HEIDENHAIN

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

EnDat 2.2

70C flange (82A)

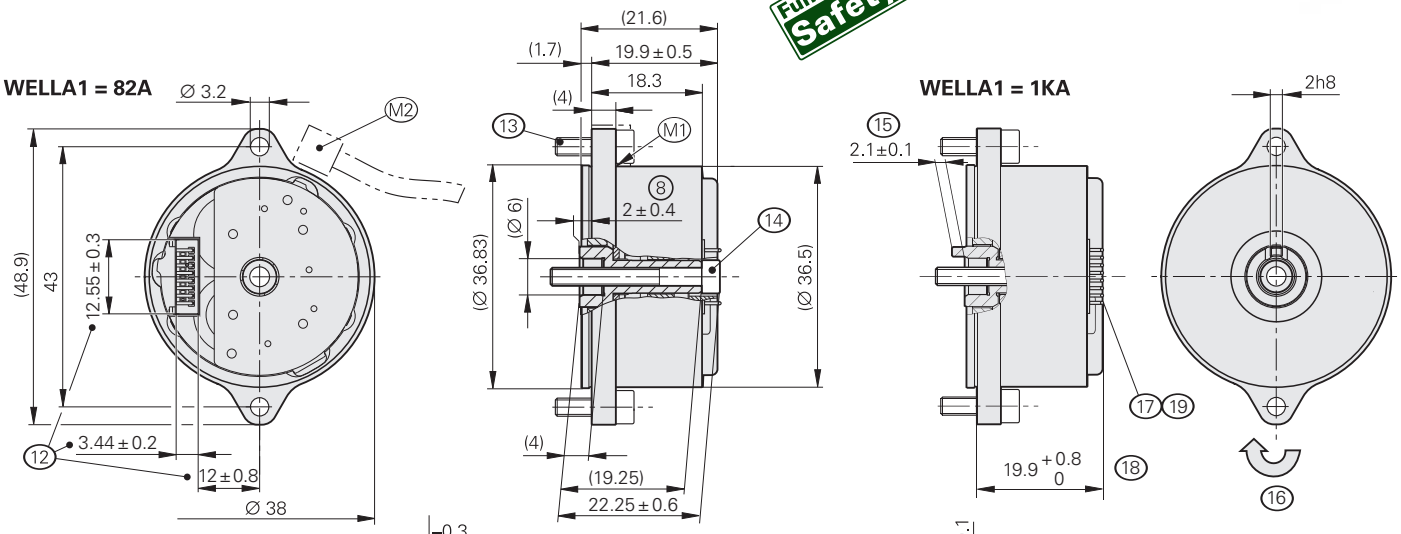
02/2024

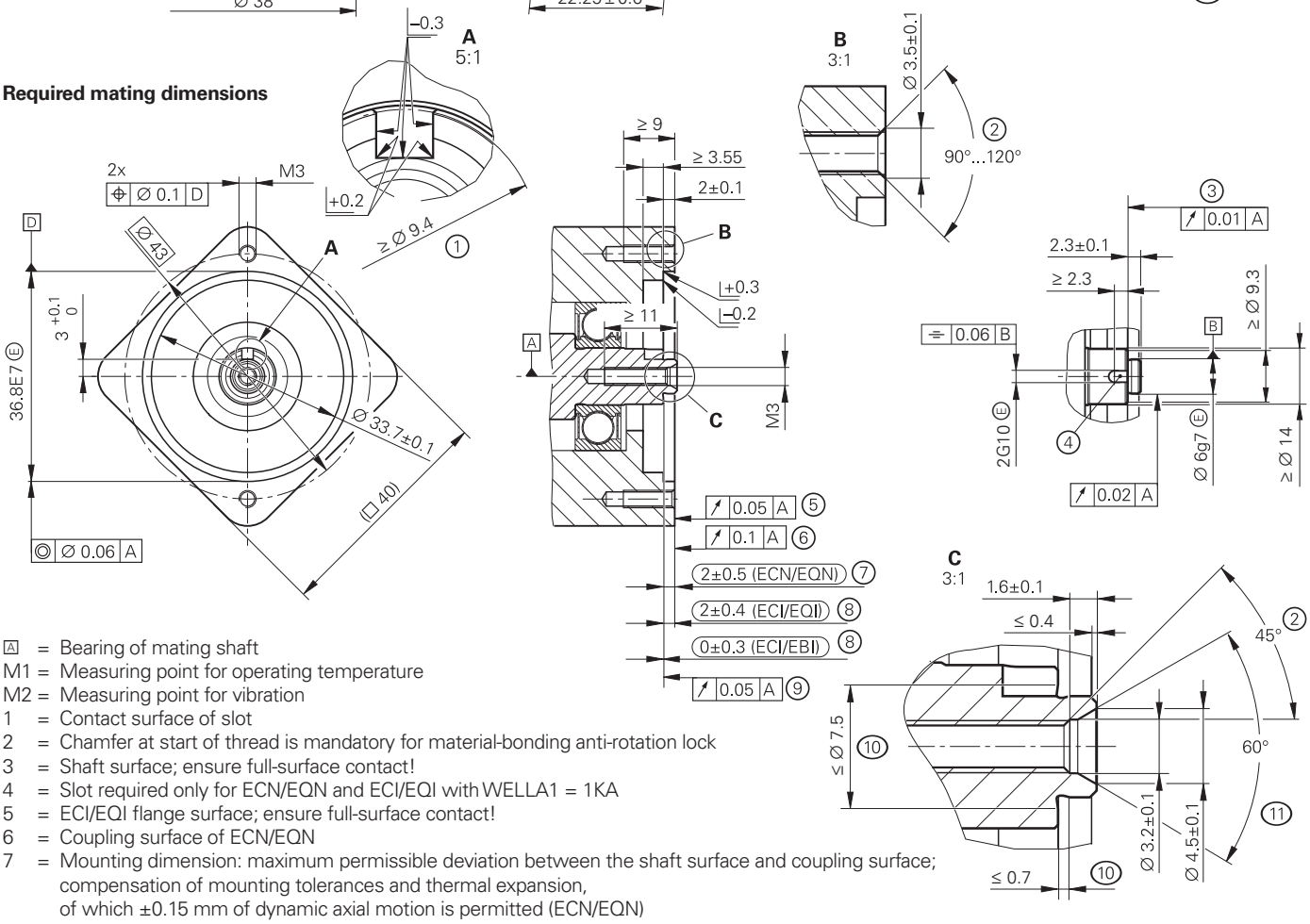
ECI 1119, EQI 1131

Rotary encoders for absolute position values with safe singleturn information

- **Robust inductive scanning principle**
- **Mounting-compatible with photoelectric rotary encoders with a 75A stator coupling**
- **70C 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 M3×25 central screw and version for customer cost optimization available upon request**

Functional Safety





A = Bearing of mating shaft
M1 = Measuring point for operating temperature
M2 = Measuring point for vibration
1 = Contact surface of slot
2 = Chamfer at start of thread is mandatory for material-bonding anti-rotation lock
3 = Shaft surface; ensure full-surface contact!
4 = Slot required only for ECN/EQN and ECI/EQI with WELLA1 = 1KA
5 = ECI/EQI flange surface; ensure full-surface contact!
6 = Coupling surface of ECN/EQN
7 = Mounting dimension: maximum permissible deviation between the shaft surface and coupling surface; compensation of mounting tolerances and thermal expansion, of which ±0.15 mm of dynamic axial motion is permitted (ECN/EQN)
8 = Maximum permissible deviation between shaft and flange surfaces; compensation of mounting tolerances and thermal expansion; dynamic motion permitted over entire range (ECI/EBI/EQI)
9 = ECI/EBI flange surface; ensure full-surface contact!
10 = Undercut
11 = Possible centering hole
12 = Distance to cover; note the opening for PCB connector, header connector, and wires
13 = Screw: ISO 4762 – M3x10 – 8.8 – MKL; tightening torque: 1 Nm ±0.1 Nm
14 = Screw: ISO 4762 – M3x25 – 8.8 – MKL; tightening torque: 1 Nm ±0.1 Nm
15 = Positive-locking element; ensure correct engagement in the slot (e.g., by measuring the device overhang)
16 = Direction of shaft rotation for ascending position values
17 = 15-pin header
18 = Dimension for standard HEIDENHAIN cable
19 = Ensure installation space for cable

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

Specifications	ECI 1119 singleturn	EQI 1131 multiturn
Functional safety for applications with up to	As a single-encoder system for monitoring functions 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 With additional measures as per Document 1000344 for safety-related applications with up to SIL 3 or category 4, PL e Safe in the singleturn range	
PFH	*SIL 2:* ≤ $15 \cdot 10^{-9}$ (probability of dangerous failure per hour) *SIL 3:* ≤ $2 \cdot 10^{-9}$	
Safe position[1)]	*Encoder:* ±0.88° (safety-related measuring step: SM = 0.35°) *Mechanical coupling for 82A shaft:* ±0°; *for 1KA shaft:* ±2°; (fault exclusion for loosening of the shaft coupling and stator coupling; designed for accelerations at the stator of ≤ 400 m/s², at the rotor: ≤ 600 m/s²)	
Interface	EnDat 2.2	
Ordering designation	EnDat22	
Position values per revolution	524 288 (19 bits)	
Revolutions	–	4096 (12 bits)
Calculation time t_{cal}/clock frequency	≤ 5 µs/≤ 16 MHz	
System accuracy	±120"	
Electrical connection	15-pin PCB connector (with connection for external temperature sensor[2)])	
Cable length	≤ 100 m (see the EnDat description in the *Interfaces of HEIDENHAIN Encoders* brochure)	
Supply voltage	DC 3.6 V to 14 V	
Power consumption[3)] (max.)	*At 3.6 V:* ≤ 650 mW; *at 14 V:* ≤ 700 mW	*At 3.6 V:* ≤ 750 mW; *at 14 V:* ≤ 850 mW
Current consumption (typical)	*At 5 V:* 95 mA (without load)	*At 5 V:* 115 mA (without load)

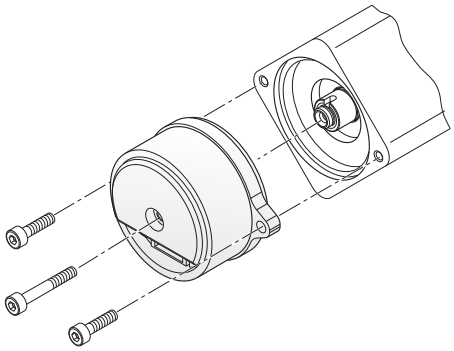
[1)] Further tolerances may arise in the downstream electronics after position value compensation (contact mfr. of the downstream electronics)
[2)] See *Temperature measurement in motors* in the *Encoders for Servo Drives* brochure
[3)] See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure

Specifications	ECI 1119 singleturn	EQI 1131 multiturn
Shaft	Blind hollow shaft for axial clamping (Ø 6 mm) without positive-locking element (82A) or with positive-locking element (1KA)	
Speed	≤ 15000 rpm	≤ 12000 rpm
Moment of inertia of rotor	$0.2 \cdot 10^{-6}$ kgm^2	
Angular acceleration of rotor	$\leq 1 \cdot 10^5$ rad/s^2	
Axial motion of measured shaft	≤ ±0.4 mm	
Vibration 55 Hz to 2000 Hz[1)] **Shock** 6 ms	*Stator:* ≤ 400 m/s^2; *rotor:* ≤ 600 m/s^2 (EN 60068-2-6) ≤ 2000 m/s^2 (EN 60068-2-27)	
Operating temperature	–40 °C to 110 °C	
Trigger threshold of error message for excessive temperature	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 (see *Electrical safety* under *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure; conformity with the EMC Directive must be ensured in the complete system)	
Mass	≈ 0.04 kg	
ID number	*1KA shaft:* ID 1164809-01/-51[2)] *82A shaft:* ID 1164809-02/-52[2)]	*1KA shaft:* ID 1164811-01/-51[2)] *82A shaft:* ID 1164811-02/-52[2)]

[1)] At 10 Hz to 55 Hz, constant over 6.5 mm peak to peak (stator), 10 mm peak to peak (rotor)
[2)] Rotary encoders in collective package

Mounting

The blind hollow 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 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. In each case, use screws with material-bonding anti-rotation lock (see Mounting accessories).



Mounting accessories

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

ECI 1119 **EQI 1131**	**Screws**[1)]		**Quantity**
Central screw for shaft fastening	ISO 4762-**M3×25**-8.8-**MKL**	ID 202264-86	10 or 100
Mounting screw for flange	ISO 4762-**M3×10**-8.8-**MKL**	ID 202264-87	20 or 200

[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 *General mechanical information*.

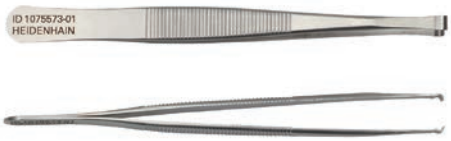
More information:

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).

Mounting aid
To avoid damage to the cable, use the mounting aid to connect and disconnect the cable assembly. Apply pulling force solely 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

For more mounting information and mounting aids, see the Mounting Instructions and the *Encoders for Servo Drives* brochure. The installation can be inspected with the PWM 21 and the ATS software (see Document 1082415).

Electrical connection

Cables

Output cables inside the motor housing with TPE single wires (8 × 0.16 mm²) and net sleeve without shield		
Output cable with 15-pin PCB connector and 8-pin M12 straight flange socket (male) with TPE single wires for temperature sensor (2 × 0.16 mm²)		ID 1119952-xx
Output cable with 15-pin PCB connector and 8-pin M12 straight flange socket (male)		ID 804201-xx
Output cable with 15-pin PCB connector and TPE single wires for temperature sensor (2 × 0.16 mm²), and stripped cable end		ID 1119958-xx

Output cable inside the motor housing with TPE single wires (8 × 0.16 mm²) and heat shrink tubing without a shield		
Output cable with 15-pin PCB connector and stripped cable end		ID 640055-xx

Output cable for HMC 6: ∅ 3.7 mm EPG 1 × (4 × 0.06 mm²) + 4 × 0.06 mm²		
Output cable with 15-pin PCB connector and contact insert for 6-pin HMC 6 hybrid connecting element (male) with TPE single wires for temperature sensor (2 × 0.16 mm²), with cable clamp for shield connection		ID 1072652-xx

Connecting cables and adapter cables PUR ∅ 6 mm; 2 × (2 × 0.09 mm²) + 2 × (2 × 0.16 mm²); A_P = 2 × 0.16 mm²		
Connecting cable with 8-pin M12 connector (female) and 8-pin M12 coupling (male)		ID 1036372-xx
Adapter cable with 8-pin M12 connector (female) and 15-pin D-sub connector (female)		ID 1036521-xx
Adapter cable with 8-pin M12 connector (female) and 15-pin D-sub connector (male)		ID 1036526-xx
Connecting cable with 8-pin M12 connector (female) and unstripped cable end		ID 1129581-xx[1)]

A_P: Cross section of power supply lines

1) Connecting elements must be suitable for the maximum clock frequency used

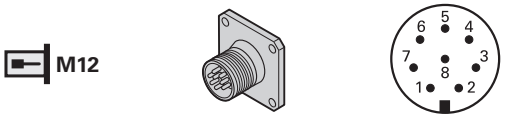
Conformity with the EMC Directive must be ensured for the complete system!

Note for safety-related applications: Document the bit error rate in accordance with Specification 533095!

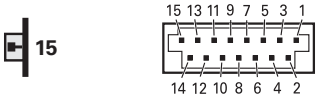
Electrical connection
Pin assignment

Pin layout

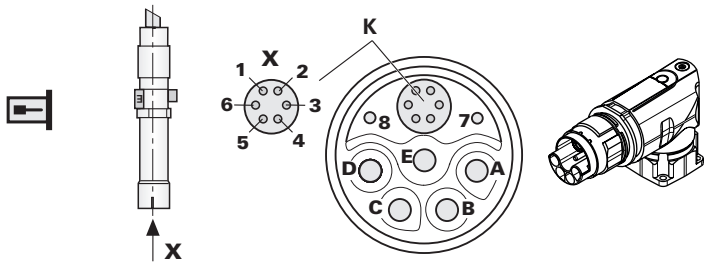
8-pin M12 flange socket

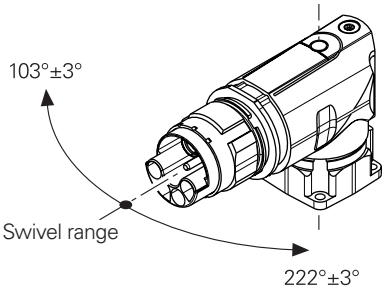


15-pin PCB connector



HMC 6 flange socket





Encoder

	Power supply				Serial data transmission				Other signals[1]	
M12	**8**	**2**	**5**	**1**	**3**	**4**	**7**	**6**	**/**	**/**
	1	**/**	**2**	**/**	**3**	**4**	**5**	**6**	**/**	**/**
15	**13**	**11**	**14**	**12**	**7**	**8**	**9**	**10**	**5**	**6**
	U_P	Sensor **U_P**	**0 V**	Sensor **0 V**	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**	**T+**[2]	**T–**[2]
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow	Brown	Green

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

Motor

	Brake		Power				
	7	**8**	**A**	**B**	**C**	**D**	**E**
	BRAKE–	**BRAKE+**	**U**	**V**	**W**	**/**	**PE**
	White	White/Black	Blue	Brown	Black	/	Yellow/Green

Outer shield of the encoder output cable on housing of communication element **K.**

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

- Operating Instructions: *ECI 1119, EQI 1131 Functional Safety* 1384898-xx