

# Incremental encoders

<b>Standard, ATEX/IECEX – zone 1/21 optical</b>	<b>Sendix 7000 / 7020 (shaft / hollow shaft)</b>	<b>Push-pull / RS422</b>
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The Sendix 7000 / 7020 incremental encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing.

These shock and vibration resistant encoders operate flexibly with a resolution of up to 5000 pulses per rotation; they are also available with axial and radial cable outlets.



Ex approval	Safety-Lock™	High rotational speed	High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Short-circuit proof	Reverse polarity protection	Optical sensor	Seawater durable

### Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

### Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEX with certificate of conformity (CoC).

<b>Order code</b>	<b>8.7000</b>	<b>. 1</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>. XXXX</b>	<b>. XXXX</b>
<b>Shaft version</b>	Type	a	b	c	d	e	f

<p><b>a</b> Flange 1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p><b>b</b> Shaft (ø x L) 2 = 10 x 20 mm [0.39 x 0.79"], with flat 1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p><b>c</b> Output circuit / supply voltage 4 = RS422 (with inverted signal) / 5 V DC 1 = RS422 (with inverted signal) / 5 ... 30 V DC 2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC 5 = push-pull (with inverted signal) / 10 ... 30 V DC</p>	<p><b>d</b> Type of connection 1 = axial cable, 2 m [6.56'] PUR 2 = radial cable, 2 m [6.56'] PUR A = axial cable, length &gt; 2 m [6.56'] B = radial cable, length &gt; 2 m [6.56']</p> <p><b>e</b> Pulse rate 1, 5, 10, 12, 36, 50, 100, 200, 250, 256, 300, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000 (e.g. 100 pulses =&gt; 0100)</p>	<p><b>f</b> Cable length in dm<sup>1)</sup> 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']</p> <p><i>Optional on request</i> - other pulse rates - special cable length - seawater resistant (stainless steel V4A)</p>
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1) Not applicable with connection types 1 and 2.

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<b>Order code</b> <b>Hollow shaft</b>	<b>8.7020</b> Type	<b>.XXXXX</b> a b c d	<b>.XXXX</b> e	<b>.XXXX</b> f
<b>a Flange</b> 1 = with spring element, short 5 = with stator coupling, ø 65 mm [2.56"]	<b>d Type of connection</b> 1 = axial cable, 2 m [6.56'] PUR 2 = radial cable, 2 m [6.56'] PUR A = axial cable, length > 2 m [6.56'] B = radial cable, length > 2 m [6.56']	<b>f Cable length in dm <sup>1)</sup></b> 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']		
<b>b Blind hollow shaft</b> (insertion depth max. 41.5 mm [1.63"]) 1 = ø 12 mm [0.47"] 2 = ø 14 mm [0.55"]	<b>e Pulse rate</b> 1, 5, 10, 12, 36, 50, 100, 200, 250, 256, 300, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000 (e.g. 100 pulses => 0100)	<b>Optional on request</b> - other pulse rates - special cable length - IP65 version for T6 - seawater resistant (stainless steel V4A)		
<b>c Output circuit / supply voltage</b> 4 = RS422 (with inverted signal) / 5 V DC 1 = RS422 (with inverted signal) / 5 ... 30 V DC 2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC 5 = push-pull (with inverted signal) / 10 ... 30 V DC				

<b>Mounting accessory for shaft encoders</b>	<b>Coupling</b>	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	<b>Order no.</b> <b>8.0000.1102.1010</b>
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Further accessories can be found in the accessories section or in the accessories area of our website at: [kuebler.com/accessories](http://kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [kuebler.com/connection\\_technology](http://kuebler.com/connection_technology).

## Technical data

Explosion protection Sendix 7000	
<b>ATEX</b>	
<b>EC type-examination certificate</b>	PTB09 ATEX 1106 X
<b>Category (gas)</b>	⊕ II 2 G Ex d IIC T4 - T6 Gb
<b>Category (dust)</b>	⊕ II 2D Ex tb IIIC T135°C - T85°C Db
<b>Relevant standards</b> ATEX guideline 94/9/EC	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
<b>IECEX</b>	
<b>Certificate of Conformity (CoC)</b>	IECEX PTB 13.0026 X
<b>Category (gas)</b>	Ex d IIC T4 - T6 Gb
<b>Category (dust)</b>	Ex tb IIIC T135°C - T85°C Db
<b>Relevant standards</b>	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7020	
<b>ATEX</b>	
<b>EU type-examination certificate</b>	IBExU 15 ATEX 1091 X
<b>Category (gas)</b>	⊕ II 2 G Ex db IIC T4/120°C (T4)/T6 Gb
<b>Category (dust)</b>	⊕ II 2 D Ex tb IIIC T135°C - T85°C Db
<b>Relevant standards</b> ATEX guideline 2014/34/EU	EN 60079-0:2012 + A11:2013; EN 60079-1:2014; EN 60079-31:2014
<b>IECEX</b>	
<b>Certificate of Conformity (CoC)</b>	IECEX IBE 15.0020 X
<b>Category (gas)</b>	Ex db IIC T4/120°C (T4)/T6 Gb
<b>Category (dust)</b>	Ex tb IIIC T135°C - T85°C Db
<b>Relevant standards</b>	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

1) Not applicable with connection types 1 and 2.

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Mechanical characteristics	
<b>Maximum speed</b>	shaft 6000 min <sup>-1</sup> (continuous) hollow shaft 3000 min <sup>-1</sup> (continuous)
<b>Starting torque – at 20 °C [68 °F]</b>	< 0.05 Nm
<b>Mass moment of inertia</b>	4.0 x 10 <sup>-6</sup> kgm <sup>2</sup>
<b>Load capacity of shaft</b>	radial 80 N axial 40 N
<b>Weight</b>	approx. 1.5 kg [52.91 oz]
<b>Protection acc. to EN 60529</b>	IP67
<b>Ambient temperature</b>	-40 °C ... +60 °C [-40 °C ... +140 °F] Please note the specifications for temperature class in EC type-examination certificate!
<b>Materials</b>	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
<b>Shock resistance acc. to EN/IEC 60068-2-27</b>	2500 m/s <sup>2</sup> , 6 ms
<b>Vibration resistance acc. to EN/IEC 60068-2-6</b>	100 m/s <sup>2</sup> , 55 ... 2000 Hz

EMC	
<b>Relevant standards</b>	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Approvals	
<b>CE compliant</b> in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU
ATEX Directive	2014/34/EU (for Ex 2/22 variants)

Electrical characteristics				
Output circuit	RS422 (TTL compatible)	RS422 (TTL compatible)	Push-pull	Push-pull (7272 compatible)
	Order code <b>1</b>	<b>4</b>	<b>5</b>	<b>2</b>
<b>Supply voltage</b>	5 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC	5 ... 30 V DC
<b>Power consumption (no load)</b>	typ. 40 mA max. 90 mA	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA
<b>Permissible load / channel</b>	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA
<b>Pulse frequency</b>	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz <sup>1)</sup>
<b>Signal level</b>	HIGH min. 2.5 V LOW max. 0.5 V	min. 2.5 V max. 0.5 V	min +V - 1.0 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V
<b>Rising edge time t<sub>r</sub></b>	max. 200 ns	max. 200 ns	max. 1 μs	max. 1 μs
<b>Falling edge time t<sub>f</sub></b>	max. 200 ns	max. 200 ns	max. 1 μs	max. 1 μs
<b>Short circuit proof outputs<sup>2)</sup></b>	yes <sup>3)</sup>	yes <sup>3)</sup>	yes	yes
<b>Reverse polarity protection of the supply voltage</b>	yes	no	yes	no

## Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)												
1, 2, 4, 5	1, 2, A, B	Signal:	0 V	+V	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	0 V <sub>sens</sub>	+V <sub>sens</sub>	$\perp$	
		Core marking:	1	2	3	4	5	6	7	8	9	10	shield	

- +V: Supply voltage encoder +V DC
- 0 V: Supply voltage encoder ground GND (0 V)
- 0 V<sub>sens</sub> / +V<sub>sens</sub>: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A,  $\bar{A}$ : Incremental output channel A / cosine signal
- B,  $\bar{B}$ : Incremental output channel B / sine signal
- 0,  $\bar{0}$ : Reference signal
- $\perp$ : Plug connector housing (shield)

1) Max. recommended cable length 30 m [98.43'].  
 2) Short-circuit with 0 V or output, only one channel at a time, supply voltage correctly applied.

3) Only one channel allowed to be shorted-out:  
 at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.  
 at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

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optical**

**Sendix 7000 / 7020 (shaft / hollow shaft)**

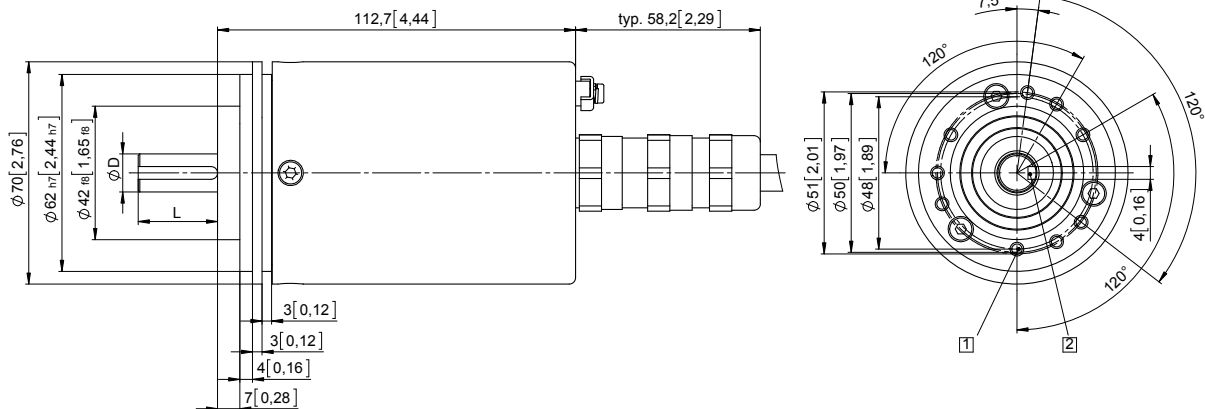
**Push-pull / RS422**

## Dimensions shaft version

Dimensions in mm [inch]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 1 with axial cable outlet**

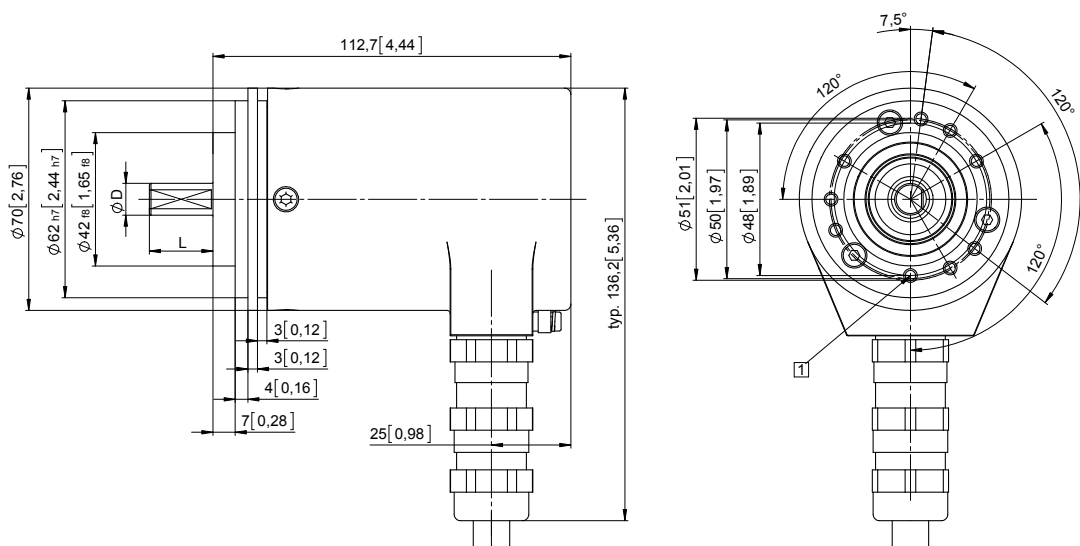
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

**Clamping / synchronous flange,  $\varnothing$  70 [2.76]**  
**Shaft type 2 with radial cable outlet**

- 1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

