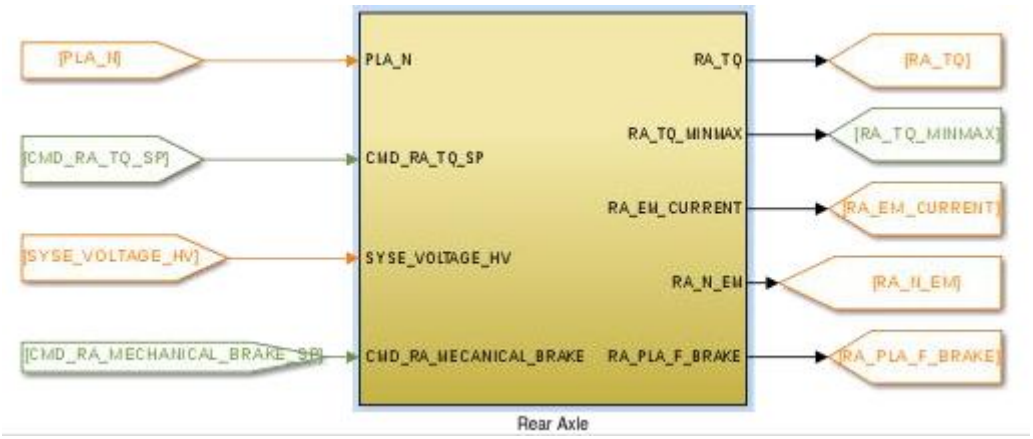
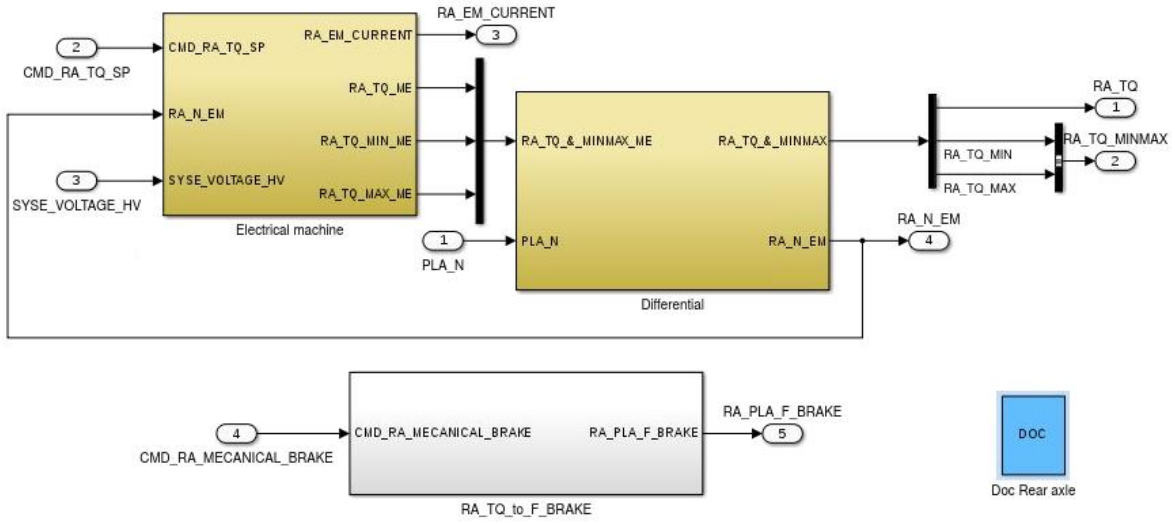
Rear axle model

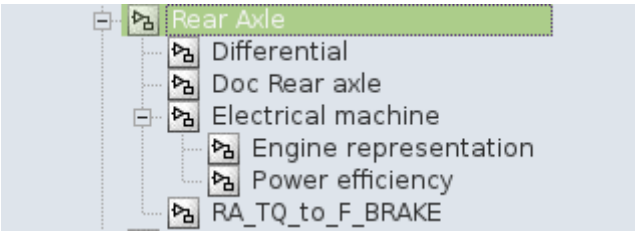
1 System description

Model of the rear axle. The model includes the electrical machine and the converter associated, and the differential representing the transmission.



2 System organization





Model browser

3 Signals and parameters

Inputs

Name	Description	Note
PLA_N	Wheel speed	In RPM
CMD_RA_TQ_SP	Torque set point for the electrical machine	
CMD_RA_MECHANICAL_BRAKE_SP	Torque set point of mechanical brake ofrear axle	In N.m
SYSE_VOLTAGE_HV	Voltage on the DC power bus	

Outputs

Name	Description	Note	Destination
RA_TQ	Torque to wheel from the rear axle		Platform
RA_PLA_F_BRAKE	Force set point of mechanical brake ofrear axle	In N	Platform
RA_TQ_MINMAX	Minimum and maximum torque of the electrical machine	Bus signal	Command
RA_EM_CURRENT	Electrical machine requested current	-	Electrical system
RA_N_EM	Electrical machine shaft speed	In RPM	Electrical system

Parameters

Native

Name	Type	Unit	Description	Source	Linked to
ra_electrical_machine_efficiency	table	-	Electrical machine efficiency	Continental	ra_electrical_machine_torque; ra_electrical_machine_speed
ra_electrical_machine_speed	vector	RPM	Electrical machine speed input vector for table and vector	Continental	ra_electrical_machine_efficiency _modified; syse_em_in_power; ra_em_max_tq; ra_em_min_tq; syse_electrical_machine_torque_ vs_power_speed_nneg; syse_electrical_machine_torque_ vs_power_speed_nnpos
ra_electrical_machine_tau	var	s	Electrical machine time constant	Continental	
ra_electrical_machine_torque	vector	Nm	Electrical machine torque input vector for efficency	Continental	ra_electrical_machine_efficiency _modified;

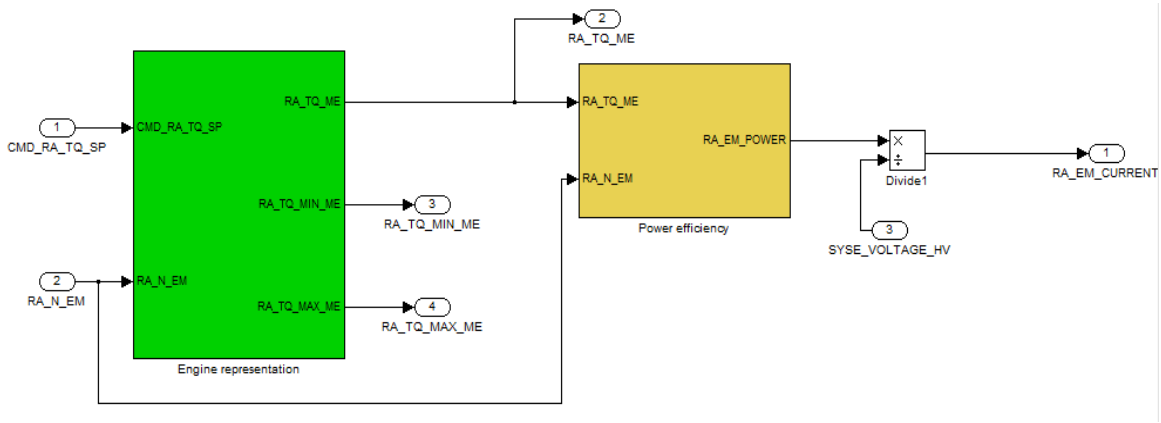
					ra_electrical_machine_speed
ra_em_max_tq	vector	Nm	Electrical machine maximum torque	Continental	ra_electrical_machine_speed
ra_em_min_tq	vector	Nm	Electrical machine minimum torque	Continental	ra_electrical_machine_speed
ra_differential_ratio	var	-	Rearaxledifferential ratio	Continental	
ra_transmission_efficiency	var	-	Rearaxledifferentialefficiency	Continental	

Inherited

Name	Type	Unit	Description	Source	Linked to
pla_wheel_radius	var	m	Wheel radius (includes tire deformation)	BEI N7 2014	

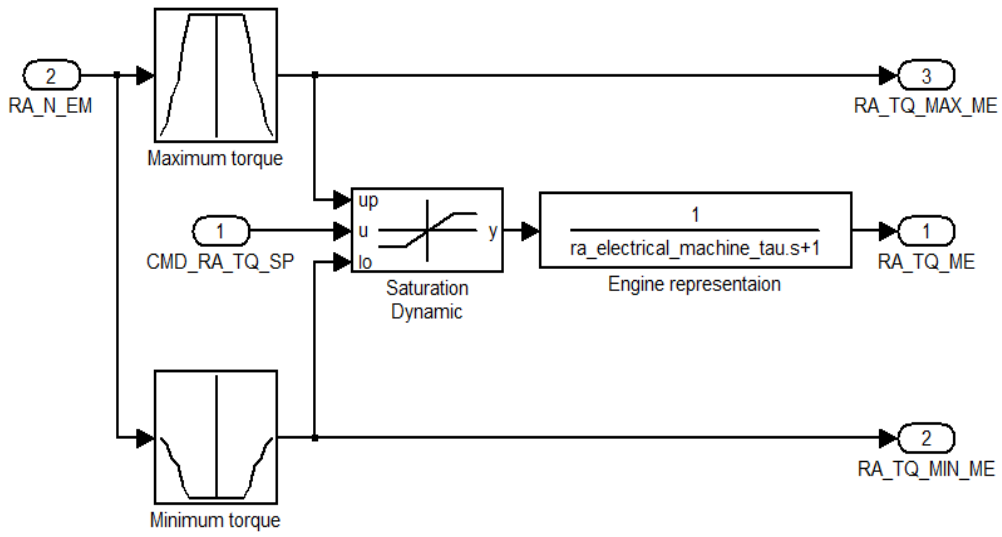
4 Subsystems description

Electrical machine:

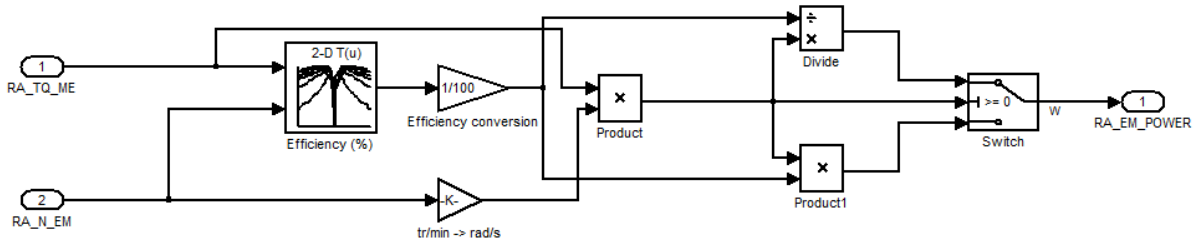


Two part model:

Engine representation: calculate the torque generated and the torque limits

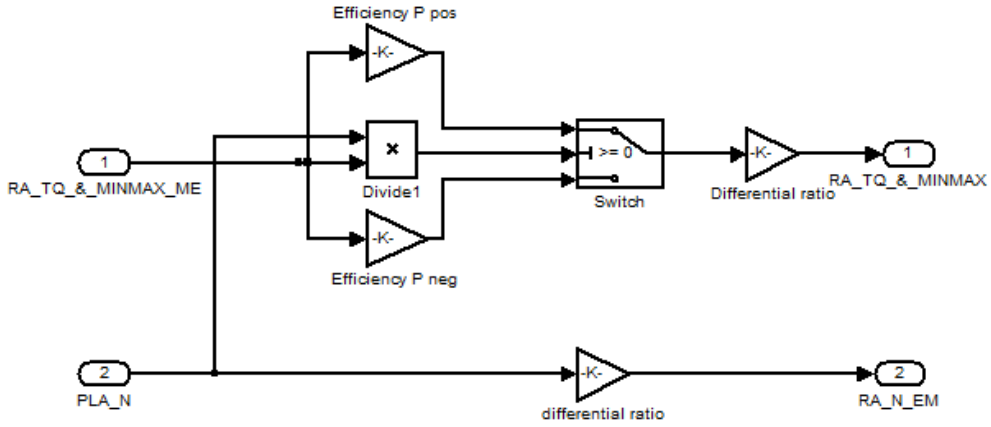


Power efficiency: determines the consumed electrical power.



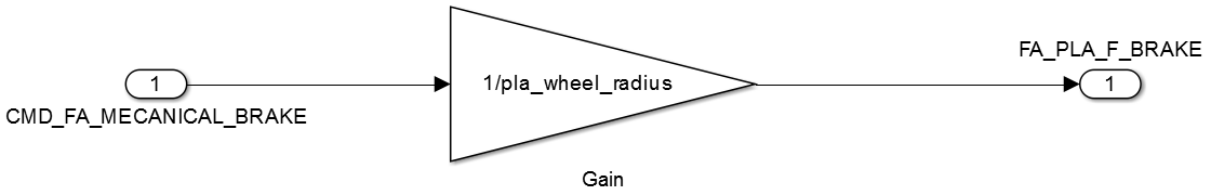
Differential

Conversion of the speed and torque between the engine and the wheel

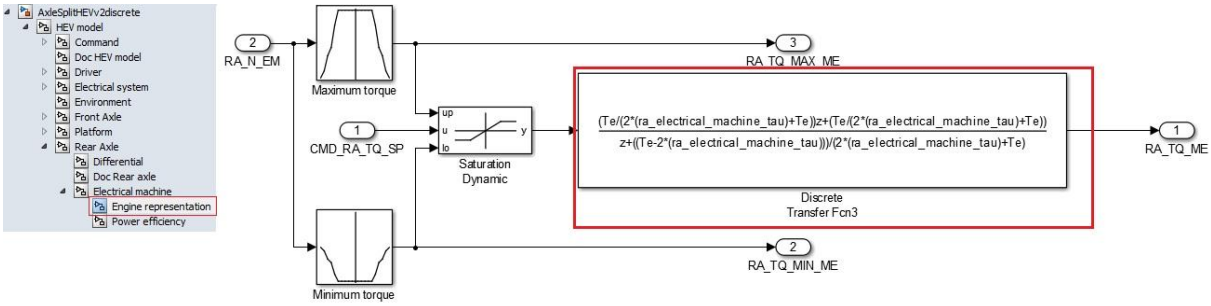


Braking Torque to force conversion

Convert torque to wheel braking to force braking



5 Discrete Model



Same inputs, outputs and parameters. The only changes are in the red square.

See part 5 (“Discrete model”) of the document “HEV model” to know how are made the discrete blocs.