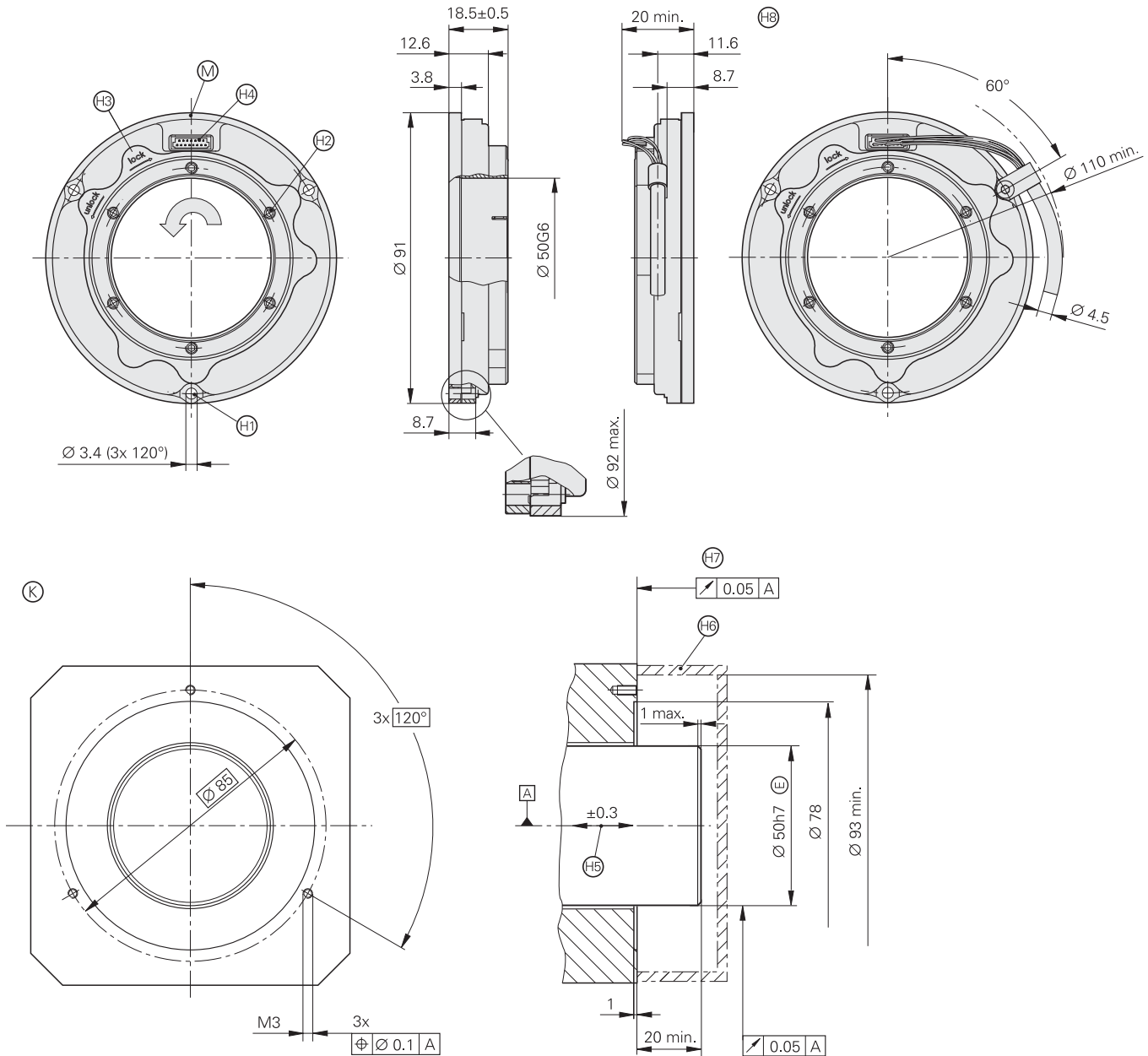# HEIDENHAIN

Product Information

ECI 119
Absolute Rotary Encoder

November 2010

ECI 119

Rotary encoders without integral bearing for integration in motors
- **Hollow through shaft Ø 50 mm**
- **Inductive scanning principle**

18.5±0.5
12.6
3.8
20 min.
11.6
8.7
60°
Ø 110 min.
Ø 91
Ø 50G6
Ø 4.5
8.7
Ø 92 max.

3x 120°
Ø 85
Ø 78
Ø 50h7
Ø 93 min.
±0.3
1 max.
1
20 min.
M3
3x
0.05 A
0.05 A
0.1 A

Ø 3.4 (3x 120°)

mm

Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

Ⓐ = Bearing
Ⓚ = Required mating dimensions
Ⓜ = Measuring point for operating temperature
H1 = Cylinder head screw ISO 4762-M3 with ISO 7092 (3x) washer. Tightening torque 0.9±0.05 Nm
H2 = SW 2.0 (6x). Evenly tighten crosswise with increasing tightening torque; final tightening torque 0.5 ±0.05 Nm
H3 = Shaft detent: For function, see Mounting/Removal
H4 = 15-pin plug connector
H5 = Compensation of mounting tolerances and thermal expansion, no dynamic motion
H6 = Protection against contact as per EN 60529
H7 = Required up to max. Ø 92 mm
H8 = Required mounting frame for output cable with cable clamp (accessory). Bending radius of connecting wires min. R3

↻ Direction of shaft rotation for output signals as per the interface description

	Absolute Singleturn ECI 119	
Absolute position values	EnDat 2.1	EnDat 2.1
Order designation*	EnDat 01	EnDat 21
Positions per revolution	524 288 (19 bits)	
Elec. permissible speed/ Deviations [1]	≤ 3750 min^{-1}/$\pm$ 128 LSB ≤ 6000 min^{-1}/$\pm$ 512 LSB	≤ 6000 min^{-1} (for continuous position value)
Calculation time t_{cal}	≤ 8 µs	
Incremental signals	$\sim$ 1 V$_{PP}$	–
Line counts	32	–
Cutoff frequency –3 dB	≥ 6 kHz typical	–
System accuracy	$\pm$ 90″	
Power supply	5 V $\pm$ 5 %	
Power consumption (maximum)	≤ 0.85 W	
Current consumption (typical)	135 mA (without load)	
Electrical connection	PCB connector, JAE, 15-pin	
Shaft	Hollow through shaft D = 50 mm	
Mech. permissible speed n	≤ 6000 min^{-1}	
Moment of inertia of rotor	$63 \cdot 10^{-6}$ kgm^2	
Permissible axial motion of measured shaft	$\pm$ 0.3 mm	
Vibration 55 to 2000 Hz **Shock** 6 ms	$\leq$ 300 m/s^2 (EN 60068-2-6) ≤ 1000 m/s^2 (EN 60068-2-27)	
Max. operating temperature	115 °C	
Min. operating temperature	–20 °C	
Protection EN 60529	IP 20 when mounted	
Weight	Approx. 0.14 kg	

* Please select when ordering
[1] Velocity-dependent deviation between the absolute and incremental signals

Mounting Information

The ECI 119 is an encoder without integral bearing. This means that mounting and operating conditions influence the functional reserves of the encoder. It is essential to ensure that the specified mating dimensions and tolerances are maintained in all operating conditions.

The following in particular must be kept in mind:
- Axial runout of flange mounting surface
- Radial runout of the motor shaft
- Maintaining the scanning gap (a), while taking into account the superimposition of motions, such as:
  - The length relation of the motor shaft and housing under temperature influence (T_1; T_2; $\alpha 1$; $\alpha 2$) depending on the position of the fixed bearing (b)
  - The bearing play (Cx)
  - Nondynamic shaft offsets due to load (X_1)
  - The effect of engaging motor brakes (X_2)

The application analysis must result in values within specification under all operating conditions (above all under max. load and at minimum and maximum operating temperature for the measured
- max. runout of the motor shaft
- max. runout of the motor shaft with respect to the mounting surface
- max. scanning gap (a)
- minimum scanning gap (a)

and under consideration of the signal amplitude (by inspecting the scanning gap at room temperature) by means of ATS software.

Furthermore, the general mechanical and electrical information in the current "Position Encoders for Servo Drives" brochure must be kept in mind!
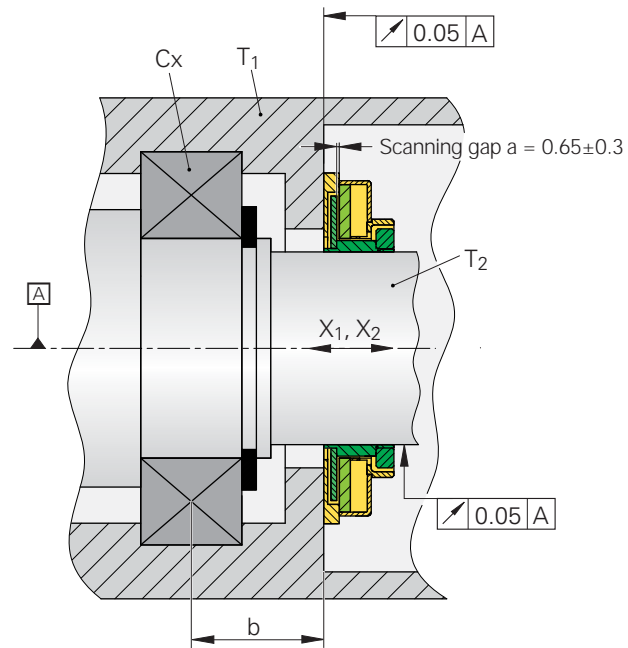
Mounting/Removal
Preparing Installation

Align
Place the rotary encoder flat with the flange side on a clean, even surface (e.g. a granite plate). The shaft detent (arrow) must be disabled, i.e. the encoder shaft must move freely within the encoder housing.

Lock
Press the encoder housing (stator) against the supporting surface and tighten the locking ring by turning it clockwise until it is **finger tight**.

Ready for mounting
The rated scanning gap is set now. The encoder shaft is locked and the connector is blocked.

Check
Ensure the correct position of the locking ring. The ring ends must lie between the encoder shaft and the clamping ring (no overhang permitted).

Mounting/Removing the Rotary Encoder

Slide on the encoder
Slide the encoder into the mating shaft; do not jam it. Apply pressure only on the encoder shaft (clamping ring).

Screw on
Fasten the encoder housing with three screws and washers.
- M3 screws; head $\varnothing \leq 5.5$ mm
- Washers as per ISO 7092
- Tightening torque 0.9 ± 0.05 Nm (with torque wrench)

If required, fasten the clamp of the output cable. Appropriate tools are available from HEIDENHAIN.

Clamp the shaft
Evenly tighten crosswise the clamping screws (SW 2.0, 6x60°) with increasing tightening torque. Do not exert additional axial pressure; final tightening torque = 0.5 ± 0.05 Nm.

Release the lock
Turn the locking ring counterclockwise up to the stop (snap-in point). The locking ring is now in its operating position: the connector is accessible.
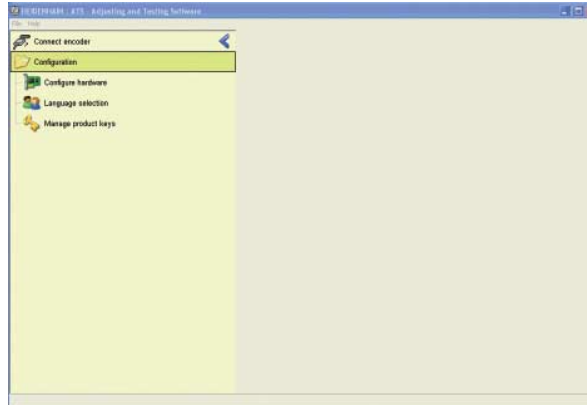
Removing the Rotary Encoder
The encoder is removed in the opposite sequence with a loosened shaft lock. Remount only if the encoder and mounting parts are in faultless condition.

Checking the Mounting

Examination with ATS software
(At room temperature, U_P = 5 V)
Start the ATS software.

Rotary encoder inspection is supported as of ATS version 2.2.00. The software version can be called over "Help" in the menu bar.
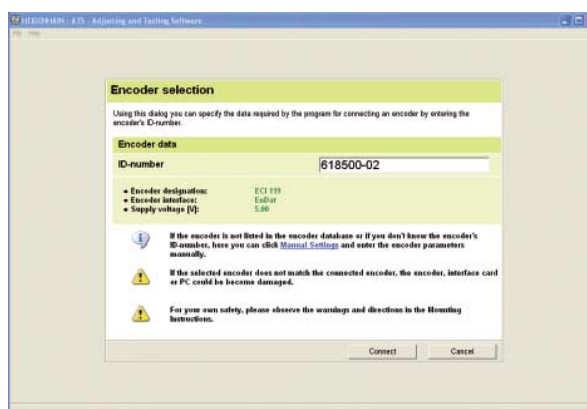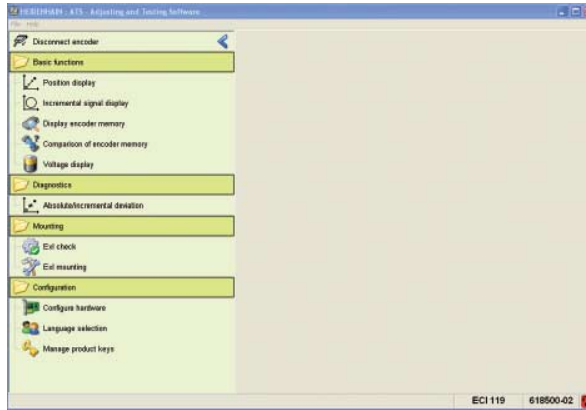

Connect the testing cable
(JAE 15-pin plug connector; ensure proper polarization). Check the mounting quality by means of the ATS software.

Establish the connection: Select "Connect encoder" and enter the ID number. Then select "Connect."
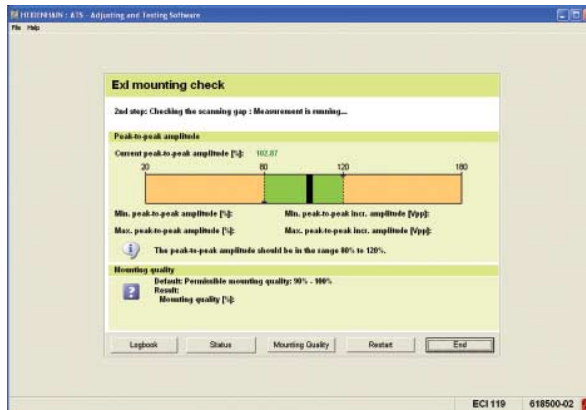
Select **ExI check** under **Mounting**.
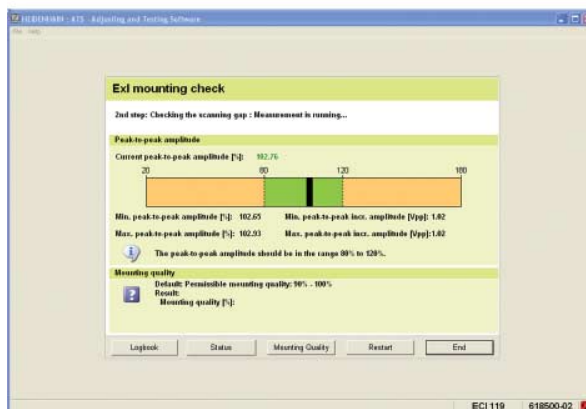

Press "Next."

Check "scanning gap."

Important note
A signal amplitude deviating from 100 %
limits permissible axial motion for
operation. 5 % deviation means a
reduction of 0.03 mm of the permissible
axial motion for operation.

"Scanning gap" check is finished.
Then select "Mounting quality."
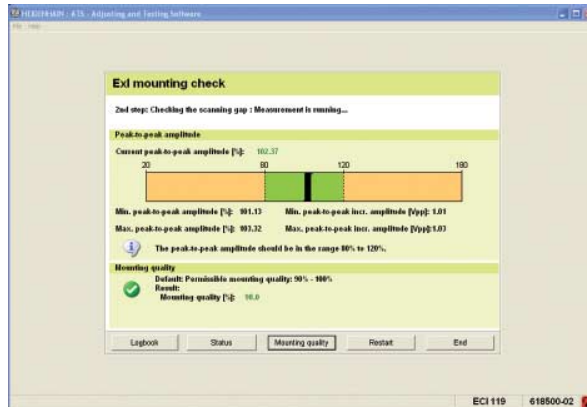To do so, rotate the motor slowly.

Check the mounting quality.

Important note
The mounting quality must lie within 95%
to 100%. A mounting quality of < 95%
indicates an inadequate mounting situation.
If necessary, check the mating dimensions
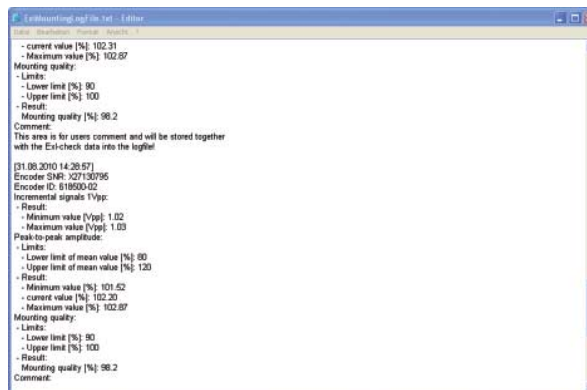and repeat the mounting procedure.

The detailed results of all measurements
are saved in the log file through the
logbook. It is possible to enter comments.

Note
The measurement results (amplitude,
mounting quality, etc.) can be called over
the **log file**. The log file is in the ATS
program folder and has to be called using
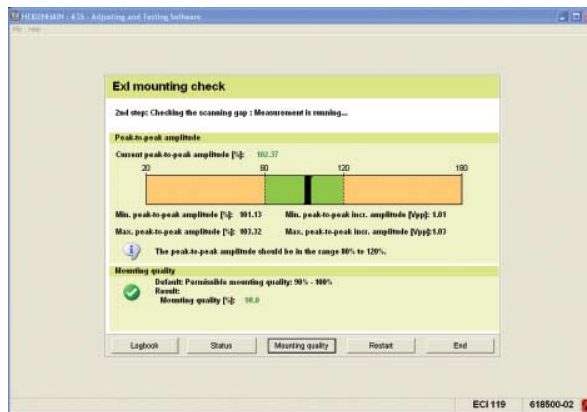the Explorer.

Active warnings and alarms can be displayed over "Status."

Inspection complete. Select "End" or "Restart." Remove the test cable.

Mount the connecting cable.

Accessories

Adjusting and testing package
HEIDENHAIN offers an adjusting and testing package for diagnosis and adjustment of HEIDENHAIN encoders with absolute interface.
- **IK 215** PC expansion board
- **ATS** adjusting and testing software

	IK 215
Encoder input	• EnDat 2.1 or EnDat 2.2 (absolute value with/without incremental signals) • FANUC serial interface • Mitsubishi High Speed Serial Interface • SSI
Interface	PCI bus, Rev. 2.1
System requirements	• Operating system: Windows XP (Vista upon request) • Approx. 20 MB free space on the hard disk
Signal subdivision for incremental signals	Up to 65 536-fold
Dimensions	100 mm x 190 mm

	ATS
Languages	Choice between English or German
Features	• Position display • Connection dialog • Diagnostics • Mounting wizard for ECI/EQI • Additional functions (if supported by the encoder) • Memory contents

Encoder cable
For IK 215, incl. 3 adapter connectors, 12-pin and 3 adapter connectors, 15-pin
ID 621 742-01

15-pin adapter connector
Three connectors for replacement
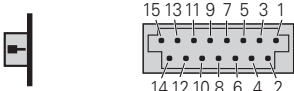ID 528 694-02

Mounting aid
For JAE connector
ID 592 818-01

Electrical Connection

Cables inside the motor housing

With one connector 15-pin (male), with cable clamp Length 0.3 m		EPG (16 x AWG30/7) Cable Ø 4.5 mm	640067-N3

Pin layout

15-pin PCB connector

15 13 11 9 7 5 3 1
14 12 10 8 6 4 2

	Power supply				Incremental signals[1]				Absolute position values (EnDat)			
	13	**11**	**14**	**12**	**1**	**2**	**3**	**4**	**7**	**8**	**9**	**10**
	U_P	Sensor U_P	0 V	Sensor 0 V	**A+**	**A–**	**B+**	**B–**	**DATA**	$\overline{\text{DATA}}$	**CLOCK**	$\overline{\text{CLOCK}}$
	Brown/ Green	Blue	White/ Green	White	Green/ Black	Yellow/ Black	Blue/ Black	Red/Black	Gray	Pink	Violet	Yellow

U_P = power supply
Sensor: The sensor line is connected internally with the corresponding power line.
Vacant pins or wires must not be used!
[1] Only with ordering designation EnDat01

For more information
• Brochure: *Position Encoders for Servo Drives*