Encoder Pulse Frequency and Speed Measurement Resolution

Pulse frequency of an incremental encoder at a speed, counts per gate time, speed resolution by frequency counting and by period timing, and angular resolution.

Method: Incremental encoder speed measurement; Liptak; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Pulses per revolution	1,024.0	
Edge multiplication (1, 2 or 4)	4.0000	
Shaft speed	1,500.0	rpm
Gate (counting) time	10.000	ms
Timer clock for period method	10.000	MHz

Calculated results

Parameter	Value	Unit
Pulse (count) frequency	102.40	kHz
Counts per gate	1,024.0	
Resolution, frequency method	1.4648	rpm
Relative resolution, period method	1.0240	%
Angular resolution	0.087891	°

Notes for this case

• Frequency method: one count in the gate time is 1/(PPR·k·T_g) rev/s, good at high speed. Period method: timing one edge interval with a clock, relative resolution f/f_clk, good at low speed. Many drives switch between the two.

Formula and method

$$f = n \cdot PPR \cdot k, \quad \Delta n_f = \frac{1}{PPR \cdot k \cdot T_g}, \quad \frac{\Delta n_p}{n} = \frac{f}{f_{clk}}$$

Variables

PPR	Pulses per revolution	-
k	Edge multiplication (1, 2 or 4)	-
n	Shaft speed	1/s
T_g	Gate (counting) time	s
f_{clk}	Timer clock for period method	1/s
f	Pulse (count) frequency	1/s
N_g	Counts per gate	-
Δn_f	Resolution, frequency method	1/s
$\Delta n_p/n$	Relative resolution, period method	-
$\Delta\theta$	Angular resolution	rad

Method and standards

Encoder resolution.

Assumptions and limits

- Ideal encoder without jitter.

References

Incremental encoder speed measurement, Liptak, Instrument Engineers' Handbook, Vol. 1 and 2 (CRC Press)

Report details

Report reference	FCC-0PC0-Q807 (the same inputs always give the same reference)
Generated	23 November 2026, 18:32 UTC
Calculator	Encoder Pulse Frequency and Speed Measurement Resolution
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/instrumentation/signals-calibration/encoder-speed-resolution

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.