HEIDENHAIN

Product Information

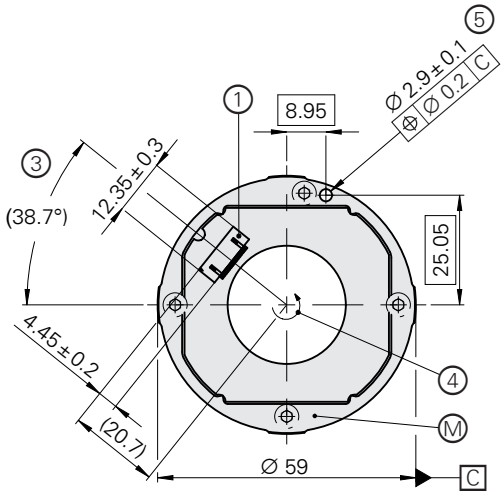
KCI 1319
KBI 1335

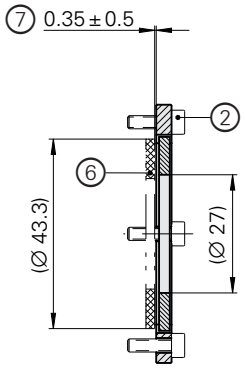
Absolute Inductive
Rotary Encoders without
Integral Bearing

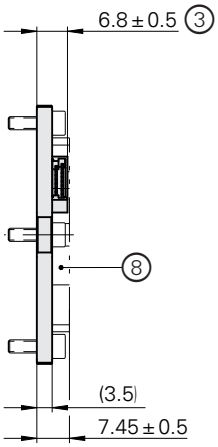
11/2021

KCI 1319, KBI 1335

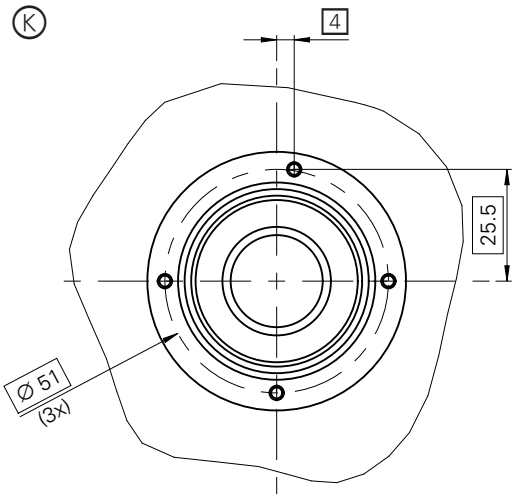
Rotary encoders for absolute position values
- **Robust inductive scanning principle**
- **Consisting of an AE scanning unit and a rotor unit**

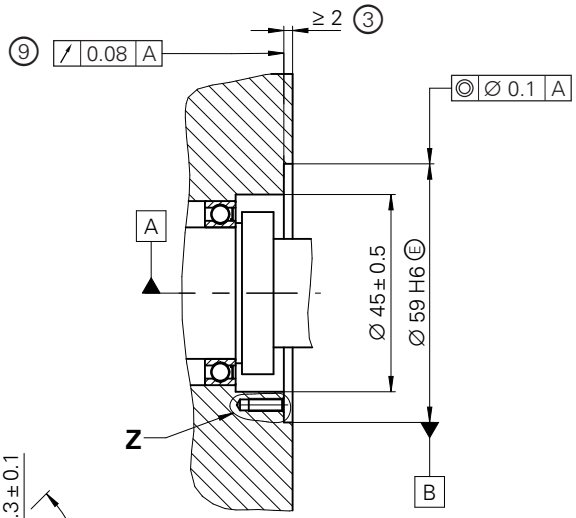


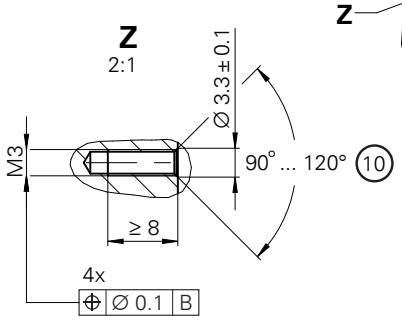




Required mating dimensions for AE KxI 13xx







All drawings with brakes released

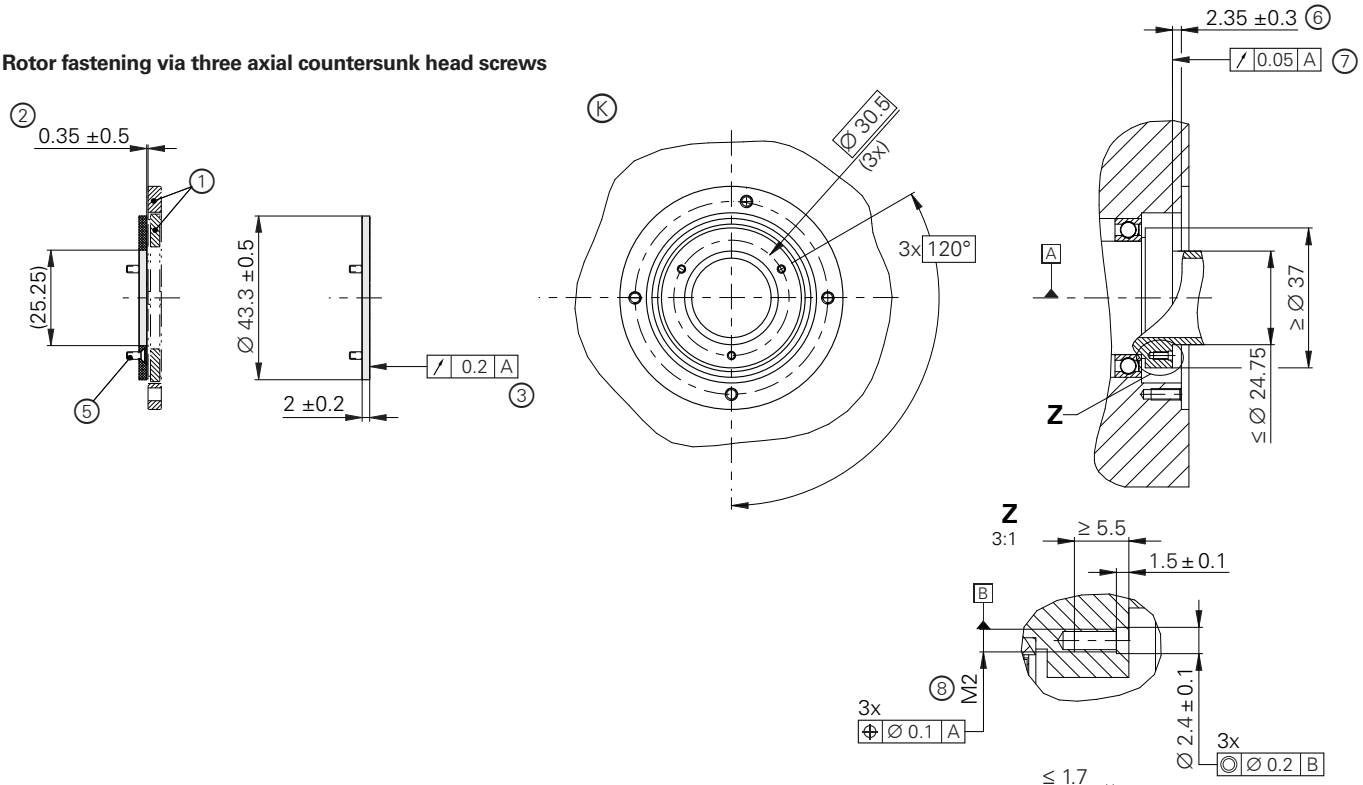
mm

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

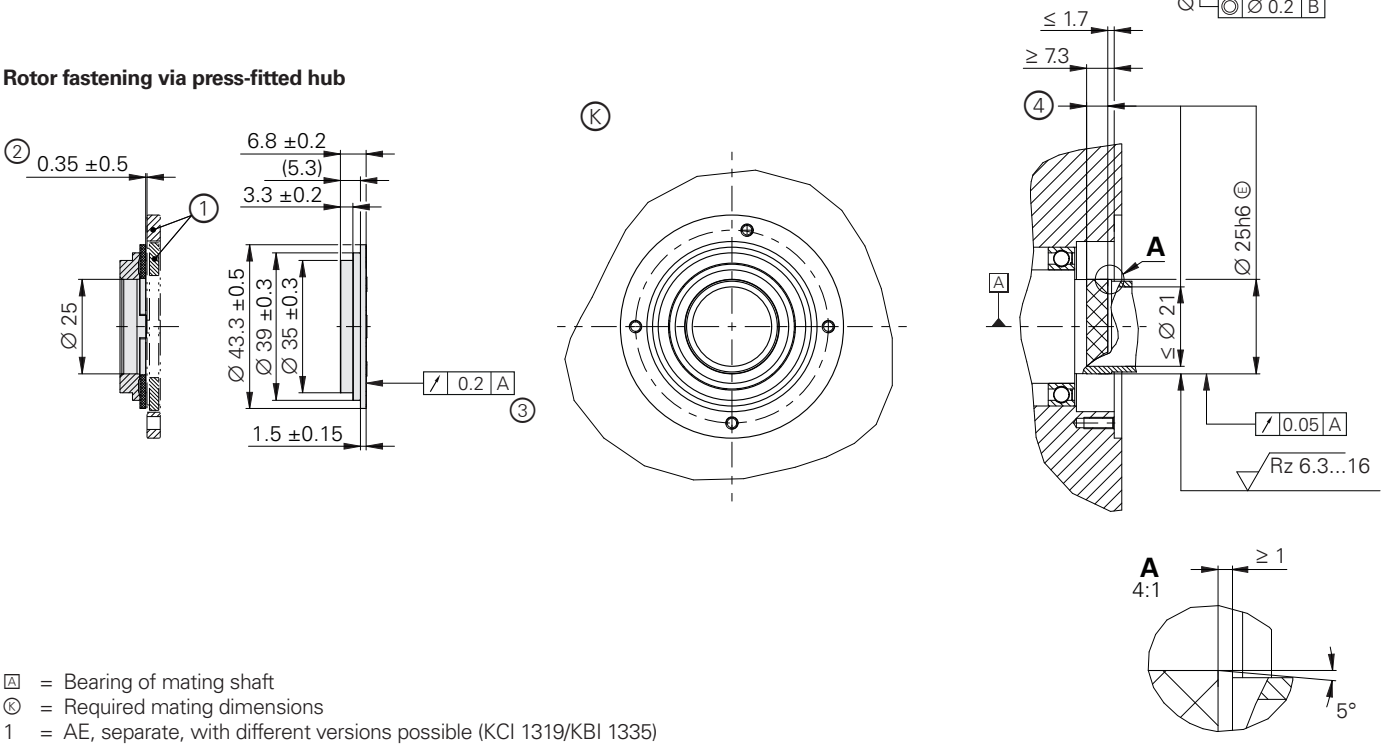
		Total height	Tolerance
AE KxI 13xx	Circular scale (screw-fastened version)	9.8	±1.2
	Disk/hub assembly (press-fitted version)	14.6	

A = Bearing of mating shaft
K = Required mating dimensions
M = Measuring point for operating temperature
1 = 15-pin PCB connector
2 = M3x10 cylinder head screw (4x)
3 = Ensure space for cable
4 = Direction of shaft rotation for ascending position values
5 = Additional and optional orientation possibility
6 = TK/TKN, separate, with different versions possible; for mounting, see the respective dimension drawing
7 = Mounting clearance between the circular scale surface and the flange surface;
compensation of mounting tolerances and thermal expansion;
dynamic motion permitted over entire range
(with use of ATS software for mounting inspection, the display value for the mounting clearance is shown as 1 mm)
8 = Ensure space for electronics; see also the mating dimensions model
9 = Flange surface; ensure full-surface contact!
10 = Chamfer at start of thread is mandatory for material bonding anti-rotation lock

Rotor fastening via three axial countersunk head screws



Rotor fastening via press-fitted hub



A = Bearing of mating shaft
K = Required mating dimensions
1 = AE, separate, with different versions possible (KCI 1319/KBI 1335)
2 = Mounting clearance between the circular scale surface and the AE flange surface; compensation of mounting tolerances and thermal expansion; dynamic motion permitted over entire range
3 = On the fine track (Ø 35.5 mm to Ø 42.4 mm) after screw-fastening/press-fitting
4 = For press-fitting parameters, see the Mounting Instructions
5 = Countersunk head screw: M2x6 ISO 14581-A2-70, protrusion of screw head not permitted
6 = Distance between AE flange surface and circular scale surface
7 = Circular scale surface
8 = Use material bonding anti-rotation lock (at least medium strength)

Specifications	KCI 1319 singleturn	KBI 1335 multiturn
Interface	EnDat 2.2	
Ordering designation	EnDat22	
Position values per revolution	524 288 (19 bits)	
Revolutions	–	65 536 (16 bits)
Calculation time t_{cal} Clock frequency	≤ 5 µs ≤ 16 MHz	
System accuracy	±90″	
Electrical connection	15-pin PCB connector (with connection for external temperature sensor)	
Cable length	≤ 100 m (see the EnDat description in the *Interfaces of HEIDENHAIN Encoders* brochure)	
Supply voltage	DC 3.6 V to 14 V	*Rotary encoder U_P:* DC 3.6 V to 14 V *Backup battery U_{Bat}:* DC 3.6 V to 5.25 V
Power consumption[1] (max.)	*At 3.6 V:* ≤ 650 mW *At 14 V:* ≤ 700 mW	
Current consumption (typical)	*At 5 V:* 95 mA (without load)	*Normal operation at 5 V:* 95 mA (without load) *Backup battery:* 200 µA (rotating shaft)[2] 20 µA (at standstill)
Part number	AE KCI 1319 scanning head 1314403-01 Circular scale (screw-fastened version) 1314410-01 Disk/hub assembly (press-fitted version) 1314409-01	AE KBI 1335 scanning head 1314404-01 Circular scale (screw-fastened version) 1314410-01 Disk/hub assembly (press-fitted version) 1314409-01

[1] See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure or at *www.heidenhain.com*
[2] At T = 25 °C; U_{Bat} = 3.6 V

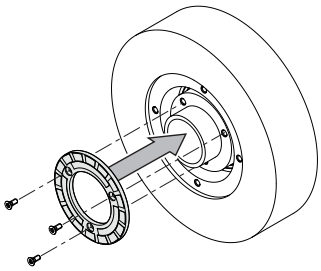
Specifications	KCI 1319 singleturn	KBI 1335 multiturn
Rotor*	Circular scale with inside hub diameter of 25 mm (press-fitted version) Circular scale with circular hole pattern diameter of 30.5 mm (screw-fastened version)	
Shaft speed	≤ 10000 rpm	
Moment of inertia	*Disk/hub assembly:* $6.3 \cdot 10^{-6}$ kgm^2 *Circular scale:* $1.16 \cdot 10^{-6}$ kgm^2	
Angular acceleration of rotor[1)]	≤ $1 \cdot 10^5$ rad/s^2	
Axial motion of measured shaft	≤ ±0.5 mm	
Vibration 55 Hz to 2000 Hz[2)] **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 115 °C	
Trigger threshold of temperature exceedance error message	130 °C (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	IP00	
Mass	AE + TK ≈ 0.03 kg AE + TKN ≈ 0.05 kg	

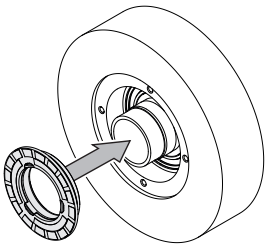
* Please select when ordering
1) With multiturn functionality in normal operation; maximum permissible acceleration in backup-battery mode upon request
2) 10 Hz to 55 Hz, 4.9 mm constant peak to peak

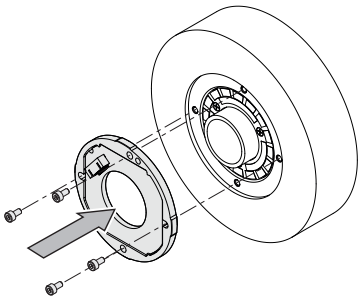
Mounting

The KCI 1319/KBI 1335 is mounted either via screw-fastening of the circular scale or through press-fitting of the disk/hub assembly and mounting of the scanning unit. The disk/hub assembly is thereby either press-fitted onto the shaft, or the circular scale is screw-fastened to the given shaft with three screws. The scanning unit is aligned and mounted via four holes on the customer's mounting surface.

The press-fitting process may be performed only once for each disk/hub assembly. For the press-fit, comply with the material properties and conditions for the mating surface stated for proper use in the relevant documents. These requirements must be followed, even when new disk/hub assemblies are press-fitted onto customer shafts that have already been used. Once the lower limit of the press-fit force has been exceeded, the press-fit force being applied must remain within the specified range for the rest of the procedure until the end position is reached.







The following material properties and conditions must be complied with for the customer-side mounting design:

	Mating stator	**Mating shaft**
Material	Aluminum	Steel
Tensile strength R_m	≥ 220 N/mm^2	≥ 600 N/mm^2
Yield strength $R_{p0.2}$ or yield point R_e	–	≥ 400 N/mm^2
Shear strength τ_m	130 N/mm^2	≥ 390 N/mm^2
Interface pressure P_G	≥ 250 N/mm^2	≥ 660 N/mm^2
Modulus of elasticity E (at 20 °C)	70 kN/mm^2 to 75 kN/mm^2	200 kN/mm^2 to 215 kN/mm^2
Coefficient of thermal expansion α_{therm} (at 20 °C)	≤ 25 · 10^{-6} K^{-1}	*Screw-fastened version:* 10 · 10^{-6}K^{-1} to 17 · 10^{-6}K^{-1} *Press-fitted version:* 10 · 10^{-6}K^{-1} to 12 · 10^{-6}K^{-1}
Surface roughness R_Z	≤ 16 µm	
Friction values	Mounting surfaces must be clean and free of grease. Use screws and washers from HEIDENHAIN in their condition as delivered.	
Tightening procedure	Use a signal-emitting torque wrench as per DIN EN ISO 6789, with an accuracy of ±6 %	
Mounting temperature	15 °C to 35 °C	

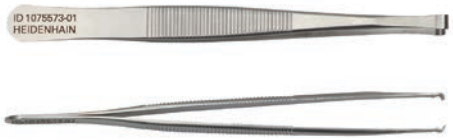
Mounting accessories

Screws
Screws (fastening screws) are not included in delivery; the M3x10 screw with material bonding anti-rotation lock can be ordered separately.

KCI 1319 KBI 1335	Screws		Quantity
Screw for fastening the scanning unit	ISO 4762-**M3×10**-8.8-**MKL**[1)]	ID 202264-87	10 or 100
Fastening screw for circular scale	ISO 14581-**M2×6**-A2-70[2)]	–	–

[1)] With coating for material bonding anti-rotation lock (for information on use, see the *Encoders for Servo Drives* brochure)
[2)] Without anti-rotation lock; use at least a medium-strength material bonding anti-rotation lock

Mounting aid
To avoid damage to the cable, use the mounting aid to connect and disconnect the cable assembly. Apply pulling force only to the connector of the cable assembly 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. The mounting quality 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 x 0.16 mm²), and stripped cable end		ID 1119958-xx[1)]

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[1)]

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

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

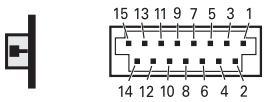
Further information:

For connecting cables and adapter cables, see the *Cables and Connectors* brochure.

Pin layout for KCI 1319

8-pin M12 coupling or flange socket

15-pin PCB connector

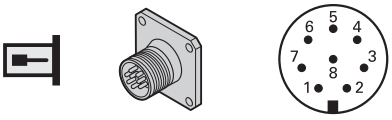


	Power supply				Serial data transmission				Other signals	
	8	**2**	**5**	**1**	**3**	**4**	**7**	**6**	**/**	**/**
	13	**11**	**14**	**12**	**7**	**8**	**9**	**10**	**5**	**6**
	U_P	**Sensor** U_P	**0 V**	**Sensor** 0 V	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**	**T+**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

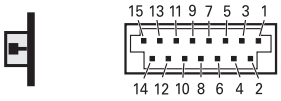
Cable shield connected with housing; **U_P** = Power supply; **T** = Temperature
Sensor: The sense line is connected in the encoder with the corresponding power line.
Vacant pins or wires must not be used!

Pin layout for KBI 1335

8-pin M12 flange socket



15-pin PCB connector



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

U_P = Power supply; **U_{BAT}** = External buffer battery (false polarity can result in damage to the encoder)
Vacant pins or wires must not be used!
[1)] Connected inside encoder

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.

Further information:

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

- Brochure: *Encoders for Servo Drives* 208922-xx
- Brochure: *Cables and Connectors* 1206103-xx
- Brochure: *Interfaces of HEIDENHAIN Encoders* 1078628-xx
- Mounting Instructions: *AE KCI 1319, KBI 1335* 1335452-xx
- Mounting Instructions: *TK KxI 13xx, TKN KxI 13xx* 1343368-xx