TRAFIKVERKET

Last revised 2018-06-05, PD

Required vehicle information for power system studies and simulations

The information is needed for traction power supply system simulations in order to develope the traction power supply system for future, investigate power systems problems and do energy demand and loss calculations.

No comment means information not found/received.
na not applicable

Vehicle: _____

Data required for all vehicles:

Item no	Trainsim parameter	Description	Comment
1		Motor type (asynchronous motor or direct-current motor)	
2	DynMass	Dynamic mass [metric tons] of vehicle (locomotive + cars (coaches)) in service order. Dynamic mass is the mass used for the calculation of the acceleration and the retardation under consideration and impact of the rotary mass.	
3	Mass	Total mass in service order [metric tons], without load	
3a		Mass [metric tons] of vehicle including normal load, only for motor train sets	
3b		Mass [metric tons] of vehicle including maximum load, only for motor train sets	
4	AdhMass	Adhesion mass [metric tons] of vehicle, which is the total mass on driving axles.	
5	MaxSpeed	Maximum speed [km/h] of vehicle	
6	Slength	Length [m] of vehicle	
6a	Front area	Front area [m^2]	
6b	Height, Width	Height [m] and width [m] of vehicle body	
7	CR0 CR1	Curve resistance [kN] as function of CR0 [kNm/tons], CR1 [m] and curve radius [m] as in formula (curve resistance) = CR0 *·MASS / ((curve radius) - CR1)	
8	CRmin	Minimum allowed curve radius [m] for the vehicle	
9	RRA RRB RRC	Running resistance RRA [kN], RRB [kN/(km/h)] and RRC [$kN/(km/h)^2$] on straight track as function of speed [km/h] in formula (running resistance) = (RRA1 + N * RRA2) + (RRB1 + N * RRB2)·v + (RRC1 + N * RRC2)·v^2 N = number of combined traction units e.g. RRA = RRA1 + N * RRA2	For multiple traction units (EMU)
10	ADH1 ADH2	Adhesion coefficients ADH1 [km/h] and ADH2 [km/h] in adhesion formula: (adhesion) = ADHCOEFF + ADH1 / (speed + ADH2). ADHCOEFF is track dependent and in this simulations presumed to be 0.161	traction units
11	U_{powlim} (in TracFeed = Unom)	Design parameter for the vehicle. The voltage level at the current collector at which the current will be reduced due to technical (e.g. thermal) reasons as a function of the voltage ($I_{ctl}(U_{ctl}) = U_{ctl}/U_{powlim}$).	
12	SauxT	Active and reactive power consumption (P_{aux} + j Q_{aux}) for auxiliary power, train heating and air condition which is taken directly from the main transformer (no load losses not included)	
13		Topic not used any longer	
14	P0	Losses [MW] for the traction equipment from current collector to wheel at no load, for instance the no load losses of the main transformer	

15	FVtrainMax FMOT FELBRAKE	Maximum (incl. weight compensation, if used) and continuous curve for tractive and electric braking effort [kN] as function of speed [km/h] at or above U_{powlim} (at least as a table)	
15a		Description of the functions of the control/brake lever. What is controlled? • Speed • Tractive effort • Acceleration • other	
16	AccRefV	Desired/max. permissable acceleration and retardation [m/s^2] as function of speed [km/h] (at least as table)	
16a		Weight compensation? [yes/no] (Is the possible maximum tractive effort depending on the load (weight) of the vehicle?)	
17	EFF	Efficiency [%] for 100 %, 75 %, 50% and 25% tractive effort from current collector to wheel as function of speed [km/h] (at least as table). Auxiliary power not included NOTE: This efficiency is also used for electrical braking.	
17a		The losses in total shall describe the chain for pantograph to wheel for power supply studies with train simulation. Losses of the transformer, converter and motor as a function of current and/or tractive effort, defined as followed: Transformer losses • $P_T(I_P) = C_{T1} + C_{T2}\ I_P + C_{T3}\ I_P^2$ Converter losses • $P_{C1}(I_T) = C_{C11} + C_{C12}\ I_T + k_{C13}(v)\ C_{C13}\ I_T^2$ • $P_{C2}(F) = C_{C21} + C_{C22}\ F + k_{C23}(v)\ C_{C23}\ F^2$ Motor losses • $P_M(F, v) = C_{M1} + C_{M2}\ F + k_{M3}(v)\ C_{M3}\ F^2$ Sum of other relevant losses (e.g. ventilation, pumps, gears and so on) in order to describe the chain from pantograph to wheel complete: • $P_{R1}(I_T, v) = C_{R11} + C_{R12}\ I_T + k_{R13}(v)\ C_{R13}\ I_T^2$ • $P_{R2}(F, v) = C_{R21} + C_{R22}\ F + k_{R23}(v)\ C_{R23}\ F^2$ • $P_{R3}(v) = C_{R31} + C_{R32}\ v + C_{R33}\ v^2$ With I_P total current at current collector (incl. auxiliary) I_T traction current, part of current at current collector used for traction (excl. auxiliary) F tractive effort k_{C23} speed depending correction factor, defined as polygon curve, if necessary k_{M3} speed depending correction factor, defined as polygon curve, if necessary For vehicles which can increase U and decreasing I correspondingly in the area of constant P the losses can be adjusted with help of k_{C13}, k_{C23}, k_{M3}, k_{R13} and k_{R23}. NOTE: The provided model of describing losses in the different parts of the traction chain is general. Therefore use only the coefficients and factors, which are relevant for the vehicle concerned.	C_{T1} = C_{T2} = C_{T3} = C_{C11} = C_{C12} = C_{C13} = k_{C13} = C_{C21} = C_{C22} = C_{C23} = k_{C23} = C_{M1} = C_{M2} = C_{M3} = k_{M3} = C_{R11} = C_{R12} = C_{R13} = k_{R13} = C_{R21} = C_{R22} = C_{R23} = k_{R23} = C_{R31} = C_{R32} = C_{R33} =
18	PUsupplyLIM PMOT PELBRAKE	Maximum traction power consumption and regeneration [MW] as function of contact line voltage [kV] at the current collector (at least as table). Power consumption for	

		passenger coaches if vehicle is locomotive, see no 12 and 13 Note: Normally used to describe power reduction, according to EN 50388:2012	
18a	Imax Smax	Maximum current and/or apparent power at the pantograph used for the power limitation according EN 50388. Specify even edition of EN 50388.	
19	4.5.2.19	Topic not used	
20	4.5. 2.22	Main circuit schematics	
	4.5. 2.20	Topic not relevant	
21	4.5. 2.23	Filter configuration and component values/data including main transformer	
22	4.5. 2.24	Admittance frequency response including control system	If applicable
22a		Software version(s) of control system	If applicable
23		Drivers manual and a detailed description of the vehicle. In order to be able to judge the figures given in this document and to be able to make own assumptions when designing models for simulation.	
28	FIU FiMOT FiBRAKE 4.5. 2.40	Power angle [deg] alternative power factor for power consumption and regeneration as function of contact line voltage	
29	PauxB 4.5. 2.41	Active power consumption [MW] for auxiliary power, train heating and air condition which is taken from the converter bridge (dc-link)	
30	PFauxB 4.5. 2.42	Power factor [] at zero speed for auxiliary power, train heating and air condition which is taken from the converter bridge. For speed above zero the FIU control (see item no 28) is used instead.	

General comments:

Name, phone and email of contact person _____

Date and signature: _____

Appendix

Tables and diagrams