Additional documentation for QSS Toolbox 26.1.2015

Parameters of the default vehicle model

Parameter description	**Units**	**Value**
Total mass of the vehicle	kg	1200
Rotating mass	%	5.0
Vehicle cross-section area	m^2	2.0
Wheel diameter	m	0.6
Aerodynamic drag coefficient	--	0.33
Rolling friction coefficient	--	0.01

Parameters of the components for the default conventional vehicle model

Parameter description	**Units**	**Value**
Manual gearbox		
Gear ratios	--	[15.174; 8.338; 5.378; 3.937; 2.748]
Differential gear ratio	--	1.0
Efficiency	--	0.98
Idling friction losses	W	300
Combustion engine		
Engine type	--	Diesel or Otto
Displacement	l	1.9
Engine inertia	kgm^2	0.1
Engine speed at idle	rad/s	105
Engine power at idle	W	0
Auxiliary power	W	300

Parameters of the components for the default electric vehicle model

Parameter description	**Units**	**Value**
Transmission		
Gear ratio	--	3.5
Efficiency	--	0.98
Idling friction losses	W	300
Electric motor		
Scaling factor	--	4.0
Motor inertia	kgm^2	0.1
Auxiliary power	W	300
Over-torque factor	--	1.25
Battery		
Initial state of charge	--	0.9
Cells in series	--	84
Cells in parallel	--	2
Initialization file	--	‘init_Kokam_BT’

Parameters of the components for the default series hybrid vehicle model

Parameter description	**Units**	**Value**
Transmission		
Gear ratio	--	3.5
Efficiency	--	0.98
Idling friction losses	W	300
Electric motor		
Scaling factor	--	3.5
Motor inertia	kgm^2	0.1
Auxiliary power	W	300
Battery		
Initial state of charge	--	0.7
Cells in series	--	70
Cells in parallel	--	1
Initialization file	--	'init_Saft_BT'
Generator transmission		
Gear ratio	--	1.6
Efficiency	--	0.98
Idling friction losses	W	200
Combustion engine		
Engine type	--	Otto
Displacement	l	1.5
Engine inertia	kgm^2	0.16
Engine speed at idle	rad/s	105
Engine power at idle	W	0
Auxiliary power	W	0

List of output parameters

Conventional vehicle model: **qss_example_conv.mdl**

Variable name	Units	Description
F_aero	N	Aerodynamic force
F_iner	N	Inertial force
F_roll	N	Rolling resistance force
P_CE	W	Fuel power
P_MGB	W	Power required for manual gearbox
P_aero	W	Aerodynamic power
P_iner	W	Inertial power
P_roll	W	Rolling resistance power
P_wheel	W	Power required for wheels
T_CE	Nm	Engine torque
T_MGB	Nm	Gearbox torque
T_wheel	Nm	Wheel torque
V_liter	l/100km	Fuel consumption
dv	m/s^2	Acceleration
i	--	Gear number
m_dot_fuel	g/s	Fuel mass flow rate
m_fuel	kg	Fuel mass
t	s	Time
v	m/s	Vehicle speed
w_CE	rad/s	Engine speed
w_MGB	rad/s	Gearbox input speed
w_wheel	rad/s	Wheel speed
x_tot	m	Distance

Electric vehicle model: **qss_example_electric.mdl**

Variable name	**Units**	**Description**
E_BT	Wh	Battery energy
F_aero	N	Aerodynamic force
F_iner	N	Inertial force
F_roll	N	Rolling resistance force
I_BT	A	Battery current
L_BT	W	Battery losses
P_BT	W	Battery output power
P_EM	W	Power required for electric motor
P_aero	W	Aerodynamic power
P_iner	W	Inertial power
P_roll	W	Rolling resistance power
P_trans	W	Power required for transmission
P_wheel	W	Power required for wheels
R_BT	Ω	Battery internal resistance
T_EM	Nm	Electric motor torque
T_trans	Nm	Transmission torque
T_wheel	Nm	Wheel torque
U_BT	V	Battery voltage
dv	m/s^2	Acceleration
i	--	Gear number
q_BT	--	Battery state of charge
t	s	Time
v	m/s	Vehicle speed
w_EM	rad/s	Electric motor speed
w_trans	rad/s	Transmission speed
w_wheel	rad/s	Wheel speed
x_tot	m	Distance

Series hybrid vehicle model: **qss_example_series.mdl**

Variable name	Units	Description
E_BT	Wh	Battery energy
F_aero	N	Aerodynamic force
F_iner	N	Inertial force
F_roll	N	Rolling resistance force
I_BT	A	Battery current
L_BT	W	Battery losses
P_BT	W	Battery output power
P_EM	W	Power required for electric motor
P_CE	W	Fuel power
P_EG	W	Generator power
P_aero	W	Aerodynamic power
P_iner	W	Inertial power
P_roll	W	Rolling resistance power
P_trans_1	W	Power required for transmission (driveline)
P_trans_2	W	Power required for transmission (gen-set)
P_wheel	W	Power required for wheels
R_BT	Ω	Battery internal resistance
T_CE	Nm	Combustion engine torque
T_EG	Nm	Generator torque
T_EM	Nm	Electric motor torque
T_ctrl	Nm	Control torque demand
T_trans_1	Nm	Transmission torque (driveline)
T_trans_2	Nm	Transmission torque (gen-set)
T_wheel	Nm	Wheel torque
U_BT	V	Battery voltage
V_liter	l/100km	Fuel consumption
dv	m/s^2	Acceleration
i	--	Gear number
ice_on	--	Engine on/off
m_dot_fuel	g/s	Fuel mass flow rate
m_fuel	kg	Fuel mass
q_BT	--	Battery state of charge
t	s	Time
v	m/s	Vehicle speed
w_CE	rad/s	Engine speed
w_EG	rad/s	Generator speed
w_EM	rad/s	Electric motor speed
w_ctrl	rad/s	Control speed demand
w_trans_1	rad/s	Transmission speed (driveline)
w_trans_2	rad/s	Transmission speed (gen-set)
w_wheel	rad/s	Wheel speed
x_tot	m	Distance