Product Information

RON 200
RON 700
RON 800
RPN 800
Incremental Angle Encoders with Integral Bearing, Hollow Shaft and Stator Coupling
RON 200 series

- Integrated stator coupling
- Hollow through shaft (Ø 20 mm)
- System accuracy: ±2.5° and ±5°

### RON 275

<table>
<thead>
<tr>
<th>Incremental</th>
<th>RON 275</th>
<th>RON 285</th>
<th>RON 287</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring standard</td>
<td>DIADUR circular scale with incremental track</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line count</td>
<td>18 000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System accuracy</td>
<td>±5°</td>
<td>±2.5°</td>
<td></td>
</tr>
<tr>
<td>Position error per signal period</td>
<td>≤ ±0.7°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>TTL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated interpolation*</td>
<td>5-fold</td>
<td>10-fold</td>
<td></td>
</tr>
<tr>
<td>Output signals per rev.</td>
<td>90 000</td>
<td>180 000</td>
<td></td>
</tr>
<tr>
<td>Reference mark*</td>
<td>One</td>
<td>RON 2xx: One</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RON 2xx C: Distance-coded</td>
<td></td>
</tr>
<tr>
<td>Cutoff frequency –3 dB</td>
<td>Output frequency</td>
<td>Edge separation a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 250 kHz</td>
<td>≥ 0.96 µs</td>
<td>≥ 0.22 µs</td>
</tr>
<tr>
<td>Electrical connection*</td>
<td>Cable (1 m), with or without 12-pin M23 coupling (male)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable length</td>
<td>≤ 50 m</td>
<td>≤ 150 m</td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>DC 5 V ±0.5 V/150 mA (without load)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaft</td>
<td>Hollow through shaft Ø = 20 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mech. permissible speed</td>
<td>≤ 3000 rpm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starting torque</td>
<td>≤ 0.08 Nm at 20 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moment of inertia of rotor</td>
<td>73.0 · 10–6 kgm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permissible axial motion of measured shaft</td>
<td>±0.1 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural frequency</td>
<td>≥ 1200 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration 55 Hz to 2000 Hz</td>
<td>Shock 6 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≤ 100 m/s² (EN 60068-2-6)</td>
<td>≤ 200 m/s² (EN 60068-2-27)</td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>Frequent flexing:</td>
<td>Stationary cable:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>–10 °C to 70 °C</td>
<td>–20 °C to 70 °C</td>
<td>0 °C to 50 °C</td>
</tr>
<tr>
<td>Protection</td>
<td>EN 60529:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IP64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>0.8 kg</td>
<td></td>
<td></td>
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</tbody>
</table>

* Please select when ordering

Tolerancing ISO 286

<table>
<thead>
<tr>
<th>Tolerance</th>
<th>Ø 2 mm</th>
<th>Ø 3 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>±0.1 mm</td>
<td>±0.2 mm</td>
<td>±0.5 mm</td>
</tr>
</tbody>
</table>

Radial cable (can also be used axially)

1) = Bearing of mating shaft

2) = Required mating dimensions

1 = Position of the reference mark signal ±5°

2 = Direction of shaft rotation for ascending position values

3 = Accessory: ring nut (ID 336669-03)

4 = Stated tolerance contains mounting tolerances and thermal expansion; no dynamic movement permitted
**RON 785**

- Integrated stator coupling
- Hollow through shaft (Ø 50 mm)
- System accuracy: ±2°

### Incremental RON 785

<table>
<thead>
<tr>
<th>Measuring standard</th>
<th>DIADUR circular scale with incremental track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line count</td>
<td>18000</td>
</tr>
<tr>
<td>System accuracy</td>
<td>±2°</td>
</tr>
<tr>
<td>Position error per signal period</td>
<td>≤ ±0.7°</td>
</tr>
<tr>
<td>Interface</td>
<td>~ 1 Vpp</td>
</tr>
<tr>
<td>Reference mark*</td>
<td>RON 785: One</td>
</tr>
<tr>
<td></td>
<td>RON 785 C: Distance-coded</td>
</tr>
<tr>
<td>Cutoff frequency -3 dB</td>
<td>≥ 180 kHz</td>
</tr>
</tbody>
</table>

#### Electrical connection*

- Cable (1 m), with or without 12-pin M23 coupling (male)
- Cable length\(^1\) ≤ 150 m
- Supply voltage DC 5 V ±0.5 V/ 150 mA (without load)
- Shaft Hollow through shaft D = 50 mm
- Mech. permissible speed ≤ 1000 rpm
- Starting torque ≤ 0.5 Nm at 20 °C
- Moment of inertia of rotor 1.05 · 10⁻³ kgm²
- Permissible axial motion of measured shaft ±0.1 mm
- Natural frequency ≥ 1000 Hz
- Vibration 55 Hz to 2000 Hz ≤ 100 m/s² (EN 60068-2-6)
- Shock 6 ms ≤ 200 m/s² (EN 60068-2-27)

#### Interface

- Reference mark*: One
- Reference mark C: Distance-coded
- Cutoff frequency –3 dB ≥ 180 kHz

#### Electrical connection

- Cable (1 m), with or without 12-pin M23 coupling (male)
- Cable length\(^1\) ≤ 150 m
- Supply voltage DC 5 V ±0.5 V/ 150 mA (without load)
- Shaft Hollow through shaft D = 50 mm
- Mech. permissible speed ≤ 1000 rpm
- Starting torque ≤ 0.5 Nm at 20 °C
- Moment of inertia of rotor 1.05 · 10⁻³ kgm²
- Permissible axial motion of measured shaft ±0.1 mm
- Natural frequency ≥ 1000 Hz
- Vibration 55 Hz to 2000 Hz ≤ 100 m/s² (EN 60068-2-6)
- Shock 6 ms ≤ 200 m/s² (EN 60068-2-27)

### Operating conditions

- Operating temperature 0 °C to 50 °C
- Protection EN 60529 IP64
- Mass \(\approx 2.5\) kg

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* Please select when ordering
\(^{1}\) With HEIDENHAIN cable
\(^2\) Range includes mounting tolerances and thermal expansion; no dynamic movement permitted
RON 786/RON 886/RPN 886

- Integrated stator coupling
- Hollow through shaft (Ø 60 mm)
- System accuracy: ±1” or ±2”

### Measuring standard

**RON 786**
- Measuring standard: DIADUR circular scale with incremental track
- Line count*: 18 000
- System accuracy: ±2”
- Position error per signal period: 18 000 lines: ±0.7”
- Interface: 1 Vpp
- Reference mark*: RON x86: One
- Cutoff frequency: ≥ 180 kHz
- Supply voltage: DC 5 V ±0.5 V
- Shaft: Hollow through shaft D = 60 mm
- Mech. permissible speed: ≤ 1000 rpm
- Starting torque: ≤ 0.5 Nm at 20 °C
- Moment of inertia of rotor: 1.20 · 10⁻³ kgm²
- Permissible axial motion of measured shaft: ≤ ±0.1 mm
- Natural frequency: ≥ 1000 Hz
- Vibration: 55 Hz to 2000 Hz
- Shock: 6 ms
- Operating temperature: 0 °C to 50 °C
- Protection: EN 60529 IP64
- Mass: 2.5 kg

**RON 886**
- Measuring standard: DIADUR circular scale with incremental track
- Line count*: 36 000
- System accuracy: ±1”
- Position error per signal period: 36 000 lines: ±0.35”
- Interface: One
- Reference mark*: RON x86C: Distance-coded
- Cutoff frequency: ≥ 800 kHz
- Supply voltage: DC 5 V ±0.5 V/250 mA
- Shaft: Hollow through shaft D = 60 mm
- Mech. permissible speed: ≤ 1000 rpm
- Starting torque: ≤ 0.5 Nm at 20 °C
- Moment of inertia of rotor: 1.20 · 10⁻³ kgm²
- Permissible axial motion of measured shaft: ≤ ±0.1 mm
- Natural frequency: ≥ 500 Hz
- Vibration: 55 Hz to 2000 Hz
- Shock: 6 ms
- Operating temperature: 0 °C to 50 °C
- Protection: EN 60529 IP64
- Mass: 2.5 kg

**RPN 886**
- Measuring standard: DIADUR circular scale with incremental track
- Line count*: 80 000
- System accuracy: ±0.35”
- Position error per signal period: ≥ 180 000 signal periods
- Interface: 1 Vpp
- Reference mark*: RON x86: One
- Cutoff frequency: ≥ 1300 kHz
- Supply voltage: DC 5 V ±0.5 V/250 mA
- Shaft: Hollow through shaft D = 60 mm
- Mech. permissible speed: ≤ 1000 rpm
- Starting torque: ≤ 0.5 Nm at 20 °C
- Moment of inertia of rotor: 1.20 · 10⁻³ kgm²
- Permissible axial motion of measured shaft: ≤ ±0.1 mm
- Natural frequency: ≥ 1000 Hz
- Vibration: 55 Hz to 2000 Hz
- Shock: 6 ms
- Operating temperature: 0 °C to 50 °C
- Protection: EN 60529 IP64
- Mass: 2.5 kg

* Please select when ordering
1) With HEIDENHAIN cable
2) Range includes mounting tolerances and thermal expansion; no dynamic movement permitted
Mechanical design types and mounting
RON, RPN

The RON and RPN angle encoders have an integral bearing, a hollow shaft and a stator-side coupling. The measured shaft is directly connected to the shaft of the angle encoder.

Setup
The circular scale is rigidly affixed to the hollow shaft. The scanning unit rides on the shaft on ball bearings and is connected to the housing with a coupling on the stator side. The stator coupling and the sealing design compensate for axial and radial mounting error to a high degree without restricting accuracy or functionality. This thereby simplifies mounting. During angular acceleration of the shaft, the stator coupling must absorb only the torque resulting from friction within the bearing. Angle encoders with stator coupling therefore provide excellent dynamic performance.

Mounting
The housing of the RON and RPN is firmly connected to the mounting surface of the machine part by means of a mounting flange and a centering collar.

RON and RPN shaft coupling

Shaft coupling with ring nut
The shaft is designed as a hollow through shaft. For installation, the hollow through shaft of the angle encoder is seated onto the machine shaft and fastened from the encoder’s front face with a ring nut. The ring nut can be easily tightened with the mounting aid.

Front-face shaft coupling
Especially for rotary tables, it is often helpful to integrate the angle encoder into the table such that the encoder is accessible when the rotor is lifted. The hollow shaft is connected through the front-face threaded holes by means of special mounting elements made for the given design (not included in delivery). In order to meet the radial and axial runout requirements, the interior hole \( D_1 \) and the shoulder surface \( D_2 \) must be used as the mounting surfaces for the front-face shaft coupling.

Ring nuts for the RON and RPN
HEIDENHAIN offers special ring nuts for RON and RPN angle encoders. Choose the tolerance of the shaft thread such that the ring nut can be tightened easily, with a small amount of axial play. This guarantees that the load is evenly distributed on the shaft connection and prevents undesirable forces on the encoder’s hollow shaft.

Mounting an angle encoder with a ring nut

Mounting tool for HEIDENHAIN ring nuts
The mounting aid is used to tighten the ring nut. Its pins lock into the holes in the ring nut. A torque wrench provides the necessary tightening torque.

Ring nut for hollow shaft \( Ø \) 20 mm

Ring nut for Hollow shaft \( Ø \) 20 mm: ID 336669-03
Hollow shaft \( Ø \) 50 mm: ID 336669-15
Hollow shaft \( Ø \) 60 mm: ID 336669-11

Mounting tool for RON/RPN angle encoders
The PWV makes it fast and easy to inspect the most significant mating dimensions. Its built-in measuring equipment measures position and radial runout, for example. It is best suited for the shaft coupling with a ring nut.

PWW inspection tool for RON/RPN angle encoders
The PWW makes it fast and easy to inspect the most significant mating dimensions. Its built-in measuring equipment measures position and radial runout, for example. It is best suited for the shaft coupling with a ring nut.

Materials required for mounting the RON and RPN
The machine shaft and the fastening components must be made of steel. The material must exhibit a thermal coefficient of expansion \( \alpha_{\text{therm}} = 10 \cdot 10^{-6} \text{ K}^{-1} \) to \( \alpha_{\text{therm}} = 16 \cdot 10^{-6} \text{ K}^{-1} \). Additionally, the material must meet the following specifications:
- For hollow-shaft connection \( R_m \geq 650 \text{ N/mm}^2 \)
- For housing connection \( R_p \geq 370 \text{ N/mm}^2 \)
### Electrical connection

\[ \sim 1 \text{ VPP incremental signals} \]

#### Pin layout

- **12-pin M23 coupling**
- **12-pin M23 connector**
- **16-pin D-sub connector**
  - For HEIDENHAIN controls and IK 220
- **15-pin D-sub connector**
  - For encoder or PWM 20

#### Power supply

<table>
<thead>
<tr>
<th>Pin</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>9</td>
<td>2</td>
<td>11</td>
<td>3</td>
<td>4</td>
<td>6</td>
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<td>10</td>
<td>12</td>
<td>5/8/13/15</td>
<td>14</td>
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</tr>
</tbody>
</table>

#### Incremental signals

<table>
<thead>
<tr>
<th>Pin</th>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td>1</td>
<td>9</td>
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<td>10</td>
<td>12</td>
<td>5/6/8/15</td>
<td>13</td>
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</table>

#### Other signals

<table>
<thead>
<tr>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>2</td>
<td>11</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>10</td>
<td>12</td>
<td>5/6/8/15</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

#### Cable shield connected to housing; \( U_p \) = Power supply voltage

**Sensor:** The sense line is connected in the encoder with the corresponding power line.

Vacant pins or wires must not be used!

1. **LIDA 2xx:** vacant
2. **ERO 14xx:** vacant
3. **Exposed linear encoders:** conversion from TTL to 11 \( \mu \text{A} \)P for the PWT, otherwise not assigned

**TTL incremental signals**