Road and Rail Unit (NSA)

NATIONAL REFERENCE DOCUMENT: SWEDEN

NATIONAL RULES APPLIED IN CONJUNCTION WITH THE AUTHORISATION OF RAILWAY VEHICLES IN ACCORDANCE TO ART.27 OF DIRECTIVE 2008/57/EC IN SWEDEN

REFERENCE:	TSJ 2009-1219	**DOCUMENT TYPE:**	**TECHNICAL DOCUMENT**
VERSION:	2.0		
DATE:	2011-07-08		

	Edited by	**Approved by**
Name	Stefan Sollander	Ove Andersson
Position	Transportstyrelsen National Safety Authority of Sweden	Transportstyrelsen National Safety Authority of Sweden
Date & Signature.		

AMENDMENT RECORD

Version	Date	Section number	Modification/description	Author
0.1	03.12.2009	All sections	First draft	Peter Mihm
0.2	28/01/2010	All Sections	Change of parameters from English into Swedish, column for notification suppressed	Benoit Debusschere
0.3	15/03/2010	All Sections	Review by NSA Sweden	Stefan Sollander
1.0	31/03/2010	All Sections	Preparation of version 1.0 Change of Version Number, Removal of Watermark	Peter Mihm
1.1	19/04/2010	All Sections	Preparation of version 1.1 Change of Version Number, Removal of Watermark	Peter Mihm
2.0	2011-07-08	All section	2011 Version	Stefan Sollander

Introduction

The document references national rules applied in conjunction with the authorization of railway vehicles in the Member State against the detailed list of parameters published by decision 2011/155/EC. The Reference Document itself does not give the national rules legal status but it is intended to be comprehensive by referencing and cross referencing "all the national rules and guide lines applied by the Member States" as advised to the Agency.

Due to timely constraints for referencing national rules against these parameters the 2011 version of the National Reference Document may not contain a full set of references to appropriate rules, for this reason for certain parameters the reference "to be investigated" has been added. As soon as possible this information will be substituted by a reference to an appropriate rule, or if a check of this parameter is not required for authorizing the railway vehicle in the Member State, by the term "no requirement".

As far as the Member State evaluate rules of another Member State and agreed with the authority of this Member State an evaluation of that rule for a certain parameter the agreed evaluation as A, B or C had been included into the document as far as this information had been made available; in relation to Member States which are not considered within this document the respective rules has to be considered as evaluated "B". The Transport Agency is also working in the Nordic Interest group for cross acceptance with classifying A, B and C-points with the NSAs from Finland, Norway, Denmark and Germany.

Parameter of detailed list of parameters in accordance to Decision 2009/965/EC	National Rules applied for the authorisation of railway vehicles in Sweden
1.0 Documentation	**-**
1.1 General documentation	Technical information on the vehicle and its intended use. Technical Specification TSFS 2010:116 §9.
1.1.1 Safety case complete vehicle	TSFS 2010:116 - Safety case for the rail vehicle. - Reliability plan and safety plan. - Hazard log. - Assessment report.
1.2 Maintenance instructions and requirements	-
1.2.1 Maintenance instructions	Maintenance instructions for the vehicle in users language TSFS 2010:116, §16 Maintenance manual.
1.2.2 The maintenance design justification file	Maintenance plan for the vehicle TSFS 2010:116, §16 Maintenance plan.
1.3 Instructions and documentation for operation	-
1.3.1 Instructions for operation in normal and degraded modes of the vehicle	Drivers manual for the vehicle in Swedish (users) language TSFS 2010:116, §16
1.3.2 Instructions for towing and rescue.	Instructions for towing and rescue. Guide for interoperability with the infrastructure, TS JV 2009:003
1.4 Track side tests of the complete vehicle	Winter tests, Interoperability with infrastructure and Experience operation including winter conditions is required, TSFS 2010:116 §16 Documents confirming that the rail vehicle has been tested in its operating environment.
1.4.1Validation report on vehicle level	TSFS 2010:116 §13 Validation plan. Validation report.
1.4.2 Winter test report	Winter test is required according to TSFS 2010:116 §16 Documents confirming that the rail vehicle has been tested in its operating environment.
1.4.3 Experience operation report	Experience operation including winter conditions TSFS 2010:116 §16 Documents confirming that the rail vehicle has been tested in its operating environment.

2. 0 Structure and mechanical parts	**-**
2.1 Vehicle structure	-
2.1.1 Strength and integrity	Safety case according to TSFS 2010:116 EN 12663 is accepted as demonstration of safety
2.1.1.1 Snow plough	The obstacle deflector shall work as a snow plough according to EN 15227. Requirements according to TSI LOC&PAS 4.2.6.1.5 are applicable.
2.1.1.2 Surface of the car body	Swedish requirement that the vehicle surface shall be anti train surfing and anti train climbing
2.1.2 Load capability	-
2.1.2.1 Load conditions and weighted mass	Load conditions shall be stated according to TSI LOC&PAS 4.2.2.10 and EN 15663.
2.1.2.2 Axle load and wheel load	Load conditions, axles and wheel loads shall be stated according to TSI LOC&PAS 4.2.2.10, 4.2.3.2 and EN 15663.
2.1.3 Joining technology	EN 12663-1 is accepted for strength. EN 15085 accepted for welding.
2.1.4 Lifting and jacking	TSI LOC&PAS 4.2.2.6 paragraphs in EN 12663
2.1.5 Fixing of devices to car body structure	EN 12663-1 and UIC 566 is accepted for strength
2.1.6 Connections used between different parts of the vehicle	EN 12663-1 is accepted for strength UIC 577 and ERRI12/RP17 is also accepted
2.2 Mechanical interfaces for End coupling or Inner coupling	-
2.2.1 Automatic coupling	For automatic couplers and other central couplers: Requirements according to TSI LOC&PAS 4.2.2.2.3.
2.2.2 Characteristics of rescue coupling	For vehicles not equipped with UIC-coupler: Rescue coupler according to TSI LOC&PAS 4.2.2.2.4. The rescue coupler shall be possible to handle and adapt by two persons.
2.2.3 Screw couplings	Screw couplers according to EN 15566 and UIC520 are accepted
2.2.4 Buffing, inner coupling and draw gear components	For Buffers draw gear and inner couplers: Requirements according to TSI LOC&PAS 4.2.2.2.2 EN 15551 and EN 15566 are accepted.
2.2.5 Buffer marking	no requirement
2.2.6 Draw hook	For draw hook: Requirements according to TSI LOC&PAS 4.2.2.2.3. EN 15566, EN15551 are accepted (also UIC 520, 526,527 and 528).
2.2.7 Gangways	For gangways: PRM TSI: 4.2.2.7 Clearways GMRT 2120 is also accepted.
2.3 Passive safety	For passive safety: Requirements according to TSI LOC&PAS 4.2.2.5, EN 15227 is accepted. Collision with wild animals is national requirement only for drivers safety, but vehicle destructions may be a customer requirement.

3. Track interaction and gauging	**-**
3.1 Vehicle gauge	-
3.1.1 Vehicle gauge	Vehicle gauge according to: TSI LOC&PAS 4.2.3.1, EN 15273-2 gauges SEA, GA or GB are accepted, also SEC is acceptable on some lines.
3.1.2 Specific case	No national requirement
3.2 Vehicle dynamics	-
3.2.1 Running safety and dynamics	Running dynamics according to TSI LOC&PAS 4.2.3.4, EN 14363 only the paragraphs mandatory in TSI. Also UIC 518 is accepted.
3.2.1.1 Stability after derailment	Derailment safety valid for passenger vehicles of new design. Simulation/calculation on a trains ability to stay on embankment in case of a derailment.
3.2.2 Equivalent conicity, wheel profile and limits	For equivalent conicity: TSI LOC&PAS 4.2.3.4 and 4.2.3.5 applies Wheel limits according to UIC 510 is accepted in Sweden, there are also other requirements and wheel defects (qR >6,0 mm is accepted).
3.2.3 Track loading	For track loading: TSI LOC&PAS 4.2.3.4.2.2, EN 14363 only the paragraphs mandatory in TSI applies Max axle load shall be given in the vehicle register.
3.2.4 Vertical acceleration	No requirement
3.3 Bogies / running gear	-
3.3.1 Boogies	For bogie structure: TSI LOC&PAS 4.2.3.5.1, EN 13749 only the paragraphs mandatory in TSI.
3.3.2 Wheel set (Axle + wheels)	For wheel set: TSI LOC&PAS 4.2.3.5.2.1, EN 13260, EN 13103 and EN 13104 only the paragraphs mandatory in TSI.
3.3.3 Wheel	For wheels: TSI LOC&PAS 4.2.3.5.2.2, EN 13979-1 and EN 13715 only the paragraphs mandatory in TSI . For cast iron wheels EN 13979-2 and 15718 are accepted.
3.3.4 Wheel/rail interface (including wheel flange lubrication and sanding)	Sanding and flange lubrication are voluntary in Sweden. When used requirements according to TSI CCS annex A appendix 1 shall be fulfilled.
3.3.5 Bearings on the wheel set	Safety case mechanical forces, e.g. EN 12080, EN 12081 are accepted. TSFS 2010:116
3.3.6 Minimum curve radius to be negotiated	Requirement on lines 150 m. Vertical radius to be investigated.
3.3.7 Rail guard	For rail guards: TSI LOC&PAS 4.2.3.7 is required.
3.4 Limit of maximum longitudinal positive and negative acceleration	Requirements in ATC-specifications, max 2,5 m/s^2.

4. Braking	**-**
4.1 Functional Requirements at train level	Requirements according to "Swedish requirements on brake system in train set X62" TSJ 2009-98, 2009-11-10.
4.2 Safety requirements for braking at train level	Tolerable hazard rate for emergency brake $\leq 10^{-8}$ dangerous failures/h According to "Swedish requirements on brake system in train set X62" TSJ 2009-98, 2009-11-10.
4.2.1 Traction/braking interlocking	Tolerable hazard rate for traction cut off by emergency brake $\leq 1*10^{-8}$ dangerous failures/h. According to "Swedish requirements on brake system in train set X62" TSJ 2009-98, 2009-11-10".
4.3 Brake system Recognised architecture and associated standards	A safety case for brake system is required According to "Swedish requirements on brake system in train set X62" TSJ 2009-98, 2009-11-10".
4.4 Brake command	-
4.4.1 Emergency braking command	Requirement on tolerable hazard rate for emergency brake command according to "Swedish requirements on brake system in train set X62" .
4.4.2 Service braking command	Requirement on brake command according to "Swedish requirements on brake system in train set X62"
4.4.3 Direct braking command	Direct brake: TSI LOC&PAS 4.2.4.4.3
4.4.4 Dynamic braking command	No specific requirement
4.4.5 Parking braking command	The isolation of the parking brake shall be protected to unauthorized persons (e.g. by a specific tool)
4.5 Brake performance	-
4.5.1 Emergency braking	Requirements on safe retardation performance dependent on maximum speed According to "Swedish requirements on brake system in train set X62" TSJ 2009-98, 2009-11-10 and BVF 544.98007.
4.5.2 Service braking	Requirements on service brake retardation performance dependent on maximum speed According to "Swedish requirements on brake system in train set X62" TSJ 2009-98, 2009-11-10 and BVF 544.98007.
4.5.3 Calculations related to thermal capacity	Safety case brakes According to "Swedish requirements on brake system in train set X62" TSJ 2009-98, 2009-11-10.
4.5.4 Parking brake	Parking brake: TSI LOC&PAS 4.2.4.5.5, Capacity for slope shall be given by applicant.
4.6 Braking adhesion management	-
4.6.1 Limit of wheel rail adhesion profile	To be investigated
4.6.2 Wheel slide protection system	Tolerable hazard rate for wheel slide protection < $1*10^{-8}$ dangerous failures/h (e.g. no brake due to WSP) According to "Swedish requirements on brake system in train set X62" TSJ 2009-98, 2009-11-10. Also TSI LOC&PAS 4.2.4.6.2 applies.
4.7 Braking force production	-
4.7.1 Braking force production	Brake system with compressed air shall have the dewpoint -40 C when operation in Nordic winter conditions, for unrestricted winter operation (ISO 8573-1 specifies the compressed air purity classes).
4.7.2 Friction brake	To be investigated

4.7.2.1 Brake blocks	Brake blocks shall be approved for winter operation for unrestricted winter operation.
4.7.2.2 Brake discs	Vehicles with Brake discs and pads shall be tested for winter operation for unrestricted winter operation.
4.7.2.3 Brake pads	Vehicles with Brake discs and pads shall be winter tested for winter operation for unrestricted winter operation.
4.7.3 Dynamic brake linked to traction	Tolerable hazard rate for traction cut off by emergency brake, have effect on dynamic brake, (se 4.2.1).
4.7.4 Magnetic track brake	Multiple units, locomotives and coaches with sth >140 km/h shall have Mg-brake with Tolerable hazard rate < $1*10^{-8}$ dangerous failures/h according to X62 document. Also TSI LOC&PAS 4.2.4.8.2 applies.
4.7.5 Eddy current track brake	Not allowed to be used in Sweden today.
4.7.6 Parking brake	Parking brake is required according to TSI LOC&PAS 4.2.4.5.5.
4.8 Brake state and fault indication	There shall be a start up test of brake system. All faults should be detected. (There are also operational rules). According to "Swedish requirements on brake system in train set X62" TSJ 2009-98, 2009-11-10. Also TSI LOC&PAS 4.2.4.9 applies.
4.9 Brake requirements for rescue purposes	No national requirements
5.0 Passenger related items	**-**
5.1 Access	-
5.1.1 Exterior doors	Safety requirements according to TSI LOC&PAS 4.2.5.6 and 4.2.5.7.
Mechanical construction / strength for the exterior door	Safety requirements according to TSI LOC&PAS 4.2.5.6 and 4.2.2.4.
Door opening system incl. Emergency opening	Safety requirements according to TSI LOC&PAS 4.2.5.6 .
Door / Passenger protection system	Safety requirements according to TSI LOC&PAS 4.2.5.6.
Door Traction interlocking	Safety requirements according to TSI LOC&PAS 4.2.5.6.
Exterior Handrails /in case of exterior handrails prevent train surfing	Safety requirements according to TSI LOC&PAS 4.2.5.7.
5.1.2 Interior doors	Interial doors according to TSI PRM 4.2.2.4.3
5.1.3 Clearways	Clearways according to TSI PRM 4.2.2.7
5.1.4 Steps and lighting	Distance between foot step and platform according to “Swedish requirements on door system in train set X55, 2009-246, 2009-07-02”.
5.1.5 Height changes	Height changes according to TSI PRM 4.2.2.9
5.1.6 Handrails	Hand rail according to TSI PRM 4.2.2.10
5.1.7 Boarding aids	Requirements according to TSI PRM 4.2.2.12 .

5.2 Side windows	Requirements for side windows TSI LOC&PAS 4.2.2.9.
5.3 Toilets	If there is toilets on board TSI PRM 4.2.2.6 should apply and TSI LOC&PAS 4.2.5.1.
5.4 Passenger information	-
5.4.1 Public address system	Requirements according to TSI LOC&PAS 4.2.5.2
5.4.2 Signs and information	Requirements according to TSI PRM 4.2.2.8
5.5 Seats and Specific PMR arrangements	Requirements according to TSI PRM 4.2.2.2
5.6 Specific passenger related facilities	no requirement
5.6.1 Lift systems	Requirements according to TSI PRM 4.2.2.12 and the aids shall be designed for motorised wheel chairs.
5.6.2 Heating, ventilation and Air condition systems	CO2 level according to TSI LOC&PAS 4.2.5.9 and TSI SRT 4.2.5.10.
5.6.3 Others	no requirement
6.0 Environmental conditions and aerodynamic effects	**-**
6.1 Impact of the Environment on the vehicle	-
6.1.1 Environmental conditions impacting on the vehicle	-
6.1.1.1 Altitude	no requirement
6.1.1.2 Temperature	For unrestricted operation in winter conditions a winter test is required Winter test and temperature range according to EN 50125 class T2 (T >-40 C). Functions according to TSI LOC&PAS 4.2.6.1.2 and 4.2.6.1.5 are required.
6.1.1.3 Humidity	no requirement
6.1.1.4 Rain	no requirement
6.1.1.5 Snow, ice and hail	For unrestricted operation in winter conditions a winter test is required Winter test and temperature range according to EN 50125 class T2 (T >-40 C). Functions according to TSI LOC&PAS 4.2.6.1.2 and 4.2.6.1.5 are required.
6.1.1.6 Solar radiation	no requirement
6.1.1.7 Chemical and particulate matter	According to TSI LOC&PAS 4.2.6.1.7
6.1.2 Aerodynamic effects	no requirement-
6.1.2.1 Crosswind effects	Side wind capability as X61 calculation according to prEN 14067
6.1.2.2 Maximum pressure variation in tunnels	no requirement

6.2 Impact of the vehicle on the environment	-
6.2.1 Impact of the vehicle on the environment (general)	To be investigated
6.2.2 Chemical and particulate emissions	Noxious chemicals, Asbestos, Chlorofluorocarbons
6.2.2.1 Toilet emissions	Only closed toilet systems are allowed
6.2.2.2 Exhaust gas emissions	Requirements for diesel exhaust are applied according to relevant EU directives and -regulations, such as 2004/26/EC
6.2.3 Limits for noise emissions	TSI Noise applies for newer vehicles. No requirement for vehicles approved before midsummer 2006
6.2.3.1 Exterior noise impact	TSI Noise applies for newer vehicles. No requirement for vehicles approved before midsummer 2006
6.2.3.2 Stationary noise impact	TSI Noise applies for newer vehicles. No requirement for vehicles approved before midsummer 2006
6.2.3.3 Starting noise impact	TSI Noise applies for newer vehicles. No requirement for vehicles approved before midsummer 2006
6.2.3.4 Pass-by noise impact	TSI Noise applies for newer vehicles. No requirement for vehicles approved before midsummer 2006
6.2.4 Limits for Aerodynamic loads impact	no requirement
6.2.4.1 Head pressure pulses	no requirement
6.2.4.2 Aerodynamic impact on passengers on platform	no requirement
6.2.4.3 Aerodynamic impact on track workers	no requirement
6.2.4.4 Ballast pick up and projection onto neighbouring property	no requirement
7.0 External warning, marking functions and software integrity requirements	**-**
7.1 Integrity of software employed for safety related functions	For safety related software SIL $\geq$2 is required (according to EN 50128) For some brake functions SIL $\geq$3
7.1.1 software for door monitoring	Traction block for not closed door se 5.1.1.
7.2 Visual and audible vehicle identification and warning functions	-
7.2.1 Vehicle marking	According to TSI OPE Marking of lifting points according to TSI LOC&PAS 4.2.2.6.
7.2.2 External lights	-
7.2.2.1 Head lights	The vehicle with drivers cab shall have both dimmed and head lights according to TSI LOC&PAS 4.2.7.1.1 For white colour Halogen and Xenon is accepted
7.2.2.2 Marker lights	The vehicle with drivers cab shall have marker lights according to TSI LOC&PAS 4.2.7.1 .2. For white colour Halogen and Xenon is accepted.
7.2.2.3 Tail lights	The vehicle with drivers cab shall have tail lights according to TSI LOC&PAS 4.2.7.1 .3.

7.2.2.4 Lamp controls	The vehicle with drivers cab shall have both dimmed and head lights according to TSI LOC&PAS 4.2.7.1.4.
7.2.3 Warning Horn	-
7.2.3.1 Warning Horn tones	The vehicle with drivers cab shall have warning horn tones according to TSI LOC&PAS 4.2.7.2.1
7.2.3.2 Warning horn sound pressure levels	The vehicle with drivers cab shall have warning horn sound pressure according to to TSI LOC&PAS 4.2.7.2.2 and 4.2.7.2.3 including operation in snowfall.
7.2.3.3 Warning horns, protection	The vehicle with drivers cab shall have warning horn sound pressure according to to TSI LOC&PAS 4.2.7.2.2 and 4.2.7.2.3 including operation in snowfall.
7.2.3.4 Warning horns, control	The vehicle with drivers cab shall have warning horn regulation according to TSI LOC&PAS 4.2.7.2.4.
7.2.3.5 Warning horns verification of sound pressure levels	The vehicle with drivers cab shall have warning horn sound pressure according to to TSI LOC&PAS 4.2.7.2.2 and 4.2.7.2.3 including operation in snowfall.
7.2.4 Brackets	Requirement only for freight wagons
8.0 Onboard power supply and control systems	**-**
8.1 Traction performance requirements	-
8.1.1 Residual acceleration at max speed	no requirement
8.1.2 Residual traction capability in degraded mode	For new passenger trains according to TSI SRT 4.2.5.3.1
8.1.3 Traction wheel/rail adhesion requirements	To be investigated
8.2 Functional and technical specification related to the interface between the vehicle and the energy subsystem	-
8.2.1 Functional and technical specification related to the electric power supply	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300.
8.2.1.1 Power supply	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300.
8.2.1.2 Impedance between pantograph and wheels	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300.
8.2.1.3 Voltage and frequency of overhead contact line power supply	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300

8.2.1.4 Energy recuperation	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300
8.2.1.5 Maximum power and maximum current that is permissible to draw from the overhead contact line	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300
8.2.1.6 Power factor	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300
8.2.1.7 System energy disturbances	-
8.2.1.7.1 Harmonic characteristics and related over-voltages on the overhead contact line	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300
8.2.1.7.2 Effects of DC content in AC supply	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300
8.2.1.8 Electrical protection	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300
8.2.2 Pantograph functional and design parameters	-
8.2.2.1 Pantograph overall design	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330. German pantographs are aceepted on some lines.
8.2.2.2 Pantograph head geometry	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330. German pantographs are aceepted on some lines.
8.2.2.3 Pantograph static contact force	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.2.2.4 Pantograph contact force (including dynamic behaviour and aerodynamic effects)	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.2.2.5 Working range of pantographs	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330. German pantographs are aceepted on some lines.
8.2.2.6 Current capacity	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.2.2.7 Arrangement of pantographs	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.2.2.8 Insulation of pantograph from the vehicle	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.

8.2.2.9 Pantograph lowering	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.2.2.10 Running through phase separation sections	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.2.2.11 Running through system separation sections	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.2.3 Contact strip functional and design parameters	-
8.2.3.1 Contact strip geometry	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330. German pantographs are aceepted on some lines.
8.2.3.2 Contact strip material	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.2.3.3 Contact strip assessment.	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.2.3.4 Detection of contact strip breakage	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.2.3.5 Current capacity	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.330.
8.3 Electrical power supply and traction system	-
8.3.1 Energy consumption measurement	TSI LOC&PAS 4.2.8.2.8
8.3.2 Main electrical circuit configuration	TSI LOC&PAS 4.2.8.4 och 4.2.8.4
8.3.3 High voltage components	TSI LOC&PAS 4.2.8.4 och 4.2.8.4
8.3.4 Earthing	TSI LOC&PAS 4.2.8.4 och 4.2.8.4
8.4 Electromagnetic Compatibility	-
8.4.1 Electromagnetic compatibility within the onboard electrical power supply and control system	Applicable EN 50121 standards applies.
8.4.2 Electromagnetic compatibility with the signalling and telecommunications network	Applicable EN 50121 standards applies.
8.4.3 Electromagnetic compatibility with other vehicles and with the trackside part of the railway system	Requirements according to guide line "Granskning av järnvägsfordons samverkan med svensk järnvägsinfrastruktur; TS JV 2009:003". Test are required according to BVF 543.19300.
8.4.4 Electromagnetic compatibility with the environment	Requirements according to EN 50121-applicable parts and EN 50500.
8.5 Protection against electrical hazards	TSI LOC&PAS 4.2.8.4 och 4.2.8.4.

8.6 Diesel and other thermal traction system requirements	Requirements for diesel exhaust are applied acc to relevant EU directives and -regulations, such as 2004/26/EC.
8.7 Systems requiring special monitoring and protection measures	-
8.7.1 Tanks and pipe systems for flammable liquids	To be investigated
8.7.2 Pressure vessel systems / pressure equipment	EU directives for pressure tanks/vessels applies.
8.7.3 Steam boiler installations	To be investigated
8.7.4 Technical systems in potentially explosive atmospheres	To be investigated
8.7.5 Ionisation detectors	To be investigated
8.7.6 Hydraulic/pneumatic control systems	To be investigated
9.0 Staff facilities, interfaces and environment	**-**
9.1 Drivers cab design	-
9.1.1 Cab design	-
9.1.1.1 Interior layout	UIC 651apply (ref to be determined)(normal practise) Swedish working environmental regulations apply (this could make extra requirements after approval).
9.1.1.2 Desk ergonomics	UIC 651apply (ref to be determined)(normal practise) Swedish working environmental regulations apply (this could make extra requirements after approval).
9.1.1.3 Drives seat	UIC 651apply (ref to be determined)(normal practise) Swedish working environmental regulations apply.
9.1.1.4 Means for the driver to exchange documents	no requirement
9.1.1.5 Other Facilities to control operation of the train	no requirement
9.1.2 Access to Driver's cab	-
9.1.2.1 Access, egress and Doors	Access according to TSI LOC&PAS 4.2.9.1.2.1.
9.1.2.2 Driver's cab emergency exits	Emergency exit according to TSI LOC&PAS 4.2.9.1.2.2.
9.1.3 Windscreen in Driver's cab	-
9.1.3.1 mechanical characteristics	For vehicles with a cab, requirements according to TSI LOC&PAS 4.2.9.2.1 (Wind screen according to EN 15152).
9.1.3.2 optical characteristics	For vehicles with a cab, requirements according to TSI LOC&PAS 4.2.9.2.2 (Wind screen according to EN 15152).
9.1.3.3 equipment	For vehicles with a cab, requirements according to TSI LOC&PAS 4.2.9.2.3 (This function shall be winter tested according to TSI LOC&PAS 4.2.6.1.5).
9.1.3.4 front visibility	Requirements acc to UIC 651.

9.2 Working conditions	-
9.2.1 Environmental conditions	Swedish working environmental regulations apply.
9.2.1.1 Heating, Ventilation and Air condition systems in driver cabs	For vehicles with a cab a winter test is required Temperature shall be +18 to +26 C in all weather conditions measurement according to EN 14813-2 The CO2 level shall not exceed 5 000 ppm.
9.2.1.2 Noise in driver cabs	Noise levels in driver cab according to TSI Noise 4.2.3 for all vehicles with a cab.
9.2.1.3 Lighting in driver cabs	Safety indicators and switches shall be marked and visible even in darkness. According to Guide TS JV 2010:206.
9.2.2 Others	Swedish requirements on drivers cab, instructions and equipment in train set according to Guide TS JV 2010:206.
9.3 Driver machine interface	-
9.3.1 Driver machine interface	MMI-study is required According to Guide TS JV 2010:206.
9.3.1.1 speed indication	According to TSI CCS 4.2.13.
9.3.1.2 driver's display unit and screens	According to TSI CCS 4.2.13 and national requirements for the ATP-system.
9.3.1.3 controls and indicators	Controls and indicators According to Guide TS JV 2010:206.
9.3.2 Driver supervision	Requirements according to Guide TS JV 2010:206.
9.3.3 Rear and side view	There shall be equipment (mirrors or colour video) so the driver can see backwards along the train set and the doors from the drivers' seat. According to Guide TS JV 2010:206.
9.4 Marking in Driver cabs	Requirements according to Guide TS JV 2010:206.
9.5 Equipment and other facilities onboard for staff	-
9.5.1 Facilities onboard for staff	Requirements according to Guide TS JV 2010:206.
9.5.1.1 Staff access for coupling /uncoupling	To be investigated
9.5.1.2 External steps and handrails for shunting staff	To be investigated
9.5.1.3 Storage facilities for use by staff	no requirement
9.5.1.4 Other facilities	Requirements according to Guide TS JV 2010:206.

9.5.2 Staff and freight Access doors	no requirement
9.5.3 On board tools and portable equipment	The cab shall have a first aid material, short circuit clips, obstruction board, according to Guide TS JV 2010:206.
9.5.4 Audible communication system	Staff communication according to TSI LOC&PAS 4.2.5.2.
9.6 Recording device	Recording device is required for all vehicles with a cab, (usually integrated in the ATP-system)
9.7 Remote control function	Remote control function shall be approved by the Swedish NSA TSFS 2010:116.
10.0 Fire safety and evacuation	**-**
10.1 Fire safety	-
10.1.1 Fire protection concept	-
10.1.1.1 Fire protection concept	Requirements for vehicle class for tunnel safety according to TSI SRT, DIN 5510 or NF F16-101 is accepted.
10.1.1.2 Classification of vehicle / Fire categories	For Botnia line Fire class B according to TSI SRT is normally required. Old vehicles shall at least have passenger brake and door traction loop override and fire detection.
10.1.2 Fire protection measures	-
10.1.2.1 General protection measures for vehicles	Requirements for vehicle class for tunnel safety according to TSI SRT, DIN 5510 or NF F16-101 is accepted.
10.1.2.2 Fire protection measures for specific kind of vehicles	Requirements for vehicle class for tunnel safety according to TSI SRT, DIN 5510-2 or NF F16-101 is accepted.
10.1.2.3 Protection of drivers cab	Requirements for vehicle class for tunnel safety according to TSI SRT, DIN 5510-2 or NF F16-101 is accepted.
10.1.2.4 Fire barriers	Requirements for vehicle class for tunnel safety according to TSI SRT, DIN 5510 or NF F16-101 is accepted.
10.1.2.5 Material properties	Requirements for vehicle class for tunnel safety according to TSI SRT, DIN 5510 or NF F16-101 is accepted.
10.1.2.6 Fire detectors	Passenger vehicles running on Botnia line and sleeping cars shall have fire detectors
10.1.2.7 Fire extinction equipment	Drivers cabs and passenger areas shall have fire extinguishers according to TSI SRT 4.2.7.2.3.2.
10.2 Emergency	-
10.2.1 Passenger emergency exits	Passenger emergency exits According to TSI LOC&PAS 4.2.10.4
10.2.2 Rescue service's information, equipment and access	For passenger vehicles a rescue card shall be delivered to NSA in the approval process according to Guide TS JV 2011:201.
10.2.3 Passenger Alarm	There shall be a passenger alarm handle at every pair of passenger doors. The driver shall have a possibility to override the passenger brake in order to move the train to a suitable place, according to TSI LOC&PAS 4.2.5.3.

10.2.4 Emergency lighting	There shall be emergency light in all passenger areas according to TSI SRT 4.2.5.9. The vehicle/train shall have battery capacity for 1,5 h operation even in very cold air temperatures, Winter test is required.
10.3 Additional measures	To be investigated
11.0 Servicing	**-**
11.1 Train cleaning facilities	no requirement
11.1.1 Train external cleaning facilities	no requirement
11.1.2 Train internal cleaning	no requirement
11.2 Train refuelling facilities	To be investigated
11.2.1 Waste water disposal systems	Requirements according to TSI LOC&PAS 4.2.11.3
11.2.2 Water supply system	Requirements according to TSI LOC&PAS 4.2.11.4
11.2.3 Further supply facilities	Electrical contacts compatible to the infrastructure stabling system.
11.2.4 Interface to refuelling equipment for non electric rolling stock	Requirements according to TSI LOC&PAS 4.2.11.7
12.0 On-board control command and signalling	**-**
12.1 On board Radio system	-
12.1.1 NON GSM-R radio system	"Non GSM-R" system is not allowed to use in Sweden, except for trains going to Denmark.
	For the Øresund Link there is a requirement for a change-over function to GSM-R, ref. SP 6-01 app.1. Documentation for compliance with MSR 3 supplier's installation requirements to be given. Requirements for compatibility of other types apply. ref. BN2-74-1 ch. 12.1; table pt. 5.1
12.1.2 Use of hand portables as cab mobile radio	no requirement
12.1.3 GSM-R compliant radio system	A GSM-R train radio is required according to TSI CCS A national GSM-R train radio can be installed for national vehicles The installation on board shall according to NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.1 Text messages	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.2 Call forwarding	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.3 Broadcast calls	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.4 Cab-radio related functions	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.5 Network selection by external trigger	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.6 General purpose radio related functions	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.7 Primary controller's MMI functionality	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.8 Capacity of on board GSM-R	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.9 GSM-R-ETCS interface	NSA guide line "GSM-R installation in fordon" JVS 411-b3.

12.1.3.10 Interconnection and roaming between GSM-R networks	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.11 Border crossing	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.12 GPRS and ASCI	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.13 Interface between Rolling Stock driver's safety device, vigilance device, and GSM-R onboard assembly.	no requirement
12.1.3.14 Test specification for mobile equipment GSM-R	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.15 Directed/automatic network selection	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.16 Registration and deregistration	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.1.3.17 GSM-R Version Management	NSA guide line "GSM-R installation in fordon" JVS 411-b3.
12.2 On board signalling	-
12.2.1 National on board signalling systems	A Swedish class B system (ATC2) shall be installed on locomotivea and multiple units.
12.2.2 Compatibility of signalling system with the rest of the train	ATC shall be installed on vehicles with cab according to guide line ”ATC-installationer i fordon”, JVS guide line 411-b2. STM installation should be according to national regulation "STM nationella krav; 2009-2412, 2009-10-29".
12.2.3 Compatibility of rolling stock with Track infrastructure	For vehicles without on board axle bearing condition monitoring system: Hot box detection shall be possible according to TSFS 2010:116 and BVS 1592.0201
12.2.3.1 Relation between axle distance and wheel diameter	To be investigated
12.2.3.2 Metal free space around wheels	For vehicles without on board axle bearing condition monitoring system: Hot box detection shall be possible according to TSFS 2010:116 and BVS 1592.0201
12.2.3.3 Metal mass of a vehicle	Minimum axle load according to TSI CCS annex A appendix 1.
12.2.4 ETCS cab signalling system	A TSI CCS ver 2.3.0d compatible system is required.
12.2.4.1 Awakening	To be investigated
12.2.4.2 Train categories	To be investigated
12.2.4.3 Performance requirements for on-board GSM-R equipment related to quality of service	To be investigated
12.2.4.4 Use of ETCS modes	To be investigated
12.2.4.5 ETCS requirements when vehicle is driven from outside the cab	To be investigated
12.2.4.6 Level crossing functionality	For unrestricted operation level crossing function is required.
12.2.4.7 Interfaces with OPE TSI, braking safety margins	To be investigated
12.2.4.8 Reliability — Availability Requirements	Swedish STM specification "TSJ 2009-2412, 2009-10-29"
12.2.4.9 Marker Boards	To be investigated

12.2.4.10 Ergonomic aspects of the DMI	To be investigated
12.2.4.11 ETCS values of variables controlled outside UNISIG — Manual	To be investigated
12.2.4.12 KM Conformance Requirements	To be investigated
12.2.4.13 Requirements for pre-fitting ETCS on-board equipment	To be investigated
12.2.4.14 ETCS Version Management	To be investigated
12.2.4.15 Specification of ETCS variables	To be investigated
12.2.4.16 RBC – RBC interface	To be investigated
12.2.4.17 Additional requirements on locomotives and multiple units	To be investigated
12.2.4.18 Functionality and interfaces of staff protection systems to the signalling system	To be investigated
12.2.4.19 Interface with service brake.	To be investigated
13.0 Specific Operational Requirements	**Vehicles which are not demonstrated as safe in Nordic 9winter conditions will have operational restriction in winter conditions**
13.1 Specific items to place on-board	Se requirements for drivers cab 9.5.1.4.
13.2 Occupational health and safety	Swedish regulations regarding the working environment are enforced. There could be new requirements on approved vehicles. Se also 9.2.2.1
13.3 Lifting diagram and instructions	There shall be lifting and towing instructions according to guide line TS JV 2009:003
14.0 Freight related items	**-**
14.1 Design, operation and maintenance constraints for the transport of dangerous goods	RID-S applies in Sweden
14.2 Specific facilities for the transport of freight	No requirement on vehicel level,. This is taken car of in operators safety certificate.
14.3 Doors and loading facilities	No requirement on vehicel level,. This is taken car of in operators safety certificate.