Ideal Brake Force Distribution and Wheel Lock Order

Ideal front brake share at a deceleration from axle load transfer, and the decelerations at which front and rear wheels lock for an installed brake balance.

Method: Ideal braking and lock sequence

Input parameters

Unit system: SI

Parameter	Value	Unit
Static front axle load share	58.000	%
Wheelbase	2,600.0	mm
Centre-of-gravity height	550.00	mm
Deceleration of interest	0.80000	g
Installed front brake share	78.000	%
Tyre-road friction coefficient	0.90000	

Calculated results

Parameter	Value	Unit
Ideal front share at that deceleration	74.923	%
Deceleration at front lock	0.88532	g
Deceleration at rear lock	0.92109	g
Braking efficiency min(a_f, a_r)/μg	98.369	%

Notes for this case

• Dynamic front load share = f + (a/g)(h/L). With a fixed split β the front locks at μfg/(β − μh/L) and the rear at μ(1 − f)g/(1 − β + μh/L). Rear lock first makes the car spin, so balances are set for front lock first; ABS and electronic brake distribution manage the rest.

Formula and method

$$\beta_{ideal} = f + \frac{a}{g}\frac{h}{L}, \quad a_f = \frac{\mu f g}{\beta - \mu h/L}, \quad a_r = \frac{\mu(1-f)g}{1-\beta+\mu h/L}$$

Variables

f	Static front axle load share	-
L	Wheelbase	m
h	Centre-of-gravity height	m
a	Deceleration of interest	m/s²
β	Installed front brake share	-
μ	Tyre-road friction coefficient	-
β_{ideal}	Ideal front share at that deceleration	-
a_f	Deceleration at front lock	m/s²
a_r	Deceleration at rear lock	m/s²
η_b	Braking efficiency min(a_f, a_r)/μg	-

Method and standards

Brake balance.

Assumptions and limits

- Rigid vehicle; equal friction at all tyres.

References

Ideal braking and lock sequence

Report details

Report reference	FCC-PXKE-05RS (the same inputs always give the same reference)
Generated	23 November 2026, 18:00 UTC
Calculator	Ideal Brake Force Distribution and Wheel Lock Order
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	4 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/ideal-brake-force-distribution

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.