EUROPEAN UNION AGENCY FOR RAILWAYS

Making the railway system work better for society.

OPINION

ERA/OPI/2017-4

OF THE EUROPEAN UNION AGENCY FOR RAILWAYS

for

European Commission

regarding

a possible revision of CCS TSI - rolling stock compatibility with axle counters

1. General Context

1.1. In the note referenced as ARES (2017) 4807641 and dated on 02.10.2017 addressed to the Executive Director of European Union Agency for Railways ("the Agency"), the European Commission asked the Agency to provide an opinion related to an relaxation of constraints imposed on rolling stock to be compatible with axle counters as specified in the technical document "Interfaces between CCS track-side and other subsystems". This technical document is referenced "ERA/ERTMS/033281" (version 3.0) in the list of mandatory specifications in the Annex A (index 77) of the Control-command and Signalling TSI ("CCS TSI" - set out as Annex to the Commission Regulation (EU) 2016/919[1]) and in Appendix J-2, index 1 of the LOC&PAS TSI (set out as Annex to Commission Regulation (EU) 1302/2014[2])[3].

1.2. The possible deficiency was described in a letter from UNIFE, dated on 21 September 2016, addressed to the Head of ERTMS Unit of the Agency (see Annex 1 to this Opinion). The Agency forwarded the letter to the Commission, that issued the note mentioned above.

1.3. In their letter, UNIFE explained that, according to findings of Electromagnetic Compatibility experts, the parameters related to minimum wheel diameter and minimum axle distance are too restrictive for the design of new high speed trains.

1.4. The Agency was asked to provide an Opinion that constitutes an acceptable means of compliance concerning deficiencies in the TSIs, in accordance with Article 6(3) of Directive (EU) 2016/797 (the "Interoperability Directive"). The Agency prepared and sent the European Commission its Opinion ERA/OPI/2017-4 on this issue.

2. Legal Background

2.1. Agency Regulation (EU) 2016/796[4] Article 10(2) states that:
"The Agency shall issue opinions at the request of the Commission on amendments to any act adopted on the basis of Directive (EU) 2016/797 or Directive (EU) 2016/798, especially where any alleged deficiency is signalled"

2.2. CCS TSI and LOC&PAS TSI specify conditions that must be respected by axle counters and by vehicles, to ensure their compatibility, and corresponding vehicle design parameters.

2.3. The parameters, which are the object of the correction requested by UNIFE, have been stated in the technical document ERA/ERTMS/033281 (chapter 3.1.2 and chapter 3.1.3). The CCS TSI makes a mandatory reference to this document for the vehicle design characteristics required for axle counters.

2.4. The LOC&PAS TSI in point 4.2.3.3.1.1 makes reference to the technical document ERA/ERTMS/033281 in relation to vehicle design characteristics.

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[1] Commission Regulation (EU) 2016/919 of 27 May 2016 on the technical specification for interoperability relating to the 'control-command and signalling' subsystems of the rail system in the European Union; OJ L 158, 15.6.2016, p. 1

[2] Commission Regulation (EU) No 1302/2014 of 18 November 2014 concerning a technical specification for interoperability relating to the 'rolling stock — locomotives and passenger rolling stock' subsystem of the rail system in the European Union; OJ L 356, 12.12.2014, p. 228

[3] Commission Regulation (EU) 2016/919 (CCS TSI) amends this Regulation (LOC&PAS TSI) relatively to the index No 1 in Table J.2 of Appendix J that is replaced by the following: 'ERA/ERTMS/033281 rev 3.0'

[4] Regulation (EU) 2016/796 of the European Parliament and of the Council of 11 May 2016 on the European Union Agency for Railways and repealing Regulation (EC) No 881/2004

3. Analysis

3.1. The requested correction refers to vehicle design characteristics with regards to minimum wheel diameter and minimum axle distance.

3.2. The correction concerns the design of bogies of high speed trains.

3.3. The problem has been firstly discussed in the meetings on December 15th (2016) and March 02th (2017) of the Working Group on "Train Detection Compatibility", chaired by the Agency with the participation of experts of representative organisations of suppliers of axle counters and vehicles, Infrastructure Managers, Railway Undertaking and Notified Bodies.

3.4. The experts of the Working Group highly recommended the correction for the following reasons:

- Vehicle supplier can use innovative bogie solutions for high speed trains (light weight bogies)
- Vehicle manufactures can address market segments where speeds above 330km/h are requested without changing existing bogie designs.
- Railway Operators can address market segments where speeds above 330km/h are required, more easily with existing vehicles
- No negative impact is expected neither for suppliers of axle counters nor for Infrastructure Managers.

3.5. A light impact assessment was performed by the Agency confirming the above mentioned positive impacts especially for suppliers of high speed vehicles as well as railway undertakings. This impact assessment is annexed to this Technical Opinion (see annex 3).

3.6. In addition, the proposed correction will remove two open points related to minimum axle distance (section 3.1.2.3) and minimum wheel diameter (section 3.1.3.2) for speeds above 350 km/h.

4. The opinion

4.1. Taking into account the statements in the UNIFE letters, the results of the discussions in the Working Group on Train Detection Compatibility as well as the results of the light impact assessment, the Agency proposes to modify chapter 3.1.2 and 3.1.3 of ERA/ERTMS/033281 according to annex 2 to this Opinion.

4.2. These corrections should be applicable to version 3.0 of ERA/ERTMS/033281.

4.3. This Opinion should constitute acceptable means of compliance, pending the revision of the relevant TSIs.

Valenciennes, 28.11.2017

Josef DOPPELBAUER
Executive Director

ANNEX 1 – UNIFE Proposal for Correction

Director General
TEL: +32 2 643 78 82
MOB: +32 2492 72 81 09
EMAIL: philippe.citroen@unife.org

UNIFE aisbl
Avenue Louise 221, B11
B-1050 Brussels
Belgium
TEL: +32 2 626 12 60
EMAIL: general@unife.org
WWW.UNIFE.ORG

Name: Mr Pio Guido
Head of the ERTMS Unit
Address: European Union Agency for Railways
Agence de l'Union européenne pour les chemins de fer
120, Rue Marc Lefrancq120 rue Marc Lefrancq
City: F-59300 Valenciennes
Country: France

Brussels, 21st September 2016

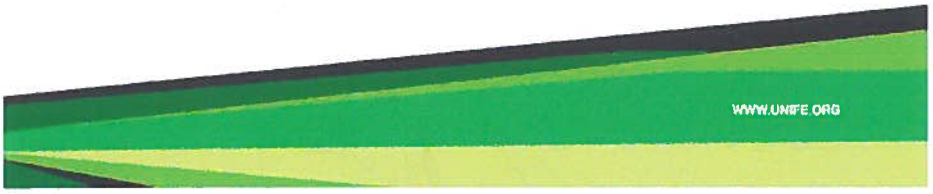
Dear Pio,

I write you concerning the ERA/ERTMS/033281 ("Interfaces between CCS track-side and other subsystems") to share the opinion of our members concerning the parameters for minimum axle distances (a_i) and minimum wheel diameters (D), specified in chapters *3.1.2.2/3.1.2.3* (a_i) and 3.1.3.2 (D).

The aforementioned parameters have been discussed among our members in order to close the open points for the speeds above 350 km/h (for both a_i and D) and also to support innovative solutions for the modern rolling stock.

For the minimum axle distances (a_i), the proposal is to keep for the speed between *0-300 km/h* the existing formula $a_i \geq v \times 7{,}2$ (v is in *km/h*) for all track gauges. For the speed between *300 km/h – 400 km/h*, it is proposed to keep the constant parameter of minimum axle distance: $a_i = 2\,160$ *mm*.

Speed v [$^{km}/_{h}$]	Minimum axle distance (a_i) [mm]
$v \leq 300$	$v \times 7{,}2$
$300 < v \leq 400$	*2 160*



Embedded Document:

2016-09-21 UNIFE proposal for minimu

ANNEX 2 – Proposed Changes in the Interface Document

Section 3.1.2.2 of ERA/ERTMS/033281 (Minimum Axle Distance)

Harmonised parameter for 1435 mm, 1600 mm and 1668 mm track gauge:

The minimum axle distances (a_i) shall be dependent to the speed of the vehicle (v) as follows:

Speed v [km/h]	Minimum axle distances a_i [mm]
$v \leq 300$	$v \times 7.2$
$300 < v \leq 400$	2160

This value applies jointly with the minimum wheels size (see 3.1.3.2)

Harmonised parameter for 1520 mm and 1524 mm track gauge:

The minimum axle distances (a_i) shall be dependent to the speed of the vehicle (v) as follows:

Speed v [km/h]	Minimum axle distances a_i [mm]
$v \leq 300$	$v \times 7.2$
$300 < v \leq 400$	2160

$a_i \geq 500$ *mm*

This value applies jointly with the minimum wheels size (see 3.1.3.2)

Section 3.1.2.3 of ERA/ERTMS/033281

[deleted]

Section 3.1.3.2 of ERA/ERTMS/033281 (Minimum Wheel Diameter)

Harmonised parameter:

For the maximum speed v, the dimension D (Fig. 2) is at least

Speed v [km/h]	Diameter [mm]
v ≤ 100	330
100 < v ≤ 250	150 + 1.8 x v
250 < v ≤ 350	50 + 2.2 x v
350 < v ≤ 400	750 + 0.2 x v

ANNEX 3 – Light Impact Assessment

Embedded Document

ERA-TO-Axle
Distance Impact Ass

EUROPEAN UNION AGENCY FOR RAILWAYS

Making the railway system work better for society.

Light Impact Assessment

CCS Interface Document –

Technical Opinion related to Minimum Axle Distance and Minimum Wheel Diameter

	Elaborated by	*Validated by*	*Approved by*
Name	Martin Schroeder	Oana Gherginescu	Jens Engelmann
Position			
Date	11/10/2017	07/11/2017	07/11/2017
Signature			

Document History

Version	*Date*	*Comments*
0.1	24/02/2017	First draft
0.2	02/03/2017	Review TDC WG
1.0	11/10/2017	Final Draft
1.1	07/11/2017	Review OG

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1. Context and problem definition

1.1. Problem and problem drivers	High speed trains from European vehicle suppliers are currently designed with bogies with **minimum axle distances above 2,3m**. For operational speeds above 330 km/h they just fail to meet the requirements of minimum axle distance as specified in the interface document, which were determined based on detection mechanisms of axle counters placed into market 30-40 years ago. In general, this requirements restrict any innovative solution for light weight bogies, which would lead to energy savings and reduction in track maintenance costs. State of the art technology of axle counters allow minimum distances of 1 meter for speeds above 330 km/h. Complex re-engineering of the bogie (or a new design of the bogie) is necessary to meet the requirements of the TSI/ interface document, if a supplier would enter into this market segment. The requirement of the minimum axle distance is linked with the requirement on **wheel diameter**. For speeds higher than 350 km/h the requirement of the minimum wheel diameter as well as the minimum axle distance are open points. The sector is currently able to close the open points which would ensure more certainty for the design of new bogies and of axle counters. Therefore the **problem** can be formulated as follows: Requirements related to **axle distances and wheel diameter** from the current CCS TSI interface document are obsolete for high speed trains operating above 330km/h. This impedes innovative solutions which could help save on energy and maintenance costs.
1.2. Main assumptions	The TSI describes a target system. This target cannot base on out-dated technology. Current state of art axle counters allow less restrictive requirements.
1.3. Stakeholders affected	Relevance of the problem for each of the categories selected is ranked from 1-low to 5-very high in the table below.

Category of stakeholder	*Importance of the problem*
Vehicle Supplier	5 Current requirement related to wheel diameter can be regarded as a technical barrier for high speed trains
Railway Undertaking	3 Limitations in operation – they cannot increase operating speed based on

		existing high speed vehicles, even if the vehicles would technically allow higher speeds.
	Axle Counter Supplier	2 Limitations in applying innovative design for axle counters
1.4.	**Evidence and magnitude of the problem**	The problem was discussed within UNIFE among vehicle and axle counter suppliers. The problem including a proposal for the solution was explained in the letter from UNIFE to the Agency dated 21st Sep. 2016. Although the problem does not relate to a safety critical error in the TSI, the economic consequences are considered to be very strong especially for suppliers of high speed trains (and indirectly the railway undertakings). There is a need to modify the requirements as quick as possible and not to wait for a general revision of the TSI.
1.5.	**Baseline scenario**	Do Nothing No correction is performed in the interface document for the requirements related to minimum axle distance and wheel diameter; the current open points in CCS TSI remain open.
1.6.	**Subsidiarity and proportionality**	Both requirements are necessary for interoperability and therefore part of the interface document (chapter 3.1.2/3.1.3 in ERA/ERTMS/033281 interface document). The problem can only be solved at European level by changing the requirements in the interface document, which is directly referenced in the TSI CCS.

2. Objectives

2.1.	**Strategic and specific objectives**	**The strategic objective(s) of the Agency** with which this initiative is coherent: ☐ Europe becoming the world leader in railway safety ☒ Promoting rail transport to enhance its market share ☒ Improving the efficiency and coherence of the railway legal framework ☐ Optimising the Agency's capabilities ☐ Transparency, monitoring and evaluation ☒ Improve economic efficiency and societal benefits in railways ☐ Fostering the Agency's reputation in the world The **specific objectives** of this initiative: Remove technical barriers generated by obsolete requirements in the CCS TSI Interface document
2.2.	**Link with Railway Indicators**	N/A

3. Options

3.1. List of options	List of **options** proposed, including the baseline (Option 0). Option 0: Do nothing Option 1: Modify requirements for minimum axle distance and wheel diameter (as per UNIFE proposed Technical Solution)

3.2. Description of options	**Option 0: Do nothing**
	
	No correction is performed in the interface document for the requirements related to minimum axle distance and wheel diameter; the current open points in CCS TSI remain open.
	
	Option 1: Modify requirements for minimum axle distance and wheel diameter (as per UNIFE proposed Technical Solution)
	
	› *For **minimum axle distance**:*
	  › For speeds above 300 km/h, the minimum axle distance is fixed at a value of **2160 mm** (in order to take a number of currently installed axle counters into account but not to block modern bogie design for high speed trains).
	  › Closure of open point for speeds above 350 km/h
	› *For **wheel diameter**:*
	  › *Closure of the open point, for speeds above 350km/h*
	  › For *speeds from 350km/h to 400 km/h, minimum **wheel diameter between 820mm and 830mm** (propotionally increasing).*
	  › The maximum speed of high speed vehicles is restricted up to 400 km/h

3.3. Uncertainties/risks	Option 1 No risks are known. For the requirement related to minimum axle distance, the proposal still includes a high margin (about 1m) compared to state of art axle counters. Therefore the risk to interfere with existing axle counter designs is extremely low or negligible.

4. Impacts of the options

4.1. Impacts of the options (qualitative analysis)

Category of stakeholder		*Option 0 Baseline*
Vehicle Supplier	Positive impacts	-
	Negative impacts	Need to re-design existing bogies in order to operate at speeds higher than 330 km/h
Railway Unterdaking	Positive impacts	-
	Negative impacts	No possibility to operate at speeds higher than 330 km/h even if infrastructure and vehicle design would allow it
Axle Counter Supplier	Positive impacts	-
	Negative impacts	No full planning certainty as long as the open point related to wheel diameter is not closed

Category of stakeholder		*Option 1 Modify requirements for minimum axle distance and wheel diameter (as per UNIFE proposed Technical Solution)*
Vehicle Supplier	Positive impacts	- Vehicle supplier can use innovative bogie solutions for high speed trains (light weight bogies) - Vehicle manufactures can address market segments where speeds above 330km/h are requested without changing existing bogie designs
	Negative impacts	
Railway Undertakings	Positive impacts	Railway Operators can address market segments where speeds above 330km/h are required, more easily with existing vehicles
	Negative impacts	
Axle Counter Suppliers	Positive impacts	Planning certainty in the design of new Axle Counters as the Open Point related to wheel diameter is closed
	Negative impacts	

Remark: Another beneficiary from the proposed option is the Infrastructure Manager. Lower axle distances will reduce kinematic forces from the vehicle. This results in lower track maintenance costs of high speed lines.

4.2. Impacts of the options (quantitative analysis)

The bogie of a vehicle represents about 40% of vehicle costs. An adaptation of the minimum axle distance by only 10cm would require a complete re-design of the bogie including a new authorization of the vehicle. This takes about 4 years and the costs are at least 10 M€.

5. Comparison of options and preferred option

5.1. Effectiveness criterion (options' response to specific objectives)

Based on the findings from section 4.1, assess the extent to which the various options respond to the specific objectives, from 1-very low response to 5-very high response and calculate the average score (**effectiveness**).

	Option 0 Baseline	*Option 1 Modify requirements for minimum axle distance and wheel diameter*
Remove technical barriers generated by obsolete requirements in the CCS TSI Interface document	3*	4**
Effectiveness (average score)	3	4

* The current TSI has already removed a number of technical barriers.

** In addition, the specific technical barrier related to the minimum axle distance is removed for high speed vehicles.

5.2. Efficiency (NPV and B/C ratio) criterion

<Based on the findings from section 4.2, rate the **overall efficiency** of the various options as follows:

	Option 0 Baseline	*Option 1 Modify requirements for minimum axle distance and wheel diameter*
Efficiency	1	4*

* The option eliminates a number of negative impacts from stakeholders from the baseline scenario (do nothing)

5.3. Summary of the comparison

	Option 0 Baseline	*Option 1 Modify requirements for minimum axle distance and wheel diameter*
Effectiveness	3	4
Efficiency	1	4
Overall rating	2	4

5.4.	**Preferred option(s)**	The proposed solution should be integrated in the TSI (as a Technical Opinion) to realise its positive impact especially for vehicle suppliers and railway undertakings as fast as possible.
5.5.	**Further work required**	Development of the corresponding TO. Endorsement in RISC

6. Monitoring and evaluation

6.1.	**Monitoring indicators**	N/A
6.2.	**Future evaluations**	Not foreseen – as no specific risks are associated with the proposal.