



HEIDENHAIN



Product Information

AEF 1323

Absolute Rotary Encoder
for Integration in Elevator
Servo Drives

AEF 1323

– The versatile digital feedback system for elevator drives

Modern elevator technology primarily employs direct drive motors, with permanent-magnet synchronous motors being the predominant drive system.

When it comes to the selection of drive systems for new elevators or modernization projects, the following characteristics are important:

- Compact design
- High power density
- High energy efficiency
- Maintenance-free design

In certain market segments, factors such as passenger comfort and ride smoothness are also among the important selection criteria. An efficient drive package is essential for optimally meeting these requirements. And a key component of any drive package consisting of an inverter and a motor is its rotary encoder—the drive's feedback system. The encoder provides position values for determining the actual rotational speed of the elevator's motor and for controlling the motor windings in permanent-magnet motors. Both measuring tasks are vital for achieving a high level of ride smoothness and energy efficiency. With the AEF 1323 rotary encoder, HEIDENHAIN is offering a solution perfectly tailored to meet these requirements.

The AEF 1323 provides the inverter with position information at a resolution of 23 bits (8 388 608 distinguishable positions) and a clock rate of up to 4 MHz. This enables highly dynamic and efficient motor control, so that elevator passengers barely even notice changes in position. It also allows elevator manufacturers to expand the range of possible travel options (e.g., by including a fast start function).

The AEF 1323 also offers significant advantages when it comes to the commissioning process. For example, the protocol of the AEF 1323 enables the assignment of any position value (e.g., zeroing of the singleturn position value). This facilitates and speeds up optimum torque alignment with the correct phase between the inverter and the magnetic field of the motor. Due to its high resolution, the AEF 1323 can be precisely adapted to many different numbers of pole pairs, allowing a single rotary encoder model to be combinable with a wide range of motor designs.

As the communication link between the motor and the inverter, the digital EnDat 2.2 protocol offers additional important advantages. During commissioning of the inverter, the parameters of the rotary encoder and the predefined parameters for the motor and brake can be loaded from the EEPROM area (electronic ID label) of the rotary encoder electronics. This saves time and avoids the entry errors that are otherwise difficult to rule out when the drive system is configured manually. In addition, the EnDat 2.2 protocol supports monitoring functions that make it possible to ensure high availability for the elevator system.

The sophisticated electronics of the rotary encoder enable the evaluation of the encoder's internal temperature sensor and

of an optional external temperature sensor as well. These electronics also provide diagnostic values in the form of valuation numbers for assessing the encoder's functional reserves. The temperature and diagnostic values are transmitted continuously in a closed loop to the inverter for further processing. When critical values change, preventive measures can be initiated in order to avoid unscheduled maintenance of the elevator.

The AEF 1323 features the option of storing operating data within the rotary encoder itself. This data can then be evaluated in the event of disruptions or for the purpose of fault analysis and prevention. Storing this data in the rotary encoder permits evaluation even after the motor and the rotary encoder have been



disconnected from the inverter. With its highly reliable data transmission and carefully configured warning and alarm sources, the AEF 1323 offers strong self-monitoring and evaluation capability.

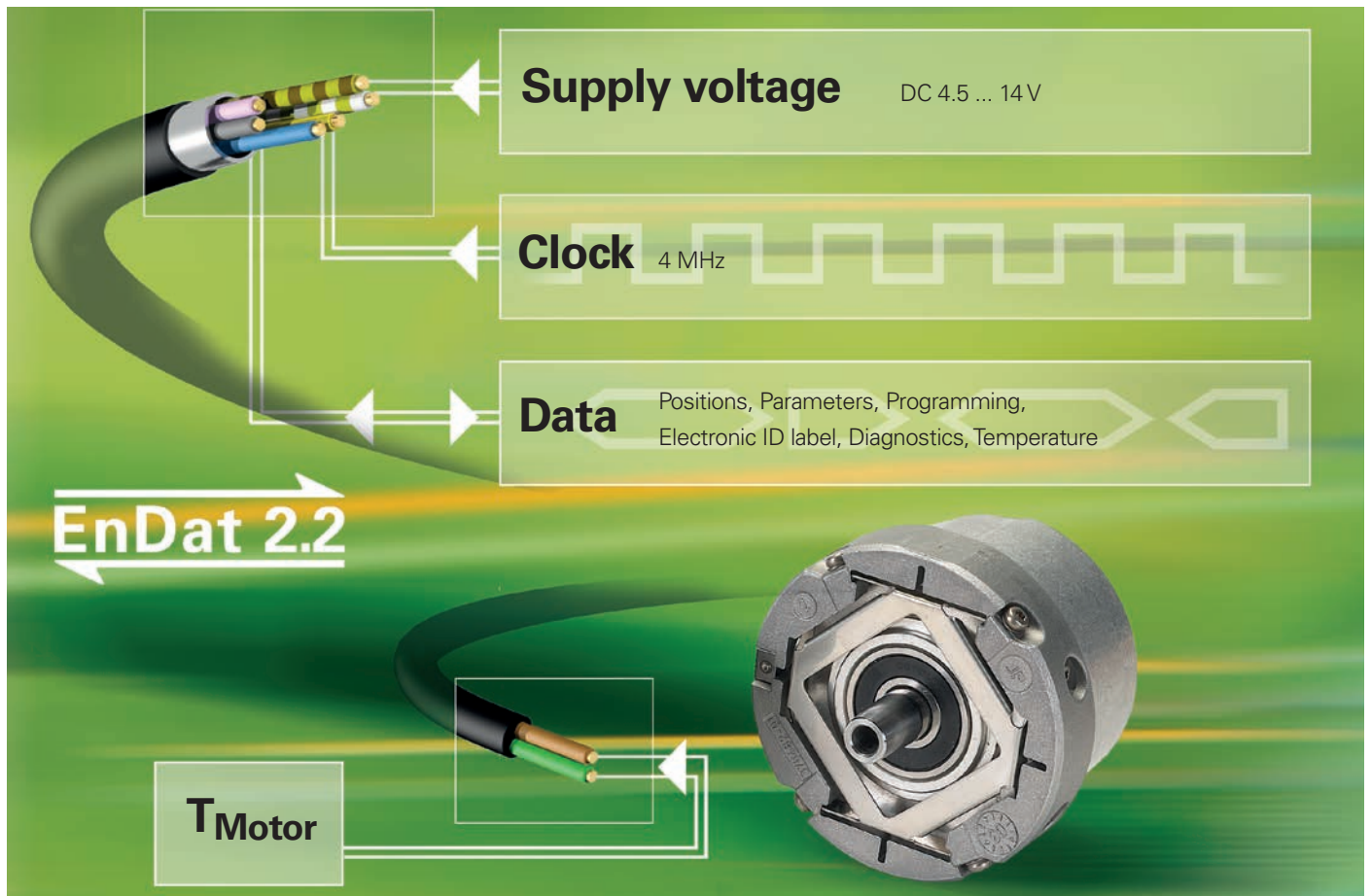
Thanks to its operating temperature range of up to +100 °C, the AEF 1323 is also well suited for particularly demanding and high-performance drive technology. Moreover, the digital design of the rotary encoder is resilient against electromagnetic interference. The system demonstrates strong resistance to interference imposed on its differentially transmitted (RS-485) bit sequences. In addition, connecting cables with only six wires and an external shield simplify the connection technology. The

ample supply voltage range, from +4.5 V to +14 V, eliminates the need for sense lines for monitoring the supply voltage in the case of large cable lengths, and it keeps the level of provisioning complexity low. In addition to reverse-polarity protection, the unit's electronics feature an ESD-resistant RS-485 interface for a high degree of protection during installation and operation.

As an alternative to a functional connection of the digital rotary encoder with EnDat 2.2 protocol, units with SSI protocol are available as well.

The mechanical connection of the rotary encoder can be adapted to the respective elevator motor application. You have a

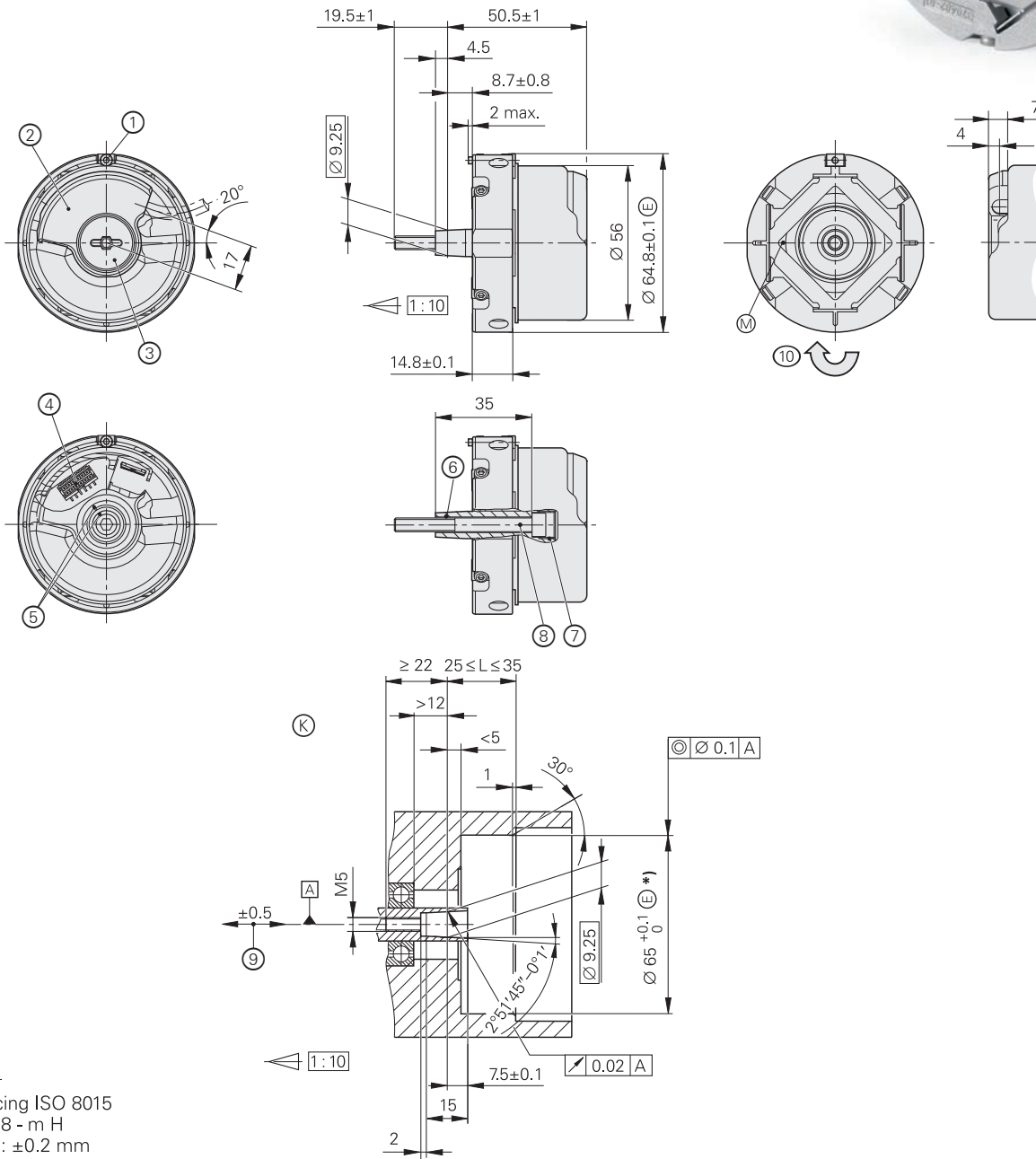
choice between two mechanical mounting options with a standardized taper shaft. One of the mounting systems, which uses an expanding ring coupling, is highly rigid and thus optimized for dynamic control. The other has a more forgiving design when it comes to mounting tolerances thanks its stator coupling for plane surfaces. The latter option can compensate for axial offsets (up to ±1.5 mm) that arise during mounting and can also compensate for static direction-dependent eccentricity of the motor shaft (up to ±0.13 mm). The additional permissible runout error of the motor shaft is likewise a maximum of 0.13 mm.



AEF 1323

Rotary encoder with integral bearing for elevator technology

- 06 stator coupling for axial mounting and compensation of mounting tolerances
- Rigid shaft coupling with 65B tapered shaft
- Standardized dimensions for various interfaces



mm

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

- ☒ = Bearing of mating shaft
- ⊗ = Required mating dimensions
- ⊙ = Measuring point for operating temperature
- 1 = Clamping screw for coupling ring width A/F 2; tightening torque: 1.25 – 0.2 Nm
- 2 = Die-cast cover
- 3 = Screw plug, width A/F 3 and A/F 4; tightening torque 5 + 0.5 Nm
- 4 = PCB connector
- 5 = Location of reference marks of shaft and housing
- 6 = M6 back-off thread
- 7 = M10 back-off thread
- 8 = Self-tightening screw as per ISO 6912 – M5 x 50 – 08.8, width A/F 4; tightening torque: 5 + 0.5 Nm
- 9 = Compensation for mounting tolerances and thermal expansion; no dynamic motion permitted
- 10 = Direction of shaft rotation for output signals as per the interface description

Absolute		
AEF 1323		
Interface ¹⁾	EnDat 2.2	SSI
Ordering designation	EnDat22	SSI03r1
Position values per rev.	8 388 608 (23 bits)	
Elec. permissible speed	≤ 15000 rpm (for continuous position value)	
Calculation time t_{cal} Clock frequency	≤ 7 μ s ≤ 4 MHz	≤ 5 μ s
Line count	2048	
System accuracy	±20"	
Electrical connection	16-pin PCB connector with connection for temperature sensor ²⁾	12-pin PCB connector
Supply voltage	DC 4.5 V to 14 V	
Power consumption (max.)	4.5 V: ≤ 0.6 W 14 V: ≤ 0.7 W	
Current consumption (typical)	4.5 V: 85 mA (typical, without load)	
Stator coupling	Expanding ring coupling	
Natural frequency of the stator coupling	≥ 1800 Hz	
Shaft	Taper shaft \varnothing 9.25 mm; taper 1:10	
Mech. permiss. speed n	≤ 15000 rpm	
Starting torque	≤ 0.01 Nm (at 20 °C)	
Moment of inertia of rotor	$2.6 \cdot 10^{-6} \text{ kgm}^2$	
Permiss. axial motion of measured shaft	±0.5 mm	
Vibration 55 Hz to 2000 Hz Shock 6 ms	≤ 300 m/s^2 (EN 60068-2-6) ≤ 2000 m/s^2 (EN 60068-2-27)	
Max. operating temp.	100 °C	
Min. operating temperature	-40 °C	
Protection EN 60529	IP40 when mounted	
Mass	≈ 0.25 kg	
Valid for ID	1179213-02	1179215-01

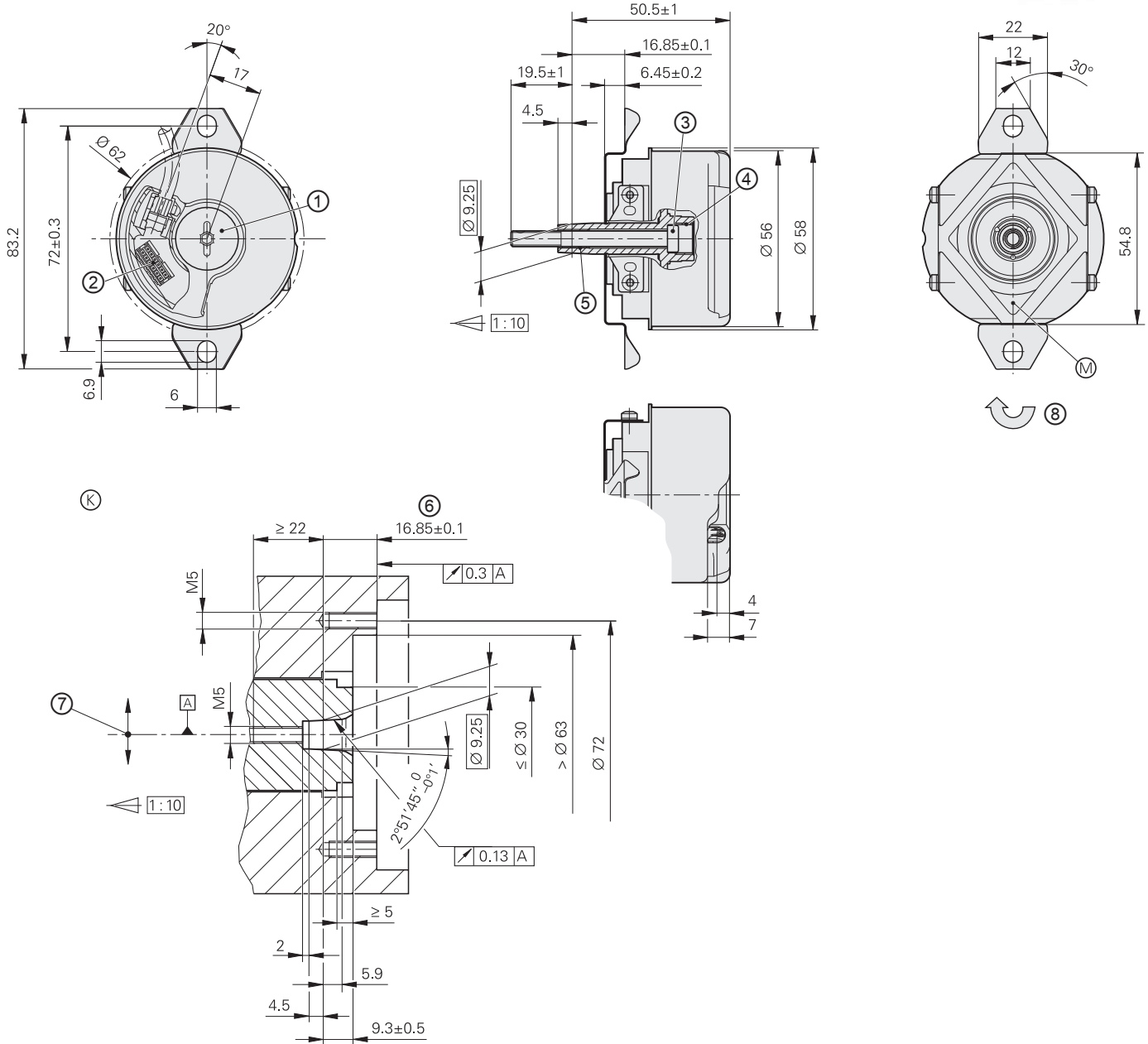
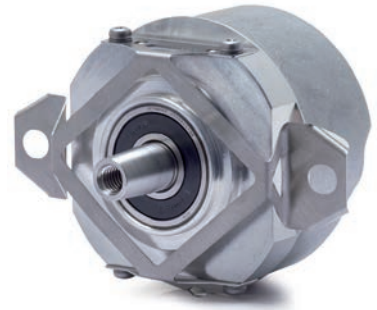
¹⁾ With reverse polarity protection diode and short-circuit protected outputs (against U_P up to +12 V)

²⁾ Evaluation optimized for KTY 84-130

AEF 1323

Rotary encoder with integral bearing for elevator technology

- Simple installation
- Rigid shaft coupling with 65B tapered shaft
- 66A plane-surface coupling for large mounting tolerances
- Standardized dimensions for various interfaces



mm



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

- ▣ = Bearing of mating shaft
- ▢ = Bearing of encoder
- ⊗ = Required mating dimensions
- Ⓜ = Measuring point for operating temperature
- 1 = Screw plug width A/F 3 and 4; tightening torque 5 Nm +0.5 Nm
- 2 = PCB connector
- 3 = Self-locking screw as per ISO 6912 – M5 x 50 – 08.8, width A/F 4; tightening torque: 5 Nm +0.5 Nm
- 4 = M10 back-off thread
- 5 = M6 back-off thread
- 6 = Max. permissible tolerance during motor shaft rotation: ±1.5 mm
- 7 = Max. permissible static radial offset of motor shaft in indicated direction: ±0.13 mm
- 8 = Direction of shaft rotation for output signals according to interface description

Absolute		
AEF 1323		
Interface¹⁾	EnDat 2.2	SSI
Ordering designation	EnDat22	SSI03r1
Position values/revolution	8 388 608 (23 bits)	
Elec. permissible speed	≤ 15000 rpm (for continuous position value)	
Calculation time t_{cal} Clock frequency	≤ 7 μs ≤ 4 MHz	≤ 5 μs
Line count	2048	
System accuracy	±20''	
Electrical connection	16-pin PCB connector with connection for temperature sensor ²⁾	12-pin PCB connector
Supply voltage	DC 4.5 V to 14 V	
Power consumption (max.)	4.5 V: ≤ 0.6 W 14 V: ≤ 0.7 W	
Current consumption (typical)	4.5 V: 85 mA (typical, without load)	
Stator coupling	Plane-surface coupling	
Natural frequency of the stator coupling	≥ 400 Hz	
Shaft	Taper shaft Ø 9.25 mm; taper 1:10	
Mech. permiss. speed n	≤ 2000 rpm	
Starting torque	≤ 0.01 Nm (at 20 °C)	
Moment of inertia of rotor	$2.6 \cdot 10^{-6} \text{ kgm}^2$	
Permiss. Axial motion of measured shaft ³⁾	±1.5 mm	
Permiss. axial motion of measured shaft	0.13 mm (static radial offset additionally ±0.13 mm)	
Vibration 55 Hz to 2000 Hz Shock 6 ms	≤ 300 m/s ² (EN 60068-2-6) ≤ 2000 m/s ² (EN 60068-2-27)	
Max. operating temp.	100 °C	
Min. operating temperature	-40 °C	
Protection EN 60529	IP40 when mounted	
Mass	≈ 0.25 kg	
Valid for ID	1179213-01	1179215-xx


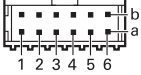

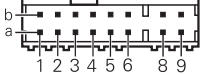



¹⁾ With reverse polarity protection diode and short-circuit protected outputs (against U_P up to + 12 V)

²⁾ Evaluation optimized for KTY 84-130

³⁾ Compensation for mounting tolerances and thermal expansion, but not for dynamic motion

Electrical connection

Pin layout of AEF 1323

12-pin PCB connector		16-pin PCB connector							
									
12		16							
	Power supply		Serial data transfer				Other signals ¹⁾		
	12	1b	4b	6b	1a	2b	5a		
	16	1b	4b	6b	1a	2b	5a	8a 8b	
		Brown/Green	White/Green	Gray	Pink	Violet	Yellow	Brown Green	
		U_P	0V	DATA	$\overline{\text{DATA}}$	CLOCK	$\overline{\text{CLOCK}}$	T⁺ T⁻	



Cable shield connected to housing;

U_P = Power supply; **T** = Temperature


Sensor: The sensor line is connected to the respective power supply in the encoder.
Vacant pins or wires must not be used!

¹⁾ Only for AEF 1323 with temperature sensor connection

Output and adapter cables

PUR output cable ¹⁾ Ø 4.5 mm [3 x (2 x 0.19 mm ²)]		
With 16-pin PCB connector (cable cut off) Wires for TPE temperature sensor 2 x 0.16 mm ²		1180955-xx
With 12-pin PCB connector (cable cut off)		1180959-xx

¹⁾ Up to cable length of 15 m

Adapter cable for connection to PWM 21 and PWT 100 EPG Ø 4.5 mm [16 x 0.057 mm ²]; cable length 2 m		
With PCB connector With strain relief, 12-pin connector and 15-pin male D-sub connector (including three 12-pin adapter connectors and three 15-pin adapter connectors)		621742-01

HEIDENHAIN measuring equipment

PWT 100

The PWT 100 is a testing device for checking the function and adjustment of incremental and absolute HEIDENHAIN encoders. Thanks to its compact dimensions and robust design, the PWT 100 is ideal for portable use.



	PWT 100
Encoder input Only for HEIDENHAIN encoders	<ul style="list-style-type: none"> • EnDat • Fanuc Serial Interface • Mitsubishi high speed interface • Panasonic Serial Interface • Yaskawa Serial Interface • 1 V_{PP} • 11 μA_{PP} • TTL
Display	4.3" color flat-panel display (touch screen)
Supply voltage	DC 24 V Power consumption: max. 15 W
Operating temperature	0 °C to 40 °C
Protection EN 60529	IP20
Dimensions	≈ 145 mm x 85 mm x 35 mm

PWM 21

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



For more information, please refer to the Product Information document *PWM 21 ATS Software*.

	PWM 21
Encoder input	<ul style="list-style-type: none"> • EnDat 2.1 or EnDat 2.2 (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 x 154 mm x 55 mm

	ATS
Languages	Choice between English and German
Functions	<ul style="list-style-type: none"> • Position display • Connection dialog • Diagnostics • Mounting wizard for EBI/ECI/EQI, LIP 200, LIC 4000 and others • Additional functions (if supported by the encoder) • Memory contents
System requirements and recommendations	PC (dual-core processor > 2 GHz) RAM > 2 GB Operating systems: Windows Vista (32-bit), 7, 8, and 10 (32-bit / 64-bit) 500 MB free space on hard disk

DRIVE-CLiQ is a registered trademark of SIEMENS AG.

Further Information

For detailed information, such as general technical descriptions, mounting instructions, specifications, and exact dimensions, please refer to our brochures and product information documents, or visit us on the Internet at www.heidenhain.de



Brochure **Encoders for Servo Drives**

Contents:
Rotary encoders
Angle encoders
Linear encoders



Product Overview **Rotary Encoders for the Elevator Industry**

Contents:
Incremental rotary encoders
and
Absolute rotary encoders

For detailed information on the EnDat 2.2 bidirectional interface, please refer to the technical information document *EnDat 2.2 – Bidirectional Interface for Position Encoders*.



Technical Information **EnDat 2.2 – Bidirectional Interface for Position Encoders**

Contents:
Benefits of the EnDat interface,
Data transfer and memory areas

You can find detailed descriptions of all available interfaces as well as general electrical information in the *Interfaces of HEIDENHAIN Encoders* brochure.



Brochure **Interfaces of HEIDENHAIN Encoders**

HEIDENHAIN

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This Product Information 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 made.



More information:

Comply with the requirements described in the following documents to ensure the correct operation of the encoder:

- Brochure: *Encoders for Servo Drives* 208922-xx
- Brochure: *Interfaces of HEIDENHAIN Encoders* 1078628-xx
- Mounting Instructions: *AEF 1323* 1247482-xx and 1247662-xx
- Brochure: *Cables and Connectors* 1206109-xx

For brochures and product information documents, visit www.heidenhain.de.