

COMMISSION IMPLEMENTING REGULATION (EU) 2019/776**of 16 May 2019****amending Commission Regulations (EU) No 321/2013, (EU) No 1299/2014, (EU) No 1301/2014, (EU) No 1302/2014, (EU) No 1303/2014 and (EU) 2016/919 and Commission Implementing Decision 2011/665/EU as regards the alignment with Directive (EU) 2016/797 of the European Parliament and of the Council and the implementation of specific objectives set out in Commission Delegated Decision (EU) 2017/1474****(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to 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 ⁽¹⁾, and in particular Articles 5(11) and 48(2) thereof,

Whereas:

- (1) In accordance with Article 19 of Regulation (EU) 2016/796 of the European Parliament and of the Council ⁽²⁾ the European Union Agency for Railways (the 'Agency') is required to address recommendations to the Commission on the technical specifications for interoperability (TSIs) and their revision and to ensure that TSIs are adapted to technical progress, market trends and social requirements.
- (2) TSIs should be amended in order to indicate provisions applicable to existing subsystems and vehicles, in particular in the event of their upgrading and renewal as well as to indicate the parameters of the vehicles and fixed subsystems to be checked by the railway undertaking to ensure compatibility between vehicles and the routes on which they are to be operated and the procedures to be applied to check those parameters after the vehicle authorisation for placing on the market and before the first use of the vehicle.
- (3) Commission Delegated Decision (EU) 2017/1474 ⁽³⁾ sets out specific objectives for the drafting, adoption and review of TSIs. On 22 September 2017, the Commission asked the Agency to prepare recommendations implementing a number of those objectives.
- (4) Under Decision (EU) 2017/1474, TSIs should be reviewed in order to take into account developments of the Union railway system relating to research and innovation activities, and update references to standards.
- (5) Furthermore TSIs should be reviewed in order to close the remaining open points. In particular, open points as regards specifications on the design of track to be compatible with the use of eddy current brake and the minimum factor for traffic codes should be closed in Commission Regulation (EU) No 1299/2014 ⁽⁴⁾. Open points as regards specifications on aerodynamic effects, passive safety and variable gauge systems and braking systems should be closed in Commission Regulation (EU) No 1302/2014 ⁽⁵⁾. Open points as regards specifications on test conditions for on-track tests and variable gauge systems should be closed in Commission Regulation (EU) No 321/2013 ⁽⁶⁾.

⁽¹⁾ OJ L 138, 26.5.2016, p. 44.

⁽²⁾ 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).

⁽³⁾ Commission Delegated Decision (EU) 2017/1474 of 8 June 2017 supplementing Directive (EU) 2016/797 of the European Parliament and of the Council with regard to specific objectives for the drafting, adoption and review of technical specifications for interoperability (OJ L 210, 15.8.2017, p. 5).

⁽⁴⁾ Commission Regulation (EU) No 1299/2014 of 18 November 2014 on the technical specifications for interoperability relating to the 'infrastructure' subsystem of the rail system in the European Union (OJ L 356, 12.12.2014, p. 1).

⁽⁵⁾ 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).

⁽⁶⁾ Commission Regulation (EU) No 321/2013 of 13 March 2013 concerning the technical specification relating to the subsystem 'rolling stock — freight wagons' of the rail system in the European Union and repealing Decision 2006/861/EC (OJ L 104, 12.4.2013, p. 1).

- (6) Decision (EU) 2017/1474 also sets out specific objectives applicable to the TSI relating to the subsystem 'rolling stock — locomotives and passenger rolling stock' and the TSI relating to the subsystem 'rolling stock — freight wagons'. In particular the provisions on automatic variable gauge systems should be reviewed and access to passenger coaches, the authorisation of passenger vehicles in large areas of use and the composition of passenger trains should be facilitated.
- (7) Certain components for which a single failure has potential to lead directly to a serious accident are critical for the safety of the rail system and should be labelled as 'safety-critical' on a case-by-case basis. The manufacturer should identify safety-critical components in the vehicle maintenance file.
- (8) Trackside and on-board investments should be protected by guaranteeing compatibility and stability of the specifications of the European rail traffic management system (ERTMS), giving legal and technical certainty that a compliant Baseline 3 ERTMS on-board unit can safely run on compliant ERTMS line with an acceptable level of performance. In order to keep pace with technological progress and encourage modernisation such as ERTMS game changers, as specified in the Agency's report on *ERTMS longer-term perspective* (ERA-REP-150), their implementation should, under certain conditions, be allowed. Where the Agency issues draft released specifications of ERTMS game changers before the planned legal release in 2022, suppliers and early implementers should use the specifications in their pilot phase, provided that any Baseline 3 on-board unit can safely run on any infrastructure implementing a game changer.
- (9) On the basis of the system architecture research and innovation work of the Shift2Rail Joint Undertaking, the Agency work on the game changer related to the evolution of the radio communication system aims at proposing solutions that would allow independent life cycle management for the radio communication system and the train protection system, while facilitating the integration of the new radio communication system with the European Train Control system (ETCS) on-boards that follow the set#3 of specifications listed in Table 2.3 of Annex A to Commission Regulation (EU) 2016/919 ⁽⁷⁾.
- (10) Even a successful certification process cannot always exclude that, when an on-board CCS subsystem interacts with a trackside CCS subsystem, one of the subsystems repeatedly fails to function or perform as intended under certain conditions. This may be due to variance in national control-command and signalling equipment (e.g. interlockings), engineering and operational rules, deficiencies in the specifications, different interpretations, design errors or equipment being installed incorrectly. Therefore, checks might need to be carried out to demonstrate the technical compatibility of the control-command and signalling subsystems in the area of use for a vehicle. The necessity of these checks should be considered as a temporary measure to increase the confidence on the technical compatibility between the subsystems. In addition, Regulation (EU) 2016/919 should specify the procedure for those checks. In particular, the principles applicable to those checks should be transparent and prepare the ground for further harmonisation. The possibility of executing those checks in a laboratory representing the trackside configuration to be made available by the Infrastructure Manager should be prioritised.
- (11) To limit to a minimum the checks each Member State should promote harmonisation within its infrastructure. Following this principle, only one single set of compatibility checks for radio (one for voice transmission and another one for data transmission), if at all needed, should be requested per Member State.
- (12) Consideration should be given on the necessary steps in the shortest possible time to increase the confidence on the technical compatibility and to reduce and eliminate the tests or checks to prove technical compatibility of on-board units with different European rail traffic management system trackside implementations. Therefore, the Agency should assess the underlying technical divergences and define the necessary steps to eliminate the tests or checks to prove technical compatibility of on-board units with different trackside implementations.
- (13) Certain TSIs may provide transitional measures in order to keep the railway sector competitive and to prevent undue costs triggered by too frequent changes in the legal framework. Such transitional measures apply to contracts in course of performance and to projects at an advanced stage of development on the date of application of the relevant TSI. As long as these transitional measures apply, requests for application of Article 7(1) of Directive 2016/797/EC should not be needed. Once these transitional measures expire, applicants requesting non-application of TSIs or part of them should do so pursuant to Article 7(1) of Directive (EU) 2016/797. Such requests should however only in duly justified cases be based on Article 7(1)(a) of Directive 2016/797/EC.

⁽⁷⁾ 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).

- (14) Directive (EU) 2016/797 and Commission Implementing Regulation (EU) 2018/545 ⁽⁸⁾ set out the Agency's role as authorising entity. In addition, Implementing Regulation (EU) 2018/545 sets out the procedure applicable in the event of a change to existing vehicle types, in particular for the creation of versions of a vehicle type and versions of a vehicle type variant. The Agency's role in registering data in the European register of authorised types of railway vehicles (ERATV) and the tasks of authorising entities as regards versions of a vehicle type and versions of a vehicle type variant should be adapted accordingly.
- (15) Regulations (EU) No 321/2013, (EU) No 1302/2014, and (EU) 2016/919 should take into account changes in the procedure for placing mobile subsystems on the market, as provided for in Articles 20 to 26 of Directive (EU) 2016/797. Those TSIs should therefore list the basic design characteristics used to identify the vehicle type and set out requirements regarding changes that impact them. The list of ERATV parameters should be amended accordingly.
- (16) Under Decision (EU) 2017/1474, TSIs should indicate whether it is necessary to re-notify the conformity assessment bodies that were notified on the basis of a previous version of the TSI and whether a simplified notification process should be applied. This Regulation brings about limited changes and it should not be necessary to re-notify bodies notified on the basis of a previous version of the TSIs.
- (17) This Regulation amends TSIs so as to further achieve interoperability within the Union rail system, improve and develop international rail transport, contribute to the progressive creation of the internal market and complement TSIs in view of covering essential requirements. It enables to achieve the objectives and to meet the essential requirements of Directive 2008/57/EC of the European Parliament and of the Council ⁽⁹⁾ and Directive (EU) 2016/797. Therefore this Regulation should be directly applicable in all Member States including Member States which have notified the Agency and the Commission under Article 57(2) of Directive (EU) 2016/797 that they have extended the transposition period and thus continue to apply Directive 2008/57/EC until 15 June 2020 at the latest. Notified Bodies exercising under Directive 2008/57/EC in the Member States that have extended the transposition period should be able to issue 'EC' certificate in accordance with this Regulation as long as Directive 2008/57/EC applies in the Member State where they are established.
- (18) On 17 December 2015, 6 January 2016 and 14 November 2017, the Agency issued three recommendations to amend Regulation (EU) No 1302/2014 covering the conditions for having an authorisation for placing on the market not limited to particular national networks, the closing of open-points, requirements regarding safety critical components and the revision of provisions on automatic variable gauge systems.
- (19) On 11 April 2016, the Agency issued a recommendation on the amendment to Regulation (EU) No 321/2013 covering the closing of open-points.
- (20) On 4 October 2017, the Agency issued a recommendation on the amendment to Regulation (EU) No 1299/2014 covering the closing of open-points.
- (21) On 19 July 2018, the Agency issued a recommendation on the amendment to Regulations (EU) No 321/2013 and (EU) No 1302/2014 and Commission Implementing Decision 2011/665/EU ⁽¹⁰⁾ covering the changes in the procedure for placing mobile subsystems on the market, including the checking of vehicle-route compatibility after the vehicle authorisation and before the first use of authorised vehicles and provisions applicable to existing subsystems and vehicles, in particular in the event of their upgrading and renewal.
- (22) On 19 October 2018, the Agency issued a recommendation on the amendment to Regulation (EU) 2016/919 covering the changes in the procedure for placing mobile subsystems on the market, including the checking of vehicle-route compatibility before the first use of authorised vehicles and provisions applicable to existing subsystems and vehicles, in particular in the event of their upgrading and renewal.
- (23) On 15 November 2018, the Agency issued a recommendation on the amendment to Regulation (EU) No 1303/2014 covering the changes to align that Regulation with Directive (EU) 2016/797.

⁽⁸⁾ Commission Implementing Regulation (EU) 2018/545 of 4 April 2018 establishing practical arrangements for the railway vehicle authorisation and railway vehicle type authorisation process pursuant to Directive (EU) 2016/797 of the European Parliament and of the Council (OJ L 90, 6.4.2018, p. 66).

⁽⁹⁾ Directive 2008/57/EC of the European Parliament and of the Council of 17 June 2008 on the interoperability of the rail system within the Community (OJ L 191, 18.7.2008, p. 1).

⁽¹⁰⁾ Commission Implementing Decision 2011/665/EU of 4 October 2011 on the European register of authorised types of railway vehicles (OJ L 264, 8.10.2011, p. 32).

- (24) On 29 November 2018, the Agency issued a recommendation on the amendment to Regulations (EU) No 1299/2014 and (EU) No 1301/2014 covering the changes to align those Regulations with Directive (EU) 2016/797.
- (25) Regulation (EU) No 321/2013, Regulation (EU) No 1299/2014, Regulation (EU) No 1301/2014, Regulation (EU) No 1302/2014, Regulation (EU) No 1303/2014, Regulation (EU) 2016/919 and Implementing Decision 2011/665/EU should therefore be amended accordingly.
- (26) The measures provided for in this Regulation are in accordance with the opinion of the Committee established in accordance with Article 51(1) of Directive (EU) 2016/797,

HAS ADOPTED THIS REGULATION:

Article 1

Regulation (EU) No 321/2013 is amended as follows:

- (1) in Article 2(1), the reference to ‘point 2.7 of Annex II to Directive 2008/57/EC’ is replaced by a reference to ‘point 2.7 of Annex II to Directive (EU) 2016/797 of the European Parliament and of the Council (*)’

(*) 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).’;

- (2) in Article 3, the second subparagraph is amended as follows:

- (a) point (a) is replaced by the following:

‘(a) when it is renewed and upgraded in accordance with section 7.2.2 of the Annex to this Regulation’;

- (b) point (c) is replaced by the following:

‘(c) with regards to the marking “GE” as depicted in point 5 of Appendix C of the Annex, wagons of the existing fleet which have been authorised in accordance with Commission Decision 2006/861/EC as amended by Decision 2009/107/EC or with Decision 2006/861/EC as amended by Decisions 2009/107/EC and 2012/464/EU and meeting the conditions set out in point 7.6.4 of Decision 2009/107/EC may receive this marking “GE” without any additional third party assessment or new authorisation for placing on the market. The use of this marking in wagons in operation remains under the responsibility of the railway undertakings.’;

- (3) Article 4 is amended as follows:

- (a) paragraph 1 is replaced by the following:

‘1. With regard to “open points” set out in Appendix A, the conditions to be complied with for the verification of the essential requirements of Directive (EU) 2016/797 shall be those laid down by national rules in force in the Member State which is part of the area of use of the vehicles covered by this Regulation’;

- (b) point (c) of paragraph 2 is replaced as follows:

‘(c) the bodies designated to carry out the conformity assessment and verification procedures with respect to the open points’;

- (4) Article 5 is amended as follows:

- (a) paragraph 1 is replaced by the following:

‘1. With regard to specific cases set out in Section 7.3 of the Annex, the conditions to be met for the verification of the essential requirements of Directive (EU) 2016/797 shall be those laid down in Section 7.3 of the Annex or by national rules in force in the Member State which is part of the area of use of the vehicles covered by this Regulation’;

- (b) point (c) of paragraph 2 is replaced as follows:

‘(c) the bodies designated to carry out the conformity assessment and verification procedures for the national rules relating to the specific cases set out in point 7.3 of the Annex’;

(5) Article 8 is amended as follows:

(a) paragraph 1 is replaced by the following:

‘1. An EC certificate of verification for a subsystem that contains interoperability constituents which do not have an EC declaration of conformity or suitability for use may be issued during a transition period ending on 1 January 2024, provided the provisions set out in Section 6.3 of the Annex are met.’;

(b) paragraph 2 is replaced by the following:

‘2. The production or upgrade/renewal of the subsystem using non-certified interoperability constituents shall be completed within the transition period set out in paragraph 1, including placing on the market.’;

(c) in point (b) of paragraph 3, the reference to ‘Article 18 of Directive 2004/49/EC’ is replaced by a reference to ‘Article 19 of Directive (EU) 2016/798 of the European Parliament and of the Council (*)’

(*) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (OJ L 138, 26.5.2016, p. 102).’;

(d) paragraph 4 is replaced by the following:

‘4. After a transition period ending on 1 January 2015, newly produced interoperability constituents of “rear-end signals”, shall be covered by the required EC declaration of conformity.’;

(6) Article 8a is amended as follows:

(a) paragraph 1 is replaced by the following:

‘1. Notwithstanding the provisions in Section 6.3 of the Annex, an EC certificate of verification may be issued for a subsystem containing components corresponding to the “friction element for wheel tread brakes” interoperability constituent that does not have an EC declaration of conformity during a transition period ending on 1 January 2024, if the following conditions are met:

(a) the component was manufactured before the date of application of this Regulation; and

(b) the interoperability constituent has been used in a subsystem that had been approved and placed on the market in at least one Member State before the date of application of this Regulation.’;

(b) paragraph 2 is replaced by the following:

‘2. The production, upgrade or renewal of any subsystem using non-certified interoperability constituents shall be completed, including granting authorisation for placing on the market, before the transition period set out in paragraph 1 expires.’;

(c) in point (b) of paragraph 3, the reference to ‘Article 18 of Directive 2004/49/EC’ is replaced by a reference to ‘Article 19 of Directive (EU) 2016/798’;

(7) Article 8 c is amended as follows:

(a) point (b) of paragraph 1 is replaced by the following:

‘(b) the interoperability constituent has been used in a subsystem that had been approved and placed on the market in at least one Member State before the expiry of its approval period.’;

(b) paragraph 2 is replaced by the following:

‘2. The production, upgrade or renewal of any subsystem using non-certified interoperability constituents shall be completed, including granting authorisation for placing on the market, before the transition period set out in paragraph 1 expires.’;

(c) in point (b) of paragraph 3, the reference to ‘Article 18 of Directive 2004/49/EC’ is replaced by a reference to ‘Article 19 of Directive (EU) 2016/798’;

(8) Article 9 is amended as follows:

‘The declaration of verification and/or conformity to type of a new vehicle established in accordance with Decision 2006/861/EC shall be considered valid until the end of a transition period ending on 1 January 2017.’;

(9) Article 10a is amended as follows:

(a) in paragraph 4, the reference to 'Article 6 of Directive 2008/57/EC' is replaced by a reference to 'Article 5 of Directive (EU) 2016/797';

(b) in paragraph 5, the reference to 'Directive 2008/57/EC' is replaced by a reference to 'Directive (EU) 2016/797';

(10) the Annex is amended in accordance with Annex I to this Regulation.

Article 2

Regulation (EU) No 1299/2014 is amended as follows:

(1) Article 2 is amended as follows:

(a) in paragraph 1, the reference to 'point 2.1 of Annex I to Directive 2008/57/EC' is replaced by a reference to 'point 2.1 of Annex II to Directive (EU) 2016/797 of the European Parliament and of the Council (*)'

(*) 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).';

(b) in paragraph 3, the reference to 'Article 20 of Directive 2008/57/EC' is replaced by a reference to 'Article 18 of Directive (EU) 2016/797';

(c) paragraph 4 is replaced as follows:

'4. The TSI shall apply to the network of the Union rail system as described in Annex I of Directive (EU) 2016/797 with the exclusion of cases referred to in Article 1(3) and (4) of Directive (EU) 2016/797';

(2) Article 3 is amended as follows:

(a) paragraph 1 is replaced by the following:

'1. With regard to the aspects listed as "open points" in Appendix R to the Annex to this Regulation, the conditions to be complied with for verifying the essential requirements set out in Annex III to Directive (EU) 2016/797 shall be those laid down by national rules in force in the Member State which authorises the placing in service of the subsystem covered by this Regulation.';

(b) point (c) of paragraph 2 is replaced as follows:

'(c) the bodies designated to carry out the conformity assessment and verification procedures with respect to the open points';

(3) in Article 4, paragraph 1 is replaced by the following:

'1. With regard to specific cases listed in Section 7.7 of the Annex, the conditions to be met for the verification of the essential requirements set out in Annex III to Directive (EU) 2016/797 shall be those laid down in Section 7.7 of the Annex or by national rules in force in the Member State which authorises the placing in service of the subsystem covered by this Regulation';

(4) point (c) of paragraph 2 of Article 4 is replaced by the following:

'(c) the bodies designated to carry out the conformity assessment and verification procedures for the national rules relating to the specific cases set out in point 7.7 of the Annex';

(5) Article 7(3) is amended as follows;

(a) in point (a), the reference to 'Article 18 of Directive 2008/57/EC' is replaced by a reference to 'Article 15 of Directive (EU) 2016/797';

(b) in point (b), the references to 'Article 16(2)(c) of Directive 2004/49/EC' and 'Article 18 of Directive 2004/49/EC' are replaced by references to 'Article 16(2)(d) of Directive (EU) 2016/798 of the European Parliament and of the Council (*)'

(*) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (OJ L 138, 26.5.2016, p. 102).'

and 'Article 19 of Directive (EU) 2016/798' respectively;

- (6) in Article 9, paragraph 2 is deleted;
- (7) Article 10 is amended as follows:
 - (a) in paragraph 4, the reference to 'Article 6 of Directive 2008/57/EC' is replaced by a reference to 'Article 5 of Directive (EU) 2016/797';
 - (b) in paragraph 5, the reference to 'Directive 2008/57/EC' is replaced by a reference to 'Directive (EU) 2016/797';
- (8) the Annex is amended in accordance with Annex II to this Regulation.

Article 3

Regulation (EU) No 1301/2014 is amended as follows:

- (1) Article 2 is amended as follows:
 - (a) in paragraph 1, the reference to 'point 2.2 of Annex II to Directive 2008/57/EC' is replaced by a reference to 'point 2.2 of Annex II to Directive (EU) 2016/797 of the European Parliament and of the Council (*)'
 - (*) 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).';
 - (b) in paragraph 3, the reference to 'Article 20 of Directive 2008/57/EC' is replaced by a reference to 'Article 18 of Directive (EU) 2016/797';
 - (c) paragraph 4 is replaced as follows:

'4. The TSI shall apply to the network of the Union rail system as described in Annex I of Directive (EU) 2016/797 with the exclusion of cases referred to in Article 1(3) and (4) of Directive (EU) 2016/797';
- (2) Article 4 is amended as follows:
 - (a) paragraph 1 is replaced by the following:

'1. With regard to specific cases listed in Section 7.4.2 of the Annex, the conditions to be met for the verification of compliance with the essential requirements set out in Annex III to Directive (EU) 2016/797 shall be those laid down in Section 7.4.2 of the Annex or by national rules in force in the Member State which authorises the placing in service of the subsystem covered by this Regulation.';
 - (b) point (c) of paragraph 2 is replaced by the following:

'(c) the bodies designated to carry out the conformity assessment and verification procedures for the national rules relating to the specific cases set out in point 7.4.2 of the Annex';
- (3) Article 7(3) is amended as follows:
 - (a) in point (a), the reference to 'Article 18 of Directive 2008/57/EC' is replaced by a reference to 'Article 15 of Directive (EU) 2016/797';
 - (b) in point (b), the references to 'Article 16(2)(c) of Directive 2004/49/EC' and 'Article 18 of Directive 2004/49/EC' are replaced by references to 'Article 16(2)(d) of Directive (EU) 2016/798 of the European Parliament and of the Council (*)'
 - (*) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (OJ L 138, 26.5.2016, p. 102).'

and 'Article 19 of Directive (EU) 2016/798' respectively;
- (4) in Article 9, paragraph 2 is deleted;
- (5) Article 10 is amended as follows:
 - (a) in paragraph 4, the reference to 'Article 6 of Directive 2008/57/EC' is replaced by a reference to 'Article 5 of Directive (EU) 2016/797';
 - (b) in paragraph 5, the reference to 'Directive 2008/57/EC' is replaced by a reference to 'Directive (EU) 2016/797';
- (6) the Annex is amended in accordance with Annex III to this Regulation.

Article 4

Regulation (EU) No 1302/2014 is amended as follows:

- (1) in Article 2(1), the reference to ‘point 2.7 of Annex II to Directive 2008/57/EC’ is replaced by a reference to ‘point 2.7 of Annex II to Directive (EU) 2016/797 of the European Parliament and of the Council (*)’

(*) 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).’;

- (2) in Article 3, paragraph 2 is replaced by the following:

‘2. The TSI shall not apply to existing rolling stock of the rail system in the Union which is already placed in service on all or part of the network of any Member State on 1 January 2015, except when it is subject to renewal or upgrading in accordance with Section 7.1.2 of the Annex.’;

- (3) Article 4 is amended as follows:

- (a) paragraph 1 is replaced by the following:

‘1. With regard to the aspects listed as “open points” in Appendix I of the Annex, the conditions to be complied with for verifying the essential requirements set out in Annex III to Directive (EU) 2016/797 shall be those laid down by national rules in force in the Member States which are part of the area of use of the vehicles covered by this Regulation.’;

- (b) point (c) of paragraph 2 is replaced as follows:

‘(c) the bodies designated to carry out the conformity assessment and verification procedures with respect to the open points’;

- (4) in Article 5, paragraph 1 is replaced by the following:

‘1. With regard to specific cases listed in Section 7.3 of the Annex, the conditions to be met for the verification of the essential requirements set out in Annex III to Directive (EU) 2016/797 shall be those laid down in Section 7.3 of the Annex or by national rules in force in the Member States which are part of the area of use of the vehicles covered by this Regulation’;

- (5) point (c) of paragraph 2 of Article 5 is replaced by the following:

‘(c) the bodies designated to carry out the conformity assessment and verification procedures for the national rules relating to the specific cases set out in point 7.3 of the Annex’;

- (6) Article 8(3) is amended as follows:

- (a) in point (a), the references to ‘Article 18 of Directive 2008/57/EC’ and ‘Article 16(2)(c) of Directive 2004/49/EC’ are replaced by a reference to ‘Article 15 of Directive (EU) 2016/797’;

- (b) in point (b) the references to ‘Article 16(2)(c) of Directive 2004/49/EC’ and ‘Article 18 of Directive 2004/49/EC’ are replaced by references to ‘Article 16(2)(d) of Directive (EU) 2016/798 of the European Parliament and of the Council (*)’

(*) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (OJ L 138, 26.5.2016, p. 102).’

and ‘Article 19 of Directive (EU) 2016/798’ respectively;

- (7) in Article 9, the references to ‘Articles 16 to 18 of Directive 2008/57/EC’ and ‘Article 26 of Directive 2008/57/EC’ are replaced by references to ‘Articles 13 to 15 of Directive (EU) 2016/797’ and ‘Article 24 of Directive (EU) 2016/797’ respectively;

- (8) Article 10 is amended as follows:

- (a) in paragraph 4, the reference to ‘Article 6 of Directive 2008/57/EC’ is replaced by a reference to ‘Article 5 of Directive (EU) 2016/797’;

- (b) in paragraph 5, the reference to ‘Directive 2008/57/EC’ is replaced by a reference to ‘Directive (EU) 2016/797’;

(9) the following paragraph 3 is added in Article 11:

‘3. Section 7.1.3.1 of the Annex to this Regulation shall not apply for vehicles placed on the market after 31 December 2028. Vehicles placed on the market after that date shall be conform to chapters 4, 5 and 6 of the Annex to the present Regulation.’;

(10) the following paragraph 4 is added in Article 11:

‘4. Member States may only in duly justified cases permit applicants not to apply this Regulation or parts of it pursuant to Article 7(1)(a) of Directive 2016/797/EC for projects for which the possibility to apply sections 7.1.1.2 or 7.1.3.1 of the Annex exists or has expired. The application of sections 7.1.1.2 or 7.1.3.1 of the Annex does not require the application of Article 7(1)(a) of Directive 2016/797/EC.’;

(11) the Annex is amended in accordance with Annex IV to this Regulation.

Article 5

Regulation (EU) No 1303/2014 is amended as follows:

(1) in Article 2, the reference to ‘Annex II to Directive 2008/57/EC’ is replaced by a reference to ‘Annex II to Directive (EU) 2016/797 (*)’

(*) 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).’;

(2) Article 4 is amended as follows:

(a) paragraph 1 is replaced by the following:

‘1. With regard to specific cases listed in Section 7.3 of the Annex, the conditions to be met for the verification of the essential requirements set out in Annex III to Directive (EU) 2016/797 shall be those laid down in Section 7.3 of the Annex or by national rules in force in the Member State which authorises the placing in service of the fixed subsystems or which is part of the area of use of the vehicles covered by this Regulation.’;

(b) point (c) of paragraph 2 is replaced by the following:

‘(c) the bodies designated to carry out the conformity assessment and verification procedures for the national rules relating to the specific cases set out in point 7.3 of the Annex’;

(3) Article 8 is amended as follows:

(a) in paragraph 4, the reference to ‘Article 6 of Directive 2008/57/EC’ is replaced by a reference to ‘Article 5 of Directive (EU) 2016/797’;

(b) in paragraph 5, the reference to ‘Directive 2008/57/EC’ is replaced by a reference to ‘Directive (EU) 2016/797’;

(4) the Annex is amended in accordance with Annex V to this Regulation.

Article 6

Regulation (EU) 2016/919 is amended as follows:

(1) Article 2 is amended as follows:

(a) paragraph 1 is replaced by:

‘1. The TSI shall apply to all new, upgraded or renewed “trackside control-command and signalling” and “on-board control-command and signalling subsystems of the rail system as defined in points 2.3 and 2.4 of Annex II to Directive (EU) 2016/797 of the European Parliament and of the Council (*). Section 7.2.1a of the Annex shall apply to all changes to an existing On-Board subsystem.

(*) 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).’;

- (b) in paragraph 2, the words ‘Article 20 of Directive 2008/57/EC and’ are deleted;
- (c) paragraph 3 is deleted;
- (2) in Article 3(1), the reference to ‘Article 17(3) of Directive 2008/57/EC’ is replaced by a reference to ‘Article 14 of Directive (EU) 2016/797’;
- (3) Article 5 is deleted;
- (4) Article 6 is amended as follows:
- (a) in paragraph 2, the reference to ‘Articles 13 and 18 of Directive 2008/57/EC’ is replaced by the reference to ‘Articles 10 and 15 of Directive (EU) 2016/797’;
- (b) in paragraph 3, the reference to ‘Article 16 of Directive 2004/49/EC’ is replaced by a reference to ‘Article 16 of Directive (EU) 2016/798 of the European Parliament and of the Council (*)’.
- (*) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (OJ L 138, 26.5.2016, p. 102).;
- (5) Article 9 is amended as follows:
- (a) in paragraph 4, the reference to ‘Article 29(1) of Directive 2008/57/EC’ is replaced by a reference to ‘Article 51(1) of Directive (EU) 2016/797’;
- (b) in paragraph 5, the reference to ‘points 7.3.2.1, 7.3.2.2 and 7.3.2.3 of Decision 2012/88/EU’ is replaced by a reference to ‘Article 2(1) of Commission Implementing Regulation (EU) 2017/6 (*) and point 7.4.1.1 of the Annex to this Regulation.’
- (*) Commission Implementing Regulation (EU) 2017/6 of 5 January 2017 on the European Rail Traffic Management System European deployment plan (OJ L 3, 6.1.2017, p. 6);
- (6) Articles 10 and 11 are replaced by the following:

‘Article 10

Error corrections

If errors that do not allow the system to provide a normal service are detected, the Agency shall of its own motion or at the request of the Commission identify as soon as possible solutions to correct them and an evaluation of their impact on the compatibility and stability of the existing ERTMS deployment. In such cases, the Agency shall send to the Commission an opinion on such solutions and the evaluation. The Commission shall analyse the Agency’s opinion, assisted by the committee referred to in Article 51(1) of Directive (EU) 2016/797, and may recommend that the solutions specified in the Agency’s opinion apply until the next revision of the TSI.

Article 11

ERTMS game changers

1. By June 2021, taking into consideration the input from Shift2Rail and the Agency, the Commission shall issue a report on the definition of the next generation communication system. The report shall include the conditions and possible strategies for the migration to that system with due considerations for the coexistence of the system and spectrum requirements.

2. Where the Agency has issued an opinion with the draft release specifications relating to an ERTMS game changer as identified within ERA-REP-150, suppliers and early implementers shall use those specifications in their pilots and shall inform the Agency.’;

- (7) the following Article 11a is inserted:

‘Article 11a

ERTMS compatibility and future revision

1. By 1 June 2020, the Agency shall send a report to the Commission on the implementation of ETCS system compatibility (ESC) and radio system compatibility (RSC). The report shall include an assessment of the differing types of ESC and RSC, and the potential for reducing the underlying technical divergences of ESC and RSC types. Member States shall provide the Agency with the necessary information to complete the analysis.

2. By 1 December 2021, the Commission shall, based on input from the Agency, define the necessary steps to eliminate the tests or checks to prove technical compatibility of on-board units with different ERTMS trackside implementations, in particular to achieve harmonisation of engineering and operational rules at Member State level and between Member States. Member States shall provide the Commission and the Agency with the necessary information to complete the analysis.

3. By 1 December 2020, the Agency shall send a report to the Commission on the potential for including further elements of trackside and vehicle control-command and signalling system architecture, in particular to achieve a future proof design, facilitating the use of state of the art technology and ensuring backward compatibility.;

(8) the following paragraphs 2 and 3 are added in Article 13:

‘2. Member States may only in duly justified cases permit applicants not to apply Section 7.4.2.1 of the Annex pursuant to Article 7(1)(a) of Directive 2016/797/EC for projects for which the possibility to apply section 7.4.2.3 of the Annex exists or has expired. The application of section 7.4.2.3 of the Annex does not require the application of Article 7(1)(a) of Directive 2016/797/EC.

3. Without prejudice to sections 6.1.2.4 and 6.1.2.5 of the Annex, applicants may continue to apply the provisions of the original version of Regulation (EU) 2016/919 (and relevant Agency opinions) when applying for authorisation of:

(a) trackside projects which are at an advanced stage of development at the date of entry into force of this Regulation; and

(b) on-board projects developed in accordance with ERTMS specifications #2 or #3 listed in Table A.2 of Annex A which are at an advanced stage of development at the date of entry into force of this Regulation.;

(9) the Annex is amended in accordance with Annex VII to this Regulation.’.

Article 7

Implementing Decision 2011/665/EU is amended as follows:

(1) the following Article 2a is inserted:

‘Article 2a

Information to be inserted by the Agency

The Agency shall insert in the European register of authorised types of vehicles information on the vehicle type authorisations or vehicle type variants it has granted and on new versions of a vehicle type or of a vehicle type variant in accordance with Article 50 of Commission Implementing Regulation (EU) 2018/545 (*), as set out in Annex II to this Decision.

(*) Commission Implementing Regulation (EU) 2018/545 of 4 April 2018 establishing practical arrangements for the railway vehicle authorisation and railway vehicle type authorisation process pursuant to Directive (EU) 2016/797 of the European Parliament and of the Council (OJ L 90, 6.4.2018, p. 66).;

(2) in Article 3, paragraph 1 is replaced by the following:

‘1. Member States shall ensure that the national safety authorities provide the information on the vehicle type authorisations or vehicle type variants they have granted and on the new version of a vehicle type or of a vehicle type variant in accordance with Article 50 of Regulation (EU) 2018/545, as set out in Annex II to this Decision.’;

(3) Article 4 is replaced by the following:

‘Article 4

Restriction codes

Harmonised restriction codes shall be applicable in all Member States.

The list of harmonised restriction codes shall be the list referred to in Commission Implementing Decision (EU) 2018/1614 (*).

(*) Commission Implementing Decision (EU) 2018/1614 of 25 October 2018 laying down specifications for the vehicle registers referred to in Article 47 of Directive (EU) 2016/797 of the European Parliament and of the Council and amending and repealing Commission Decision 2007/756/EC (OJ L 268, 26.10.2018, p. 53).;

- (4) Annex I is amended in accordance with Annex VIII to this Regulation;
- (5) Annex II is replaced by Annex IX to this Regulation.

Article 8

In accordance with Regulations (EU) No 1299/2014 and (EU) No 1303/2014, each Member State shall update its national implementation plan for the INF TSI and SRT TSI. Each Member State shall forward its updated implementation plan to the other Member States and the Commission by 1 January 2020.

Article 9

1. Notifications of conformity assessment bodies for the purposes of Regulations (EU) No 321/2013, (EU) No 1299/2014, (EU) No 1301/2014, (EU) No 1302/2014, (EU) No 1303/2014 and (EU) 2016/919 shall remain valid on the basis of those Regulations, as amended by the present Regulation.
2. Conformity assessment bodies notified in accordance with Directive 2008/57/EC may issue 'EC' certificate of verification and 'EC' certificate of conformity or suitability for use of interoperability constituents in accordance with this Regulation as long as Directive 2008/57/EC applies in the Member State where they are established in accordance with Article 57(2) of Directive (EU) 2016/797 and until 15 June 2020 at the latest.

Article 10

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

It shall apply from 16 June 2019.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 16 May 2019.

For the Commission
The President
Jean-Claude JUNCKER

ANNEX I

The Annex to Regulation (EU) No 321/2013 is amended as follows:

- (1) in sections 1, 1.3, 3, 4.1, 4.2.1, 4.7, 5.1, 6.1.2.3, the references to 'Directive 2008/57/EC' are replaced by references to 'Directive (EU) 2016/797';
- (2) section 1.2 is replaced by the following:

1.2. Geographical scope

The geographical scope of this TSI is the entire European Union's rail system as set out in the section 1 of Annex I to Directive (EU) 2016/797, taking into account the limitations concerning the track gauge set out in Article 2.;

- (3) Section 2 is replaced as follows:

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.

The other vehicles listed in Section 2 of Annex I to Directive (EU) 2016/797 are excluded from the scope of this TSI; this is especially the case for:

- (a) mobile railway infrastructure construction and maintenance equipment;
- (b) vehicles designed to carry:
 - motor vehicles with their passengers on board, or
 - motor vehicles without passengers on board but intended to be integrated in passenger trains (car carriers);
- (c) vehicles which
 - increase their length in loaded configuration, and
 - their payload itself is part of the vehicle structure.

Note: See also section 7.1 for particular cases.

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.
- (b) A "train" is an operational formation consisting of several units.

- (c) The “design operating state” covers all conditions under which the unit is intended to operate and its technical boundaries. This design operating state may go beyond the specifications of this TSI in order that units may be used together in a train on the network under the safety management system of a railway undertaking;”;

- (4) Section 3, row 4.2.3.6.6 of Table 1 is replaced as follows:

‘4.2.3.6.6	Automatic variable gauge systems	1.1.1, 1.1.2, 1.1.3	1.2			1.5’
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- (5) Section 4.2.2.2 is replaced as follows:

‘4.2.2.2 The structure of a unit body, any equipment attachments and lifting and jacking points shall be designed such that no cracks, no significant permanent deformation or ruptures occur under the load cases defined in Chapter 5 of EN 12663-2:2010.

In case of a rake of a rail compatible system composed of separate rail bogies connected to compatible road vehicles, the load cases may differ from those mentioned above, due to their bi-modal specification; in such a case, the load cases considered shall be described by the applicant based on a consistent set of specifications with consideration of the specific conditions of use related to train composition, shunting and operation.

The demonstration of conformity is described in point 6.2.2.1.

The lifting and jacking positions shall be marked on the unit. The marking shall comply with point 4.5.14 of EN 15877-1:2012.

Note: Joining techniques are deemed to be covered as well by the demonstration of conformity in accordance to point 6.2.2.1.’;

- (6) in the second and third paragraph of section 4.2.3.1, the text ‘EN 15273-2:2009’ is replaced by ‘EN 15273-2:2013 +A1:2016’;
- (7) in section 4.2.3.1, the text ‘GIC1 and GIC2’ is replaced by ‘GI1 and GI2’;
- (8) in section 4.2.3.2, the text ‘EN 15528:2008’ is replaced by ‘EN 15528:2015’;
- (9) in section 4.2.3.3, the text ‘Commission Decision 2012/88/EU (1)’ is replaced by ‘ERA/ERTMS/033281 rev. 4.0’;
- (10) in point 4.2.3.3 the footnote ‘⁽¹⁾ OJ L 51, 23.2.2012, p. 1.’ is deleted;
- (11) in section 4.2.3.4, the text ‘The specifications of the design and the conformity assessment of on-board equipment is an open point in this TSI.’ is replaced as follows:

‘If the unit is intended to be capable of being monitored by on-board equipment, the following requirements shall apply:

- This equipment shall be able to detect a deterioration of any of the axle box bearings of the unit.
- The bearing condition shall be evaluated either by monitoring its temperature, or its dynamic frequencies or some other suitable bearing condition characteristic.
- The detection system shall be located entirely on board the unit, and diagnosis messages shall be available on board the unit.
- The diagnosis messages delivered and how they are made available shall be described in the operating documentation set out in section 4.4 of this TSI, and in the maintenance rules described in section 4.5 of this TSI.’;

- (12) in section 4.2.3.5.2 the text ‘Chapter 5 of EN 14363:2005’ is replaced by ‘chapters 4, 5 and 7 of EN 14363:2016’;

(13) section 4.2.3.6.6 is replaced as follows:

4.2.3.6.6. Automatic variable gauge systems

This requirement is applicable to units equipped with an automatic variable gauge system with changeover mechanism of the axial position of the wheels allowing the unit to be compatible with 1 435 mm track gauge and other track gauge(s) within the scope of this TSI by means of passage through a track gauge changeover facility.

The changeover mechanism shall ensure the locking in the correct intended axial position of the wheel.

After passage through the track gauge changeover facility, the verification of the state of the locking system (locked or unlocked) and of the position of the wheels shall be performed by one or more of the following means: visual control, on-board control system or infrastructure/facility control system. In case of on-board control system, a continuous monitoring shall be possible.

If a running gear is equipped with brake equipment subject to a change in position during the gauge change operation, the automatic variable gauge system shall ensure the position and safe locking in the correct position of this equipment simultaneously to those of the wheels.

The failure of the locking of the position of the wheels and braking equipment (if relevant) during operation has typical credible potential to lead directly to a catastrophic accident (resulting in multiple fatalities); considering this severity of the failure consequence, it shall be demonstrated that the risk is controlled to an acceptable level.

The automatic variable gauge system is defined as an interoperability constituent (point 5.3.4b) and is part of the interoperability constituent wheelset (point 5.3.2). The conformity assessment procedure is specified in point 6.1.2.6 (interoperability constituent level), point 6.1.2.2 (safety requirement) and in point 6.2.2.4a (subsystem level) of this TSI.

The track gauges the unit is compatible with shall be recorded in the technical documentation.

A description of the changeover operation in normal mode, including the type(s) of track gauge changeover facility(ies) the unit is compatible with, shall be part of the technical documentation (see also section 4.4 of this TSI).

The requirements and conformity assessments required in other sections of this TSI apply independently for each wheel position corresponding to one track gauge and have to be documented accordingly.;

- (14) in section 4.2.4.2 the text ‘Commission Regulation (EC) No 352/2009 ⁽¹⁾’ is replaced by the text ‘Commission Implementing Regulation (EU) No 402/20131 ⁽¹⁾’;
- (15) in section 4.2.4.2 the footnote ‘⁽¹⁾ OJ L 108, 29.4.2009, p. 4.’ is replaced by the footnote ‘⁽¹⁾ OJ L 121, 3.5.2013, p. 8.’;
- (16) in section 4.2.4.3.2.1, the text ‘UIC leaflet 544-1:2013’ and ‘UIC 544-1:2013’ is replaced by the text ‘UIC 544-1:2014’;
- (17) in section 4.2.4.3.2.2, the text ‘the minimum parking brake performance’ is replaced by the text ‘the minimum parking brake force’
- (18) in section 4.2.4.3.2.2, the text ‘the minimum performance of the parking brake shall be marked on the unit. The marking shall comply with clause 4.5.25 of EN 15877- 1:2012.’ is deleted;
- (19) in section 4.2.5, the text ‘EN 50125-1:1999’ is replaced by ‘EN 50125-1:2014’;
- (20) in section 4.2.6.2.1, the text ‘EN 50153:2002’ is replaced by ‘EN 50153:2014’;
- (21) in section 6.2.2.8.4, the text ‘TS 45545-7:2009’ is replaced by ‘EN 45545-7:2013’;
- (22) in section 4.2.6.2.2, the text ‘EN 50153:2002’ is replaced by ‘EN 50153:2014’;
- (23) in section 4.2.6.3, the text ‘chapter 1 of ERA technical document ERA/TD/2012-04/INT version 1.2 of 18.1.2013 published on the ERA website (<http://www.era.europa.eu>)’ is replaced by ‘Figure 11 of EN 16116-2:2013’;

(24) in Table 7 of section 4.3.3, the text 'Reference Commission Decision 2012/88/EU Annex A, Table A2, index 77' is replaced by 'Reference ERA/ERTMS/033281 rev. 4.0';

(25) Section 4.4 is replaced as follows:

4.4 Operating rules

Operating rules are developed within the procedures described in the railway undertaking safety management system. These rules take into account the documentation related to operation which forms a part of the technical file as required in Article 15(4) of and as set out in Annex IV to Directive (EU) 2016/797.

For the safety critical components (see also 4.5), the specific operational and operational traceability requirements are developed by the designers/manufacturers at design phase and through a collaboration between designers/manufacturers and the concerned railway undertakings or the concerned wagon keeper after vehicles have entered into operation.

The documentation related to operation describes the characteristics of the unit in relation to the design operating state to be considered in order to define the operating rules in normal and in various reasonably foreseeable degraded modes.

The documentation related to operation is composed of:

- a description of operation in normal mode, including the operational characteristics and limitations of the unit (e.g. vehicle gauge, maximum design speed, axle loads, brake performance, compatibility with train detection systems, permitted environmental conditions, type(s) and operation of track gauge changeover facility(ies) the unit is compatible with),
- a description of operation in degraded mode (when equipment or functions described in this TSI suffer safety failures) as far as can reasonably be predicted, together with the related acceptable limits and operating conditions of the unit that could be experienced,
- a safety critical components list: The safety critical components list shall contain the specific operational and operational traceability requirements.

The applicant shall provide the initial version of the documentation related to operating rules. This documentation might be modified later in accordance with the corresponding Union legislation, taking into account the existing operating and maintenance conditions of the unit. The Notified Body shall verify only that the documentation on operation is provided.;

(26) Section 4.5 is replaced as follows:

4.5 Maintenance rules

Maintenance is a set of activities intended to keep a functional unit in, or to restore it to a state in which it can perform its required function.

The following documents being part of the technical file as required in Article 15(4) of and as set out in Annex IV to Directive (EU) 2016/797 are necessary to undertake maintenance activities on the units:

- general documentation (point 4.5.1),
- the maintenance design justification file (point 4.5.2), and
- the maintenance description file (point 4.5.3).

The applicant shall provide the three documents described in 4.5.1, 4.5.2. and 4.5.3. This documentation might be modified later in accordance with the corresponding EU legislation, taking into account the existing operating and maintenance conditions of the unit. The Notified Body shall verify only that the documentation on maintenance is provided.

The applicant or any entity authorised by the applicant (e.g. a keeper) shall provide this documentation to the entity in charge of maintenance as soon as it is assigned for the maintenance of the unit.

On the basis of these three documents, the entity in charge of maintenance shall define a maintenance plan and appropriate maintenance requirements at maintenance operational level under its sole responsibility (not in the scope of the assessment against this TSI).

The documentation includes a list of safety critical components. Safety critical components are components for which a single failure has a credible potential to lead directly to a serious accident as defined in Article 3(12) of Directive (EU) 2016/798.

The safety critical components and their specific servicing, maintenance and maintenance traceability requirements are identified by the designers/manufacturers at design phase and through a collaboration between designers/manufacturers and the concerned entities in charge of maintenance after vehicles have entered into operation.

4.5.1 *General documentation*

The general documentation comprises of:

- Drawings and description of the unit and its components.
- Any legal requirement concerning the maintenance of the unit.
- Drawing of systems (electrical, pneumatic, hydraulic and control-circuit diagrams).
- Additional on-board systems (description of the systems including description of functionality, specification of interfaces and data processing and protocols).
- Configuration files for each vehicle (parts list and bill of material) to enable (in particular but not only) traceability during maintenance activities.

4.5.2 *Maintenance design justification file*

The maintenance design justification file explains how maintenance activities are defined and designed in order to ensure that the rolling stock characteristics will be kept within permissible limits of use during its lifetime. The file shall give input data in order to determine the criteria for inspection and the periodicity of maintenance activities. The maintenance design justification file consists of:

- Precedents, principles and methods used to design the maintenance of the unit.
- Precedents, principles and methods used to identify the safety critical components and their specific operational, servicing, maintenance and traceability requirements.
- Limits of the normal use of the unit (e.g. km/month, climatic limits, foreseen types of loads, etc.).
- Relevant data used to design the maintenance and origin of these data (return of experience).
- Tests, investigations and calculations carried out to design the maintenance.

4.5.3 *Maintenance description file*

The maintenance description file describes how maintenance activities can be conducted. Maintenance activities include, among others, inspections, monitoring, tests, measurements, replacements, adjustments and repairs.

Maintenance activities are split into:

- preventive maintenance (scheduled and controlled), and
- corrective maintenance.

The maintenance description file includes the following:

- Component hierarchy and functional description which sets up the boundaries of the rolling stock by listing all the items belonging to the product structure of that rolling stock and using an appropriate number of discrete levels. The lowest item of the hierarchy shall be a replaceable component.

- Parts list which shall contain the technical and functional descriptions of the spare parts (replaceable units). The list shall include all parts specified for changing based on condition, which may require a replacement following electrical or mechanical malfunction or which will foreseeable require a replacement after an accidental damage. Interoperability constituents shall be indicated and referenced to their corresponding declaration of conformity.
- Safety critical components list: The safety critical components list shall contain the specific servicing, maintenance and servicing/maintenance traceability requirements.
- Limit values for components which are not to be exceeded in service. It is permitted to specify operational restrictions in degraded mode (limit value reached).
- List of reference to the European legal obligations to which components or subsystems are subject.
- Maintenance plan (*) i.e. the structured set of tasks to perform the maintenance including the activities, procedures and means. The description of this set of tasks includes:
 - (a) Disassembly/assembly instructions drawings necessary for correct assembly/disassembly of replaceable parts.
 - (b) Maintenance criteria.
 - (c) Checks and tests in particular of safety relevant parts; these include visual inspection and non-destructive tests (where appropriate e.g. to detect deficiencies that may impair safety).
 - (d) Tools and materials required to undertake the task.
 - (e) Consumables required to undertake the task.
 - (f) Personal protective safety provision and equipment.
- Necessary tests and procedures to be undertaken after each maintenance operation before re-entry into service of rolling stock.

(*) The maintenance plan shall take into accounts the findings of the ERA Task force on Freight Maintenance (see “Final report on the activities of the Task Force Freight Wagon Maintenance” published on the ERA website <http://www.era.europa.eu>);

(27) in section 4.8, the text ‘GIC1 and GIC2’ is replaced by ‘GI1 and GI2’;

(28) a new section 4.9 is added as follows:

‘4.9 Route compatibility checks before the use of authorised vehicles

The parameters of the subsystem “rolling stock — freight wagons” to be used by the railway undertaking, for the purpose of route compatibility check, are described in Appendix D1 of Commission Implementing Regulation (EU) 2019/773 (*)

(*) Commission Implementing Regulation (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU (OJ L 139 I, 27.5.2019, p. 5).;

(29) in section 5.3.1, the text ‘The running gear shall be designed for an application range, the area of use, as defined by the following parameters:’ is replaced as follows:

‘The running gear shall be designed for all application ranges, the areas of use, as defined by the following parameters:

- Track gauge’;

(30) in section 5.3.2, the text ‘The wheelset shall be assessed and designed for the area of use as defined by’ is replaced as follows:

‘For the purpose of this TSI, wheelsets include the main parts ensuring the mechanical interface with the track (wheels and connecting elements: e.g. transverse axle, independent wheel axle). Accessories parts (axle bearings, axle boxes and brake discs) are assessed at subsystem level.

The wheelset shall be assessed and designed for the area of use as defined by:

— track gauge;'

(31) in section 5.3.3, the text: '— maximum speed and service life, and' is replaced as follows:

'— maximum speed,

— in-service limits, and'

(32) a new section 5.3.4b is added below section 5.3.4a:

'5.3.4b. *Automatic variable gauge system*

An IC "automatic variable gauge system" shall be designed and assessed for an area of use defined by:

— the track gauges the system is designed for,

— the range of maximum static axle loads,

— the range of nominal wheel tread diameters,

— the maximum design speed of the unit, and

— the types of track gauge changeover facility(ies) the system is designed for, including the nominal speed through the track changeover facility(ies) and the maximum axial forces during the automatic gauge changeover process.

An automatic variable gauge system shall comply with the requirements set out in point 4.2.3.6.6; these requirements shall be assessed at IC level as set out in point 6.1.2.6.'

(33) in section 6.1.2, Table 9, a new row 4.2.3.6.6 is added below the row '4.2.3.6.4 Axle'

'4.2.3.6.6	Automatic variable gauge system	X (*)	X	X	X (*)	X	X (**)
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(34) in section 6.1.2, the following text is added after the last paragraph:

'In case of a specific case applicable to a component defined as interoperability constituent in section 5.3 of this TSI, the corresponding requirement can be part of the verification at interoperability constituent level only in the case where the component remains compliant to the chapters 4 and 5 of this TSI and where the specific case does not refer to a national rule (i.e. additional requirement compatible with the core TSI and fully specified in the TSI).

In other cases, the verification shall be made at subsystem level; when a national rule applies to a component, the concerned Member State may define relevant applicable conformity assessment procedures.'

(35) the section 6.1.2.1 is replaced as follows:

'6.1.2.1. *Running gear*

The demonstration of conformity for running dynamic behaviour is set out in EN 16235:2013.

Units equipped with an established running gear as described in chapter 6 of EN 16235:2013 are presumed to be in conformity with the relevant requirement provided that the running gears are operated within their established area of use.

The assessment of the bogie frame strength shall be based on clause 6.2 of EN 13749:2011.'

(36) in section 6.1.2.2, the last paragraph is replaced as follows:

'A verification procedure shall exist to ensure at the assembly phase that no defects may detrimentally affect safety due to any change in the mechanical characteristics of the fitted parts of the axle. This procedure shall contain the determination of the interference values and, in case of press-fitted wheelsets, the corresponding press-fitting diagram.'

(37) in section 6.1.2.5, four instances of text ‘ERA/TD/2013-02/INT version 2.0 of XX.XX.2014’ are replaced by the text ‘ERA/TD/2013-02/INT version 3.0 of 27.11.2015’;

(38) a new section 6.1.2.6 is added below the section 6.1.2.5:

‘6.1.2.6. Automatic variable gauge system

The assessment procedure shall be based on a validation plan covering all aspects mentioned in points 4.2.3.6.6 and 5.3.4b.

The validation plan shall be consistent with the safety analysis required in clause 4.2.3.6.6 and shall define the assessment needed in all the following different phases:

- Design review
- Static tests (bench tests and integration-in-the-wheelset/unit tests)
- Test on track gauge changeover facility(ies), representative of in-service conditions
- On-track tests, representative of in-service conditions.

Regarding the demonstration of compliance to the safety level required in point 4.2.3.6.6, the assumptions considered for the safety analysis related to the unit the system is intended to be integrated in, and related to the mission profile of that unit, shall be clearly documented.

The automatic variable gauge system may be subject to an assessment of suitability for use (module CV). Before commencing in-service tests, a suitable module (CB or CH1) shall be used to certify the design of the interoperability constituent. The in-service tests shall be organised on request from the manufacturer, who must obtain an agreement from a railway undertaking for its contribution to such assessment.

The certificate delivered by the notified body in charge of the conformity assessment shall include both the conditions for use as per clause 5.3.4b and the type(s) and operating conditions of the track gauge changeover facility(ies) the automatic variable gauge system has been assessed for.;

(39) In section 6.2.2.1, the text ‘The demonstration of conformity shall be in accordance with Chapters 6 and 7 of EN 12663-2:2010.’ is replaced by ‘The demonstration of conformity shall be in accordance with chapters 6 and 7 of EN 12663-2:2010, or alternatively with chapter 9.2 of EN 12663-1:2010+A1:2014.’;

(40) section 6.2.2.2 is replaced as follows:

‘6.2.2.2. Safety against derailment running on twisted track

The demonstration of conformity shall be carried out in accordance with chapters 4, 5 and 6.1 of EN 14363:2016.’;

(41) section 6.2.2.3 is replaced as follows:

‘6.2.2.3. Running dynamic behaviour

On-track tests

The demonstration of conformity shall be carried out in accordance with chapters 4, 5 and 7 of EN 14363:2016.

For units operated on the 1 668 mm track gauge network, the evaluation of the estimated value for the guiding force normalized to the radius $R_m = 350$ m according to EN 14363:2016, clause 7.6.3.2.6 (2), shall be calculated according to the following formula:

$$Y_{a,nf,qst} = Y_{a,f,qst} - (11\,550 \text{ m}/R_m - 33) \text{ kN.}$$

The limit value of the quasi-static guiding force $Y_{j,a,qst}$ shall be 66 kN.

Values of cant deficiency can be adapted to 1 668 mm track gauge by multiplying the corresponding 1 435 mm parameter values by the following conversion factor: 1 733/1 500.

The combination of the highest equivalent conicity and speed for which the unit meets the stability criterion in chapters 4, 5 and 7 of EN 14363:2016 shall be recorded in the report.’;

(42) in section 6.2.2.4, following text is added below the text:

‘It is permitted to use other standards for the above demonstration of conformity where the EN standards do not cover the proposed technical solution; in that case the notified body shall verify that the alternative standards form part of a technically consistent set of standards applicable to the design, construction and testing of the bearings.

Only standards that are publicly available can be referred to in the demonstration required above.

In the case of bearings manufactured according to a design developed and already used to place products on the market before the entry into force of relevant TSIs applicable to those products, the applicant is allowed to deviate from the demonstration of conformity above and refer to design review and type examination performed for previous applications under comparable conditions instead; this demonstration shall be documented and is considered as providing the same level of proof as type examination according to module SB or design examination according to module SH1.’;

(43) a new section 6.2.2.4a is added below section 6.2.2.4:

‘6.2.2.4a. Automatic variable gauge systems

The safety analysis required in point 4.2.3.6.6, and performed at IC level, shall be consolidated at the level of the unit; in particular, the assumptions made in accordance with point 6.1.2.6 may need to be reviewed to take into account the unit and its mission profile.’;

(44) in section 6.2.2.5, the text ‘for bogie units: Figure 18 of Annex H of Annex I of UIC leaflet 430-1:2012.’ is replaced by ‘for bogie units: Figure 18 of Annex H and Figures 19 and 20 of Annex I of UIC leaflet 430-1:2012.’;

(45) in section 6.2.2.8.1, the text ‘EN 1363-1:1999’ is replaced by ‘EN 1363-1:2012’;

(46) in section 6.2.2.8.2, the text: ‘Testing of the materials ignitability and flame spread properties shall be performed in accordance with ISO 5658-2:2006/Am1:2011 for which the limit value shall be $CFE \geq 18 \text{ kW/m}^2$. For the following materials and components the fire safety requirements are deemed to comply with the required ignitability and flame spread properties:’ is replaced by ‘Testing of the materials ignitability and flame spread properties shall be performed in accordance with ISO 5658-2:2006/Am1:2011 for which the limit value shall be $CFE \geq 18 \text{ kW/m}^2$.

For rubber parts of bogies, the testing shall be performed in accordance with ISO 5660-1:2015 for which the limit value shall be $MARHE \leq 90 \text{ kW/m}^2$ under the test conditions specified in reference T03.02 of Table 6 of EN 45545-2:2013+A1:2015.

For the following materials and components the fire safety requirements are deemed to comply with the required ignitability and flame spread properties:

— Wheelsets, coated or uncoated,;

(47) in section 6.2.2.8.3, the text ‘EN 50355:2003’ is replaced by ‘EN 50355:2013’;

(48) in section 6.2.2.8.3, the text ‘EN 50343:2003’ is replaced by ‘EN 50343:2014’;

(49) the section 7.1 is replaced as follows:

‘7.1. Authorisation for placing on the market

This TSI is applicable to the subsystem “rolling stock — freight wagons” within the scope set out in its Sections 1.1, 1.2 and 2.1, which are placed on the market after the date of application of this TSI.

This TSI is also applicable on a voluntary basis to:

- units referred to in section 2.1 point (a) in transport (running) configuration, in case they correspond to a “unit” as defined in this TSI, and
- units as defined in section 2.1 point (c), in case they are in empty configuration.

In case the applicant chooses to apply this TSI, the corresponding EC declaration of verification shall be recognised as such by Member States.’

(50) the section 7.1.2 is replaced as follows:

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

In accordance with Article 21(3)(b) of Directive (EU) 2016/797 the authorisation for placing of the market of a vehicle (as defined in this TSI) is granted on the basis of:

- in accordance with point (a) of Article 21(3): the “EC” declaration of verification as provided for in Article 15 of the same directive, and
- in accordance with (d) of Article 21(3): evidence of the technical compatibility of the unit with the network in the area of use covering the EU network.

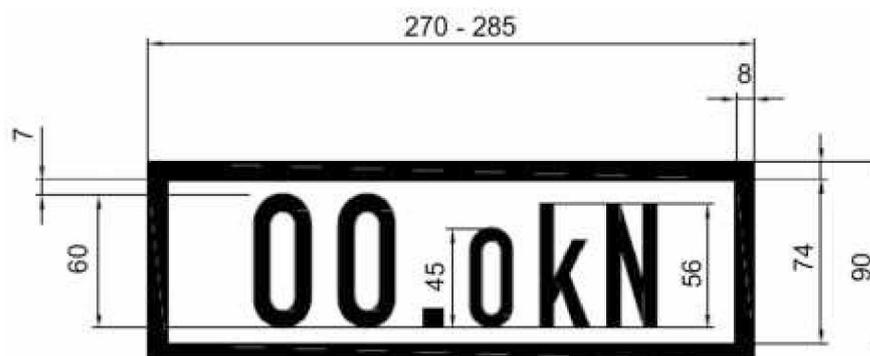
Points (b) and (c) of Article 21(3) of Directive (EU) 2016/797 do not represent any additional requirement. The technical compatibility of the vehicle with the network being covered by rules (TSIs or national rules), this aspect is also considered at the level of the “EC” verification.

Therefore, the conditions for having an area of use not limited to particular national networks are specified below as additional requirements to be covered in the EC verification of the subsystem rolling stock. These conditions shall be seen as complementary to the requirements in Section 4.2 and must be fulfilled in their entirety:

- (a) The unit must be equipped with forged and rolled wheels assessed according to point 6.1.2.3(a).
- (b) The compliance/non-compliance with the requirements regarding the axle bearing condition monitoring by line side equipment as set out in point 7.3.2.2.(a) must be recorded in the technical file.
- (c) The reference profile established for the unit as per point 4.2.3.1 must be allocated to one of the target reference profile(s) G1, GA, GB and GC including those used for the lower part GI1 and GI2.
- (d) The unit must be compatible with the train detection systems based on track circuits, on axle counters and on loop equipment as specified in clauses 4.2.3.3(a), 4.2.3.3(b) and 4.2.3.3(c).
- (e) The unit must be equipped with the manual coupling system in accordance with the prescriptions set out in Appendix C, Section 1, including the fulfilment of Section 8 or with any semi-automatic or automatic standardised coupling system.
- (f) The brake system must be in accordance with the conditions of Appendix C, Sections 9, 14 and 15 when applying the reference case set out in point 4.2.4.2.
- (g) The unit must be marked with all applicable markings in accordance with EN 15877-1:2012, except the marking defined in its clause 4.5.25(b).
- (h) The parking brake force shall be marked as set out in Figure 1, 30 mm below the marking defined in clause 4.5.3 of EN 15877-1:

Figure 1

Marking of the parking brake force



When an international agreement to which the European Union is party provides for reciprocal legal provisions, units which have been authorised to operate according to said international agreement and comply with all requirements set out in section 4.2 and in this point 7.1.2 shall be deemed as authorised for placing on the market in the Member States of the European Union.;

(51) section 7.2 is replaced as follows:

7.2 General rules for implementation

7.2.1 Substitution of constituents

This section deals with substitutions of constituents as referred to in Article 2 of Directive (EU) 2016/797.

The following categories have to be considered:

Certified ICs: Components which correspond to an IC in Chapter 5 and which are holding a certificate of conformity.

Other components: Any component, which is not corresponding to an IC in Chapter 5.

Non-certified ICs: Components which correspond to an IC in Chapter 5 but are not holding a certificate of conformity and which are produced before the expiry of the transitional period referred to in Section 6.3.

Table 11 shows the possible permutations.

Table 11

Substitution permutation table

	... substituted by ...		
	... certified ICs	... other components	... non-certified ICs
Certified ICs ...	Check	not possible	check
Other components ...	not possible	check	not possible
Non-certified ICs ...	Check	not possible	check

The word “check” in Table 11 means that the entity in charge of maintenance (ECM) may under its responsibility substitute a component by another one utilising the same function and at least the same performance in accordance with the relevant TSI requirements considering that these components are:

- suitable, i.e. conform to the relevant TSI(s),
- used within its area of use,
- enabling interoperability,
- meeting the essential requirements, and
- in line with restrictions stated in the technical file.

7.2.2 Changes to an existing unit or to an existing unit type

7.2.2.1 Introduction

This point 7.2.2 defines the principles to be applied by the entities managing the change and authorising entities in line with the EC verification procedure described in Article 15(9), Article 21(12) and Annex IV of Directive (EU) 2016/797. This procedure is further developed in Article 13, 15 and 16 of Commission Implementing Regulation (EU) 2018/545 (*) and in Commission Decision 2010/713/EC (**).

This point 7.2.2 applies in case of any change(s) to an existing unit or unit type, including renewal or upgrade. It does not apply in case of changes:

- that do not introduce a deviation from the technical files accompanying the EC declarations for verification for the subsystems, if any, and
- that do not have an impact on basic parameters not covered by the EC declaration, if any.

The holder of the vehicle type authorisation shall provide, under reasonable conditions, the information necessary for assessing the changes to the entity managing the change.

7.2.2.2 Rules to manage changes in both a unit or a unit type

Parts and basic parameters of the unit that are not affected by the change(s) are exempt from conformity assessment against the provisions in this TSI.

Without prejudice to clause 7.2.2.3, compliance with the requirements of this TSI or the TSI Noise (Commission Regulation (EU) No 1304/2014 (***) , see clause 7.2 of that TSI) shall only be needed for the basic parameters in this TSI which may be affected by the change(s).

In accordance with Articles 15 and 16 of Commission Implementing Regulation (EU) 2018/545 and Decision 2010/713/EU and by application of modules SB, SD/SF or SH1 for the EC verification, and if relevant in accordance with Article 15(5) of Directive (EU) 2016/797, the entity managing the change shall inform a notified body of all changes affecting the conformity of the subsystem with requirements of the relevant TSI(s) requiring new checks by a notified body. This information shall be provided by the entity managing the change with corresponding references to the technical documentation relating to the existing EC type or design examination certificate.

Without prejudice of the general safety judgement mandated in article 21(12)(b) of Directive (EU) 2016/797, in case of changes requiring reassessment of the safety requirements set out in clauses 4.2.4.2 for the brake system, a new authorization for placing on the market will be required unless one of the following conditions are met:

- The brake system fulfils the conditions of C.9 and C.14 of Appendix C after change or,
- Both the original and changed brake systems fulfil the safety requirements set out in clause 4.2.4.2.

National migration strategies related to the implementation of other TSIs (e.g. TSIs covering fixed installations) shall be taken into account when defining to what extent the TSIs covering rolling stock needs to be applied.

The basic design characteristics of the rolling stock are defined in Table 11a. Based on these tables and on the safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797, the changes shall be categorised as follows:

- 15(1)(c) of Commission Implementing Regulation (EU) 2018/545 if they are above the thresholds set out in column 3 and below thresholds set out in column 4 unless the safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797 requires to categorise them as 15(1)(d), or
- 15(1)(d) of Commission Implementing Regulation (EU) 2018/545 if they are above the thresholds set out in column 4 or if the safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797 requires to categorise them as 15(1)(d).

The determination whether the changes are beyond or above the thresholds mentioned above shall be done in reference to the values of the parameters at the time of the last authorisation of the rolling stock or rolling stock type.

Changes not referred to in the paragraph above are deemed not to have any impact on the basic design characteristics and will be categorised as 15(1)(a) or 15(1)(b) of Commission Implementing Regulation (EU) 2018/545, unless the safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797 requires to categorise them as 15(1)(d).

The safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797 shall cover all changes concerning basic parameters of table 1, related to all the essential requirements, in particular the requirements “Safety” and “Technical compatibility”.

Without prejudice to clause 7.2.2.3, all changes shall remain compliant with the applicable TSIs regardless their classification.

The replacement of a whole element within a rake of permanently connected elements after a severe damage does not require a conformity assessment against this TSI, as long as the element is identical to the one it replaces. Such element must be traceable and certified in accordance with any national or international rule, or any code of practice widely acknowledged in the railway domain.

Table 11a

Basic design characteristics related to basic parameters set out in the WAG TSI

1. TSI clause	2. Related basic design characteristic(s)	3. Changes impacting the basic design characteristic and not classified as 21(12)(a) of Directive (EU) 2016/797	4. Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.2.1.1 End coupling	Type of end coupling	Change of end coupler type	N/A
4.2.3.1 Gauging	Reference profile	N/A	Change of reference profile the vehicle is conform to
	Minimum vertical convex curve radius capability	Change in minimum vertical convex curve radius capability the unit is compatible with of more than 10 %	N/A
	Minimum vertical concave curve radius capability	Change in minimum vertical concave curve radius capability the unit is compatible with of more than 10 %	N/A
4.2.3.2. Compatibility with load carrying capacity of lines	Permissible payload for different line categories	Change (!) of any of the vertical loading characteristics resulting in a change of the line category (ies) the wagon is compatible with	N/A
4.2.3.3 Compatibility with train detection systems	Compatibility with train detection systems	N/A	Change of declared compatibility with one or more of the three train detection systems: Track circuits Axle counters Loop equipment
4.2.3.4 Axle bearing condition monitoring	On-board detection system	N/A	Fitting/Removal of on-board detection system

1. TSI clause	2. Related basic design characteristic(s)	3. Changes impacting the basic design characteristic and not classified as 21(12)(a) of Directive (EU) 2016/797	4. Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.3.5 Running safety	Combination of maximum speed and maximum cant deficiency for which the unit was assessed	N/A	Increase in maximum speed of more than 15 km/h or change of more than $\pm 10\%$ in maximum admissible cant deficiency
	Rail inclination	N/A	Change of rail inclination the vehicle is conform to ⁽²⁾
4.2.3.6.2 Characteristics of wheelsets	Wheelset gauge	N/A	Change of track gauge the wheelset is compatible with
4.2.3.6.3 Characteristics of wheels	Minimum required in-service wheel diameter	Change of minimum required in-service diameter of more than 10 mm	N/A
4.2.3.6.6 Automatic variable gauge systems	Wheelset gauge changeover facility	Change in the unit leading to a change in the changeover facility(ies) the wheelset is compatible with	Change of track gauge(s) the wheelset is compatible with
4.2.4.3.2.1 Service brake	Stopping distance	Change of stopping distance of more than $\pm 10\%$ Note: Brake weight percentage (also called "lambda" or "braked mass percentage") or braked mass may also be used, and can be derived (directly or via stopping distance) from deceleration profiles by a calculation. The allowed change is the same ($\pm 10\%$)	N/A
	Maximum deceleration for the load condition 'maximum speed under normal payload at the maximum design speed	Change of more than $\pm 10\%$ on the maximum average brake deceleration	N/A
4.2.4.3.2.2 Parking brake	Parking brake	Parking brake function installed/removed	N/A
4.2.4.3.3 Thermal capacity	Thermal capacity expressed in terms of Speed Gradient Brake distance	N/A	New reference case declared
4.2.4.3.4 Wheel slide protection (WSP)	Wheel slide protection	N/A	Fitting/removal of WSP function

1. TSI clause	2. Related basic design characteristic(s)	3. Changes impacting the basic design characteristic and not classified as 21(12)(a) of Directive (EU) 2016/797	4. Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.5 Environmental conditions	Temperature range	Change of temperature range (T1, T2, T3)	N/A
	Snow, ice and hail conditions	Change of the selected range "snow, ice and hail" (nominal or severe)	N/A

(1) Change of the loading characteristics is not to be re-assessed in operation (loading/unloading of the wagon)

(2) The rolling stock fulfilling one of the following conditions are deemed to be compatible with all rail inclinations:

- Rolling stock assessed according to EN 14363:2016
- Rolling stock assessed according to EN 14363:2005 (amended or not amended by ERA/TD/2012-17/INT) or UIC 518:2009 with the result, that there is no restriction to one rail inclination
- vehicles assessed according to EN 14363:2005 (amended or not amended by ERA/TD/2012-17/INT) or UIC 518:2009 with the result, that there is a restriction to one rail inclination and a new assessment of the wheel-rail-contact test conditions based on real wheel- and rail profiles and measured track gauge show compliance with the requirements on wheel-rail-contact conditions of EN 14363:2016

In order to establish the EC type or design examination certificate, the notified body selected by the entity managing the change is permitted to refer to:

The original EC type or design examination certificate for parts of the design that are unchanged or those that are changed but do not affect the conformity of the subsystem, as far as it is still valid (during 10 years phase B period).

Additional EC type or design examination certificate (amending the original certificate) for modified parts of the design that affect the conformity of the subsystem with the latest revision of this TSI in force at that time.

In any case, the entity managing the change shall ensure that the technical documentation which is relating to the EC type or design examination certificate is updated accordingly.

The updated technical documentation, related to the EC type or design examination certificate is referred to in the technical file accompanying the EC declaration of verification issued by the entity managing the change for rolling stock declared as conformant to the modified type.

7.2.2.3 Particular rules for existing units not covered by an EC declaration of verification with a first authorisation for placing in service before 1 January 2015

The following rules apply, in addition to clause 7.1.2.2, to existing units with a first authorisation for placing in service before 1 January 2015, where the scope of the change has an impact on basic parameters not covered by the EC declaration

The compliance with technical requirements of this TSI is deemed established when a basic parameter is improved in the direction of the TSI defined performance and the entity managing the change demonstrates that the corresponding essential requirements are met and the safety level is maintained and, where reasonably practicable, improved. The entity managing the change shall in this case justify the reasons for which the TSI defined performance was not met, taking into account migration strategies of other TSIs as stated in section 7.2.2.2. This justification shall be in the technical file, if any, or in the original technical documentation of the unit.

The particular rule set out in the above paragraph is not applicable in changes impacting the basic design characteristics and classified as 21(12)a set out in table 11b. For those changes, compliance with the TSI requirements is mandatory.

Table 11b

Changes to basic parameters for which compliance with TSI requirements is mandatory for rolling stock not holding an EC type or design examination certificate

TSI clause	Related basic design characteristic(s)	Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.3.1 Gauging	Reference profile	Change of reference profile the unit is conform to
4.2.3.3 Compatibility with train detection systems	Compatibility with train detection systems	Change of declared compatibility with one or more of the three train detection systems: Track circuits Axle counters Loop equipment
4.2.3.4 Axle bearing condition monitoring	On-board detection system	Fitting/Removal of on-board detection system
4.2.3.6.2 Characteristics of wheelsets	Wheelset gauge	Change of track gauge the wheelset is compatible with
4.2.3.6.6 Automatic variable gauge systems	Wheelset gauge changeover facility	Change of track gauge(s) the wheelset is compatible with

7.2.3 Rules related to the EC type or design examination certificates

7.2.3.1 Rolling stock subsystem

This point concerns a rolling stock type (unit type in the context of this TSI), as defined in Article 2(26) of Directive (EU) 2016/797, which is subject to an EC type or design verification procedure in accordance with section 6.2 of this TSI. It also applies to the EC type or design verification procedure in accordance with the TSI Noise, which refers to this TSI for its scope of application to freight units.

The TSI assessment basis for an EC type or design examination is defined in columns “Design review” and “Type test” of Appendix F of this TSI and of Appendix C of the TSI Noise.

7.2.3.1.1 Phase A

Phase A starts once a notified body, which is responsible for EC verification, is appointed by the applicant and ends when the EC type or design examination certificate is issued.

The TSI assessment basis for a type is defined for a phase A period, with a duration of maximum four years. During the phase A period the assessment basis for EC verification to be used by the notified body will not change.

When a revision of this TSI or of the TSI Noise comes into force during the phase A period, it is permissible (but not mandatory) to use the revised version(s), either totally or for particular sections, unless explicitly otherwise specified in the revision of these TSIs. In case of application limited to particular sections, the applicant has to justify and document that applicable requirements remain consistent, and this has to be approved by the notified body.

7.2.3.1.2 Phase B

The phase B period defines the period of validity of the EC type or design examination certificate once it is issued by the notified body. During this time, units may be EC certified on the basis of conformity to type.

The EC type or design examination certificate of EC verification for the subsystem is valid for a ten-year phase B period after its issue date, even if a revision of this TSI or of the TSI Noise come into force, unless explicitly otherwise specified in the revision of these TSIs. During this period of validity, new rolling stock of the same type is permitted to be placed on the market on the basis of an EC declaration of verification referring to the type certificate of verification.

The updated technical documentation related to the EC type or design examination certificate is referred to in the technical file accompanying the EC declaration of verification issued by the applicant for rolling stock declared as conformant to the modified type.

7.2.3.2 Interoperability constituents

This point concerns interoperability constituents which are subject to EC type examination (module CB), design examination (module CH1) or to suitability for use (module CV) in accordance with section 6.1 of this TSI.

The EC type or design examination or suitability for use certificate is valid for a ten-year period. During this time, new constituents of the same type are permitted to be placed on the market without a new type assessment, unless explicitly otherwise specified in the revision of this TSI. Before the end of the ten-year period, the constituent shall be assessed according to the latest revision of this TSI in force at that time, for those requirements that have changed or are new in comparison to the certification basis.

(*) Commission Implementing Regulation (EU) 2018/545 of 4 April 2018 establishing practical arrangements for the railway vehicle authorisation and railway vehicle type authorisation process pursuant to Directive (EU) 2016/797 of the European Parliament and of the Council (OJ L 90, 6.4.2018, p. 66).

(**) Commission Decision 2010/713/EU of 9 November 2010 on modules for the procedures for assessment of conformity, suitability for use and EC verification to be used in the technical specifications for interoperability adopted under Directive 2008/57/EC of the European Parliament and of the Council (OJ L 319, 4.12.2010, p. 1).

(***) Commission Regulation (EU) No 1304/2014 of 26 November 2014 on the technical specification for interoperability relating to the subsystem 'rolling stock — noise' amending Decision 2008/232/EC and repealing Decision 2011/229/EU (OJ L 356, 12.12.2014, p. 421).;

(52) in section 7.2.2.2, a new footnote '(¹) OJ L 356, 12.12.2014, p. 421.' is added in the same page as text 'Commission Regulation (EU) No 1304/2014 (¹)';

(53) section 7.3.1 is replaced as follows:

'The specific cases, as listed in point 7.3.2, are classified as:

— "P" cases: "permanent" cases.

— "T" cases: "temporary" cases, where the target system shall be reached by 31 December 2025.

All specific cases and their relevant dates shall be re-examined in the course of future revisions of the TSI with a view to limiting their technical and geographical scope based on an assessment of their impact on safety, interoperability, cross border services, TEN-T corridors, and the practical and economic impacts of retaining or eliminating them. Special account shall be given to availability of EU funding.

Specific cases shall be limited to the route or network where they are strictly necessary and taken account of through route compatibility procedures.

In case of a specific case applicable to a component defined as interoperability constituent in section 5.3 of this TSI, the conformity assessment has to be performed according to point 6.1.2.;

(54) section 7.3.2.1a. is added:

'7.3.2.1a Gauging (point 4.2.3.1)

Specific case Ireland and UK for Northern Ireland

("P") It is permissible for the reference profile of the upper and the lower part of the unit to be established in accordance with the national technical rules notified for this purpose.

This specific case does not prevent access of any TSI compliant rolling stock as long as it is also compatible with an IRL gauge (track gauge system 1 600 mm).;

(55) in section 7.3.2.2, the following text is deleted:

'(b) Specific case Portugal'

("P") Units intended to operate on the Portuguese railway network shall be compliant with the target and prohibitive zones as set out in table 13.

Table 13

Target and prohibitive zone for units intended to be operated in Portugal

	Y _{TA} [mm]	W _{TA} [mm]	L _{TA} [mm]	Y _{PZ} [mm]	W _{PZ} [mm]	L _{PZ} [mm]
Portugal	1 000	≥ 65	≥ 100	1 000	≥ 115	≥ 500'

(56) in section 7.3.2.3, the text 'EN 14363:2005 point 4.1.3.4.1' is replaced by 'EN 14363:2016 clause 6.1.5.3.1';

(57) in section 7.3.2.3, the following text is added below the text:

'This specific case does not prevent the access of TSI compliant rolling stock to the national network.';

(58) section 7.3.2.4, 'Running dynamic behaviour (point 4.2.3.5.2)' is replaced by:

'Specific case UK for Great Britain'

("P") Base condition for use of simplified measuring method specified in EN 14363:2016 clause 7.2.2 should be extended to nominal static vertical wheelset forces (PF0) up to 250 kN. For technical compatibility with the existing network it is permissible to use national technical rules amending EN 14363:2016 and notified for the purpose of running dynamic behaviour.

This specific case does not prevent the access of TSI compliant rolling stock to the national network.

Specific case Ireland and UK for Northern Ireland

("P") For technical compatibility with the existing 1 600 mm track gauge network it is permissible to use notified national technical rules for the purpose of assessing running dynamic behaviour.

This specific case does not prevent the access of TSI compliant rolling stock to the national network.';

(59) section 7.3.2.5, 'Characteristics of wheelsets (points 4.2.3.6.2)' is replaced by:

'7.3.2.5 Characteristics of wheelsets, wheels and axles (points 4.2.3.6.2 and 4.3.2.6.3)

Specific case UK for Great Britain

("P") For units intended to operate solely on the railway network of Great Britain the characteristics of the wheelsets, wheels and axles may be in accordance with the national technical rules notified for this purpose.

This specific case does not prevent the access of TSI compliant rolling stock to the national network.';

(60) section 7.3.2.6, 'Characteristics of wheels (point 4.2.3.6.3)' is deleted;

(61) section 7.3.2.7 is re-numbered 7.3.2.6. The text of the section is replaced by:

'Attachment devices for rear end signals (point 4.2.6.3)

Specific case Ireland and UK for Northern Ireland

("P") The attachment devices for rear-end signals on units intended to be operated only in traffic on networks with 1 600 mm track gauge shall conform with the national rules notified for the purpose.

This specific case does not prevent the access of TSI compliant rolling stock to the national network.'

(62) section 7.3.2.7 is added:

‘7.3.2.7. Rules to manage changes in both rolling stock and rolling stock type (7.2.2.2)

Specific case the United Kingdom (Great Britain)

“(P”) Any change to a vehicle swept envelope as defined in the national technical rules notified for the gauging process (for example as described in RIS-2773-RST) will be categorised as 15(1)(c) of Implementing Regulation (EU) 2018/545, and will not be classified as 21(12)(a) of Directive (EU) 2016/797.’

(63) A new section 7.6 is added as follows:

‘7.6. **Aspects that have to be considered in the revision process or in other activities of the Agency**

Further to the analysis performed during the drafting process of this TSI, particular aspects have been identified as of interest for the future development of the EU railway system.

These aspects are identified below.

7.6.1. *Rules for extension of area of use for existing rolling stock not covered by an EC declaration of verification*

Pursuant to Article 54(2) and (3) of Directive (EU) 2016/797, vehicles authorised for placing in service prior to 15 June 2016 shall receive an authorization for placing on the market according to Article 21 of Directive (EU) 2016/797 in order to operate on one or more networks which are not yet covered by their authorisation. Such vehicles shall thus be conform to this TSI or benefit from a non-application of this TSI pursuant to Article 7(1) of Directive 2016/797/EC.

In order to facilitate the free movement of vehicles, provisions shall be developed to set out which level of flexibility could be granted to such vehicles as well as to vehicles which were not subject to authorization, as regards compliance with the TSI requirements while fulfilling the essential requirements, maintaining the appropriate safety level, and where reasonably practicable, improving it.’;

(64) In Appendix A, the complete text is replaced by ‘Not used’;

(65) In Appendix C, condition C.1 ‘Manual coupling system’, the text ‘The clearance for the draw hook shall be in accordance with chapter 2 of ERA technical document ERA/TD/2012-04/INT version 1.2 of 18.1.2013 published on the Agency website (<http://www.era.europa.eu>).’ is replaced by ‘The clearance for the draw hook shall be in accordance with clause 6.3.2 of EN 16116-2:2013.’;

(66) In Appendix C, condition C.1 ‘Manual coupling system’, the text ‘The space for shunting staff operation shall be in accordance with chapter 3 of ERA technical document ERA/TD/2012-04/INT version 1.2 of 18.1.2013 published on the Agency website (<http://www.era.europa.eu>).’ is replaced by ‘The space for shunting staff operation shall be in accordance with clause 6.2.1 of EN 16116- 2:2013. For manual coupling systems equipped with 550 mm wide buffers the calculation of the free space may be done considering that the coupling gear components are lateral centrally positioned (D = 0 mm as defined in Annex A of EN 16116-2:2013).’;

(67) In Appendix C, condition C.2 ‘**UIC footsteps and handrails**’ is replaced as follows:

‘2. **UIC footsteps and handrails**

The unit shall be equipped with footsteps and handrails in accordance with chapters 4 and 5 of EN 16116-2:2013 and with clearances in accordance with clause 6.2.2 of EN 16116-2:2013.’;

(68) In Appendix C, condition C.5 ‘**Marking of units**’, the following text is deleted:

‘Markings of EN 15877-1:2012 are required where applicable. The following are always applicable:

- 4.5.2 Gauge marking
- 4.5.3 Vehicle Tare Weight
- 4.5.4 Vehicle load table
- 4.5.5 Sign for length over buffers

- 4.5.12 Table of Maintenance dates
- 4.5.14 Lifting and re-railing signs
- 4.5.23 Distances between end axles and bogie centres
- 4.5.29 Brake weight.;

- (69) In Appendix C, condition C.6 '**G1 gauge**', the text 'GIC1' is replaced by 'GI1';
- (70) In Appendix C, condition C.8 '**Tests concerning longitudinal compressive forces**', the text 'EN 15839:2012' is replaced by 'EN 15839:2012+A1:2015';
- (71) In Appendix C, condition C.9 '**UIC brake**', the text 'UIC 540:2006' is replaced by the text 'UIC 540:2014' in points (c) and (e);
- (72) In Appendix C, condition C.9 '**UIC brake**', the text '(i) The pneumatic half coupling' is replaced by '(i) The pneumatic half coupling and its hose';
- (73) In Appendix C, condition C.9 '**UIC brake**', the text '(k) Brake block holders shall be in accordance with UIC leaflet 542:2010' is replaced by '(k) Brake block holders shall be in accordance with UIC 542:2015';
- (74) In Appendix C, condition C.9 '**UIC brake**', the point (m) is replaced as follows:
- '(m) Slack adjusters shall be in accordance with chapters 4 and 5 of EN 16241:2014. The assessment of conformity shall be carried out in accordance with clauses 6.3.2 to 6.3.5 of EN 16241:2014. Additionally, a life test shall be performed to demonstrate the suitability of the slack adjuster for service on the unit and to verify the maintenance requirements for the operational design life. This shall be carried out at the maximum rated load cycling through the full range of adjustment.';
- (75) In Appendix C, condition C.9 '**UIC brake**', the text 'UIC 544-1:2013' in row 'Braking mode 'G' of Table C.3 is replaced by the text 'UIC 544-1:2014';
- (76) In Appendix C, condition C.9 '**UIC brake**', the text 'EN 14531-1:2005 section 5.11' of the footnote (1) of Table C.3 is replaced by the text 'EN 14531-1:2015 section 4';
- (77) In Appendix C, condition C.11 '**Temperature ranges for air reservoirs, hoses and grease**' is replaced as follows condition:

'11. Temperature ranges for air reservoirs, hoses and grease

The following requirements are deemed to comply with any temperature range indicated in point 4.2.5:

- Air reservoirs shall be designed for the temperature range of – 40 °C to + 70 °C.
- Brake cylinders and brake couplings shall be designed for the temperature range of – 40 °C to + 70 °C.
- Hoses for air brakes and air supply shall be specified for the temperature range of – 40 °C to + 70 °C.

The following requirement is deemed to comply with the range T1 indicated in point 4.2.5:

- The grease for the lubrication of roller bearing shall be specified for ambient temperatures down to – 20 °C.;

- (78) In Appendix C, condition C.12 '**Welding**' is replaced as follows condition:

'Welding shall be carried out in accordance with EN 15085-1:2007+A1:2013, EN 15085-2:2007, EN 15085-3:2007, EN 15085-4:2007 and EN 15085-5:2007.';

- (79) In Appendix C, the following text is added below the text in condition C.16 '**Tow hooks**':

'Alternative technical solutions are allowed as far as conditions 1.4.2 to 1.4.9 of UIC 535-2:2006 are respected. If the alternative solution is a cable eye bracket, it shall in addition have a minimum diameter of 85 mm.';

(80) In Appendix C, the following condition C.19 is added:

'19. Axle bearing condition monitoring

It shall be possible to monitor the axle bearing condition of the unit by means of line side detection equipment.;

(81) Appendix D is replaced as follows:

'Appendix D

Mandatory standards or normative documents referred to in this TSI

TSI		Standard/document	
Characteristics to be assessed		References to Standard or document	Clauses
Structure and mechanical part	4.2.2		
Strength of unit	4.2.2.2	EN 12663-2:2010	5
		EN 15877-1:2012	4.5.14
	6.2.2.1	EN 12663-1:2010+A1:2014	9.2
		EN 12663-2:2010	6, 7
Gauging and track interaction	4.2.3		
Gauging	4.2.3.1	EN 15273-2:2013	all
Compatibility with load carrying capacity of lines	4.2.3.2	EN 15528:2015	6.1, 6.2
Compatibility with train detection systems	4.2.3.3	ERA/ERTMS/033281 rev. 4.0	See table 7 of this TSI
Axle bearing condition monitoring	4.2.3.4	EN 15437-1:2009	5.1, 5.2
Safety against derailment running on twisted track	4.2.3.5.1	—	—
	6.2.2.2	EN 14363:2016	4, 5, 6.1
Running dynamic behaviour	4.2.3.5.2	EN 14363:2016	4, 5, 7
	6.1.2.1	EN 14363:2016	4, 5, 7
	6.2.2.3	EN 16235:2013	all
	6.1.2.1	EN 13749:2011	6.2
Structural design of bogie frame	4.2.3.6.1	EN 13749:2011	6.2
	6.1.2.1	EN 13749:2011	6.2
Characteristics of wheelsets	4.2.3.6.2	—	—
	6.1.2.2	EN 13260:2009+A1:2010	3.2.1

TSI		Standard/document	
Characteristics to be assessed		References to Standard or document	Clauses
Characteristics of wheels	4.2.3.6.3	—	—
	6.1.2.3	EN 13979-1:2003+A1:2009 +A2:2011	7, 6.2
Characteristics of axles	4.2.3.6.4	—	—
	6.1.2.4	EN 13103:2009 + A2:2012	4, 5, 6, 7
Axle boxes/bearings	4.2.3.6.5	—	—
	6.2.2.4	EN 12082:2007+A1:2010	6
Running gear for manual change of wheelsets	4.2.3.6.7	—	—
	6.2.2.5	UIC leaflet 430-1:2012	Annexes B, H, I
		UIC 430-3:1995	Annex 7
Brake	4.2.4		
Service brake	4.2.4.3.2.1	EN 14531-6:2009	all
		UIC 544-1:2014	all
Parking brake	4.2.4.3.2.2	EN 14531-6:2009	6
Friction element for wheel tread brakes	4.2.4.3.5	—	—
	6.1.2.5	ERA technical document ERA/TD/2013-02/INT Version 3.0 of 27.11.2015	All
Environmental conditions	4.2.5		
Environmental conditions	4.2.5	EN 50125-1:2014	4.7
	6.2.2.7	—	—
System protection	4.2.6		
Barriers	4.2.6.1.2.1	—	—
	6.2.2.8.1	EN 1363-1:2012	all
Materials	4.2.6.1.2.2	—	—
	6.2.2.8.2	ISO 5658- 2:2006/Am1:2011	all
		EN 13501-1:2007+A1:2009	all
		EN 45545-2:2013+A1:2015	Table 6
ISO 5660-1:2015		all	

TSI		Standard/document	
Characteristics to be assessed		References to Standard or document	Clauses
Cables	6.2.2.8.3	EN 50355:2013	all
		EN 50343:2014	all
Flammable liquids	6.2.2.8.4	EN 45545-7:2013	all
Protective measures against indirect contact (protective bonding)	4.2.6.2. 1	EN 50153:2014	6.4
Protective measures against direct contact	4.2.6.2. 2	EN 50153:2014	5
Attachment devices for rear-end signal	4.2.6.3	EN 16116-2:2013	Figure 11

Standards or documents referred to in the additional optional conditions set out in Appendix C:

Additional optional conditions for units	App. C	Standard/UIC leaflet/document	
Manual coupling system	C.1	EN 15566:2009+A1:2010	all (except 4.4)
		EN 15551:2009+A1:2010	all
		EN 16116-2:2013	6.2.1, 6.3.2
		EN 15877-1:2012	Figure 75
UIC footsteps and handrails	C.2	EN 16116-2:2013	4, 5, 6.2.2
Ability to be hump shunted	C.3	EN 12663-2:2010	5, 8
Tests concerning longitudinal compressive forces	C.8	EN 15839:2012+A1:2015	all
UIC brake	C.9	EN 15355:2008+A1:2010	all
		EN 15611:2008+A1:2010	all
		UIC 540:2014	all
		EN 14531-1:2015	4
		EN 15624:2008+A1:2010	all
		EN 15625:2008+A1:2010	all
		EN 286-3:1994	all
		EN 286-4:1994	all
		EN 15807:2011	all
		EN 14601:2005+A1:2010	all
		UIC 544-1:2014	all
		UIC 542:2015	all
UIC 541-4:2010	all		

Additional optional conditions for units	App. C	Standard/UIC leaflet/document	
		EN 16241:2014	4, 5, 6.3.2 to 6.3.5
		EN 15595:2009+A1:2011	all
Welding	C.12	EN 15085-1:2007+A1:2013 EN 15085-2:2007 EN 15085-3:2007 EN 15085-4:2007 EN 15085-5:2007	all
Specific product properties concerning the wheel	C.15	EN 13262:2004 +A1:2008+A2:2011	all
		EN 13979-1:2003 +A1:2009+A2:2011	all
Tow hooks	C.16	UIC 535-2:2006	1.4
Protective devices on protruding parts	C.17	UIC 535-2:2006	1.3
Label holders and attachment devices for rear end signal	C.18	UIC 575:1995	1'

- (82) In Appendix E, the text 'The lamp shall display a luminous area of at least 170 mm diameter. The lamp shall display a luminous area of at least 170 mm diameter. The reflector system shall be designed to display a lighting strength of at least 15 candela of red light along the axis of the lighting surface for an angle of opening of 15° horizontally and 5° vertically. The intensity must be at least 7.5 candela of red light.' is replaced by 'The tail lamp shall be designed to display a lighting intensity in accordance with table 8 of EN 15153-1:2013+A1:2016';
- (83) In Appendix E, the text 'EN 15153-1:2013' is replaced by 'EN 15153-1:2013+A1:2016';
- (84) In Appendix F, the row 'Variable gauge wheelsets' of Table F.1 is replaced by:

'Automatic variable gauge system	4.2.3.6.6	X	X	X	6.1.2.6/6.2.2.4a'
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ANNEX II

The Annex to Commission Regulation (EU) No 1299/2014 is amended as follows:

(1) section 1.1 is replaced by the following:

‘1.1. Technical Scope

This TSI concerns the infrastructure subsystem and part of the maintenance subsystem of the Union rail system in accordance with Article 1 of Directive (EU) 2016/797.

The infrastructure and the maintenance subsystems are defined respectively in points 2.1 and 2.8 of Annex II to Directive (EU) 2016/797.

The technical scope of this TSI is further defined in Article 2(1), 2(5) and 2(6) of this Regulation.’;

(2) point (1) of section 1.3 is replaced by the following:

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

- (a) indicates its intended scope (section 2);
- (b) lays down essential requirements for the infrastructure and part of the maintenance subsystems (section 3);
- (c) establishes the functional and technical specifications to be met by the infrastructure and part of the maintenance subsystems and its interfaces vis-à-vis other subsystems (section 4);
- (d) specifies the interoperability constituents and interfaces which must be covered by European specifications, including European standards, which are necessary to achieve interoperability within the Union rail system (section 5);
- (e) states, in each case under consideration, which procedures are to be used in order to assess the conformity or the suitability for use of the interoperability constituents, on the one hand, or the EC verification of the subsystems, on the other hand (section 6);
- (f) indicates the strategy for implementing this TSI (section 7);
- (g) indicates, for the staff concerned, the professional qualifications and health and safety conditions at work required for the operation and maintenance of the infrastructure subsystem, as well as for the implementation of this TSI (section 4);
- (h) indicates the provisions applicable to the existing infrastructure subsystem, in particular in the event of upgrading and renewal and, in such cases, the modification work which requires an application for a new authorisation;
- (i) indicates the parameters of infrastructure subsystem to be checked by the railway undertaking and the procedures to be applied to check those parameters after the delivery of the vehicle authorisation for placing on the market and before the first use of the vehicle to ensure compatibility between vehicles and the routes on which they are to be operated.

In accordance with Article 4(5) of the Directive (EU) 2016/797, provisions for specific cases are indicated in section 7.’;

(3) section 2.1 is replaced by the following:

‘2.1. Definition of the infrastructure subsystem

This TSI covers:

- (a) the infrastructure structural subsystem
- (b) the part of the maintenance functional subsystem relating to the infrastructure subsystem (that is: washing plants for external cleaning of trains, water restocking, refuelling, fixed installations for toilet discharge and electrical shore supplies).

The elements of the infrastructure subsystem are described in point 2.1 of Annex II to Directive (EU) 2016/797.

The elements of the maintenance subsystem are described in point 2.8 of Annex II to Directive (EU) 2016/797.

The scope of this TSI therefore includes the following aspects of the infrastructure subsystem:

- (a) Line layout,
- (b) Track parameters,
- (c) Switches and crossings,
- (d) Track resistance to applied loads,
- (e) Structures resistance to traffic loads,
- (f) Immediate action limits on track geometry defects,
- (g) Platforms,
- (h) Health, safety and environment,
- (i) Provision for operation,
- (j) Fixed installations for servicing trains.

Further details are set out in point 4.2.2 of this TSI;

(4) in section 2.5, the reference to 'Directive 2004/49/EC' is replaced by the reference to 'Directive (EU) 2016/798';

(5) in section 3, the reference to 'Directive 2008/57/EC' is replaced by the reference to 'Directive (EU) 2016/797';

(6) Table 1 in section 3 is replaced by the following:

'Table 1

Basic Parameters of the infrastructure subsystem corresponding to the essential requirements

TSI point	Title of TSI point	Safety	Reliability Availability	Health	Environmental protection	Technical compatibility	Accessibility
4.2.3.1	Structure gauge	1.1.1, 2.1.1				1.5	
4.2.3.2	Distance between track centres	1.1.1, 2.1.1				1.5	
4.2.3.3	Maximum gradients	1.1.1				1.5	
4.2.3.4	Minimum radius of horizontal curve	1.1.3				1.5	
4.2.3.5	Minimum radius of vertical curve	1.1.3				1.5	
4.2.4.1	Nominal track gauge					1.5	
4.2.4.2	Cant	1.1.1, 2.1.1				1.5	1.6.1
4.2.4.3	Cant deficiency	1.1.1				1.5	

TSI point	Title of TSI point	Safety	Reliability Avail- ability	Health	Environ- mental protection	Technical compati- bility	Accessi- bility
4.2.4.4	Abrupt change of cant defi- ciency	2.1.1					
4.2.4.5	Equivalent conicity	1.1.1, 1.1.2				1.5	
4.2.4.6	Railhead profile for plain line	1.1.1, 1.1.2				1.5	
4.2.4.7	Rail inclination	1.1.1, 1.1.2				1.5	
4.2.5.1	Design geometry of switches and crossings	1.1.1, 1.1.2, 1.1.3				1.5	
4.2.5.2	Use of swing nose crossings	1.1.2, 1.1.3					
4.2.5.3	Maximum unguided length of fixed obtuse crossings	1.1.1, 1.1.2				1.5	
4.2.6.1	Track resistance to vertical loads	1.1.1, 1.1.2, 1.1.3				1.5	
4.2.6.2	Longitudinal track resistance	1.1.1, 1.1.2, 1.1.3				1.5	
4.2.6.3	Lateral track resistance	1.1.1, 1.1.2, 1.1.3				1.5	
4.2.7.1	Resistance of new bridges to traffic loads	1.1.1, 1.1.3				1.5	
4.2.7.2	Equivalent vertical loading for new earthworks and earth pressure effects imposed on new structures	1.1.1, 1.1.3				1.5	
4.2.7.3	Resistance of new structures over or adjacent to tracks	1.1.1, 1.1.3				1.5	
4.2.7.4	Resistance of existing bridges and earthworks to traffic loads	1.1.1, 1.1.3				1.5	
4.2.8.1	The immediate action limit for alignment	1.1.1, 1.1.2	1.2				
4.2.8.2	The immediate action limit for longitudinal level	1.1.1, 1.1.2	1.2				
4.2.8.3	The immediate action limit for track twist	1.1.1, 1.1.2	1.2				

TSI point	Title of TSI point	Safety	Reliability Avail- ability	Health	Environ- mental protection	Technical compati- bility	Accessi- bility
4.2.8.4	The immediate action limit of track gauge as isolated defect	1.1.1, 1.1.2	1.2				
4.2.8.5	The immediate action limit for cant	1.1.1, 1.1.2	1.2				
4.2.8.6	The immediate action limit for switches and crossings	1.1.1, 1.1.2	1.2			1.5	
4.2.9.1	Usable length of platforms	1.1.1, 2.1.1				1.5	
4.2.9.2	Platform height	1.1.1, 2.1.1				1.5	1.6.1
4.2.9.3	Platform offset	1.1.1, 2.1.1				1.5	1.6.1
4.2.9.4	Track layout alongside plat- forms	1.1.1, 2.1.1				1.5	1.6.1
4.2.10.1	Maximum pressure variations in tunnels	1.1.1, 2.1.1				1.5	
4.2.10.2	Effect of cross winds	1.1.1, 2.1.1	1.2			1.5	
4.2.10.3	Aerodynamic effect on bal- lasted track	1.1.1	1.2			1.5	
4.2.11.1	Location markers	1.1.1	1.2				
4.2.11.2	Equivalent conicity in service	1.1.1, 1.1.2				1.5	
4.2.12.2	Toilet discharge	1.1.5	1.2	1.3.1		1.5	
4.2.12.3	Train external cleaning facil- ities		1.2			1.5	
4.2.12.4	Water restocking	1.1.5	1.2	1.3.1		1.5	
4.2.12.5	Refuelling	1.1.5	1.2	1.3.1		1.5	
4.2.12.6	Electric shore supply	1.1.5	1.2			1.5	
4.4	Operating rules		1.2				
4.5	Maintenance rules		1.2				
4.6	Professional qualifications	1.1.5	1.2				
4.7	Health and safety conditions	1.1.5	1.2	1.3	1.4.1'		

(7) in point (1) of section 4.1, the reference to ‘Directive 2008/57/EC’ is replaced by the reference to ‘Directive (EU) 2016/797’;

(8) point (3) of section 4.1 is replaced by the following:

‘(3) The functional and technical specifications of the infrastructure and part of the maintenance subsystems and their interfaces, as described in points 4.2 and 4.3, do not impose the use of specific technologies or technical solutions, except where this is strictly necessary for the interoperability of the Union rail system.’;

(9) the title of section 4.2 is replaced by the following

‘4.2. Functional and technical specifications of the infrastructure subsystem’;

(10) points (1) to (3) of section 4.2.1 are replaced by the following:

‘(1) The elements of the Union’s rail network are set out in point 1 of Annex I to Directive (EU) 2016/797. In order to deliver interoperability cost-effectively, each element of the Union’s rail network shall be assigned a “TSI category of line”.

(2) The TSI category of line shall be a combination of traffic codes. For lines where only one type of traffic is carried (for example, a freight only line), a single code may be used to describe the performances; where mixed traffic runs the category will be described by one or more codes for passenger and freight. The combined traffic codes describe the envelope within which the desired mix of traffic can be accommodated.

(3) These TSI categories of line shall be used for the classification of existing lines to define a target system so that the relevant performance parameters will be met.’;

(11) in point (7) of section 4.2.1, note (*) of Table 3 is replaced by the following:

‘(*) Axle load is based on design mass in working order for power heads and locomotives as defined in point 2.1 of EN 15663:2009+AC:2010 and design mass under normal payload for other vehicles in accordance with point 6.3 of EN15663:2009+AC:2010.’;

(12) point (10) of section 4.2.1 is replaced by the following:

‘(10) In accordance with Article 4(7) of Directive (EU) 2016/797 which provides that TSIs shall not prevent the Member States from deciding on the use of infrastructures for the movement of vehicles not covered by the TSIs, it is allowed to design new and upgraded lines able to accommodate:

- gauges larger,
- axle loads higher,
- speeds greater,
- usable length of platform greater,
- trains longer

than those specified in Table 2 and Table 3.’;

(13) point (c) of point H in section 4.2.2.1 is replaced by the following:

‘(c) Aerodynamic effect on ballasted track (4.2.10.3)’;

(14) in point K of section 4.2.2.1 the following point is added:

‘(b) Maintenance plan (4.5.2).’;

(15) point (5) in section 4.2.4.2 is replaced by the following:

‘(5) Instead of point (1), for the 1 668 mm track gauge system, the design cant shall not exceed 185 mm.’;

(16) point (4) in section 4.2.4.4 is replaced by the following:

'(4) Instead of point (1), for the 1 668 mm track gauge system, the maximum design values of abrupt change of cant deficiency shall be:

- (a) 150 mm for $V \leq 45$ km/h
- (b) 115 mm for $45 \text{ km/h} < V \leq 100$ km/h,
- (c) $(399-V)/2.6$ [mm] for $100 \text{ km/h} < V \leq 220$ km/h,
- (d) 70 mm for $220 \text{ km/h} < V \leq 230$ km/h,
- (e) Abrupt change of cant deficiency is not allowed for speeds of more than 230 km/h.;

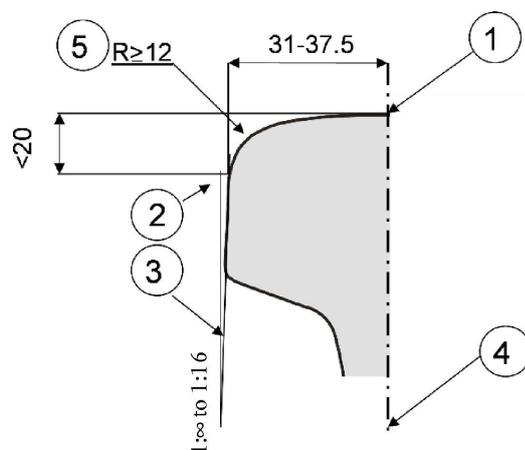
(17) point (3) in section 4.2.4.5 is replaced by the following:

'(3) Design track gauge, rail head profile and rail inclination for plain line shall be selected to ensure that the equivalent conicity limits set out in Table 10 are not exceeded.;

(18) figure 1 in section 4.2.4.6 is replaced by the following:

'Figure 1

Railhead profile



- 1 crown of rail
- 2 tangent point
- 3 lateral slope
- 4 vertical axis of rail head
- 5 gauge corner'

(19) point (2) in section 4.2.4.7.1 is replaced by the following:

'(2) For tracks intended to be operated at speeds greater than 60 km/h, the rail inclination for a given route shall be selected from the range $1/20$ to $1/40$.;

(20) point (2) in section 4.2.6.2.2 is replaced by the following:

'(2) Provisions for the use of eddy current braking systems on track shall be defined at operational level by the infrastructure manager on the basis of the specific characteristics of the track, including switches and crossings. The conditions of use of this braking system are registered in accordance with Commission Implementing Regulation (EU) 2019/777 (*) (RINF).

(*) Commission Implementing Regulation (EU) 2019/777 of 16 May 2019 on the common specifications for the register of railway infrastructure and repealing Implementing Decision 2014/880/EU (OJ L 139 I, 27.5.2019, p. 312).;

(21) Table 11 in section 4.2.7.1.1 is replaced by the following:

Table 11

Factor alpha (α) for the design of new structures

Type of traffic	Minimum factor alpha (α)
P1, P2, P3, P4	1,0
P5	0,91
P6	0,83
P1520	1
P1600	1,1
F1, F2, F3	1,0
F4	0,91
F1520	1,46
F1600	1,1'

(22) section 4.2.10.3 is replaced by the following:

4.2.10.3 Aerodynamic effect on ballasted track

- (1) The aerodynamic interaction between rolling stock and infrastructure may cause the lifting and further blowing away of ballast stones from the track bed in plain line and switches and crossings (Ballast pick up). This risk shall be mitigated.
- (2) The requirements for the infrastructure subsystem aimed at mitigating the risk for "ballast pick up" apply only to lines intended to be operated at speed greater than 250 km/h.
- (3) The requirements of point (2) above are an open point.;

(23) section 4.2.12.2 is replaced by the following:

4.2.12.2 Toilet discharge

Fixed installations for toilet discharge shall be compatible with the characteristics of the retention toilet system specified in the LOC & PAS TSI.;

(24) point (1) in section 4.2.12.4 is replaced by the following:

(1) Fixed equipment for water restocking shall be compatible with the characteristics of the water system specified in the LOC & PAS TSI.;

(25) section 4.2.12.5 is replaced by the following:

4.2.12.5 Refuelling

Refuelling equipment shall be compatible with the characteristics of the fuel system specified in the LOC & PAS TSI.;

(26) section 4.2.12.6 is replaced by the following:

4.2.12.6 Electrical shore supply

Where provided, electrical shore supply shall be by means of one or more of the power supply systems specified in the LOC & PAS TSI.;

(27) Table 15 in section 4.3.1 is replaced by the following:

Table 15

Interfaces with the rolling stock subsystem, “Locomotives and Passenger Rolling Stock TSI”

Interface	Reference Infrastructure TSI	Reference Locomotives and Passenger Rolling Stock TSI
Track gauge	4.2.4.1 Nominal track gauge 4.2.5.1 Design geometry of switches and crossings 4.2.8.6 The immediate action limits for switches and crossings	4.2.3.5.2.1 Mechanical and geometrical characteristics of wheelset 4.2.3.5.2.3 Variable gauge wheelsets
Gauge	4.2.3.1 Structure gauge 4.2.3.2 Distance between track centres 4.2.3.5 Minimum radius of vertical curve 4.2.9.3 Platform offset	4.2.3.1 Gauging
Axle load and axle spacing	4.2.6.1 Track resistance to vertical loads 4.2.6.3 Lateral track resistance 4.2.7.1 Resistance of new bridges to traffic loads 4.2.7.2 Equivalent vertical loading for new earthworks and earth pressure effects imposed on new structures 4.2.7.4 Resistance of existing bridges and earthworks to traffic loads	4.2.2.10 Load conditions and weighed mass 4.2.3.2.1 Axle load parameter
Running characteristics	4.2.6.1 Track resistance to vertical loads 4.2.6.3 Lateral track resistance 4.2.7.1.4 Nosing forces	4.2.3.4.2.1 Limit values for running safely 4.2.3.4.2.2 Track loading limit values
Ride stability	4.2.4.4 Equivalent conicity 4.2.4.6 Railhead profile for plain line 4.2.11.2 Equivalent conicity in service	4.2.3.4.3 Equivalent conicity 4.2.3.5.2.2 Mechanical and geometrical characteristics of wheels
Longitudinal actions	4.2.6.2 Longitudinal track resistance 4.2.7.1.5 Actions due to traction and braking (longitudinal loads)	4.2.4.5 Braking performance
Minimum horizontal curve radius	4.2.3.4 Minimum radius of horizontal curve	4.2.3.6 Minimum curve radius Annex A, A.1 Buffers
Running dynamic behaviour	4.2.4.3 Cant deficiency	4.2.3.4.2 Running dynamic behaviour
Maximum deceleration	4.2.6.2 Longitudinal track resistance 4.2.7.1.5 Actions due to traction and braking	4.2.4.5 Braking performance

Interface	Reference Infrastructure TSI	Reference Locomotives and Passenger Rolling Stock TSI
Aerodynamic effect	4.2.3.2 Distance between track centres 4.2.7.3 Resistance of new structures over or adjacent to tracks 4.2.10.1 Maximum pressure variations in tunnels 4.2.10.3 Aerodynamic effect on ballasted track	4.2.6.2.1 Slipstream effects on passengers on platforms and on trackside workers 4.2.6.2.2 Head pressure pulse 4.2.6.2.3 Maximum pressure variations in tunnels 4.2.6.2.5 Aerodynamic effect on ballasted tracks
Crosswind	4.2.10.2 Effect of crosswinds	4.2.6.2.4 Crosswind
Installations for servicing trains	4.2.12.2 Toilet discharge 4.2.12.3 Train external cleaning facilities 4.2.12.4 Water restocking 4.2.12.5 Refuelling 4.2.12.6 Electric shore supply	4.2.11.3 Toilet discharge system 4.2.11.2.2 Exterior cleaning through a washing plant 4.2.11.4 Water refilling equipment 4.2.11.5 Interface for water refilling 4.2.11.7 Refuelling equipment 4.2.11.6 Special requirements for stabling of trains'

(28) Table 16 in section 4.3.1 is replaced by the following:

'Table 16

Interfaces with the rolling stock subsystem, "Freight Wagons TSI"

Interface	Reference Infrastructure TSI	Reference Freight wagons TSI
Track gauge	4.2.4.1 Nominal track gauge 4.2.4.6 Railhead profile for plain line 4.2.5.1 Design geometry of switches and crossings 4.2.8.6 The immediate action limits for switches and crossings	4.2.3.6.2 Characteristics of wheelsets 4.2.3.6.3 Characteristics of wheels
Gauge	4.2.3.1 Structure gauge 4.2.3.2 Distance between track centres 4.2.3.5 Minimum radius of vertical curve 4.2.9.3 Platform offset	4.2.3.1 Gauging
Axle load and axle spacing	4.2.6.1 Track resistance to vertical loads 4.2.6.3 Lateral track resistance 4.2.7.1 Resistance of new bridges to traffic loads 4.2.7.2 Equivalent vertical loading for new earthworks and earth pressure effects imposed on new structures 4.2.7.4 Resistance of existing bridges and earthworks to traffic loads	4.2.3.2 Compatibility with load carrying capacity of lines

Interface	Reference Infrastructure TSI	Reference Freight wagons TSI
Running dynamic behaviour	4.2.8 Immediate action limits on track geometry defects	4.2.3.5.2 Running dynamic behaviour
Longitudinal actions	4.2.6.2 Longitudinal track resistance 4.2.7.1.5 Actions due to traction and braking (longitudinal loads)	4.2.4.3.2 Brake performance
Minimum curve radius	4.2.3.4 Minimum radius of horizontal curve	4.2.2.1 Mechanical interface
Vertical curve	4.2.3.5 Minimum radius of vertical curve	4.2.3.1 Gauging'

(29) Table 19 in section 4.3.4 is replaced by the following:

'Table 19

Interfaces with the operation and traffic management subsystem

Interface	Reference Infrastructure TSI	Reference Operation and Traffic Management TSI
Ride stability	4.2.11.2 Equivalent conicity in service	4.2.3.4.4 Operational quality
Use of eddy current brakes	4.2.6.2 Longitudinal track resistance	4.2.2.6.2 Braking performance
Crosswinds	4.2.10.2 Effect of crosswinds	4.2.3.6.3 Contingency arrangements
Operating rules	4.4 Operating rules	4.2.1.2.2.2 Modifications to information contained in the route book 4.2.3.6 Degraded operation
Staff competences	4.6 Professional competences	2.2.1 Staff and trains'

(30) in point (1) of section 4.4, the terms 'Article 18(3) and set out in Annex VI (point I.2.4) of Directive 2008/57/EC' are replaced by the terms 'Article 15(4) and set out in Annex IV (point 2.4) of Directive (EU) 2016/797';

(31) section 4.5.2 is replaced by the following:

'4.5.2. Maintenance plan

The infrastructure manager shall have a maintenance plan containing the items listed in point 4.5.1 together with at least the following:

- (a) a set of values for intervention limits and alert limits,
- (b) a statement about the methods, professional competences of staff and personal protective safety equipment necessary to be used,
- (c) the rules to be applied for the protection of people working on or near the track,
- (d) the means used to check that in-service values are respected,
- (e) the measures taken, for speed greater than 250 km/h, to mitigate the risk of ballast pick up.';

(32) point (1) in section 4.7 is replaced by the following:

‘(1) the health and safety conditions of staff required for the operation and maintenance of the infrastructure subsystem shall be compliant with the relevant European and national legislation.’;

(33) point (b) of point (2) in section 5.3.2 is replaced by the following:

‘(b) the rail fastening shall resist application of 3 000 000 cycles of the typical load applied in a sharp curve, such that the change in performance of the fastening system shall not exceed:

- 20 % in terms of clamping force,
- 25 % in terms of vertical stiffness,
- a reduction of more than 20 % in terms of longitudinal restraint.

The typical load shall be appropriate to:

- the maximum axle load the rail fastening system is designed to accommodate,
- the combination of rail, rail inclination, rail pad and type of sleepers with which the fastening system may be used.’;

(34) section 6.1.4.1 is replaced by the following:

‘6.1.4.1. Interoperability constituents subject to other European Union Directives

- (1) in accordance with Article 10(3) of Directive (EU) 2016/797, for interoperability constituents that are the subject of other legal acts of the Union covering other matters, the EC declaration of conformity or suitability for use shall state that the interoperability constituents also meet the requirements of those other legal acts;
- (2) in accordance with Annex I to Commission Implementing Regulation (EU) 2019/250 (*), the EC declaration of conformity or suitability for use shall include a list of restrictions or conditions of use.

(*) Commission Implementing Regulation (EU) 2019/250 of 12 February 2019 on the templates for “EC” declarations and certificates for railway interoperability constituents and subsystems, on the model of declaration of conformity to an authorised railway vehicle type and on the “EC” verification procedures for subsystems in accordance with Directive (EU) 2016/797 of the European Parliament and of the Council and repealing Commission Regulation (EU) No 201/2011 (OJ L 42, 13.2.2019, p. 9).’;

(35) in point (1) of section 6.2.1, the reference to ‘Article 18 of Directive 2008/57/EC’ is replaced by the reference to ‘Article 15 of Directive (EU) 2016/797’;

(36) point (6) of section 6.2.1 is replaced by the following:

‘(6) The applicant shall draw up the EC declaration of verification for the infrastructure subsystem in accordance with Article 15 of Directive (EU) 2016/797’;

(37) in section 6.2.4 the following point is added after point 6.2.4.14:

‘6.2.4.15. Assessment of compatibility with braking systems

The assessment of the requirements laid down in point 4.2.6.2.2(2) is not required.’;

(38) point (3) of section 6.4 is replaced by the following:

‘(3) The notified body shall include a reference to the maintenance file required by point 4.5.1 of this TSI in the technical file referred to in Article 15(4) of Directive (EU) 2016/797.’;

(39) in point (2) of section 6.5.2, the reference to ‘Article 17 of Directive 2008/57/EC’ is replaced by the reference to ‘Article 14 of Directive (EU) 2016/797’;

(40) the first paragraph in section 7 above section 7.1 is replaced by the following:

‘Member States shall develop a national plan for the implementation of this TSI, considering the coherence of the entire rail system of the European Union. This plan shall include all projects regarding new, renewal and upgrading of infrastructure subsystem, in line with the details mentioned in points 7.1 to 7.7 here below.’;

(41) section 7.3.1 is replaced by the following:

‘7.3.1. Upgrading or renewal of a line

- (1) In accordance with Article 2(14) of Directive (EU) 2016/797, “upgrading” means any major modification work on a subsystem or part of it which results in a change in the technical file accompanying the “EC” declaration of verification, if that technical file exists, and which improves the overall performance of the subsystem.
- (2) The infrastructure subsystem of a line is considered to be upgraded in the context of this TSI when at least the performance parameters axle load or gauge, as defined in point 4.2.1 are improved in order to meet the requirements of another traffic code.
- (3) In accordance with Article 2(15) of Directive (EU) 2016/797, “renewal” means any major substitution work on a subsystem or part of it which does not change the overall performance of the subsystem.
- (4) For this purpose, major substitution should be interpreted as a project undertaken to systematically replace elements of a line or a section of a line. Renewal differs from a substitution in the framework of maintenance, referred to in point 7.3.3 below, since it gives the opportunity to achieve a TSI compliant line. A renewal is the same case as upgrading, but without a change in performance parameters.
- (5) The scope of the upgrading or renewal of the infrastructure subsystem may cover the entire subsystem on a given line or only certain parts of the subsystem. According to Article 18(6) of Directive (EU) 2016/797, the national safety authority shall examine the project and decide whether a new authorisation for placing in service is needed.
- (6) Where a new authorisation is required, parts of the infrastructure subsystem falling under the scope of the upgrading or renewal shall comply with this TSI and shall be subject to the procedure established in Article 15 of Directive (EU) 2016/797, unless a permission for non-application of TSI is granted according to Article 7 of Directive (EU) 2016/797.
- (7) Where a new authorisation for placing in service is not required, compliance with this TSI is recommended. Where compliance is not possible, the contracting entity shall inform the Member State of the reasons thereof.’;

(42) section 7.3.2 is deleted;

(43) point (4) in section 7.3.3 is replaced by the following:

- ‘(4) In such cases, it is noted that each of the above elements taken separately cannot ensure compliance of the whole subsystem. The conformity of a subsystem can only be stated when all the elements are compliant with the TSI.’;

(44) section 7.6 is replaced by the following:

‘7.6. Route compatibility checks before the use of authorised vehicles

The procedure to be applied and the parameters of the infrastructure subsystem to be used by the railway undertaking, for the purpose of route compatibility check are described in point 4.2.2.5 and appendix D1 of the Annex to Commission Implementing Regulation (EU) 2019/773 (*).

(*) Commission Implementing Regulation (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU (OJ L 139 I, 27.5.2019, p. 5).’;

(45) in section 7.7, after point (b) and above section 7.7.1, the following paragraph is added:

‘All specific cases and their relevant dates shall be re-examined in the course of future revisions of the TSI with a view to limiting their technical and geographical scope based on an assessment of their impact on safety, interoperability, cross border services, TEN-T corridors, and the practical and economic impacts of retaining or eliminating them. Special account shall be given to availability of EU funding.

Specific cases shall be limited to the route or network where they are strictly necessary and taken account of through route compatibility procedures.’;

(46) in section 7.7.2.1 the second paragraph is replaced by the following:

‘For platform heights of 550 mm and 760 mm, the conventional value b_{q0} of platform offset shall be calculated according to the following formulas:’;

(47) in section 7.7.8.1 the title ‘Platform height (4.2.9.3)’ is replaced by ‘Platform height (4.2.9.2)’;

(48) point (2) of section 7.7.11.1 is deleted;

(49) section 7.7.13.5 is replaced by the following:

‘7.7.13.5. Platform height (4.2.9.2)

P cases

For the nominal track gauge of 1 668 mm, for upgraded or renewed platforms the nominal platform height of 685 mm (general use) or 900 mm (urban and suburban traffic) above the running surface for radii of more than 300 m or 350 m respectively shall be allowed.’;

(50) Table 36 in Appendix A is replaced by the following:

‘Table 36

Assessment of interoperability constituents for the EC declaration of conformity

Characteristics to be assessed	Assessment in the following phase			
	Design and development phase			Production phase Manufacturing process + product test
	Design review	Review of manu- facturing process	Type test	Product quality (series)
5.3.1 The rail				
5.3.1.1 Railhead profile	X	n.a.	X	X
5.3.1.2 Rail steel	X	X	X	X
5.3.2 The rail fastening systems	n.a.	n.a.	X	X
5.3.3 Track sleepers	X	X	n.a.	X

(51) in Table 37 in Appendix B, the row concerning ‘Longitudinal track resistance’ is replaced by the following:

Characteristics to be assessed	Design review	Assembly before putting into service	Particular assessment procedures
‘Longitudinal track resistance (4.2.6.2)	X	n.a.	6.2.5 6.2.4.15’

(52) point (c) in Appendix C2 is replaced by the following:

‘(c) Bearer’;

(53) Appendix E is amended as follows:

(a) the second paragraph is replaced by the following:

‘EN line category is a function of axle load and geometrical aspects relating to the spacing of axles. EN line categories are set out in Annex A of EN 15528:2015.’;

(b) Table 38 is replaced by the following:

Table 38

EN Line Category — Associated Speed ⁽¹⁾ ⁽⁶⁾ [km/h] — Passenger traffic

Traffic code	Passenger Carriages (including Coaches, Vans and Car Carriers) and Light Freight Wagons ⁽²⁾ ⁽³⁾	Locomotives and Power Heads ⁽²⁾ ⁽⁴⁾	Electric or Diesel Multiple Units, Power Units and Railcars ⁽²⁾ ⁽⁵⁾
P1	n.a. ⁽¹²⁾	n.a. ⁽¹²⁾	Open Point
P2	n.a. ⁽¹²⁾	n.a. ⁽¹²⁾	Open Point
P3a (> 160 km/h)	A – 200 B1 – 160	D2 – 200 ⁽¹¹⁾	Open point
P3b (≤ 160 km/h)	B1 – 160	D2 – 160	C2 ⁽¹⁸⁾ – 160 D2 ⁽⁹⁾ – 120
P4a (> 160 km/h)	A – 200 B1 – 160	D2 – 200 ⁽¹¹⁾	Open point
P4b (≤ 160 km/h)	A – 160 B1 – 140	D2 – 160	B1 ⁽⁷⁾ – 160 C2 ⁽⁸⁾ – 140 D2 ⁽⁹⁾ – 120
P5	B1 – 120	C2 – 120 ⁽⁵⁾	B1 ⁽⁷⁾ – 120
P6	a12		
P1520	Open point		
P1600	Open point'		

(c) note ⁽¹⁾ is replaced by the following:

'⁽¹⁾ The indicated speed value in the table represents the maximum requirement for the line and may be lower in accordance with the requirements in point 4.2.1(12). When checking individual structures on the line, it is acceptable to take account of the type of vehicle and local allowed speed.';

(d) note ⁽²⁾ is replaced by the following:

'⁽²⁾ Passenger Carriages (including Coaches, Vans, Car Carriers), Other Vehicles, Locomotives, Power Heads, Diesel and Electric Multiple Units, Power Units and Railcars are defined in the LOC & PAS TSI. Light Freight Wagons are defined as vans except that they are allowed to be conveyed in formations which are not intended to convey passengers.';

(e) note ⁽¹⁰⁾ is deleted;

(f) the following note ⁽¹²⁾ is added:

'⁽¹²⁾ Taking into account the state of art of operation there is no need to define harmonized requirements to deliver an adequate level of interoperability for this type of vehicles for P1 and P2 traffic codes.';

(54) Appendix F is amended as follows:

(a) Table 40 is replaced by the following:

Table 40

Route Availability number —Associated Speed ⁽¹⁾ ⁽²⁾ [miles per hour] — Passenger traffic

Traffic code	Passenger Carriages (including Coaches, Vans and Car Carriers) and Light Freight Wagons ⁽²⁾ ⁽³⁾ ⁽⁶⁾	Locomotives and Power Heads ⁽²⁾ ⁽⁴⁾	Electric or Diesel Multiple Units, Power Units and Railcars ⁽²⁾ ⁽³⁾ ⁽⁶⁾
P1	n.a. ⁽¹¹⁾	n.a. ⁽¹¹⁾	Open Point
P2	n.a. ⁽¹¹⁾	n.a. ⁽¹¹⁾	Open Point
P3a (> 160 km/h)	RA1 – 125 RA2 – 90	RA7 – 125 ⁽⁷⁾ RA8 – 110 ⁽⁷⁾ RA8 – 100 ⁽⁸⁾ RA5 – 125 ⁽⁹⁾	Open point
P3b (≤ 160 km/h)	RA1 – 100 RA2 – 90	RA8 – 100 ⁽⁸⁾ RA5 – 100 ⁽⁹⁾	RA3 – 100
P4a (> 160 km/h)	RA1 – 125 RA2 – 90	RA7 – 125 ⁽⁷⁾ RA7 – 100 ⁽⁸⁾ RA4 – 125 ⁽⁹⁾	Open point
P4b (≤ 160 km/h)	RA1 – 100 RA2 – 90	RA7 – 100 ⁽⁸⁾ RA4 – 100 ⁽⁹⁾	RA3 – 100
P5	RA1 – 75	RA5 – 75 ⁽⁸⁾ ⁽¹⁰⁾ RA4 – 75 ⁽⁹⁾ ⁽¹⁰⁾	RA3 – 75
P6	RA1		
P1600	Open point'		

(b) note ⁽¹⁾ is replaced by the following:

'⁽¹⁾ The indicated speed value in the table represents the maximum requirement for the line and may be lower in accordance with the requirements in point 4.2.1(12). When checking individual structures on the line, it is acceptable to take account of the type of vehicle and local allowed speed.';

(c) note ⁽²⁾ is replaced by the following:

'⁽²⁾ Passenger Carriages (including Coaches, Vans, Car Carriers), Other Vehicles, Locomotives, Power Heads, Diesel and Electric Multiple Units, Power Units and Railcars are defined in the LOC & PAS TSI. Light Freight Wagons are defined as vans except that they are allowed to be conveyed in formations which are not intended to convey passengers.';

(d) the following note ⁽¹¹⁾ shall be added:

'⁽¹¹⁾ Taking into account the state of art of operation there is no need to define harmonized requirements to deliver an adequate level of interoperability for this type of vehicles for P1 and P2 traffic codes.';

(55) the fourth paragraph in Appendix K, immediately above Table 45, is deleted;

(56) Appendix L is deleted;

(57) the second paragraph of point P3 in Appendix P is modified by the following (normal font):

‘The vertical curve radius R_v is limited to 500 m. Heights not exceeding 80 mm shall be considered as zero within a radius R_v between 500 m and 625 m.’;

(58) Table 47 in Appendix Q is replaced by the following:

‘Table 47

Notified national technical rules for UK-GB Specific Cases

Specific Case	TSI Point	Requirement	NTR Ref	NTR Title
7.7.17.1	4.2.1: Table 2 & Table 3	Categories of line: Gauge	GI/RT7073	Requirements for the Position of Infrastructure and for Defining and Maintaining Clearances
			GE/RT8073	Requirements for the Application of Standard Vehicle Gauges
			GI/RT7020	GB Requirements for Platform Height, Platform Offset and Platform Width
7.7.17.2 & 7.7.17.9	4.2.3.1 & 6.2.4.1	Structure gauge	GI/RT7073	Requirements for the Position of Infrastructure and for Defining and Maintaining Clearances
			GE/RT8073	Requirements for the Application of Standard Vehicle Gauges
			GI/RT7020	GB Requirements for Platform Height, Platform Offset and Platform Width
7.7.17.3 & 7.7.17.10	4.2.3.2: Table 4 & 6.2.4.2	Distance between track centres	GI/RT7073	Requirements for the Position of Infrastructure and for Defining and Maintaining Clearances
7.7.17.4	4.2.5.3 & Appendix J	Maximum unguided length of fixed obtuse crossings	GC/RT5021	Track System Requirements
			GM/RT2466	Railway Wheelsets
7.7. 17.6	4.2.9.2	Platform height	GI/RT7020	GB Requirements for Platform Height, Platform Offset and Platform Width
7.7. 17.7 & 7.7. 17.11	4.2.9.3 & 6.2.4.11	Platform offset	GI/RT7020	GB Requirements for Platform Height, Platform Offset and Platform Width
			GI/RT7073	Requirements for the Position of Infrastructure and for Defining and Maintaining Clearances’

(59) Appendix R is replaced by the following:

‘Appendix R

List of open points

(1) Immediate action limits for isolated defects in alignment for speeds of more than 300 km/h (4.2.8.1).

(2) Immediate action limits for isolated defects in longitudinal level for speeds of more than 300 km/h (4.2.8.2).

- (3) The minimum allowed value of distance between track centres for the uniform structure gauge IRL3 is an open point (7.7.18.2).
- (4) EN Line Category — Associated Speed [km/h] for Traffic codes P1 (multiple units), P2 (multiple units), P3a (multiple units), P4a (multiple units), P1520 (all vehicles), P1600 (all vehicles), F1520 (all vehicles) and F1600 (all vehicles) in Appendix E, Tables 38 and 39.
- (5) Route Availability Number — Associated Speed [miles/h] for Traffic codes P1 (multiple units), P2 (multiple units), P3a (multiple units), P4a (multiple units), P1600 (all vehicles) and F1600 (all vehicles) in Appendix F, Tables 40 and 41.
- (6) Rules and drawings related to gauges IRL1, IRL2 and IRL3 are an open point (Appendix O).
- (7) The requirements for mitigating the risk for ballast pick up for speed greater than 250 km/h.:
- (60) Table 48 in Appendix S is replaced by the following:

‘Table 48

Terms

Defined term	TSI point	Definition
Actual point (RP)/ Praktischer Herzpunkt/ Pointe de coeur	4.2.8.6	Physical end of a crossing vee. See Figure 2, which shows the relationship between the actual point (RP) and the intersection point (IP).
Alert limit/ Auslösewert/ Limite d’alerte	4.5.2	Refers to the value which, if exceeded, requires that the track geometry condition is analysed and considered in the regularly planned maintenance operations.
Axle load/ Achsfahrmasse/ Charge à l’essieu	4.2.1, 4.2.6.1	Sum of the static vertical wheel forces exerted on the track through a wheelset or a pair of independent wheels divided by acceleration of gravity.
Braking systems independent of wheel-rail adhesion conditions	4.2.6.2.2	“Braking systems independent of wheel – rail adhesion conditions” refers to all brake systems of the rolling stock capable to develop a brake force applied to the rails independently of the wheel – rail adhesion conditions (e.g. magnetic braking systems and eddy current braking systems)
Cant/ Überhöhung/ Dévers de la voie	4.2.4.2 4.2.8.5	Difference in height, relative to the horizontal, of the two rails of one track at a particular location, measured at the centrelines of the heads of the rails.
Cant deficiency/ Überhöhungsfehlbetrag/Insuffisance de devers	4.2.4.3	Difference between the applied cant and a higher equilibrium cant.
Common crossing/ Starres Herzstück/ Coeur de croisement	4.2.8.6	Arrangement ensuring intersection of two opposite running edges of turnouts or diamond crossings and having one crossing vee and two wing rails.
Crosswind/ Seitenwind/ Vents traversiers	4.2.10.2	Strong wind blowing laterally to a line which may adversely affect the safety of trains running.

Defined term	TSI point	Definition
Design value/ Planungswert/ Valeur de conception	4.2.3.4, 4.2.4.2, 4.2.4.5, 4.2.5.1, 4.2.5.3	Theoretical value without manufacturing, construction or maintenance tolerances.
Design track gauge/ Konstruktionsspurweite/ Ecartement de conception de la voie	5.3.3	A single value which is obtained when all the components of the track conform precisely to their design dimensions or their median design dimension when there is a range.
Distance between track centres/ Gleisabstand/ Entraxe de voies	4.2.3.2	The distance between points of the centre lines of the two tracks under consideration, measured parallel to the running surface of the reference track namely the less canted track.
Dynamic lateral force/ Dynamische Querkraft/ Effort dynamique transversal	4.2.6.3	The sum of dynamic forces exerted by a wheelset on the track in lateral direction.
Earthworks/ Erdbauwerke/ Ouvrages en terre	4.2.7.2, 4.2.7.4	Soil structures and soil-retaining structures that are subject to railway traffic loading.
EN Line Category/ EN Streckenklasse/ EN Catégorie de ligne	4.2.7.4, Appendix E	The result of the classification process set out in EN 15528:2015 Annex A and referred to in that standard as "Line Category". It represents the ability of the infrastructure to withstand the vertical loads imposed by vehicles on the line or section of line for regular ("normal") service.
Equivalent conicity/ Äquivalente Konizität/ Conicité équivalente	4.2.4.5, 4.2.11.2	The tangent of the cone angle of a wheelset with coned wheels whose lateral movement has the same kinematic wavelength as the given wheelset on straight track and large-radius curves.
Fixed nose protection/ Leitweite/ Cote de protection de pointe	4.2.5.3, Appendix J	Dimension between the crossing nose and check rail (see dimension No 2 on Figure 10 below).
Flangeway depth/ Rillentiefe/ Profondeur d'ornière	4.2.8.6	Dimension between the running surface and the bottom of flangeway (see dimension No 6 on Figure 10 below).
Flangeway width/ Rillenweite/ Largeur d'ornière	4.2.8.6	Dimension between a running rail and an adjacent check or wing rail (see dimension No 5 on Figure 10 below).
Free wheel passage at check rail/wing rail entry/ Freier Raddurchlauf im Radlenker-Einlauf/Flügelschienen-Einlauf/Côte d'équilibrage du contre-rail	4.2.8.6	Dimension between the working face of the crossing check rail or wing rail and the gauge face of the running rail opposite across the gauge measured at entry to check rail or wing rail respectively. (see dimensions No 4 on Figure 10 below). The entry to the check rail or wing rail is the point at which the wheel is allowed to contact the check rail or wing rail.

Defined term	TSI point	Definition
Free wheel passage at crossing nose/ Freier Raddurchlauf im Bereich der Herzspitze/ Cote de libre passage dans le croisement	4.2.8.6	Dimension between the working face of the crossing wing rail and check rail opposite across the gauge (see dimension No 3 on Figure 10 below).
Free wheel passage in switches/Freier Raddurchlauf im Bereich der Zungen- vorrichtung/Côte de libre passage de l'aiguillage	4.2.8.6.	Dimension from the gauge face of one switch rail to the back edge of the opposite switch rail (see dimension No 1 on Figure 10 below).
Gauge/ Begrenzungslinie/ Gabarit	4.2.1, 4.2.3.1	Set of rules including a reference contour and its associated calculation rules allowing definition of the outer dimensions of the vehicle and the space to be cleared by the infrastructure.
HBW/HBW/HBW	5.3.1.2	The non SI unit for steel hardness defined in EN ISO 6506-1:2005 Metallic materials – Brinell hardness test. Test method.
Height of check rail/ Radlenkerüberhöhung/ Surélévation du contre rail	4.2.8.6, Appendix J	Height of the check rail above the running surface (see dimension 7 on Figure 14 below).
Immediate Action Limit/Soforteingriffsschwelle/ Limite d'intervention immédiate	4.2.8, 4.5	The value which, if exceeded, requires taking measures to reduce the risk of derailment to an acceptable level.
Infrastructure Manager/ Betreiber der Infrastruktur/ Gestionnaire de l'Infrastructure	4.2.5.1, 4.2.8.3, 4.2.8.6, 4.2.11.2 4.4, 4.5.2, 4.6, 4.7, 6.2.2.1, 6.2.4, 6.4	As defined in Article 2h) of Directive 2001/14/EC of 26 February 2001 on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification (OJ L 75, 15.3.2001, p. 29).
In service value/ Wert im Betriebszustand/ Valeur en exploitation	4.2.8.5, 4.2.11.2	Value measured at any time after the infrastructure has been placed into service.
Intersection point (IP)/ Theoretischer Herzpunkt/ Point d'intersection théorique	4.2.8.6	Theoretical intersection point of the running edges at the centre of the crossing (see figure 2).
Intervention Limit/Eingriffsschwelle/ Valeur d'intervention	4.5.2	The value, which, if exceeded, requires corrective maintenance in order that the immediate action limit shall not be reached before the next inspection;
Isolated defect/ Einzelfehler/ Défaut isolé	4.2.8	A discrete track geometry fault.

Defined term	TSI point	Definition
Line speed/ Streckengeschwindigkeit/ Vitesse de la ligne	4.2.1	Maximum speed for which a line has been designed.
Maintenance file/ Instandhaltungsdossier/ Dossier de maintenance	4.5.1	Elements of the technical file relating to conditions and limits of use and instructions for maintenance.
Maintenance plan/ Instandhaltungsplan/ Plan de maintenance	4.5.2	A series of documents setting out the infrastructure maintenance procedures adopted by an Infrastructure Manager.
Multi-rail track/ Mehrschienengleis/ Voie à multi écartement	4.2.2.2	Track with more than two rails, where at least two pairs of respective rails are designed to be operated as separate single tracks, with or without different track gauges.
Nominal track gauge/ Nennspurweite/ Ecartement nominal de la voie	4.2.4.1	A single value which identifies the track gauge but may differ from the design track gauge.
Normal service/ Regelbetrieb/ Service régulier	4.2.2.2 4.2.9	The railway operating to a planned timetable service.
Passive provision/ Vorsorge für künftige Erweiterungen/Réservation pour extension future	4.2.9	Provision for the future construction of a physical extension to a structure (for example: increased platform length).
Performance Parameter/ Leistungskennwert/ Paramètre de performance	4.2.1	Parameter describing a TSI Category of Line used as the basis for the design of infrastructure subsystem elements and as the indication of the performance level of a line.
Plain line/ Freie Strecke/ Voie courante	4.2.4.5 4.2.4.6 4.2.4.7	Section of track without switches and crossings.
Point retraction/ Spitzenbeihobelung/ Dénivellation de la pointe de cœur	4.2.8.6	The reference line in a fixed common crossing can deviate from the theoretical reference line. From a certain distance to the crossing point, the reference line of the vee can, depending on the design, be retracted from this theoretical line away from the wheel flange in order to avoid contact between both elements. This situation is described in Figure 2.
Rail inclination/ Schienenneigung/ Inclinaison du rail	4.2.4.5 4.2.4.7	An angle defining the inclination of the head of a rail when installed in the track relative to the plane of the rails (running surface), equal to the angle between the axis of symmetry of the rail (or of an equivalent symmetrical rail having the same rail head profile) and the perpendicular to the plane of the rails.

Defined term	TSI point	Definition
Rail pad/ Schienenzwischenlage/ Semelle sous rail	5.3.2	A resilient layer fitted between a rail and the supporting sleeper or baseplate.
Reverse curve/ Gegenbogen/ Courbes et contre-courbes	4.2.3.4	Two abutting curves of opposite flexure or hand
Structure gauge/ Lichtraum/ Gabarit des obstacles	4.2.3.1	Defines the space in relation to the reference track that shall be cleared of all objects or structures and of the traffic on the adjacent tracks, in order to allow safe operation on the reference track. It is defined on the basis of the reference contour by application of the associated rules.
Swing nose	4.2.5.2	Within the domain of “common crossing with movable point”, the term “swing nose” identifies the part of the crossing which forms the vee and that it is moved to form a continuous running edge for either the main or the branch line.
Switch/ Zungenvorrichtung/ Aiguillage	4.2.8.6	A unit of track comprising two fixed rails (stock rails) and two movable rails (switch rails) used to direct vehicles from one track to another track.
Switches and crossings/ Weichen und Kreuzungen/ Appareil de voie	4.2.4.5, 4.2.4.7, 4.2.5, 4.2.6, 4.2.8.6, 5.2, 6.2.4.4, 6.2.4.8, 6.2.5.2, 7.3.3, Ap- pendix C and D,	Track constructed from sets of switches and individual crossings and the rails connecting them.
Through route/ Stammgleis/ Voie directe	Appendix D	In the context of switches and crossings a route which perpetuate the general alignment of the track.
Track design	4.2.6, 6.2.5, Appendix C and D	The track design consists of cross-section defining basic dimensions and track components (for example rail, rail fastenings, sleepers, ballast) used together with operating conditions with an impact on forces related to 4.2.6, such as axle load, speed and radius of horizontal curvature.
Track gauge/ Spurweite/ Ecartement de la voie	4.2.4.1, 4.2.4.5, 4.2.8.4, 5.3.3, 6.1.5.2, 6.2.4.3, Ap- pendix H	The smallest distance between lines perpendicular to the running surface intersecting each rail head profile in a range from 0 to 14 mm below the running surface.
Track twist/ Gleisverwindung/ Gauche	4.2.7.1.6 4.2.8.3, 6.2.4.9,	Track twist is defined as the algebraic difference between two cross levels taken at a defined distance apart, usually expressed as a gradient between the two points at which the cross level is measured.
Train length/ Zuglänge/ Longueur du train	4.2.1	The length of a train, which can run on a certain line in normal operation.

Defined term	TSI point	Definition
Unguided length of an obtuse crossing/ Führungslöse Stelle/ Lacune dans la traversée	4.2.5.3, Appendix J	Portion of obtuse crossing where there is no guidance of the wheel described as “unguided distance” in EN 13232-3:2003.
Usable length of a platform/Bahnsteignutzlänge/ Longueur utile de quai	4.2.1, 4.2.9.1	The maximum continuous length of that part of platform in front of which a train is intended to remain stationary in normal operating conditions for passengers to board and alight from the train, making appropriate allowance for stopping tolerances. Normal operating conditions means that railway is operating in a non-degraded mode (e.g. rail adhesion is normal, signals are working, everything is working as planned).’

(61) index number 4 of Table 49 in Appendix T is replaced by the following:

‘4	EN 13848-1	Track geometry quality – Part 1: Characterisation of track geometry (with Amendment A1:2008)	2003 A1:2008	The immediate action limit for track twist (4.2.8.3)’
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(62) index number 9 of Table 49 in Appendix T is replaced by the following:

‘9	EN 15528	Railway applications – Line categories for managing the interface between load limits of vehicles and infrastructure	2015	Capability requirements for structures according to traffic code (Appendix E)’
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ANNEX III

The Annex to Regulation (EU) No 1301/2014 is amended as follows:

(1) section 1.1 is replaced by the following:

‘1.1. Technical Scope

This TSI concerns the energy subsystem and part of the maintenance subsystem of the Union rail system in accordance with Article 1 of Directive (EU) 2016/797.

The energy and the maintenance subsystems are defined respectively in points 2.2 and 2.8 of Annex II to Directive (EU) 2016/797.

The technical scope of this TSI is further defined in Article 2 of this Regulation.’;

(2) points (1) and (2) of section 1.3 are replaced by the following:

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

- (a) indicates its intended scope (section 2);
- (b) lays down essential requirements for the energy and part of the maintenance subsystems (section 3);
- (c) establishes the functional and technical specifications to be met by the energy and part of the maintenance subsystems and its interfaces vis-à-vis other subsystems (section 4);
- (d) specifies the interoperability constituents and interfaces which must be covered by European specifications, including European standards, which are necessary to achieve interoperability within the Union rail system (section 5);
- (e) states, in each case under consideration, which procedures are to be used in order to assess the conformity or the suitability for use of the interoperability constituents, on the one hand, or the EC verification of the subsystems, on the other hand (section 6);
- (f) indicates the strategy for implementing this TSI (section 7);
- (g) indicates, for the staff concerned, the professional qualifications and health and safety conditions at work required for the operation and maintenance of the energy subsystem, as well as for the implementation of this TSI (section 4);
- (h) indicates the provisions applicable to the existing energy subsystem, in particular in the event of upgrading and renewal and, in such cases, the modification work which requires an application for a new authorisation;
- (i) indicates the parameters of energy subsystem to be checked by the railway undertaking and the procedures to be applied to check those parameters after the delivery of the vehicle authorisation for placing on the market and before the first use of the vehicle to ensure compatibility between vehicles and the routes on which they are to be operated.

(2) In accordance with Article 4(5) of the Directive (EU) 2016/797, provisions for specific cases are indicated in Section 7.’;

(3) in point (3) of section 2.1, section 3 and point (1) of section 4.1, the references to ‘Directive 2008/57/EC’ are replaced by the references to ‘Directive (EU) 2016/797’;

(4) section 4.2.11(4) is replaced by:

‘(4) The curves apply to speed up to 360 km/h. For speeds above 360 km/h procedures set out in point 6.1.3 shall apply.’;

(5) section 4.4(1) is replaced by:

‘(1) Operating rules are developed within the procedures described in the infrastructure manager safety management system. These rules take into account the documentation related to operation, which forms a part of the technical file, as required in Article 15(4) and as set out in Annex IV of Directive (EU) 2016/797.’;

(6) in point (1) of section 5.1, the reference to 'Directive 2008/57/EC' are replaced by the reference to 'Directive (EU) 2016/797';

(7) section 6.2.1 is modified as follows:

(a) point (1) is replaced by:

'(1) At the request of the applicant, the notified body carries out EC verification in accordance with Article 15 of Directive (EU) 2016/797 and in accordance with the provisions of the relevant modules.:'

(b) point (4) is replaced by:

'(4) The applicant shall draw up the EC declaration of verification for the energy subsystem in accordance with Article 15(1) of and Annex IV to Directive (EU) 2016/797.:'

(8) point (c) of Section 6.3.2 is replaced by:

'(c) for those interoperability constituents, the reason(s) why the manufacturer did not provide an EC declaration of conformity and/or suitability for use before its incorporation into the subsystem, including the application of national rules notified under Article 13 of Directive (EU) 2016/797.:'

(9) the first paragraph of section 7 is replaced by:

'Member States shall develop a national plan for the implementation of this TSI, considering the coherence of the entire rail system of the European Union. This plan shall include all projects regarding new, renewal and upgrading of energy subsystem, in line with the details mentioned in points 7.1 to 7.4 here below.:'

(10) point (3) in Section 7.2.1 is deleted;

(11) section 7.3.1 *Introduction* is modified as follows:

'7.3.1 *Introduction*

In case this TSI shall apply to existing lines and without prejudice to point 7.4 (specific cases), the following elements shall be considered:

(a) The scope of the upgrading or renewal of the energy subsystem may cover the entire subsystem on a given line or only certain parts of the subsystem. In accordance with Article 18(6) of Directive (EU) 2016/797 the national safety authority shall examine the project and decide whether a new authorisation for placing in service is needed.

(b) Where a new authorisation is required, parts of the energy subsystem falling under the scope of the upgrading or renewal shall comply with this TSI and shall be subject to the procedure established in Article 15 of Directive (EU) 2016/797, unless a permission for non-application of TSI is granted according to Article 7 of Directive (EU) 2016/797.

(c) Where a new authorisation for placing in service is required, the Contracting Entity shall define the practical measures and different phases of the project, which are necessary to achieve the required levels of performance. These project phases may include transition periods for placing equipment into service with reduced levels of performance.

(d) Where a new authorisation for placing in service is not required, compliance with this TSI is recommended. Where compliance is not possible, the contracting entity shall inform the Member State of the reasons thereof.:'

(12) point (2) in Section 7.3.2 is deleted;

(13) a new section 7.3.5 is added:

'7.3.5. *Route compatibility checks before the use of authorised vehicles*

The procedure to be applied and the parameters of the energy subsystem to be used by the railway undertaking, for the purpose of route compatibility check are described in point 4.2.2.5 and appendix D1 of the Annex to Commission Implementing Regulation (EU) 2019/773 (*).

(*) Commission Implementing Regulation (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU (OJ L 139 I, 27.5.2019, p. 5).:'

(14) section 7.4.1 is replaced by the following:

‘7.4.1. *General*

- (1) The specific cases, as listed in point 7.4.2, describe special provisions that are needed and authorised on particular networks of each Member State.
- (2) These specific cases are classified as:
 - “P” cases: “permanent” cases,
 - “T” cases: “temporary” cases, where the target system shall be reached by 31 December 2035.

All specific cases and their relevant dates shall be re-examined in the course of future revisions of the TSI with a view to limiting their technical and geographical scope based on an assessment of their impact on safety, interoperability, cross border services, TEN-T corridors, and the practical and economic impacts of retaining or eliminating them. Special account shall be given to availability of EU funding.

Specific cases shall be limited to the route or network where they are strictly necessary and taken account of through route compatibility procedures.’

ANNEX IV

The Annex to Regulation (EU) No 1302/2014 is amended as follows:

(1) section 1.1 is amended as follows:

- (a) the reference to 'Article 1 of Directive 2008/57/EC' is replaced by the reference to 'Article 1 of Directive (EU) 2016/797';
- (b) the reference to 'Annex II section 2.7 of Directive 2008/57/EC' is replaced by the reference to 'section 2.7 of Annex II to Directive (EU) 2016/797';
- (c) the text 'Annex I sections 1.2 and 2.2 of Directive 2008/57/EC' is replaced by the text 'section 2 of Annex I to Directive (EU) 2016/797';
- (d) the text 'Article 1(3) of Directive 2008/57/EC' is replaced by the text 'Articles 1(3) and (4) of Directive (EU) 2016/797';

(2) sections 1.2 to 1.3 are replaced by the following:

1.2. Geographical Scope

The geographical scope of this TSI is the Union rail system as set out in Annex I to Directive (EU) 2016/797 and excludes the cases referred to in Articles 1(3) and (4) of Directive (EU) 2016/797.;

1.3. Content of this TSI

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

- (a) indicates its intended scope (Chapter 2);
- (b) lays down essential requirements for the subsystem rolling stock "Locomotives and passenger rolling stock" and 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);
- (d) determines the interoperability constituents and interfaces which must be covered by European specifications, including European standards, which are necessary to achieve interoperability within the European Union's rail system (Chapter 5);
- (e) states, in each case under consideration, which procedures are to be used in order to assess the conformity or the suitability for use of the interoperability constituents, on the one hand, or the "EC" verification of the subsystems, on the other hand (Chapter 6);
- (f) indicates the strategy for implementing this TSI (Chapter 7);
- (g) indicates for the staff concerned, the professional qualifications and health and safety conditions at work required for the operation and maintenance of the subsystem, as well as for the implementation of this TSI (Chapter 4);
- (h) indicates the provisions applicable to the existing "rolling stock" subsystem, in particular in the event of upgrading and renewal and, in such cases, the modification work which requires an application for a new authorisation;
- (i) indicates the parameters of "rolling stock" subsystem to be checked by the railway undertaking and the procedures to be applied to check those parameters after the delivery of the vehicle authorisation for placing on the market and before the first use of the vehicle to ensure compatibility between vehicles and the routes on which they are to be operated.

In accordance with Article 4(5) of the Directive (EU) 2016/797, provisions for specific cases are indicated in Chapter 7.;

- (3) in section 2.1, the reference to 'Directive 2008/57/EC' is replaced by the reference to 'Directive (EU) 2016/797';
- (4) in section 2.2, the text 'Directive 2008/57/EC, Article 2(c)' is replaced by the text 'point (3) of Article 2 of Directive (EU) 2016/797';
- (5) in section 2.2.2, the text is replaced by the following:

'2.2.2. Rolling stock

Definitions below are classified in three groups as defined in the section 2 of Annex I to Directive (EU) 2016/797:

- (A) Locomotives and passenger rolling stock, including thermal or electric traction units, self-propelling thermal or electric passenger trains, and passenger coaches:

(1) Thermal or electric traction units

A Locomotive is a traction vehicle (or combination of several vehicles) that is not intended to carry a payload and has the ability to be uncoupled in normal operation from a train and to operate independently.

A Shunter is a traction unit designed for use only on shunting yards, stations and depots.

Traction in a train can also be provided by a powered vehicle with or without driving cab, which is not intended to be uncoupled during normal operation. Such a vehicle is called a Power Unit (or power car) in general or a Power Head when located at one end of the trainset and fitted with a driving cab.

(2) Self-propelling thermal or electric passenger trains

A Trainset is a fixed formation that can operate as a train; it is by definition not intended to be reconfigured, except within a workshop environment. It is composed of only motored or of motored and non-motored vehicles.

An Electric and/or Diesel Multiple Unit is a trainset in which all vehicles are capable of carrying a payload (passengers or luggage/mail or freight).

A Railcar is a vehicle that can operate autonomously and is capable of carrying a payload (passengers or luggage/mail or freight).

A tram – train is a vehicle designed for combined use on both a light-rail infrastructure and a heavy-rail infrastructure;

(3) Passenger coaches and other related cars

A Coach is a vehicle without traction in a fixed or variable formation capable of carrying passengers (by extension, requirements specified to apply to coaches in this TSI are deemed to apply also to restaurant cars, sleeping cars, couchettes cars, etc.).

A Van is a vehicle without traction capable of carrying payload other than passengers, e.g. luggage or mail, intended to be integrated into a fixed or variable formation which is intended to transport passengers.

A Driving Trailer is a vehicle without traction equipped with a driving cab.

A coach may be equipped with a driver's cab; such a coach is then named a Driving Coach.

A van may be fitted with a driver's cab and as such is known as a Driving Van.

A Car carrier is a vehicle without traction capable of carrying passenger motor cars without their passengers and which is intended to be integrated in a passenger train.

A Fixed Rake of Coaches is a formation of several coaches “semi-permanently” coupled together, or which can be reconfigured only when it is out of service.

- (B) Freight wagons, including low-deck vehicles designed for the entire network and vehicles designed to carry lorries

These vehicles are out of the scope of this TSI. They are covered by Regulation (EU) No 321/2013 (the “freight wagons” TSI).

- (C) Special vehicles, such as on-track machines.

On track Machines (OTMs) are vehicles specially designed for construction and maintenance of the track and infrastructure. OTMs are used in different modes: working mode, transport mode as self-propelling vehicle, transport mode as a hauled vehicle.

Infrastructure inspection vehicles are utilised to monitor the condition of the infrastructure. They are operated in the same way as freight or passenger trains, with no distinction between transport and working modes.;

- (6) section 2.3.1 is replaced by the following:

‘2.3.1 Types of rolling stock

The scope of this TSI concerning rolling stock, classified in three groups as defined in the Annex I section 2 of Directive (EU) 2016/797, is detailed as follows:

- (A) Locomotives and passenger rolling stock, including thermal or electric traction units, self-propelling thermal or electric passenger trains, and passenger coaches

- (1) Thermal or electric traction units

This type includes traction vehicles that are not capable of carrying a payload, such as thermal or electric locomotives or power units.

The concerned traction vehicles are intended for freight or/and passenger transport.

Exclusion from the scope:

Shunters (as defined in Section 2.2) are not in the scope of this TSI. When they are intended to operate on the Union railway network (movement between shunting yards, stations and depots), article 1.4(b) of Directive (EU) 2016/797 applies.

- (2) Self-propelling thermal or electric passenger trains

This type includes any train in fixed or pre-defined formation, composed of vehicles passenger carrying and/or vehicles not carrying passengers.

Thermal or electric traction equipment is installed in some vehicles of the train, and the train is fitted with a driver's cab.

Exclusion from the scope:

In accordance with Articles 1.3, 1.4(d) and 1.5 of Directive (EU) 2016/797, the following rolling stock is excluded from the scope of the TSI:

- Rolling stock intended to operate on local, urban or suburban networks functionally separate from the rest of the railway system.

- Rolling stock primarily used on light rail infrastructure but equipped with some heavy rail components necessary to enable transit to be effected on a confined and limited section of heavy rail infrastructure for connectivity purposes only.
- Tram – trains.

(3) Passenger coaches and other related cars

Passenger carriages:

This type includes vehicles without traction carrying passengers (coaches, as defined in Section 2.2), and operated in a variable formation with vehicles from the category “thermal or electric traction units” defined above to provide the traction function.

Non-passenger carrying vehicles included in a passenger train:

This type includes vehicles without traction included in passenger trains (e.g. luggage or postal vans, car carriers, vehicles for service...); they are in the scope of this TSI, as vehicles related to transport of passengers.

(B) Freight wagons, including low-deck vehicles designed for the entire network and vehicles designed to carry lorries

Freight wagons are not in the scope of this TSI; they are covered by the “freight wagons” TSI even when they are included in a passenger train (the train composition is in this case an operational issue).

Vehicles intended to carry road motor vehicles (with persons on-board these road motor vehicles) are not in the scope of this TSI.

(C) Special vehicles, such as on-track machines

This type of rolling stock is in the scope of the TSI only when:

- (1) It is running on its own rail wheels; and
- (2) It is designed and intended to be detected by a track based train detection system for traffic management; and
- (3) In case of OTMs, it is in transport (running) configuration, self-propelled or hauled.

Exclusion from the scope of this TSI:

In case of OTMs, working configuration is outside the scope of this TSI.;

(7) in chapter 3, the references to ‘Annex III to Directive 2008/57/EC’ are replaced by the reference to ‘Annex III to Directive (EU) 2016/797’;

(8) section 3.1 is replaced as follows:

‘3.1 Elements of the rolling stock subsystem corresponding to the essential requirements

The following table indicates the essential requirements, as set out and numbered in Annex III of Directive (EU) 2016/797, taken into account by the specifications set out in Chapter 4 of this TSI.

Rolling stock elements corresponding to essential requirements

Note: only points in section 4.2 which contain requirements are listed.

Ref. Point	Element of the rolling stock sub-system	Safety	Reliability-Availability	Health	Environmental protection	Technical compatibility
4.2.2.2.2	Inner coupling	1.1.3 2.4.1				
4.2.2.2.3	End coupling	1.1.3 2.4.1				
4.2.2.2.4	Rescue coupling		2.4.2			2.5.3
4.2.2.2.5	Staff access for coupling and uncoupling	1.1.5		2.5.1		2.5.3
4.2.2.3	Gangways	1.1.5				
4.2.2.4	Strength of vehicle structure	1.1.3 2.4.1				
4.2.2.5	Passive safety	2.4.1				
4.2.2.6	Lifting and jacking					2.5.3
4.2.2.7	Fixing of devices to carbody structure	1.1.3				
4.2.2.8	Staff and freight access doors	1.1.5 2.4.1				
4.2.2.9	Mechanical characteristics of glass	2.4.1				
4.2.2.10	Load conditions and weighted mass	1.1.3				
4.2.3.1	Gauging					2.4.3
4.2.3.2.1	Axle load parameter					2.4.3
4.2.3.2.2	Wheel load	1.1.3				
4.2.3.3.1	Rolling stock characteristics for compatibility with train detection systems	1.1.1				2.4.3 2.3.2
4.2.3.3.2	Axle bearing condition monitoring	1.1.1	1.2			
4.2.3.4.1	Safety against derailment running on twisted track	1.1.1 1.1.2				2.4.3
4.2.3.4.2	Running dynamic behaviour	1.1.1 1.1.2				2.4.3
4.2.3.4.2.1	Limit values for running safety	1.1.1 1.1.2				2.4.3
4.2.3.4.2.2	Track loading limit values					2.4.3

Ref. Point	Element of the rolling stock sub-system	Safety	Reliability-Availability	Health	Environmental protection	Technical compatibility
4.2.3.4.3	Equivalent conicity	1.1.1 1.1.2				2.4.3
4.2.3.4.3.1	Design values for new wheel profiles	1.1.1 1.1.2				2.4.3
4.2.3.4.3.2	In-service values of wheelset equivalent conicity	1.1.2	1.2			2.4.3
4.2.3.5.1	Structural design of bogie frame	1.1.1 1.1.2				
4.2.3.5.2.1	Mechanical and geometrical characteristics of wheelsets	1.1.1 1.1.2				2.4.3
4.2.3.5.2.2	Mechanical and geometrical characteristics of wheels	1.1.1 1.1.2				
4.2.3.5.3	Automatic variable gauge systems	1.1.1 1.1.2, 1.1.3	1.2			1.5
4.2.3.6	Minimum curve radius	1.1.1 1.1.2				2.4.3
4.2.3.7	Life guards	1.1.1				
4.2.4.2.1	Braking — Functional requirements	1.1.1 2.4.1	2.4.2			1.5
4.2.4.2.2	Braking — Safety requirements	1.1.1	1.2 2.4.2			
4.2.4.3	Type of brake system					2.4.3
4.2.4.4.1	Emergency braking command	2.4.1				2.4.3
4.2.4.4.2	Service braking command					2.4.3
4.2.4.4.3	Direct braking command					2.4.3
4.2.4.4.4	Dynamic braking command	1.1.3				
4.2.4.4.5	Parking braking command					2.4.3
4.2.4.5.1	Braking performance -General requirements	1.1.1 2.4.1	2.4.2			1.5
4.2.4.5.2	Emergency braking	1.1.2 2.4.1				2.4.3

Ref. Point	Element of the rolling stock sub-system	Safety	Reliability-Availability	Health	Environmental protection	Technical compatibility
4.2.4.5.3	Service braking					2.4.3
4.2.4.5.4	Calculations related to thermal capacity	2.4.1				2.4.3
4.2.4.5.5	Parking brake	2.4.1				2.4.3
4.2.4.6.1	Limit of wheel rail adhesion profile	2.4.1	1.2 2.4.2			
4.2.4.6.2	Wheel slide protection system	2.4.1	1.2 2.4.2			
4.2.4.7	Dynamic brake — Braking systems linked to traction system	2.4.1	1.2 2.4.2			
4.2.4.8.1.	Braking system independent of adhesion conditions – General	2.4.1	1.2 2.4.2			
4.2.4.8.2.	Magnetic track brake					2.4.3
4.2.4.8.3	Eddy current track brake					2.4.3
4.2.4.9	Brake state and fault indication	1.1.1	1.2 2.4.2			
4.2.4.10	Brake requirements for rescue purposes		2.4.2			
4.2.5.1	Sanitary systems				1.4.1	
4.2.5.2	Audible communication system	2.4.1				
4.2.5.3	Passenger alarm	2.4.1				
4.2.5.4	Communication devices for passengers	2.4.1				
4.2.5.5	Exterior doors: access to and egress from Rolling stock	2.4.1				
4.2.5.6	Exterior doors: system construction	1.1.3 2.4.1				
4.2.5.7	inter-unit doors	1.1.5				
4.2.5.8	Internal air quality			1.3.2		
4.2.5.9	body side windows	1.1.5				

Ref. Point	Element of the rolling stock sub-system	Safety	Reliability-Availability	Health	Environmental protection	Technical compatibility
4.2.6.1	Environmental conditions		2.4.2			
4.2.6.2.1	Slipstream effects on passengers on platform and on workers at track side	1.1.1		1.3.1		
4.2.6.2.2	Head pressure pulse					2.4.3
4.2.6.2.3	Maximum pressure variations in tunnels					2.4.3
4.2.6.2.4	Cross wind	1.1.1				
4.2.6.2.5	Aerodynamic effect on ballasted track	1.1.1				2.4.3
4.2.7.1.1	Head lights					2.4.3
4.2.7.1.2	Marker lights	1.1.1				2.4.3
4.2.7.1.3	Tail lights	1.1.1				2.4.3
4.2.7.1.4	Lamp controls					2.4.3
4.2.7.2.1	Horn – General	1.1.1				2.4.3 2.6.3
4.2.7.2.2	Warning horn sound pressure levels	1.1.1		1.3.1		
4.2.7.2.3	Protection					2.4.3
4.2.7.2.4	Horn control	1.1.1				2.4.3
4.2.8.1	Traction performance					2.4.3 2.6.3
4.2.8.2 4.2.8.2.1 to 4.2.8.2.9	Power supply					1.5 2.4.3 2.2.3
4.2.8.2.10	Electrical protection of the train	2.4.1				
4.2.8.3	Diesel and other thermal traction system	2.4.1				1.4.1
4.2.8.4	Protection against electrical hazards	2.4.1				
4.2.9.1.1	Driver's cab – General	—	—	—	—	—
4.2.9.1.2	Access and egress	1.1.5				2.4.3
4.2.9.1.3	External visibility	1.1.1				2.4.3

Ref. Point	Element of the rolling stock sub-system	Safety	Reliability-Availability	Health	Environmental protection	Technical compatibility
4.2.9.1.4	Interior layout	1.1.5				
4.2.9.1.5	Driver's seat			1.3.1		
4.2.9.1.6	Driver's desk- Ergonomics	1.1.5		1.3.1		
4.2.9.1.7	Climate control and air quality			1.3.1		
4.2.9.1.8	Internal lighting					2.6.3
4.2.9.2.1	Windscreen — Mechanical characteristics	2.4.1				
4.2.9.2.2	Windscreen — Optical characteristics					2.4.3
4.2.9.2.3	Windscreen – Equipment					2.4.3
4.2.9.3.1	Driver's activity control function	1.1.1				2.6.3
4.2.9.3.2	Speed indication	1.1.5				
4.2.9.3.3	Driver display unit and screens	1.1.5				
4.2.9.3.4	Controls and indicators	1.1.5				
4.2.9.3.5	Labelling					2.6.3
4.2.9.3.6	Radio remote control function by staff for shunting operation	1.1.1				
4.2.9.4	Onboard tools and portable equipment	2.4.1				2.4.3 2.6.3
4.2.9.5	Storage facility for staff personal effects	—	—	—	—	—
4.2.9.6	Recording device					2.4.4
4.2.10.2	Fire safety – Measures to prevent fire	1.1.4		1.3.2	1.4.2	
4.2.10.3	Measures to detect/control fire	1.1.4				
4.2.10.4	Requirements related to emergency situations	2.4.1				
4.2.10.5	Requirements related to evacuation	2.4.1				
4.2.11.2	Train exterior cleaning					1.5
4.2.11.3	Connection to toilet discharge system					1.5

Ref. Point	Element of the rolling stock sub-system	Safety	Reliability-Availability	Health	Environmental protection	Technical compatibility
4.2.11.4	Water refilling equipment			1.3.1		
4.2.11.5	Interface for water refilling					1.5
4.2.11.6	Special requirements for stabling of trains					1.5
4.2.11.7	Refuelling equipment					1.5
4.2.11.8	Train interior cleaning – power supply					2.5.3
4.2.12.2	General documentation					1.5
4.2.12.3	Documentation related to maintenance	1.1.1				2.5.1 2.5.2 2.6.1 2.6.2
4.2.12.4	Operating documentation	1.1.1				2.4.2 2.6.1 2.6.2
4.2.12.5	Lifting diagram and instructions					2.5.3
4.2.12.6	Rescue related descriptions		2.4.2			2.5.3'

(9) in section 4.1, the text 'Directive 2008/57/EC' is replaced by the text 'Directive (EU) 2016/797';

(10) in section 4.2.1.1, the text 'Article 5(8) of Directive 2008/57/EC' is replaced by the text 'Article 4(8) of Directive (EU) 2016/797';

(11) section 4.2.1.2 is amended as follows:

(a) the text 'Article 5(6) of Directive 2008/57/EC' is replaced by the text 'Article 4(6) of Directive (EU) 2016/797';

(b) the text 'Articles 5(6) and 17(3) of Directive 2008/57/EC' is replaced by the text 'Articles 4(6) and 13(2) of Directive (EU) 2016/797';

(12) point (b-2) of section 4.2.2.3 is replaced as follows:

'(b-2) Compatibility between units

On units equipped with manual coupling system of UIC type (as described in clause 5.3.2) and pneumatic brake system compatible with UIC type (as described in clause 4.2.4.3), the following requirements apply:

(1) The buffers and the screw coupling shall be installed according to clauses 5 and 6 of the specification referenced in Appendix J-1, index 110.

(2) The dimensions and layout of brake pipes and hoses, couplings and cocks shall meet the requirements set out in clauses 7 and 8 of the specification referenced in Appendix J-1, index 110.;

(13) points (5) to (9) of section 4.2.2.5 are replaced by the following:

(5) Passive safety is aimed at complementing active safety when all other measures have failed. For this purpose, the mechanical structure of vehicles shall provide protection of the occupants in the event of a collision by providing means of:

- limiting deceleration
- maintaining survival space and structural integrity of the occupied areas
- reducing the risk of overriding
- reducing the risk of derailment
- limiting the consequences of hitting a track obstruction.

To meet these functional requirements, units shall comply with the detailed requirements specified in the specification referenced in Appendix J-1, index 8 related to crashworthiness design category C-I (as per the specification referenced in Appendix J-1, index 8, Table 1 section 5), unless specified otherwise below.

The following four reference collision scenarios shall be considered:

- scenario 1: A front end impact between two identical units,
- scenario 2: A front end impact with a freight wagon,
- scenario 3: An impact of the unit with a large road vehicle on a level crossing,
- scenario 4: An impact of the unit into a low obstacle (e.g. car on a level crossing, animal, rock, etc.).

(6) These scenarios are described in the specification referenced in Appendix J-1, index 8, Table 3 of Section 5.

(7) The present TSI specifies crashworthiness requirements applicable within its scope; therefore, the Annex A of the specification referenced in Appendix J-1, index 8 shall not apply. The requirements of the specification referenced in Appendix J-1, index 8 Section 6 shall be applied in relation to the above given reference collision scenarios.

(8) To limit the consequences of hitting a track obstruction, the leading ends of locomotives, power heads, driving coaches and trainsets shall be equipped with an obstacle deflector. The requirements with which obstacle deflectors shall comply are defined in the specification referenced in Appendix J-1, index 8, Section 6.5.;

(14) in point (1) of section 4.2.2.10, the reference to ‘clause 2.1’ is replaced by ‘clause 4.5’;

(15) a new point (2a) is added below point (2) of section 4.2.3.3.2.2 as follows:

(2a) For units designed to be operated on the 1 668 mm system, the zone visible to the trackside equipment on rolling stock shall be the area as defines in Table 1 referring to the parameters of the specification referenced in Appendix J-1, index 15.

Table 1

Target and prohibitive zone for units intended to be operated on 1 668 mm networks

Track gauge [mm]	YTA [mm]	WTA [mm]	LTA [mm]	YPZ [mm]	WPZ [mm]	LPZ [mm]
1 668	1 176 ± 10	≥ 55	≥ 100	1 176 ± 10	≥ 110	≥ 500'

(16) point (2) of section 4.2.3.3.2.2 is replaced by the following:

‘(2) For units designed to be operated on other track gauges than 1 435 mm or 1 668 mm a specific case is declared where relevant (harmonised rule available for the concerned network).’;

(17) point (3) of section 4.2.3.4.2 is replaced by the following:

‘(3) The unit shall run safely and produce an acceptable level of track loading when operated within the limits defined by the combination(s) of speed and cant deficiency under the conditions set out in the specification referenced in Appendix J-1, index 16.

This shall be assessed by verifying that limit values specified below in clauses 4.2.3.4.2.1 and 4.2.3.4.2.2 of this TSI are respected; the conformity assessment procedure is described in clause 6.2.3.4 of this TSI.’;

(18) point (5) of section 4.2.3.4.2 is replaced by the following:

‘(5) The running dynamic behaviour test report (including limits of use and track loading parameters) shall be stated in the technical documentation described in clause 4.2.12 of this TSI.

Track loading parameters (including the additional ones Y_{max} , B_{max} and the B_{qst} where relevant) to be recorded are defined in the specification referenced in Appendix J-1, index 16.’;

(19) point (1) of section 4.2.3.4.2.1 is replaced by the following:

‘(1) The limit values for running safety which the unit shall meet are specified in the specification referenced in Appendix J-1, index 17.’;

(20) point (1) of section 4.2.3.4.2.2 is replaced by the following:

‘(1) The limit values for track loading which the unit shall meet (when assessing with the normal method) are specified in the specification referenced in Appendix J-1, index 19.’;

(21) section 4.2.3.5.2.3 is deleted;

(22) section 4.2.3.5.3 is added after section 4.2.3.5.2.2 as follows:

‘4.2.3.5.3. *Automatic variable gauge systems*

- (1) This requirement is applicable to units equipped with an automatic variable gauge system with changeover mechanism of the axial position of the wheels allowing the unit to be compatible with 1 435 mm track gauge and other track gauge(s) within the scope of this TSI by means of passage through a track gauge changeover facility.
- (2) The changeover mechanism shall ensure the locking in the correct intended axial position of the wheel.
- (3) After passage through the track gauge changeover facility, the verification of the state of the locking system (locked or unlocked) and of the position of the wheels shall be performed by one or more of the following means: visual control, on-board control system or infrastructure/facility control system. In case of on-board control system, a continuous monitoring shall be possible.
- (4) If a running gear is equipped with brake equipment subject to a change in position during the gauge change operation, the automatic variable gauge system shall ensure the position and safe locking in the correct position of this equipment simultaneously to those of the wheels.
- (5) The failure of the locking of the position of the wheels and braking equipment (if relevant) during operation has typical credible potential to lead directly to a catastrophic accident (resulting in multiple fatalities); considering this severity of the failure consequence, it shall be demonstrated that the risk is controlled to an acceptable level.

- (6) The automatic variable gauge system is defined as an interoperable constituent (clause 5.3.4b). The conformity assessment procedure is specified in clause 6.1.3.1a (IC level), in clause 6.2.3.5 (safety requirement) and in clause 6.2.3.7b (subsystem level) of this TSI.
- (7) The track gauges the unit is compatible with shall be recorded in the technical documentation. A description of the changeover operation in normal mode, including the type(s) of track gauge changeover facility(ies) the unit is compatible with, shall be part of the technical documentation (see also clause 4.2.12.4 (1) of this TSI).
- (8) The requirements and conformity assessments required in other sections of this TSI apply independently for each wheel position corresponding to one track gauge, and have to be documented accordingly.;

(23) section 4.2.4.8.2 is replaced by the following:

4.2.4.8.2. Magnetic track brake

- (1) Requirements on magnetic brakes specified for compatibility with train detection system based on axle counters are referenced in point 4.2.3.3.1.2(10) of this TSI.
- (2) A magnetic track brake is allowed to be used as an emergency brake, as mentioned in the TSI INF, clause 4.2.6.2.2.
- (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.
- (4) Magnetic track brake shall not be used at speed higher than 280 km/h.
- (5) The braking performance of the unit specified in clauses 4.2.4.5.2 of this TSI shall be determined with and without the use of magnetic track brakes.;

(24) section 4.2.4.8.3 is replaced by the following:

4.2.4.8.3. Eddy current track brake

- (1) This clause covers only eddy current track brake developing a brake force between the unit and the rail.
- (2) Requirements on eddy current track brakes specified for compatibility with train detection system based on axle counters, track circuits, wheel detectors and vehicle detectors based on inductive loops are referenced in point 4.2.3.3.1.2(10) of this TSI.
- (3) If the eddy current track brake requires a displacement of its magnets when the brake is applied, the unobstructed movement of such magnets between the “brake released” and “brake applied” positions shall be demonstrated by calculation in accordance with the specification referenced in Appendix J-1, index 14.
- (4) The maximum distance between the eddy current track brake and the track corresponding to “brake released” position will be recorded in the technical documentation described in clause 4.2.12 of this TSI.
- (5) The eddy current track brake shall not operate below a fixed speed threshold.
- (6) The conditions for use of eddy current track brake for technical compatibility with the track are not harmonised (regarding in particular their effect on rail heating and vertical force) and are an open point.
- (7) The Register of Infrastructure indicates per track section if their use is allowed, and provides in such case their conditions for use.
 - The maximum distance between the eddy current track brake and the track corresponding to “brake released” referred to in point (4),
 - Fixed speed threshold referred to in point (5),

- Vertical force as a function of the train speed, for the case of full application of eddy current track brake (emergency braking) and limited application of eddy current brake (service braking),
 - Braking force as a function of the train speed, for the case of full application of eddy current track brake (emergency braking) and limited application of eddy current brake (service braking).
- (8) The braking performance of the unit specified in clauses 4.2.4.5.2 and 4.2.4.5.3 of this TSI shall be determined with and without the use of eddy current track brakes.;

(25) point (1) of section 4.2.6.2 is replaced by the following:

- (1) The requirements in this clause apply to all rolling stock. For rolling stock operated on the 1 520 mm and 1 600 mm track gauge systems, in case of a maximum speed higher than the limits specified in the clauses 4.2.6.2.1 to 4.2.6.2.5, the procedure for innovative solution shall apply.;

(26) section 4.2.6.2.1 is replaced by the following:

4.2.6.2.1. Slipstream effects on passengers on platform and on workers trackside

- (1) Units of maximum design speed $v_{tr,max} > 160$ km/h, running in the open air at a reference speed $v_{tr,ref}$ shall not cause the air speed to exceed, at each measurement point defined in clause 4.2.2.1 and Table 5 of the specification referenced in Appendix J-1 index 108, the value $u_{95\%,max}$ as indicated in Table 5 of the specification referenced in Appendix J-1, index 108.
- (2) For units intended to be operated on the networks with track gauges of 1 524 mm and 1 668 mm, the corresponding values in Table 4 referring to the parameters of the specification referenced in Appendix J-1, index 108 shall be applied:

Table 4

Limit criteria

Track gauge (mm)	Maximum design speed $v_{tr,max}$ (km/h)	Measurement point		Trackside maximum permissible air speed, (limit values for $u_{95\%,max}$ (m/s))	Reference speed $v_{tr,ref}$ (km/h)
		Measurement performed at height above the top of rail	Measurement performed at a distance from the track centre		
1 524	$160 < v_{tr,max} < 250$	0,2 m	3,0 m	22,5	Maximum design speed
		1,4 m	3,0 m	18	200 km/h or the maximum design speed, whichever is lower
1 668	$160 < v_{tr,max} < 250$	0,2 m	3,1 m	20	Maximum design speed
		1,4 m	3,1 m	15,5	200 km/h or the maximum design speed, whichever is lower
	$250 \leq v_{tr,max}$	0,2 m	3,1 m	22	300 km/h or the maximum design speed, whichever is lower
		1,4 m	3,1 m	15,5	200 km/h

- (3) The train formation to be tested is specified for fixed/predefined formations and units assessed for use in general operation respectively in clauses 4.2.2.2 and 4.2.2.4 of the specification referenced in Appendix J-1, index 108. Single units fitted with a drivers cab shall be tested within a formation complying with the requirements set out in clause 4.2.2.3 of specification referenced in Appendix J-1, index 108.
- (4) The conformity assessment procedure is described in clause 6.2.3.13 of this TSI;

(27) section 4.2.6.2.2 is amended as follows:

(a) point (1) is replaced by the following:

‘(1) The passing of two trains generates an aerodynamic load on each of the two trains. The requirement on head pressure pulse in open air allows a limit aerodynamic load induced by the rolling stock in open air to be defined assuming a distance between track centres for the track where the train is intended to be operated.

The distance between track centres depends on the speed and the gauge of the line. Minimum values of a distance between track centres depending on speed and gauge are defined in the INF TSI.’;

(b) point (2) is replaced by the following:

‘(2) Units with a maximum design speed higher than 160 km/h running in the open air at their reference speed $v_{tr,ref}$ on 1 435 mm track gauge shall not cause the maximum peak-to-peak pressure to exceed the maximum permissible pressure change defined in Table 2 of the specification referenced in Appendix J-1, index 109 assessed over the measurement positions defined in point 4.1.2 of the specification referenced in Appendix J-1, index 109.’;

(c) point (3) is replaced by the following:

‘(3) For units intended to be operated on the networks with track gauges of 1 524 mm and 1 668 mm, the corresponding values in Table 4a referring to the parameters of the specification referenced in Appendix J-1, index 109 shall be applied:

Table 4a

Limit criteria

Track gauge	Maximum design speed $v_{tr,max}$ (km/h)	Measurement point		Permissible pressure change, $(\Delta P_{95\%,max})$	Reference speed $v_{tr,ref}$ (km/h)
		Measurement performed at height above the top of rail	Measurement performed at a distance from the track centre		
1 524 mm	$160 < v_{tr,max} < 250$	between 1,5 m and 3,0 m	2,5 m	1 600 Pa	Maximum design speed
1 668 mm	$160 < v_{tr,max} < 250$	between 1,5 m and 3,0 m	2,6 m	800 Pa	Maximum design speed
	$250 \leq v_{tr,max}$	between 1,5 m and 3,0 m	2,6 m	800 Pa	250 km/h’

(28) section 4.2.6.2.5 is replaced by the following:

‘4.2.6.2.5 Aerodynamic effect on ballasted tracks

- (1) This requirement applies to units of maximum design speed higher than 250 km/h.
- (2) The requirement on the aerodynamic effect of trains on ballasted tracks, in order to limit risks induced by the projection of ballast (ballast pick up), is an open point.’;

(29) point (2) of section 4.2.7.1 is replaced by the following:

‘(2) This requirement is not applicable to lights with luminous intensity not higher than 100 cd that are included in push buttons for the command of passenger doors (not continuously lit).’;

(30) a new point (5) is added below point (4) of section 4.2.8.2.9.1.1 as follows:

‘(5) 3 920 mm and 5 700 mm above rail level for electric units designed to be operated on the 1 500 V DC system in accordance with the IRL gauge (track gauge system 1 600 mm).’;

(31) point (1) of section 4.2.8.2.9.2 is replaced by the following:

‘(1) For electric units designed to be operated on other track gauge systems than 1 520 mm or 1 600 mm system, at least one of the pantograph(s) to be installed shall have a head geometry type compliant with one of the two specifications given in the clauses 4.2.8.2.9.2.1 and 2 below.’;

(32) a new point (2a) is added below point (2) of section 4.2.8.2.9.2 as follows:

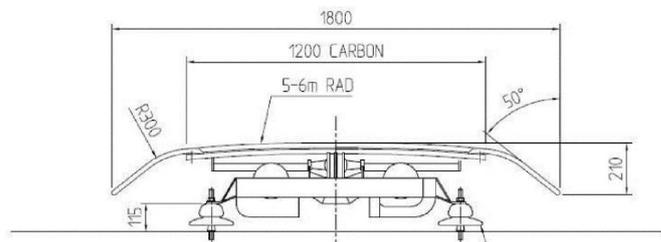
‘(2a) For electric units designed to be operated solely on the 1 600 mm system, at least one of the pantographs to be installed shall have a head geometry type compliant with the specifications given in the clauses 4.2.8.2.9.2.3a below.’;

(33) section 4.2.8.2.9.3 is re-numbered 4.2.8.2.9.3a;

(34) section 4.2.8.2.9.3 is added after section 4.2.8.2.9.2.3 as follows:

‘4.2.8.2.9.3 Pantograph head geometry type 1 800 mm

(1) The profile of the pantograph head shall be as depicted below:



(35) point (4) of section 4.2.11.6 is replaced by the following:

‘(4) “Single pole” power supply line (AC 1 kV, AC/DC 1,5 kV, DC 3 kV), in accordance with the specification referenced in Appendix J-1, index 111.’;

(36) in section 4.2.12.1, the reference to ‘clause 2.4 of Annex VI of Directive 2008/57/EC’ is replaced by the reference to ‘clause 2.4(a) of Annex IV of Directive (EU) 2016/797’;

(37) in section 4.2.12.1, points (2) and (3) are replaced by:

‘(2) This documentation, being part of the technical file, is compiled by the applicant and has to accompany the EC declaration of verification. It is kept by the applicant throughout the service life of the subsystem.’;

(38) a new point (3) is added below point (2) of section 4.2.12.1 as follows:

‘(3) The applicant or any entity authorised by the applicant (e.g. a keeper) shall provide the part of this documentation required to manage the maintenance documentation as defined in the art 14(3)(b) of Directive (EU) 2016/798 of the European Parliament and of the Council (*) to the entity in charge of maintenance as soon as it is assigned for the maintenance of the unit.

(*) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (OJ L 138, 26.5.2016, p. 102).’;

(39) point (4) of section 4.2.12.1 is replaced by the following:

‘(4) The documentation also includes a list of safety critical components. Safety critical components are components for which a single failure has a credible potential to lead directly to a serious accident as defined in Article 3(12) of Directive (EU) 2016/798.

(5) The content of the documentation is described in the clauses below.;

(40) a new point (3a) is added below point (3) of section 4.2.12.2 as follows:

‘(3a) For units designed and assessed for general operation, this shall include a description of the electric interfaces between units and of communication protocols, with the reference to the standards or other normative documents that have been applied. Communication protocols (if used) shall comply with the specification referenced in Appendix J-1, index 112.’;

(41) a new point (9a) is added below point (9) of section 4.2.12.2 as follows:

‘(9a) Maximum distance between the eddy current track brake and the track corresponding to “brake released”, fixed speed threshold, vertical force and braking force as a function of the train speed, for the case of full application of eddy current track brake (emergency braking) and limited application of eddy current brake (service braking), as required in clause 4.2.4.8.3.’;

(42) point (2) of section 4.2.12.3 is replaced by the following:

‘(2) The maintenance design justification file: explains how maintenance activities are defined and designed in order to ensure that the rolling stock characteristics will be kept within acceptable limits of use during its lifetime.

The maintenance design justification file shall give input data in order to determine the criteria for inspection and the periodicity of maintenance activities.’;

(43) point (3) of section 4.2.12.3 is replaced by the following:

‘(3) The maintenance description file: explains how maintenance activities are recommended to be performed.’;

(44) a new point (1a) is added below point (1) of section 4.2.12.3.1 as follows:

‘(1a) Precedents, principles and methods used to identify the safety critical components and their specific operational, servicing, maintenance and traceability requirements.’;

(45) a new point (6a) is added below point (6) of section 4.2.12.3.2 as follows:

‘(6a) Safety critical components list: The safety critical components list shall contain the specific servicing, maintenance and servicing/maintenance traceability requirements.’;

(46) point (1) of section 4.2.12.4 is replaced by the following:

‘(1) A description of operation in normal mode, including the operational characteristics and limitations of the unit (e.g. vehicle gauge, maximum design speed, axle loads, brake performance, type(s) and operation of track gauge changeover facility(ies) the unit is compatible with...).’;

(47) a new point (3a) is added below point (3) of section 4.2.12.4 as follows:

‘(3a) Safety critical components list: The safety critical components list shall contain the specific operational and traceability requirements.’;

(48) Table 7 in section 4.3.2 is replaced by the following:

‘Table 7

Interface with the Infrastructure subsystem

Reference LOC & PAS TSI		Reference Infrastructure TSI	
Parameter	Point	Parameter	Point
Rolling stock kinematic gauge	4.2.3.1.	Structure gauge	4.2.3.1
		Distance between track centres	4.2.3.2
		Minimum radius of vertical curve	4.2.3.5
Axle load parameter	4.2.3.2.1	Track resistance to vertical loads	4.2.6.1
		Lateral track resistance	4.2.6.3
		Resistance of new bridges to traffic loads	4.2.7.1
		Equivalent vertical loading for new earthworks and earth pressure effects	4.2.7.2
		Resistance of existing bridges and earthworks to traffic loads	4.2.7.4
Running dynamic behaviour	4.2.3.4.2.	Cant deficiency	4.2.4.3
Running dynamic limit values for track loading	4.2.3.4.2.2	Track resistance to vertical loads	4.2.6.1
		Lateral track resistance	4.2.6.3
Equivalent conicity	4.2.3.4.3	Equivalent conicity	4.2.4.5
Geometrical characteristics of wheelset	4.2.3.5.2.1	Nominal track gauge	4.2.4.1
Geometrical characteristics of wheels	4.2.3.5.2.2	Rail head profile for plain line	4.2.4.6
Automatic variable gauge systems	4.2.3.5.3	In service geometry of switches and crossings	4.2.5.3
Minimum curve radius	4.2.3.6	Minimum radius of horizontal curve	4.2.3.4
Maximum average deceleration	4.2.4.5.1	Longitudinal track resistance	4.2.6.2
		Actions due to traction and braking	4.2.7.1.5
Slipstream effects	4.2.6.2.1	Resistance of new structures over or adjacent to tracks	4.2.7.3
Head pressure pulse	4.2.6.2.2	Maximum pressure variations in tunnels	4.2.10.1
Maximum pressure variations in tunnels	4.2.6.2.3	Distance between track centres	4.2.3.2

Reference LOC & PAS TSI		Reference Infrastructure TSI	
Parameter	Point	Parameter	Point
Crosswind	4.2.6.2.4	Effect of crosswinds	4.2.10.2
Aerodynamic effect on ballasted track	4.2.6.2.5	Ballast pick-up	4.2.10.3
Toilet discharge system	4.2.11.3	Toilet discharge	4.2.12.2
Exterior cleaning through a washing plant	4.2.11.2.2	Train external cleaning facilities	4.2.12.3
Water refilling equipment:	4.2.11.4	Water restocking	4.2.12.4
Interface for water refilling	4.2.11.5		
Refuelling equipment	4.2.11.7	Refuelling	4.2.12.5
Special requirements for stabling of trains	4.2.11.6	Electric shore supply	4.2.12.6'

(49) a new point (3a) is added below point (3) of section 4.4 as follows:

'(3a) For the safety critical components, the specific operational and operational traceability requirements are developed by the designers/manufacturers at design phase and through a collaboration between designers/manufacturers and the concerned railway undertakings after vehicles have entered into operation.';

(50) section 4.5 is replaced by the following:

'4.5. Maintenance rules

- (1) In light of the essential requirements mentioned in Section 3, the provisions for maintenance of the rolling stock in the scope of this TSI:
 - Clause 4.2.11 "Servicing"
 - Clause 4.2.12 "Documentation for Operation and Maintenance".
- (2) Other provisions in the section 4.2 (clauses 4.2.3.4 and 4.2.3.5) specify for particular characteristics the limit values that have to be verified during maintenance activities.
- (2a) The safety critical components and their specific servicing, maintenance and maintenance traceability requirements are identified by the designers/manufacturers at design phase and through a collaboration between designers/manufacturers and the concerned entities in charge of maintenance after vehicles have entered into operation.
- (3) From the information mentioned above and provided in the clause 4.2, the appropriate tolerances and intervals to ensure compliance with the essential requirements throughout the lifetime of the rolling stock are defined at maintenance operational level by and under the sole responsibility of entities in charge of maintenance (not in the scope of the assessment against this TSI); this activity includes:
 - The definition of the in-service values where they are not specified in this TSI, or where operating conditions allow the use of different in-service limit values than those specified in this TSI.
 - The justification of the in-service values, by providing the equivalent information to those required in clause 4.2.12.3.1 "The maintenance design justification file".
- (4) On the basis of the information mentioned above in this clause, a maintenance plan is defined at maintenance operational level by and under the sole responsibility of the entities in charge of maintenance (not in the scope of the assessment against this TSI), consisting in a structured set of maintenance tasks that include the activities, tests and procedures, means, maintenance criteria, periodicity, working time required to carry out the maintenance tasks.

- (5) For on-board software, the designer/manufacturer shall specify, for any on-board software modification, all maintenance requirements and procedures (including health monitoring, diagnosis of events, test methods and tools and also the required professional competence) necessary for achieving essential requirements and values quoted in the mandatory requirements of this TSI throughout the life-cycle (Installation, normal operation, failures, repair work, checking and maintenance, decommissioning, etc.);

(51) in section 4.7, the reference to 'Directive 2008/57/EC' is replaced by the reference to 'Directive (EU) 2016/797';

(52) in section 4.8, the reference to 'Article 34(2a) of Directive 2008/57/EC' is replaced by the reference to 'point (a) of Article 48(3) of Directive (EU) 2016/797';

(53) a new section 4.9 is added below point (3) of section 4.8 as follows:

'4.9. Route compatibility checks before the use of authorised vehicles

The parameters of the subsystem "rolling stock — locomotives and passenger rolling stock" to be used by the railway undertaking, for the purpose of route compatibility check, are described in Appendix D1 of Commission Implementing Regulation (EU) 2019/773 (*).

(*) Commission Implementing Regulation (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU (OJ L 139 I, 27.5.2019, p. 5).;

(54) in section 5.1, the reference to 'Article 2(f) of Directive 2008/57/EC' is replaced by the reference to 'Article 2(7) of Directive (EU) 2016/797';

(55) a new section 5.3.4a is added below section 5.3.4 as follows:

'5.3.4a Automatic variable gauge systems

- (1) An IC "automatic variable gauge system" shall be designed and assessed for an area of use defined by:

- The track gauges the system is designed for.
- The range of maximum static axle loads (corresponding to design mass under normal payload as defined in clause 4.2.2.10 of this TSI).
- The range of nominal wheel tread diameters.
- The maximum design speed of the unit.
- The type(s) of track gauge changeover facility(ies) the system is designed for, including the nominal speed through the track gauge changeover facility(ies) and the maximum axial forces during the automatic gauge changeover process.

- (2) An automatic variable gauge system shall comply with the requirements set out in clause 4.2.3.5.2.3; these requirements shall be assessed at IC level as set out in clause 6.1.3.1a.;

(56) in section 6.1.1, the text 'Article 13(1) and Annex IV of Directive 2008/57/EC' is replaced by the reference to 'Article 10 of Directive (EU) 2016/797';

(57) a new point (3) is added below point (2) of section 6.1.1 as follows:

(3) In case of a specific case applicable to a component defined as interoperability constituent in section 5.3 of this TSI, the corresponding requirement can be part of the verification at interoperability constituent level only in the case where the component remains compliant to the chapters 4 and 5 of this TSI, and where the specific case does not refer to a national rule (i.e. additional requirement compatible with the core TSI and fully specified in the TSI).

In other cases, the verification shall be made at subsystem level; when a national rule applies to a component, the concerned Member State may define relevant applicable conformity assessment procedures.;

(58) in the second table of section 6.1.2, a new row is added below the row '5.3.4 wheel' as follows:

'5.3.4a	Automatic variable gauge systems		X (*)		X	X	X (*)	X'
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(59) a new section 6.1.3.1a is added below point (8) of section 6.1.3.1 as follows:

'6.1.3.1a. Automatic variable gauge system (clause 5.3.4a)

- (1) The assessment procedure shall be based on a validation plan covering all aspects mentioned in clauses 4.2.3.5.3 and 5.3.4a.
- (2) The validation plan shall be consistent with the safety analysis required in clause 4.2.3.5.3 and shall define the assessment needed in all the following different phases:
 - Design review.
 - Static tests (bench tests and integration in the running gear/unit tests).
 - Test on track gauge changeover facility(ies), representative of in-service conditions.
 - On-track tests, representative of in-service conditions.
- (3) Regarding the demonstration of compliance to points (5) of clause 4.2.3.5.3, the assumptions considered for the safety analysis related to the vehicle the system is intended to be integrated in, and related to the mission profile of that vehicle, shall be clearly documented.
- (4) The automatic variable gauge system may be subject to an assessment of suitability for use (module CV; see also clause 6.1.6).
- (5) The certificate delivered by the Notified Body in charge of the conformity assessment shall include both the conditions for use as per clause 5.3.4a (1) and the type(s) and operating conditions of the track gauge changeover facility(ies) the automatic variable gauge system has been assessed for.;

(60) point (1) of section 6.1.6 is replaced by the following:

- '(1) Assessment of suitability for use according to the type validation of in service experience procedure (module CV) may be part of the assessment procedure for the following interoperability constituents:
- Wheels (see clause 6.1.3.1).
 - Automatic variable gauge system (see clause 6.1.3.1a).
 - Wheel slide protection system (see clause 6.1.3.2).
 - Contact strips (see clause 6.1.3.8).';

(61) in section 6.2.1, the text 'Article 18 and Annex VI of Directive 2008/57/EC' is replaced by the reference to 'Article 15 and Annex IV of Directive (EU) 2016/797';

(62) point (1) of section 6.2.3.3 is replaced by the following:

- '(1) The demonstration of conformity shall be carried out in accordance with one of the methods specified in the specification referenced in Appendix J-1, index 83.'

(63) section 6.2.3.4 is replaced by the following:

'6.2.3.4. Running dynamic behaviour – technical requirements (Clause 4.2.3.4.2 a)

- (1) For units designed to be operated on 1 435 mm or 1 524 mm or 1 668 mm system, the demonstration of conformity shall be carried out in accordance with the specification referenced in Appendix J-1, index 84, clause 7.

The parameters described in clauses 4.2.3.4.2.1 and 4.2.3.4.2.2 shall be assessed using criteria defined in the specification referenced in Appendix J-1, index 84.;

(64) point (3) of section 6.2.3.5 is replaced by the following:

‘(3) The compliance with the safety requirements that are specified in clauses 4.2.3.4.2, 4.2.3.5.3, 4.2.4.2.2, 4.2.5.3.5, 4.2.5.5.8 and 4.2.5.5.9 in terms of level of severity/consequences associated to hazardous failure scenarios shall be demonstrated by one of the two following methods:

1. Application of a harmonised risk acceptance criterion associated to the severity specified in the clause 4.2 (e.g. “fatalities” for emergency braking).

The applicant may choose to use this method, provided that there is an available harmonized risk acceptance criterion defined in the CSM on Risk Assessment and its amendments (Commission Implementing Regulation (EU) No 402/2013 (*)).

The applicant shall demonstrate compliance with the harmonised criterion by applying Annex I-3 of the CSM on RA. The following principles (and their combinations) may be used for the demonstration: similarity with reference system(s); application of codes of practice; application of explicit risk estimation (e.g. probabilistic approach).

The applicant shall designate the body for the assessment of the demonstration he will provide: the notified body selected for the RST sub-system or an assessment body as defined in the CSM on RA.

The demonstration shall be recognized in all Member States; or

2. Application of a risk evaluation and assessment in accordance with the CSM on RA, in order to define the risk acceptance criterion to be used, and demonstrate compliance to this criterion.

The applicant may choose to use this method in any case.

The applicant shall designate the assessment body for the assessment of the demonstration he will provide, as defined in the CSM on RA.

A safety assessment report shall be provided in compliance with the requirements defined in the CSM on RA and its amendments.

The safety assessment report shall be taken into account by the Authorising Entity, in accordance with Section 2.5.6 of Annex I and Article 15(2) of the CSM on RA.

(*) Commission Implementing Regulation (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009 as referred to in Article 6(3)(a) of Directive 2004/49/EC of the European Parliament and of the Council (OJ L 121, 3.5.2013, p. 8).’;

(65) the second paragraph in point (1) of section 6.2.3.6 is replaced by the following:

‘The evaluation of the equivalent conicity is set out in the specification referenced in Appendix J-1, index 107.’;

(66) a new section 6.2.3.7a is added after section 6.2.3.7 as follows:

‘6.2.3.7a Automatic variable gauge system

- (1) The safety analysis required in clause 4.2.3.5.3 point (5), and performed at IC level, shall be consolidated at the level of the unit (vehicle); in particular, the assumptions made according to clause 6.1.3.1a point (3) may need to be reviewed to take into account the vehicle and its mission profile.

- (2) The assessment of the integration of the IC within the running gear/unit and the technical compatibility with the track gauge changeover facility shall consist of:

— The compliance with the area of use defined in clause 5.3.4.a (1) shall be verified,

- Verification of the correct integration of the IC within the running gear/unit, including the correct performance of its on-board control/monitoring system (when applicable), and
- On-track tests including tests on the track gauge changeover facility(ies), representative of in-service conditions.;

(67) section 6.2.3.13 is replaced by the following:

‘6.2.3.13. Slipstream effects on passengers on platform and on workers trackside (clause 4.2.6.2.1)

- (1) Demonstration of conformity with the limit value of trackside maximum permissible air speed set out in clause 4.2.6.2.1 of this TSI shall be demonstrated on the basis of full-scale tests on straight track performed in accordance with clause 6.2.2.1 of specification referenced in Appendix J-1, index 94.
- (2) Instead of the full assessment described above, it is permitted to carry out a simplified assessment for rolling stock of a similar design to rolling stock for which the full assessment defined in this TSI has been carried out. In such cases, the simplified conformity assessment defined in clause 4.2.4 of the specification referenced in Appendix J-1, index 94, can be applied as long as the differences in the design remain within the limits of table 7 of the specification referenced in Appendix J-1, index 94.;

(68) section 6.2.3.14 is replaced by the following:

‘6.2.3.14. Head pressure pulse (clause 4.2.6.2.2)

- (1) Conformity shall be assessed on the basis of full-scale tests under conditions specified in the specification referenced in Appendix J-1, index 95, clause 6.1.2.1. Alternatively conformity may be assessed by means of either validated Computational Fluid Dynamics (CFD) simulations as described in the specification referenced in Appendix J-1, index 95, clause 6.1.2.4 or as an additional alternative conformity is permitted to be assessed by moving model tests as specified in the specification referenced in Appendix J-1, index 95, clause 6.1.2.2.
- (2) Instead of the full assessment described above, it is permitted to carry out a simplified assessment for rolling stock of a similar design to rolling stock for which the full assessment defined in this TSI has been carried out. In such cases, the simplified conformity assessment defined in clause 4.1.4 of the specification referenced in Appendix J-1, index 95, can be applied as long as the differences in the design remain within the limits of table 4 of the specification referenced in Appendix J-1, index 95.;

(69) in section 6.2.6, the text ‘Article 18(3) of Directive 2008/57/EC’ is replaced by the reference to ‘Article 15(4) of Directive (EU) 2016/797’;

(70) a new section 6.2.7a is added after section 6.2.7 as follows:

‘6.2.7a *Additional optional requirements for units intended to be used in general operation*

- (1) The compliance with the following set of conditions (2) to (9) is optional and only aims to facilitate exchange of units intended for general operations. Compliance with these provisions does not assure full interchangeability of units and does not exempt the railway undertaking of its responsibilities regarding the use of these units in a train formation as defined in clause 6.2.7. If the applicant selects this option, a notified body has to assess the compliance within the EC verification procedure. This shall be reported in the certificate and in the technical documentation.
- (2) The unit shall be fitted with a manual coupling system as defined in clauses 4.2.2.2.3 b) and 5.3.2
- (3) The unit shall be fitted with an EN-UIC braking system as defined in the specification referenced in Appendix J-1, index 22.
- (4) The unit shall meet the requirements of this TSI at least within the temperature range T1 (– 25 °C to + 40 °C; nominal) as defined in clause 4.2.6.1 of this TSI and in the specification referenced in Appendix J-1, index 34.

- (5) The tail lights requested in clause 4.2.7.1 shall be provided by fixed tail lamps.
 - (6) If the unit is fitted with a gangway, the gangway shall fulfil the specification referenced in Appendix J-1, index 113.
 - (7) Power supply shall be compliant to point 4 of clause 4.2.11.6
 - (8) The physical interface between units for the signal transmission shall ensure that the cable and plug of at least one line is compatible with the 18-conductor cable defined in the plate 2 of the specification referenced in Appendix J-1, index 114.
 - (9) The unit shall be marked at least with the following markings in accordance with the specification referenced in Appendix J-1, index 115:
 - Length over buffers
 - Electric power supply.;
- (71) in section 6.3.2, the text ‘Article 17 of Directive 2008/57/EC’ is replaced by the reference to ‘Article 14 of Directive (EU) 2016/797’;
- (72) in point (1) of section 7.1.1.1, the text ‘OTMs’ is replaced by the text ‘special vehicles, such as on-track machines’;
- (73) in point (1) of section 7.1.1.2.1, the text ‘in accordance with point (f) of Article 5(3) of Directive 2008/57/EC’ is replaced by the text ‘in accordance with point (f) of Article 4(3) of Directive (EU) 2016/797’;
- (74) in section 7.1.1.2.1, point (3) is replaced by the following:
- ‘(3) The application of this TSI to rolling stock which falls under one of the three cases above is not mandatory if one of the following conditions is met:
- In case the rolling stock is in the scope of the HS RST TSI 2008 or of the CR LOC&PAS TSI 2011, the relevant TSI(s), including implementation rules and period of validity of the “type or design examination certificate” (7 years) are applied. This provision shall not apply to vehicles that are not conform to the HS RST TSI 2008 or to the CR LOC&PAS TSI 2011 and that are placed on the market after 31 May 2017.
 - In case the rolling stock is in the scope of neither the HS RST TSI 2008 nor the CR LOC&PAS TSI 2011: the authorisation for placing on the market is delivered during a transition period ending on 31 December 2020.’;
- (75) in point (4) of section 7.1.1.2.1, the text ‘in service in accordance with Articles 22 to 25 of Directive 2008/57/EC’ is replaced by the text ‘on the market in accordance with Article 21 of Directive (EU) 2016/797’;
- (76) in point (1) of section 7.1.1.2.2, the text ‘Article 2(t) of the Directive 2008/57/EC’ is replaced by the text ‘point (23) of Article 2 of Directive (EU) 2016/797’;
- (77) in section 7.1.1.3, the title ‘Application to mobile equipment for railway infrastructure construction and maintenance’ is replaced by the title ‘Application to special vehicles, such as on-track machines’;
- (78) in point (3) of section 7.1.1.3, the text ‘in accordance with Article 24 or 25 of Directive 2008/57/EC’ is replaced by the text ‘in accordance with Article 21 of Directive (EU) 2016/797 against national rules as regards the basic parameters of this TSI’;
- (79) in point (3) of section 7.1.1.4, the text ‘in accordance with Article 24 or 25 of Directive 2008/57/EC’ is replaced by the text ‘in accordance with Article 21 of Directive (EU) 2016/797 against national rules as regards the basic parameters of this TSI’;
- (80) in section 7.1.1.4a, the reference to section ‘4.2.8.2.8’ is replaced by the reference to ‘4.2.8.2.8.4’;

(81) in point (1) of section 7.1.1.5, the text ‘three years after the date of application of this TSI’ is replaced by the text ‘on 1 January 2018’;

(82) in section 7.1.1, a new section 7.1.1.8 is added below section 7.1.1.7 as follows:

‘7.1.1.8 Transitional measure for passive safety requirement

Requirements set out in 4.2.2.5(6) shall not be mandatory during a transition period ending on 1 January 2022 for locomotives with a single “central cab” which, on 27 May 2019, are projects at an advanced stage of development, contracts in course of performance and rolling stock of an existing design as set out in point 7.1.1.2 of this TSI.

When the requirements set out in 4.2.2.5(6) are not applied, it is permitted as an alternative method, to demonstrate compliance against the requirement of scenario 3 of 4.2.2.5(5) by demonstrating compliance with following criteria:

- the frame of the locomotive is designed according to the specification referenced in Appendix J-1, index 7 cat L (as already specified in clause 4.2.2.4 of this TSI),
- the distance between the buffers and the cab windscreen is at least 2,5 m.;

(83) section 7.1.2 is replaced by the following:

‘7.1.2 Changes to an existing rolling stock or rolling stock type

7.1.2.1 Introduction

- (1) This clause 7.1.2 defines the principles to be applied by the entities managing the change and authorising entities in line with the EC verification procedure described in Article 15(9), Article 21(12) and Annex IV of Directive (EU) 2016/797. This procedure is further developed in Article 13, 15 and 16 of Commission Implementing Regulation (EU) 2018/545 (*) and in Decision 2010/713/EU (**).
- (2) This clause 7.1.2 applies in case of any change(s) to an existing rolling stock or rolling stock type, including renewal or upgrade. It does not apply in case of changes:
 - that do not introduce a deviation from the technical files accompanying the EC declarations for verification for the subsystems, if any, and
 - that do not have an impact on basic parameters not covered by the EC declaration, if any.

The holder of the vehicle type authorisation shall provide, under reasonable conditions, the information necessary for assessing the changes to the entity managing the change.

7.1.2.2 Rules to manage changes in both rolling stock and rolling stock type

- (1) Parts and basic parameters of the rolling stock that are not affected by the change(s) are exempt from conformity assessment against the provisions in this TSI.
- (2) Without prejudice to clause 7.1.2.2a, compliance with the requirements of this TSI, the TSI Noise (Commission Regulation (EC) No 1304/2014, see clause 7.2 of that TSI) and the TSI PRM (Commission Regulation (EU) No 1300/2014 (***) , see clause 7.2.3 of that TSI) shall only be needed for the basic parameters in this TSI which may be affected by the change(s).
- (3) In accordance with Articles 15 and 16 of Commission Implementing Regulation (EU) 2018/545 and Decision 2010/713/EU and by application of modules SB, SD/SF or SH1 for the EC verification, and if relevant in accordance with Article 15(5) of Directive (EU) 2016/797, the entity managing the change shall inform a notified body of all changes affecting the conformity of the subsystem with requirements of the relevant TSI(s) requiring new checks by a notified body. This information shall be provided by the entity managing the change with corresponding references to the technical documentation relating to the existing EC type or design examination certificate.

- (4) Without prejudice of the general safety judgement mandated in article 21(12)(b) of Directive (EU) 2016/797, in case of changes requiring reassessment of the safety requirements set out in clauses 4.2.3.4.2, 4.2.3.5.3, 4.2.4.2.2, 4.2.5.3.5, 4.2.5.5.8 and 4.2.5.5.9, the procedure set out in clause 6.2.3.5 shall be applied. Table 17 sets out when a new authorisation is required.

Table 17

		Vehicle originally assessed against...		
		First method of clause 6.2.3.5(3)	Second method of clause 6.2.3.5(3)	No CSM on RA applied
Change assessed against...	First method of clause 6.2.3.5(3)	No new authorisation required	Check (*)	No new authorisation required
	Second method of clause 6.2.3.5(3)	Check (*)	Check (*)	Check (*)
	No CSM on RA applied	Not possible	Not possible	Not possible

(*) The word "Check" means that the applicant will apply Annex I of the CSM on RA in order to demonstrate that the changed vehicle ensures an equal or higher level of safety. This demonstration shall be independently assessed by an assessment body as defined in CSM on RA. If the body concludes that the new safety assessment demonstrates a lower level of safety or the result is unclear, the applicant shall request an authorization for placing on the market.

- (4a) Without prejudice of the general safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797, in case of changes impacting requirements set out in 4.2.4.9, 4.2.9.3.1 and 4.2.10.3.4 which require a new reliability study, a new authorisation for placing in the market shall be required unless the NoBo concludes that the safety-related requirements covered by the reliability study are improved or maintained. The NoBo will consider in its judgement the revised maintenance and operation documentation, where required.
- (5) National migration strategies related to the implementation of other TSIs (e.g. TSIs covering fixed installations) shall be taken into account when defining to what extent the TSIs covering rolling stock needs to be applied.
- (6) The basic design characteristics of the rolling stock are defined in Table 17a and Table 17b. Based on these tables and on the safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797, the changes shall be categorised as follows:
- (a) 15(1)(c) of Commission Implementing Regulation (EU) 2018/545 if they are above the thresholds set out in column 3 and below thresholds set out in column 4 unless the safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797 requires to categorise them as 15(1)(d), or
- (b) 15(1)(d) of Commission Implementing Regulation (EU) 2018/545 if they are above the thresholds set out in column 4 or if the safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797 requires to categorise them as 15(1)(d).

The determination whether the changes are beyond or above the thresholds mentioned above shall be done in reference to the values of the parameters at the time of the last authorisation of the rolling stock or rolling stock type,

- (7) Changes not covered by point 7.1.2.2(6) above are deemed not to have any impact on the basic design characteristics and may be categorised as 15(1)(a) or 15(1)(b) of Commission Implementing Regulation (EU) 2018/545, unless the safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797 requires to categorise them as 15(1)(d).
- (8) The safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797 shall cover changes concerning basic parameters of the table of section 3.1, related to all the essential requirements, in particular the requirements “Safety” and “Technical compatibility”.
- (9) Without prejudice to clause 7.1.2.2a, all changes shall remain compliant with the applicable TSIs regardless their classification.
- (10) The replacement of one or more vehicle(s) within a fixed formation after a severe damage does not require a conformity assessment against this TSI, as long as the unit or the vehicle(s) are unchanged in technical parameters and function to the ones they replace. Such units must be traceable and certified in accordance with any national or international rule, or any code of practice widely acknowledged in the railway domain.

Table 17a

Basic design characteristics related to basic parameters set out in the LOC&PAS TSI

1. TSI clause	2. Related basic design characteristic(s)	3. Changes impacting the basic design characteristic and not classified as 21(12)(a) of Directive (EU) 2016/797	4. Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.2.2.3 End coupling	Type of end coupling	Change of end coupler type	N/A
4.2.2.10 Load conditions and weighed mass 4.2.3.2.1 Axle load parameter	Design mass in working order Design mass under normal payload Design mass under exceptional payload Maximum design speed (km/h) Static axle load in working order Static axle load under exceptional payload Vehicle length Static axle load under normal payload Position of the axles along the unit (axle spacing)	Change in any of the corresponding basic design characteristics resulting in a change of the line category(ies) the vehicle is compatible with	N/A

1. TSI clause	2. Related basic design characteristic(s)	3. Changes impacting the basic design characteristic and not classified as 21(12)(a) of Directive (EU) 2016/797	4. Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
	Total vehicle mass (for each vehicle of the unit)	Change in any of the corresponding basic design characteristics resulting in a change of the line category(ies) the vehicle is compatible with	Change of more than $\pm 10\%$
	Mass per wheel	Change in any of the corresponding basic design characteristics resulting in a change of the line category(ies) the vehicle is compatible with or Change of more than $\pm 10\%$	N/A
4.2.3.1 Gauging	Reference profile	N/A	Change of reference profile the vehicle is conform to
	Minimum vertical convex curve radius capability	Change in minimum vertical convex curve radius capability the vehicle is compatible with of more than 10%	N/A
	Minimum vertical concave curve radius capability	Change in minimum vertical concave curve radius capability the vehicle is compatible with of more than 10%	N/A
4.2.3.3.1 Rolling stock characteristics for the compatibility with train detection systems	Compatibility with train detection systems	N/A	Change of declared compatibility with one or more of the three following train detection systems: — Track circuits — Axle counters — Loop equipment
4.2.3.3.2 Axle bearing condition monitoring	On-board detection system	Fitting of on-board detection system	Removal of declared on-board detection system
4.2.3.4. Rolling stock dynamic behaviour	Combination of maximum speed and maximum cant deficiency for which the vehicle was assessed	N/A	Increase in maximum speed of more than 15 km/h or change of more than $\pm 10\%$ in maximum admissible cant deficiency
	Rail inclination	N/A	Change of rail inclination(s) the vehicle is conform to (*)
4.2.3.5.2.1. Mechanical and geometric characteristics of wheelsets	Wheelset gauge	N/A	Change of track gauge the wheelset is compatible with

1. TSI clause	2. Related basic design characteristic(s)	3. Changes impacting the basic design characteristic and not classified as 21(12)(a) of Directive (EU) 2016/797	4. Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.3.5.2.2 Characteristics of wheels	Minimum required in-service wheel diameter	Change of minimum required in-service diameter of more than ± 10 mm	N/A
4.2.3.5.2.3 Automatic variable gauge systems	Wheelset gauge changeover facility	Change in the vehicle leading to a change in the changeover facility(ies) the wheelset is compatible with	Change of track gauge(s) the wheelset is compatible with
4.2.3.6. Minimum curve radius	Minimum horizontal curve radius capability	Increase of minimum horizontal curve radius of more than 5 m	N/A
4.2.4.5.1 Braking performance — General requirements	Maximum average deceleration	Change of more than ± 10 % on the maximum average brake deceleration	N/A
4.2.4.5.2 Braking performance – Emergency braking	Stopping distance and deceleration profile for each load condition per design maximum speed.	Change of stopping distance of more than ± 10 % Note: Brake weight percentage (also called “lambda” or “braked mass percentage”) or braked mass may also be used, and can be derived (directly or via stopping distance) from deceleration profiles by a calculation. The allowed change is the same (± 10 %)	N/A
4.2.4.5.3 Braking performance – Service braking	Stopping distance and maximum deceleration for the load condition “design mass under normal payload” at the design maximum speed	Change of stopping distance of more than ± 10 %	N/A
4.2.4.5.4 Braking performance – Thermal capacity	Maximum brake thermal energy capacity or Thermal capacity in terms of maximum line gradient, associated length and operating speed	N/A Change of maximum gradient, associated length or operating speed for which the brake system is designed in relation with brake thermal energy capacity	Change of maximum brake thermal energy ≥ 10 %
4.2.4.5.5 Braking performance – Parking brake	Maximum gradient on which the unit is kept immobilized by the parking brake alone (if the vehicle is fitted with it)	Change of declared maximum gradient of more than ± 10 %	N/A

1. TSI clause	2. Related basic design characteristic(s)	3. Changes impacting the basic design characteristic and not classified as 21(12)(a) of Directive (EU) 2016/797	4. Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.4.6.2. Wheel slide protection system	Wheel slide protection system	N/A	Fitting/removal of WSP function
4.2.4.8.2 Magnetic track brake	Magnetic track brake	N/A	Fitting/removal of magnetic track brake function
	Possibility of preventing the use of the magnetic track brake	N/A	Fitting/removal of the brake control allowing the activation/deactivation of magnetic track brake
4.2.4.8.3 Eddy current track brake	Eddy current track brake	N/A	Fitting/removal of the eddy current track brake function
	Possibility of preventing the use of the eddy current track brake	N/A	Fitting/removal of the brake control allowing the activation/deactivation of eddy current track brake
4.2.6.1.1 Temperature	Temperature range	Change of temperature range (T1, T2, T3)	N/A
4.2.6.1.2 Snow, ice and hail	Snow, ice and hail conditions	Change of the selected range "snow, ice and hail" (nominal or severe)	N/A
4.2.8.2.2 Operation within range of voltages and frequencies	Energy supply system (voltage and frequency)	N/A	Change of voltage(s)/frequency(ies) of the energy supply system (AC 25 kV-50 Hz, AC 15 kV-16,7 Hz, DC 3 kV, DC 1,5 kV, DC 750 V, third rail, others)
4.2.8.2.3 Regenerative brake with energy to the overhead contact line	Regenerative brake	N/A	Fitting/removal of regenerative brake function
	Possibility of preventing the use of the regenerative brake when fitted	Fitting/removing the possibility of preventing the use of regenerative brake	N/A
4.2.8.2.4 Maximum power and current from the overhead contact line	<u>Applicable to Electric units with power higher than 2 MW only:</u> Power or current limitation function	Power or current limitation function fitted/removed	N/A

1. TSI clause	2. Related basic design characteristic(s)	3. Changes impacting the basic design characteristic and not classified as 21(12)(a) of Directive (EU) 2016/797	4. Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.8.2.5 Maximum current at standstill for DC systems	Maximum current at standstill per pantograph for each DC system the vehicle is equipped for	Change of the maximum current value by 50 A without exceeding the limit set in the TSI	N/A
4.2.8.2.9.1.1 Height of interaction with contact wires (RST level)	Height of interaction of pantograph with contact wires (over top of rail)	Change of height of interaction allowing/no longer allowing mechanical contact with one of the contact wires at heights above rail level between: 4 800 mm and 6 500 mm 4 500 mm and 6 500 mm 5 550 mm and 6 800 mm 5 600 mm and 6 600 mm	N/A
4.2.8.2.9.2 Pantograph head geometry (IC level)	Pantograph head geometry	N/A	Change of pantograph head geometry to or from one of the types defined in clauses 4.2.8.2.9.2.1, 4.2.8.2.9.2.2 or 4.2.8.2.9.2.3
4.2.8.2.9.4.2 Contact strip material	Contact strip material	New contact strip as per 4.2.8.2.9.4.2(3)	N/A
4.2.8.2.9.6 Pantograph contact force and dynamic behaviour	Mean contact force curve	Change requiring a new assessment of pantograph dynamic behaviour.	N/A
4.2.8.2.9.7 Arrangement of pantographs (RST level)	Number of pantograph and shortest distance between two pantographs	N/A	Where the spacing of 2 consecutive pantographs in fixed or pre-defined formations of the assessed unit is reduced by means of removing a vehicle
4.2.8.2.9.10 Pantograph lowering (RST level)	Automatic dropping device (ADD)	Automatic dropping device (ADD) function fitted/removed	N/A
4.2.10.1. General and categorisation	Fire safety category	N/A	Change of fire safety category
4.2.12.2. General documentation — number of units in multiple operation	Maximum number of trainsets or locomotives coupled together in multiple operation.	N/A	Change of maximum allowed number of trainsets or locomotives coupled together in multiple operation

1. TSI clause	2. Related basic design characteristic(s)	3. Changes impacting the basic design characteristic and not classified as 21(12)(a) of Directive (EU) 2016/797	4. Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.12.2. General documentation – number of vehicles in a unit	For fixed formations only: Vehicles composing the fixed formation	N/A	Change in the number of vehicles composing the fixed formation

(*) The rolling stock fulfilling one of the following conditions are deemed to be compatible with all rail inclinations:

- Rolling stock assessed according to EN 14363:2016
- Rolling stock assessed according to EN 14363:2005 (amended or not amended by ERA/TD/2012-17/INT) or UIC 518:2009 with the result, that there is no restriction to one rail inclination
- Rolling stock assessed according to EN 14363:2005 (amended or not amended by ERA/TD/2012-17/INT) or UIC 518:2009 with the result, that there is a restriction to one rail inclination and a new assessment of the wheel-rail-contact test conditions based on real wheel- and rail profiles and measured track gauge show compliance with the requirements on wheel-rail-contact conditions of EN 14363:2016.

Table 17b

Basic design characteristics related to basic parameters set out in the PRM TSI

1. TSI clause	2. Related basic design characteristic(s)	3. Changes impacting the basic design characteristic and not classified as 21(12)(a) of Directive (EU) 2016/797	4. Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.2.11. Step position for vehicle access and egress	Platform heights for which the vehicle is designed	N/A	Change of platform height the vehicle is compatible with

(11) In order to establish the EC type or design examination certificate, the notified body selected by the entity managing the change is permitted to refer to:

- The original EC type or design examination certificate for parts of the design that are unchanged or those that are changed but do not affect the conformity of the subsystem, as far as it is still valid (during 7 years phase B period).
- Additional EC type or design examination certificate (amending the original certificate) for modified parts of the design that affect the conformity of the subsystem with the latest revision of this TSI in force at that time.

(12) In any case, the entity managing the change shall ensure that the technical documentation which is relating to the EC type or design examination certificate is updated accordingly.

(13) The updated technical documentation, related to the EC type or design examination certificate is referred to in the technical file accompanying the EC declaration of verification issued by the entity managing the change for rolling stock declared as conformant to the modified type.

7.1.2.2a Particular rules for existing rolling stock not covered by an EC declaration of verification with a first authorisation for placing in service before 1 January 2015

(1) The following rules apply, in addition to clause 7.1.2.2, to existing rolling stock with a first authorisation for placing in service before 1 January 2015, where the scope of the change has an impact on basic parameters not covered by the EC declaration (if any).

- (2) The compliance with technical requirements of this TSI is deemed established when a basic parameter is improved in the direction of the TSI defined performance and the entity managing the change demonstrates that the corresponding essential requirements are met and the safety level is maintained and, where reasonably practicable, improved. The entity managing the change shall in this case justify the reasons for which the TSI defined performance was not met, taking into account paragraph 3 of section 7.1.2.2. This justification shall be included in the technical file, if any, or in the original technical documentation of the vehicle.
- (3) The particular rule set out in paragraph (2) above is not applicable to changes to basic parameters classified as 21(12)(a) in table 17c and 17d. For those changes, compliance with the TSI requirements is mandatory.

Table 17c

Changes to basic parameters for which compliance with TSI requirements is mandatory for rolling stock not holding an EC type or design examination certificate

TSI clause	Related basic design characteristic(s)	Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.3.1 Gauging	Reference profile	Change of reference profile the vehicle is conform to
4.2.3.3.1 Rolling stock characteristics for the compatibility with train detection systems	Compatibility with train detection systems	Change of declared compatibility with one or more of the three following train detection systems: — Track circuits — Axle counters — Loop equipment
4.2.3.3.2 Axle bearing condition monitoring	On-board detection system	Fitting/Removal of declared on-board detection system
4.2.3.5.2.1. Mechanical and geometric characteristics of wheelsets	Wheelset gauge	Change of track gauge the wheelset is compatible with
4.2.3.5.2.3 Automatic variable gauge systems	Wheelset gauge changeover facility	Change of track gauge(s) the wheelset is compatible with
4.2.8.2.3 Regenerative brake with energy to the overhead contact line	Regenerative brake	Fitting/removal of regenerative brake function

Table 17d

Changes to basic parameters of the PRM TSI for which compliance with TSI requirements is mandatory for rolling stock not holding an EC type or design examination certificate

TSI clause	Related basic design characteristic(s)	Changes impacting the basic design characteristic and classified as 21(12)(a) of Directive (EU) 2016/797
4.2.2.11. Step position for vehicle access and egress	Platform heights for which the vehicle is designed	Change of platform height the vehicle is compatible with

7.1.2.2b. Particular rules for vehicles modified to test performance or reliability of technological innovations for a limited period of time

- (1) The following rules apply, in addition to clause 7.1.2.2, in case of modifications to single authorised vehicles for the purpose of testing the performance and reliability of technological innovations for a fixed period of time not longer than 1 year. They don't apply if the same modifications are made to several vehicles.
- (2) The compliance with technical requirements of this TSI is deemed established when a basic parameter is kept unchanged or improved in the direction of the TSI defined performance and the entity managing the change demonstrates that the corresponding essential requirements are met and the safety level is maintained and, where reasonably practicable, improved

(*) Commission Implementing Regulation (EU) 2018/545 of 4 April 2018 establishing practical arrangements for the railway vehicle authorisation and railway vehicle type authorisation process pursuant to Directive (EU) 2016/797 of the European Parliament and of the Council (OJ L 90, 6.4.2018, p. 66).

(**) Commission Decision 2010/713/EU of 9 November 2010 on modules for the procedures for assessment of conformity, suitability for use and EC verification to be used in the technical specifications for interoperability adopted under Directive 2008/57/EC of the European Parliament and of the Council (OJ L 319, 4.12.2010, p. 1).

(***) Commission Regulation (EU) No 1300/2014 of 18 November 2014 on the technical specifications for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with reduced mobility (OJ L 356, 12.12.2014, p. 110).;

(84) the title of section 7.1.3 '*Rules related to the type or design examination certificates*' is replaced by '*Rules related to the EC type or design examination certificates*';

(85) section 7.1.3.1 is replaced by the following:

7.1.3.1. Rolling stock subsystem

- (1) This clause concerns a rolling stock type (unit type in the context of this TSI), as defined in Article 2(26) of Directive (EU) 2016/797, which is subject to a EC type or design verification procedure in accordance with the section 6.2 of this TSI. It also applies to the EC type or design verification procedure in accordance with the TSI Noise (Commission Regulation (EU) No 1304/2014 (*)), and the TSI PRM (Commission Regulation (EU) No 1300/2014) which refers to this TSI for its scope of application to Locomotives and Passenger rolling Stock.
- (2) The TSI assessment basis for a "EC type or design examination" is defined in columns 2 and 3 "Design review" and "Type test" of Appendix H of this TSI.

Phase A

- (3) Phase A starts once a notified body, which is responsible for EC verification, is appointed by the applicant and ends when the EC type or design examination certificate is issued.
- (4) The TSI assessment basis for a type is defined for a phase A period, with a duration of maximum seven years. During the phase A period the assessment basis for EC verification to be used by the notified body will not change.
- (5) When a revision of this TSI or of the TSI Noise or the TSI PRM comes into force during the phase A period, it is permissible (but not mandatory) to use the revised version, either totally or for particular sections, unless explicitly otherwise specified in the revision of these TSIs; in case of application limited to particular sections, the applicant has to justify and document that applicable requirements remain consistent, and this has to be approved by the notified body.

Phase B

- (6) The phase B period defines the period of validity of the EC type or design examination certificate once it is issued by the notified body. During this time, units may be EC certified on the basis of conformity to type.

- (7) The EC type or design examination certificate of EC verification for the subsystem is valid for a seven year phase B period after its issue date, even if a revision of this TSI or of the TSI Noise or the TSI PRM comes into force, unless explicitly otherwise specified in the revision of these TSIs. During this period of validity, new rolling stock of the same type is permitted to be placed on the market on the basis of an EC declaration of verification referring to the type certificate of verification.

(*) Commission Regulation (EU) No 1304/2014 of 26 November 2014 on the technical specification for interoperability relating to the subsystem “rolling stock — noise” amending Decision 2008/232/EC and repealing Decision 2011/229/EU (OJ L 356, 12.12.2014, p. 421).;

(86) Section 7.2 is amended as follows:

- (a) the reference to ‘Article 34 of Directive 2008/57/EC’ is replaced by the reference to ‘Article 48 of Directive (EU) 2016/797’;
- (b) the text ‘Article 35 of Directive 2008/57/EC and Commission Implementing Decision 2011/633/EU’ is replaced by the text ‘Article 48 of Directive (EU) 2016/797 and Commission Implementing Regulation (EU) 2019/777 (*)’.

(*) Commission Implementing Regulation (EU) 2019/777 of 16 May 2019 on the common specifications for the register of railway infrastructure and repealing Implementing Decision 2014/880/EU [RINF] (OJ L 139 I, 27.5.2019, p. 312);

(87) Point (2) of section 7.3.1 is replaced by the following:

‘(2) These specific cases are classified as:

- “P” cases: “permanent” cases,
- “T0”: “temporary” cases of indefinite duration, where the target system shall be reached by a date still to be determined.
- “T1” cases: “temporary” cases, where the target system shall be reached by 31 December 2025.
- “T2” cases: “temporary” cases, where the target system shall be reached by 31 December 2035.

All specific cases and their relevant dates shall be re-examined in the course of future revisions of the TSI with a view to limiting their technical and geographical scope based on an assessment of their impact on safety, interoperability, cross border services, TEN-T corridors, and the practical and economic impacts of retaining or eliminating them. Special account shall be given to availability of EU funding.

Specific cases shall be limited to the route or network where they are strictly necessary and taken account of through route compatibility procedures.;

(88) a new point (6) is added below point (5) of section 7.3.1 as follows:

‘(6) In case of a specific case applicable to a component defined as interoperability constituent in section 5.3 of this TSI, the conformity assessment has to be made according to the clause 6.1.1 point (3).’;

(89) in section 7.3.2.3, the following text is deleted:

‘Specific case Portugal (“P”)

For units intended to operate on Portuguese network (1 668 mm track gauge) and which depends on track side equipment for axle bearing condition monitoring, the target area that shall remain unobstructed to permit observation by a trackside HABD and its position related to centre line vehicle shall be the following:

- YTA = 1 000 mm (lateral position of the centre of the target area relative to the centre line of the vehicle)
- WTA ≥ 65 mm (lateral width of the target area)

- LTA \geq 100 mm (longitudinal length of the target area)
- YPZ = 1 000 mm (lateral position of the centre of the prohibitive zone relative to the centre line of the vehicle)
- WPZ \geq 115 mm (lateral width of the prohibitive zone)
- LPZ \geq 500 mm (longitudinal length of the prohibitive zone)

Specific case Spain (“P”)

For rolling stock intended to be used on the Spanish network (1 668 mm track gauge) and which depends on track side equipment for axle bearing condition monitoring, the zone visible to the trackside equipment on rolling stock shall be the area as defined in EN 15437-1:2009 clauses 5.1 and 5.2 considering the following values instead of the stated ones:

- YTA = $1\,176 \pm 10$ mm (lateral position of the centre of the target area relative to the centre line of the vehicle)
- WTA \geq 55 mm (lateral width of the target area)
- LTA \geq 100 mm (longitudinal length of the target area)
- YPZ = $1\,176 \pm 10$ mm (lateral position of the centre of the prohibitive zone relative to the centre line of the vehicle)
- WPZ \geq 110 mm (lateral width of the prohibitive zone)
- LPZ \geq 500 mm (longitudinal length of the prohibitive zone);

(90) in section 7.3.2.3, the text ‘**Specific case Sweden (“T”)**’ is replaced by the text ‘**Specific case Sweden (“T1”)**’;

(91) section 7.3.2.4 is replaced by the following:

‘7.3.2.4. Safety against derailment running on twisted track (4.2.3.4.1)

Specific case United Kingdom (Great Britain) (“P”)

It is permissible for all units and cases to use Method 3 set out in EN14363:2016 clause 6.1.5.3.1.

This specific case does not prevent the access of TSI compliant rolling stock to the national network.’;

(92) section 7.3.2.5 is replaced by the following:

‘7.3.2.5. Running dynamic behaviour (4.2.3.4.2, 6.2.3.4)

Specific case Finland (“P”)

The following modifications to the running dynamic behaviour clauses of the TSI applies to vehicle to be operated solely on Finnish 1 524 mm network:

- Test zone 4 is not applicable for running dynamic testing.
- Mean value of curve radius of all track sections for test zone 3 shall be 550 ± 50 metres for running dynamic testing.
- Track quality parameters in running dynamics testing shall be according to RATO 13 (Track inspection).
- Measuring methods are according to EN 13848:2003+A1.

Specific case Ireland and UK for Northern Ireland (“P”)

For technical compatibility with the existing network it is permissible to use notified national technical rules for the purpose of assessing running dynamic behaviour.

Specific case Spain (“P”)

For rolling stock intended to be used on 1 668 mm track gauge, the quasi-static guiding force Y_{qst} limit value shall be evaluated for curve radii

$$250 \text{ m} \leq R_m < 400 \text{ m.}$$

The limit value shall be: $(Y_{qst})_{lim} = 66 \text{ kN}$.

For the normalisation of the estimated value to the radius $R_m = 350 \text{ m}$ according to clause 7.6.3.2.6 (2) of EN 14363:2016, the formula “ $Y_{a,nf,qst} = Y_{a,f,qst} - (10\,500 \text{ m}/R_m - 30) \text{ kN}$ ” shall be replaced by “ $Y_{a,nf,qst} = Y_{a,f,qst} - (11\,550 \text{ m}/R_m - 33) \text{ kN}$ ”.

Values of cant deficiency can be adapted to 1 668 mm track gauge by multiplying the corresponding 1 435 mm parameter values by the following conversion factor: 1733/1500.

Specific case the United Kingdom (Great Britain) (“P”)

For technical compatibility with the existing network it is permissible to use national technical rules amending EN 14363 requirements and notified for the purpose of running dynamic behaviour. This specific case does not prevent the access of TSI compliant rolling stock to the national network.;

(93) In section 7.3.2.6, table 21 is replaced by the following table:

	Designation	Wheel diameter D (mm)	Minimum value (mm)	Maximum value (mm)
1 600 mm	Width of the rim (B_R) (with maximum BURR of 5 mm)	$690 \leq D \leq 1\,016$	137	139
	Thickness of the flange (S_d)	$690 \leq D \leq 1\,016$	26	33
	Height of the flange (S_h)	$690 \leq D \leq 1\,016$	28	38
	Face of the flange (q_R)	$690 \leq D \leq 1\,016$	6,5	—

(94) In section 7.3.2.6, table 22 is replaced by the following table:

	Designation	Wheel diameter D (mm)	Minimum value (mm)	Maximum value (mm)
1 600 mm	Front-to-front dimension (SR) $SR = AR + S_d, \text{ left} + S_d, \text{ right}$	$690 \leq D \leq 1\,016$	1 573	1 593,3
	Back to back distance (AR)	$690 \leq D \leq 1\,016$	1 521	1 527,3
	Width of the rim (BR) (with maximum BURR of 5 mm)	$690 \leq D \leq 1\,016$	127	139
	Thickness of the flange (S_d)	$690 \leq D \leq 1\,016$	24	33
	Height of the flange (S_h)	$690 \leq D \leq 1\,016$	28	38
	Face of the flange (q_R)	$690 \leq D \leq 1\,016$	6,5	—

(95) in section 7.3.2.6, below Table 22, the text ‘**Specific case Spain (“P”)**’ of clause 7.3.2.6 is replaced by ‘**Specific case Spain for 1 668 mm track gauge (“P”)**’;

(96) a new section 7.3.2.6a is added after section 7.3.2.6:

‘7.3.2.6a Minimum curve radius (4.2.3.6)

Specific case Ireland (“P”)

In the case of track gauge system 1 600 mm, the minimum curve radius to be negotiated shall be 105 m for all units;’

(97) in section 7.3.2.10, the text ‘clause 7.4.2.8.1’ is replaced by ‘clause 7.4.2.9.1’;

(98) section 7.3.2.11 is amended as follows:

- The text ‘Specific case Estonia (“T”)
- The text ‘Specific case France (“T”)
- The text ‘Specific case Latvia (“T”)

(99) in section 7.3.2.11, the text ‘clause 7.4.2.3.1’ is replaced by ‘clause 7.4.2.4.1’;

(100) in section 7.3.2.12, the text ‘(“T”)

(101) section 7.3.2.14, is amended as follows:

- The text ‘Specific case Croatia (“T”)
- The text ‘Specific case Finland (“T”)
- The text ‘Specific case France (“T”)
- The text ‘Specific case Italy (“T”)
- The text ‘Specific case Portugal (“T”)
- The text ‘Specific case Slovenia (“T”)
- The text ‘Specific case Sweden (“T”)

(102) section 7.3.2.16, is amended as follows:

- The text ‘Specific case France (“T”)
- The text ‘Specific case Sweden (“T”)

(103) in section 7.3.2.20, the text ‘Specific case Italy (“T”)

(104) in section 7.3.2.20, the following paragraph is added:

‘Review clause:

At the latest by 31 July 2025, the Member State shall deliver to the Commission a report on possible alternatives to the above additional specifications, in order to remove or significantly reduce the constraints on rolling stocks caused by the non-compliance of the tunnels with the TSIs.’;

(105) in section 7.3.2.21, the text ‘Specific case Channel Tunnel (“T”)

(106) a new section 7.3.2.27 is added below section 7.3.2.26 as follows:

‘7.3.2.27. Rules to manage changes in both rolling stock and rolling stock type (7.1.2.2)

Specific case the United Kingdom (Great Britain) (“P”)

Any change to a vehicle swept envelope as defined in the national technical rules notified for the gauging process (for example as described in RIS-2773-RST) will be categorised as 15(1) (c) of Commission Implementing Regulation (EU) 2018/545, and will not be classified as 21(12)(a) of Directive (EU) 2016/797.’;

(107) a new section 7.5.1.3 is added below section 7.5.1.2 as follows:

‘7.5.1.3. Aerodynamic effects on ballasted tracks (clause 4.2.6.2.5)

Requirements on aerodynamic effects on ballasted tracks have been set up for units of maximum design speed higher than 250 km/h.

As the current state of the art does not allow to provide for a harmonized requirement nor assessment methodology, the TSI allows the application of national rules.

This will need to be reviewed in order to consider the following:

- Study of ballast-pick-up occurrences, and corresponding safety impact (if any)
- Development of a harmonized, cost-effective methodology applicable in EU.’;

(108) a new section 7.5.2.2 is added below section 7.5.2.1 as follows:

‘7.5.2.2. Conditions for having an authorization for placing on the market not limited to particular networks

In order to facilitate free circulation of locomotives and passenger coaches, conditions for having an authorization for placing on the market not limited to particular networks have been developed during the preparation of ERA recommendation ERA-REC-111-2015-REC of 17 December 2015.

These provisions should be further developed to adapt them to Directive (EU) 2016/797 and to take into account the cleaning up of national technical rules, with particular focus on passenger coaches.’;

(109) a new section 7.5.2.3 is added below section 7.5.2.2 as follows:

‘7.5.2.3. Rules for extension of area of use for existing rolling stock not covered by an EC declaration of verification

Pursuant to Article 54(2) and (3) of Directive (EU) 2016/797, vehicles authorised for placing in service prior to 15 June 2016 shall receive an authorization for placing on the market according to Article 21 of Directive (EU) 2016/797 in order to operate on one or more networks which are not yet covered by their authorisation. Such vehicles shall thus be conform to this TSI or benefit from a non-application of this TSI pursuant to Article 7(1) of Directive 2016/797/EC.

In order to facilitate the free movement of vehicles, provisions shall be developed to set out which level of flexibility could be granted to such vehicles as well as to vehicles which were not subject to authorization, as regards compliance with the TSI requirements while fulfilling the essential requirements, maintaining the appropriate safety level, and where reasonably practicable, improving it.’;

(110) section 7.5.3.1 is amended as follows:

- (a) the reference to ‘Directive 2008/57/EC’ is replaced by the reference to ‘Directive (EU) 2016/797’;
- (b) The text ‘in accordance with article 17 of Directive 2008/57/EC or through the Infrastructure Register referred to in article 35 of the same Directive’ is replaced by the text ‘in accordance with article 14 of Directive (EU) 2016/797 or through the Infrastructure Register referred to in article 49 of the same Directive’;

- (111) in the list 'APPENDICES' following Chapter 7, the text 'Appendix A: Buffer and draw gear' is replaced by 'Appendix A: Intentionally deleted';
- (112) the text of Appendix A is replaced by 'Intentionally deleted';
- (113) section C.3 of Appendix C is replaced by the following:

'C.3 Running dynamic behaviour

The running characteristics are permitted to be determined by running tests or by reference to a similar type approved machine as detailed in clause 4.2.3.4.2 of this TSI or by simulation.

The following additional deviations from the specification referenced in Annex J-1, index 16 apply:

- The test shall always be taken as the simplified method for this type of machines
- when running tests according to the specification referenced in Annex J-1, index 16 are done with wheel profile in new condition, these are valid for a maximum distance of 50 000 km. After 50 000 km it is necessary to:
 - either re-profile the wheels;
 - or calculate the equivalent conicity of the worn profile and check that it does not differ more than 50 % from the value of the test of the specification referenced in Annex J-1, index 16 (with a maximum difference of 0,05);
 - or make a new test according to the specification referenced in Annex J-1, index 16 with worn wheel profile;
- in general, stationary tests to determine the parameters of characteristic running gear in accordance with the specification referenced in Annex J-1, index 16, clause 5.3.1 are not necessary;
- if the required test speed cannot be obtained by the machine itself, the machine shall be hauled for the tests.

Running behaviour can be proven by simulation of the tests described in to the specification referenced in Annex J-1, index 16 (with the exceptions as specified above) when there is a validated model of representative track and operating conditions of the machine.

A model of a machine for simulation of running characteristics shall be validated by comparing the model results against the results of running tests when the same input of track characteristic is used.

A validated model is a simulation model that has been verified by an actual running test that excites the suspension sufficiently and where there is a close correlation between the results of the running test and the predictions from the simulation model over the same test track.;

- (114) Appendix H is replaced by the following:

'Appendix H

Assessment of the rolling stock subsystem

H.1 Scope

This Appendix indicates the assessment of conformity of the rolling stock subsystem.

H.2 Characteristics and modules

The sub-system characteristics to be assessed in the different phases of design, development and production are marked by X in Table H.1. A cross in column 4 of Table H.1 indicates that the relevant characteristics shall be verified by testing each single subsystem.

Table H.1

Assessment of the rolling stock subsystem

1		2	3	4	5
Characteristics to be assessed, as specified in clause 4.2 of this TSI		Design and development phase		Production phase	Particular assessment procedure
		Design review	Type Test	Routine Test	
Element of the Rolling Stock sub-system	Clause				Clause
Structure and mechanical parts	4.2.2				
Inner coupling	4.2.2.2.2	X	n.a.	n.a.	—
End coupling	4.2.2.2.3	X	n.a.	n.a.	—
IC automatic centre buffer coupler	5.3.1	X	X	X	—
IC manual end coupling	5.3.2	X	X	X	—
Rescue coupling	4.2.2.2.4	X	X	n.a.	—
IC rescue coupling	5.3.3	X	X	X	
Staff access for coupling and uncoupling	4.2.2.2.5	X	X	n.a.	—
Gangways	4.2.2.3	X	X	n.a.	—
Strength of vehicle structure	4.2.2.4	X	X	n.a.	—
Passive safety	4.2.2.5	X	X	n.a.	—
Lifting and jacking	4.2.2.6	X	X	n.a.	—
Fixing of devices to carbody structure	4.2.2.7	X	n.a.	n.a.	—
Staff and freight access doors	4.2.2.8	X	X	n.a.	—
Mechanical characteristics of glass	4.2.2.9	X	n.a.	n.a.	—
Load conditions and weighted mass	4.2.2.10	X	X	X	6.2.3.1
Track interaction and gauging	4.2.3				
Gauging	4.2.3.1	X	n.a.	n.a.	—
Wheel load	4.2.3.2.2	X	X	n.a.	6.2.3.2
Rolling Stock characteristics for compatibility with train detection systems	4.2.3.3.1	X	X	X	—
Axle bearing condition monitoring	4.2.3.3.2	X	X	n.a.	—

1		2	3	4	5
Characteristics to be assessed, as specified in clause 4.2 of this TSI		Design and development phase		Production phase	Particular assessment procedure
		Design review	Type Test	Routine Test	
Element of the Rolling Stock sub-system	Clause				Clause
Safety against derailment running on twisted track	4.2.3.4.1	X	X	n.a.	6.2.3.3
Running dynamic behaviour requirements	4.2.3.4.2 a)	X	X	n.a.	6.2.3.4
Active systems – safety requirement	4.2.3.4.2 b)	X	n.a.	n.a.	6.2.3.5
Limit values for running safety	4.2.3.4.2.1	X	X	n.a.	6.2.3.4
Track loading limit values	4.2.3.4.2.2	X	X	n.a.	6.2.3.4
Equivalent conicity	4.2.3.4.3	X	n.a.	n.a.	—
Design values for new wheel profiles	4.2.3.4.3.1	X	n.a.	n.a.	6.2.3.6
In-service values of wheelset equivalent conicity	4.2.3.4.3.2	X			—
Structural design of bogie frame	4.2.3.5.1	X	X.	n.a.	—
Mechanical and geometrical characteristics of wheelsets	4.2.3.5.2.1	X	X	X	6.2.3.7
Mechanical and geometrical characteristics of wheels	4.2.3.5.2.2	X	X	X	—
Wheels (IC)	5.3.2	X	X	X	6.1.3.1
Automatic variable gauge systems	4.2.3.5.3	X	X	X	6.2.3.7a
Automatic variable gauge systems (IC)	5.3.4a	X	X	X	6.1.3.1a
Minimum curve radius	4.2.3.6	X	n.a.	n.a.	—
Life guards	4.2.3.7	X	n.a.	n.a.	—
Braking	4.2.4				
Functional requirements	4.2.4.2.1	X	X	n.a.	—
Safety requirements	4.2.4.2.2	X	n.a.	n.a.	6.2.3.5
Type of brake system	4.2.4.3	X	X	n.a.	—

1		2	3	4	5
Characteristics to be assessed, as specified in clause 4.2 of this TSI		Design and development phase		Production phase	Particular assessment procedure
		Design review	Type Test	Routine Test	
Element of the Rolling Stock sub-system	Clause				Clause
Brake command	4.2.4.4				
Emergency braking	4.2.4.4.1	X	X	X	—
Service braking	4.2.4.4.2	X	X	X	—
Direct braking command	4.2.4.4.3	X	X	X	—
Dynamic braking command	4.2.4.4.4	X	X	n.a	—
Parking braking command	4.2.4.4.5	X	X	X	—
Braking performance	4.2.4.5				
General requirements	4.2.4.5.1	X	n.a	n.a	—
Emergency braking	4.2.4.5.2	X	X	X	6.2.3.8
Service braking	4.2.4.5.3	X	X	X	6.2.3.9
Calculations related to thermal capacity	4.2.4.5.4	X	n.a	n.a	—
Parking brake	4.2.4.5.5	X	n.a	n.a	—
Limit of wheel rail adhesion profile	4.2.4.6.1	X	n.a	n.a	—
Wheel slide protection system	4.2.4.6.2	X	X	n.a	6.2.3.10
Wheel slide protection system (IC)	5.3.5	X	X	X	6.1.3.2
Interface with traction — Braking systems linked to traction (electric, hydrodynamic)	4.2.4.7	X	X	X	—
Braking system independent of adhesion conditions	4.2.4.8				
General	4.2.4.8.1.	X	n.a	n.a	—
Magnetic track brake	4.2.4.8.2.	X	X	n.a	—
Eddy current track brake	4.2.4.8.3	X	X	n.a.	—
Brake state and fault indication	4.2.4.9	X	X	X	—

1		2	3	4	5
Characteristics to be assessed, as specified in clause 4.2 of this TSI		Design and development phase		Production phase	Particular assessment procedure
		Design review	Type Test	Routine Test	
Element of the Rolling Stock sub-system	Clause				Clause
Brake requirements for rescue purposes	4.2.4.10	X	X	n.a	—
Passenger related items	4.2.5				
Sanitary systems	4.2.5.1	X	n.a	n.a	6.2.3.11
Audible communication system	4.2.5.2	X	X	X	—
Passenger alarm	4.2.5.3	X	X	X	—
Passenger alarm – safety requir.	4.2.5.3	X	n.a	n.a	6.2.3.5
Communication devices for passengers	4.2.5.4	X	X	X	—
Exterior doors: access to and egress from Rolling Stock	4.2.5.5	X	X	X	—
Exterior doors – safety requir.	4.2.5.5	X	n.a	n.a	6.2.3.5
Exterior door system construction	4.2.5.6	X	n.a	n.a	—
inter-unit doors	4.2.5.7	X	X	n.a	—
Internal air quality	4.2.5.8	X	n.a	n.a	6.2.3.12
Body side windows	4.2.5.9	X			—
Environmental conditions and aerodynamic effects	4.2.6				
Environmental conditions	4.2.6.1				
Temperature	4.2.6.1.1	X	n.a. X ⁽¹⁾	n.a.	—
Snow, ice and hail	4.2.6.1.2	X	n.a. X ⁽¹⁾	n.a.	—
⁽¹⁾ Type test if and as defined by the Applicant.					
Aerodynamic effects	4.2.6.2				
Slipstream effects on passengers on platform and on workers trackside	4.2.6.2.1	X	X	n.a.	6.2.3.13

1		2	3	4	5
Characteristics to be assessed, as specified in clause 4.2 of this TSI		Design and development phase		Production phase	Particular assessment procedure
		Design review	Type Test	Routine Test	
Element of the Rolling Stock sub-system	Clause				Clause
Head pressure pulse	4.2.6.2.2	X	X	n.a.	6.2.3.14
Maximum pressure variations in tunnels	4.2.6.2.3	X	X	n.a.	6.2.3.15
Cross wind	4.2.6.2.4	X	n.a.	n.a.	6.2.3.16
External lights & visible and audible warning devices	4.2.7				
External front and rear lights	4.2.7.1				
Head lights IC	4.2.7.1.1 5.3.6	X	X	n.a.	-6.1.3.3
Marker lights IC	4.2.7.1.2 5.3.7	X	X	n.a.	-6.1.3.4
Tail lights IC	4.2.7.1.3 5.3.8	X	X	n.a.	-6.1.3.5
Lamp controls	4.2.7.1.4	X	X	n.a.	—
Horn	4.2.7.2				
General – warning sound IC	4.2.7.2.1 5.3.9	X	X	n.a.	-6.1.3.6
Warning horn sound pressure levels	4.2.7.2.2 5.3.9	X	X	n.a.	6.2.3.17 6.1.3.6
Protection	4.2.7.2.3	X	n.a.	n.a.	—
Control	4.2.7.2.4	X	X	n.a.	—
Traction and electrical equipment	4.2.8				
Traction performance	4.2.8.1				
General	4.2.8.1.1				
Requirements on performance	4.2.8.1.2	X	n.a.	n.a.	—

1		2	3	4	5
Characteristics to be assessed, as specified in clause 4.2 of this TSI		Design and development phase		Production phase	
		Design review	Type Test	Routine Test	
Element of the Rolling Stock sub-system	Clause				Clause
Power supply	4.2.8.2				
General	4.2.8.2.1	X	n.a	n.a	—
Operation within range of voltages and frequencies	4.2.8.2.2	X	X	n.a	—
Regenerative brake with energy to the overhead contact line	4.2.8.2.3	X	X	n.a	—
Maximum power and current from the overhead contact line	4.2.8.2.4	X	X	n.a	6.2.3.18
Maximum current at standstill for DC systems	4.2.8.2.5	X	X	n.a	—
Power factor	4.2.8.2.6	X	X	n.a	6.2.3.19
System energy disturbances	4.2.8.2.7	X	X	n.a	—
Energy consumption measuring function	4.2.8.2.8	X	X	n.a	—
Requirements linked to pantograph	4.2.8.2.9	X	X	n.a	6.2.3.20 & 21
Pantograph (IC)	5.3.10	X	X	X	6.1.3.7
Contact strips (IC)	5.3.11	X	X	X	6.1.3.8
Electrical protection of the train IC Main circuit breaker	4.2.8.2.10 5.3.12	X	X	n.a	—
Diesel and other thermal traction system	4.2.8.3	—	—	—	Other Directive
Protection against electrical hazards	4.2.8.4	X	X	n.a	—
Cab and operation	4.2.9				
Driver's Cab	4.2.9.1	X	n.a	n.a	—
General	4.2.9.1.1	X	n.a	n.a	—
Access and egress	4.2.9.1.2	X	n.a	n.a	—

1		2	3	4	5
Characteristics to be assessed, as specified in clause 4.2 of this TSI		Design and development phase		Production phase	Particular assessment procedure
		Design review	Type Test	Routine Test	
Element of the Rolling Stock sub-system	Clause				Clause
Access and egress in operating conditions	4.2.9.1.2.1	X	n.a	n.a	—
Driver's cab emergency exit	4.2.9.1.2.2	X	n.a	n.a	—
External visibility	4.2.9.1.3	X	n.a	n.a	—
Front visibility	4.2.9.1.3.1	X	n.a	n.a	—
Rear and side view	4.2.9.1.3.2	X	n.a	n.a	—
Interior layout	4.2.9.1.4	X	n.a	n.a	—
Driver's seat	4.2.9.1.5	X	n.a	n.a	—
IC	5.3.13	X	X	X	—
Driver's desk- Ergonomics	4.2.9.1.6	X	n.a	n.a	—
Climate control and air quality	4.2.9.1.7	X	X	n.a	6.2.3.12
Internal lighting	4.2.9.1.8	X	X	n.a	—
Windscreen-Mechanical characteristics	4.2.9.2.1	X	X	n.a	6.2.3.22
Windscreen-Optical characteristics	4.2.9.2.2	X	X	n.a	6.2.3.22
Windscreen-Equipment	4.2.9.2.3	X	X	n.a	—
Driver machine interface	4.2.9.3				
Driver's activity control function	4.2.9.3.1	X	X	X	—
Speed indication	4.2.9.3.2	—	—	—	—
Driver display unit and screens	4.2.9.3.3	X	X	n.a	—
Controls and indicators	4.2.9.3.4	X	X	n.a	—
Labelling	4.2.9.3.5	X	n.a	n.a	—
Radio remote control function by staff for shunting operation	4.2.9.3.6	X	X	n.a	—

1		2	3	4	5
Characteristics to be assessed, as specified in clause 4.2 of this TSI		Design and development phase		Production phase	Particular assessment procedure
		Design review	Type Test	Routine Test	
Element of the Rolling Stock sub-system	Clause				Clause
Onboard tools and portable equipment	4.2.9.4	X	n.a	n.a	—
Storage facility for staff personal effects	4.2.9.5	X	n.a	n.a	—
Recording device	4.2.9.6	X	X	X	—
Fire safety and evacuation	4.2.10				
General and categorisation	4.2.10.1	X	n.a	n.a	—
Measures to prevent fire	4.2.10.2	X	X	n.a	—
Measures to detect/control fire	4.2.10.3	X	X	n.a	—
Requirements related to emergencies	4.2.10.4	X	X	n.a	—
Requirements related to evacuation	4.2.10.5	X	X	n.a	—
Servicing	4.2.11				
Cleaning of driver's cab windscreen	4.2.11.2	X	X	n.a	—
Connection to toilet discharge system IC	4.2.11.3 5.3.14	X	n.a	n.a	—
Water refilling equipment	4.2.11.4	X	n.a	n.a	—
Interface for water refilling IC	4.2.11.5 5.3.15	X	n.a	n.a	—
Special requirements for stabling of trains	4.2.11.6	X	X	n.a	—
Refuelling equipment	4.2.11.7	X	n.a	n.a	—
Train interior cleaning – power supply	4.2.11.8	X	n.a	n.a	—
Documentation for operation and maintenance	4.2.12				
General	4.2.12.1	X	n.a	n.a	—

1		2	3	4	5
Characteristics to be assessed, as specified in clause 4.2 of this TSI		Design and development phase		Production phase	Particular assessment procedure
		Design review	Type Test	Routine Test	
Element of the Rolling Stock sub-system	Clause				Clause
General documentation	4.2.12.2	X	n.a	n.a	—
Documentation related to maintenance	4.2.12.3	X	n.a	n.a	—
The maintenance design justification file	4.2.12.3.1	X	n.a	n.a	—
The Maintenance description file	4.2.12.3.2	X	n.a	n.a	—
Operating documentation	4.2.12.4	X	n.a	n.a	—
Lifting diagram and instructions	4.2.12.4	X	n.a	n.a	—
Rescue related descriptions	4.2.12.5	X	n.a	n.a	—

(115) Appendix I is replaced by the following:

‘Appendix I

**Aspects for which the technical specification is not available
(open points)**

Open points that relate to technical compatibility between the vehicle and the network:

Element of the Rolling Stock sub-system	Clause of this TSI	Technical aspect not covered by this TSI	Comments
Compatibility with train detection systems	4.2.3.3.1	See specification referenced in Annex J-2, index 1.	Open points also identified in the TSI CCS.
Running dynamic behaviour for 1 520 mm track gauge system	4.2.3.4.2 4.2.3.4.3	Running dynamic behaviour. Equivalent conicity.	Normative documents referred to in the TSI are based on experience gained on the 1 435 mm system.
Braking system independent of adhesion conditions	4.2.4.8.3	Eddy current track brake	Equipment not mandatory. Electromagnetic compatibility with concerned network.
Aerodynamic effect on ballasted track for RST of design speed > 250 km/h	4.2.6.2.5	Limit value and conformity assessment in order to limit risks induced by the projection of ballast	On-going work within CEN. Open point also in TSI INF.

Open points that do not relate to technical compatibility between the vehicle and the network:

Element of the Rolling Stock sub-system	Clause of this TSI	Technical aspect not covered by this TSI	Comments
Fire Containment and Control Systems	4.2.10.3.4	Conformity assessment of FCCS other than full partitions.	Assessment procedure of efficiency for controlling fire and smoke developed by CEN according to a request for standard issued by ERA.'

(116) Appendix J is replaced by the following:

'Appendix J

Technical specifications referred to in this TSI

J.1 Standards or normative documents

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
1	Inner coupling for articulated units	4.2.2.2.2	EN 12663-1:2010 +A1:2014	6.5.3, 6.7.5
2	End coupling – manual UIC type – pipes interface	4.2.2.2.3	EN 15807:2011	relevant cl. (!)
3	End coupling – manual UIC type – end cocks	4.2.2.2.3	EN 14601:2005+ A1:2010	relevant cl. (!)
4	End coupling – manual UIC type – lateral location of brake pipe and cocks	4.2.2.2.3	UIC 648:Sept 2001	relevant cl. (!)
5	Rescue coupling — interface with recovery unit	4.2.2.2.4	UIC 648:Sept 2001	relevant cl. (!)
6	Staff access for coupling and uncoupling – space for shunting staff	4.2.2.2.5	EN 16839:2017	4
7	Strength of vehicle structure – general	4.2.2.4	EN 12663-1:2010 +A1:2014	relevant cl. (!)
	Strength of vehicle structure – categorisation of rolling stock			5.2
	Strength of vehicle structure – method of verification			9.2
	Strength of vehicle structure – alternative requirements for OTMs	Appendix C Section C.1		6.1 to 6.5

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
8	Passive safety – general	4.2.2.5	EprEN 15227:2017	relevant cl. (!) Except Annex A
	Passive safety – categorisation			5-table 1
	Passive safety – scenarios			5-table 3, 6.
	Passive safety – obstacle deflector			6.5
9	Lifting and jacking — geometry of permanent and removable points	4.2.2.6	EN 16404:2016	5.2, 5.3
10	Lifting and jacking — marking	4.2.2.6	EN 15877-2:2013	4.5.17
11	Lifting and jacking — strength method of verification	4.2.2.6	EN 12663-1:2010 +A1:2014	6.3.2, 6.3.3, 9.2
12	Fixing of devices to carbody structure	4.2.2.7	EN 12663-1:2010 +A1:2014	6.5.2
13	Load conditions and weighed mass – load conditions hypothesis of load conditions	4.2.2.10	EN 15663:2009 /AC:2010	2.1 relevant cl. (!)
14	Gauging – method, reference contours	4.2.3.1	EN 15273-2:2013 +A1:2016	relevant cl. (!)
	Gauging – method, reference contours verification of eddy current track brakes verification of pantograph gauge	4.2.4.8.3(3)		A.3.12
	Gauging – method, reference contours verification of eddy current track brakes verification of pantograph gauge	4.2.3.1		relevant cl. (!)
15	Axle bearing condition monitoring – zone visible to track side equipment	4.2.3.3.2.2	EN 15437-1:2009	5.1, 5.2
16	Running dynamic behaviour	4.2.3.4.2 Appendix C	EN 14363:2016	relevant cl. (!)
17	Running dynamic behaviour – limit values for running safety	4.2.3.4.2.1	EN 14363:2016	7.5

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
18	NOT USED			
19	Running dynamic behaviour – track loading limit values	4.2.3.4.2.2	EN 14363: 2016	7.5
20	Structural design of the bogie frame	4.2.3.5.1	EN 13749:2011	6.2, Annex C
21	Structural design of the bogie frame – body to bogie connection	4.2.3.5.1	EN 12663-1:2010 +A1:2014	relevant cl. (!)
22	Braking – type of brake system, UIC brake system	4.2.4.3 6.2.7a	EN 14198:2016	5.4
23	Braking performance – calculation – general	4.2.4.5.1	EN 14531-1:2005 or EN 14531-6:2009	relevant cl. (!)
24	Braking performance – friction coefficient	4.2.4.5.1	EN 14531-1:2005	5.3.1.4
25	Emergency braking performance – response time/delay time	4.2.4.5.2	EN 14531-1:2005	5.3.3
	Emergency braking performance –brake weight percentage			5.12
26	Emergency braking performance – calculation	4.2.4.5.2	EN 14531-1:2005 or EN 14531-6:2009	relevant cl. (!)
27	Emergency braking performance – friction coefficient	4.2.4.5.2	EN 14531-1:2005	5.3.1.4
28	Service braking performance – calculation	4.2.4.5.3	EN 14531-1:2005 or EN 14531-6:2009	relevant cl. (!)
29	Parking brake performance – calculation	4.2.4.5.5	EN 14531-1:2005 or EN 14531-6:2009	relevant cl. (!)
30	Wheel slide protection system – design	4.2.4.6.2	EN 15595:2009 +A1:2011	4
	Wheel slide protection system – verification method			5, 6
	Wheel slide protection system – wheel rotation monitoring system			4.2.4.3
31	Magnetic track brake	4.2.4.8.2	EN 16207:2014	Annex C

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
32	Door obstacle detection – sensitivity	4.2.5.5.3	EN 14752:2015	5.2.1.4.1
	Door obstacle detection – maximum force			5.2.1.4.2.2
33	Door emergency opening – manual force to open the door	4.2.5.5.9	EN 14752:2015	5.5.1.5
34	Environmental conditions – temperature	4.2.6.1.1	EN 50125-1:2014	4.3
35	Environmental conditions – snow, ice and hail conditions	4.2.6.1.2	EN 50125-1:2014	4.7
36	Environmental conditions – obstacle deflector	4.2.6.1.2	EN 15227:2008 +A1:2011	relevant cl. (!)
37	Aerodynamic effects –crosswind method of verification	4.2.6.2.4.	EN 14067-6:2010	5
38	Head lights – colour full-beam headlamp luminous intensity alignment	4.2.7.1.1	EN 15153-1:2013 +A1:2016	5.3.3 5.3.5
	Head lights – dimmed headlamp luminous intensity			5.3.4 table 2 first line
	Head lights – full-beam headlamp luminous intensity			5.3.4 table 2 first line
	Head lights – alignment			5.3.5
39	Marker lights – colour	4.2.7.1.2	EN 15153-1:2013 +A1:2016	5.4.3.1 table 4
	Marker lights – spectral radiation distribution			5.4.3.2
	Marker lights – luminous intensity			5.4.4 table 6
40	Tail lights – colour	4.2.7.1.3	EN 15153-1:2013 +A1:2016	5.5.3 table 7
	Tail lights – luminous intensity			5.5.4 table 8
41	Warning horn sound pressure levels	4.2.7.2.2	EN 15153-2:2013	5.2.2
42	Regenerative brake with energy to the overhead contact line	4.2.8.2.3	EN 50388:2012 and EN 50388:2012/AC:2013	12.1.1

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
43	Maximum power and current from the overhead contact line – automatic regulation of current	4.2.8.2.4	EN 50388:2012 and EN 50388:2012/AC:2013	7.2
44	Power factor – verification method	4.2.8.2.6	EN 50388:2012 and EN 50388:2012/AC:2013	6
45	System energy disturbances for AC systems – harmonics and dynamic effects	4.2.8.2.7	EN 50388:2012 and EN 50388:2012/AC:2013	10.1
	System energy disturbances for AC systems – compatibility study			10.3 Table 5 Annex D 10.4
46	Working range in height of pantograph (IC level) – characteristics	4.2.8.2.9.1.2	EN 50206-1:2010	4.2, 6.2.3
47	Pantograph head geometry	4.2.8.2.9.2	EN 50367:2012 and EN 50367:2012/AC:2013	5.3.2.2
48	Pantograph head geometry – type 1 600 mm	4.2.8.2.9.2.1	EN 50367:2012 and EN 50367:2012/AC:2013	Annex A.2 Figure A.6
49	Pantograph head geometry – type 1 950 mm	4.2.8.2.9.2.2	EN 50367:2012 and EN 50367:2012/AC:2013	Annex A.2 Figure A.7
50	Pantograph current capacity (IC level)	4.2.8.2.9.3	EN 50206-1:2010	6.1.3.2
51	Pantograph lowering (RST level) – time to lower the pantograph	4.2.8.2.9.10	EN 50206-1:2010	4.7
	Pantograph lowering (RST level) – ADD			4.8
52	Pantograph lowering (RST level) – dynamic insulating distance	4.2.8.2.9.10	EN 50119:2009 and EN 50119:2009/A1:2013	Table 2
53	Electrical protection of the train – coordination of protection	4.2.8.2.10	EN 50388:2012 and EN 50388:2012/AC:2013	11
54	Protection against electrical hazard	4.2.8.4	EN 50153:2014	relevant cl. (!)
55	Windscreen – mechanical characteristics	4.2.9.2.1	EN 15152:2007	4.2.7, 4.2.9

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
56	Windscreen – angle between primary and secondary images	4.2.9.2.2	EN 15152:2007	4.2.2
	Windscreen – optical distortion			4.2.3
	Windscreen – haze			4.2.4
	Windscreen – luminous transmittance			4.2.5
	Windscreen – chromaticity			4.2.6
57	Recording device – functional requirements	4.2.9.6	EN/IEC 62625-1:2013	4.2.1, 4.2.2, 4.2.3, 4.2.4
	Recording device – recording performance			4.3.1.2.2
	Recording device – integrity			4.3.1.4
	Recording device – data integrity safeguard			4.3.1.5
	Recording device – level of protection			4.3.1.7
58	Measures to prevent fire – material requirements	4.2.10.2.1	EN 45545-2:2013 +A1:2015	relevant cl. (!)
59	Specific measures for flammable liquids	4.2.10.2.2	EN 45545-2:2013 +A1:2015	Table 5
60	Fire spreading protection measures for passenger rolling stock – partition test	4.2.10.3.4	EN 1363-1:2012	relevant cl. (!)
61	Fire spreading protection measures for passenger rolling stock – partition test	4.2.10.3.5	EN 1363-1:2012	relevant cl. (!)
62	Emergency lighting – lighting level	4.2.10.4.1	EN 13272:2012	5.3
63	Running capability	4.2.10.4.4	EN 50553:2012 and EN 50553:2012/AC:2013	relevant cl. (!)
64	Interface for water filling	4.2.11.5	EN 16362:2013	4.1.2 figure 1
65	Special requirements for stabling of trains – local external auxiliary power supply	4.2.11.6	EN/IEC 60309-2:1999 and amendments EN 60309-2:1999/A11:2004, A1:2007 and A2:2012	relevant cl. (!)
66	Automatic centre buffer coupler – type 10	5.3.1	EN 16019:2014	relevant cl. (!)

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
67	Manual end coupling – UIC type	5.3.2	EN 15551:2017	relevant cl. (!)
68	Manual end coupling – UIC type	5.3.2	EN 15566:2016	relevant cl. (!)
69	Rescue coupler	5.3.3	EN 15020:2006 +A1:2010	relevant cl. (!)
70	Main circuit breaker – coordination of protection	5.3.12	EN 50388:2012 and EN 50388:2012/AC:2013	11
71	Wheels – verification method decision criteria	6.1.3.1	EN 13979-1:2003 +A2:2011	7.2.1, 7.2.2 7.2.3
	Wheels – verification method Further verification method			7.3
	Wheels – verification method Thermomechanical behaviour			6
72	Wheel slide protection – method of verification	6.1.3.2	EN 15595:2009 +A1:2011	5
	Wheel slide protection – test programme			only 6.2.3 of 6.2
73	Head lamps – colour	6.1.3.3	EN 15153-1:2013 +A1:2016	6.3
	Head lamps – luminous intensity			6.4
74	Marker lamps – colour	6.1.3.4	EN 15153-1:2013 +A1:2016	6.3
	Marker lamps – luminous intensity			6.4
75	Tail lamps – colour	6.1.3.5	EN 15153-1:2013 +A1:2016	6.3
	Tail lamps – luminous intensity			6.4
76	Horn – sounding	6.1.3.6	EN 15153-2:2013	6
	Horn – sound pressure level			6
77	Pantograph – static contact force	6.1.3.7	EN 50367:2012 and EN 50367:2012/AC:2013	7.2
78	Pantograph – limit value	6.1.3.7	EN 50119:2009 and EN 50119:2009/A1:2013	5.1.2
79	Pantograph – verification method	6.1.3.7	EN 50206-1:2010	6.3.1

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
80	Pantograph – dynamic behaviour	6.1.3.7	EN 50318:2002	relevant cl. (!)
81	Pantograph – interaction characteristics	6.1.3.7	EN 50317:2012 and EN 50317:2012/AC:2012	relevant cl. (!)
82	Contact strips – verification method	6.1.3.8	EN 50405:2015	7.2, 7.3 7.4, 7.6 7.7
83	Safety against derailment running on twisted track	6.2.3.3	EN 14363:2016	4, 5, 6.1
84	Running dynamic behaviour – method of verification assessment of criteria conditions of assessment	6.2.3.4	EN 14363:2016	4, 5, 7
85	Equivalent conicity – rail section definitions	6.2.3.6	EN 13674-1:2011	relevant cl. (!)
86	Equivalent conicity – wheel profile definitions	6.2.3.6	EN 13715:2006 +A1:2010	relevant cl. (!)
87	Wheelset – assembly	6.2.3.7	EN 13260:2009 +A1:2010	3.2.1
88	Wheelset – axles, method of verification	6.2.3.7	EN 13103:2009 +A1:2010 +A2:2012	4, 5, 6
	Wheelset – axles, decision criteria			7
89	Wheelset – axles, method of verification	6.2.3.7	EN 13104:2009 +A1:2010	4, 5, 6
	Wheelset – axles, decision criteria			7
90	Axle boxes/bearings	6.2.3.7	EN 12082:2007 +A1:2010	6
91	Emergency braking performance	6.2.3.8	EN 14531-1:2005	5.11.3
92	Service braking performance	6.2.3.9	EN 14531-1:2005	5.11.3
93	Wheel slide protection, method of verification of performance	6.2.3.10	EN 15595:2009 +A1:2011	6.4
94	Slipstream effect – full scale tests	6.2.3.13	EN 14067-4:2013	6.2.2.1
	Slipstream effect – simplified assessment			4.2.4 and table 7

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
95	Head pressure pulse – method of verification	6.2.3.14	EN 14067-4:2013	6.1.2.1
	Head pressure pulse – CFD			6.1.2.4
	Head pressure pulse – moving model			6.1.2.2
	Head pressure pulse – simplified assessment method			4.1.4 and table 4
96	Maximum pressure variations — distance xp between the entrance portal and the measuring position, the definitions of Δp_{Fr} , Δp_N , Δp_T , the minimum tunnel length	6.2.3.15	EN 14067-5:2006 +A1:2010	relevant cl. (!)
97	Horn – sound pressure level	6.2.3.17	EN 15153-2:2013 +A1:2016	5
98	Maximum power and current from the overhead contact line – method of verification	6.2.3.18	EN 50388:2012 and EN 50388:2012/AC:2013	15.3
99	Power factor — method of verification	6.2.3.19	EN 50388:2012 and EN 50388:2012/AC:2013	15.2
100	Current collection dynamic behaviour – dynamic tests	6.2.3.20	EN 50317:2012 and EN 50317:2012/AC:2012	relevant cl. (!)
101	Windscreen – characteristics	6.2.3.22	EN 15152:2007	6.2.1 to 6.2.7
102	Structural strength	Appendix C Section C.1	EN 12663-2:2010	5.2.1 to 5.2.4
103	NOT USED			
104	NOT USED			
105	NOT USED			
106	NOT USED			
107	Design values for new wheel profiles – evaluation of the equivalent conicity	6.2.3.6	EN 14363:2016	Annexes O and P
108	Slipstream effects – Requirements	4.2.6.2.1	EN 14067-4:2013	4.2.2.1, 4.2.2.2, 4.2.2.3 and 4.2.2.4
109	Head pressure pulse – Requirements	4.2.6.2.2	EN 14067-4:2013	4.1.2

Index No	TSI		Normative document	
	Characteristics to be assessed	Point	Document No	Mandatory points
110	End coupling – Compatibility between units –manual UIC type	4.2.2.2.3	EN 16839:2017	5, 6 7, 8
111	“Single pole” power supply line	4.2.11.6	CLC/TS 50534:2010	Annex A
112	Communication protocols	4.2.12.2	IEC 61375-1:2012	relevant cl. (1)
113	Gangways-Flange intercommunication connections	6.2.7a	EN 16286-1:2013	Annexes A and B
114	Physical interface between units for the signal transmission	6.2.7a	UIC 558, January 1996	Plate 2
115	Marking: length over buffers and electric power supply	6.2.7a	EN 15877-2:2013	4.5.5.1 4.5.6.3
116	On-board location function-Requirements	4.2.8.2.8.1	EN 50463-3:2017	4.4
117	Energy measurement function – accuracy for active energy measurement:	4.2.8.2.8.2	EN 50463-2:2017	4.2.3.1 and 4.2.3.4
	Energy measurement function – Class designations			4.3.3.4, 4.3.4.3 and 4.4.4.2
	Energy measurement function — Assessment	6.2.3.19b		5.4.3.4.1, 5.4.3.4.2, 5.4.4.3.1, Table 3, 5.4.3.4.3.1 and 5.4.4.3.2.1
118	Energy measurement function: consumption point identification — Definition	4.2.8.2.8.3	EN 50463-1:2017	4.2.5.2
119	Interface protocols between on-board energy measurement system (EMS) and on-ground data collection system (DCS) - Requirements	4.2.8.2.8.4	EN 50463-4:2017	4.3.3.1, 4.3.3.3, 4.3.4, 4.3.5, 4.3.6 and 4.3.7
120	Energy measurement function: mean temperature coefficient of each device — Assessment methodology	6.2.3.19b	EN 50463-2:2017	5.4.3.4.3.2 and 5.4.4.3.2.2
121	The compiling and handling of data within the data handing system-Assessment methodology	6.2.3.19b	EN 50463-3:2017	5.4.8.3, 5.4.8.5 and 5.4.8.6
122	On-board energy measurement system-Tests	6.2.3.19b	EN 50463-5:2017	5.3.3 and 5.5.4

(1) Clauses of the standard that are in direct relationship to the requirement expressed in the clause of the TSI indicated in column 3.

J.2 Technical documents (available on ERA website)

Index No	TSI		ERA technical document	
	Characteristics to be assessed	Point	Mandatory ref Document No	Points
1	Interface between control-command signalling trackside and other subsystems	4.2.3.3.1	ERA/ERTMS/033281 rev 4.0	3.1 & 3.2
2	Friction elements for wheel tread brake for freight wagons	7.1.4.2	ERA/TD/2013-02/INT v.3.0	All

ANNEX V

The Annex to Regulation (EU) No 1303/2014 is amended as follows:

- (1) in Sections 1.1, 3, 4.1, 4.4 and 6.2.5 the references to 'Directive 2008/57/EC' are replaced by references to 'Directive (EU) 2016/797';
- (2) in section 1.1.1(a), 'European Union rail network' is replaced by 'network of the Union rail system';
- (3) in section 1.1.3.1 'European Union rail' is replaced by 'network of the Union rail';
- (4) section 1.1.4 is modified as follows:

1.1.4 Risk scope

1.1.4.1. Risks covered by this TSI

- (a) This TSI covers only specific risks to the safety of passengers and on-board staff in tunnels for the subsystems above.
- (b) Where a risk analysis comes to the conclusion that other tunnel incidents might be of relevance, specific measures to deal with these scenarios shall be defined.

1.1.4.2. Risks not covered by this TSI

- (a) Risks not covered by this TSI are as follows:
 - (1) Health and safety of staff involved in maintenance of the fixed installations in tunnels.
 - (2) Financial loss due to damage to structures and trains, and consequently the losses resulting from non-availability of the tunnel for repairs.
 - (3) Trespass into the tunnel through the tunnel portals.
 - (4) Terrorism, as a deliberate and premeditated act, which is designed to cause wanton destruction, injury and loss of life.
 - (5) Risks for people in the neighbourhood of a tunnel where collapse of the structure could have catastrophic consequences.;

- (5) section 1.2 is replaced as follows:

1.2 Geographical scope

The geographical scope of this TSI is the network of the Union rail system as described in Annex I of Directive (EU) 2016/797 with the exclusion of the cases referred to in Articles 1(3) and 1(4) of Directive (EU) 2016/797;

- (6) 'fire fighting point(s)' is replaced by 'evacuation and rescue point(s)' in sections 1.1.1(b), 2.2.1(b), 2.4(c), 4.2.1.7, 4.2.3, 4.4.1(c), 4.4.2(a), 4.4.6;
- (7) in point (b) of Section 2.2.3, the text 'panic and to' is deleted;
- (8) in point (c) (1) of Section 2.3, the text 'inside the tunnel' is deleted;
- (9) point (f) of Section 2.3 is replaced as follows:

'(f) If the expectations of the emergency response services expressed in emergency plans go beyond the assumptions described above, the need for additional measures or tunnel equipment can be considered.;
- (10) in Section 2.4, a definition (b1) 'Final place of safety' is added as follows:

'(b1) Final place of safety: the final place of safety is the place where passengers and staff will no longer be impacted by the effects of the initial incident (e.g. smoke opacity and toxicity, temperature). It is the termination point of the evacuation.;

(11) point 2.4(c) is replaced as follows:

‘(c) Evacuation and rescue point: an evacuation and rescue point is a defined location, inside or outside the tunnel, where fire fighting equipment can be used by the emergency response services and where passengers and staff can evacuate from a train.’;

(12) a definition (g) ‘CSM on risk assessment’ is added as follows:

‘(g) CSM on risk assessment: this term is used to designate the Annex I of the Commission Implementing Regulation (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009 (OJ L 121, 3.5.2013, p. 8).’;

(13) section 3 is replaced as follows:

‘3. ESSENTIAL REQUIREMENTS

(a) The following table indicates basic parameters of this TSI and their correspondence to the essential requirements as set out and numbered in Annex III to Directive (EU) 2016/797.

(b) For meeting the essential requirements, the corresponding parameters of sections 4.2.1, 4.2.2 and 4.2.3 shall apply.

3.1 Infrastructure and energy subsystems

(a) In order to meet the essential requirement “Safety” applying to the Infrastructure and Energy subsystems, the CSM on risk assessment may be applied as an alternative to the corresponding parameters of sections 4.2.1 and 4.2.2.

(b) Accordingly, for the risks identified in point 1.1.4 and the scenarios listed in point 2.2, the risk can be assessed by:

- (1) a comparison with a reference system;
- (2) an explicit risk estimation and evaluation.

(c) For meeting the essential requirements other than “Safety”, the corresponding parameters of sections 4.2.1 and 4.2.2 shall apply.

Element of the infrastructure sub-system	Ref. Clause	Safety	Reliability Availability	Health	Environmental protection	Technical compatibility	Accessibility
Prevent unauthorised access to emergency exits and technical rooms	4.2.1.1.	2.1.1					
Fire resistance of tunnel structures	4.2.1.2.	1.1.4 2.1.1					
Fire reaction of building material	4.2.1.3.	1.1.4 2.1.1		1.3.2	1.4.2		
Fire detection	4.2.1.4.	1.1.4 2.1.1					
Evacuation facilities	4.2.1.5.	1.1.5 2.1.1					
Escape walkways	4.2.1.6.	2.1.1					
Evacuation and rescue points	4.2.1.7 except (b)	2.1.1					
Evacuation and rescue points	4.2.1.7 (b)					1.5	

Element of the infrastructure sub-system	Ref. Clause	Safety	Reliability Availability	Health	Environmental protection	Technical compatibility	Accessibility
Emergency communication	4.2.1.8.	2.1.1					
Electricity supply for emergency response services	4.2.1.9	2.1.1					
Reliability of electrical systems	4.2.1.10	2.1.1					
Sectioning of contact line	4.2.2.1.	2.2.1					
Earthing of contact line	4.2.2.2.	2.2.1					

3.2 Rolling stock subsystem

(a) For meeting the essential requirements, the corresponding parameters of section 4.2.3 shall apply.

Element of the rolling stock sub-system	Ref. Clause	Safety	Reliability Availability	Health	Environmental protection	Technical compatibility	Accessibility
Measures to prevent fire	4.2.3.1	1.1.4 2.4.1		1.3.2	1.4.2		
Measures to detect and control fire	4.2.3.2	1.1.4 2.4.1					
Requirements related to emergencies	4.2.3.3	2.4.1	2.4.2			1.5 2.4.3	
Requirements related to evacuation	4.2.3.4	2.4.1'					

(14) in section 4.1, 'European Union rail system' is replaced by 'Union rail system';

(15) section 4.2.1.2(b) is deleted;

(16) section 4.2.1.3 is replaced as follows:

'4.2.1.3 Fire reaction of building material

This specification applies to all tunnels.

(a) This specification applies to construction products and building elements inside tunnels. These products shall fulfil the requirements of Commission Regulation (EU) 2016/364 (*):

(1) Tunnel building material shall fulfil the requirements of classification A2.

(2) Non-structural panels and other equipment shall fulfil the requirements of classification B.

(3) Exposed cables shall have the characteristics of low flammability, low fire spread, low toxicity and low smoke density. These requirements are fulfilled when the cables fulfil at least the requirements of classification B2ca, s1a, a1.

If the classification is lower than B2ca, s1a, a1, the class of cables may be determined by the infrastructure manager after a risk assessment, taking into account the characteristics of the tunnel and the intended operational regime. For the avoidance of doubt, different classifications of cable may be used for different installations within the same tunnel provided that the requirements of this point are met.

- (b) Materials that would not contribute significantly to a fire load shall be listed. They are allowed to not comply with the above.

(*) Commission Delegated Regulation (EU) 2016/364 of 1 July 2015 on the classification of the reaction to fire performance of construction products pursuant to Regulation (EU) No 305/2011 of the European Parliament and of the Council (OJ L 68, 15.3.2016, p. 4).;

- (17) section 4.2.1.4 is replaced as follows:

‘4.2.1.4. Fire detection in technical rooms

This specification applies to all tunnels of more than 1 km in length.

- (a) Fire in technical rooms shall be detected in order to alert the infrastructure manager.’;

- (18) section 4.2.1.5.2(b3) is deleted;

- (19) in section 4.2.1.5.4, the terms ‘on escape routes’ and ‘as low as possible,’ are deleted and point (c) is replaced as follows:

‘(c) Autonomy and reliability: an alternative electricity supply shall be available for an appropriate period of time after failure of the main supply. The time required shall be consistent with the evacuation scenarios and reported in the Emergency Plan.’;

- (20) in section 4.2.1.5.5, point (f), the term ‘cross-passage’ is replaced by ‘cross-passages’;

- (21) in section 4.2.1.6 point (a), the term ‘top’ is replaced by ‘bottom’;

- (22) section 4.2.1.7 is modified as follows:

- (a) in point (a)(1) the terms ‘length of the train’ are replaced by the terms ‘length of the passenger train’;

- (b) in point (a)(2) the terms ‘safe space’ are replaced by ‘open air area’ and the terms ‘along a safe space’ are deleted;

- (23) table in 4.2.1.7 is replaced as follows:

Rolling stock category according to paragraph 4.2.3	Maximum distance from the portals to an evacuation and rescue point and between evacuation and rescue points
Category A	5 km
Category B	20 km’

- (24) in point 4 of point (c) of section 4.2.1.7 is replaced as follows:

‘(4) It shall be possible to switch off and earth the contact line, either locally or remotely’;

- (25) a new section 4.2.1.9 is added with the following text:

‘4.2.1.9 Electricity supply for emergency response services

This specification applies to all tunnels of more than 1 km length.

The electricity supply system in the tunnel shall be suitable for the emergency response services equipment in accordance with the emergency plan for the tunnel. Some national emergency response services groups may be self-sufficient in relation to electricity supply. In this case, the option of not providing electricity supply facilities for the use of such groups may be appropriate. Such a decision, however, must be described in the emergency plan.’;

(26) a new section 4.2.1.10 is added with the following text:

‘4.2.1.10 Reliability of electrical systems

This specification applies to all tunnels of more than 1 km length.

- (a) Electrical systems identified by the Infrastructure Manager as vital to the safety of passengers in the tunnel shall be kept in use as long as necessary according to the evacuation scenarios considered in the emergency plan.
- (b) Autonomy and reliability: an alternative electricity supply shall be available for an appropriate period of time after failure of the main supply. The time required shall be consistent with the evacuation scenarios considered and included in the emergency plan.’;

(27) a new section 4.2.1.11 is added with the following text:

‘4.2.1.11. Communication and lighting at switching locations

This specification applies to all tunnels of more than 1 km in length.

- (a) When the contact line is divided into sections that can be locally switched, a means of communication and lighting shall be provided at the switching location.’;

(28) section 4.2.2.1 is replaced as follows:

‘4.2.2.1. Sectioning of contact line

This specification applies to all tunnels of more than 1 km length.

- (a) The traction power supply system in tunnels may be divided into sections.
- (b) In such case, it shall be possible to switch off each section of the contact line, either locally or remotely.’;

(29) in section 4.2.2.2, the term ‘Overhead line or conductor rail earthing’ is replaced by ‘Earthing of contact line’. The point c and the term ‘operations’ in point b are deleted;

(30) section 4.2.2.3 is deleted;

(31) section 4.2.2.4 is deleted;

(32) section 4.2.2.5. is deleted;

(33) in the table in section 4.3.1 the reference to clause ‘4.2.2.4(a)’ is replaced by a reference to clause ‘4.2.1.3’;

(34) in the table in section 4.3.2 the terms ‘specific elements for train crew and auxiliary staff’ and ‘4.6.3.2.3’ are deleted;

(35) in section 4.4, the terms ‘Article 18(3)’ are replaced by ‘Article 15(4)’ and ‘Annex VI’ is replaced by ‘Annex IV’;

(36) section 4.4.2 is replaced as follows:

‘4.4.2. Tunnel emergency plan

These rules apply to tunnels of more than 1 km in length

- (a) An emergency plan shall be developed under the direction of the Infrastructure Manager(s), in cooperation with the emergency response services and the relevant authorities for each tunnel. Station managers shall be equally involved if one or more stations are used as a safe area or an evacuation and rescue point. In case the emergency plan concerns an existing tunnel, Railway Undertakings already operating in the tunnel must be consulted. In case the emergency plan concerns a new tunnel, Railway Undertakings planning to operate in the tunnel may be consulted.
- (b) The emergency plan shall be consistent with the self-rescue, evacuation, fire-fighting and rescue facilities available.

- (c) Detailed tunnel-specific incident scenarios adapted to the local tunnel conditions shall be developed for the emergency plan.
- (d) Once developed, the emergency plan shall be communicated to Railway Undertakings intending to use the tunnel.;

(37) section 4.4.4. is modified as follows:

‘4.4.4. Switching off and Earthing procedures

These rules apply to all tunnels.

- (a) In the case it is required to switch off the traction power supply system the infrastructure manager shall make sure that relevant sections of the contact line have been switched off, and inform the emergency response services before they enter the tunnel or a section of the tunnel.
- (b) It is the responsibility of the infrastructure manager to switch off the traction power supply.
- (c) Procedures and responsibilities for earthing of the contact line shall be defined between the Infrastructure Manager and the emergency response services, and reported in the emergency plan. Provision shall be made for switching off the section in which the incident has taken place.;

(38) in Section 4.4.6.(a) the text ‘in the Register of Infrastructure defined in clause 4.8.1 and’ is deleted;

(39) in Section 4.4.6.(c) the text ‘panic and’ is deleted;

(40) section 4.8 is deleted;

(41) section 6.2.5(a) is modified as follows:

- (a) ‘Article 18(3)’ is replaced by ‘Article 15(4)’;
- (b) ‘a notified body’ is replaced by ‘the applicant’;

(42) Section 6.2.6 is replaced as follows:

‘6.2.6. Assessment of conformity to the Safety requirements applying to the Infrastructure and Energy subsystems

- (a) This clause applies when a comparison with a reference system or an explicit risk estimation is used to meet the essential requirement “Safety” applying to the Infrastructure and Energy subsystems.
- (b) In such case, the applicant shall:
 - (1) determine the risk acceptance principle, the methodology for the risk assessment, the safety requirements to be fulfilled by the system and the demonstration that they are fulfilled;
 - (2) determine the risk acceptance levels with the relevant national authority/authorities;
 - (3) designate the independent assessment body as defined in the CSM on risk assessment. This assessment body can be the notified body selected for the Infrastructure or Energy subsystem if recognised or accredited as per Section 7 of the CSM on risk assessment.
- (c) A safety assessment report shall be provided in compliance with the requirements defined in the CSM on risk assessment.
- (d) The EC certificate issued by the notified body shall explicitly mention the risk acceptance principle used for meeting the “Safety” requirement of this TSI. It shall also mention the methodology applied for the risk assessment and the risk acceptance levels.;

(43) section 6.2.7 is modified as follows:

in section 6.2.7.1., the complete text is replaced by ‘not used’;

section 6.2.7.2. (a)(2) is deleted;

in section 6.2.7.3. (a), the term ‘4.2.1.3 (c)’ is replaced by ‘4.2.1.3 (b)’;

section 6.2.7.4. (b) is deleted;

section 6.2.7.5. is replaced by the following text:

‘6.2.7.5. Emergency lighting in upgraded/renewed tunnels

In case of upgraded/renewed tunnels as required by clause 7.2.2.1, the assessment consists in the verification of the existence of the lighting. It is not necessary to apply detailed requirements.’;

in section 6.2.7.6, the term ‘installations’ is replaced by ‘systems’ and the reference to clause ‘4.2.2.5’ is replaced by a reference to clause ‘4.2.1.10.’;

(44) section 7(b) is modified as follows:

the text ‘suitable for safe integration in accordance with Section 15(1) of Directive 2008/57/EC with all non-TSI compliant tunnels within the geographical scope of this TSI.’ is replaced by ‘technically compatible with all non-TSI compliant tunnels within the geographical scope of this TSI in accordance with Article 21(3) of Directive (EU) 2016/797.’;

(45) section 7.1.1.(b) is modified as follows:

‘In the latter case Article 24 and 25 of Directive 2008/57/EC apply.’ is deleted;

(46) Section 7.2.2 is replaced as follows:

‘7.2.2. *Upgrade and renewal measures for tunnels*

In case of the upgrade or renewal of a tunnel, according to Article 15(7) and Annex IV of Directive (EU) 2016/797, the notified body issues certificates of verification for those parts of the subsystem composing the tunnel under the scope of the upgrade or renewal.

7.2.2.1. Upgrade or renewal of a tunnel

- (a) A tunnel is considered to be upgraded or renewed in the context of this TSI when any major modification or substitution work are carried out on a subsystem (or part of it) composing the tunnel.
- (b) Assemblies and components that are not included in the scope of a particular upgrade or renewal programme do not have to be made compliant at the time of such a programme.
- (c) When upgrading or renewal works are carried out, the following parameters apply if they are in the scope of work:
 - 4.2.1.1. Prevent unauthorised access to emergency exits and technical rooms
 - 4.2.1.3. Fire reaction of building material
 - 4.2.1.4. Fire detection in technical rooms
 - 4.2.1.5.4 Emergency lighting: where provided, it is not necessary to apply detailed requirements
 - 4.2.1.5.5 Escape signage
 - 4.2.1.8. Emergency communication.
- (d) The tunnel emergency plan shall be revised.

7.2.2.2. Extension of a tunnel

- (a) A tunnel is considered to be extended in the context of this TSI when its geometry is affected (e.g. extension in length, connection to another tunnel).
- (b) When a tunnel extension is carried out, then the following measures shall be implemented for assemblies and components included in the extension. For their application, the tunnel length to consider is the total tunnel length after extension:
 - 4.2.1.1. Prevent unauthorised access to emergency exits and technical rooms
 - 4.2.1.2. Fire resistance of tunnel structures
 - 4.2.1.3. Fire reaction of building material

- 4.2.1.4. Fire detection in technical rooms
- 4.2.1.5.4 Emergency lighting
- 4.2.1.5.5 Escape signage
- 4.2.1.6. Escape walkways
- 4.2.1.8. Emergency communication
- 4.2.1.9. Electricity supply for emergency response services
- 4.2.1.10. Reliability of electrical systems
- 4.2.1.11 Communication and lighting at switching locations
- 4.2.2.1. Sectioning of contact line
- 4.2.2.2. Earthing of contact line.

(c) The CSM on risk assessment shall be implemented as described in point 6.2.6 for defining the relevance of applying other measures of clause 4.2.1.5 and the measures of clause 4.2.1.7 to the complete tunnel resulting from the extension.

(d) When applicable, the tunnel emergency plan shall be revised.;

(47) section 7.3.1 is replaced by the following:

‘7.3.1. *General*

- (1) The specific cases, as listed in the following clause, describe special provisions that are needed and authorised on particular networks of each Member State.
- (2) These specific cases are classified as:
 - “P” cases: “permanent” cases.
 - “T0”: “temporary” cases of indefinite duration, where the target system shall be reached by a date still to be determined.
 - “T1” cases: “temporary” cases, where the target system shall be reached by 31 December 2025.
 - “T2” cases: “temporary” cases, where the target system shall be reached by 31 December 2035.

All specific cases and their relevant dates shall be re-examined in the course of future revisions of the TSI with a view to limiting their technical and geographical scope based on an assessment of their impact on safety, interoperability, cross border services, TEN-T corridors, and the practical and economic impacts of retaining or eliminating them. Special account shall be given to availability of EU funding.

Specific cases shall be limited to the route or network where they are strictly necessary and taken account of through route compatibility procedures.

- (3) Any specific case applicable to rolling stock within the scope of this TSI in detailed in the LOC&PAS TSI.

7.3.2. *Operational rules related to trains running in tunnels (clause 4.4.6)*

7.3.2.1 Specific case Italy (“T0”)

Additional prescriptions for rolling stock intended to be operated in non TSI compliant tunnels in Italy are detailed in the LOC&PAS TSI, clause 7.3.2.20.

7.3.2.2 Specific case Channel Tunnel (“P”)

Additional prescriptions for passenger rolling stock intended to be operated in the Channel Tunnel are detailed in the LOC&PAS TSI, clause 7.3.2.21’;

(48) The table in appendix B is replaced as follows:

'Characteristics to be assessed	Project phase		Particular assessment procedures
	Design review	Assembly before putting into service	
	1	2	3
4.2.1.1. Prevent unauthorised access to emergency exits and technical rooms	X	X	
4.2.1.2. Fire resistance of tunnel structures	X		6.2.7.2
4.2.1.3. Fire reaction of building material	X		6.2.7.3
4.2.1.4. Fire detection in technical rooms	X	X	
4.2.1.5. Evacuation facilities	X	X	6.2.7.4 6.2.7.5
4.2.1.6. Escape walkways	X	X	
4.2.1.7. Evacuation and rescue points	X	X	
4.2.1.8. Emergency communication	X		
4.2.1.9. Electricity supply for emergency response services	X		
4.2.1.10. Reliability of electrical systems	X		6.2.7.6
4.2.2.1. Sectioning of contact line	X	X	
4.2.2.2. Earthing of contact line	X	X'	

ANNEX VI

The Annex to Regulation (EU) 2016/919 is amended as follows:

(1) Section 1.1 is amended as follows:

(a) in the second subparagraph, the text ‘Annex I points 1.2 and 2.2 of Directive 2008/57/EC’ is replaced by the text ‘Annex I point 2 of Directive (EU) 2016/797’;

(b) points (1) to (4) are replaced by the following:

‘(1) locomotives and passenger rolling stock, including thermal or electric traction units, self-propelling thermal or electric passenger trains, and passenger coach, if equipped with a driving cab.

(2) special vehicles, such as on-track machines, if equipped with a driving cab and intended to be used in transport mode on its own wheels.

This list of vehicles shall include those which are specially designed to operate on the different types of high-speed lines described in point 1.2. (Geographical scope).’;

(2) Section 1.2 is replaced by the following:

‘1.2. Geographical Scope

The geographical scope of this TSI is the network of the whole rail system, as described in Annex I point 1 of Directive (EU) 2016/797 and excludes the infrastructure cases referred to in Articles 1(3) and 1(4) of Directive (EU) 2016/797.

The TSI shall apply to networks with 1 435 mm, 1 520 mm, 1 524 mm, 1 600 mm and 1 668 mm track gauges. However, it shall not apply to short border crossing lines with 1 520 mm track gauges that are connected to the network of third countries.’;

(3) Section 1.3 is amended as follows:

(a) the text ‘Article 5(3) of Directive 2008/57/EC’ is replaced by the text ‘Article 4(3) of Directive (EU) 2016/797’;

(b) points (8) and (9) are added after point (7) as follows:

‘(8) indicates the provisions applicable to the existing subsystems, in particular in the event of upgrading and renewal and, in such cases, the modification work which requires an application for a new authorisation for the vehicle or trackside subsystem — Chapter 7 (Implementing the Control-Command and Signalling Subsystems TSI);

(9) indicates the parameters of the subsystems to be checked by the railway undertaking and the procedures to be applied to check those parameters after the delivery of the vehicle authorisation for placing on the market and before the first use of the vehicle to ensure compatibility between vehicles and the routes on which they are to be operated — Chapter 4 (Characterisation of the Subsystems).’;

(c) the text ‘Article 5(5) of Directive 2008/57/EC’ is replaced by the text ‘Article 4(5) of Directive (EU) 2016/797’;

(4) The first paragraph of section 2.1 is replaced by the following:

‘The Control-Command and Signalling Subsystems are defined in Annex II of Directive (EU) 2016/797 as:

(a) Trackside control-command and signalling as: “all the trackside equipment required to ensure safety and to command and control movements of trains authorised to travel on the network.”

(b) On-board control-command and signalling as “all the on-board equipment required to ensure safety and to command and control movements of trains authorised to travel on the network”.’;

(5) Section 2.2 is amended as follows:

(a) The first paragraph is replaced by the following:

'The Control-Command and Signalling Subsystem TSI specifies only those requirements which are necessary to assure the interoperability of the Union rail system and the compliance with the essential requirements (*).

(*) Currently the CCS TSI does not specify any interoperability requirement for the interlockings, level crossings and certain other elements of the CCS.;

(b) the text 'Class B systems for the trans-European rail system network are a limited set of train protection limited set of train protection legacy systems that were in use in the trans-European rail network before 20 April 2001' is replaced by 'Class B systems for the trans-European rail system network are a limited set of train protection and voice radio legacy systems that were already in use in the trans-European rail network before 20 April 2001';

(c) the text 'Class B systems for other parts of the network of the rail system in the European Union are a limited set of train protection legacy systems that were in use in that networks before 1 July 2015' is replaced by 'Class B systems for other parts of the network of the rail system in the European Union are a limited set of train protection and voice radio legacy systems that were already in use in those networks before 1 July 2015';

(d) the text 'The list of Class B systems is established in the European Railway Agency technical documents "List of CCS Class B systems, ERA/TD/2011-11, version 3.0."' is replaced by 'The list of Class B systems is established in the European Union Agency for Railways technical document "List of CCS Class B systems, ERA/TD/2011-11, version 4.0."';

(e) the text 'All Control-Command and Signalling Subsystems, even where not specified in this TSI, shall be assessed according with Commission Implementing Regulation (EU) No 402/2013.' is added at the end of Section 2.2.

(6) Section 2.3 is replaced by the following:

2.3 Trackside Application Levels (ETCS)

The interfaces specified by this TSI define the means of data transmission to, and (where appropriate) from trains. The ETCS specifications referenced by this TSI provide application levels from which a trackside implementation may choose the means of transmission that meet its requirements.

This TSI defines the requirements for all application levels.

For the technical definition of the ETCS application levels see Annex A, 4.1 c.;

(7) Section 3.1 is amended as follows:

(a) the text 'Directive 2008/57/EC' is replaced by the reference to 'Directive (EU) 2016/797';

(b) a new point (6) is added after point 5 as follows:

'(6) Accessibility.;

(8) Section 3.2.1 is replaced by the following:

3.2.1 Safety

Every Control-Command and Signalling Subsystems project shall take the measures necessary to ensure that the level of risk of an incident occurring within the scope of the Control-Command and Signalling Subsystems, is not higher than the objective for the service.

To ensure that the measures taken to achieve safety do not jeopardise interoperability, the requirements of the basic parameter defined in point 4.2.1 (Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability) shall be respected.

For the ETCS Class A system the safety objective is apportioned between the Control-Command and Signalling On-board and Trackside Subsystems. The detailed requirements are specified in the basic parameter defined in point 4.2.1 (Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability). This safety requirement shall be met together with the availability requirements as defined in Point 3.2.2 (Reliability and Availability).

For the ETCS Class A system:

- (a) the changes made by railway undertakings and infrastructure managers shall be managed in compliance with the processes and procedures of their safety management system;
- (b) the changes made by other actors (e.g. manufacturers or other suppliers) shall be managed according to the risk management process set out in Annex I to the Commission Implementing Regulation (EU) No 402/2013 (*), as referred to in Article 6(1)(a) of Directive (EU) 2016/798 of the European Parliament and of the Council (**).

Additionally the correct application of the risk management process as set out in Annex I of Regulation (EU) No 402/2013, as well as the appropriateness of the results from this application, shall be independently assessed by a CSM assessment body according to Article 6 of that Regulation. The CSM Assessment Body shall be accredited or recognised according to the requirements in Annex II of Regulation (EU) No 402/2013 in the fields of "Control-command and signalling" and "System safe integration" as listed in item 5 "classification" of ERADIS database entry for Assessment Bodies.

The application of the specifications as referred to in Annex A, Table A 3 is an appropriate means to fully comply to the risk management process as set out in Annex I of the Commission Implementing Regulation (EU) No 402/2013 for design, implementation, production, installation and validation (incl. Safety acceptance) of interoperability constituents and subsystems. When different specifications from the ones referred to in Annex A, Table 3 are applied, at least equivalence shall be demonstrated with the specifications in Annex A, Table 3.

Whenever the specifications as referred to in Annex A, Table A 3 are used as an appropriate means to fully comply to the risk management process as set out in Annex I of the Commission Implementing Regulation (EU) No 402/2013, in order to avoid unnecessary duplication of independent assessment work, the independent safety assessment activities that are required by the specifications referred to in Annex A, Table A 3 shall be carried out by an Assessment Body accredited or recognized as specified in the section above instead of a CENELEC independent safety assessor.

(*) Commission Implementing Regulation (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009 (OJ L 121, 3.5.2013, p. 8).

(**) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (OJ L 138, 26.5.2016, p. 102).;

- (9) The second paragraph of section 3.2.2 is replaced by the following:

'The level of risk caused by age and wear of constituents used within the subsystem shall be monitored. The requirements for maintenance stated in point 4.5 shall be respected.;

- (10) Section 3.2.5.2 is deleted;

- (11) A new section 3.2.6 is added as follows:

'3.2.6 Accessibility

No requirements are mandated for the CCS subsystems for the essential requirement accessibility.'

- (12) Section 4.1.1 is amended as follows:

- (a) in point (16) the text 'points 4.2.16' is replaced by 'point 4.2.16';

- (b) a new point (17) is added as follows:

'(17) ETCS and Radio System Compatibility (point 4.2.17);

- (13) In section 4.1.2 the text ‘limiting the movement of TSI-compliant on-board subsystems.’ is replaced by ‘limiting the movement of vehicles with TSI-compliant on-board subsystems.’;
- (14) Table 4.1 in section 4.1.3 is replaced by:

‘Table 4.1

Subsystem	Part	Basic parameters
Control-Command and Signalling On-board	Train protection	4.2.1, 4.2.2, 4.2.5, 4.2.6, 4.2.8, 4.2.9, 4.2.12, 4.2.14, 4.2.16, 4.2.17
	Voice radio communication	4.2.1.2, 4.2.4.1, 4.2.4.2, 4.2.5.1, 4.2.13, 4.2.16, 4.2.17
	Data radio communication	4.2.1.2, 4.2.4.1, 4.2.4.3, 4.2.5.1, 4.2.6.2, 4.2.16, 4.2.17
Control-Command and Signalling Trackside	Train protection	4.2.1, 4.2.3, 4.2.5, 4.2.7, 4.2.8, 4.2.9, 4.2.15, 4.2.16, 4.2.17
	Voice radio communication	4.2.1.2, 4.2.4, 4.2.5.1, 4.2.7, 4.2.16, 4.2.17
	Data radio communication	4.2.1.2, 4.2.4, 4.2.5.1, 4.2.7, 4.2.16, 4.2.17
	Train detection	4.2.10, 4.2.11, 4.2.16’

- (15) The title of section 4.2.1 is replaced by ‘Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability’;
- (16) Section 4.2.2 is replaced by the following:

‘4.2.2. On-board ETCS functionality

The basic parameter for ETCS on-board functionality describes all of the functions needed to run a train in a safe way. The primary function is to provide automatic train protection and cab signalling:

- (1) setting the train characteristics (e.g., maximum train speed, braking performance);
- (2) selecting the supervision mode on the basis of information from trackside;
- (3) performing odometry functions;
- (4) locating the train in a coordinate system based on Eurobalise locations;
- (5) calculating the dynamic speed profile for its mission on the basis of train characteristics and of information from trackside;
- (6) supervising the dynamic speed profile during the mission;
- (7) providing the intervention function.

These functions shall be implemented in accordance with Annex A 4.2.2 b and their performance shall conform to Annex A 4.2.2 a.

The requirements for tests are specified in Annex A 4.2.2 c.

The main functionality is supported by other functions, to which Annex A 4.2.2 a and Annex A 4.2.2 b also apply, together with the additional specifications indicated below:

- (1) Communication with the Control-Command and Signalling Trackside Subsystem.
 - (a) Eurobalise data transmission. See point 4.2.5.2 (Eurobalise communication with the train).

- (b) Euroloop data transmission. See point 4.2.5.3 (Euroloop communication with the train). This functionality is optional on-board unless Euroloop is installed trackside in ETCS Level 1 and the release speed is set to zero for safety reasons (e.g. protection of danger points).
 - (c) Radio data transmission for radio infill. See Annex A, 4.2.2 d, point 4.2.5.1 (Radio communications with the train), point 4.2.6.2 (Interface between GSM-R Radio Data Communication and ETCS) and point 4.2.8 (Key Management). This functionality is optional on-board unless radio data transmission for radio in-fill is installed trackside in ETCS Level 1 and the release speed is set to zero for safety reasons (e.g., protection of danger points).
 - (d) Radio data transmission. See point 4.2.5.1 (Radio communications with the train), point 4.2.6.2 (Interface between GSM-R Radio Data Communication and ETCS) and point 4.2.8 (Key Management). This radio data transmission is optional unless operating on an ETCS level 2 or level 3 lines.
- (2) Communicating with the driver. See Annex A, 4.2.2 e and point 4.2.12 (ETCS DMI).
- (3) Communicating with the STM. See point 4.2.6.1 (Interface between ETCS and STM). This function includes:
- (a) managing the STM output;
 - (b) providing data to be used by the STM;
 - (c) managing STM transitions.
- (4) Managing information about the completeness of the train (train integrity) — Supplying the train integrity to the on-board subsystem, is optional unless it is required by trackside.
- (5) Equipment health monitoring and degraded mode support. This function includes:
- (a) initialising the on-board ETCS functionality;
 - (b) providing degraded mode support;
 - (c) isolating the on-board ETCS functionality.
- (6) Support data recording for regulatory purposes. See point 4.2.14 (Interface to Data Recording for Regulatory Purposes).
- (7) Forwarding information/orders and receiving state information from rolling stock:
- (a) to the DMI. See point 4.2.12 (ETCS DMI)
 - (b) to/from the train interface unit. See Annex A, 4.2.2 f.;
- (17) Section 4.2.3 is replaced by the following:

‘4.2.3. *Trackside ETCS functionality*

This Basic parameter describes the ETCS trackside functionality. It contains all ETCS functionality to provide a safe path to a specific train.

The main functionality is:

- (1) locating a specific train in a coordinate system based on Eurobalise locations (level 2 and level 3);
- (2) translating the information from trackside signalling equipment into a standard format for the Control-Command and Signalling On-board Subsystem;
- (3) sending movement authorities including track description and orders assigned to a specific train.

These functions shall be implemented in accordance with Annex A 4.2.3 b and their performance shall conform to Annex A 4.2.3 a.

The main functionality is supported by other functions, to which Annex A 4.2.3 a and Annex A 4.2.3 b also apply, together with the additional specifications indicated below:

- (1) communicating with the Control-Command and Signalling On-board Subsystem. This includes:
 - (a) Eurobalise data transmission. See point 4.2.5.2 (Eurobalise communication with the train) and point 4.2.7.4 (Eurobalise/Line-side Electronic Unit (LEU));
 - (b) Euroloop data transmission. See point 4.2.5.3 (Euroloop communication with the train) and point 4.2.7.5 (Euroloop/LEU). Euroloop is only relevant in level 1, in which it is optional;
 - (c) Radio data transmission for radio infill. See Annex A, 4.2.3 d, point 4.2.5.1 (Radio communications with the train), point 4.2.7.3 (GSM-R/trackside ETCS functionality) and point 4.2.8 (Key Management). Radio in-fill is only relevant in level 1, in which it is optional;
 - (d) Radio data transmission. See point 4.2.5.1 (Radio communications with the train), point 4.2.7.3 (GSM-R/trackside ETCS functionality) and point 4.2.8 (Key Management). Radio data transmission is only relevant to level 2 and level 3.
 - (2) generating information/orders to the on-board ETCS, e.g. information related to closing/opening the air flaps, lowering/raising the pantograph, opening/closing the main power switch, changing from traction system A to traction system B. Implementation of this functionality is optional for trackside; it can however be required by other applicable TSIs or national rules or the application of risk evaluation and assessment to ensure safe integration of subsystems;
 - (3) managing the transitions between areas supervised by different Radio Block Centres (RBCs) (only relevant for level 2 and level 3). See point 4.2.7.1 (Functional interface between RBCs) and point 4.2.7.2 (Technical interface between RBCs).;
- (18) In section 4.2.6.3 the reference to '4.2.6f' is deleted.
- (19) In section 4.2.11 the text 'Control-Command and Signalling equipment.' is replaced by 'Control-Command and Signalling train detection equipment.'
- (20) In section 4.2.16 the text 'by Control-command and signalling On-board Subsystems' is replaced by 'by Control-command and signalling On-board Interoperability Constituents and Subsystems';
- (21) A new section 4.2.17 is added as follows:

4.2.17. *ETCS and Radio System Compatibility*

Due to the different possible implementations and the status of the migration to fully compliant CCS Subsystems, checks shall be performed in order to demonstrate the technical compatibility between the on-board and trackside CCS Subsystems. The necessity of these checks shall be considered as a measure to increase the confidence on the technical compatibility between the CCS subsystems. It is expected that these checks will be reduced until the principle stated in 6.1.2.1 is achieved.

4.2.17.1. ETCS System Compatibility

ETCS System Compatibility (ESC) shall be the recording of technical compatibility between ETCS on-board and the trackside parts ETCS of the CCS subsystems within an area of use.

ESC type shall be the value assigned to record the technical compatibility between an ETCS on-board and a section within the area of use. All sections of the Union network which require the same set of checks for the demonstration of ESC shall have the same ESC type.

4.2.17.2. Radio System Compatibility

Radio System Compatibility (RSC) shall be the recording of technical compatibility between voice or data radio on-board and the trackside parts of GSM-R of the CCS subsystems.

RSC type shall be the value assigned to record the technical compatibility between a voice or data radio and a section within the area of use. All sections of the Union network which require the same set of checks for the demonstration of RSC shall have the same RSC type.;

(22) Section 4.3 is amended as follows:

- (a) in the title of the tables, the text 'Clause' is replaced by 'Point';
 (b) section 4.3.1 is replaced by the following:

'4.3.1 Interface to the Operation and Traffic Management Subsystem

Interface with Operation and Traffic Management TSI			
Reference CCS TSI		Reference Operation and Traffic Management TSI ⁽¹⁾	
Parameter	Point	Parameter	Point
Operating rules (normal and degraded conditions)	4.4	Rule book Operating rules	4.2.1.2.1 4.4
Visibility of trackside Control-Command and Signalling objects	4.2.15	Signal and line-side marker sighting	4.2.2.8
Train braking performance and characteristics	4.2.2	Braking performance	4.2.2.6
Use of sanding equipment On-board flange lubrication Use of composite brake blocks	4.2.10	Rule book	4.2.1.2.1
Interface to Data Recording for Regulatory Purposes	4.2.14	Data recording on-board	4.2.3.5
ETCS DMI	4.2.12	Train running number	4.2.3.2.1
GSM-R DMI	4.2.13	Train running number	4.2.3.2.1
Key Management	4.2.8	Ensuring that the train is in running order	4.2.2.7
Route compatibility checks before the use of authorised vehicles	4.9	Parameters for the vehicle and train compatibility over the route intended for operation	Appendix D1

⁽¹⁾ Commission Regulation (EU) 2015/995 of 8 June 2015 amending Decision 2012/757/EU concerning the technical specification for interoperability relating to the "operation and traffic management" subsystem of the rail system in the European Union (OJ L 165, 30.6.2015, p. 1).'

- (c) section 4.3.2 is replaced by the following:

'4.3.2. Interface to the Rolling Stock Subsystem

Interface with Rolling Stock TSIs				
Reference CCS TSI		Reference Rolling Stock TSIs		
Parameter	Point	Parameter		Point
Compatibility with trackside train detection systems: vehicle design	4.2.10	Rolling stock characteristics to be compatible with train detection systems based on track circuits	HS RS TSI ⁽¹⁾ wheelset location	4.2.7.9.2
			axle load	4.2.3.2
			sanding	4.2.3.10
			electrical resistance between wheels	4.2.3.3.1
			CR RS TSI ⁽²⁾	4.2.3.3.1.1
LOC & PAS TSI ⁽³⁾	4.2.3.3.1.1			
Wagon TSI ⁽⁴⁾	4.2.3.2			

Interface with Rolling Stock TSIs					
Reference CCS TSI		Reference Rolling Stock TSIs			
Parameter	Point	Parameter		Point	
		Rolling stock characteristics to be compatible with train detection systems based on axle counters	HS RS TSI	wheelset geometry	4.2.7.9.2
				wheels	4.2.7.9.3
			CR RS TSI		4.2.3.3.1.2
			LOC & PAS TSI		4.2.3.3.1.2
			Wagon TSI		4.2.3.3
		Rolling stock characteristics to be compatible with loop equipment	HS RS TSI		None
					4.2.3.3.1.3
			LOC & PAS TSI		4.2.3.3.1.3
			Wagon TSI		4.2.3.3
Electromagnetic compatibility between rolling stock and Control-Command and Signalling trackside equipment	4.2.11	Rolling stock characteristics to be compatible with train detection systems based on track circuits	HS RS TSI		4.2.6.6.1
					4.2.3.3.1.1
			LOC & PAS TSI		4.2.3.3.1.1
			Wagon TSI		4.2.3.3
		Rolling stock characteristics to be compatible with train detection systems based on axle counters	HS RS TSI		4.2.6.6.1
					4.2.3.3.1.2
			LOC & PAS TSI		4.2.3.3.1.2
			Wagon TSI		4.2.3.3
Train braking performance and characteristics	4.2.2	Emergency braking performance	HS RS TSI	Emergency braking	4.2.4.1
				Service braking	4.2.4.4
			CR RS TSI	Emergency braking	4.2.4.5.2
				Service braking	4.2.4.5.3
			LOC & PAS TSI	Emergency braking	4.2.4.5.2
				Service braking	4.2.4.5.3
		Wagon TSI		4.2.4.1.2	
Position of Control-Command and Signalling on-board antennas	4.2.2	Kinematic gauge	HS RS TSI		4.2.3.1
					4.2.3.1
			LOC & PAS TSI		4.2.3.1
			Wagon TSI		none
Isolation of on-board ETCS functionality	4.2.2	Operating rules	HS RS TSI		4.2.7.9.1
					4.2.12.3
			LOC & PAS TSI		4.2.12.3
			Wagon TSI		none
Data interfaces	4.2.2	Monitoring and diagnostic concepts	HS RS TSI		4.2.7.10
					4.2.1.1
			LOC & PAS TSI		4.2.1.1
			Wagon TSI		None

Interface with Rolling Stock TSIs				
Reference CCS TSI		Reference Rolling Stock TSIs		
Parameter	Point	Parameter		Point
Visibility of trackside Control-Command and Signalling objects	4.2.15	External visibility Head lights	HS RS TSI	4.2.7.4.1.1
			CR RS TSI	4.2.7.1.1
LOC & PAS TSI	4.2.7.1.1			
Wagon TSI	None			
		Driver's external field of view	HS RS TSI	4.2.2.6 b
			line of sight	4.2.2.7
			windscreen	4.2.9.1.3.1
			CR RS TSI	4.2.9.2
line of sight	4.2.9.1.3.1			
windscreen	4.2.9.2			
LOC & PAS TSI	4.2.9.2			
Wagon TSI	None			
Interface to data recording for regulatory purposes	4.2.14	Recording device	HS RS TSI	4.2.7.10
			CR RS TSI	4.2.9.6
			LOC & PAS TSI	4.2.9.6
			Wagon TSI	none
Commands to rolling stock equipment	4.2.2	Phase separation	HS RS TSI	4.2.8.3.6.7
	4.2.3		CR RS TSI	4.2.8.2.9.8
	LOC & PAS TSI		4.2.8.2.9.8	
	Wagon TSI		none	
Emergency braking command	4.2.2	Emergency braking command	HS RS TSI	none
			CR RS TSI	4.2.4.4.1
			LOC & PAS TSI	4.2.4.4.1
			Wagon TSI	none
Construction of equipment	4.2.16	Material requirements	HS RS TSI	4.2.7.2.2
			CR RS TSI	4.2.10.2.1
			LOC&PAS TSI	4.2.10.2.1
			Wagon TSI	none

(1) HS RS TSI is Commission Decision of 21 February 2008 concerning a technical specification for interoperability relating to the rolling stock sub-system of the trans-European high-speed rail system (2008/232/CE).

(2) CR RS TSI is Commission Decision 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 (2011/291/EU).

(3) LOC & PAS TSI is 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.

(4) Wagon TSI is Commission Regulation (EU) No 321/2013 of 13 March 2013 concerning the technical specification for interoperability relating to the subsystem rolling stock — freight wagons of the rail system in the European Union and repealing Decision 2006/861/EC.’

(d) in section 4.3.4 the text ‘Phase separation points’ is replaced by ‘Phase separation sections’;

(23) In section 4.4 the text ‘Traffic Operation and Management TSI’ is replaced by ‘Operation and Traffic Management TSI’.

(24) In section 4.5.1 at the end of point (1) the following text is added 'For equipment error corrections see point 6.5.'

(25) Section 4.8 is replaced by:

4.8 Registers

The data to be provided for the registers provided for in Articles 48 and 49 of Directive (EU) 2016/797 are those indicated in Commission Implementing Decision 2011/665/EU (*) and Commission Implementing Regulation (EU) 2019/777 (**).

(*) Commission Implementing Decision 2011/665/EU of 4 October 2011 on the European register of authorised types of railway vehicles (OJ L 264, 8.10.2011, p. 32).

(**) Commission Implementing Regulation (EU) 2019/777 of 16 May 2019 on the common specifications for the register of railway infrastructure and repealing Implementing Decision 2014/880/EU (OJ L 139 I, 27.5.2019, p. 312).;

(26) A new section 4.9 is added below section 4.8 as follows:

4.9. Route compatibility checks before the use of authorised vehicles

The parameters of the on-board CCS subsystem to be used by the railway undertaking, for the purpose of route compatibility check, are described in Appendix D1 of Commission Implementing Regulation (EU) 2019/773 (*).

(*) Commission Implementing Regulation (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU (OJ L 139 I, 27.5.2019, p. 5).;

(27) Section 5.1 is replaced by the following:

5.1 Definition

In accordance with Article 2(7) of Directive (EU) 2016/797, interoperability constituents means any elementary component, group of components, subassembly or complete assembly of equipment incorporated or intended to be incorporated into a subsystem, upon which the interoperability of the rail system depends directly or indirectly, including both tangible objects and intangible objects.;

(28) In section 5.2.2 a new paragraph is added at the end of the section as follows:

'Compliance of interfaces internal to the group of ICs to basic parameters of Chapter 4 does not have to be verified. Compliance of interfaces external to the group of ICs has to be verified to demonstrate conformity with the basic parameters related to the requirements of these external interfaces.;

(29) Section 5.3 is amended as follows:

(a) Table 5.1.a is replaced by:

'Table 5.1.a

Basic interoperability constituents in the Control-Command and Signalling On-board Subsystem

1	2	3	4
No	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
1	ETCS on-board	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		On-board ETCS functionality (excluding odometry)	4.2.2

1	2	3	4
No	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
		ETCS and GSM-R air gap interfaces — RBC (Radio data transmission optional) — Radio in-fill unit (functionality optional) — Eurobalise air gap — Euroloop air gap (functionality optional)	4.2.5 4.2.5.1 4.2.5.1 4.2.5.2 4.2.5.3
		Interfaces — STM (implementation of interface K optional) — GSM-R ETCS Data Only Radio — Odometry — Key management system — ETCS ID Management — ETCS Driver-Machine Interface — Train interface — On-board recording device	4.2.6.1 4.2.6.2 4.2.6.3 4.2.8 4.2.9 4.2.12 4.2.2 4.2.14
	2	Odometry equipment	Reliability, Availability, Maintainability, Safety (RAMS) 4.2.1 4.5.1
		On-board ETCS functionality: only Odometry	4.2.2
		Interfaces — On-board ETCS	4.2.6.3
		Construction of equipment	4.2.16
	3	Interface of External STM Interfaces — On-board ETCS	4.2.6.1
	4	GSM-R voice cab radio	Reliability, Availability, Maintainability, (RAM) 4.2.1.2 4.5.1
	Note: SIM card, antenna, connecting cables and filters are not part of this interoperability constituent	Basic communication functions	4.2.4.1
		Voice and operational communication applications	4.2.4.2
		Interfaces — GSM-R air gap — GSM-R Driver-Machine Interface	4.2.5.1 4.2.13
		Construction of equipment	4.2.16
	5	GSM-R ETCS Data only Radio	Reliability, Availability, Maintainability (RAM) 4.2.1.2 4.5.1
	Note: SIM card, antenna, connecting cables and filters are not part of this interoperability constituent	Basic communication functions	4.2.4.1
		ETCS data communication applications	4.2.4.3

1	2	3	4
No	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
		Interfaces	
		— On-board ETCS	4.2.6.2
		— GSM-R air gap	4.2.5.1
		Construction of equipment	4.2.16
6	GSM-R SIM card	Basic communication functions	4.2.4.1
	Note: it is the responsibility of the GSM-R network operator to deliver to railway undertakings the SIM cards to be inserted in GSM-R terminal equipment	Construction of equipment	4.2.16'

(b) table 5.1.b is replaced by:

'Table 5.1.b

Groups of interoperability constituents in the Control-Command and Signalling On-board Subsystem

(This table is an example to show the structure. Other groups are allowed.)

1	2	3	4
No	Group of Interoperability constituents	Characteristics	Specific requirements to be assessed by reference to Chapter 4
1	ETCS on-board Odometry equipment	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		On-board ETCS functionality	4.2.2
		ETCS and GSM-R air gap interfaces	4.2.5
		— RBC (Radio data transmission optional)	4.2.5.1
		— Radio in-fill unit (functionality optional)	4.2.5.1
		— Eurobalise air gap	4.2.5.2
		— Euroloop air gap (functionality optional)	4.2.5.3
		Interfaces	
		— STM (implementation of interface K optional)	4.2.6.1
		— GSM-R ETCS Data Only Radio	4.2.6.2
		— Key management system	4.2.8
		— ETCS-ID Management	4.2.9
		— ETCS Driver Machine Interface	4.2.12
		— Train interface	4.2.2
		— On-board recording device	4.2.14
		Construction of equipment	4.2.16'

(c) table 5.2.a is replaced by:

‘Table 5.2.a

Basic interoperability constituents in the Control-Command and Signalling Trackside Subsystem

1	2	3	4
No	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
1	RBC	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		Trackside ETCS functionality (excluding communication via Eurobalises, radio in-fill and Euroloop)	4.2.3
		ETCS and GSM-R air gap interfaces: only radio communication with train	4.2.5.1
		Interfaces — Neighbouring RBC — Data radio communication — Key management system — ETCS-ID Management	4.2.7.1, 4.2.7.2 4.2.7.3 4.2.8 4.2.9
		Construction of equipment	4.2.16
2	Radio in-fill unit	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		Trackside ETCS functionality (excluding communication via Eurobalises, Euroloop and level 2 and level 3 functionality)	4.2.3
		ETCS and GSM-R air gap interfaces: only radio communication with train	4.2.5.1
		Interfaces — Data radio communication — Key management system — ETCS-ID Management — Interlocking and LEU	4.2.7.3 4.2.8 4.2.9 4.2.3
		Construction of equipment	4.2.16
3	Eurobalise	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		ETCS and GSM-R air gap interfaces: only Eurobalise communication with train	4.2.5.2
		Interfaces — LEU — Eurobalise	4.2.7.4
		Construction of equipment	4.2.16

1	2	3	4
No	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
4	Euroloop	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		ETCS and GSM-R air gap interfaces: only Euroloop communication with train	4.2.5.3
		Interfaces — LEU – Euroloop	4.2.7.5
		Construction of equipment	4.2.16
5	LEU Eurobalise	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		Trackside ETCS functionality (excluding communication via radio in-fill, Euroloop and level 2 and level 3 functionality)	4.2.3
		Interfaces — LEU — Eurobalise	4.2.7.4
		Construction of equipment	4.2.16
6	LEU Euroloop	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		Trackside ETCS functionality (excluding communication via radio in-fill, Eurobalise and level 2 and level 3 functionality)	4.2.3
		Interfaces — LEU – Euroloop	4.2.7.5
		Construction of equipment	4.2.16
7	Axle Counter	Trackside train detection systems (only parameters relevant for axle counters)	4.2.10
		Electromagnetic compatibility (only parameters relevant for axle counters)	4.2.11
		Construction of equipment	4.2.16'

(30) Section 6.1 is replaced by the following:

6.1. Introduction

6.1.1. *General principles*

6.1.1.1. Compliance with basic parameters

Fulfilment of the essential requirements set out in Chapter 3 of this TSI shall be ensured through compliance with the basic parameters specified in Chapter 4.

This compliance shall be demonstrated by:

- (1) assessing the conformity of the interoperability constituents specified in Chapter 5 (see point 6.2.1, 6.2.2, 6.2.3, 6.2.4);
- (2) verifying the subsystems (see point 6.3 and point 6.4).

6.1.1.2. Essential requirements fulfilled by National Rules

In certain cases, some of the essential requirements may be met by national rules, because of:

- (1) the use of Class B systems;
- (2) open points in the TSI;
- (3) non-application of TSIs (derogations) under Article 7 of Directive (EU) 2016/797;
- (4) specific cases described in point 7.6.

In such cases, assessment of conformity with those rules shall be carried out under the responsibility of the Member States concerned according to notified procedures. See point 6.4.2.

6.1.1.3. Partial fulfilment of TSI requirements

With regard to checking if essential requirements are fulfilled through compliance with the basic parameters, and without prejudice to the obligations set out in Chapter 7 of this TSI, control-command and signalling interoperability constituents and subsystems that do not implement all functions, performance and interfaces as specified in Chapter 4 (including the specifications referred to in Annex A), can obtain EC certificates of conformity or, respectively, certificates of verification, under the following conditions for issuing and using the certificates:

- (1) The applicant for EC verification of a trackside control-command and signalling subsystem is responsible for deciding which functions, performance and interfaces need to be implemented to meet the objectives for the service and to ensure that no requirements contradicting or exceeding the TSIs are exported to the on-board control-command and signalling subsystems.
- (2) The operation of an on-board control-command and signalling subsystem, that does not implement all functions, performance and interfaces specified in this TSI, may be subject to conditions and limits of use due to compatibility and/or safe integration with trackside control-command and signalling subsystems. Without prejudice to the tasks of a Notified Body described in respective Union legislation and related documents the applicant for EC verification is responsible for ensuring that the technical file provides all the information (*) that an operator needs to identify such conditions and limits of use.
- (3) The authorising entity may refuse for duly justified reasons the authorisation for placing in service or on the market, or place conditions and limits of use on the operation, of control-command and signalling subsystems that do not implement all functions, performance and interfaces specified in this TSI.

If a control-command and signalling interoperability constituent or subsystem does not implement all functions, performance and interfaces specified in this TSI, the provisions of point 6.4.3 shall apply.

6.1.2. Principles for testing ETCS and GSM-R

6.1.2.1. Principle

The principle is that a Control-Command and Signalling On-board Subsystem covered by an “EC” declaration of verification is able to run on every Control-Command and Signalling Trackside Subsystem covered by an “EC” Declaration of verification, under the conditions specified in this TSI, with no additional verifications.

Achievement of this principle is facilitated by:

- (1) rules for the design and installation of the Control-Command and Signalling On-board and the Trackside subsystems;
- (2) test specifications to prove that the Control-Command and Signalling On-board and Trackside Subsystems comply with the requirements of this TSI and are mutually compatible.

6.1.2.2. Operational test scenarios

For the purpose of this TSI, an “operational test scenario” means a sequence of trackside and on-board events related to or influencing the Control-command and Signalling subsystems (e.g. sending/receiving messages, exceeding a speed limit, actions of operators) and the specified timing between them in order to test the intended railway system operation in situations relevant for ETCS and GSM-R (e.g. entry of a train into an equipped area, awakening of a train, overriding a signal at stop).

The operational tests scenarios are based on the engineering rules adopted for the project.

Check of compliance of a real implementation with an operational tests scenario shall be possible gathering information through easily accessible interfaces (preferably the standard interfaces specified in this TSI).

6.1.2.3. Requirements for Operational test scenarios

The set of engineering rules for the trackside parts of ETCS and GSM-R and related operational test scenarios for the Trackside Control-command and Signalling Subsystem shall be sufficient to describe all intended system operations relevant for the Trackside Control-command and Signalling Subsystem in normal and identified degraded situations, and:

- (1) shall be consistent with the specifications referenced in this TSI;
- (2) shall assume that functions, interfaces and performance of the Control-command and Signalling On-board Subsystems interacting with the Trackside Subsystem are compliant with the requirements of this TSI;
- (3) shall be the ones used in the EC Verification of the Trackside Control-command and Signalling Subsystem, to check that the implemented functions, interfaces and performance are able to ensure that the intended system operation in combination with the relevant modes and transitions between levels and modes of the Control-command and Signalling On-board Subsystems are respected.

6.1.2.4. Requirements for ETCS System Compatibility

The Agency shall set up and manage in a technical document the set of checks to demonstrate the technical compatibility of an on-board subsystem with the trackside subsystem.

Infrastructure Managers, with the support of the ETCS suppliers for their network, shall submit to the Agency the definition of the necessary checks (as defined in 4.2.17) on their network by 16 January 2020 at the latest.

Infrastructure Managers shall classify the ETCS lines according to ESC types in RINF.

Infrastructure Managers shall submit to the Agency any changes on the referred checks for their network. The Agency shall update the technical document within 5 working days.

6.1.2.5. Requirements for Radio System Compatibility

The Agency shall set up and manage in a technical document the set of checks to demonstrate the technical compatibility of an on-board subsystem with the trackside subsystem.

Infrastructure Managers, with the support of the GSM-R suppliers for their network, shall submit to the Agency the definition of the necessary checks (as defined in 4.2.17) on their network by 16 January 2020 at the latest.

Infrastructure Managers shall classify their lines according to RSC types for voice and, if applicable, ETCS data in RINF.

Infrastructure Managers shall submit to the Agency any changes on the referred checks for their network. The Agency shall update the technical document within 5 working days.

(*) The template to be used to provide this information will be defined in the Application Guide.;

(31) Section 6.2 is amended as follows:

(a) in section 6.2.1, the text ‘Article 13(1) and Annex IV to Directive 2008/57/EC’ is replaced by the text ‘Article 10(1) and Article 9(2) of Directive (EU) 2016/797’;

(b) table 6.1 is replaced by the following:

‘Table 6.1

Conformity assessment requirements of an interoperability constituent or a group of interoperability constituents

No	Aspect	What to assess	Supporting evidence
1	Functions, interfaces and performances	Check that all mandatory functions, interfaces and performances as described in the basic parameters referenced in the relevant table of Chapter 5 are implemented and that they comply with the requirements of this TSI	Design documentation and running of test cases and test sequences, as described in the basic parameters referenced in the relevant table of Chapter 5
		Check which optional functions and interfaces as described in the basic parameters referenced in the relevant table of Chapter 5 are implemented and that they comply with the requirements of this TSI	Design documentation and running of test cases and test sequences, as described in the basic parameters referenced in the relevant table of Chapter 5
		Check which additional functions and interfaces (not specified in this TSI) are implemented and that they do not lead to conflicts with implemented functions specified in this TSI	Impact analysis
2	Construction of equipment	Check compliance with mandatory conditions, where specified in the basic parameters referenced in the relevant table of Chapter 5	Documentation on material used and, where necessary, tests to ensure that the requirements of the basic parameters referenced in the relevant table of Chapter 5 are satisfied
		In addition, check that the interoperability constituent functions correctly in the environmental conditions for which it is designed	Tests according to the applicant's specifications
3	Reliability, Availability, Maintainability, Safety (RAMS)	<p>Check compliance with the safety requirements described in the basic parameters referenced in the relevant table of Chapter 5, i.e.</p> <ol style="list-style-type: none"> 1. respect for quantitative Tolerable Hazard Rates (THRs) caused by random failures 2. the development process is able to detect and eliminate systematic failures 	<ol style="list-style-type: none"> 1. Calculations for the THRs caused by random failures, supported by reliability data. 2.1. The manufacturer's quality and safety management throughout design, manufacturing and testing conforms to a recognised standard (see note) 2.2. The software development life-cycle, the hardware development life-cycle and the integration of hardware and software have each been undertaken in accordance with a recognised standard (see note)

No	Aspect	What to assess	Supporting evidence
			<p>2.3. The safety verification and validation process has been undertaken in accordance with a recognised standard (see Note) and respects the safety requirements described in the basic parameters referenced in the relevant table of Chapter 5</p> <p>2.4. The functional and technical safety requirements (correct operation under fault-free conditions, effects of faults and of external influences) are verified in accordance with a recognised standard (see Note)</p> <p><i>Note:</i> The standard shall satisfy at least the following requirements:</p> <ol style="list-style-type: none"> 1. be compliant with the requirements for code of practice, as stated in Annex I, point 2.3.2, of Regulation (EU) No 402/2013 2. be widely acknowledged in the railway domain. If this is not the case, the standard will have to be justified and be acceptable to the Notified Body; 3. be relevant for the control of the considered hazards in the system under assessment; 4. be publicly available for all actors who want to use it.
4		Check that the quantitative reliability target (related to random failures) indicated by the applicant is met	Calculations
5		Elimination of systematic failures	<p>Tests of equipment (full Interoperability Constituent or separately for subassemblies) in operational conditions, with repair when defects are detected.</p> <p>Documentation accompanying the certificate which indicates which kind of verifications have been performed, which standards have been applied and criteria adopted to consider these tests completed (according to decisions of the applicant).</p>
6		Check compliance with maintenance requirements – point 4.5.1	Document check'

(c) in section 6.2.4.1 point (2) is replaced by the following:

'(2) these tests were carried out in a laboratory accredited in accordance with Regulation (EC) No 765/2008 of the European Parliament and of the Council (*) and the standards referred to in Annex A, Table A 4 to carry out tests with the use of the test architecture and the procedures specified in Annex A 4.2.2.c.

(*) Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance to the marketing of products and repealing Regulation (EEC) No 339/93 (OJ L 218, 13.8.2008, p. 30).'

(d) sections 6.2.5 and 6.2.6 are deleted;

(32) Section 6.3 is amended as follows:

(a) section 6.3.1 is replaced by the following:

‘6.3.1. Assessment procedures for Control-Command and Signalling Subsystems

This Chapter deals with the “EC” declaration of verification for the Control-Command and Signalling On-board Subsystem and the “EC” declaration of verification for the Control-Command and Signalling Trackside Subsystem.

At the request of the applicant the Notified Body shall carry out an “EC” verification of a Control-Command and Signalling On-board or Trackside Subsystem in accordance with Annex IV to Directive (EU) 2016/797.

The applicant shall draw up the “EC” declaration of verification for the Control-Command and Signalling On-board or Trackside Subsystem in accordance with Article 15(1) and Article 15(9) of Directive (EU) 2016/797.

The content of the “EC” declaration of verification shall conform to Article 15(9) of Directive (EU) 2016/797.

The assessment procedure shall be carried out using the modules specified in point 6.3.2 (Modules for Control-Command and Signalling Subsystems).

The “EC” declarations of verification for a Control-Command and Signalling On-board Subsystem and of a Control-Command and Signalling Trackside Subsystem, together with the certificates of conformity, shall be deemed sufficient to ensure that the subsystems are compatible under the conditions specified in this TSI.;

(b) section 6.3.2.3 is replaced by the following:

‘6.3.2.3. Conditions for using modules for On-board and Trackside Subsystems

With reference to point 4.2 of Module SB (type-examination), design review is requested.

With reference to point 4.2 of Module SH1 (full quality management system with design examination), an additional type test is required.;

(c) in section 6.3.3, Table 6.2 is replaced by the following:

‘Table 6.2

Conformity assessment requirements for an On-board Subsystem

No	Aspect	What to assess	Supporting evidence
1	Use of interoperability constituents	Check whether the interoperability constituents to be integrated into the subsystem are all covered by an “EC” Declaration of conformity and a corresponding certificate. The Subsystem needs to be checked with a SIM card compliant with the requirements of this TSI. Changing the SIM card with another one compliant with the TSI is not a modification of the Subsystem.	Existence and content of documents
		Check conditions and limits of use on the use of Interoperability Constituents against the characteristics of the subsystem and of the environment	Analysis by document check
		For interoperability constituents that have been certified against a version of the CCS TSI, which is different from the version applied for the “EC” Verification of the subsystem and/or against a set of specifications which is different from the set of specifications applied for the “EC” Verification of the subsystem, check that the certificate still ensures subsystem compliance with the requirements of the TSI currently in force.	Impact analysis by document checks

No	Aspect	What to assess	Supporting evidence
2	Integration of interoperability constituents in the subsystem	Check the correct installation and functioning of the internal interfaces of the subsystem — Basic parameter 4.2.6	Checks according to specifications
		Check that additional functions (not specified in this TSI) do not impact the mandatory ones	Impact analysis
		Check that the values of ETCS IDs are within the allowed range and, if required by this TSI, have unique values – Basic parameter 4.2.9	Check of design specifications
3	Integration with rolling stock	Check the correct installation of equipment — Basic Parameters 4.2.2, 4.2.4, 4.2.14 and conditions for installation of equipment, as specified by the manufacturer	Results of checks (according to specifications referenced in the Basic Parameters and the manufacturer's installation rules)
		Check that the Control-Command and Signalling On-board Subsystem is compatible with the rolling stock environment – Basic parameter 4.2.16	Document check (certificates of interoperability constituents and possible integration methods checked against characteristics of rolling stock)
		Check that parameters (e.g., braking parameters) are correctly configured and that they are within the allowed range	Document check (values of parameters checked against characteristics of rolling stock)
4	Integration with Class B	Check that the external STM is connected to on-board ETCS with TSI-compliant interfaces	Nothing to test: there is a standard interface already tested at interoperability constituent level. Its functioning has already been tested when checking the integration of interoperability constituents in the subsystem
		Check that Class B functions implemented in the on-board ETCS– Basic parameter 4.2.6.1 — create no additional requirements for the Control-Command and Signalling Trackside Subsystem due to transitions	Nothing to test: everything has already been tested at interoperability constituent level
		Check that separate Class B equipment which is not connected to the on-board ETCS– Basic Parameter 4.2.6.1 — creates no additional requirements for Control-Command and Signalling Trackside Subsystem due to transitions	nothing to test: no interface (!)
		Check that separate Class B equipment connected on-board ETCS using (partly) non TSI compliant interfaces – basic parameter 4.2.6.1 — creates no additional requirements for the Control-Command and Signalling Trackside Subsystem due to transitions. Also check that ETCS functions are not affected	impact analysis
5	Integration with Control-Command and Signalling Trackside Subsystems	Check that Eurobalise telegrams can be read (scope of this test is limited to checking that the antenna has been appropriately installed. The tests already carried out at Interoperability Constituent level shall not be repeated) – Basic Parameter 4.2.5	Test using a certified Eurobalise: the ability to read correctly the telegram is the supporting evidence.

No	Aspect	What to assess	Supporting evidence
		Check that Euroloop telegrams (if applicable) can be read – Basic Parameter 4.2.5	Test using a certified Euroloop: the ability to read correctly the telegram is the supporting evidence.
		Check that the equipment can handle a GSM-R call for voice and data (if applicable) – Basic Parameter 4.2.5	Test with a certified GSM-R network. The ability to set up, maintain and disconnect a connection is the supporting evidence.
6	Reliability, Availability, Maintainability, Safety (RAMS)	Check that the equipment complies with safety requirements — Basic Parameter 4.2.1	Application of procedures specified in the Common Safety Method for Risk Evaluation and Assessment.
		Check that the quantitative reliability target is met — Basic Parameter 4.2.1	Calculations
		Check the compliance with requirements about maintenance – point 4.5.2	Documents check
7	Integration with Control-Command and Signalling Trackside Subsystems and other subsystems: tests under conditions representing the intended operation.	<p>Test the behaviour of the subsystem under as many different conditions as reasonably possible representing the intended operation (e.g line gradient, train speed, vibrations, traction power, weather conditions, design of Control-Command and Signalling trackside functionality). The test must be able to verify:</p> <ol style="list-style-type: none"> 1. that odometry functions are correctly performed — basic parameter 4.2.2 2. that the on-board Control-Command and Signalling Subsystem is compatible with the rolling stock environment – basic parameter 4.2.16 <p>These tests must also be such as to increase confidence that there will be no systematic failures.</p> <p>The scope of these tests excludes tests already carried out at different stages: tests performed on the interoperability constituents and tests performed on the subsystem in a simulated environment shall be taken into account.</p> <p>Tests under environmental conditions are not necessary for on-board GSM-R voice equipment.</p> <p>Note: Indicate in the certificate which conditions have been tested and which standards have been applied.</p>	Reports of test runs.

(¹) In this case, the assessment of the management of transitions shall be according to national specifications.'

(d) a new section 6.3.3.1 is added after table 6.2 as follows:

'6.3.3.1. ETCS and radio system compatibility checks

Particular attention shall be given to assessing the conformity of the on-board CCS subsystem regarding the Basic Parameter ETCS and radio system compatibility referred to in 4.2.17.

Regardless of the module selected for the previous EC verification procedure for the on-board subsystem, the Notified Body shall check:

- (a) the availability of the result of the technical compatibility checks for the selected area of use of the vehicle.
- (b) That the technical compatibility checks have been performed in accordance with the technical document published by the Agency, referred in points 6.1.2.4 and 6.1.2.5.
- (c) Based on the report of the checks, that the technical compatibility checks results indicate all the incompatibilities and errors encountered during the technical compatibility checks.

The Notified Body shall not check again any aspect covered during the already performed EC Verification procedure for the on-board subsystem.

The Notified Body performing these checks may be a different one from the Notified Body performing the EC Verification procedure for the on-board subsystem.

Performing these checks also at the level of Interoperability Constituent may reduce the amount of checks at the level of Control-command and Signalling Subsystem.;

- (e) in section 6.3.4, table 6.3 is replaced by the following:

Table 6.3

Conformity assessment requirements for a Trackside Subsystem

No	Aspect	What to assess	Supporting evidence
1	Use of interoperability constituents	Check that all interoperability constituents to be integrated into the subsystem are covered by an EC declaration of conformity and the corresponding certificate.	Existence and content of documents
		Check conditions and limits of use on the use of interoperability constituents against the characteristics of the subsystem and of the environment	Impact analysis by documents check
		For interoperability constituents that have been certified against a version of the Control-Command and Signalling TSI, which is different from the version applied for the "EC" Verification of the subsystem and/or against a set of specifications which is different from the set of specifications applied for the "EC" Verification of the subsystem, check that the certificate still ensures compliance with the requirements of the TSI currently in force	Impact analysis by comparison of specifications referenced in the TSI and certificates of the interoperability constituents
2	Integration of interoperability constituents in the subsystem	Check that the internal interfaces of the subsystem have been installed properly and function properly — Basic parameters 4.2.5, 4.2.7 and conditions specified by the manufacturer (N/A for IC axle counter)	Checks according to specifications
		Check that additional functions (not specified in this TSI) do not impact the mandatory ones	Impact analysis

No	Aspect	What to assess	Supporting evidence
		<p>Check that the values of ETCS IDs are within the allowed range and, if required by this TSI, have unique values – Basic Parameter 4.2.9</p> <p>(N/A for IC axle counter)</p>	Check of design specifications
		<p>For IC axle counters (only):</p> <p>The integration of the IC in the subsystem has to be verified:</p> <p>Check index 77 document points 3.1.2.1, 3.1.2.4 and 3.1.2.5 only.</p> <p>Check the correct installation of equipment and conditions specified by the manufacturer and/or the Infrastructure manager.</p>	Document check
3	Visibility of trackside Control-Command objects	<p>Check that requirements for marker boards specified in this TSI are fulfilled (characteristics, compatibility with the infrastructure requirements (gauge, ...), compatibility with the driver's field of view) – Basic parameter 4.2.15</p>	Design documentation, results of tests or test runs with TSI compliant rolling stock
4	Integration with infrastructure	<p>Check that the equipment has been properly installed — Basic parameters 4.2.3, 4.2.4 and conditions for installation specified by the manufacturer</p>	Results of checks (according to specifications referenced in the basic parameters and manufacturer's installation rules)
		<p>Check that the Control-Command and Signalling Trackside subsystem equipment is compatible with the trackside environment – Basic parameter 4.2.16</p>	Document check (certificates of interoperability constituents and possible methods of integration checked against trackside characteristics)
5	Integration with trackside signalling	<p>Check that all functions required by the application are implemented in accordance with specifications referenced in this TSI — Basic parameter 4.2.3</p>	Document check (applicant's design specification and certificates of interoperability constituents)
		<p>Check the correct configuration of parameters (Eurobalise telegrams, RBC messages, marker boards positions, etc.)</p>	Document check (values of parameters checked against characteristics of trackside and of signalling)
		<p>Check that the interfaces are correctly installed and function properly.</p>	Design verification and tests according to information supplied by the applicant
		<p>Check that the Control-Command and Signalling Trackside subsystem operates correctly according to information at the interfaces with trackside signalling (e.g., appropriate generation of Eurobalise telegrams by a LEU or of message by RBC)</p>	Design verification and tests according to the information supplied by the applicant

No	Aspect	What to assess	Supporting evidence
6	Integration with Control-Command and Signalling On-board Subsystems and with rolling stock	Check the GSM-R coverage — Basic Parameter 4.2.4	On site measurements
		Check that all functions required by the application are implemented in accordance with specifications referenced in this TSI — basic parameters 4.2.3, 4.2.4 and 4.2.5	Reports of the operational test scenarios specified in point 6.1.2 with at least two certified Control-Command and Signalling On-board Subsystems from different suppliers. The report shall indicate which operational test scenarios have been tested, which on-board equipment has been used and whether tests have been performed in laboratories, test lines or real implementation.
7	Compatibility of train detection systems (Excluding axle counters)	Check that the train detection systems comply with the requirements of this TSI — Basic parameters 4.2.10 and 4.2.11	Evidence of compatibility of equipment from existing installations (for systems already in use); perform tests according to standards for new types.
		Check the correct installation of equipment and conditions specified by the manufacturer and/or the Infrastructure manager.	On-site measurements to prove correctness of installation. Document check of correct installation of equipment.
8	Reliability, Availability, Maintainability, Safety (RAMS) (excluding train detection)	Check compliance with safety requirements — Basic Parameter 4.2.1.1	Application of procedures specified in the Common Safety Method for Risk Evaluation and Assessment
		Check that quantitative reliability targets are respected — Basic Parameter 4.2.1.2	Calculations
		Check the compliance with requirements about maintenance — point 4.5.2	Document check
9	Integration with Control-Command and Signalling On-board Subsystems and rolling stock: tests under conditions representing the intended operation.	<p>Test the behaviour of the subsystem under many different conditions as reasonably feasible representing the intended operation (e.g. train speed, number of trains on the line, weather conditions). The test must be able to verify:</p> <ol style="list-style-type: none"> 1. the performance of train detection systems — Basic parameters 4.2.10, 4.2.11, 2. that the Control-Command and Signalling Trackside subsystem is compatible with trackside environment — Basic parameter 4.2.16 <p>These tests will also increase confidence in the absence of systematic failures.</p> <p>The scope of these tests excludes tests already done in different steps: tests performed at the level of interoperability constituents and tests performed on the subsystem in a simulated environment shall be taken into account.</p> <p>Note: Indicate in the certificate which conditions have been tested and which standards have been applied.</p>	Reports of test runs.

No	Aspect	What to assess	Supporting evidence
10	ETCS and radio System Compatibility	The necessary ESC and RSC check definition is made available to the Agency – Basic Parameter 4.2.17.	Technical compatibility checks for ESC and RSC published and maintained by the Agency.'

(33) Section 6.4 is replaced as follows:

(a) section 6.4.1 is replaced by the following:

'6.4.1. Assessment of parts of control-command and signalling subsystems

Pursuant to Article 15(7) of Directive (EU) 2016/797, the Notified Body may issue certificates of verification for certain parts of a subsystem, if allowed to do so under the relevant TSI.

As pointed out in point 2.2 (Scope) of this TSI, the trackside and on-board control-command and signalling subsystems contain parts, as specified in point 4.1 (Introduction).

A certificate of verification may be issued for each part or for a combination of parts specified in this TSI; the Notified Body only checks if that particular part fulfils the TSI requirements.

Regardless of which module is chosen, the Notified Body shall check that:

- (1) the TSI requirements for the part in question have been fulfilled; and
- (2) the fulfilment of the TSI requirements already assessed for other parts of the same subsystem has not been modified.;

(b) in section 6.4.2, the text 'certificate' is replaced by the text 'EC certificate';

(c) section 6.4.3.3 is replaced by the following:

'6.4.3.3. Content of certificates

In any event, notified bodies shall coordinate with the Agency the way in which conditions and restrictions of use of interoperability constituents and subsystems are managed in the relevant certificates and technical files in the working group set up under Article 24 of Regulation (EU) 2016/796 of the European Parliament and of the Council.;

(d) Section 6.4.4 is replaced by the following:

'6.4.4. Intermediate Statement of Verification

If conformity is assessed for parts of subsystems specified by the applicant and different from the parts allowed in Table 4.1 of this TSI, or if only certain stages of the verification procedure have been performed, only an intermediate statement of verification may be issued.;

(34) Section 6.5 is replaced by the following:

'6.5. Management of errors

Where deviations from intended functions and/or performance are detected during the tests or during the operational life of a subsystem, the applicants and/or operators shall inform without delay the Agency and the authorising entity that issued the authorisations for the concerned trackside subsystems or vehicles, to initiate the procedures set out in Article 16 of Directive (EU) 2016/797. As a result of the application of Article 16(3) of that Directive:

- (1) if the deviation is due to incorrect application of this TSI or to errors in design or installation of equipment, the applicant for the relevant certificates shall take the necessary corrective actions and the certificates affected and/or the corresponding technical files (for interoperability constituents and/or subsystems), together with the corresponding EC Declarations, shall be updated;

- (2) if the deviation is due to errors in this TSI or in specifications referenced therein, the procedure set out in Article 6 of the Directive (EU) 2016/797 shall be initiated.

The Agency shall organise an efficient processing of all the information received in order to facilitate the Change Control Management process for improvement/further development of the specifications, including the test specifications.;

(35) Section 7.2 is amended as follows:

- (a) two new sections 7.2.1a and 7.2.1b are added below section 7.2.1 as follows:

7.2.1a Changes to an existing On-Board subsystem

This point defines the principles to be applied by the entities managing the change and authorising entities in line with the EC verification procedure described in Article 15(9), Article 21(12) and Annex IV of Directive (EU) 2016/797. This procedure is further developed in Article 13, 15 and 16 of Commission Implementing Regulation (EU) 2018/545 ⁽¹⁾ and in Commission Decision 2010/713/EU ⁽²⁾.

This point applies in case of any change(s) to an existing on-board subsystem or on-board subsystem type, including renewal or upgrade. It does not apply in case of changes covered by Article 15(1)(a) of Implementing Regulation (EU) 2018/545.

7.2.1a.1 Rules to manage changes in on-board CCS subsystems

1. Parts, as defined in Table 4.1 of this TSI, and basic parameters of the on-board subsystem that are not affected by the change(s) are exempt from conformity assessment against the provisions in this TSI. The list of parts and basic parameters affected by the change is to be provided by the entity managing the change.
2. A new assessment against the requirements of the applicable TSI shall only be needed for the basic parameters which may be affected by the change(s).
3. The entity managing the change shall inform a Notified Body of all changes affecting the conformity of the subsystem with the requirements of the relevant TSI(s) requiring new checks, in accordance with Articles 15 and 16 of Implementing Regulation (EU) 2018/545 and Decision 2010/713/EU and by application of modules SB, SD/SF or SH1 for the EC verification, and if relevant Article 15(5) of Directive (EU) 2016/797. This information shall be provided by the entity managing the change with corresponding references to the technical documentation relating to the existing EC certificate.
4. The entity managing the change has to justify and document that applicable requirements remain consistent at subsystem level, and this has to be assessed by a Notified Body.
5. The changes impacting the Basic Design Characteristics of the on-board subsystem are defined in Table 7.1 Basic Design Characteristics and shall be classified as 15(1)(c) or 15(1)(d) of Implementing Regulation (EU) 2018/545, and in accordance with Table 7.1 Basic Design Characteristics changes not impacting but related to the Basic Design Characteristics shall be classified by the entity managing the change as 15(1)(b) of Implementing Regulation (EU) 2018/545.
6. Changes not covered by point 7.2.1a.1(5) above are deemed not to have any impact on the basic design characteristics. They will be classified by the entity managing the change as 15(1)(a) or 15(1)(b) of Implementing Regulation (EU) 2018/545.

Note: The classification of the changes set out in points 7.2.1a.1(5) and 7.2.1a.1(6) above is performed by the entity managing the change without prejudice of the safety judgement mandated in Article 21(12)(b) of Directive (EU) 2016/797.

7. All changes shall remain compliant with the applicable TSIs ⁽³⁾ regardless its classification.

Table 7.1

Basic Design Characteristics

1. TSI Point	2. Related basic design characteristic(s)	3. Changes not impacting the basic design characteristics according to 15(1)(b) of Regulation (EU) 2018/545	4. Changes impacting the basic design characteristic but inside the acceptable range of parameters therefore to be classified as Art 15.1(c) of Regulation (EU) 2018/545	5. Changes impacting the basic design characteristic and outside the acceptable range of parameters therefore to be classified as Art 15.1(d) of Regulation (EU) 2018/545
4.2.2 On-board ETCS functionality	Set of specification of Annex A	Not Applicable	Not Applicable	Use another Annex A set of specifications
	On-board ETCS implementation	Fulfilling all the conditions in point 7.2.1a.2 (change of realisation)	Not Applicable	Not fulfilling all the conditions in point 7.2.1a.2 (Functional change)
	Managing information about the completeness of the train	Not applicable	Adding or removing train integrity supervision	Not applicable
4.2.17.1 ETCS System Compatibility	ETCS System Compatibility	Not applicable	Adding or removing ESC statements, after checking by a NoBo	Not applicable
4.2.4 Mobile communication functions for railways GSM-R 4.2.4.2 Voice and operational communication application	GSM-R Baseline	Use another Baseline fulfilling all the conditions in point 7.2.1a.3.	Not Applicable	Use another Baseline not fulfilling all the conditions in point 7.2.1a.3.
	Voice and operational communication implementation	Fulfilling all the conditions in point 7.2.1a.3 (change of realisation)	Not Applicable	Not fulfilling all the conditions in point 7.2.1a.3 (Functional change)
	SIM Card support of Group ID 555	Not applicable	Change the SIM Card support of Group ID 555	Not applicable
4.2.17.2 Radio System Compatibility	Radio Voice System Compatibility	Not applicable	Adding or removing RSC statements, after checking by a NoBo	Not applicable
4.2.4 Mobile communication functions for railways GSM-R 4.2.4.3 Data communication applications for ETCS	GSM-R Baseline	Use another Baseline fulfilling all the conditions in point 7.2.1a.3.	Not Applicable	Use another Baseline not fulfilling all the conditions in point 7.2.1a.3.
	Data communication for ETCS implementation	Fulfilling all the conditions in point 7.2.1a.3 (change of realisation)	Not Applicable	Not fulfilling all the conditions in point 7.2.1a.3 (Functional change)
4.2.17.2 Radio System Compatibility	Radio Data System Compatibility	Not applicable	Adding or removing RSC statements, after checking by a NoBo	Not applicable
4.2.4 Mobile communication functions for railways GSM-R 4.2.4.1 Basic communication function	SIM Card GSM-R Home Network	Not applicable	Replacement of a TSI compliant GSM-R SIM Card by another TSI compliant GSM-R SIM Card with a different GSM-R Home Network	Not applicable

1. TSI Point	2. Related basic design characteristic(s)	3. Changes not impacting the basic design characteristics according to 15(1)(b) of Regulation (EU) 2018/545	4. Changes impacting the basic design characteristic but inside the acceptable range of parameters therefore to be classified as Art 15.1(c) of Regulation (EU) 2018/545	5. Changes impacting the basic design characteristic and outside the acceptable range of parameters therefore to be classified as Art 15.1(d) of Regulation (EU) 2018/545
4.2.6.1 ETCS and Class B train protection	Class B train protection legacy system	The requirements for Class B system are the responsibility of the relevant Member State.	The requirements for Class B system are the responsibility of the relevant Member State.	Add or remove Class B train protection systems. The requirements for Class B system are the responsibility of the relevant Member State.
4.2.5.1 Radio communication with the train	Class B radio legacy system	The requirements for Class B system are the responsibility of the relevant Member State.	The requirements for Class B system are the responsibility of the relevant Member State.	Add or remove Class B radio legacy systems. The requirements for Class B system are the responsibility of the relevant Member State.

8. In order to establish the EC certificate, the Notified Body may refer to:

- The original EC certificate for parts of the design that are unchanged or those that are changed but do not affect the conformity of the subsystem, as far as it is still valid.
- Amendments to the original EC certificate for modified parts of the design that affect the conformity of the subsystem with the applicable TSI version used for the EC verification.

9. In any case, the entity managing the change shall ensure that the technical documentation which is relating to the EC certificate is updated accordingly.

10. The updated technical documentation, related to the EC certificate is referred to in the technical file accompanying the EC declaration of verification issued by the entity managing the change for on-board subsystem declared as conformant to the modified type.

11. The “system identifier” is as a numbering scheme to identify the system version of a CCS subsystem and distinguish between a functional and a realization identifier. The “functional identifier” is part of the system identifier and means a figure or a number of figures defined by the individual configuration management, which represents a reference of the basic design characteristics for CCS implemented in a CCS subsystem. The “Realization identifier” is part of the system identifier and means a figure or a number of figures defined by the individual configuration management of a supplier, which represents a specific configuration (e.g. HW and SW) of a CCS subsystem. The “system identifier”, “functional identifier” and “realization identifier” shall be defined by each supplier.

7.2.1a.2 Conditions for a change in the On-board ETCS functionality that does not impact the basic design characteristics

1. The target functionality (*) remains unchanged or is set to the state already expected during the original certification or authorisation.
2. The interfaces relevant for safety & technical compatibility remain unchanged or are set to the state already expected during the original certification or authorisation.
3. The result of the safety judgement (e.g. safety case according to EN 50126) remains unchanged.
4. No new safety related application conditions (SRAC) or interoperability constraints have been added due to the change.

5. An Assessment Body (CSM RA) as specified in point 3.2.1 has independently assessed the applicant's risk assessment and within it the demonstration that the change does not adversely affect safety. The applicant's demonstration shall include the evidence that the change actually corrects the causes of the initial deviation of the functionality.
6. The change is performed under a quality management system approved by a notified body (e.g. according to modules CH1, SH1, CD, SD). For other modules (e.g. CF, SF) it shall be justified that the verification performed remains valid ⁽⁵⁾.
7. The individual configuration management defines a "system identifier" (as defined in 7.2.1a.1.11) and the functional part has not been changed after the change.
8. The change shall be part of the configuration management required by Article 5 of Regulation (EU) 2018/545.

7.2.1a.3 Conditions for a change in the on-board mobile communication functions for railways that does not impact the basic design characteristics

1. The target functionality ⁽⁶⁾ remains unchanged or is set to the state already expected during the original certification or authorisation.
2. The interfaces relevant for technical compatibility remain unchanged or are set to the state already expected during the original certification or authorisation
3. The change is performed under a quality management system approved by a notified body (e.g. according to modules CH1, SH1, CD, SD). For other modules (e.g. CF, SF) it shall be justified that the verification performed remains valid ⁽⁷⁾.
4. The change shall be part of the configuration management required by Article 5 of the Regulation (EU) 2018/545.

7.2.1b Changes to an existing trackside subsystem

This point defines the principles to be applied by the entities managing the change and authorising entities in line with the EC verification procedure described in Article 15(9), Article 18(6) of Directive (EU) 2016/797 and in Decision 2010/713/EU.

7.2.1b.1 Rules to manage changes in trackside CCS subsystems

In the event of upgrading or renewing the Control-Command and Signalling Subsystems bearing EC certificate of verification the following rules apply:

1. The changes require new authorisation if they impact basic parameters as defined in table 7.2.

Table 7.2

Trackside basic parameters modifications which requires a new authorisation

Basic Parameter		Modification which requires a new authorisation
4.2.3	Trackside ETCS functionality	Not fulfilling all the conditions in point 7.2.1b.2
4.2.4	Mobile communication functions for railways GSM-R	Not fulfilling all the conditions in point 7.2.1b.3
4.2.4.2	Voice and operational communication application	
4.2.4	Mobile communication functions for railways GSM-R	Not fulfilling all the conditions in point 7.2.1b.3
4.2.4.3	Data communication applications for ETCS	

2. The changes are permitted to be dealt with by only re-assessing those modifications that affect the conformity of the subsystem with the applicable TSIs version used for the EC verification. The entity managing the change has to justify and document that applicable requirements remain consistent at subsystem level, and this has to be assessed by a Notified Body.
3. The entity managing the change shall inform the Notified Body of all changes that may affect the conformity of the subsystem with the requirements of the relevant TSI(s) or the conditions for validity of the certificate.

This information shall be provided by the entity managing the change with corresponding references to the technical documentation relating to the existing EC certificate.

4. In order to establish the EC certificate, the Notified Body may refer to:
 - The original EC certificate for parts of the design that are unchanged or those that are changed but do not affect the conformity of the subsystem, as far as it is still valid.
 - Additional EC certificate (amending the original certificate) for modified parts of the design that affect the conformity of the subsystem with the applicable TSI version used for the EC verification.
5. In any case, the entity managing the change shall ensure that the technical documentation which is relating to the EC certificate is updated accordingly.
6. The “system identifier” is as a numbering scheme to identify the system version of a CCS subsystem and distinguish between a functional and a realization identifier. The “functional identifier” is part of the system identifier and means a figure or a number of figures defined by the individual configuration management, which represents a reference of the basic design characteristics for CCS implemented in a CCS subsystem. The “Realization identifier” is part of the system identifier and means a figure or a number of figures defined by the individual configuration management of a supplier, which represents a specific configuration (e.g. HW and SW) of a CCS subsystem. The “system identifier”, “functional identifier” and “realization identifier” shall be defined by each supplier.
7. “Configuration management” means a systematic organisational, technical and administrative process to ensure that the consistency of the documentation and the traceability of the changes are established and maintained so that:
 - (a) requirements from relevant Union law and national rules are met;
 - (b) changes are controlled and documented either in the technical files or in the file accompanying the issued authorisation;
 - (c) information and data is kept current and accurate;
 - (d) relevant parties are informed of changes, as required.

7.2.1b.2 Conditions for a change in the trackside ETCS functionality that, if not fulfilled, requires new authorisation for placing in service

1. The target functionality (*) remains unchanged or is set to the state already expected during the original certification or authorisation.
2. The interfaces relevant for safety & technical compatibility remain unchanged or are set to the state already expected during the original certification or authorisation.
3. The result of the safety judgement (e.g. safety case according to EN 50126) remains unchanged.
4. No new safety related application conditions (SRAC) or interoperability constraints have been added due to the change.
5. When required in point 3.2.1, an Assessment Body (CSM RA) has independently assessed the applicant's risk assessment and within it the demonstration that the change does not adversely affect safety. The applicant's demonstration shall include the evidence that the change actually corrects the causes of the initial deviation of the functionality.

6. The change is performed under a quality management system approved by a notified body (e.g. according to modules CH1, SH1, CD, SD). For other modules (e.g. CF, SF, SG) it shall be justified that the verification performed remains valid ⁽⁹⁾.
7. The individual configuration management defines a “system identifier” (as defined in 7.2.1b.1.6) and the functional part has not been changed after the change.
8. The change shall be part of the configuration management as defined in 7.2.1b.1.7.

7.2.1b.3 Conditions for a change in the trackside mobile communication functions for railways that if not fulfilled requires a new authorisation for placing in service

1. The target functionality ⁽¹⁰⁾ remains unchanged or is set to the state already expected during the original certification or authorisation.
2. The interfaces relevant for technical compatibility remain unchanged or are set to the state already expected during the original certification or authorisation.
3. The change is performed under a quality management system approved by a notified body (e.g. according to modules CH1, SH1, CD, SD). For other modules (e.g. CF, SF, SG) it shall be justified that the verification performed remains valid ⁽¹¹⁾.
4. The change shall be part of the configuration management as defined in 7.2.1b.1.7.

7.2.1b.4 Impact on the technical compatibility between on-board and trackside parts of the CCS subsystems

Infrastructure managers shall ensure that changes to an existing trackside subsystem allow the continuation of the operation of TSI compliant ⁽¹²⁾ on-board subsystems in operation on the lines concerned by the changes.

This requirement is not applicable when the changes are due to the implementation of a new level application trackside, by requirements defined in 7.2.6 (1) and (3), or of an incompatible application of the set of specifications referred to in Annex A to this TSI if the change is announced at least 3 years in advance unless a shorter period is agreed between the IM and the RU's who run services on these tracks ⁽¹³⁾.

⁽¹⁾ Commission Implementing Regulation (EU) 2018/545 of 4 April 2018 establishing practical arrangements for the railway vehicle authorisation and railway vehicle type authorisation process pursuant to Directive (EU) 2016/797 of the European Parliament and of the Council (OJ L 90, 6.4.2018, p. 66).

⁽²⁾ Commission Decision 2010/713/EU of 9 November 2010 on modules for the procedures for assessment of conformity, suitability for use and EC verification to be used in the technical specifications for interoperability adopted under Directive 2008/57/EC of the European Parliament and of the Council (OJ L 319, 4.12.2010, p. 1).

⁽³⁾ According to Agency's Advice 2017/3 if there is no need for new authorisation the applicable TSI corresponds to the one used for the original certification. In case there is a need for new authorisation applicable TSI corresponds to the latest TSI.

⁽⁴⁾ Target functionality refers to the ETCS functionality that has been evaluated in the subsystem EC certificate. The Technical Opinions published by the Agency that correct errors in the TSI are considered to define the functionality state already expected during the original certification or authorisation.

⁽⁵⁾ All activities required for a modification which are performed outside a quality management system approved by a notified body might require additional examinations or tests by the notified body.

⁽⁶⁾ Target functionality refers to the mobile communication functionality that has been evaluated in the subsystem EC certificate. The Technical Opinions published by the Agency that correct errors in the TSI are considered to define the functionality state already expected during the original certification or authorisation.

⁽⁷⁾ All activities required for a modification which are performed outside a quality management system approved by a notified body might require additional examinations or tests by the notified body.

⁽⁸⁾ Target functionality refers to the ETCS functionality that has been evaluated in the subsystem EC certificate. The Technical Opinions published by the Agency that correct errors in the TSI are considered to define the functionality state already expected during the original certification or authorisation.

- (^{9°}) All activities required for a modification which are performed outside a quality management system approved by a notified body might require additional examinations or tests by the notified body.
- (^{10°}) Target functionality refers to the ETCS functionality that has been evaluated in the subsystem EC certificate. The Technical Opinions published by the Agency that correct errors in the TSI are considered to define the functionality state already expected during the original certification or authorisation.
- (^{11°}) All activities required for a modification which are performed outside a quality management system approved by a notified body might require additional examinations or tests by the notified body.
- (^{12°}) On-board subsystems with conditions and restrictions of use or non-detected deficiencies are not considered compliant regarding this clause.
- (^{13°}) An upgrade of tracks operated in mixed traffic to ETCS level 3 shall only be done if passenger and freight trains retain access to these tracks.'

(b) in section 7.2.3, the text 'Article 29(1) of Directive 2008/57/EC' is replaced by 'Article 51(1) of Directive (EU) 2016/797';

(c) section 7.2.6 is replaced by the following:

'7.2.6. Conditions for mandatory and optional functions

The applicant for EC verification of a Control-command and Signalling Trackside subsystem shall check whether Control-command and Signalling Trackside functions, which are defined "optional" in this TSI, are required by other TSIs or national rules or by the application of risk evaluation and assessment to ensure safe integration of subsystems.

The trackside implementation of national or optional functions shall not prevent the use of that infrastructure by a train that complies only with the mandatory requirements of the On-board Class A system except as required for the following on-board optional functions:

- (1) An ETCS Level 3 Trackside application requires that the on-board is able to confirm the train integrity;
- (2) An ETCS Level 1 Trackside application with infill requires that the on-board is equipped with the corresponding in-fill data transmission (Euroloop or radio) if the release speed is set to zero for safety reasons (e.g. protection of danger points).
- (3) When ETCS needs data transmission by radio, the data radio communication part as specified in this TSI is required.

An on-board subsystem, which incorporates a KER STM, may make it necessary to implement the K-interface.;

(36) Section 7.3.2 is amended as follows:

- (a) the text 'point' is replaced by 'section';
- (b) the text 'already in service' is replaced by 'already on the market';

(37) Section 7.4.1 is replaced by:

'7.4.1 Trackside installations

Articles 1, 2 and Annex I to Commission Implementing Regulation (EU) 2017/6 (*) of 5 January 2017 on the European Rail Traffic Management System European deployment plan shall apply as referred to in Article 47 of Regulation (EU) No 1315/2013 (**).

Trackside shall not install and operate the Euroloop and radio infill data transmission, except on already existing installations or planned projects that use those data transmission. Such planned projects shall be notified to the European Commission by 30 June 2020.

7.4.1.1 High-speed network

It is mandatory to fit ETCS trackside when:

1. installing for the first time the train protection part of a Control-Command and Signalling Trackside Subsystem (with or without a Class B system); or

2. upgrading the existing train protection part of a Control-Command and Signalling Trackside Subsystem, where this would change the functions, performance and/or interoperability-relevant interfaces (air gaps) of the existing legacy system. This does not apply to modifications deemed necessary to mitigate safety-related defects in the legacy installation.

(*) Commission Implementing Regulation (EU) 2017/6 of 5 January 2017 on the European Rail Traffic Management System European deployment plan (OJ L 3, 6.1.2017, p. 6).

(**) Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU (OJ L 348, 20.12.2013, p. 1).;

(38) Section 7.4.2.1 is amended as follows:

‘7.4.2.1 New vehicles

1. In order to be placed on the market in accordance with Article 21 of Directive (EU) 2016/797, new vehicles, including vehicles authorised in conformity to a type shall be equipped with ETCS in accordance with Annex A of this TSI and shall comply with set of specifications #2 or #3 referred to in Table A 2 of Annex A (*).
2. The requirement to be equipped with ETCS does not apply to:
 - (1) new mobile railway infrastructure construction and maintenance equipment;
 - (2) new shunting locomotives;
 - (3) other new vehicles not intended for operating on high-speed lines;
 - (a) if they are intended exclusively for national service operated outside the corridors defined in point Annex I of Implementing Regulation (EU) 2017/6 and outside the lines ensuring the connections to the main European ports, marshalling yards, freight terminals and freight transport areas defined in Article 2(1) of Implementing Regulation (EU) 2017/6; or
 - (b) if they are intended for off-TEN cross-border service, i.e., service until the first station in the neighbouring country or to the first station where there are connections further in the neighbouring country utilising only lines outside of the TEN.
3. All vehicle type authorisations granted based on conformity to set of specifications #1 referred to in Table A 2 of Annex A of this TSI shall not remain valid for authorising new vehicles in conformity to those vehicle types (without prejudice to the application of 7.4.2.3). All vehicles already authorised according to those vehicle types are not affected.

(*) Or placed into service in accordance with Directive 2008/57/EC, if Directive (EU) 2016/797 is not yet applicable.’;

(39) New section 7.4.2.3 is added as follows:

‘7.4.2.3 Application of the TSI requirements for new vehicles during a transition phase

1. Some projects or contracts, which started before the date of application of this TSI, may lead to apply for an authorisation to put on the market (*) of new vehicles equipped with ETCS complying with specification #1 referred to in Table A 2.1 of Annex A of this TSI, and which do not fully comply with Section 7.4.2.1 of this TSI. For vehicles concerned by those projects or contracts, and in accordance with point (f) of Article 4(3) of Directive (EU) 2016/797, a transition phase is defined, during which the application of Section 7.4.2.1 of this TSI is not mandatory.
2. This transition phase applies to new vehicles authorised in conformity to a vehicle type (**) authorised before 1 January 2019 in any Member State on the basis of conformity to set of specifications #1 referred to in Table A 2 of Annex A of this TSI up to December 31 2020.
3. The transition phase is:
 - (a) up to December 31 2020: In order to be placed on the market (*) in accordance with Article 21 of Directive 2016/797/EC, those new vehicles referred under 2 shall be equipped with ETCS in accordance with set of specifications #1, #2 or #3 referred to in Table A 2 of Annex A of this TSI.

- (b) If set of specification #1 is used, a condition for use shall be included in their authorisation to put on the market (*) enforcing compliance with set specifications #2 or #3 within a period of time not exceeding 1 July 2023.

(*) Or placed into service in accordance with Directive 2008/57/EC, if Directive (EU) 2016/797 is not yet applicable.

(**) Variants or versions of a vehicle type are considered to be authorised in conformity to an existing authorised type. Where the regime of Directive 2008/57/EC applies, changes which would give rise to variants or versions of a vehicle type under Implementing Regulation (EU) 2018/545 are also considered to be based upon an existing authorised type.;

(40) In section 7.4.3, the text 'placing in service' is replaced by 'placing on the market';

(41) Section 7.4.4 is amended as follows:

(a) In the first paragraph the text 'those lines with ETCS and decommissioning of class B systems' is replaced by 'those lines with ETCS and Class A Radio and decommissioning of class B systems';

(b) In point (1) the text 'General and context description, including facts and figures on existing train protection systems, such as capacity, safety, reliability performance, remaining economic lifetime of the installed equipment and cost benefit analysis of ETCS implementation.' is replaced by 'General and context description, including:

(1) facts and figures on existing train protection systems, such as capacity, safety, reliability performance;

(2) remaining economic lifetime of the installed equipment and cost benefit analysis of ETCS and Class A Radio implementation;

(3) national requirements relevant for Baseline 3 on-board units;

(4) information on communication systems between on-board units and track side installations (e.g. radio circuit switching or packet switching, in-fill options for ETCS; Class B communication systems);

(c) In point (4)(i) the text 'The dates of ETCS deployment' is replaced by 'The dates of ETCS and Class A Radio deployment';

(d) In point (4)(iii) the text 'or other parts of the network.' is replaced by 'or other parts of the network, including service facilities';

(e) In the third paragraph the text 'at least every five years.' is replaced by 'at least every five years. The update of the national implementation plans shall take into account the introduction of the next generation communication system(s), including but not limited to the date of start of operation and, when applicable, the date of decommissioning of GSM-R on (parts of) the Network.;

(f) the text 'Article 29(1) of Directive 2008/57/EC' is replaced by 'Article 51(1) of Directive (EU) 2016/797';

(42) A new section 7.4a is added below section 7.4.4 as follows:

7.4a ETCS and radio system compatibility checks implementation rules

Existing vehicles shall be deemed compatible with the ETCS and radio system compatibility types of the networks on which they are operating by 16 January 2020 without any further checks, maintaining the existing restrictions or conditions for use.

Any subsequent modification of the vehicle or the infrastructure regarding the technical or route compatibility shall be managed according to the requirements specified for ETCS and Radio system compatibility.;

(43) In section 7.5 the fourth paragraph is replaced by the following:

'Implementing a train detection system that is compliant with the requirements of this TSI can be done independently of the installation of ETCS or GSM-R.;

(44) In section 7.6.1, the text 'points below should be read' is replaced by 'points below shall be read';

(45) In section 7.6.1, a new paragraph is added at the end as follows:

'All specific cases and their relevant dates shall be re-examined in the course of future revisions of the TSI with a view to limiting their technical and geographical scope based on an assessment of their impact on safety, interoperability, cross border services, TEN-T corridors, and the practical and economic impacts of retaining or eliminating them. Special account shall be given to availability of EU funding.

Specific cases shall be limited to the route or network where they are strictly necessary and taken account of through route compatibility procedures.'

(46) Section 7.6.2.1 is amended as follows:

- (a) the text 'the vehicle should have' is replaced by 'the vehicle shall have';
- (b) the text 'Index 77, point 3.1.2.4' is replaced by 'Index 77, point 3.1.2.3';
- (c) the text 'Index 77, point 3.1.8' is replaced by 'Index 77, point 3.1.7';

(47) Section 7.6.2.2 is amended as follows:

- (a) the text 'Index 77, point 3.1.2.4' is replaced by 'Index 77, point 3.1.2.3';

(48) In the last two rows in the third column of the table, the text 'set of specifications 2' is replaced by 'set of specifications 2 or 3';

(49) Section 7.6.2.3 is amended as follows:

- (a) the text 'Index 77, point 3.1.2.4' is replaced by 'Index 77, point 3.1.2.3';
- (b) the text 'Index 77, point 3.1.8' is replaced by 'Index 77, point 3.1.7';
- (c) in the first row in the second column of the table; the text 'T3' is replaced by 'P';
- (d) in the first row in the third column of the table, the text 'This Specific Case is linked with the use of TVM' is replaced by 'This Specific Case is linked with the use of track circuits using electrical joints';
- (e) in the third row of the first column of the table, the text 'the vehicle should have' is replaced by 'the vehicle shall have';
- (f) a new row is added at the end of the table as follows:

'4.2.10 Trackside Train Detection Systems Index 77, point 3.1.4.1. In addition to the TSI requirements, the allowed maximum amount of sand per unit and per rail within 30 s is: 750 g	P	This specific case is linked to the use of track circuits with a higher sensitivity regarding the isolation layer between wheels and rails due to sanding on the French Network'
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(50) Section 7.6.2.6 is replaced by the following:

'7.6.2.6. Sweden

Specific case	Category	Notes
4.2.4 Mobile communication functions for railways – GSM-R Index 33, statement 4.2.3: It is permissible to put on the market on-board Control-Command and Signalling Subsystems including 2 Watt GSM-R voice cab radios and ETCS data only radios. The subsystems shall be able to operate in networks with – 82 dBm.	P	No impact on interoperability
4.2.10 — Trackside Train Detection Systems Index 77, point 3.1.2.1: Maximum axle distance between two axles $\leq 17,5$ m (ai in Fig. 1, point 3.1.2.1).	P	

Specific case	Category	Notes
<p>4.2.10 — Trackside Train Detection Systems Index 77, point 3.1.2.3: Minimum axle distance between first and last axle \geq 4,5 m (L-b1-b2 in Fig. 1, point 3.1.2.3).</p>	P	
<p>4.2.10 — Trackside Train Detection Systems Index 77, point 3.2.2.5: Frequency range: 0,0-2,0 Hz Interference current limit [rms value]: 25,0 A Evaluation method: Low-Pass filter Evaluation parameters: (Down sampling to 1 kHz, followed by) 2,0 Hz 4th order Butterworth low-pass filter, followed by an ideal rectifier to give the absolute value. The maximum interference current for a rail vehicle must not exceed 25,0 A in the frequency range 0,0-2,0 Hz. Inrush current may exceed 45,0 A for less than 1,5 seconds and 25 A for less than 2,5 seconds.</p>	P'	

(51) In section 7.6.2.7 the text 'Index 77, point 3.1.2.4' is replaced by 'Index 77, point 3.1.4.1'

(52) In section 7.6.2.8 a new row is added at the end of the table as follows:

<p>'4.2.10 Trackside Train Detection Systems Index 77, point 3.2.2.5: Frequency range: 93 - 110 Hz Interference current limit [rms value]: 2.8 A (for influencing unit) 2 A (for one traction unit) Evaluation method: Band Pass Filters Evaluation parameters: — BP filter characteristics: Centre frequencies: 95, 96, 98, 100, 104, 106 and 108 Hz 3dB-Bandwidth: 4 Hz Butterworth, 6th order — RMS calculation: Integration time: 0,5 s Time overlap: 50 %</p>	T3	<p>This specific case is needed because these track circuits may be modified by shifting the centre frequency from 100 Hz to 106,7 Hz. This would make obsolete a vehicle related National Technical Rule requiring a 100 Hz monitoring system.'</p>
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(53) A new section 7.6.2.9 is added after 7.6.2.8 as follows:

‘7.6.2.9 Italy

Specific case	Category	Notes
4.2.10 — Trackside Train Detection Systems Index 77, point 3.2.2.4 and point 3.2.2.6: Frequency range: 82 - 86 Hz Interference current limit [rms value]: 1 125 A Evaluation method: Fast Fourier Transformation Evaluation parameters: Time window 1s, Hanning window, 50 % overlap, average on 6 consecutive windows	P'	

(54) A new section 7.6.2.10 is added after 7.6.2.9 as follows:

‘7.6.2.10 Czech Republic

Specific case	Category	Notes
4.2.10 — Trackside Train Detection Systems Index 77, point 3.2.2.4 and point 3.2.2.6: Frequency range: 70,5 – 79,5 Hz Interference current limit [rms value]: 1 A Evaluation method: Band Pass Filters Evaluation parameters: — BP filter characteristics: Centre frequencies: 73, 75, 77 Hz (continuous band) 3dB-Bandwidth: 5 Hz Butterworth, order 2*4 — RMS calculation: Integration time: 0,5 s Time overlap: min 75 % Frequency range: 271,5 – 278,5 Hz Interference current limit [rms value]: 0,5 A Evaluation method: Band Pass Filters Evaluation parameters: — BP filter characteristics: Centre frequencies: 274, 276 Hz (continuous band) 3dB-Bandwidth: 5 Hz Butterworth, order 2*4 — RMS calculation: Integration time: 0,5 s Time overlap: min 75 %	T3	This specific case is needed as long as track circuits type EFCP are used.’

(55) A new section 7.6.2.11 is added after 7.6.2.10 as follows:

‘7.6.2.11 The Netherlands

Specific case	Category	Notes
4.2.10 — Trackside Train Detection Systems Index 77, point 3.2.2.6: Frequency range: 65-85 Hz (ATBEG limit) Interference current limit [rms value]: 0,5 A Evaluation method: Band Pass Filters Evaluation parameters: — BP filter characteristics Centre frequency: 75 Hz 3dB-Bandwidth: 20 Hz 20dB-Bandwidth: 40 Hz — RMS calculation Integration time: 5 s Time overlap: 80 % Transient shorter than 1s only exceeding the ATBEG limit and not the GRS limit may be ignored. Frequency range: 65-85 Hz (GRS TC limit) Interference current limit [rms value]: 1,7 A Evaluation method: Band Pass Filters Evaluation parameters: — BP filter characteristics Centre frequency: 75 Hz 3dB-Bandwidth: 20 Hz 20dB-Bandwidth: 40 Hz — RMS calculation Integration time: 1,8 s Time overlap: 80 %	T3	This Specific Cases is needed in the context of the Class-B system ATBEG.’

(56) Annex A is replaced by the following:

‘ANNEX A

References

For each reference made in the basic parameters (Chapter 4 of this TSI) the following table indicates the corresponding mandatory specifications, via the Index in Table A 2 (Table A 2.1, Table A 2.2, Table A 2.3).

Table A 1

Reference in Chapter 4	Index number (see Table A 2)
4.1	
4.1 a	Intentionally deleted

Reference in Chapter 4	Index number (see Table A 2)
4.1 b	Intentionally deleted
4.1 c	3
4.2.1	
4.2.1 a	27, 78
4.2.2	
4.2.2 a	14
4.2.2 b	1, 4, 13, 15, 60
4.2.2 c	31, 37b, c, d
4.2.2 d	18, 20
4.2.2 e	6
4.2.2 f	7, 81, 82
4.2.3	
4.2.3 a	14
4.2.3 b	1, 4, 13, 15, 60
4.2.3 c	Intentionally deleted
4.2.3 d	18, 21
4.2.4	
4.2.4 a	64, 65
4.2.4 b	66
4.2.4 c	67
4.2.4 d	68
4.2.4 e	73, 74
4.2.4 f	32, 33
4.2.4 g	48
4.2.4 h	69, 70
4.2.4 j	71, 72
4.2.4 k	75, 76

Reference in Chapter 4	Index number (see Table A 2)
4.2.5	
4.2.5 a	64, 65
4.2.5 b	10, 39, 40
4.2.5 c	19, 20
4.2.5 d	9, 43
4.2.5 e	16, 50
4.2.6	
4.2.6 a	8, 25, 26, 36 c, 49, 52
4.2.6 b	29, 45
4.2.6 c	46
4.2.6 d	34
4.2.6 e	20
4.2.6 f	Intentionally deleted
4.2.7	
4.2.7 a	12
4.2.7 b	62, 63
4.2.7 c	34
4.2.7 d	9
4.2.7 e	16
4.2.8	
4.2.8 a	11, 79, 83
4.2.9	
4.2.9 a	23
4.2.10	
4.2.10 a	77 (point 3.1)
4.2.11	
4.2.11 a	77 (point 3.2)

Reference in Chapter 4	Index number (see Table A 2)
4.2.12	
4.2.12 a	6, 51
4.2.13	
4.2.13 a	32, 33, 51, 80
4.2.14	
4.2.14 a	5
4.2.15	
4.2.15 a	38

Specifications

One of the three tables in Table A 2 (Table A 2.1, Table A 2.2, Table A 2.3) of this Annex shall be applied for the trackside subsystem. For the on-board subsystem either Table A 2.2 or Table A 2.3 shall be applied, after the transition period defined in 7.4.2.3.

When a document listed in Table A 2 incorporates, by copying or by reference to, a clearly identified point of another document, this point, and only this, shall be considered a part of the document listed in Table A 2.

For the purposes of this TSI, when a document listed in Table A 2 makes a “mandatory” or “normative” reference to a document not listed in Table A 2, the referenced document shall always be understood as an acceptable means of compliance with basic parameters (that can be used for certification of Interoperability Constituents and Subsystems and not requiring future revisions of the TSI) and not as a mandatory specification.

Note: specifications indicated as “Reserved” in Table A 2 are also listed as open points in Annex G when there is a need for notification of national rules to close the corresponding open points. Reserved documents not listed as open points are intended as improvements to the system.

Table A 2.1

List of mandatory specifications

Index No	Set of specifications # 1 (only for trackside Subsystems. For on-board subsystems not to be applied after the transition period defined in 7.4.2.3) (ETCS Baseline 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
1	ERA/ERTMS/003204	ERTMS/ETCS Functional requirement specification	5.0	
2	Intentionally deleted			
3	SUBSET-023	Glossary of Terms and Abbreviations	2.0.0	
4	SUBSET-026	System Requirements Specification	2.3.0	
5	SUBSET-027	FFFIS Juridical recorder-downloading tool	2.3.0	Note 1

Index No	Set of specifications # 1 (only for trackside Subsystems. For on-board subsystems not to be applied after the transition period defined in 7.4.2.3) (ETCS Baseline 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
6	SUBSET-033	FIS for man-machine interface	2.0.0	
7	SUBSET-034	FIS for the train interface	2.0.0	
8	SUBSET-035	Specific Transmission Module FFFIS	2.1.1	
9	SUBSET-036	FFFIS for Eurobalise	2.4.1	
10	SUBSET-037	EuroRadio FIS	2.3.0	
11	SUBSET-038	Offline key management FIS	2.3.0	
12	SUBSET-039	FIS for the RBC/RBC handover	2.3.0	
13	SUBSET-040	Dimensioning and Engineering rules	2.3.0	
14	SUBSET-041	Performance Requirements for Interoperability	2.1.0	
15	SUBSET-108	Interoperability related consolidation on TSI Annex A documents	1.2.0	
16	SUBSET-044	FFFIS for Euroloop	2.3.0	
17	Intentionally deleted			
18	SUBSET-046	Radio infill FFFS	2.0.0	
19	SUBSET-047	Trackside-Trainborne FIS for Radio infill	2.0.0	
20	SUBSET-048	Trainborne FFFIS for Radio infill	2.0.0	
21	SUBSET-049	Radio infill FIS with LEU/interlocking	2.0.0	
22	Intentionally deleted			
23	SUBSET-054	Responsibilities and rules for the assignment of values to ETCS variables	2.1.0	
24	Intentionally deleted			
25	SUBSET-056	STM FFFIS Safe time layer	2.2.0	
26	SUBSET-057	STM FFFIS Safe link layer	2.2.0	
27	SUBSET-091	Safety Requirements for the Technical Interoperability of ETCS in Levels 1 and 2	2.5.0	
28	Intentionally deleted			
29	SUBSET-102	Test specification for interface "K"	1.0.0	
30	Intentionally deleted			
31	SUBSET-094	Functional requirements for an onboard reference test facility	2.0.2	
32	EIRENE FRS	GSM-R Functional requirements specification	8.0.0	Note 10

Index No	Set of specifications # 1 (only for trackside Subsystems. For on-board subsystems not to be applied after the transition period defined in 7.4.2.3) (ETCS Baseline 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
33	EIRENE SRS	GSM-R System requirements specification	16.0.0	Note 10
34	A11T6001	(MORANE) Radio Transmission FFFIS for EuroRadio	13.0.0	
35	Intentionally deleted			
36 a	Intentionally deleted			
36 b	Intentionally deleted			
36 c	SUBSET-074-2	FFFIS STM Test cases document	1.0.0	
37 a	Intentionally deleted			
37 b	SUBSET-076-5-2	Test cases related to features	2.3.3	
37 c	SUBSET-076-6-3	Test sequences	2.3.3	
37 d	SUBSET-076-7	Scope of the test specifications	1.0.2	
37 e	Intentionally deleted			
38	06E068	ETCS Marker-board definition	2.0	
39	SUBSET-092-1	ERTMS EuroRadio Conformance Requirements	2.3.0	
40	SUBSET-092-2	ERTMS EuroRadio test cases safety layer	2.3.0	
41	Intentionally deleted			
42	Intentionally deleted			
43	SUBSET 085	Test specification for Eurobalise FFFIS	2.2.2	
44	Intentionally deleted			
45	SUBSET-101	Interface "K" Specification	1.0.0	
46	SUBSET-100	Interface "G" Specification	1.0.1	
47	Intentionally deleted			
48	Reserved	Test specification for mobile equipment GSM-R		Note 4
49	SUBSET-059	Performance requirements for STM	2.1.1	
50	SUBSET-103	Test specification for Euroloop	1.0.0	
51	Reserved	Ergonomic aspects of the DMI		
52	SUBSET-058	FFFIS STM Application layer	2.1.1	
53	Intentionally deleted			
54	Intentionally deleted			

Index No	Set of specifications # 1 (only for trackside Subsystems. For on-board subsystems not to be applied after the transition period defined in 7.4.2.3) (ETCS Baseline 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
55	Intentionally deleted			
56	Intentionally deleted			
57	Intentionally deleted			
58	Intentionally deleted			
59	Intentionally deleted			
60	Intentionally deleted			
61	Intentionally deleted			
62	Reserved	RBC-RBC Test specification for safe communication interface		
63	SUBSET-098	RBC-RBC Safe Communication Interface	1.0.0	
64	EN 301 515	Global System for Mobile Communication (GSM); Requirements for GSM operation on railways	2.3.0	Note 2
65	TS 102 281	Detailed requirements for GSM operation on railways	3.0.0	Note 3
66	TS 103 169	ASCI Options for Interoperability	1.1.1	
67	(MORANE) P 38 T 9001	FFFIS for GSM-R SIM Cards	5.0	Note 10
68	ETSI TS 102 610	Railway Telecommunication; GSM; Usage of the UUIE for GSM operation on railways	1.3.0	
69	(MORANE) F 10 T 6002	FFFS for Confirmation of High Priority Calls	5.0	
70	(MORANE) F 12 T 6002	FIS for Confirmation of High Priority Calls	5.0	
71	(MORANE) E 10 T 6001	FFFS for Functional Addressing	4.1	
72	(MORANE) E 12 T 6001	FIS for Functional Addressing	5.1	
73	(MORANE) F 10 T 6001	FFFS for Location Dependent Addressing	4	
74	(MORANE) F 12 T 6001	FIS for Location Dependent Addressing	3	
75	(MORANE) F 10 T 6003	FFFS for Presentation of Functional Numbers to Called and Calling Parties	4	
76	(MORANE) F 12 T 6003	FIS for Presentation of Functional Numbers to Called and Calling Parties	4	

Index No	Set of specifications # 1 (only for trackside Subsystems. For on-board subsystems not to be applied after the transition period defined in 7.4.2.3) (ETCS Baseline 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
77	ERA/ERTMS/033281	Interfaces between CCS trackside and other subsystems	4.0	Note 7
78	Reserved	Safety requirements for ETCS DMI functions		
79	Not applicable	Not applicable		
80	Not applicable	Not applicable		
81	Not applicable	Not applicable		
82	Not applicable	Not applicable		

Table A 2.2

List of mandatory specifications

Index No	Set of specifications # 2 (ETCS Baseline 3 Maintenance Release 1 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
1	Intentionally deleted			
2	Intentionally deleted			
3	SUBSET-023	Glossary of Terms and Abbreviations	3.1.0	
4	SUBSET-026	System Requirements Specification	3.4.0	
5	SUBSET-027	FIS Juridical Recording	3.1.0	
6	ERA_ERTMS_015560	ETCS Driver Machine interface	3.4.0	
7	SUBSET-034	Train Interface FIS	3.1.0	
8	SUBSET-035	Specific Transmission Module FFFIS	3.1.0	
9	SUBSET-036	FFFIS for Eurobalise	3.0.0	
10	SUBSET-037	EuroRadio FIS	3.1.0	
11	SUBSET-038	Offline key management FIS	3.0.0	
12	SUBSET-039	FIS for the RBC/RBC handover	3.1.0	
13	SUBSET-040	Dimensioning and Engineering rules	3.3.0	
14	SUBSET-041	Performance Requirements for Interoperability	3.1.0	
15	Intentionally deleted			
16	SUBSET-044	FFFIS for Euroloop	2.4.0	
17	Intentionally deleted			

Index No	Set of specifications # 2 (ETCS Baseline 3 Maintenance Release 1 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
18	Intentionally deleted			
19	SUBSET-047	Trackside-Trainborne FIS for Radio infill	3.0.0	
20	SUBSET-048	Trainborne FFFIS for Radio infill	3.0.0	
21	Intentionally deleted			
22	Intentionally deleted			
23	SUBSET-054	Responsibilities and rules for the assignment of values to ETCS variables	3.0.0	
24	Intentionally deleted			
25	SUBSET-056	STM FFFIS Safe time layer	3.0.0	
26	SUBSET-057	STM FFFIS Safe link layer	3.0.0	
27	SUBSET-091	Safety Requirements for the Technical Interoperability of ETCS in Levels 1 and 2	3.4.0	
28	Intentionally deleted			
29	SUBSET-102	Test specification for interface "K"	2.0.0	
30	Intentionally deleted			
31	SUBSET-094	Functional requirements for an onboard reference test facility	3.0.0	
32	EIRENE FRS	GSM-R Functional requirements specification	8.0.0	Note 10
33	EIRENE SRS	GSM-R System requirements specification	16.0.0	Note 10
34	A11T6001	(MORANE) Radio Transmission FFFIS for EuroRadio	13.0.0	
35	Intentionally deleted			
36 a	Intentionally deleted			
36 b	Intentionally deleted			
36 c	SUBSET-074-2	FFFIS STM Test cases document	3.0.0	
37 a	Intentionally deleted			
37 b	SUBSET-076-5-2	Test cases related to features	3.2.0	
37 c	SUBSET-076-6-3	Test sequences	3.1.0	
37 d	SUBSET-076-7	Scope of the test specifications	3.2.0	
37 e	Intentionally deleted			

Index No	Set of specifications # 2 (ETCS Baseline 3 Maintenance Release 1 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
38	06E068	ETCS Marker-board definition	2.0	
39	SUBSET-092-1	ERTMS EuroRadio Conformance Requirements	3.0.0	
40	SUBSET-092-2	ERTMS EuroRadio test cases safety layer	3.0.0	
41	Intentionally deleted			
42	Intentionally deleted			
43	SUBSET 085	Test specification for Eurobalise FFFIS	3.0.0	
44	Intentionally deleted			
45	SUBSET-101	Interface "K" Specification	2.0.0	
46	SUBSET-100	Interface "G" Specification	2.0.0	
47	Intentionally deleted			
48	Reserved	Test specification for mobile equipment GSM-R		Note 4
49	SUBSET-059	Performance requirements for STM	3.0.0	
50	SUBSET-103	Test specification for Euroloop	1.1.0	
51	Intentionally deleted			
52	SUBSET-058	FFFIS STM Application layer	3.1.0	
53	Intentionally deleted			
54	Intentionally deleted			
55	Intentionally deleted			
56	Intentionally deleted			
57	Intentionally deleted			
58	Intentionally deleted			
59	Intentionally deleted			
60	SUBSET-104	ETCS System Version Management	3.2.0	
61	Intentionally deleted			
62	Intentionally deleted			
63	SUBSET-098	RBC-RBC Safe Communication Interface	3.0.0	
64	EN 301 515	Global System for Mobile Communication (GSM); Requirements for GSM operation on railways	2.3.0	Note 2
65	TS 102 281	Detailed requirements for GSM operation on railways	3.0.0	Note 3

Index No	Set of specifications # 2 (ETCS Baseline 3 Maintenance Release 1 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
66	TS 103 169	ASCI Options for Interoperability	1.1.1	
67	(MORANE) P 38 T 9001	FFFIS for GSM-R SIM Cards	5.0	Note 10
68	ETSI TS 102 610	Railway Telecommunication; GSM; Usage of the UUIE for GSM operation on railways	1.3.0	
69	(MORANE) F 10 T 6002	FFFS for Confirmation of High Priority Calls	5.0	
70	(MORANE) F 12 T 6002	FIS for Confirmation of High Priority Calls	5.0	
71	(MORANE) E 10 T 6001	FFFS for Functional Addressing	4.1	
72	(MORANE) E 12 T 6001	FIS for Functional Addressing	5.1	
73	(MORANE) F 10 T6001	FFFS for Location Dependent Addressing	4	
74	(MORANE) F 12 T6001	FIS for Location Dependent Addressing	3	
75	(MORANE) F 10 T 6003	FFFS for Presentation of Functional Numbers to Called and Calling Parties	4	
76	(MORANE) F 12 T 6003	FIS for Presentation of Functional Numbers to Called and Calling Parties	4	
77	ERA/ERTMS/033281	Interfaces between CCS trackside and other subsystems	4.0	Note 7
78	Intentionally deleted			Note 6
79	SUBSET-114	KMC-ETCS Entity Off-line KM FIS	1.0.0	
80	Intentionally deleted			Note 5
81	Reserved	Train Interface FFFIS		
82	Reserved	FFFIS TI – Safety Analysis		

Table A 2.3

List of mandatory specifications

Index No	Set of specifications # 3 (ETCS Baseline 3 Release 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
1	Intentionally deleted			
2	Intentionally deleted			

Index No	Set of specifications # 3 (ETCS Baseline 3 Release 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
3	SUBSET-023	Glossary of Terms and Abbreviations	3.3.0	
4	SUBSET-026	System Requirements Specification	3.6.0	
5	SUBSET-027	FIS Juridical Recording	3.3.0	
6	ERA_ERTMS_015560	ETCS Driver Machine interface	3.6.0	
7	SUBSET-034	Train Interface FIS	3.2.0	
8	SUBSET-035	Specific Transmission Module FFFIS	3.2.0	
9	SUBSET-036	FFFIS for Eurobalise	3.1.0	
10	SUBSET-037	EuroRadio FIS	3.2.0	
11	SUBSET-038	Offline key management FIS	3.1.0	
12	SUBSET-039	FIS for the RBC/RBC handover	3.2.0	
13	SUBSET-040	Dimensioning and Engineering rules	3.4.0	
14	SUBSET-041	Performance Requirements for Interoperability	3.2.0	
15	Intentionally deleted			
16	SUBSET-044	FFFIS for Euroloop	2.4.0	
17	Intentionally deleted			
18	Intentionally deleted			
19	SUBSET-047	Trackside-Trainborne FIS for Radio infill	3.0.0	
20	SUBSET-048	Trainborne FFFIS for Radio infill	3.0.0	
21	Intentionally deleted			
22	Intentionally deleted			
23	SUBSET-054	Responsibilities and rules for the assignment of values to ETCS variables	3.0.0	
24	Intentionally deleted			
25	SUBSET-056	STM FFFIS Safe time layer	3.0.0	
26	SUBSET-057	STM FFFIS Safe link layer	3.1.0	
27	SUBSET-091	Safety Requirements for the Technical Interoperability of ETCS in Levels 1 and 2	3.6.0	
28	Intentionally deleted			
29	SUBSET-102	Test specification for interface "K"	2.0.0	
30	Intentionally deleted			

Index No	Set of specifications # 3 (ETCS Baseline 3 Release 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
31	SUBSET-094	Functional requirements for an onboard reference test facility	3.1.0	
32	EIRENE FRS	GSM-R Functional requirements specification	8.0.0	Note 10
33	EIRENE SRS	GSM-R System requirements specification	16.0.0	Note 10
34	A11T6001	(MORANE) Radio Transmission FFFIS for EuroRadio	13.0.0	
35	Intentionally deleted			
36 a	Intentionally deleted			
36 b	Intentionally deleted			
36 c	SUBSET-074-2	FFFIS STM Test cases document	3.1.0	
37 a	Intentionally deleted			
37 b	SUBSET-076-5-2	Test cases related to features	3.3.0	
37 c	SUBSET-076-6-3	Test sequences	3.2.0	
37 d	SUBSET-076-7	Scope of the test specifications	3.3.0	
37 e	Intentionally deleted			
38	06E068	ETCS Marker-board definition	2.0	
39	SUBSET-092-1	ERTMS EuroRadio Conformance Requirements	3.1.0	
40	SUBSET-092-2	ERTMS EuroRadio test cases safety layer	3.1.0	
41	Intentionally deleted			
42	Intentionally deleted			
43	SUBSET 085	Test specification for Eurobalise FFFIS	3.0.0	
44	Intentionally deleted			
45	SUBSET-101	Interface "K" Specification	2.0.0	
46	SUBSET-100	Interface "G" Specification	2.0.0	
47	Intentionally deleted			
48	Reserved	Test specification for mobile equipment GSM-R		Note 4
49	SUBSET-059	Performance requirements for STM	3.1.0	
50	SUBSET-103	Test specification for Euroloop	1.1.0	
51	Intentionally deleted			

Index No	Set of specifications # 3 (ETCS Baseline 3 Release 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
52	SUBSET-058	FFFIS STM Application layer	3.2.0	
53	Intentionally deleted			
54	Intentionally deleted			
55	Intentionally deleted			
56	Intentionally deleted			
57	Intentionally deleted			
58	Intentionally deleted			
59	Intentionally deleted			
60	SUBSET-104	ETCS System Version Management	3.3.0	
61	Intentionally deleted			
62	Intentionally deleted			
63	SUBSET-098	RBC-RBC Safe Communication Interface	3.0.0	
64	EN 301 515	Global System for Mobile Communication (GSM); Requirements for GSM operation on railways	2.3.0	Note 2
65	TS 102 281	Detailed requirements for GSM operation on railways	3.0.0	Note 3
66	TS 103 169	ASCI Options for Interoperability	1.1.1	
67	(MORANE) P 38 T 9001	FFFIS for GSM-R SIM Cards	5.0	Note 10
68	ETSI TS 102 610	Railway Telecommunication; GSM; Usage of the UUIE for GSM operation on railways	1.3.0	
69	(MORANE) F 10 T 6002	FFFS for Confirmation of High Priority Calls	5.0	
70	(MORANE) F 12 T 6002	FIS for Confirmation of High Priority Calls	5.0	
71	(MORANE) E 10 T 6001	FFFS for Functional Addressing	4.1	
72	(MORANE) E 12 T 6001	FIS for Functional Addressing	5.1	
73	(MORANE) F 10 T 6001	FFFS for Location Dependent Addressing	4	
74	(MORANE) F 12 T 6001	FIS for Location Dependent Addressing	3	
75	(MORANE) F 10 T 6003	FFFS for Presentation of Functional Numbers to Called and Calling Parties	4	

Index No	Set of specifications # 3 (ETCS Baseline 3 Release 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
76	(MORANE) F 12 T 6003	FIS for Presentation of Functional Numbers to Called and Calling Parties	4	
77	ERA/ERTMS/033281	Interfaces between CCS trackside and other subsystems	4.0	Note 7
78	Intentionally deleted			Note 6
79	SUBSET-114	KMC-ETCS Entity Off-line KM FIS	1.1.0	
80	Intentionally deleted			Note 5
81	Reserved	Train Interface FFFIS		
82	Reserved	FFFIS TI – Safety Analysis		
83	SUBSET-137	On-line Key Management FFFIS	1.0.0	

Note 1: only the functional description of information to be recorded is mandatory, not the technical characteristics of the interface

Note 2: the points of the specifications listed in point 2.1 of EN 301 515 which are referenced in Index 32 and Index 33 as “MI” are mandatory.

Note 3: the change requests (CRs) listed in table 1 and 2 of TS 102 281 which affect points referenced in Index 32 and Index 33 as “MI” are mandatory.

Note 4: Index 48 refers only to test cases for GSM-R mobile equipment. It is kept “reserved” for the time being. When agreed in a future revision of the TSI, the catalogue of available harmonised test cases for the assessment of mobile equipment and networks, according to the steps indicated in point 6.1.2 of this TSI, will be introduced in these tables.

Note 5: the products which are on the market are already tailored to the needs of the RU related to GSM-R Driver Machine Interface and fully interoperable so there is no need for a standard in the TSI CCS.

Note 6: information that was intended for index 78 is now incorporated in Index 27 (SUBSET-091).

Note 7: this document is ETCS and GSM-R baseline independent.

Note 8: Intentionally deleted.

Note 9: Intentionally deleted.

Note 10: Only the (MI) requirements are mandated by TSI CCS.

Note 11: Intentionally deleted.

Note 12: Intentionally deleted.

Note 13: Intentionally deleted.

Note 14: Intentionally deleted.

Table A 3

List of mandatory standards

The application of the version of the standards listed in the table below, and their subsequent amendments when published as harmonised standard in the certification process is an appropriate means to fully comply to the risk management process as set out in Annex I of the Commission Implementing Regulation (EU) No 402/2013, without prejudice for the provisions of chapter 4 and chapter 6 of this TSI.

No	Reference	Document name and comments	Version	Note
A1	EN 50126-1	Railway applications — The specification and demonstration of reliability, availability, maintainability and safety (RAMS) – Part 1: Generic RAMS Process	2017	
			1999	1,2
A2	EN 50128	Railway applications — Communication, signalling and processing systems — Software for railway control and protection systems	2011	
A3	EN 50129	Railway applications — Communication, signalling and processing systems — Safety related electronic systems for signalling	2003	1
A4	EN 50159	Railway applications — Communication, signalling and processing systems	2010	1
A5	EN 50126-2	Railway Applications — The specification and demonstration of reliability, availability, maintainability and safety (RAMS) – Part 2: Systems Approach to Safety	2017	3

Note 1: this standard is harmonised, see “Commission Communication in the framework of the implementation of the Directive 2008/57/EC of the European Parliament and of the Council of 17 June 2008 on the interoperability of the rail system within the Community (recast)” (OJ C 435, 15.12.2017), where also published editorial corrigenda are indicated.

Note 2: this version of the standard may be used during the transitional period defined in the updated version of the standard.

Note 3: To be used in combination with EN 50126-1 (2017).

Table A 4

List of mandatory standards for accredited laboratories

No	Reference	Document name and comments	Version	Note
A6	ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories	2017'	

(57) the Annex G is replaced by the following:

‘ANNEX G

Open Points

Open Point	Notes
Braking aspects	It only applies to ETCS Baseline 2 (see Annex A, Table A 2, Index 15). Resolved for ETCS Baseline 3 (see Annex A, Table A 2, Indexes 4 and 13).
Reliability/availability requirements	Frequent occurrences of degraded situations caused by failures of control-command and signalling equipment will decrease the system safety.
Characteristics of sand applied to tracks	See Annex A, Table A 2, Index 77 This is not an open point for 1 520 mm.
Characteristics of flange lubricators	See Annex A, Table A 2, Index 77
Combination of rolling stock characteristics influencing shunting impedance	See Annex A, Table A 2, Index 77
Conducted interference: — Vehicle impedance — Substation impedance (for DC networks only) — Out-band limits — Interference current limits attributed to the substations and attributed to the rolling stock — Measurement, test and evaluation specification	See Annex A, Table A 2, Index 77’

ANNEX VII

Annex I to Decision 2011/665/EU is amended as follows:

(1) point 2.3 is replaced by the following:

‘2.3 Users and user access rights

ERATV shall have the following users:

Table 1

Access rights to ERATV

User	Access rights	Log in, user accounts
National safety authority of any Member State	Submission of data related to this Member State to be validated by the Agency. Unrestricted consultation of any data, including the data for which the validation is pending.	Logging in with user name and password. No functional or anonymous accounts shall be made available. Several accounts shall be created if the national safety authority so requires.
Agency	Registration of data related to vehicle type authorisation it has processed as authorising entity. Validation regarding the compliance with this specification and publication of the data submitted by a national safety authority. Unrestricted consultation of any data, including the data for which the validation is pending.	Logging in with user name and password.
Public	Consultation of validated data.	Not applicable.’

(2) in point 2.4, the following paragraph is added:

‘ERATV shall, as appropriate, allow for exchange of information with other information systems of the Agency such as the European Vehicle Register (“EVR”) as referred to in Decision (EU) 2018/1614, the common user interface for the railway register of infrastructure as referred to in Commission Decision 2014/880/EU (*) and the one stop-shop (“OSS”) as referred to in Article 12 of Regulation (EU) 2016/796 of the European Parliament and of the Council (**).

(*) 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).

(**) 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).’;

(3) in point 2.5, the following indents are added:

- ‘EVR: the format of data on the type of vehicle in EVR shall have a one-to-one correspondence with the designation of types and, where applicable, variants or versions of type in ERATV;
- The One Stop Shop (*) (OSS): OSS shall rely on ERATV to manage any information related to the types/variants/versions. The identification of the type shall be used as reference during the exchange of information between the systems; OSS will allow retrieving information for types/variants/versions from ERATV and will trigger the publication of the type/variant/version information in ERATV when the vehicle type authorisation is delivered;

- Single Rule Database (**) containing national rules: for the national rules for vehicle authorisation: the list of parameters for which the conformity assessment is done against national rules indicated in ERATV shall be the same in the Single Rule Database. ERATV must not allow referring to any parameter not included in the Single Rule Database.

Until the Single Rules Database is operational and data migrated from the Reference Document Database and Notif-IT, the list of parameters for which the conformity assessment is done against national rules indicated in ERATV shall be the same as in the Reference Document Database. ERATV must not allow referring to any parameter not included in the Reference Document Database.

(*) As provided for in Article 12 of Regulation (EU) 2016/796.

(**) As provided for in Article 27 of Regulation (EU) 2016/796.;

- (4) point 5.1 is replaced by the following:

5.1 General principle

Every national safety authority shall submit information related to the authorisations of a type of vehicle or vehicle type variant it has granted.

Every national safety authority shall submit information related to the versions of a vehicle type or versions of a vehicle type variant it has received in accordance with in accordance with Article 15(3) of Regulation (EU) 2018/545.

The Agency shall directly register information related to the authorisations of a type of vehicle or vehicle type variant it has granted and information related to the versions of a vehicle type or versions of a vehicle type variant it has received.

ERATV shall include a web based tool for exchange of information between the national safety authorities and the Agency. This tool shall allow the following exchanges of information:

- (1) reservation of a type ID;
- (2) submission of data for the register by a national safety authority to the Agency including:
 - (a) data related to granting an authorisation for a new type of vehicle or a new vehicle type variant (in this case the national safety authority shall provide the full set of data as set out in Annex II);
 - (b) data related to granting an authorisation for a type of vehicle previously registered in ERATV (in this case the national safety authority shall only provide data related to the authorisation itself, i.e. fields in Section 3 of the list set out in Annex II);
 - (c) data related to registering a version of a vehicle type or version of a vehicle type variant (in this case the national safety authority shall provide the full set of data as set out in Annex II);
 - (d) data related to modification of an existing authorisation (in this case the national safety authority shall only provide data related to the fields that need to be modified; this may not include modification of data related to the characteristics of the vehicle);
 - (e) data related to suspension of an existing authorisation (in this case the national safety authority shall only provide the date of suspension);
 - (f) data related to reactivation of an existing authorisation (in this case the national safety authority shall only provide data related to the fields that need to be modified), distinguishing between
 - reactivation without modification of data,
 - reactivation with modification of data (these data may not be related to the characteristics of the vehicle);
 - (g) data related to withdrawal of an authorisation;
 - (h) data related to correction of an error;

- (3) sending of requests for data clarification and/or correction by the Agency to a national safety authority;
- (4) sending of answers by a national safety authority to the requests of clarification and/or correction done by the Agency.

The national safety authority shall submit the data for updating the register electronically by means of a web based application and using the standard web based electronic form with the relevant fields filled in as set out in Annex II.

The Agency shall check the data submitted by the national safety authority regarding their compliance with this specification, and either validate them or request a clarification.

If the Agency considers that the data submitted by the national safety authority are not in compliance with this specification, the Agency shall send the national safety authority a request for correction or clarification of the submitted data.

Upon each update of data regarding a type of vehicle the system shall generate a confirmation message, which shall be sent by email to the users of the national safety authority that submitted the data, to the national safety authority of all other Member States where the type is authorised, to the vehicle type authorisation holder and to the Agency;

- (5) point 5.2.1 is replaced by the following:

‘5.2.1 Registering a new vehicle type authorisation, a new vehicle type variant a new version of a vehicle type or a new version of a vehicle type

- (1) The national safety authority shall inform the Agency of any vehicle type authorisation within 20 working days following the issue of the authorisation.
- (2) The national safety authority shall inform the Agency of any vehicle type variant within 20 working days following the issue of the authorisation.
- (3) The national safety authority shall inform the Agency of any version of a vehicle type or version of a vehicle type variant it has received in accordance with Article 15(3) of Regulation (EU) 2018/545 within 20 working days following receipt of the complete information.
- (4) The Agency shall check the information submitted by the national safety authority and within 20 working days following the receipt of this information either validate it and assign a type of vehicle number as set out in Annex III or request its correction or clarification. In particular, in order to prevent an unintended duplication of types in ERATV, the Agency shall check, as far as the data available in ERATV allows, that this type has not been registered before by another Member State.
- (5) After validation of the information submitted by the national safety authority, the Agency shall assign the new type of vehicle its number. The rules for assigning the type of vehicle number are set out in Annex III.’;

- (6) point 5.3 is replaced by the following:

‘5.3 Entry or modification of data by the Agency

5.3.1 The authorising entity is a national safety authority

Where a national safety authority acts as authorising entity, the Agency shall not modify data submitted by a national safety authority. The role of the Agency shall consist of validation and publication only.

In exceptional circumstances, such as technical impossibility of following the normal procedure, the Agency may, following a request from a national safety authority, enter or modify data submitted by a national safety authority. In this case, the national safety authority that requested the entry or modification of data shall confirm the data entered or modified by the Agency and the Agency shall duly document the process. The timescales for entering data in ERATV as indicated in Section 5.2 shall apply.

5.3.2 *The authorising entity is the Agency*

Where the Agency acts as authorising entity, it shall:

- (a) register any vehicle type authorisation or vehicle type variant within 20 working days following the issue of the authorisation;
- (b) register any version of a vehicle type or version of a vehicle type variant within 20 working days following receipt of the complete information;
- (c) modify any existing authorisation for a type of vehicle within 20 working days following the issue of the modification to the authorisation;
- (d) suspend any existing authorisation for a type of vehicle within 5 working days following the issue of the suspension of the authorisation;
- (e) reactivate any authorisation for a type of vehicle previously suspended within 20 working days following the issue of the reactivation of the authorisation;
- (f) withdraw any existing authorisation for a type of vehicle within 5 working days following the withdrawal of the authorisation.;

(7) section 6 is replaced by the following:

‘6. GLOSSARY

Term or abbreviation	Definition
Type ID	An identification for the type composed of the type number (parameter 0.1, number composed of 10 digits), the variant (parameter 0.2, alphanumeric composed of three characters) and the version (parameter 0.4, alphanumeric composed of three characters): TypeID = Type number+Variant+Version = XX-XXX-XXXX-X-ZZZ-VVV
Restriction	Any condition or limitation indicated in the authorisation of type of vehicle that applies to placing on the market or use of any vehicle in conformity with this type. Restrictions do not include technical characteristics that are included in Section 4 of Annex II (List and format of parameters).
Modification of authorisation	Modification, at the request of an authorising entity, of information of the registered vehicle type authorisation previously published which needs to be changed.
Suspension of authorisation	Decision taken by an authorising entity according to which an authorisation for a vehicle type is temporarily suspended and no vehicle may be authorised to be placed on the market on the basis of its conformity to the given type, until the causes that motivated the suspension have been analysed. Suspension of authorisation for a vehicle type does not apply to the vehicles already in use.
Reactivation of authorisation	Decision taken by an authorising entity according to which a suspension of authorisation it previously issued no longer applies.
Authorisation to be renewed	Decision taken by an authorising entity according to which an authorisation for a vehicle type needs to be renewed in accordance with Article 24(3) of Directive (EU) 2016/797 and no vehicle may be authorised to be placed on the market on the basis of its conformity to the given type. Authorisation to be renewed status for a vehicle type does not affect the vehicles already in use.
Revocation of authorisation	Decision taken in accordance with Article 26 of Directive (EU) 2016/797 by an authorising entity according to which an authorisation for a vehicle type is no longer valid. Vehicle already authorised to be placed on the market on the basis of its type shall be withdrawn.
Error	Transmitted or published data that do not correspond to the given authorisation for type of vehicle. Modification of authorisation does not fall under this definition.’

ANNEX VIII

Annex II to Decision 2011/665/EU is replaced by the following:

ANNEX II

DATA TO BE REGISTERED AND FORMAT

- (1) For each authorised type of vehicle, ERATV shall include the following data:
 - (a) identification of the type;
 - (b) manufacturer;
 - (c) conformity with the TSIs;
 - (d) authorisations, including general information about these authorisations, their status, list of parameters for which conformity with national rules has been checked;
 - (e) technical characteristics.
- (2) The data to be registered in ERATV for each type of vehicle and their format shall be as indicated in Table 2. The data to be registered depend on the category of the vehicle as indicated in Table 2.
- (3) The values indicated for the parameters related to the technical characteristics shall be those recorded in the file accompanying the application.
- (4) In the cases where possible values for a parameter are limited to a predefined list, these lists shall be maintained and updated by the Agency.
- (5) For the types of vehicle that are not in conformity with all the relevant TSIs in force, the national safety authority that has granted the type authorisation may limit the information to be provided on the technical characteristics indicated in Section 4 below to the parameters that have been checked according to the applicable rules.
- (6) Where a parameter is defined in the applicable TSI, the value indicated for the parameter shall be the one assessed in the verification procedure.
- (7) Predefined lists shall be maintained and kept updated by the Agency in accordance with the TSIs in force, including the TSIs that may be applied during a transitional period.
- (8) For parameters indicated as “open point” no data shall be introduced until the “open point” is closed in the relevant TSI.
- (9) For parameters indicated as “optional”, indication of data shall be subject to the decision of the applicant for the type authorisation.
- (10) Fields 0.1-0.4 shall be filled in by the Agency.

Table 2

Parameters of ERATV

Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use
		1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles	
0	Identification of the type	Heading (no data)				
0.1	Type number (in accordance with Annex III)	[number] XX-XXX-XXXX-X	Y	Y	Y	Y
0.2	Variant included in this type (in accordance with Article 2(13) of Regulation (EU) 2018/545)	[alphanumeric] ZZZ	Y	Y	Y	Y
0.4	Versions included in this type. (in accordance with Article 2(14) of Regulation (EU) 2018/545)	[alphanumeric] VVV	Y	Y	Y	Y
0.3	Date of record in ERATV	[date] YYYYMMDD	Y	Y	Y	Y
1	General information	Heading (no data)				
1.1	Type name	[character string] (max 256 characters)	O	O	O	O
1.2	Alternative type name	[character string] (max 256 characters)	O	O	O	O
1.3	Manufacturer's name	Heading (no data)				
1.3.1	Manufacturer identification data	Heading (no data)				
1.3.1.1	Name of organisation	[character string] (max 256 characters) Selection from a predefined list, possibility to add new organisations	Y	Y	Y	Y
1.3.1.2	Registered business number	Text	O	O	O	O
1.3.1.3	Organisation code	Alphanumeric code	O	O	O	O

Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use	
		1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles		
1.3.2	Manufacturer contact data	Heading (no data)					
1.3.2.1	Address of organisation, street and number	Text	O	O	O	O	
1.3.2.2	Town	Text	O	O	O	O	
1.3.2.3	Country code	Code as in EU interinstitutional style guide	O	O	O	O	
1.3.2.4	Post code	Alphanumeric code	O	O	O	O	
1.3.2.5	Email address	Email	O	O	O	O	
1.4	Category	[character string] Selection from a predefined list (according to Annex III)	Y	Y	Y	Y	
1.5	Subcategory	[character string] Selection from a predefined list (according to Annex III)	Y	Y	Y	Y	
2	Conformity with TSIs	Heading (no data)					
2.1	Conformity with TSI	For each TSI: [character string] Y/N/Partial/Not applicable Selection from a predefined list of vehicle related TSIs (both in force and those that were previously in force) (multiple selection possible)	Y	Y	Y	Y	
2.2	EC certificate of verification: Reference of "EC type examination certificates" (if module SB applied) and/or "EC design examination certificates" (if module SH1 applied)	[character string] (possibility to indicate several certificates, e.g. certificate for rolling stock subsystem, certificate for CCS, etc.)	Y	Y	Y	Y	
2.3	Applicable specific cases (specific cases conformity with which has been assessed)	[character string] Selection from a predefined list (multiple selection possible) based on TSIs (for each TSI marked as Y or P)	Y	Y	Y	Y	

Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use	
		1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles		
2.4	Sections of TSI not complied with	[character string] Selection from a predefined list (multiple selection possible) based on TSIs (for each TSI marked as P)	Y	Y	Y	Y	
3	Authorisations	Heading (no data)					
3.0	Area of use	[character string] Selection from a predefined list (multiple selection): MS — Network	Y	Y	Y	Y	
3.1	Authorisation in	Heading (no data)					
3.1.1	Member State of authorisation	[character string] Selection from a predefined list (multiple selection)	Y	Y	Y	Y	
3.1.2	Current status	Heading (no data)					
3.1.2.1	Status	[character string] + [date] Possible options: Valid, Suspended YYYYMMDD, Revoked YYYYMMDD, to be renewed YYYYMMDD	Y	Y	Y	Y	
3.1.2.2	Validity of authorisation (if defined)	[date] YYYYMMDD	Y	Y	Y	Y	
3.1.2.3	Coded conditions for use and other restrictions	[character string] Code assigned by the Agency	Y	Y	Y	Y	
3.1.2.4	Non-coded conditions for use and other restrictions	[character string]	Y	Y	Y	Y	
3.1.3	Historical	Heading (no data)					
3.1.3.1	Original authorisation	Heading (no data)					
3.1.3.1.1	Date of the original authorisation	[date] YYYYMMDD	Y	Y	Y	Y	

	Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use
			1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles	
3.1.3.1.2	Authorisation holder	Heading (no data)					
3.1.3.1.2.1	Authorisation holder identification data	Heading (no data)					
3.1.3.1.2.1.1	Name of organisation	[character string] (max 256 characters) Selection from a predefined list, possibility to add new organisations	Y	Y	Y	Y	
3.1.3.1.2.1.2	Registered business number	Text	Y	Y	Y	Y	
3.1.3.1.2.1.3	Organisation code	Alphanumeric code	O	O	O	O	
3.1.3.1.2.2	Authorisation holder contact data	Heading (no data)					
3.1.3.1.2.2.1	Address of organisation, street and number	Text	Y	Y	Y	Y	
3.1.3.1.2.2.2	Town	Text	Y	Y	Y	Y	
3.1.3.1.2.2.3	Country code	Code as in EU interinstitutional style guide	Y	Y	Y	Y	
3.1.3.1.2.2.4	Post code	Alphanumeric code	Y	Y	Y	Y	
3.1.3.1.2.2.5	Email address	Email	Y	Y	Y	Y	
3.1.3.1.3	Authorisation document reference	[character string] (EIN)	Y	Y	Y	Y	
3.1.3.1.4	Certificate of verification: Reference of type examination or design examination type	[character string] (Possibility to indicate several certificates, e.g. certificate for rolling stock subsystem, certificate for Control, command and signalling subsystem, etc.)	Y	Y	Y	Y	

Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use	
		1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles		
3.1.3.1.5	Parameters for which conformity to applicable national rules has been assessed	[character string] Selection from a predefined list (multiple selection possible) based on Commission Decision 2015/2299/EU	Y	Y	Y	Y	
3.1.3.1.6	Comments	[character string] (max 1 024 characters)	O	O	O	O	
3.1.3.1.7	Reference to the written declaration by the proposer referred to in Article 3(11) of Regulation (EU) No 402/2013	[character string]	Y	Y	Y	Y	
3.1.3.X	Modification of authorisation	Heading (no data) (X is progressive from 2 onwards, as many times as modifications of the authorisation of type have been issued)	Y	Y	Y	Y	
3.1.3.X.1	Type of modification	[character string] Text from a predefined list	Y	Y	Y	Y	
3.1.3.X.2	Date	[date] YYYYMMDD	Y	Y	Y	Y	
3.1.3.X.3	Authorisation holder (if applicable)	[character string] (max 256 characters) Selection from a predefined list, possibility to add new organisations	Y	Y	Y	Y	
3.1.3.X.3.1	Authorisation holder identification data	Heading (no data)					
3.1.3.X.3.1.1	Name of organisation	[character string] (max 256 characters) Selection from a predefined list, possibility to add new organisations	Y	Y	Y	Y	
3.1.3.X.3.1.2	Registered business number	Text	Y	Y	Y	Y	

	Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use
			1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles	
3.1.3.X.3.1.3	Organisation code	Alphanumeric code	O	O	O	O	
3.1.3.X.3.2	Authorisation holder contact data	Heading (no data)					
3.1.3.X.3.2.1	Address of organisation, street and number	Text	Y	Y	Y	Y	
3.1.3.X.3.2.2	Town	Text	Y	Y	Y	Y	
3.1.3.X.3.2.3	Country code	Code as in EU interinstitutional style guide	Y	Y	Y	Y	
3.1.3.X.3.2.4	Post code	Alphanumeric code	Y	Y	Y	Y	
3.1.3.X.3.2.5	Email address	Email	Y	Y	Y	Y	
3.1.3.X.4	Authorisation modification document reference	[character string]	Y	Y	Y	Y	
3.1.3.X.5	Certificate of verification: Reference of type examination or design examination type	[character string] (possibility to indicate several certificates, e.g. certificate for rolling stock subsystem, certificate for CCS, etc.)	Y	Y	Y	Y	
3.1.3.X.6	Applicable national rules (if applicable)	[character string] Selection from a predefined list (multiple selection possible) based on Commission Decision 2015/2299/EU	Y	Y	Y	Y	
3.1.3.X.7	Comments	[character string] (max 1 024 characters)	O	O	O	O	
3.1.3.X.8	Reference to the written declaration by the proposer referred to in Article 3(11) of Regulation (EU) No 402/2013	[character string]	Y	Y	Y	Y	

Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use	
		1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles		
3.X	Authorisation in	Heading (no data) (X is progressive incremented by one unit from 2 onwards each time an authorisation for this type has been granted). This Section contains same fields as 3.1	Y	Y	Y	Y	
4	Technical characteristics of the vehicle	Heading (no data)					
4.1	General technical characteristics	Heading (no data)					
4.1.1	Number of driving cabs	[Number] 0/1/2	Y	Y	Y	Y	N
4.1.2	Speed	Heading (no data)					
4.1.2.1	Maximum design speed	[Number] km/h	Y	Y	Y	Y	N
4.1.3	Wheel set gauge	[character string] Selection from predefined list	Y	Y	Y	Y	Y
4.1.5	Maximum number of trainsets or locomotives coupled together in multiple operation.	[number]	Y	N	N	N	N
4.1.11	Wheelset gauge changeover facility	[character string] Selection from predefined list	Y	Y	Y	Y	Y
4.1.12	Number of vehicles composing the fixed formation (for fixed formation only)	[number]	Y	Y	Y	Y	N
4.2	Vehicle gauge	Heading (no data)					
4.2.1	Reference profile	[character string] Selection from predefined list (more than one possible) (the list will be different for different categories depending on the applicable TSI)	Y	Y	Y	Y	Y

Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use	
		1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles		
4.3	Environmental conditions	Heading (no data)					
4.3.1	Temperature range	[character string] Selection from a predefined list (more than one possible)	Y	Y	Y	Y	N
4.3.3	Snow, ice and hail conditions	[character string] Selection from a predefined list	Y	Y	Y	Y	N
4.4	Fire safety	Heading (no data)					
4.4.1	Fire safety category	[character string] Selection from a predefined list	Y	Y	N	Y	Y
4.5	Design mass and loads	Heading (no data)					
4.5.1	Permissible payload for different line categories	[number] t for line category [character string]	OP	OP	Y	OP	Y
4.5.2	Design mass	Heading (no data)					
4.5.2.1	Design mass in working order	[number] kg	Y	Y	O	Y	Y
4.5.2.2	Design mass under normal payload	[number] kg	Y	Y	O	Y	Y
4.5.2.3	Design mass under exceptional payload	[number] kg	Y	Y	N	Y	Y
4.5.3	Static axle load	Heading (no data)					
4.5.3.1	Static axle load in working order	[number] kg	Y	Y	O	Y	Y
4.5.3.2	Static axle load under normal payload	[number] kg	Y	Y	Y	Y	Y
4.5.3.3	Static axle load under exceptional payload	[number] kg	Y	Y	N	Y	Y

Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use	
		1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles		
4.5.3.4	Position of the axles along the unit (axle spacing): a: Distance between axles b: Distance from end axle to the end of the nearest coupling plane c: distance between two inside axles	a [number] m b [number] m c [number] m	Y	Y	Y	Y	Y
4.5.5	Total vehicle mass (for each vehicle of the unit)	[number] kg	Y	Y	Y	Y	Y
4.5.6	Mass per wheel	[number] kg	Y	Y	Y	Y	Y
4.6	Rolling stock dynamic behaviour	Heading (no data)					
4.6.4	Combination of maximum speed and maximum cant deficiency for which the vehicle was assessed	[number] km/h - [number] mm	Y	Y	Y	Y	Y
4.6.5	Rail inclination	[character string] from a predefined list	Y	Y	Y	Y	Y
4.7	Braking	Heading (no data)					
4.7.1	Maximum average deceleration	[number] m/s ²	Y	N	N	Y	N
4.7.2	Thermal capacity	Heading (no data)					
4.7.2.1	Brake performance on steep gradi- ents with normal payload	Heading (no data)					
4.7.2.1.1	Reference case of TSI	[character string] from a predefined list	Y	Y	Y	Y	N
4.7.2.1.2	Speed (if no reference case is indi- cated)	[number] km/h	Y	Y	Y	Y	N

	Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use
			1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles	
4.7.2.1.3	Gradient (if no reference case is indicated)	[number] ‰ (mm/m)	Y	Y	Y	Y	N
4.7.2.1.4	Distance (if no reference case is indicated)	[number] km	Y	Y	Y	Y	N
4.7.2.1.5	Time (if distance is not indicated) (if no reference case is indicated)	[number] min	Y	Y	Y	Y	N
4.7.2.1.6	Maximum brake thermal energy capacity	[number] kW	Y	Y	Y	Y	N
4.7.3	Parking brake	Heading (no data)					
4.7.3.3	Maximum gradient on which the unit is kept immobilised by the parking brake alone (if the vehicle is fitted with it)	[number] ‰ (mm/m)	Y	Y	Y	Y	N
4.7.3.4	Parking brake	[Boolean] Y/N	N	N	Y	N	N
4.7.4	Braking systems fitted on the vehicle	Heading (no data)					
4.7.4.1	Eddy current brake	Heading (no data)					
4.7.4.1.1	Eddy current track brake fitted	[Boolean] Y/N	Y	Y	N	Y	Y
4.7.4.1.2	Possibility of preventing the use of the eddy current track brake (only if fitted with eddy current track brake)	[Boolean] Y/N	Y	Y	N	Y	Y
4.7.4.2	Magnetic brake	Heading (no data)					
4.7.4.2.1	Magnetic track brake fitted	[Boolean] Y/N	Y	Y	N	Y	Y
4.7.4.2.2	Possibility of preventing the use of the magnetic track brake (only if fitted with magnetic brake)	[Boolean] Y/N	Y	Y	N	Y	Y

Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use	
		1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles		
4.7.4.3	Regenerative brake (only for vehicles with electrical traction)	Heading (no data)					
4.7.4.3.1	Regenerative brake fitted	[Boolean] Y/N	Y	N	N	Y	Y
4.7.4.3.2	Possibility of preventing the use of the regenerative brake (only if fitted with regenerative brake)	[Boolean] Y/N	Y	N	N	Y	Y
4.7.5	Emergency brake: Stopping distance and deceleration profile for each load condition per design maximum speed	[number] m [number] m/s ²	Y	Y	N	Y	N
4.7.6	For general operation: Brake weight percentage (lambda) or Braked mass	Lambda (%) [number] tonnes	Y	Y	Y	Y	N
4.7.7	Service brake: At maximum service brake: Stopping distance, Maximum deceleration, for the load condition "design mass under normal payload" at the design maximum speed.	[number] m [number] m/s ²	Y	Y	Y	Y	N
4.7.8	Wheel slide protection system	[Boolean] Y/N	Y	Y	Y	Y	N
4.8	Geometrical characteristics	Heading (no data)					
4.8.1	Vehicle length	[number] m	Y	Y	Y	Y	N
4.8.2	Minimum in-service wheel diameter	[number] mm	Y	Y	Y	Y	Y
4.8.4	Minimum horizontal curve radius capability	[number] m	Y	Y	N	Y	Y
4.8.5	Minimum vertical convex curve radius capability	[number] m	Y	Y	Y	Y	N
4.8.6	Minimum vertical concave curve radius capability	[number] m	Y	Y	Y	Y	N

Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use	
		1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles		
4.9	Equipment	Heading (no data)					
4.9.1	Type of end coupling	[Character string] From a predefined list (multiple selection possible)	Y	Y	Y	Y	N
4.9.2	Axle bearing condition monitoring (hot axles box detection)	[Character string] From a predefined list (multiple selection possible)	Y	Y	Y	Y	Y
4.10	Energy supply	Heading (no data)					
4.10.1	Energy supply system (voltage and frequency)	[Character string] From a predefined list (multiple selection possible)	Y	Y	N	Y	Y
4.10.4	Maximum current at standstill per pantograph (to be indicated for each DC systems the vehicle is equipped for)	[Number] A for [Voltage automatically prefilled in]	Y	Y	N	Y	N
4.10.5	Height of interaction of pantograph with contact wires (over top of rail) (to be indicated for each energy supply system the vehicle is equipped for)	[Number] From [m] to [m] (with two decimals)	Y	Y	N	Y	Y
4.10.6	Pantograph head geometry (to be indicated for each energy supply system the vehicle is equipped for)	[Character string] for [energy supply system automatically prefilled in] From a predefined list (multiple selection possible)	Y	Y	N	Y	Y
4.10.7	Number of pantographs in contact with the overhead contact line (OCL) (to be indicated for each energy supply system the vehicle is equipped for)	[Number]	Y	Y	N	Y	Y

	Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use
			1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles	
4.10.8	Shortest distance between two pantographs in contact with the OCL (to be indicated for each energy supply system the vehicle is equipped for; to be indicated for single and, if applicable, multiple operation) (only if number of raised pantographs is more than 1)	[Number] [m]	Y	Y	N	Y	Y
4.10.10	Material of pantograph contact strip the vehicle may be equipped with (to be indicated for each energy supply system the vehicle is equipped for)	[Character string] for [energy supply system automatically prefilled in] From a predefined list (multiple selection possible)	Y	Y	N	Y	Y
4.10.11	Automatic dropping device (ADD) fitted (to be indicated for each energy supply system the vehicle is equipped for)	[Boolean] Y/N	Y	Y	N	Y	Y
4.10.14	Electric units equipped with power or current limitation function	[Boolean] Y/N	Y	N	N	Y	Y
4.10.15	Mean contact force	[Number] [N]	Y	Y	N	Y	Y
4.12	Passenger related characteristics	Heading (no data)					
4.12.3.1	Platform heights for which the vehicle is designed.	[Number] from predefined list (multiple selection possible)	Y	Y	N	N	Y
4.13	On-board CCS equipment (for vehicles with a driving cab only)	Heading (no data)					
4.13.1	Signalling	Heading (no data)					
4.13.1.1	ETCS equipment on-board and the set of specifications from CCS TSI Annex A	[Character string] From a predefined list	Y	N	N	Y	Y
4.13.1.5	Class B or other train protection, control and warning systems installed (system and, if applicable, version)	[Character string] From a predefined list (more than one option possible)	Y	N	N	Y	Y

	Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use
			1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles	
4.13.1.7	ETCS on-board implementation	[Character string]	Y	N	N	Y	Y
4.13.1.8	ETCS System Compatibility	[Character string] From a predefined list (more than one option possible)	Y	N	N	Y	N
4.13.1.9	Managing information about the completeness of the train	[Boolean] Y/N	Y	N	N	Y	Y
4.13.2	Radio	Heading (no data)					
4.13.2.1	GSM-R Radio voice on board and its Baseline	[Character string] From a predefined list	Y	N	N	Y	Y
4.13.2.3	Class B or other radio systems installed (system and, if applicable, version)	[Character string] From a predefined list (more than one option possible)	Y	N	N	Y	Y
4.13.2.5	Radio Voice System Compatibility	[Character string] From a predefined list (more than one option possible)	Y	N	N	Y	N
4.13.2.6	Voice and operational communication implementation	[Character string]	Y	N	N	Y	Y
4.13.2.7	GSM-R Radio Data communication on board and its Baseline	[Character string] From a predefined list	Y	N	N	Y	Y
4.13.2.8	Radio Data System Compatibility	[Character string] From a predefined list (more than one option possible)	Y	N	N	Y	N
4.13.2.9	Data communication application for ETCS implementation	[Character string]	Y	N	N	Y	Y
4.13.2.10	Voice SIM Card GSM-R Home Network	[Character string] From a predefined list	Y	N	N	Y	N
4.13.2.11	Data SIM Card GSM-R Home Network	[Character string] From a predefined list	Y	N	N	Y	N

Parameter	Data format	Applicability to vehicle categories (Yes, No, Optional, Open Point)				Parameters for technical compatibility between Vehicle and the network(s) of area of use	
		1. Traction vehicles	2. Hauled passenger vehicles	3. Freight wagons	4. Special vehicles		
4.13.2.12	Voice SIM Card support of Group ID 555	[Boolean] Y/N	Y	N	N	Y	N
4.14	Compatibility with train detection systems	Heading (no data)					
4.14.1	Type of train detection systems for which the vehicle has been designed and assessed	[Character string] From a predefined list (more than one option possible)	Y	Y	Y	Y	Y