Tyre Rolling Resistance Force, Power and Energy per km

Rolling resistance force, power and energy per kilometre of a vehicle from mass, a base coefficient with its speed dependence, speed and road grade.

Method: Rolling resistance with linear speed dependence

Input parameters

Unit system: SI

Parameter	Value	Unit
Vehicle mass	1,500.0	kg
Base rolling resistance coefficient	0.010000	
Speed constant in f = $f_0(1 + v/v_{ref})$	160.00	km/h
Road speed	90.000	km/h
Road grade (rise/run)	0	%

Calculated results

Parameter	Value	Unit
Rolling resistance coefficient at speed	0.015625	
Rolling resistance force	0.22984	kN
Rolling resistance power	5.7461	kW
Energy per km	63.845	Wh/km

Notes for this case

• F = f·mg·cos θ with f = $f_0(1 + v/v_{ref})$ (about 160 km/h for car tyres). Typical f_0: low-rolling-resistance car tyres 0.006–0.008, ordinary 0.010–0.015, truck tyres 0.005–0.007; soft or wet surfaces raise it.

Formula and method

$$f_r = f_0\left(1 + \frac{v}{v_{ref}}\right), \quad F_r = f_r m g \cos\theta, \quad P_r = F_r v$$

Variables

m	Vehicle mass	kg
f_0	Base rolling resistance coefficient	-
v_{ref}	Speed constant in f = $f_0(1 + v/v_{ref})$	m/s
v	Road speed	m/s
G	Road grade (rise/run)	-
f_r	Rolling resistance coefficient at speed	-
F_r	Rolling resistance force	N
P_r	Rolling resistance power	W
E_r	Energy per km	J/m

Method and standards

Rolling resistance.

Assumptions and limits

- Steady speed on a hard road.

References

Rolling resistance with linear speed dependence

Report details

Report reference	FCC-4HWV-5SPB (the same inputs always give the same reference)
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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/automotive/tyres-wheels/tyre-rolling-resistance-power

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.