



# HEIDENHAIN



**Functional  
Safety**

Product Information

**ECN 1325**  
**EQN 1337**

Absolute Rotary Encoders  
with Blind Hollow Shaft for  
Safety-Related Applications

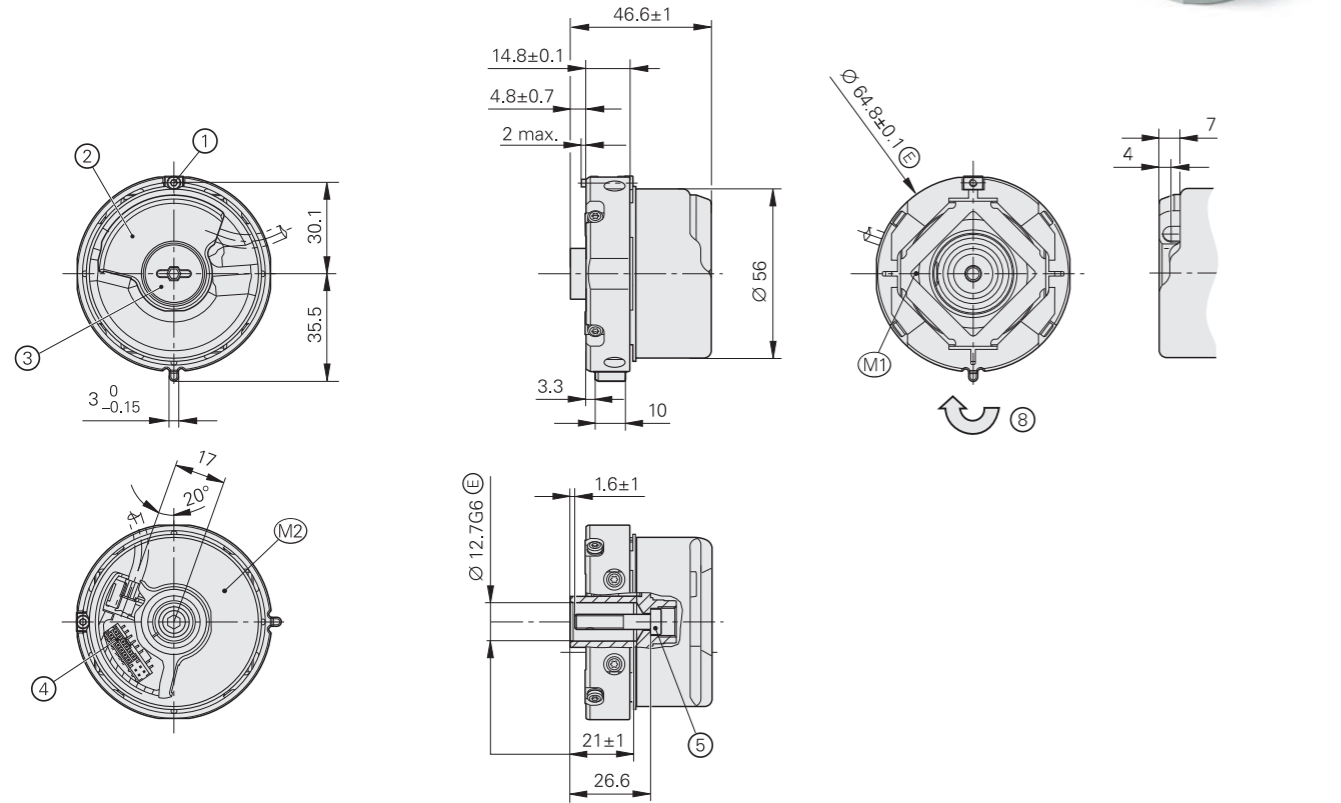
1327452-02  
1327453-04

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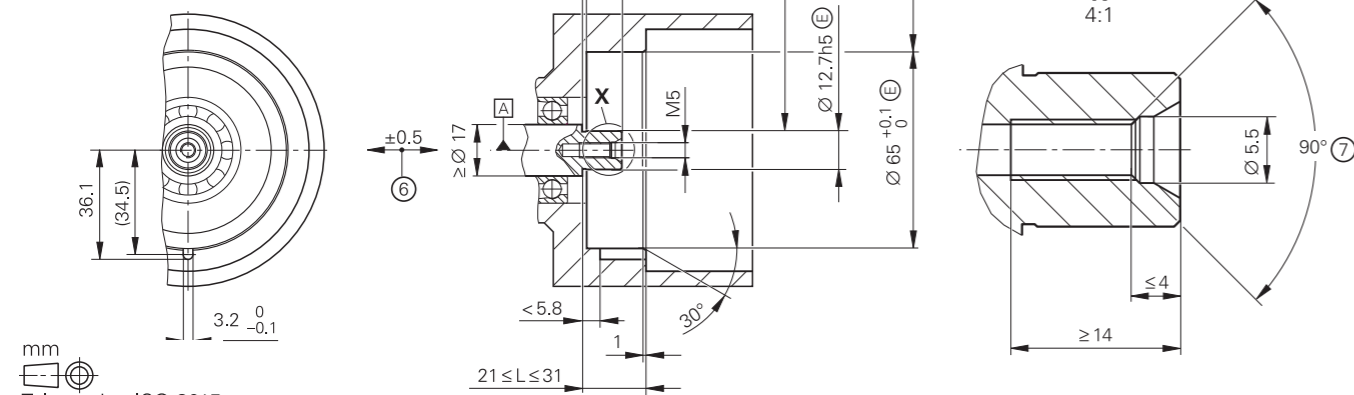
# ECN 1325, EQN 1337

Rotary encoders for absolute position feedback with safe singleturn information

- 65 mm installation diameter
- 07B expanding ring coupling
- 67M blind hollow shaft (Ø 12.7 mm) for axial clamping



## Required mating dimensions



mm  
Tolerancing ISO 8015  
ISO 2768:1989-mH  
≤ 6 mm: ±0.2 mm

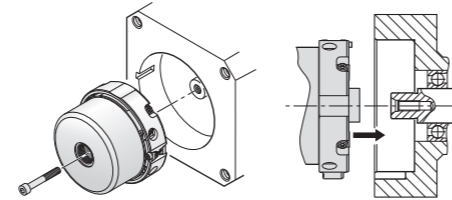
- = Bearing of mating shaft
- M1 = Measuring point for operating temperature
- M2 = Measuring point for vibration (see D741714)
- 1 = Clamping screw for coupling ring: width A/F 2; tightening torque: 1.25 Nm -0.2 Nm
- 2 = Die-cast cover
- 3 = Screw plug: widths A/F 3 and 4; tightening torque: 5 Nm +0.5 Nm
- 4 = 16-pin (12+4-pin) 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

Specifications	ECN 1325 singleturn	EQN 1337 multiturn
<b>Functional safety</b> for applications with up to	As a single-encoder system for monitoring functions and closed-loop functions <ul style="list-style-type: none"> <li>• SIL 2 as per EN 61508 (further basis for testing: IEC 61800-5-3)</li> <li>• Category 3, PL d, according to EN ISO 13849-1:2015</li> </ul> Safe in the singleturn range	
PFH <sup>1)</sup>	≤ 10 · 10 <sup>-9</sup> (probability of dangerous failure per hour)	
Safe position <sup>2)</sup>	Encoder: ±1.76° (safety-related measuring step: SM = 0.7°) Mechanical coupling: ±2° (exclusion for loosening of shaft and stator coupling; designed for accelerations of ≤ 300 m/s <sup>2</sup> )	
Interface/ordering designation	EnDat 2.2/EnDat22	
Position values per revolution	33554432 (25 bits)	
Revolutions	-	4096 (12 bits)
Calculation time t <sub>cal</sub> /clock frequency	≤ 7 μs/≤ 16 MHz	
<b>System accuracy at 20 °C</b>	±20"	
Supply voltage	DC 3.6 V to 14 V	
Power consumption (maximum)	At 3.6 V: ≤ 600 mW; at 14 V: ≤ 700 mW	At 3.6 V: ≤ 700 mW; at 14 V: ≤ 800 mW
Current consumption (typical)	At 5 V: 80 mA (without load)	At 5 V: 95 mA (without load)
<b>Electrical connection</b>	PCB connector: 16-pin (12+4-pin), with connection for external temperature sensor <sup>3)</sup>	
Cable length <sup>4)</sup>	≤ 100 m (at clock frequency ≤ 8 MHz) ≤ 20 m (at clock frequency ≤ 16 MHz)	
Shaft	67M blind hollow shaft for axial clamping (Ø 12.7 mm)	
Permissible shaft speed	≤ 12000 rpm	
Starting torque at 20 °C (typical)	≤ 0.01 Nm	
Moment of inertia of rotor	3.6 · 10 <sup>-6</sup> kgm <sup>2</sup>	
Angular acceleration of rotor	≤ 5 · 10 <sup>4</sup> rad/s <sup>2</sup>	
Natural frequency f <sub>E</sub> (typical)	≥ 1800 Hz	
Permiss. axial motion of measured shaft	≤ ±0.5 mm	
<b>Vibration</b> 55 Hz to 2000 Hz	≤ 300 m/s <sup>2</sup> <sup>5)</sup> (EN 60068-2-6); 10 Hz to 55 Hz constant over 4.9 mm peak to peak	
<b>Shock</b> 6 ms	≤ 2000 m/s <sup>2</sup> (EN 60068-2-27)	
<b>Operating temperature</b>	-30 °C to 115 °C	
<b>Trigger threshold</b> of error message due to excessive temperature <sup>6)</sup>	125 °C (measuring accuracy of the internal temperature sensor: ±1 K)	
<b>Relative humidity</b>	≤ 93% (40 °C/21 d as per EN 60068-2-78), condensation excluded	
<b>Protection</b> EN 60529	IP40 (read about insulation under <i>Electrical safety</i> in the <i>Interfaces of HEIDENHAIN Encoders</i> brochure; contamination through the ingress of liquids must be avoided)	
<b>Mass</b>	≈ 0.3 kg	
<b>ID number</b>	1327452-02	1327453-04

<sup>1)</sup> For use at ≤ 2000 m above sea level (≤ 6000 m above seal level upon request)  
<sup>2)</sup> Further tolerances may arise in the downstream electronics after position value comparison (contact the manufacturer)  
<sup>3)</sup> Connectable temperature sensor for rotary encoders: KTY 84-130 or PT 1000 (see *Temperature measurement in motors* in the *Encoders for Servo Drives* brochure)  
<sup>4)</sup> See the EnDat description in the *Interfaces of HEIDENHAIN Encoders* brochure  
<sup>5)</sup> Valid at room temperature in accordance with the standard; at operating temperatures of up to 100 °C: ≤ 300 m/s<sup>2</sup>; up to 115 °C: ≤ 150 m/s<sup>2</sup>  
<sup>6)</sup> The internal temperature evaluation is not designed with functional safety

# Mounting

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 tightenable screw in a locating hole.



### 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).

## Mounting accessories

### Screws

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

ECN 1325, EQN 1337	Screws <sup>1)</sup>	Lot size
Central screw for shaft fastening	DIN 6912 – M5x25 – 08.8 – MKL ID 202264-55	10 or 100

<sup>1)</sup> 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 1075573-01

For more mounting information and mounting aids, see the *Mounting Instructions* and the *Encoders for Servo Drives* brochure.



# Electrical connection

## Pin layout

16-pin (12+4-pin) PCB connector											
	Power supply				Serial data transmission				Other signals <sup>1)</sup>		
12+4	1b	6a	4b	3a	6b	1a	2b	5a	1a <sup>2)</sup>	1b <sup>2)</sup>	2a/2b
	U <sub>P</sub>	Sensor U <sub>P</sub>	0V	Sensor 0V	DATA	DATA	CLOCK	CLOCK	T+	T-	/

<sup>1)</sup> Only for adapter cables inside the motor housing

<sup>2)</sup> Connections for an external temperature sensor (see *Temperature measurement in motors* in the *Encoders for Servo Drives* brochure)

**Cable shield** connected to housing; **U<sub>P</sub>** = Power supply voltage; **T** = Temperature

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

Vacant pins or wires must not be used!

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

# HEIDENHAIN

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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 information in the following document to ensure correct and intended operation:

- Mounting Instructions: *ECN 1325, EQN 1337*

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