

# Incremental Encoders

<b>Large hollow shaft Optical</b>	<b>A020 (Hollow shaft)</b>	<b>Push-Pull / RS422 / SinCos</b>
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The incremental encoder type A020 with optical sensor technology is available with a through hollow shaft up to max. 42 mm diameter.

With an installation depth of just 43 mm it is optimally suited for mounting on large shafts, even where space is tight.



Incremental Encoders

High rotational speed	High protection level	Shock / vibration resistant	Magnetic field proof	Optical sensor

### Compact

- Minimal installation depth but large hollow shaft
- Available with compact M12 connector
- Torque stop can be implemented even with small radius

### Flexible

- With Push-Pull, RS422 or SinCos interface
- Hollow shaft from 20 mm up to 42 mm as standard
- With cable connection, M23 or M12 connectors

### Order code Hollow shaft

<b>8.A020</b>	.	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	.	<b>XXXX</b>
Type		<b>a</b>	<b>b</b>	<b>c</b>	<b>d</b>		<b>e</b>

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



<p><b>a Flange</b> 2 = with spring element short <b>3 = with spring element long</b> 5 = with fastening arm long</p> <p><b>b Hollow shaft</b> C = <math>\varnothing</math> 20 mm [0.79"] 6 = <math>\varnothing</math> 24 mm [0.94"] <b>5 = <math>\varnothing</math> 25 mm [0.98"]</b> 3 = <math>\varnothing</math> 28 mm [1.10"] <b>A = <math>\varnothing</math> 30 mm [1.18"]</b> 2 = <math>\varnothing</math> 38 mm [1.50"] B = <math>\varnothing</math> 40 mm [1.57"] 1 = <math>\varnothing</math> 42 mm [1.65"] 4 = <math>\varnothing</math> 1"</p>	<p><b>c Output circuit / Power supply</b> <b>1 = RS422 (with inverted signal) / 5 V DC</b> 4 = RS422 (with inverted signal) / 10 ... 30 V DC 2 = Push-pull (without inverted signal) / 10 ... 30 V DC 5 = Push-pull (with inverted signal) / 5 ... 30 V DC <b>3 = Push-pull (with inverted signal) / 10 ... 30 V DC</b> A = Push-pull (7272 compatible) / 5 ... 30 V DC 8 = SinCos, 1 Vpp (with inverted signal) / 5 V DC 9 = SinCos, 1 Vpp (with inverted signal) / 10 .. 30 V DC</p> <p><b>d Type of connection</b> 1 = radial cable, 1 m [3.28'] PVC cable <b>2 = M23 connector, 12-pin, radial, without mating connector</b> E = M12 connector, 8-pin, radial</p>	<p><b>e Pulse rate</b> 50, 360, 512, 600, 1000, <b>1024</b>, 1500, 2000, <b>2048</b>, 2500, 4096, <b>5000</b> (e.g. 360 pulses =&gt; 0360) Other pulse rates on request</p> <p>SinCos version only available with pulses <math>\geq</math> 1024</p>
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### Mounting accessory for hollow shaft encoders Order No.

<b>Cylindrical pin, long</b>	<p>with fixing thread</p>	<b>8.0010.4700.0003</b>
for torque stops		

Connection technology		
<b>Connector, self-assembly (straight)</b>	M12 female connector with coupling nut	<b>05.CMB 8181-0</b>
	M23 female connector with coupling nut	<b>8.0000.5012.0000</b>
<b>Cordset, pre-assembled</b>	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	<b>05.00.6041.8211.002M</b>
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	<b>8.0000.6201.0002</b>

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## Technical data

Mechanical characteristics		Electrical characteristics SinCos output		
<b>Speed</b>	max. 3000 min <sup>-1</sup> 1)	<b>Output circuit</b>	<b>SinCos U = 1 Vpp</b>	<b>SinCos U = 1 Vpp</b>
<b>Moment of inertia</b> 2)	< 150 x 10 <sup>-6</sup> kgm <sup>2</sup>	<b>Power supply</b>	5 V DC ±5%	10 ... 30 V DC
<b>Starting torque with sealing</b> at 20°C [68°F]	< 0.2 Nm	<b>Power consumption with inverted signal</b> (no load)	typ. 65 mA/max. 110 mA	typ. 65 mA/max. 110 mA
<b>Weight</b>	approx. 0.7 kg [24.69 oz]	<b>-3 dB frequency</b>	≤180 kHz	≤180 kHz
<b>Protection</b> acc. to EN 60529	IP65	<b>Signal level</b>	channels A/B channel 0	1 Vpp (±20%) 0.1 ... 1.2 V
<b>Working temperature range</b>	-40°C 3) ... +70°C [-40°F 3) ... +158°F]	<b>Short circuit proof outputs</b> 4)	yes	yes
<b>Material</b>	shaft stainless steel H7	<b>Reverse polarity protection of the power supply</b>	no	yes
<b>Shock resistance</b> acc. to EN 60068-2-27	1000 m/s <sup>2</sup> , 6 ms	<b>UL approval</b>	File 224618	
<b>Vibration resistance</b> acc. to EN 60068-2-6	100 m/s <sup>2</sup> , 10...2000 Hz	<b>CE compliant</b> acc. to	EMC guideline 2004/108/EC	
		<b>RoHS compliant</b> acc. to	guideline 2002/95/EC	

Electrical characteristics				
Output circuit	RS422 (TTL compatible)	Push-Pull	Push-Pull (7272 compatible)	
<b>Power supply</b>	5 V DC (±5 %) o. 10 ... 30 V DC	10 ... 30 V DC	5 ... 30 V DC	
<b>Power consumption</b> (no load)	without inverted signal – with inverted signal typ. 40 mA/max. 90 mA	typ. 55 mA/max. 125 mA typ. 80 mA/max. 150 mA	– typ. 50 mA/max. 100 mA	
<b>Permissible load / channel</b>	max. ±20 mA	max. ±30 mA	max. ±20 mA	
<b>Pulse frequency</b>	max. 300 kHz	max. 300 kHz	max. 300 kHz	
<b>Signal level</b>	HIGH min. 2.5 V LOW max. 0.5 V	min. +V – 3 V max. 2.5 V	min. +V – 2.0 V max. 0.5 V	
<b>Rising edge time t<sub>r</sub></b>	max. 200 ns	max. 1 μs	max. 1 μs	
<b>Falling edge time t<sub>f</sub></b>	max. 200 ns	max. 1 μs	max. 1 μs	
<b>Short circuit proof outputs</b> 4)	yes 5)	yes	yes	
<b>Reverse polarity protection of the power supply</b>	no, 10 ... 30 V DC: yes	yes	no	
<b>UL approval</b>	File 224618			
<b>CE compliant</b> acc. to	EMC guideline 2004/108/EC			
<b>RoHS compliant</b> acc. to	guideline 2002/95/EC			

1) Short term (app. 15 min. range) up to 3500 min<sup>-1</sup>

2) Depending on shaft diameter

3) With connector: -40°C [-40°F], securely installed: -30°C [-22°F], flexibly installed: -20°C [-4°F]

4) If supply voltage correctly applied.

5) 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 = 10 ... 30 V DC short circuit to channel or 0 V is permitted.

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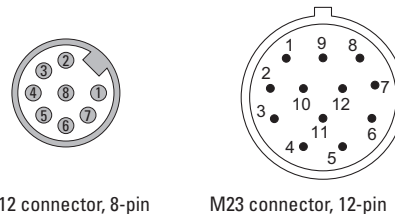
<b>Large hollow shaft Optical</b>	<b>A020 (Hollow shaft)</b>	<b>Push-Pull / RS422 / SinCos</b>
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## Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1 ... A	1	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Cable colour:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield
Output circuit	Type of connection	M23 connector, 12 pin											
1 ... A	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Pin:	10	12	11	2	5	6	8	1	3	4	PH <sup>1)</sup>
Output circuit	Type of connection	M12 connector, 8 pin											
1 ... A	E	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	$\perp$
		Pin:	1	2	-	-	3	4	5	6	7	8	PH <sup>1)</sup>

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: 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
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal
- PH  $\perp$ : Plug connector housing (Shield)

### Top view of mating side, male contact base



## Dimensions hollow shaft version

Dimensions in mm [inch]

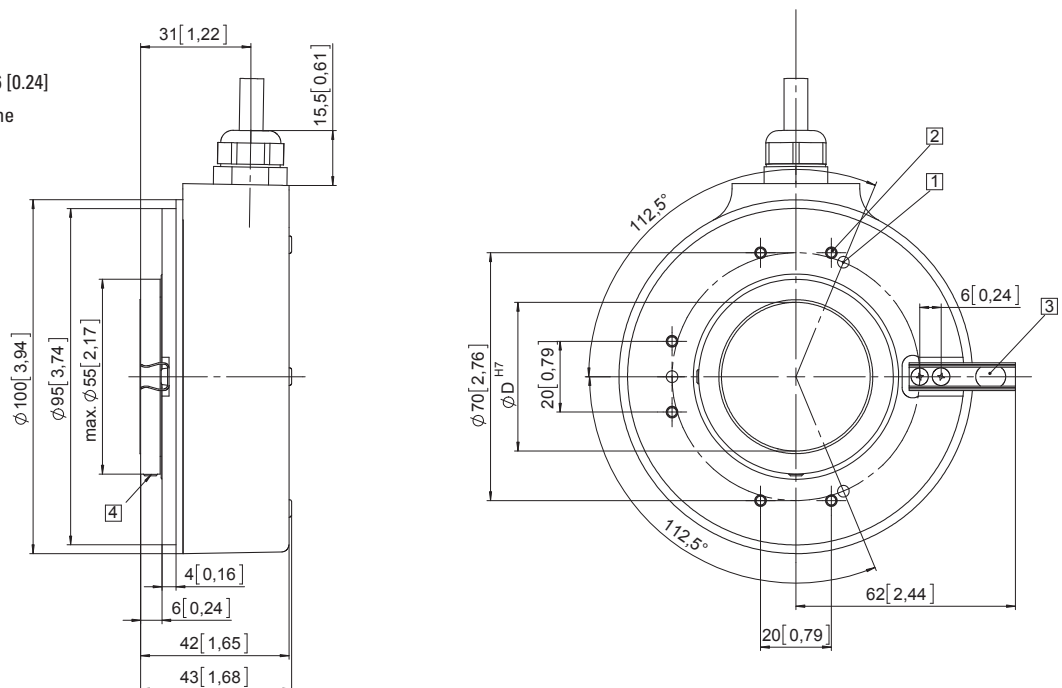
### Flange with spring element long

#### Flange type 3

- 1) 3 x M4, 7 [0.28] deep
- 2) 6 x M3, 8 [0.31] deep
- 3) Cylindrical pin DIN 6325,  $\phi$  6 [0.24]
- 4) Recommended torque for the clamping ring 1.0 Nm

#### Note:

Minimum insertion depth  
1.5 x D<sub>hollow shaft</sub>



1) PH = Shield is attached to connector housing

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## Dimensions hollow shaft version

Dimensions in mm [inch]

### Flange with fastening arm, long Flange type 5

- 1 Recommended torque for the clamping ring 1.0 Nm

**Note:**  
Minimum insertion depth  
 $1.5 \times D_{\text{hollow shaft}}$

