



## Confirmation of fault exclusion mechanical connection of the encoder systems

### ExN 11xx (1KC / 75A) ExI 11xx (1126353)

Manufacturer STÖBER ANTRIEBSTECHNIK GmbH+Co.  
Kieselbronner Strasse 12  
75177 Pforzheim  
Germany

Product designation / Typ Synchronous Servo Motor Type EZ

Encoder brand Heidenhain  
Encoder designation ECN 1113 EnDat 2.1 FMA  
ECN 1123 EnDat 2.2 FMA  
EQN 1125 EnDat 2.1 FMA  
EQN 1135 EnDat 2.2 FMA  
ECN 1113-512 EnDat 2.1 FMA  
EQN 1125-512 EnDat 2.1 FMA  
  
EQI 1131 EnDat 2.2 FMA

This document confirms that the attachment of the above listed encoders to the synchronous servo motors type EZ is in accordance with the requirements of FA. HEIDENHAIN **Customer information for fault exclusion of mechanical connection (FMA)**.

The fault exclusion of mechanical connection is achieved by means of form fit connection between motor shaft and encoder including adhesive bonding of related screws.

The relevant instructions for mechanical fault exclusion for optical devices of the type ExN ... have been certified by Fa. Heidenhain and are described under the designation WELLA1-1KC and KUPPA1-75A.

The relevant instructions for mechanical fault exclusion for optical devices of the type ExI ... have been certified by Fa. Heidenhain and are described in the document 1126353 issue 1/2015.

Attachments:

Customer information "Fault exclusion mechanical connection "(FMA) of Fa. Heidenhain

- document number 16.03.2012 für ExN 11xx
- document number 1126353 für ExI 11xx

Pforzheim, den 12.11.2015

Artur Wagner  
MCGM

Heinz Bätzner  
MCGM-Motoren

# ExN 1100 (1KC/75A) Fault Exclusion for Mechanical Connection

## Customer Information

### 1 General information

The absolute ExN 1100 rotary encoders with safe mechanics (attribute: WELLA1 - 1KC and KUPPA1 - 75A), which are integrated into servo motors, attain fault exclusion for loosening of shaft and stator coupling if the following documents are adhered to.



Adhere to the information in the following documents to ensure the correct and intended operation of the encoder:

- Position Encoders for Servo Drives catalog: 208 922-xx (current edition) or *Product Information* (if available)
- General mounting instructions for the product

Device designation	Product ID number	Mounting Instructions ID number
ECN 1113	803427-02	816486-xx
EQN 1125	803428-03	

- This document for mounting and operation

The restrictions and specifications stated below have priority over the corresponding information given in the catalog, the Product Information or the mounting instructions. They can influence the attainable technical data in the application.

### 2 Additional specifications

Tolerance for safe mechanical connection:  $\pm 2^\circ$  (fault exclusion for loosening of shaft and stator coupling)

Max. permissible vibration for fault exclusion:  $\leq 300 \text{ m/s}^2$  (at the encoder in the application; for mechanical fault exclusion). For information on the measuring point and the measurement, please refer to the specifications in the catalog.

Moment of inertia: Rotor:  $J_R \leq 0.4 \times 10^{-6} \text{ kgm}^2$   
Stator:  $J_S \leq 1.0 \times 10^{-5} \text{ kgm}^2$

Angular acceleration: Rotor:  $\alpha_R \leq 0.8 \times 10^5 \text{ rad/s}^2$   
Stator:  $\alpha_S \leq 1.0 \times 10^4 \text{ rad/s}^2$

### 3 Important notes

- After installation and exchange, an acceptance test according to the manufacturer's information about the machine must be performed.

Edited on: Initial version



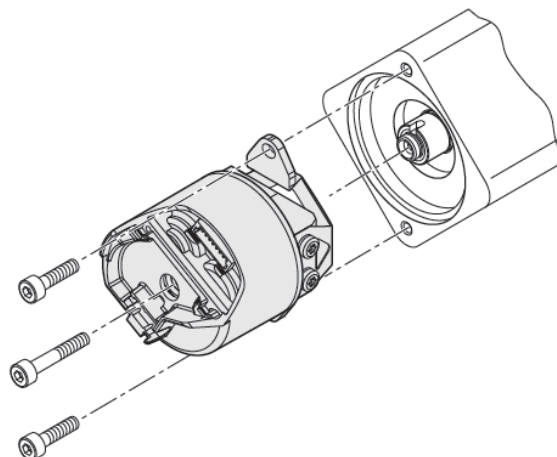
Release no.  
**R6972**

Version	Rev.	Sheet	Page
<b>D1000428 - 00 - A - 01</b>			1/
Document no.			6

- Information on mounting (e.g. optional checking of the shaft connection) must be specified by the machine manufacturer or designer.
- Encoders that have contributed to the failure of a safety function in the application must be returned to HEIDENHAIN Traunreut, together with the fasteners (screws).
- Ripple currents through the ball bearings of the encoder are not permissible.
- Do not drop the encoder or subject it to major vibration; avoid impact or shock.
- Avoid direct contact of aggressive media with the encoder and connector.
- Do not clean the encoder with thinners, alcohol or benzine.
- Prevent the encoder from getting into contact with chips, sharp objects etc. because they can destroy the sealing system.

#### 4 Mounting (differs from standard mounting to some extent)

The blind hollow shaft of the rotary encoder is slid onto the back of the motor's drive shaft and fastened with a central screw. It is particularly important to ensure that the positive-locking element of the encoder shaft securely engages the corresponding slot in the measured shaft. In some cases, an appropriate check is necessary. The stator is connected to a flat surface with two clamping screws. Use the screws with materially bonding anti-rotation lock available as mounting accessories.



To mount the ExN 1100, the following conditions are required for a safe mechanical connection:

	Antriebswelle	Kupplungsanlage
Material	Stahl	Aluminium
Zugfestigkeit $R_m$	$\geq 600 \text{ N/mm}^2$	$\geq 220 \text{ N/mm}^2$
Scherfestigkeit $\tau_m$	-	$\geq 130 \text{ N/mm}^2$
Grenzflächenpressung $P_G$	$\geq 500 \text{ N/mm}^2$	$\geq 200 \text{ N/mm}^2$
Oberflächenrauheit $R_z$	$\leq 20 \mu\text{m}$	$< 10 \mu\text{m}$
aufzunehmende Drehmomente <sup>1)</sup>	$\leq 0,54 \text{ Nm} + \alpha_R \times J_R$	$\leq 0,55 \text{ Nm} + \alpha_S \times J_S$

- 1) bezogen auf Rotationsachse der Drehgeberwelle;  
mit  $\alpha_R, \alpha_S$ : Winkelbeschleunigung Rotor/Stator und  $J_R, J_S$ : Trägheitsmoment Rotor/Stator (Seite 1)

#### 4.1 Mounting accessories

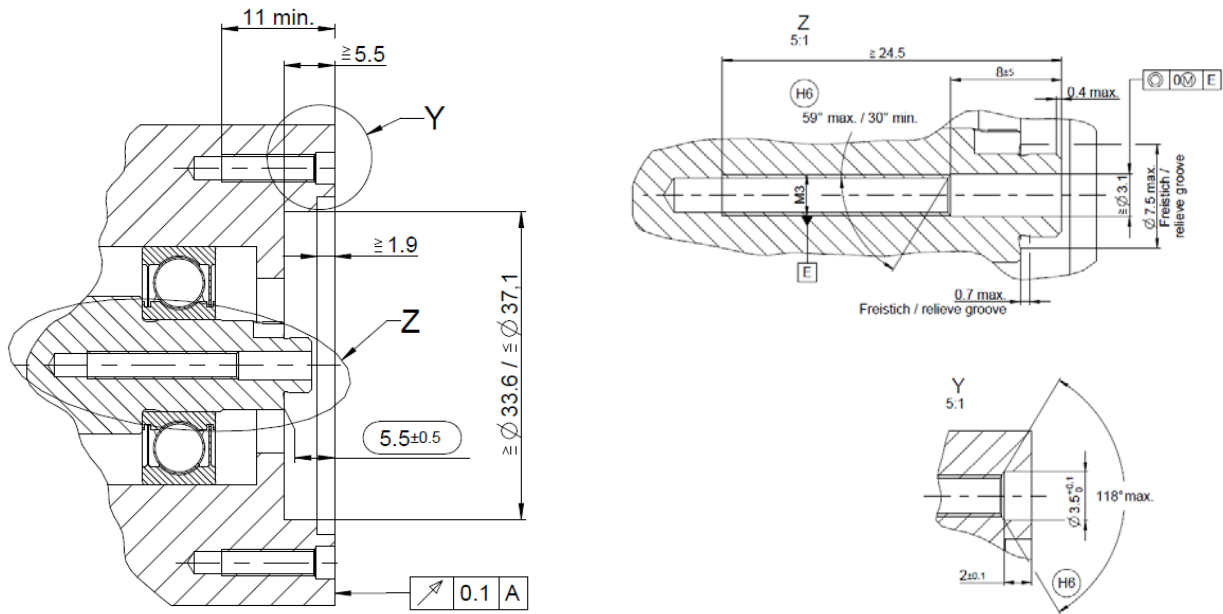
Clamping screws and the central screw are not included in delivery. They can be ordered separately. The screws feature a coating that forms a materially bonding anti-rotation lock after a curing time of six hours. Therefore the screws cannot be reused. Unused screws are not storable indefinitely. The minimum shelf life is two years. The expiration date is printed on the package.

Zubehör	Losgröße	ECN 1113	EQN 1125
Zentralschraube <sup>1)</sup>	10 oder 100 Stück	M3×40; ID 202 264-82	M3×50; ID 202 264-81
Kupplungsschraube <sup>1)</sup>	20 oder 200 Stück	M3×12; ID 202 264-69	

- 1) mit Beschichtung für stoffschlüssige Losdrehsicherung



## 4.2 Required mating dimensions



**H6** = Fase an Gewindeanfang obligatorisch für stoffschlüssige Losdreh-sicherung  
 Chamfer is obligatory at start of thread for materially bonding anti-rotation lock

## 4.3 Mounting information



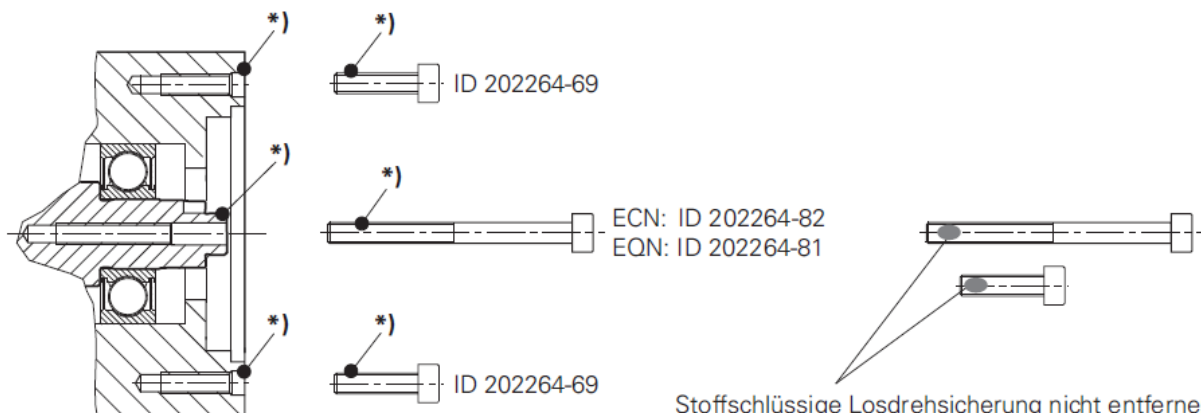
**Achtung:** Montageflächen\*), Kundenwelle mit Gewinde\*) und Schrauben M3 \*) müssen sauber und fettfrei sein.

**Caution:** Mounting surfaces\*), mating shaft with thread\*) and screw M3 \*) must be clean and free of grease.

**Attention:** Les surfaces de montage \*), l'arbre moteur avec filetage\*) et la vis M3 \*) doivent être propres et exempts de graisse.

**Attenzione:** superfici di montaggio \*), albero lato cliente con filettatura \*) e vite M3 \*) devono essere puliti e liberi da grasso.

**Atención:** Las superficies de montaje \*), el eje con rosca del cliente \*) y el tornillo M3 \*) deben estar limpios y libres de grasa.



Stoffschlüssige Losdreh-sicherung nicht entfernen.  
 Do not remove materially bonding anti-rotation lock.  
 Ne pas retirer la sécurité adhésive anti-torsion.  
 Non rimuovere il frenafiletto.  
 No retirar el seguro de tornillo contra el giro por adhesión.



Release no.  
**R6972**

Version Rev. Sheet Page

**D1000428 - 00 - A - 01** 3/

Document no.

6

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without express authorization is prohibited. Offenders will be held liable for the payment of damages. All rights reserved in the event of a patent, utility model or design.

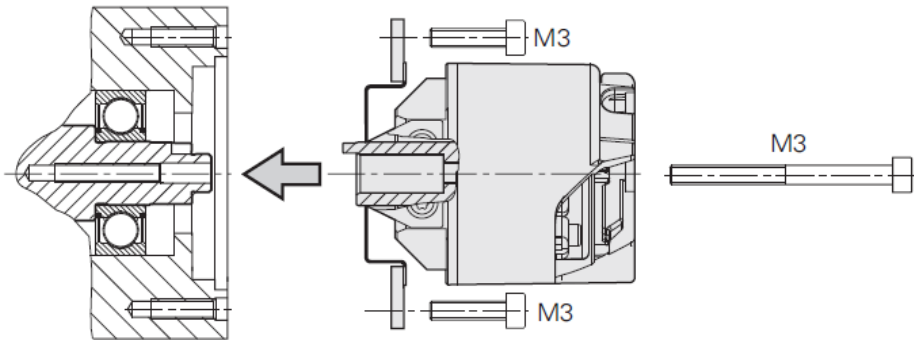
**Achtung:** Schrauben M3 nur 1x verwenden, (Stoffschlüssige Losdreh Sicherung).

**Caution:** Use M3 screws only once (materially bonding anti-rotation lock).

**Attention:** n'utiliser qu'une fois seulement les vis M3, (anti-débricolage par liaison moléculaire).

**Attenzione:** Utilizzare solo viti M3 x1 (utilizzare frenafilletti).

**Atención:** utilizar sólo tornillo M3 (1x), (Seguro anti-giro por adhesión).



**Achtung:** Messgerät mit verbogener oder beschädigter Statorkupplung darf nicht verwendet, bzw. muss an HEIDENHAIN-Traunreut zurückgesendet werden!

**Caution:** Do not use encoders with a deformed or damaged stator coupling. Return them to HEIDENHAIN Traunreut!

**Attention:** le système de mesure avec un accouplement statorique tordu ou détérioré ne doit pas être utilisé ou doit être retourné chez HEIDENHAIN Traunreut.

**Attenzione:** nel caso il giunto lato statore sia piegato o danneggiato, il sistema di misura non può essere utilizzato e deve essere restituito alla HEIDENHAIN a Traunreut.

**¡Atención:** No utilizar un sistema de medida con el acoplamiento estator doblado o dañado, en este caso debe ser devuelto a HEIDENHAIN-Traunreut!



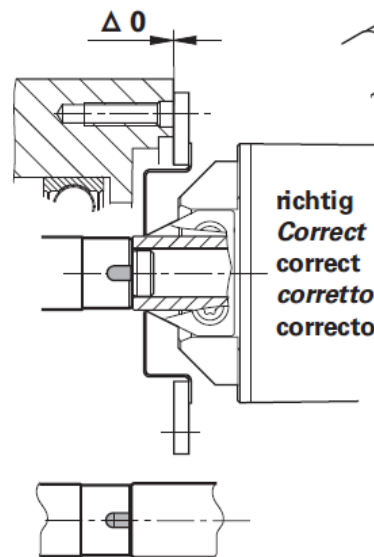
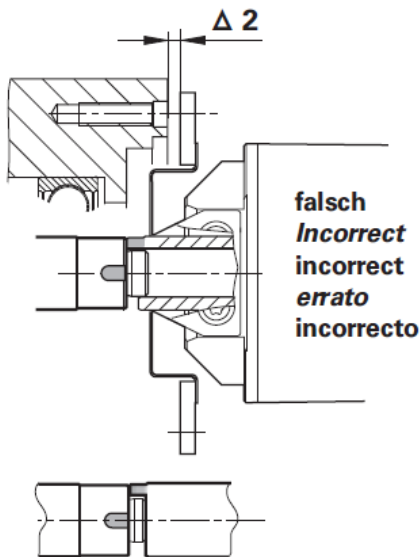
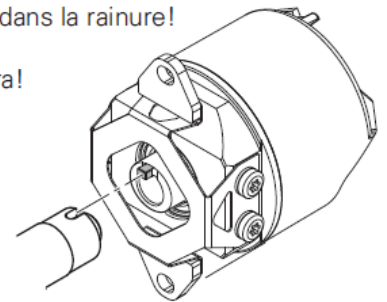
**Achtung:** Auf korrekten Formschluss der Welle in der Nut achten!

**Caution:** Ensure correct positive fit of the shaft in the slot!

**Attention:** attention à l'assemblage correct par conformation de l'arbre dans la rainure!

**Attenzione:** prestare attenzione al corretto orientamento della!

**Atención:** ¡Tener en cuenta que el eje encaje perfectamente en la ranura!



Release no.  
**R6972**

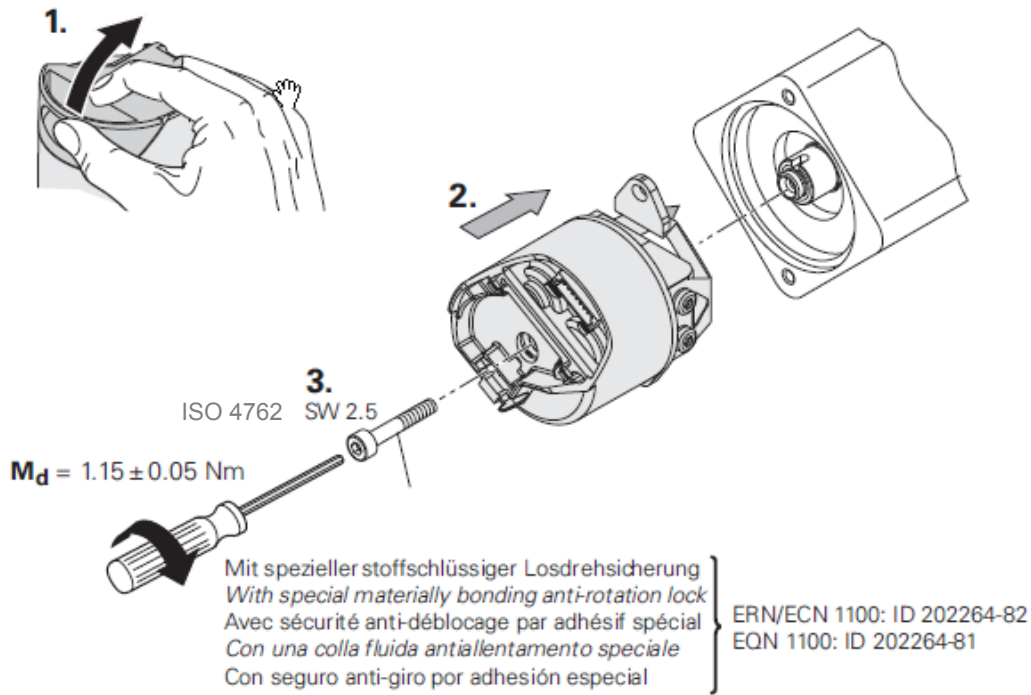
Version Rev. Sheet Page

**D1000428 - 00 - A - 01** 4/

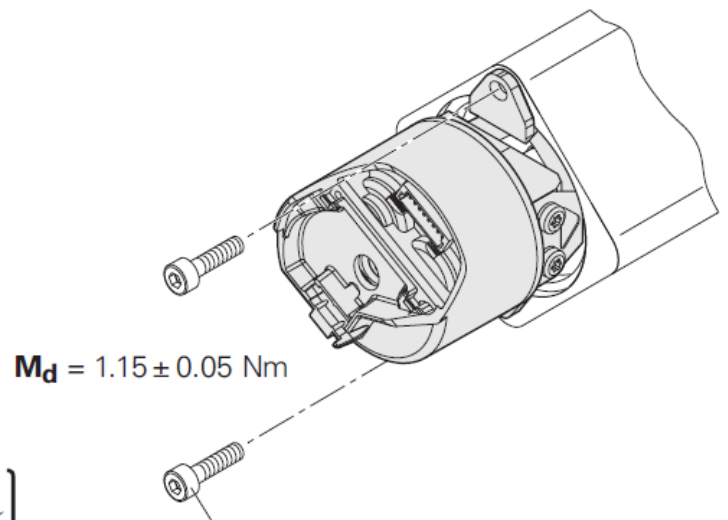
Document no.

6

#### 4.4 Mounting sequence



4.



Mit spezieller stoffschlüssiger Losdrehicherung  
 With special materially bonding anti-rotation lock  
 Avec sécurité anti-débloccage par adhésif spécial  
 Con una colla fluida antiallentamento speciale  
 Con seguro anti-giro por adhesión especial

2x ID 202 264-69 ISO 4762 – Width A/F 2.5

Die Aushärtezeit der stoffschlüssigen Losdrehicherung der M3 Schrauben beträgt 6 Stunden!

*The curing time for the materially bonding anti-rotation lock of the central screw is 6 hours.*

La durée de durcissement du blocage adhésif anti-torsion de la vis centrale est de 6 heures!

*Il tempo di indurimento della colla frenafiletto della vite centrale è di 6 ore!*

¡El tiempo de endurecimiento del seguro de tornillo contra el giro por adhesión del tornillo central es de 6 horas



Release no.

**R6972**

Version

Rev.

Sheet

Page

**D1000428 - 00 - A - 01**

5/

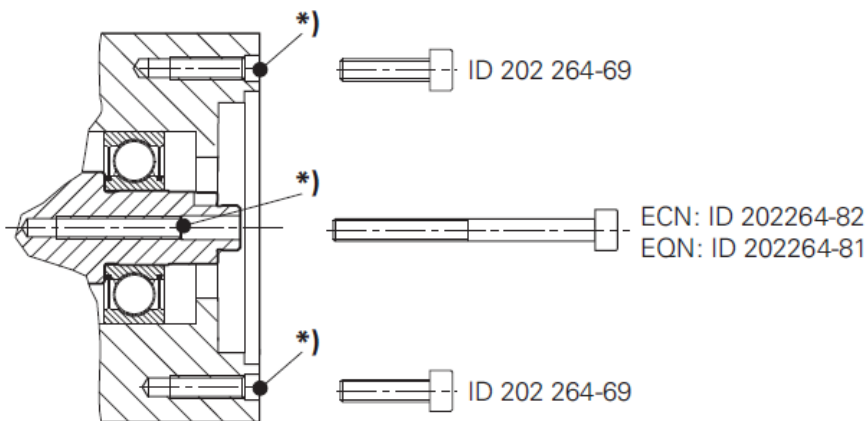
Document no.

6

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without express authorization is prohibited. Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design.

**Demontage in umgekehrter Reihenfolge**  
**Disassembly in reverse order**  
**Demontage dans l'ordre inverse**  
**Smontaggio in sequenza inversa**  
**Desmontaje en orden contrario**

Im Ersatzfall Gewinde M3 \*) nachschneiden und neue Schrauben M3 mit Losdrehsicherung verwenden!  
*In case of replacement, recut the M3 threads\*) and use new M3 screws with anti-rotation lock!*  
 En cas de remplacement, réuser le filetage et utiliser des nouvelles vis M3 \*) avec anti-déblocage!  
*In caso di sostituzione della vite M3 \*) riprendere il filetto e montare una nuova vite M3 con frenafilletti!*  
 ¡En caso de reposición reparar la rosca M3 \*) y utilizar un nuevo tornillo M3 con seguro anti-giro!



Release no.  
**R6972**

Version	Rev.	Sheet	Page
			6/
<b>D1000428 - 00 - A - 01</b>			6
Document no.			



# HEIDENHAIN



Product Information

## **ECI 1119** **EQI 1131**

70D Flange

Absolute Rotary Encoders  
without Integral Bearings

Suited for safety-related applications  
up to SIL 3 when coupled with  
additional measures

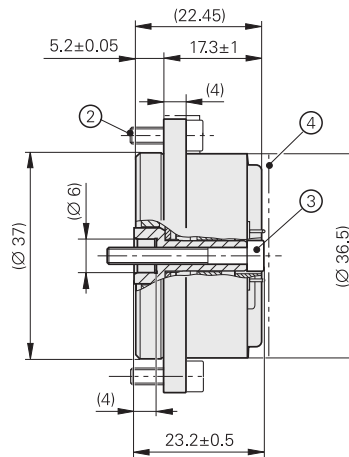
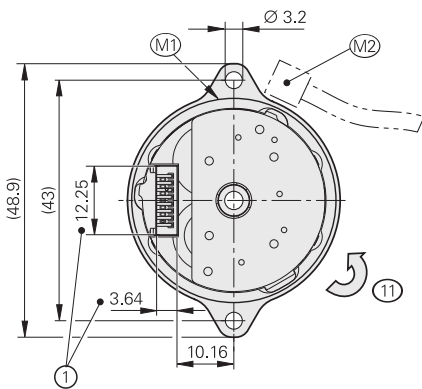
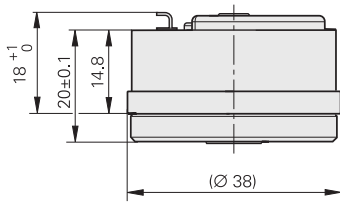




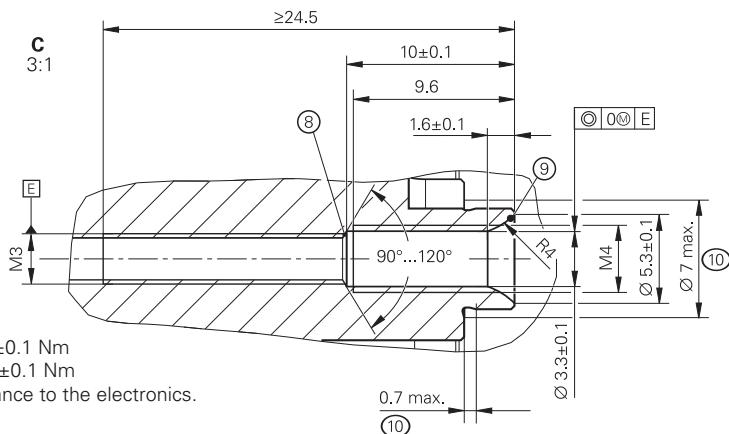
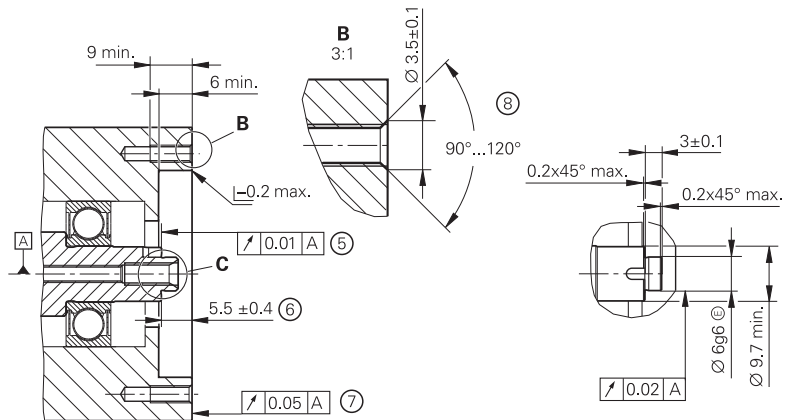
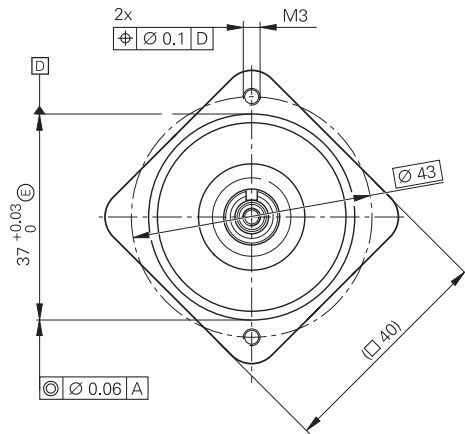
# ECI 1119, EQI 1131

Rotary encoders for absolute position values with safe singleturn information

- Rugged inductive scanning principle
- 70D mounting flange
- Blind hollow shaft  $\varnothing 6$  mm, axial clamping (82A)
- Required mating dimensions with M3 central screw  $\times 40$



## Required mating dimensions



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

- ☒ = Bearing of mating shaft
- M1 = Messpunkt Arbeitstemperatur
- M2 = Messpunkt Vibration
- 1 = Opening for plug connector min. 1.5 mm larger all around
- 2 = Screw ISO 4762 - M3x10 - 8.8 - MKL, tightening torque  $1 \pm 0.1$  Nm
- 3 = Screw, ISO 4762 - M3x40 - 8.8 - MKL, tightening torque  $1 \pm 0.1$  Nm
- 4 = Distance to cover including air clearance and creepage distance to the electronics.  
Provide opening for connector; at least 1 mm larger
- 5 = Shaft; ensure full-surface contact!
- 6 = Maximum permissible deviation between shaft and flange surfaces. Compensation of mounting tolerances and thermal expansion.  
(When using the ATS software for inspecting the mounting, the display value for the mounting dimension deviates by 2 mm)
- 7 = Exl flange surface; ensure full-surface contact!
- 8 = Chamfer at start of thread is obligatory for materially bonding anti-rotation lock
- 9 = Possible centering hole
- 10 = Undercut
- 11 = Drehrichtung der Welle für Ausgangssignale gemäß Schnittstellen-Beschreibung

Specifications	ECI 1119 – Singletum	EQI 1131 – Multitum
These data apply for	Upon request	ID 826980-53 <sup>1)</sup>
<b>Functional safety</b> For applications up to	As single-encoder system for monitoring and closed-loop functions <ul style="list-style-type: none"> <li>• SIL 2 according to EN 61508 (further basis for testing: EN 61800-5-2)</li> <li>• Category 3 PL d according to EN ISO 13849-1:2008</li> </ul> With additional measures as per document 1000344 for safety-related applications up to SIL 3 or category 4, PL e Safe in singletum range	
PFH	<i>SIL 2: <math>\leq 15 \times 10^{-9}</math> (probability of dangerous failure per hour)</i> <i>SIL 3: <math>\leq 2 \times 10^{-9}</math></i>	
Safe position <sup>2)</sup>	<i>Encoder: <math>\pm 0.88^\circ</math> (safety-related measuring step: SM = <math>0.35^\circ</math>)</i> <i>Mechanical coupling: <math>\pm 0^\circ</math>; (fault exclusion for loosening of shaft and stator couplings, designed for acceleration of the stator: <math>\leq 400 \text{ m/s}^2</math>; of the rotor: <math>\leq 600 \text{ m/s}^2</math>)</i>	
<b>Interface</b>	EnDat 2.2	
Ordering designation	EnDat22	
Position values/revolution	524 288 (19 bits)	
Revolutions	-	4096 (12 bits)
Calculation time $t_{\text{cal}}$ Clock frequency	$\leq 5 \mu\text{s}$ $\leq 16 \text{ MHz}$	
<b>System accuracy</b>	$\pm 120''$	
<b>Electrical connection</b>	15-pin PCB connector (with connection for external temperature sensor <sup>3)</sup> )	
Cable length	$\leq 100 \text{ mm}$ (See "General electrical information" in the <i>Interfaces of HEIDENHAIN Encoders</i> brochure)	
Voltage supply	3.6 V to 14 V DC	
Power consumption <sup>4)</sup> (maximum)	<i>At 3.6 V: <math>\leq 650 \text{ mW}</math>; At 14 V: <math>\leq 700 \text{ mW}</math></i>	<i>At 3.6 V: <math>\leq 750 \text{ mW}</math>; at 14 V: <math>\leq 850 \text{ mW}</math></i>
Current consumption (typical)	<i>At 5 V: 95 mA (without load)</i>	<i>At 5 V: 115 mA (without load)</i>
<b>Shaft</b>	Blind hollow shaft for axial clamping $\varnothing 6 \text{ mm}$ (82A)	
Spindle speed	$\leq 15\,000 \text{ min}^{-1}$	$\leq 12\,000 \text{ min}^{-1}$
Moment of inertia of rotor	$0.3 \times 10^{-6} \text{ kgm}^2$	
Angular acceleration of rotor	$\leq 1 \times 10^5 \text{ rad/s}^2$	
Axial motion of measured shaft	$\leq \pm 0.4 \text{ mm}$	
<b>Vibration</b> 55 to 2000 Hz <sup>5)</sup> <b>Shock</b> 6 ms	<i>Stator: <math>\leq 400 \text{ m/s}^2</math>; rotor: <math>\leq 600 \text{ m/s}^2</math> (EN 60 068-2-6)</i> $\leq 2000 \text{ m/s}^2$ (EN 60 068-2-27)	
<b>Operating temperature</b>	-40 °C to 110 °C	
<b>Trigger threshold</b> of error message for excessive temperature	125 °C (measuring accuracy of the internal temperature sensor: $\pm 1 \text{ K}$ )	
<b>Relative humidity</b>	$\leq 93 \%$ (40 °C/21 d as per EN 60 068-2-78); without condensation	
<b>Protection</b> EN 60 529	IP 00 (see <i>Insulation</i> under <i>General mechanical information</i> in the <i>Encoders for Servo Drives</i> catalog; use installation measures to ensure CE conformity of the total system!)	
<b>Weight</b>	$\approx 0.04 \text{ kg}$	

1) Rotary encoders in collective package

2) Further tolerances may occur in the subsequent electronics after the position value comparison (contact the manufacturer of the subsequent electronics)

3) See *Temperature measurement in motors* in the *Encoders for Servo Drives* catalog.

4) See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure

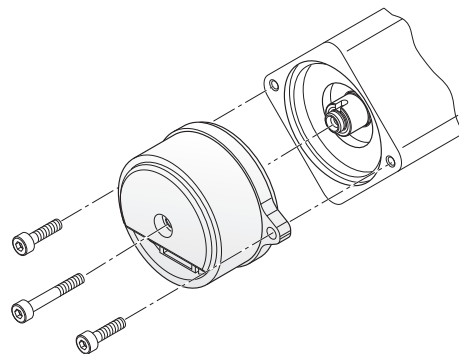
5) 10 Hz to 55 Hz, constant over distance, 4.9 mm peak to peak

# Mounting

The blind hollow shaft of the rotary encoder is slid onto the motor's drive shaft and fastened with a central screw. The stator is connected with two mounting screws using a centering diameter. Use screws with materially bonding anti-rotation locking (see *Mounting accessories*).

Conditions required on the motor side for a safe mechanical connection:

	Mating shaft	Mating stator
Material	Steel	Aluminum
Tensile strength $R_m$	$\geq 600 \text{ N/mm}^2$	$\geq 220 \text{ N/mm}^2$
Shear strength $\tau_m$	-	$\geq 150 \text{ N/mm}^2$
Interface pressure $P_G$	$\geq 500 \text{ N/mm}^2$	$\geq 200 \text{ N/mm}^2$
Surface roughness $R_z$	$\leq 10 \mu\text{m}$	$\leq 10 \mu\text{m}$
Coefficient of expansion $\alpha_{\text{therm}}$	$(10 \text{ to } 17) \times 10^{-6} \text{ K}^{-1}$	$\leq 25 \times 10^{-6} \text{ K}^{-1}$



## Mounting accessories

### Screws

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

ECI 1119; EQI 1131	Screws <sup>1)</sup>		Lot size
Central screw for fastening the shaft	ISO 4762-M3×40-8.8-MKL	ID 202264-82	10 or 100 pieces
Mounting screw for flange	ISO 4762-M3×10-8.8-MKL	ID 202264-87	20 or 200 pieces

1) With coating for materially bonding anti-rotation lock

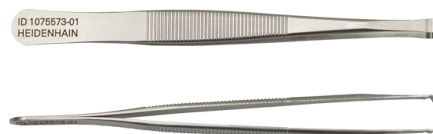
Please note the information on screws from HEIDENHAIN in the catalog titled *Encoders for Servo Drives*, chapter *General Mechanical Information* under *Rotary encoders with functional safety*.

### Mounting aid

The mounting aid serves to plug and unplug the PCB connector. It prevents damage to the cable because the strain is applied only to the connector. The wires themselves must not be strained.



ID 1075573-01

**For further mounting information and mounting aids, refer to the *Encoders for Servo Drives* catalog. The installation can be inspected using a PWM 20 and ATS software (see document 1082415)**



# Electrical connection – cable





## Cable

<b>Motor-internal encoder cables TPE</b> [10×0.16 mm <sup>2</sup> ] <sup>1)</sup> ; A <sub>V</sub> = 0.16 mm <sup>2</sup>		
<b>Complete</b> with PCB connector (15-pin) and M12 flange socket (male), 8-pin; length ≤ 0.3 m; including two wires for temperature sensor		ID 1119952-xx
<b>With one</b> PCB connector (15-pin); length ≤ 0.15 m; including two lines for temperature sensor		ID 1119958-xx

1) Single wires with braided sleeving; without shielding

Output cable inside the motor, without wires for temperature sensor available on request

**Note for safety-related applications:** Provide bit error rate as per specification 533095!

<b>PUR connecting cable PUR</b> Ø 6 mm; [(4×0.4 mm <sup>2</sup> ) + (4×0.34 mm <sup>2</sup> )]; A <sub>P</sub> = 0.34 mm <sup>2</sup>		
<b>Complete</b> with M12 connector (female) and M12 coupling (male), 8 pins each		ID 368330-xx
<b>Complete</b> with 8-pin M12 connector (female) and 15-pin D-sub connector (female)		ID 533627-xx
<b>Complete</b> with 8-pin M12 connector (female) and 15-pin D-sub connector (male)		ID 524599-xx
<b>With one</b> 8-pin M12 connector (female)		ID 634265-xx <sup>1)</sup>


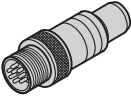
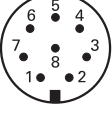

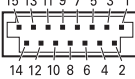


A<sub>P</sub>: Cross section of power supply lines

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

**Note for safety-related applications:** Provide bit error rate as per specification 533095!

# Electrical connection – pin layout

## Pin layout

8-pin coupling or flange socket M12		Voltage supply				Position values				Other signals <sup>1)</sup>	
											
											
											
	<b>8</b>	<b>2</b>	<b>5</b>	<b>1</b>	<b>3</b>	<b>4</b>	<b>7</b>	<b>6</b>	/	/	
	<b>13</b>	<b>11</b>	<b>14</b>	<b>12</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>5</b>	<b>6</b>	
	<b>U<sub>p</sub></b>	Sensor <b>U<sub>p</sub></b>	<b>0 V</b>	Sensor <b>0 V</b>	<b>DATA</b>	<b>DATA</b>	<b>CLOCK</b>	<b>CLOCK</b>	<b>T<sup>+</sup></b> <sup>2)</sup>	<b>T<sup>-</sup></b> <sup>2)</sup>	
	Brown/ Green	Blue	White/ Green	White	Gray	Pink	Violet	Yellow	Brown	Green	

1) Only with adapter cables inside the motor

2) Connections for external temperature sensor; evaluation optimized for KTY 84-130 (see *Temperature measurement in motors* in the *Encoders for Servo Drives* catalog)

**Cable shield** connected to housing; **U<sub>p</sub>** = Power supply

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

Vacant pins or wires must not be used!

**Note for safety-oriented applications:** Only HEIDENHAIN cables complete with connectors are qualified for use. Exchange connectors or modify cables only after consultation with HEIDENHAIN Traunreut.

## HEIDENHAIN

DR. JOHANNES HEIDENHAIN GmbH

Dr.-Johannes-Heidenhain-Straße 5

83301 Traunreut, Germany

☎ +49 8669 31-0

☎ +49 8669 5061

E-mail: info@heidenhain.de

www.heidenhain.de

1126353 · 00 · A · 02 · 1/2015 · PDF

This Product Information supersedes all previous editions, which thereby become invalid. The basis for ordering from HEIDENHAIN is always the Product Information valid when the contract is made.

**Related documents:** Adhere to the information in the following documents to ensure the correct and intended operation of the encoder:

- Catalog: *Position Encoders for Servo Drives*: 208922-xx
- Mounting Instructions: *ECl 1119, EQl 1131*: 1126437-xx
- Technical Information: *Safety-Related Position Measuring Systems* 596632
- For implementation in a safe control or inverter: Specification: 533095 and *Supplementary Catalog of Measures (SIL 3, PL e)*: 1000344