

# Incremental encoders

<b>Miniature optical</b>	<b>2400 / 2420 (shaft / hollow shaft)</b>	<b>Push-pull, RS422</b>
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The incremental miniature encoders type 2400 / 2420 with their optical sensor technology offer a resolution of up to 1024 pulses per revolution.

With a diameter of just 24 mm this encoder is ideal for use where space is tight.



High rotational speed	Temperature range -20°...+85°C	Shock / vibration resistant	Short-circuit proof	Magnetic field proof	Optical sensor

### Reliable

- Robust bearing construction.
- Cable outlet boasts high degree of strain relief thanks to multiple clamping.
- Short-circuit proof outputs.

### Versatile

- Ideally suited for use in small devices.

### Order code Shaft version

<b>05.2400</b>	<b>.XXXX</b>	<b>.XXXX</b>
Type	a b c d	e

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.



#### a Flange

- 1** = ø 24 mm [0.94"]
- 3 = ø 28 mm [1.10"]
- 2 = ø 30 mm [1.18"]

#### b Shaft (ø x L)

- 1** = ø 4 x 10 mm [0.16 x 0.39"]
  - 3 = ø 5 x 10 mm [0.20 x 0.39"], with flat
  - 2 = ø 6 x 10 mm [0.24 x 0.39"]
- 
- 4 = ø 1/4" x 10 mm [1/4" x 0.39"], with flat <sup>1)</sup>
  - 6 = ø 6 x 10 mm [0.24 x 0.39"], with flat <sup>1)</sup>

#### c Output circuit / supply voltage

- 1 = push-pull (without inverted signal) / 5 ... 24 V DC
- 2** = **push-pull (with inverted signal) / 5 ... 24 V DC**
- 3 = push-pull (without inverted signal) / 8 ... 30 V DC
- 4 = push-pull (with inverted signal) / 8 ... 30 V DC
- 6 = RS422 (with inverted signal) / 5 V DC

#### d Type of connection

- 1 = axial cable, 2 m [6.56'] PVC
- A = axial cable, special length PVC \*)
- 2** = **radial cable, 2 m [6.56'] PVC**
- B = radial cable, special length PVC \*)

\*) Available special lengths (connection types A, B):  
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']  
order code expansion .XXXX = length in dm  
ex.: 05.2400.122A.1024.0030 (for cable length 3 m)

#### e Pulse rate


- 4, 6, 8, 10, 16, 20, 25, 36, 40, 50, 60, 80, **100**, 120, 125, 180, **200**, 250, 300, **360**, 400, **500**, 512, **1000**, **1024** (e.g. 360 pulses => 0360)

Optional on request  
- other pulse rates

1) US version.

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<b>Order code</b>	<b>05.2420</b>	<b>1</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XXXX</b>	If for each parameter of an encoder the <u>underlined preferred option</u> 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.	
<b>Hollow shaft</b>	Type	a	b	c	d	e			
<b>a Flange</b> <u>1 = ø 24 mm [0.94"]</u>  <b>b Blind hollow shaft</b> <i>(insertion depth max. 14 mm [0.55"])</i> 1 = ø 4 mm [0.16"] <u>2 = ø 6 mm [0.24"]</u>  4 = ø 1/4" <sup>1)</sup>	<b>c Output circuit / supply voltage</b> 1 = push-pull (without inverted signal) / 5 ... 24 V DC <u>2 = push-pull (with inverted signal) / 5 ... 24 V DC</u> 3 = push-pull (without inverted signal) / 8 ... 30 V DC 4 = push-pull (with inverted signal) / 8 ... 30 V DC 6 = RS422 (with inverted signal) / 5 V DC  <b>d Type of connection</b> 1 = axial cable, 2 m [6.56'] PVC A = axial cable, special length PVC *) <u>2 = radial cable, 2 m [6.56'] PVC</u> B = radial cable, special length PVC *)  *) Available special lengths (connection types A, B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 05.2420.122A.1024.0030 (for cable length 3 m)	<b>e Pulse rate</b> 4, 6, 8, 10, 16, 20, 25, 36, 40, 50, 60, 80, <u>100</u> , 120, 125, 180, <u>200</u> , 250, 300, <u>360</u> , 400, <u>500</u> , 512, <u>1000</u> , <u>1024</u> (e.g. 360 pulses => 0360)  <i>Optional on request</i> - other pulse rates							

<b>Mounting accessory for shaft encoders</b>	Order no.
<b>Coupling</b>	bellows coupling ø 15 mm [0.59"] for shaft 4 mm [0.16"]
	<b>8.0000.1202.0404</b>

1) US version.

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## Technical data

Mechanical characteristics	
<b>Maximum speed</b>	12000 min <sup>-1</sup>
<b>Mass moment of inertia</b>	approx. 0.1 x 10 <sup>-6</sup> kgm <sup>2</sup>
<b>Starting torque</b> – at 20 °C [68 °F]	< 0.01 Nm <sup>3)</sup>
<b>Shaft load capacity</b>	radial 20 N axial 10 N
<b>Weight</b>	approx. 0.06 kg [2.12 oz]
<b>Protection</b> acc. to EN 60529	housing side IP65 flange side IP50 (IP64 on request)
<b>Working temperature range</b>	-20 °C ... +85 °C [-4 °F ... +185 °F]
<b>Materials</b>	shaft stainless steel blind hollow shaft brass
<b>Shock resistance</b> acc. to EN 60068-2-27	1000 m/s <sup>2</sup> , 6 ms
<b>Vibration resistance</b> acc. to EN 60068-2-6	100 m/s <sup>2</sup> , 55 ... 2000 Hz

Approvals	
<b>UL compliant</b> in accordance with	File no. E224618
<b>CE compliant</b> in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU

## Electrical characteristics

Output circuit	Push-pull <sup>1)</sup> (7272 compatible)	Push-pull <sup>1)</sup> (7272 compatible)	RS422 (TTL compatible)
<b>Supply voltage</b>	5 ... 24 V DC <sup>2)</sup>	8 ... 30 V DC	5 V DC (±5 %)
<b>Power consumption</b> (no load)	max. 50 mA	max. 50 mA	max. 90 mA
<b>Permissible load / channel</b>	max. +/- 50 mA	max. +/- 50 mA	max. +/- 20 mA
<b>Pulse frequency</b>	max. 160 kHz	max. 160 kHz	max. 300 kHz
<b>Signal level</b>	HIGH min. +V - 2.5 V LOW max. 0.5 V	min. +V - 3.0 V max. 0.5 V	min. 2.5 V max. 0.5 V
<b>Rising edge time t<sub>r</sub></b>	max. 1 μs	max. 1 μs	max. 200 ns
<b>Falling edge time t<sub>f</sub></b>	max. 1 μs	max. 1 μs	max. 200 ns
<b>Short circuit proof outputs</b>	yes	yes	yes

### Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)						
1, 3 without inv. signal	1, 2, A, B	Signal:	0 V	+V	A	B	0	
		Core color:	WH	BN	GN	YE	GY	

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)									
2, 4, 6 with inv. signal	1, 2, A, B	Signal:	0 V	+V	A	$\bar{A}$	B	$\bar{B}$	0	$\bar{0}$	
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	

- +V: Supply voltage encoder <+V DC
- 0 V: Supply voltage encoder ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal

1) Max. recommended cable length 30 m [98.4].  
 2) With 24 V DC there is no tolerance above 24 V DC. Please use output circuit 8 ... 30 V DC.  
 3) Also for protection level IP64 on the shaft.

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## Miniature optical

2400 / 2420 (shaft / hollow shaft)

Push-pull, RS422

### Dimensions shaft version

Dimensions in mm [inch]

#### Flange type 1, $\varnothing$ 24 [0.94]

- 1 min R50 [1.97]
- 2 3 x M3, 4 [0.16] deep

D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]
1/4"	f7	10 [0.39]



#### Flange type 2, $\varnothing$ 30 [1.18]

#### Flange type 3, $\varnothing$ 28 [1.10]

- 1 min R50 [1.97]
- 2 2 x M3, 4 [0.16] deep

D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]
1/4"	f7	10 [0.39]



Flange type	A	B
2	$\varnothing$ 30 [1.18]	3 [0.12]
3	$\varnothing$ 28 [1.10]	2 [0.08]

### Dimensions hollow shaft version

Dimensions in mm [inch]

#### Flange type 1, $\varnothing$ 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5

Recommended torque for the set screw in the clamping ring 0.1 Nm.  
To ensure optimal clamping by the clamping ring, the customer shaft should be without flat surface.

D	Fit	L
4 [0.16]	H7	14 [0.55]
6 [0.24]	H7	14 [0.55]
1/4"	H7	14 [0.55]

L = insertion depth max. blind hollow shaft

