Incremental encoders

RS 422 interface (TTL) incremental encoder

Product name	**TTL (RS 422) incremental encoder**
Encoder operating voltage	5 V DC ±10% or 10 … 30 V DC
Sampling frequency, max.	300 kHz
No-load current consumption, max.	150 mA
Signal level	TTL (RS 422)
Outputs protected against short-circuit to 0 V	Yes
Switching time (10 … 90%) (with 1 m (3.3 ft) cable and recommended input circuit)	Rise/fall time t_+/t_- ≤ 50 ns
Phase angle, signal A to B min. edge spacing at:	90°
• 300 kHz	≥ 0.45 µs
Cable length to electronic circuitry [1] **, max.**	100 m (328 ft)
LED failure monitoring	High-resistance driver
Resolution, max.	5000 S/R
Accuracy (in angular seconds)	±18° mech. × 3600/revolution z
Electr. speed, permissible	(18 × 10^6 rpm)/revolution
Mech. speed, max.	12,000 rpm
Friction torque (at 20 °C (68 °F))	≤ 0.01 Nm (0.08 lb_f-in)
Starting torque (at 20 °C (68 °F))	≤ 0.01 Nm (0.08 lb_f-in)
Shaft loading capability	
• n > 6000 rpm	
– Axial	10 N (2.2 lb_f)
– Radial at shaft extension	20 N (4.5 lb_f)
• n ≤ 6000 rpm	
– Axial	40 N (9 lb_f)
– Radial at shaft extension	60 N (13.5 lb_f)
Angular acceleration, max.	> 10^5 rad/s^2
Moment of inertia of rotor	1.45 × 10^{-6} kgm^2 (12.83 × 10^{-6} lb_f-in-s^2)

Vibration (55 … 2000 Hz) in accordance with EN 60068-2-6	≤ 300 m/s^2 (984 ft/s^2)
Shock in accordance with EN 60068-2-27	
● **2 ms**	≤ 2000 m/s^2 (6563 ft/s^2)
● **6 ms**	≤ 1000 m/s^2 (3281 ft/s^2)
Operating temperature	
● Flange socket or fixed cable	
– At V_p = 5 V ±10%	-40 ... +100 °C (-40 … +212 °F)
– At V_p = 10 … 30 V	-40 ... +70 °C (-40 … +158 °F)
● Flexible cable	
– At V_p = 5 V ±10%	-10 ... +100 °C (+14 … +212 °F)
– At V_p = 10 … 30 V	-10 ... +70 °C (+14 … +158 °F)
Degree of protection in accordance with EN 60529 (IEC 60529)	
● Without shaft input	IP67
● With shaft input	IP64
EMC	Tested in accordance with the electromagnetic compatibility directive 89/336/EEC and the regulations of the EMC guidelines (applicable basic standards).
Weight, approx.	0.25 kg (0.55 lb)
CE marking	Yes

1) With recommended cable and input circuitry of the follow-up electronics, observe max. permissible cable length of module to be evaluated.

Product name	**TTL (RS 422) double-track incremental encoder**
Encoder operating voltage	5 V DC ±5%
Sampling frequency, max.	
● Track 1	160 kHz
● Track 2	1 MHz
No-load current consumption, max.	
● Track 1	150 mA
● Track 2	150 mA
Signal level	TTL (RS 422)
Outputs protected against short-circuit to 0 V	Yes
Switching time (10 … 90%) (with 1 m (3.3 ft) cable and recommended input circuit)	Rise/fall time t_+/t_- ≤ 100 ns

Phase angle, signal A to B min. edge spacing at:	90°
• 1 MHz (track 2)	≥ 0.125 µs
• 160 kHz (track 1)	≥ 0.8 µs
Cable length to electronic circuitry [1], max.	
• Up to 500 kHz	100 m (328 ft)
• Up to 1 MHz	50 m (164 ft)
Resolution, max.	
• Track 1	1024 S/R
• Track 2	9000 S/R
Accuracy (in angular seconds)	
• Track 1	±63
• Track 2	±12
Electr. speed, permissible	
• Track 1	9000 rpm
• Track 2	6500 rpm
Mech. speed, max.	12,000 rpm
Friction torque (at 20 °C (68 °F))	≤ 0.01 Nm (0.08 lb_f-in)
Starting torque (at 20 °C (68 °F))	≤ 0.01 Nm (0.08 lb_f-in)
Shaft loading capability	
• n ≤ 6000 rpm	
– Axial	10 N(2.2 lb_f)
– Radial at shaft extension	20 N (4.5 lb_f)
Angular acceleration, max.	> 10^5 rad/s^2
Moment of inertia of rotor	20 × 10^{-6} kgm^2 (177 × 10^{-6} lb_f-in-s^2)
Vibration (55 … 2000 Hz) in accordance with EN 60068-2-6	≤ 100 m/s^2 (328 ft/s^2)
Shock (6 ms) to EN 60068-2-27	≤ 1000 m/s^2 (3281 ft/s^2)
Operating temperature	-10 … +70 °C (+14 … +158 °F)
Degree of protection in accordance with EN 60529 (IEC 60529)	
• Without shaft input	IP67
• With shaft input	IP64
EMC	Tested in accordance with the electromagnetic compatibility directive 89/336/EEC and the regulations of the EMC

	guidelines (applicable basic standards).
Weight, approx.	0.7 kg (1.5 lb)
CE marking	Yes

1) With recommended cable and input circuitry of the follow-up electronics, observe max. permissible cable length of module to be evaluated.