Drag and Rolling Resistance from a Coastdown Test

Aerodynamic drag coefficient and rolling resistance coefficient of a vehicle from timed coastdowns over a high-speed and a low-speed band on a level road.

Method: Two-band coastdown fit

Input parameters

Unit system: SI

Parameter	Value	Unit
Test mass	1,500.0	kg
Rotating mass allowance	3.0000	%
Frontal area	2.2000	m²
Air density	1.2000	kg/m³
High band: start speed	105.00	km/h
High band: end speed	95.000	km/h
High band: time	6.1000	s
Low band: start speed	55.000	km/h
Low band: end speed	45.000	km/h
Low band: time	12.000	s

Calculated results

Parameter	Value	Unit
Deceleration, high band	0.45537	m/s²
Deceleration, low band	0.23148	m/s²
Aerodynamic term ½ρC_dA	0.59774	kg/m
Drag coefficient	0.45283	
Speed-independent resistance	242.33	N
Rolling resistance coefficient	0.016474	

Notes for this case

• m(1 + δ)·a = F₀ + Cv² fitted at the mean speed of each band. Run both directions and average to cancel wind and grade; F₀ includes driveline drag in neutral, so f_r is an upper bound for the tyres alone.

Formula and method

$$m(1+\delta)a = F_0 + Cv^2, \quad C_d = \frac{2C}{\rho A}, \quad f_r = \frac{F_0}{mg}$$

Variables

m	Test mass	kg
δ	Rotating mass allowance	-
A	Frontal area	m²
ρ	Air density	kg/m³
v_1	High band: start speed	m/s
v_2	High band: end speed	m/s
t_h	High band: time	s
v_3	Low band: start speed	m/s

v_4	Low band: end speed	m/s
t_l	Low band: time	s
a_h	Deceleration, high band	m/s²
a_l	Deceleration, low band	m/s²
C	Aerodynamic term ½ρC_dA	kg/m
C_d	Drag coefficient	-
F_0	Speed-independent resistance	N
f_r	Rolling resistance coefficient	-

Method and standards

Coastdown fit.

Assumptions and limits

- Level road; still air; neutral gear.

References

Two-band coastdown fit

Report details

Report reference	FCC-1XWQ-MYEN (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/vehicle-dynamics/coastdown-drag-rolling-coefficients

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.