



# Vehicle aerodynamics

i Calculation without errors.

ii Project information

## ? Input section

### 1.0 Setting of environment units and parameters

1.1 Calculation units		SI Units (N, mm, kW...)	▼
1.2 Altitude	H	0	[m]
1.3 Air temperature	T	20.0	[°C]
1.4 Air pressure	p	101.320	[kPa]
1.5 Air density	Q	1.20411	[kg/m <sup>3</sup> ] <input checked="" type="checkbox"/>

### 2.0 Calculation of the vehicle motion and parameters

2.1 Vehicle parameters Sedan - Tesla model S; RWD 85 (E - LiIon) ▼

2.2 Width	w	1.963	[m]	<input checked="" type="checkbox"/>
2.3 Height	h	1.435	[m]	
2.4 Gross frontal area (w * h)	s	2.817	[m <sup>2</sup> ]	
2.5 Coefficient of reduction of the facing	cs	0.850		
2.6 The real frontal area	S	2.394	[m <sup>2</sup> ]	
2.7 Vehicle Weight (empty)	m0	2100.0	[kg]	
2.8 Load weight (load)	m1	90.0	[kg]	
2.9 Gross vehicle weight	m	2190.0	[kg]	
2.10 Drag coefficient	cx	0.240		
2.11 Drag coefficient cx * S	cx*S	0.575	[m <sup>2</sup> ]	
2.12 Wheel diameter	Dw	0.686	[m]	
2.13 Engine type		<b>E - LiIon</b>		
2.14 Energy in 1kg of the batteries	E	0.141	[kWh/kg]	
2.15 Battery specific weight	ρ	1.500	[kg/l]	
2.16 Maximum engine power	Pwmax	278.00	[kW]	
2.17 Engine efficiency	eta e	0.90		
2.18 Efficiency of the gearing, bearings...	eta g	0.99		
2.19 Total efficiency drive	eta	0.89		
2.20 Battery capacity	C	85.00	[kWh]	
2.21 Battery weight	m	602.84	[kg]	

2.22 **Definitions of the motion and environment**

2.23 Vehicle speed	v	150.00	[km/h]
2.24 Aerodynamic drag	Fa	600.64	[N]
2.25 Traction coefficient	Asphalt / Tire (passenger car)...(0.0047) ▼		
2.26 Traction coefficient	fr	0.00470	<input checked="" type="checkbox"/>
2.27 The rolling resistance of tires (wheels)	Fr	294.39	[N]
2.28 Climbing / descent	alfa	0.00	[deg]
2.29 Force	Fu	0.00	[N]
2.30 Total force	Fsum	<b>895.03</b>	[N]

2.31 **Performance parameters**

2.32 Vehicle speed	v	150.000	[km/h]
2.33 Torque on wheels	Mk	306.995	[Nm]
2.34 Wheel speed	n	1160.021	[/min]
2.35 Power on wheels	Pw	37.293	[kW]
2.36 Engine power	Pwe	37.670	[kW]
2.37 Energy on wheels	E	0.249	[kWh/km]
2.38 Energy on wheels	E100	24.862	[kWh/100km]
2.39 Total energy	Ee	0.279	[kWh/km]
2.40 Total energy	Ee100	27.903	[kWh/100km]
2.41 Battery weight	M	1.979	[kg/km]
2.42 Battery weight	M100	197.896	[kg/100km]
2.43 Operating range	R	304.62	[km]

2.44 **Graph**

