This text is meant purely as a documentation tool and has no legal effect. The Union's institutions do not assume any liability for its contents. The authentic versions of the relevant acts, including their preambles, are those published in the Official Journal of the European Union and available in EUR-Lex. Those official texts are directly accessible through the links embedded in this document

►**B**

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

(Text with EEA relevance)

(OJ L 158, 15.6.2016, p. 1)

Amended by:

		Official Journal		
		No	page	date
►**M1**	Commission Implementing Regulation (EU) 2019/776 of 16 May 2019	L 139I	108	27.5.2019

Corrected by:

►**C1** Corrigendum, OJ L 279, 15.10.2016, p. 94 (2016/919)

▼B

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

(Text with EEA relevance)

Article 1

Subject matter

The technical specification for interoperability (TSI) relating to the control-command and signalling (CCS) subsystems of the rail system in the European Union, as set out in the Annex, is hereby adopted.

Article 2

Scope

▼M1

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 [1]. Section 7.2.1a of the Annex shall apply to all changes to an existing On-Board subsystem.

▼B

2. The TSI shall not apply to existing 'trackside control-command and signalling' and 'on-board control-command and signalling' subsystems of the rail system already placed in service on all or part of any Member State's railway network on the day this Regulation enters into force, except when the subsystem is subject to renewal or upgrading in accordance with ►M1 ——————— ◄ Section 7 of the Annex.

▼M1

———————

▼B

4. The technical and geographical scope of the TSI is set out in points 1.1 and 1.2 of the Annex.

Article 3

Open points and specific cases

1. Within six months of the entry into force of this Regulation, each Member State shall send to the other Member States and the Commission a list of bodies designated in accordance with ►M1 Article 14 of Directive (EU) 2016/797 ◄ to carry out the conformity assessment and verification procedures in respect of:

[1] 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

(a) the open points specified in Annex G;

(b) the specific cases set out in point 7.6.2 of the Annex;

2. If a Member State has already sent this information pursuant to previous Commission Decisions, it shall be considered to have met this obligation.

Article 4

Projects at an advanced stage of development

In accordance with Article 9(3) of Directive 2008/57/EC, each Member State shall communicate to the Commission a list of projects being implemented within its territory and are at an advanced stage of development. This list shall be sent within one year of the entry into force of this Regulation.

▼M1

———————

▼B

Article 6

Implementation

1. Suppliers and applicants for authorisation for placing in service shall ensure that all equipment referred to in Article 2.1 and intended to be used on the networks referred to in Article 2(3) complies with the TSI set out in the Annex of this Regulation.

2. Notified bodies shall ensure that certificates based on the TSI set out in the Annex of this Regulation, specifically on the provisions set out in point 6, are issued within their responsibilities in accordance with ►M1 Articles 10 and 15 of Directive (EU) 2016/797 ◄.

3. National safety authorities shall, within their responsibilities according to ►M1 Article 16 of Directive (EU) 2016/798 of the European Parliament and of the Council [1] ◄ of the European Parliament and of the Council, ensure that all equipment referred to in Article 2 and placed in service in their territory complies with the TSI set out in the Annex of this Regulation.

[1] 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).

▼B

4. Member States shall draw up a national implementation plan, describing their actions to comply with this TSI, in accordance with Section 7 of the Annex, setting out the steps to be followed for the implementation of fully interoperable 'control-command and signalling' subsystems.

5. Member States shall send their national implementation plan to the other Member States and the Commission within one year of entry into force of this Regulation.

Article 7

Availability of ETCS on-board products compliant with Baseline 3 specifications

The Agency will prepare by 1 January 2018 a report to the Commission on the availability of ETCS on-board products compliant with Baseline 3 specifications. The Commission will present it to the Committee referred to in Article 29(1) of Directive 2008/57/EC and take appropriate measures.

Article 8

Class B systems

Member States shall ensure that the functionality, performance and interfaces of the Class B systems remain as currently specified, except where modifications are needed to mitigate safety-related flaws in those systems.

Article 9

EU-funded projects

1. ETCS shall be installed in railway infrastructure projects receiving financial support from European funds when:

(1) installing the train protection part of a CCS subsystem for the first time; or

(2) upgrading the train protection part of a CCS subsystem already in service, where upgrading changes the functions or the performance of the subsystem.

2. The Commission may grant a derogation from the obligation laid down in the paragraphs above when signalling is renewed on short (less than 150 km) and discontinuous sections of a line and provided that ETCS is installed before the earlier of these two dates:

— 5 years after the end of the project,

— the date on which the section of the line is connected to another ETCS equipped line.

▼B

3. The Member State concerned shall send the Commission a file with an economic analysis of the project showing that there is a substantial economic and/or technical advantage in putting ERTMS into service at the earlier of the two dates mentioned in the previous paragraph rather than during the course of the EU-funded project.

4. The Commission shall examine the file and the measures proposed by the Member State and shall inform the committee referred to in ►M1 Article 51(1) of Directive (EU) 2016/797 ◄ of its findings. If the Commission grants a derogation, the Member State shall ensure that ERTMS is installed before the earlier of the two dates mentioned in paragraph 2.

5. This derogation shall not prevent application of ►M1 Article 2(1) of Commission Implementing Regulation (EU) 2017/6 [1] and point 7.4.1.1 of the Annex to this Regulation. ◄

▼M1

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.

[1] 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)

▼M1

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.

▼B

Article 12

Repeal

Decision 2012/88/EU is repealed.

Article 13

Transitional provisions

Points 7.3.1, 7.3.2, 7.3.4 and 7.3.5 of the Annex III to Decision 2012/88/EU shall apply until the date of application of the implementing acts referred to in Article 47(2) of Regulation (EU) No 1315/2013.

▼M1

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:

▼M1

(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.

▼B

Article 14

Entry into force

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

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

▼B

ANNEX

Technical specification for interoperability relating to the 'control-command and signalling' subsystems of the rail system in the European Union

TABLE OF CONTENTS

1. Introduction

1.1. Technical scope

1.2. Geographical scope

1.3. Content of this TSI

2. Subsystem definition and scope

2.1. Introduction

2.2. Scope

2.3. Trackside Application Levels (ETCS)

3. The Essential Requirements for the Control-command and signalling Subsystems

3.1. General

3.2. Specific Aspects of the Control-Command and Signalling Subsystems

3.2.1. Safety

3.2.2. Reliability and Availability

3.2.3. Health

3.2.4. Environmental Protection

3.2.5. Technical Compatibility

3.2.5.1. Engineering Compatibility

3.2.5.1.1 Physical environmental conditions

3.2.5.1.2 Railway Internal Electromagnetic Compatibility

3.2.6. Accessibility

4. Characterisation of the Subsystems

4.1. Introduction

4.1.1. Basic parameters

4.1.2. Overview of the requirements

4.1.3. Parts of Control-command and Signalling Subsystems

4.2. Functional and technical specifications of the Subsystems

4.2.1. Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability

4.2.1.1. Safety

4.2.1.2. Availability/Reliability

4.2.2. On-board ETCS functionality

4.2.3. Trackside ETCS functionality

4.2.4. Mobile communication functions for railways GSM-R

4.2.4.1. Basic communication function

4.2.4.2. Voice and operational communication applications

4.2.4.3. Data communication applications for ETCS

▼B

4.2.5.	ETCS and GSM-R air gap interfaces
4.2.5.1.	Radio communications with the train
4.2.5.2.	Eurobalise communication with the train
4.2.5.3.	Euroloop communication with the train
4.2.6.	On-Board Interfaces Internal to Control-Command and Signalling
4.2.6.1.	ETCS and Class B train protection
4.2.6.2.	Interface between GSM-R Radio Data Communication and ETCS
4.2.6.3.	Odometry
4.2.7.	Trackside Interfaces Internal to Control-Command and Signalling
4.2.7.1.	Functional interface between RBCs
4.2.7.2.	RBC/RBC
4.2.7.3.	GSM-R/trackside ETCS
4.2.7.4.	Eurobalise/LEU
4.2.7.5.	Euroloop/LEU
4.2.8.	Key Management
4.2.9.	ETCS-ID Management
4.2.10.	Trackside Train Detection Systems
4.2.11.	Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment
4.2.12.	ETCS DMI (Driver-Machine Interface)
4.2.13.	GSM-R DMI (Driver-Machine Interface)
4.2.14.	Interface to Data Recording for Regulatory Purposes
4.2.15.	Visibility of trackside Control-Command and Signalling objects
4.2.16.	Construction of equipment used in CCS subsystems
4.2.17.	ETCS and Radio System Compatibility
4.2.17.1.	ETCS System Compatibility
4.2.17.2.	Radio System Compatibility
4.3.	Functional and technical specifications of the interfaces to other Subsystems
4.3.1.	Interface to the Operation and Traffic Management Subsystem
4.3.2.	Interface to the Rolling Stock Subsystem
4.3.3.	Interfaces to Infrastructure Subsystem
4.3.4.	Interfaces to Energy Subsystem
4.4.	Operating rules
4.5.	Maintenance rules
4.5.1.	Responsibility of the manufacturer of equipment
4.5.2.	Responsibility of the applicant for subsystem verification
4.6.	Professional competences
4.7.	Health and safety conditions
4.8.	Registers
4.9.	Route compatibility checks before the use of authorised vehicles

▼B

5. Interoperability Constituents

5.1. Definition

5.2. List of interoperability constituents

5.2.1. Basic interoperability constituents

5.2.2. Grouping of interoperability constituents

5.3. Constituents' performance and specifications

6. Assessing the conformity and/or suitability for use of the constituents and verifying the subsystems

6.1. Introduction

6.1.1. General principles

6.1.1.1. Compliance with basic parameters

6.1.1.2. Essential requirements fulfilled by National Rules

6.1.1.3. Partial fulfilment of TSI requirements

6.1.2. Principles for testing ETCS and GSM-R

6.1.2.1. Principle

6.1.2.2. Operational test scenarios

6.1.2.3. Requirements for Operational test scenarios

6.1.2.4. Requirements for ETCS System Compatibility

6.1.2.5. Requirements for Radio System Compatibility

6.2. Interoperability constituents

6.2.1. Assessment procedures for Control-Command and Signalling Interoperability Constituents

6.2.2. Modules for Control-Command and Signalling Interoperability Constituents

6.2.3. Assessment requirements

6.2.4. Special issues

6.2.4.1. Mandatory tests for the on-board ETCS

6.2.4.2. The Specific Transmission Module (STM)

6.3. Control-Command and Signalling Subsystems

6.3.1. Assessment procedures for Control-Command and Signalling Subsystems

6.3.2. Modules for Control-Command and Signalling Subsystems

6.3.2.1. On-board Subsystem

6.3.2.2. Trackside Subsystem

6.3.2.3. Conditions for using modules for On-board and Trackside Subsystems

6.3.3. Assessment requirements for an On-board Subsystem

6.3.3.1. ETCS and radio system compatibility checks

6.3.4. Assessment requirements for a Trackside Subsystem

6.4. Provisions in case of the partial fulfilment of TSI requirements

6.4.1. Assessment of parts of control-command and signalling subsystems

▼B

6.4.2. Assessment in case of application of National Rules

6.4.3. Partial fulfilment of the requirements due to limited application of the TSI

6.4.3.1. Interoperability constituents

6.4.3.2. Subsystems

6.4.3.3. Content of certificates

6.4.4. Intermediate Statement of Verification

6.5. Management of errors

7. Implementing the TSI Control-Command and Signalling

7.1. Introduction

7.2. Generally applicable rules

7.2.1. Upgrading or renewing the Control-Command Subsystems or parts of them

7.2.1a. Changes to an existing On-Board subsystem

7.2.1a.1. Rules to manage changes in on-board CCS subsystems

7.2.1a.2. Conditions for a change in the On-board ETCS functionality that does not impact the basic design characteristics

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

7.2.1b. Changes to an existing trackside subsystem

7.2.1b.1. Rules to manage changes in trackside CCS subsystems

7.2.1b.2. Conditions for a change in the trackside ETCS functionality that, if not fulfilled, requires new authorisation for placing in service

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

7.2.1b.4. Impact on the technical compatibility between on-board and trackside parts of the CCS subsystems

7.2.2. Legacy systems

7.2.3. Availability of Specific Transmission Modules

7.2.4. Additional Class B equipment on a line equipped with Class A

7.2.5. Rolling stock with Class A and Class B equipment

7.2.6. Conditions for mandatory and optional functions

7.3. GSM-R specific implementation rules

7.3.1. Trackside installations

7.3.2. On-board installations

7.4. ETCS specific implementation rules

7.4.1. Trackside installations

7.4.1.1. High-speed network

7.4.2. On-board installations

7.4.2.1. New vehicles

7.4.2.2. Upgrading and renewal of existing vehicles

▼B

7.4.2.3. Application of the TSI requirements for new vehicles during a transition phase

7.4.3. Additional requirements

7.4.4. National Implementation Plans

7.4a. ETCS and radio system compatibility checks implementation rules

7.5. Train detection systems specific implementation rules

7.6. Specific cases

7.6.1. Introduction

7.6.2. List of specific cases

7.6.2.1. Belgium

7.6.2.2. UK

7.6.2.3. France

7.6.2.4. Poland

7.6.2.5. Lithuania, Latvia and Estonia

7.6.2.6. Sweden

7.6.2.7. Luxembourg

7.6.2.8. Germany

7.6.2.9. Italy

7.6.2.10. Czech Republic

7.6.2.11. The Netherlands

Annex A

Annex B

Annex C

Annex D

Annex E

Annex F

Annex G

1. INTRODUCTION

1.1. **Technical scope**

This TSI concerns the Control Command and Signalling On-board Subsystem and the Control-Command and Signalling Trackside Subsystem.

This TSI is applicable to control-command and signalling trackside Subsystems of the rail network defined in the point 1.2 (Geographical scope) of this TSI and to the control-command and signalling on-board subsystems of vehicles which are (or are intended to be) operated on it. These vehicles are of one of the following types (as defined in ►**M1** Annex I point 2 of Directive (EU) 2016/797 ◄):

▼M1

(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.

▼M1

(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).

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.

▼B

1.3. **Content of this TSI**

In accordance with ►M1 Article 4(3) of Directive (EU) 2016/797 ◄, this TSI:

(1) indicates its intended scope — Chapter 2 (Subsystem Definition and Scope);

(2) lays down essential requirements for the Control-Command and Signalling Subsystems and their interfaces vis-à-vis other subsystems — Chapter 3 (The Essential Requirements of the Control-Command and Signalling Subsystems);

(3) lays down the functional and technical specifications to be met by the Subsystems and their interfaces vis-à-vis other subsystems — Chapter 4 (Characterisation of the Subsystem);

(4) determines the interoperability constituents and interfaces which must be covered by European specifications, including European standards, and which are necessary to achieve interoperability within the Union rail system — Chapter 5 (Interoperability Constituents);

(5) states, in each case under consideration, which procedures are to be used to assess the conformity or the suitability for use of the interoperability constituents and for the 'EC' verification of the subsystems — Chapter 6 (Assessing the Conformity and/or Suitability For Use of the Constituents and Verifying the Subsystems);

(6) indicates the strategy for implementing this TSI. — Chapter 7 (Implementing the Control-Command and Signalling Subsystems TSI);

(7) indicates the professional competences and health and safety conditions at work required for the staff operating and maintaining these subsystems and implementing the TSI — Chapter 4 (Characterisation of the Subsystem);

▼M1

(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).

▼B

In accordance with ►M1 Article 4(5) of Directive (EU) 2016/797 ◄, provisions for specific cases are indicated in Chapter 7 (Implementing the Control-Command and Signalling Subsystems TSI).

This TSI also sets out, in Chapter 4 (Characterisation of the Subsystems), the operating and maintenance rules which specifically apply to the scope indicated in paragraphs 1.1 and 1.2 above.

2. SUBSYSTEM DEFINITION AND SCOPE

2.1. Introduction

▼M1

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’.

▼B

The features of the Control-Command and Signalling Subsystems are:

(1) the functions that are essential for the safe control of railway traffic, and that are essential for its operation, including those required for degraded modes ([1]);

(2) the interfaces;

(3) the level of performance required to meet the essential requirements.

2.2. Scope

▼M1

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 ([2]).

([1]) Degraded modes are modes of operation designed to deal with faults. They have been taken into account when designing the Control-Command and Signalling Subsystems

([2]) Currently the CCS TSI does not specify any interoperability requirement for the interlockings, level crossings and certain other elements of the CCS.

▼B

The Control-Command and Signalling Subsystems include the following parts:

(1) train protection;

(2) voice radio communication;

(3) data radio communication;

(4) train detection.

The Class A train protection system is ETCS ([1]) whilst the Class A radio system is GSM-R.

For Class A train detection this TSI specifies only the requirements for the interface with other subsystems.

▼M1

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.

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.

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.’

▼B

The requirements for the Control-Command and Signalling On-board Subsystem are specified in relation to Class A radio mobiles and train protection.

The requirements for the Control-Command and Signalling Trackside Subsystem are specified in relation to:

(1) the Class A radio network;

(2) Class A train protection;

(3) the interface requirements for train detection systems, to ensure their compatibility with rolling stock.

▼M1

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.

([1]) In some documents referenced in this TSI the term ‘ERTMS’ (European Rail Traffic Management System) is used to indicate a system including both ETCS and GSM-R and ‘ETCS’ is indicated as ‘ERTMS/ETCS’.

▼M1

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.

▼B

3. THE ESSENTIAL REQUIREMENTS FOR THE CONTROL-COMMAND AND SIGNALLING SUBSYSTEMS

3.1. **General**

►M1 Directive (EU) 2016/797 ◄ requires that the subsystems and the interoperability constituents including interfaces meet the essential requirements set out in general terms in Annex III to the Directive.

The essential requirements are:

(1) Safety;

(2) Reliability and Availability;

(3) Health;

(4) Environmental Protection;

(5) Technical compatibility;

▼M1

(6) Accessibility.

▼B

The essential requirements for Class A systems are described below.

The requirements for Class B systems are the responsibility of the relevant Member State.

3.2. **Specific Aspects of the Control-Command and Signalling Subsystems**

▼M1

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.

▼M1

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 ([1]), as referred to in Article 6(1)(a) of Directive (EU) 2016/798 of the European Parliament and of the Council ([2]).

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.

([1]) 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).

([2]) 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).

▼B

3.2.2. *Reliability and Availability*

For the Class A system, the reliability and availability objectives are 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 safety characteristics relevant to interoperability).

▼M1

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.

▼B

3.2.3. *Health*

In accordance with Union legislation and with national legislation that is compatible with the Union legislation, care shall be taken to ensure that the materials used in and the design of the Control-Command and Signalling Subsystems do not constitute a health hazard to persons having access to them.

3.2.4. *Environmental Protection*

In accordance with Union legislation and with national legislation that is compatible with Union legislation:

(1) the Control-Command and Signalling equipment, if subjected to excessive heat or fire, shall not exceed limits for the emission of fumes or gases which are harmful to the environment;

(2) the Control-Command and Signalling equipment shall not contain substances which may abnormally contaminate the environment during their normal use;

(3) the Control-Command and Signalling equipment shall be subject to the Union legislation in force controlling the limits to the emission of and the susceptibility to electromagnetic interference along the boundaries of railway property;

(4) the Control-Command and Signalling equipment shall comply with existing regulations on noise pollution;

(5) the Control-Command and Signalling equipment shall not give rise to any inadmissible level of vibration which could jeopardise the integrity of the infrastructure (when the infrastructure is in the correct state of maintenance).

3.2.5. *Technical Compatibility*

Technical compatibility includes the functions, interfaces and performances required to achieve interoperability.

The requirements of technical compatibility are subdivided in the following three categories:

(1) The first category sets out the general engineering requirements for interoperability namely environmental conditions, internal electromagnetic compatibility (EMC) within the railway boundaries, and installation. These compatibility requirements are defined in this chapter.

(2) The second category describes how the Control Command and Signalling Subsystems have to be applied technically and what functions they have to perform to ensure interoperability. This category is defined in Chapter 4.

▼B

(3) The third category describes how the Control Command and Signalling Subsystems have to be operated in order that interoperability is achieved. This category is defined in Chapter 4.

3.2.5.1. Engineering Compatibility

3.2.5.1.1 Physical environmental conditions

Control Command and Signalling equipment shall be capable of operating under the climatic and physical conditions which characterise the area in which the relevant part of the Union rail system is located.

The requirements of basic parameter 4.2.16 (Construction of equipment used in CCS Subsystems) shall be respected.

3.2.5.1.2 Railway Internal Electromagnetic Compatibility

In accordance with Union legislation and with national legislation that is compatible with the Union legislation, the Control Command and Signalling equipment shall neither interfere with nor be interfered with by other control-command and signalling equipment or other subsystems.

The basic parameter related for electromagnetic compatibility between rolling stock and control-command and signalling trackside equipment is described in point 4.2.11 (Electromagnetic Compatibility).

▼M1

———————

3.2.6. *Accessibility*

No requirements are mandated for the CCS subsystems for the essential requirement accessibility.

▼B

4. CHARACTERISATION OF THE SUBSYSTEMS

4.1. **Introduction**

4.1.1. *Basic parameters*

In accordance with the relevant essential requirements, the Control-Command and Signalling Subsystems are characterised by the following basic parameters:

(1) Control-Command and Signalling safety characteristics relevant to interoperability (point 4.2.1)

(2) On-board ETCS functionality (point 4.2.2)

(3) Trackside ETCS functionality (point 4.2.3)

(4) Mobile communication functions for railways — GSM-R (point 4.2.4)

(5) ETCS and GSM-R air gap interfaces (point 4.2.5)

(6) On-board interfaces Internal to Control-Command and Signalling (point 4.2.6)

(7) Trackside interfaces Internal to Control-Command and Signalling (point 4.2.7)

(8) Key management (point 4.2.8)

(9) ETCS-ID management (point 4.2.9)

(10) Train detection systems (point 4.2.10)

▼B

(11) Electromagnetic compatibility between rolling stock and Control-Command and Signalling trackside equipment (point 4.2.11)

(12) ETCS DMI (driver-machine interface) (point 4.2.12)

(13) GSM-R DMI (driver-machine interface) (point 4.2.13)

(14) Interface to data recording for regulatory purposes (point 4.2.14)

(15) Visibility of trackside Control-Command and Signalling objects (point 4.2.15)

(16) Construction of equipment used in CCS subsystems (►M1 point 4.2.16 ◄)

▼M1

(17) ETCS and Radio System Compatibility (point 4.2.17).

▼B

4.1.2. *Overview of the requirements*

All requirements in point 4.2 (Functional and technical specifications of the Subsystems) related to these basic parameters shall be applied to the Class A system.

Requirements for Class B systems and for STMs (which enable the Class A On-board system to operate on Class B infrastructure) are the responsibility of the appropriate Member State.

This TSI is based on the principles of enabling the Control-Command and Signalling Trackside Subsystem to be compatible with TSI-compliant Control-Command and Signalling On-board Subsystems. To achieve this goal:

(1) functions, interfaces and performances of the Control-Command and Signalling On-board Subsystem are standardised, ensuring that every train will react in a predictable way to data received from trackside;

(2) for the Control-Command and Signalling Trackside Subsystem, track-to-train and train-to-track communication are fully standardised in this TSI. The specifications referenced in the points below allow Control-Command and Signalling trackside functionality to be applied in a flexible way, so that it can be optimally integrated into the railway system. This flexibility shall be exploited without ►M1 limiting the movement of vehicles with TSI-compliant on-board subsystems. ◄

The Control-Command and Signalling functions are classified in categories indicating whether they are optional or mandatory. The categories are defined in the specifications referred to in Annex A and these texts also state how the functions are classified.

Annex A, 4.1c provides the Glossary of ETCS terms and definitions, which are used in the specifications referred to in Annex A.

▼B

4.1.3. *Parts of Control-command and Signalling Subsystems*

According to point 2.2 (Scope) the Control-Command and Signalling Subsystems can be subdivided in parts.

The following table indicates which basic parameters are relevant for each subsystem and for each part.

▼M1

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

▼B

4.2. **Functional and technical specifications of the Subsystems**

4.2.1. ►M1 *Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability* ◄

This basic parameter describes the requirements for the Control-Command and Signalling On-board Subsystem and Trackside subsystem with reference to point 3.2.1 (Safety) and point 3.2.2 (Availability and Reliability).

In order to achieve interoperability, when implementing Control-Command and Signalling On-board and Trackside subsystems the following provisions shall be respected:

(1) The design, implementation and use of a Control-Command and Signalling On-board or Trackside subsystem shall not export any requirements:

(a) across the interface between Control-Command and Signalling On-board and Trackside subsystems in addition to the requirements specified in this TSI;

(b) to any other subsystem in addition to the requirements specified in the corresponding TSIs.

(2) The requirements set out in points 4.2.1.1 and 4.2.1.2 below shall be respected.

4.2.1.1. S a f e t y

The Control-Command and Signalling On-board and Trackside subsystems shall respect the requirements for ETCS equipment and installations stated in this TSI.

▼B

For the hazard ‘exceeding speed and/or distance limits advised to ETCS’ the tolerable rate (THR) is 10^{-9} h^{-1} for random failures, for on-board ETCS and for trackside ETCS. See Annex A 4.2.1 a.

To achieve interoperability, the on-board ETCS shall fully respect all requirements specified in Annex A 4.2.1. Nevertheless, less stringent safety requirements are acceptable for trackside ETCS provided that, in combination with TSI-compliant Control-Command and Signalling On-board subsystems, the safety level for the service is met.

4.2.1.2. Availability/Reliability

This point refers to the occurrence of failure modes not causing safety hazards but creating degraded situations, the management of which could decrease the overall safety of the system.

In the context of this parameter, ‘failure’ means the termination of the ability of an item to perform a required function with the required performance and ‘failure mode’ means the effect by which the failure is observed.

To ensure that the relevant infrastructure managers and railway undertaking are given all the information they need to define appropriate procedures for managing degraded situations, the technical file accompanying the EC declaration of verification for an on-board or trackside CCS subsystem shall contain the calculated availability/reliability values related to failure modes having an impact on the capability of the CCS subsystem to supervise the safe movement of one or more vehicles or to establish radio voice communication between traffic control and the train drivers.

Compliance with the following calculated values shall be ensured:

(1) Mean time of hours of operation between failures of a CCS on-board subsystem requiring the isolation of the train protection functions: (open point).

(2) Mean time of hours of operation between failures of a CCS on-board subsystem preventing radio voice communication between traffic control and the train driver: (open point).

To allow the infrastructure managers and railway undertakings to monitor, during the life of the subsystems, the level of risk and the respect of the reliability/availability values used for the definition of procedures to manage degraded situations, the requirements for maintenance stated in point 4.5 (Maintenance rules) shall be respected.

▼M1

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;

▼M1

(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.

▼**M1**

(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.

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;

▼M1

(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).

▼B

4.2.4. *Mobile communication functions for railways GSM-R*

This basic parameter describes the radio communication functions. Such functions shall be implemented in the Control-Command and Signalling On-board and Trackside subsystems, according to the specifications indicated below.

4.2.4.1. Basic communication function

The general requirements are specified in Annex A 4.2.4a.

In addition, the following specifications shall be respected:

(1) ASCI features; Annex A 4.2.4b;

(2) SIM card; Annex A 4.2.4c;

(3) location-dependent addressing; Annex A 4.2.4e.

4.2.4.2. Voice and operational communication applications

The general requirements are defined in Annex A 4.2.4f.

The requirements for tests are specified in Annex A 4.2.4g.

In addition, the following specifications shall be respected:

(1) confirmation of high priority calls; Annex A 4.2.4h;

(2) functional addressing; Annex A 4.2.4j;

▼B

(3) presentation of functional numbers; Annex A 4.2.4k;

(4) User-to-User Signalling; Annex A 4.2.4d.

4.2.4.3. Data communication applications for ETCS

The general requirements are defined in Annex A 4.2.4f.

The requirements for tests are specified in Annex A 4.2.4g.

The 'data radio communication' part of the On-board Control-command and Signalling Subsystem shall be able to support the establishment of at least two simultaneous communication sessions with the Trackside Control-command and signalling Subsystem.

This functionality is mandatory only in the case of ETCS level 2 and level 3 and radio in-fill applications.

4.2.5. *ETCS and GSM-R air gap interfaces*

This basic parameter specifies the requirements for the air gap between Control-Command and Signalling Trackside and On-board subsystems and has to be taken into account in conjunction with the requirements for the interfaces between ETCS and GSM-R equipment, as specified in point 4.2.6 (On-board Interfaces Internal to Control-Command and Signalling) and point 4.2.7 (Trackside Interfaces Internal to Control-Command and Signalling).

This basic parameter includes:

(1) the physical, electrical and electromagnetic values to be respected to allow safe functioning;

(2) the communication protocol to be used;

(3) the availability of the communication channel.

The applicable specifications are listed below.

4.2.5.1. Radio communications with the train

Class A radio communication interfaces shall operate in the frequency band specified in Annex A 4.2.5a and in Annex A 4.2.4f.

On-board Control-command and Signalling Subsystems shall be protected against interference, fulfilling the requirements specified in Annex A 4.2.4f.

For data communication the protocols shall comply with Annex A 4.2.5b.

Where radio in-fill is implemented, the requirements stated in Annex A 4.2.5c shall be respected.

4.2.5.2. Eurobalise communication with the train

Eurobalise communication interfaces shall comply with Annex A 4.2.5d.

4.2.5.3. Euroloop communication with the train

Euroloop communication interfaces shall comply with Annex A 4.2.5e.

▼B

4.2.6. *On-Board Interfaces Internal to Control-Command and Signalling*

This Basic Parameter consists of three parts.

4.2.6.1. ETCS and Class B train protection

Where ETCS and Class B train protection functions are installed on-board, the transitions between them can be managed with a standardised interface as specified in Annex A, 4.2.6 a.

Annex A, 4.2.6b specifies the K interface (to allow certain STMs to read information from Class B balises through the ETCS on-board antenna) and Annex A 4.2.6c the G interface (air gap between ETCS on-board antenna and Class B balises).

Implementation of Interface 'K' is optional, but if done it must be in accordance with Annex A, 4.2.6b.

Furthermore, if Interface 'K' is implemented, the on-board transmission channel functionality must be able to handle the properties of Annex A, 4.2.6c.

If the transitions between ETCS and Class B train protection on-board are not managed using the standardised interface specified in Annex A, 4.2.6 a, steps must be taken to ensure that the method used does not impose any additional requirements on the Control-Command and Signalling Trackside Subsystem.

4.2.6.2. Interface between GSM-R Radio Data Communication and ETCS

The requirements for the interface between the Class A radio and the on-board ETCS functionality are specified in Annex A 4.2.6d.

Where radio in-fill is implemented the requirements stated in Annex A 4.2.6e shall be respected.

4.2.6.3. Odometry

The interface between the odometry function and on-board ETCS shall meet the requirements of Annex A, ►**M1** ——————— ◄. This interface contributes to this Basic Parameter only when odometry equipment is supplied as a separate interoperability constituent (see point 5.2.2, Grouping of interoperability constituents).

4.2.7. *Trackside Interfaces Internal to Control-Command and Signalling*

This Basic Parameter consists of five parts.

4.2.7.1. Functional interface between RBCs

This interface defines the data to be exchanged between neighbouring RBCs to allow the safe movement of a train from one RBC area to the next:

(1) Information from the 'Handing Over' RBC to the 'Accepting' RBC.

▼B

(2) Information from the ‘Accepting’ RBC to the ‘Handing Over’ RBC.

The requirements are specified in Annex A, 4.2.7a.

4.2.7.2. RBC/RBC

This is the technical interface between two RBCs. The requirements are specified in Annex A, 4.2.7b.

4.2.7.3. GSM-R/trackside ETCS

This is the interface between the Class A radio system and the trackside ETCS functionality. The requirements are specified in Annex A, 4.2.7c.

4.2.7.4. Eurobalise/LEU

This is the interface between Eurobalise and the LEU. The requirements are specified in Annex A, 4.2.7d.

This interface contributes to this basic parameter only when Eurobalise and LEU are supplied as separate interoperability constituents (see point 5.2.2, Grouping of interoperability constituents).

4.2.7.5. Euroloop/LEU

This is the interface between Euroloop and the LEU. The requirements are specified in Annex A, 4.2.7e.

This interface contributes to this Basic Parameter only when Euroloop and LEU are supplied as separate interoperability constituents (see point 5.2.2, Grouping of interoperability constituents).

4.2.8. *Key Management*

This basic parameter specifies requirements for the management of cryptographic keys used for the protection of data transmitted via radio.

The requirements are specified in Annex A 4.2.8a. Only requirements related to the interfaces of Control-Command and Signalling equipment fall within the scope of this TSI.

4.2.9. *ETCS-ID Management*

This basic parameter concerns the ETCS-identities (ETCS-IDs) for equipment in Control-Command and Signalling Trackside and On-board Subsystems.

The requirements are specified in Annex A, 4.2.9a.

4.2.10. *Trackside Train Detection Systems*

This basic parameter specifies the interface requirements between the trackside train detection systems and rolling stock, related to vehicle design and operation.

The interface requirements to be respected by the train detection systems are specified in Annex A 4.2.10a.

▼B

4.2.11. *Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment*

This basic parameter specifies the interface requirements for electromagnetic compatibility between rolling stock and trackside ►M1 Control-Command and Signalling train detection equipment. ◄

The interface requirements to be respected by the train detection system are specified in Annex A 4.2.11a

4.2.12. *ETCS DMI (Driver-Machine Interface)*

This basic parameter describes the information provided from ETCS to the driver and entered into the on-board ETCS by the driver. See Annex A, 4.2.12a.

It includes:

(1) ergonomics (including visibility);

(2) ETCS functions to be displayed;

(3) ETCS functions triggered by driver input.

4.2.13. *GSM-R DMI (Driver-Machine Interface)*

This basic parameter describes the information provided from GSM-R to the driver and entered into the GSM-R on-board by the driver. See Annex A, 4.2.13a.

It includes:

(1) ergonomics (including visibility);

(2) GSM-R functions to be displayed;

(3) call-related information outgoing;

(4) call-related information incoming.

4.2.14. *Interface to Data Recording for Regulatory Purposes*

This basic parameter describes:

(1) data exchange between the on-board ETCS and the rolling stock recording device;

(2) communication protocols;

(3) physical interface.

See Annex A 4.2.14a.

4.2.15. *Visibility of trackside Control-Command and Signalling objects*

This basic parameter describes:

(1) the characteristics of retro-reflecting signs to ensure correct visibility;

▼B

(2) the characteristics of interoperable marker boards.

See Annex A 4.2.15a.

In addition, the installation of trackside Control-Command and Signalling objects shall be compatible with the driver's field of view and the infrastructure requirements.

4.2.16. *Construction of equipment used in CCS subsystems*

The environmental conditions specified in the documents listed in Annex A, Table A2 of this TSI shall be respected.

Requirements for materials referred to in Regulation (EU) No 1302/2014 (LOC&PAS TSI) (e.g. related to fire protection) shall be respected ►M1 by Control-command and signalling On-board Interoperability Constituents and Subsystems ◄.

▼M1

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.

▼B

4.3. **Functional and technical specifications of the interfaces to other Subsystems**

▼M1

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).

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

▼M1

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
			HS RS TSI 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
			CR RS TSI	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
			CR RS TSI	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
			CR RS TSI	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
			HS RS TSI Service braking	4.2.4.4
			CR RS TSI Emergency braking	4.2.4.5.2
			CR RS TSI Service braking	4.2.4.5.3
			LOC & PAS TSI Emergency braking	4.2.4.5.2
			LOC & PAS TSI 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
			CR RS TSI	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
			CR RS TSI	4.2.12.3
			LOC & PAS TSI	4.2.12.3
			Wagon TSI	none

▼M1

Interface with Rolling Stock TSIs				
Reference CCS TSI		Reference Rolling Stock TSIs		
Parameter	Point	Parameter		Point
Data interfaces	4.2.2	Monitoring and diagnostic concepts	HS RS TSI	4.2.7.10
			CR RS TSI	4.2.1.1
			LOC & PAS TSI	4.2.1.1
			Wagon TSI	None
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 line of sight	4.2.2.6 b
			windscreen	4.2.2.7
			CR RS TSI line of sight	4.2.9.1.3.1
			windscreen	4.2.9.2
			LOC & PAS TSI line of sight	4.2.9.1.3.1
			windscreen	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 4.2.3	Phase separation	HS RS TSI	4.2.8.3.6.7
			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.

▼B

4.3.3. *Interfaces to Infrastructure Subsystem*

Interface with Infrastructure TSI				
Reference CCS TSI		Reference Infrastructure TSI		
Parameter	Clause	Parameter		Clause
Train detection systems (space for installation)	4.2.10	Minimum infrastructure gauge Structure gauge Structure gauge	HS INF TSI (1) CR INF TSI (2) INF TSI (3)	4.2.3 4.2.4.1 4.2.3.1
Eurobalise communication (space for installation)	4.2.5.2	Minimum infrastructure gauge Structure gauge Structure gauge	HS INF TSI CR INF TSI INF TSI	4.2.3 4.2.4.1 4.2.3.1
Euroloop communication (space for installation)	4.2.5.3	Minimum infrastructure gauge Structure gauge Structure gauge	HS INF TSI CR INF TSI INF TSI	4.2.3 4.2.4.1 4.2.3.1
Visibility of trackside Control-Command and Signalling objects	4.2.15	Minimum infrastructure gauge Structure gauge Structure gauge	HS INF TSI CR INF TSI INF TSI	4.2.3 4.2.4.1 4.2.3.1

(1) HS INF TSI is 2008/217/EC: Commission Decision of 20 December 2007 concerning a technical specification for interoperability relating to the infrastructure sub-system of the trans-European high-speed rail system (OJ L 77, 19.3.2008, p. 1).
(2) CR INF TSI is 2011/275/EU: Commission Decision of 26 April 2011 concerning a technical specification for interoperability relating to the 'infrastructure' subsystem of the trans-European conventional rail system (OJ L 126, 14.5.2011, p. 53).
(3) INF TSI is 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).

4.3.4. *Interfaces to Energy Subsystem*

Interface with Energy TSI				
Reference CCS TSI		Reference Energy TSI		
Parameter	Clause	Parameter		Clause
Commands to rolling stock equipment	4.2.2 4.2.3	►**M1** Phase separation sections ◄ System separation points Phase separation points System separation points Phase separation points System separation points	HS ENE TSI (1) CR ENE TSI (2) ENE TSI (3)	4.2.21 4.2.22 4.2.19 4.2.20 4.2.15 4.2.16

(1) HS ENE TSI is 2008/284/EC: Commission Decision of 6 March 2008 concerning a technical specification for interoperability relating to the energy sub-system of the trans-European high-speed rail system (OJ L 104, 14.4.2008, p. 1).
(2) CR ENE TSI is 2011/274/EU: Commission Decision of 26 April 2011 concerning a technical specification for interoperability relating to the 'energy' subsystem of the trans-European conventional rail system (OJ L 126, 14.5.2011, p. 1).
(3) ENE TSI is Commission Regulation (EU) No 1301/2014 of 18 November 2014 on the technical specifications for interoperability relating to the 'energy' subsystem of the rail system in the Union (OJ L 356, 12.12.2014, p. 179).

▼B

4.4. **Operating rules**

The rules for operating a railway service with ETCS and GSM-R are specified in the ►M1 Operation and Traffic Management TSI ◄.

4.5. **Maintenance rules**

The maintenance rules of the subsystems covered by this TSI shall ensure that the values quoted in the basic parameters indicated in Chapter 4 are maintained within the required limits throughout the lifetime of the subsystems. However, during preventative or corrective maintenance, the subsystem may not be able to respect the values quoted in the basic parameters; the maintenance rules shall ensure that safety is not prejudiced during these activities.

The entity in charge of the Control-Command and Signalling Subsystems shall set up maintenance rules to achieve the above objectives. To assist with the preparation of these rules, the following requirements shall be respected.

4.5.1. *Responsibility of the manufacturer of equipment*

The manufacturer of equipment incorporated in the subsystem shall specify:

(1) 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 equipment life-cycle (transport and storage before installation, normal operation, failures, repair work, checking and maintenance, decommissioning, etc.). ►M1 For equipment error corrections see point 6.5; ◄

(2) the health and safety risks that may affect the public and the maintenance staff;

(3) the conditions for first line maintenance, i.e. the definition of Line Replaceable Units (LRUs), the definition of approved compatible versions of hardware and software, the procedures for replacing failed LRUs, the conditions for storing LRUs and for repairing failed LRUs;

(4) the checks to be carried out if equipment is subject to exceptional stress (e.g. adverse environmental conditions or abnormal shocks);

(5) the checks to be carried out when maintaining equipment other than Control-Command and Signalling equipment and which influences the Control-Command and Signalling Subsystems (e.g. changing the wheel diameter).

4.5.2. *Responsibility of the applicant for subsystem verification*

The applicant shall:

(1) ensure that the maintenance requirements as described in point 4.5.1 (Responsibility of the Manufacturer of Equipment) are defined for all components within the scope of this TSI regardless of whether or not they are interoperability constituents;

▼B

(2) complete the above requirements taking into account the risks arising from interactions between different components of the subsystem and interfaces to other subsystems.

4.6. **Professional competences**

The manufacturers of the equipment and of the subsystem shall provide information sufficient to define the professional competences required for the installation, final inspection and maintenance of the Control-Command and Signalling Subsystems. See point 4.5 (Maintenance rules).

4.7. **Health and safety conditions**

Care shall be taken to ensure health and safety for maintenance and operations staff, in accordance with Union legislation and the national legislation that is compatible with the Union legislation.

Manufacturers shall indicate the risks for health and safety that arise from using and maintaining their equipment and subsystems. See point 4.4 (Operating rules) and point 4.5 (Maintenance rules).

▼M1

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 ([1]) and Commission Implementing Regulation (EU) 2019/777 ([2]).

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 ([3]).

▼B

5. INTEROPERABILITY CONSTITUENTS

▼M1

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.

▼B

5.2. **List of interoperability constituents**

5.2.1. *Basic interoperability constituents*

The basic interoperability constituents in the Control-Command and Signalling Subsystems are defined in:

(1) Table 5.1.a for the Control-Command and Signalling On-board Subsystem;

([1]) 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).

([2]) 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).

([3]) 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).

▼B

(2) Table 5.2.a for the Control-Command and Signalling Trackside Subsystem.

5.2.2. *Grouping of interoperability constituents*

The functions of basic interoperability constituents may be combined to form a group. This group is then defined by those functions and by its remaining external interfaces. If a group is formed in this way, it shall be considered as an interoperability constituent.

(1) Table 5.1.b lists the groups of interoperability constituents of the Control-Command and Signalling On-board Subsystem.

(2) Table 5.2.b lists the groups of interoperability constituents of the Control-Command and Signalling Trackside Subsystem.

▼M1

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.

▼B

5.3. **Constituents' performance and specifications**

For each basic interoperability constituent or group of interoperability constituents, the tables in Chapter 5 describe:

(1) in column 3, the functions and interfaces. Note that some interoperability constituents have functions and/or interfaces that are optional;

(2) in column 4, the mandatory specifications for the conformity assessment of each function or interface (where applicable) by reference to the relevant point of Chapter 4.

▼M1

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
		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

▼**M1**

1	2	3	4
No	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
		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
		Construction of equipment	4.2.16
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 Note: SIM card, antenna, connecting cables and filters are not part of this interoperability constituent	Reliability, Availability, Maintainability, (RAM)	4.2.1.2 4.5.1
		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 Note: SIM card, antenna, connecting cables and filters are not part of this interoperability constituent	Reliability, Availability, Maintainability (RAM)	4.2.1.2 4.5.1
		Basic communication functions	4.2.4.1
		ETCS data communication applications	4.2.4.3
		Interfaces — On-board ETCS — GSM-R air gap	 4.2.6.2 4.2.5.1
		Construction of equipment	4.2.16

▼M1

1	2	3	4
No	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
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

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 — 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 — Key management system — ETCS-ID Management — ETCS Driver Machine Interface — Train interface — On-board recording device	 4.2.6.1 4.2.6.2 4.2.8 4.2.9 4.2.12 4.2.2 4.2.14
		Construction of equipment	4.2.16

▼M1

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

▼M1

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

▼B

Table 5.2.b

Groups of interoperability constituents in the Control-Command and Signalling Trackside Subsystem

This table is an example to show the structure. Other groups are allowed

1	2	3	4
N	Group of interoperability constituents	Characteristics	Specific requirements to be assessed by reference to Chapter 4
1	Eurobalise LEU Eurobalise	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		Trackside ETCS functionality (excluding communication via Euroloop and level 2 and level 3 functionality)	4.2.3
		ETCS and GSM-R air gap interfaces: only Eurobalise communication with train	4.2.5.2
		Construction of equipment	4.2.16
2	Euroloop LEU Euroloop	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		Trackside ETCS functionality, (excluding communication via Eurobalise and level 2 and level 3 functionality)	4.2.3
		ETCS and GSM-R air gap interfaces: only Euroloop communication with train	4.2.5.3
		Construction of equipment	4.2.16

6. ASSESSING THE CONFORMITY AND/OR SUITABILITY FOR USE OF THE CONSTITUENTS AND VERIFYING THE SUBSYSTEMS

▼M1

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;

▼**M1**

(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 [1] 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.

[1] The template to be used to provide this information will be defined in the Application Guide.

▼**M1**

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.

▼**M1**

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.

▼**B**

6.2. **Interoperability constituents**

6.2.1. *Assessment procedures for Control-Command and Signalling Interoperability Constituents*

Before placing on the market an interoperability constituent and/or groups of interoperability constituents the manufacturer or his authorised representative established within the European Union shall draw up an 'EC' declaration of conformity in accordance with ►**M1** Article 10(1) and Article 9(2) of Directive (EU) 2016/797 ◄.

The assessment procedure shall be carried out using one of the modules specified in point 6.2.2 (Modules for Control-Command and Signalling Interoperability Constituents).

An 'EC' declaration of suitability for use is not required for Control-Command and Signalling interoperability constituents. Compliance with relevant basic parameters, as demonstrated by the 'EC' Declaration of conformity, is sufficient for placing the interoperability constituents on the market ([1]).

6.2.2. *Modules for Control-Command and Signalling Interoperability Constituents*

For assessing interoperability constituents within the Control-Command and Signalling Subsystems, the manufacturer or his authorised representative established within the European Union, may choose:

([1]) Checking that an Interoperability Constituent is used appropriately is part of the overall EC verification of Control-Command and Signalling On-board and Track-side Subsystems, as explained in 6.3.3 and 6.3.4.

▼B

(1) either the type-examination procedure (Module CB) for the design and development phase in combination with the production quality management system procedure (Module CD) for the production phase; or

(2) the type-examination procedure (Module CB) for the design and development phase in combination with the product verification procedure (Module CF); or

(3) the full quality management system with design examination procedure (Module CH1).

In addition, for checking the SIM card Interoperability Constituent, the manufacturer or his representative may choose module CA.

The modules are described in detail in the Commission Decision 2010/713/EU ([1]).

The following clarifications apply to the use of some of the modules:

(1) with reference to Chapter 2 of the 'Module CB', 'EC'-type examination shall be carried out through a combination of production type and design type;

(2) with reference to Chapter 3 of the 'Module CF' (product verification) statistical verification is not allowed, i.e. all interoperability constituents shall be individually examined.

6.2.3. *Assessment requirements*

Independently of the selected module:

(1) the requirements stated in point 6.2.4.1 of this TSI shall be respected for the 'On-board ETCS' interoperability constituent,

(2) the activities shown in Table 6.1 shall be carried out when assessing the conformity of an interoperability constituent or a group of interoperability constituents as defined in Chapter 5 of this TSI. All verifications shall be carried out by reference to the applicable table in Chapter 5 and the basic parameters indicated there.

▼M1

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

([1]) 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).

▼**M1**

No	Aspect	What to assess	Supporting evidence
		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)	Check compliance with the safety requirements described in the basic parameters referenced in the relevant table of Chapter 5, i.e. 1. respect for quantitative Tolerable Hazard Rates (THRs) caused by random failures 2. the development process is able to detect and eliminate systematic failures	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) 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 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)

▼**M1**

No	Aspect	What to assess	Supporting evidence
			Note: The standard shall satisfy at least the following requirements: 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	Tests of equipment (full Interoperability Constituent or separately for subassemblies) in operational conditions, with repair when defects are detected. 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).
6		Check compliance with maintenance requirements – point 4.5.1	Document check

▼**B**

6.2.4. *Special issues*

6.2.4.1. Mandatory tests for the on-board ETCS

Particular attention shall be given to assessing the conformity of the on-board ETCS interoperability constituent, since it is complex and plays a key role in achieving interoperability.

Regardless of whether module CB or CH1 is chosen, the Notified Body shall check that

(1) a representative specimen of the interoperability constituent has been submitted to a full set of test sequences including all test cases necessary to check the functions referenced in point 4.2.2 (on-board ETCS functionality). The applicant is responsible to define the test cases and their organisation in sequences, if this is not included in specifications referenced in this TSI;

▼M1

(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 ([1]) 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.

▼B

The laboratory shall provide a full report clearly indicating the results of the tests cases and sequences used. The Notified Body is responsible to assess the suitability of test cases and sequences to check compliance with all relevant requirements and to evaluate the results of tests in view of the certification of the Interoperability Constituent.

6.2.4.2. The Specific Transmission Module (STM)

Each Member State shall be responsible for verifying that STMs conform to its national requirements.

Verification of the STM interface to the on-board ETCS requires a conformity assessment carried out by a Notified Body.

▼M1

———————

▼B

6.3. **Control-Command and Signalling Subsystems**

▼M1

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.

([1]) 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).

▼B

6.3.2. *Modules for Control-Command and Signalling Subsystems*

All modules indicated below are specified in the Commission Decision 2010/713/EU.

6.3.2.1. On-board Subsystem

For verifying the Control-Command and Signalling On-board Subsystem, the applicant may choose either:

(1) the type-examination procedure (Module SB) for the design and development phase in combination with the production quality management system procedure (Module SD) for the production phase; or

(2) the type-examination procedure (Module SB) for the design and development phase in combination with the product verification procedure (Module SF); or

(3) the full quality management system with design examination procedure (Module SH1).

6.3.2.2. Trackside Subsystem

For verifying the Control-Command and Signalling Trackside Subsystem, the applicant may choose either:

(1) the unit verification procedure (Module SG); or

(2) the type-examination procedure (Module SB) for the design and development phase in combination with the production quality management system procedure (Module SD) for the production phase; or

(3) the type-examination procedure (Module SB) for the design and development phase in combination with the product verification procedure (Module SF); or

(4) the full quality management system with design examination procedure (Module SH1).

▼M1

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.

▼B

6.3.3. *Assessment requirements for an On-board Subsystem*

Table 6.2 shows the checks that must be carried out when verifying a Control-Command and Signalling On-board Subsystem and the basic parameters that must be respected.

Independently of the module chosen:

(1) verification shall demonstrate that the Control-Command and Signalling On-board Subsystem complies with basic parameters when it is integrated into the vehicle;

(2) the functionality and performances of interoperability constituents already covered by their EC Declaration of conformity do not require additional verifications,

▼M1

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
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)

▼M1

No	Aspect	What to assess	Supporting evidence
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 [1]
		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.
		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

▼M1

No	Aspect	What to assess	Supporting evidence
7	Integration with Control-Command and Signalling Trackside Subsystems and other subsystems: tests under conditions representing the intended operation.	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: 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 These tests must also be such as to increase confidence that there will be no systematic failures. 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. Tests under environmental conditions are not necessary for on-board GSM-R voice equipment. Note: Indicate in the certificate which conditions have been tested and which standards have been applied.	Reports of test runs.

([1]) In this case, the assessment of the management of transitions shall be according to national specifications.

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.

▼M1

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.

▼B

6.3.4. *Assessment requirements for a Trackside Subsystem*

The purpose of assessments carried out within the scope of this TSI is to verify that the equipment complies with the requirements stated in Chapter 4.

However, for the design of the ETCS part of the Control-Command and Signalling Trackside Subsystem, application-specific information is needed. This shall include:

(1) line characteristics such as gradients, distances, positions of route elements and Eurobalises/Euroloops, locations to be protected, etc.;

(2) the signalling data and rules to be handled by the ETCS system.

This TSI does not cover checks to assess whether the application-specific information is correct:

Regardless of the module chosen:

(1) Table 6.3 shows the checks that shall be carried out to verify a Control-Command and Signalling Trackside Subsystem and the basic parameters that shall be respected;

(2) functionality and performance that have already been checked at the level of the interoperability constituents do not require additional verification.

▼M1

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

▼**M1**

No	Aspect	What to assess	Supporting evidence
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
		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 (N/A for IC axle counter)	Check of design specifications
		For IC axle counters (only): The integration of the IC in the subsystem has to be verified: Check index 77 document points 3.1.2.1, 3.1.2.4 and 3.1.2.5 only. Check the correct installation of equipment and conditions specified by the manufacturer and/or the Infrastructure manager.	Document check
3	Visibility of trackside Control-Command objects	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	Design documentation, results of tests or test runs with TSI compliant rolling stock
4	Integration with infrastructure	Check that the equipment has been properly installed — Basic parameters 4.2.3, 4.2.4 and conditions for installation specified by the manufacturer	Results of checks (according to specifications referenced in the basic parameters and manufacturer's installation rules)
		Check that the Control-Command and Signalling Trackside subsystem equipment is compatible with the trackside environment – Basic parameter 4.2.16	Document check (certificates of interoperability constituents and possible methods of integration checked against trackside characteristics)
5	Integration with trackside signalling	Check that all functions required by the application are implemented in accordance with specifications referenced in this TSI — Basic parameter 4.2.3	Document check (applicant's design specification and certificates of interoperability constituents)

▼M1

No	Aspect	What to assess	Supporting evidence
		Check the correct configuration of parameters (Eurobalise telegrams, RBC messages, marker boards positions, etc.)	Document check (values of parameters checked against characteristics of trackside and of signalling)
		Check that the interfaces are correctly installed and function properly.	Design verification and tests according to information supplied by the applicant
		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)	Design verification and tests according to the information supplied by the applicant
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 Check the correct installation of equipment and conditions specified by the manufacturer and/or the Infrastructure manager.	Evidence of compatibility of equipment from existing installations (for systems already in use); perform tests according to standards for new types. 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

▼M1

No	Aspect	What to assess	Supporting evidence
9	Integration with Control-Command and Signalling On-board Subsystems and rolling stock: tests under conditions representing the intended operation.	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: 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 These tests will also increase confidence in the absence of systematic failures. 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. Note: Indicate in the certificate which conditions have been tested and which standards have been applied.	Reports of test runs.
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.

▼B

6.4. **Provisions in case of the partial fulfilment of TSI requirements**

▼M1

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

▼**M1**

(2) the fulfilment of the TSI requirements already assessed for other parts of the same subsystem has not been modified.

▼**B**

6.4.2. *Assessment in case of application of National Rules*

If some essential requirements are fulfilled by national rules, the EC certificate of conformity for an interoperability constituent and the ►**M1** EC certificate ◄ of verification for a subsystem shall make precise reference to the parts of this TSI whose conformity has been assessed and the parts whose conformity has not been assessed.

6.4.3. *Partial fulfilment of the requirements due to limited application of the TSI*

6.4.3.1. Interoperability constituents

If an interoperability constituent does not implement all functions, performance and interfaces specified in this TSI, an EC certificate of conformity may only be issued if the unimplemented functions, interfaces or performance are not required to integrate the interoperability constituent into a subsystem for the use indicated by the applicant, for example ([1]),

(1) the on-board ETCS interface to STM if the interoperability constituent is intended for installation on vehicles in which no external STM is needed;

(2) the RBC interface to other RBCs, if the RBC is intended for use in an application for which no neighbouring RBCs are planned.

The EC certificate of conformity (or accompanying documents) for the interoperability constituent shall fulfil all the following requirements:

(1) it indicates which functions, interfaces or performance are not implemented;

(2) it provides enough information to make it possible to identify the conditions under which the interoperability constituent can be used;

(3) it provides enough information to make it possible to identify the conditions of and restriction on the use that will apply to the interoperability of a subsystem incorporating it.

6.4.3.2. Subsystems

If a control-command and signalling subsystem does not implement all functions, performance and interfaces of this TSI (e.g. because they are not implemented by an interoperability constituent integrated into it), the certificate of verification shall indicate which requirements have been assessed and the corresponding conditions and restrictions on the use of the subsystem and its compatibility with other subsystems.

([1]) The procedures described in this Chapter do not prejudice the possibility of grouping constituents together.

▼M1

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.

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.

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.

▼B

7. IMPLEMENTING THE TSI CONTROL-COMMAND AND SIGNALLING

7.1. **Introduction**

This Chapter outlines the strategy and the associated technical measures for implementing the TSI, and in particular the conditions for migrating to Class A systems.

Account must be taken of the fact that the implementation of a TSI occasionally has to be coordinated with the implementation of other TSIs.

7.2. **Generally applicable rules**

7.2.1. *Upgrading or renewing the Control-Command Subsystems or parts of them*

Upgrading or renewing the Control-Command and Signalling Subsystems may concern any or all of the parts constituting them, as specified in point 2.2.

▼B

The different parts of the Control-Command and Signalling Subsystems may therefore be upgraded or renewed separately, if interoperability is not jeopardised.

See Chapter 4.1 (Introduction) for the definition of the basic parameters for each part.

▼M1

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.

([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).

▼**M1**

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 ([1*]) 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

([1*]) 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.

▼**M1**

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
4.2.4 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
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.

▼M1

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
4.2.5.1 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.

▼M1

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 ([1*]) 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 ([2*]).

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 ([3*]) 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

([1*]) 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.

([2*]) 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.

([3*]) 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.

▼M1

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 ([1*]).

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 4.2.4.2	Mobile communication functions for railways GSM-R Voice and operational communication application	Not fulfilling all the conditions in point 7.2.1b.3
4.2.4 4.2.4.3	Mobile communication functions for railways GSM-R Data communication applications for ETCS	Not fulfilling all the conditions in point 7.2.1b.3

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.

([1*]) 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.

▼M1

4. In order to establish the EC certificate, the Notified Body may to 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 ([1*]) remains unchanged or is set to the state already expected during the original certification or authorisation.

([1*]) 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.

▼M1

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 ([1*]).

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 ([2*]) 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 ([3*]).

([1*]) 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.

([2*]) 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.

([3*]) 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.

▼M1

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 (1*) 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 (2*).

▼B

7.2.2. *Legacy systems*

Member States shall ensure that the functionality of the legacy systems and their interfaces remains unchanged, except where modifications are needed to mitigate safety-related flaws in these systems.

7.2.3. *Availability of Specific Transmission Modules*

If lines that fall within the scope of this TSI are not equipped with the Class A train protection system, the Member State shall make every effort to ensure the availability of an external Specific Transmission Module (STM) for its legacy Class B train protection system or systems.

In this context, due regard is to be given to ensuring an open market for STMs under fair commercial conditions. If, for technical or commercial reasons (3*) the availability of an STM cannot be ensured, the Member State concerned shall inform the Committee referred to in ►M1 Article 51(1) of Directive (EU) 2016/797 ◄ of the underlying reasons for the problem and of the mitigation measures that it intends to put into place in order to allow operators — and in particular foreign operators — access to its infrastructure.

7.2.4. *Additional Class B equipment on a line equipped with Class A*

On a line equipped with ETCS and/or GSM-R, additional Class B equipment may be installed in order to allow the operation of rolling stock not compatible with Class A during the migration phase.

(1*) On-board subsystems with conditions and restrictions of use or non-detected deficiencies are not considered compliant regarding this clause.

(2*) 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.

(3*) E.g. the feasibility of the external STM concept cannot be technically guaranteed or potential issues relating to the ownership of the intellectual property rights of the Class B systems prevent the timely development of an STM product.

▼B

Trackside shall support transitions between Class A and Class B without imposing on the Control-Command and Signalling On-board Subsystem requirements additional to those specified in this TSI.

7.2.5. *Rolling stock with Class A and Class B equipment*

Rolling stock may be equipped with both Class A and Class B systems to enable operation on several lines.

The Member State concerned may restrict the use of an on-board Class B system on lines where the corresponding system is not installed trackside.

When running on a line which is equipped with both Class A and Class B systems, a train that is also equipped with both Class A and Class B systems may use the Class B systems as a fallback arrangement. Being equipped with a Class B system in addition to Class A shall not be a requirement for the compatibility of a vehicle with lines where Class B is installed in parallel with Class A.

The Class B train protection systems may be implemented:

(1) using an STM operating via the standard interface (‘external STM’); or

(2) integrated within the ETCS equipment or connected via a non-standard interface; or

(3) independently from the ETCS equipment, for example via a system that enables switching between equipment. The railway undertaking must then ensure that the transitions between Class A and Class B train protection are carried out in conformity with the requirements of this TSI and with the national rules for the Class B system.

▼M1

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).

▼M1

(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.

▼B

7.3. **GSM-R specific implementation rules**

7.3.1. *Trackside installations*

The fitting of GSM-R is mandatory when:

(1) installing for the first time the radio communication part of a Control-Command and Signalling Trackside Subsystem;

(2) upgrading the radio communication part of a Control-Command and Signalling Trackside Subsystem already in service in such a way that it changes the functions or the performance of the subsystem. This does not include the modifications deemed necessary to mitigate safety-related defects in the legacy installation;

(3) Implementation of ETCS level 2, level 3 or level 1 with radio in-fill needs data radio communication.

7.3.2. *On-board installations*

The fitting of GSM-R in rolling stock intended for use on a line including at least one ►M1 section ◄ equipped with GSM-R (even if superimposed to a legacy radio communication system), is mandatory when:

(1) installing for the first time the voice radio communication part of a Control-Command and Signalling On-board Subsystem;

(2) upgrading the voice radio communication part of a Control-Command and Signalling On-board Subsystem ►M1 already on the market ◄ in such a way that it changes the functions or the performance of the subsystem. This does not apply to modifications deemed necessary to mitigate safety-related defects in the legacy installation;

(3) Implementation of ETCS level 2, level 3 or level 1 with radio in-fill need data radio communication.

7.4. **ETCS specific implementation rules**

▼M1

7.4.1. *Trackside installations*

Articles 1, 2 and Annex I to Commission Implementing Regulation (EU) 2017/6 ([1]) 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 ([2]).

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.

([1]) 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).

([2]) 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).

▼M1

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.

▼B

7.4.2. *On-board installations*

▼M1

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 ([1]).

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.

▼B

7.4.2.2. Upgrading and renewal of existing vehicles

It is mandatory to fit ETCS on-board existing vehicles if installing any new train protection part of a control-command and signalling on-board subsystem on existing high-speed vehicles.

([1]) Or placed into service in accordance with Directive 2008/57/EC, if Directive (EU) 2016/797 is not yet applicable.

▼M1

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 [1] 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 [2] 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 [1] 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 [1] enforcing compliance with set specifications #2 or #3 within a period of time not exceeding 1 July 2023.

▼B

7.4.3. *National requirements*

(1) Member States may introduce additional requirements at national level, in particular with a view to:

   (1) allowing only ETCS-equipped vehicles to access ETCS-equipped lines, so that existing national systems can be decommissioned;

   (2) requesting that new and upgraded or renewed mobile railway infrastructure construction and maintenance equipment, shunting locomotives and/or other vehicles, even if intended exclusively for national service, be equipped with ETCS.

(2) Member States may decide to exclude from the obligation set out in the first paragraph of point 7.4.2.1 all new vehicles intended exclusively for national service except when the area of use of those vehicles includes more than 150 km of a section currently equipped or to be equipped with ETCS within 5 years after the authorisation for ►M1 placing on the market◄ of those vehicles. Member States shall publish their decision for implementing this provision, notify such decision to the Commission and include it in the National Implementation Plan referred to in point 7.4.4.

[1] Or placed into service in accordance with Directive 2008/57/EC, if Directive (EU) 2016/797 is not yet applicable.

[2] 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.

▼B

7.4.4. *National Implementation Plans*

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 taking into account the economic viability of the rail system. This plan shall include all new, renewed and upgraded lines, in particular a detailed timeline for equipping ►M1 those lines with ETCS and Class A Radio and decommissioning of class B systems ◄. Trackside implementation rules are set out in point 7.4.1 of this Regulation. The national implementation plan does not include additional trackside implementation rules.

The national implementation plan shall include:

(1) ►M1 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). ◄

(2) Definition of the technical migration strategy (overlay on-board or overlay at trackside) and the financial migration strategy (both at infrastructure and rolling-stock side).

(3) A description of the measures taken to ensure open market conditions for its legacy Class B train protection systems as set out in paragraph 7.2.3.

(4) Planning which includes:

(i) ►M1 The dates of ETCS and Class A Radio deployment ◄ on the different lines of the network (when services are allowed to operate with ETCS);

(ii) the indicative dates of decommissioning of Class B systems on the different lines of the network (when services cannot operate anymore with legacy systems). If decommissioning of Class B systems is not foreseen within a period of 15 years, these indicative dates are not required;

▼B

(iii) the dates when existing cross-border vehicles shall fully benefit from operation with 'ETCS only equipped on-board' on the high-speed network, corridors ►M1 or other parts of the network, including service facilities. ◄ For high-speed services, this date depends on ETCS deployment on the high-speed network and on other parts of the network (e.g. stations being used by these high-speed services); For freight services, this date depends on the ETCS deployment on the corridors and on other parts of the network (e.g. last miles).

The national implementation plans shall run over a period of at least 15 years and shall be updated regularly, ►M1 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. ◄

Member States shall notify their national implementation plans to the Commission no later than 5 July 2017. The national implementation plans shall be used to update the data into the geographical and technical information system for the trans-European transport network (TENtec) referred to in Article 49 of Regulation (EU) No 1315/2013. The Commission shall publish the national implementation plans on its website and inform Member States about them through the Committee referred to in ►M1 Article 51(1) of Directive (EU) 2016/797 ◄.

The Commission shall draw up a comparative overview of the national implementation plans. On the basis of this overview, the need for additional coordination measures shall be identified.

▼M1

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.

▼B

7.5. **Train detection systems specific implementation rules**

In the context of this TSI, train detection system means the equipment installed trackside, which detects the presence or absence of vehicles either on an entire line of route or on a local point of it.

Trackside systems (e.g. interlocking or level crossing control systems) which use information from detection equipment are not considered parts of the train detection system.

This TSI specifies the requirements for the interface with rolling stock only to the extent necessary to ensure compatibility between TSI-compliant rolling stock and the Control-command and Signalling Trackside.

▼M1

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.

▼B

The requirements of this TSI relating to train detection systems shall be respected when:

(1) upgrading the train detection system;

(2) renewing the train detection system, provided that respecting the requirements of this TSI does not imply unwanted modifications or upgrades of other trackside or on-board systems;

(3) renewing the train detection system, where this is required by the upgrade or renewal of trackside systems that use information from the train detection system;

(4) removing Class B train protection systems where the train detection and train protection systems are integrated.

In the migration phase care shall be taken to ensure that installing a TSI-compliant train detection system has a minimal negative impact on the existing non-TSI-compliant rolling stock.

To achieve this, it is recommended that the Infrastructure Manager selects a TSI-compliant train detection system that, at the same time, is compatible with the non-TSI-compliant rolling stock already operating on that infrastructure.

7.6. **Specific cases**

7.6.1. *Introduction*

The following special provisions are permitted in the specific cases below.

These specific cases belong to two categories: the provisions apply either permanently (case 'P') or temporarily (case 'T').

In this TSI, temporary case 'T3' is defined as temporary cases which will still exist after 2020.

The specific cases set out in ►M1 points below shall be read ◄ in conjunction with the relevant points of Chapter 4 and/or specifications referenced there.

The specific cases replace the corresponding requirements set out in Chapter 4.

Where the requirements set out in the relevant point of Chapter 4 are not subject to a specific case, those requirements have not been duplicated in points below and continue to apply unmodified.

▼M1

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.

▼M1

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

▼B

7.6.2. *List of specific cases*

7.6.2.1. Belgium

Specific case	Category	Notes
4.2.10 Trackside Train Detection Systems ►M1 Index 77, point 3.1.2.3 ◄: The distance between first and last axle L - (b1 + b2) (Fig.1) is at least 15 000 mm	T3	Applicable on HS L1 This Specific Case is linked with the use of TVM
4.2.10 Trackside Train Detection Systems ►M1 Index 77, point 3.1.7 ◄: The weight of an isolated vehicle or a trainset is at least 40 t. If the weight of an isolated vehicle or a trainset is inferior to 90 t, ►M1 the vehicle shall have ◄ a system ensuring the shunting which has an electrical basis superior or equal to 16 000 mm	T3	Applicable on HS L1, L2,L3,L4 This Specific Case is linked with the use of TVM

7.6.2.2. UK

Specific case	Category	Notes
4.2.10 Trackside Train Detection Systems ►M1 Index 77, point 3.1.2.3 ◄: The distance between first and last axle L - (b1 + b2) (Fig.1) is at least 15 000 mm	T3	Applicable on High Speed Line 1 This Specific Case is linked with the use of TVM
4.2.10 Trackside Train Detection Systems Index 77, point 3.1.3.1: The minimum wheel rim width (B_R) for 1 600 mm track gauge network is 127 mm	T3	Applicable in Northern Ireland
4.2.10 Trackside Train Detection Systems Index 77, point 3.1.3.3: The minimum flange thickness (S_d) for 1 600 mm track gauge network is 24 mm	T3	Applicable in Northern Ireland
4.2.10 — Trackside Train Detection Systems Index 77, point 3.1.4.1: In addition to the requirements in point 3.1.4.1, sanding for traction purposes on multiple units: (a) is not permitted ahead of the leading axle below 40 km/h; and (b) is only permitted where it can be demonstrated that at least a further six axles of the multiple unit are beyond the laying position	T3	

▼B

Specific case	Category	Notes
4.2.12 ETCS DMI (Driver-Machine Interface) Index 6: It is permissible to use an alphanumeric keyboard to enter the train running number if support for alphanumeric train running numbers is required by the technical rule notified for this purpose.	T3	This specific case is needed when ►M1 set of specifications 2 or 3 ◄ (see Table A2 in Annex A) is applied, while this is an open point for set of specifications 1. There is no impact on interoperability
4.2.12 ETCS DMI (Driver-Machine Interface) Index 6: It is permissible for the ETCS DMI to display dynamic train speed information in miles per hour (and indicate 'mph') when operating on parts of the GB mainline network.	T3	This specific case is needed when set of specifications 2 (see Table A2 in Annex A) is applied, while this is an open point for set of specifications 1. There is no impact on interoperability

7.6.2.3. France

Specific case	Category	Notes
4.2.10 Trackside Train Detection Systems ►M1 Index 77, point 3.1.2.3 ◄: The distance between first and last axle L - (b1 + b2) (Fig.1) is at least 15 000 mm	►M1 P ◄	►M1 This Specific Case is linked with the use of track circuits using electrical joints ◄
4.2.10 Trackside Train Detection Systems Index 77, point 3.1.9: The electrical resistance between the running surfaces of the opposite wheels of a wheelset does not exceed 0,05 Ohm, measured by a voltage between 1,8 VDC and 2,0 VDC (open circuit). In addition, the electrical reactance between the running surfaces of the opposite wheels of a wheelset does not exceed f/100 mOhm when f is between 500 Hz and 40 kHz, under a measuring current of at least 10 ARMS and open voltage of 2 VRMS.	T3	This specific case may be revised when the open point related to the frequency management for track circuits is closed
4.2.10 — Trackside Train Detection Systems ►M1 Index 77, point 3.1.7 ◄: The weight of an isolated vehicle or a trainset is at least 40 t. If the weight of an isolated vehicle or a trainset is inferior to 90 t, ►M1 the vehicle shall have ◄ a system ensuring the shunting which has an electrical basis superior or equal to 16 000 mm.	T3	This Specific Case is linked with the use of TVM

▼B

Specific case	Category	Notes
4.2.10 — Trackside Train Detection Systems Index 77, point 3.1.3.2: Dimension D (figure 2) is not less than: 450 mm independently of the speed	T3	

▼M1

Specific case	Category	Notes
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

▼B

7.6.2.4. Poland

Specific case	Category	Notes
4.2.10 Trackside Train Detection Systems Index 77, point 3.1.9: The electrical resistance between the running surfaces of the opposite wheels of a wheelset does not exceed 0,05 Ohm, measured by a voltage between 1,8 VDC and 2,0 VDC (open circuit). In addition, the electrical reactance between the running surfaces of the opposite wheels of a wheelset does not exceed f/100 mOhm when f is between 500 Hz and 40 kHz, under a measuring current of at least 10 ARMS and open voltage of 2 VRMS.	T3	This specific case may be revised when the open point related to the frequency management for track circuits is closed

7.6.2.5. Lithuania, Latvia and Estonia

Specific case	Category	Notes
4.2.10 Trackside Train Detection Systems Index 77, point 3.1.3.3: The minimum flange thickness (S_d) for 1 520 mm track gauge network is 20 mm	T3	This specific case is needed as long as ČME locomotives operate on 1 520 mm network
4.2.10 Trackside Train Detection Systems Index 77, point 3.1.3.4: The minimum flange height (S_h) for 1 520 mm track gauge network is 26,25 mm	T3	This specific case is needed as long as ČME locomotives operate on 1 520 mm network

▼M1

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 ≤ 17,5 m (ai in Fig. 1, point 3.1.2.1).	P	
4.2.10 — Trackside Train Detection Systems Index 77, point 3.1.2.3: Minimum axle distance between first and last axle ≥ 4,5 m (L-b1-b2 in Fig. 1, point 3.1.2.3).	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	

▼B

7.6.2.7. Luxembourg

Specific case	Category	Notes
4.2.10 Trackside Train Detection Systems ►M1 Index 77, point 3.1.4.1 ◄: 1. The output of the sanding devices fitted to the vehicle shall not exceed 0,3 l per minute per rail. 2. The sanding in the stations identified in the infrastructure register is prohibited. 3. The Sanding in the area of switches is prohibited. 4. For emergency braking, no restrictions shall apply	T3	

▼B

7.6.2.8. Germany

Specific case	Category	Notes
4.2.10 Trackside Train Detection Systems Index 77, point 3.1.7.1: The minimum axle load of vehicles to run on specific lines indicated in the register of infrastructure is 5 t. This specific case only applies to vehicles; it does not modify the technical requirements for train detection systems specified in Index 77 and the provisions of point 7.2.8 related to their implementation.	T3	This specific case is needed as long as track circuits type WSSB are used.
4.2.10 Trackside Train Detection Systems Index 77, point 3.1.2.2: For speed not higher than 140 km/h, the distance ai (Fig 1) between two consecutive axles (concerning the first 5 axles of the consist or the whole set of axles if the total number of axles is lower than 5) is in no case less than 1 000 mm. This specific case only applies to vehicles; it does not modify the technical requirements for train detection systems specified in Index 77 and the provisions of point 7.2.8 related to their implementation.	T3	This specific case is needed as long as EBUET 80 type of level crossing protection is used.

▼M1

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 %	T3	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.

▼**M1**

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	

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.

▼**M1**

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-Bandwith: 20 Hz 20dB-Bandwith: 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-Bandwith: 20 Hz 20dB-Bandwith: 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.

▼**M1**

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
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

▼M1

Reference in Chapter 4	Index number (see Table A 2)
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
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

▼M1

Reference in Chapter 4	Index number (see Table A 2)
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)
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.

▼M1

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
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	

▼M1

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
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
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	

▼**M1**

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
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			
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	

▼M1

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
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 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	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		

▼M1

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			
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	

▼M1

Index No	Set of specifications # 2 (ETCS Baseline 3 Maintenance Release 1 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
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			
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	

▼M1

Index No	Set of specifications # 2 (ETCS Baseline 3 Maintenance Release 1 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
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
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	

▼M1

Index No	Set of specifications # 2 (ETCS Baseline 3 Maintenance Release 1 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
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			
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	

▼M1

Index No	Set of specifications # 3 (ETCS Baseline 3 Release 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
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			
31	SUBSET-094	Functional requirements for an onboard reference test facility	3.1.0	

▼M1

Index No	Set of specifications # 3 (ETCS Baseline 3 Release 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
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			

▼M1

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 T6001	FFFS for Location Dependent Addressing	4	
74	(MORANE) F 12 T6001	FIS for Location Dependent Addressing	3	

▼M1

Index No	Set of specifications # 3 (ETCS Baseline 3 Release 2 and GSM-R Baseline 1)			
	Reference	Name of Specification	Version	Notes
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	1.1.0	
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.

▼M1

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	

▼B

ANNEX B

Intentionally deleted.

▼B

ANNEX C

Intentionally deleted.

▼B

ANNEX D

Intentionally deleted.

▼B

ANNEX E

Intentionally deleted.

▼B

ANNEX F

Intentionally deleted.

▼**M1**

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