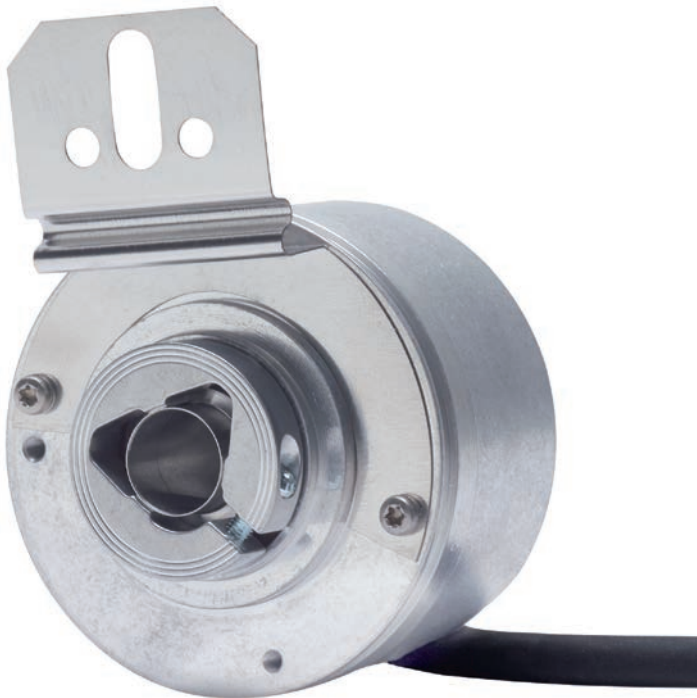




# HEIDENHAIN



Product Information

**EQN 400**

**ERN 400**

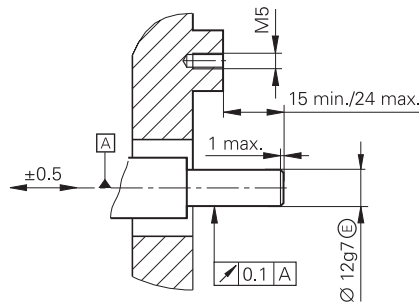
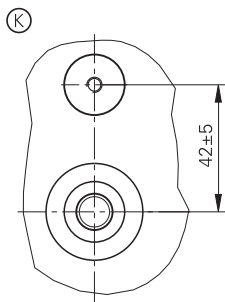
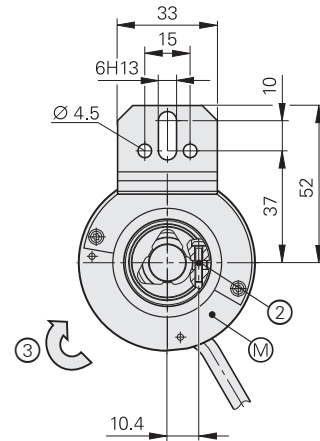
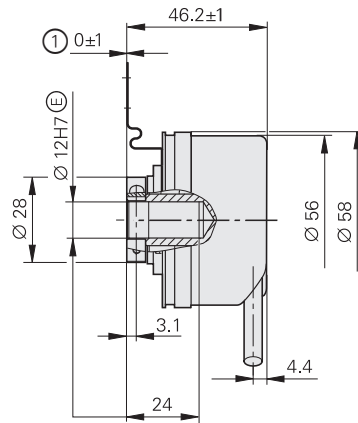
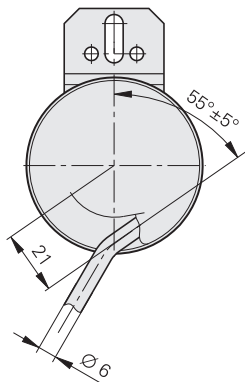
**ERN 401**

Rotary Encoders as  
Replacements for  
Siemens 1XP8000 and  
Siemens 1XP8001

# EQN/ERN 400 series

Absolute and incremental rotary encoders

- Torque support
- Blind hollow shaft
- Replacement for Siemens 1XP8000



mm



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

Siemens model	Replacement model	ID	Design
1XP8012-10	ERN 430 <sup>1)</sup>	HTL	Cable (0.8 m) with 12-pin M23 mounted coupling with central fastening
1XP8032-10	ERN 430	HTL	
1XP8012-20	ERN 420 <sup>1)</sup>	TTL	
1XP8032-20	ERN 420	TTL	
1XP8014-10	EQN 425 <sup>1)</sup>	EnDat	Cable (1 m) with 17-pin M23 coupling
1XP8024-10	EQN 425	EnDat	
1XP8014-20	EQN 425 <sup>1)</sup>	SSI	
1XP8024-20	EQN 425	SSI	

<sup>1)</sup> Original Siemens encoder has a 17-pin M23 flange socket

⊠ = Bearing of mating shaft

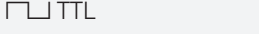
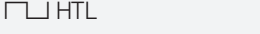
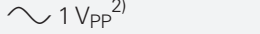
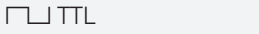
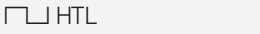
⊙ = Required mating dimensions

M = Measuring point for operating temperature

1 = Distance from clamping ring to coupling

2 = Clamping screw with X8 hexalobular socket: tightening torque: 1.1 Nm ±0.1 Nm

3 = Direction of shaft rotation for ascending position values

	<b>Absolute</b>		<b>Incremental</b>	
	<b>EQN 425</b>		<b>ERN 420</b>	<b>ERN 430</b>
<b>Interface*</b>	EnDat 2.2	SSI	 TTL	 HTL
Ordering designation	EnDat01	SSI41r1	–	
Position values per rev.	8192 (13 bits)		–	
Revolutions	4096		–	
Code	Pure binary	Gray	–	
Elec. permiss. shaft speed Deviations <sup>1)</sup>	≤ 1500/10000 rpm ±1 LSB/±50 LSB	≤ 12000 rpm ±12 LSB	–	
Calculation time $t_{cal}$ Clock frequency	≤ 9 μs ≤ 2 MHz	≤ 5 μs –	–	
Incremental signals	 1 V <sub>PP</sub> <sup>2)</sup>		 TTL	 HTL
Line count	2048	512	1024	
Cutoff frequency –3 dB Output frequency Edge separation $a$	≥ 400 kHz – –	≥ 130 kHz – –	– ≤ 300 kHz ≥ 0.39 μs	
<b>System accuracy</b>	±20"	±60"	1/20 of grating period	
<b>Electrical connection</b>	Cable (1 m) with M23 coupling		Cable (0.8 m) with mounted coupling and central fastening	
Supply voltage	DC 3.6 V to 14 V	DC 4.75 V to 30 V	DC 5 V ±0.5 V	DC 10 V to 30 V
Power consumption (max.)	3.6 V: ≤ 0.7 W 14 V: ≤ 0.8 W	4.75 V: ≤ 0.675 W 30 V: ≤ 0.875 W	–	
Current consumption (typical, without load)	5 V: 105 mA	5 V: 85 mA 24 V: 20 mA	≤ 120 mA	≤ 150 mA
<b>Shaft</b>	Blind hollow shaft Ø 12 mm			
Mech. permiss. shaft speed $n$	≤ 6000 rpm			
Starting torque (typical)	0.05 Nm at 20 °C			
Moment of inertia of rotor	≤ 4.6 · 10 <sup>-6</sup> kgm <sup>2</sup>			
Permiss. axial motion of measured shaft	±0.5 mm			
<b>Vibration</b> 55 Hz to 2000 Hz <b>Shock</b> 6 ms	≤ 300 m/s <sup>2</sup> (EN 60068-2-6) ≤ 1000 m/s <sup>2</sup> (EN 60068-2-27)			
<b>Max. operating temperature</b>	100 °C			
<b>Min. operating temperature</b>	Fixed cable: –40 °C Moving cable: –10 °C			
<b>Protection</b> EN 60529	IP66			
<b>Mass</b>	≈ 0.3 kg			
<b>ID number</b>	1109258-74	1132407-73	597330-74	597331-76

\* Please select when ordering

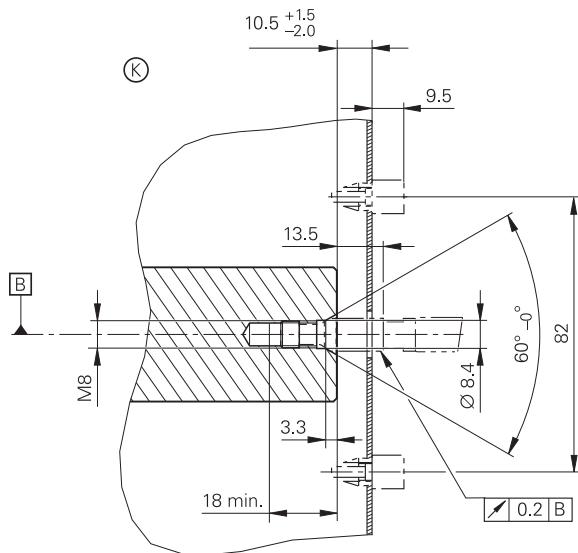
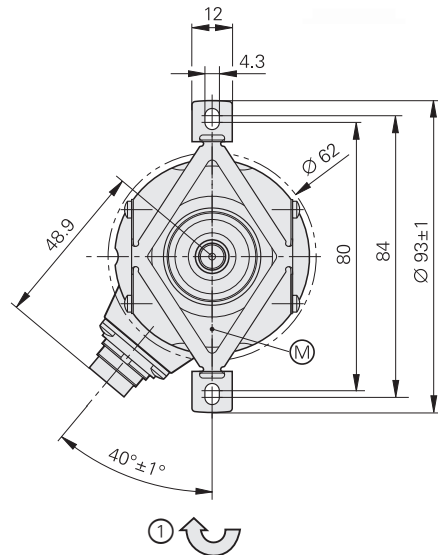
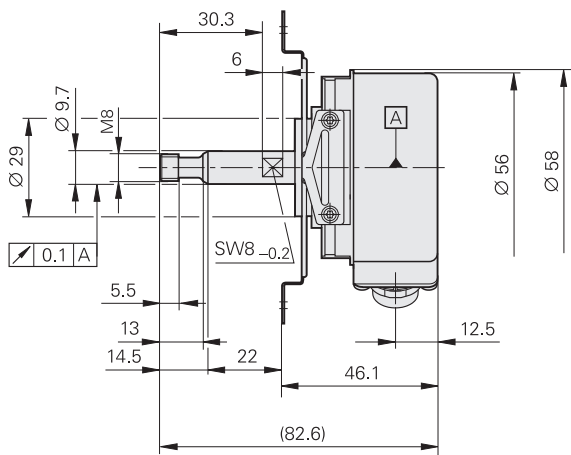
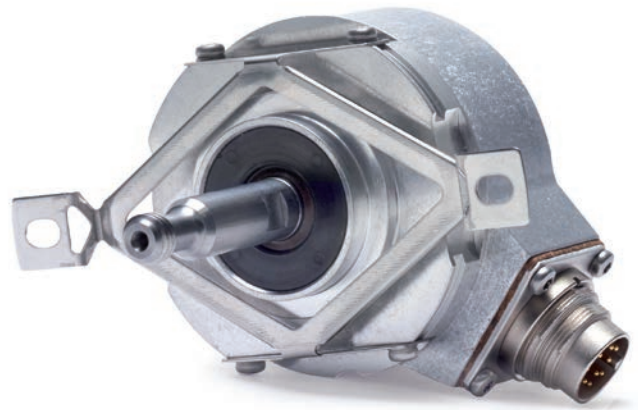
<sup>1)</sup> Speed-dependent deviations between absolute value and incremental signal

<sup>2)</sup> Deviating tolerances: signal amplitudes: 0.8 V<sub>PP</sub> to 1.2 V<sub>PP</sub>

# ERN 401 series

## Incremental rotary encoders



- Stator coupling via fastening clips
- Solid shaft with 60° centering taper
- Replacement for Siemens 1XP8001
- Includes installation kit with housing



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

- ▣ = Encoder bearing
- ▣ = Bearing of mating shaft
- ⊙ = Required mating dimensions
- M = Measuring point for operating temperature
- 1 = Direction of shaft rotation for ascending position values

Siemens model	Replacement model	ID
1XP8001-2	ERN 421	538724-71
1XP8001-1	ERN 431	538725-02

	Incremental	
	ERN 421	ERN 431
<b>Interface</b>	 TTL	 HTL
Line count	1024	
Reference mark	One	
Output frequency Edge separation <i>a</i>	≤ 300 kHz ≥ 0.39 μs	
<b>System accuracy</b>	1/20 of grating period	
<b>Electrical connection</b>	12-pin flange socket (male)	
Supply voltage	DC 5 V ±0.5 V	DC 10 V to 30 V (with reverse-polarity protection)
Current consumption without load	≤ 120 mA	≤ 150 mA
<b>Shaft</b>	Solid shaft with M8 external thread, 60° centering taper	
Mech. permiss. shaft speed <i>n</i> <sup>1)</sup>	≤ 6000 rpm	
Starting torque (typical)	0.025 Nm (at 20 °C)	
Moment of inertia of rotor	≤ 2.7 · 10 <sup>-6</sup> kgm <sup>2</sup>	
Permiss. axial motion of measured shaft	±1 mm	
<b>Vibration</b> 55 Hz to 2000 Hz <b>Shock</b> 6 ms	≤ 100 m/s <sup>2</sup> (EN 60068-2-6); higher values upon request ≤ 1000 m/s <sup>2</sup> (EN 60068-2-27)	
<b>Operating temperature</b>	-40 °C to 100 °C	
<b>Protection</b> EN 60529	IP66	
<b>Mass</b>	≈ 0.3 kg	
<b>ID number</b>	538724-71	538725-02

<sup>1)</sup> For the relationship of operating temperature to shaft speed and supply voltage, see *General mechanical information* in the *Encoders for Servo Drives* brochure


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This Product Information document 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 placed.



## Further information:

Comply with the requirements described in the following documents to ensure correct and intended operation:

- Brochure: *Rotary Encoders* 349529-xx
- Brochure: *Encoders for Servo Drives* 208922-xx
- Brochure: *Interfaces of HEIDENHAIN Encoders* 1078628-xx
- Brochure: *Cables and Connectors* 1206103-xx