Multichannel speed sensor
with various signal pattern combinations

GEL 247MCx

Technical information

Version 28-07-2021

Description

- Application-proven speed sensor using magnetic scanning
- Maintenance- and wear-free operation by contactless rotary motion measuring
- Wide measuring range for reliable detection of creeping without pulse loss and also for fast rotary motion
- Detection of direction by evaluating two channels with 90° phase offset
- Constant duty cycle of output signals

Features

- Target wheel module: 1.00 to 3.50
- Degree of protection: IP 68 sensor housing
- in accordance with DIN EN 50155:2018-05

Advantages

- Integration of different signal patterns in the familiar flange housing
- Perfectly suited for retrofits and for retrofitting additional systems
- No mechanical adjustments required
- Cost-efficient due to reduced cabling effort (cables, cable protection, connectors)
- Electrically isolated rotational speed systems for operation on different supply voltages and control systems
- Large permissible measuring distance facilitates design and assembly

Field of application

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

Do you have special requirements regarding flange shape, shaft 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.

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Dohlenstraße 32
46145 Oberhausen, Germany

Voltage output
Technical data

	D	E	V
Electrical data			
Supply voltage U_B (reverse polarity protected)	10 to 30 V DC		
Current consumption I_B (without load)	≤ 30 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 to 20 kHz		
Duty cycle	50 % ± 10 %(2)		
Phase offset	typ. 90°	–	typ. 90°
Mechanical data			
Sensor tube material	Stainless steel		
Flange material	Stainless steel		
Sensor weight (incl. 2 m cable)	approx. 500 g		
Cable			
Cable	halogen-free and screened(3)		
Cable diameter	8.0 ± 0.3 mm		
Cable cross section	12 x 0.34 mm^2		
Minimum bending radius static/dynamic	24 mm/40 mm		
Screening note	Cable screen is connected directly or, as an option, capacitively in the sensor		
Environmental testing			
Working and operating temperature	-40 °C to +120 °C		
Storage temperature	-40 °C to +120 °C		
Dielectric strength	500 V AC/750 V DC (DIN EN 50155:2018-05)		
Electromagnetic compatibility(4)	DIN EN 50121-3-2:2017-11; DIN EN 50121-3-2/A1:2020-11		
Degree of protection on measuring side(5)	IP 68		
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		
Requirements for the target wheel			
Material	Ferromagnetic steel		
Tooth form	Involute gear teeth as per DIN 867 (others upon request)		
Width	≥ 15 mm (smaller upon request)		
Module m	1.00/1.25/1.50/1.75/2.00/2.25/2.50/3.00/3.25/3.50		
Air gap	see air gap table, page 9		

(1) depending on output current and temperature
(2) applies to operation with nominal air gap and toothing as per DIN 867
(3) Specification upon request
(4) Observe EMC notes in the mounting/operating instructions
(5) Degree of protection on the cable outlet side depends on cable gland or cable protection

Signal pattern	DM	EM
Electrical data		
Supply voltage U_B (reverse polarity protected)	10 ... 20 V DC	
Current consumption I_B (without load)	≤ 12 mA per channel	
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	
Output current per channel	≤ 10 mA	
Frequency range	0 ... 8 kHz	
Duty cycle	50 % ± 10 %(2)	
Phase offset	typ. 90°	–
Mechanical data		
Sensor tube material	Stainless steel	
Flange material	Stainless steel	
Sensor weight (incl. 2 m cable)	approx. 500 g	
Environmental testing		
Working and operating temperature	-40 °C to +85 °C	
Storage temperature	-40 °C to +120 °C	
Dielectric strength	500 V AC/750 V DC (DIN EN 50155:2018-05)	
Electromagnetic compatibility(3)	DIN EN 50121-3-2:2017-11; DIN EN 50121-3-2/A1:2020-11	
Degree of protection on measuring side(4)	IP 68	
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	
Requirements for the target wheel		
Material	Ferromagnetic steel	
Tooth form	Involute gear teeth as per DIN 867 (others upon request)	
Width	≥ 15 mm (smaller upon request)	
Module m	1.00/1.25/1.50/1.75/2.00/2.25/2.50/3.00/3.25/3.50	
Air gap	see air gap table, page 9	

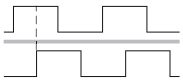
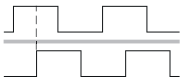
(1) depending on output current and temperature
(2) applies to operation with nominal air gap and toothing as per DIN 867
(3) Observe EMC notes in the mounting/operating instructions
(4) Degree of protection on the cable outlet side depends on cable gland or cable protection

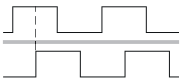
Current output

	DI	VI	EI
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°		–
Mechanical data			
Sensor tube material	Stainless steel		
Flange material	Stainless steel		
Sensor weight (incl. 2 m cable)	approx. 500 g		
Environmental testing			
Working and operating temperature	-40 °C to +120 °C		
Storage temperature	-40 °C to +120 °C		
Dielectric strength	500 V AC/750 V DC (DIN EN 50155:2018-05)		
Electromagnetic compatibility(3)	DIN EN 50121-3-2:2017-11; DIN EN 50121-3-2/A1:2020-11		
Degree of protection on measuring side(4)	IP 68		
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		
Requirements for the target wheel			
Material	Ferromagnetic steel		
Tooth form	Involute gear teeth as per DIN 867 (others upon request)		
Width	≥ 15 mm (smaller upon request)		
Module m	1.00/1.25/1.50/1.75/2.00/2.25/2.50/3.00/3.25/3.50		
Air gap	see air gap table, page 9		

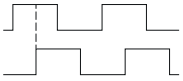
(1) depending on output current and temperature
(2) applies to operation with nominal air gap and toothing as per DIN 867
(3) Observe EMC notes in the mounting/operating instructions
(4) Degree of protection on the cable outlet side depends on cable gland or cable protection

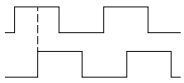
System combinations

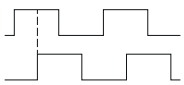
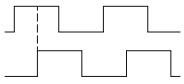
Signal pattern D/D (type code option 01)		
System 1		2 electrically isolated voltage signals with 90° phase offset
System 2		2 electrically isolated voltage signals with 90° phase offset

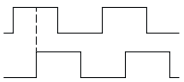
Signal pattern D/E (type code option 02)		
System 1		2 electrically isolated voltage signals with 90° phase offset
System 2		1 voltage signal

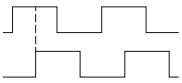
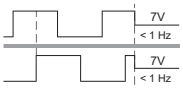
Signal pattern E/E/E/E (type code option 03)		
System 1		1 voltage signal
System 2		1 voltage signal
System 3		1 voltage signal
System 4		1 voltage signal

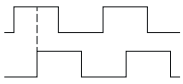
Signal pattern V/E/E (type code option 04)		
System 1		2 voltage signals with 90° phase offset
System 2		1 voltage signal
System 3		1 voltage signal

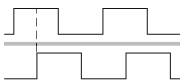
Signal pattern V/E (type code option 05)		
System 1		2 voltage signals with 90° phase offset
System 2		1 voltage signal

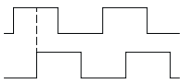
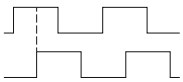
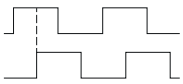
Signal pattern V/V (type code option 06)		
System 1		2 voltage signals with 90° phase offset
System 2		2 voltage signals with 90° phase offset

Signal pattern V/EM/EM (type code option 07)		
System 1		2 voltage signals with 90° phase offset
System 2		1 voltage signal with standstill voltage
System 3		1 voltage signal with standstill voltage

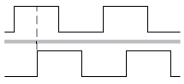
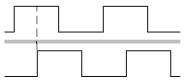
Signal pattern V/DM (type code option 08)		
System 1		2 voltage signals with 90° phase offset
System 2		2 electrically isolated voltage signals with 90° phase offset and standstill voltage

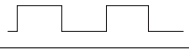
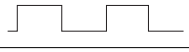
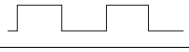
Signal pattern V/EM (type code option 09)		
System 1		2 voltage signals with 90° phase offset
System 2		1 voltage signal with standstill voltage

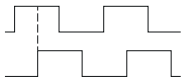
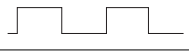
Signal pattern D/EM (type code option 10)		
System 1		2 electrically isolated voltage signals with 90° phase offset
System 2		1 voltage signal with standstill voltage

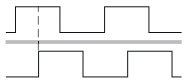
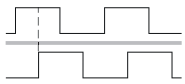
Signal pattern V/V/V (type code option 11)		
System 1		2 voltage signals with 90° phase offset
System 2		2 voltage signals with 90° phase offset
System 3		2 voltage signals with 90° phase offset

System combinations

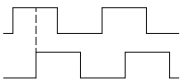
Signal pattern DI/D (type code option 12)		
System 1		2 electrically isolated current signals with 90° phase offset
System 2		2 electrically isolated voltage signals with 90° phase offset

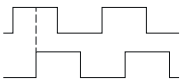
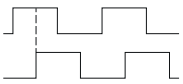
Signal pattern EI/EI/E/E (type code option 13)		
System 1		1 current signal
System 2		1 current signal
System 3		1 voltage signal
System 4		1 voltage signal

Signal pattern VI/E/E (type code option 14)		
System 1		2 current signals with 90° phase offset
System 2		1 voltage signal
System 3		1 voltage signal

Signal pattern DI/DI (type code option 16)		
System 1		2 electrically isolated current signals with 90° phase offset
System 2		2 electrically isolated current signals with 90° phase offset

Signal pattern EI/EI/EI/EI (type code option 17)		
System 1		1 current signal
System 2		1 current signal
System 3		1 current signal
System 4		1 current signal

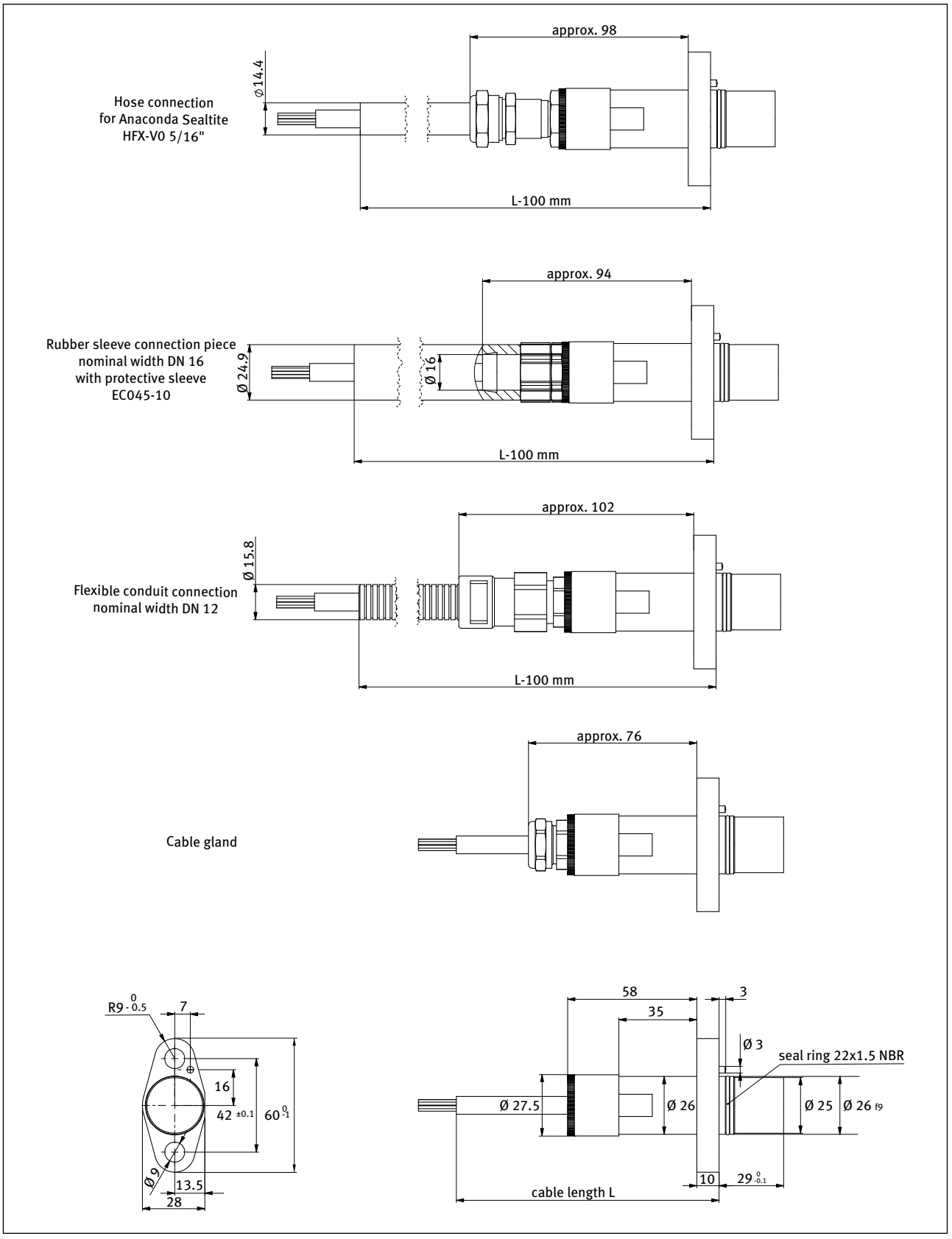
Signal pattern VI/EI (type code option 18)		
System 1		2 current signals with 90° phase offset
System 2		1 current signal

Signal pattern VI/VI (type code option 19)		
System 1		2 current signals with 90° phase offset
System 2		2 current signals with 90° phase offset

Technical drawings

All dimensions in mm, general tolerance DIN ISO 2768 mK

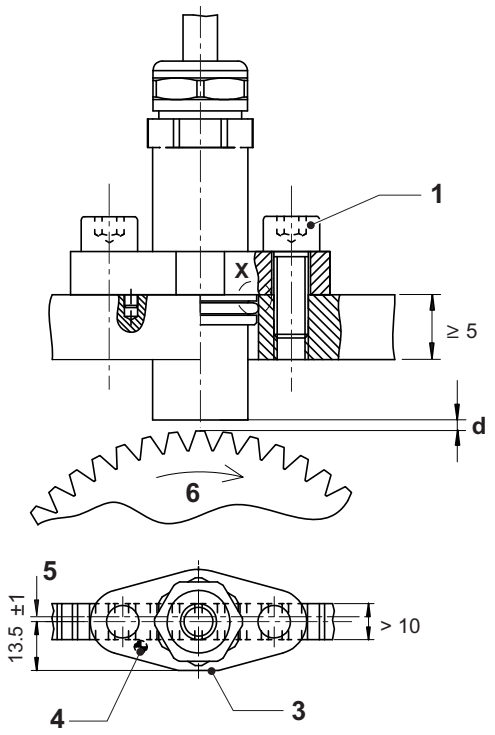
Dimensional drawing



Technical drawings

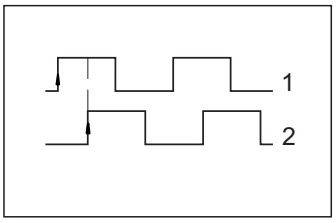
All dimensions in mm, general tolerance DIN ISO 2768 mK

Assembly drawing

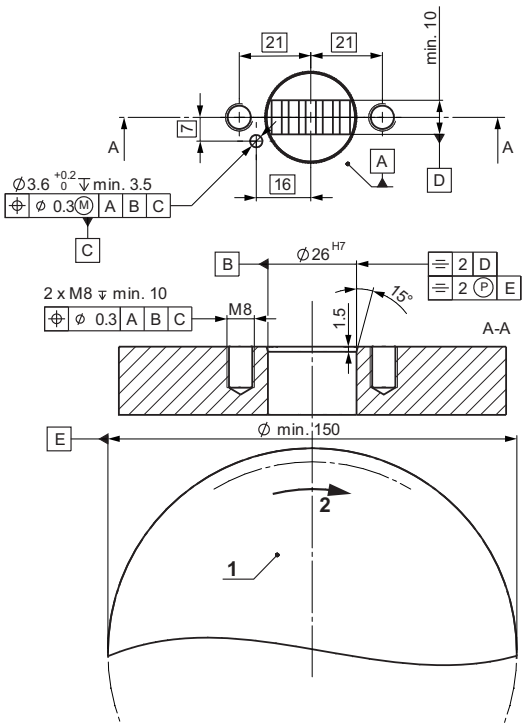


X Insertion chamfer
d Air gap(1)
(see air gap table)
1 Fastening screw
(recommended: M8 x 20
DIN EN ISO 4762)
2 Sealing ring
3 Visible surface(2)
4 Index pin
5 Axial offset
6 Direction of rotation of target
wheel (forward)

Signal for forward travel



Hole pattern



1 target wheel
2 directions of rotation

(1) depending on signal pattern and module
(2) Looking at the visible surface, the signals are output forward when the target wheel rotates clockwise.

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 ... 2.8 mm		
2.75			
3.00			
3.25			
3.50	0.2 ... 3.0 mm		

Type code GEL 247MCx

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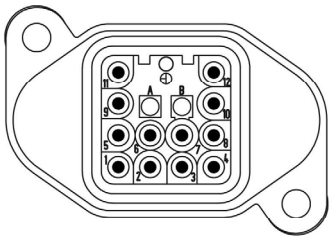
	Signal pattern option						
	01 System combination 2 x signal pattern D						
	02 System combination signal pattern D with signal pattern E						
	03 System combination of 4 x signal pattern E						
	04 System combination signal pattern V with 2 x signal pattern E						
	05 System combination signal pattern V with signal pattern E						
	06 System combination 2 x signal pattern V						
	07 System combination signal pattern V combined with 2 x signal pattern EM						
	08 System combination signal pattern V with signal pattern DM						
	09 System combination signal pattern V with signal pattern EM						
	10 System combination signal pattern D with signal pattern EM						
	11 System combination 3 x signal pattern V (for module 2.00 only)						
	12 System combination signal pattern D with signal pattern DI						
	13 System combination 2 x signal pattern E with 2 x signal pattern EI						
	14 System combination 2 x signal pattern E with signal pattern VI						
	15 System combination signal pattern D with signal pattern VI						
	16 System combination 2 x signal pattern DI						
	17 System combination 4 x signal pattern EI						
	18 System combination signal pattern VI with signal pattern EI						
	19 System combination 2 x signal pattern VI						
		Module m					
		M100 M = 1.00 mm					
		M125 M = 1.25 mm					
		M150 M = 1.50 mm					
		M175 M = 1.75 mm					
		M200 M = 2.00 mm					
		M225 M = 2.25 mm					
		M250 M = 2.50 mm					
		M300 M = 3.00 mm					
		M325 M = 3.25 mm					
		M350 M = 3.50 mm					
			Cable screen				
			L Cable screen is connected to the sensor housing				
			C Cable screen is connected capacitively to the sensor housing				
				Cable length L			
				xxxx cm Cable length			
					Cable outlet		
					A ABB flexible conduit, type XPCST-12BG		
					B Anaconda Sealtite, type HFX-V0348.010.1		
					C Eaton hose, type EC045-8		
					K Cable gland without cable protection		
						Tailoring	
						O Flying lead	
						S Special design	
						H Preassembled with Harting connector	
247MCx	_ _	_ _ _ _ _	_	_ _ _ _ _	_	_	

Pin assignment Harting connector HAN HPR (type code option H)



Pin assignment Harting connector			1	2	3	4	5	6	7	8	9	10	11	12
Wire color			VT	PK-BU	GY	YE	BU	RD-BU	PK	WH	RD	GN	BK	BN
	Signal pattern	Type code options												
Voltage output	D/D	1	track B1	GND2	GND3	track A2	GND1	U_{B2}	U_{B3}	track B2	U_{B1}	U_{B4}	track A1	GND4
	D/E	2	track B1	GND2	GND3	track A2	GND1	U_{B2}	U_{B3}	n. c.	U_{B1}	n. c.	track A1	n. c.
	E/E/E/E	3	track B1	GND2	GND3	track A2	GND1	U_{B2}	U_{B3}	track B2	U_{B1}	U_{B4}	track A1	GND4
	V/E/E	4	track B1	n. c.	GND3	track A2	GND1	n. c.	U_{B3}	track B2	U_{B1}	U_{B4}	track A1	GND4
	V/E	5	track B1	n. c.	GND3	track A2	GND1	n. c.	U_{B3}	n. c.	U_{B1}	n. c.	track A1	n. c.
	V/V	6	track B1	n. c.	GND3	track A2	GND1	n. c.	U_{B3}	track B2	U_{B1}	n. c.	track A1	n. c.
	V/EM/EM	7	track B1	n. c.	GND3	track A2	GND1	n. c.	U_{B3}	track B2	U_{B1}	U_{B4}	track A1	GND4
	V/DM	8	track B1	n. c.	GND3	track A2	GND1	n. c.	U_{B3}	track B2	U_{B1}	U_{B4}	track A1	GND4
	V/EM	9	track B1	n. c.	GND3	track A2	GND1	n. c.	U_{B3}	n. c.	U_{B1}	n. c.	track A1	n. c.
	D/EM	10	track B1	GND2	GND3	track A2	GND1	U_{B2}	U_{B3}	n. c.	U_{B1}	n. c.	track A1	n. c.
	V/V/V	11	track A2	GND2	GND3	track B1	GND1	U_{B2}	U_{B3}	track B2	U_{B1}	track A3	track A1	track B3
Current output	DI/D	12	n. c.	track B1	GND3	track A2	track A1	U_{B2}	U_{B3}	track B2	U_{B1}	U_{B4}	n. c.	GND4
	EI/EI/E/E	13	n. c.	track B1	GND3	track A2	track A1	U_{B2}	U_{B3}	track B2	U_{B1}	U_{B4}	n. c.	GND4
	VI/E/E	14	n. c.	track B1	GND3	track A2	track A1	n. c.	U_{B3}	track B2	U_{B1}	U_{B4}	n. c.	GND4
	VI/D	15	n. c.	track B1	GND3	track A2	track A1	n. c.	U_{B3}	track B2	U_{B1}	U_{B4}	n. c.	GND4
	DI/DI	16	n. c.	track B1	track A2	n. c.	track A1	U_{B2}	U_{B3}	n. c.	U_{B1}	U_{B4}	n. c.	track B2
	EI/EI/EI/EI	17	n. c.	track B1	track A2	n. c.	track A1	U_{B2}	U_{B3}	n. c.	U_{B1}	U_{B4}	n. c.	track B2
	VI/EI	18	n. c.	track B1	track A2	n. c.	track A1	n. c.	U_{B3}	n. c.	U_{B1}	n. c.	n. c.	n. c.
	VI/VI	19	n. c.	track B1	track A2	n. c.	track A1	n. c.	U_{B3}	n. c.	U_{B1}	n. c.	n. c.	track B2

Cable screen is connected directly or, as an option, capacitively.

Accessories

ZB247XM8 (2 screws M8 x 20 EN ISO 4762 with washer and spring washer)

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.

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