HEIDENHAIN

Product Overview

Rotary Encoders for the Elevator Industry

Rotary encoders for the elevator industry

The demands on elevator technology have been growing steadily over these last several years: They call for high speeds and large heights together with compact design and low operating costs. And all that, of course, with optimal passenger comfort. Smooth starting and continuous acceleration are as much a prerequisite for a comfortable ride without unpleasant loads as are gentle braking and exact stopping at the target position.

The **drive control** plays an important role here. The trend continues toward gearless drive machines, which offer a series of economical and environmental advantages:
- Elevator systems with little vibration or noise
- Reduced space requirement thanks to machine-room-less elevators (MRL)
- Comfortable ride properties
- Low energy consumption
- Freedom from maintenance and oil

Permanent-magnet synchronous motors are often used because of their greater power density. Depending on the control strategy, these types of motors require absolute position information for correctly controlling the rotor position. This position information can be provided by an absolute rotary encoder or an incremental rotary encoder with commutation signals, for example.

In addition, these demanding drive strategies mostly require high-resolution rotary encoders, which are integrated as position encoders in the control loop in order to ascertain the actual shaft 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 use either optical or inductive scanning principles. Scanning can be performed radially or axially, over the entire circumference or just a certain segment. With mechanical adaptations, rotary encoders from HEIDENHAIN can be used for feedback control of various motor designs for elevator technology, such as internal, external, or pancake motors.

In order to fulfill the great expectations placed on functionality and reliability, as well as to make a suitable and well thought-out system integration possible, rotary encoders used in elevator technology must fulfill very specific requirements. This applies to the other fields of application for rotary encoders in elevator technology as well: **digital shaft resolution** and the controlling of **door drives.**
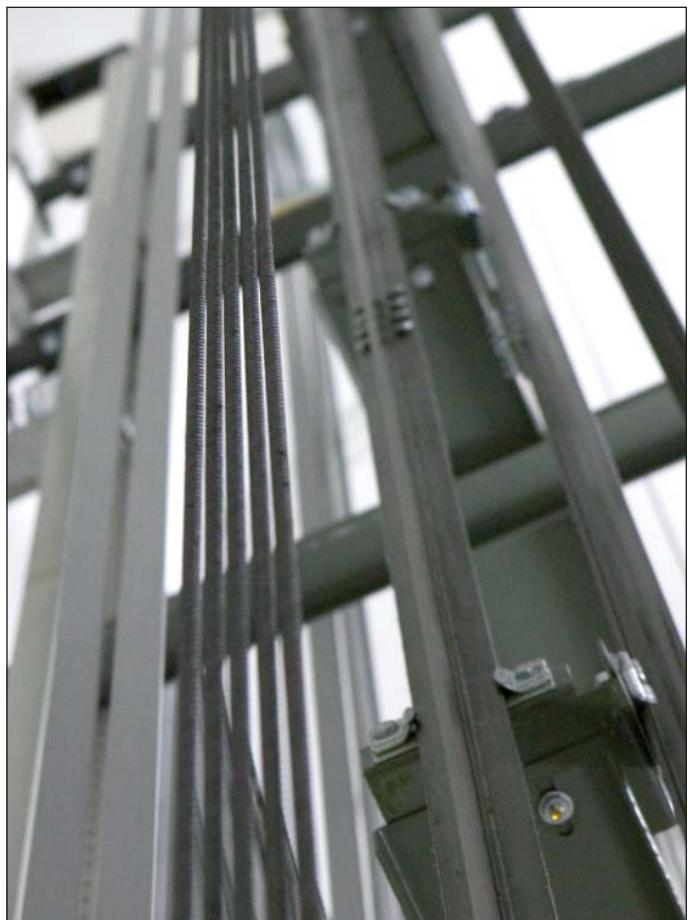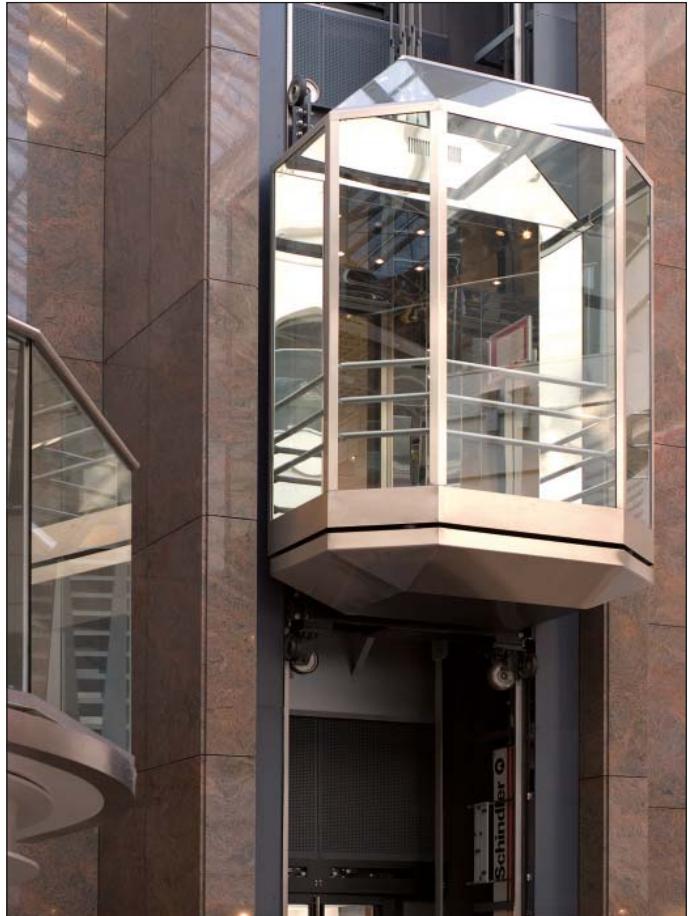
Overview
Rotary encoders for drive control in elevators

In its product program, HEIDENHAIN offers solutions tailored to the drive technology in elevators. Rotary encoders from HEIDENHAIN are characterized by excellent signal quality and high accuracy, and as such are a guarantee for high-quality velocity control and exact positioning. Technical details such as stiff shaft connections, rotary encoder couplings with a high mechanical natural frequency or with extended running tolerances, simple mounting, and powerful bidirectional interfaces (EnDat) for absolute rotary encoders are all standard for HEIDENHAIN.

Encoders with EnDat interface (purely digital or with analog signals) offer the option of retrieving encoder parameters and predefined characteristic values of the motor and brake from an internal EEPROM. This can shorten commissioning times and prevent input errors when entering parameters of the drive system. In addition, EnDat encoders offer the possibility of electronic position adjustment (zeroing). Thus, the absolute position value of the encoder can be adjusted to the orientation of the motor rotating field, eliminating complicated mechanical alignment. Depending on the encoder, diagnostic functions such as temperature evaluation and valuation numbers are available for assessing the encoder's functional reserves. When critical values change, preventive measures can be taken in order to avoid unscheduled maintenance of the elevator.

AEF/ECN/ERN 1300 series (plug-in PCB) and ECN/ERN 400 (cable connection) with expanding ring coupling (with high natural frequency of the stator coupling)

AEF/ECN/ERN 1300 series (plug-in PCB) and ECN/ERN 400 (cable connection) with plane-surface coupling (expanded running and mounting tolerances)

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

ERN incremental rotary encoders / AEF, ECN, ECI absolute singleturn rotary encoders

Model	Outside diameter[2]	Shaft version	Protection	Incremental signals	Signal periods per revolution	Absolute position values	Position values per revolution Commutation
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 ⊓⊔ HTL ∿ 1 V_{PP}	1000 to 5000	–	–
ECN 113				∿ 1 V_{PP}	2048	EnDat01	8192 (13 bits)
ECN 125				–	–	EnDat22	33 554 435 (25 bits)
ERN 1321[1]	58 mm	Taper shaft Ø 9.25 mm Taper 1:10	*ECN/ ERN 400:* IP64 *AEF/ECN/ ERN 1300:* IP40	⊓⊔ TTL	1024 to 10000	–	–
ERN 1326[1]				⊓⊔ TTL	1024, 2048, 4096, or 8192	UVW	3 signals for block commutation
ERN 1381[1]				∿ 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 **ECN 413**					2048	EnDat01	8192 (13 bits)
ECN 1325 **ECN 425**				–	–	EnDat22	33 554 435 (25 bits)
AEF 1323							8 388 608 (23 bits)
ECI 119	87 mm	30 mm, 38 mm, 50 mm	IP20	–	–	EnDat22	524 288 (19 bits)
ECI 4010	220 mm, 310 mm	90 mm, 180 mm	IP20	–	–	EnDat22	1 048 576 (20 bits)

[1] Only in version with expanding ring coupling;   [2] Rotary encoder housing

4

Rotary encoders for digital shaft resolution

The shaft resolution serves to brake the elevator cabin without jerk in a timely manner, as well as to position it exactly. The position of the cabin is captured at all times and transmitted to the control. Incremental rotary encoders, and especially absolute rotary encoders from HEIDENHAIN are well suited to this purpose. They make digital shaft resolution possible, with its distinct advantages regarding control technology and mounting efforts.

The special advantage of position detection with absolute multiturn rotary encoders is the availability at any time of the cabin's absolute position (even after power failure). And since the actual position value is permanently on hand, the cabin can be moved directly to the entrance.

An RIQ 400 or a bearing assembly with an EQN 400 is offered specifically for shaft resolution. The cabin position is often measured through toothed belts and deflection pulleys. The bearing assembly decouples the large forces that often occur here from the precision bearing of the rotary encoder, thereby preventing an overload on the encoder.

Bearing assembly with EQN 400
Shaft load up to:
Axial   150 N
Radial   350 N

RIQ 400 series (clamping flange)
Shaft load up to:
Axial   100 N
Radial   125 N

EQN 400 series

EQN/IQN absolute multiturn rotary encoders with mounted stator coupling
RIQ absolute multiturn rotary encoders for separate shaft coupling

Model	Outside dia. [1]	Shaft version	Protection	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		
IQN 425			IP66		32	EnDat01		
						SSI		
RIQ 425	58 mm	Solid shaft Ø 10 mm (clamping flange) or Ø 6 mm (synchro flange)	IP66	$\sim$ 1 V$_{PP}$	32	EnDat01	8192 (13 bits)	4096
						SSI		

[1] Rotary encoder housing

Overview
Rotary encoders for door drives

Shorter holding times and thus an increase in the transport of passengers is the main goal especially for large transport capacities in high-rises with a high volume of passengers. Correct operation of the elevator doors is a particularly critical topic in managing the pedestrian traffic of a large building.

Fast and precise opening and closing with minimal noise development requires controlled door drives. Compact rotary encoders from HEIDENHAIN are especially suited for speed and position feedback. Their mounting diameter of less than 40 mm makes them ideal for when space is limited.

ERN 1123

ERO 1420

ECI/EBI 1100 series

ERN 1023

ERO modular incremental rotary encoders
ERN incremental rotary encoders
ECI absolute singleturn rotary encoders
EBI absolute multiturn rotary encoders

Model	Outside dia.[1]	Shaft version	Protection	Incremental signals	Signal periods per revolution	Absolute position values	Position values per revolution	Revolu- tions[2]
ERO 1420	38.4 mm	Hollow through shaft ∅ 4 mm, 6 mm or 8 mm	IP00	⊓⊔ TTL	512, 1000 or 1024	–	–	–
ERN 1020 **ERN 1030** **ERN 1080**	36.5 mm	Blind hollow shaft ∅ 6 mm	IP64	⊓⊔ TTL ⊓⊔ HTL ∿ 1 V_{PP}	100 to 3600	–	–	–
ERN 1023	35 mm		IP 64	⊓⊔ TTL	500 to 2048	UVW	3 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] With battery-buffered revolution counter

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	• EnDat • Fanuc Serial Interface • Mitsubishi high speed interface • Panasonic Serial Interface • Yaskawa Serial Interface • 1 V$_{PP}$ • 11 µA$_{PP}$ • TTL
Display	4.3″ display for touch operation
Supply voltage	DC 24 V Power consumption: max. 15 W
Operating temperature	0 °C to 40 °C
Type of protection EN 60 529	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, see the *PWM 21/ ATS Software* Product Information document.

	PWM 21
Encoder input	• 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 × 154 mm × 55 mm

	ATS
Languages	Choice between English and German
Functions	• Position display • Connection dialog • Diagnosis • 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.

For more information

For more detailed information such as general technical descriptions, mounting instructions, technical specifications, and exact dimensions, please refer to our brochures and product information documents, or visit us on the Internet at 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 drive control (IP64 degree of protection)

Product Information
ECN 1313
ECN 1325
ERN 1387

Contents:
Rotary encoders for servo drive control in elevators

Brochure
Position Encoders for Servo Drives

Contents:
Rotary encoders
Angle encoders
Linear encoders

Brochure
Rotary Encoders

Contents:
Incremental rotary encoders
ERN, ROD
Absolute rotary encoders
ECN, EQN, ROC, ROQ

Comprehensive descriptions of all available interfaces as well as general electrical information are included in the *Interfaces* brochure.

Brochure
Interfaces of HEIDENHAIN Encoders

HEIDENHAIN