HEIDENHAIN

Product Information

ECI 1323 S*plus*
EQI 1335 S*plus*

Bearingless Absolute Rotary Encoders With Accelerometer

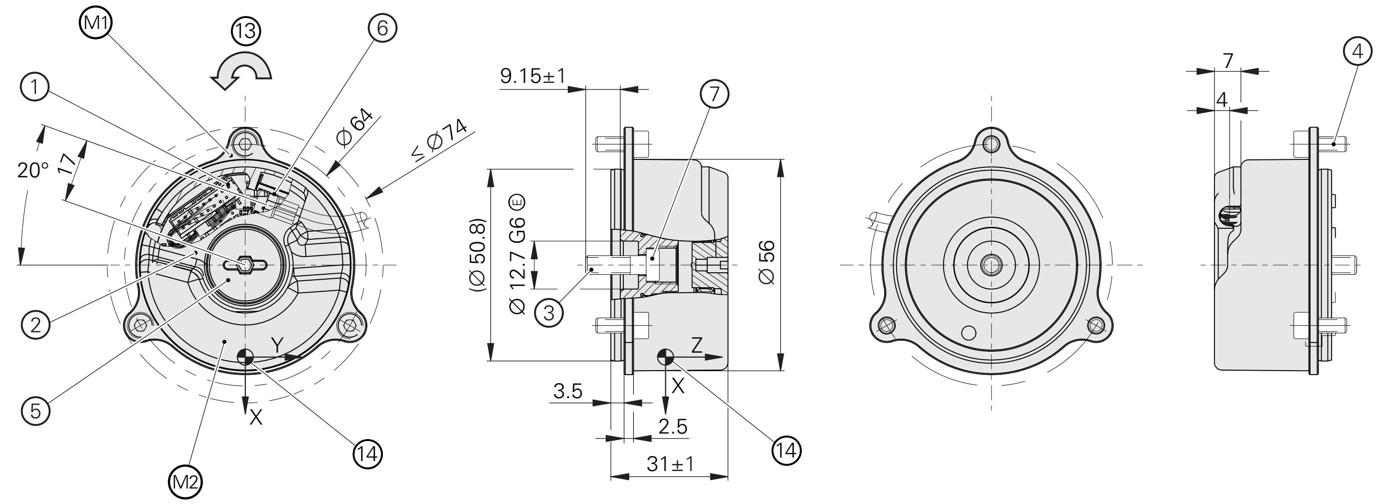
EnDat 3

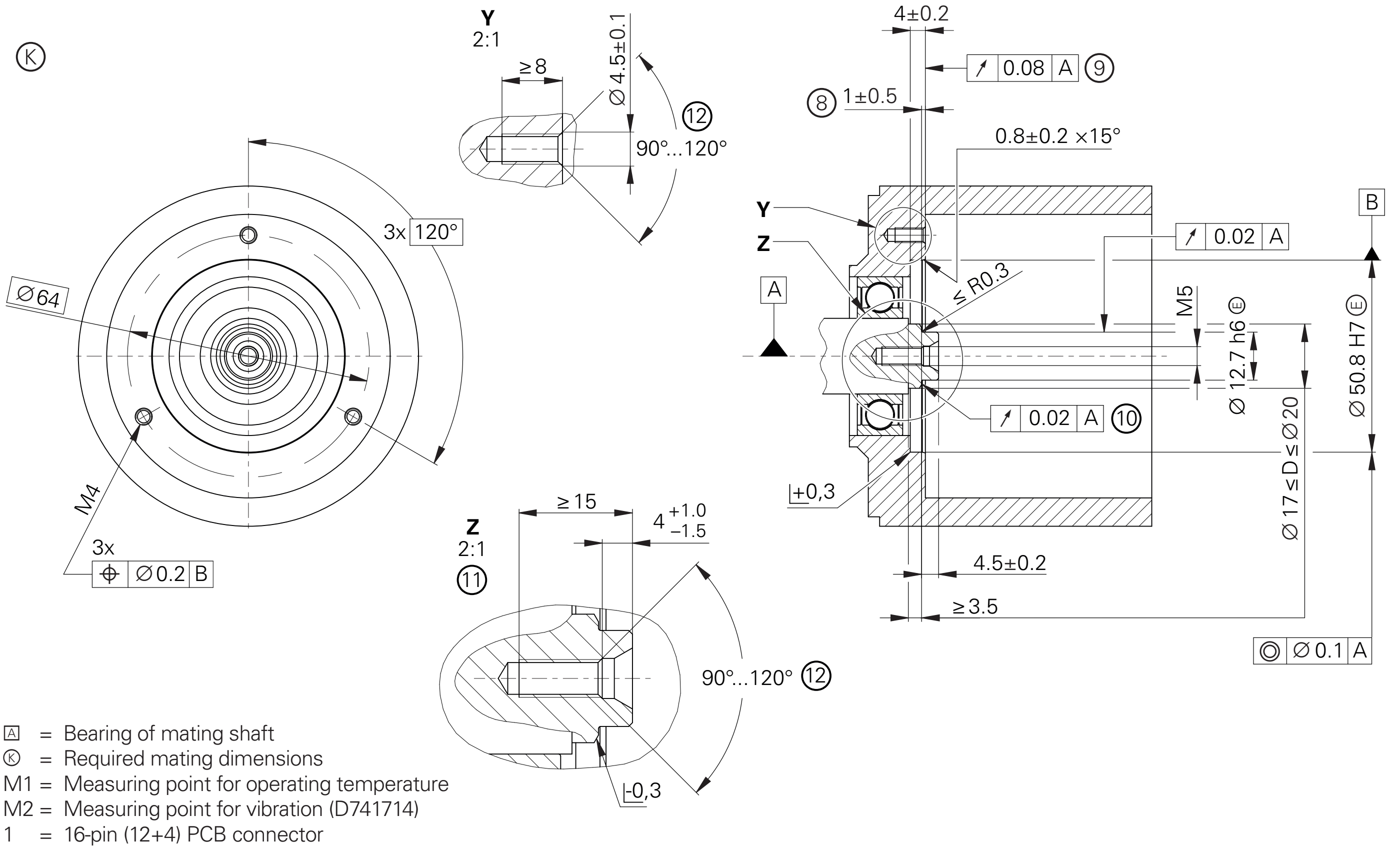
0YA (44C) flange

05/2025

ECI 1323 S*plus*, EQI 1335 S*plus*

Rotary encoders for absolute position values
- **Robust inductive scanning principle**
- **Built-in accelerometer**
- **Configurable vibration data analysis**
- **44C blind hollow shaft for axial clamping (Ø 12.7 mm)**





A = Bearing of mating shaft
K = Required mating dimensions
M1 = Measuring point for operating temperature
M2 = Measuring point for vibration (D741714)
1 = 16-pin (12+4) PCB connector
2 = Die-cast cover
3 = Cylinder head screw: DIN 6912 –M5×16 – 08.8 – MKL; tightening torque: 5 Nm +0.5 Nm
4 = Cylinder head screw: ISO 4762 – M4×10 – 8.8 – MKL; tightening torque: 2 Nm ±0.1 Nm
5 = Screw plug: widths A/F 3 and 4; tightening torque: 5 Nm +0.5 Nm
6 = Fastening for cable with crimp sleeve (Ø 6.1 +0.2 × 10)
7 = M10 back-off thread
8 = Mounting clearance between shaft surface and flange surface; compensation of mounting tolerances and thermal expansion; dynamic motion permitted over entire range; consult with HEIDENHAIN if tolerance range deviates
9 = ExI flange surface: ensure full-surface contact!
10 = Shaft surface; ensure full-surface contact!
11 = Centering hole as per DIN 332 Part 2 permissible
12 = Chamfer at start of thread is mandatory for material bonding anti-rotation lock
13 = Direction of shaft rotation for output signals as per the interface description
14 = Position and orientation of the built-in accelerometer (optional)

*Instructions: 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

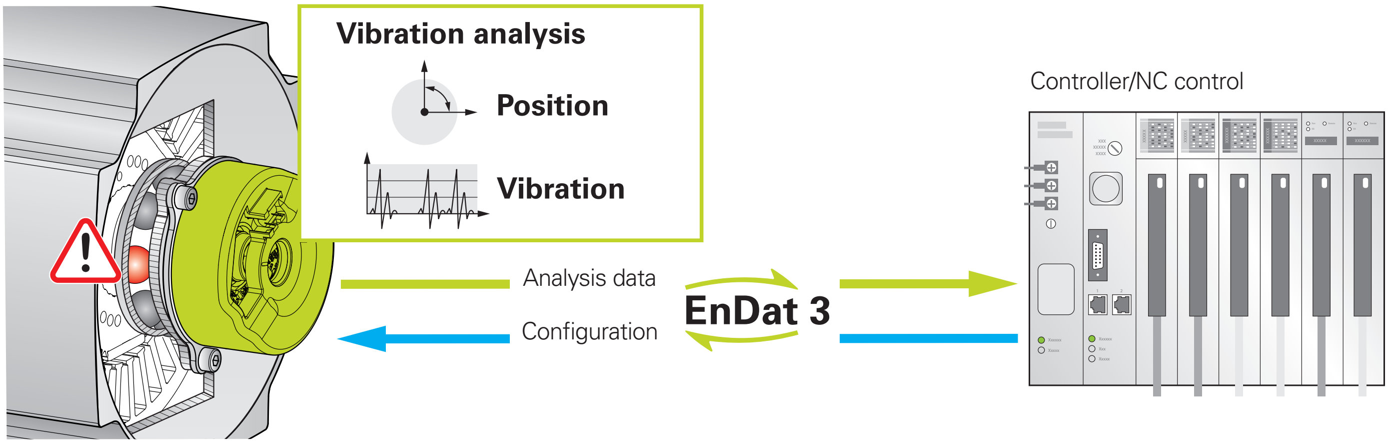
Specifications	**ECI 1323 *Splus* singleturn**	**EQI 1335 *Splus* multiturn**
Interface	EnDat 3	
Ordering designation	E30-R2	
Position values per rev.	8 388 608 (23 bits)	
Revolutions	–	4096 (12 bits)
Availability of position value[1)]	≤ 11 µs at 12.5 Mbit/s ≤ 8.2 µs at 25 Mbit/s	
Analog delay time t_{AD} (typical)	22.9 µs	
System accuracy	±40″	
Accelerometer	*Number of axes:* 3	
Measuring range	±15 g, ±30 g, ±60 g	
Measuring step	16 bits	
Bandwidth	Up to 8000 Hz	
Vibration analysis	• RMS value (Root Mean Square) • Frequency analysis • Order analysis	
Operating status data	Available	
Electrical connection	16-pin (12+4) PCB connector, with connection for external temperature sensor	
Cable length	≤ 100 m at 12.5 Mbit/s; ≤ 40 m at 25 Mbit/s	
Supply voltage	DC 4 V to 14 V	
Power consumption[2)] (maximum)	≤ 720 mW	≤ 800 mW
Current consumption (typical)	*At 12 V:* 30 mA (without load)	*At 12 V:* 36 mA (without load)
Shaft	44C blind hollow shaft for axial clamping (∅ 12.7 mm)	
Speed	≤ 15 000 rpm	≤ 12 000 rpm
Moment of inertia of rotor	$2.45 \cdot 10^{-6}$ kgm^2	$2.6 \cdot 10^{-6}$ kgm^2
Angular acceleration of rotor	$\leq 1 \cdot 10^5$ rad/s^2	
Axial motion of measured shaft	≤ ±0.5 mm	
Vibration 55 Hz to 2000 Hz[3)] **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 error message for excessive temperature	126 °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 rating EN 60529	IP20	
Mass	≈ 0.13 kg	
ID number	1433674-01/1433674-51[4)]	1433675-01/1433675-51[4)]

[1)] The value is stored as the parameter XEL.timeHPFout in the encoder and states the period of time between the request of the position value (from latch) and the availability of the position value in the master (without cable influence); [2)] See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure; [3)] 10 Hz to 55 Hz, constant over 4.9 mm peak to peak; [4)]In collective package

Vibration analysis

Unnoticed damage in a production system may lead to scrap or a production stop. The resulting knock-on damage usually requires costly repairs and causes long periods of downtime. Being able to detect vibrations early on is an effective way to prevent machine damage, system failure and damaged production parts. Featuring a built-in 3D accelerometer and special evaluation electronics, the ECI 1323 S*plus* and EQI 1335 S*plus* inductive rotary encoders provide a highly efficient solution for analyzing vibrations, thereby enabling the detection of damage to rotating machine components at an early stage.

ECI 1323 S*plus*/EQI 1335 S*plus*
Design



The ECI 1323 S*plus* and EQI 1335 S*plus* rotary encoders offer different methods of vibration analysis.

In the simpler method, the Root Mean Square (RMS) of the acceleration is provided as an indicator for the operating status. High RMS values usually indicate large amounts of energy, most often in the form of vibrations. Loads of this magnitude may increase wear and material fatigue or cause structural failure. The RMS value, however, does not permit detailed fault analysis, because important information is still lacking.

The ECI 1323 S*plus* and EQI 1335 S*plus* rotary encoders also feature highly effective frequency and order analysis for machine and component monitoring. These methods even enable early damage detection for rolling bearings. By means of the fast Fourier transform, signals are converted into a frequency spectrum, allowing frequencies arising from damage to be identified and correlated with the sources of error.
A frequency analysis offers the following benefits:

- The ability to identify the sources of error (e.g., unbalance, bearing faults and gear errors)
- The ability to track speed-independent frequencies

Order analysis is particularly beneficial for machines with rotating components.

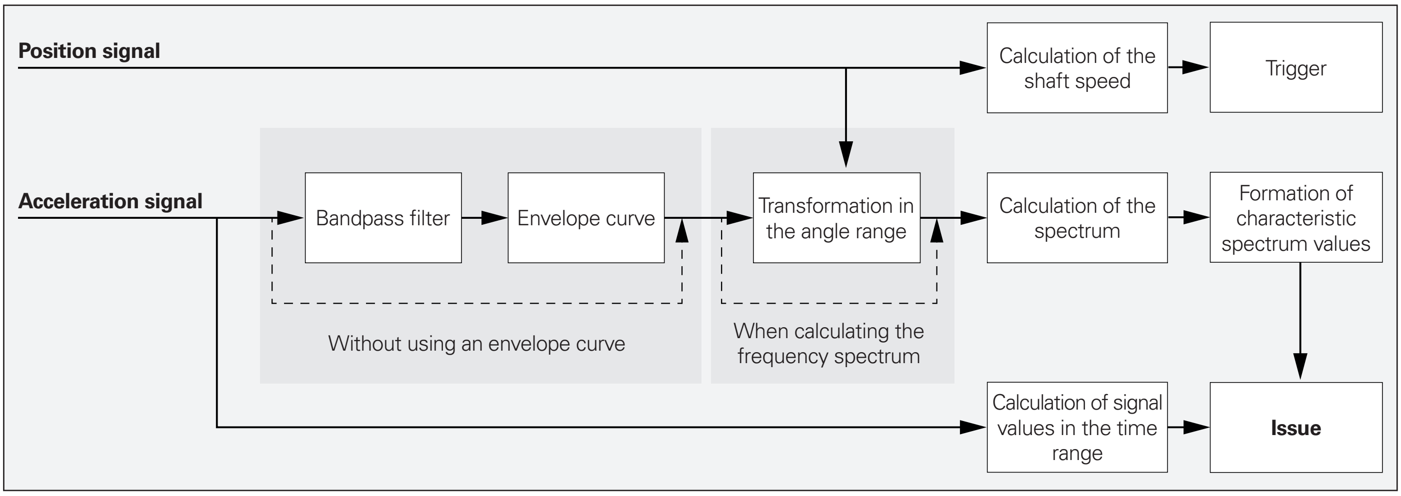
In this type of analysis, vibrations are examined relative to the rotational speed and sorted into orders. An order is a multiple of a rotational speed. The 2nd order, for example, is equivalent to twice the rotational speed. Order analysis is possible in the rotary encoder because the position and acceleration signals are tracked synchronously.

An order analysis offers the following benefits:

- Resonances and harmonic effects are identified independently of the speed.
- Damage can be detected in its early stages thanks to high sensitivity for irregular damage.
- Analysis results are consistently exact, even with changes in rotational speed

These two methods often complement each other and can be used in combination to enable more comprehensive diagnostics and machine monitoring.

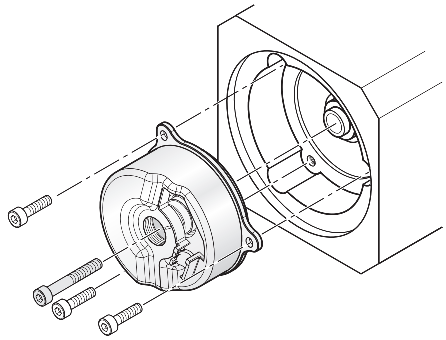
Meanwhile, the EnDat interface enable versatile configuration of the signal processing at any time, allowing the different methods of analysis—the filter option and the fast Fourier transform—to be deployed as needed. The documents about vibration analysis are listed in the Operating Instructions.



Simplified block diagram of signal processing by the additional sensor

Mounting

The blind hollow shaft of the rotary encoder is pressed onto the measured shaft and fastened with a central screw. Mounting on the stator side is performed via a centering diameter with three mounting screws. Use screws with material-bonding anti-rotation lock (see *Mounting accessories*).



Mounting accessories

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

ECI 1323 S*plus* **EQI 1335 S*plus***	**Screws**[1]		**Lot size**
Central screw for shaft fastening	DIN 6912 – **M5×16** – 08.8 – **MKL**	ID 202264-77	10 or 100
Mounting screw for flange	ISO 4762 – **M4×10** – 8.8 – **MKL**	ID 202264-85	30 or 300

[1] With coating for material-bonding anti-rotation lock as per DIN 267-27

More information:

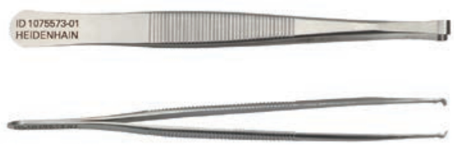
A steel mating shaft and aluminum mating stator are assumed for the fault exclusion design for functional safety.

In addition, comply with the material specifications and other material characteristics in the *Encoders for Servo Drives* brochure (ID 208922-xx).

Please note the information on screws from HEIDENHAIN in the *Encoders for Servo Drives* brochure, under the heading *Screws with material bonding anti-rotation lock* in the chapter *General mechanical information*.

Mounting aid
To avoid damage to the cable, use the mounting aid to connect and disconnect the cable assembly. Apply pulling force solely to the connector 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 1308573).

EnDat 3 adapter
Adapter for connecting an encoder with EnDat 3 (E30-R2) to the PWM 21.

ID 1317260-01

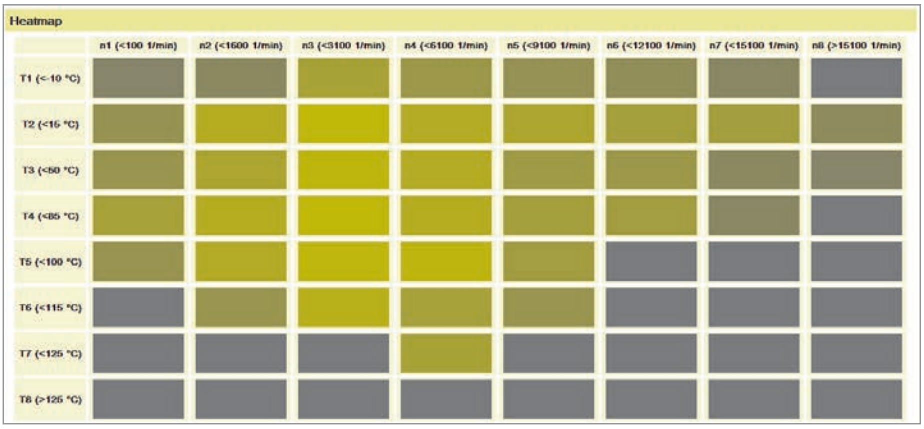
Operating status data

These HEIDENHAIN encoders support the collection of operating data. While the encoder is operating in the application, different data are collected and stored in the device (recorded in permanent memory via a data logger):

- Periodic data (status, histogram and operating statuses, such as operating time and number of reversals)
- Status-based data (extreme values such as temperature, shaft speed and acceleration)
- Status-triggered data (alarm-triggered data such as temperature, valuation numbers and position with time stamp)

This application-specific data can be used for the current analysis of the application or as an input value for higher-level condition monitoring. The data can also be output to help during servicing or for quality management. In such cases, the specific mounting situation of the encoder must be taken into account because it may affect the collected values (mainly the temperatures).

The data can be output directly via the EnDat 3 interface or through an inspection or testing device from HEIDENHAIN. The software belonging to the inspection or testing device (e.g., the ATS software used with the PWM 21) enables visualization of the collected data in the form of tables and histograms.



A typical heatmap (depicting temperature relative to shaft speed during operation)

Built-in temperature evaluation

These rotary encoders features an internal temperature sensor built into its electronics and an evaluation circuit for an external temperature sensor. In both cases, the respective digitized temperature value is transmitted purely serially via the EnDat protocol. Please bear in mind that neither the temperature measurement nor its transmission is safe in terms of functional safety.

Connectible external temperature sensors
The following external temperature sensors can be evaluated in the encoder:

- PT 1000 (activated by default)
- KTY84-130
- KTY83-110

See *Sensor settings* in the EnDat 3 interface specification (Document 3000001).

More information:

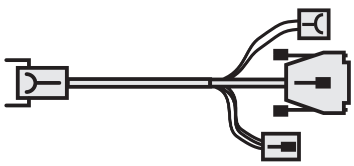
For more information, see the *Encoders for Servo Drives* brochure (chapter on *Temperature measurement in motors*).

Electrical connection

Cables

ETFE output cable for inside the motor 2 x 0.15 mm^2; length: 0.30 m, twisted with cable bushing (for communication); A_P = 0.15 mm^2		
12-pin PCB connector and 8-pin HMC 2 M23 SpeedTEC angle flange socket (male), without shield		1275042-30
12-pin PCB connector and cable end without connecting element, without shield		1302701-30[1]

Pre-assembled cable for ETFE temperature sensor 2 x 0.15 mm^2; length: 0.30 m, with heat shrink tubing (temperature sensor); A_P = 0.15 mm^2		
4-pin PCB connector and 2-pin connector (male), without shield		1302763-30

HMC 2 PUR adapter cable length: 10 m, 25 m, 50 m		
HMC 2 PUR hybrid cable (Ø 11 mm), 1.5 mm^2 power wires with outer shield, orange (2 x 0.25 mm^2) + (2 x 0.75 mm^2) + (4 x 1.5 mm^2); 8-pin M23 SpeedTEC straight connector (female) and 3-pin female header (power); 4-pin male header (brake); 15-pin D-sub connector (male, for communication); also usable as a testing cable (with SA 1210 adapter) for the PWM 21.		1275291-xx

A_P: Cross section of power supply lines
[1] Connecting elements must be suitable for the maximum clock frequency used

Conformity with the EMC Directive must be ensured in the complete system!

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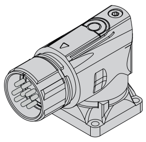
More information:

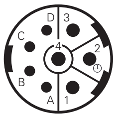
For more cables, see the *Cables and Connectors* brochure (ID 1206103-xx).

Pin layout of ECI, EQI

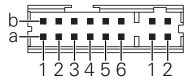
HMC 2 angle flange socket
8-pin M23 SpeedTEC

M23





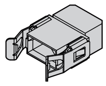
16-pin (12+4)
PCB connector

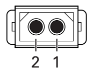


12

4

2





	Encoder			
	Power supply / Serial data transfer		Other signals	
M23	**A**	**B**	**/**	**/**
12	**2b**	**5a**	**/**	**/**
4	**/**	**/**	**1a**	**1b**
2	**/**	**/**	**2**	**1**
	P_SD+[1)]	**P_SD–**[1)]	**T+**[2)]	**T–**[2)]
	Violet	Yellow	Brown	Green

	Motor					
	Brake		**Power supply**			
M23	**C**	**D**	**1**	**4**	**3**	**2**
	Brake +	**Brake –**	**U**	**V**	**W**	**PE**

1) Supply voltage and data: P_SD+ contains U_P (power supply); P_SD– contains 0 V
2) Connections for an external temperature sensor

Cable shield connected to housing; **U_P** = Power supply voltage
Vacant pins or wires must not be used!
Note for safety-related applications: Only completely assembled HEIDENHAIN cables are qualified.
Do not modify cables or exchange their connectors without first consulting with HEIDENHAIN Traunreut!

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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 1447519

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