



HEIDENHAIN



Product Information

KCI 1318

KBI 1335

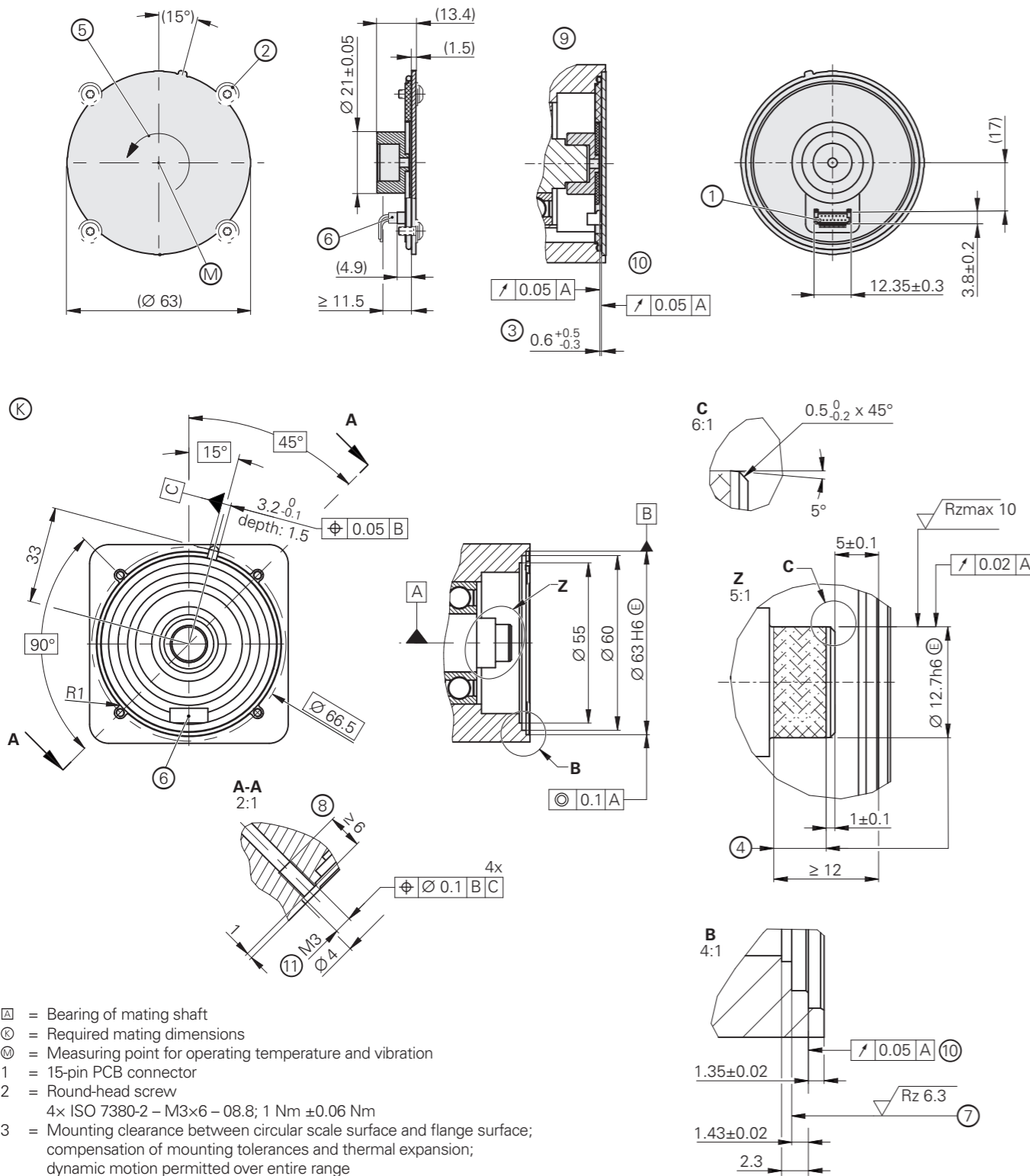
Bearingless Absolute
Inductive Rotary Encoders
with NDE Bearing Cover
Functionality

06/2023

KCI 1318, KBI 1335

Rotary encoders for absolute position values

- Robust inductive scanning principle
- Consisting of a scanning unit and a rotor unit
- Can be used as NDE bearing cover



- ▣ = Bearing of mating shaft
- ⊙ = Required mating dimensions
- ⊗ = Measuring point for operating temperature and vibration
- 1 = 15-pin PCB connector
- 2 = Round-head screw
- 3 = Mounting clearance between circular scale surface and flange surface; compensation of mounting tolerances and thermal expansion; dynamic motion permitted over entire range
- 4 = Distance between flange surface and beginning and end of press-fit area
- 5 = Direction of shaft rotation for ascending position values
- 6 = Note the space required for cables. Strain relief and shield connection must be close to the encoder; dimensions for HEIDENHAIN standard cables
- 7 = Sealing surface
- 8 = Pay attention to the minimum thread depth
- 9 = Depiction of KxI 13xx with mounted rotor
- 10 = Flange surface; ensure full-surface contact
- 11 = Use suitable material bonding anti-rotation lock (at least medium strength)

* Instructions for 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

Specifications	KCI 1318 singletum	KBI 1335 multitum
Interface	EnDat 2.2	
Ordering designation	EnDat22	
Position values per revolution	262 144 (18 bits)	262 144 (18 bits; 19-bit data word length with LSB = 0)
Revolutions	–	65 536 (16 bits)
Calculation time t_{cal}	≤ 5 μs	
Clock frequency	≤ 16 MHz	
System accuracy	±120"	
Electrical connection	15-pin PCB connector (with connection for external temperature sensor)	
Cable length	≤ 100 m (see the EnDat description in the <i>Interfaces of HEIDENHAIN Encoders</i> 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: ≤ 700 mW At 14 V: ≤ 750 mW	
Current consumption (typical)	At 5 V: 97 mA	Normal operation at 5 V: 97 mA Buffer mode ²⁾ : 330 μA (rotating shaft) 22 μA (at standstill)
Rotor	Circular scale with inside hub diameter of 12.7 mm	
Shaft speed	≤ 12 000 rpm	
Moment of inertia	Disk/hub assembly: $1.42 \cdot 10^{-6}$ kgm ²	
Angular acceleration of rotor ³⁾	≤ $1 \cdot 10^5$ rad/s ²	
Axial motion of measured shaft	–0.3 mm to 0.5 mm	
Vibration 55 Hz to 2000 Hz ⁴⁾ 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	IP67 when mounted	
Mass	Scanning unit (AE): 0.04 kg Disk/hub assembly (TKN): 0.020 kg	
ID number	Scanning unit (AE): 1341973-01 Disk/hub assembly (TKN): 1341977-01	Scanning unit (AE): 1341972-01 Disk/hub assembly (TKN): 1341977-01

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

³⁾ In normal operation; maximum permissible acceleration in backup-battery mode upon request

⁴⁾ 10 Hz to 55 Hz, 4.9 mm constant peak to peak

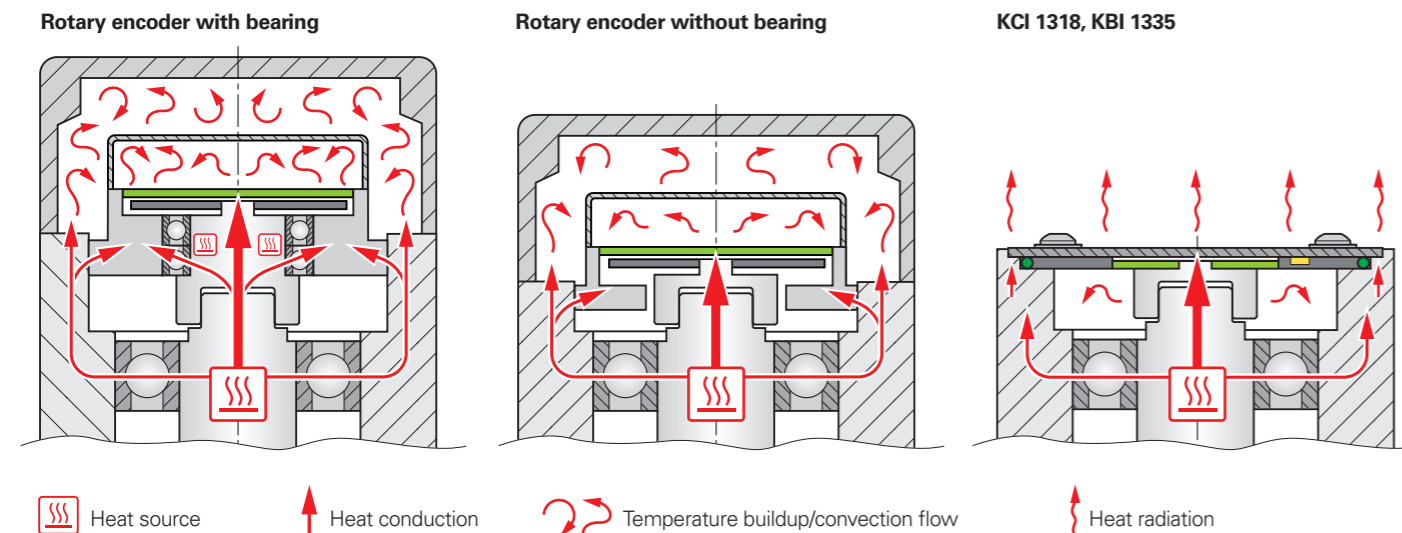
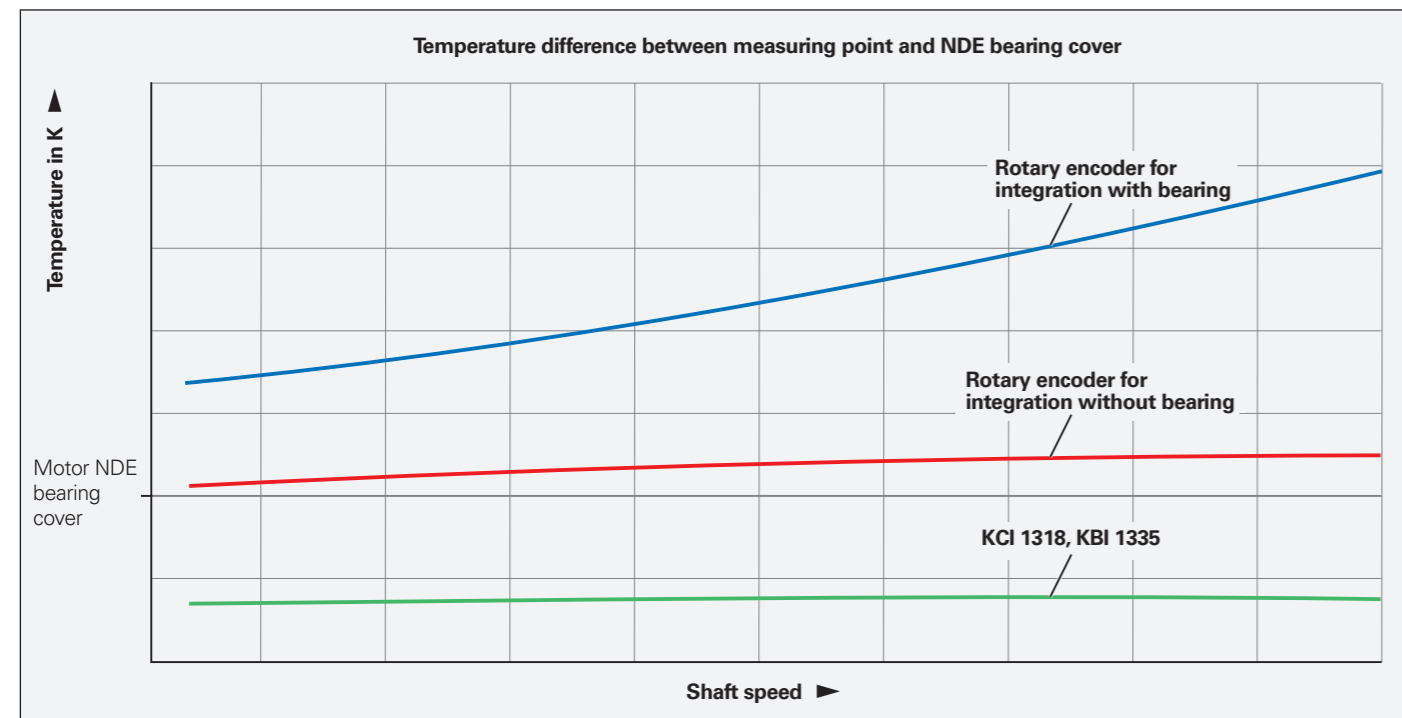
Thermal behavior when mounted

Due to the structural design, the temperature of the rotary encoder is always less than that of the motor's NDE bearing cover.

The graph shows the difference in temperature at the measuring point and at the NDE bearing cover as a function of the speed. The flange temperature of the new rotary encoders is less than that of the NDE bearing cover. The temperatures of the comparison encoders (with and without bearing) are greater than that of the NDE bearing cover.

The ASIC temperature (internal temperature sensor) is proportional to the motor temperature, and is greater than the measuring point temperature of the rotary encoder's flange. Depending on the application, in some cases no external temperature sensor is necessary after the appropriate calibration.

The figures below schematically show the heat conduction of the various types of rotary encoders. In the figure at right you can see how the heat radiates out through the metal plate of the KCI 1318 / KBI 1335 encoder.

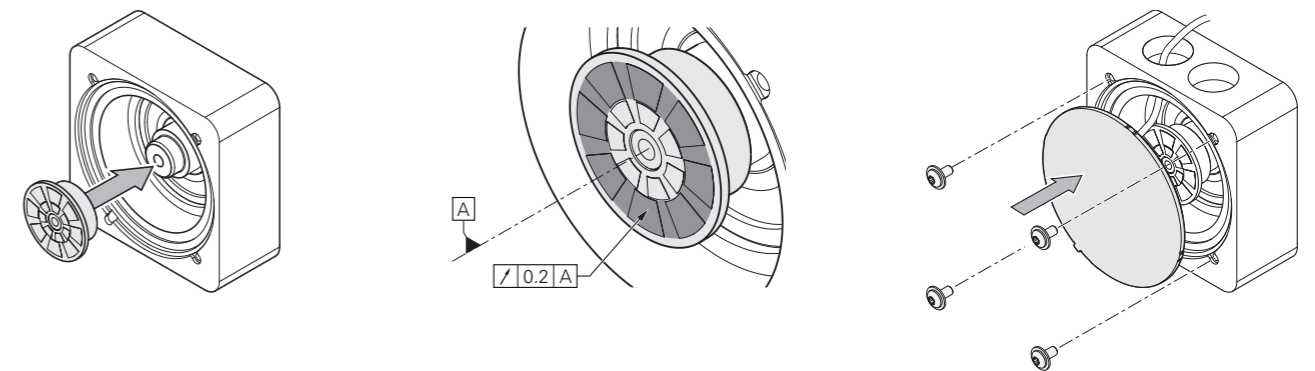


Mounting

The KCI 1318/KBI 1335 is mounted through press-fitting of the disk/hub assembly, followed by mounting of the scanning unit. The disk/hub assembly is press-fit onto the corresponding shaft. The scanning unit is aligned and mounted via four screws to 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 surfaces stated in the relevant documents for proper use. These requirements must be followed, even when new disk/hub assemblies are press-fitted onto a customer

shaft that has 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 final 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	$\geq 220 \text{ N/mm}^2$	$\geq 600 \text{ N/mm}^2$
Yield strength $R_{p0.2}$ or yield point R_e	–	$\geq 400 \text{ N/mm}^2$
Shear strength τ_m	130 N/mm^2	$\geq 390 \text{ N/mm}^2$
Interface pressure P_G	$\geq 250 \text{ N/mm}^2$	$\geq 660 \text{ N/mm}^2$
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)	$\leq 25 \cdot 10^{-6} \text{ K}^{-1}$	$10 \cdot 10^{-6} \text{ K}^{-1}$ to $12 \cdot 10^{-6} \text{ K}^{-1}$
Surface roughness R_z	$\leq 16 \mu\text{m}$	
Friction values	Mounting surfaces must be clean and free of grease.	
Tightening procedure	Use a signal-emitting torque wrench as per DIN EN ISO 6789, with an accuracy of $\pm 6\%$	
Mounting temperature	15 °C to 35 °C	

Mounting accessories

Screws

Screws (mounting screws) are not included in delivery and cannot be ordered from HEIDENHAIN. The M3x10 screw with materially bonding anti-rotation lock must be ordered separately.

KCI 1318 KBI 1335	Screws
Screw for fastening the scanning unit	ISO 7380-2-M3x6-08.8-MKL ¹⁾

¹⁾With coating for material bonding anti-rotation lock (for information on use, see the *Encoders for Servo Drives* brochure)

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 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 mm ²) 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 mm ²)		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 mm ²), and stripped cable end		ID 1119958-xx ¹⁾

Output cable inside the motor housing with TPE single wires (8 × 0.16 mm ²) 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: Ø 3.7 mm EPG 1 × (4 × 0.06 mm ²) + 4 × 0.06 mm ²		
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 mm ²), with cable clamp for shield connection		ID 1072652-xx

Connecting cables and adapter cables PUR Ø 6 mm; 2 × (2 × 0.09 mm ²) + 2 × (2 × 0.16 mm ²); A _P = 2 × 0.16 mm ²		
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⁾


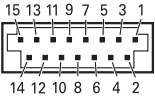


A_P: Cross section of power supply lines

¹⁾ Connecting element 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 1318


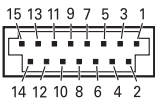


15-pin PCB connector										
										
	Power supply				Serial data transmission				Other signals	
	13	11	14	12	7	8	9	10	5	6
	U_P	Sensor U _P	0V	Sensor 0V	DATA	DATA	CLOCK	CLOCK	T+	T-
	Brown/ Green	Blue	White/ Green	White	Gray	Pink	Violet	Yellow	Brown	Green

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

15-pin PCB connector										
										
	Power supply				Serial data transmission				Other signals	
	13	11	14	12	7	8	9	10	5	6
	U_P	U_{BAT}	0V¹⁾	0V_{BAT}¹⁾	DATA	DATA	CLOCK	CLOCK	T+	T-
	Brown/ Green	Blue	White/ Green	White	Gray	Pink	Violet	Yellow	Brown	Green

Cable shield connected with housing; **U_P** = Power supply voltage; **T** = Temperature

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 for scanning unit (AE) 1380426-xx
- Operating Instructions for disk/hub assembly (TKN) 1380692-xx