HEIDENHAIN

Product Overview

Rotary Encoders

with Optimized Scanning

November 2006

Rotary encoders for electrical drives are subject to high requirements: they are expected to function reliably and provide dependable measurement data in spite of their often harsh environments. The optimized scanning—made possible by the serial-coded absolute track—meets these requirements.

Absolute rotary encoders with optimized scanning are distinguished by the high quality of their scanning signals and their significantly reduced sensitivity to contamination. An innovative scanning and evaluation unit permits both high interpolation and optimized control loop performance.

Interpolation and position value generation within the rotary encoder permits reliable, purely digital data transmission and relieves the higher-level electronics. Also, because their safety-related functions comply with IEC 61 508, the rotary encoders now are ready for use in SIL-2 applications.

These changes have no effect on the dimensions of the encoders, so that no mechanical design changes are required in the motor connections.

Primary benefits of optimized scanning

- Optimized scanning through serial code structure
- High resolution
- Constant accuracy over the entire shaft speed range
- Tolerance to contamination
- Higher reliability thanks to fewer components
- Expanded power supply range from 3.6 to 14 V
- Calculation of the position value in the encoder
- Purely serial data transmission (with EnDat 22)
- ECN 1325/EQN 1337 certified for safety-related applications

Available rotary encoders with optimized scanning

HEIDENHAIN is gradually converting its absolute rotary encoders to optimized scanning. The following variants are planned:

- ECN 1325/EQN 1337
- ECN 425/EQN 437
- ROC 425/ROQ 437

Two rotary encoder models are already available as position encoders for safety-related applications.

- ECN 1325 (singleturn)
- EQN 1337 (multiturn)

More absolute rotary, angular and linear encoders will follow.

Circular scale with serial code track and incremental track

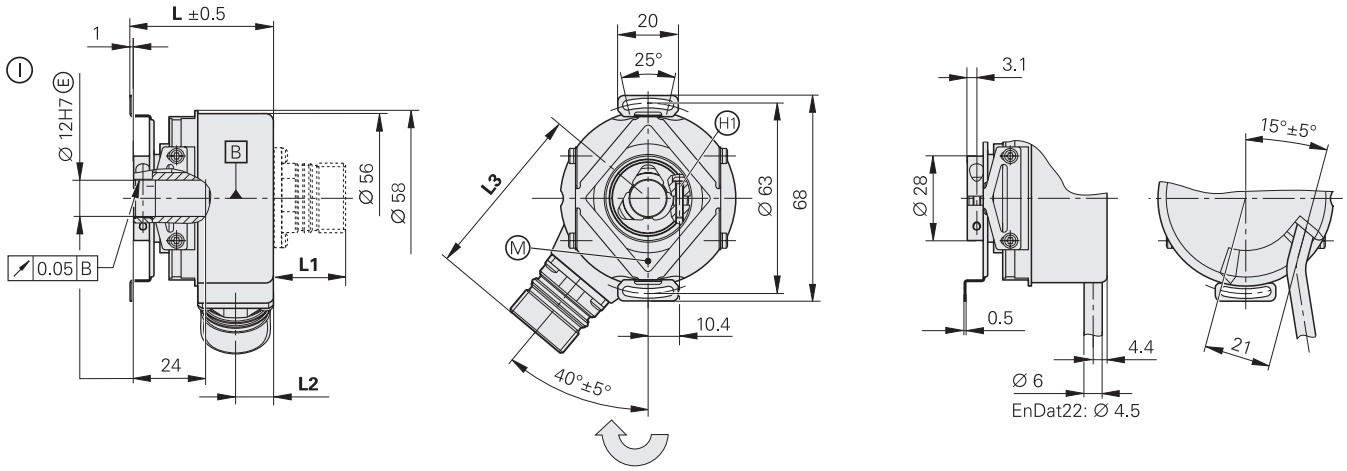
Contents

Specifications	*Absolute Rotary Encoders*	*Singleturn*	*Multiturn*	
	ECN 400/EQN 400 series	ECN 413	EQN 425	**4**
		ECN 425	EQN 437	
	ECN 400/EQN 400 series with universal stator coupling	ECN 413	EQN 425	**6**
		ECN 425	EQN 437	
	ROC 400/ROQ 400 series with synchro flange	ROC 413	ROQ 425	**8**
		ROC 425	ROQ 437	
	ROC 400/ROQ 400 series with clamping flange	ROC 413	ROQ 425	**10**
		ROC 425	ROQ 437	
	ECN 1300/EQN 1300 series	ECN 1313	EQN 1325	**12**
		ECN 1325	EQN 1337	
Electrical Connection				
	Pin Layout			**14**
	Connecting Elements and Cables			**15**
	Encoder Cable			**16**

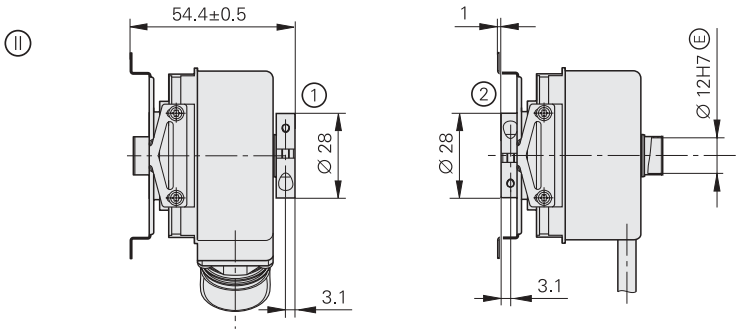
ECN/EQN 400 Series

- **Rotary encoders with mounted stator coupling**
- **Blind hollow shaft or hollow through shaft**

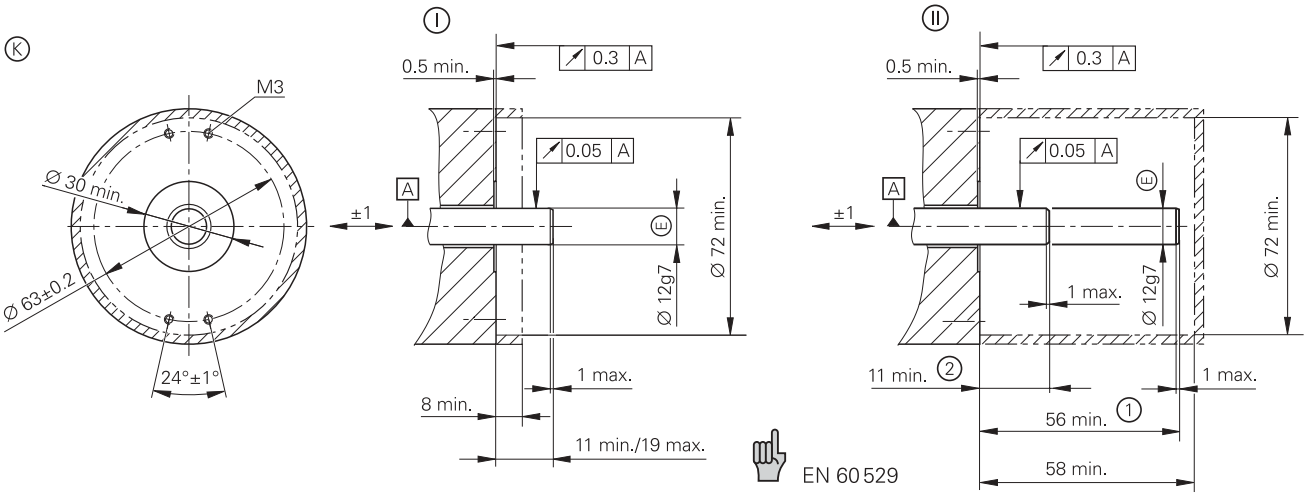
Blind hollow shaft



Hollow through shaft



	Flange socket	
	M12	M23
L	47.2	
L1	14	23,6
L2	12.5	12.5
L3	48.5	58.1



Dimensions in mm

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

Cable radial, also usable axially
Ⓐ = Bearing
Ⓑ = Bearing of encoder
Ⓜ = Measuring point for operating temperature
Ⓚ = Required mating dimensions
Ⓗ1 = Clamping screw M2.5 with hexalobular socket X8
Ⓗ2 = Hole circle for fastening, see coupling
① = Clamping ring on housing side (status at delivery)
② = Clamping ring on coupling side (optionally mountable)
Direction of shaft rotation for output signals as per the interface description

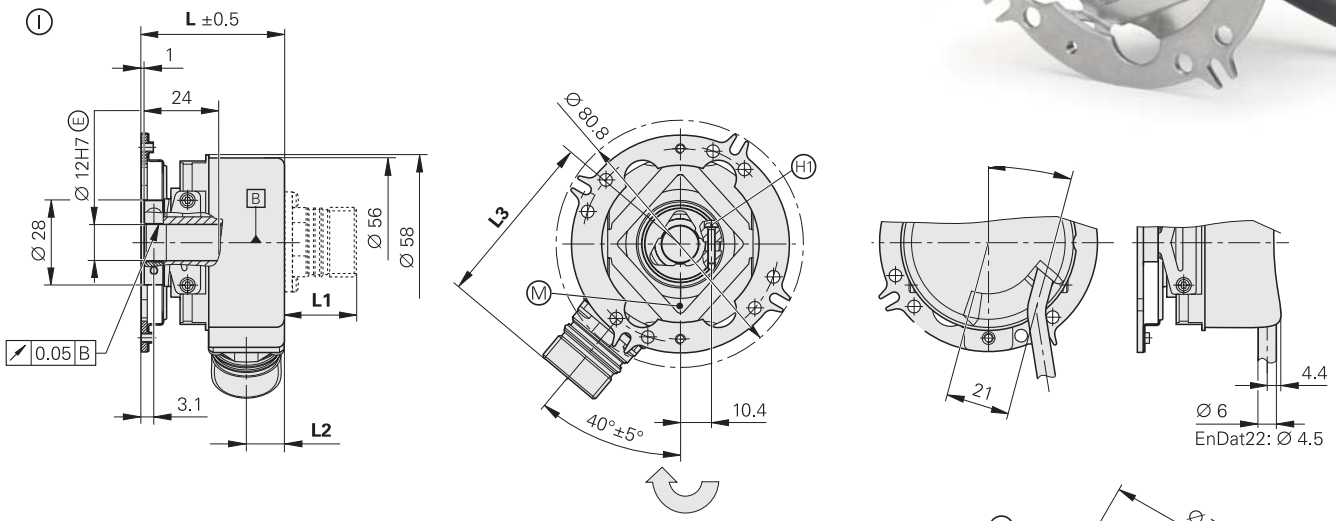
	Absolute					
	Singleturn			**Multiturn**		
	ECN 425	**ECN 413**	**ECN 413**	**EQN 437**	**EQN 425**	**EQN 425**
Absolute position values*	**EnDat 2.2**	**EnDat 2.2**	**SSI**	**EnDat 2.2**	**EnDat 2.2**	**SSI**
Ordering designation	EnDat 22	EnDat 01		EnDat 22	EnDat 01	
Positions per rev	33 554 432 (25 bits)	8192 (13 bits)		33 554 432 (25 bits)	8192 (13 bits)	
Revolutions	–			4096		
Code	Pure binary		Gray	Pure binary		Gray
Elec. permissible speed/ at accuracy	≤ 12 000 rpm for continuous position value	≤ 12 000 rpm/ ± 1 LSB	≤ 12 000 rpm/ ± 12 LSB	≤ 12 000 rpm for continuous position value	≤ 10 000 rpm/ ± 1 LSB	≤ 12 000 rpm/ ± 12 LSB
Calculation time t_{cal}	≤ 5 µs	≤ 0.25 µs	≤ 5 µs	≤ 5 µs	≤ 0.25 µs	≤ 5 µs
Incremental signals	Without	~ 1 V_{PP} [1]		Without	~ 1 V_{PP} [1]	
Line counts*	–	**512** 2048	**512**	–	**512** 2048	**512**
Cutoff frequency –3 dB	–	*512 lines:* ≥ 100 kHz; *2048 lines:* ≥ 200 kHz		–	*512 lines:* ≥ 100 kHz; *2048 lines:* ≥ 200 kHz	
System accuracy	± 20"	*512 lines:* ± 60" *2048 lines:* ± 20"		± 20"	*512 lines:* ± 60" *2048 lines:* ± 20"	
Power supply*	**3.6 to 14 V**	**3.6 to 14 V**	5 V ± 5 % or **10 to 30 V**	**3.6 to 14 V**	**3.6 to 14 V**	5 V ± 5 % or **10 to 30 V**
Current consumption (without load)	≤ 150 mA	≤ 160 mA	≤ 160 mA	≤ 180 mA	≤ 200 mA	≤ 200 mA
Electrical connection*	• **Flange socket** M12, radial • Cable 1 m, with coupling M12	• **Flange socket** M23, radial • Cable 1 m, with M23 coupling or without connector		• **Flange socket** M12, radial • Cable 1 m, with coupling M12	• **Flange socket** M23, radial • Cable 1 m, with M23 coupling or without connector	
Shaft*	**Blind hollow shaft** or hollow through shaft **D = 12 mm**					
Mech. perm. speed n [2]	≤ 6000 rpm/≤ 12 000 rpm [5]					
Starting torque at 20 °C below –20 °C	*Blind hollow shaft:* ≤ 0.01 Nm *Hollow through shaft:* ≤ 0.025 Nm ≤ 1 Nm					
Moment of inertia of rotor	$4.3 \cdot 10^{-6}$ kgm^2					
Permissible axial motion of measured shaft	± 1 mm					
Vibration 55 to 2000 Hz **Shock** 6 ms/2 ms	≤ 300 m/s^2 [3] (IEC 60 068-2-6) ≤ 1000 m/s^2/≤ 2000 m/s^2 (IEC 60 068-2-27)					
Max. operating temp. [2]	U_P = *5 V:* 100 °C; U_P = *10 to 30 V:* 85 °C					
Min. operating temp.	*Flange socket or fixed cable:* –40 °C *Moving cable:* –10 °C					
Protection IEC 60 529	IP 67 at housing; IP 64 at shaft inlet					
Weight	Approx. 0.3 kg					

Bold: These preferred versions are available on short notice
* Please indicate when ordering
1) Restricted tolerances: Signal amplitude 0.8 to 1.2 V_{PP}
2) For information on the relationship between operating temperature and shaft speed or power supply, see *General Mechanical Information* in the *Rotary Encoders* catalog
3) 150 m/s^2 with flange socket version
4) With two shaft clamps (only for hollow through shaft)

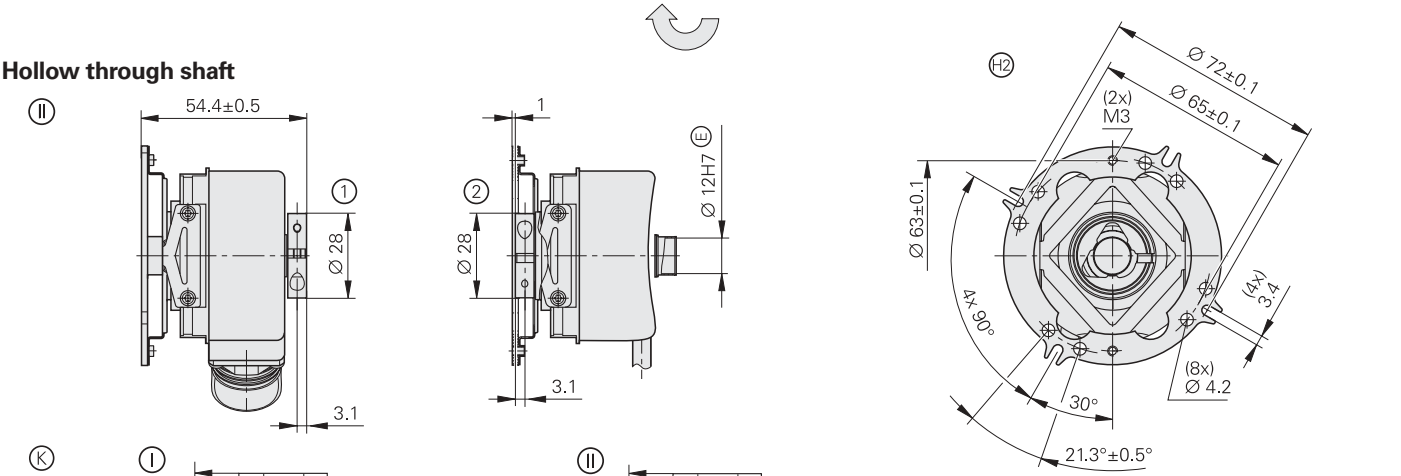
ECN/EQN 400 Series

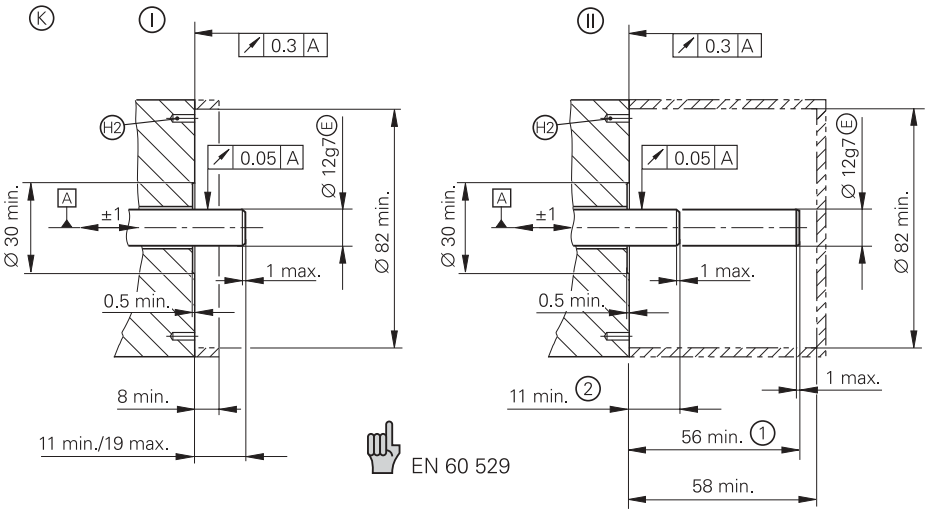
- **Rotary encoders with mounted universal stator coupling**
- **Blind hollow shaft or hollow through shaft**

Blind hollow shaft



Hollow through shaft





	Flange socket	
	M12	M23
L	47.2	
L1	14	23.6
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L3	48.5	58.1

Dimensions in mm

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

Cable radial, also usable axially
A = Bearing
B = Bearing of encoder
M = Measuring point for operating temperature
K = Required mating dimensions
H1 = Clamping screw M2.5 with hexalobular socket X8
H2 = Hole circle for fastening, see coupling
① = Clamping ring on housing side (status at delivery)
② = Clamping ring on coupling side (optionally mountable)
Direction of shaft rotation for output signals as per the interface description

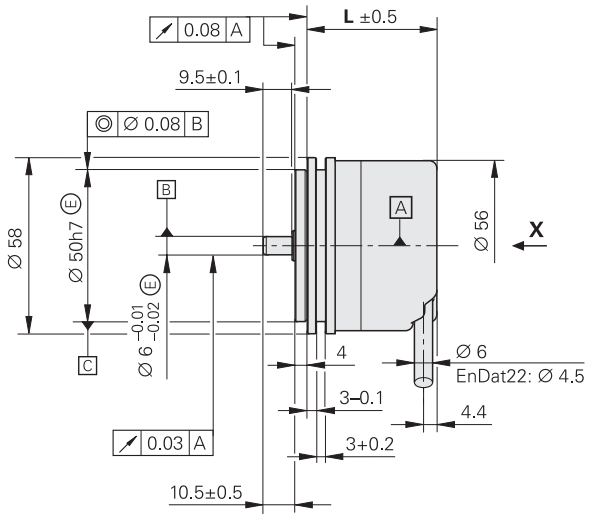
	Absolute					
	Singleturn			Multiturn		
	ECN 425	ECN 413	ECN 413	EQN 437	EQN 425	EQN 425
Absolute position values*	**EnDat 2.2**	**EnDat 2.2**	**SSI**	**EnDat 2.2**	**EnDat 2.2**	**SSI**
Ordering designation	EnDat 22	EnDat 01		EnDat 22	EnDat 01	
Positions per rev	33 554 432 (25 bits)	8192 (13 bits)		33 554 432 (25 bits)	8192 (13 bits)	
Revolutions	–			4096		
Code	Pure binary		Gray	Pure binary		Gray
Elec. permissible speed/ at accuracy	≤ 12 000 rpm for continuous position value	≤ 12 000 rpm/ ± 1 LSB	≤ 12 000 rpm/ ± 12 LSB	≤ 12 000 rpm for continuous position value	≤ 10 000 rpm/ ± 1 LSB	≤ 12 000 rpm/ ± 12 LSB
Calculation time t_{cal}	≤ 5 µs	≤ 0.25 µs	≤ 5 µs	≤ 5 µs	≤ 0.25 µs	≤ 5 µs
Incremental signals	Without	~ 1 V_{PP} [1]		Without	~ 1 V_{PP} [1]	
Line counts*	–	**512** 2048	**512**	–	**512** 2048	**512**
Cutoff frequency –3 dB	–	*512 lines:* ≥ 100 kHz; *2048 lines:* ≥ 200 kHz		–	*512 lines:* ≥ 100 kHz; *2048 lines:* ≥ 200 kHz	
System accuracy	± 20"	*512 lines:* ± 60" *2048 lines:* ± 20"		± 20"	*512 lines:* ± 60" *2048 lines:* ± 20"	
Power supply*	**3.6 to 14 V**	**3.6 to 14 V**	5 V ± 5 % or **10 to 30 V**	**3.6 to 14 V**	**3.6 to 14 V**	5 V ± 5 % or **10 to 30 V**
Current consumption (without load)	≤ 150 mA	≤ 160 mA	≤ 160 mA	≤ 180 mA	≤ 200 mA	≤ 200 mA
Electrical connection*	• **Flange socket** M12, radial • Cable 1 m, with coupling M12	• **Flange socket** M23, radial • Cable 1 m, with M23 coupling or without connector		• **Flange socket** M12, radial • Cable 1 m, with coupling M12	• **Flange socket** M23, radial • Cable 1 m, with M23 coupling or without connector	
Shaft*	**Blind hollow shaft** or hollow through shaft **D = 12 mm**					
Mech. perm. speed n [2]	≤ 6000 rpm/≤ 12 000 rpm [5]					
Starting torque at 20 °C below –20 °C	*Blind hollow shaft:* ≤ 0.01 Nm *Hollow through shaft:* ≤ 0.025 Nm ≤ 1 Nm					
Moment of inertia of rotor	$4.3 \cdot 10^{-6}$ kgm^2					
Permissible axial motion of measured shaft	± 1 mm					
Vibration 55 to 2000 Hz **Shock** 6 ms/2 ms	≤ 300 m/s^2 [3] (IEC 60 068-2-6) ≤ 1000 m/s^2/≤ 2000 m/s^2 (IEC 60 068-2-27)					
Max. operating temp. [2]	U_P = *5 V:* 100 °C; U_P = *10 to 30 V:* 85 °C					
Min. operating temp.	*Flange socket or fixed cable:* –40 °C *Moving cable:* –10 °C					
Protection IEC 60 529	IP 67 at housing; IP 64 at shaft inlet					
Weight	Approx. 0.3 kg					

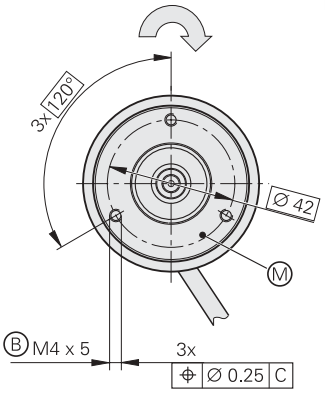
Bold: These preferred versions are available on short notice
* Please indicate when ordering
1) Restricted tolerances: Signal amplitude 0.8 to 1.2 V_{PP}
2) For information on the relationship between operating temperature and shaft speed or power supply, see *General Mechanical Information* in the *Rotary Encoders* catalog
3) 150 m/s^2 with flange socket version
4) With two shaft clamps (only for hollow through shaft)

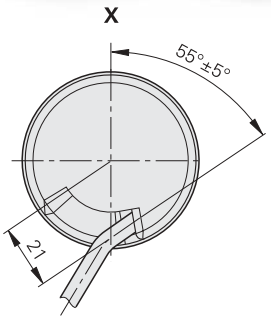
ROC/ROQ 400 Series with Synchro Flange

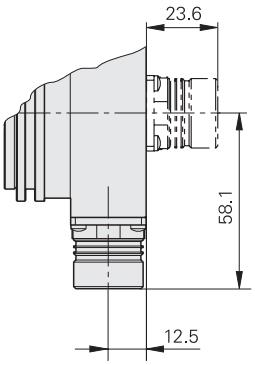
Rotary encoders for separate shaft coupling

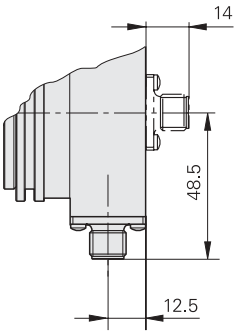
ROC/ROQ 4xx











L	47.2

Dimensions in mm

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

Cable radial, also usable axially
A = Bearing
B = Threaded mounting hole
M = Measuring point for operating temperature
Direction of shaft rotation for output signals as per the interface description

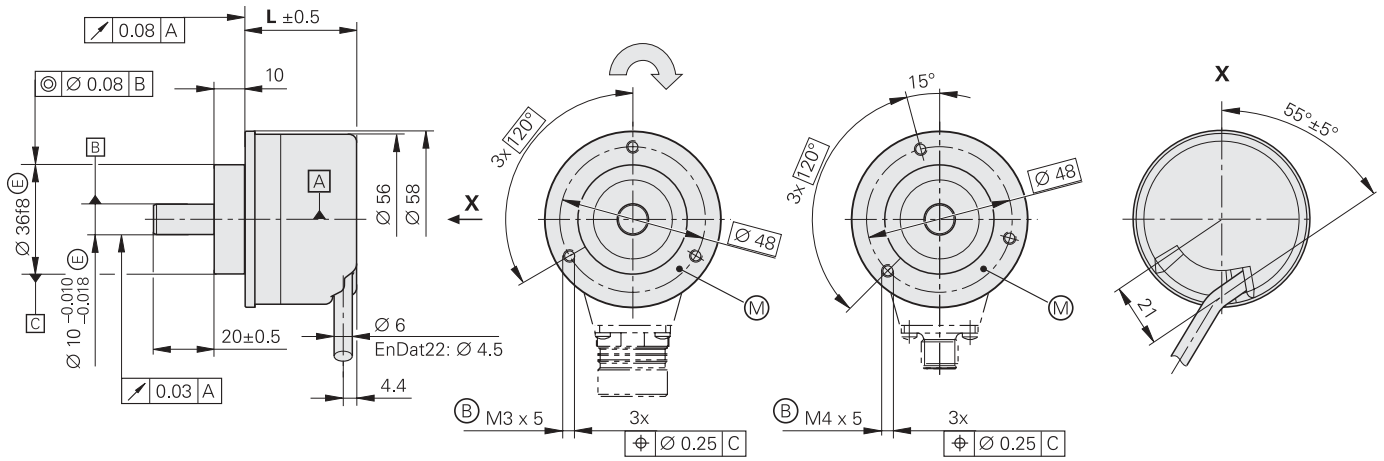
	Absolute					
	Singleturn			**Multiturn**		
	ROC 425	**ROC 413**		**ROQ 437**	**ROQ 425**	
Absolute position values*	**EnDat 2.2**	**EnDat 2.2**	**SSI**	**EnDat 2.2**	**EnDat 2.2**	**SSI**
Ordering designation	EnDat 22	EnDat 01		EnDat 22	EnDat 01	
Positions per rev	33 554 432 (25 bits)	8192 (13 bits)	8192 (13 bits)	33 554 432 (25 bits)	8192 (13 bits)	8192 (13 bits)
Revolutions	–			4096		
Code	Pure binary		Gray	Pure binary		Gray
Elec. permissible speed/ at accuracy	≤ 12 000 rpm for continuous position value	≤ 12 000 rpm/ ± 1 LSB	≤ 12 000 rpm/ ± 12 LSB	≤ 12 000 rpm for continuous position value	≤ 10 000 rpm/ ± 1 LSB	≤ 12 000 rpm/ ± 12 LSB
Calculation time t_{cal}	≤ 5 µs	≤ 0.25 µs	≤ 5 µs	≤ 5 µs	≤ 0.25 µs	≤ 5 µs
Incremental signals	Without	~ 1 V_{PP} [1]		Without	~ 1 V_{PP} [1]	
Line counts*	–	**512** 2048	**512**	–	**512** 2048	**512**
Cutoff frequency –3 dB Scanning frequency Edge separation a	– – – –	*512 lines:* ≥ 100 kHz *2048 lines:* ≥ 200 kHz – –		– – – –	*512 lines:* ≥ 100 kHz *2048 lines:* ≥ 200 kHz – –	
System accuracy	± 20"	*512 lines:* ± 60", *2048 lines:* ± 20"		± 20"	*512 lines:* ± 60" *2048 lines:* ± 20"	
Power supply* **Current consumption** (without load)	**3.6 to 14 V** ≤ 150 mA	**3.6 to 14 V** ≤ 160 mA	5 V ± 5 % or **10 to 30 V** ≤ 160 mA	**3.6 to 14 V** ≤ 180 mA	**3.6 to 14 V** ≤ 200 mA	5 V ± 5 % or **10 to 30 V** ≤ 200 mA
Electrical connection*	• **Flange socket** M12, radial • Cable 1 m, with coupling M12	• **Flange socket** M23, axial or radial • Cable 1 m/5 m, with or without coupling M23		• **Flange socket** M12, radial • Cable 1 m, with coupling M12	• **Flange socket** M23, axial or radial • Cable 1 m/5 m, with or without coupling M23	
Shaft	Solid shaft D = 6 mm					
Mech. perm. speed n	≤ 12 000 rpm					
Starting torque	≤ 0.01 Nm (at 20 °C)					
Moment of inertia of rotor	2.7 · 10^{-6} kgm^2			2.7 · 10^{-6} kgm^2		
Shaft load[3]	Axial 10 N/radial 20 N at shaft end					
Vibration 55 to 2000 Hz **Shock** 6 ms/2 ms	≤ 300 m/s^2 (IEC 60 068-2-6) ≤ 1000 m/s^2/≤ 2000 m/s^2 (IEC 60 068-2-27)					
Max. operating temp.	*U_P = 5 V:* 100 °C; *U_P = 10 to 30 V:* 85 °C			*U_P = 5 V:* 100 °C; *U_P = 10 to 30 V:* 85 °C		
Min. operating temp.	*Flange socket or fixed cable:* –40 °C *Moving cable:* –10 °C			*Flange socket or fixed cable:* –40 °C *Moving cable:* –10 °C		
Protection IEC 60 529	IP 67 at housing; IP 64 at shaft end[2]					
Weight	Approx. 0.35 kg					

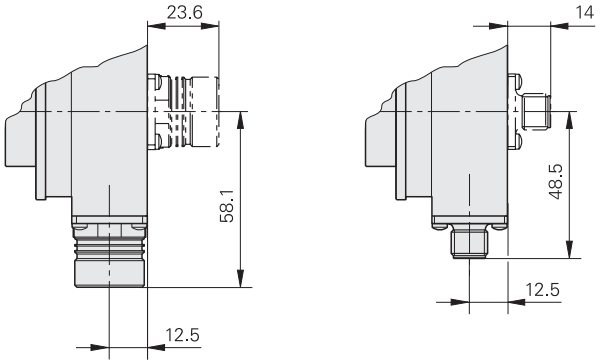
Bold: These preferred versions are available on short notice
***** Please indicate when ordering
[1] Restricted tolerances: Signal amplitude 0.8 to 1.2 V_{PP}
[2] IP 66 upon request
[3] See also *Mechanical Design and Installation* in the *Rotary Encoders* catalog

ROC/ROQ 400 Series with Clamping Flange

Rotary encoders for separate shaft coupling

ROC/ROQ/ROD 4xx





L	36.7

Dimensions in mm

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

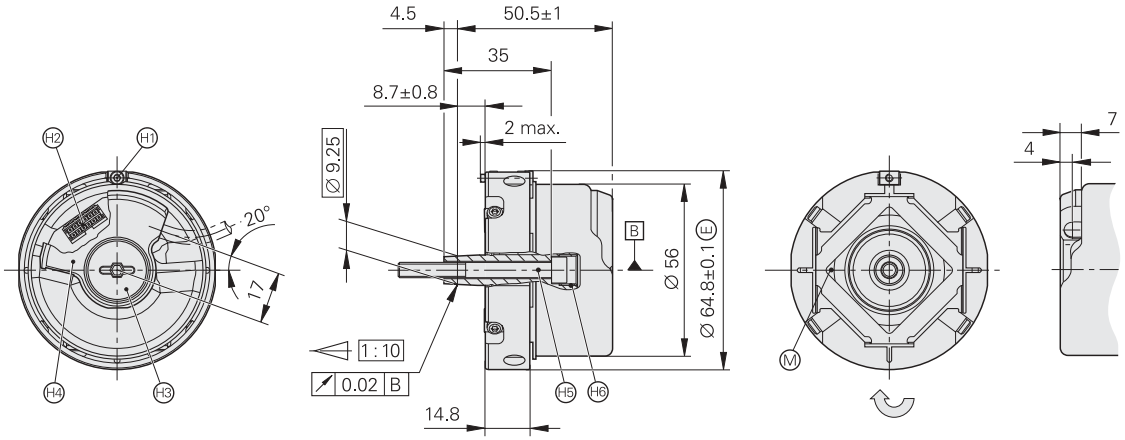
Cable radial, also usable axially
A = Bearing
B = Threaded mounting hole
M = Measuring point for operating temperature
Direction of shaft rotation for output signals as per the interface description

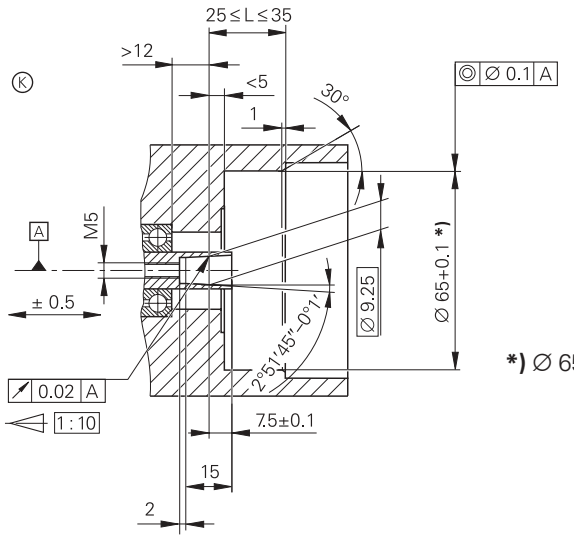
	Absolute					
	Singleturn			**Multiturn**		
	ROC 425	**ROC 413**		**ROQ 437**	**ROQ 425**	
Absolute position values*	**EnDat 2.2**	**EnDat 2.2**	**SSI**	**EnDat 2.2**	**EnDat 2.2**	**SSI**
Ordering designation	EnDat 22	EnDat 01		EnDat 22	EnDat 01	
Positions per rev	33 554 432 (25 bits)	8192 (13 bits)		33 554 432 (25 bits)	8192 (13 bits)	8192 (13 bits)
Revolutions	–			4096		
Code	Pure binary		Gray	Pure binary		Gray
Elec. permissible speed/ at accuracy	≤ 12 000 rpm for continuous position value	≤ 12 000 rpm/ ± 1 LSB	≤ 12 000 rpm/ ± 12 LSB	≤ 12 000 rpm for continuous position value	≤ 10 000 rpm/ ± 1 LSB	≤ 12 000 rpm/ ± 12 LSB
Calculation time t_{cal}	≤ 5 µs	≤ 0.25 µs	≤ 5 µs	≤ 5 µs	≤ 0.25 µs	≤ 0.5 µs
Incremental signals	Without	~ 1 V_{PP} [1]		Without	~ 1 V_{PP} [1]	
Line counts*	–	**512**		–	**512**	
Cutoff frequency –3 dB	–	≥ 100 kHz		–	≥ 100 kHz	
System accuracy	± 20"	± 60"		± 20"	± 60"	
Power supply*	**3.6 to 14 V**	**3.6 to 14 V**	5 V ± 5 % or **10 to 30 V**	**3.6 to 14 V**	**3.6 to 14 V**	5 V ± 5 % or **10 to 30 V**
Current consumption (without load)	≤ 150 mA	≤ 160 mA	≤ 160 mA	≤ 180 mA	≤ 200 mA	≤ 200 mA
Electrical connection*	• **Flange socket** M12, radial • Cable 1 m, with coupling M12	• **Flange socket** M23, axial or radial • Cable 1 m/5 m, with or without coupling M23		• Flange socket M12, radial • Cable 1 m, with coupling M12	• **Flange socket** M23, axial or radial • Cable 1 m/5 m, with or without coupling M23	
Shaft	Solid shaft D = 10 mm					
Mech. perm. speed n	≤ 12 000 rpm					
Starting torque	≤ 0.01 Nm (at 20 °C)					
Moment of inertia of rotor	$2.8 \cdot 10^{-6}$ kgm^2			$2.8 \cdot 10^{-6}$ kgm^2		
Shaft load[3]	Axial 10 N/radial 20 N at shaft end					
Vibration 55 to 2000 Hz **Shock** 6 ms/2 ms	≤ 300 m/s^2 (IEC 60 068-2-6) ≤ 1000 m/s^2/≤ 2000 m/s^2 (IEC 60 068-2-27)					
Max. operating temp.	*U_P = 5 V:* 100 °C *U_P = 10 to 30 V:* 85 °C			*U_P = 5 V:* 100 °C *U_P = 10 to 30 V:* 85 °C		
Min. operating temp.	*Flange socket or fixed cable:* –40 °C *Moving cable:* –10 °C			*Flange socket or fixed cable:* –40 °C *Moving cable:* –10 °C		
Protection IEC 60 529	IP 67 at housing; IP 64 at shaft end[2]					
Weight	Approx. 0.35 kg					

Bold: These preferred versions are available on short notice
***** Please indicate when ordering
1) Restricted tolerances: Signal amplitude 0.8 to 1.2 V_{PP}
2) IP 66 upon request
3) See also *Mechanical Design and Installation* in the *Rotary Encoders* catalog

ECN/EQN 1300 Series

Rotary Encoders with Integral Bearings for Integration in Motors
- **Mounted stator coupling**
- **Installation diameter 65 mm**
- **Taper shaft**





***)** Ø 65 +0.02 for ECI/EQI 13xx

Dimensions in mm

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

A = Bearing of mating shaft
B = Bearing of encoder
K = Required mating dimensions
M = Measuring point for operating temperature
H1 = Clamping screw for coupling ring – width A/F 2; Tightening torque 1.25 Nm
H2 = ECN/EQN: Plug connector 12-pin (and 4 pins for temperature sensor, on ECN 1325/EQN 1337)
H3 = Screw plug widths A/F 3 and 4; tightening torque 5+0.5 Nm
H4 = Die-cast cover
H5 = Self-tightening screw M5 x 50 DIN 6912 width A/F 4; tightening torque 5 +0.5 Nm
H6 = Back-off thread M10
Direction of shaft rotation for output signals as per the interface description

	Absolute			
	ECN 1313	**ECN 1325**[1]	**EQN 1325**	**EQN 1337**[1]
Incremental signals	~ V_{PP}[2]	–	~ V_{PP}[2]	–
Line count*/ System accuracy	512/± 60" 2048/± 20"	2048/± 20"	512/± 60" 2048/± 20"	2048/± 20"
Cutoff frequency –3dB	*2048 lines:* ≥ 200 kHz *512 lines:* ≥ 100 kHz	–	*2048 lines:* ≥ 200 kHz *512 lines:* ≥ 100 kHz	–
Absolute position values	EnDat 2.2			
Ordering designation	EnDat 01	EnDat 22	EnDat 01	EnDat 22
Position values/rev	8192 (13 bits)	33554432 (25 bits)	8192 (13 bits)	33554432 (25 bits)
Revolutions	–		4096 (12 bits)	
Elec. permissible speed/ System accuracy	12000 rpm/± 1 LSB	12000 rpm (for continuous position value)	12000 rpm/± 1 LSB	12000 rpm (for continuous position value)
Calculation time t_{cal}	≤ 0.25 µs	≤ 5 µs	≤ 0.25 µs	≤ 5 µs
Power supply	3.6 to 14 V			
Current consumption (without load)	≤ 160 mA	≤ 150 mA	≤ 200 mA	≤ 180 mA
Electrical connection via PCB connector	12-pin	*Rotary encoder:* 12-pin *Temperature sensor*[3]*:* 4-pin	12-pin	*Rotary encoder:* 12-pin *Temperature sensor*[3]*:* 4-pin
Shaft	Taper shaft ∅ 9.25 mm; taper 1:10			
Mech. perm. speed n	≤ 15000 rpm		≤ 12000 rpm	
Starting torque at 20 °C	≤ 0.01 Nm			
Moment of inertia of rotor	$2.6 \cdot 10^{-6}$ kgm^2			
Natural frequency of stator coupling	≥ 1800 Hz			
Permissible axial motion of measured shaft	± 0.5 mm			
Vibration 55 to 2000 Hz **Shock** 6 ms	≤ 300 m/s^2 [4] (IEC 60068-2-6) ≤ 1000 m/s^2 / ≤ 2000 m/s^2 (IEC 60068-2-27)		≤ 300 m/s^2 [4] (IEC 60068-2-6) ≤ 1000 m/s^2 / ≤ 2000 m/s^2 (IEC 60068-2-27)	
Max. operating temp.	115 °C			
Min. operating temp.	–40 °C			
Protection IEC 60529	IP 40 when mounted			
Weight	Approx. 0.25 kg			

***** Please indicate when ordering

[1] version also available for safety-related applications

[2] Restricted tolerances
- Signal amplitude: 0.75 to 1.2 V_{PP}
- Asymmetry: 0.05
- Amplitude ratio: 0.9 to 1.1
- Phase angle: 90° ± 5° elec.
- Signal-to-noise ratio E, F: 100 mV

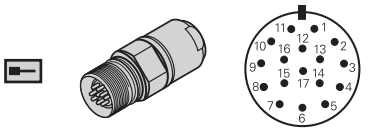
[3] Evaluation optimized for KTY 84
Only use sensors with double or reinforced insulation. Ensure that the lines are routed inside the motor housing.

[4] As per standard for room temperature, the following applies for operating temperature
Up to 100 °C: ≤ 300 m/s^2
Up to 115 °C: ≤ 150 m/s^2

Electrical Connection
Pin Layout

EnDat 01

17-pin coupling M23

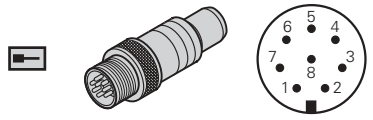


	Power supply					Incremental signals[1]				Absolute position values			
	7	**1**	**10**	**4**	**11**	**15**	**16**	**12**	**13**	**14**	**17**	**8**	**9**
	U_P	**Sensor** U_P	0 V	**Sensor** 0 V	**Inside shield**	**A+**	**A–**	**B+**	**B–**	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**
	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!
[1] Not with EnDat 2.2, order designation 22

EnDat 22

8-pin M12 coupling

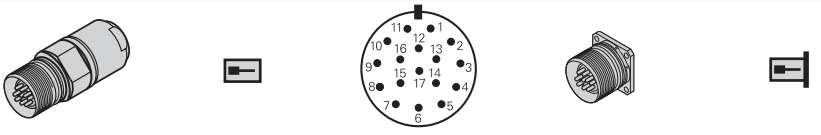


	Power supply				Absolute position values			
	2	**8**	**1**	**5**	**3**	**4**	**7**	**6**
	U_P[1]	**U_P**	**0 V**[1]	**0 V**	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**
	Blue	Brown/Green	White	White/Green	Gray	Pink	Violet	Yellow

Shield on housing; **U_P** = power supply voltage
1) For parallel supply lines
Vacant pins or wires must not be used!

SSI

17-pin coupling M23

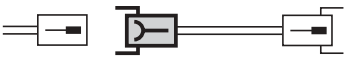
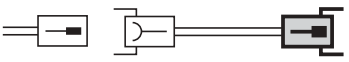
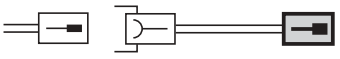
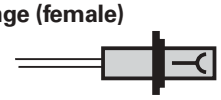
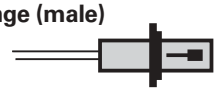
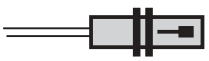


	Power supply					Incremental signals				Absolute position values				Other signals	
	7	**1**	**10**	**4**	**11**	**15**	**16**	**12**	**13**	**14**	**17**	**8**	**9**	**2**	**5**
	U_P	**Sensor** U_P	**0 V**	**Sensor** 0 V	**Inside shield**	**A+**	**A–**	**B+**	**B–**	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**	**Direc-tion of rota-tion**[1]	**Zero reset**[1]
	Brown/ Green	Blue	White/ Green	White	/	Green/ Black	Yellow/ Black	Blue/ Black	Red/ Black	Gray	Pink	Violet	Yellow	Black	Green

Shield on housing; **U_P** = power supply voltage
Sensor: With a 5 V supply voltage, the sensor line is connected internally with the corresponding power line.
[1] Vacant on ECN/EQN 10xx and ROC/ROQ 10xx

Connecting Elements and Cables

8-pin M12 | 17-pin M23

		for **EnDat** without incremental signals	for **EnDat** with incremental signals **SSI**
PUR connecting cable	**8-pin:** [(4 × 0.14 mm²) + (4 × 0.34 mm²)] **Ø 6 mm** **17-pin:** [(4 × 0.14 mm²) + 4(2 × 0.14 mm²) + (4 × 0.5 mm²)] **Ø 8 mm**		
Complete with connector (female) and coupling (male)		368330-xx	323897-xx
Complete with connector (female) and D-sub connector (female) for IK 220		530627-xx	332115-xx
Complete with connector (female) and D-sub connector (male) for IK 115/IK 215		524599-xx	324544-xx
With one connector (female)		559346-xx	309778-xx
Cable only, Ø 8 mm		–	266306-01
Mating element on connecting cable to connector on encoder cable	**Connector (female)** for cable Ø 8 mm 	–	291697-26
Connector on cable for connection to subsequent electronics	**Connector (male)** for cable Ø 8 mm 	–	291697-27
Coupling on connecting cable	**Coupling (male)** for cable Ø 4.5 mm Ø 6 mm Ø 8 mm 	–	291698-25 291698-26 291698-27
Flange socket for mounting on the subsequent electronics	**Flange socket (female)** 	–	315892-10
Mounted couplings	**With flange (female)** Ø 6 mm 	**–**	291698-35
	With flange (male) Ø 6 mm Ø 8 mm 	–	291698-41 291698-29
	With central fastening (male) Ø 6 mm 	–	291698-37

Encoder Cable

Encoder cable inside the motor housing Cable diameter 4.5 mm 16xAWG30/7 for			**Complete** With PCB connector and right-angle socket M23, 17-pin	**Complete** With PCB connector and right-angle socket M12, 8-pin for pure serial data transmission
	PCB connector	Crimp sleeve		
ECN 1313 **EQN 1325**	12-pin	Ø 6 mm	332201-xx	–
ECN 1325 **EQN 1337**	12-pin, 4-pin	Ø 6 mm	–	530094-01

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Related documents
- Technical Information: *Rotary Encoders with Optimized Scanning*
- Technical Information: *Safety-Related Position Encoders*
- Product Information: *ECN1325/ EQN 1337 for safety-related applications*
- Catalog: *Rotary Encoders*
- Catalog: *Position Encoders for Servo Drives*

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