Product Information

**ECI 1119**  
**EQI 1131**  
Absolute Rotary Encoders without Integral Bearing

With additional measures: suitable for safety-related applications with up to SIL 3

For HMC 2 connection technology
Rotary encoders for absolute position values with safe singletum information

- Robust inductive scanning principle
- Mounting compatible with photoelectric rotary encoders with a 75A stator coupling
- 75C mounting flange
- Blind hollow shaft (Ø 6 mm) for axial clamping without a positive-locking element (82A)
or with a positive-locking element (1KA)
- Required mating dimensions with a M3x25 central screw and cost optimization for the customer side upon request

Specifications ECI 1119 singletum EGI 1131 multturn

Functional safety
for applications with up to 19.25 Hz

As a single-encoder system for monitoring and closed-loop functions:
- SIL 2 as per EN 61508
- Category 3, PL d as per EN ISO 13849-1:2015
With additional measures as per Document 1277016, suitable for safety-related applications with up to SIL 3 or Category 4, PL e
Safe in the singletum range

PFH1)
SIL 2: ≤ 15 · 10−9 (probability of dangerous failure per hour)
SIL 3: ≤ 2 · 10−9

Safe position2)
Encoder: ±0.88° (safety-related measuring step SM = 0.39°)
Mechanical coupling for 82A shaft: ±0.1°; for 1KA shaft: ±0.2° (fault exclusion for loosening of the shaft coupling and stator coupling; designed for accelerations at the stator: ≤ 400 m/s², and the rotor: ≤ 600 m/s²)

Interface
Endat 3
Ordering designation E30-R2
Position values per revolution
ECI: 32886 (19 bits)
EQI: 524288

Revolutions
–
4096 (12 bits)

Electrical connection
15-pin PCB connector (with connection for external temperature sensor)3)

Cable length
At 12.5 Mbit/s: ≤ 100 m; at 25 Mbit/s: ≤ 40 m

Supply voltage
DC 4 V to 14 V

Current consumption (typical)
At 12 V: 45 mA (without communication)
At 12 V: 50 mA (without communication)

Power consumption4)
(maximum)
At 4 V: ≤ 850 mW; at 14 V: ≤ 900 mW
At 4 V: ≤ 950 mW; at 14 V: ≤ 1000 mW

Shaft
- Blind hollow shaft for axial clamping (Ø 6 mm) without positive-locking element (82A)
or with positive-locking element (1KA)

Shaft speed
- ≤ 15 000 rpm
- ≤ 12 000 rpm

Moment of inertia of rotor
0.2 · 10−4 kgm²

Angular acceleration of rotor
≤ 1 · 10⁶ rad/s²

Axial motion of measured shaft
≤ ±0.4 mm

Vibration
55 Hz to 2000 Hz5)
Slator: ≤ 400 m/s²; rotor: ≤ 600 m/s²
(EN 60068-2-6)
≤ 2000 m/s²
(EN 60068-2-27)

Shock 6 ms
≤ 15 · 10−9 (probability of dangerous failure per hour)
≤ 2 · 10−9

Operating temperature
-40 °C to 110 °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), without condensation

Protection
EN 60529
IP00

Mass
≤ 0.04 kg

ID number
1259551-01/51 (shaft: 1KA)
1259551-02/52 (shaft: 82A)
1259552-01/51 (shaft: 1KA)
1259552-02/52 (shaft: 82A)

1) For use at ≤ 2000 m above sea level
2) Further tolerances may arise in subsequent electronics after position value comparison (contact mfr. of subsequent electronics)
3) See Temperature measurement in motors in the Encoders for Servo Drives brochure
4) General technical information in the Interfaces of HEIDENHAIN Encoders brochure or at www.heidenhain.de
5) For d to 55 Hz, 4.9 mm constant peak to peak
6) Rotary encoders in a collective package

Product Information ECI 1119, EQI 1131 01/2022
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### Mounting

The blind hollow shaft of the rotary encoder is seated onto the measured shaft and fastened with a central screw. It is particularly important to ensure that the positive-locking element of the 1KA rotary encoder shaft securely engages the corresponding slot in the measured shaft. The stator is positioned for mounting via a centering diameter and fastened with two mounting screws. Use screws with material bonding anti-rotation lock (see Mounting accessories).

### Further information:
For the customer-side mounting design, aluminum and steel are permissible materials for the customer-side shaft and stator.

In addition, comply with the material specifications and other material characteristics in the Encoders for Servo Drives brochure (ID 208922-xx).

### Integrated temperature evaluation

This rotary encoder features 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 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 (FID 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 (HPFSTATUS.W “collective warning bit”). In addition, bit 26 (W10) “Temperature warning threshold exceeded” is set in the LPF with the FID=ERRMSG. 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 (HPFSTATUS.F “collective error bit”). In addition, bit 8 (A8) “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. Fulfillment of the encoder’s intended use requires adherence to the operating temperature at measuring point M1.

### Mounting accessories

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

<table>
<thead>
<tr>
<th>ECN 1119/EQN 1131</th>
<th>Screws</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central screw for shaft fastening</td>
<td>ISO 4762-M3x25-8.8-MKL</td>
<td>ID 202264-86</td>
</tr>
<tr>
<td>Fastening screw for flange</td>
<td>ISO 4762-M3x10-8.8-MKL</td>
<td>ID 202264-87</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 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. Apply pulling force only to the connector of the cable assembly and not to the wires.

**ID 1075573-01**

### Mounting aid

For turning the encoder shaft from the rear. This facilitates finding the positive-locking connection between the encoder and the measured shaft.

**ID 821017-03**

### EnDat 3 adapter

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

**ID 1317260-01**

For further mounting information and mounting aids, please refer to the relevant mounting instructions and the Encoders for Servo Drives brochure. The mounting arrangement can be checked with the PWM 21 and ATS software. For selection of the software, please contact HEIDENHAIN.
# Electrical connection

## Cables

**ETFE encoder cable inside the motor** Ø 1.8 mm^2 x 0.15 mm^2, without shield and with ETFE wires Ø 2.2 mm^2 x 0.16 mm^2 for a temperature sensor; \( A_P = 0.15 \text{ mm}^2 \)

- 15-pin PCB connector (female) and unassembled cable end with two twisted ETFE single wires (communication) and two ETFE single wires (length: 0.10 m) with heat shrink tubing (temperature sensor)
- 15-pin PCB connector (female) and 8-pin M12 SpeedTEC angle flange socket (male), with two twisted ETFE single wires (communication) and two ETFE single wires (length: 0.10 m) with heat shrink tubing and a 2-pin connector (male) for a temperature sensor

**PUR adapter cable** Ø 9.3 mm with external shield;
- 4 x 0.5 mm^2 (power wires)
- 2 x 0.34 mm^2 (brake wires, shielded)
- 2 x 0.14 mm^2 (communication wires, shielded); \( A_P = 0.14 \text{ mm}^2 \)

- 8-pin M12 SpeedTEC straight connector (female), 3-pin header connector (power), 4-pin header (brake wires), and 15-pin D-sub connector (male) (communication)

The connecting element must be suitable for the maximum clock frequency used.

### Note for safety-related applications:
- Conformity with the EMC Directive must be ensured in the complete system!

SpeedTEC is a registered trademark of TE Connectivity Industrial GmbH.

## Pin layout of ECI, EQI

### 8-pin M12 SpeedTEC angle flange socket

<table>
<thead>
<tr>
<th>Encoder</th>
<th>Power supply / Serial data transfer</th>
<th>Other signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>15</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>( P_{SD+}) &amp; 1</td>
<td>( P_{SD–}) &amp; 1</td>
<td>( T+) &amp; 2</td>
</tr>
</tbody>
</table>

- Violet
- Yellow
- Brown
- Green

### Motor

<table>
<thead>
<tr>
<th>Brake</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Brake +</td>
<td>Brake –</td>
</tr>
</tbody>
</table>

1. Power supply and data: \( P_{SD+}\) includes \( U_P\); \( P_{SD–}\) includes 0 V
2. Connections for external temperature sensor; evaluation optimized for a KTY 84-130, PT 1000, and other sensors; 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!

### Note on safety-related applications:
- Only completely assembled HEIDENHAIN cables are qualified for this.
- Do not modify cables or exchange their connectors without first consulting with HEIDENHAIN Traunreut!

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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 made.

Further information:
To ensure proper use, comply with the requirements described in the following documents:

- Brochure: Encoders for Servo Drives 208922-xx
- Brochure: Cables and Connectors 1206103-xx
- Brochure: Interfaces of HEIDENHAIN Encoders 1078628-xx
- Product Information doc.: HMC 2 1305512-xx
- Technical Information doc.: EnDat 3 1305415-xx
- Mounting Instructions: ECI 1119, EOI 1131 1306491-xx
- EnDat 3 Application Conditions for Functional Safety 3000003-xx
- Supplementary Application Conditions for EnDat 3 for Step Monitoring (SIL 3, PL e) 1277016-xx