Made in Germany

www.lenord.com



Technical Information

GEL 2460

Incremental Bearingless Rotary Encoders

1-/2-Channel Hall-Effect Speed Sensor with Screw-in Shread

D-51T-2460 | Status 2026-07-07

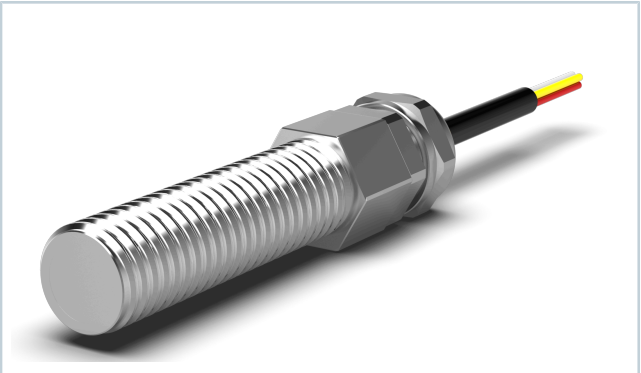
LENORD +BAUER

Finding solutions.
Founding trust.

Motion sensors and integrated drive technology

General Information

- Maintenance- and wear-free Speed Sensor based on magnetic sensing
- Detection of measurement elements (e.g., target wheels made of ferromagnetic materials)
- Reliable detection of high rotational speeds down to creeping movements (0 Hz…20 kHz)
- Highly reliable rotation direction detection and standstill detection at power-on
- Space-saving sensor with standard thread types



Features

- Incremental, differentially measuring 1-/2-channel threaded tube sensor based on the magnetic principle
- Robust stainless steel housing with various thread types and nominal lengths
- High EMC immunity for interference-free signal transmission in demanding industrial environments
- Configuration flexibility thanks to freely selectable cable exit, cable protection, and connector options
- Compliant with a wide range of standards and requirements for a variety of applications:
see „Technical Data - Environmental Testing“, page 12

Advantages

- Optimized lifecycle cost
- Maintenance-free and wear-resistant
- Space-saving and compact
- Standard sensors available on short notice
- Easy integration
- Easy to install
- High signal quality

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

Applications

Industry & Automation

Printing & Packaging Machines:
- Synchronization of Conveyor Belts
- Register control in printing

Automotive & Commercial Vehicles

Vehicle Drivetrains:
- RPM measurement on crankshafts and camshafts for engine control units
- Rotor position detection in electric motors (BLDC, PMSM)
- Input/output speed in the transmission for shift strategy

Vehicle Dynamics Systems:
- Wheel speed sensors for ABS/ESP
- Torque distribution in all-wheel-drive systems

Commercial Vehicles & Agricultural Machinery:
- Speed monitoring on PTOs, hydraulic pumps
- Harvesting Machinery: Conveyor screws, threshing drums

Rail Technology & Transportation

Rail vehicles:
- Wheel speed sensors for slip control and brake control
- Drive control for electric locomotives and railcars

Conveyor and cable cars:
- Speed monitoring on idler pulleys
- Synchronization of drives in multi-motor systems

Marine applications

Drive:
- Speed measurement on marine engines, turbochargers, gearboxes, and generators

Auxiliary units:
- Input/output speed measurement for slip monitoring

Energy & Utilities

Wind turbines:
- Rotor speed for power control
- Pitch adjustment (blade angle control)

Hydroelectric Power Plants / Turbines:
- Speed control for synchronization with grid frequency

Generators & emergency power systems:
- Speed measurement for frequency monitoring and load management

Building Services & Infrastructure

Elevators & escalators:
- Cabin speed and position
- Safety Systems (Emergency Stop in Case of Overspeed)

Building equipment:
- Pump and fan speeds in large HVAC systems

Logistics & Conveyor Technology

Conveyor belts:
- Speed control in distribution centers

Automated Storage Systems:
- Positioning of Storage and Retrieval Machines

Crane Systems:
- Hoist and Traverse Control

Technical Data for the Sensor Tube

Thread Type	A	B	C	D	E	F	G
Mechanical Data							
Diameter	5/8"	M16		M18		M20	M22
Fine-pitch thread	18 UNF	1.0	1.5	1.0	1.5	1.5	1.5
Thread length (1)	60 mm						
Mounting hardware	2× hex nuts; stainless steel; included						
Sensor material	Stainless steel						
Weight (without cable)	100 g						
Mounting	Screw-in thread						
Cable							
Connection	Straight cable outlet, plug as specified						
Cable length	≤ 100 m						
Note on shielding	Cable shield directly attached to the sensor or optionally capacitively attached						
Environmental testing							
The Speed Sensor complies with a wide range of standards and requirements for a variety of applications: *see „Technical Data - Environmental Testing“, page 12*							
Available Signal Patterns							
Voltage output	**E-** **V-**					**E-** **S-** **V-** **X-** **D-**	
with Standstill Voltage	-					**EM** **VM** **DM**	
Current output	**EI**					**EI** **VI** **DI**	

(1) Other lengths available upon request

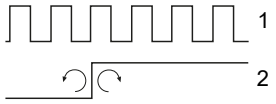
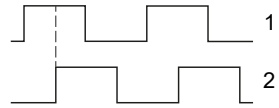
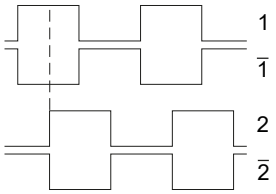
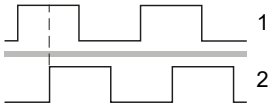
Technical Data: Voltage Output

Signal Pattern	E-	S-	V-	X-	D-
Electrical Data					
Supply voltage U_B (reverse polarity protected)	10 ... 30 V DC				
Current consumption I_B (no load)	≤ 15 mA	≤ 25 mA			
Output signal (short-circuit-proof)	Square-wave signals				
Output signal level (High) (1)	≥ U_B - 1.5 V				
Output signal level (Low) (1)	≤ 1.0 V				
Output current per channel	≤ 20 mA				
Frequency range	0 ... 20 kHz				
Duty cycle	50% ± 10% (2)				
phase offset	–		typ. 90°		
Environmental testing					
The Speed Sensor complies with a wide range of standards and requirements for a variety of applications: *„Technical Data - Environmental Testing“*					
Requirements for the target wheel					
Material	Ferromagnetic steel				
Tooth Profile	Involute teeth per DIN 867, Rectangular teeth 1:1, slotted disc (upon request)				
Width	≥ 10 mm (smaller sizes available upon request)				
Module m	2.00 (other values available upon request)				
Air gap	*„Air Gap Table“*				

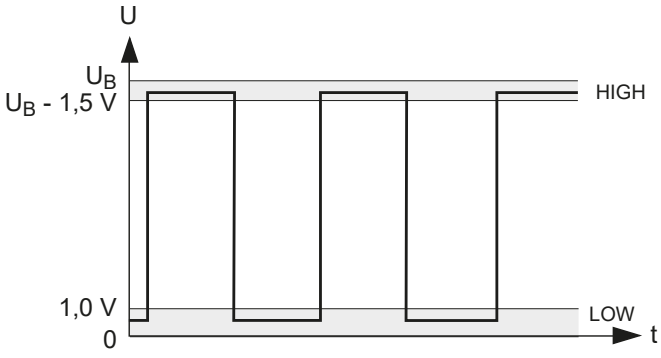
(1) Depends on output current and temperature

(2) Applies to operation at the rated air gap and with gear teeth in accordance with DIN 867

Voltage Output - Signal Pattern

Signal Pattern			
Output Signals		**Supply Voltage**	**Pulse Diagram**
E-	1 channel	10 ... 30 V DC	
S-	1 channel with direction signal ↻ forward ↺ reverse	10 ... 30 V DC	
V-	2 channels, 90° phase offset	10 ... 30 V DC	
X-	2 channels, 90° phase offset, with inverted channels	10 ... 30 V DC	
D-	2 channels, electrically isolated, 90° phase offset	10 ... 30 V DC	

Output signal level – voltage output



Voltage Output - Connection

Standard cable			
Signal Pattern	**E**, **S**, **V**	**X-**	**D-**
Cables	halogen-free and Shielded (specifications available upon request)		
Cable diameter	5.4 ± 0.2 mm	6.5 ± 0.3 mm	8.0 ± 0.3 mm
Cable cross-section	4 × 0.5 mm²	6 × 0.5 mm²	12 × 0.34 mm²
Minimum bend radius	16 mm (static) 27 mm (dynamic)	20 mm (static) 33 mm (dynamic)	24 mm (static) 40 mm (dynamic)

Pin Assignment

Follow the EMC instructions in the accompanying documents.

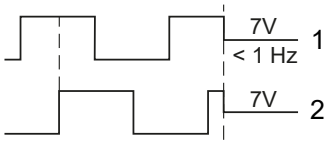
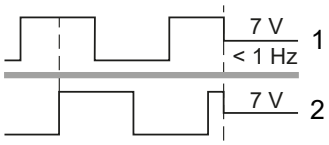
Flying lead						
Signal	**E-**	**S-**	**V-**	**X-**	**D-**	
Channel 1	YE	YE	YE	YE	YE	
Channel 2		WH	WH	WH		WH
Channel 1 inverted				BK		
Channel 2 inverted				BN		
GND (0 V)	BU	BU	BU	BU	BU	GY
$+U_B$	RD	RD	RD	RD	RD	PK
Cables / Shields	1 / 1	1 / 1	1 / 1	1 / 1	1 / 1	
Cable shield directly attached to the sensor or capacitively attached. Wire color codes: **BK** black, **BN** brown, **BU** blue, **GY** gray, **PK** pink, **RD** red, **WH** white, **YE** yellow						

Technical Data: Voltage Output with Standstill Voltage

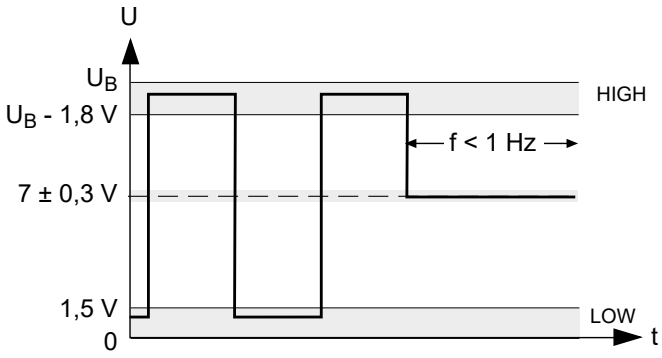
Signal Pattern	EM	VM	DM
Electrical Data			
Supply voltage U_B (reverse-polarity protected)	10 ... 20 V DC		
Current consumption I_B (no load)	≤ 15 mA	≤ 25 mA	
Output signal (short-circuit-proof)	Square-wave signals		
Output signal level (High) (1)	≥ U_B - 1.8 V		
Output signal level (Low) (1)	≤ 1.5 V (2)		
Output current per channel	≤ 10 mA		
Frequency range	0 ... 8 kHz		
Duty cycle	50% ± 10% (3)		
phase offset	-	typ. 90°	
Cable			
Cable	halogen-free and with a Shield (3)		
Cable diameter	5.4 ± 0.3 mm		8.0 ± 0.3 mm
Cable cross-section	4 x 0.5 mm²		12 x 0.34 mm²
Minimum bending radius (static/dynamic)	16 mm / 27 mm		24 mm / 40 mm
Note on shielding	Cable shield directly attached to the sensor or optionally capacitively attached		
Environmental testing			
Working and operating temperature	-40 °C ... +85 °C		
Storage temperature	-40 °C ... +120 °C		
Requirements for the target wheel			
Material	ferromagnetic steel		
Tooth profile	Involute gearing per DIN 867, Rectangular teeth 1:1, slotted disc (upon request)		
Width	≥ 10 mm (smaller sizes available upon request)		
Module m	2.00 (other values available upon request)		
Air gap	*„Air Gap Table“*		

(1) Depends on output current and temperature
(2) Standstill Voltage: 7 V ± 0.3 V at frequencies < 1 Hz ± 0.3 Hz
(3) Applies to operation at the rated air gap and with teeth according to DIN 867

Output with Standstill Voltage - Output Signals and Connectors

Signal Patterns with Standstill Voltage (DM, EM)			
Output Signals		**Supply Voltage**	**Pulse Diagram**
EM	1 channel with Standstill Voltage	10 ... 20 V DC	
VM	2 channels, 90° phase offset, with Standstill Voltage	10 ... 20 V DC	
DM	2 channels, galvanically isolated, 90° phase offset, with Standstill Voltage	10 ... 20 V DC	

Output signal level – voltage output (DM, EM)



Pin assignment – voltage output (DM, VM, EM)

Observe the EMC notes in the accompanying documents.

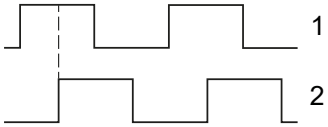
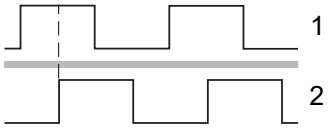
Signal	EM	VM	DM	
Channel 1	YE	YE	YE	
Channel 2		WH		WH
GND (0 V)	BU	BU	BU	GY
+U_B	RD	RD	RD	PK
Cables / Shields	1 / 1	1 / 1	1 / 1	
Cable shield directly attached to the sensor or optionally capacitively attached Wire color codes: **BK** black, **BN** brown, **BU** blue, **GY** gray, **PK** pink, **RD** red, **WH** white, **YE** yellow				

Technical Data: Current Output

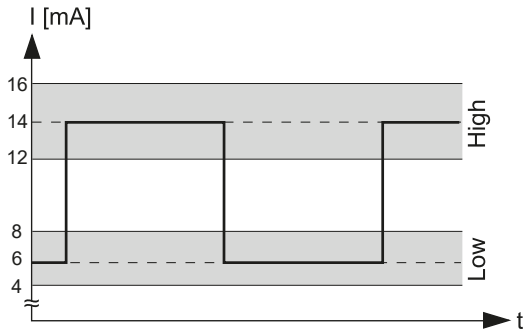
Signal Pattern	EI	DI	VI
Electrical Data			
Supply voltage U_B (reverse-polarity protected)	10 ... 20 V DC		
Output signal (short-circuit-proof)	Square-wave signals		
Output signal level (High) (1)	typ. 14 mA		
Output signal level (Low) (1)	typ. 6 mA		
Output current per channel	≤ 16 mA		
Frequency range	0 ... 12 kHz		
Duty cycle	50% ± 10% (2)		
phase offset	-	typ. 90°	
Cable			
Cable	halogen-free and with a Shield (3)		
Cable diameter	5.4 ± 0.3 mm		
Cable cross-section	4 x 0.5 mm²		
Minimum bending radius (static/dynamic)	16 mm / 27 mm		
Note on shielding	Cable shield directly attached to the sensor or optionally capacitively attached		
Environmental testing			
Working and operating temperature	-40 °C ... +85 °C		
Storage temperature	-40 °C ... +120 °C		
Requirements for the target wheel			
Material	ferromagnetic steel		
Tooth profile	Involute gearing per DIN 867, Rectangular teeth 1:1, slotted disc (upon request)		
Width	≥ 10 mm (smaller sizes available upon request)		
Module m	2.00 (other values available upon request)		
Air gap	*„Air Gap Table“*		

(1) Depends on output current and temperature
(2) Applies to operation at nominal air gap and with teeth according to DIN 867
(3) Specifications available upon request

Current Output - Output Signals and Connectors

Signal Patterns (EI, VI, DI)			
Output Signals		**Supply Voltage**	**Pulse Diagram**
EI	1 channel	10 ... 20 V DC	
VI	2 channels, 90° phase offset	10 ... 20 V DC	
DI	2 channels, electrically isolated, 90° phase offset	10 ... 20 V DC	

Output signal level (EI, VI, DI)

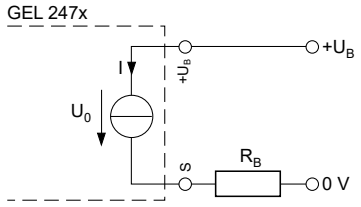


Pin Assignment (EI, VI, DI)

Observe the EMC notes in the accompanying documents.

Signal	EI	VI	DI	
Channel 1	BU	SU	BU	
Channel 2		GN		GN
$+U_B$	RD	RD	RD	YE
Cables / Shields		1 / 1	1 / 1	

Cable shield directly attached to the sensor or optionally capacitively attached
Wire color codes: **BK** black, **BN** brown, **BU** blue, **GY** gray, **GN** green, **PK** pink, **RD** red, **WH** white, **YE** yellow



U_B Supply voltage
S Signal
I_{max} Maximum output current

Measurement resistance
The measurement resistor R_B to be connected must fall within the following limits:
$R_{B,min}$ = 240 Ω
$R_{B,max} = (U_B – 5\ V) / I_{max}$

Example

with U_B = 15 V and I_{max} = 16 mA:
$R_{B,max}$ = 15 V - 5 V / 16 mA = 10 V / 16 mA
= 625 Ω

Technical Data - Environmental Testing

Lenord+Bauer's Speed Sensors are designed for a wide range of applications. During design and manufacturing, we consistently ensure the reliability and compatibility of the Speed Sensors with a wide variety of standards, and these are continuously tested.

Through the ongoing development and optimization of sensors for a wide range of applications, Lenord+Bauer has extensive experience in this field.

Only the minimum standards for all sensors are listed below.

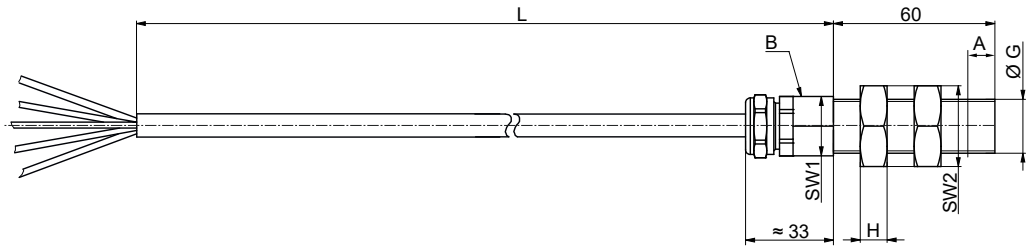
If you have additional requirements regarding standards and approvals, please feel free to contact us.

	Rail Vehicle Industry	Maritime Applications	Industrial applications
Operating and working temperature	-40 °C … +120 °C		
Storage temperature	-40 °C … +120 °C		
General Industry Standard	DIN EN 50155:2022-06	DNV-CG-0339	Depending on the application
Dielectric strength	500 V AC / 750 V DC DIN EN 50155:2022-06	DNV-CG-0339	500 V AC
Electromagnetic compatibility	DIN EN 50121-3-2:2017-11	DNV-CG-0339	IEC 61000-6-2:2016 IEC 61000-6-4:2016
Vibration Resistance	DIN EN 61373:2011-04 Cat. 3	DNV-CG-0339	IEC 60068-2-64:2008 IEC 60068-2-6:2008
Shock resistance	DIN EN 61373-2011-04 Cat. 3	DNV-CG-0339	IEC 60068-2-27:2008
Fire protection	DIN EN 45545-2:2023-12 NFPA 130 upon request	IMO 2010 FTP	Upon request
Degree of protection on the measurement side (1)	IP68		
MTTF value	> 2,000,000 h at 55 °C		

(1) The degree of protection on the cable outlet side depends on the cable gland or cable protection

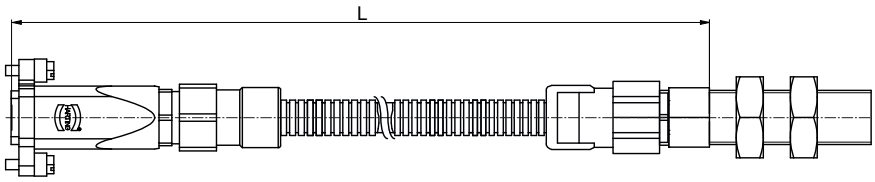
Dimensional Drawings

Dimensional Drawing GEL 2460 - Cable gland without cable protection; flying lead
All dimensions in mm; general tolerance per DIN ISO 2768 mK
Selection of Cable Exit **P00**: Cable gland without cable protection Connector selection **O**: Flying lead



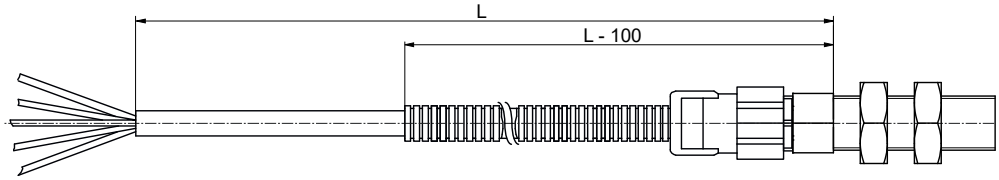
A	The front 10 mm must not be used for tightening
B	Labeling area
L	Cable length L is determined by the Type Code (tolerance depends on the assembled cable length)

Dimension drawing GEL 2460 - Corrugated tube; Harting connector,
All dimensions in mm, general tolerance DIN ISO 2768 mK
Cable outlet selection **P02**: Corrugated tube NW12 Connector selection **H**: Harting connector,



L	Cable length L is determined by the Type Code (tolerance depends on the assembled cable length)

Dimension drawing GEL 2460 – Corrugated tube; flying lead
All dimensions in mm; general tolerance per DIN ISO 2768 mK
Selection of cable outlet **P02**: Corrugated tube NW12 Connector selection **O**: Flying lead

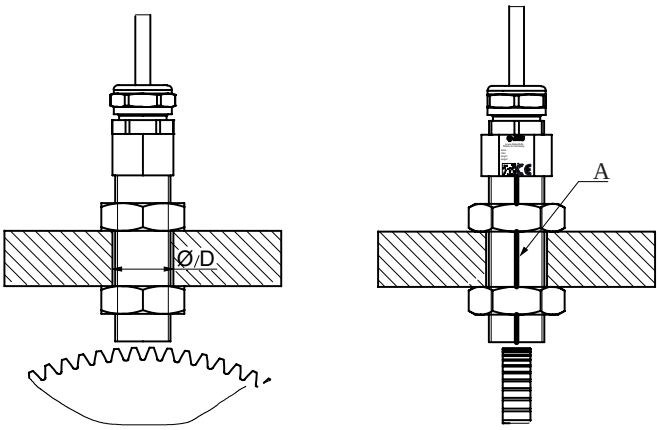


L	Cable length L is determined by the Type Code (tolerance depends on the assembled cable length)

Installation Drawing

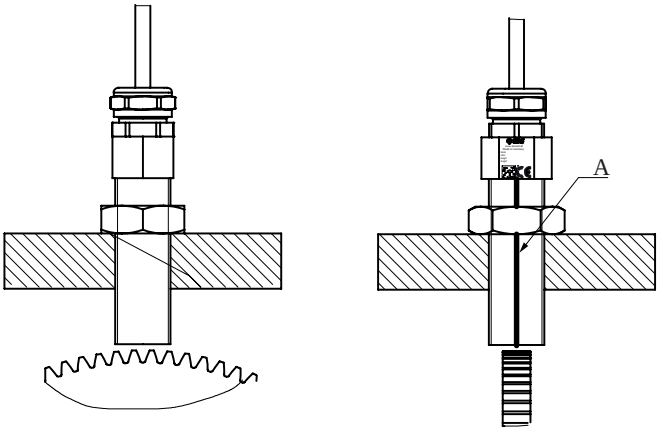
All dimensions in mm; general tolerance DIN ISO 2768 mK

Installation: Through-hole



A Marking for installation position

Installation: Threaded hole



A Marking for installation position

Ø G = Thread	SW1	SW2	H	Ø D
5/8" - 18 UNF	22	23.8 (15/16")	9.525 (3/8")	min. 17
M 16 x 1.0	22	24	8	min. 17
M 16 x 1.5	22	24	8	min. 17
M 18 x 1.0	22	27	9	min. 19
M 18 x 1.5	22	27	9	min. 19
M 20 x 1.5	22	30	10	min. 21
M 22 x 1.5	24	32	11	min. 23

Air Gap Table and Accessories

Air Gap Table

Module	Permissible Air Gap	Nominal Air Gap	Max. Permissible Runout
1.00	0.2 … 1.4 mm	0.5 mm	± 0.3 mm
1.25			
1.50	0.2 … 1.8 mm	0.7 mm	
1.75			
2.00	0.2 … 2.2 mm	0.7 mm	
2.25			
2.50	0.2 … 2.8 mm		
2.75			
3.00			
3.25			
3.50	0.2 … 3.0 mm		

Accessories

Description	Part Number
Accessory set for thread type **A** (5/8" 18 UNF)	ZB2460A
Accessory kit for thread type **B** (M16×1.0)	ZB2460B
Accessory kit for thread type **C** (M16×1.5)	ZB2460C
Accessory kit for thread type **D** (M18×1.0)	ZB2460D
Accessory kit for thread type **E** (M18×1.5)	ZB2460E
Accessory kit for thread type **F** (M20×1.5)	ZB2460F
Accessory kit for thread type **G** (M22×1.5)	ZB2460G

Type Code GEL 2460

2460	**Product Type**							
	Application							
	RA	Rail Vehicle Industry						
	MA	Maritime Applications						
	IA	Industrial Applications						
		Signal Pattern						
		E-	*1-channel square-wave signals, voltage output; standard*					
		S-	1-channel square-wave signals with direction signal (upon request)					
		V-	*2-channel square-wave signals with 90° phase offset, voltage output; standard*					
		X-	2-channel square-wave signals with 90° phase offset and their inverse signals (upon request)					
		D-	2-channel square-wave signals with 90° phase offset, electrically isolated, voltage output (upon request)					
		EI	*1-channel square-wave signals, current output; standard*					
		VI	*2-channel square-wave signals with 90° phase offset, current output (upon request)*					
		DI	2-channel square-wave signals with 90° phase offset, electrically isolated, current output (upon request)					
		EM	1-channel square-wave signal and Standstill Voltage, voltage output (upon request)					
		VM	2-channel square-wave signals with 90° phase offset and Standstill Voltage, voltage output (upon request)					
		DM	2-channel square-wave signals with Standstill Voltage, galvanically isolated, voltage output (upon request)					
			Shield contact					
			SD	*Directly attached; standard*				
			SC	*Capacitively attached; standard*				
				Module				
				M05	*m = 2.00, steel, involute (others available upon request)*			
					Thread type		**Thread type**	
					A	*5/8" 18 UNF; standard*		
					B	*M16×1.0; Standard*	**E**	*M18×1.5; Standard*
					C	*M16×1.5; Standard*	**F**	*M20×1.5; Standard*
					D	*M18×1.0; Standard*	**G**	*M22×1.5; Standard*
						Sensor tube length		
						060	*60 mm; Standard (Other lengths available upon request)*	
							Cable outlet	
							P00	*None*
							P02	*Corrugated tube NW12*
							P03	*Hydraulic hose DN12*
							P06	*Anaconda HFXV0 5/16"*
								Cable length L
								L1 1000 mm
								LX X=2: 2000 mm, X=3: 3000 mm ... X=7: 7000 mm
								L8 8,000 mm
▼	▼	▼	▼	▼	▼	▼	▼	▼
2460	__	__	__	___	_	___	___	__ ◄ **Product code**

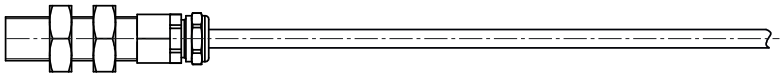
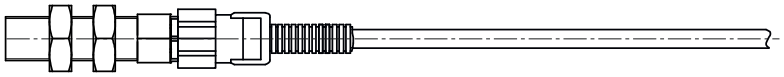
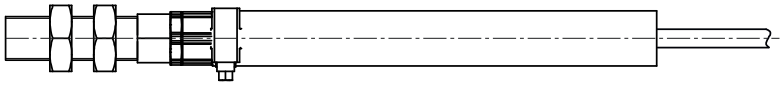
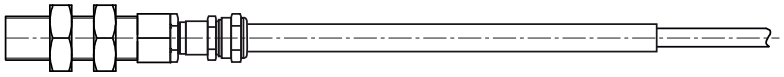
Standard Models

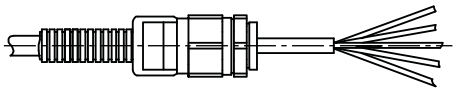
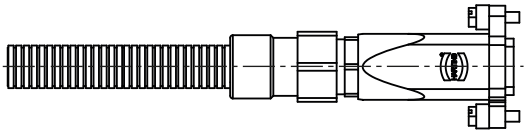
Standard options are indicated in italics. A sensor configured exclusively with standard options is a standard model that is available for immediate delivery ex works.

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.

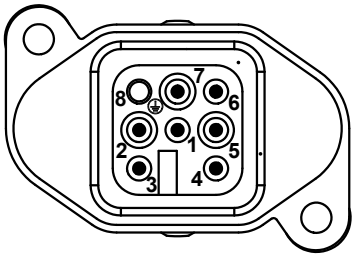
Examples of Preferred Types

Upon request, we can customize the following for you:

Examples of the sensor side, preferred types	
P00	 Standard, straight cable outlet
P02	 Corrugated tube NW12, straight cable outlet Type
P03	 Hydraulic hose DN12, straight cable outlet
P06	 Anaconda HFXV0 5/16", straight cable outlet

Examples of cable ends, preferred types	
O	 Corrugated tube and open cable end
H	 Corrugated tube with Harting HAN HPR connector

Pin assignment for Harting HAN HPR connectors, preferred type



PIN	E-	S-, V-	X-	D-	EM	DM	EI	VI	DI
1	$+U_{B1}$	$+U_{B1}$	$+U_{B1}$	$+U_{B1}$	$+U_{B1}$	$+U_{B1}$	$+U_{B1}$	$+U_{B1}$	$+U_{B1}$
2	GND1	GND1	GND1	GND1	GND1	GND1	Channel 1	Channel 1	Channel 1
3	Channel 1	Channel 1	Channel 1	Channel 1	Channel 1	Channel 1	-	-	-
4	-	Channel 2	Channel 2	Channel 2	-	Channel 2	-	-	-
5	-	-	Channel 1 inverted	GND2	-	GND2	-	Channel 2	Channel 2
6	-	-	Channel 2 inverted	-	-	-	-	-	-
7	-	-	-	$+U_{B2}$	-	$+U_{B2}$	-	-	$+U_{B2}$
8	Shield	Shield	Shield	Shield	Shield	Shield	Shield	Shield	Shield

If you decide to have us assemble our Speed Sensors with cable protection and connectors, we recommend using the preferred types shown here. The necessary materials have been field-tested in large quantities and are always in stock. This allows us to achieve the fastest delivery times thanks to optimal material availability and the lowest retail prices due to large purchasing volumes. If you need assistance defining your desired product, please contact our sales team atsupport@lenord.deor +49(0)208 9963-215.

Europe

Germany

Lenord, Bauer & Co. GmbH
Dohlenstrasse 32
46145 Oberhausen
Tel. +49 (0)208 9963 0
Email info@lenord.de
www.lenord.de

Italy

Lenord+Bauer Italia S.r.l.
Via Gustavo Fara, 26
20124 Milan
Tel. +39 340 1047184
Email salesitaly@lenord.com
www.lenord.com

Spain

Lenord Bauer Iberica, S.L.
Carrer de Balmes, 150, 5°
08008 Barcelona
Tel. +34 603 607 499
Email info@lenord.es
www.lenord.com

North America

USA

Lenord+Bauer USA Inc.
32000 Northwestern Highway, Suite 150,
Farmington Hills, MI 48334
Tel. +1 248 446 7003
Email orders@lenord.com
www.lenord.com

Asia

China

Lenord+Bauer Automation Technology (Shanghai) Co., Ltd.
Block 42, Room 302, No. 1000,
Jinhai Road, 201206 Shanghai
Tel. +86 21 50398270
Email Info@lenord.cn
www.lenord.cn

India

Lenord+Bauer India Private Limited
417 Golden Square Prime Serviced Office
Davanam Sarovar Portico Suites
Hosur Main Road, Bengaluru 560068
Karnataka
Tel. +919901516814
Email info@lenord.co.in
www.lenord.co.in

Certified quality for your safety

DIN EN ISO 9001 CERTIFIED
DIN EN ISO 14001 CERTIFIED
DIN EN ISO 22163 CERTIFIED

LENORD +BAUER
Finding solutions. Founding trust.