

Description

- Speed sensor using magnetic scanning
- Scans measuring scales such as target wheels made of ferromagnetic materials
- Stainless steel housing with standard thread types and nominal lengths
- Detection of direction by evaluating two channels with 90° phase offset
- Tailor-made cable fabrication according to customer's specifications
- Optional DNV GL, SIL, ATEX or IECEx certification

Advantages

- Space saving and compact sensor
- Standard sensors available at short notice ex factory
- Maintenance- and wear-free operation by contactless rotary motion measuring

Field of application

Designed for the mechanical loads in the bogie area

- Rail vehicle industry
 - Traction monitoring
 - Anti-slip protection
 - Motor speed
 - Anti-skid protection
 - Automatic Train Protection
 - Odometry

Do you have special requirements regarding thread length, number of channels, cable protection, cable outlet, connector assembly or EMC concept?

Then talk to us. Our experts can design the optimal solution for your application from an extensive modular system and will be pleased to advise you how to customize your solution in the most cost-efficient way.

Write to support@lenord.de or call +49 208 9963-215.



Technical data

Sensor tube

Thread type	A	B	C	D	E	F	G
Mechanical data							
Diameter	5/8"	M16		M18		M20	M22
Fine thread pitch	18 UNF	1.0	1.5	1.0	1.5		
Thread length ⁽¹⁾	60 mm						
Mounting material	2× hexagon nut; VA (contained in scope of supply)						
	5/8"	M16		M18		M20	M22
Sensor material	Stainless steel						
Weight (without cables)	100 g	–				–	
Fastening	Screw-in thread						
Cable							
Connection	Cable outlet straight, connector upon consultation						
Cable length	≤ 100 m						
Screening note	Cable screen is connected directly or capacitively in the sensor as an option						
Environmental testing							
Degree of protection on measuring side ⁽²⁾	IP 68						
Dielectric strength	500 V AC / 750 V DC						
Vibration resistance	DIN EN 61373:2011-04 cat. 3						
Shock resistance	DIN EN 61373:2011-04 cat. 3						
MTTF value	2,000,000 h at 55 °C						
Realizable 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 upon request

⁽²⁾ Degree of protection on the cable outlet side depends on cable glands or cable protection

Voltage output

Technical data

Signal pattern	E-	S-	V-	X-	D-
Electrical data					
Supply voltage U_B reverse polarity protected	10 to 30 V DC				
Current consumption per channel I_B (without load)	≤ 30 mA				
Output signal (short-circuit-proof)	Square-wave signals				
Output signal level High ⁽¹⁾	$\geq U_B - 1.5$ V				
Output signal level Low ⁽¹⁾	≤ 1.0 V				
Output current per channel	≤ 20 mA				
Frequency range	0 to 20 kHz				
Duty cycle ⁽²⁾	50 % $\pm$ 10 %				
Phase offset	typ. 90°				
Environmental testing					
Working and operating temperature	-40 °C to +120 °C				
Storage temperature	-40 °C to +120 °C				
Requirements for the target wheel					
Material	Ferromagnetic steel				
Tooth form	Involute gear teeth as per DIN 867, square gear teeth 1:1, slotted disk (upon request)				
Width	≥ 10 mm (smaller upon request)				
Permissible eccentricity of target wheel ⁽³⁾	± 0.3 mm				

⁽¹⁾ depending on output current and temperature

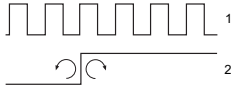
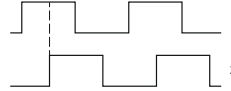
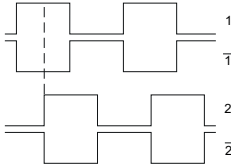
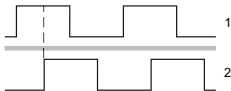
⁽²⁾ applies to operation with nominal air gap and toothing as per DIN 867

⁽³⁾ The permissible air gap range may not fall below or above the eccentricity.

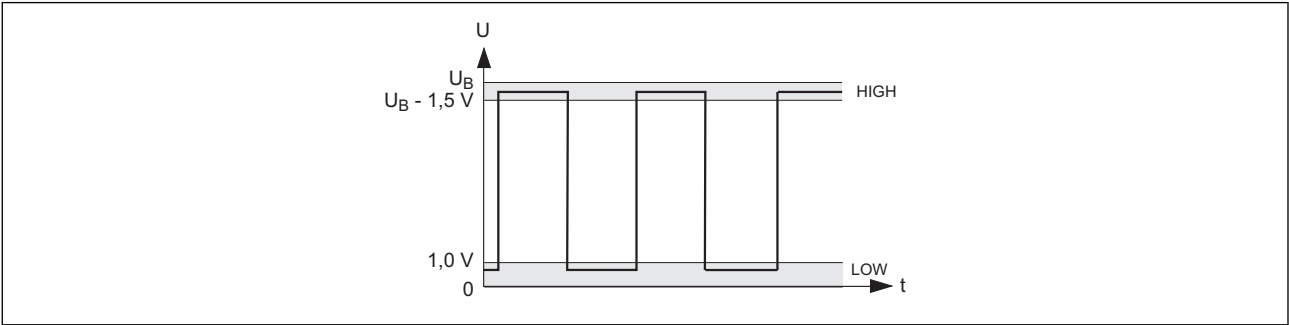
Voltage output

Output signals

Signal pattern

Output signals		Supply voltage	Pulse diagram
E-	1 channel	10 to 30 V DC	
S-	1 channel with directional signal ↻ forward ↻ backward	10 to 30 V DC	
V-	2 channels, 90° phase offset	10 to 30 V DC	
X-	2 channels, 90° phase offset with inverse channels	10 to 30 V DC	
D-	2 channels, electrically isolated, 90° phase offset	10 to 30 V DC	

Output signal level



Voltage output

Connection

Standard cable

Signal pattern E-, S- and V-

Cable data	
Cable	halogen-free and screened ⁽¹⁾
Cable diameter	5.4 ± 0.2 mm
Cable cross section	4 × 0.5 mm ²
Minimum bending radius static/dynamic	16 mm / 27 mm

Signal pattern X-

Cable data	
Cable	halogen-free and screened ⁽¹⁾
Cable diameter	6.5 ± 0.3 mm
Cable cross section	6 × 0.5 mm ²
Minimum bending radius static/dynamic	20 mm / 33 mm

Signal pattern D-

Cable data	
Cable	halogen-free, screened ⁽¹⁾
Cable diameter	8.0 ± 0.3 mm
Cable cross section	12 × 0.34 mm ²
Minimum bending radius static/dynamic	24 mm / 40 mm

Core assignment

Observe EMC notes in the mounting/operating instructions.

Flying lead

Signal	E-	S-	V-	X-	D-	
Channel 1	YE	YE	YE	YE	YE	
Channel 2		WH	WH	WH		WH
Channel 1 inverse				BK		
Channel 2 inverse				BN		
GND (0 V)	BU	BU	BU	BU	BU	GY
+U _B	RD	RD	RD	RD	RD	PK
Cables/Screens	1 / 1	1 / 1	1 / 1	1 / 1	1 / 1	
Cable screen is connected directly or capacitively in the sensor as an option Core identifier: BK black, BN brown, BU blue, GY gray, PK pink, RD red, WH white, YE yellow						

⁽¹⁾ Specification upon request

Voltage output with standstill voltage

Technical data

Signal pattern	EM, VM, DM
Electrical data	
Supply voltage U_B reverse polarity protected	10 to 20 V DC
Current consumption per channel I_B (without load)	≤ 12 mA
Output signal (short-circuit-proof)	Square-wave signals
Output signal level High ⁽¹⁾	$\geq U_B - 1.8$ V
Output signal level Low ⁽¹⁾	≤ 1.5 V ⁽²⁾
Output current per channel	≤ 10 mA
Frequency range	0 Hz to 8 kHz
Duty cycle ⁽³⁾	50 % $\pm$ 10 %
Phase offset	typ. 90°
Environmental testing	
Working and operating temperature	-40 °C to +85 °C
Storage temperature	-40 °C to +120 °C
Requirements for the target wheel	
Tooth form	Involute gear teeth as per DIN 867, square gear teeth 1:1, slotted disk (upon request)
Material	Ferromagnetic steel
Width	≥ 10 mm (smaller upon request)
Permissible eccentricity of target wheel ⁽⁴⁾	± 0.3 mm

⁽¹⁾ depending on output current and temperature

⁽²⁾ Standstill voltage: 7 V $\pm$ 0.3 V at frequencies < 1 Hz $\pm$ 0.3 Hz

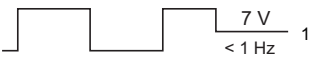
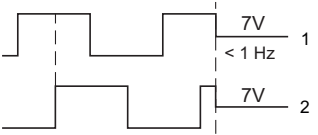
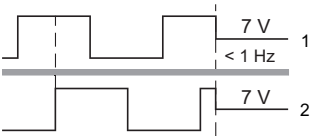
⁽³⁾ applies to operation with nominal air gap and toothing as per DIN 867

⁽⁴⁾ The permissible air gap range may not fall below or above the eccentricity.

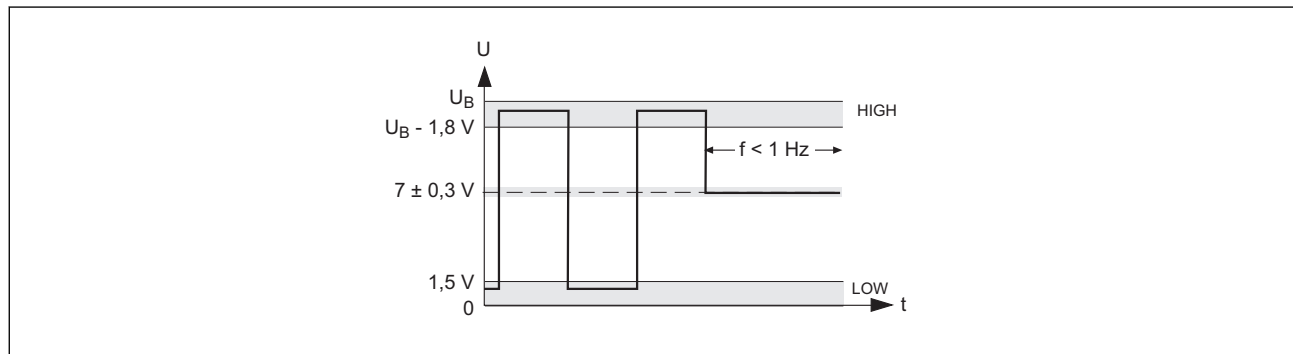
Voltage output with standstill voltage

Output signals

Signal pattern

Output signals		Supply voltage	Pulse diagram
EM	1 channel	10 to 20 V DC	
VM	2 channels, 90° phase offset, with standstill voltage	2 × 10 to 20 V DC	
DM	2 channels, electrically isolated, 90° phase offset, with standstill voltage	2 × 10 to 20 V DC	

Output signal level



Voltage output with standstill voltage

Connection

Standard cable

Signal pattern EM and VM

Cable data	
Cable	halogen-free and screened ⁽¹⁾
Cable diameter	5.4 ± 0.2 mm
Cable cross section	4 × 0.5 mm ²
Minimum bending radius static/dynamic	16 mm / 27 mm

Signal pattern DM

Cable data	
Cable	halogen-free, screened ⁽¹⁾
Cable diameter	8.0 ± 0.3 mm
Cable cross section	12 × 0.34 mm ²
Minimum bending radius static/dynamic	24 mm / 40 mm

Core assignment

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/Screens	1 / 1	1 / 1	1 / 1	
Cable screen is connected directly or capacitively in the sensor as an option Core identifier: BU blue, GY gray, PK pink, RD red, WH white, YE yellow				

⁽¹⁾ Specification upon request

Current output technical data

Signal pattern	EI	VI	DI
Electrical data			
Supply voltage U _B reverse polarity protected	10 to 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 Hz to 12 kHz		
Duty cycle ⁽²⁾	50 % ± 10 %		
Phase offset	–	typ. 90°	
Environmental testing			
Working and operating temperature	-40 °C to +120 °C		
Storage temperature	-40 °C to +120 °C		
Requirements for the target wheel			
Tooth form	Involute gear teeth as per DIN 867, square gear teeth 1:1, slotted disk (upon request)		
Material	Ferromagnetic steel		
Width	≥ 10 mm (smaller upon request)		
Permissible eccentricity of target wheel ⁽³⁾	±0.3 mm		

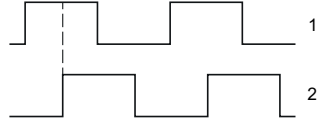
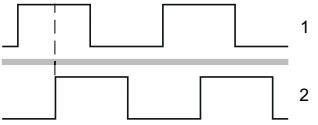
⁽¹⁾ depending on output current and temperature

⁽²⁾ applies to operation with nominal air gap and toothing as per DIN 867

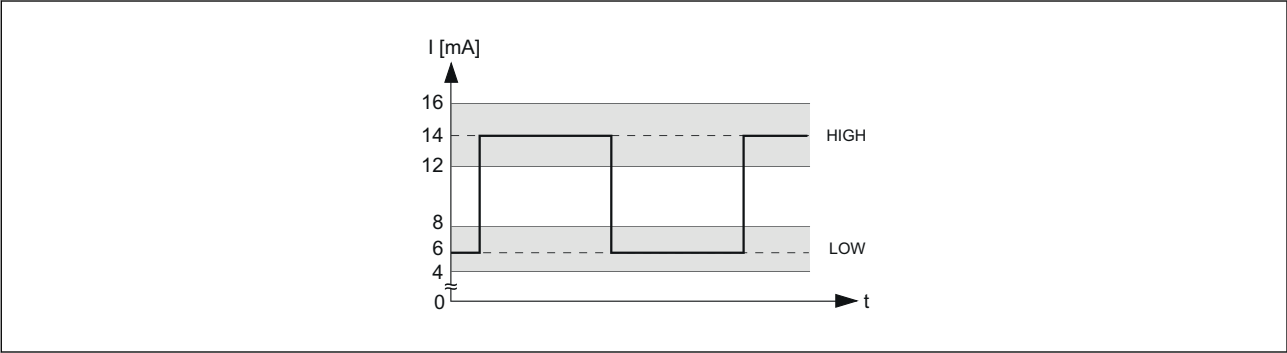
⁽³⁾ The permissible air gap range may not fall below or above the eccentricity.

Current output output signals

Signal pattern

Output signals		Supply voltage	Pulse diagram
EI	1 channel	10 to 20 V DC	
VI	2 channels, 90° phase offset	10 to 20 V DC	
DI	2 channels, electrically isolated, 90° phase offset	2 x 10 to 20 V DC	

Output signal level



Current output Connection

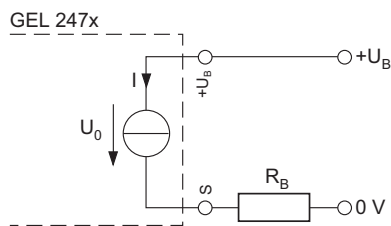
Standard cable

Cable data	
Cable	halogen-free and screened ⁽¹⁾
Cable diameter	5.4 ± 0.2 mm
Cable cross section	4 × 0.5 mm ²
Minimum bending radius static/dynamic	16 mm / 27 mm

Core assignment

Signal	EI	VI	DI	
Channel 1	BU	BU	BU	
Channel 2		GN		GN
+U _B	RD	RD	RD	WH
Cables/Screens	1 / 1	1 / 1	1 / 1	
Core identifier: BU blue, GN green, RD red, YE yellow				

Current output – Measuring resistor



U_B Supply voltage
 10 to 20 V DC
 S Signal
 I_{max} maximal output current 16 mA

The measuring resistor R_B to be connected must be within the following limits:

$$R_{B, \min} = 240 \, \Omega$$

$$R_{B, \max} = (U_B - 5 \, \text{V}) / I_{\max}$$

Example

for U_B = 15 V:

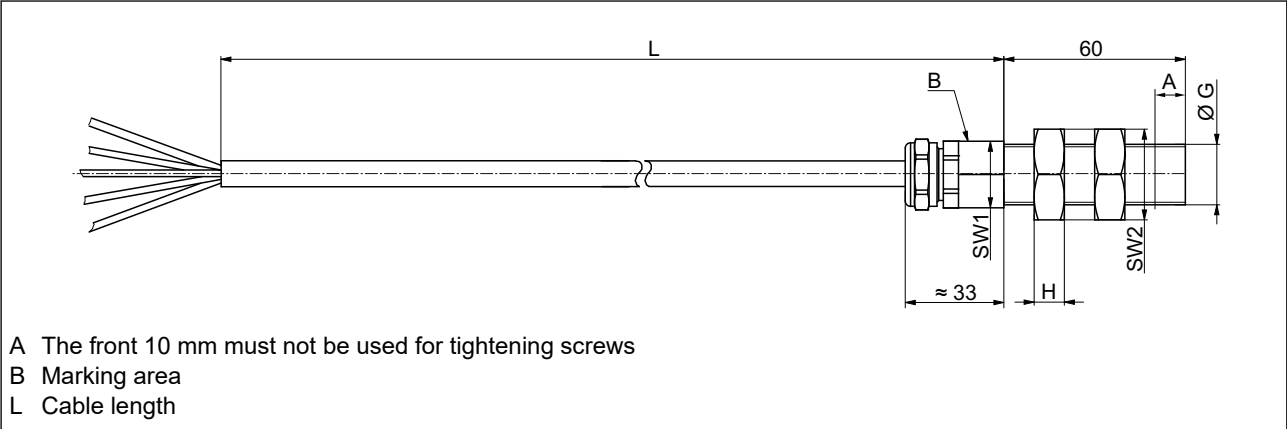
$$R_{B, \max} = 15 \, \text{V} - 5 \, \text{V} / 16 \, \text{mA} = 10 \, \text{V} / 16 \, \text{mA} = 625 \, \Omega$$

⁽¹⁾ Specification upon request

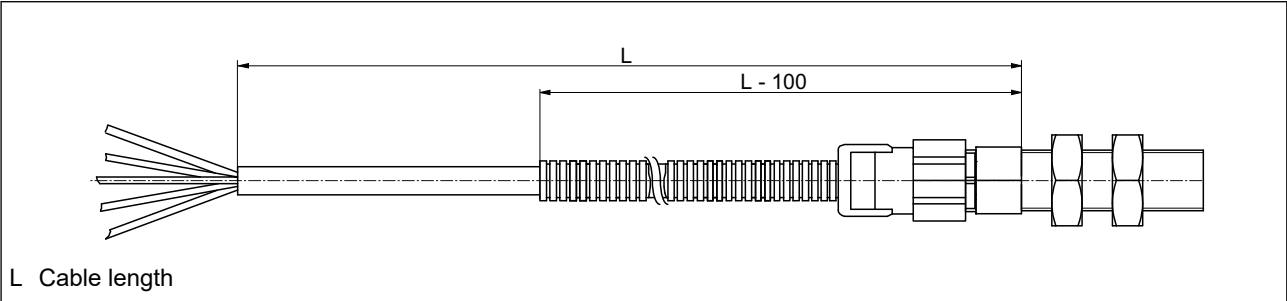
Technical drawings

All dimensions in mm ($\approx$ approximate measurement), general tolerance DIN ISO 2768 (tolerance classes -mK)

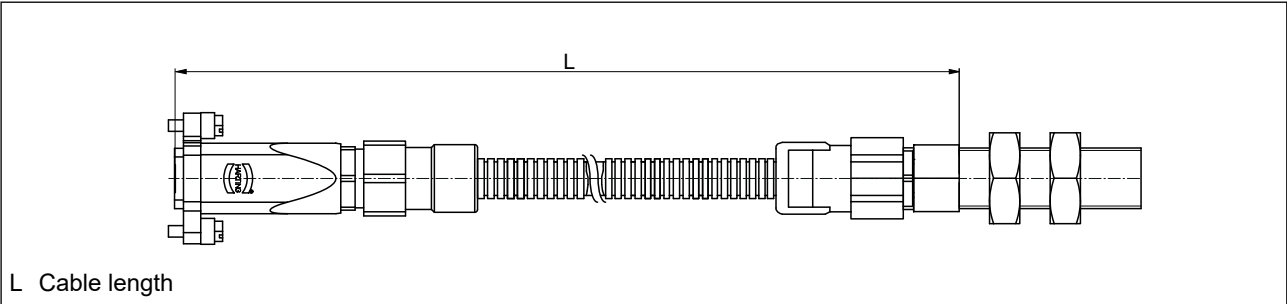
Dimensional drawing GEL 2460KO (without cable protection; flying lead)



Dimensional drawing GEL 2460AO (ABB flexible conduit, flying lead)



Dimensional drawing GEL 2460AH (ABB flexible conduit, Harting connector HAN HPR)

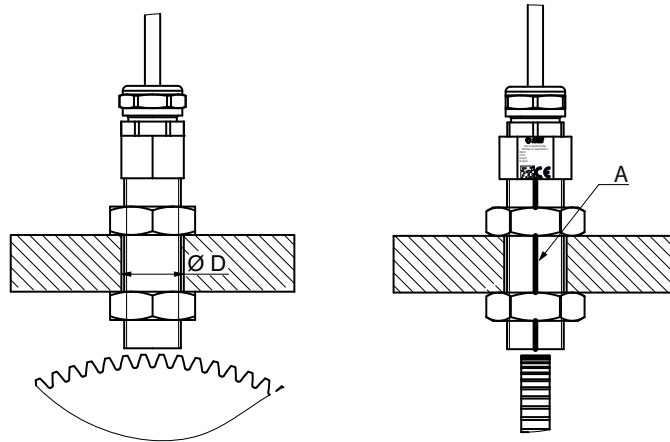


Technical drawings

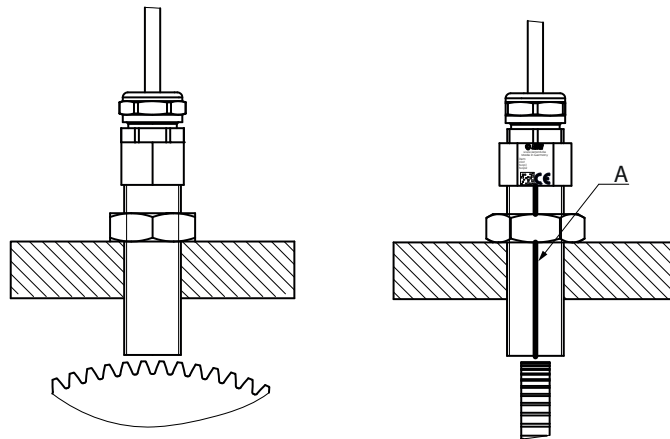
All dimensions in mm ($\approx$ approximate measurement), general tolerance DIN ISO 2768 (tolerance classes -mK)

Installation diagram

Installation through bore



Installation thread bore



A Marking for mounting 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 radial runout
1.00	0.2 to 1.4 mm	0.5 mm	±0.3 mm
1.25			
1.50	0.2 to 1.8 mm	0.7 mm	
1.75			
2.00	0.2 to 2.2 mm	0.7 mm	
2.25			
2.50	0.2 to 2.8 mm		
2.75			
3.00			
3.25			
3.50			

Scope of supply / accessories

Designation	Item no.:
Accessory set for thread type A (5/8" 18 UNF)	ZB2460A
Accessory set for thread type B (M16×1.0)	ZB2460B
Accessory set for thread type C (M16×1.5)	ZB2460C
Accessory set for thread type D (M18×1.0)	ZB2460D
Accessory set for thread type E (M18×1.5)	ZB2460E
Accessory set for thread type F (M20×1.5)	ZB2460F
Accessory set for thread type G (M22×1.5)	ZB2460G

Type code

GEL 2460	Signal pattern										
	E-	1-channel square-wave signals, voltage output; standard									
	S-	1-channel square-wave signals with directional 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 signals with standstill voltage, voltage output (upon request)									
	VM	2-channel square-wave signals with standstill voltage, voltage output (upon request)									
	DM	2-channel square-wave signals with standstill voltage, electrically isolated, voltage output (upon request)									
	Module										
	20	Module 2.00; standard (others upon request)									
	Thread type										
	A	5/8" 18 UNF; standard									
	B	M16×1.0; standard									
	C	M16×1.5; standard									
	D	M18×1.0; standard									
	E	M18×1.5; standard									
F	M20×1.5; standard										
G	M22×1.5; standard										
Sensor tube length											
060	60 mm; standard (others upon request)										
Screen connection on encoder side											
C	Capacitor, standard										
D	Direct screen connection, standard										
Cable length (L)											
xxxx	Length in cm										
Cable outlet											
A	ABB flexible conduit, type XPCST-12BG; standard										
B	Anaconda Sealite, type HFX-V0 348.010.1 5/16"; standard										
C	Eaton hose, type EC 045-8; standard										
K	Cable gland without cable protection, standard										
Connector											
H	Harting connector, type HAN HPR; standard										
O	Flying lead, standard										

Standard types

Default options are marked in *italics*. A sensor configured exclusively with standard options is a standard type that is available ex factory at short notice.

Example

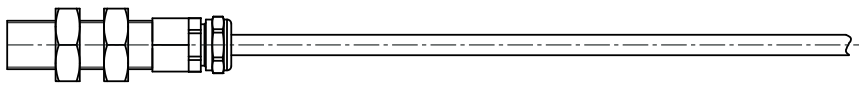
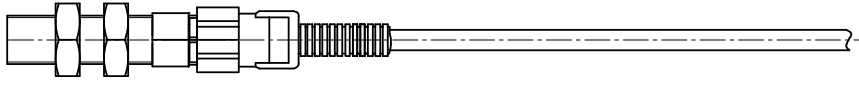
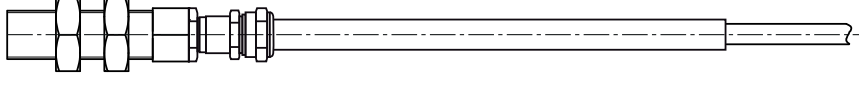
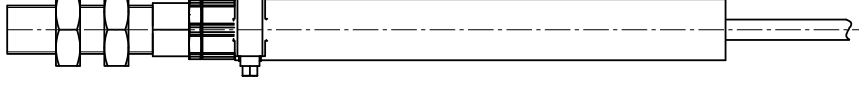
EI20B060D0200KO 1-channel square-wave signal with current output for module 2 with M16×1.0 thread and 60 mm sensor tube length, direct screen connection, 2 m cable length, cable gland without cable protection, flying lead

Customized designs (Y number)

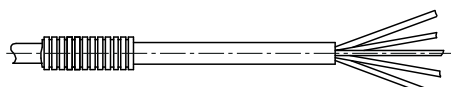
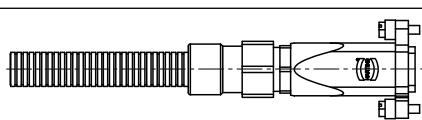
Customized adaptations of mechanical and electrical properties are generally possible. This special design GEL 2460Yxxx is manufactured according to drawing or application description and may deviate from the standard technical specifications.

We can manufacture according to your specifications:

Examples for the sensor side, preferred types

Cable outlet	
K	 <i>Standard, cable outlet straight</i>
A	 <i>ABB flexible conduit, cable outlet straight; type XPCST –12BG</i>
B	 <i>Anaconda Sealtite, cable outlet straight; type HFX-V0 348.010.1 5/16"</i>
C	 <i>Eaton hose, cable outlet straight; type EC 045-8</i>

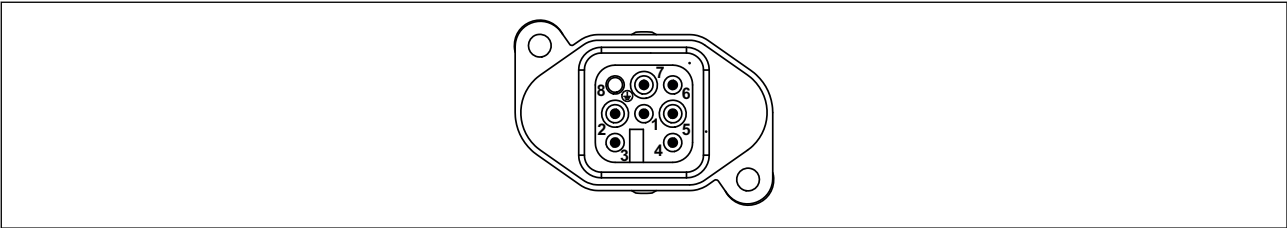
Examples for the flying lead, preferred types

Connector	
H	 <i>Flexible conduit and flying lead</i>
O	 <i>Flexible conduit with Harting connector HAN HPR</i>

We can manufacture according to your specifications:

Example connector H (Harting connector, type HAN HPR)

Pin assignment Harting connector HAN HPR, preferred type



Pin assignment Harting connector HAN HPR

Pin	E-	V-	X-	D-	S-	EI	DI	VI	EM	DM	VM
1	+U _{B1}	+U _{B1}	+U _{B1}	+U _{B1}	+U _{B1}	+U _{B1}	+U _{B1}	+U _{B1}	+U _{B1}	+U _{B1}	+U _{B1}
2	GND1	GND1	GND1	GND1	GND1	Channel 1	Channel 1	Channel 1	GND1	GND1	GND1
3	Channel 1	Channel 1	Channel 1	Channel 1	Channel 1	-	-	-	Channel 1	Channel 1	Channel 1
4	-	Channel 2	Channel 2	Channel 2	Channel 2	-	-	-	-	Channel 2	Channel 2
5	-	-	Channel 1 inverse	GND2	-	-	Channel 2	Channel 2	-	GND2	-
6	-	-	Channel 2 inverse	-	-	-	-	-	-	-	-
7	-	-	-	+U _{B2}	-	-	+U _{B2}	-	-	+U _{B2}	-
8	Screen	Screen	Screen	Screen	Screen	Screen	Screen	Screen	Screen	Screen	Screen

If you decide to have our speed sensors assembled with cable protection and connectors, we recommend using the preferred types shown in the figure. The required materials are field-tested in large quantities and are always in stock. This guarantees the fastest delivery times with the best material availability and the lowest prices due to large purchasing volumes.

If you need help in finding the product you need, please contact our internal sales team at support@lenord.de or call +49 208 9963-215.

Notes:

Notes:



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