

# Incremental encoders

**Miniature optical**

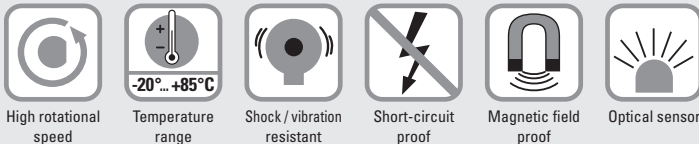
**2400 / 2420 (shaft / hollow shaft)**

**Push-Pull**



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.
- Meets the certification requirements of railways standard EN 50121.

## Order code Shaft version

**05.2400** . **XXXX** . **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"]
- 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 / power supply

- 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**

### **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)

### Stock types

- 05.2400.1122.0050
- 05.2400.1122.0360
- 05.2400.1122.0500
- 05.2400.1122.1000
- 05.2400.1122.1024

Optional on request  
- other pulse rates

1) US version.

# Incremental encoders

|                          |   |                  |
|--------------------------|---|------------------|
| <b>Miniature optical</b> | <b>2400 / 2420 (shaft / hollow shaft)</b> | <b>Push-Pull</b> |
|--------------------------|---|------------------|

|   |  |   |   |   |
|---|--|---|---|---|
| <b>Order code</b><br><b>Hollow shaft</b>      | <b>05.2420</b><br>Type   | <b>1</b> <b>X</b> <b>X</b> <b>X</b> <b>X</b> <b>X</b><br>a b c d e  | <p>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.</p>  | <b>10 By 10</b>   |
| <b>a Flange</b><br><u>1 = ø 24 mm [0.94"]</u> | <b>b Blind hollow shaft</b><br>insertion depth max. 14 mm [0.55"]<br><u>1 = ø 4 mm [0.16"]</u><br>2 = ø 6 mm [0.24"]<br><br>4 = ø 1/4" <sup>1)</sup> | <b>c Output circuit / power supply</b><br>1 = Push-Pull (without inverted signal) / 5 ... 24 V DC<br>2 = Push-Pull (with inverted signal) / 5 ... 24 V DC<br>3 = Push-Pull (without inverted signal) / 8 ... 30 V DC<br><u>4 = Push-Pull (with inverted signal) / 8 ... 30 V DC</u> | <b>d Type of connection</b><br><u>1 = axial cable, 2 m [6.56'] PVC</u><br>A = axial cable, special length PVC *)<br>2 = radial cable, 2 m [6.56'] PVC<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) | <b>e Pulse rate</b><br>4, 6, 8, 10, 16, 20, 25, 36, 40, 50, 60, 80, <u>100</u> , 120, 125, 180, 200, 250, 300, <u>360</u> , 400, 500, <u>512</u> , <u>1000</u> , <u>1024</u><br>(e.g. 360 pulses => 0360) |
|   |  |   | <b>Stock types</b><br>05.2420.1212.0500<br>05.2420.1222.0500<br>05.2420.1222.1000<br>05.2420.1222.1024  |   |
|   |  |   | <b>Optional on request</b><br>- other pulse rates   |   |

Incremental encoders

|  |   |
|--|---|
| <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>                                 |

Further accessories can be found in the accessories section or in the accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

## 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 – at 20°C [68°F]</b>          | < 0.01 Nm   |
| <b>Shaft load capacity</b>                       | radial 10 N<br>axial 20 N                               |
| <b>Weight</b>                                    | approx. 0.06 kg [2.12 oz]                               |
| <b>Protection acc. to EN 60529</b>               | housing side IP65<br>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<br>blind hollow shaft brass       |
| <b>Shock resistance acc. to EN 60068-2-27</b>    | 1000 m/s <sup>2</sup> , 6 ms                            |
| <b>Vibration resistance acc. to EN 60068-2-6</b> | 100 m/s <sup>2</sup> , 55 ... 2000 Hz                   |

| Electrical characteristics             |  |   |
|--|--|---|
| <b>Output circuit</b>                  | <b>Push-Pull <sup>2)</sup></b><br>(7272 compatible)    | <b>Push-Pull <sup>2)</sup></b><br>(7272 compatible) |
| <b>Power supply</b>                    | 5 ... 24 V DC <sup>3)</sup>                            | 8 ... 30 V DC                                       |
| <b>Power consumption (no load)</b>     | max. 50 mA   | max. 50 mA  |
| <b>Permissible load / channel</b>      | max. +/- 50 mA   | max. +/- 50 mA                                      |
| <b>Pulse frequency</b>                 | max. 160 kHz   | max. 160 kHz  |
| <b>Signal level</b>                    | HIGH min. +V - 2.5 V<br>LOW max. 0.5 V                 | min. +V - 3.0 V<br>max. 0.5 V                       |
| <b>Rising edge time t<sub>r</sub></b>  | max. 1 µs  | max. 1 µs   |
| <b>Falling edge time t<sub>f</sub></b> | max. 1 µs  | max. 1 µs   |
| <b>Short circuit proof outputs</b>     | yes  | yes   |
| <b>UL approval</b>                     | file 224618  |   |
| <b>CE compliant acc. to</b>            | EMC guideline 2004/108/EC<br>RoHS guideline 2011/65/EU |   |

An independent test laboratory (TTI-PG115/96-01) approved by the German Accreditation Council (DAR) certified the compliance with the Railways Standard, according to EN 50121. This means our encoder is compatible with higher electromagnetic noise standards than standard industrial encoders.

You will have a higher quality encoder even in applications with higher EMC noise levels. We will gladly send you a copy of the test report on request. When ordering an encoder to the railway standard, please ensure you state this explicitly on the order.



1) US version.  
2) Max. recommended cable length 30 m [98.4'].  
3) With 24 V DC there is no tolerance above 24 V DC. Please use output circuit 8 ... 30 V DC.

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**Miniature optical**

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

**Push-Pull**

## Terminal assignment

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

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

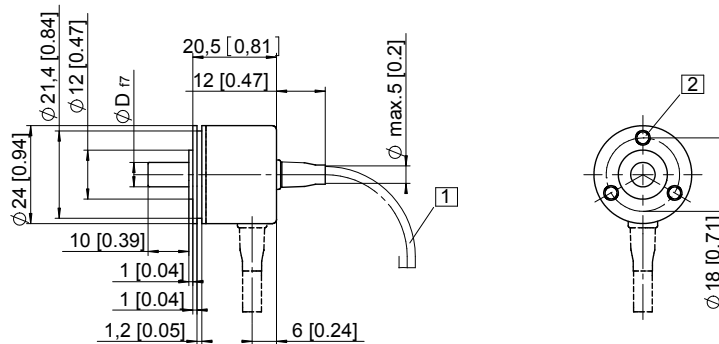
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A,  $\bar{A}$ : Incremental output channel A
- B,  $\bar{B}$ : Incremental output channel B
- 0,  $\bar{0}$ : Reference signal

## Dimensions shaft version

Dimensions in mm [inch]

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

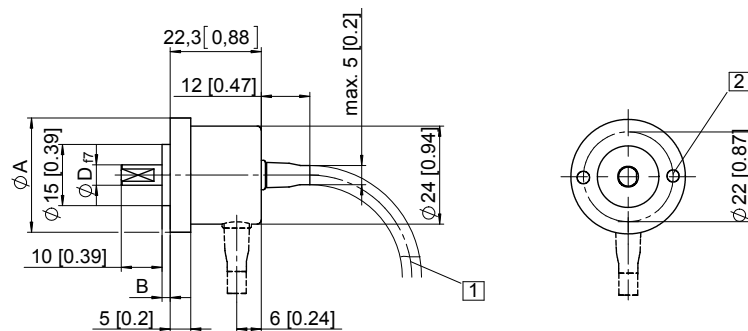
- 1 min R50 [1.97]
- 2 3 x M3, 4 [0.16] deep



### 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



| 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

