HEIDENHAIN

Product Information

ROQ 425

Absolute Rotary Encoders with TTL or HTL Signals

ROQ 425

Rotary encoder for absolute position values with solid shaft for separate shaft coupling

- **EnDat or SSI interface**
- **Additional incremental signals with TTL or HTL levels**

mm

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

Ⓐ = Bearing
Ⓑ = Threaded mounting hole
M1 = Measuring point for operating temperature
M2 = Measuring point for vibration, see also D 774714
1 = Connector coding
2 = Direction of shaft rotation for output signals as per the interface description

Specifications	Absolute						
	ROQ 425 – Multiturn						
Interface	EnDat 2.2						
Ordering designation *****	EnDatH				EnDatT		
Position values per revolution	8192 (13 bits)						
Revolutions	4096 (12 bits)						
Code	Pure binary						
Calculation time t_{cal} Clock frequency	≤ 9 µs ≤ 2 MHz						
Incremental signals	HTL				TTL		
Signal periods *****	256	512	1024	2048	512	2048	4096
Edge separation a	≥ 3.3 µs	≥ 2.4 µs	≥ 0.8 µs	≥ 0.6 µs	≥ 2.4 µs	≥ 0.6 µs	≥ 0.2 µs
Output frequency	≤ 26 kHz	≤ 52 kHz	≤ 103 kHz	≤ 205 kHz	≤ 52 kHz	≤ 205 kHz	≤ 410 kHz
System accuracy [1]	± 60"	± 60"	± 60"	± 20"	± 60"	± 20"	± 20"
Electrical connection	M23 flange socket (male) 17-pin, radial						
Cable length [2]	≤ 100 m (with HEIDENHAIN cable)						
Power supply	10 V to 30 V DC				4.75 V to 30 V DC		
Power consumption [3] (maximum)	See *Power consumption* diagram				*At 4.75 V:* ≤ 900 mW *At 30 V:* ≤ 1100 mW		
Current consumption (typical, without load)	*At 10 V:* ≤ 56 mA *At 24 V:* ≤ 34 mA				*At 5 V:* ≤ 100 mA *At 24 V:* ≤ 25 mA		
Shaft	Solid shaft Ø 10 mm with flat						
Speed n [4]	≤ 12 000 min $^{-1}$						
Starting torque at 20 °C	≤ 0.01 Nm						
Moment of inertia of rotor	2.7×10^{-6} kgm^2						
Shaft load	*Axial:* ≤ 40 Nm *Radial:* ≤ 60 Nm at shaft end (see also *Mechanical design types and mounting* in the *Rotary Encoders* catalog)						
Vibration 10 to 2000 Hz [5] **Shock** 6 ms	≤ 150 m/s^2 (EN 60 068-2-6) ≤ 1000 m/s^2 (EN 60 068-2-27)						
Operating temperature [4]	–40 °C to 100 °C						
Protection EN 60 529	*Housing:* IP 67 *Shaft exit:* IP 66						
Weight	≈ 0.30 kg						

*   Please select when ordering
1)   For absolute position value; accuracy of the incremental signal upon request
2)   For HTL signals, the maximum cable length depends on the output frequency (see *Cable length for HTL* diagrams)
3)   See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* catalog
4)   For the correlation between the operating temperature and the shaft speed or supply voltage, see *General mechanical information* in the *Rotary Encoders* catalog
5)   10 Hz to 55 Hz, constant over distance, 4.9 mm peak to peak

Specifications	Absolute						
	ROQ 425 – Multiturn						
Interface	SSI						
Ordering designation *	SSI41H				SSI41T		
Position values per revolution	8192 (13 bits)						
Revolutions	4096 (12 bits)						
Code	Gray						
Calculation time t_{cal} Clock frequency	≤ 5 µs ≤ 1 MHz						
Incremental signals *	HTL or HTLs				TTL		
Signal periods *	256	512	1024	2048	512	2048	4096
Edge separation a	≥ 3.3 µs	≥ 2.4 µs	≥ 0.8 µs	≥ 0.6 µs	≥ 2.4 µs	≥ 0.6 µs	≥ 0.2 µs
Output frequency	≤ 28 kHz	≤ 52 kHz	≤ 103 kHz	≤ 205 kHz	≤ 52 kHz	≤ 205 kHz	≤ 410 kHz
System accuracy [1]	± 60"	± 60"	± 60"	± 20"	± 60"	± 20"	± 20"
Electrical connection	M23 flange socket (male) 12-pin, radial				M23 flange socket (male) 17-pin, radial		
Cable length [2]	≤ 100 m (with HEIDENHAIN cable)						
Power supply	10 V to 30 V DC				4.75 V to 30 V DC		
Power consumption [3] (maximum)	See *Power consumption* diagram				*At 4.75 V:* ≤ 900 mW *At 30 V:* ≤ 1100 mW		
Current consumption (typical, without load)	*At 10 V:* ≤ 56 mA *At 24 V:* ≤ 34 mA				*At 5 V:* ≤ 100 mA *At 24 V:* ≤ 25 mA		
Shaft	Solid shaft Ø 10 mm with flat						
Speed n [4]	≤ 12 000 min $^{-1}$						
Starting torque at 20 °C	≤ 0.01 Nm						
Moment of inertia of rotor	2.7×10^{-6} kgm^2						
Shaft load	*Axial:* ≤ 40 Nm *Radial:* ≤ 60 Nm at shaft end (see also *Mechanical design types and mounting* in the *Rotary Encoders* catalog)						
Vibration 10 to 2000 Hz [5] **Shock** 6 ms	≤ 150 m/s^2 (EN 60 068-2-6) ≤ 1000 m/s^2 (EN 60 068-2-27)						
Operating temperature [4]	–40 °C to 100 °C						
Protection EN 60 529	*Housing:* IP 67 *Shaft exit:* IP 66						
Weight	≈ 0.30 kg						

*	Please select when ordering
1)	For absolute position value; accuracy of the incremental signal upon request
2)	For HTL signals, the maximum cable length depends on the output frequency (see *Cable length for HTL* diagrams)
3)	See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* catalog
4)	For the correlation between the operating temperature and the shaft speed or supply voltage, see *General mechanical information* in the *Rotary Encoders* catalog
5)	10 Hz to 55 Hz, constant over distance, 4.9 mm peak to peak

Diagrams

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:

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

where
f = Output frequency in kHz
n = Shaft speed in min^{-1}
z = Number of signal periods per 360°
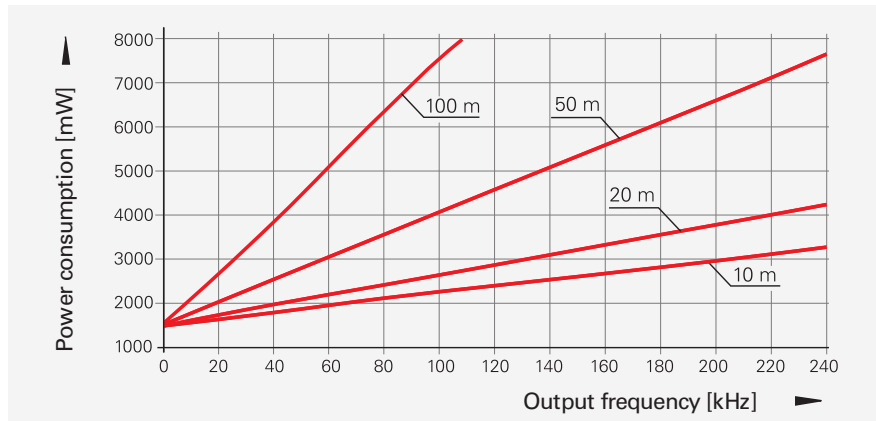
Power consumption (maximum) for HTL interface and supply voltage U_P = 30 V
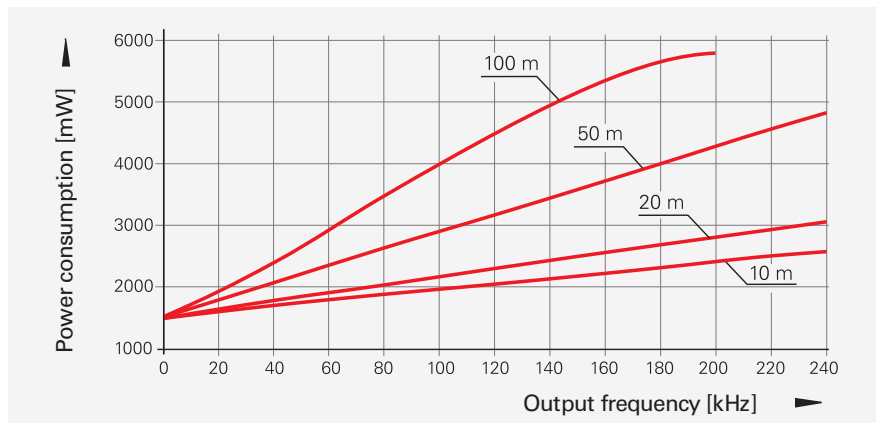
Power consumption (maximum) for HTLs interface and supply voltage U_P = 30 V

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 correlations 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.
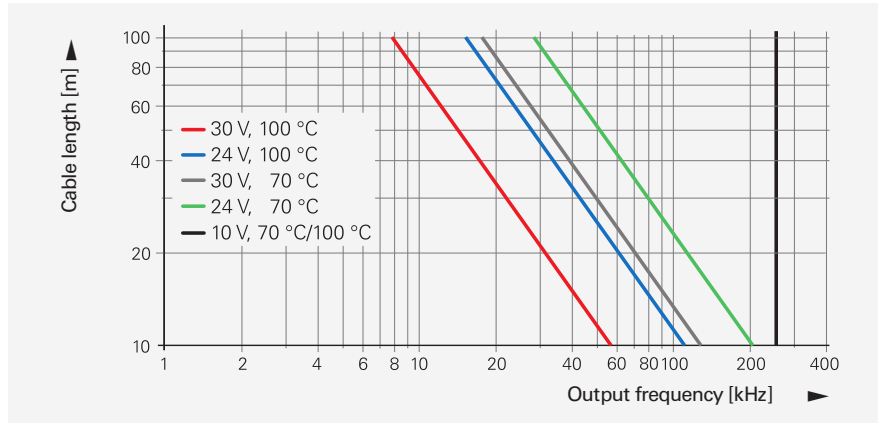
Maximum permissible cable length for HTL interface
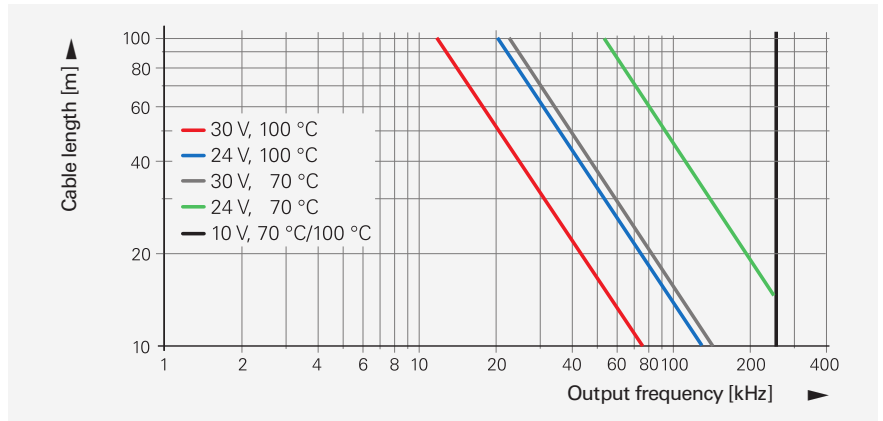
Maximum permissible cable length for HTLs interface

Electrical connection

Pin layout for EnDat with TTL or HTL

17-pin flange socket, M23

	Power supply					Incremental signals				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**	**Internal shield**	U_{a1}	$\overline{U_{a1}}$	U_{a2}	$\overline{U_{a2}}$	**DATA**	**$\overline{DATA}$**	**CLOCK**	**$\overline{CLOCK}$**
	Brown/ Green	Blue	White/ Green	White	/	Green/ Black	Yellow/ Black	Blue/ Black	Red/ Black	Gray	Pink	Violet	Yellow

Cable shield connected to housing; **Up** = Power supply voltage
Sensor: The sensor line is connected in the encoder with the corresponding power line
Vacant pins or wires must not be used!

Pin layout for SSI with TTL

17-pin flange socket, M23

	Power supply					Incremental signals				Absolute position values				Others	
	7	**1**	**10**	**4**	**11**	**15**	**16**	**12**	**13**	**14**	**17**	**8**	**9**	**2**	**5**
SSI with TTL	U_P	Sensor U_P	**0 V**	Sensor **0 V**	**Internal shield**	U_{a1}	$\overline{U_{a1}}$	U_{a2}	$\overline{U_{a2}}$	**DATA**	**$\overline{DATA}$**	**CLOCK**	**$\overline{CLOCK}$**	**Direction of rotation** [1]	**Zero reset** [1]
	Brown/ Green	Blue	White/ Green	White	/	Green/ Black	Yellow/ Black	Blue/ Black	Red/ Black	Gray	Pink	Violet	Yellow	Black	Green

[1] See *Interfaces of HEIDENHAIN Encoders* catalog

Cable shield connected to housing; **Up** = Power supply voltage
Sensor: The sensor line is connected in the encoder with the corresponding power line
Vacant pins or wires must not be used!

Pin layout for SSI with HTL

12-pin flange socket, M23											
	Power supply		Incremental signals				Absolute position values				Others	
	7	10	11	10	12	8	4	6	3	7	9	5
SSI with HTL	U_P	0 V	U_{a1}	$\overline{U_{a1}}$	U_{a2}	$\overline{U_{a2}}$	DATA	$\overline{DATA}$	CLOCK	$\overline{CLOCK}$	Direction of rotation [1]	Zero reset [1]
	Brown/ Green	White/ Green	Green/ Black	Yellow/ Black	Blue/ Black	Red/ Black	Gray	Pink	Violet	Yellow	Black	Green

1) See *Interfaces of HEIDENHAIN Encoders* catalog

Cable shield connected to housing; **Up** = Power supply voltage
Sensor: The sensor line is connected in the encoder with the corresponding power line
Vacant pins or wires must not be used!

Pin layout for SSI with HTLs

12-pin flange socket, M23											
	Power supply			Incremental signals		Absolute position values				Others		
	1	10	2	8	9	4	6	3	7	11	5	12
SSI with HTLs	U_P	U_P	0 V	U_{a1}	U_{a2}	DATA	$\overline{DATA}$	CLOCK	$\overline{CLOCK}$	Direction of rotation [1]	Zero reset [1]	/
	Brown/ Green	Blue	White/ Green	Green/ Black	Blue/ Black	Gray	Pink	Violet	Yellow	Black	Green	/

1) See *Interfaces of HEIDENHAIN Encoders* catalog

Cable shield connected to housing; **Up** = Power supply voltage
Sensor: The sensor line is connected in the encoder with the corresponding power line
Vacant pins or wires must not be used!

Electrical connection

Cables for rotary encoder with 12-pin flange socket

PUR connecting cable Ø 8 mm; [4(2×0.14 mm²) + (4×0.5 mm²); A_P = 0.5 mm²]		
Complete with M23 connector (female) and M23 coupling (male), both 12 pins		ID 298401-xx
Complete with M23 connector (female) and M23 connector (male), both 12 pins		ID 298399-xx
Complete with M23 connector (female), 12-pin and D-sub connector (female), 15-pin		ID 310199-xx
Complete with M23 connector (female), 12-pin and D-sub connector (male), 15-pin		ID 310196-xx
With one connector M23 (female), 12-pin		ID 309777-xx
Cable without connectors, Ø 8 mm		ID 816317-xx

Cables for rotary encoder with 17-pin flange socket

PUR connecting cable Ø 8 mm; [(4×0.14 mm²) + 4(2×0.14 mm²) + (4×0.5 mm²); A_P = 0.5 mm²]		
Complete with M23 connector (female) and M23 coupling (male), both 17 pins		ID 323897-xx
Complete with M23 connector (female), 17-pin and D-sub connector (female), 15-pin		ID 332115-xx
Complete with M23 connector (female), 17-pin and D-sub connector (male), 15-pin		ID 324544-xx
With one connector M23 (female), 17-pin		ID 309778-xx
Cable without connectors, Ø 8 mm		ID 816322-xx

This Product Information supersedes all previous editions, which thereby become invalid. The basis for ordering from HEIDENHAIN is always the Product Information valid when the contract is made.

Related documents:
For general mechanical and electrical information as well as the detailed interface description, please see:
- *Encoders for Servo Drives* catalog
- *Rotary Encoders* catalog
- *Interfaces of HEIDENHAIN Encoders* catalog