HEIDENHAIN

Product Information

ECN 1324S
EQN 1336S

Absolute Rotary Encoders with DRIVE-CLiQ Interface for Safety-Related Applications

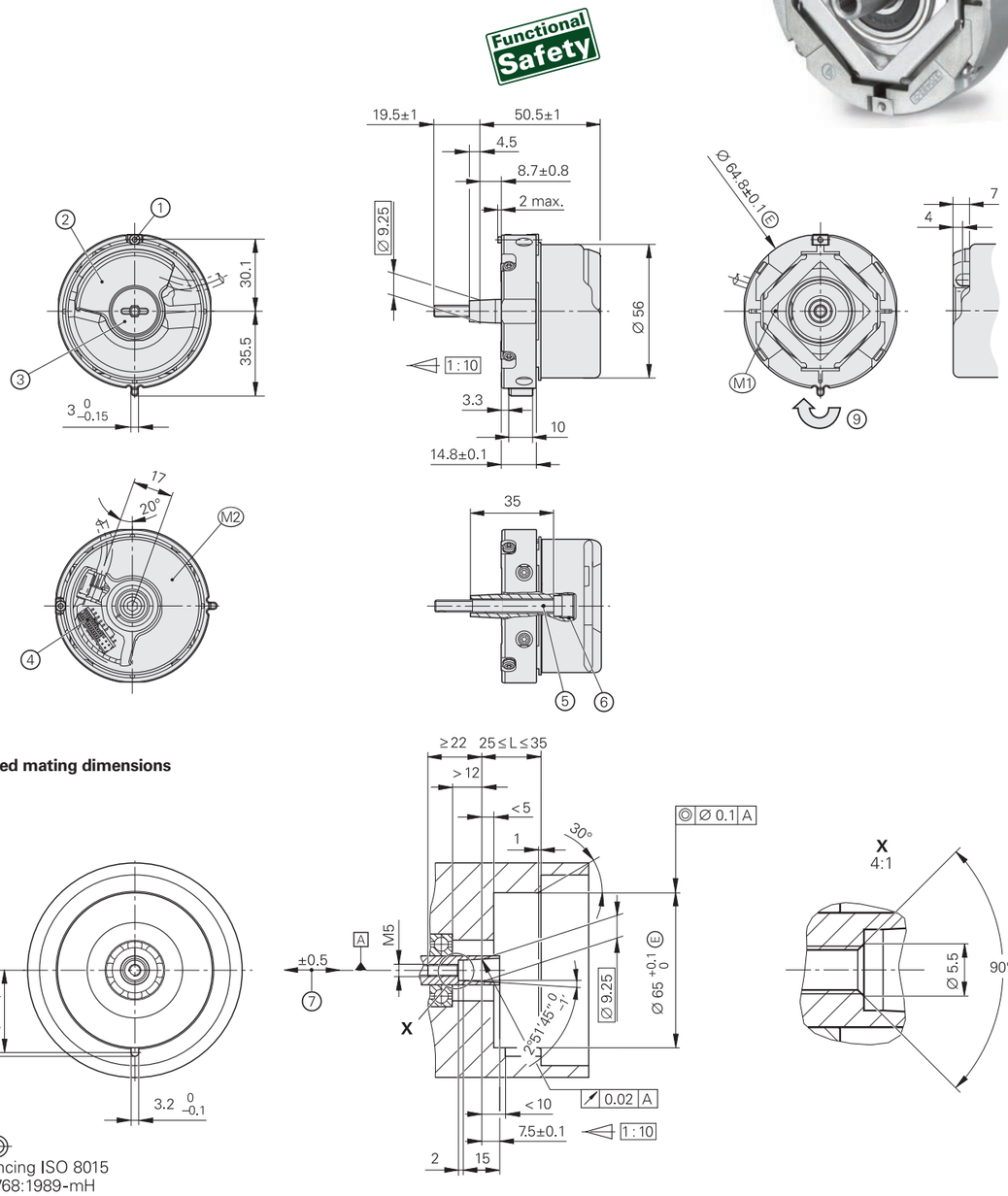
Firmware 53

Functional Safety

06/2022

ECN 1324S, EQN 1336S

Rotary encoders for absolute position values with safe singleturn information
- **65 mm installation diameter**
- **07B expanding ring coupling**
- **65B tapered shaft**



Required mating dimensions

A = Bearing of mating shaft
M1 = Measuring point for operating temperature
M2 = Measuring point for vibration (see D741714)
1 = Clamping screw for coupling ring: width A/F 2; tightening torque: 1.25 Nm –0.2 Nm
2 = Die-cast cover
3 = Screw plug: widths A/F 3 and 4; tightening torque: 5 Nm +0.5 Nm
4 = 16-pin header (12+4-pin)
5 = Screw: DIN 6912 – M5x50 – 08.8 – MKL; width A/F 4; tightening torque: 5 Nm +0.5 Nm
6 = M10 back-off thread
7 = Compensation of mounting tolerances and thermal expansion; no dynamic movement permitted
8 = Chamfer at start of thread is mandatory for material bonding anti-rotation lock
9 = Direction of shaft rotation for ascending position values

Specifications	ECN 1324S singleturn	EQN 1336S multiturn
Functional safety for applications with up to	As a single-encoder system for monitoring and closed-loop functions • SIL 2 as per EN 61508 (further basis for testing: IEC 61800-5-3) • Category 3, PL d, according to EN ISO 13849-1:2015 Safe in the singleturn range	
PFH[1]	≤ 27 · 10^{-9} (probability of dangerous failure per hour)	
Safe position[2]	*Encoder:* ±1.76° (safety-related measuring step: SM = 0.7°) *Mechanical coupling:* ±2° (fault exclusion for loosening of the shaft coupling and stator coupling, designed for accelerations of ≤ 300 m/s^2)	
Interface/ordering designation	DRIVE-CLiQ / DQ01	
Firmware	01.32.26.53	
SINAMICS, SIMOTION[3]	≥ V4.4 HF4	
SINUMERIK with safety[3]	≥ V4.4 SP2	
SINUMERIK without safety[3]	≥ V4.4 SP1 HF3	
Position values per revolution	16777216 (24 bits)	
Revolutions	–	4096 (12 bits)
Calculation time TIME_MAX_ACTVAL[4]	≤ 8 µs	
System accuracy	±20″	
Electrical connection	*PCB connector:* 16-pin (12+4-pin), with connection for an external temperature sensor[5]	
Cable length	< 40 m (for the calculation, see the *Cables and Connectors* brochure)	
Supply voltage	DC 24 V (10 V to 28.8 V); up to DC 36.0 V possible without compromising functional safety	
Power consumption[6] (maximum)	*At 10 V:* ≤ 950 mW; *at 28.8 V:* ≤ 1000 mW	*At 10 V:* ≤ 1050 mW; *at 28.8 V:* ≤ 1150 mW
Current consumption (typical)	*At 24 V:* 38 mA (without load)	*At 24 V:* 43 mA (without load)
Shaft	Tapered shaft (Ø 9.25 mm); taper: 1:10	
Shaft speed	≤ 15000 rpm (at ≥ 2 position requests per rev.)	≤ 12000 rpm (at ≥ 2 position requests per rev.)
Starting torque (typical)	0.01 Nm (at 20 °C)	
Moment of inertia of rotor	2.6 · 10^{-6} kgm^2	
Angular acceleration of rotor	≤ 1 · 10^5 rad/s^2	
Natural frequency of the stator coupling (typical)	1800 Hz	
Axial motion of measured shaft	≤ ±0.5 mm	

1) For use at ≤ 1000 m above sea level (≤ 6000 m above sea level upon request)
2) Further tolerances may arise in the downstream electronics after position value comparison (contact mfr.)
3) See Siemens document "Certified encoders with DRIVE-CLiQ Dependencies on SIMOTION / SINUMERIK and SINAMICS Hardware and Software versions"
4) The calculation time TIME_MAX_ACTVAL specifies the time after which data transfer from the encoder to the control can start within the current-regulator clock time
5) See *Temperature measurement in motors* in the *Encoders for Servo Drives* brochure
6) See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure

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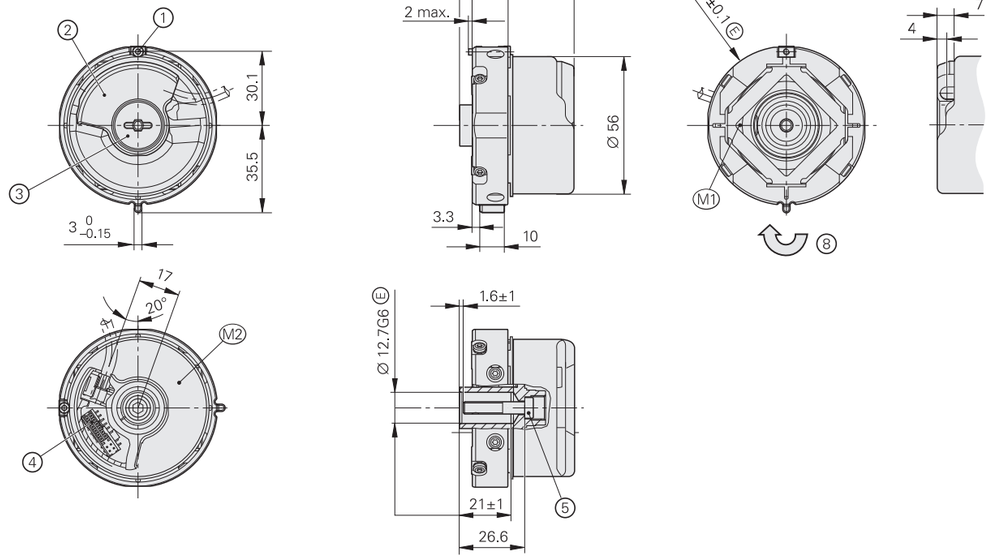
Specifications	ECN 1324S singleturn	EQN 1336S multiturn
Vibration 55 Hz to 2000 Hz **Shock** 6 ms	≤ 300 m/s² (EN 60068-2-6); 10 Hz to 55 Hz constant over 4.9 mm peak to peak ≤ 2000 m/s² (EN 60068-2-27)	
Operating temperature	–40 °C to 100 °C	
Trigger threshold of exceeded temperature error message	117 °C in the scanning ASIC (measuring accuracy of internal temperature sensor: ±2 K at 117 °C)	
Relative humidity	≤ 93% (40 °C/21 d as per EN 60068-2-78), condensation excluded	
Protection rating EN 60529	IP40 (read about insulation under *Electrical safety* in the *Interfaces of HEIDENHAIN Encoders* brochure; contamination from the ingress of fluids must be avoided)	
Mass	≈ 0.3 kg	
ID number	1179144-02 1179144-52[1)]	1179145-03

[1)] In collective package

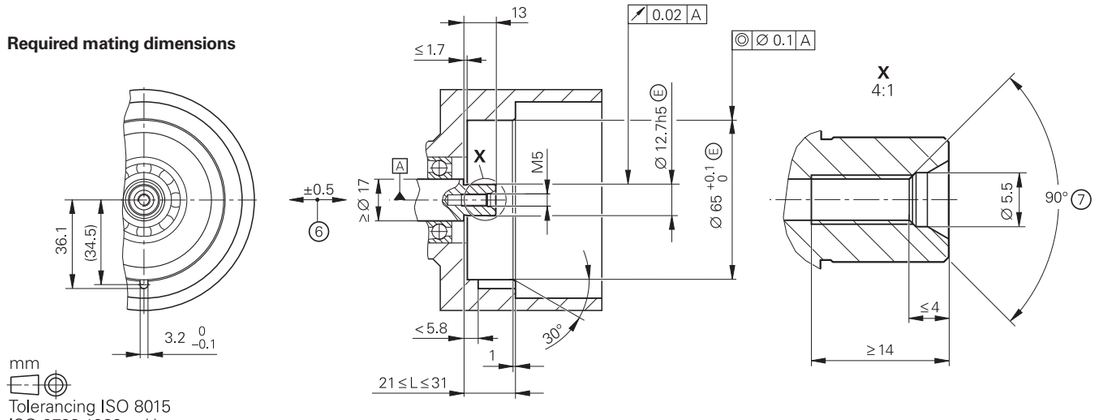
ECN 1324S, EQN 1336S

Rotary encoders for absolute position values with safe singleturn information
- **65 mm installation diameter**
- **07B expanding ring coupling**
- **67M blind hollow shaft for axial clamping**

Functional Safety



Required mating dimensions



mm

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

A = Bearing of mating shaft
M1 = Measuring point for operating temperature
M2 = Measuring point for vibration (see D741714)
1 = Clamping screw for coupling ring: width A/F 2; tightening torque: 1.25 Nm –0.2 Nm
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5 = Screw: DIN 6912 – M5x25 – 08.8 – MKL; width A/F 4; tightening torque: 5 Nm +0.5 Nm
6 = Compensation of mounting tolerances and thermal expansion; no dynamic movement permitted
7 = Chamfer at start of thread is obligatory for material bonding anti-rotation lock
8 = Direction of shaft rotation for ascending position values

Specifications	ECN 1324S singleturn	EQN 1336S multiturn
Functional safety for applications with up to	As a single-encoder system for monitoring functions and closed-loop functions • SIL 2 as per EN 61508 (further basis for testing: IEC 61800-5-3) • Category 3, PL d, according to EN ISO 13849-1:2015 Safe in the singleturn range	
PFH[1]	≤ 27 · 10^{-9} (probability of dangerous failure per hour)	
Safe position[2]	*Encoder:* ±1.76° (safety-related measuring step: SM = 0.7°) *Mechanical coupling:* ±2° (fault exclusion for loosening of the shaft coupling and stator coupling, designed for accelerations of ≤ 300 m/s²)	
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SINAMICS, SIMOTION[3]	≥ V4.4 HF4	
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Position values per revolution	16777216 (24 bits)	
Revolutions	–	4096 (12 bits)
Calculation time TIME_MAX_ACTVAL[4]	≤ 8 µs	
System accuracy	±20″	
Electrical connection	*PCB connector:* 16-pin (12+4-pin); with connection for an external temperature sensor[5]	
Cable length	< 40 m (for the calculation, see the *Cables and Connectors* brochure)	
Supply voltage	DC 24 V (10 V to 28.8 V); up to DC 36.0 V possible without compromising functional safety	
Power consumption[6] (maximum)	*At 10 V:* ≤ 950 mW; *at 28.8 V:* ≤ 1000 mW	*At 10 V:* ≤ 1050 mW; *at 28.8 V:* ≤ 1150 mW
Current consumption (typical)	*At 24 V:* 38 mA (without load)	*At 24 V:* 43 mA (without load)
Shaft	Blind hollow shaft for axial clamping (Ø 12.7 mm)	
Shaft speed	≤ 12000 rpm (at ≥ 2 position requests per rev.)	
Starting torque (typical)	0.01 Nm (at 20 °C)	
Moment of inertia of rotor	3.6 · 10^{-6} kgm²	
Angular acceleration of rotor	≤ 5 · 10^{4} rad/s²	
Axial motion of measured shaft	≤ ±0.5 mm	

1) For use at ≤ 1000 m above sea level (≤ 6000 m above sea level upon request)
2) Further tolerances may arise in the downstream electronics after position value comparison (contact mfr.)
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4) The calculation time TIME_MAX_ACTVAL specifies the time after which data transfer from the encoder to the control can start within the current-regulator clock time
5) See *Temperature measurement in motors* in the *Encoders for Servo Drives* brochure
6) See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure

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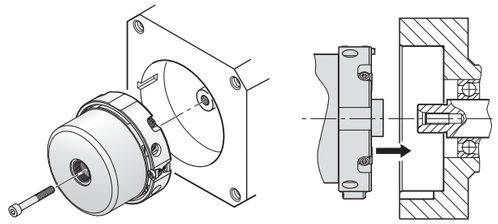
Specifications	ECN 1324S singleturn	EQN 1336S multiturn
Vibration 55 Hz to 2000 Hz **Shock** 6 ms	≤ 300 m/s² (EN 60068-2-6); 10 Hz to 55 Hz constant over 4.9 mm peak to peak ≤ 2000 m/s² (EN 60068-2-27)	
Operating temperature	–30 °C to 100 °C	
Trigger threshold for exceeded temperature error message	117 °C in the scanning ASIC (measuring accuracy of internal temperature sensor: ±2 K at 117 °C)	
Relative humidity	≤ 93% (40 °C/21 d as per EN 60068-2-78), condensation excluded	
Protection rating EN 60529	IP40 (read about insulation under *Electrical safety* in the *Interfaces of HEIDENHAIN Encoders* brochure; contamination from the ingress of fluids must be avoided)	
Mass	≈ 0.3 kg	
ID number	1179144-04	1179145-04

Mounting

The shaft of the rotary encoder is pressed onto the motor's drive shaft and fastened with a central screw. It is particularly important to ensure that the positive-locking element of the stator coupling securely engages the corresponding slot in the measured shaft. Use a central screw with material-bonding anti-rotation lock (see *Mounting accessories*). The stator coupling is clamped by means of an axially tightenable screw in a locating hole.



More information:

For the customer-side mounting design, the material specifications for steel apply to the customer-side shaft. For the customer-side stator, the material specifications for aluminum apply.

In addition, take into account the other material properties in the *Encoders for Servo Drives* brochure (ID 208922-xx).

Mounting accessories

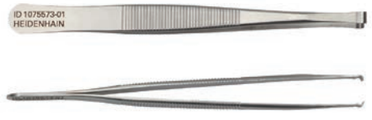
Screws
Screws (central screw, mounting screws) are not included in delivery and can be ordered separately.

ECN 1324S, EQN 1336S	Central screws for fastening the shaft[1]		Lot size
For tapered shaft 65B	DIN 6912 – **M5×50** – 08.8 – **MKL**	ID 202264-54	10 or 100
For hollow shaft 67M	DIN 6912 – **M5×25** – 08.8 – **MKL**	ID 202264-55	

[1] With coating for material bonding anti-rotation lock

Please note the information on screws from HEIDENHAIN in the *Encoders for Servo Drives* brochure, under the heading *Rotary encoders with functional safety* in the chapter *General mechanical information*.

Mounting aid
To avoid damage to the cable, use the mounting aid to connect and disconnect the cable assembly. The pulling force must be applied solely to the connector and not to the wires.



ID 1075573-01

For further mounting information and mounting aids, please refer to the relevant mounting instructions and the *Encoders for Servo Drives* brochure.

Integrated temperature evaluation

These rotary encoders feature a temperature sensor integrated into the encoder electronics and an evaluation circuit for an external temperature sensor. In both cases, the respective digitized temperature value is transmitted purely serially via the DRIVE-CLiQ interface. Please bear in mind that neither the temperature measurement nor the transmission of the temperature value is safe in terms of functional safety.

The temperature measured by the internal temperature sensor is higher by a device-specific and application-specific amount than the temperature at measuring point M1, as shown in the dimension drawing.

Upon reaching a trigger threshold for the internal temperature sensor, these rotary encoders issue an "Alarm 405" error message. This threshold may vary depending on the encoder and is stated in the specifications. During operation, it is recommended that the temperature be kept adequately below the error-message threshold.

The encoder's intended use requires compliance with the operating temperature at measuring point M1.

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Temperature measurement in motors
To protect a motor from overloading, the motor manufacturer usually installs a temperature sensor in close proximity to the motor winding.

The PT 1000 or, for example, the KTY 84-130 semiconductor sensor is to be used. For a PT 1000, the following values apply with regard to the accuracy of the evaluation circuit:

	±6 K	at	–40.0 °C	to	80 °C
	±4 K	at	80.1 °C	to	160 °C
and	±6 K	at	160.1 °C	to	200 °C

For a KTY 84-130 semiconductor sensor, the following values apply with regard to the accuracy of the evaluation circuit:

	±6 K	at	–40.0 °C	to	80 °C
	±2 K	at	80.1 °C	to	160 °C
and	±6 K	at	160.1 °C	to	200 °C

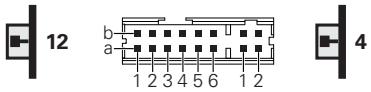
The temperature values are transmitted via the DRIVE-CLiQ protocol.

The temperature sensor used is adjustable via Parameter 601 in the configuration software (e.g., Starter software) of the drive.

Electrical connection

Pin layout

16-pin (12+4-pin) PCB connector



	Power supply				Serial data transmission				Other signals[1]		
12+4	**1b**	**6a**	**3a**	**4b**	**6b**	**1a**	**2b**	**5a**	**1a** [2]	**1b** [2]	**2a/2b**
			U_P	**0 V**	**RXP**	**RXN**	**TXP**	**TXN**	**T+**	**T–**	**/**

[1] Only with adapter cables inside the motor housing
[2] Connections for external temperature sensor; evaluation optimized for KTY 84-130/PT 1000 (see *Temperature measurement in motors* in the *Encoders for Servo Drives* brochure)

Cable shield connected to housing; **U_P** = Power supply voltage
Vacant pins or wires must not be used!
Output cables with a cable length > 0.5 m require strain relief for the cable

HEIDENHAIN

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More information:

Comply with the requirements described in the following documents to ensure correct and intended operation:
- Operating Instructions 1380044-xx