

Rolling Stock – Noise National Technical Specification

Notice

NOI NTSN – Technical Annex

Draft for preliminary consultation based on the [NTSN published on 1st January 2021](#) with the [ERA proposals for the TSI 2022 package \(Digital Rail and Green Freight\)](#) shown as changes to this. The markup reflects the proposed TSI text, except where this has been amended for applicability to GB, such as substituting 'NTSN' for 'TSI'. Please note, this draft may still include TSI proposals which need to be further amended where text is not applicable to GB.

This is provided to elicit views on the TSI proposals to inform the development of the industry recommendation for similar NTSN changes. It does not reflect RSSB or industry proposals for NTSN changes. These will be provided with a supporting business case for change for consultation in early 2023.

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1. INTRODUCTION

A National Technical Specification Notice (NTSN) is a specification that covers a subsystem (or part of it) as described in regulation 2 of the Railways (Interoperability) Regulations 2011 in order:

- to ensure the interoperability of the GB rail system, and
- to meet the essential requirements.

1.1. TECHNICAL SCOPE

1.1.1. Scope related to rolling stock

This NTSN applies to all rolling stock within the scope of the LOC&PAS NTSN and the WAG NTSN.

1.1.2. Scope related to operational aspects

Alongside with the OPE NTSN, this NTSN applies to the operation of freight wagons which are used on railway infrastructure designated as ‘quieter routes’.

1.2. GEOGRAPHICAL SCOPE

The geographical scope of this NTSN is the network of the whole GB rail system.

2. DEFINITION OF THE SUBSYSTEM

A ‘unit’ means the rolling stock which is subject to the application of this NTSN, and therefore subject to the ‘UK’ verification procedure. Chapter 2 in the annex to the LOC&PAS NTSN and chapter 2 in the annex to the WAG NTSN describe what a unit can consist of.

The requirements of this NTSN apply to the following categories of rolling stock:

- (a) Locomotives and passenger rolling stock including thermal or electric traction units, self-propelling thermal or electric passenger trains, and passenger coaches. This category is further defined in chapter 2 in the annex to the LOC&PAS NTSN and shall be referred to in this NTSN as locomotives, electric multiple units (EMU), diesel multiple units (DMU) and coaches;
- (b) Freight wagons, including low-deck vehicles designed for the entire network and vehicles designed to carry lorries. This category is further defined in

chapter 2 in the annex to the WAG NTSN and shall be referred to in this NTSN as wagons;

- (c) Special vehicles, such as on-track machines. This category is further defined in chapter 2 in the annex to the LOC&PAS NTSN ~~and consists of on-track machines (referred to in this NTSN as OTMs) and infrastructure inspection vehicles, which belong to the categories in points (a) or (b) depending on their design.~~

3. ESSENTIAL REQUIREMENTS

All basic parameters set out in this NTSN shall be linked to at least one of the essential requirements as set out in Schedule 2 to the Railways (Interoperability) Regulations 2011. Table 1 indicates the allocation.

Table 1

Basic parameters and their link to the essential requirements

Point	Clause	Basic parameter	Essential requirements				
			Safety	Reliability and availability	Health	Environmental protection	Technical compatibility
4.2.1		Limits for stationary noise				1.4.4	
4.2.2		Limits for starting noise				1.4.4	
4.2.3		Limits for pass-by noise				1.4.4	
4.2.4		Limits for driver's cab interior noise				1.4.4	

4. CHARACTERISATION OF THE SUBSYSTEM

4.1. INTRODUCTION

This Chapter sets out the optimal level of harmonisation related to specifications on the rolling stock subsystem intended to limit the noise emission of the GB rail system and to achieve interoperability.

4.2. FUNCTIONAL AND TECHNICAL SPECIFICATIONS OF THE SUBSYSTEMS

The following parameters have been identified as critical for the interoperability (basic parameters):

- (a) 'stationary noise';
- (b) 'starting noise';
- (c) 'pass-by noise';
- (d) 'driver's cab interior noise'.

The corresponding functional and technical specifications allocated to the different categories of rolling stock are set out in this section. In case of units equipped with both thermal and electric power the relevant limit values under all normal operation modes shall be respected. If one of these operation modes foresees the use of both thermal and electric power at the same time the less restrictive limit value applies. There are UK specific cases indicated in Section 7.3.

The assessment procedures for the requirements in this section are defined in the indicated ~~points and sub-points~~ [clauses](#) of Chapter 6.

4.2.1. Limits for stationary noise

The limit values for the following sound pressure levels under normal vehicle conditions concerning the stationary noise allocated to the categories of the rolling stock subsystem are set out in Table 2:

- (a) the A-weighted equivalent continuous sound pressure level of the unit ($L_{pAeq,T[unit]}$);
- (b) the A-weighted equivalent continuous sound pressure level at the nearest measuring position i considering the main air compressor ($L_{pAeq,T}^i$); and
- (c) the AF-weighted sound pressure level at the nearest measuring position i considering impulsive noise of the exhaust valve of the air dryer (L_{pAFmax}^i).

The limit values are defined at a distance of 7,5 m from the centre of the track and 1,2 m above top of rail.

Table 2

Limit values for stationary noise

Category of the rolling stock subsystem	$L_{pAeq,T}$ [unit] [dB]	$L^i_{pAeq,T}$ [dB]	L^i_{pAFmax} [dB]
Electric locomotives and OTMs with electric traction	70	75	85
Diesel locomotives and OTMs with diesel traction	71	78	
EMUs	65	68	
DMUs	72	76	
Coaches	64	68	
Wagons	65	n.a.	n.a.

The demonstration of conformity is described in ~~point~~ [clause](#) 6.2.2.1.

4.2.2. Limits for starting noise

The limit values for the AF-weighted maximum sound pressure level ($L_{pAF,max}$) concerning the starting noise allocated to the categories of the rolling stock subsystem are set out in Table 3. The limit values are defined at a distance of 7,5 m from the centre of the track and 1,2 m above top of rail.

Table 3

Limit values for starting noise

Category of the rolling stock subsystem	$L_{pAF,max}$ [dB]
Electric locomotives with total tractive power $P < 4\,500$ kW	81
Electric locomotives with total tractive power $P \geq 4\,500$ kW OTMs with electric traction	84
Diesel locomotives $P < 2\,000$ kW at the engine output shaft	85
Diesel locomotives $P \geq 2\,000$ kW at the engine output shaft OTMs with diesel traction	87
EMUs with a maximum speed $v_{max} < 250$ km/h	80
EMUs with a maximum speed $v_{max} \geq 250$ km/h	83
DMUs $P < 560$ kW/engine at the engine output shaft	82
DMUs $P \geq 560$ kW/engine at the engine output shaft	83

The demonstration of conformity is described in ~~point~~[clause](#) 6.2.2.2.

4.2.3. Limits for pass-by noise

The limit values for the A-weighted equivalent continuous sound pressure level at a speed of 80 km/h ($L_{pAeq,Tp,(80\text{ km/h})}$) and, if applicable, at 250 km/h ($L_{pAeq,Tp,(250\text{ km/h})}$) concerning the pass-by noise allocated to the categories of the rolling stock subsystem are set out in Table 4. The limit values are defined at a distance of 7,5 m from the centre of the track and 1,2 m above top of rail.

Measurements at speeds higher than or equal to 250 km/h shall also be made at the ‘additional measurement position’ with a height of 3,5 m above top of rail in accordance with [the specification referenced in Appendix B index \[1\]](#)~~Chapter 6 of EN ISO 3095:2013~~ and assessed against the applicable limit values of Table 4.

Table 4

Limit values for pass-by noise

Category of the rolling stock subsystem	$L_{pAeq,Tp}$ (80 km/h) [dB]	$L_{pAeq,Tp}$ (250 km/h) [dB]
Electric locomotives and OTMs with electric traction	84	99
Diesel locomotives and OTMs with diesel traction	85	n.a.
EMUs	80	95
DMUs	81	96
Coaches	79	n.a.
Wagons (normalised to APL = 0,225) ⁽¹⁾	83	n.a.
⁽¹⁾ APL: the number of axles divided by the length over the buffers (m ⁻¹)		

The demonstration of conformity is described in ~~point~~-[clause](#) 6.2.2.3.

4.2.3.a. **Friction elements for wheel tread brakes**

The friction element for wheel tread brakes (i.e. brake block) has an influence on the pass-by noise by creating roughness on the wheel tread when braking.

If wheel tread brakes are used the characteristics of the friction element for wheel tread brakes shall contribute to achieving the intended pass-by noise, unless it is demonstrated at subsystem level that the wagon fulfils the requirement set out in point 4.2.3 of this NTSN.

The demonstration of conformity is described in point 6.1.2.1 of this NTSN.

This requirement above does not exempt the unit under assessment from the requirements set out in point 4.2.3 and the demonstration of conformity set out in point 6.2.2.3.

4.2.4. **Limits for the driver's cab interior noise**

The limit values for the A-weighted equivalent continuous sound pressure level ($L_{pAeq,T}$) concerning the noise within the driver's cab of electric and diesel locomotives, OTMs, EMUs, DMUs and coaches fitted with a cab are set out in Table 5. The limit values are defined in the vicinity of the driver's ear.

Table 5

Limit values for driver's cab interior noise

Noise within the driver's cab	$L_{pAeq,T}$ [dB]
At standstill with horns sounding	95
At maximum speed v_{max} if $v_{max} < 250$ km/h	78
At maximum speed v_{max} if $250 \text{ km/h} \leq v_{max} < 350$ km/h	80

The demonstration of conformity is described in ~~point~~ [clause](#) 6.2.2.4.

4.3. FUNCTIONAL AND TECHNICAL SPECIFICATIONS OF THE INTERFACES

This NTSN has the following interfaces with the rolling stock subsystem:

Interface with subsystems of points (a) [and](#) ~~(b)~~, (c) ~~and (e)~~ of chapter 2 (dealt with in the LOC&PAS NTSN) with regard to:

- stationary noise,
- starting noise (not applicable to coaches),
- pass-by noise,
- interior noise within the driver's cab, where applicable.

Interface with subsystems of point [\(b\)](#) of chapter 2 (dealt with in the WAG NTSN) with regard to:

- pass-by noise,
- [stationary noise.](#)

[This NTSN has the following interface with the OPE NTSN with regard to:](#)

- [pass-by noise.](#)

4.4. OPERATING RULES

Requirements concerning the operating rules for the subsystem rolling stock are set out in the LOC&PAS NTSN and in section 4.4 of the WAG NTSN.

4.4.1. Specific rules for the operation of wagons on quieter routes in case of degraded operation

The contingency arrangements as defined in [point-clause 4.2.3.6.3](#) of the ~~Annex of the~~ OPE NTSN include the operation of wagons not compliant with [point-clause 7.2.2.2](#) on quieter routes.

This measure can be applied to address capacity restrictions or operational constraints caused by rolling stock failures, extreme weather conditions, accidents or incidents and infrastructure failures.

4.4.2. Specific rules for the operation of wagons on quieter routes in case of infrastructure works and wagons maintenance

The operation of wagons not compliant with [point-clause 7.2.2.2](#) on quieter routes shall be possible in case of wagons maintenance activities where only a quieter route is available in order to access the maintenance workshop.

Contingency arrangements set out in [point-clause 4.4.1](#) are applicable in case of infrastructure works where a quieter route is the only suitable alternative.

4.5. MAINTENANCE RULES

Requirements concerning the maintenance rules for the subsystem rolling stock are set out in section 4.5 of the LOC&PAS NTSN and in section 4.5 of the ~~Annex of the~~ WAG NTSN.

4.6. PROFESSIONAL QUALIFICATIONS

Not applicable.

4.7. HEALTH AND SAFETY CONDITIONS

See Article 6 of this Regulation.

4.8. LIST OF DETERMINATIONS OF TYPES FOR VEHICLES

The data of the rolling stock must be recorded in the list of determinations of types for vehicles authorised by the Safety Authority under regulation 8 of the Railways (Interoperability) Regulations 2011.

5. INTEROPERABILITY CONSTITUENTS

5.1. GENERAL

Interoperability constituents (ICs), as defined in [Article 2(7) of Directive (EU) 2016/797], are listed in section 5.2 together with the reference to corresponding requirements defined in section 4.2.

5.2. INTEROPERABILITY CONSTITUENT SPECIFICATIONS

5.2.1. Friction element for wheel tread brakes

This interoperability constituent is only applicable to the subsystem ‘rolling stock - freight wagons’.

A friction element for wheel tread brakes shall comply with the requirements defined in point 4.2.3.a. These requirements shall be assessed at IC level.

~~There is no interoperability constituent specified in this NTSN.~~

6. CONFORMITY ASSESSMENT AND UK VERIFICATION

6.1. INTEROPERABILITY CONSTITUENTS

6.1.1. Modules

The conformity assessment of an interoperability constituent shall be performed in accordance with the module(s) described in Table 5a.

Table 5a

Modules for conformity assessment of interoperability constituents

<u>Module CB</u>	<u>EC-Type examination</u>
<u>Module CD</u>	<u>Conformity to type based on quality management system of the production process</u>
<u>Module CF</u>	<u>Conformity to type based on product verification</u>
<u>Module CH1</u>	<u>Conformity based on full quality management system plus design examination</u>

These modules are specified in detail in Decision 2010/713/EU.

6.1.2. Conformity assessment procedures

The manufacturer or his authorised representative ~~established within the Union~~ shall choose one of the modules or module combinations indicated below for the required constituent ‘Friction element for wheel tread brakes’:

— CB+CD

— CB+CF

— CH1

Within the application of the chosen module or combination of modules, the interoperability constituent shall be assessed against the requirements mentioned in section 4.2. If necessary, additional requirements concerning the assessment of particular interoperability constituents are defined in the following clauses.

6.1.2.1. Friction element for wheel tread brakes

A friction element for wheel tread brakes shall comply with the requirements defined in Appendix F.

Until the end of the transition period set out in Appendix G, the types of friction elements for wheel tread brakes listed in Appendix G are deemed compliant with the requirements above without testing.

~~Not applicable.~~

6.2. SUBSYSTEM ROLLING STOCK REGARDING NOISE EMITTED BY ROLLING STOCK

6.2.1. Modules

The UK verification shall be performed in accordance with the module(s) described in Table 6.

Table 6

Modules for UK verification of subsystems

SB	UK-Type Examination
SD	UK verification based on quality management system of the production process
SF	UK verification based on product verification
SH1	UK verification based on full quality management system plus design examination

These modules are specified in detail in the Modules NTSN.

6.2.2. UK verification procedures

The applicant shall choose one of the following assessment procedures consisting of one or more modules for the UK verification of the subsystem:

- (SB+SD),
- (SB+SF),
- (SH1).

Within the application of the chosen module or module combination the subsystem shall be assessed against the requirements defined in Section 4.2. If necessary, additional requirements concerning the assessment are given in the following ~~points~~[clauses](#).

6.2.2.1. Stationary noise

The demonstration of conformity with the limit values on stationary noise as set out in ~~point~~[clause](#) 4.2.1 shall be carried out in accordance with [the specification referenced in Appendix B, index \[1\]](#)~~Sections 5.1, 5.2, 5.3, 5.4, 5.5 (without clause 5.5.2), 5.7 and clause 5.8.1 of EN ISO 3095:2013.~~

For the assessment of the main air compressor noise at the nearest measuring position i , the $L^i_{pAeq,T}$ indicator shall be used with T representative of one operating cycle as defined in [the specification referenced in Appendix B, index \[1\]](#)~~Section 5.7 of EN ISO 3095:2013.~~ Only the train systems that are required for the air compressor to run under normal operating conditions shall be used for this. The train systems which are not needed for the operation of the compressor may be switched off to prevent contribution to the noise measurement. The demonstration

of conformity with the limit values shall be carried out under the conditions solely necessary for operation of the main air compressor at the lowest rpm.

For the assessment of the impulsive noise sources at the nearest measuring position i , the L^i_{pAFmax} indicator shall be used. The relevant noise source is the exhaust from the valves of the air dryer.

6.2.2.2. Starting noise

The demonstration of conformity with the limit values on starting noise as set out in ~~point clause~~ 4.2.2 shall be carried out in accordance with [the specification referenced in Appendix B, index \[1\]](#)~~Chapter 7 (without clause 7.5.1.2) of EN ISO 3095:2013~~. The maximum level method ~~referring to Section 7.5 of EN ISO 3095:2013~~ shall apply. Deviating from [the test procedure of the specification](#) ~~clause 7.5.3 of EN ISO 3095:2013~~ the train shall accelerate from standstill up to 30 km/h and then maintain the speed.

In addition the noise shall be measured at [the same](#) distance ~~of 7,5 m~~ from the centre of the track and [the same](#) height ~~of 1,2 m~~ above top of rail [as set out in clause 4.2.2](#). The ‘averaged level method’ and the ‘maximum level method’ in accordance with [the specification referenced in Appendix B, index \[1\]](#)~~Section 7.6 and 7.5 respectively of EN ISO 3095:2013~~ shall apply and the train shall accelerate from standstill up to 40 km/h and then maintain the speed. The measured values are not assessed against any limit value and shall be recorded in the technical file.

For OTMs the starting procedure shall be performed without additional trailer loads.

6.2.2.3. Pass-by noise

The demonstration of conformity with the limit values on pass-by noise as set out in ~~point clause~~ 4.2.3 shall be carried out in accordance with ~~points clauses~~ 6.2.2.3.1 and 6.2.2.3.2.

6.2.2.3.1. Test track conditions

The tests shall be performed on a reference track as defined in [the specification referenced in Appendix B, index \[1\]](#)~~Section 6.2 of EN ISO 3095:2013~~.

However, it is permitted to carry out the test on a track that does not comply with the reference track conditions in terms of acoustic rail roughness level and track decay rates as long as the noise levels measured in accordance with ~~point clause~~ 6.2.2.3.2 do not exceed the limit values set out in ~~point clause~~ 4.2.3.

The acoustic rail roughness and the decay rates of the test track shall be determined in any case. If the track on which the tests are performed does meet

the reference track conditions, the measured noise levels shall be marked 'comparable', otherwise they shall be marked 'non-comparable'. It shall be recorded in the technical file whether the measured noise levels are 'comparable' or 'non-comparable'.

The measured acoustic rail roughness values of the test track remain valid during a period starting 3 months before and ending 3 months after this measurement, provided that during this period no track maintenance has been performed which influences the rail acoustic roughness.

The measured track decay rate values of the test track shall remain valid during a period starting 1 year before and ending 1 year after this measurement, provided that during this period no track maintenance has been performed which influences the track decay rates.

Confirmation shall be provided in the technical file that the track data related to the type's pass-by noise measurement were valid during the day(s) of testing, e.g. by providing the date of last maintenance having an impact on noise.

Furthermore, it is permitted to carry out tests at speeds equal to or higher than 250 km/h on slab tracks. In this case the limit values shall be 2 dB higher than those set out in ~~point~~ [clause](#) 4.2.3.

6.2.2.3.2. Procedure

The tests shall be carried out in accordance with the provision in [the specification referenced in Appendix B, index \[1\]](#) ~~Sections 6.1, 6.3, 6.4, 6.5, 6.6 and 6.7 (without 6.7.2) of EN ISO 3095:2013~~. Any comparison against limit values shall be carried out with results rounded to the nearest integer decibel. Any normalisation shall be performed before rounding. The detailed assessment procedure is set out in ~~points~~ [clauses](#) 6.2.2.3.2.1, 6.2.2.3.2.2 and 6.2.2.3.2.3.

6.2.2.3.2.1. EMU, DMUs, locomotives and coaches

For EMU, DMUs, locomotives and coaches three classes of maximum operational speed are distinguished:

- (1) If the maximum operational speed of the unit is lower than or equal to 80 km/h, the pass-by noise shall be measured at its maximum speed v_{\max} . This value shall not exceed the limit value $L_{pAeq,Tp(80\text{ km/h})}$ as set out in ~~point~~ [clause](#) 4.2.3.
- (2) If the maximum operational speed v_{\max} of the unit is higher than 80 km/h and lower than 250 km/h, the pass-by noise shall be measured at 80 km/h and at its maximum speed. Both measured pass-by noise values $L_{pAeq,Tp(v_{\text{test}})}$ shall be normalised to the reference speed of 80 km/h $L_{pAeq,Tp(80\text{ km/h})}$ using formula

(1). The normalised value shall not exceed the limit value $L_{pAeq,Tp(80\text{ km/h})}$ as set out in ~~point~~[clause 4.2.3](#).

Formula (1):

$$L_{pAeq,Tp(80\text{ km/h})} = L_{pAeq,Tp(v_{test})} - 30 * \log(v_{test}/80\text{ km/h})$$

v_{test} = Actual speed during the measurement

- (3) If the maximum operational speed v_{max} of the unit is equal to or higher than 250 km/h, the pass-by noise shall be measured at 80 km/h and at its maximum speed with an upper test speed limit of 320 km/h. The measured pass-by noise value $L_{pAeq,Tp(v_{test})}$ at 80 km/h shall be normalised to the reference speed of 80 km/h $L_{pAeq,Tp(80\text{ km/h})}$ using formula (1). The normalised value shall not exceed the limit value $L_{pAeq,Tp(80\text{ km/h})}$ as set out in ~~point~~[clause 4.2.3](#). The measured pass-by noise value at maximum speed $L_{pAeq,Tp(v_{test})}$ shall be normalised to the reference speed of 250 km/h $L_{pAeq,Tp(250\text{ km/h})}$ using formula (2). The normalised value shall not exceed the limit value $L_{pAeq,Tp(250\text{ km/h})}$ as set out in ~~point~~[clause 4.2.3](#).

Formula (2):

$$L_{pAeq,Tp(250\text{ km/h})} = L_{pAeq,Tp(v_{test})} - 50 * \log(v_{test}/250\text{ km/h})$$

v_{test} = Actual speed during the measurement

6.2.2.3.2.2. Wagons

For wagons two classes of maximum operational speed are distinguished:

- (1) If the maximum operational speed v_{max} of the unit is lower than or equal to 80 km/h, the pass-by noise shall be measured at its maximum speed. The measured pass-by noise value $L_{pAeq,Tp(v_{test})}$ shall be normalised to a reference APL of $0,225\text{ m}^{-1}$ $L_{pAeq,Tp}(APL_{ref})$ using formula (3). This value shall not exceed the limit value $L_{pAeq,Tp(80\text{ km/h})}$ as set out in ~~point~~[clause 4.2.3](#).

Formula (3):

$$L_{pAeq,Tp}(APL_{ref}) = L_{pAeq,Tp(v_{test})} - 10 * \log(APL_{wag}/0,225\text{ m}^{-1})$$

APL_{wag} = Number of axles divided by the length over the buffers [m^{-1}]

v_{test} = Actual speed during the measurement

- (2) If the maximum operational speed v_{max} of the unit is higher than 80 km/h, the pass-by noise shall be measured at 80 km/h and at its maximum speed. Both measured pass-by noise values $L_{pAeq,Tp(v_{test})}$ shall be normalised to the reference speed of 80 km/h and to a reference APL of $0,225\text{ m}^{-1}$ $L_{pAeq,Tp}(APL_{ref})$,

80 km/h) using formula (4). The normalised value shall not exceed the limit value $L_{pAeq,Tp(80\text{ km/h})}$ as set out in [point clause 4.2.3](#).

Formula (4):

$$L_{pAeq,Tp}(APL_{ref}, 80\text{ km/h}) = L_{pAeq,Tp}(v_{test}) - 10 * \log(APL_{wag}/0,225\text{ m}^{-1}) - 30 * \log(v_{test}/80\text{ km/h})$$

APL_{wag} = Number of axles divided by the length over the buffers [m^{-1}]

v_{test} = Actual speed during the measurement

6.2.2.3.2.3. *OTMs*

For OTMs the same assessment procedure as set out in 6.2.2.3.2.1 applies. The measuring procedure shall be performed without additional trailer loads.

OTMs are deemed to comply with the pass-by noise level requirements in [point clause 4.2.3](#) without measuring when they are:

- solely braked by either composite brake blocks or disc brakes, and
- equipped with composite scrubbers, if scrubber blocks are fitted.

6.2.2.4. *Driver's cab interior noise*

The demonstration of conformity with the limit values on the driver's cab interior noise as set out in [point clause 4.2.4](#) shall be carried out in accordance with [the specification referenced in Appendix B, index \[2\] EN-15892:2011](#). For OTMs the measuring procedure shall be performed without additional trailer loads.

6.2.3. *Simplified evaluation*

Instead of the test procedures as set out in [point clause 6.2.2](#), it is permitted to substitute some or all of the tests by a simplified evaluation. The simplified evaluation consists of acoustically comparing the unit under assessment to an existing type (further referred to as the reference type) with documented noise characteristics.

The simplified evaluation may be used for each of the applicable basic parameters 'stationary noise', 'starting noise', 'pass-by noise' and 'driver's cab interior noise' autonomously and shall consist of providing evidence that the effects of the differences of the unit under assessment do not result in exceeding the limit values set out in Section 4.2.

For the units under simplified evaluation, the proof of conformity shall include a detailed description of the noise relevant changes compared to the reference type.

From this description, a simplified evaluation shall be performed. The estimated noise values shall include the uncertainties of the applied evaluation method. The simplified evaluation can either be a calculation and/or simplified measurement.

A unit certified on the basis of the simplified evaluation method shall not be used as a reference unit for a further evaluation.

If the simplified evaluation is applied for pass-by noise, the reference-type shall comply with at least one of the following:

- Chapter 4 and for which the pass-by noise results are marked ‘comparable’
- Chapter 4 of Decision 2011/229/EU and for which the pass-by noise results are marked ‘comparable’
- Chapter 4 of Decision 2006/66/EC¹
- Chapter 4 of Decision 2008/232/EC.

In case of a wagon whose parameters remain, compared to the reference type, within the permitted range of Table 7 it is deemed without further verification that the unit complies with the limit values on pass-by noise as set out in ~~point~~[clause 4.2.3](#).

Table 7

Permitted variation of wagons for the exemption from verification

Parameter	Permitted variation (compared to the reference unit)
Max. unit speed	Any speed up to 160 km/h
Type of wheel	Only if equally or less noisy (acoustic characterisation i. a. w. the specification referenced in Appendix B, index [3] Annex E of EN 13979-1:2011)
Tare weight	Only within the range of +20 %/- 5 %
Brake block	Only if the reference unit is fitted with brake blocks and the brake block of the unit under assessment is covered either by an EC Declaration of Conformity in accordance with this NTSN or it is listed in Appendix G of this NTSN -variation does not result in higher noise emission.

¹ Commission Implementing Decision 2006/66/EC of 23 December 2005 concerning the technical specification for interoperability relating to the subsystem rolling stock- noise of the trans-European conventional rail system, repealed 4 April 2011. (OJ L 37, 8.2.2006, p. 1-49).

7. IMPLEMENTATION

7.1. APPLICATION OF THIS NTSN TO NEW SUBSYSTEMS

- (1) This NTSN is applicable to all units of rolling stock in its scope which are placed on the market after the date of application of this NTSN, except where clause 7.1.1.2 'Application to ongoing projects' of the LOC&PAS NTSN or clause 7.1.1 'Application to ongoing projects' of the WAG NTSN applies.
- (2) Compliance with the previous NOI NTSN is deemed equivalent to compliance with this NTSN, except for the NTSN changes listed in Appendix H.
- (3) For the rolling stock subsystem and the associated interoperability constituents, the rules related to the EC type or design examination certificates shall be as specified in the LOC&PAS NTSN clause 7.1.3. and in the WAG NTSN clause 7.2.3. ~~See Article 8 of this NTSN.~~

7.2. APPLICATION OF THIS NTSN TO EXISTING SUBSYSTEMS

The principles to be applied by the applicants and Safety Authority in case of change(s) to ~~an existing~~ rolling stock in operation or to an existing rolling stock type are defined in ~~point~~ clause 7.1.2 of the Annex to the LOC&PAS NTSN and ~~section~~ clause 7.2.2 of the Annex to the WAG NTSN.

7.2.1. Provisions in case of changes to ~~existing~~ rolling stock in operation or to an existing rolling stock type

The applicant shall ensure that the noise levels of rolling stock subject to change(s) remain below the limits set out in the NTSN or TSI, which was applicable when the rolling stock in question was first authorised. If no TSI existed at the time of the first authorisation, the applicant shall ensure that the noise levels of the rolling stock subject to change(s) are either not increased or remain below the limits set out in Decision 2006/66/EC or Decision 2002/735/EC.

If an assessment is required, it shall be limited to the basic parameters affected by the change(s).

If the simplified evaluation is applied, the original unit may represent the reference unit in accordance with the provisions of ~~point~~ clause 6.2.3.

The replacement of a whole unit or (a) vehicle(s) within a unit (e.g. a replacement after a severe damage) does not require a conformity assessment against this NTSN, as long as the unit or the vehicle(s) are identical to the ones they replace.

7.2.2. Additional provisions for the application of this NTSN to existing wagons

The restriction of the operation set out in Article 5a of this Regulation shall not apply to wagons mostly operated on lines with a gradient of more than 40 ‰, wagons with a maximum operating speed higher than 120 km/h, wagons with a maximum axle load higher than 22,5 t, wagons exclusively operated for infrastructure works and wagons used in rescue trains.

If a wagon is being equipped with [either friction elements for wheel tread brakes covered by an EC Declaration of Conformity in accordance with this NTSN or with friction elements for wheel tread brakes listed in Appendix G](#) ~~quieter brake blocks as defined in point 7.2.2.1~~ and no noise sources are added to the wagon, then it shall be assumed that the requirements of ~~point~~ [clause](#) 4.2.3 are met without further testing.

7.2.2.1. ~~Quieter brake blocks~~ [Not used](#)

~~A quieter brake block is a brake block belonging to one of the following categories:~~

- ~~— Brake block listed in Appendix G of the WAG NTSN;~~
- ~~— Brake block assessed in accordance with the procedure set out in Appendix F of this NTSN.~~

7.2.2.2. Wagons operated on quieter routes

Wagons belonging to one of the categories below can be operated on the quieter routes:

- Wagons holding an EC declaration of verification against Commission Decision 2006/66/EC concerning the technical specification for interoperability relating to the subsystem ‘rolling stock — noise’ of the trans-European conventional rail system;
- Wagons holding an EC declaration of verification against Commission Decision 2011/229/EU concerning the technical specifications of interoperability relating to the subsystem ‘rolling stock – noise’ of the trans-European conventional rail system;
- Wagons holding a UK declaration of verification against this NTSN
- Wagons holding an EC declaration of verification against Commission Implementing Regulation (EU) 2019/774 and used in the UK before 1 January 2021;

- Wagons fitted with ~~quieter brake blocks as defined in point 7.2.2.1~~ either:
 - friction elements for wheel tread brakes covered by an EC Declaration of Conformity in accordance with this NTSN, or
 - friction elements for wheel tread brakes listed in Appendix G,
 - or brake discs for the service brake function;
- Wagons fitted with composite brake blocks listed in Appendix E for the service brake function. The operation of these wagons on the quieter routes shall be limited in accordance with the conditions described in this appendix.

7.2.2.3. Interoperability constituents

This clause concerns interoperability constituents which are subject to type examination or design examination.

The type or design examination or suitability for use remains valid even if a revision of this NTSN comes into force, unless explicitly otherwise specified in the revision of these NTSNs.

During this time, new constituents of the same type are permitted to be placed on the market without a new type assessment.

7.3. UK SPECIFIC CASES

7.3.1. Introduction

The UK specific cases, as listed in ~~point~~ clause 7.3.2, are classified as

- (a) **‘P’ cases:** ‘permanent’ cases;
- (b) **‘T’ cases:** ‘temporary’ cases.

7.3.2. List of UK specific cases

7.3.2.1. This provision has been left intentionally blank.

7.3.2.2. Limits for stationary noise (point 4.2.1)

- (a) *This provision has been left intentionally blank*
- (b) UK Specific case for Great Britain

(‘P’) For DMUs intended to operate solely on the railway network of Great Britain the limit value for stationary noise $L_{pAeq,T} [unit]$ in Table 2 may be raised up to 77 dB.

This specific case does not apply to DMUs intended to operate solely on the High Speed 1 railway network.

(c) UK Specific case for Great Britain

(‘T’) For units intended to operate solely on the railway network of Great Britain the limit values $L_{pAeq,T}^i$ in Table 2 considering the main air compressor do not apply. The measured values shall be submitted to the Safety Authority.

This specific case does not apply to units intended to operate solely on the High Speed 1 railway network.

7.3.2.3. **Limits for starting noise (point 4.2.2)**

(a) This provision has been left intentionally blank

(b) UK Specific case for Great Britain

(‘P’) For units specified in Table 8 intended to operate solely on the railway network of Great Britain the limit value for starting noise $L_{pAF,max}$ in Table 3 may be raised up to the values set out in Table 8.

Table 8

Limit values for starting noise regarding a UK specific case for Great Britain

Category of the rolling stock subsystem	$L_{pAF,max}$ [dB]
Electric locomotives with total tractive power $P < 4\,500$ kW	83
Diesel locomotives $P < 2\,000$ kW at the engine output shaft	89
DMUs	85

This specific case does not apply to units intended to operate solely on the High Speed 1 railway network.

7.3.2.4. **Limits for pass-by noise (point 4.2.3)**

(a) UK Specific case Channel Tunnel

(‘P’) For the Channel Tunnel, the limits for pass-by noise shall not apply to wagons dedicated to the transport of heavy goods vehicles between Coquelles (France) and Folkestone (United Kingdom).

7.4. PARTICULAR IMPLEMENTATION RULES

7.4.1. Particular implementation rules for the application of this NTSN to existing wagons (~~point~~[clause 7.2.2](#))

- (a) Particular implementation rules for the application of this NTSN to existing wagons in the Channel Tunnel

(‘P’) For the calculation of the annual average daily operated freight trains during night-time the freight trains composed of wagons dedicated to the transport of heavy goods vehicles confined in the Coquelles (France) - Folkestone (United Kingdom) line shall not be taken into account.

7.4.2. Particular rules for wagons operated on quieter routes (~~point~~[clause 7.2.2.2](#))

- (b) Particular implementation rules for wagons operated on quieter routes of Channel Tunnel

(‘P’) On top of the wagons listed in ~~point~~[clause 7.2.2.2](#), the following existing wagons can be operated on quieter routes in the Channel Tunnel concession:

Wagons dedicated to the transport of heavy goods vehicles between Coquelles (France) and Folkestone (United Kingdom)

- (h) Particular rules for wagons operated on quieter routes of Great Britain

(‘P’) For units intended to operate solely on the GB Network, where existing wagons are equipped with composite brake blocks published in GMGN 2688 it shall be permitted to operate on quieter routes

(‘T’) The following types of existing wagons equipped with cast iron brake blocks intended to operate on the GB Network shall be permitted to operate on quieter routes:

- Wagons equipped with a non-UIC braking system for which there are no compatible silent brake blocks available for retrofitting until 31 December 2030.
- Wagons with a designed braking distance of 810m or less from 60 mph in brake mode G (goods timing)/75 mph in brake mode P (passenger

timing), where those wagons are operated in trains with other wagons which have stopping distances in accordance with the relevant UK(GB) national technical rules, until 31 December 2030.

- Wagons used exclusively for the transport of nuclear products until 31 December 2050.

Appendix A ~~Open points~~Not used

Element of the rolling stock subsystem	Clause of this NTSN	Technical aspect not covered by this NTSN	Comments
Quieter brake block	7.2.2.1 and Appendix F	Assessment of the acoustic properties of the brake blocks	Alternative technical solutions available (see point 7.2.2)

Appendix B Standards referred to in this NTSN

Index	Standard name	Standard reference	Standard version
	Parameter	NTSN Clause	Standard Clause
[1]	<u>Acoustics — Railway applications — Measurement of noise emitted by railbound vehicles</u>	<u>EN ISO 3095</u>	<u>2013</u>
[1.1]	<u>Pass-by noise - measurements at speeds higher than or equal to 250 km/h</u>	<u>4.2.3</u>	<u>6</u>
[1.2]	<u>Stationary noise – demonstration of conformity</u>	<u>6.2.2.1</u>	<u>5.1, 5.2, 5.3, 5.4, 5.5 (without 5.5.2), 5.7 and clause 5.8.1</u>
[1.3]	<u>Stationary noise – operating cycle of the main air compressor</u>	<u>6.2.2.1</u>	<u>5.7</u>
[1.4]	<u>Starting noise</u>	<u>6.2.2.2</u>	<u>7 (without 7.5.1.2) Deviation to 7.5.3</u>

Index	Standard name	Standard reference	Standard version
	Parameter	NTSN Clause	Standard Clause
[1.5]	Pass-by noise – test track conditions	6.2.2.3.1	6.2
[1.6]	Pass-by noise - procedure	6.2.2.3.2	6.1, 6.3, 6.4, 6.5, 6.6 and 6.7 (without 6.7.2)
[2]	Railway applications - Noise Emission - Measurement of noise inside driver's cabs	EN 15892	2011
[2.1]	Driver's cab interior noise	6.2.2.4	All
[3]	Railway applications - Wheelsets and bogies - Monobloc wheels - Technical approval procedure - Part 1: Forged and rolled wheels	EN 13979-1	2020
[3.1]	Simplified evaluation	6.2.3 – table 7	Annex E
[3.2]	Particular implementation rules for wagons operated on quieter routes	7.4.2	All
[4]	Composite brake blocks - General conditions for certification and use	UIC 541-4	2020
[4.1]	Brake performance test program	Appendix F	Test programs A1 a and A2 a
[5]	Railway applications - Braking - Brake blocks	EN 16452	2015+A1:2019
[5.1]	Brake performance test program – LL-blocks and K-blocks	Appendix F	Test programs D.1 and C.1
[5.2]	Brake performance test program – other blocks	Appendix F	Test program J.2

Index	Standard name	Standard reference	Standard version
	Parameter	NTSN Clause	Standard Clause
[6]	Railway applications - Acoustics - Rail and wheel roughness measurement related to noise generation	EN 15610	2019
[6.1]	Wheel acoustic roughness measurement procedure	Appendix F	All except clause 6.2.2.2

NTSN		Standard	
Characteristics to be assessed		References to mandatory standards	Chapter
Stationary noise	4.2.1	—	—
	6.2.2.1	EN ISO 3095:2013	5
Starting noise	4.2.2	—	—
	6.2.2.2	EN ISO 3095:2013	7
Pass-by noise	4.2.3	EN ISO 3095:2013	6
	6.2.2.3	EN ISO 3095:2013	6
Driver's cab interior noise	4.2.4	—	—
	6.2.2.4	EN 15892:2011	all
Simplified evaluation	6.2.3	EN 13979-1:2011	Annex E

Appendix C Assessment of the rolling stock subsystem

Characteristics to be assessed, as specified in Section 4.2					Particular assessment procedure
Element of the rolling stock sub-system	Point Clause	Design review	Type Test	Routine Test	Point Clause
Stationary noise	4.2.1	X (1*)	X	n.a.	6.2.2.1
Starting noise	4.2.2	X (1*)	X	n.a.	6.2.2.2
Pass-by noise	4.2.3	X (1*)	X	n.a.	6.2.2.3
Driver's cab interior noise	4.2.4	X (1*)	X	n.a.	6.2.2.4

(1*) Only if the simplified evaluation in accordance with point 6.2.3 is applied.

Appendix D Quieter routes

D.1 Identification of quieter routes

The Competent Authority shall publish a list of quieter routes. The list shall contain at least the following information:

- Start and end points of the quieter routes and their corresponding sections, using geographical code location as defined in the register set out in Commission Implementing Decision 2014/880/EU² (RINF). If one of these points is at the border with an EU Member State, it shall be reflected.
- Identification of the sections making up the quieter route

The list shall be provided using the template below:

² Commission Implementing Decision 2014/880/EU of 26 November 2014 on the common specifications of the register of railway infrastructure and repealing Implementing Decision 2011/633/EU (OJ L 356, 12.12.2014, p. 489).

Quieter route	Sections in the route	Unique section ID	Quieter route starts/finishes at the border
Point A — Point E	Point A — Point B	201	Yes POINT E (Country Y)
	Point B — Point C	202	
	Point C — Point D	203	
	Point D — Point E	204	
Point F — Point I	Point F — Point G	501	No
	Point G — Point H	502	
	Point H — Point I	503	

In addition, the Competent Authority may provide maps illustrating the quieter routes on a voluntary basis. All lists and maps shall be published by the Competent Authority no later than 9 months after 27.5.2019.

D.2 Update of quieter routes

The freight traffic data used for the update of quieter routes in accordance with Article 5c(2) of this Regulation shall refer to the last three years preceding the update for which the data is available. In case the freight traffic due to exceptional circumstances diverges in a given year from that average number by more than 25 %, the Competent Authority can calculate the average number on the basis of the remaining two years.

The routes designated as quieter routes shall remain as such following the update unless during the period concerned the volume of traffic has decreased by more than 50 % and the average number of daily operated freight trains during the night-time is lower than 12.

In case of new and upgraded lines, the expected volume of traffic shall be used for the designation of those lines as quieter routes.

The Competent Authority shall publish the updated quieter routes.

Appendix E Historic composite brake blocks

E.1 Historic composite brake blocks for international use

Existing wagons equipped with the brake blocks listed below are allowed to be used on the quieter routes, until the relevant date set out in Appendix N of UIC 541-4.

Manufacturer/name of product	Designation/type of block	Type of friction coefficient
Valeo/Hersot Wabco/Cobra	693 W554	K
Ferodo	I/B 436	K
Abex	229	K (Fe — sintered)
Jurid	738	K (Fe — sintered)

Wagons equipped with historic composite brake blocks not listed in the table above but already authorised for international traffic in conformity with the provisions of Decision 2004/446/EC or Decision 2006/861/EC can still be used without any deadline within the area of use covered by their authorisation.

Appendix F Assessment of acoustic performance of a brake block

The purpose of this procedure is to demonstrate the acoustic performance of a composite brake block at interoperability constituent level.

The procedure consists of the following steps:

1. Measure the acoustic roughness of a wheel representative of the brake block under assessment.

Wheel acoustic roughness development on bench test

New brake blocks shall be used. Only new or reprofiled wheels shall be used. The wheels shall be free of any damage (cracks, flats, etc).

The brake performance test program:

- A2 a for LL-Blocks and A1 a for K-blocks of the specification referenced in Appendix B index [4] or
 - D.1 for LL-Blocks and C.1 for K-blocks of the specification referenced in Appendix B index [5] or
 - J.2 of the specification referenced in Appendix B index [5] for other blocks
- shall be applied to at least one wheel of 920 mm nominal diameter.

The selected program shall be completed and the results of the measurement series after completion shall be used to determine the wheel roughness index.

It is optional to continue with a second run of the selected program. If this option is chosen, it is the results of the measurement series after completion of the second run that shall be used to determine the wheel roughness index. The results from both runs shall be documented.

The second run shall be performed with the same wheel, but the brake block can be renewed and replaced with another block of the same type. In this option the bedding-in of the new brake block shall be completely executed at the beginning of the second run.

Wheel acoustic roughness measurement procedure

The measurement will be performed as set out in the specification referenced in Appendix B index [6]. In order to ensure the representativeness of the acoustic roughness of the rolling surface of the wheel, 8 measurement lines spaced 5 mm are deemed sufficient instead of the positions defined in the specification referenced in Appendix B index [6].

The measurement shall be performed during the wheel acoustic roughness development on bench test defined above in accordance with one of the tables below:

If the selected program is A2 a of the specification referenced in Appendix B index [4]:

<u>Acoustic roughness measurement series / Label</u>		<u>Programme section</u>	<u>Brake application No.</u>
<u>1st run</u>	<u>2nd run</u>		
<u>A</u>		<u>At start</u>	<u>Initial condition</u>
<u>B</u>	<u>I</u>	<u>After bedding-in</u>	<u>after Br 6</u>
<u>C</u>	<u>J</u>	<u>After conditioning the block for empty load</u>	<u>after Br. 26</u>
<u>D</u>	<u>K</u>	<u>Dry and empty conditions</u>	<u>after Br. 51</u>
<u>E</u>	<u>L</u>	<u>Wet and empty conditions</u>	<u>after Br. 87</u>
<u>F</u>	<u>M</u>	<u>Laden conditions</u>	<u>after Br. 128</u>
<u>G</u>	<u>N</u>	<u>Drag braking (steep gradient downhill simulation)</u>	<u>after Br. 130</u>
<u>H</u>	<u>O</u>	<u>End of programme</u>	<u>after Br. 164</u>

If the selected program is A1 a of the specification referenced in Appendix B index [4]:

<u>Acoustic roughness measurement series / Label</u>		<u>Programme section</u>	<u>Brake application No.</u>
<u>1st run</u>	<u>2nd run</u>		
<u>A</u>		<u>At start</u>	<u>Initial condition</u>
<u>B</u>	<u>I</u>	<u>After bedding-in</u>	<u>after Br 6</u>
<u>C</u>	<u>J</u>	<u>After conditioning the block for empty load</u>	<u>after Br. 26</u>
<u>D</u>	<u>K</u>	<u>Dry and empty conditions</u>	<u>after Br. 51</u>
<u>E</u>	<u>L</u>	<u>Wet and empty conditions</u>	<u>after Br. 87</u>
<u>F</u>	<u>M</u>	<u>Laden conditions</u>	<u>after Br. 128</u>
<u>G</u>	<u>N</u>	<u>Drag braking (steep gradient downhill simulation)</u>	<u>after Br. 130</u>
<u>H</u>	<u>O</u>	<u>End of programme</u>	<u>after Br. 164</u>

If the selected program is D.1 of the specification referenced in Appendix B index [5]

<u>Acoustic roughness measurement series / Label</u>		<u>Programme section</u>	<u>Brake application No.</u>
<u>1st run</u>	<u>2nd run</u>		
<u>A</u>		<u>At start</u>	<u>Initial condition</u>
<u>B</u>	<u>I</u>	<u>After bedding-in</u>	<u>after Br 6</u>
<u>C</u>	<u>J</u>	<u>After conditioning the block for empty load</u>	<u>after Br. 26</u>
<u>D</u>	<u>K</u>	<u>Dry and empty conditions</u>	<u>after Br. 51</u>
<u>E</u>	<u>L</u>	<u>Wet and empty conditions</u>	<u>after Br. 87</u>
<u>F</u>	<u>M</u>	<u>Laden conditions</u>	<u>after Br. 128</u>
<u>G</u>	<u>N</u>	<u>Drag braking (steep gradient downhill simulation)</u>	<u>after Br. 130</u>
<u>H</u>	<u>O</u>	<u>End of programme</u>	<u>after Br. 149</u>

If the selected program is C.1 of the specification referenced in Appendix B index [5]

<u>Acoustic roughness measurement series / Label</u>		<u>Programme section</u>	<u>Brake application No.</u>
<u>1st run</u>	<u>2nd run</u>		
<u>A</u>		<u>At start</u>	<u>Initial condition</u>
<u>B</u>	<u>I</u>	<u>After bedding-in</u>	<u>after Br 6</u>
<u>C</u>	<u>J</u>	<u>After conditioning the block for empty load</u>	<u>after Br. 26</u>
<u>D</u>	<u>K</u>	<u>Dry and empty conditions</u>	<u>after Br. 51</u>
<u>E</u>	<u>L</u>	<u>Wet and empty conditions</u>	<u>after Br. 87</u>
<u>F</u>	<u>M</u>	<u>Laden conditions</u>	<u>after Br. 128</u>
<u>G</u>	<u>N</u>	<u>Drag braking (steep gradient downhill simulation)</u>	<u>after Br. 130</u>
<u>H</u>	<u>O</u>	<u>End of programme</u>	<u>after Br. 149</u>

If the selected program is J.2 of the specification referenced in Appendix B index [4]

<u>Acoustic roughness measurement series / Label</u>		<u>Programme section</u>	<u>Brake application No.</u>
<u>1st run</u>	<u>2nd run</u>		
<u>A</u>		<u>At start</u>	<u>Initial condition</u>
<u>B</u>	<u>I</u>	<u>After bedding-in</u>	<u>after Br 6</u>
<u>C</u>	<u>J</u>	<u>After conditioning the block for empty load</u>	<u>after Br. 26</u>
<u>D</u>	<u>K</u>	<u>Dry and empty conditions</u>	<u>after Br. 51</u>
<u>E</u>	<u>L</u>	<u>Wet and empty conditions</u>	<u>after Br. 87</u>
<u>F</u>	<u>M</u>	<u>Laden conditions</u>	<u>after Br. 128</u>
<u>G</u>	<u>N</u>	<u>Drag braking (steep gradient downhill simulation)</u>	<u>after Br. 130</u>
<u>H</u>	<u>O</u>	<u>End of programme</u>	<u>after Br. 149</u>

— Sampling: The acoustic roughness of 1 wheel shall be measured.

— Averaging: the RMS average of the acoustic roughness shall be used.

The result is a representative one-third octave wavelength wheel roughness spectrum in the wavelength domain L_r

2. Derive a scalar indicator from the measured wheel roughness L_r in step 1

$$C(i) = B(i) + 10 \log_{10}[10^{0,1L_R(i)} + 10^{0,1A(i)}]$$

$$Indicator = 10 \log_{10}(\sum_{i=1}^{19} 10^{0,1 C(i)})$$

Where A(i) and B(i) are tabulated as follows :

<u>i</u>	<u>Wavelength λ</u> <u>[m]</u>	<u>A</u> <u>dB re 1</u> <u>micrometer</u>	<u>B</u> <u>dB re 1</u> <u>micrometer</u>	<u>L_r</u> <u>dB re 1</u> <u>micrometer</u>
<u>1</u>	<u>0,00315</u>	<u>-17,9</u>	<u>-19,2</u>	<u>Obtained from</u> <u>Wheel roughness</u> <u>measurements</u>
<u>2</u>	<u>0,004</u>	<u>-16,2</u>	<u>-16,5</u>	
<u>3</u>	<u>0,005</u>	<u>-15,5</u>	<u>-13,1</u>	
<u>4</u>	<u>0,0063</u>	<u>-14,4</u>	<u>-9,5</u>	
<u>5</u>	<u>0,008</u>	<u>-13,3</u>	<u>-8,0</u>	
<u>6</u>	<u>0,01</u>	<u>-13,1</u>	<u>-6,8</u>	
<u>7</u>	<u>0,0125</u>	<u>-12,8</u>	<u>-5,1</u>	
<u>8</u>	<u>0,016</u>	<u>-12,4</u>	<u>-4,5</u>	
<u>9</u>	<u>0,02</u>	<u>-10,9</u>	<u>-4,4</u>	
<u>10</u>	<u>0,025</u>	<u>-11,1</u>	<u>-6,5</u>	
<u>11</u>	<u>0,0315</u>	<u>-10,5</u>	<u>-9,0</u>	
<u>12</u>	<u>0,04</u>	<u>-9,8</u>	<u>-11,1</u>	
<u>13</u>	<u>0,05</u>	<u>-4,8</u>	<u>-15,5</u>	
<u>14</u>	<u>0,063</u>	<u>-5,9</u>	<u>-17,5</u>	
<u>15</u>	<u>0,08</u>	<u>-5,6</u>	<u>-22,3</u>	
<u>16</u>	<u>0,1</u>	<u>-0,5</u>	<u>-30,3</u>	
<u>17</u>	<u>0,125</u>	<u>2,4</u>	<u>-31,4</u>	
<u>18</u>	<u>0,16</u>	<u>4,8</u>	<u>-32,9</u>	
<u>19</u>	<u>0,2</u>	<u>2,4</u>	<u>-32,2</u>	

(14) Coefficients A(i) and B(i) are tailored to the current limit values for pass-by noise and reference track conditions

3. Pass-fail criterion

The indicator measured in step 2 shall be lower than or equal to 1.

The indicator measured in step 2 as well as the representative one-third octave wavelength wheel roughness spectrum in the wavelength domain L_r shall be recorded in the IC certificate.

Appendix G

The blocks listed below are exempted from an EC Declaration of conformity for a period of 10 years after the entry into force of this NTSN.

<u>Manufacturer</u>	<u>Type description and abbreviated designation (if different)</u>
<u>Becorit</u>	<u>K40</u>
<u>CoFren</u>	<u>C333</u>
<u>CoFren</u>	<u>C810</u>
<u>Knorr-Bremse</u>	<u>Cosid 704</u>
<u>Knorr-Bremse</u>	<u>PROBLOCK J816M</u>
<u>Frenoplast</u>	<u>FR513</u>
<u>Federal Mogul</u>	<u>Jurid 816 M</u> <u>abbreviated: J816M</u>
<u>Federal Mogul</u>	<u>Jurid 822</u>
<u>Knorr-Bremse</u>	<u>PROBLOCK J822</u>
<u>CoFren</u>	<u>C952-1</u>
<u>Federal Mogul</u>	<u>J847</u>
<u>Knorr-Bremse</u>	<u>PROBLOCK J847</u>
<u>Icer Rail / Becorit</u>	<u>IB 116*</u>
<u>Alstom/Flertex</u>	<u>W30-1</u>

Appendix H Changes of requirements and transition regimes

Changes with a generic transition regime:

For NTSN clauses listed in table 1, compliance with the previous NTSN does not systematically imply compliance with this NTSN. However, for projects already in design phase when this NTSN enters into force, the requirement of the previous

NTSN can still apply for a duration of 7 years from the entry into force of this NTSN. Projects in production phase and rolling stock in operation are not affected by the NTSN requirements listed in table H.1

Table H.1

Transition regime of 7 years

<u>NTSN clause(s)</u>	<u>NTSN clause(s) in previous NTSN</u>	<u>Explanation of the NTSN change</u>
<u>Not applicable</u>		

Changes with a specific transition regime:

For NTSN clauses listed in table 2, compliance with the previous NTSN does not systematically imply compliance with this NTSN. However, for projects already in design phase when this NTSN enters into force, the requirement of the previous NTSN can still apply according to the specific transition regime described in the table. Projects in production phase and rolling stock in operation are affected by the NTSN requirements listed in table H.2 according to the specific transition regime described in the table.

Table H.2

Specific transition regime

<u>NTSN clause(s)</u>	<u>NTSN clauses(s) in previous version</u>	<u>Explanation on NTSN change</u>	<u>Transition regime</u>			
			<u>Design phase not started</u>	<u>Design phase started</u>	<u>Production phase</u>	<u>RST in operation</u>
<u>Not applicable</u>						