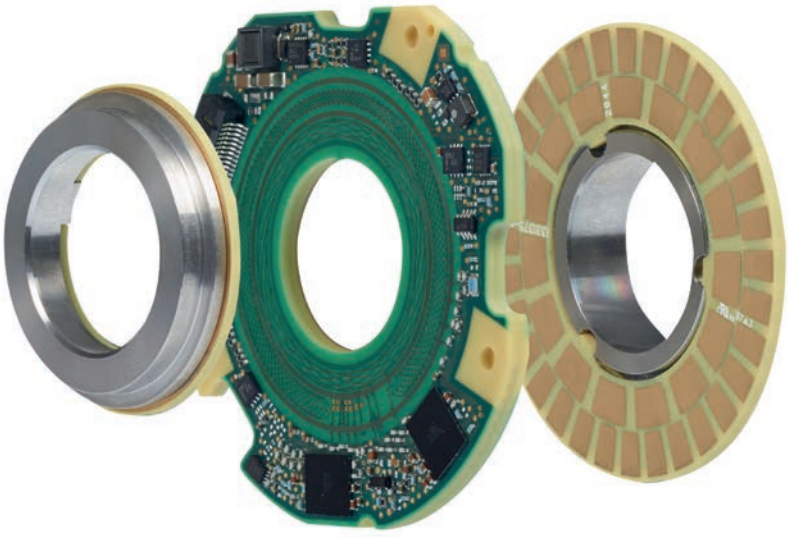
HEIDENHAIN



Functional Safety

Product Information

KCI 120 D*plus*
KBI 136 D*plus*

Absolute Inductive
Rotary Encoder
with Additional
Functionality:

Position measurement at
the output side

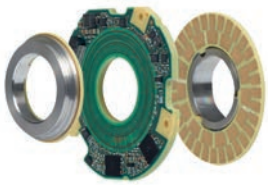
Suitable for safety-related
applications up to SIL 3
when coupled with
additional measures

03/2025

KCI 120 D*plus*, KBI 136 D*plus*

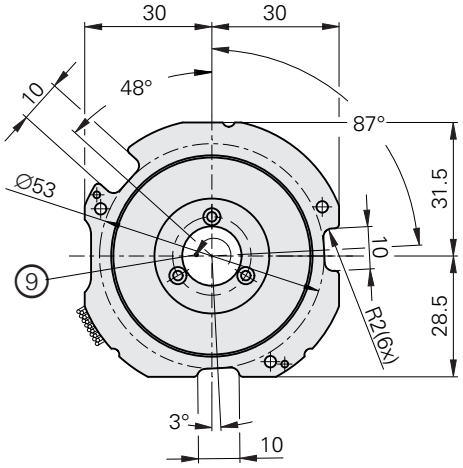
Absolute inductive rotary encoder with additional functionality

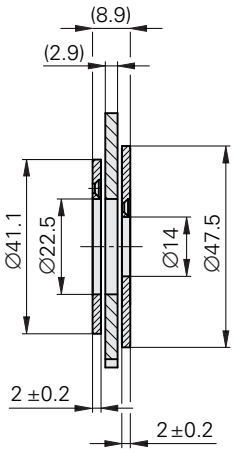
- **Robust inductive scanning principle**
- **Consisting of an AE scanning unit and two rotor units (TKN disk/hub assembly or TK circular scale)**
- **Second position measurement on the output side (alternatively also with multiturn)**

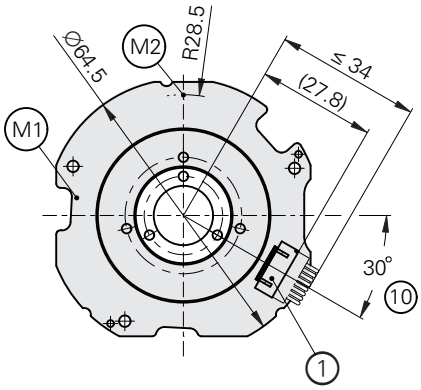


Circular scale (screw-fastened)

Functional Safety





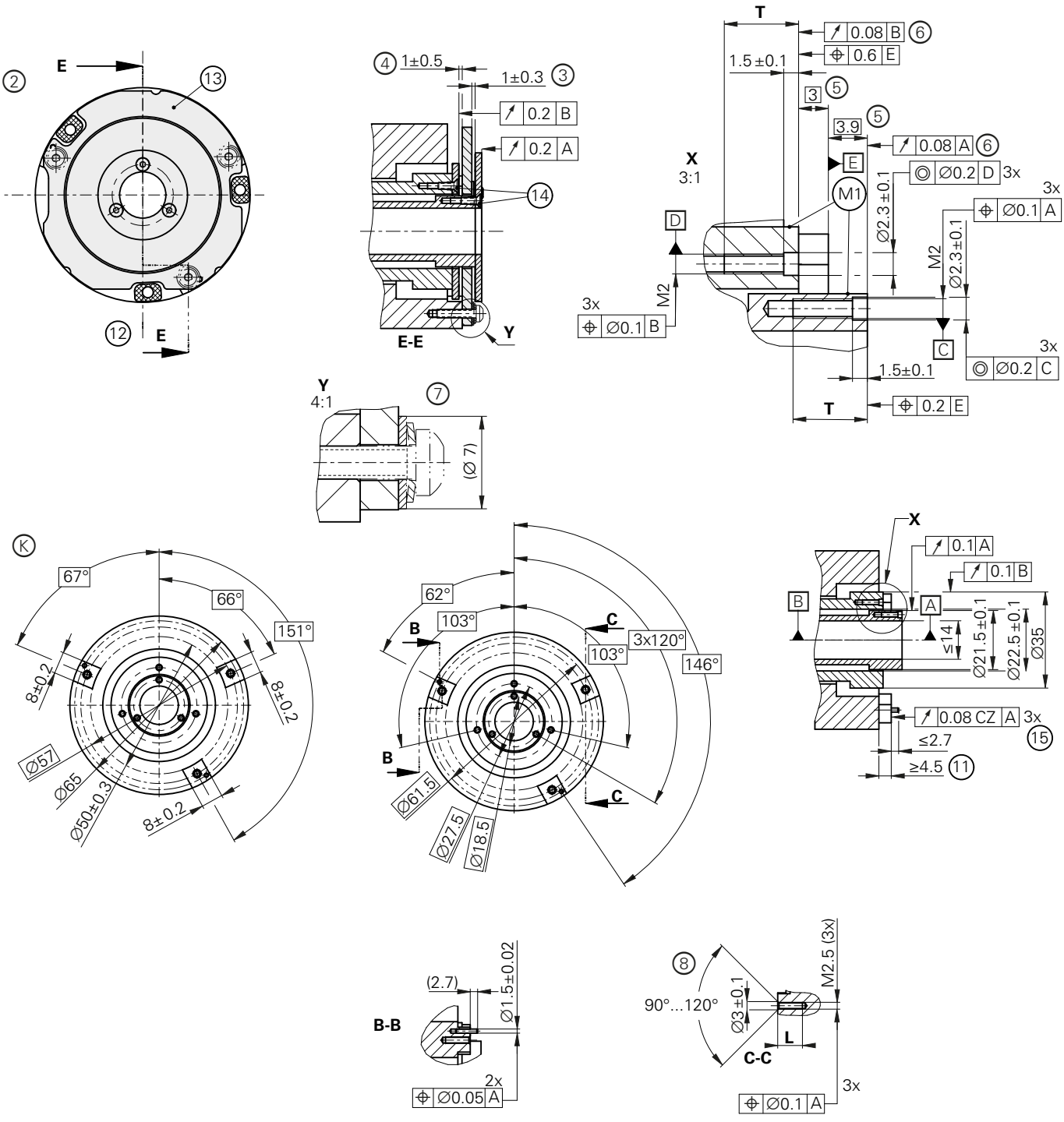


Ⓐ = Bearing of Rotor A
Ⓑ = Bearing of Rotor B
Ⓚ = Required mating dimensions
M1 = Measuring point for operating temperature
M2 = Measuring point for vibration
1 = 15-pin PCB connector
2 = Shown with customer side
3 = Rotor A mounting dimension; tolerance includes compensation of mounting tolerances and thermal expansion
4 = Rotor B mounting dimension; tolerance includes compensation of mounting tolerances and thermal expansion
5 = Distance between scanning unit flange surface and circular scale surface
6 = Circular scale surface
7 = Cylinder head screw:
Steel mating stator: 3x DIN EN ISO 4762 – M2.5x8 – 8.8 – MKL or DIN EN ISO 14583 – M2.5x12 – 8.8 – MKL*
with DIN 6796 – 2.5 – FSt spring washer and washer (ID 1334909-01);
M_d = 0.7 Nm ±0.05 Nm; note the position of the spring washer during installation!
Aluminum mating stator: 3x DIN EN ISO 4762 or DIN EN ISO 14583 – M2.5x12 – 8.8 – MKL* with DIN 6796 – 2.5 – FSt spring washer and washer (ID 1334909-01);
M_d = 0.7 Nm ±0.05 Nm; note the position of the spring washer during installation!
8 = Chamfer at start of thread is mandatory for material bonding anti-rotation lock
9 = Direction of rotation of both shafts for ascending position values
10 = Ensure space for cable
11 = Ensure space for electronics; see also the mating dimensions model
12 = Avoid collision with the scanning unit
13 = Gap for air and creepage distances > 1 mm
14 = Countersunk head screws
Steel mating shaft: 6x DIN EN ISO 14581 – M2x6 – A2 – 070; aluminum mating shaft: 6x DIN EN ISO 1451 – M2x8 – A2 – 070;
protrusion of screw head not permitted; use suitable material-bonding anti-rotation lock (at least medium strength)*
15 = Free of burrs

*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 *Rotary Encoders* brochure

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

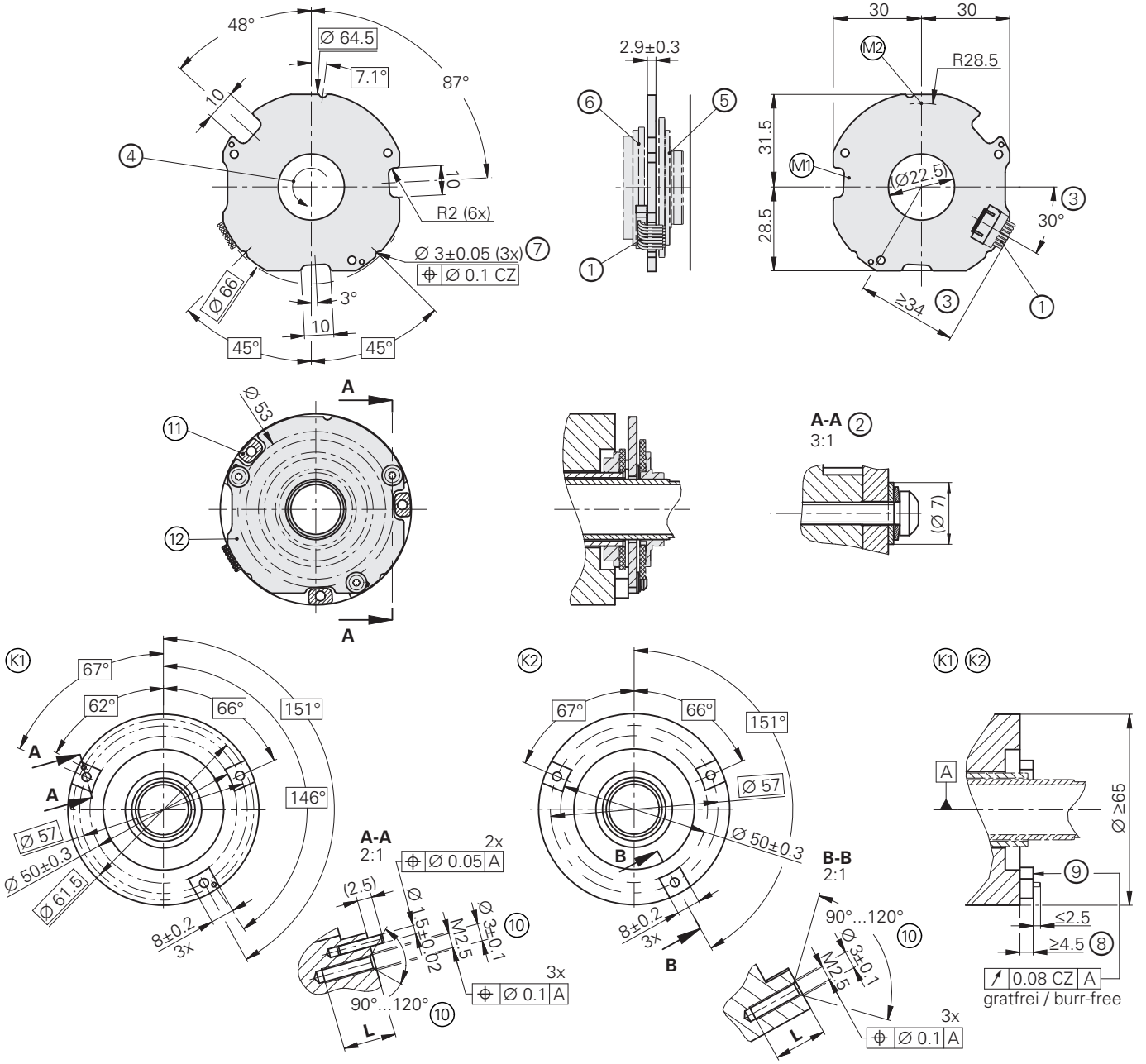
Kundenwelle	T	L
Steel	≥ 5.5	≥ 9
Aluminium	≥ 7.5	≥ 5



mm

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

Disk/hub assembly (press-fitted version)

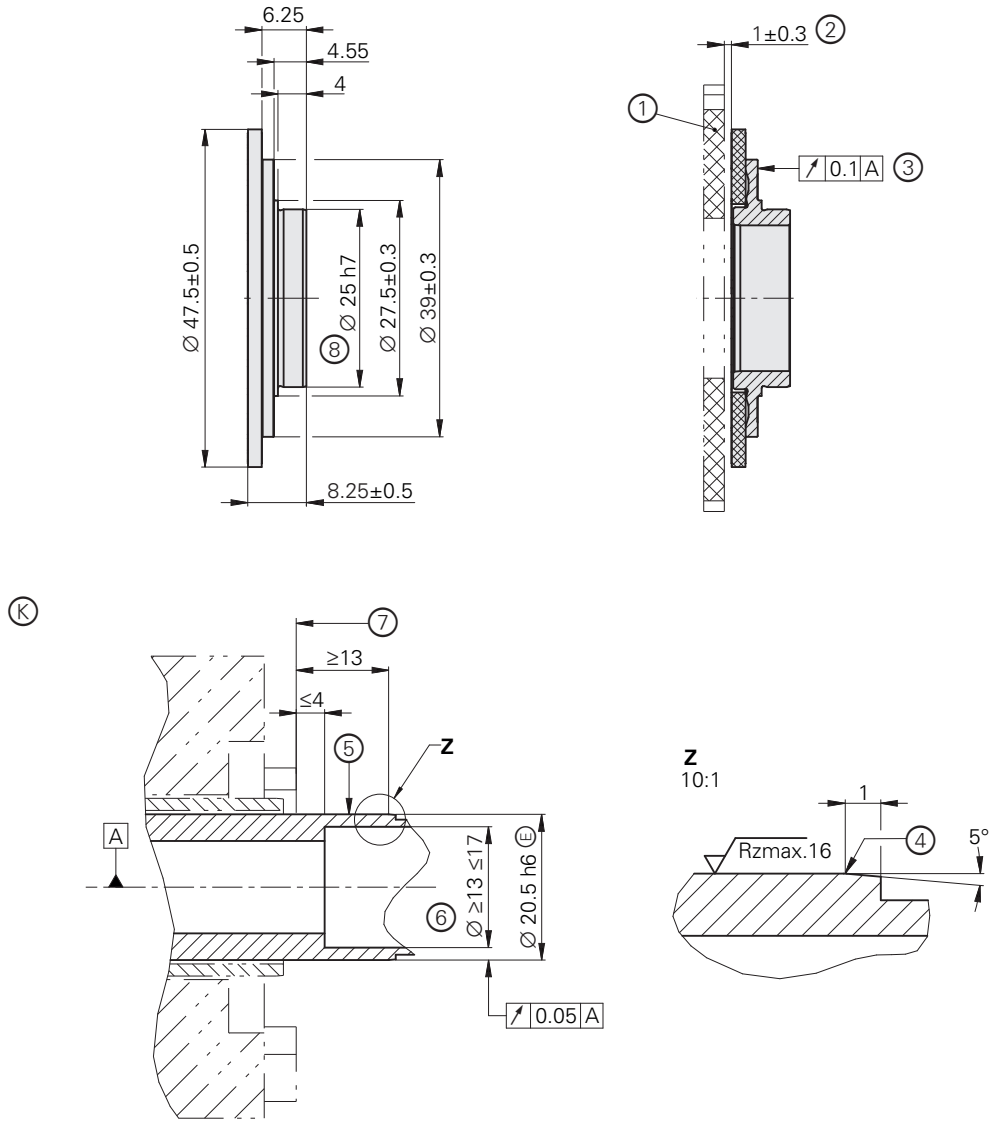


Mating stator	L
Steel	≥ 5
Aluminum	≥ 9

Ⓐ = Bearing of mating shaft
Ⓚ = Required mating dimensions; mounting with cylindrical pins
Ⓓ = Required mating dimensions; mounting with device
M1 = Measuring point for operating temperature
M2 = Measuring point for vibration
1 = 15-pin PCB connector
2 = Cylinder head screw:
Steel mating stator: 3x DIN EN ISO 4762 – M2.5x8 – 8.8 – MKL or DIN EN ISO 14583 – M2.5x12 – 8.8 – MKL* with DIN 6796 – 2.5 – FSt spring washer and washer (ID 1334909-01);
M_d = 0.7 Nm ±0.05 Nm; note the position of the spring washer during installation!
Aluminum mating stator: 3x DIN EN ISO 4762 or DIN EN ISO 14583 – M2.5x12 – 8.8 – MKL* with DIN 6796 – 2.5 – FSt spring washer and washer (ID 1334909-01);
M_d = 0.7 Nm ±0.05 Nm; note the position of the spring washer during installation!
3 = Ensure space for cable
4 = Direction of shaft rotation for ascending position values
5 = TKN for Rotor A (separate); for mounting, see the respective mounting dimensions
6 = TKN for Rotor B (separate); for mounting, see the respective mounting dimensions
7 = Holes as an option for aligning the scanning unit by means of a device;
centered position relative to reference Ⓐ after assembly: ⌖ Ø 0.2 CZ
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 obligatory for material-bonding anti-rotation lock
11 = Avoid collision with the scanning unit
12 = Gap for air and creepage distances > 1 mm

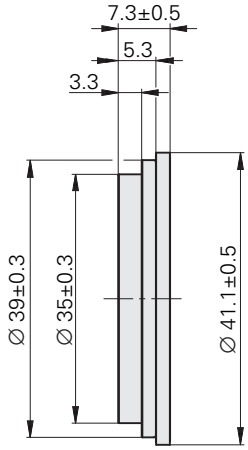
*Instructions for use: Screw with material-bonding anti-rotation lock as per DIN 267-27 (not included in delivery!); see *General mechanical information* in the *Rotary Encoders* brochure

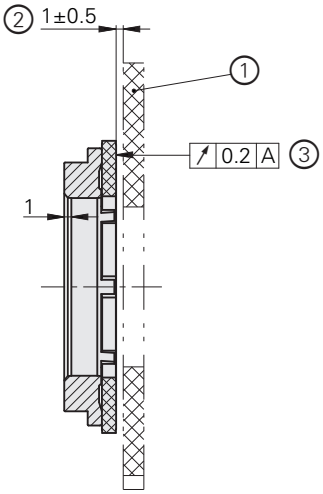
mm
Tolerancing ISO 8015
ISO 2768:1989-mH
≤ 6 mm: ±0.2 mm

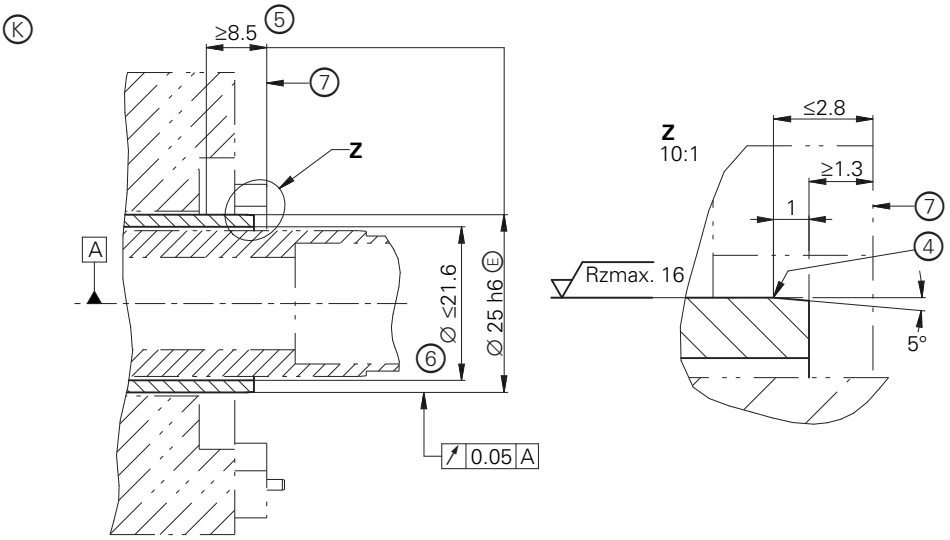


A = Bearing of mating shaft
K = Required mating dimensions
1 = Separate scanning unit (AE); for mounting, see the respective dimension drawing
2 = Rotor B mating dimension;
tolerance includes compensation for the mounting tolerances and thermal expansion;
dynamic motion permitted over the entire range
3 = Axial runout after press-fitting
4 = Rounded transition to the fit surface
5 = Required fit length on the mating shaft
6 = Permissible inside diameter in the press-fit area E
7 = Bearing surface of scanning unit (AE)
8 = A suitable support bearing is permissible but optional.
Permissible forces and torques during operation:
– Axial force: 60 N
– Radial force: 60 N
– Torque: 0.5 Nm

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







A = Bearing of mating shaft
K = Required mating dimensions
1 = Separate scanning unit (AE); for mounting, see the respective dimension drawing
2 = Rotor B mating dimension;
tolerance includes compensation for the mounting tolerances and thermal expansion;
dynamic motion permitted over the entire range
3 = On the fine track (Ø 34 mm to Ø 39 mm), after press-fitting
4 = Rounded transition to the fit surface
5 = Required fit length on the mating shaft
6 = Permissible inside diameter in the press-fit area E
7 = Bearing surface of scanning unit (AE)

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

General information

Specifications	KCI 120 D*plus*	KBI 136 D*plus*
Interface	EnDat 2.2	
Ordering designation	EnDat22	
Calculation time t_{cal} Clock frequency	≤ 5 µs ≤ 16 MHz	
Electrical connection	15-pin PCB connector (radial); cable length ≤ 10 m[1)]	
Supply voltage	DC 3.6 V to 14 V (for both axes together)	U_P: DC 3.6 V to 14 V (for both axes together) U_{BAT}: DC 3.6 V to 5.25 V (backup battery)
Power consumption (max.)[2)]	*At 3.6 V:* ≤ 1.2 W *At 14 V:* ≤ 1.4 W	
Current consumption (typical)	*At 5 V:* 200 mA (without load)	*Normal operation at 5 V:* 200 mA (without load) *Backup battery:* 200 µA (rotating shaft)[4)] 20 µA (at standstill)
Angular acceleration of rotors[5)]	≤ $1 \cdot 10^5$ rad/s^2 (*circular scale of Encoder A, Ø 22.5 mm:* ≤ $2 \cdot 10^4$ rad/s^2)	
Vibration 55 Hz to 2000 Hz[3)] **Shock** 6 ms	*AE scanning unit:* ≤ 400 m/s^2; *rotors:* ≤ 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 Exceeded temperature error message	127 °C (measuring accuracy of the internal temperature sensor: ±1 K)	
Relative humidity	≤ 93% (40 °C/21 d as per EN 60068-2-78), without condensation	
Protection EN 60529	IP00 (read about insulation under *Electrical safety* in the *Interfaces of HEIDENHAIN Encoders* brochure)	
Mass	≈ 0.068 kg (scanning unit and disk/hub assemblies) ≈ 0.028 kg (scanning unit with circular scales)	
ID number	ID 1354407-01 (AE scanning unit)	ID 1421551-01 (AE scanning unit)
	ID 1348267-03 (TKN: Encoder A, Ø 20.5 mm) ID 1348268-03 (TKN: Encoder B, Ø 25 mm) ID 1445825-01 (TK: Encoder A, Ø 14 mm) ID 1445827-01 (TK: Encoder B, Ø 22.5 mm)	

1) See pin layout for encoder
2) See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure, or visit *www.heidenhain.com*
3) *Scanning unit:* 10 Hz to 55 Hz, 6.5 mm constant peak to peak
Rotors: 10 Hz to 55 Hz, 10 mm constant peak to peak
4) The typical service life is eight years when a recommended lithium thionyl chloride battery is used (3.6 V and 1200 mAh) and under the right conditions (two 10-hour shifts under normal operation; battery temperature: 25 °C; typical self-discharge)
5) With multiturn functionality in normal operation; maximum permissible acceleration in backup-battery mode upon request

Position measurement

Specifications	KCI 120 D*plus* singleturn Output side (Encoder A)	KBI 136 D*plus* multiturn Output side (Encoder A)	KCI 120 D*plus* singleturn Motor side (Encoder B)
Functional safety for applications with up to	As a single-encoder system for monitoring functions and control-loop functions: • SIL 2, as per EN 61508 (further basis for testing: IEC 61800-5-3) • Category 3, PL d, in accordance with EN ISO 13849-1:2015 With additional measures as per Document 1000344, suitable for safety-related applications with up to SIL 3 or Category 4, PL e Safe in the singleturn range of both axes		
PFH (each encoder)	*SIL 2:* ≤ $15 \cdot 10^{-9}$ (probability of dangerous failure per hour) *SIL 3:* ≤ $2 \cdot 10^{-9}$		
Safe position[1)]	*Encoder:* ±0.44° (safety-related measuring step SM = 0.176°) *Mechanical coupling for shaft:* 0° (fault exclusion for the loosening of the shaft coupling and stator coupling, designed for accelerations at the stator: ≤ 400 m/s²; at the rotor: ≤ 600 m/s²)		
Shaft	Hub with inside diameter of 20.5 mm Circular scale with inside hub diameter of 14 mm		Hub with inside diameter of 25 mm Circular scale with inside hub diameter of 22.5 mm
Shaft speed	≤ 6000 rpm		≤ 15 000 rpm
Moment of inertia of rotor	*TK of Encoder A:* $1.9 \cdot 10^{-6}$ kg · m² *TK of Encoder B:* $9.7 \cdot 10^{-7}$ kg · m² *TKN of Encoder A:* $5.5 \cdot 10^{-6}$ kg · m² (without supporting ball bearing) *TKN of Encoder B:* $5.0 \cdot 10^{-6}$ kg · m²		
Axial motion[2)]	±0.3 mm		±0.5 mm
Position values per rev.	1 048 576 (20 bits)		524 288 (19 bits)
Revolutions	–	65536 (16 bits)	–
System accuracy	±40″		±120″
Online compensation	No		Yes

[1)] Further tolerances may arise in the downstream electronics after position value comparison (contact mfr.)
[2)] Including thermal linear expansion and mounting tolerance

Mounting
Mounting and protection rating

Mounting and protection rating
The KCI 120 D*plus* / KBI 136 D*plus* is mounted either by screw-fastening the two circular scales or by press-fitting the two disk/hub assemblies, and then mounting the scanning unit. The disk/hub assemblies are press-fitted onto their respective shafts, or the circular scales are fastened to their respective shafts via three screws, and the scanning unit is mounted onto the mating surface via centering pins. 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 mating shaft that has already been used.

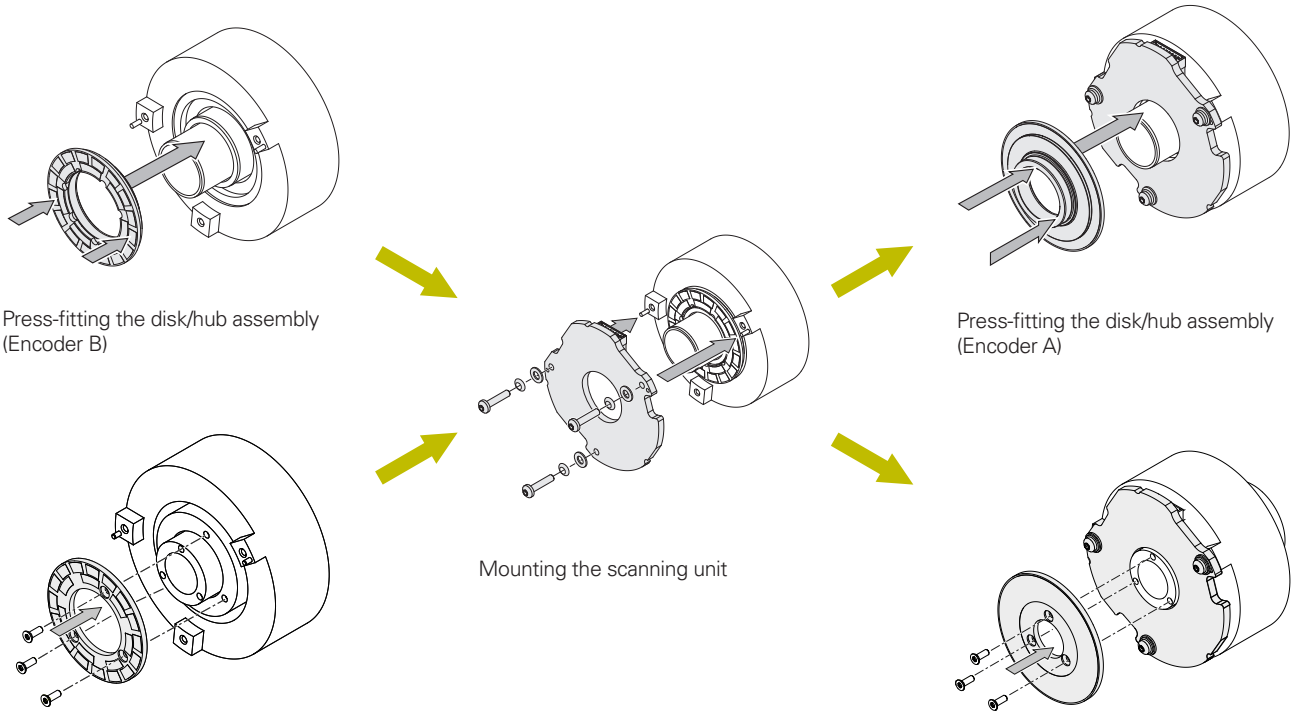
If the application features functional safety, then, after the mounting or installation of the encoder onto the mating surface, the device must be protected from at least the ingress of solid foreign matter in accordance with an IP6x protection rating, as well as from the ingress of liquids (the protection rating for liquids depends on the application, e.g., IPx5: protection from water jets). If exposure to contamination such as dust and liquids can be excluded, then a protection rating of at least IP40 when mounted is sufficient.

Once the lower limit of the pressing force has been exceeded, the pressing force being applied must remain within the specified range for the rest of the procedure until the final position is reached.

When the disk/hub assembly is press-fitted, force may be applied only to the intended surfaces by means of pressing stamps (see mounting instructions).

If a support bearing is used in conjunction with the hub of Encoder A, then the stated forces and the torque must not be exceeded:
Axial force ≤ 60 N
Radial force ≤ 60 N
Torque ≤ 0.5 Nm

Further information:
Follow the measures for electromagnetic compatibility described under *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure to ensure disturbance-free operation.



Press-fitting the disk/hub assembly (Encoder B)

Press-fitting the disk/hub assembly (Encoder A)

Mounting the scanning unit

Screw-fastening the circular scale (Encoder B)

Screw-fastening the circular scale (Encoder A)

The following material properties and conditions for the mating surfaces are assumed for the fault exclusion design for functional safety.

Rotary encoders may exert a torque of up to 1 Nm on the mating shaft. The customer-side mechanical design must be designed to handle this load.

	Mating shaft[1], mating stator	**Mating shaft, mating stator**
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_a	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 in accordance with DIN EN ISO 6789, with an accuracy of ±6%	
Mounting temperature	15 °C to 35 °C	

[1] Only when screw-fastened circular scale is used

Mounting accessories

Screws, spring washers and washer
Screws (mounting screws) are not included in delivery.
The washer can be ordered separately.

KCI 120 D*plus* KBI 136 D*plus*	**Mating shaft, mating stator**		
Screw for fastening the scanning unit	Steel Aluminum	DIN EN ISO 4762/14583-**M2.5x8**-8.8-**MKL**[1)] DIN EN ISO 4762/14583-**M2.5x12**-8.8-**MKL**[1)]	–
Fastening-screw for circular scale	Steel Aluminum	ISO 14581-**M2×6**-A2-070[2)] ISO 14581-**M2×8**-A2-070[2)]	–
Spring washers	–	DIN 6796 – 2.5 – FSt.	–
Washer	–	–	ID 1334909-01

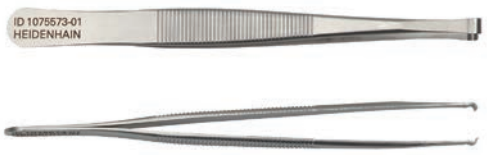
[1)] With coating for material-bonding anti-rotation lock (for information on use, see the *Encoders for Servo Drives* brochure)
[2)] Screw without material-bonding anti-rotation lock; a material-bonding anti-rotation lock of at least medium strength must be used

Instructions for use: use screws with material-bonding anti-rotation lock as per DIN 267-27 (see *General mechanical information* in the *Rotary Encoders* brochure). Fastening-screws and spring washers are not included in delivery.

For more mounting information and mounting aids, see the Mounting Instructions and the *Encoders for Servo Drives* brochure. The mounting quality can be checked with the PWM 21 and the ATS software (see document ID 1082415).

Mounting aid
To avoid damage to the cable, use the mounting aid to disconnect the cable assembly. Apply pulling force solely to the connector of the cable assembly and not to the wires.

ID 1075573-01



Built-in temperature evaluation

Each axis of these rotary encoders features an internal temperature sensor integrated into the encoder's electronics. The digitized temperature value is transmitted purely serially via the EnDat protocol.

Regarding the internal temperature sensor, the rotary encoder supports the two-stage cascaded signaling of a temperature exceedance. This consists of an EnDat warning and an EnDat error message.

In accordance with the EnDat specification, an EnDat warning (EnDat memory area "Operating status," word 1 "Warnings," bit 2^1 "Temperature exceeded") is output when the warning threshold for the temperature exceedance of the internal temperature sensor is reached. This warning threshold for the internal temperature sensor is stored in the EnDat memory area "Operating parameters," word 6 "Trigger threshold warning bit for excessive temperature" of each axis, and can be individually adjusted.

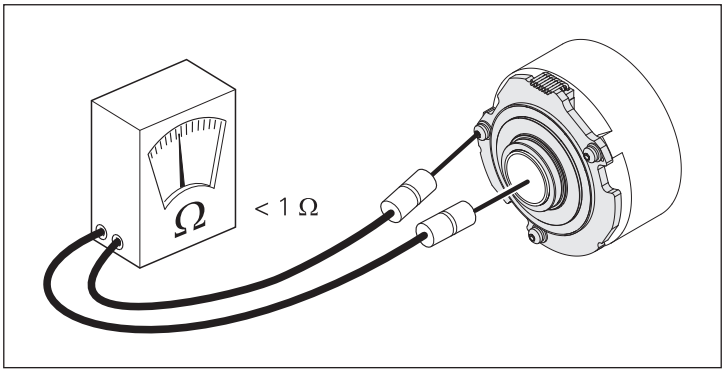
A device-specific default value is saved here before the encoder is shipped. The temperature measured by the internal temperature sensor is higher by a device-specific and application-specific amount than the temperature at the measuring point as shown in the dimension drawing.

Each axis of the rotary encoders features a further, albeit non-adjustable trigger threshold for the "Temperature exceeded" EnDat error message of the internal temperature sensor. When this is reached, an EnDat error message is output (EnDat memory area "Operating status," word 0 "Error messages," bit 2^2 "Position" and in additional data 2 "Operating status error sources," bit 2^6 "Temperature exceeded"). This trigger threshold may vary depending on the encoder and is stated in the specifications.

HEIDENHAIN recommends adjusting the warning threshold based on the application such that this threshold is sufficiently below the trigger threshold for the "Temperature exceeded" EnDat error message. Compliance with the temperature at the measuring point is required for adherence to the encoder's intended and proper use.

Electrical resistance

Check the electrical resistance between the customer-side stator and both customer-side shafts. Nominal value:
< 1 ohm



Testing and inspection devices, and diagnostics

HEIDENHAIN encoders provide all of the information needed for setup, monitoring and diagnostics. The type of information available depends on whether the encoder is incremental or absolute and on which interface is being used.

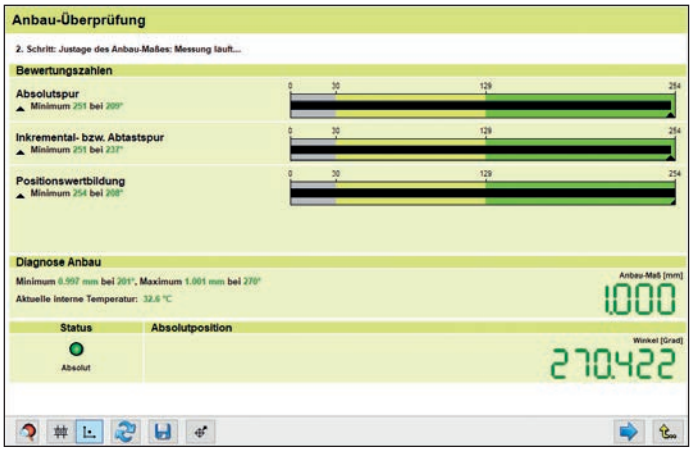
Absolute encoders employ serial data transmission. The signals are extensively monitored within the encoder. The monitoring results (particularly valuation numbers) can be transmitted to the downstream electronics along with the position values via the serial interface (**digital diagnostic interface**). The following information is available:

- Error message: position value is not reliable
- Warning: an internal functional limit of the encoder has been reached
- Valuation numbers:
  - Detailed information about the encoder's function reserve
  - Identical scaling for all HEIDENHAIN encoders
  - Cyclic reading capability

This enables the downstream electronics to evaluate the current status of the encoder with little effort, even in closed-loop mode.

For the analysis of these encoders, HEIDENHAIN offers the appropriate PWM inspection devices and PWT testing units. Based on how these devices are integrated, a distinction is made between two types of diagnostics:

- Encoder diagnostics: the encoder is connected directly to the testing or inspection device, thereby enabling a detailed analysis of encoder functions.
- Monitoring mode: the PWM inspection device is inserted within the closed control loop (via suitable testing adapters as needed). This enables real-time diagnosis of the machine or equipment during operation. The available functions depend on the interface.



Mounting accuracy with the PWM 21 and ATS software

PWM 21

The PWM 21 phase-angle measuring unit, in conjunction with the included ATS adjusting and testing software, serves as an adjusting and testing package for the diagnosis and adjustment of HEIDENHAIN encoders.

For more information, see the *PWM 21, ATS Software* Product Information document.

	PWM 21
Encoder input	• EnDat 2.1, EnDat 2.2 or EnDat 3 (absolute value with or without incremental signals) • DRIVE-CLiQ • Fanuc Serial Interface • Mitsubishi high speed interface • Yaskawa Serial Interface • Panasonic Serial Interface • SSI • 1 V_{PP}/TTL/11 μA_{PP} • HTL (via signal adapter)
Interface	USB 2.0
Supply voltage	AC 100 V to 240 V or DC 24 V
Dimensions	258 mm × 154 mm × 55 mm

DRIVE-CLiQ is a registered trademark of Siemens AG.

Electrical connection

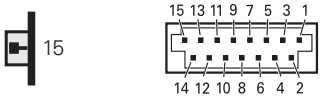
Connecting a special testing cable to the PWM 21 diagnostic and inspection unit establishes a connection with Encoder A (output side). Encoder B (motor side) is connected via a different special testing cable.

HEIDENHAIN offers two testing cables for this purpose. As a result, either a testing cable for the output-side encoder or a testing cable for the motor-side encoder can be connected to the PWM 21 as needed.

Pin layout of the testing cables

Testing cables for connecting to Encoder A: 1311046-xx (contained in the testing cable package (ID 1311061-xx))

15-pin PCB connector



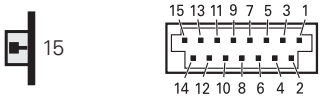
	Power supply				Serial data transmission (Encoder A)			
15	**14**	**12**	**13**	**11**	**7**	**8**	**9**	**10**
KCI 120 D*plus*	**0 V**[1)]	**Sensor**[1)] 0 V	**U_P**[1)]	**Sensor**[1)] U_P	**DATA A**	**$\overline{\text{DATA}}$ A**	**CLOCK A**	**$\overline{\text{CLOCK}}$ A**
KBI 136 D*plus*	**U_P**	**U_{BAT}**	**0 V**[1)]	**0 V_{BAT}**[1)]	**DATA A**	**$\overline{\text{DATA}}$ A**	**CLOCK A**	**$\overline{\text{CLOCK}}$ A**
	White/Green	White	Brown/Green	Blue	Gray	Pink	Violet	Yellow

U_P = Power supply
Vacant pins or wires must not be used!

[1)] Connected inside the encoder

Testing cables for connecting to Encoder B: 1311047-xx (contained in the testing cable package (ID 1311061-xx))

15-pin PCB connector



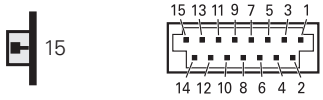
	Power supply				Serial data transmission (Encoder B)			
15	**14**	**12**	**13**	**11**	**1**	**2**	**3**	**4**
KCI 120 D*plus*	**0 V**[1)]	**Sensor**[1)] 0 V	**U_P**[1)]	**Sensor**[1)] U_P	**DATA B**	**$\overline{\text{DATA}}$ B**	**CLOCK B**	**$\overline{\text{CLOCK}}$ B**
KBI 136 D*plus*	**U_P**	**U_{BAT}**	**0 V**[1)]	**0 V_{BAT}**[1)]	**DATA B**	**$\overline{\text{DATA}}$ B**	**CLOCK B**	**$\overline{\text{CLOCK}}$ B**
	White/Green	White	Brown/Green	Blue	Gray	Pink	Violet	Yellow

U_P = Power supply
Vacant pins or wires must not be used!

[1)] Connected inside the encoder

Pin layout

15-pin PCB connector



	Power supply				Serial data transmission (Encoder A)				Serial data transmission (Encoder B)			
15	**14**	**12**	**13**	**11**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
KCI 120 D*plus*	**0 V**[1]	**Sensor**[1] 0 V	**U_P**[1]	**Sensor**[1] U_P	**DATA A**	**$\overline{\text{DATA}}$ A**	**CLOCK A**	**$\overline{\text{CLOCK}}$ A**	**DATA B**	**$\overline{\text{DATA}}$ B**	**CLOCK B**	**$\overline{\text{CLOCK}}$ B**
KBI 136 D*plus*	**U_P**	**U_{BAT}**	**0 V**[1]	**0 V_{BAT}**[1]	**DATA A**	**$\overline{\text{DATA}}$ A**	**CLOCK A**	**$\overline{\text{CLOCK}}$ A**	**DATA B**	**$\overline{\text{DATA}}$ B**	**CLOCK B**	**$\overline{\text{CLOCK}}$ B**

U_P = Power supply
Vacant pins or wires must not be used!
[1] Connected inside the encoder

The downstream electronics must have a common ground reference!

Cable length > 0.5 m:
To prevent crosstalk, the two EnDat interfaces must be separately shielded from each other. The cable sold by the meter with ID 1347450-xx (PUR, Ø 3.7 mm) can be used for this. Two cables must be attached to the PCB connector in order to transmit the EnDat signals separately. Only one cable is used for the power supply.

When using the cable sold by the meter with ID 1347450-xx, comply with the general information in the *Cables and Connectors* brochure; use of the cables at temperatures of up to 100 °C is possible, provided that the exposure to hydrolysis and harmful media is low.

Cable length ≤ 0.5 m:
When single wires with up to a maximum length of 0.5 m are used, each data and clock wire combination must be implemented as a twisted wire pair in order to avoid coupled interferences. As an alternative, the cable with ID 605090-51 (EPG, Ø 4.5 mm) and a length of 0.3 m can be used. The general information in the *Cables and Connectors* brochure must be taken into account.

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.

More information:

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

- Operating Instructions: KCI 120 D*plus*, KBI 136 D*plus* 1381290-xx
- Operating Instructions: TK KCI 120 D*plus*, KBI 136 D*plus* AE04 1432069-xx