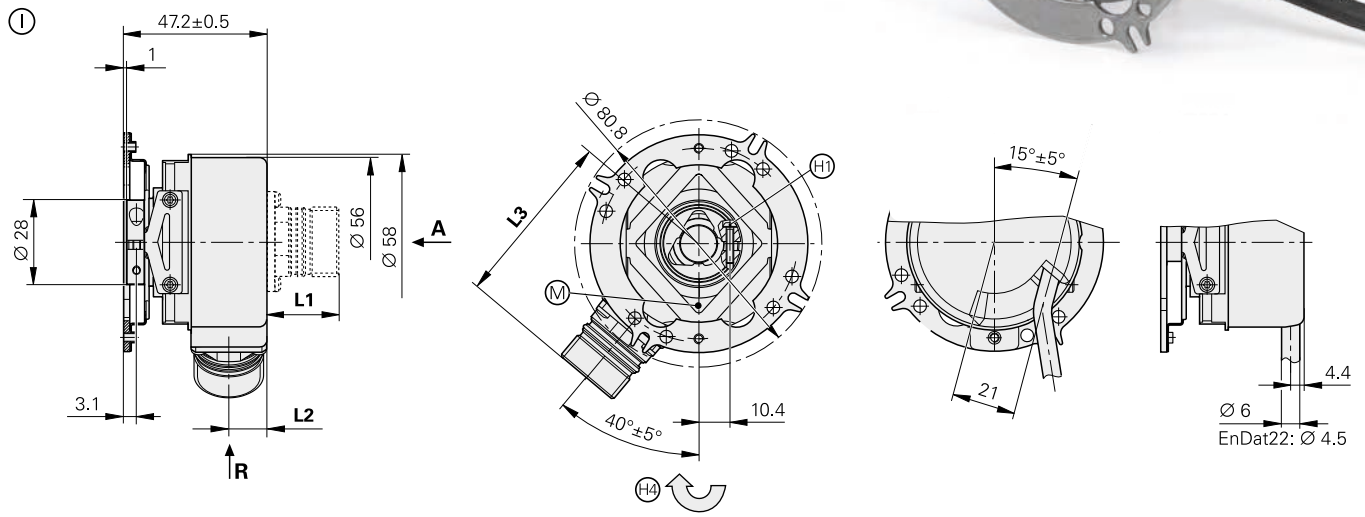
ECN/EQN/ERN 400 series

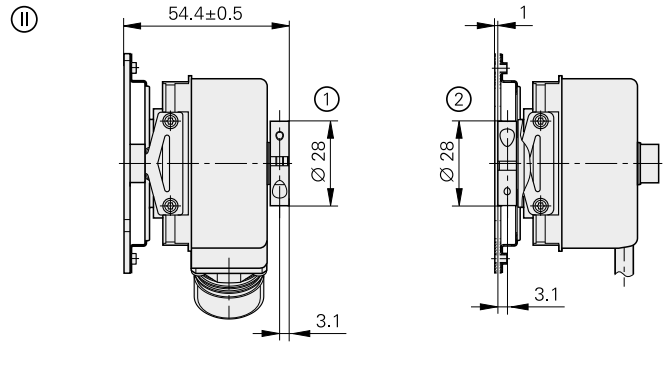


Absolute and incremental rotary encoders
- **Stator coupling for universal mounting**
- **Blind hollow shaft or hollow through shaft**

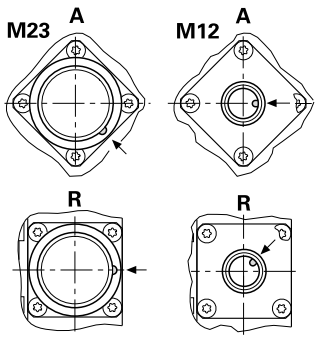
Blind hollow shaft



Hollow through shaft

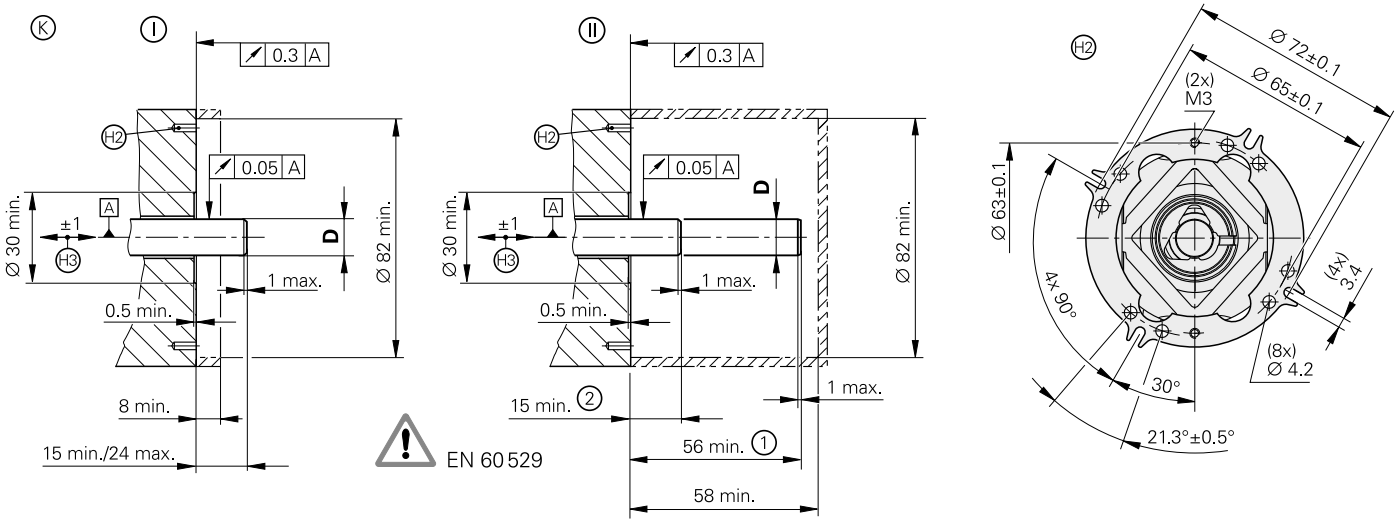


Connector coding
A = Axial, **R** = Radial



	Flange socket	
	M12	M23
L1	14	23.6
L2	12.5	12.5
L3	48.5	58.1

D
Ø 8g7 Ⓔ
Ø 12g7 Ⓔ



mm

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

Cable radial, also usable axially
Ⓐ = Bearing of mating shaft
Ⓚ = Required mating dimensions
Ⓜ = Measuring point for operating temperature
H1 = Clamping screw with X8 hexalobular socket
H2 = Hole pattern for fastening, see coupling
H3 = Compensation of mounting tolerances and thermal expansion, no dynamic motion permitted
H4 = Direction of shaft rotation for output signals as per the interface description
① = Clamping ring on housing side (condition upon delivery)
② = Clamping ring on coupling side (optionally mountable)

	Incremental			
	ERN 420	**ERN 460**	**ERN 430**	**ERN 480**
Interface	⊓⊔TTL		⊓⊔ HTL	∿ 1 V_{PP} [1]
Line counts*	250 500			–
	1000 1024 1250 2000 2048 2500 3600 4096 5000			
Reference mark	One			
Cutoff frequency –3 dB Output frequency Edge separation a	– ≤ 300 kHz ≥ 0.39 µs			≥ 180 kHz – –
System accuracy	1/20 of grating period			
Electrical connection*	• M23 flange socket, radial and axial (with blind hollow shaft) • Cable 1 m, without connecting element			
Voltage supply	5 V DC ± 0.5 V	10 V to 30 V DC	10 V to 30 V DC	5 V ± 0.5 V DC
Current consumption without load	≤ 120 mA	≤ 100 mA	≤ 150 mA	≤ 120 mA
Shaft*	**Blind hollow shaft** or **hollow through shaft; D = 8 mm** or **D = 12 mm**			
Mech. permiss. speed n [2]	≤ 6000 rpm/≤ 12 000 rpm [3]			
Starting torque At 20 °C Below –20 °C	*Blind hollow shaft:* ≤ 0.01 Nm *Hollow through shaft:* ≤ 0.025 Nm (for IP66: ≤ 0.075 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	≤ 300 m/s^2; *Flange socket version:* 150 m/s^2 (EN 60 068-2-6); higher values upon request ≤ 1000 m/s^2 (EN 60 068-2-27)			
Max. operating temp. [2]	100 °C	70 °C	100 °C [4]	
Min. operating temp.	*Flange socket or fixed cable:* –40 °C; *moving cable:* –10 °C			
Protection EN 60 529	*At housing:* IP67 (IP66 for hollow through shaft) *At shaft inlet:* IP64 (with D = 12 mm, IP66 available on request)			
Mass	≈ 0.3 kg			
Valid for ID	385424-xx	385464-xx	385434-xx	385483-xx

Bold: This preferred version is available on short notice.

* Please select when ordering

1) Restricted tolerances: Signal amplitude 0.8 to 1.2 V_{PP}

2) For the relationship between the operating temperature and the shaft speed or supply voltage, see *General Mechanical Information*

3) With two shaft clamps (only for hollow through shaft)

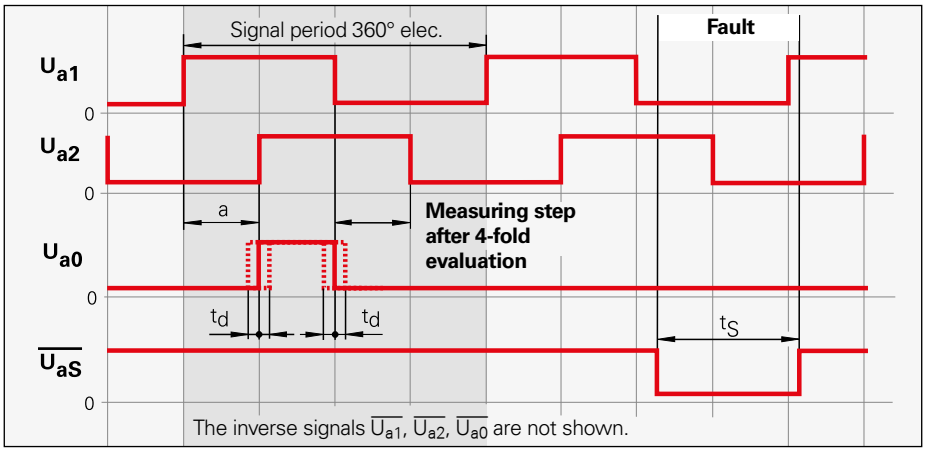
4) 80° for ERN 480 with 4096 or 5000 lines

Incremental signals ⊓⊔ HTL, HTLs

HEIDENHAIN encoders with ⊓⊔ HTL interface incorporate electronics that digitize sinusoidal scanning signals with or without interpolation.

The **incremental signals** are transmitted as the square-wave pulse trains U_{a1} and U_{a2}, phase-shifted by 90° elec. The **reference mark signal** consists of one or more reference pulses U_{a0}, which are gated with the incremental signals. In addition, the integrated electronics produce their **inverted signals** $\overline{U_{a1}}$, $\overline{U_{a2}}$ and $\overline{U_{a0}}$ for noise-proof transmission (does not apply to HTLs). The illustrated sequence of output signals—with U_{a2} lagging U_{a1}—applies to the direction of motion shown in the dimension drawing.

The **fault detection signal** $\overline{U_{aS}}$ indicates fault conditions, for example a failure of the light source.



The distance between two successive edges of the incremental signals U_{a1} and U_{a2} through 1-fold, 2-fold or 4-fold evaluation is one **measuring step.**

Comprehensive descriptions of all available interfaces as well as general electrical information are included in the *Interfaces* catalog ID 1078628-xx.

Power and current consumption

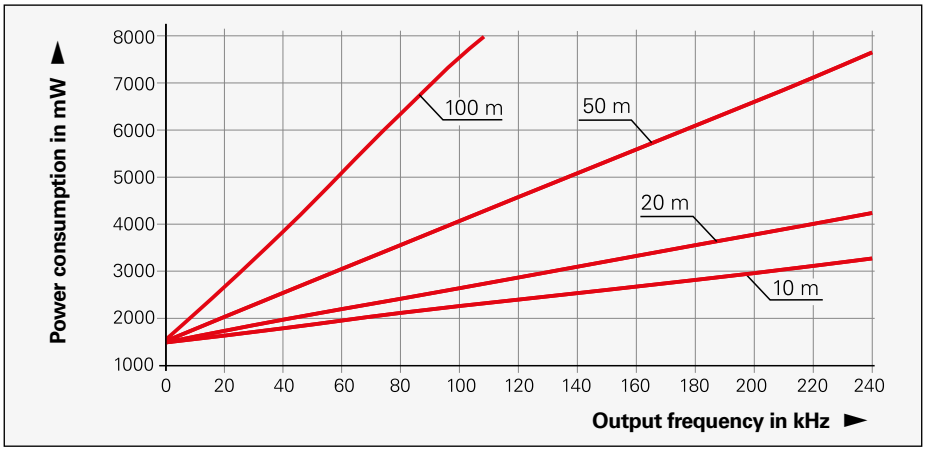
For encoders with a large supply voltage range, the current consumption has a nonlinear relationship with the supply voltage. It is determined using the calculation described in the *Interfaces of HEIDENHAIN Encoders* catalog.

For the rotary encoders with additional HTL output signals, the power consumption also depends on the output frequency and the cable length. The power consumption values for the HTL or HTLs interface can therefore be taken from the diagrams.

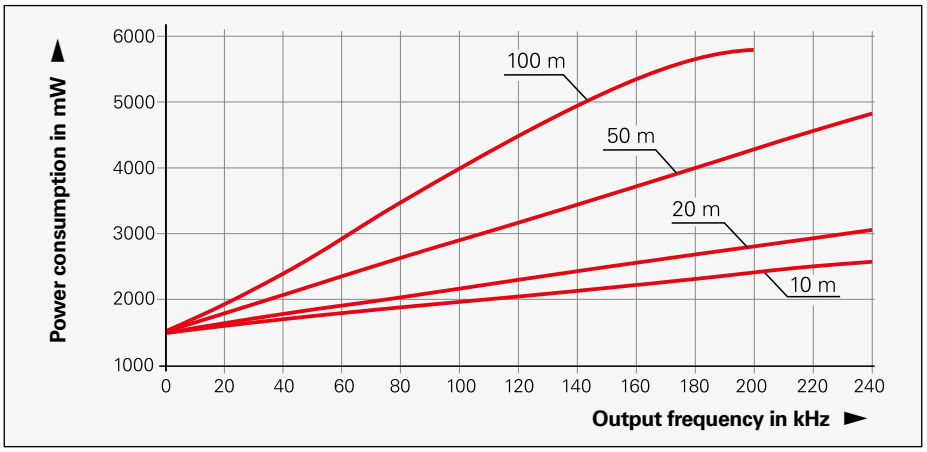
The maximum permissible output frequency is shown in the specifications. It occurs at the maximum permissible shaft speed. The output frequency for any shaft speed is calculated using the following formula:

$f = (n/60) \cdot z \cdot 10^{-3}$

With
f = Output frequency in kHz
n = Shaft speed in rpm
z = Number of signal periods per 360°



Power consumption (maximum) for HTL interface and supply voltage U_P = 30 V



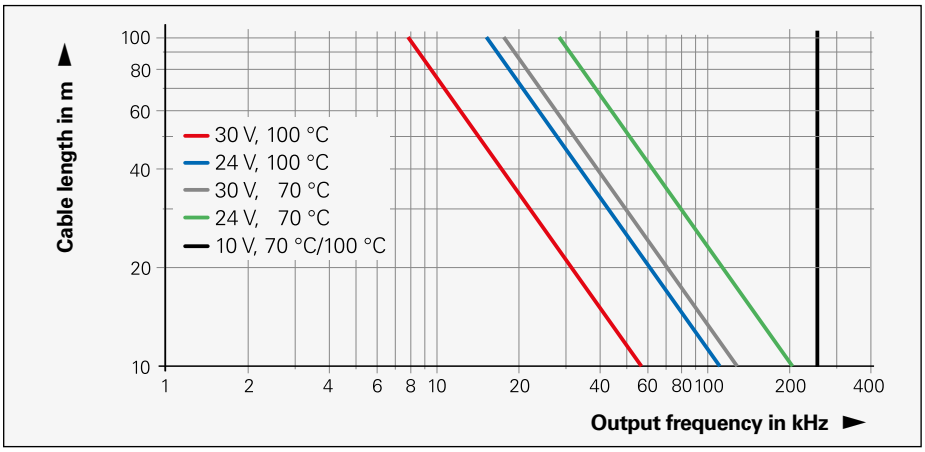
Power consumption (maximum) for HTLs interface and supply voltage U_P = 30 V

Cable length for HTL

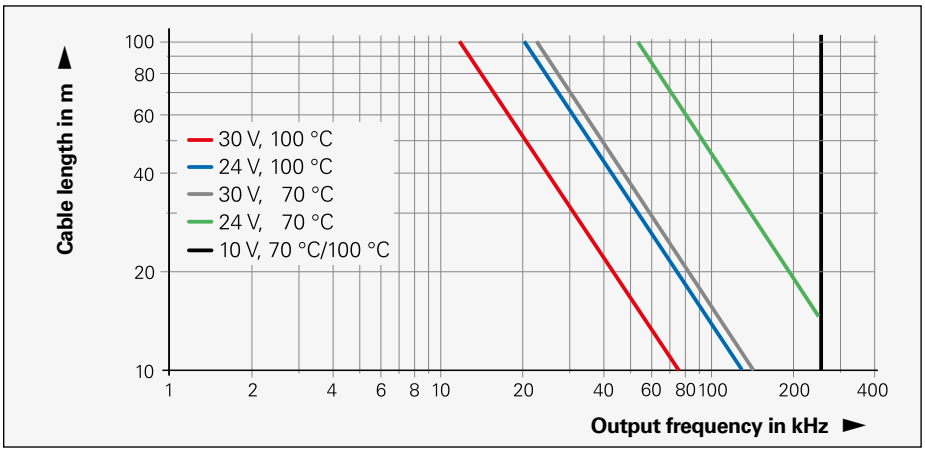
For the rotary encoders with additional HTL output signals, the maximum permissible cable length depends on several criteria:

- Output frequency
- Supply voltage
- Operating temperature

The relationships are shown separately for the HTL and HTLs interface in the diagrams. There are no limitations if a supply voltage of 10 V DC is used.



Maximum permissible cable length for HTL interface

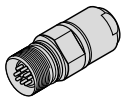
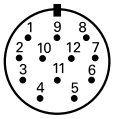


Maximum permissible cable length for HTLs interface

Pin layout

12-pin flange socket or coupling, M23



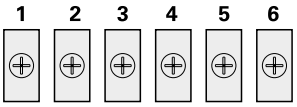



	Voltage supply				Incremental signals						Other signals		
	12	**2**	**10**	**11**	**5**	**6**	**8**	**1**	**3**	**4**	**7**	**/**	**9**
HTL	**U_P**	**Sensor** U_P	0 V	**Sensor** 0 V	**U_{a1}**	**$\overline{U_{a1}}$**	**U_{a2}**	**$\overline{U_{a2}}$**	**U_{a0}**	**$\overline{U_{a0}}$**	**$\overline{U_{aS}}$**	**Vacant**	**Vacant**
HTLs						**0 V**		**0 V**		**0 V**			
	Brown/ Green	Blue	White/ Green	White	Brown	Green	Gray	Pink	Red	Black	Violet	/	Yellow

Shield on housing; **U_P** = Power supply voltage
Sensor: The sensor line is connected in the encoder with the corresponding power line.

ROD 1930 pin layout

Screw-terminal connection



	Voltage supply		Incremental signals			
Connection	**1**	**2**	**3**	**4**	**5**	**6**
HTL	**U_P**	**U_N** 0V	**U_{a1}**	**$\overline{U_{a1}}$**	**U_{a2}**	**$\overline{U_{a2}}$**
HTLs				**U_{a2}**	0 V	**U_{a0}**

A shielded cable with a cross section of at least 0.5 mm^2 is recommended when connecting to the voltage supply.

The encoder is connected through screw terminals. The appropriate wire end sleeves must be attached to the wires.