Product Information

**ECN 1324 S  
EQN 1336 S**

Absolute Rotary Encoders with DRIVE-CLiQ Interface for Safety-Related Applications

Firmware 53
ECN 1324 S, EQN 1336 S

Rotary encoders for absolute position values with safe singleturn information

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

**Specifications**

**Functional safety**

- As a single-encoder system for monitoring and closed-loop functions
- • SIL 2 as per EN 61508 (further basis for testing: IEC 61800-5-3)
- • Category 3, PL d, according to EN ISO 13849-1:2015
- Safe in the singleturn range

- PFH\textsuperscript{1)} ≤ 27 · 10\textsuperscript{-9} (probability of dangerous failure per hour)
- Safe position\textsuperscript{2)}

**Interface/ordering designation**

- DRIVE-CLiQ / DQ01
- Firmware 01.32.26.S3
- SINAMICS: V4.4 HF4
- SINUMERIK with safety\textsuperscript{3)}: V4.4 SP2
- SINUMERIK without safety\textsuperscript{3)}: V4.4 SP1 HF3

**Position values per revolution**

- 16,777,216 (24 bits)
- Revolutions – 4096 (12 bits)

**Calculation time**

- TIME\textsubscript{MAX}\_ACTVAL\textsuperscript{4)} ≤ 8 µs

**System accuracy**

- ±20

**Electrical connection**

- PCB connector: 16-pin (12+4-pin), with connection for an external temperature sensor\textsuperscript{5)

**Supply voltage**

- DC 24 V (10 V to 28.8 V); up to DC 36.0 V possible without compromising functional safety

**Power consumption\textsuperscript{6)} (maximum)**

- At 10 V: \textsuperscript{6)} 950 mW; at 28.8 V: \textsuperscript{6)} 1000 mW
- At 10 V: \textsuperscript{6)} 1050 mW; at 28.8 V: \textsuperscript{6)} 1150 mW

**Shaft speed**

- ≤ 15,000 rpm (at ≥ 2 position requests per rev.)
- ≤ 12,000 rpm (at ≥ 2 position requests per rev.)

**Angular acceleration of rotor**

- ≤ 1 · 10\textsuperscript{6} rad/s\textsuperscript{2}

**Natural frequency of the stator coupling (typical)**

- 1800 Hz

**Axial motion of measured shaft**

- ≤ 0.5 mm

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\textsuperscript{1) For use at ≤ 1000 m above sea level (≤ 6000 m above sea level upon request)}

\textsuperscript{2) Further tolerances may arise in the downstream electronics after position value comparison (contact mfr.)}

\textsuperscript{3) See Siemens document “Certified encoders with DRIVE-CLiQ Dependencies on SIMOTION / SINUMERIK and SINAMICS Hardware and Software versions”}

\textsuperscript{4) The calculation time TIME\_MAX\_ACTUAL specifies the time after which data transfer from the encoder to the control can start within the current-regulator clock time}

\textsuperscript{5) See Temperature measurement in motors in the Encoders for Servo Drives brochure}

\textsuperscript{6) See General electrical information in the Interfaces of HEIDENHAIN Encoders brochure}
ECN 1324 S, EQN 1336 S

Rotary encoders for absolute position values with safe singletum information
- 65 mm installation diameter
- Ø7B expanding ring coupling
- Ø7M blind hollow shaft for axial clamping

Specifications

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<th>Specifications</th>
<th>ECN 1324 S singletum</th>
<th>EQN 1336 S multitum</th>
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<tr>
<td><strong>Vibration</strong></td>
<td>55 Hz to 2000 Hz</td>
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<tr>
<td><strong>Shock</strong></td>
<td>6 ms</td>
<td></td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>-40 °C to 100 °C</td>
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<tr>
<td><strong>Trigger threshold of exceeded temperature error message</strong></td>
<td>117 °C in the scanning ASIC (measuring accuracy of internal temperature sensor: ±2 K at 117 °C)</td>
<td></td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td>≤ 53% (40 °C/21 d as per EN 60068-2-78; condensation excluded)</td>
<td></td>
</tr>
<tr>
<td><strong>Protection rating</strong></td>
<td>EN 60529</td>
<td></td>
</tr>
<tr>
<td><strong>ID number</strong></td>
<td>1179144-02 1179144-52 1179145-03</td>
<td></td>
</tr>
</tbody>
</table>

1) In collective package

Vibration 55 Hz to 2000 Hz
Shock 6 ms
Operating temperature -40 °C to 100 °C
Trigger threshold of exceeded temperature error message 117 °C in the scanning ASIC (measuring accuracy of internal temperature sensor: ±2 K at 117 °C)
Relative humidity ≤ 53% (40 °C/21 d as per EN 60068-2-78; condensation excluded)
Protection rating EN 60529
ID number 1179144-02 1179144-52 1179145-03

Requirements for mating dimensions
- A = Bearing of mating shaft
- M1 = Measuring point for operating temperature
- M2 = Measuring point for vibration (see D917/16)
- 1 = Clamping screw for coupling ring; width A/F 2; tightening torque: 1.25 Nm – 0.2 Nm
- 2 = Die-cast cover
- 3 = Screw plug; widths A/F 3 and 4; tightening torque: 5 Nm + 0.5 Nm
- 4 = 16-polig (12+4-polig) PCB connector
- 5 = Screw; DIN 6912 – M5x25 – 08.8 – MKL; width A/F 4; tightening torque: 5 Nm + 0.5 Nm
- 6 = Compensation of mounting tolerances and thermal expansion; no dynamic movement permitted
- 7 = Chamfer at start of thread is obligatory for material bonding anti-rotation lock
- 8 = Direction of shaft rotation for ascending position values

Vibration
- 55 Hz to 2000 Hz

Shock
- 6 ms

Operating temperature
- -40 °C to 100 °C

Trigger threshold of exceeded temperature error message
- 117 °C in the scanning ASIC (measuring accuracy of internal temperature sensor: ±2 K at 117 °C)

Relative humidity
- ≤ 53% (40 °C/21 d as per EN 60068-2-78; condensation excluded)

Protection rating EN 60529

ID number
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1) In collective package

Electrical safety in the Interfaces of HEIDENHAIN Encoders brochure; contamination from the ingress of fluids must be avoided

Protection rating EN 60529 IP40 (read about insulation under)

Mass
- 0.3 kg

ID number
- 1179144-02 1179144-52 1179145-03

1) In collective package

Required mating dimensions
- A = Bearing of mating shaft
- M1 = Measuring point for operating temperature
- M2 = Measuring point for vibration (see D917/16)
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- 6 = Compensation of mounting tolerances and thermal expansion; no dynamic movement permitted
- 7 = Chamfer at start of thread is obligatory for material bonding anti-rotation lock
- 8 = Direction of shaft rotation for ascending position values

Id number
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1) In collective package

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1) In collective package
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<tr>
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<th>ECN 1324S singleturn</th>
<th>EQN 1336S multturn</th>
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<tbody>
<tr>
<td><strong>Functional safety</strong> for applications with up to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIL 2 as per EN 61508 (further basis for testing: IEC 61800-5-3)</td>
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<tr>
<td>Category 3, PL d, according to EN ISO 13849-1:2015</td>
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<tr>
<td>Safe in the singleturn range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFH$^{1)}$</td>
<td>≤ 27 · 10$^{-9}$ (probability of dangerous failure per hour)</td>
<td></td>
</tr>
<tr>
<td>Safe position$^{2)}$</td>
<td>Encoder: ±1.76° (safety-related measuring step: SM = 0.7°)</td>
<td></td>
</tr>
<tr>
<td>Mechanical coupling: ±2° (fault exclusion for loosening of the shaft coupling and stator coupling, designed for accelerations of ≤ 300 m/s$^2$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface/ordering designation</td>
<td>DRIVE-CLiQ / DQ01</td>
<td></td>
</tr>
<tr>
<td>Firmware</td>
<td>01.32.26.53</td>
<td></td>
</tr>
<tr>
<td>SINAMICS, SIMOTION$^{3)}$</td>
<td>≥ V4.4 HF4</td>
<td></td>
</tr>
<tr>
<td>SINUMERIK with safety$^{3)}$</td>
<td>≥ V4.4 SP2</td>
<td></td>
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<tr>
<td>SINUMERIK without safety$^{3)}$</td>
<td>≥ V4.4 SP1 HF3</td>
<td></td>
</tr>
<tr>
<td>Position values per revolution</td>
<td>16 777 216 (24 bits)</td>
<td></td>
</tr>
<tr>
<td>Revisions</td>
<td>–</td>
<td>4096 (12 bits)</td>
</tr>
<tr>
<td>Calculation time $^{4)}$</td>
<td>≤ 8 µs</td>
<td></td>
</tr>
<tr>
<td>System accuracy</td>
<td>±20”</td>
<td></td>
</tr>
<tr>
<td>Electrical connection</td>
<td>PCB connector: 16-pin (12+4-pin); with connection for an external temperature sensor$^{5)}$</td>
<td></td>
</tr>
<tr>
<td>Cable length</td>
<td>&lt; 40 m (for the calculation, see the Cables and Connectors brochure)</td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>DC 24 V (10 V to 28.8 V); up to DC 36.0 V possible without compromising functional safety</td>
<td></td>
</tr>
<tr>
<td>Power consumption$^{6)}$ (maximum)</td>
<td>At 10 V: ≤ 950 mW; at 28.8 V: ≤ 1000 mW</td>
<td>At 10 V: ≤ 1050 mW; at 28.8 V: ≤ 1150 mW</td>
</tr>
<tr>
<td>Current consumption (typical)</td>
<td>At 24 V: 38 mA (without load)</td>
<td>At 24 V: 43 mA (without load)</td>
</tr>
<tr>
<td>Shaft</td>
<td>Blind hollow shaft for axial clamping (Ø 12.7 mm)</td>
<td></td>
</tr>
<tr>
<td>Shaft speed</td>
<td>≤ 12 000 rpm (at ≥ 2 position requests per rev.)</td>
<td></td>
</tr>
<tr>
<td>Starting torque (typical)</td>
<td>0.01 Nm (at 20 °C)</td>
<td></td>
</tr>
<tr>
<td>Moment of inertia of rotor</td>
<td>3.6 · 10$^{-5}$ kgm$^2$</td>
<td></td>
</tr>
<tr>
<td>Angular acceleration of rotor</td>
<td>≤ 5 · 10$^5$ rad/s$^2$</td>
<td></td>
</tr>
<tr>
<td>Axial motion of measured shaft</td>
<td>≤ 0.5 mm</td>
<td></td>
</tr>
</tbody>
</table>

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1) For use at ≤ 1000 m above sea level (≤ 6000 m above sea level upon request)
2) Further tolerances may arise in the downstream electronics after position value comparison (contact mfr.)
3) See Siemens document “Certified encoders with DRIVE-CLiQ Dependencies on SIMOTION / SINUMERIK and SINAMICS Hardware and Software versions.”
4) The calculation time TIME_MAX_ACTVAL specifies the time after which data transfer from the encoder to the control can start within the current-regulator clock time
5) See Temperature measurement in motors in the Encoders for Servo Drives brochure
6) See General electrical information in the Interfaces of HEIDENHAIN Encoders brochure

DRIVE-CLiQ is a registered trademark of Siemens AG.
The shaft of the rotary encoder is pressed onto the motor’s drive 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 central screw with material-bonding anti-rotation lock (see Mounting accessories). The stator coupling is clamped by means of an axially tightening 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 1324 S, EQN 1336 S</th>
<th>Central screws for fastening the shaft</th>
<th>Lot size</th>
</tr>
</thead>
<tbody>
<tr>
<td>For tapered shaft 65B</td>
<td>DIN 6912 – M5x50 – 08.8 – MKL</td>
<td>ID 202264-54</td>
</tr>
<tr>
<td>For hollow shaft 67M</td>
<td>DIN 6912 – M5x25 – 08.8 – MKL</td>
<td>ID 202264-55</td>
</tr>
</tbody>
</table>

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 Rotary encoders with functional safety 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 107673-01

For further mounting information and mounting aids, please refer to the relevant mounting instructions and the Encoders for Servo Drives brochure.

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### Integrated temperature evaluation

These rotary encoders feature a 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 via the DRIVE-CLiQ interface.

Please bear in mind that neither the temperature measurement nor the transmission of the temperature value is safe in terms of functional safety.

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. Upon reaching a trigger threshold for the internal temperature sensor, these rotary encoders issue an "Alarm 405" error message. This threshold may vary depending on the encoder and is stated in the specifications. During operation, it is recommended that the temperature be kept adequately below the error-message threshold.

The encoder’s intended use requires compliance with the operating temperature at measuring point M1.

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### Temperature measurement in motors

To protect a motor from overloading, the motor manufacturer usually installs a temperature sensor in close proximity to the motor winding.

The PT 1000 or, for example, the KTY 84-130 semiconductor sensor is to be used. For a PT 1000, the following values apply with regard to the accuracy of the evaluation circuit:

- ±6 K at –40.0 °C to 80 °C
- ±4 K at 80.1 °C to 160 °C
- ±6 K at 160.1 °C to 200 °C

For a KTY 84-130 semiconductor sensor, the following values apply with regard to the accuracy of the evaluation circuit:

- ±6 K at –40.0 °C to 80 °C
- ±2 K at 80.1 °C to 160 °C
- ±6 K at 160.1 °C to 200 °C

The temperature values are transmitted via the DRIVE-CLiQ protocol.

The temperature sensor used is adjustable via Parameter 601 in the configuration software (e.g., Starter software) of the drive.
Electrical connection

Pin layout

<table>
<thead>
<tr>
<th>16-pin (12+4-pin) PCB connector</th>
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</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

16-pin (12+4-pin) PCB connector

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Serial data transmission</th>
<th>Other signals 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12+4 1b 6a 3a 4b 6b 1a 2b 5a</td>
<td>U_p 0V RXP RXN TXP TXN</td>
<td>1a 2) 1b 2) 2a/2b</td>
</tr>
</tbody>
</table>

1) Only with adapter cables inside the motor housing
2) Connections for external temperature sensor; evaluation optimized for KTY 84-130/PT 1000 (see Temperature measurement in motors in the Encoders for Servo Drives brochure)

Cable shield connected to housing; U_p = Power supply voltage
Vacant pins or wires must not be used!
Output cables with a cable length > 0.5 m require strain relief for the cable

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