HEIDENHAIN

Product Information

ECN 425
EQN 437

Absolute Rotary Encoders
with EnDat 2.2

EQN 424
EQN 425

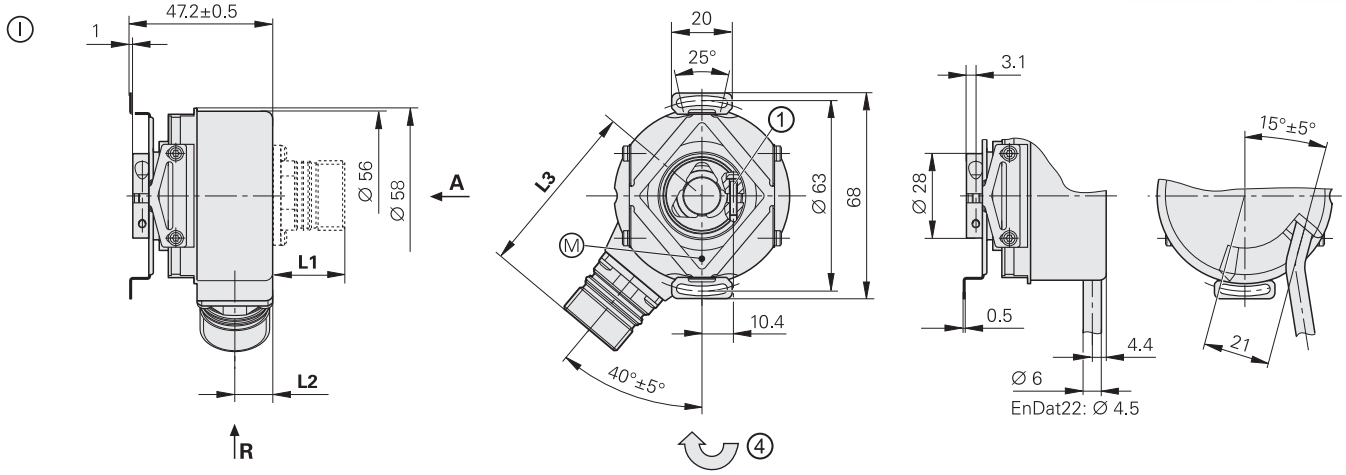
Absolute Rotary Encoders
with SSI

02/2023

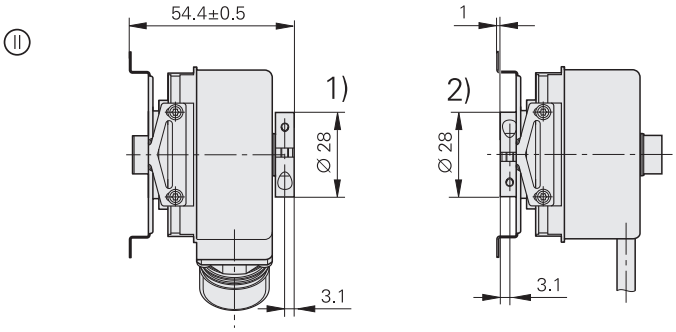
ECN 425, EQN 437, EQN 424, EQN 425 series

Absolute rotary encoders
- **Stator coupling for plane surface**
- **Blind hollow shaft or hollow through shaft**

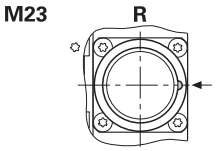
Blind hollow shaft



Hollow through shaft



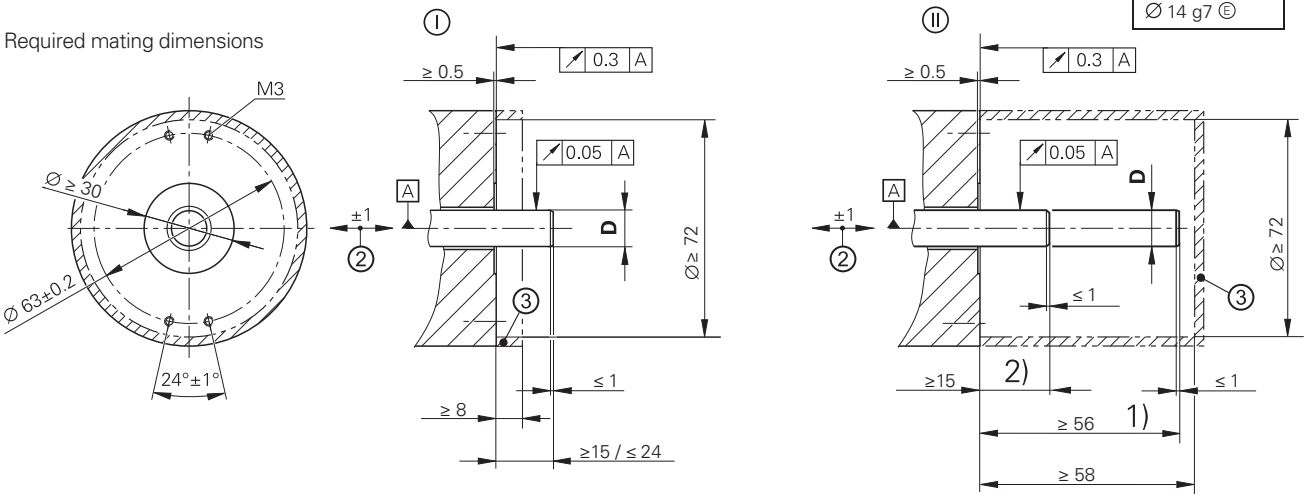
Connector coding
R = Radial



	Flange socket M23
L1	23.6
L2	12.5
L3	58.1

D
Ø 10g7 Ⓔ
Ø 12g7 Ⓔ
Ø 14 g7 Ⓔ

Required mating dimensions



mm
Tolerancing ISO 8015
ISO 2768:1989-mH
≤ 6 mm: ±0.2 mm

Radial cable (can also be used axially)
Ⓐ = Bearing of mating shaft
Ⓜ = Measuring point for operating temperature
1 = Clamping screw with X8 hexalobular socket
2 = Compensation of mounting tolerances and thermal expansion; no dynamic motion permitted
3 = Ensure protection against contact (EN 60529)
4 = Direction of shaft rotation for ascending position values
1) = Clamping ring on housing side (delivery condition)
2) = Clamping ring on coupling side (optionally mountable)

Specifications	Singleturn	Multiturn	
	ECN 425	**EQN 437**	**EQN 424/EQN 425**
Interface*	EnDat 2.2	EnDat 2.2	SSI
Ordering designation	EnDat22	EnDat22	SSI41r1/SSI07r1
Positions per revolution	33554432 (25 bits)	33554432 (25 bits)	8192 (13 bits)
Revolutions	–	4096	
Code	Pure binary	Pure binary	Gray
Elec. permiss. shaft speed Deviations[1)]	≤ 15000 rpm for continous position value –	≤ 12000 rpm for continous position value –	≤ 12000 rpm ±12 LSB
Calculation time t_{cal} Clock frequency	≤ 7 µs ≤ 16 MHz	≤ 7 µs ≤ 16 MHz	≤ 5 µs –
Incremental signals	Without	Without	~ 1 V_{PP}[2)]
Line count	–	–	512
Cutoff frequency –3 dB Output frequency	– –	– –	≥ 130 kHz –
System accuracy	±20″	±20″	±60″
Electrical connection*	• Cable (0.33 m) with D-sub connector • Cable (1 m) with M12 coupling	• Cable (0.18 m) with crimp contacts • Cable (1 m) with M12 coupling	17-pin M23 radial **flange socket**
Supply voltage	DC 3.6 V to 14 V	DC 3.6 V to 14 V	DC 4.75 V to 30 V
Power consumption (max.)	*3.6 V:* ≤ 0.6 W *14 V:* ≤ 0.7 W	*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:* 80 mA	*5 V:* 95 mA	*5 V:* 85 mA *24 V:* 20 mA
Shaft*	Blind hollow shaft or hollow through shaft; Ø 10 mm, Ø 12 mm or Ø 14 mm		
Mech. permiss. shaft speed[3)]	≤ 6000 rpm/≤ 12000 rpm[4)]		
Starting torque (typical) at 20 °C	*Blind hollow shaft:* 0.01 Nm; *hollow through shaft:* 0.025 Nm		
Moment of inertia of rotor	≤ 4.6 · 10^{-6} kgm^2		
Permiss. axial motion of measured shaft	±1 mm		
Vibration 55 Hz to 2000 Hz **Shock** 6 ms	≤ 300 m/s^2; *flange socket version:* ≤ 150 m/s^2 (EN 60068-2-6); higher values upon request ≤ 2000 m/s^2 (EN 60068-2-27)		
Max. operating temp.[3)]	100 °C		
Min. operating temperature	*Flange socket or fixed cable:* –40 °C; *moving cable:* –10 °C		
Protection EN 60529	*At housing:* IP67 (IP66 with hollow through shaft) *At shaft inlet:* IP64		
Mass	≈ 0.3 kg		
ID number	1178024-01 1178024-20 1178024-21	1178025-13 1178025-50 1178025-57	1353131-27 1353131-28 1353131-35

* Please select when ordering

1) Speed-dependent deviations between absolute value and incremental signal

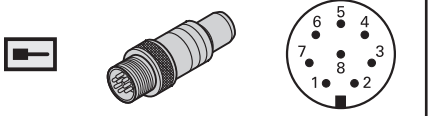
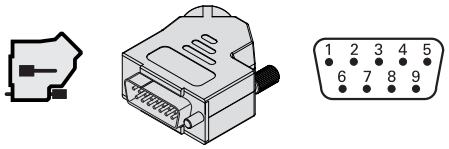
2) Limited tolerances: signal amplitude: 0.8 V_{PP} to 1.2 V_{PP}

3) For the relationship between the operating temperature and the shaft speed or supply voltage, see *General mechanical information* in the *Rotary Encoders* brochure

4) With two shaft clampings (only with hollow through shaft)

Pin layout

EnDat22 pin layout

8-pin M12 coupling	9-pin D-sub connector	Seven crimp contacts (male)
		

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

Cable shield connected to housing (for the version with an 8-pin M12 coupling and 9-pin, 2-row D-sub connector (male));
U_P = Power supply voltage
Sensor: The sense line is connected in the encoder with the corresponding power line.
Vacant pins or wires must not be used!
[1] With the crimp contacts, the U_P and 0 V sense lines are not assigned. Outer shield crimped to black wire with contact.

SSI position values

The **position value** is transmitted, starting with the most significant bit (MSB), over the data lines (DATA) in synchronism with a clock signal (CLOCK) provided by the control. The SSI standard data word length for singleturn encoders is 13 bits, and for multiturn encoders, 25 bits. In addition to the absolute position values, **incremental signals** can also be transmitted. For a signal description, see *1 V_{PP} incremental signals* in the *Interfaces of HEIDENHAIN Encoders* brochure.

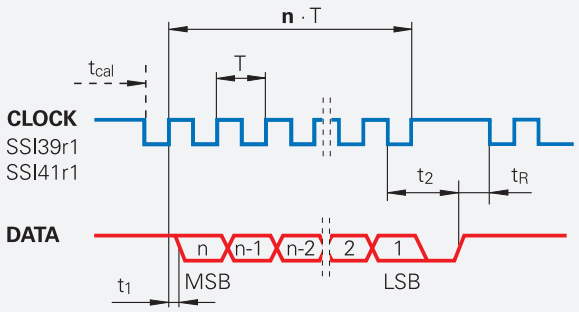
The following **functions** can be activated with SSI41r1 via programming inputs:
- **Direction of rotation**
- **Zeroing** (setting to zero)

The direction of rotation and zeroing functions are not possible with SSI07r1.

Data transmission

T = 1 to 10 µs
t_{cal} = See the specifications
$t_1 \leq$ 0.4 µs (without cable)
t_2 = 17 µs to 20 µs
$t_R \geq$ 5 µs
n = Data word length: 24/25 bits with EQN

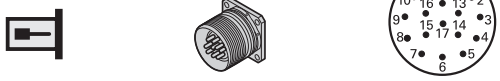
$\overline{\text{CLOCK}}$ and $\overline{\text{DATA}}$ not shown



Warning: The programming inputs must always be terminated with a resistor (see *Input circuit design of the downstream electronics* in the *Interfaces of HEIDENHAIN Encoders* brochure).

SSI pin layout

17-pin M23 flange socket



	Power supply					Incremental signals				Serial data transmission				Other signals	
	7	1	10	4	11 [1]	15	16	12	13	14	17	8	9	2 [1]	5 [1]
	U_P	**Sensor** U_P	**0 V**	**Sensor** 0 V	**Internal shield**	**A+**	**A–**	**B+**	**B–**	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**	**Direction of rotation**	**Zeroing**
	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: The sense line is connected in the encoder with the corresponding power supply line.
Vacant pins or wires must not be used!
[1] Not used with SSI07r1

HEIDENHAIN

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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.

More information:

Comply with the requirements described in the following documents to ensure correct and intended operation:
- Brochure: *Rotary Encoders* 349529-xx
- Brochure: *Interfaces of HEIDENHAIN Encoders* 1078628-xx
- Brochure: *Cables and Connectors* 1206103-xx
- SSI interface description 391244-xx
- Mounting Instructions: EQN 424/EQN 425 SSI 584320-xx
- Mounting Instructions: ECN 425/EQN 437 upon request