Product Overview

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 planesurface 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 singletum rotary encoders

<table>
<thead>
<tr>
<th>Model</th>
<th>Outside diameter[^2]</th>
<th>Shaft version</th>
<th>Protection</th>
<th>Incremental signals</th>
<th>Signal periods per revolution</th>
<th>Absolute position values</th>
<th>Position values per revolution Commutation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERN 120</td>
<td>87 mm</td>
<td>Hollow through shaft Ø 20 mm, 25 mm, 30 mm, 38 mm, or 50 mm</td>
<td>IP64</td>
<td>TTL, HTL, 1 Vpp</td>
<td>1000 to 5000</td>
<td>-</td>
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<tr>
<td>ERN 130</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ERN 180</td>
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<tr>
<td>ECN 125</td>
<td></td>
<td></td>
<td></td>
<td>1 Vpp</td>
<td>2048</td>
<td>EnDat01</td>
<td>8192 (13 bits)</td>
</tr>
<tr>
<td>ERN 1321[^1]</td>
<td>58 mm</td>
<td>Taper shaft Ø 9.25 mm Taper 1:10</td>
<td>ECN/ERN 400:</td>
<td>TTL</td>
<td>1024 to 10000</td>
<td>-</td>
<td>-</td>
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<tr>
<td>ERN 1326[^1]</td>
<td></td>
<td></td>
<td>AEF/ECN/ERN 1300:</td>
<td>TTL</td>
<td>1024, 2048, 4096, or 8192</td>
<td>UVW</td>
<td>3 signals for block commutation</td>
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<tr>
<td>ERN 1381[^1]</td>
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<td></td>
<td>IP40</td>
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<tr>
<td>ERN 1387</td>
<td></td>
<td></td>
<td></td>
<td>TTL</td>
<td>512, 1024, 2048, 4096</td>
<td>-</td>
<td>Z1 track for sine commutation</td>
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<tr>
<td>ERN 487</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
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</tr>
<tr>
<td>ECN 1313</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ECN 413</td>
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<tr>
<td>ECN 1325</td>
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<td></td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ECN 425</td>
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<td></td>
<td></td>
<td></td>
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<td>-</td>
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<tr>
<td>AEF 1323</td>
<td></td>
<td></td>
<td></td>
<td>TTL</td>
<td></td>
<td>EnDat22</td>
<td>33554435 (25 bits)</td>
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<tr>
<td>ECI 119</td>
<td>87 mm</td>
<td>30 mm, 38 mm, 50 mm</td>
<td>IP20</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ECI 4010</td>
<td>220 mm, 310 mm</td>
<td>90 mm, 180 mm</td>
<td>IP20</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>EQN 425</th>
<th>58 mm</th>
<th>Blind hollow shaft or hollow through shaft, Ø 12 mm</th>
<th>IP64</th>
<th>1 Vpp</th>
<th>512 or 2048</th>
<th>EnDat01</th>
<th>8192 (13 bits)</th>
<th>4096</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQN 425</td>
<td>58 mm</td>
<td>Solid shaft Ø 10 mm (clamping flange) or Ø 6 mm (synchro flange)</td>
<td>IP66</td>
<td>1 Vpp</td>
<td>32</td>
<td>EnDat01</td>
<td>8192 (13 bits)</td>
<td>4096</td>
</tr>
</tbody>
</table>

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

RIQ 425 series (synchro flange)
Shaft load up to:
Axial 150 N
Radial 350 N

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

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.
### 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.

<table>
<thead>
<tr>
<th><strong>Encoder input</strong></th>
<th><strong>PWT 100</strong></th>
</tr>
</thead>
</table>
| Only for HEIDENHAIN encoders | - EnDat  
- Fanuc Serial Interface  
- Mitsubishi high speed interface  
- Panasonic Serial Interface  
- Yaskawa Serial Interface  
- 1 Vpp  
- 11 µAPP  
- 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 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.

<table>
<thead>
<tr>
<th><strong>Encoder input</strong></th>
<th><strong>PWM 21</strong></th>
</tr>
</thead>
</table>
| Only for HEIDENHAIN encoders | - 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 Vpp/TTL/11 µAPP  
- 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** | - 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, see the PWM 21/ATS Software Product Information document.
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

Brochure
Interfaces of HEIDENHAIN Encoders

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

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