

Rotary Measurement Technology  
Incremental Encoders



Large bore type A02H (hollow shaft)

Temperature

Shock/vibration resistant

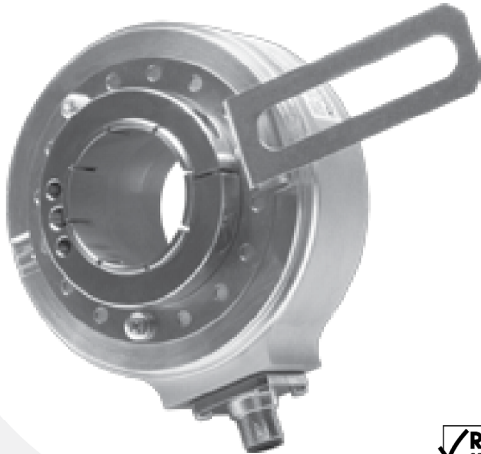
Short-circuit protection

Reverse polarity protection

High rotational speed

Rugged

- Balanced, stainless-steel clamping rings, special bearing-shaft connection increases stability and vibration resistance.
- Optional plastic isolating inserts protect against damage from shaft currents.
- New type of mechanical construction, ideal for handling tough mechanical stresses and strains.



Economical

- Alternative to traditional heavy duty encoders that are often over-engineered and expensive.

Versatile

- Very compact. Optional isolating inserts protect against damage from shaft currents, e.g. with AC vector motors.
- Only 49 mm clearance needed.
- Hollow shaft diameter up to Ø 42 mm.
- RS422, push-pull or SIN/COS outputs.
- Extended speed range up to 6,000 RPM.
- High-quality construction, balanced, stainless steel - ensures quiet vibration-free running.

Mechanical characteristics:

|                                              |                                                                                              |
|----------------------------------------------|----------------------------------------------------------------------------------------------|
| Speed:                                       | max. 6,000 RPM at 158°F (70°C) <sup>1)</sup><br>max. 3,500 RPM at 176°F (80°C) <sup>1)</sup> |
| Rotor moment of inertia:                     | < 12 oz-in <sup>2</sup> (< 220 x 10 <sup>-6</sup> kgm <sup>2</sup> ) <sup>2)</sup>           |
| Starting torque with sealing:                | < 28.3 oz-in (< 0.2 Nm)                                                                      |
| Weight:                                      | approx. 1.8 lbs (0.8 kg)                                                                     |
| Protection acc. to EN 60 529:                | IP65                                                                                         |
| EX approval for hazardous areas:             | optional zone 2 and 22                                                                       |
| Working temperature:                         | -4 to +176°C (-20 to +80°C) <sup>3)</sup>                                                    |
| Shaft:                                       | stainless steel H7                                                                           |
| Shock resistance acc. to DIN-IEC 68-2-27     | 200 g (2,000 m/s <sup>2</sup> ), 6 ms                                                        |
| Vibration resistance acc. to DIN-IEC 68-2-6: | 10 g (100 m/s <sup>2</sup> ), 10-2,000 Hz                                                    |

<sup>1)</sup> During the run-in-phase of approx. 2 hours, reduce the limits for working temperature max or speed max by 1/3  
<sup>2)</sup> Dependent on the shaft diameter  
<sup>3)</sup> Non-condensing

Electrical characteristics sine wave output:

|                                                                                 |                             |                             |
|---------------------------------------------------------------------------------|-----------------------------|-----------------------------|
| Output circuit:                                                                 | Sine<br>U = 1 Vss           | Sine<br>U = 1 Vss           |
| Supply voltage:                                                                 | 5 V (±5 %)                  | 10-30 VDC                   |
| Current consumption (no load) with inverted signal:                             | typ. 65 mA /<br>max. 110 mA | typ. 65 mA /<br>max. 110 mA |
| -3 dB frequency:                                                                | ≥ 180 kHz                   | ≥ 180 kHz                   |
| Signal level channels A/B:                                                      | 1 Vss (±20%)                | 1 Vss (±20%)                |
| Signal level channel 0:                                                         | 0.1-1.2 V                   | 0.1-1.2 V                   |
| Short-circuit proof outputs <sup>1)</sup> :                                     | yes                         | yes                         |
| Reverse connection protection at +V:                                            | no                          | yes                         |
| UL certified                                                                    | File 224618                 |                             |
| Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3 |                             |                             |
| RoHS compliant acc. to EU guideline 2002/95/EG                                  |                             |                             |

<sup>1)</sup> If supply voltage correctly applied

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Large bore type A02H (hollow shaft)

Electrical characteristics RS422 or push-pull output:

|                                                                                 |                         |                          |                                |
|---------------------------------------------------------------------------------|-------------------------|--------------------------|--------------------------------|
| Output circuit:                                                                 | RS 422 (TTL compatible) | Push-pull                | Push-pull (7272) <sup>3)</sup> |
| Supply voltage:                                                                 | 5 V (±5 %) or 10-30 VDC | 10-30 VDC                | 5-30 VDC                       |
| Power consumption (no load) without inverted signal:                            | -                       | typ. 55 mA / max. 125 mA | -                              |
| Power consumption (no load) with inverted signal:                               | typ. 40 mA / max. 90 mA | typ. 80 mA / max. 150 mA | typ. 50 mA / max. 100 mA       |
| Permissible load/channel:                                                       | max. ±20 mA             | max. ±30 mA              | max. ±20 mA                    |
| Pulse frequency:                                                                | max. 300 kHz            | max. 300 kHz             | max. 300 kHz                   |
| Signal level high:                                                              | min. 2.5 V              | min. +V -3 V             | min. +V -2.0 V                 |
| Signal level low:                                                               | max. 0.5 V              | max. 2.5 V               | max. 0.5 V                     |
| Rise time t <sub>r</sub> :                                                      | max. 200 ns             | max. 1 µs                | max. 1 µs                      |
| Fall time t <sub>f</sub> :                                                      | max. 200 ns             | max. 1 µs                | max. 1 µs                      |
| Short-circuit proof outputs <sup>1)</sup> :                                     | yes <sup>2)</sup>       | yes                      | yes                            |
| Reverse connection protection at +V:                                            | 5 V: no, 10-30 V: yes   | yes                      | no                             |
| UL certified:                                                                   | File 224618             |                          |                                |
| Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3 |                         |                          |                                |

<sup>1)</sup> If supply voltage correctly applied  
<sup>2)</sup> Only one channel allowed to be shorted-out:  
(If +V = 5 V, short-circuit to channel, 0 V, or +V is permitted) (If +V = 5-30 V, short-circuit to channel or 0 V is permitted)  
<sup>3)</sup> Max. recommended cable length 30 m

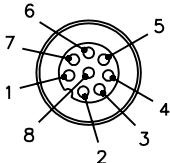
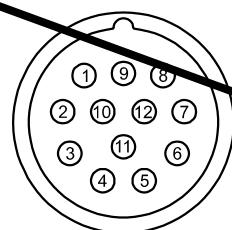
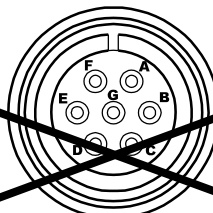
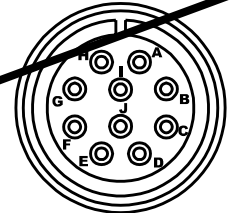
Standard wiring / pin configuration:

| Output:                | Case Ground  | Common (0 V) | +V | A  | $\bar{A}$ | B  | $\bar{B}$ | Z  | $\bar{Z}$ | -  | -  |
|------------------------|--------------|--------------|----|----|-----------|----|-----------|----|-----------|----|----|
| M23 <i>multifast</i> ® | Coupling Nut | 10           | 12 | 5  | 6         | 8  | 1         | 3  | 4         | -  | -  |
| MS 7-pin               | G            | F            | D  | A  | -         | B  | -         | C  | -         | -  | -  |
| MS 10-pin              | J            | F            | D  | A  | G         | B  | H         | C  | I         | -  | -  |
| M12 <i>eurofast</i> ®  | Coupling Nut | 1            | 2  | 3  | 4         | 5  | 6         | 7  | 8         | -  | -  |
| Cable:                 | Shield/Drain | WH           | BN | GN | YE        | GY | PK        | BU | RD        | BK | VT |

Special connector pin configuration:

|             |   | Output:             | Case Ground  | Common (0 V) | +V | A | $\bar{A}$ | B | $\bar{B}$ | Z | $\bar{Z}$ | - | - |
|-------------|---|---------------------|--------------|--------------|----|---|-----------|---|-----------|---|-----------|---|---|
| Output Code | 7 | M23 <i>eurofast</i> | Coupling Nut | 7            | 2  | 1 | 3         | 4 | 5         | 6 | 8         | - | - |
|             | 2 | MS 7-pin            | G            | F            | D  | A | C         | B | E         | - | -         | - | - |
|             | 6 | MS 10-pin           | G            | F            | D  | A | H         | B | I         | C | J         | - | - |

Wiring diagrams:

| Male encoder view                                                                   |                                                                                     |                                                                                      |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |  |
| M12 <i>eurofast</i> pinout                                                          | M23 <i>multifast</i> pinout                                                         | MS pinout (7-pin)                                                                    | MS pinout (10-pin)                                                                    |
| Mating cordset: E-RKC 8T-930-*                                                      | Mating cordset: E-CK 12-931-*                                                       | Mating cordset: E-MK 7-930-*                                                         | Mating cordset: E-MK 10-931-*                                                         |

\* Length in meters.

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Large bore type A02H (hollow shaft)

Part number key: A02H hollow shaft version

**64AE.2048.P13BO**

**T8.A02H.**~~XXXX.XXXX.PXXXX~~

Options for special output only.

**Special connector pin configuration**

0 = standard wiring  
Other = see page C35

**Special insert options**

A = isolation insert not included  
B = isolation insert included<sup>4)</sup>

**Special output signal formats**

00 = standard output  
Other = see page C42

**Pulse rate**

50\*, 360\*, 512\*, 600\*, 1000\*, 1024, 1500, 2000, 2048, 2500, 4096, 5000  
\* not for SIN/COS version (SIN/COS version not available with pulses <1024)  
(e.g. 360 pulses => 0360) Other pulse rates on request

**Type of connection**

1 = cable radial (1 m PVC-cable)  
2 = radial 12-pin plug without mating connector  
D= radial MS, 10-pin (MS 3102R18-1P)  
E = radial connector M12 8-pin  
K = radial MS, 7-pin (MS 3102R165-1P)

**Type**

**Flange**

1 = face mount  
2 = short anti-rotation spring  
3 = long anti-rotation spring

5 = tether arm (long)  
6 = 4 1/2" C-face tether

**Hollow shaft**

|                                  |                           |                            |
|----------------------------------|---------------------------|----------------------------|
| 1 = Ø 42 mm                      | A = Ø 30 mm <sup>1)</sup> | G = Ø 1-1/8" <sup>1)</sup> |
| 2 = Ø 38 mm                      | B = Ø 40 mm               | H = Ø 35 mm                |
| 3 = Ø 28 mm                      | C = Ø 20 mm <sup>1)</sup> | M = Ø 19 mm                |
| 4 = Ø 25.4 mm (1") <sup>1)</sup> | D = Ø 1/2"                | N = Ø 1-1/4" <sup>1)</sup> |
| 5 = Ø 25 mm <sup>1)</sup>        | E = Ø 5/8" <sup>1)</sup>  | P = Ø 32 mm <sup>2)</sup>  |
| 6 = Ø 24 mm                      | F = Ø 3/4" <sup>1)</sup>  |                            |

**Output circuit and voltage supply**

1 = RS422 (with inverted signal), 5 V supply voltage  
3 = push-pull (with inverted signal), 10-30 V supply voltage  
4 = RS422 (with inverted signal), 10-30 V supply voltage  
5 = push pull (with inverted signal), 5-30 V supply voltage  
8 = SIN/COS 1 Vpp (with inverted signal), 5 V supply voltage<sup>3)</sup>  
9 = SIN/COS 1 Vpp (with inverted signal), 10-30 V supply voltage<sup>3)</sup>  
A = line driver 7272, 5-30 V supply voltage  
B = 5-30 VDC / open collector (7273)  
D = 5-30 VDC / TTL (26C31)  
E = 5-30 VDC / TTL line driver (7272)

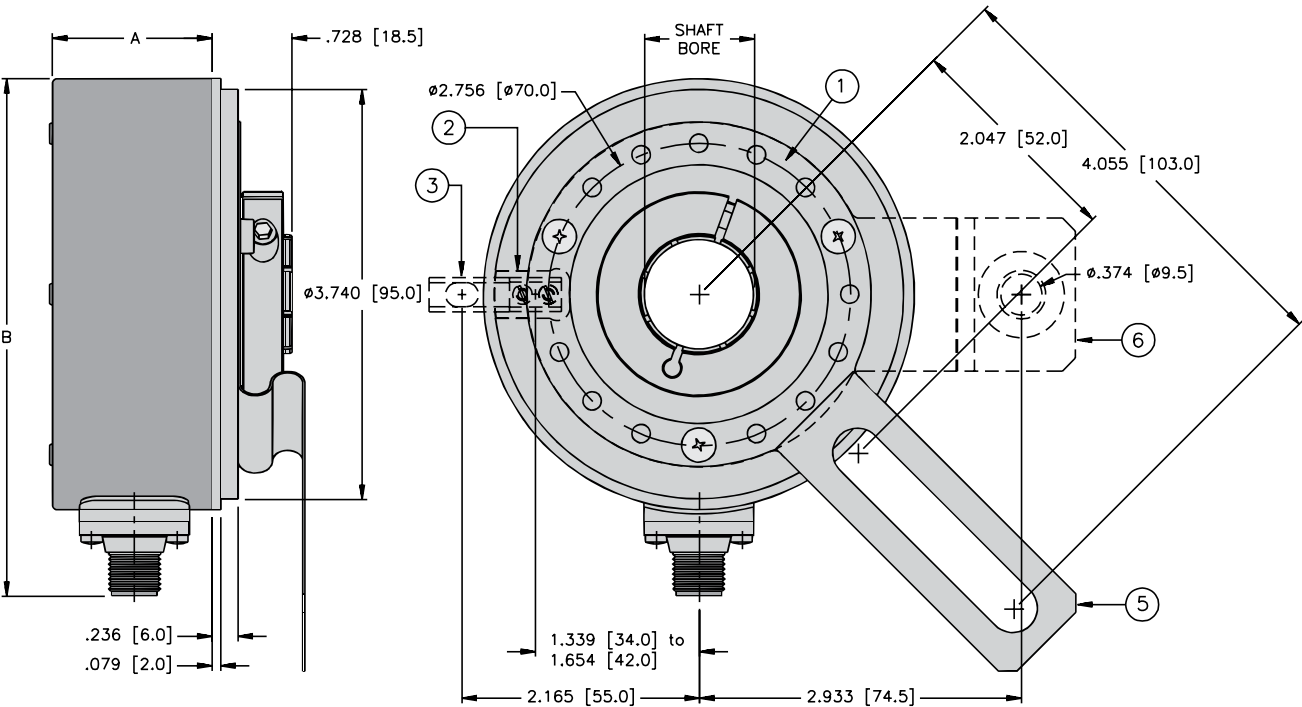
**Accessories:**

- See page J1, Connectivity, for cables and connectors

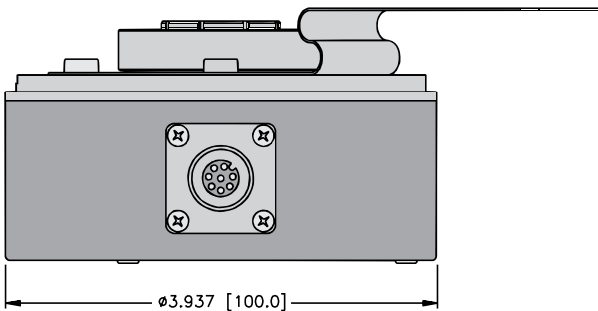
<sup>1)</sup> Boxes available with isolation inserts.  
<sup>2)</sup> This bored size only available as an isolation insert.  
<sup>3)</sup> P04XX is the only valid output code for SIN/COS outputs.  
<sup>4)</sup> Includes plastic hollow shaft inserts for electrical isolation.

Dimensions: A02H hollow shaft version

A02H flange



- 1 = face mount  
2 = short anti-rotation spring  
3 = long anti-rotation spring  
5 = tether arm (long)  
6 = 4 1/2" C-face tether



Dimensions for Radial Connector - in [mm]

| Connection Style |              |               |               |               |               |
|------------------|--------------|---------------|---------------|---------------|---------------|
| DIM              | Cable        | M12           | M23           | MS (7-pin)    | MS (10-pin)   |
| A                | 1.181 [30.0] | 1.181 [30.0]  | 1.181 [30.0]  | 1.457 [37.0]  | 1.457 [37.0]  |
| B                | -            | 4.705 [119.5] | 4.961 [126.0] | 5.079 [129.0] | 5.394 [137.0] |

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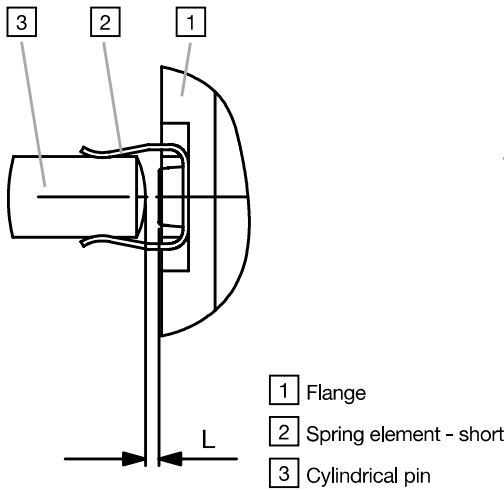
Mating shaft requirements:

| Type of flange                        | Axial end play | Radial runout | Angular offset |
|---------------------------------------|----------------|---------------|----------------|
| Type 2 (anti-rotational spring short) | max. ±1 mm     | max. ±0.3 mm  | max. ±2°       |
| Type 3 (anti-rotational spring long)  | max. ±1 mm     | max. ±0.3 mm  | max. ±2°       |
| Type 5 (tether arm long)              | max. ±0.5 mm   | max. ±0.3 mm  | max. ±2°       |
| Type 6 (C-face tether)                | max. ±0.5 mm   | max. ±0.3 mm  | max. ±2°       |

Mounting:

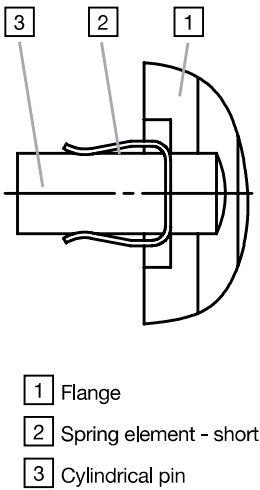
Mounting using the spring element - short:

When mounting the encoder, ensure that dimension **L** is larger than the maximum axial play of the drive in the direction of the arrow.



Mounting using the spring element - long:

Cylindrical pin fed through the bore of the spring.



Large bore type A02H (hollow shaft) accessories

Isolation insert



The A02H encoder is used for AC vector motor and general industrial applications. For AC vector motor applications, the encoder should be electrically isolated from the motor chassis to minimize encoder bearing currents and ground noise. An isolation insert for the hollow shaft is provided with the encoder by specifying B0 in the “special insert option” decode. **When ordering isolation inserts separately, choose option A0 with a bore diameter of 38 mm.**

For general industrial applications, isolation is not required and the decode for “special insert options” can be left blank.

Isolation insert for hollow shaft Ø 42 mm:

External diameter 42 mm  
Internal diameter 38 H7 in accordance with ISO 286-2  
Order Number: **T8.0010.4017.0000**

| Part Number:     | Inner Dimensions  |
|------------------|-------------------|
| 8.0010.4013.0000 | 12.7 mm (1/2")    |
| 8.0010.4070.0000 | 15.875 mm (5/8")  |
| 8.0010.4019.0000 | 16 mm             |
| 8.0010.4080.0000 | 18 mm             |
| 8.0010.4090.0000 | 19.05 mm (3/4")   |
| 8.0010.4011.0000 | 20 mm             |
| 8.0010.4012.0000 | 25 mm             |
| 8.0010.4050.0000 | 25.4 mm (1")      |
| 8.0010.4014.0000 | 28.58 mm (1-1/8") |
| 8.0010.4016.0000 | 30 mm             |
| 8.0010.4060.0000 | 31.75 mm (1-1/4") |
| 8.0010.4015.0000 | 32 mm             |

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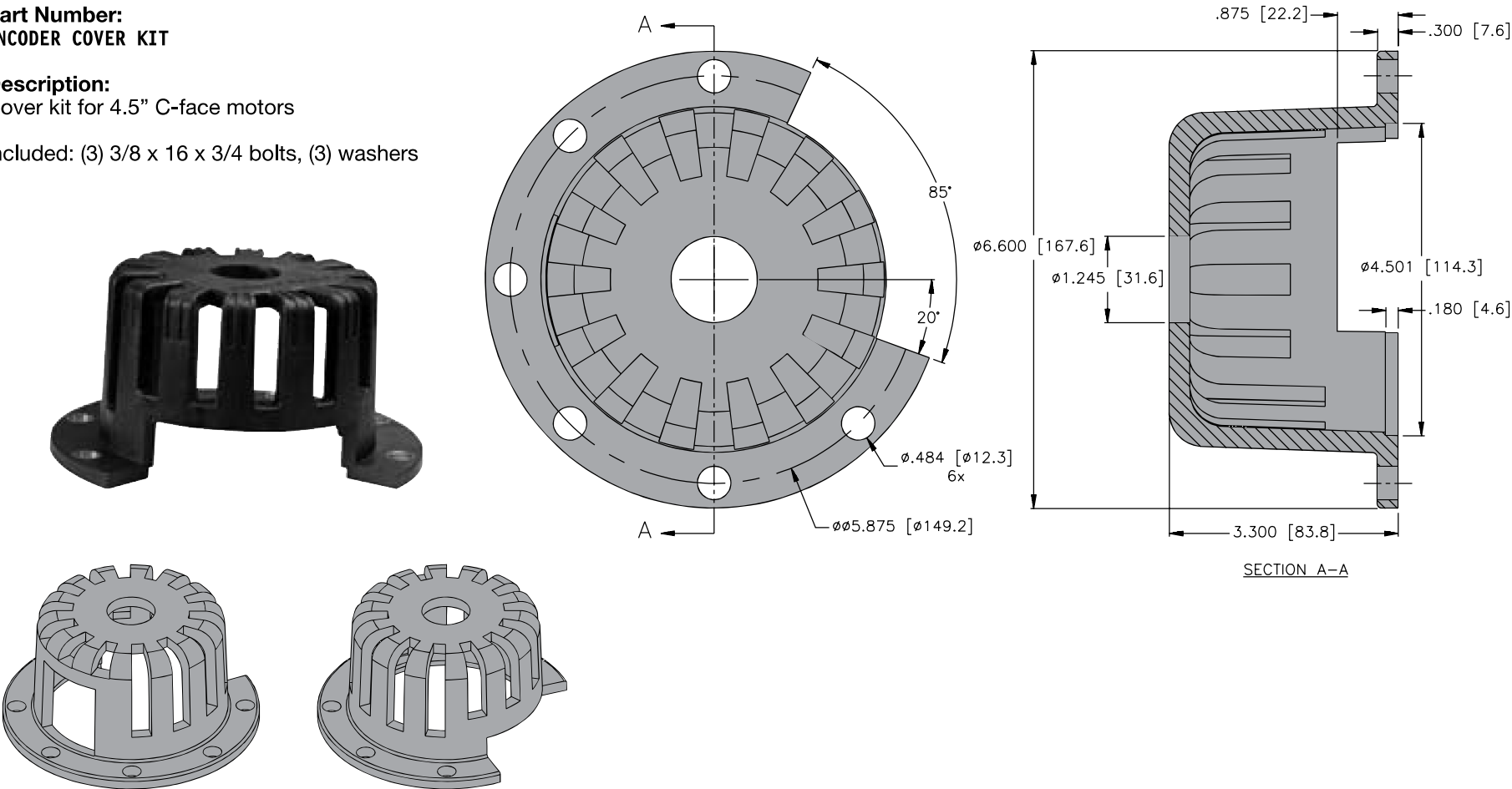


Large bore type A02H (hollow shaft) accessories

Part Number:  
ENCODER COVER KIT

Description:  
Cover kit for 4.5" C-face motors

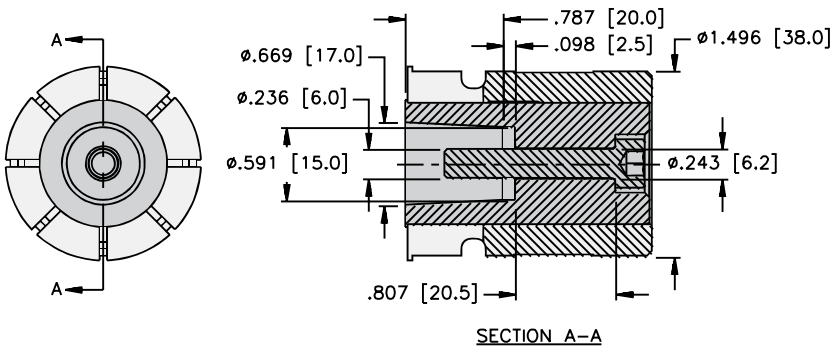
Included: (3) 3/8 x 16 x 3/4 bolts, (3) washers



Part Number:  
8.0010.4028.0000

Description:  
Mounting kit adapts the A02H hollow shaft encoder for mounting onto a tapered shaft. Tapered shafts are used for high-precision direct coupling to direct devices. An isolating insert is also included in the mounting kit; this reliably protects the encoder from shaft currents.

Included: Insert for cone blind hole, cone 1:10, 17 mm length, insulation insert, allen screw for tightening



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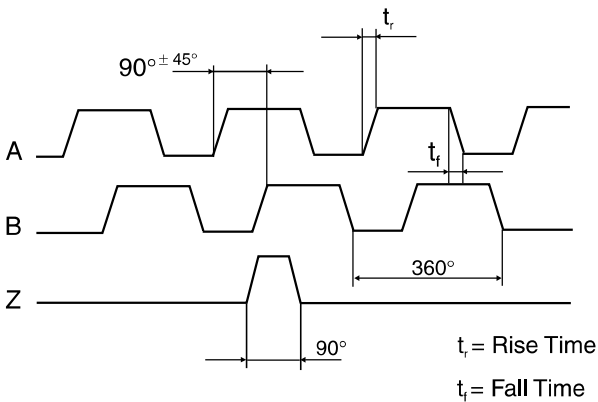
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Wave Forms

Outputs

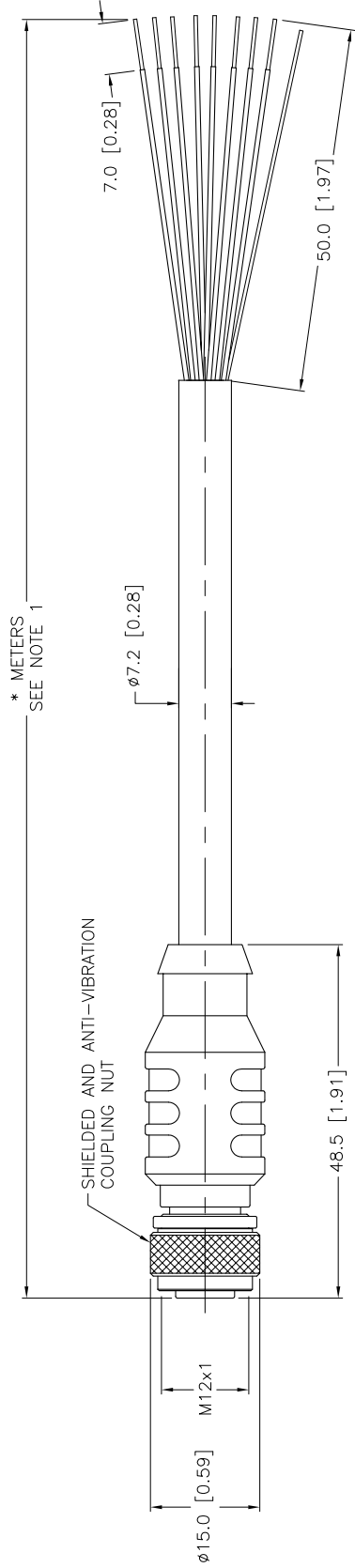
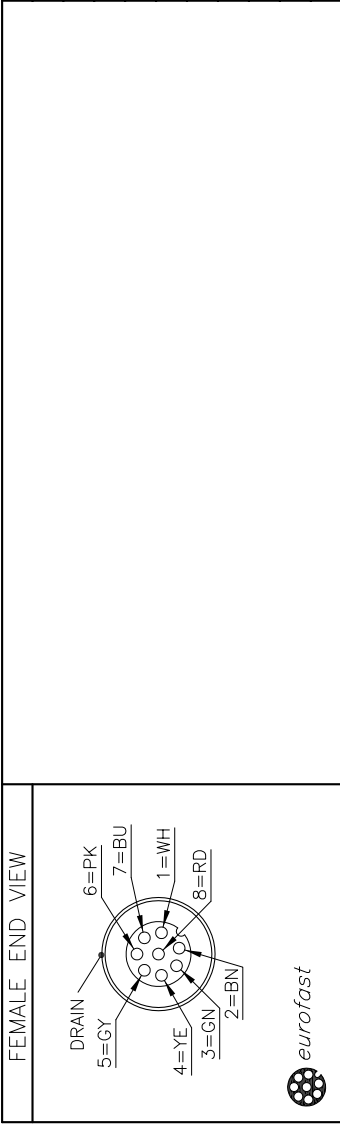
All Kübler by TURCK encoders come standard with six channels where A leads B in the clockwise direction and the standard index is gated with A & B. The tolerance of the wave form affects the control and, in some cases, may affect the smoothness of system operation.

Wave Form Tolerances



|                                                                                                                                                                                                           |                                                                           |                                                                                                                                                                      |                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <p>A leads B when the shaft is turned in the clockwise direction viewing the shaft or collet end.</p> <p>This is the Kübler by TURCK standard. This format applies to the pin key codes listed below.</p> | <p>A</p> <p><math>\bar{A}</math></p> <p>B</p> <p><math>\bar{B}</math></p> | <p>B leads A when the shaft is rotated in the clockwise direction viewing the shaft or collet end.</p> <p>This format applies to the pin key codes listed below.</p> | <p>A</p> <p><math>\bar{A}</math></p> <p>B</p> <p><math>\bar{B}</math></p> |
| <p>A leads B, Z gated with A &amp; B. This is the Kübler by TURCK standard. Z is 90° wide.</p>                                                                                                            | <p>Z</p> <p><math>\bar{Z}</math></p>                                      | <p><b>Code 04:</b><br/>B leads A, Z gated with A &amp; B. Z is 90° wide.</p>                                                                                         | <p>Z</p> <p><math>\bar{Z}</math></p>                                      |
| <p><b>Code 01:</b><br/>A leads B, Z gated with B. Z is 180° wide.</p>                                                                                                                                     | <p>Z</p> <p><math>\bar{Z}</math></p>                                      | <p><b>Code 05:</b><br/>B leads A, Z gated with B. Z is 180° wide.</p>                                                                                                | <p>Z</p> <p><math>\bar{Z}</math></p>                                      |
| <p><b>Code 02:</b><br/>A leads B, Z gated with A. Z is 180° wide.</p>                                                                                                                                     | <p>Z</p> <p><math>\bar{Z}</math></p>                                      | <p><b>Code 06:</b><br/>B leads A, Z gated with A. Z is 180° wide.</p>                                                                                                | <p>Z</p> <p><math>\bar{Z}</math></p>                                      |
| <p><b>Code 03:</b><br/>A leads B, Z ungated. Z is 330° to 360° wide.</p>                                                                                                                                  | <p>Z</p> <p><math>\bar{Z}</math></p>                                      | <p><b>Code 07:</b><br/>B leads A, Z is ungated. Z is 330° to 360° wide.</p>                                                                                          | <p>Z</p> <p><math>\bar{Z}</math></p>                                      |
| <p><b>Code 08:</b><br/>A leads B, Z is 180° wide.</p>                                                                                                                                                     | <p>Z</p> <p><math>\bar{Z}</math></p>                                      | <p><b>Code 09:*</b><br/>B leads A, Z gated with <math>\bar{B}</math>. Z is 180° wide.</p>                                                                            | <p>Z</p> <p><math>\bar{Z}</math></p>                                      |
| <p><b>Code 13:*</b><br/>A leads B, Z gated with <math>\bar{B}</math>. Z is 180° wide.</p>                                                                                                                 | <p>Z</p> <p><math>\bar{Z}</math></p>                                      | <p><b>Code 10:</b><br/>B leads A, Z is a negative marker gated with B. Z is 180° wide.</p>                                                                           | <p>Z</p> <p><math>\bar{Z}</math></p>                                      |
| <p><b>Code 11:</b><br/>A leads B, Z is a minimum with of 270° (electrical degrees).</p>                                                                                                                   | <p>Z</p> <p><math>\bar{Z}</math></p>                                      | <p><b>Code 12:</b><br/>B leads A. Z has a minimum width of 270°.</p>                                                                                                 | <p>Z</p> <p><math>\bar{Z}</math></p>                                      |

| SPECIFICATIONS                    |                                      |  |
|-----------------------------------|--------------------------------------|--|
| CONTACT CARRIER MATERIAL          | PUR                                  |  |
| MOLDED HEAD MATERIAL/COLOR        | THERMOPLASTIC PUR/YELLOW             |  |
| CONTACT MATERIAL/PLATING          | GOLD-PLATED BRASS                    |  |
| COUPLING NUT MATERIAL/PLATING     | NICKEL-PLATED BRASS                  |  |
| RATED CURRENT [A]                 | 2.0 A                                |  |
| RATED VOLTAGE [V]                 | 60 VAC/75 VDC                        |  |
| OUTER CABLE JACKET MATERIAL/COLOR | PVC/BLACK                            |  |
| CONDUCTOR INSULATION MATERIAL     | PVC                                  |  |
| NUMBER OF CONDUCTORS [AWG]        | 8x24 AWG                             |  |
| DRAIN/SHIELD                      | 26 AWG DRAIN/FOIL AND BRAIDED SHIELD |  |
| TEMPERATURE RANGE                 | -40°C to +105°C (-40°F to +221°F)    |  |
| PROTECTION CLASS                  | MEETS NEMA 1,3,4,6P AND IEC IP68     |  |
| SPACINGS                          | TO VDE 0110 GROUP C                  |  |



| CABLE LENGTH | TOLERANCE                                                                   |
|--------------|-----------------------------------------------------------------------------|
| ALL LENGTHS  | + 4% (OR 50mm) OF LENGTH<br>- 0% (OR 0mm) OF LENGTH<br>WHICHEVER IS GREATER |
| STRIP LENGTH | TOLERANCE                                                                   |
| 0-7mm        | ±0.5mm                                                                      |
| 8-29mm       | ±1.0mm                                                                      |
| 30-49mm      | ±2.0mm                                                                      |
| 50-69mm      | ±3.0mm                                                                      |
| 70-100mm     | ±4.0mm                                                                      |
| OVER 100mm   | ±5.0mm                                                                      |

NOTES:

1. "\*" INDICATES CABLE LENGTH IN METERS. CONTACT TURCK TO ORDER SPECIFIC LENGTHS.
2. STRIP AND TIN LENGTHS ARE FOR REFERENCE ONLY; SOME LENGTHS MAY NOT BE STRIPPED OR TINNED.
3. COUPLING NUT IS CONNECTED TO SHIELD.

SOURCE DRAWING - FOR REFERENCE ONLY

|                    |  |                                                                                                                         |                                                                                                        |                                                                                                                                                                                                 |               |                               |              |
|--------------------|--|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------|--------------|
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|                    |  |                                                                                                                         |                                                                                                        |                                                                                                                                                                                                 |               |                               |              |
| 1. MATERIAL        |  | TOLERANCES UNLESS OTHERWISE SPECIFIED<br>0.5 TO 6 ±0.1<br>6 TO 30 ±0.2<br>30 TO 200 ±0.3<br>OVER 200 ±0.4<br>ANGLES ±1° | DRFT                                                                                                   | RDS                                                                                                                                                                                             | DATE 08/06/02 | DESCRIPTION<br>E-RKS 8T-930-* |              |
| SEE SPECIFICATIONS |  |                                                                                                                         | DSGN                                                                                                   | SCALE 1=1.0                                                                                                                                                                                     |               |                               |              |
| FINISH             |  | ALL INCH DIMENSIONS ARE REFERENCE ONLY                                                                                  | UNIT OF MEASUREMENT<br><b>MILLIMETER [ INCH ]</b>                                                      |                                                                                                                                                                                                 |               | IDENTIFICATION NO.            | REV<br>A     |
| SEE SPECIFICATIONS |  |                                                                                                                         | DO NOT SCALE THIS DRAWING                                                                              |                                                                                                                                                                                                 |               | FILE: EURO-C\777001265        | SHEET 1 OF 1 |

NOTES:

1. "x" INDICATES CABLE LENGTH IN METERS. CONTACT TURCK TO ORDER SPECIFIC LENGTHS.

2. STRIP AND TIN LENGTHS ARE FOR REFERENCE ONLY; SOME LENGTHS MAY NOT BE STRIPPED OR TINNED.

3. COUPLING NUT IS CONNECTED TO SHIELD.

|     |                 |     |          |
|-----|-----------------|-----|----------|
| A   | DRAWING RELEASE | RDS | 09/19/02 |
| REV | DESCRIPTION     | BY  | DATE     |
|     |                 |     | ECO NO.  |