



# HEIDENHAIN



Product Information

**ECN 413**

**ECN 425**

**ERN 421**

**ERN 487**

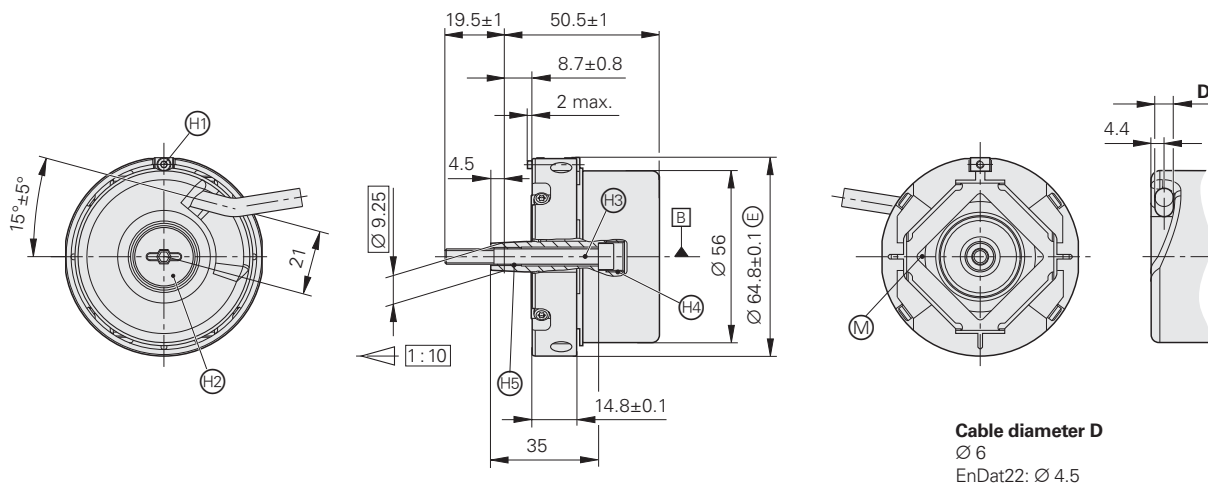
Rotary Encoders for  
Drive Control in Elevators

October 2007

# ECN/ERN 400 Series

## Rotary Encoders with Integral Bearings for Elevator Technology

- Simple installation
- Rigid shaft coupling
- Direct cable connection
- Uniform dimensions for various interfaces






Dimensions in mm



Tolerancing ISO 8015  
 ISO 2768 - m H  
 < 6 mm:  $\pm 0.2$  mm

- Ⓐ = Bearing of mating shaft
- Ⓑ = Bearing of encoder
- Ⓚ = Required mating dimensions
- Ⓜ = Measuring point for operating temperature
- Ⓜ = Clamping screw for coupling ring – width A/F 2, tightening torque 1.25 Nm–0.2 Nm
- Ⓜ = Screw plug width A/F 3 and 4, tightening torque 5 + 0.5 Nm
- Ⓜ = Self-tightening screw (with Tuflok coating) M5 x 50 DIN 6912 width A/F 4, tightening torque 5+0.5 Nm
- Ⓜ = Back-off thread M10
- Ⓜ = Back-off thread M6
- Ⓜ = Encoder version with flange socket
- Ⓜ = Compensation of mounting tolerances and thermal expansion, not dynamic motion

	Absolute		Incremental	
	ECN 425	ECN 413	ERN 487	ERN 421
<b>Incremental signals</b> <sup>1)</sup>	–	 1 V <sub>PP</sub>	 1 V <sub>PP</sub>	 TTL (max. 10000 signal periods)
Line count*/ System accuracy	2048/± 20"	512/± 60" 2048/± 20"	2048/± 20"	1024/± 64" 2048/± 32" 4096/± 16" 5000/± 13"
Reference mark	–		One	
Cutoff frequency –3 dB	–	2048 lines: ≥ 200 kHz 512 lines: ≥ 100 kHz	≥ 210 kHz	–
Scanning frequency Edge separation	– –	–	– –	≤ 300 kHz ≥ 0.35 μs
<b>Absolute position values</b> <sup>1)</sup>	EnDat 2.2		1 V <sub>PP</sub>	–
Order designation	EnDat22	EnDat01	–	
Position values per rev	33554432 (25 bits)	8192 (13 bits)	Z1 track <sup>3)</sup>	–
Elec. permissible speed/ deviation <sup>2)</sup>	≤ 12000 min <sup>-1</sup> (for continuous position value)	512 lines: ≤ 5000 min <sup>-1</sup> /± 1 LSB ≤ 12000 min <sup>-1</sup> /± 100 LSB 2048 lines: ≤ 1500 min <sup>-1</sup> /± 1 LSB ≤ 12000 min <sup>-1</sup> /± 50 LSB	–	
Calculation time t <sub>cal</sub>	≤ 5 μs		–	
<b>Power supply</b>	3.6 to 14 V		5 V ± 5%	5 V ± 10%
<b>Current consumption</b> without load	≤ 150 mA	≤ 160 mA	≤ 130 mA	≤ 120 mA
<b>Electrical connection</b> <sup>2)</sup>	Cable 1 m/5 m with M12 coupling	Cable 1 m/5 m without coupling	Cable 1 m/5 m without coupling	
<b>Shaft</b>	Taper shaft Ø 9.25 mm; taper 1:10		Taper shaft Ø 9.25 mm; taper 1:10	
<b>Mech. permissible speed n</b>	≤ 12000 min <sup>-1</sup>		≤ 12000 min <sup>-1</sup>	
<b>Starting torque</b> at 20 °C	≤ 0.01 Nm		≤ 0.01 Nm	
<b>Moment of inertia</b> of rotor	2.6 · 10 <sup>-6</sup> kgm <sup>2</sup>		2.6 · 10 <sup>-6</sup> kgm <sup>2</sup>	
<b>Permissible axial motion of measured shaft</b> <sup>4)</sup>	± 0.5 mm		± 0.5 mm	
<b>Max. operating temperature</b>	100 °C		100 °C	
<b>Min. operating temperature</b>	–10 °C		–10 °C	
<b>Protection</b> IEC 60529	IP 64 when mounted		IP 64 when mounted	
<b>Weight</b>	Approx. 0.25 kg		Approx. 0.25 kg	

\* Please indicate when ordering

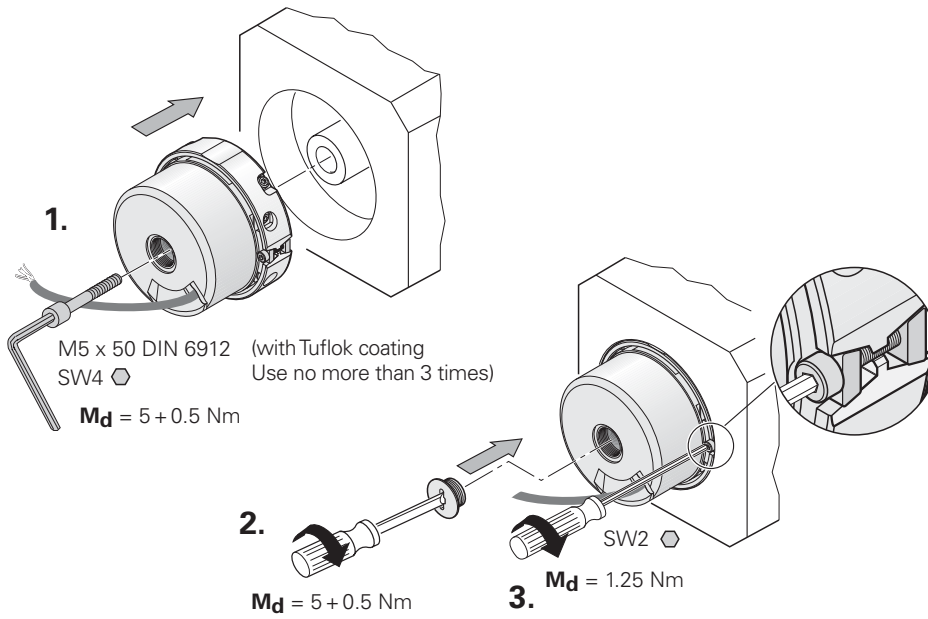
1) For signal description, see *Position Encoders for Servo Drives* catalog

2) Velocity-dependent difference between the absolute and incremental signals

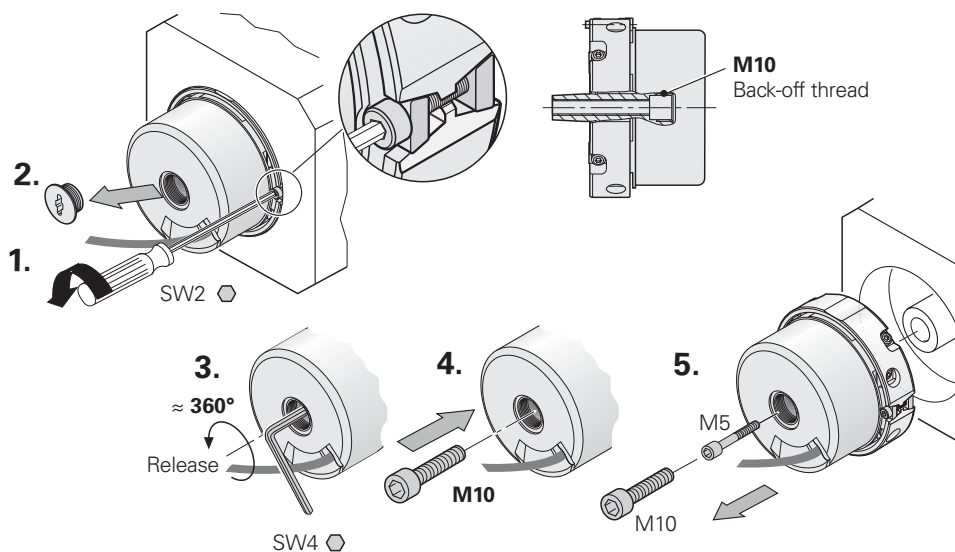
3) One sine and one cosine signal per revolution

4) Compensation of mounting tolerances and thermal expansion, not dynamic motion

# Mounting



# Dismounting


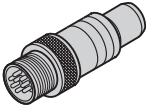





**M10** Tighten the screw only until the taper disconnects.

# Electrical Connection

## Pin Layouts

### Pin layout for ECN 425


8-pin M12 coupling								
								
	Power supply				Absolute position values			
	<b>2</b>	<b>8</b>	<b>1</b>	<b>5</b>	<b>3</b>	<b>4</b>	<b>7</b>	<b>6</b>
	$U_P^{1)}$	$U_P$	$0V^{1)}$	$0V$	<b>DATA</b>	$\overline{\text{DATA}}$	<b>CLOCK</b>	$\overline{\text{CLOCK}}$
	Blue	Brown/Green	White	White/Green	Gray	Pink	Violet	Yellow

**Shield** on housing;  $U_P$  = power supply voltage

<sup>1)</sup> For parallel supply lines

Vacant pins or wires must not be used!

### Pin layout for ECN 413


	Power supply					Incremental signals				Absolute position values			
	$U_P$	Sensor $U_P$	$0V$	Sensor $0V$	Inside shield	<b>A+</b>	<b>A-</b>	<b>B+</b>	<b>B-</b>	<b>DATA</b>	$\overline{\text{DATA}}$	<b>CLOCK</b>	$\overline{\text{CLOCK}}$
	Brown/ Green	Blue	White/ Green	White	/	Green/ Black	Yellow/ Black	Blue/ Black	Red/ Black	Gray	Pink	Violet	Yellow


**Shield** on housing;  $U_P$  = power supply voltage

**Sensor:** The sensor line is connected internally with the corresponding power line.

Vacant pins or wires must not be used!


### Pin layout for ERN 487

	Power supply					Incremental signals					
	<b>U<sub>P</sub></b>	<b>Sensor</b> U <sub>P</sub>	<b>0V</b>	<b>Sensor</b> 0V	<b>Inside shield</b>	<b>A+</b>	<b>A-</b>	<b>B+</b>	<b>B-</b>	<b>R+</b>	<b>R-</b>
	Brown/ Green	Blue	White/ Green	White	/	Green/ Black	Yellow/ Black	Blue/ Black	Red/ Black	Red	Black

	Other signals			
	<b>C+</b>	<b>C-</b>	<b>D+</b>	<b>D-</b>
	Gray	Pink	Yellow	Violet

**Shield** on housing; **U<sub>P</sub>** = power supply voltage  
**C, D** = commutation signals for sinusoidal commutation  
**Sensor:** The sensor line is connected internally with the corresponding power line.  
 Vacant pins or wires must not be used!

### Pin layout for ERN 421

	Power supply				Incremental signals						Other signals	
	<b>U<sub>P</sub></b>	<b>Sensor</b> U <sub>P</sub>	<b>0V</b>	<b>Sensor</b> 0V	<b>U<sub>a1</sub></b>	<b>U<sub>a1</sub></b>	<b>U<sub>a2</sub></b>	<b>U<sub>a2</sub></b>	<b>U<sub>a0</sub></b>	<b>U<sub>a0</sub></b>	<b>U<sub>aS</sub></b>	<b>Vacant</b>
	Brown/ Green	Blue	White/ Green	White	Brown	Green	Gray	Pink	Red	Black	Violet	Yellow

**Shield** on housing; **U<sub>P</sub>** = power supply voltage  
**Sensor:** The sensor line is connected internally with the corresponding power line.  
 Vacant pins or wires must not be used!

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#### For more information

- Brochure: *Position Encoders for Servo Drives*
- *Rotary Encoders* catalog

