

## 2-channel speed sensor

### ▶ GEL 2476

Sensor with current output or voltage output (standstill voltage)

SENSORLINE

▶ **LENORD+BAUER**

**Technical information**

Version 03.10



#### General

- ▶ Application approved speed sensor based on magnetic measurement principle
- ▶ Maintenance- and wear-free operation due to non-contact measurement of rotation
- ▶ Suitable for ferromagnetic target wheels
- ▶ Safe detection of slow rotation from 0 Hz without pulse loss and for high-speed rotation up to 25 kHz
- ▶ Two channels shifted by 90° provide the direction of rotation
- ▶ Robust and compact stainless steel housing suitable for harsh application
- ▶ Constant duty output signals
- ▶ Customized cable fittings

#### Features

- ▶ Modul target wheel 1.00 to 3.50
- ▶ Measuring range 0 Hz to 25 kHz
- ▶ Temperature range -40 to +120°C
- ▶ Protection class IP 68
- ▶ Type testing according to EN 50155

#### Advantages

- ▶ Current output signals unsusceptible to electromagnetic disturbances
- ▶ Cable break monitoring by current output or voltage output with standstill voltage
- ▶ Maintenance-free due to significant measuring distance (air gap up to 3 mm)
- ▶ 45° mounting position possible

#### Fields of application

- ▶ Rail vehicles
  - Traction control
  - Anti-slip
  - Anti-skid
- ▶ Automation
  - Measurement of speed and positions at gears, motors and roller

# Technical data

Signal pattern	D-	H-	S-	E-	V-
<b>Electrical Data</b>					
Supply voltage $V_S$	reverse battery protected 10 to 30 V DC				
Current consumption per channel $I_S$ (no load)	$\leq 30$ mA				
Output signal (short circuit-proof)	Square-wave signals				
Output signal level high <sup>(1)</sup>	$\geq V_S - 1.8$ V		$\geq V_S - 1.0$ V		
Output signal level low <sup>(1)</sup>	$\leq 1.5$ V		$\leq 1.0$ V		
Output current per channel	$\leq 20$ mA				
Input frequency at target wheel	0 to 25 kHz				
Output frequency	0 to 25 kHz				
Duty cycle (depends on measuring scale and air gap)	50% $\pm$ 5%				
Phase shift	typ. 90°		–	–	typ. 90°
Slew rate (2 m cable)	$\geq 10$ V / $\mu$ s				
Electromagnetic compatibility	Rail vehicles (EN 50121-3-2) Industrial applications (EN 61000-6-1 to 4)				
Isolation strength	500 V AC (EN 60439-1)				
<b>Mechanical Data</b>					
Module m of target wheel	1.00 / 1.25 / 1.50 / 1.75 / 2.00 / 2.25 / 2.50 / 3.50				
Permissible air gap (for module m) <sup>(2)</sup>	0.2 to 3.0 mm				
Width of target wheel	$\geq 10$ mm (smaller ones upon request)				
Form of target wheel	Involute gear as per DIN 867, rectangular gear 1:1 or slotted disk (on request)				
Material of target wheel	Ferromagnetic steel				
Operating and ambient temperature	-40 °C to +120 °C				
Storage temperature	-40 °C to +120 °C				
Protection class	IP 68				
Vibration resistance	EN 61373 Cat. 3				
Shock resistance	EN 61373 Cat. 3				
Type test	EN 50155				
Housing material of sensor	Stainless steel				
Weight of sensor (2 m cable)	650 g				

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

(2) Please observe the permissible air gap table in this document

# Technical data

Signal pattern	X-	DI	VI	DL	HL
<b>Electrical Data</b>					
Supply voltage $V_S$	10 to 30 V DC	reverse battery protected 10 to 20 V DC		10 to 30 V DC	
Current consumption per channel $I_S$ (no load)	$\leq 30$ mA	$< 12$ mA			
Output signal (short circuit-proof)	Square-wave signals				
Output signal level high <sup>(1)</sup>	$\geq V_S - 1.0$ V	$\geq 14$ mA		$\geq V_S - 1.8$ V	
Output signal level low <sup>(1)</sup>	$\leq 1.0$ V	typ. 7 mA		$\leq 1.5$ V	
Output current per channel	$\leq 20$ mA	$\leq 16$ mA		$\leq 10$ mA	
Input frequency at target wheel	0 to 25 kHz		0.004 to 20 kHz		
Output frequency	0 to 25 kHz		0.004 to 20 kHz		
Duty cycle (depends on measuring scale and air gap)	50% $\pm$ 5%		50% $\pm$ 10%		
Phase shift	typ. 90°				
Slew rate (2 m cable)	$\geq 10$ V / $\mu$ s	$\geq 6$ V / $\mu$ s; $R_B = 560 \Omega$		$\geq 4$ V / $\mu$ s	
Electromagnetic compatibility	Rail vehicles (EN 50121-3-2) Industrial applications (EN 61000-6-1 to 4)				
Isolation strength	500 V AC (EN 60439-1)				
<b>Mechanical Data</b>					
Module m of target wheel	1.00 / 1.25 / 1.50 / 1.75 / 2.00 / 2.25 / 2.50 / 3.50				
Permissible air gap (for module m) <sup>(2)</sup>	0.2 to 3.0 mm				
Width of target wheel	$\geq 10$ mm (smaller ones upon request)				
Form of target wheel	Involute gear as per DIN 867, rectangular gear 1:1 or slotted disk (on request)				
Material of target wheel	Ferromagnetic steel				
Operating and ambient temperature	-40 °C to +120 °C				
Storage temperature	-40 °C to +120 °C				
Protection class	IP 68				
Vibration resistance	EN 61373 Cat. 3				
Shock resistance	EN 61373 Cat. 3				
Type test	EN 50155				
Housing material of sensor	Stainless steel				
Weight of sensor (2 m cable)	650 g				

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

(2) Please observe the permissible air gap table in this document

# Technical data

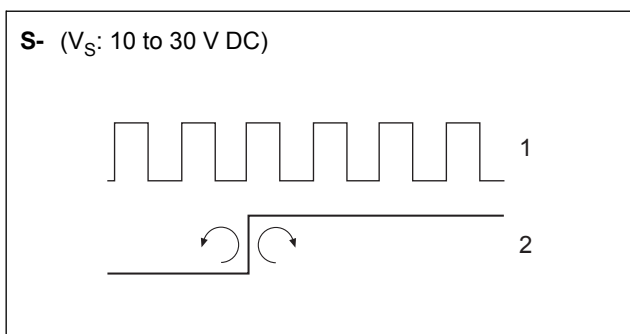
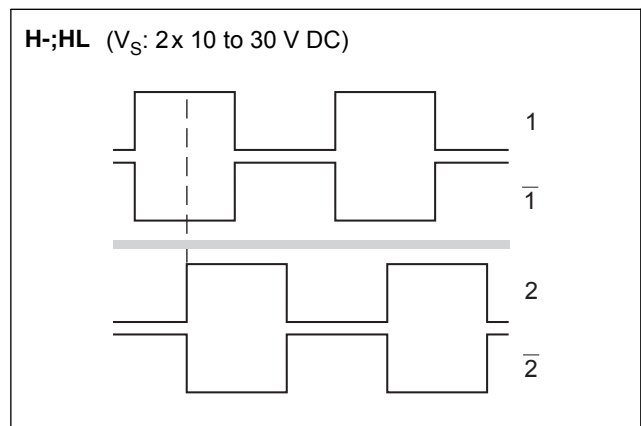
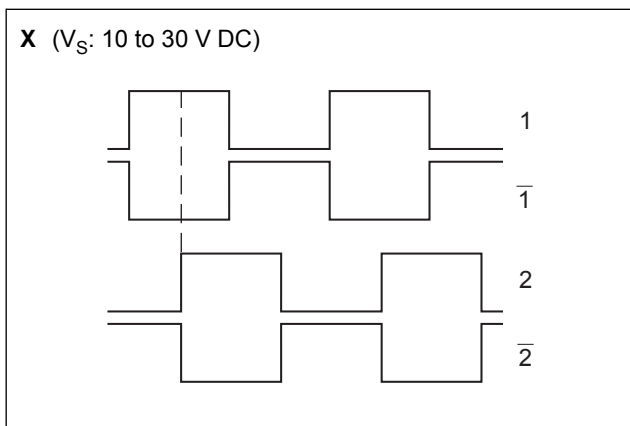
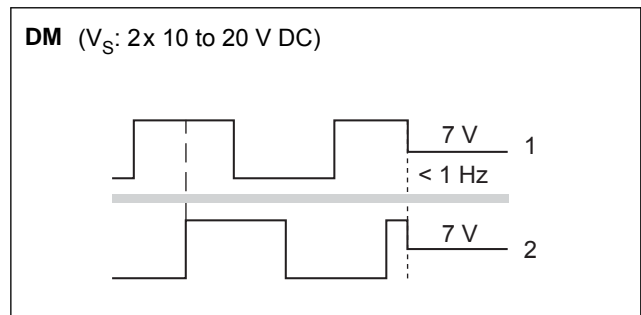
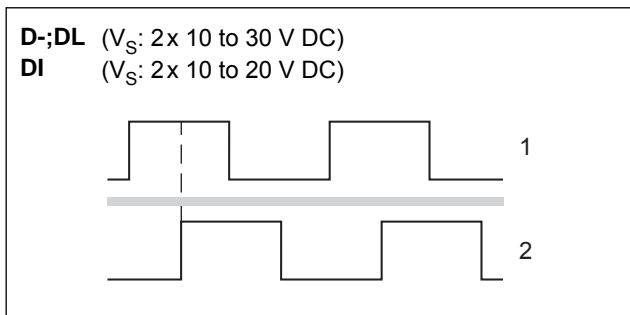
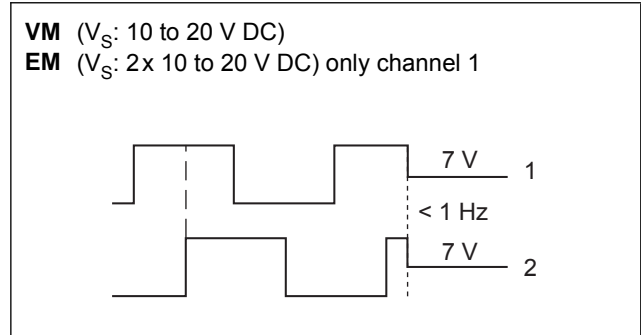
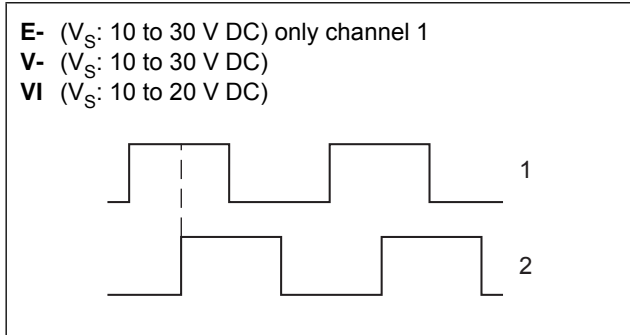
Signal pattern	DM	VM	EM
<b>Electrical Data</b>			
Supply voltage $V_S$	reverse battery protected 10 to 20 V DC		
Current consumption per channel $I_S$ (no load)	< 12 mA		
Output signal (short circuit-proof)	Square-wave signals		
Output signal level high <sup>(1)</sup>	$\geq V_S - 1.8 \text{ V}$		
Output signal level low <sup>(1)</sup>	$\leq 1.5 \text{ V}^{(2)}$		
Output current per channel	$\leq 10 \text{ mA}$		
Input frequency at target wheel	0.001 to 8kHz		
Output frequency	0.001 to 8kHz		
Duty cycle (depends on measuring scale and air gap)	50% $\pm$ 10%		
Phase shift	typ. 90°		–
Slew rate (2 m cable)	$\geq 4 \text{ V} / \mu\text{s}$		
Electromagnetic compatibility	Rail vehicles (EN 50121-3-2) Industrial applications (EN 61000-6-1 to 4)		
Isolation strength	500 V AC (EN 60439-1)		
<b>Mechanical Data</b>			
Module m of target wheel	2.0		
Permissible air gap (for module m) <sup>(3)</sup>	0.2 to 3.0 mm		
Width of target wheel	$\geq 10 \text{ mm}$ (smaller ones upon request)		
Form of target wheel	Involute gear as per DIN 867, rectangular gear 1:1 or slotted disk (on request)		
Material of target wheel	Ferromagnetic steel		
Operating and ambient temperature	-40 °C to +85 °C		
Storage temperature	-40 °C to +120 °C		
Protection class	IP 68		
Vibration resistance	EN 61373 Cat. 3		
Shock resistance	EN 61373 Cat. 3		
Type test	EN 50155		
Housing material of sensor	Stainless steel		
Weight of sensor (2 m cable)	650 g		

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

(2) 7 V  $\pm$  0,3 V at frequencies < 1 Hz  $\pm$  0,3 Hz

(3) Please observe the permissible air gap table in this document

# Signal pattern

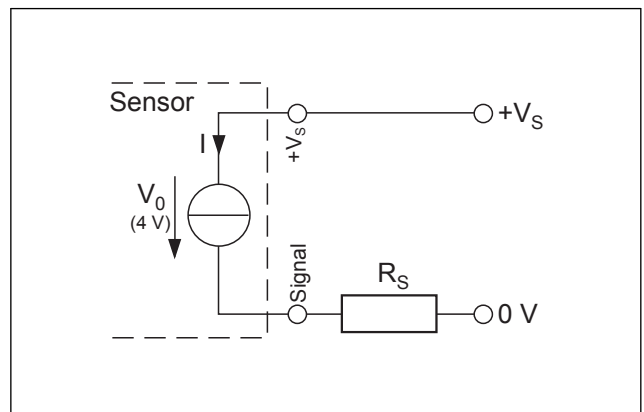
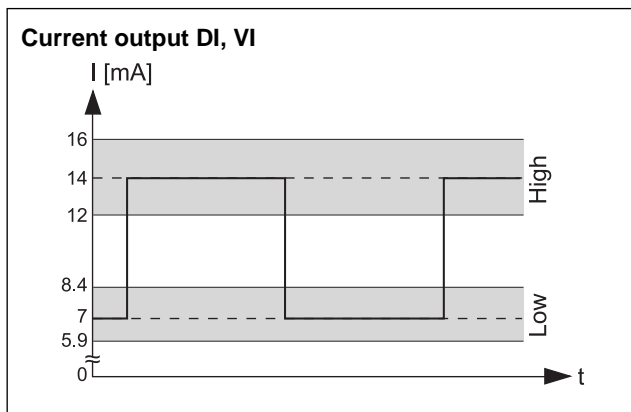
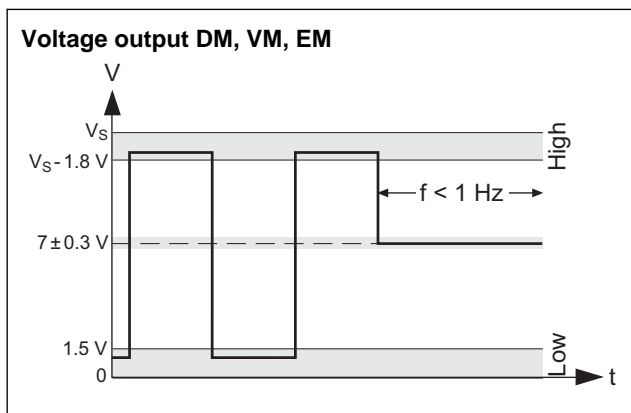
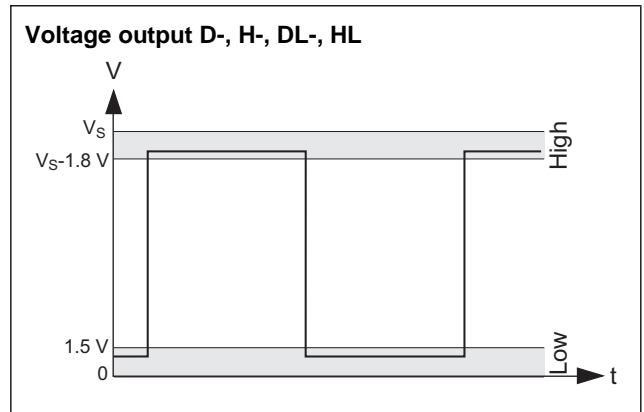
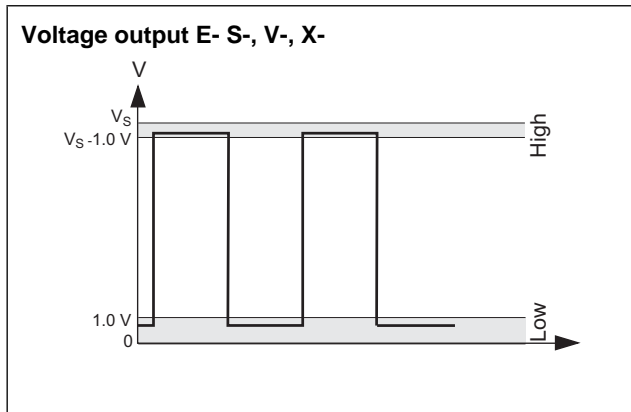


## Explanation

- x- = voltage output
- xI = current output
- xL = voltage output (low current)<sup>(1)</sup>
- xM = voltage output (standstill voltage)
- 1, 2 = channel 1, channel 2
- $\bar{1}$ ,  $\bar{2}$  = inverse channel 1; inverse channel 2
- = galvanically isolated
- $V_S$  = supply voltage

<sup>(1)</sup> with reduced current consumption

# Signal level



When using the current output, the resistor to be connected must not exceed a specific value:

$$R_{B,max} = (V_S - 4 \text{ V}) / I_{max}$$

with  $V_S = 10 \text{ to } 20 \text{ V DC}$  and  $I_{max} = 16 \text{ mA}$

Example for  $V_S = 15 \text{ V}$ :

$$R_{B,max} = 11 \text{ V} / 16 \text{ mA} = 690 \Omega$$

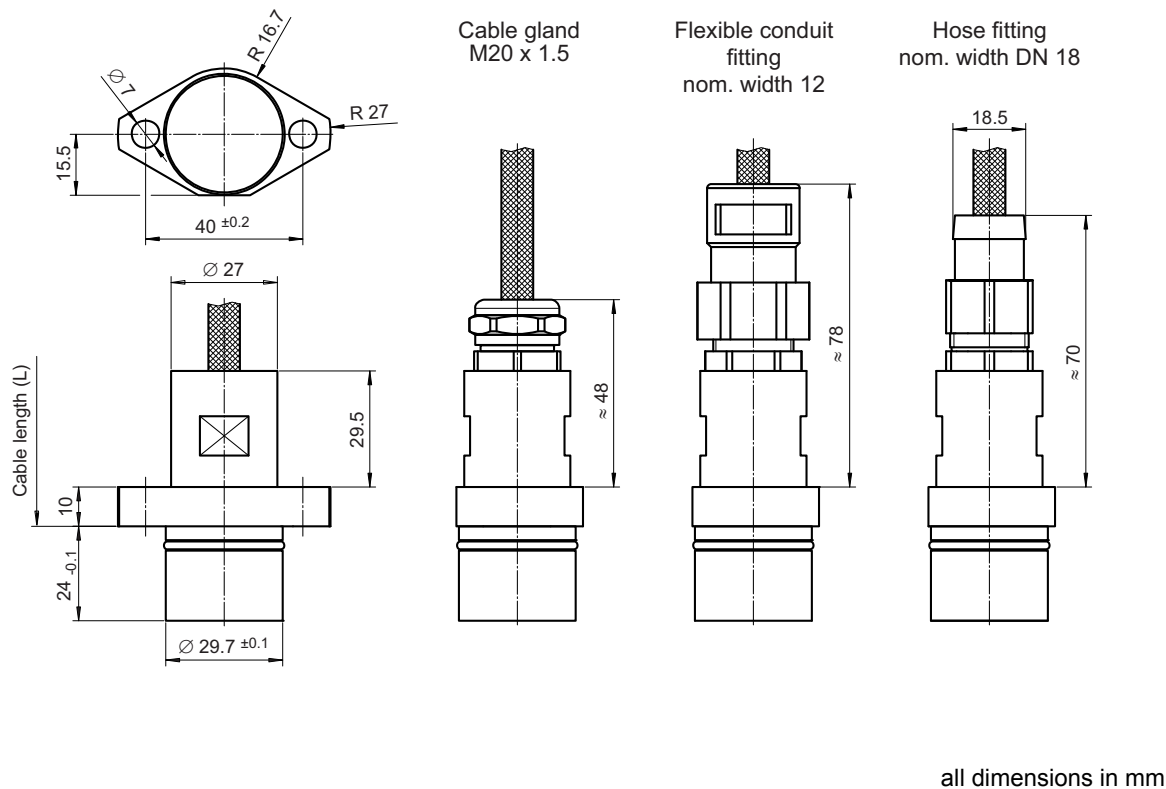
# Electrical connection, Dimensions

## Electrical connection

Signal	D-	H-	S-	E-	V-	X-	DI	VI	DL	HL	DM	VM	EM
Channel 1	ye	ye	ye	ye	ye	ye	bl	bl	ye	ye	wh	bl	wh
Channel 2		wh	wh	wh	wh	wh	gn	gn	wh	wh	gn	wh	
Channel 1̄			bk			bk				bk			
Channel 2̄				br		br				br			
GND (0 V)	bl	gr	bl	gr	bl	bl			bl	gr	bl	gr	bk
+V <sub>S</sub> (10 to 30 V DC)	rd	pi	rd	pi	rd	rd			rd	pi	rd	pi	
+V <sub>S</sub> (10 to 20 V DC)							rd	ye	rd		rd	or	or
Cable / Screen	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	2/2	1/1	1/1

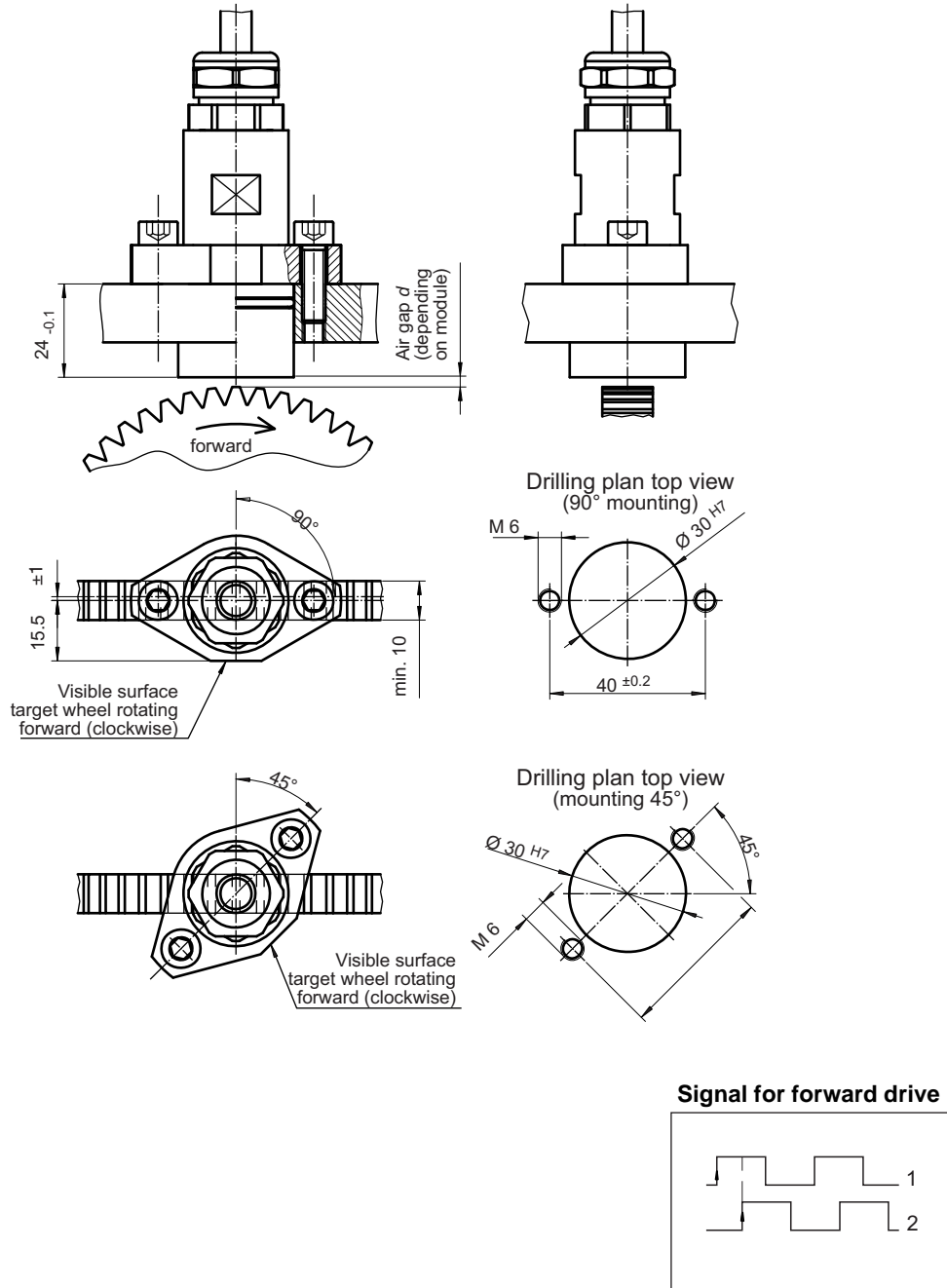
bk = black, bl = blue, br = brown, gn = green, gr = grey, or = orange, pi = pink, rd = red, vi = violet, ye = yellow, wh = white

## Dimensions



# Assembly drawing

## Assembly drawing



Please observe the EMC-reference into the operating instruction!

## Permissible air gap (for module m)

	D-	H-	S-	E-	V-	X-	DI	VI	DL	HL	DM	VM	EM
m = 1.0				0.2 to 1.4 mm					0.2 to 0.9 mm				
m = 1.5				0.2 to 1.8 mm					0.2 to 1.5 mm				
m = 2.0				0.2 to 2.2 mm					0.2 to 2.0 mm		0.2 to 2.2 mm		
m = 2.5				0.2 to 2.8 mm					0.2 to 2.2 mm				
m = 3.5				0.2 to 3.0 mm					0.2 to 2.8 mm				



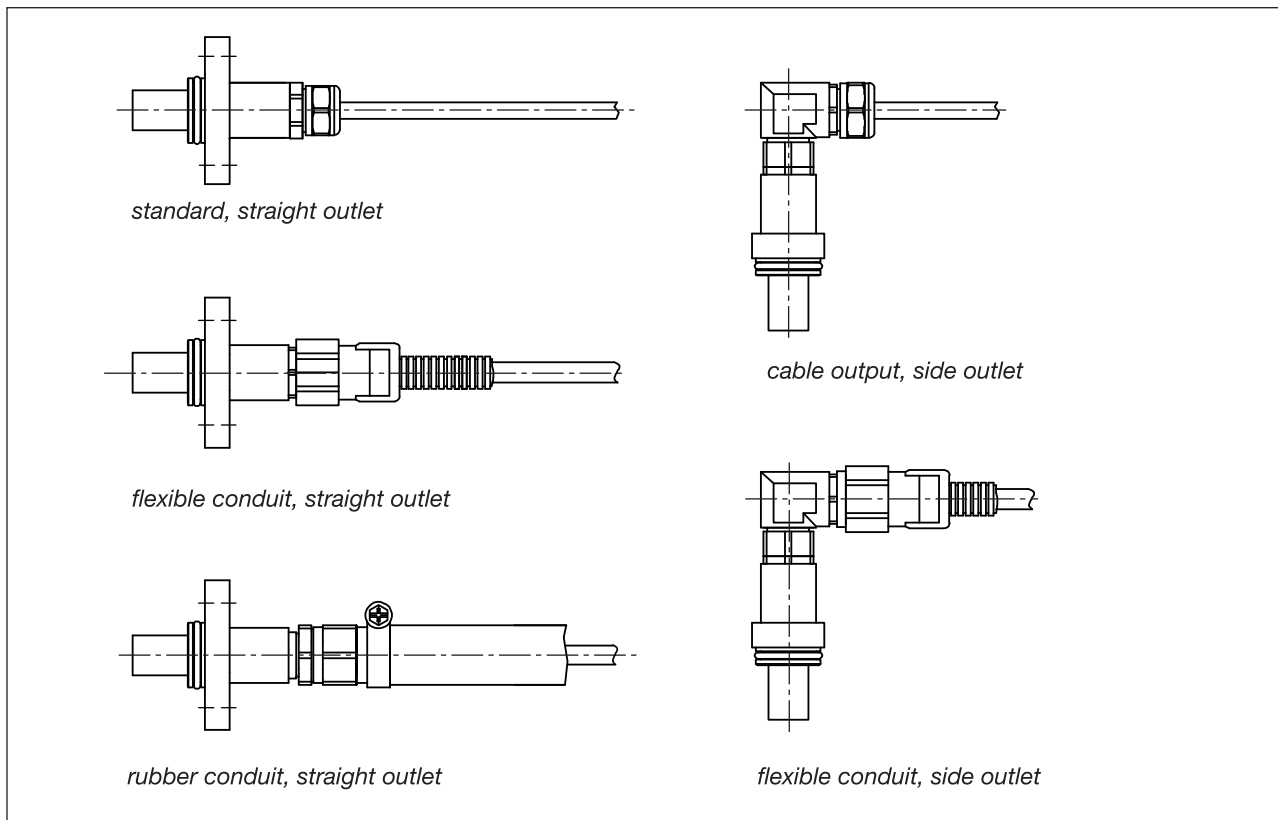
## Type code GEL 2476

<b>Signal pattern</b>	
<b>E</b>	1-channel square-wave signals
<b>S</b>	1-channel square-wave signals with direction signal
<b>V</b>	2-channel square-wave signals shifted by 90°
<b>X</b>	2-channel square-wave signals shifted by 90° and their inversed signals
<b>D</b>	2-channel square-wave signals shifted by 90°, galvanically separated
<b>H</b>	2-channel square-wave signals shifted by 90° and their inversed signals, galvanically separated
<b>Signal output</b>	
-	Voltage
<b>I</b>	Current (with signal patterns V and D only)
<b>L</b>	Voltage, with reduced current consumption (with signal patterns D and H only)
<b>M</b>	Standstill monitoring voltage 7 V (with signal patterns E, V and D for module 2.00 only)
<b>Module M</b>	
<b>100</b>	Module 1.00
<b>125</b>	Module 1.25
<b>150</b>	Module 1.50
.	
.	
.	
<b>350</b>	Module 3.50
<b>Cable screening</b>	
<b>L</b>	Connected to sensor housing
<b>P</b>	Not connected to sensor housing
<b>Cable outlet</b>	
<b>K</b>	Screwed cable gland
<b>W</b>	Flexible tube fitting
<b>G</b>	Rubber tube adapter
<b>Mounting position</b>	
<b>A</b>	90°
<b>B</b>	45°
<b>Cable length L</b>	
<b>xxx</b>	cm cable length
<b>Costumising</b>	
<b>N</b>	Standard version
<b>S</b>	Special version
<b>2476</b>	

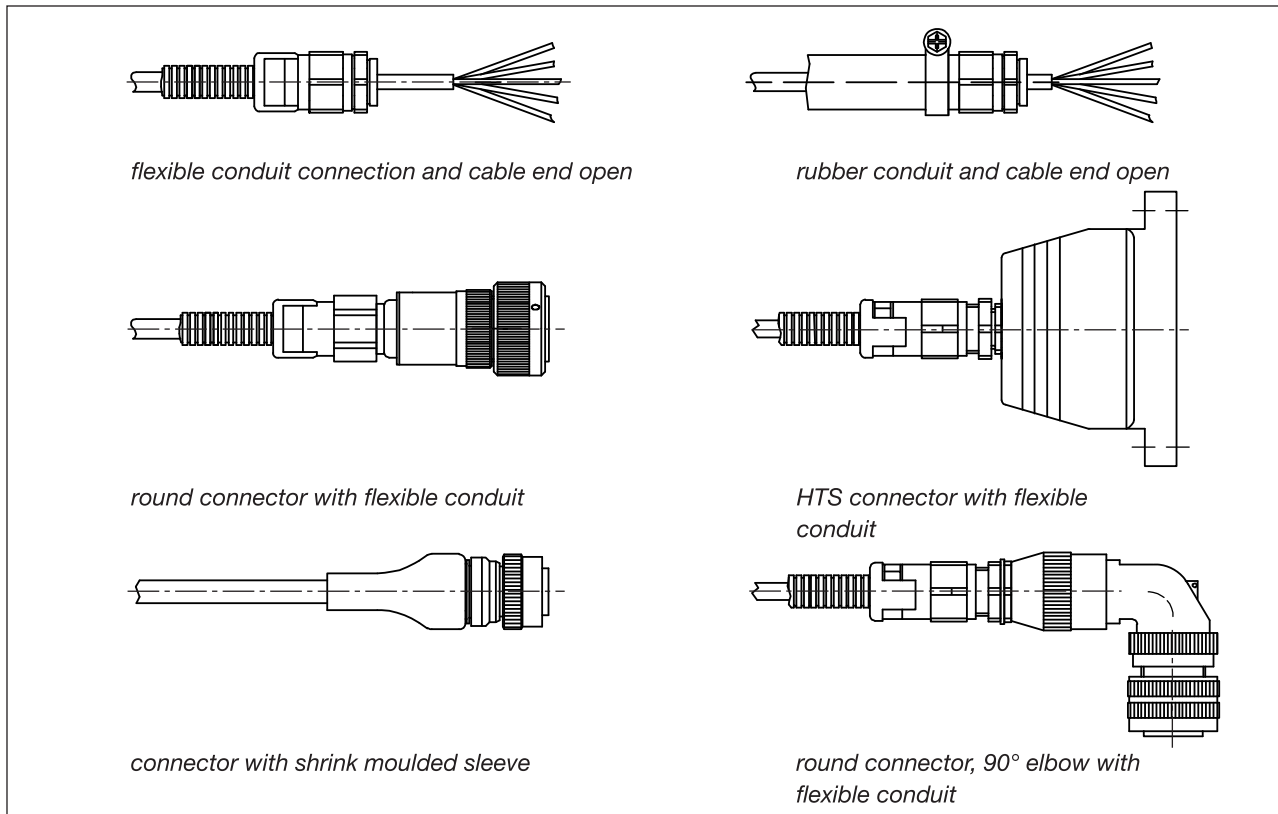
**Notes:** For a special customized version a Y-No. will be created. A special version 2476Yxxx is manufactured according to a drawing or application description and could differ from the technical standard specification.

# Example for customized cable connections

## Encoder end



## Cable end





We have agencies in:

Austria  
Belgium  
Canada  
China  
Czech Republic  
Denmark  
Finland  
France  
Germany  
Great Britain  
Israel  
Italy  
Korea  
Malaysia  
Netherlands  
Norway  
Portugal  
Sweden  
Switzerland  
Spain  
Turkey  
USA



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+BAUER**

*... automates motion.*

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