EUROPEAN UNION AGENCY FOR RAILWAYS

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Clarification note

Wagons with electrical and/or electronic equipment

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Document History

Version	*Date*	*Comments*
0.1	10/03/2025	Initial draft
1.0	04/04/2025	Version for publication after internal review
1.1	01/09/2025	Version after VA WP meeting no.3 - Moved paragraph concerning lack of evidence related to electromagnetic compatibility from §2.2 to §1 - 2.1 added reference to route compatibility check - 2.1 wording adjustments on communication with NSAs and CfU to be applied in concerned MSs - 2.2 moved text related to vehicle design and operation before the text related to electrical equipment - 2.2 Added ATEX Directive - 2.3 introduced references to designated area for freight cargo

The purpose of this document is to provide applicants and other external stakeholders of the vehicle authorisation business with information in regard to the specific topic referenced in the title. The clarifications contained in this document may be integrated in the next revision of the guidelines for the practical arrangements for the vehicle authorisation process, without prejudice of the formal process foreseen for updating the guideline.

The present document is a non-legally binding guidance of the European Union Agency for Railways. It 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. Description of the issue

The integration of electrical equipment in freight wagons raises concerns regarding the applicable requirements and the process to authorise such vehicles.

The requirements in the WAG TSI and related standards reflect how wagons have been designed and built during decades: mostly mechanical systems with some pneumatic add-ons (i.e. brake system). However, this may not be sufficient to fully address the specific technical and legal aspects of modern wagons, for which the incorporation electrical equipment (converters, generators, batteries, pole lines, diesel engines, pumps, air compressors, etc) or electronic equipment is a raising trend.

For wagons with electrical or electronic equipment, the Agency often finds that the EC verification procedure performed (e.g. evaluation of the WAG TSI requirements with regards to the interface document) does not cover all aspect related to electromagnetic compatibility (e.g., point 3.2 of ERA/ERTM/033281 V5.0)

Furthermore, the fact that national rules may be applicable to ensure compatibility with legacy track-side detection systems also raises concerns about the possibility to allow such wagons to receive an authorisation not limited to any particular national network on the base of the requirements in WAG TSI §7.1.2, that can be delivered by the Agency without intervention of national safety authorities in the authorisation process.

2. Line to take

2.1. Compliance with 7.1.2 (d1) and (d2) of WAG TSI ("Whole EU" authorisation) for wagons with on-board electrical or electronic equipment

For wagons with electrical or electronic equipment, Member States may have national rules regarding **compatibility with trackside train detection systems**, pursuant to points 7.1.2(d1) and (d2) of the WAG TSI in force. In such cases, the Agency, when acting as authorising entity, requires an assessment report from the concerned NSAs covering compliance with these national rules before issuing an authorisation.

For applications for vehicle type authorisation submitted through the OSS for wagons with an area of use covering the entire EU ("Whole EU"), NSA OSS programme managers do not normally appoint assessors to the assessment team, as for wagons compliant with 7.1.2 of WAG TSI there were no national rules to assess before the amendment of WAG TSI brought by Regulation (EU) 2023/1694.

After the amendment of TSI WAG in 2023, for freight wagons with electrical or electronic equipment there is the need to assess compliance with points 7.1.2(d1) and (d2) of WAG TSI and with the applicable national rules regarding compatibility with trackside train detection systems (until the relevant national rules are transferred as specific cases in TSIs in accordance with article 13 of CCS TSI). However, NSAs may not be aware that they need to provide an assessment report concerning such national rules and are not notified of issues in the OSS addressed to them by the Agency in this regard, leading to ineffective communication and a lack of proper feedback mechanisms.

To address this issue, for wagons fitted with electrical or electronic equipment and requesting a "Whole EU" authorisation, ERA programme managers will proactively contact NSA programme managers of all EU NSAs (e.g., via email) immediately after the submission of the application through the OSS, requesting that they appoint assessors to the assessment team of the concerned application. By doing so, ERA programme managers will be able to exchange information with NSAs through the OSS as it is the case for any other application for authorisation, specifically to:

- Determine whether applicable national rules for compatibility with trackside train detection systems exist, and/or
- Receive the results of the NSA assessments concerning such national rules.

If these assessments are not provided (e.g. no response from certain NSAs, compliance with national rules not assessed by a DeBo), it remains possible to issue a "Whole EU" authorisation by including conditions for use that restrict the operation of electrical or electronic components (e.g., batteries, converters, generators, etc.) in the concerned Member States, rendering not applicable the requirements related to the interface with the trackside CCS subsystems nor the Directive on electromagnetic compatibility. In practical terms, even if wagons are equipped with electrical or electronic equipment, the authorisation will require that these systems are disabled and isolated in the concerned Member States during regular operation, with appropriate measures in place to prevent accidental activation. Where this is not possible from a technical and/or operational point of view (e.g. the concerned equipment cannot be disabled and isolated during regular operation), or introduces not acceptable operational risks due to the way in which "Whole EU" wagons are operated, then the condition for use shall be applicable across the entire area of use,

This approach is aligned with the anticipated future status of the interface document and the planned introduction of specific cases in the TSIs to phase out outstanding national rules for legacy ("Class B") trackside train detection systems.

In case of non-compliance with the applicable national rules, when it is not possible to correct the non-conformity pursuant to Article 27 of Regulation (EU) 2018/545, either:

- A condition for use is defined in the concerned Member State(s) restricting the use of electrical or electronic components (where this is feasible, see paragraphs above), or
- The networks in the concerned Member State(s) will be excluded from the area of use for authorisation, and the wagon cannot be considered as compliant with section 7.1.2 of WAG TSI

In all cases, the RU is responsible for conducting the route compatibility check in accordance with Article 23 of Directive (EU) 2016/797 prior to operating any authorised vehicle. The results of this check may identify specific sections of the networks within the authorised area of use where the vehicle cannot be operated.

2.2. Requirements applicable to wagons with electrical or electronic equipment

The applicant for placing a mobile subsystem on the market is solely responsible for ensuring that the subsystem complies with the applicable requirements, based on their knowledge, experience, and the characteristics of the subsystem. Likewise, the identification, implementation, and validation of the applicable requirements at vehicle level is the responsibility of the applicant for authorisation, in accordance with Articles 5 and 13 of Regulation (EU) 2018/545.

Freight wagons shall comply with the vehicle design requirements laid down in ERA/ERTM/033281 §3.1 “Vehicle design and operation” that are relevant to ensure compatibility with train detection systems, such as axle distances, wheel geometry, use of sanding equipment, on-board flange lubrication, axle load and metal construction, impedance between wheels, etc

Notwithstanding the above, it should be noted that the following requirements may also be applicable to wagons due to the fact that they are fitted with electrical or electronic equipment:

- Interfaces with CCS trackside, pursuant to sections 7.1.2 (d), 7.1.2(d1) and 7.1.2(d2) of WAG TSI, that refers to the section 3.2 “Electromagnetic compatibility” of the technical document ERA/ERTM/033281 V5.0. This section of the document defines frequency ranges and associated limits (frequency management) to minimize interference between rolling stock and trackside systems:
  - punctually working train detection systems like axle counters (ERA/ERTM/033281 §3.2.1) and
  - track circuits which detects vehicles along a certain track section length (ERA/ERTM/033281 §3.2.2).
- National rules applicable in the Member States of the Area of Use in addition to the TSIs, in particular, national rules concerning compatibility with (legacy) track-side train detection systems
- Directive 2014/30/EU on electromagnetic compatibility [1]
- Directive 2014/53/EU on radio equipment [2]
- Directive 2013/35/EU on exposure to electromagnetic fields [3]
- Directive 2014/35/EU low voltage [4]
- Directive 2002/49/EC relating to the assessment and management of environmental noise [5]

[1] Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast) (OJ L 96, 29.3.2014, p. 79–106), as amended by Regulation (EU) 2018/1139

[2] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC (OJ L 153, 22.5.2014, p. 62–106), as amended by Regulation (EU) 2018/1139, Directive 2022/2380 and Commission Delegated Regulation (EU) 2023/1717

[3] Directive 2013/35/EU of the European Parliament and of the Council of 26 June 2013 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (20th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) and repealing Directive 2004/40/EC (OJ L 179, 29.6.2013, p. 1–21)

[4] Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits (recast) (OJ L 96, 29.3.2014, p. 357–374)

[5] Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise - Declaration by the Commission in the Conciliation Committee on the Directive relating to the assessment and management of environmental noise (OJ L 189, 18.7.2002, p. 12–25), as amended by Regulation (EC) No 1137/2008, Directive (EU) 2015/996, Regulation (EU) 2019/1010, Regulation (EU) 2019/1243, Directive (EU) 2020/367 and Delegated Directive (EU) 2021/1226

- Directive 2014/34/EU on equipment and protective systems intended for use in potentially explosive atmospheres [6]
- Directive 2006/66/EC on batteries and accumulators [7]
- Regulation (EU) 2023/1542 concerning batteries and waste batteries [8]
- Etc.

Further information concerning Union law that may be applicable to railways can be found in the following websites:

https://single-market-economy.ec.europa.eu/single-market/european-standards/harmonised-standards_en

https://www.era.europa.eu/domains/applicants/applications-vehicle-type-authorisations_en

It should be noted that the requirements mentioned above may be applicable irrespective of the voltage, electrical classification (e.g. concerning grounding and insulation) or power of the concerned systems (e.g. the fact that the system is powered by a low voltage battery does not necessarily rule out the need to consider (some of) the aspects mentioned above).

2.3. Exchangeable electrical or electronic equipment in wagons

In the context of Directive (EU) 2016/797 and Regulation (EU) 321/2013, freight refers to goods or cargo transported by rail, which are not an integral part of the railway vehicle but are carried for commercial or logistical purposes on the areas of the vehicle designed for such purpose. In this sense, a freight wagon is a non-self-propelled vehicle designed for transporting freight, where freight is distinct from the vehicle itself. The elements not affixed to the wagon, such as containers, are considered freight rather than part of the railway vehicle.

Conversely, equipment permanently affixed to the vehicle is not considered freight but instead forms part of the rolling stock and falls under interoperability and safety regulations.

As a consequence:

- The assessment of compliance for electrical equipment installed in exchangeable elements (not affixed to the wagon), such as containers, is outside the scope of the authorisation process. These elements transported in the designated cargo area are considered “freight” (i.e. goods to be transported) and are not regarded as an integral part of the vehicle.

  The concerned Railway Undertaking (RU) must incorporate appropriate measures within its Safety Management System (SMS) to ensure that such exchangeable elements meet the applicable requirements.

- Equipment affixed to the vehicle is not considered freight but an integral part of the vehicle, even if it can be dismantled and reassembled in another wagon. Consequently, ensuring that the entire vehicle (including this type of equipment) complies with the applicable requirements falls within the scope of the authorisation process.

[6] Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast) (OJ L 96, 29.3.2014, p. 309–356)

[7] Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC (OJ L 266, 26.9.2006, p. 1–14), as amended by Directive 2008/12/EC, Directive 2008/103/EC, Directive 2013/56/EU and Directive (EU) 2018/849

[8] Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC (OJ L 191, 28.7.2023, p. 1–117), as amended by Regulation (EU) 2024/1781

3. Background

a) Directive (EU) 2016/797

› Article 2 Definitions

"*(45) 'railway undertaking' means a railway undertaking as defined in point (1) of Article 3 of Directive 2012/34/EU, and any other public or private undertaking, the activity of which is to provide* ***transport of goods*** *and/or passengers by rail on the basis that the undertaking is to ensure traction; this also includes undertakings which provide traction only.*"

› Annex I Elements of the Union Rail System

"2.Vehicles

For the purposes of this Directive, Union vehicles shall comprise all vehicles likely to travel on all or part of the Union's network:
[…]

- *freight wagons, including low-deck vehicles designed for the entire network and vehicles designed to carry lorries;*

[…]"

› Annex II Subsystems

"*2.7 Rolling stock*

Structural body, command and control system for all train equipment, electric current collection devices, traction and energy conversion units, on-board equipment for electricity consumption measuring and charging, braking, coupling and running gear (bogies, axles, etc.) and suspension, doors, man/machine interfaces (driver, on-board staff and passengers, including accessibility features for persons with disabilities and persons with reduced mobility), passive or active safety devices and requisites for the health of passengers and on-board staff."

› Annex III Essential requirements §2.7.1

"2.7.1 Technical compatibility

[…]

The essential requirements for telematics applications guarantee a minimum quality of service for passengers and ***carriers of goods****, particularly in terms of technical compatibility.*
[…]"

b) Regulation (EU) 2013/321 (WAG TSI)

› 1.3. Content of this TSI

"*In accordance with Article 4(3) of Directive (EU) 2016/797, this TSI:*

(a) covers the 'rolling stock-freight wagons' subsystem;
(b) lays down essential requirements for the part of the rolling stock subsystem concerned and for its interfaces vis-à-vis other subsystems (Chapter 3);
(c) establishes the functional and technical specifications to be met by the subsystem and its interfaces vis-à-vis other subsystems (Chapter 4).

[…] "

› *2. Scope and definition of subsystem*

"*2.1. Scope*

This TSI is applicable to 'freight wagons including vehicles designed to carry lorries' as referred to in Annex I Section 2 to Directive (EU) 2016/797 taking into account the limitations as set out

in Article 2. In the following this part of the subsystem rolling stock is called 'freight wagon' and belongs to the subsystem 'rolling stock' as set out in Annex II to Directive 2016/797/EC.

[…]"

› 2.2 Definitions

"In the present TSI the following definitions are used:

(a) A 'unit' is the generic term used to name the rolling stock. It is subject to the application of this TSI, and therefore subject to the EC verification procedure.

A unit can consist of:

- *a 'wagon' that can be operated separately, featuring an individual frame mounted on its own set of wheels, or*
- *a rake of permanently connected 'elements', those elements cannot be operated separately, or*
- *'separate rail bogies connected to compatible road vehicle(s)' the combination of which forms a rake of a rail compatible system.*

[…]"

› 4.2.3.3 Compatibility with train detection systems

"*If the unit is intended to be compatible with one or more of the following train detection systems, this compatibility shall be established in accordance with the provisions of the technical document referenced in Appendix D.2 Index [A]:*

(a) train detection systems based on track circuits (the electrical resistance of the wheelset can be assessed at IC level or at vehicle level);

(b) train detection systems based on axle counters;

(c) train detection systems based on loop equipment.

The related specific cases are defined in section 7.7 of the CCS TSI"

› 7.1.2 Mutual recognition of the first authorisation of placing on the market

"(d1) If the unit has electronic equipment on board emitting interference current via the rail, the 'influencing unit' (as defined in the technical document referenced in Appendix D.2 Index [A]) of which the unit is planned to be part shall be compliant with specific cases for track circuits notified under Article 13 of CCS TSI by applying the harmonised vehicle test methods and vehicle impedance referred in the technical document referenced in Appendix D.2 Index [A]. Compliance of the unit can be demonstrated based on the technical document referred in Article 13 of CCS TSI and is checked by the Notified Body as part of EC verification.

(d2) If the unit has electrical or electronic equipment on board emitting interference electromagnetic fields:

- *close to the wheel sensor of an axle counter, or*
- *induced by the return current via the rail if applicable.*

The 'influencing unit' (as defined in the technical document referenced in Appendix D.2 Index [A]) of which the unit is planned to be part shall be compliant with specific cases for axle counters notified under Article 13 of CCS TSI. Compliance of the unit shall be demonstrated by applying the harmonised vehicle test methods referred in the technical document referenced in appendix D.2 index [A] or alternatively based on the technical document referred in Article 13 of CCS TSI. It is checked by the Notified Body as part of EC verification"

› Annex D.2 Technical documents (available on ERA website)

"Index [A] Interfaces between Control-Command and Signalling Trackside and other Subsystems Appendix A of CCS TSI, index [77] ERA/ERTMS/033281 V5.0"

c) Regulation (EU) 2018/545

› Article 3. Responsibilities of the applicant

"*The applicant shall submit its application for vehicle type authorisation and/or vehicle authorisation for placing on the market in accordance with the provisions of this Regulation.*

It is the responsibility of the applicant to ensure that the relevant requirements from applicable legislation are identified and met when submitting its application for vehicle type authorisation and/or vehicle authorisation for placing on the market."

› Article 5. Responsibilities of the holder of the vehicle type authorisation

"*1. The holder of the vehicle type authorisation shall be responsible for the configuration management of the vehicle type and the accompanying file for the decision issued in accordance with Article 46.*

[…]"

› Article 13. Requirements capture

"*In accordance with the overall objective of managing and mitigating all the identified risks to an acceptable level, the applicant shall, before submitting an application, undertake a requirements capture process which shall ensure that all the necessary requirements covering the design of the vehicle for its life cycle have been:*

(a) identified properly;

(b) assigned to functions or subsystems or are addressed through conditions for use or other restrictions; and

(c) implemented and validated.

[…] "

› Identification of the intended conditions for use of the vehicle and other restrictions

"The applicant shall identify the intended conditions for use of the vehicle and other restrictions linked to the vehicle type."

d) VA guidelines 2.1 (ERA1209/222)

› *3.3.1.4* Other applicable legislation of the Union

"The applicant for placing on the market of a mobile subsystem, based on its knowledge and experience, and considering the characteristics of the subsystem, is the sole responsible for the identification of the applicable Union law and for ensuring that the law(s) is actually fulfilled.

Before placing a mobile subsystem on the market, the applicant shall take any necessary measure to ensure that the subsystem complies with the relevant Union law and national rules. The Union law includes Directives, Technical Specifications for Interoperability (TSIs), but also any other applicable Union law, that, not being railway specific, shall also be complied with.

As a result, the applicant for placing on the market the mobile subsystem shall issue an EC DoV, where it shall declare that the subsystem complies with the relevant Union law and any relevant national rule. In other words, the EC DoV shall contain the references to the Union law that the subsystem complies with, and the references to the outcomes required by such law (e.g., certificates, reports, etc.).

Similarly, the applicant for vehicle and/or vehicle type authorisation, or the entity managing the change, is responsible for ensuring that all applicable requirements, including other legislation of the Union, are met at vehicle level.

Notwithstanding the above, it should be noted that the following EU laws may be applicable to railway vehicles, depending on vehicle characteristics:

- *Simple pressure vessels directive 2014/29/EU;*
- *Electromagnetic compatibility directive 2014/30/EU;*
- *Emissions from non-road mobile machinery regulation (NRMM) (EU) 2016/1628;*
- *Registration, Evaluation, Authorisation and Restriction of Chemicals regulation (REACH), EC 1907/2006;*
- *Machinery Directive 2006/42/EC;*
- *Regulations concerning the international carriage of dangerous goods by rail (RID), and*
- *Radio Equipment Directive (RED) 2014/53/EU.*

Further information concerning Union law that may be applicable to railways can be found in the following website of the European Commission:

https://single-market-economy.ec.europa.eu/single-market/european-standards/harmonised-standards_en

The Agency has also developed an informative list of Union law that may be applicable to railways. This list includes information as well about the evidence of the fulfilment of the concerned Union law that should be included in the file accompanying the application through the OSS. The list can be found in the website of the Agency (link), in the section "Related documents" of the following webpage:

https://www.era.europa.eu/domains/applicants/applications-vehicle-type-authorisations_en

See also section 2.7.3 and 2.7.4 of the guide for the application of the TSIs, available in the website of the Agency (https://www.era.europa.eu/domains/technical-specifications-interoperability_en)."