IECEx BVS 15.0034**	Page 1 of 4	Certificate history:
Status:	**Current**	Issue No: 1	Issue 0 (2015-04-22)
Date of Issue:	2021-10-22		
Applicant:	**Lenord, Bauer & Co. GmbH** Dohlenstraße 32 46145 Oberhausen **Germany**		
Equipment:	**Speed sensor type GEL 2478*Z***********		
Optional accessory:			
Type of Protection:	**Intrinsic Safety "i"**		
Marking:	Ex ib IIB T4 Gb		

Approved for issue on behalf of the IECEx Certification Body: **Dr Franz Eickhoff**

Position: **Lead Auditor and officially recognised expert**

Signature: (for printed version)

Date: 2021-10-22

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting www.iecex.com or use of this QR Code.

Certificate issued by:

DEKRA Testing and Certification GmbH
Certification Body
Dinnendahlstrasse 9
44809 Bochum
Germany

DEKRA
On the safe side.

Issue No. 1 (Page 2 of 4)

IECEx Certificate of Conformity

Certificate No.:	**IECEx BVS 15.0034**	Page 2 of 4
Date of issue:	2021-10-22	Issue No: 1

Manufacturer: **Lenord, Bauer & Co. GmbH**
Dohlenstraße 32
46145 Oberhausen
Germany

Additional manufacturing locations:

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements.This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended

STANDARDS :
The equipment and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards

IEC 60079-0:2017 Edition:7.0	Explosive atmospheres - Part 0: Equipment - General requirements
IEC 60079-11:2011 Edition:6.0	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"

This Certificate **does not** indicate compliance with safety and performance requirements other than those expressly included in the Standards listed above.

TEST & ASSESSMENT REPORTS:
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in:

Test Report:

DE/BVS/ExTR15.0030/01

Quality Assessment Report:

DE/BVS/QAR15.0004/05

Issue No. 1 (Page 3 of 4)

IECEx Certificate of Conformity

Certificate No.:	**IECEx BVS 15.0034**	Page 3 of 4	
Date of issue:	2021-10-22	Issue No: 1	

EQUIPMENT:
Equipment and systems covered by this Certificate are as follows:

General product information:

The Speed sensor Type GEL 2478*Z********* is used for contactless measurement of linear or rotational movements. The electrical circuit is completely encapsulated and mounted in a metal enclosure. The electrical connection is performed by using a cable with a length of up to 100 m.

Parameters

Voltage	U_i	DC	28	V
Current	I_i		250	mA
Power	P_i		1	W
Effective internal capacitance	C_i		480	nF
Effective internal inductance	L_i		negligible	
Ambient temperature range	T_a		-40 °C up to +85 °C	

SPECIFIC CONDITIONS OF USE: NO

Issue No. 1 (Page 4 of 4)

IECEx Certificate of Conformity

Certificate No.:	**IECEx BVS 15.0034**	Page 4 of 4
Date of issue:	2021-10-22	Issue No: 1

DETAILS OF CERTIFICATE CHANGES (for issues 1 and above)
- The equipment has been assessed in accordance with current standard versions.
- An alternative encapsulation can be used.

Type Code

2478	Product Type									
	Certification									
	NN No certification									
	EZ Ex certificate, protection type II 2G Ex ib IIB T4 Gb (ATEX and IECEx certified)									
		Signal Pattern								
		E- 1-channel square-wave signal								
		F- 1-channel square-wave signal with inverse signal								
		V- 2-channel square-wave signals with a 90° phase offset								
		X- 2-channel square-wave signals with a 90° phase offset and their inverse signals								
			Shield contact							
			SD directly attached							
				Module		**Module**				
				M01 m = 1.00, steel, involute		**M12** m = 1.00, steel, rectangular				
				M02 m = 1.25, steel, involute		**M13** m = 1.25, steel, rectangular				
				M03 m = 1.50, steel, involute		**M14** m = 1.50, steel, rectangular				
				M04 m = 1.75, steel, involute		**M15** m = 1.75, steel, rectangular				
				M05 m = 2.00, steel, involute		**M16** m = 2.00, steel, rectangular				
				M06 m = 2.25, steel, involute		**M17** m = 2.25, steel, rectangular				
				M07 m = 2.50, steel, involute		**M18** m = 2.50, steel, rectangular				
				M08 m = 2.75, steel, involute		**M19** m = 2.75, steel, rectangular				
				M09 m = 3.00, steel, involute		**M20** m = 3.00, steel, rectangular				
				M10 m = 3.25, steel, involute		**M21** m = 3.25, steel, rectangular				
				M11 m = 3.50, steel, involute		**M22** m = 3.50, steel, rectangular				
				P04 Measuring rod, 4 mm graduations						
					Sensor tube length					
					K 29 mm					
					L 45 mm					
						Installation position				
						A Standard mounting position 0°				
						B Installation position offset by 90°				
							Cable type			
							N 6 x 1 mm² PUR jacket			
							S 6 x 0.75 mm² silicone jacket			
								Cable outlet		
								P00 Without		
								P02 Corrugated tube NW12		
									Cable length L	
									L1 1000 mm	
									LX X=2: 2,000 mm, X=3: 3,000 mm ... X=7: 7,000 mm	
									L8 8,000 mm	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
2478	__	__	__	___	_	_	___	_	__	◄ **Product code**

A Y-number is assigned for customer-specific designs. Custom designs are manufactured according to drawings or application descriptions and may differ from the standard technical specifications.

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