European Railway Agency

Guide for the application of the NOI TSI

According to Framework Mandate C(2010)2576 final of 29/04/2010

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0. DOCUMENT INFORMATION

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0.2. CONTENTS

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1. ABOUT THIS GUIDE

1.1. SCOPE

This document is an annex to the “Guide for the Application of TSIs”. It provides information on the application of the Commission Regulation 1304/2014 of 26 November 2014 concerning the technical specifications for interoperability relating to the ‘rolling stock - noise’ subsystem (further referred to as NOI TSI).

The guide should be read and used only in conjunction with the NOI TSI. It is intended to facilitate its application but does not replace it. The general part of the “Guide for the Application of TSIs” should also be considered.

1.2. CONTENT OF THE GUIDE

In section 2 of this document, extracts of the original text of the NOI TSI are provided, shown in a shaded text box and these are followed by a text that gives guidance.

Guidance is not provided for every clause where the original NOI TSI requires no further explanation.

Guidance is of voluntary application. It does not mandate any requirement in addition to those set out in the NOI TSI.

Guidance is given by means of further explanatory text and where relevant by reference to standards that are means of demonstrating compliance with the NOI TSI; relevant standards are listed in section 4 of this document, and their purpose is indicated in the column “purpose” of the table.

1.3. REFERENCE DOCUMENTS

Reference documents are listed in the general part of the “Guide for the Application of TSIs”.

1.4. DEFINITIONS AND ABBREVIATIONS

Definitions and abbreviations are given in the general part of the “Guide for the application of TSIs”.

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2. EXPLANATIONS ON THE APPLICATION OF THE NOI TSI

2.1. CHAPTER 1: “INTRODUCTION”

Section 1.1: “Technical scope”

“This TSI applies to all rolling stock in the scope of Regulation (EU) XXX/2014 (LOC&PAS TSI) and Regulation (EU) 321/2013 (WAG TSI).

NOI TSI does not apply to wagons designed to operate only on the 1520 mm network and the application of the NOI TSI for mobile railway infrastructure construction and maintenance equipment as defined in chapter 2 bullet e) of the NOI TSI is voluntary.

Section 1.2: “Geographical scope”

“The geographical scope of this TSI follows the scope defined in section 1.2 of Regulation (EU) XXX/2014 and in section 1.2 of Regulation (EU) 321/2013, each for their RST concerned.”

The geographical scope of the NOI TSI includes the extension of scope to the entire European Union´s rail system as set out in Article 1 of Directive 2008/57/EC. The reference to the LOC&PAS TSI and the WAG TSI makes sure that the same restrictions affecting the rolling stock are taken over by the NOI TSI.

2.2. CHAPTER 2: “SCOPE AND DEFINITION OF SUBSYSTEM”

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2.3. CHAPTER 3: “ESSENTIAL REQUIREMENTS”

Section 3: “Essential Requirements”

> *“All basic parameters treated in this TSI must be linked with at least one of the essential requirements as set out in Annex III of Directive 2008/57/EC. Table 1 indicates the allocation.”*

The basic parameters harmonised in TSIs must be critical to interoperability and linked with at least one of the essential requirements set out in Annex III of the Interoperability Directive. The basic parameters of the noise TSI are all linked with the essential requirement 1.4.4.

Additional rolling stock measures are not needed in order to comply with neither Directive 2002/49/EC (END) nor Directive 2003/10/EC.

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2.4. CHAPTER 4: "CHARACTERISATION OF THE SUBSYSTEM"

Point 4.2.3: "Limits for pass-by noise"

> *"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 chapter 6 of EN ISO 3095:2013 and assessed against the applicable limit values of table 4"*

The distance from the centre of the track of the 'additional measurement position' is 7,5 m.

Section 4.4: "Operating rules"

> *"Requirements concerning the operating rules for the subsystem rolling stock are set out in section 4.4 of Regulation (EU) XXX/2014 and in section 4.4 of Regulation (EU) 321/2013"*

The applicant has the obligation to add in the technical file, if necessary, operating rules and requirements which ensure that during operation the noise emission remains within the permitted range of limit values of the NOI TSI.

Section 4.5: "Maintenance rules"

> *"Requirements concerning the maintenance rules for the subsystem rolling stock are set out in section 4.5 of Regulation (EU) XXX/2014 and in section 4.5 of Regulation (EU) 321/2013."*

The applicant has the obligation to add in the technical file, if necessary, maintenance rules and requirements which ensure that the noise emission remains within the permitted range of limit values of the NOI TSI throughout the life cycle of the rolling stock.

2.5. CHAPTER 5: "INTEROPERABILITY CONSTITUENT"

There are no interoperability constituents specified in this TSI.

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2.6. CHAPTER 6: "CONFORMITY ASSESSMENT AND EC VERIFICATION"

Point 6.2.2.1: "Stationary Noise"

> *"6.2.2.1 Stationary noise*
> *[...]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 5.7 of EN ISO 3095:2013. Thereby only the train systems that are required for the air compressor to run under normal operating conditions shall be used. 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."*

During this assessment process it is not mandatory to switch on any system powered by the compressor (e.g. toilet, secondary suspension, pneumatic door step, intercirculation pneumatic doors, etc).

The cycle as defined in the last paragraph of section 5.7 of the EN ISO 3095:2013 does not include the silent period between the shut-down of the compressor and the successive start-up.

When measuring the noise emitted by the main air compressor and the exhaust valve of the air dryer the "nearest position" of the mesh set out in clause 5.5.1.1 of EN ISO 3095:2013 is assumed to be the noisiest one. In case of doubt it may be necessary to measure more than one position in the mesh e.g. on both sides of the rolling stock.

Point 6.2.2.2.: Starting noise

> *"In addition the noise shall be measured at a distance of 7,5m from the centre of the track and a height of 1,2 m above top of rail. The "averaged level method" and the "maximum level method" in accordance with 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 and communicated to the Agency".*

The positions alongside the vehicle should be those set out in point 7.5 of EN ISO 3095 for both the "averaged level method" and the "maximum level method".

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Point 6.2.2.3.2.: “Procedure”

“The tests shall be carried out in accordance with the provision in sections 6.1, 6.3, 6.4, 6.5, 6.6 and 6.7 (without 6.7.2) of EN ISO 3095:2013.”

If the unit under assessment is a locomotive, it is allowed to carry out the measurements at all test speeds with a tractive effort equal to at least two thirds of the maximum available value at maximum speed. This value can be deduced from calculated tractive effort versus speed curves.

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Point 6.2.3: “Simplified evaluation”

> *“… Instead of the test procedures as set out in point 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 reference type and the unit under assessment should be of similar design. Therefore, the simplified evaluation method can only be applied to a limited number and extent of design modifications. Before the simplified evaluation method can be applied, it should be established that the unit under assessment and the reference type are comparable in terms of design, operation and acoustic behaviour.

“Documented noise characteristics” means that the total sound emission as well as the acoustic behaviour of the single components that are contributing to it should be known and listed.

It should be explicitly declared whether a modification of one component has an impact on other noise sources.

> *“…*
> *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. …”*

Evidence should be robust and verifiable. The analysis should be repeatable with equal results. Calculations should be described in detail to enable the NoBo to assess the quality of the calculation process. Assumptions should be made conservatively.

The calculation of the uncertainties of the simplified evaluation method may consist of the determination, in the frequency domain, of the difference between the calculation

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and the measurement results for the reference type. These differences should be added to the calculation result obtained for the type under assessment.

Some practical cases of simplified evaluation are given in section 2.9.

> *"In case of a wagon which 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 4.2.3."*

If e.g. a wagon under assessment is equipped with brake blocks listed in Appendix G of Commission Regulation 321/2013 (WAG TSI 2013) or in the ERA Technical Document TD-2009-02 "list of fully UIC approved composite brake block for international transport", it is assumed without further verification that such blocks do not result in higher pass-by noise emissions.

2.7. CHAPTER 7: "IMPLEMENTATION"

7.2 Application of this TSI to renewed and upgraded subsystems

> *"[...] If, during renewal or upgrading of a wagon, a wagon is being equipped with composite brake blocks and no noise sources are added to the wagon under assessment, then it shall be assumed that the requirements of point 4.2.3 are met without further testing."*

If a wagon under assessment is equipped with brake blocks listed in Appendix G of Commission Regulation 321/2013 (WAG TSI 2013) or in the ERA Technical Document TD-2009-02 "list of fully UIC approved composite brake block for international transport", it is assumed without further verification that such blocks do comply with the TSI requirements on pass-by noise.

2.8. APPENDICES OF THE NOI TSI

The table in Appendix C "Assessment of the rolling stock subsystem" is to be understood as follows: During the application of the assessment procedures of point 6.2.2 only the type test shall be carried out. If the simplified evaluation in point 6.2.3 is applied the design review has to be done based on a type test of the reference unit.

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2.9. PRACTICAL CASES

In this section, some practical cases are provided for the application of the simplified evaluation in accordance with point 6.2.3 of the NOI TSI :

- **Removal of noise sources.**

  → No calculation or measurements required. Any impact that the removal could have on other noise sources should be investigated.

- **Replacing or modifying equipment which is acoustically relevant (traction motors, HVAC, horn, etc).**

  → Only the relevant TSI – basic parameters should be reevaluated. E.g. if the horn is replaced, only cab's interior noise should be reevaluated.

  → No calculation or measurements required if it is demonstrated that the emitted noise level of the new equipment is at least 10 dB lower than the noise level of the equipment fitted in the reference type.

  Otherwise, both reference and modified equipment should be assessed regarding sound power level and directivity. The assessment should be performed under realistic TSI operating conditions. This could either be achieved with measurements in a laboratory or built-in condition in the vehicle or with calculations if a reliable source model is available (e.g. rolling noise). If the modification does not lead to a higher sound pressure levels than the reference equipment, the type under assessment can be considered NOI TSI compliant. If the new equipment is noisier than the reference, the impact on the total noise level shall be assessed.

- **Modification having an impact in aerodynamics (e.g. pantograph, roof mounted device, modification of nose shape, etc.).**

  → No calculation or measurements required for units with a top speed lower than 250 km/h

  → For units with a speed equal or higher than 250 km/h, a simplified method consisting of a measurement campaign in an anechoic wind tunnel is permitted (use of scale models may be possible). The airflow shall be representative of the actual case and the measurement positions shall take into account the directivity of the noise sources.

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- **Modification of the wheel design.**

  → The simplified evaluation consisting of a suitable combination of measurements and calculations shall be applied (see EN 13979-1:2011).

- **Assessment of a family of vehicles**

  → A family of vehicles is defined as a group of vehicles which are largely based on the same design. (e.g. multiple units with a minimum number of vehicles which can be increased by adding vehicles identical to one of the existing in the minimum configuration). In such case it is sufficient to select for each basic parameter the vehicle with the highest noise emission level for the assessment according to NOI TSI. If such vehicle is TSI compliant, it can be assumed that the other vehicles in the same family comply as well without further tests.

- **Modification of train interiors such as number and arrangement of seats, furniture, etc.**

  → No measurements or calculations required as long as no acoustic insulation material has been removed which may affect the driver´s cab interior noise. In such case, only the driver's cab noise has to be reevaluated.

NOTE: This list of practical cases may be modified in future revisions of the Application Guide in order to take into account the feedback of currently ongoing research projects such as the EU-funded project ACOUTRAIN.

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APPENDIX 1: VOLUNTARY STANDARDS

Reference in the NOI TSI		Voluntary Standard	
Element of the subsystem	**Point**	**Standard ref.**	**Purpose**
Stationary noise	4.2.1		
Starting noise	4.2.2		
Pass-by noise	4.2.3		
Driver´s Cab interior noise	4.2.4		

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