

# Incremental encoders

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



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.



## 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

Type

. XXXXX . XXXX

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

## Incremental encoders

|                                                                                                                                             |  |                                                                                                                                                                                                                                                                                                                                                                                                                           |  |                                                                                                                                                                                                                                                            |  |
|---------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Miniature optical                                                                                                                           |  | 2400 / 2420 (shaft / hollow shaft)                                                                                                                                                                                                                                                                                                                                                                                        |  | Push-pull, RS422                                                                                                                                                                                                                                           |  |
| Order code<br>Hollow shaft                                                                                                                  |  | 05.2420 . 1XXXX . XXXX<br>Type                                                                                                                                                                                                                                                                                                                                                                                            |  | 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.<br>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. |  |
| <b>a</b> Flange<br>1 = ø 24 mm [0.94"]                                                                                                      |  | <b>c</b> Output circuit / supply voltage<br>1 = push-pull (without inverted signal) / 5 ... 24 V DC<br>2 = <u>push-pull (with inverted signal)</u> / 5 ... <u>24 V DC</u><br>3 = push-pull (without inverted signal) / 8 ... 30 V DC<br>4 = push-pull (with inverted signal) / 8 ... 30 V DC<br>6 = RS422 (with inverted signal) / 5 V DC                                                                                 |  | <b>e</b> Pulse rate<br>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><br>(e.g. 360 pulses => 0360)                                          |  |
| <b>b</b> Blind hollow shaft<br>(insertion depth max. 14 mm [0.55"])<br>1 = ø 4 mm [0.16"]<br>2 = ø 6 mm [0.24"]<br>4 = ø 1/4" <sup>1)</sup> |  | <b>d</b> Type of connection<br>1 = axial cable, 2 m [6.56'] PVC<br>A = axial cable, special length PVC *)<br>2 = <u>radial cable, 2 m [6.56'] PVC</u><br>B = radial cable, special length PVC *)<br><br>*) Available special lengths (connection types A, B):<br>3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']<br>order code expansion .XXXX = length in dm<br>ex.: 05.2420.122A.1024.0030 (for cable length 3 m) |  | Optional on request<br>- other pulse rates                                                                                                                                                                                                                 |  |
| 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                                                                                                                                                                                                                                           |  |

1) US version.

# Incremental encoders

|                          |                                           |                         |
|--------------------------|-------------------------------------------|-------------------------|
| <b>Miniature optical</b> | <b>2400 / 2420 (shaft / hollow shaft)</b> | <b>Push-pull, RS422</b> |
|--------------------------|-------------------------------------------|-------------------------|

## Technical data

| Mechanical characteristics                |                    |                                                 |  |
|-------------------------------------------|--------------------|-------------------------------------------------|--|
| Maximum speed                             |                    | 12000 min <sup>-1</sup>                         |  |
| Mass moment of inertia                    |                    | approx. 0.1 x 10 <sup>-6</sup> kgm <sup>2</sup> |  |
| Starting torque – at 20 °C [68 °F]        |                    | < 0.01 Nm <sup>3)</sup>                         |  |
| 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 <sup>2</sup> , 6 ms                    |  |
| Vibration resistance acc. to EN 60068-2-6 |                    | 100 m/s <sup>2</sup> , 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       |

| Electrical characteristics             |                                              |                                              |                           |
|----------------------------------------|----------------------------------------------|----------------------------------------------|---------------------------|
| Output circuit                         | Push-pull <sup>1)</sup><br>(7272 compatible) | Push-pull <sup>1)</sup><br>(7272 compatible) | RS422<br>(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                              | min. 2.5 V                |
|                                        | LOW                                          | max. 0.5 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<br>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<br>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.

## Incremental encoders

## Miniature optical

**2400 / 2420 (shaft / hollow shaft)**

## Push-pull, RS422

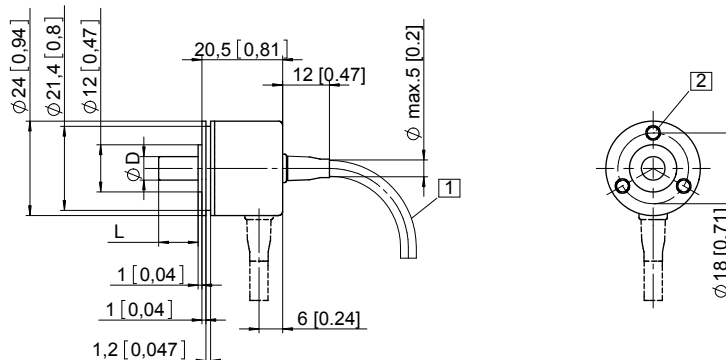
### Dimensions shaft version

Dimensions in mm [inch]

**Flange type 1, ø 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] |

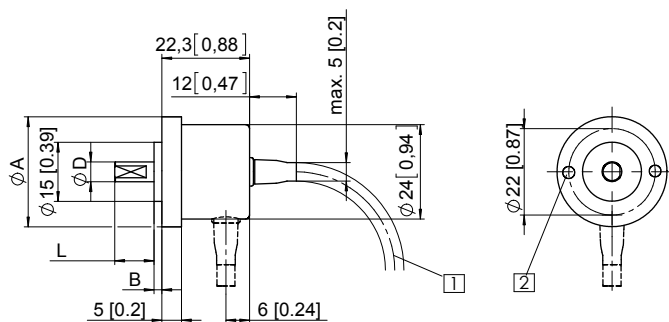


**Flange type 2, ø 30 [1.18]**

**Flange type 3, ø 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           | ø 30 [1.18] | 3 [0.12] |
| 3           | ø 28 [1.10] | 2 [0.08] |

### Dimensions hollow shaft version

Dimensions in mm [inch]

**Flange type 1, ø 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

