Vehicle Speed from Engine Speed, Gear Ratio and Tyre

Wheel speed and road speed from engine speed, gear ratio, final drive ratio and tyre rolling radius, and the engine speed at a chosen road speed.

Method: Kinematics of the driveline (Gillespie, Fundamentals of Vehicle Dynamics (SAE, 1992), ch. 2)

Input parameters

Unit system: SI

Parameter	Value	Unit
Engine speed	3,000.0	rpm
Gear ratio	1.0000	
Final drive ratio	4.1000	
Tyre rolling radius	310.00	mm
Road speed of interest	100.00	km/h

Calculated results

Parameter	Value	Unit
Wheel speed	731.71	rpm
Road speed	85.513	km/h
Overall ratio	4.1000	
Engine speed at v_t	3,508.3	rpm

Notes for this case

- No slip; rolling radius is a little less than the unloaded tyre radius (about 97 %). Torque converter slip in automatics lowers the road speed.

Formula and method

$$n_w = \frac{n_e}{i_g i_0}, \quad v = 2\pi r n_w$$

Variables

n_e	Engine speed	1/s
i_g	Gear ratio	-
i_0	Final drive ratio	-
r	Tyre rolling radius	m
v_t	Road speed of interest	m/s
n_w	Wheel speed	1/s
v	Road speed	m/s
i_t	Overall ratio	-
$n_{e,t}$	Engine speed at v_t	1/s

Method and standards

Driveline kinematics.

Assumptions and limits

- No slip.

References

- Kinematics of the driveline (Gillespie, Fundamentals of Vehicle Dynamics (SAE, 1992), ch. 2)

Report details

Report reference	FCC-WA1X-JZAT (the same inputs always give the same reference)
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Calculator	Vehicle Speed from Engine Speed, Gear Ratio and Tyre
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Release checks	2 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/transmission/vehicle-speed-from-gear

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.