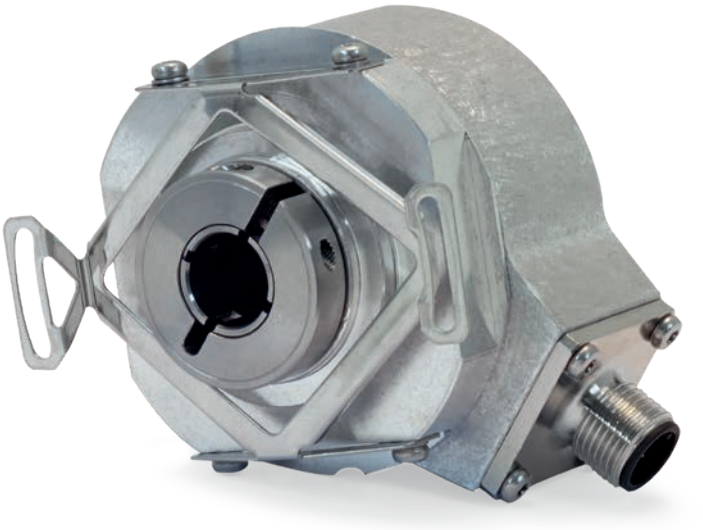
HEIDENHAIN



Functional Safety

Product Information

ECN 425
EQN 437

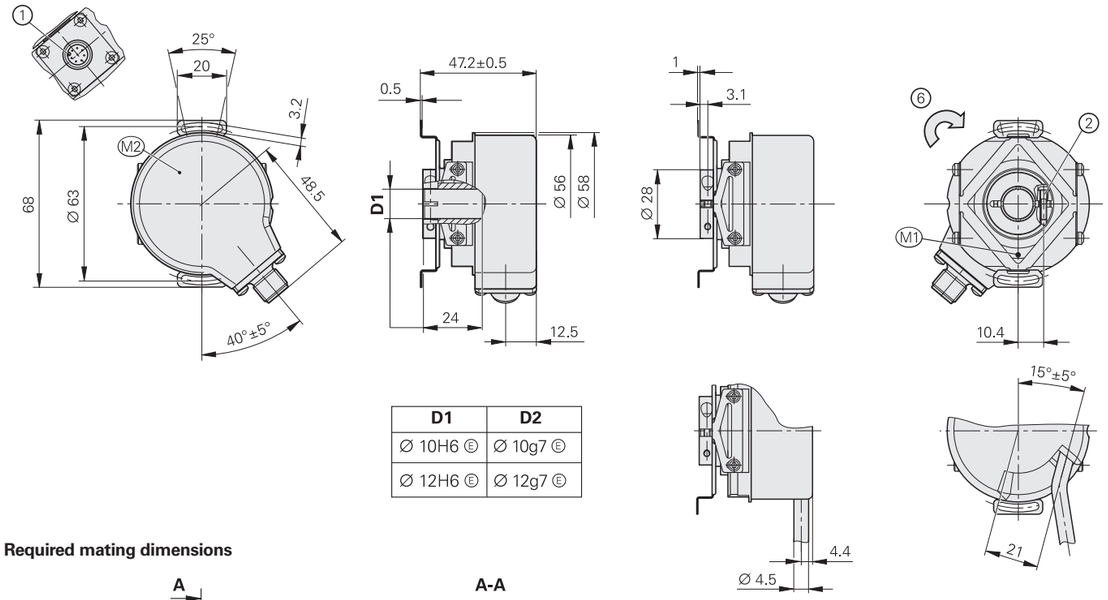
Absolute Rotary Encoders with EnDat22 for Safety-Related Applications

ID 1327454-xx
ID 1327455-xx

06/2022

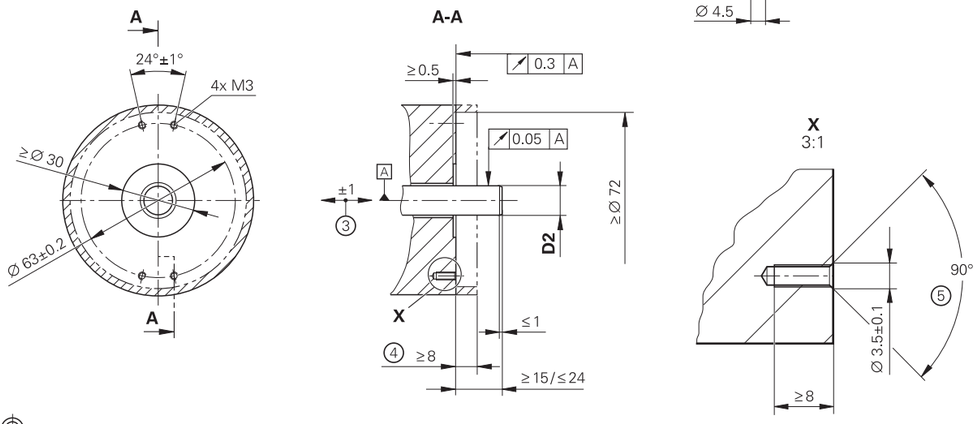
ECN 425, EQN 437

Rotary encoders for absolute position values with safe singleturn information
- **Blind hollow shaft with steel clamping ring:**
  Ø 12 mm (68S)
  Ø 10 mm (68T)



D1	D2
Ø 10H6 Ⓔ	Ø 10g7 Ⓔ
Ø 12H6 Ⓔ	Ø 12g7 Ⓔ

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
1 = Connector coding
2 = X8 clamping screw with hexalobular socket; tightening torque: 1 Nm ±0.06 Nm
3 = Compensation of mounting tolerances and thermal expansion; no dynamic motion permitted
4 = Protection against contact as per EN 60529
5 = Chamfer at start of thread is obligatory for material bonding anti-rotation lock
6 = Direction of shaft rotation for ascending position values

Specifications	ECN 425	EQN 437
Functional safety for applications with up to	*As a single-encoder system for monitoring functions and control-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[1]	≤ $10 \cdot 10^{-9}$ (probability of dangerous failure per hour)	
Safe position[2]	*Encoder:* ±1.76° (safety-related measuring step: SM = 0.7°) *Mechanical coupling:* ±2° (fault exclusion for the loosening of the shaft and stator coupling; designed for accelerations ≤ 300 m/s²; flange socket design: ≤ 150 m/s²)	
Interface/ordering designation	EnDat 2.2/EnDat22	
Position values per revolution	33 554 432 (25 bits)	
Revolutions	–	4096 (12 bits)
Calculation time t_{cal}/clock frequency	≤ 7 µs/≤ 16 MHz	
System accuracy at 20 °C	±20″	
Supply voltage	DC 3.6 V to 14 V	
Power consumption[3] (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)
Electrical connection*	8-pin M12 radial flange socket or PUR cable (1 m) with 8-pin M12 coupling (male)	
Cable length[4]	≤ 100 m (at clock frequency ≤ 8 MHz) ≤ 20 m (at clock frequency ≤ 16 MHz)	
Shaft*	Blind hollow shaft D = 12 mm or D = 10 mm	
Permissible shaft speed	≤ 6000 rpm	
Starting torque at 20 °C	≤ 0.01 Nm	
Moment of inertia of rotor	≤ $6 \cdot 10^{-6}$ kgm²	
Angular acceleration of rotor	≤ $4 \cdot 10^{4}$ rad/s²	
Permiss. axial motion of measured shaft	≤ ±1 mm	
Vibration 55 Hz to 2000 Hz[5] **Shock** 6 ms	≤ 300 m/s²; flange socket version: 150 m/s² (EN 60068-2-6) ≤ 2000 m/s² (EN 60068-2-27)	
Operating temperature[6]	–30 °C to 100 °C	
Trigger threshold for exceeded temperature error mesage[7]	125 °C in the scanning ASIC (measuring accuracy of the internal temperature sensor: ±1 K)	
Relative humidity	≤ 93% (40 °C/21 d as per EN 60068-2-78), condensation excluded	
Protection rating EN 60529	IP67 on housing; IP64 at shaft inlet (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	
ID number	1327454-03/1327454-05/1327454-06/ 1327454-04 (rapid delivery as preferred version)	1327455-03/1327455-05/1327455-06/ 1327455-04 (rapid delivery as preferred version)

***** Please select when ordering
1) For use at ≤ 2000 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 manufacturer)
3) See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure
4) See the EnDat description in the *Interfaces of HEIDENHAIN Encoders* brochure
5) 10 Hz to 55 Hz constant over 4.9 mm peak to peak
(flange socket design: 2.45 mm peak to peak)
6) For information on operating temperature, shaft speed, and supply voltage, see *General mechanical information* in the *Rotary Encoders* brochure
7) The internal temperature evaluation is not designed with functional safety

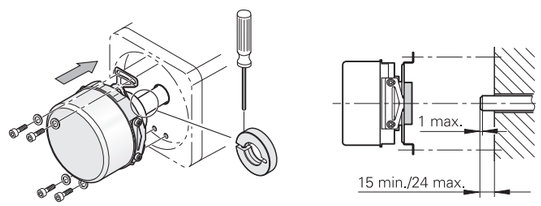
Mounting

Mounting
The rotary encoder's hollow shaft is pressed onto the measured shaft and clamped on its rotor side via a screw (tightening torque: 1 Nm ±0.06 Nm). The stator is connected without a centering collar on a flat surface.

For the hollow-shaft connections 68S and 68T, repeated fastening reduces the screw retaining force. In order to maintain the required safety factor for friction-locked connections, the maximum permissible number of fastening procedures is limited to four. Beyond this number of repetitions, mechanical fault exclusion cannot be guaranteed. In such cases, new clamping rings must be separately ordered:

Clamping ring for 10 mm	ID 540741-06
Clamping ring for 12 mm	ID 540741-07

With standard stator coupling
Blind hollow shaft



Cables with a length of more than 0.5 m must be provided with strain relief.

More information:
For the customer-side mounting design, the material specifications for steel apply to the customer-side shaft, and for the customer-side stator, the material specifications for aluminum apply.

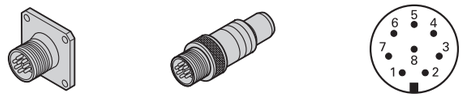
Note the other material properties in the *Rotary Encoders* brochure.

For mounting tips and mounting aids, see the Mounting Instructions and the *Rotary Encoders* brochure.

Electrical connection

Pin layout

8-pin M12 flange socket or 8-pin M12 coupling



	Power supply				Serial data transmission			
	8	**2**	**5**	**1**	**3**	**4**	**7**	**6**
	U_P	Sensor **U_P**	**0 V**	Sensor **0 V**	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow

Cable shield connected to housing; **U_P** = Power supply voltage
Sensor: The sense line is connected in the encoder with the corresponding power supply 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!

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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 1379273-xx