



HEIDENHAIN



Product Overview

Rotary Encoders for the Elevator Industry

Rotary encoders for the elevator industry

The demands on elevator technology have been growing steadily in recent years, calling for higher speeds, higher shafts, smaller footprints, and lower operating costs. Also crucial is optimal passenger comfort, requiring smooth starts, constant accelerations, gentle braking, and precise arrival for a pleasant and comfortable ride.

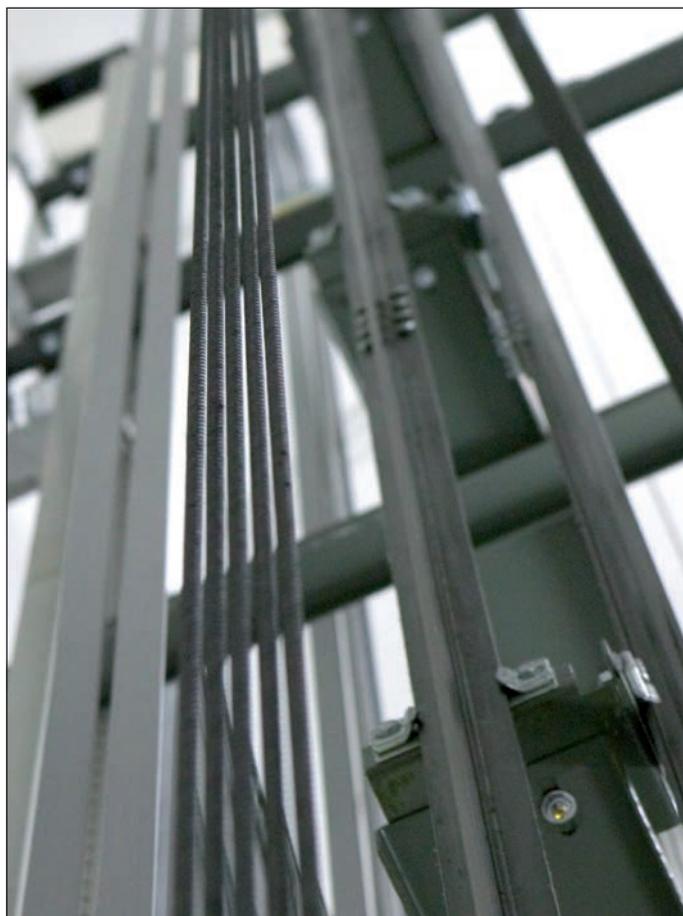
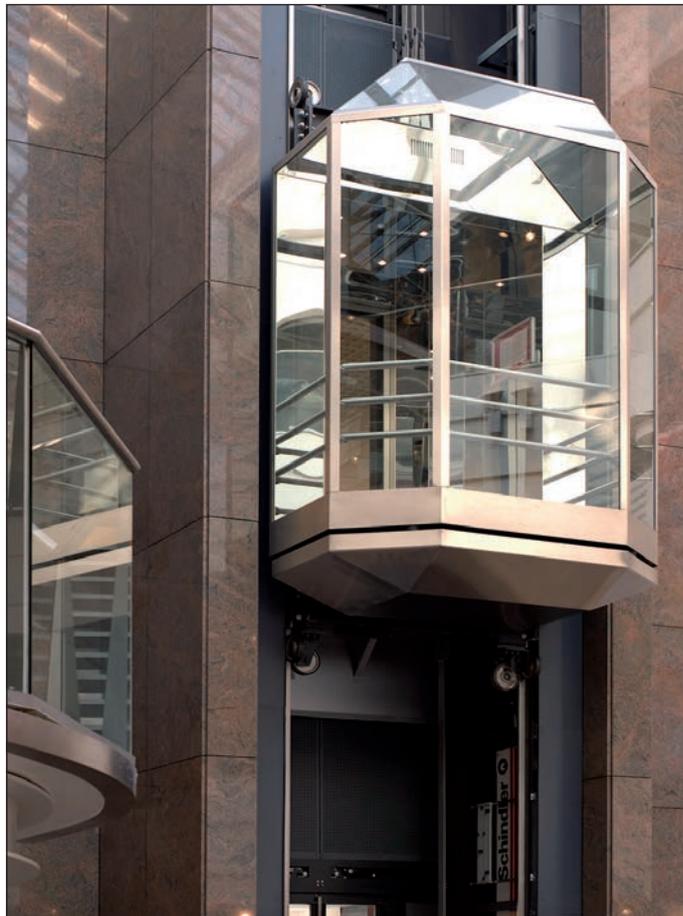
A key role in meeting these requirements is played by the **drive system**, with an unbroken trend towards gearless motor systems. These systems offer a number of economic and environmental benefits:

- Elevator systems featuring low vibration and noise
- Reduced space requirements thanks to machine-room-less elevators (MRL)
- Comfortable ride characteristics
- Low energy consumption
- Low maintenance and oil-free

Permanent-magnet synchronous motors are often used due to their higher power density. Depending on the control strategy, these motors may require absolute position feedback for proper rotor position control. This feedback can be provided by an absolute rotary encoder or an incremental rotary encoder with commutation signals.

Most of these demanding drive systems also require high-resolution rotary encoders integrated into the control loop as position encoders for measurement of the actual speed. Absolute rotary encoders with the purely serial EnDat 2.2 interface, as well as incremental rotary encoders, are ideally suited for this purpose. Rotary encoders from HEIDENHAIN utilize optical or inductive scanning principles. Radial or axial scanning is possible along the entire circumference or over a limited segment. Through mechanical adaptation, rotary encoders from HEIDENHAIN can be used for the feedback control of various motor designs in the elevator industry, such as internal, external, or disc motors.

To meet the high functionality and reliability requirements, and to enable intelligent system integration, rotary encoders for elevator drive systems must possess highly specialized characteristics. This is also true of rotary encoders for other elevator technology applications, such as **digital shaft copying systems** and **door motor** control.



Overview

Rotary encoders for elevator motor control

The HEIDENHAIN product portfolio offers solutions specifically designed for elevator technology. The excellent signal quality and high accuracy of HEIDENHAIN rotary encoders ensure high-quality speed control and exact positioning. Technical details such as rigid shaft connections, high mechanical natural frequencies for rotary encoder couplings, wider run-out tolerances, easy mounting, and, for absolute rotary encoders, high-performance bidirectional interfaces (EnDat), are just a few examples of HEIDENHAIN quality.



AEF/ECN/ERN 1300 series (PCB connector) and **ECN/ERN 400** (cable connection)
With expanding ring coupling (with a high natural frequency of the stator coupling)



AEF/ECN/ERN 1300 series (PCB connector) and **ECN/ERN 400** (cable connection)
With plane-surface coupling (wider run-out and mounting tolerances)

Encoders with an EnDat interface (purely digital or analog signals) permit the retrieval of encoder parameters and predefined motor and brake parameters from an internal EEPROM. This can shorten setup times and prevent input errors during the configuration of drive system parameters. EnDat encoders also permit electronic position adjustment (zeroing), allowing the encoder's absolute position value to be aligned with the orientation of the motor's rotating field and eliminating the need for complicated mechanical alignment. Depending on the encoder, diagnostic functionality such as temperature evaluation and valuation numbers are available for assessing the encoder's functional reserves. Upon a change in critical values, preventive measures can be taken to avoid an unscheduled maintenance interruption of the elevator.



ECN/ERN 100 series
Hollow shafts with inside diameters of up to 50 mm



ECI 4000 series
Featuring a hollow shaft with an inside diameter of up to 180 mm and wide mounting tolerances

The flawless operation of brakes is a key safety characteristic of elevators. Brake monitoring is usually performed by separate microswitches. These microswitches are installed specifically for brake release monitoring and incur considerable cost and effort both before and during operation. The KCI 419 *Dplus* rotary encoder lets you dramatically reduce these costs and increase operational safety at the same time. Along with rotational position feedback, the KCI 419 *Dplus* inductive rotary encoder delivers axial motion feedback for direct measurement of the brake stroke. Based on this feedback, the current brake status (released, applied, or malfunction) and the level of brake wear can be derived by the subsequent electronics.



KCI 419 *Dplus* inductive rotary encoder
Provides additional feedback for axial motion, as well as data for temperature monitoring

ERN incremental rotary encoders / AEF, ECN, ECI, and KCI absolute singletum rotary encoders

Model	Outside dia. ¹⁾	Shaft version	Protection rating	Incremental signals	Signal periods per revolution	Absolute position values	Position values per rev. Commutation	Brake stroke monitoring
ERN 120 ERN 130 ERN 180	87 mm	Hollow through shaft, Ø 20 mm, 25 mm, 30 mm, 38 mm, or 50 mm	IP64	 TTL	1000 to 5000	–	–	–
 HTL								
 1 V _{PP}								
ECN 113				 1 V _{PP}	2048	EnDat01	8192 (13 bits)	–
ECN 125				–	–	EnDat22	33 554 435 (25 bits)	–
ERN 1321 ²⁾	58 mm	Taper shaft, Ø 9.25 mm, 1:10 taper	<i>ECN/ERN 400:</i> IP64 <i>AEF/ECN/ERN 1300:</i> IP40	 TTL	1024 to 10000	–	–	–
ERN 1326 ²⁾				 TTL	1024, 2048, 4096, or 8192	UVW	Three signals for block commutation	–
ERN 1381 ²⁾				 1 V _{PP}	512, 1024, 2048, 4096	–	–	–
ERN 1387 ERN 487				 1 V _{PP}	2048	 1 V _{PP}	Z1 track for sine commutation	–
ECN 1313 ³⁾ ECN 413					2048	EnDat01	8192 (13 bits)	–
ECN 1325 ³⁾ ECN 425					–	EnDat22	33 554 435 (25 bits)	–
AEF 1323 ³⁾						8388608 (23 bits)	–	
KCI 419 ⁴⁾	65 mm	12 mm	IP37	–	–	EnDat22	524288 (19 bits)	0.5 mm to 1.6 mm
ECI 119	87 mm	30 mm, 38 mm, 50 mm	IP20	–	–	EnDat22	524288 (19 bits)	–
ECI 4010 ³⁾	174 mm, 262 mm	Hollow through shaft, Ø 90 mm, 180 mm	IP20	–	–	EnDat22	1 048 576 (20 bits)	–

1) Rotary encoder housing

2) Only in version with expanding ring coupling

3) Connection of an external temperature sensor in the motor is possible

4) Output of additional temperature values (armature plate of the brake)

Rotary encoders for digital shaft copying systems

Shaft copying is used to ensure jerk-free braking and precise positioning of the elevator car. These systems measure the car's position and forward it to the control. Incremental rotary encoders and especially absolute rotary encoders from HEIDENHAIN are ideal for this application. These encoders enable digital shaft copying with clear benefits for control technology and installation.

The key advantage of using absolute multiturn rotary encoders for position detection is the continuous availability of the car's absolute position (even after a power failure). Since actual position values are available at all times, the car can approach its destination rapidly.

A bearing assembly with an EQN 400 is offered specifically for shaft copying. Elevator car position is often measured by means of toothed belts and deflection pulleys. Thanks to the bearing assembly, the high resulting forces are decoupled from the precision bearing of the rotary encoder, thereby preventing encoder overload.



EQN 400 series



Bearing assembly with the EQN 400

Shaft load up to:
Axial 150 N
Radial 350 N

EQN absolute multiturn rotary encoders with a mounted stator coupling

Model	Outside dia. ¹⁾	Shaft version	Protection rating	Incremental signals	Signal periods per revolution	Absolute position values	Position values per revolution	Revolutions
EQN 425	58 mm	Blind hollow shaft or hollow through shaft, Ø 12 mm	IP64	$\sim 1 V_{PP}$	512 or 2048	EnDat01	8192 (13 bits)	4096
					512	SSI		
			IP66		512 or 2048	EnDat01		
					512	SSI		
EQN 437	58 mm	Blind hollow shaft or hollow through shaft, Ø 12 mm	IP64	–	2048	EnDat22	33 554 432 (25 bits)	4096

¹⁾ Rotary encoder housing

Overview

Rotary encoders for door motors

In high-rise buildings with large elevator capacities and high passenger traffic, shorter stopping times are an important goal, allowing more passengers to be transported. A critical factor in handling a building's passenger traffic is proper elevator door operation.

Fast and precise opening and closing with minimal noise requires servo-controlled door motors. Compact rotary encoders from HEIDENHAIN are particularly well suited for speed and position feedback. Thanks to a mounting diameter of less than 40 mm, they are also ideal for limited space requirements.



ERN 1023



ERN 1123



ECI/EBI 1100 series

ERN incremental rotary encoders / ECI absolute singleturn rotary encoders / EBI absolute multiturn rotary encoders

Model	Outside dia. ¹⁾	Shaft version	Protection rating	Incremental signals	Signal periods per revolution	Absolute position values	Position values per revolution	Revolutions ²⁾
ERN 1020 ERN 1030 ERN 1080	36.5 mm	Blind hollow shaft, Ø 6 mm	IP64	 TTL  HTL  ~ 1 V _{pp}	100 to 3600	–	–	–
ERN 1023	35 mm		IP64	 TTL	500 to 2048	U _{VW}	Three signals for block commutation	–
ERN 1123			IP00					
ECI 1118	37 mm		IP00	–	–	EnDat22	262 144 (18 bits)	–
EBI 1135				–	65 536			

¹⁾ Rotary encoder housing

²⁾ By means of battery-buffered revolution counter

HEIDENHAIN measuring equipment

PWM 21

The PWM 21 phase angle measuring unit, in conjunction with the included ATS adjustment and testing software, provides an adjustment 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	<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 • SSI • 1 V_{PP}/TTL/11 μA_{PP}
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	German or English (selectable)
Functions	<ul style="list-style-type: none"> • Position display • Connection dialog • Diagnostics • Mounting wizard for the EBI/ECI/EQI, LIP 200, LIC 4100, 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 system: Windows XP, Vista, 7 (32-bit/64-bit), 8, 10 200 MB of available hard-disk space

DRIVE-CLiQ is a registered trademark of Siemens AG

PWT 101

The PWT 101 is a testing device for the functional testing and adjustment of incremental and absolute HEIDENHAIN encoders. Thanks to its compact and rugged design, the PWT 101 is ideal for portable use.



	PWT 101
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} with Z1 track • 1 V_{PP} • 11 μA_{PP} • TTL
Display	4.3-inch touchscreen
Supply voltage	DC 24 V Power consumption: max. 15 W
Operating temperature	0 °C to 40 °C
Protection EN 60529	IP20
Dimensions	Approx. 145 mm x 85 mm x 35 mm

Further information

For detailed information, including general technical descriptions, mounting information, specifications, and exact dimensions, please refer to the brochures and Product Information documents, or visit www.heidenhain.de.



Product Information **AEF 1323**

Contents:
Absolute rotary encoder
for integration in
elevator servo drives



Product Information **ECN 413** **ECN 425** **ERN 487**

Contents:
Rotary encoders for
elevator motor control
(IP64 degree of
protection)



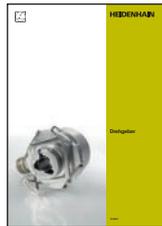
Product Information **ECN 1313** **ECN 1325** **ERN 1387**

Contents:
Rotary encoders
for elevator motor
control



Product Information **KCI 419 Dplus**

Contents:
Rotary encoder
with axial distance
measurement



Brochure **Rotary Encoders**

Contents:
ERN, ROD
incremental rotary
encoders
ECN, EQN, ROC, ROQ
absolute rotary
encoders



Brochure **Encoders for Servo Drives**

Contents:
Rotary encoders
Angle encoders
Linear encoders

For detailed descriptions of all available interfaces and cables, as well as general electrical information, please refer to the brochures.



Brochure **Interfaces** of HEIDENHAIN Encoders



Brochure **Cables and Connectors**

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