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OPINION

OPI 2021-1

OF THE EUROPEAN UNION AGENCY FOR RAILWAYS

For

THE EUROPEAN COMMISSION

Regarding

Potential deficiency in the clause 4.2.4.8.2(3) of Loc&PAS TSI-
Magnetic Track Brake

Disclaimer:

The present document is a non-legally binding opinion of the European Union Agency for Railways. It does not represent the view of other EU institutions and bodies, and is without prejudice to the decision-making processes foreseen by the applicable EU legislation. Furthermore, a binding interpretation of EU law is the sole competence of the Court of Justice of the European Union.

1. General Context

1.1. CER letter

In its letter Ref. Ares(2021)708088 -28/01/2021, the European Commission asked the Agency to provide an opinion on an issue raised by CER on a potential deficiency in the Commission Regulation(EU) 1302/2014 (hereinafter referred to as “TSI LOC&PAS”) concerning the geometrical characteristics of the end elements of the magnet of vehicles fitted with magnetic track brake in contact with the rail that shall be as specified for one of the types described in the Annex C of EN 16207:2014 referred in to clause 4.2.4.8.2(3) of the TSI LOC&PAS .

In its letter from 11th January 2021, CER considers that the current specific geometry designs of the end elements of the magnet in contact with the rail set out in the TSI LOC&PAS lead to technical compatibility issues with the axle counters in place on the European railway network and can lead to important restrictions in the area of use of vehicles placed on the market on the European railway network, with a large impact on route compatibility, and therefore on the operation of those vehicles (e.g. route and speed restrictions). CER requests the possibility to use different end element design of the magnets other than the ones defined in the clause 4.2.4.8.2 (3) provided that the technical compatibility with the network is demonstrated.

The mains elements of the letter are quoted below:

*“The TSI LOC&PAS clause 4.2.4.8.2 (3) refers to Annex C of EN 16207: 2014 which defines six designs of end elements for magnetic track brake (MTB). Although, this annex is **an outdated copy of the Appendix 3 of UIC leaflet 541-06 dated January 1992.***

Accordingly, the TSI requires the use of designs defined three decades ago, when only a few vehicles fitted with magnetic track brake were operated on the railway network, which leads today to technical compatibility issues with the axle counters in place on the European railway network.

*The current legal framework leads to **important restrictions in the area of use** of next generations of vehicles put in service on the European railway network, with a large impact on route compatibility, and therefore on the operation of those vehicles e.g. route and speed restrictions.*

*CER believes that it is urgently needed to introduce the **possibility to use a different end element design** other than the ones exclusively described in the current Annex C of EN 16207. **The technical compatibility with the fixed installations shall be demonstrated.***

While such possibility is already addressed by the CEN/TC256/SC3/WG47 working on the prEN 16207 to be released just after the 2022 TSI package, the potential TSI LOC&PAS deficiency here described needs to be urgently addressed, and possibly through an ERA Technical Opinion.

We believe that an ERA Technical Opinion on this specific TSI LOC&PAS would be needed to ensure a market uptake with the application of different end element design after three decades”.

1.2. NSA France change request

In the context of the revision of the TSI LOC&PAS which is part of the 2022 TSI revision package, the Agency has received the change request n°369 introduced by the French NSA. The objective of this change request is to review the clause 4.2.4.8.2 (3) to allow other geometrical characteristics of the end elements of the magnet in contact with the rail provided that the technical compatibility with the network is demonstrated.

2. Legal Background

According to of Article 10 (2) of Regulation (EU) 2016/796¹, the Agency shall issue opinions at the request of the Commission on amendments to any act adopted on the basis of Directive (EU) 2016/797², especially where any alleged deficiency is signalled. This is the legal background under which this opinion is prepared.

According to Article 19(1) of Regulation (EU) 2016/796, the Agency shall issue opinions which constitute acceptable means of compliance concerning deficiencies in TSIs and provide those opinions to the Commission.

The request of the Commission relates to the following clause 4.2.4.8.2(3) of LOC&PAS TSI 1302/2014³

3. Analysis

3.1. Analysis of requirements and their evolution:

The analysis of evolution of requirements within the LOC&PAS TSI and Railway standards aims to identify possible gaps and to see how to consider the most recent technical developments.

3.1.1. Evolution of the requirements of the end elements of the magnet in LOC&PAS TSI:

The requirements on the geometrical characteristics of the end elements of the magnet in contact with the rail are set out in the clause 4.2.4.8.2 of LOC&PAS TSI. The relevant parts of this clause are mentioned below in italics:

TSI LOC&PAS 2011/291/EU⁴

“4.2.4.8.2.Magnetic track brake

*[...] The geometrical characteristics of the end elements of the magnet in contact with the rail shall be as specified for one of the types described in **Appendix 3 of UIC 541-06:Jan 1992.**”*

TSI LOC&PAS 1302/2014³ as adopted of 18 November 2014 indicates:

“4.2.4.8.2 Magnetic track brake

*[...] (3) The geometrical characteristics of the end elements of the magnet in contact with the rail shall be as specified **for one of the types** described in the specification referenced in Appendix J-1, index 31.*

[..] Appendix J-1

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
31	<i>Magnetic track brake</i>	4.2.4.8.2	UIC 541-06:Jan 1992	Appendix 3

TSI LOC&PAS 1302/2014³ as amended by Regulation (EU) 2019/776 indicates:

“4.2.4.8.2 Magnetic track brake

¹ 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, OJ L 138, 26.5.2016, p. 1.

² Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union, OJ L 138, 26.5.2016, p. 44.

³ 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 amended by Regulation (EU) 2016/919 of 27 May 2016, Regulation (EU) 2018/868 of 13 June 2018, Regulation (EU) 2019/776 of 16 May 2019, and Regulation (EU) 2020/387 of 9 March 2020.

⁴ Commission Decision 2011/291/EU of 26 April 2011 concerning a technical specification for interoperability relating to the rolling stock subsystem — ‘Locomotives and passenger rolling stock’ of the trans-European conventional rail system

[...] (3) The geometrical characteristics of the end elements of the magnet in contact with the rail shall be as specified **for one of the types** described in the specification referenced in Appendix J-1, index 31.

[..] Appendix J-1

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
31	Magnetic track brake	4.2.4.8.2	EN 16207:2014	Annex C

It is to be noted that:

- the Commission Implementing Regulation (EU) 2019/776 amending regulation 1302/2014 requires the application of the annex C of the EN 16207:2014. The annex C is identical to appendix 3 of the UIC 541-06.
- between the different revisions of the TSIs, requirements regarding geometry of end elements did not change and no comments were received regarding the possibility to use other geometry than the one defined in the standards.

3.1.2. Requirements in UIC 541-06 and EN 16207:2014

3.1.2.1. Requirements in UIC541-06 of Jan 1992 (1st edition) and of March 2013 (2nd edition):

The relevant clauses in UIC 541-06 of Jan (1st edition) related to geometry of end elements are mentioned below in italics.

*“2.1.2 [...] The end elements shall be designed with the appropriate geometry to accommodate both characteristics of crossing with a tangent above or equal to 0,034 and the check rails. End elements of the types approved for international traffic, as shown in the diagrams forming **appendix 3**, meet these requirements [...]:*

- ***any new shoe in which the end element fails to comply with this condition must undergo an individual validation process – at railway level- involving tests on a crossing with a tangent of 0,034. If the tests prove satisfactory, the drawing of the corresponding end element will be added to appendix 3 by the UIC Committee responsible for the certifications of brakes.”***

It is to be noted that:

- the only mandatory parts required by the TSI LOC&PAS is compliance of the geometry of end elements with appendix 3 of UIC 541-06.
- the provisions in 2.1.2 give the possibility of using a form different from those "approved", provided that compatibility with the switches and crossings is demonstrated. When new form is developed and validated the appendix has to be amended. The clause 2.1.2 is not referred in LOC&PAS TSI therefore, it is not allowed to deviate from the geometries set out in appendix 3 of UIC 541-06.
- the technical requirements between the two revisions of UIC 541-06 (1st edition **Jan 1992** and 2nd edition **march 2013**) in clause 2.1.2 and appendix 'End elements of magnetic brake' are identical.
- between edition 1992 and 2013, the appendix related to End elements of magnetic brake between **was not amended with any new geometry.**

3.1.2.2. Requirements in EN 16207:2014

The relevant clauses related to geometry of end elements are mentioned below in italics.

“5.5.1 End pieces:

The end pieces of a magnet have several task:

- *they protect the magnet pole shoes transmitting the braking force from mechanical damage;*

- *they assist the passage of the magnet over switches and crossing when the magnets are in working position, to reduce the risk of derailment;*
- *they contribute to the overall retardation generated by the magnet.*

*To ensure the characteristics, the end pieces are fixed on the support frame of the magnets and shall have a suitable geometry. **The present state of the art is documented in Annex C.***

It is to be noted that the only mandatory parts required by the LOC&PAS TSI is the compliance of the geometry of end elements with annex C of EN 16207:2014.

3.1.2.3. Requirements in prEN 16207:2020 from October 2020

The relevant causes in the project EN 16207:2020 related to geometry of end elements are mentioned below in italics.

“5.5.1 End pieces

The end pieces of a magnet have several tasks:

- *they protect the magnet pole shoes transmitting the braking force from mechanical damage;*
- *they assist the passage of the magnet over switches and crossings when the magnets are in working position, to reduce the risk of derailment;*
- *they contribute to the overall retardation generated by the magnet.*

*To ensure these characteristics, the end pieces are fixed on the support frame of the magnets and shall have a suitable geometry. Already validated end elements are documented in Annex C. **Any other end elements shall be assessed in accordance with Annex D.***

It is to be noted that:

- the possibility to use a different end element design other than those described in the current Annex C of EN 16207 will be introduced in the next revision of the EN 16207 provided that the technical compatibility with the fixed installations is demonstrated. This standard is planned to be published in March 2023.
- the annex D will provide an harmonised validation process for new end pieces of magnetic track brake (see extract in annex 2)

3.2. Economic impact assessment

The proposed solution in the Technical Opinion will provide more flexibility for the applicant for Vehicle Authorisation to demonstrate compliance with the LOC&PAS TSI currently in force. For this reason there is no additional cost impact for the railway sector. The solution generates additional benefits for the railway sector by offering more flexibility concerning the design of magnetic brakes in rolling stock.

4. The opinion

The Agency is of the opinion that the clause 4.2.4.8.2(3) of LOC&PAS TSI 1302/2014 could be considered as a deficiency as it is unnecessarily restrictive. The TSIs are not intended to impose technical solutions unless it is absolutely necessary. In this case, the development of a harmonised methodology set out in prEN 16207 in order to perform the compatibility check between the end elements of the magnet and the axle counters, switches and crossings no longer justify the limited set of technical solutions imposed in the LOC&PAS TSI.

The Agency is of the opinion that the standard EN 16207:2014 should have been updated to reflect the most recent technical developments such as:

- Amending annex C of EN 16207 to add new geometries for the ones where it was demonstrated that technical compatibility is ensured.
- Introducing the possibility to design other geometry provided that the compatibility with the network is demonstrated.
- Introducing a harmonised way of validation of new geometry.

Pending that the EN16207 is revised, the Agency is of the opinion that the clause 4.2.4.8.2(3) of LOC&PAS TSI should be replaced by:

“(3) The geometrical characteristics of the end elements of the magnet in contact with the rail shall be as specified for one of the types described in the specification referenced in Appendix J-1, index 31. It is permitted to use other geometry of end elements of the magnet not included Appendix J-1, index 31 provided that the compatibility with switches and crossings is demonstrated in accordance with the procedure referred in annex 2 of this technical opinion.

Note. compatibility with axle counters is also to be demonstrated as required by clause 4.2.4.8.2(1) of LOC&PAS TSI (i.e compliance with requirement concerning metal free space in 3.1.3.5 of ERA/ERTMS/033281).”

The Agency is of the opinion that the LOC&PAS TSI should be revised according to the Technical Opinion

The Agency is of the opinion that the technical opinion could be used as an acceptable means of compliance, as foreseen in Article 6(3) of Directive (EU) 2016/797. Once the revised EN 16207 is available, the TSI will be updated.

Valenciennes, 19/03/2021



Josef DOPPELBAUER
Executive Director

ANNEX 1



Request of the Commission to the Agency for an Opinion/Advice

Requesting Organisation (name, address)	DG MOVE, C4	
Contact information	Bertrand COLLIGNON (bertrand.collignon@ec.europa.eu)	
Legal base	Opinion	<ul style="list-style-type: none"> ↪ Agency Regulation Art. 25 and 26 ↪ Agency Regulation Art. 10.1 ↪ Agency Regulation Art. 10.2 ↪ Agency Regulation Art. 19 ↪ Agency Regulation Art. 42
	Advice	<ul style="list-style-type: none"> ↪ Agency Regulation Art. 41
Objective	Evaluation and technical opinion	
Scope	LOC&PAs TSI 1302/2014 potential deficiency – Magnetic Track Brakes, geometry of the end elements of the magnets (Clause 4.2.4.8.2, paragraph 3 of the Annex to the TSI)	
Task Description	<p>Evaluation, technical opinion.</p> <p>If a deficiency of the TSI is confirmed, the Agency's opinion shall constitute an acceptable means of compliance.</p>	
Key input documents	<p><u>Background information and justification for the request:</u></p> <p>The TSI LOC&PAS clause 4.2.4.8.2 (3) refers to Annex C of EN 16207:2014 which defines six designs of end elements for magnetic track brake based on an outdated version of the Appendix 3 of UIC leaflet 541-06 dated January 1992 and is allegedly leading to technical compatibility problems with axle counters.</p> <p>See CER letter of 11 January 2021 (Ares(2021)258935).</p>	
Request to be sent to:	opinionadvice@portal.era.europa.eu	

ANNEX 2 pr EN 16207:2020 version of October 2020 – Annex D

Annex D (normative)

Validation process for new end pieces of Magnetic Track Brake (MTB)

The aim of the validation process is to check the compatibility of the MTB with the track elements. Any new end piece or a geometrical modified end pieces shall be tested with the following parameters:

- The tangents of the fixed crossings of the switches shall be in the range between 0,034 and 0,056 and in the range between 0,08 and 0,12 (see Table 1).
- For the test, the switches shall be crossed three times in each of the four possible directions with activated MTB with every following constant velocity (see Table 1).





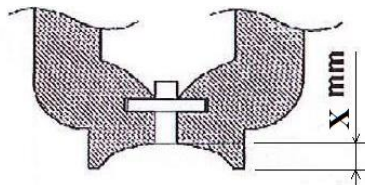
Type of switch	Velocity [km/h] direction			
				
0,08 - 0,12	15	15	15	15
0,08 - 0,12	120	40	120	40
0,034 - 0,056	15	15	15	15
0,034 - 0,056	120	80-100	120	80-100

Table 1 — Parameters for testing

NOTE For the testing, it might be necessary to adapt the control system of the MTB.

- The test shall be performed under dry conditions.
- The test shall be performed in new and worn conditions of the pole shoes and end pieces.
- The test in worn conditions shall be performed at the maximum allowed hollow wear of the friction surface or the pole shoe respectively, defined by the specification (see Figure 1).



Key

X maximum allowed hollow wear expressed in mm

Figure 1 — Maximum hollow wear

Test possibility 1:

This test applies for changes of end pieces listed in the specification referenced in Appendix J-1, index 31 of LOC&PAS TSI . Only deviations of maximum 10% for no more than 5 dimensions are allowed.

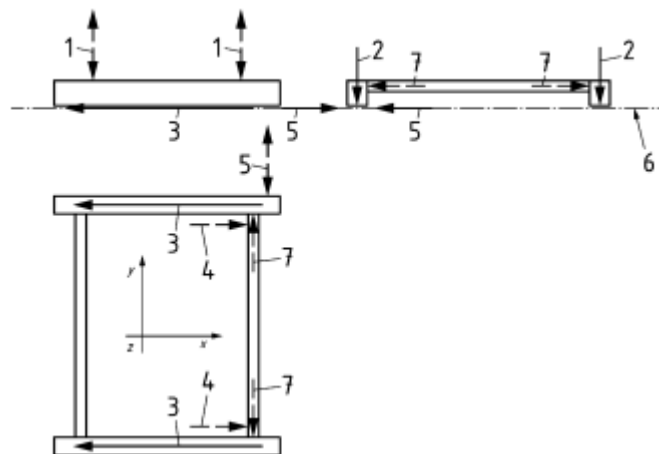
During the test optical check shall be performed by video of all end pieces. The lateral surfaces of all end pieces and pole shoes of the MTB shall be pale painted.

Acceptance criteria:

- No mechanical damage of any part of the MTB;
- No evidence of a permanent derailment of the MTB;
NOTE Sparks are allowed during braking.
- No evidence of a contact at the lateral side of the MTB outside of 55 mm in the vertical direction from the top of rail.

Test possibility 2:

This test applies for new designed end pieces. In addition to test possibility 1, the lateral and longitudinal forces (see Figure 2) between MTB and the bogie shall be measured.



- Key
 - 1 interface forces with bogie frame F_{BZ}
 - 2 attractive force F_{HZ}
 - 3 longitudinal force $F_{B,x}$
 - 4 brake force F_x
 - 5 lateral force F_Q
 - 6 top of the rail
 - 7 interface forces

Figure 2 — Overview of transmission of force

Acceptance criteria:

- Acceptance criteria for test possibility 1
- **Lateral force F_Q and longitudinal force $F_{B,x}$ when running over switches and crossings in inside direction** : Action of a lateral force equal to 0,18 times the magnetic attractive force in inside direction (toward the track centre) in the vicinity of the end pieces with a simultaneous longitudinal force of 0,2 times the magnetic attractive force shall be respected.
- **Lateral force F_Q and longitudinal force $F_{B,x}$ when running over switches and crossings in outside direction** : Action of a lateral force equal to 0,12 times the magnetic attractive force in outside direction in the vicinity of the end pieces with a simultaneous longitudinal force of 0,2 times the magnetic attractive force shall be respected.

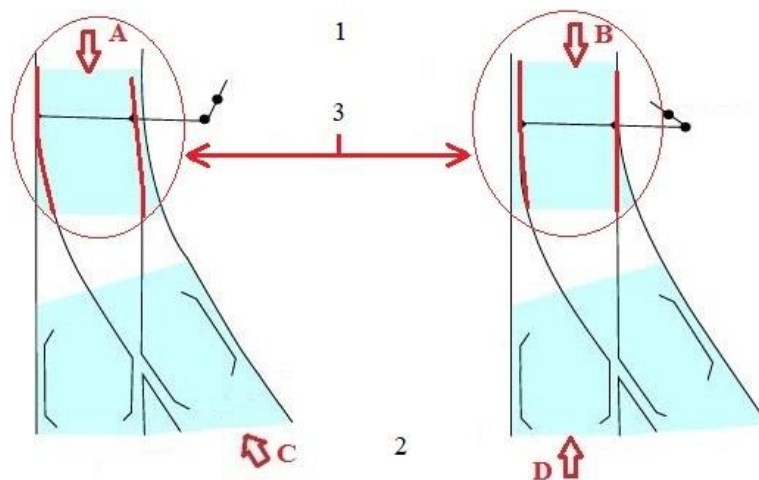
- **Exceptional lateral force FQ in inside direction (toward the track centre) when running over switches and crossings** : Measurements so far performed on vehicles have identified forces in inside direction up to about 0,35 times the magnetic attractive force (greatly dependent on the wear condition of the switch and crossing that has been traversed).
- **Exceptional lateral force FQ in outside direction when running over switches and crossings** : Measurements so far performed on vehicles have identified forces in outside direction up to about 0,23 times the magnetic attractive force (greatly dependent on the wear condition of the switch and crossing that has been traversed).

Test possibility 3:

This test applies for new designed end pieces. Subsequent to test possibility 2, the test possibility 3 shall be performed if the measurement of the displacement of the switches is required. It is allowed to perform the possibilities 2 and 3 in one test run.

Measurement of displacement of switch: The switch is equipped with sensors for measuring the displacement of moving parts identified in red in Figure-3 below (zone toe).

Test sequence: The test sequence consists of performing 3 runs per position A, B, C and D at constant speed. The speed of test shall correspond to the speed inducing the maximum coefficient of friction (typically around a speed of 15 km/h).



Key

- 1 Switch toe
- 2 Switch heel
- 3 Zone equipped with sensors

Figure 3 — Measurement of Displacement of Switch

Acceptance criteria :

- The displacement for runs types A and B from switch toe to switch heel shall not exceed 4,0 mm.
- The displacement for runs types C and D from switch heel to switch toe shall not exceed 7,0 mm.