Rotary Optical Encoder

Various Applications

Label Printing Machine
When the motor starts to run, the motor rotation number will be converted to encoder pulse signals and counted by the electronic counter. Once the counted pulse signals have reached a preset number, the electronic counter will command the machine and activate the printing operation.

Auto Bottling Machine
The operation of filling bottles can be controlled by the encoder, programmable logic controller, and motor. The position of the bottles can be confirmed by the detected encoder feedback pulse signals.

Detecting Machine
Use a sensor to generate pulse signals that is processed by the Rotary Optical Encoder for counting. When the counted pulse signals have reached a preset number, the object will be detected and its size will be verified if correct or not.

Fixed Length Cutting Machine
When the motor starts to run, the motor rotation number will be converted to encoder pulse signals and counted by the electronic counter. Once the counted pulse signals have reached a preset number, the electronic counter will command the cutting machine to cut the material in the same and fixed length.

Elevator
Rotary Optical Encoder is connected to the motor directly. When the elevator moves, the motor rotation numbers will be converted to encoder pulse signals. Then, the moving speed of the elevator can be known by the detected encoder feedback pulse signals.

Elevator Door
Rotary Optical Encoder is connected to the motor directly. When the motor starts to run, the motor rotation number will be converted to encoder pulse signals. The Rotary Optical Encoder is used to detect and confirm the position and speed of the elevator door.

Rotary Optical Encoder is a sensor, which converts rotary motion or position to electronic pulse numbers for phase change, speed and position detection. It is also used to detect the speed, position, angle, distance and counts information relating to mechanical machine.

Major applications include main host of crane (crane control), elevator, industry sewing machine, textile machine, storage equipment, medical treatment related machine, and servo motor. Therefore, Rotary Optical Encoder is a very important device in industrial automation field.
**Model Name Explanation**

ES5-05CN8942F is an incremental encoder, shaft type is solid shaft, outer diameter is 50mm, resolution can reach 500PPR, output form is open collector, signal output is A, B & Z (ungated), shaft/bore diameter is 8mm, input voltage is 7–24VDC and operation environment is IP40. It means ES5-05CN8942F this product has protection against solid foreign objects of 1.0 mm in diameter and greater but does not have waterproof protection. Also, it is suitable for the use within -10°C ~ 70°C operating temperature. Besides, the cable length of ES5-05CN8942F is 2000mm and mechanism code is F (P: Flange).

**Code Order**

1. **Product Type**
   - E: Incremental Encoder
   - A: Absolute Encoder
   - C: CNC Incremental Encoder
   - M: Incremental Encoder with commutation U/V/W (for Servo Motor)

2. **Shaft Type**
   - S: Solid Shaft
   - H: Hollow Shaft
   - T: Through Hole Shaft

3. **Outer Diameter / Frame Size**
   - 3: 36.0mm
   - 4: 38.7mm
   - 5: 50mm
   - A: 100mm
   - 7: 88mm

4. **Resolution**
   - ES/EE/ET (PPR): 01: 100; 02: 200; 08: 256; 03: 300; 00: 360; 04: 400; 05: 500; 06: 600; 10: 1000; 11: 1024; 12: 1200; 20: 2000; 25: 2500; 36: 3600; 50: 5000
   - AS/AH (BIT): 05; 06; 07; 08; 09; 10; 11; 12
   - MH/MT (PPR): 25 / 2500
   - CS/PPR: 11 / 1024

5. **Output Form**
   - V: Voltage Output
   - Q: Open Collector
   - L: Line Driver
   - P: Push Pull

6. **Signal Output**
   - ES/EE/ET:
     - A: (without Z signal output)
     - B: A & B (without Z signal output)
     - G: A, B & Z (Gated with A&B)
     - N: A, B & Z (Ungated)
     - U: A, B & Z (Ungated, active low)
     - V: A, B & Z (Gated with A&B, active low)
   - AS/AH:
     - B: Binary code
     - G: Gray code
   - MH/MT:
     - F: 14 cores, A, B & Z and U, V, W output simultaneously
     - N: 8 cores, A, B & Z and U, V, W do not output simultaneously

7. **Shaft/Bore Diameter**
   - 4: 4mm
   - 5: 5mm
   - 6: 6mm
   - 8: 8mm
   - M: 30mm
   - Q: 1/4 inch
   - T: 9mm with Taper 1:10
   - R: 15mm

8. **Input Voltage**
   - 5: 5VDC
   - 8: 5–12VDC
   - 9: 7–24VDC

9. **Operating Environment**
   - 1: IP40 & 60°C
   - 4: IP40 & 70°C
   - 6: IP65 & 70°C
   - C: IP30 & 85°C
   - H: IP55 & 70°C

10. **Cable Length**
    - 1: 1000mm
    - 2: 2000mm
    - 3: 3000mm
    - 5: 500mm
    - 7: 170mm
    - A: 300mm
    - M: Military Connector

11. **Suffix Code**
    - 0: U/VW 10 poles
    - 4: U/VW 4 poles
    - 6: U/VW 8 poles
    - 0: U/VW 8 poles
    - F: Flange

**IP (Ingress Protection)** is a coding system which is used to indicate the environmental protection of enclosures around the electrical equipment. The environmental protection includes the degree of protection from ingress of solid foreign objects, ingress of water and mechanical impacts. IP code normally has two numbers. The first number indicates the degree of protection against solid foreign objects and the degree that persons are protected against hazardous parts or harmful deposit. The second number indicates the degree of protection against water. The number is higher, the protection is better. For example, IP Rating IP 65, 6 describes the level of protection from totally protected against dust and 5 describes the level of protection against low pressure jetting water from all directions.
Incremental Encoder

**Hollow Shaft**

**Outer Diameter 50mm**

**EH5 Series**

<table>
<thead>
<tr>
<th>Model Name</th>
<th>EHS...5XX</th>
<th>EHS...XXX</th>
<th>EHS...XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage</td>
<td>5.0V ± 5%</td>
<td>2.5-15V</td>
<td>2-5V</td>
</tr>
<tr>
<td>Output Type</td>
<td>Open Collector</td>
<td>Voltage</td>
<td>Output Push Pull</td>
</tr>
<tr>
<td>Source Current</td>
<td>20 mA</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Source Voltage</td>
<td>--</td>
<td>20 mA</td>
<td>--</td>
</tr>
<tr>
<td>Max. Load Power Voltage</td>
<td>DC30V</td>
<td>A,B,Z</td>
<td>A,A,B,Z</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>VH &gt;Vh-2V</td>
<td>Z(Vo-2V)</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>VL 500mV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Electrical Specifications**

- Encoder Resolution: 100 to 2500 (PPR)
- Current Consumption: 100mA Max.
- Max. Response Frequency: 300kHz Max.
- Cable Diameter: 5.1mm
- Output Phase Difference: Output phase difference 90° ± zero point signal
- Cable Length: 500/1000/2000 ± 2mm
- Cross Sectional Area: 0.18mm
- Signal Characteristic: Rise Time 1 μs Typ.; Fall Time 1 μs Typ.

- Max. Speed of Main Shaft: 6000rpm
- Starting Torque: 4.9 N-m Typ.; 5.92N-m Typ. (IP65)
- Moment of Inertia: 0.8 kg·mm² Typ.
- Outer Diameter: 50mm
- Height: 42.8mm / 89.2mm (IP65)
- Weight: <113g / <150g (IP65)
- Bore Diameter: 8mm
- Max. Shaft Load: Thrust: 30N / Radial: 50N (10 mm from shaft end)

**Mechanical Specifications**

- Operating Temperature: -10°C~70°C, 95%RH (Non-condensing, Non-freezing)
- Storage Temperature: -25°C~80°C (Non-condensing, Non-freezing)
- Shock: 100G at 6ms
- Vibration: 10 to 200Hz at 5G's
- Protection Degree: IP40 / IP65

**Dimensions**

- Bore Diameter: 8mm

**Through Hole Shaft**

**Outer Diameter 100mm**

**ETA Series**

<table>
<thead>
<tr>
<th>Model Name</th>
<th>ETA...XXX</th>
<th>ETA...XXX</th>
<th>ETA...XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage</td>
<td>5.0V ± 5%</td>
<td>2.5-15V</td>
<td>2-5V</td>
</tr>
<tr>
<td>Output Type</td>
<td>Open Collector</td>
<td>Voltage</td>
<td>Output Push Pull</td>
</tr>
<tr>
<td>Source Current</td>
<td>20 mA</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Source Voltage</td>
<td>--</td>
<td>20 mA</td>
<td>--</td>
</tr>
<tr>
<td>Max. Load Power Voltage</td>
<td>DC30V</td>
<td>A,B,Z</td>
<td>A,A,B,Z</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>VH &gt;Vh-2V</td>
<td>Z(Vo-2V)</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>VL 500mV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Electrical Specifications**

- Encoder Resolution: 1024 (PPR)
- Current Consumption: 150mA Max.
- Max. Response Frequency: 300kHz Max.
- Cable Diameter: 9.1mm
- Output Phase Difference: Output phase difference 90° ± zero point signal
- Cable Length: 500/1000/2000 ± 2mm
- Cross Sectional Area: 0.18mm
- Signal Characteristic: Rise Time 1 μs Typ.; Fall Time 1 μs Typ.

- Max. Speed of Main Shaft: 3000rpm
- Starting Torque: 60N·mm Typ.
- Moment of Inertia: 1.8 kg·mm² Typ.
- Outer Diameter: 100mm
- Height: 37.8mm
- Weight: <1000g
- Bore Diameter: 30mm
- Max. Shaft Load: Thrust: 30N / Radial: 50N (10 mm from mounting surface)

**Mechanical Specifications**

- Operating Temperature: -25°C~70°C, 95%RH (Non-condensing, Non-freezing)
- Storage Temperature: -25°C~85°C (Non-condensing, Non-freezing)
- Shock: 100G at 6ms
- Vibration: 10 to 200Hz at 5G's
- Protection Degree: IP40

**Dimensions**

- Bore Diameter: 30mm
### Absolute Encoder

#### Solid Shaft

**Outer Diameter:** 50mm

<table>
<thead>
<tr>
<th>Series</th>
<th>Model Name</th>
<th>AS5...SXX</th>
<th>AS5...XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage</td>
<td>5±5%V</td>
<td>5-5%〜12±5%V</td>
<td></td>
</tr>
<tr>
<td>Sink Current</td>
<td>20 mA</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Source Current</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Max. Load Power Voltage</td>
<td>DC15V</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Output Voltage</td>
<td>(VH, V5-2V)</td>
<td>(V5-2V)</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>-10°C〜80°C (Non-condensing, Non-freezing)</td>
<td>-10°C〜80°C (Non-condensing, Non-freezing)</td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td>-100g @ 5mm</td>
<td>-100g @ 5mm</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>Shaft Diameter: 8mm</td>
<td>Bore Diameter: 8mm</td>
<td></td>
</tr>
</tbody>
</table>

#### Hollow Shaft

**Outer Diameter:** 50mm

<table>
<thead>
<tr>
<th>Series</th>
<th>Model Name</th>
<th>AH5...SXX</th>
<th>AH5...XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage</td>
<td>5±5%V</td>
<td>5-5%〜12±5%V</td>
<td></td>
</tr>
<tr>
<td>Sink Current</td>
<td>20 mA</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Source Current</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Max. Load Power Voltage</td>
<td>DC15V</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Output Voltage</td>
<td>(VH, V5-2V)</td>
<td>(V5-2V)</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>-10°C〜80°C (Non-condensing, Non-freezing)</td>
<td>-10°C〜80°C (Non-condensing, Non-freezing)</td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td>-100g @ 5mm</td>
<td>-100g @ 5mm</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>Shaft Diameter: 8mm</td>
<td>Bore Diameter: 8mm</td>
<td></td>
</tr>
</tbody>
</table>
### Commutation Encoder (For Servo Motor)

#### Hollow Shaft

**Outer Diameter 40.9mm**

<table>
<thead>
<tr>
<th>Series</th>
<th>MH4 Series</th>
<th>MT4 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Name</td>
<td>MT4...Exx</td>
<td>MT4...Exx</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>5±5%V</td>
<td>5±5%~12±5%V</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>5±5%V</td>
<td>5±5%~12±5%V</td>
</tr>
<tr>
<td>Sink Current</td>
<td>20mA</td>
<td>20mA</td>
</tr>
<tr>
<td>Source Current</td>
<td>26V310mA equivalent</td>
<td>26V310mA equivalent</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>5±5%V</td>
<td>5±5%~12±5%V</td>
</tr>
<tr>
<td>Signal Characteristic: Rise Time 100ns Max.</td>
<td>Fall Time 100ns Max.</td>
<td>Fall Time 100ns Max.</td>
</tr>
</tbody>
</table>

#### Through Hole Shaft

**Outer Diameter 40.9mm**

<table>
<thead>
<tr>
<th>Series</th>
<th>MT4 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Name</td>
<td>MT4...Exx</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>5±5%V</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>5±5%V</td>
</tr>
<tr>
<td>Sink Current</td>
<td>20mA</td>
</tr>
<tr>
<td>Source Current</td>
<td>26V310mA equivalent</td>
</tr>
<tr>
<td>Output Signal</td>
<td>A,B, Z, Z (U,Ω, V, W, W)</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>5±5%V</td>
</tr>
<tr>
<td>Signal Characteristic: Rise Time 100ns Max.</td>
<td>Fall Time 100ns Max.</td>
</tr>
</tbody>
</table>

#### Mechanical Specifications

- **Hollow Shaft:**
  - Bore Diameter: 6mm
  - Max. Speed of Main Shaft: 6000rpm
  - Starting Torque: 0.4 N·mm Typ.
  - Moment of Inertia: 1.3 kg·mm² Typ.
  - Outer Diameter: 40.9mm
  - Height: 26.7mm
  - Weight: 45g

- **Through Hole Shaft:**
  - Bore Diameter: 8mm
  - Max. Shaft Load: Thrust: 15N / Radial: 30N (10 mm from mounting surface)
  
#### Environmental Specifications

- **Hollow Shaft:**
  - Operating Temperature: -10°C~+65°C, 95%RH (Non-condensing, Non-freezing)
  - Storage Temperature: -25°C~+100°C (Non-condensing, Non-freezing)
  - Shock: 100g at 6ms
  - Vibration: 10 to 200Hz at 5g's
  - Protection Degree: IP50

- **Through Hole Shaft:**
  - Operating Temperature: -10°C~+65°C, 95%RH (Non-condensing, Non-freezing)
  - Storage Temperature: -25°C~+100°C (Non-condensing, Non-freezing)
  - Shock: 100g at 6ms
  - Vibration: 10 to 200Hz at 5g’s
  - Protection Degree: IP50

---

15

---

16
**Commutation Encoder** (For Servo Motor)

**Through Hole Shaft** Outer Diameter 43.7mm

<table>
<thead>
<tr>
<th>Series</th>
<th>MT4 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage</td>
<td>5V±1%</td>
</tr>
<tr>
<td>Resolution</td>
<td>2000 PPR</td>
</tr>
<tr>
<td>Output Form</td>
<td>Line Driver</td>
</tr>
<tr>
<td>Consumption Current</td>
<td>100 mA Max.</td>
</tr>
<tr>
<td>Sink Current</td>
<td>20mA</td>
</tr>
<tr>
<td>Output Signal</td>
<td>A,X,B,Z,E,F, U,V,W,Y,G</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>VH, VL (5Vn-2V)</td>
</tr>
</tbody>
</table>

Encoder Resolution: 2500 (PPR)
Current Consumption: 100mA Max.
Max. Response Frequency: 300kHz Max.
Cable Diameter: 6.8mm
Output Phase Difference: Output phase difference 90° + zero point signal
Cable Length: 1000±20mm
Signal Characteristic: Rise Time 100ns Max., Fall Time 100ns Max.

Max. Speed of Main Shaft: 600rpm
Starting Torque: ≤5.0 N·mm Typ.
Moment of Inertia: <1.2kg·mm² Typ.
Outer Diameter: 43.7mm
Height: 32.9mm
Weight: <85g
Bore Diameter: 6/9 mm
Max. Shaft Load: Thrust: 15N / Radial: 30N (10 mm from mounting surface)

Operating Temperature: -20°C~85°C, 95%RH without condensation
Storage Temperature: -25°C~100°C (Non-condensing, Non-freezing)
Shock: 100g's at 6ms
Vibration: 14 to 200Hz at 50g's
Protection Degree: IP60

---

**Incremental Encoder** (For Spindle Applications)

**Solid Shaft Frame Size 68mm**

<table>
<thead>
<tr>
<th>Series</th>
<th>CS Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Name</td>
<td>CS7...Sxx</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>5±5V</td>
</tr>
<tr>
<td>Output Type</td>
<td>Line Driver</td>
</tr>
<tr>
<td>Sink Current</td>
<td>20mA</td>
</tr>
<tr>
<td>Source Current</td>
<td>A,X,B,E,Z,F</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>VH, VL (5Vn-2V)</td>
</tr>
</tbody>
</table>

Encoder Resolution: 1024 (PPR)
Current Consumption: 150mA Max.
Max. Response Frequency: 300kHz Max.
Output Phase Difference: Output phase difference 90° + zero point signal
Signal Characteristic: Rise Time 50ns Typ., Fall Time 50ns Typ.

Max. Speed of Main Shaft: 8000rpm
Starting Torque: 23 N·mm Typ.
Moment of Inertia: 4.1kg·mm² Typ.
Frame size: 68mm
Height: 102.8mm
Weight: <420g
Shaft Diameter: 15mm
Max. Shaft Load: Thrust: 50N / Radial: 85N (10 mm from mounting surface)

Operating Temperature: 10°C~70°C, 95%RH (Non-condensing, Non-freezing)
Storage Temperature: -25°C~85°C (Non-condensing, Non-freezing)
Shock: 100g’s at 6ms
Vibration: 10 to 200Hz at 50g’s
Protection Degree: IP55

---

**Dimensions**

**Bore Diameter 9mm (Taper)**

**Shaft Diameter 15mm**

---

---

---