

Incremental encoders

Miniature optical	2400 / 2420 (shaft / hollow shaft)	Push-pull, RS422
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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

05.2400	. X X X X .	XXXX
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"]
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- 4 = ø 1/4" x 10 mm [1/4" x 0.39"], with flat ¹⁾
 - 6 = ø 6 x 10 mm [0.24 x 0.39"], with flat ¹⁾

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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Order code	05.2420	1	X	X	X	X	XXXX	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.	
Hollow shaft	Type	a	b	c	d	e			

<p>a Flange</p> <p><u>1 = ø 24 mm [0.94"]</u></p> <p>b Blind hollow shaft (insertion depth max. 14 mm [0.55"])</p> <p>1 = ø 4 mm [0.16"]</p> <p><u>2 = ø 6 mm [0.24"]</u></p> <p>-----</p> <p>4 = ø 1/4" ¹⁾</p>	<p>c Output circuit / supply voltage</p> <p>1 = push-pull (without inverted signal) / 5 ... 24 V DC</p> <p><u>2 = push-pull (with inverted signal) / 5 ... 24 V DC</u></p> <p>3 = push-pull (without inverted signal) / 8 ... 30 V DC</p> <p>4 = push-pull (with inverted signal) / 8 ... 30 V DC</p> <p>6 = RS422 (with inverted signal) / 5 V DC</p> <p>d Type of connection</p> <p>1 = axial cable, 2 m [6.56'] PVC</p> <p>A = axial cable, special length PVC *)</p> <p><u>2 = radial cable, 2 m [6.56'] PVC</u></p> <p>B = radial cable, special length PVC *)</p> <p>*) 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)</p>	<p>e Pulse rate</p> <p>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)</p> <p><i>Optional on request</i> - other pulse rates</p>
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Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 15 mm [0.59"] for shaft 4 mm [0.16"]	8.0000.1202.0404

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Technical data

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

Approvals	
UL compliant in accordance with	File no. E224618
CE compliant in accordance with	
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU
UKCA compliant in accordance with	
EMC Regulations	S.I. 2016/1091
RoHS Regulations	S.I. 2012/3032

Electrical characteristics

Output circuit	Push-pull ¹⁾ (7272 compatible)	Push-pull ¹⁾ (7272 compatible)	RS422 (TTL compatible)
Supply voltage	5 ... 24 V DC ²⁾	8 ... 30 V DC	5 V DC (±5 %)
Power consumption (no load)	max. 50 mA	max. 50 mA	max. 90 mA
Permissible load / channel	max. +/- 50 mA	max. +/- 50 mA	max. +/- 20 mA
Pulse frequency	max. 160 kHz	max. 160 kHz	max. 300 kHz
Signal level	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
Rising edge time t_r	max. 1 μs	max. 1 μs	max. 200 ns
Falling edge time t_f	max. 1 μs	max. 1 μs	max. 200 ns
Short circuit proof outputs	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.

