HEIDENHAIN

Product Information

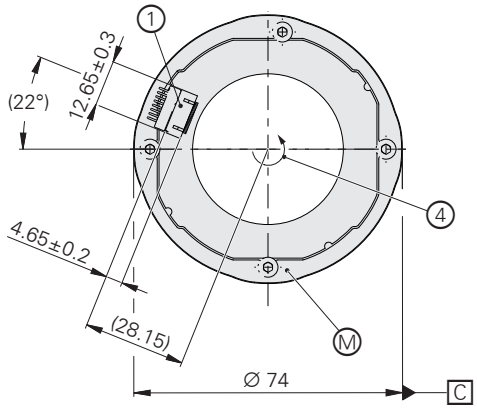
KCI 120
KBI 136

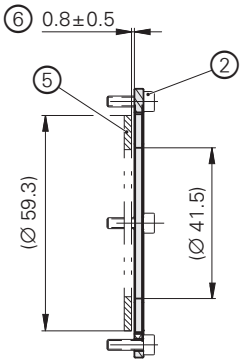
Absolute Inductive
Rotary Encoders
without Integral Bearing

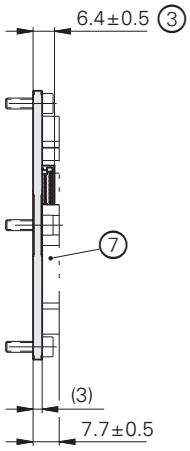
11/2022

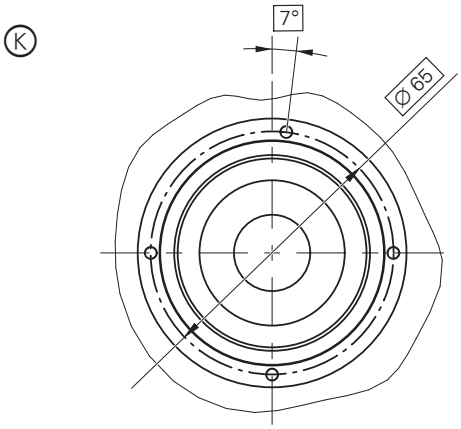
KCI 120, KBI 136

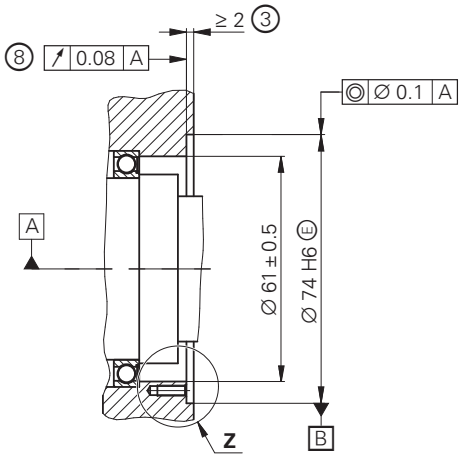
Rotary encoders for absolute position values
- **Robust inductive scanning principle**
- **Consisting of a scanning unit and a rotor unit**

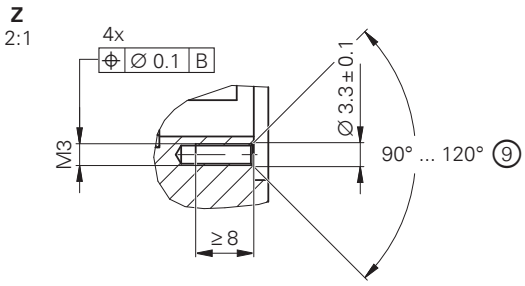












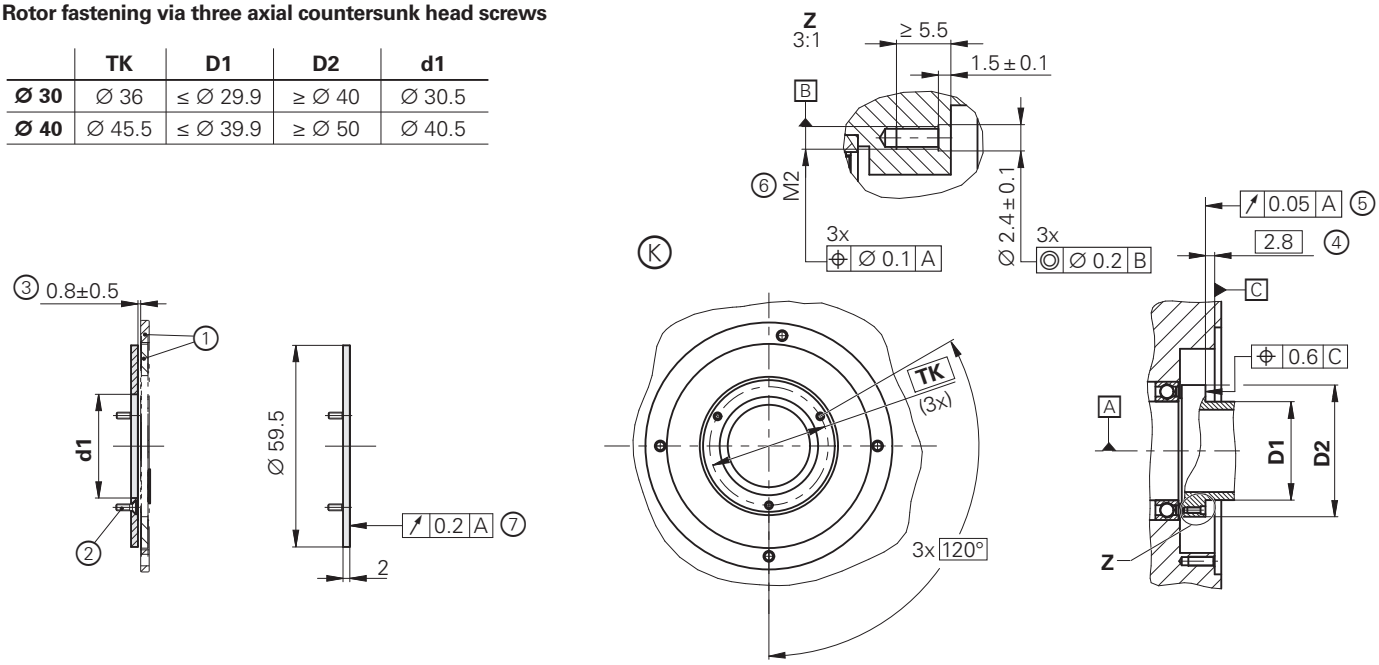
A = Bearing of mating shaft
K = Required mating dimensions
M = Measuring point for operating temperature and vibration
1 = 15-pin PCB connector
2 = Cylinder head screw:
M3x10 DIN EN ISO 4762–8.8–MKL*; ID 202264-87; 1 Nm ±0.06 Nm
3 = Ensure space for cable
4 = Direction of shaft rotation for ascending position values
5 = TK/TKN, separate, with different versions possible;
for mounting, see the respective dimension drawing
6 = Mounting clearance between circular scale surface and 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)
7 = Ensure space for electronics; see also the mating dimensions model
8 = Flange surface; ensure full-surface contact!
9 = Chamfer at start of thread is mandatory for material bonding anti-rotation lock

* Instructions for use: use screw with material bonding anti-rotation lock as per DIN 267-27 (not included in delivery); see *General mechanical information* in the *Encoders for Servo Drives* brochure

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

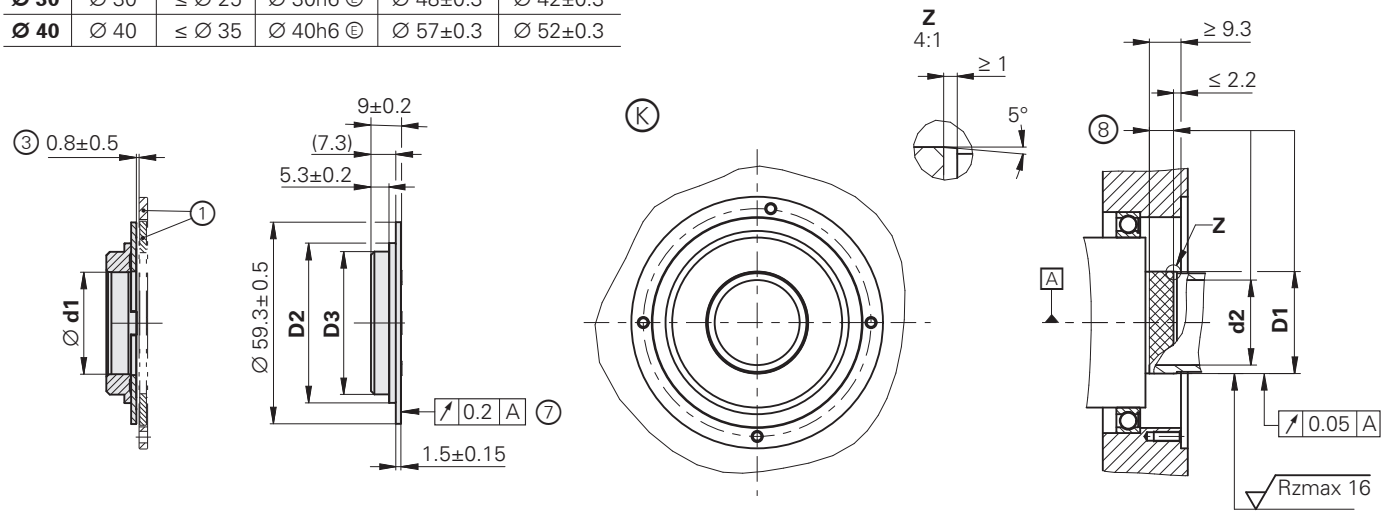
Rotor fastening via three axial countersunk head screws

	TK	D1	D2	d1
Ø 30	Ø 36	≤ Ø 29.9	≥ Ø 40	Ø 30.5
Ø 40	Ø 45.5	≤ Ø 39.9	≥ Ø 50	Ø 40.5



Rotor fastening via press-fitted hub

	d1	d2	D1	D2	D3
Ø 30	Ø 30	≤ Ø 25	Ø 30h6 Ⓔ	Ø 48±0.3	Ø 42±0.3
Ø 40	Ø 40	≤ Ø 35	Ø 40h6 Ⓔ	Ø 57±0.3	Ø 52±0.3



Ⓐ = Bearing of mating shaft
Ⓚ = Required mating dimensions
1 = Scanning unit, separate; different versions possible; for mounting, see the respective dimension drawing
2 = Countersunk head screw:
M2x6 DIN EN ISO 14581–A2–70; ID 576131-42; 0.25 Nm ±0,015 Nm; protrusion of screw head not permitted
3 = Mounting clearance between circular scale surface and flange surface of scanning unit; 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)
4 = Distance between scanning unit flange surface and circular scale surface
5 = Circular scale surface
6 = Use material bonding anti-rotation lock (at least medium strength)*
7 = On the fine track (Ø 50.8 mm to Ø 58.8 mm), after being screw-fastened
8 = For press-fitting parameters, see the Mounting Instructions

* Instructions for use: use screw with material bonding anti-rotation lock as per DIN 267-27 (not included in delivery); see *General mechanical information* in the *Encoders for Servo Drives* brochure

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

Specifications	KCI 120 singleturn	KBI 136 multiturn
Interface	EnDat 2.2	
Ordering designation	EnDat22	
Position values per revolution	1 048 576 (20 bits)	
Revolutions	–	65 563 (16 bits)
Calculation time t_{cal} Clock frequency	≤ 5 µs ≤ 16 MHz	
System accuracy	±40″	
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:* 115 mA	*Normal operation at 5 V:* 105 mA (without load) *Backup battery:* 200 µA (rotating shaft)[2] 20 µA (at standstill)
ID number	AE KCI 120 scanning head 1353138-01 Circular scale (screw-fastened version) 1353144-01 (30 mm) 1353142-01 (40 mm) Disk/hub assembly (press-fitted version) 1353143-01 (30 mm) 1353141-01 (40 mm)	AE KBI 136 scanning head 1353140-01 Circular scale (screw-fastened version) 1353144-01 (30 mm) 1353142-01 (40 mm) Disk/hub assembly (press-fitted version) 1353143-01 (30 mm) 1353141-01 (40 mm)

[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

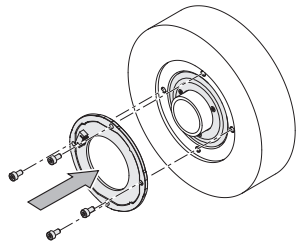
Specifications	KCI 120 singleturn	KBI 136 multiturn
Rotor*	30 mm or 40 mm disk/hub assembly (press-fit version) 36 mm or 45.5 mm disk/hub assembly (screw-fastened version)	
Shaft speed	≤ 10000 rpm	
Moment of inertia	*Disk/hub assembly:* 40 mm hollow shaft: $32.2 \cdot 10^{-6}$ kgm^2; 30 mm hollow shaft: $18 \cdot 10^{-6}$ kgm^2 *Disk/hub assembly:* 40 mm hollow shaft: $7 \cdot 10^{-6}$ kgm^2; 30 mm hollow shaft: $4.43 \cdot 10^{-6}$ 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	
Relative humidity	≤ 93% (40 °C/21 d as per EN 60068-2-78), condensation excluded	
Protection rating EN 60529	IP00	
Mass	≈ 0.09 kg (scanning unit + disk/hub assembly) ≈ 0.04 kg (scanning unit + disk/hub assembly)	

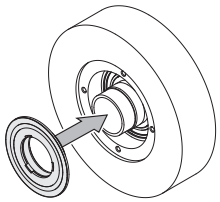
* Please select when ordering
1) With multiturn functionality in normal operation; maximum permissible acceleration in backup-battery mode upon request
2) 10 Hz to 55 Hz, 4.9 mm constant peak to peak

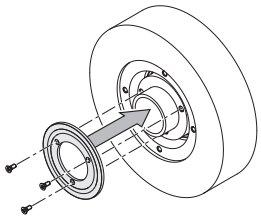
Installation

The KCI 120/KBI 136 is mounted either via screw-fastening of the circular scale or through press-fitting of the disk/hub assembly, followed by 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 press-fitting, adhere to the material properties and conditions for the mating surface stated in the relevant documents for proper use. These requirements must be followed, even when new disk/hub assemblies are press-fitted onto customer shafts that have already been used. The maximum pressing force must not be exceeded throughout the press-fitting procedure. Starting at one millimeter before reaching the final position, the pressing force must not fall below the minimum pressing force.







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; accuracy: ±6 %	
Mounting temperature	15 °C to 35 °C	

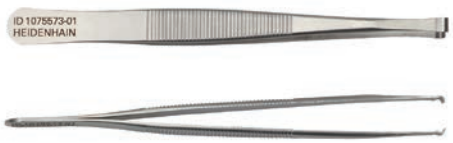
Mounting accessories

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

KCI 120 KBI 136	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 elements must be suitable for the maximum clock frequency used

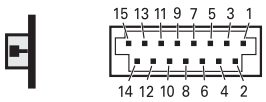
More information:

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

Pin layout for KCI 120

8-pin M12 coupling or flange socket

15-pin PCB connector

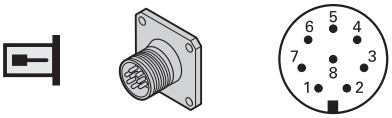


	Power supply				Serial data transmission				Other signals	
	8	**2**	**5**	**1**	**3**	**4**	**7**	**6**	**/**	**/**
	13	**11**	**14**	**12**	**7**	**8**	**9**	**10**	**5**	**6**
	U_P	**Sensor** U_P	**0 V**	**Sensor** 0 V	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**	**T+**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

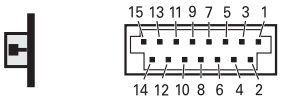
Cable shield connected with housing; **U_P** = Power supply; **T** = Temperature
Sensor: The sense line is connected in the encoder with the corresponding power line.
Vacant pins or wires must not be used!

Pin layout for KBI 136

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

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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:

- Brochure: *Encoders for Servo Drives* 208922-xx
- Brochure: *Cables and Connectors* 1206103-xx
- Brochure: *Interfaces of HEIDENHAIN Encoders* 1078628-xx
- Operating Instructions 1362766-xx