Product Information

ECN 1325
EQN 1337
Absolute Rotary Encoders with Tapered Shaft for Safety-Related Applications

For HMC 2 connection technology
ECN 1325, EQN 1337

Rotary encoders for absolute position feedback with safe singletum information

- 65 mm installation diameter
- 07B expanding ring coupling
- 65B tapered shaft

Specifications

**Functional safety**

- For applications with up to SIL 2 as per EN 61508 (further basis for testing: IEC 61800-5-3)
- Category S, PL d, according to EN ISO 13849-1:2015

**Safe singleturn information**

- PFH ≤ 20 · 10⁻⁹ (probability of dangerous failure per hour)
- Encoder: ±2.12° (safety-related measuring step: SM = 0.7°)

**Mechanical coupling**

- ±2° (fault exclusion for the loosening of the shaft coupling and stator coupling, designed for accelerations ≤ 300 m/s²)

**Interface**

- EnDat 3
- Ordering designation: E30-R2
- Position values per revolution: 33,554,432 (25 bits)
- Revolutions: ≤ 40,960 (12 bits)

**System accuracy**

- ±20°

**Electrical connection**

- PCB connector: 16-pin (12+4-pin), with connection for external temperature sensor

**Cable length**

- At 12.5 Mbit/s: ≤ 100 m; at 25 Mbit/s: ≤ 40 m
- At 12 V: ≤ 30 mA (without communication)
- At 12 V: ≤ 200 mW (without communication)

**Supply voltage**

- DC 4 V to 14 V (recommended: 12 V)
- Power consumption (maximum)
  - At 4 V: ≤ 700 mW; at 14 V: ≤ 750 mW
  - At 4 V: ≤ 800 mW, at 14 V: ≤ 850 mW

**Current consumption (typical)**

- At 12 V: 30 mA (without communication)
- At 12 V: 40 mA (without communication)

**Shaft**

- 65B tapered shaft Ø 9.25 mm; taper 1:10
- Shaft speed: ≤ 15,000 rpm
- Starting torque at 20 °C: ≤ 0.01 Nm
- Moment of inertia of rotor: 2.6 · 10⁻⁶ kgm²
- Angular acceleration of rotor: ≤ 1 · 10⁶ rad/s²
- Natural freq. of stator coupling: 1800 Hz (typical)
- Axial motion of measured shaft: ≤ ±0.5 mm
- Vibration: 55 Hz to 2000 Hz
- Shock: 6 ms

**Vibration 55 Hz to 2000 Hz**

- ≤ 300 m/s²* (EN 60068-2-6); 10 Hz to 55 Hz constant over 4.9 mm peak to peak
- ≤ 2000 m/s² (EN 60068-2-27)

**Operating temperature**

- −40 °C to 115 °C
- Trigger threshold for exceeded temperature error message: 125 °C (measuring accuracy of internal temperature sensor: ±1 K)
- Relative humidity: ≤ 93% (40 °C/21 d as per EN 60068-2-78), condensation excluded

**Protection rating**

- EN 60529: IP40 (read about insulation under Electrical safety in the Interfaces of HEIDENHAIN Encoders brochure; contamination from the ingress of fluids must be avoided)

**Mass**

- ≤ 0.3 kg

**Part number**

- ID 1296522-01/-52
- ID 1296523-01/-53

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See General electrical information in the Interfaces of HEIDENHAIN Encoders brochure

1) Valid as per standard at room temp.; at operating temps. of up to 100 °C: ≤ 200 m/s², up to 115 °C: ≤ 150 m/s²

2) See Temperature measurement in Motors in the Encoders for Servo Drives brochure

3) See Time measurement in Motors in the Encoders for Servo Drives brochure

4) For use at ≤ 2000 m above sea level, ≤ 6000 m above sea level upon request

5) Further tolerances may arise in the downstream electronics after position value comparison (contact the manufacturer)

6) In collective package upon request
Mounting

The tapered shaft of the rotary encoder is pressed onto the measured shaft and fastened with a central screw. It is particularly important to ensure that the positive-locking element of the stator coupling securely engages the corresponding slot in the measured shaft. Use a screw with material bonding anti-rotation lock (see Mounting accessories). The stator coupling is clamped by means of an axially tightenable screw in a locating hole.

Mounting accessories

Screws

Screws (central screw, mounting screws) are not included in delivery and can be ordered separately.

<table>
<thead>
<tr>
<th>ECN 1325, EQN 1337</th>
<th>Screws</th>
<th>Lot size</th>
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<tbody>
<tr>
<td>Central screw for shaft fastening</td>
<td>DIN 6912 M5x50-8.8-MKL</td>
<td>ID 202264-54</td>
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<tr>
<td></td>
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<td>10 or 100</td>
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1) With coating for material bonding anti-rotation lock.

Please note the information on screws from HEIDENHAIN in the Encoders for Servo Drives brochure, under the heading Screws with material bonding anti-rotation lock in the chapter General mechanical information.

Mounting aid

To avoid damage to the cable, use the mounting aid to connect and disconnect the cable assembly. The pulling force must be applied solely to the connector and not to the wires.

ID 107573-01

EnDat 3 adapter (5A 1210)

Adapter for connecting an encoder with EnDat 3 (E30-R2) to the PWM 21

ID 1317260-01

More information:

For the customer-side mounting design, the material specifications for steel apply to the customer-side shaft. For the customer-side stator, the material specifications for aluminum apply. Also comply with the other material properties in the Encoders for Servo Drives brochure (ID 208922-xx).

Integrated temperature evaluation

This rotary encoder features an internal temperature sensor integrated into the encoder electronics and an evaluation circuit for an external temperature sensor. In both cases, the respective digitized temperature value is transmitted purely serially over the EnDat protocol. Please bear in mind that neither the temperature measurement nor the transmission of the temperature value is safe in terms of functional safety. With regard to the internal temperature sensor IF D 0x21 SENSOR TEMP INT, the rotary encoder supports the two-stage cascaded signaling of a temperature exceedance. It consists of an EnDat warning and an EnDat error message. In compliance with the EnDat specification, when the temperature reaches the warning threshold for temperature exceedance of the internal temperature sensor, an EnDat warning is issued (HPF STATUS.W “collective warning bit”). In addition, bit 26 (W10) “Temperature warning threshold exceeded” is set in the LPF with the FID=EERRMSG. This warning threshold for the internal temperature sensor is stored in the parameter SET.tempWarnLevel and can be individually adjusted. A device-specific default value is saved here before shipping. The temperature measured by the internal temperature sensor is higher by a device-specific and application-specific amount than the temperature at measuring point M1, as shown in the dimension drawing.

The encoder features a further, albeit non-adjustable trigger threshold for the EnDat error message (HPF STATUS.F “collective error bit”). In addition, bit 8 (I48) “Permissible ambient conditions exceeded” is set in the LPF with the FID=ERRMSG. This trigger threshold may vary depending on the encoder model and is stated in the specifications. HEIDENHAIN recommends adjusting the warning threshold based on the application such that this threshold is sufficiently below the trigger threshold for the “Temperature exceeded” EnDat error message. Compliance with the operating temperature at measuring point M1 is required for adherence to the encoder’s intended and proper use.
## Electrical connection

### Pin layout

<table>
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<tr>
<th>16-pin (12+4-pin) PCB connector</th>
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<tr>
<td>![Pin layout diagram]</td>
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<table>
<thead>
<tr>
<th></th>
<th>Power supply / Serial data transfer</th>
<th>Other signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>2b</td>
<td>5a</td>
</tr>
<tr>
<td>4</td>
<td>/</td>
<td>1a</td>
</tr>
<tr>
<td></td>
<td>/</td>
<td>1b</td>
</tr>
</tbody>
</table>

1) Supply voltage and data: P_SD+ contains U_p (power supply); P_SD– contains 0 V
2) Connections for external temperature sensor; evaluation optimized for KTY 84-130, PT 1000, and others;
   (see Temperature measurement in motors in the Encoders for Servo Drives brochure)

Vacant pins or wires must not be used!

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This Product Information document supersedes all previous editions, which thereby become invalid. The basis for ordering from HEIDENHAIN is always the Product Information document edition valid when the order is placed.

**More information:**

Comply with the requirements described in the following documents to ensure correct and intended operation:

- Operating Instructions

For more information about EnDat 3, visit: [www.endat.de](http://www.endat.de)

For brochures and Product Information documents, visit: [www.heidenhain.com](http://www.heidenhain.com)