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ANNEX

to Recommendation N. ERA-REC-123-2015/REC

on amending and recasting Commission Decision 2012/88/EU on the Technical Specification for Interoperability relating to the Control-Command and Signalling Subsystems

This document is based on the Annex III to Commission Decision 2012/88/EU, amended by:

- *Commission Decision 2012/696/EU*
- *Commission Decision (EU) 2015/14*

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1. INTRODUCTION

1.1. Technical scope

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

This TSI is applicable to control-command and signalling track-side Subsystems of the rail network defined in the section 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 Annex I sections 1.2. and 2.2. of Directive 2008/57/EC):

1) self-propelling thermal or electric trains;
2) thermal or electric traction units;
3) passenger carriages, if equipped with a driving cab;
4) mobile railway infrastructure construction and maintenance equipment, if equipped with a driving cab and intended to be used in transport mode on its own wheels.

1.2. Geographical scope

The geographical scope of this TSI is the network of the whole rail system, composed of:

1) the trans-European conventional rail system network (TEN) as described in Annex I section 1.1 “Network” of Directive 2008/57/EC;
2) the trans-European high-speed rail system network (TEN) as described in Annex I section 2.1 “Network” of Directive 2008/57/EC;
3) other parts of the network of the whole rail system, following the extension of scope as described in Annex I section 4 of Directive 2008/57/EC.

and excludes the cases referred to in Article 1(3) of Directive 2008/57/EC.

The TSI shall apply to networks with 1435 mm, 1520 mm, 1524 mm, 1600 mm and 1668 mm track gauges. However, it shall not apply to short border crossing lines with 1520 mm track gauges that are connected to the network of third countries.

1.3. Content of this TSI

In accordance with Article 5(3) of the Railway Interoperability Directive, 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 with 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 trans-European 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).

In accordance with Article 5(5) of the Railway Interoperability Directive, 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

The Control-Command and Signalling Subsystems are defined in Annex II of the Railway Interoperability Directive as *"all the equipment required to ensure safety and to command and control movements of trains authorised to travel on the network".*

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.

[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

2.2. Scope

The Control-Command and Signalling Subsystems TSI specifies only those requirements which are necessary to assure the interoperability of the trans-European rail system and compliance with the essential requirements.

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 ~~ERTMS/~~ETCS[2] 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.

Class B systems for the trans-European rail system network are a limited set of legacy control-command and signalling systems that were 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 legacy control-command and signalling systems that were in use in that networks before 1 July 2015.

The list of Class B systems is established in the European Railway Agency technical documents 'List of CCS Class B systems, ERA/TD/2011-11, version ~~2~~3.0.

Commented [CA1]: Version updated

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

The requirements for the Control-Command and Signalling Track-side 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.

[2] 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".

2.3. Application Levels (~~ERTMS/~~ETCS)

The interfaces specified by this TSI define the means of data transmission to, and (where appropriate) from trains. The ~~ERTMS/~~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.

A train equipped with Class A on-board train protection for a given application level must be able to operate on that level and any lower one~~. As a consequence~~:

– A train equipped with Class A on-board train protection for level 2 must be able to operate on that level and on level 1 lines.

– A train equipped with class A on-board train protection for level 1 need not be equipped with a GSM-R ETCS Data Only ~~cab r~~Radio but must already implement all level 2 and level 3 functions so as to ensure that the mere connection of a GSM-R ~~cab~~ ETCS Data Only ~~r~~Radio at a later stage will ensure it is equipped for level 2 and level 3.

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

3.1. General

The Railway Interoperability Directive 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.

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

3.2.1. Safety

Every project to which this specification is applied 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. For this purpose the Commission Regulation (EC) No ~~352/2009~~402/2013 of ~~24~~ 30 April ~~2009~~ 2013 on the ~~adoption of a~~ common safety method ~~on~~ for risk evaluation and assessment and repealing Regulation (EC) No 352/2009, as referred to in Article 6(3)(a) of Directive 2004/49/EC of the European Parliament and of the Council[3] (Common Safety Method), applies.

To ensure that the measures taken to achieve safety do not jeopardise interoperability, the requirements of the basic parameter defined in section 4.2.1 (Control-Command and Signalling safety characteristics relevant to interoperability) shall be respected.

For the ~~ERTMS/~~ETCS Class A system the safety objective is apportioned between the Control-Command and Signalling On-board and Track-side Subsystems. The detailed requirements are specified in the basic parameter defined in section 4.2.1 (Control-Command and Signalling safety characteristics relevant to interoperability). This safety requirement must be met together with the availability requirements as defined in Section 3.2.2 (Reliability and Availability).

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 Track-side Subsystems. The detailed requirements are specified in the basic parameter defined in section 4.2.1 (Control-Command and Signalling safety characteristics relevant to interoperability).

The level of risk shall be monitored as constituents of the subsystem age and wear. The requirements for maintenance stated in section 4.5 shall be respected.

3.2.3. Health

In accordance with EU regulations and with national regulations that are compatible with the European 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] OJ L 108, 29.4.2009, p. 4.

3.2.4. Environmental Protection

In accordance with EU regulations and with national regulations that are compatible with European 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 European 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,
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 trans-European rail system is located.

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

3.2.5.1.2 Railway Internal Electromagnetic Compatibility

In accordance with EU regulations and with national regulations that are compatible with the European 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 track-side equipment is described in section 4.2.11 (Electromagnetic Compatibility).

3.2.5.2. Control-Command and Signalling Compatibility.

Chapter 4 defines the requirements for the interoperability of the Control-Command and Signalling Subsystems.

~~In addition, where the Control-Command and Signalling Subsystems are concerned, this TSI ensures technical interoperability between trans-European high-speed rail and conventional rail systems when both are fitted with Class A systems.~~

Commented [CA2]: This statement is redundant, taking into account the scope extension, as specified in section 1

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 (section 4.2.1)
2. On-board ~~ERTMS/~~ETCS functionality (section 4.2.2)
3. Track-side ~~ERTMS/~~ETCS functionality (section 4.2.3)
4. Mobile communication functions for railways – GSM-R (section 4.2.4)
5. ~~ERTMS/~~ETCS and GSM-R air gap interfaces (section 4.2.5)
6. On-board interfaces Internal to Control-Command and Signalling (section 4.2.6)
7. Track-side interfaces Internal to Control-Command and Signalling (section 4.2.7)
8. Key management (section 4.2.8)
9. ETCS-ID management (section 4.2.9)
10. Train detection systems (section 4.2.10)

11. Electromagnetic compatibility between rolling stock and Control-Command and Signalling track-side equipment (section 4.2.11)
12. ~~ERTMS/~~ETCS DMI (driver machine interface) (section 4.2.12)
13. GSM-R DMI (driver machine interface) (section 4.2.13)
14. Interface to data recording for regulatory purposes (section 4.2.14)
15. Visibility of track-side Control-Command and Signalling objects (section 4.2.15)
16. Construction of equipment used in CCS subsystems (sections 4.2.16)

~~4~~.1.2. Overview on requirements

All requirements in section 4.2 (Functional and technical specifications of the Subsystems) to meeting 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 track-side;
2. for the Control-Command and Signalling Track-side Subsystem, track-to-train and train-to-track communication are fully standardised in this TSI. The specifications referenced in the sections 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 limiting the movement of TSI-compliant on-board subsystems.

The Control-Command and Signalling functions are classified in categories indicating whether they are optional ~~(O)~~ or mandatory ~~(M)~~. The categories are defined in the specifications referenced in Annex A~~, 4.1a for ERTMS/ETCS and Annex A, 4.1b for GSM-R~~ and these texts also state how the functions are classified.

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

~~4.1.2.~~4.1.3. Parts of Control-command and Signalling Subsystems

According to section 2.2 (Scope) the Control-Command and Signalling Subsystems ~~include~~ can be subdivided in ~~three~~ parts.

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

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
	Voice radio communication	4.2.1.2, 4.2.4.1, 4.2.4.2, 4.2.5.1, ~~4.2.6,~~ 4.2.13, ~~4.2.14,~~ 4.2.16
	Data radio communication	4.2.1.2, 4.2.4.1, 4.2.4.3, 4.2.5.1, 4.2.6.2, ~~4.2.14,~~ 4.2.16
Control-Command and Signalling Track-side	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
	Voice and data radio communication	4.2.1.2, 4.2.4, 4.2.5.1, 4.2.7, 4.2.16
	train detection	4.2.10, 4.2.11, 4.2.16

~~With respect to the essential requirements set out in Chapter 3, the functional and technical specifications of the Control-Command and Signalling Subsystems are as follows.~~

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4.2. Functional and technical specifications of the Subsystems

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

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

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

1. The design, implementation and use of a Control-Command and Signalling On-board or Track-side subsystem shall not export any requirements
   (a) across the interface between Control-Command and Signalling On-board and Track-side 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 sections 4.2.1.1 and 4.2.1.2 below shall be respected.

4.2.1.1. Safety

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

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

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

~~Requirements for hazards related to errors at the interface between driver and on-board ERTMS/ETCS are an open point.~~

Commented [CA3]: Error correction. This statement is no more true with the new SUBSET-091

4.2.1.2. Availability / Reliability

This section 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 track-side 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 Section 4.5 (Maintenance rules) shall be respected.

4.2.2. On-board ~~ERTMS/~~ETCS functionality

The basic parameter for ~~ERTMS/~~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 track-side,
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 track-side,
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 4.2.2c.

The ETCS identities of equipment shall be managed in accordance with section 4.2.9 (ETCS-ID management).

The main functionality is supported by other functions, to which Annex A 4.2.2a and Annex A 4.2.2b also apply, together with the additional specifications indicated below:

1. Communication with the Control-Command and Signalling Track-side Subsystem.
   (a) Eurobalise data transmission. See section 4.2.5.2 (Eurobalise communication with the train).
   (b) Euroloop data transmission. See section 4.2.5.3 (Euroloop communication with the train). This functionality is optional on-board unless Euroloop is installed track-side in ~~ERTMS/~~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, section 4.2.5.1 (Radio communications with the train), section 4.2.6.2 (Interface between GSM-R Radio Data Communication and ~~ERTMS/~~ETCS) and section 4.2.8 (Key Management). This functionality is optional on-board unless radio data transmission for radio infill is installed track-side in ~~ERTMS/~~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 section 4.2.5.1 (Radio communications with the train), section 4.2.6.2 (Interface between GSM-R Radio Data Communication and ~~ERTMS/~~ETCS) and section 4.2.8 (Key Management). Only mandatory on-board for ~~ERTMS/~~ETCS Level 2 or ETCS Level 3 applications.
2. Communicating with the driver. See Annex A, 4.2.2 e and section 4.2.12 (~~ERTMS/~~ETCS DMI).
3. Communicating with the STM. See section 4.2.6.1 (Interface between ~~ERTMS/~~ETCS and STM). This function includes:
   (a) managing the STM output,

(b) providing data to be used by the STM,

(c) managing STM transitions.

4. Managing information about the completeness of the train (train integrity) — mandatory for level 3, not required for level 1 or 2.

5. Equipment health monitoring and degraded mode support. This function includes:

(a) initialising the on-board ~~ERTMS/~~ETCS functionality,

(b) providing degraded mode support,

(c) isolating the on-board ~~ERTMS/~~ETCS functionality.

6. Support data recording for regulatory purposes. See section 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 section 4.2.12 (~~ERTMS/~~ETCS DMI)

(b) to/from the train interface unit. See Annex A, 4.2.2 f.

4.2.3. Track-side ~~ERTMS/~~ETCS functionality

This Basic parameter describes the ~~ERTMS/~~ETCS track-side functionality. It contains all ~~ERTMS/~~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~~s~~ 2 and level 3),

2. translating the information from track-side 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 4.2.3b and their performance shall conform to Annex A 4.2.3a.

The requirements for tests are specified in Annex A 4.2.3c.

The ETCS identities of equipment shall be managed in accordance with section 4.2.9 (ETCS-ID management).

The main functionality is supported by other functions, to which Annex A 4.2.3a and Annex A 4.2.3b 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 section 4.2.5.2 (Eurobalise communication with the train) and section 4.2.7.4 (Eurobalise/Line-side Electronic Unit (LEU));

(b) Euroloop data transmission. See section 4.2.5.3 (Euroloop communication with the train) and section 4.2.7.5 (Euroloop/LEU). Euroloop is only relevant in level 1, in which it is optional;

(c) Radio data transmission for radio infill. See Annex A, 4.2.3d, section 4.2.5.1 (Radio communications with the train), section 4.2.7.3 (GSM-R/track-side ETCS functionality) and section 4.2.8 (Key Management). Radio in-fill is only relevant in level 1, in which it is optional;

(d) Radio data transmission. See section 4.2.5.1 (Radio communications with the train), section 4.2.7.3 (GSM-R/track-side ETCS functionality) and section 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 ~~ERTMS/~~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 track-side; 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 section 4.2.7.1 (Functional interface between RBCs) and section 4.2.7.2 (Technical interface between RBCs).

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 Track-side 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. User-to-User Signalling; Annex A 4.2.4d,~~

~~4.~~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,
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 S~~s~~ignalling Subsystem shall be able to support the establishment of ~~–~~at least two simultaneous communication sessions with the Track-side 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. ~~ERTMS/~~ETCS and GSM-R air gap interfaces

This basic parameter specifies the requirements for the air gap between Control-Command and Signalling Track-side and On-board subsystems and has to be taken into account in conjunction with the requirements for the interfaces between ~~ERTMS/~~ETCS and GSM-R equipment, as specified in section 4.2.6 (On-board Interfaces Internal to Control-Command and Signalling) and section 4.2.7 (Track-side 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 ~~GSM-R~~ frequency ~~B~~band ~~-~~ specified in ~~see~~ Annex A, 4.2.5a and in Annex A 4.2.4f.

On-board Control-command and Signalling~~CS s~~Subsystems shall ~~offer protection~~be protected against interferences, fulfilling the requirements specified in ~~— see Annex A 4.2.5a~~Annex A 4.2.4f.

For data communication ~~T~~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.

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

This Basic Parameter consists of three parts.

4.2.6.1. ~~ERTMS/~~ETCS and Class B train protection

Where ~~ERTMS/~~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 ~~ERTMS/~~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 ~~ERTMS/~~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 Track-side Subsystem.

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

The requirements for the interface between the Class A radio and the on-board ~~ERTMS/~~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, 4.2.6f. This interface contributes to this Basic Parameter only when odometry equipment is supplied as a separate interoperability constituent (see section 5.2.2, Grouping of interoperability constituents).

4.2.7. Track-side 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,
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/track-side ETCS

This is the interface between the Class A radio system and the track-side 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 section 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 section 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 Track-side and On-board Subsystems.

The requirements are specified in Annex A, 4.2.9a.

4.2.10. Track-side Train Detection Systems

This basic parameter specifies the interface requirements between the track-side 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.

4.2.11. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling track-side equipment

This basic parameter specifies the interface requirements for electromagnetic compatibility between rolling stock and track-side Control-Command and Signalling equipment.

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

4.2.12. ~~ERTMS/~~ETCS DMI (Driver Machine Interface)

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

It includes:

1. ergonomics (including visibility),
2. ~~ERTMS/~~ETCS functions to be displayed,
3. ~~ERTMS/~~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 ~~ERTMS/~~ETCS and the rolling stock recording device,
2. communication protocols,
3. physical interface.

See Annex A 4.2.14a.

4.2.15. Visibility of track-side Control-Command and Signalling objects

This basic parameter describes:

1. the characteristics of retro-reflecting signs to ensure correct visibility,
2. the characteristics of interoperable marker boards.

See Annex A 4.2.15a.

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

4.2.16. ~~Environmental conditions~~Construction of equipment used in CCS subsystems

The environmental conditions ~~mandated in the specifications referenced in~~specified in the documents listed in Annex A, Table A-2 of this TSI shall be respected.

Requirements for materials stated in LOC&PAS TSI (e.g. related to fire protection) shall be respected by Control-command and signalling On-board Subsystems.

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

4.3.1. Interface to the Traffic Operation and Management Subsystem

Interface with Traffic Operation and Management TSI			
Reference CCS TSI		**Reference Traffic Operation and Management TSI**	
Parameter	**Clause**	**Parameter**	**Clause**
Operating rules (normal and degraded conditions)	4.4	Rule book Operating rules	4.2.1.2.1 4.4
Visibility of track-side 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 onboard	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

4.3.2. Interface to the Rolling Stock Subsystem

Interface with Rolling Stock TSIs				
Reference CCS TSI		**Reference Rolling Stock TSIs**		
Parameter	**Clause**	**Parameter**		**Clause**

Interface with Rolling Stock TSIs				
Reference CCS TSI		**Reference Rolling Stock TSIs**		
Parameter	**Clause**	**Parameter**		**Clause**
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 wheelset location axle load sanding electrical resistance between wheels LOC & PAS TSI Wagon TSI	4.2.7.9.2 4.2.3.2 4.2.3.10 4.2.3.3.1 4.2.3.3.1.1 4.2.3.2
		Rolling stock characteristics to be compatible with train detection systems based on axle counters	HS RS TSI wheelset geometry wheels LOC & PAS TSI Wagon TSI	4.2.7.9.2 4.2.7.9.3 4.2.3.3.1.2 4.2.3.3.1
		Rolling stock characteristics to be compatible with loop equipment	HS RS TSI LOC & PAS TSI Wagon TSI	None 4.2.3.3.1.3 None
Electromagnetic compatibility between rolling stock and Control-Command and Signalling track-side equipment	4.2.11	Rolling stock characteristics to be compatible with train detection systems based on track circuits	HS RS TSI LOC & PAS TSI Wagon TSI	4.2.6.6.1 4.2.3.3.1.1 None
		Rolling stock characteristics to be compatible with train detection systems based on axle counters	HS RS TSI LOC & PAS TSI Wagon TSI	4.2.6.6.1 4.2.3.3.1.2 None
Train braking performance and characteristics	4.2.2	Emergency braking performance	HS RS TSI Emergency braking Service braking LOC & PAS TSI Emergency braking Service braking Wagon TSI	4.2.4.1 4.2.4.4 4.2.4.5.2 4.2.4.5.3 4.2.4.1.2
Position of Control-Command and Signalling on-board antennas	4.2.2	Kinematic gauge	HS RS TSI LOC & PAS TSI Wagon TSI	4.2.3.1 4.2.3.1 none
Isolation of on-board ~~ERTMS/~~ETCS functionality	4.2.2	Operating rules	HS RS TSI LOC & PAS TSI Wagon TSI	4.2.7.9.1 4.2.12.3 none
Data interfaces	4.2.2	Monitoring and diagnostic concepts	HS RS TSI LOC & PAS TSI Wagon TSI	4.2.7.10 4.2.1.1 None

Interface with Rolling Stock TSIs				
Reference CCS TSI		**Reference Rolling Stock TSIs**		
Parameter	**Clause**	**Parameter**		**Clause**
Visibility of track-side Control-Command and Signalling objects	4.2.15	External visibility Head lights	HS RS TSI LOC & PAS TSI Wagon TSI	4.2.7.4.1.1 4.2.7.1.1 None
		Driver's external field of view	HS RS TSI line of sight windscreen LOC & PAS TSI line of sight windscreen Wagon TSI	4.2.2.6 b 4.2.2.7 4.2.9.1.3.1 4.2.9.2 None
Interface to data recording for regulatory purposes	4.2.14	Recording device	HS RS TSI LOC & PAS TSI Wagon TSI	4.2.7.10 4.2.9.6 none
Commands to rolling stock equipment	4.2.2 4.2.3	Phase separation	HS RS TSI LOC & PAS TSI Wagon TSI	4.2.8.3.6.7 4.2.8.2.9.8 none
Emergency braking command	4.2.2	Emergency braking command	HS RS TSI LOC & PAS TSI Wagon TSI	none 4.2.4.4.1 none
Construction of equipment	4.2.16	Material requirements	LOC&PAS TSI	4.2.10.2.1

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	HS CR	4.2.3 4.2.4.1
Eurobalise communication (space for installation)	4.2.5.2	Minimum infrastructure gauge Structure gauge	HS CR	4.2.3 4.2.4.1
Euroloop communication (space for installation)	4.2.5.3	Minimum infrastructure gauge Structure gauge	HS CR	4.2.3 4.2.4.1

Interface with Infrastructure TSI				
Reference CCS TSI		**Reference Infrastructure TSI**		
Parameter	**Clause**	**Parameter**		**Clause**
Visibility of track-side Control-Command and Signalling objects	4.2.15	Minimum infrastructure gauge Structure gauge	HS CR	4.2.3 4.2.4.1

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	Phase separation sections System separation sections Phase separation sections System separation sections	HS ENE TSI CR ENE TSI 	4.2.21 4.2.22 4.2.19 4.2.20

4.4. Operating rules

The rules for operating a railway service with ~~ERTMS/~~ETCS and GSM-R are specified in the Traffic Operation and 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.),
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 section 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;
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 section 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 EU regulations and the national regulations that are compatible with the European legislation.

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

4.8. Registers

The data to be provided for the registers provided for in Articles 34 and 35 of Directive 2008/57/EC are those indicated in Commission Implementing Decision 2011/665/EU and Commission Implementing Decision 2011/633/EU.

5. INTEROPERABILITY CONSTITUENTS

5.1. Definition

According to Article 2(f) of the Railway Interoperability Directive, interoperability constituents are *'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 either directly or indirectly. The concept of a constituent covers both tangible objects and intangible objects such as software.'*

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,
2. Table 5.2.a for the Control-Command and Signalling Track-side 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 Track-side Subsystem

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 section of Chapter 4.

Table 5.1.a Basic interoperability constituents in the Control-Command and Signalling On-board Subsystem

1	2	3	4
N	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
1	~~ERTMS/~~ETCS on-board	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		On-board ETCS functionality (excluding odometry)	4.2.2
		~~ERTMS/~~ETCS and GSM-R air gap interfaces • RBC (level 2 and level 3) • Radio in-fill unit (optional level 1) • Eurobalise air gap • Euroloop air gap (optional level 1°	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) • ~~ERTMS/ETCS~~ GSM-R ETCS Data Only Radio ~~on-board~~ • Odometry • Key management system • ETCS ID Management • ~~ERTMS/~~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
		~~Physical environmental conditions~~Construction of equipment	4.2.16
2	Odometry equipment	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1

1	2	3	4
N	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
		On-board ~~ERTMS/~~ETCS functionality: only Odometry	4.2.2
		Interfaces • On-board ~~ERTMS/~~ETCS	4.2.6.3
		~~Environmental conditions~~Construction of equipment	4.2.16
3	Interface of External STM	Interfaces • On-board ~~ERTMS/~~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, Safety (RAMS) Note: no requirement for safety	4.2.1 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
		~~Environmental conditions~~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, Safety (RAMS) Note: no requirement for safety	4.2.1 4.5.1
		Basic communication functions	4.2.4.1
		ETCS data communication applications	4.2.4.3
		Interfaces • On-board ~~ERTMS/~~ETCS • GSM-R air gap	4.2.6.2 4.2.5.1
		~~Environmental conditions~~Construction of equipment	4.2.16
6	GSM-R SIM card	Basic communication functions	4.2.4.1

1	2	3	4
N	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
	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 ~~mobiles~~terminal equipment	~~Environmental conditions~~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
N	Group of Interoperability constituents	Characteristics	Specific requirements to be assessed by reference to Chapter 4
1	~~ERTMS/~~ETCS on-board Odometry equipment	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		On-board ~~ERTMS/~~ETCS functionality	4.2.2
		~~ERTMS/~~ETCS and GSM-R air gap interfaces • RBC (level 2 and 3) • Radio in-fill unit (optional level 1) • Eurobalise air gap • Euroloop air gap (optional level 1)	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) • ~~On-board ERTMS/ETCS~~ GSM-R ETCS Data Only Radio • Key management system • ETCS-ID Management • ~~ERTMS/~~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
		~~Physical environmental conditions~~Construction of equipment	4.2.16

Table 5.2.a Basic interoperability constituents in the Control-Command and Signalling Track-side Subsystem

1	2	3	4
N	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
		Track-side ~~ERTMS/~~ETCS functionality (excluding communication via Eurobalises, radio in-fill and Euroloop)	4.2.3
		~~ERTMS/~~ETCS and GSM-R air gap interfaces: only radio communication with train	4.2.5.1
		Interfaces • Neighbouring RBC • ~~ERTMS/ETCS GSM-R~~data radio communication ~~track-side~~ • Key management system • ETCS-ID Management	4.2.7.1, 4.2.7.2 4.2.7.3 4.2.8 4.2.9
		~~Environmental conditions~~Construction of equipment	4.2.16
2	Radio in-fill unit	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		Track-side ~~ERTMS/~~ETCS functionality (excluding communication via Eurobalises, Euroloop and level 2 and ~~/~~level 3 functionality)	4.2.3
		~~ERTMS/~~ETCS and GSM-R air gap interfaces: only radio communication with train	4.2.5.1
		Interfaces • ~~ERTMS/ETCS GSM-R~~data radio communication ~~track-side~~ • Key management system • ETCS-ID Management • Interlocking and LEU	4.2.7.3 4.2.8 4.2.9 4.2.3
		~~Environmental conditions~~Construction of equipment	4.2.16
3	Eurobalise	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1

1	2	3	4
N	Interoperability constituent IC	Characteristics	Specific requirements to be assessed by reference to Chapter 4
		~~ERTMS/~~ETCS and GSM-R air gap interfaces: only Eurobalise communication with train	4.2.5.2
		Interfaces • LEU - Eurobalise	4.2.7.4
		~~Environmental conditions~~Construction of equipment	4.2.16
4	Euroloop	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		~~ERTMS/~~ETCS and GSM-R air gap interfaces: only Euroloop communication with train	4.2.5.3
		Interfaces • LEU ~~–~~ Euroloop	4.2.7.5
		~~Environnemental conditions~~Construction of equipment	4.2.16
5	LEU Eurobalise	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		Track-side ~~ERTMS/~~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
		~~Environmental conditions~~Construction of equipment	4.2.16
6	LEU Euroloop	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		Track-side ~~ERTMS/~~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
		~~Environmental conditions~~Construction of equipment	4.2.16

Table 5.2.b Groups of interoperability constituents in the Control-Command and Signalling Track-side 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
		Track-side ~~ERTMS/~~ETCS functionality (excluding communication via Euroloop and level 2 and level 3 functionality)	4.2.3
		~~ERTMS/~~ETCS and GSM-R air gap interfaces: only Eurobalise communication with train	4.2.5.2
		~~Environmental conditions~~Construction of equipment	4.2.16
2	Euroloop LEU Euroloop	Reliability, Availability, Maintainability, Safety (RAMS)	4.2.1 4.5.1
		Track-side ~~ERTMS/~~ETCS functionality, (excluding communication via Eurobalise and level 2 and level 3 functionality)	4.2.3
		~~ERTMS/~~ETCS and GSM-R air gap interfaces: only Euroloop communication with train	4.2.5.3
		~~Environmental conditions~~Construction of equipment	4.2.16

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

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 section 6.2.1, 6.2.2, 6.2.3, 6.2.4),
2. verifying the subsystems (see section 6.3 and section 6.4.1).

6.1.1.2. Essential requirements fulfilled by National Rules

~~in~~ In certain cases, ~~however,~~ some of the essential requirements may be met by national rules, because of:

1. the use of Class B systems,
2. open points in the TSI,
3. derogations under Article 9 of the Railway Interoperability Directive,
4. specific cases described in section 7.2.9.

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 section 6.4.2.

~~6.1.1.2.~~6.1.1.3. Non implementation of all requirements of this TSI

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, EC certificates of verification, under the following conditions for issuing and using the certificates:

1. The applicant for EC verification of a track-side 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 or restrictions due to compatibility and/or safe integration with track-side control-command and signalling subsystems. Without prejudice to the tasks of a notified body described in respective EU legislation and related documents the applicant for EC verification is responsible for ensuring that the technical file provides all the information that an operator needs to identify such conditions and restrictions;

3. The Member State may refuse for duly justified reasons the authorisation for placing in service, or place conditions and restrictions on the operation, of control-command and signalling subsystems that do not implement all functions, performance and interfaces specified in this TSI.

If ~~some essential requirements are fulfilled by national rules or 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 section 6.4.~~2~~ 3 shall apply.

6.1.2. Principles for testing ~~ERTMS/~~ETCS and GSM-R

~~6.1.1.3.~~6.1.2.1. Goal

The goal to be achieved is that a~~A~~ Control-Command and Signalling On-board Subsystem covered by an 'EC' declaration of verification should be able to run on every Control-Command and Signalling Track-side Subsystem covered by an 'EC' Declaration of verification, under the conditions specified in this TSI, with no additional verifications.

Achievement of this goal is facilitated by:

1. rules for the design and installation of the Control-Command and Signalling On-board and the Track-side subsystems,

2. test specifications to prove that the Control-Command and Signalling On-board and Track-side Subsystems comply with the requirements of this TSI and are mutually compatible.

6.1.2.2. Definitions

In the scope of this TSI, an "operational test scenario" means the description of the engineering and of 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), by means of a sequence of track-side 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.

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

To ~~make the conformity assessment of ERTMS/ETCS and GSM-R equipment more effective and to~~ help the achievement of ~~the~~ the goal mentioned above, ~~each~~ Member States shall ensure that, when the process of EC Verification of a Track-side Control-command and Signalling subsystem is initiated, the engineering rules and the preliminary ~~make available to the European Commission the~~ operational test scenarios related to the interactions of its ETCS and GSM-R parts with the corresponding parts of an On-board Control-command and Signalling Subsystem are made available to the European Commission as soon as possible. The European Commission shall be informed of any changes to operational tests scenarios used during the EC Verification. ~~for checking the ERTMS/ETCS and GSM-R part of the Control-Command and Signalling Track-side Subsystem and its interaction with the corresponding part of the Control-Command and Signalling On-board Subsystem. The test scenarios in question::~~

The set of engineering rules for the track-side parts of ETCS and GSM-R and related operational test scenarios for the Track-side Control-command and Signalling Subsystem made available, shall be sufficient to describe all intended system operations relevant for the Track-side Control-command and Signalling Subsystem in normal and identified degraded situations, and:

1. shall be consistent with the specifications referenced in this TSI~~ and provide a technical description of functions and performances (e.g., reaction times) where these are relevant for the interaction between on-board and track-side subsystems;~~.

2. shall ~~be submitted in a standard format~~assume that functions, interfaces and performance of the Control-command and Signalling On-board Subsystems interacting with the Track-side Subsystem are compliant with the requirements of this TSI;~~.~~

3. shall ~~cover at least the start of mission, the transition between levels, transition between modes that may be used on the line, the main identified degraded situations, the sending of emergency messages and any other relevant aspects specific to the line~~be the ones used in the EC Verification of the Track-side 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.

The European Railway Agency:

1. shall ~~make a preliminary publication of~~publish the engineering rules for the track-side parts of ETCS and GSM-R and the operational test scenarios made available to

the European Commission. After publication of preliminary scenarios or of their subsequent modifications,~~,~~ ~~allowing~~ all interested parties shall be allowed to comment on the consistency of the test scenarios with the conditions stated in the three bullets above. ~~specifications referenced in this TSI and their impact on other implementations or developments.~~ The period for comments shall be defined with each publication and shall not exceed six months; this period shall not be a constraint on the continuation/finalisation of the EC Verification of the relevant Track-side subsystem(s);~~,~~

2. shall, if the comments are negative, ~~shall~~ coordinate the efforts of the parties involved, in order to find an agreement, e.g., by changing the engineering rules for the track-side parts of ETCS and GSM-R and, consequently, the operational test scenarios, in case they are in contradiction with the requirements of this TSI;

3. shall ~~progressively build and make publicly available a database of~~publish and maintain the operational test scenarios that have successfully passed the steps described above and representing the situations which occur in different implementations~~,~~;

4. shall use ~~the above mentioned data base~~ the received operational test scenarios to assess whether ~~further mandatory test specifications are needed and whether it is necessary to draw up additional engineering rules for the Control-Command and Signalling On-board and Track-side subsystems~~clarifications or improvements of the specifications referenced in this TSI are necessary~~,~~;

5. shall, on the basis of the operational tests scenarios received, prepare and publish a standard format for future publications of operational test scenario.

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 Article 13(1) and Annex IV of the Railway Interoperability Directive.

The assessment procedure shall be carried out using one of the modules specified in section 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.~~, because they have to fully comply with all the relevant basic~~

~~parameters. This~~ ~~c~~Compliance with relevant basic parameters, ~~i~~as demonstrated by the 'EC' Declaration of conformity, ~~and~~ is sufficient for placing them on the market[4].

Commented [CA4]: Editorial clarifications due to received comments

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. 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 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[5].

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 ~~must~~ 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 ~~must~~ shall be individually examined.

6.2.3. Assessment requirements

Independently of the selected module:

1. the requirements stated in section 6.2.4.1 of this TSI shall be respected for the 'On-board ~~ERTMS/~~ETCS' interoperability constituent,

[4] 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.

[5] OJ L 319, 4.12.2010, p. 1.

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.

Table 6.1

Aspect	What to assess	supporting evidence
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 scenarios, as described in the basic parameters referenced in the relevant table of Chapter 5
	Check which optional functions and interfaces as described in the basic parameters referenced in the relevant table of Chapter 5 are implemented and that they comply with the requirements of this TSI	design documentation and running of test cases and test scenarios, 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
~~Environment~~Construction of equipment	Check compliance with mandatory ~~environmental~~ conditions, where specified in the basic parameters referenced in the relevant table of Chapter 5	Documentation on material used and, where necessary, ~~T~~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
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, based on supportable sources of reliability data. 2.1. The manufacturer's quality and safety management throughout design, manufacturing and

Aspect	What to assess	supporting evidence
		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) Note: The standard shall satisfy at least the following requirements: 1. be widely acknowledged in the railway domain. If this is not the case, the standard will have to be justified and be

Aspect	What to assess	supporting evidence
		acceptable to the notified body; 2. be relevant for the control of the considered hazards in the system under assessment; 3. be publicly available for all actors who want to use it. See Annex A, table A3.
	Check that the quantitative reliability target (related to random failures) indicated by the applicant is met	Calculations
	Elimination of systematic failures	Tests of equipment (full Interoperability Constituent or separately for subassemblies) in operational conditions, with repair when defects are detected. Indicate in the documentation accompanying the certificate 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).
	Check compliance with maintenance requirements – section 4.5.1	Document check

6.2.4. Special issues

6.2.4.1. Mandatory tests for ~~T~~the on-board ~~ERTMS/~~ETCS

Particular attention shall be given to assessing the conformity of the on-board ~~ERTMS/~~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 ~~passed the~~been submitted to a full set of ~~mandatory~~ test sequences including all test cases necessary to check the functions referenced in section 4.2.2 (on-board ETCS functionality). ~~and~~

~~that~~ The applicant is responsible to define thes cases and their organisation in sequences, if this is not included in specifications referenced in this TSI;

~~1.~~2. these tests were carried out in a laboratory accredited ~~to carry out this type of tests~~ in accordance with 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 relating to the marketing of products and repealing Regulation (EEC) No 339/93[6] to carry out tests with the use of the test architecture and the procedures specified in Annex A 4.2.2c.~~.~~

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 ~~ERTMS/~~ETCS requires a conformity assessment carried out by a Notified Body.

6.2.5. Additional tests

To increase confidence that the On-board ETCS Interoperability Constituent will operate correctly when installed in On-board Control-command and Signalling Subsystems running on different Track-side Control-command and Signalling applications, it is recommended that it is tested using scenarios from the ones published by the Agency; see section 6.1.2 (Principles for testing ETCS and GSM-R). The tests can be performed using real equipment or a simulated Track-side Control-command and Signalling Subsystem.

These tests are not mandatory for the certification of the On-board ETCS Interoperability Constituent. The applicant for certification of the Interoperability Constituent may decide to perform them and have them assessed by a Notified Body; the corresponding documentation shall provide information about the operational test scenarios against which the Interoperability Constituent has been checked and whether tests have been carried out with simulators or using real equipment, including type and version of such equipment.

[6] OJ L 218, 13.8.2008, p. 30.

Performing these tests at the level of Interoperability Constituent may also reduce the amount of checks at the level of Control-command and Signalling Subsystem (see table 6.2, last row, and section 6.5).

Note: while it is not mandatory to perform tests using different operational scenarios, it must be noted that these tests may assist the verification of the Interoperability Constituent to eliminate as much as possible systematic failures, which is mandatory to obtain an EC certificate of conformity.

~~6.2.5.~~6.2.6. *Content of the 'EC' Declaration of conformity*

The 'EC' Declaration of conformity specified in Annex IV of the Railway Interoperability Directive shall include the following details concerning the interoperability constituent:

1. which optional and additional functions are implemented,
2. the applicable environmental conditions.

6.3. Control-Command and Signalling Subsystems

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 Track-side 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 Track-side Subsystem in accordance with Annex VI to the Railway Interoperability Directive.

The applicant shall draw up the 'EC' declaration of verification for the Control-Command and Signalling On-board or Track-side Subsystem in accordance with Article 18(1) and Annex V of the Railway Interoperability Directive.

The content of the 'EC' declaration of verification shall conform to Annex V to the Railway Interoperability Directive.

The assessment procedure shall be carried out ~~by~~ using one of the modules as specified in section 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 Track-side 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.

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. Track-side Subsystem

For verifying the Control-Command and Signalling Track-side 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).

6.3.2.3. Conditions for using modules for On-board and Track-side Subsystems

With reference to section 4.2 of Module SB (type-examination), design review is requested.

With reference to section 4.2 of Module SH1 (full quality management system with design examination), a type test is required.

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,

Table 6.2

Aspect	What to assess	supporting evidence
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. Note: the Subsystem need 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 restrictions 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 older versions of the CCS TSI, check that the certificate still ensures compliance with the requirements of the TSI currently in force.	Impact analysis by document checks
Integration of interoperability constituents in the subsystem	Check the correct installation and functioning of the internal interfaces of the subsystem - Basic parameters 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
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)

Commented [CA5]: Clarification, according to comments received

Aspect	What to assess	supporting evidence
	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)
Integration with Class B	Check that the external STM is connected to on-board ~~ERTMS/~~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 ~~ERTMS/~~ETCS– Basic parameter 4.2.6.1 - create no additional requirements for the Control-Command and Signalling Track-side 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 ~~ERTMS/~~ETCS– Basic Parameter 4.2.6.1 - creates no additional requirements for Control-Command and Signalling Track-side Subsystem due to transitions	nothing to test: no interface[7]
	Check that separate Class B equipment connected on-board ~~ERTMS/~~ETCS using (partly) non TSI compliant interfaces – basic parameter 4.2.6.1 - creates no additional requirements for the Control-Command and Signalling Track-side Subsystem due to transitions. Also check that ~~ERTMS/~~ETCS functions are not affected	impact analysis
Integration with Control-Command and Signalling Track-side 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 should 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.

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

Aspect	What to assess	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.
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
	Check that the quantitative reliability target is met - Basic Parameter 4.2.1	Calculations
	Check the compliance with requirements about maintenance – section 4.5.2	Documents check
Integration with Control-Command and Signalling Trackside Subsystems and other subsystems: tests under operational conditions	Test the behaviour of the subsystem under as many different operational conditions as reasonably possible (e.g line gradient, train speed, vibrations, traction power, weather conditions, design of Control-Command and Signalling track-side 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 earlier stages: tests performed on the interoperability constituents and tests performed on the subsystem in a simulated environment shall be taken into account. Tests under operational conditions are not necessary for on-board GSM-R voice equipment.	Reports of test runs. Note: Indicate in the certificate which conditions have been tested and~~,~~ which standards have been applied. ~~and the criteria for considering the tests terminated~~ Information in the certificate and accompanying documentation shall be sufficient to identify possible checks to be performed before using the On-board Subsystem on a specific route. If additional tests under operational conditions are made for a Subsystem having already an EC Certificate of Verification, corresponding information can be added, at the request of the applicant, as an extension of the documentation accompanying the certificate.

6.3.4. Assessment requirements for a Track-side 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 ~~ERTMS/~~ETCS part of the Control-Command and Signalling Track-side Subsystem, application-specific information is needed; This ~~should~~ 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 ~~ERTMS/~~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 ~~must~~ shall be carried out to verify a Control-Command and Signalling Track-side Subsystem and the basic parameters that ~~must~~ shall be respected.
2. Functionality and performance~~s~~ that have already been checked at the level of the interoperability constituents do not require additional verification.

Table 6.3

Aspect	What to assess	supporting evidence
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 restrictions 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 older versions of the Control-Command and Signalling TSI, 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
Use of train detection systems	Check that the selected types comply with Control-Command and Signalling TSI requirements - Basic parameters 4.2.10, 4.2.11	document check
Integration of interoperability constituents in	Check that the internal interfaces of the subsystem have been installed properly and function properly - Basic parameters 4.2.5, 4.2.7	checks according to specifications

Aspect	What to assess	supporting evidence
the subsystem	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
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 Track-side subsystem equipment is compatible with the track-side environment – Basic parameter 4.2.16	Document check (certificates of interoperability constituents and possible methods of integration checked against track-side characteristics)
Integration with track-side 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)
	Check the correct configuration of parameters (Eurobalise telegrams, RBC messages, marker boards positions, etc.)	Document check (values of parameters checked against characteristics of track-side 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 Track-side subsystem operates correctly according to information at the interfaces with track-side 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
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
	the compliance of the train detection systems with the requirements of this TSI - Basic Parameter 4.2.10	on site measurements
	Check that the train detection systems comply with the requirements of this TSI - Basic parameters 4.2.10 and 4.2.11	check evidence from existing installations (for systems already in use); perform tests according to standards for new types

Commented [CA6]: Clarification, according to comments received

Aspect	What to assess	supporting evidence
	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 tests of the operational scenarios specified in section 6.1.2 with different certified Control-Command and Signalling On-board Subsystems. The report shall indicate which operational scenarios have been tested, which on-board equipment has been used and whether tests have been performed in laboratories, test lines or real implementation.
Reliability, Availability, Maintainability, Safety (RAMS)	Check compliance with safety requirements - Basic Parameter 4.2.1	Application of procedures specified in the Common Safety Method
	Check that quantitative reliability targets are respected - Basic Parameter 4.2.1	Calculations
	Check the compliance with requirements about maintenance – section 4.5.2	Document check
Integration with Control-Command and Signalling On-board Subsystems and rolling stock: tests under operational conditions	Test the behaviour of the subsystem under such different operational conditions as reasonably feasible (~~le.~~g.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 Track-side subsystem is compatible with track-side 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 previous steps: tests performed at the level of interoperability constituents and tests performed on the subsystem in a simulated environment shall be taken into account.	Reports of test runs. Note: Indicate in the certificate which conditions have been tested~~,~~ and which standards have been applied ~~and the criteria for considering the tests terminated~~. Information in the certificate and accompanying documentation shall be sufficient to identify possible checks to be performed before using the On-board Subsystem on a specific route. If additional tests under operational conditions are made for a Subsystem having already an EC Certificate of Verification, corresponding information can be added, at the request of the applicant, as an extension of the documentation accompanying the certificate.

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

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

Pursuant to Article 18(5) of the Railway Interoperability Directive, 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 section 2.2 (Scope) of this TSI, the track-side and on-board control-command and signalling subsystems contains ~~three~~ parts, ~~while the on-board control-command and signalling subsystem contains two three parts,~~ as specified in section 4.1 (Introduction).

A certificate of verification may be issued for each part specified in this TSI; the notified body only checks if that particular part fulfils the TSI requirements.

Regardless of which module is chosen, the notified body shall check that:

(1) the TSI requirements for the part in question have been fulfilled and

(2) the TSI requirements already assessed for other parts of the same subsystem are still fulfilled.

6.4.2. ~~Control-command and signalling subsystems' partial fulfilment of the requirements due to limited application of the TSI~~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 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[8],

1) the on-board ~~ERTMS/~~ETCS interface to STM if the interoperability constituent is intended for installation on vehicles in which no external STM is needed,

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

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 EC 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.

~~6.4.2.1.~~6.4.3.3. Content of certificates

In any event, notified bodies shall coordinate with the Agency the way in which conditions and limits of use of interoperability constituents and subsystems are managed in the relevant certificates and technical files in the working group set up under Article 21a (5) of Regulation (EC) No 881/2004 of the European Parliament and of the Council[9].

~~*6.4.3.*~~*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 by section 4.1 (Introduction) of this TSI, or if only certain stages of the verification procedure have been performed, only an intermediate statement of verification may be issued.

[9] Regulation (EC) No 881/2004 of the European Parliament and of the Council of 29 April 2004 establishing a European Railway Agency (Agency Regulation) (OJ L 164, 21.6.2004, p. 1)

6.5. Compatibility tests and management of errors

The basic parameters specified in chapter 4 and assessed according to sections 6.1, 6.2, 6.3 and 6.4 of this TSI and, where necessary, specific cases and notified national rules for open points, are sufficient to determine the technical compatibility and safe integration between an On- board and a Track-side Control-command and Signalling subsystem.

However, even a successful certification process cannot completely exclude that, when an On-board CCS Subsystem interacts with a Track-side CCS Subsystem, one of them deviates repeatedly under some conditions from the intended functions and/or performance. This can be due to deficiencies in specifications, different interpretations or errors in design and/or installation of equipment.

To support the operators to take appropriate decisions on the use of an On-board (respectively, Track-side) Control-Command and Signalling subsystem, the applicant for EC Verification, at the request of the relevant operator, shall perform compatibility tests (on-site or in laboratories providing a simulated environment) where the subsystem interacts with Track-side (respectively, On-board) subsystems that are relevant for its intended use. The applicant shall provide evidence and test results to the National Safety Authority.

Note that some of these tests can already be performed at the level of Interoperability Constituents (see section 6.2.4.1.).

For ETCS and GSM-R, the operational test scenarios of the relevant track-side subsystem (see section 6.1.2) are the basis of these verifications.

Compatibility tests are not in the scope of an EC Certificate of Verification. If they are performed and assessed by a Notified Body according to a selected module, the corresponding documentation shall identify the Control-command and Signalling Subsystems with which compatibility has been checked, with indication of types and versions of equipment and of operational test scenarios applied.

Where the outcome of any additional tests demonstrate that modifications are required to documentation submitted to the Safety Authority as evidence for the authorization of the subsystem, then the project entity performing the additional tests shall ensure that the Safety Authority is notified of the changes.

Where deviations from intended functions and/or performance are detected during the above-mentioned tests or during the operational life of a subsystem, the applicants and/or operators shall inform the National Safety Authorities that issued the authorisations for the concerned subsystems, to initiate the procedures set out in art 19 of the interoperability directive, as a result of the application of art 19(3):

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 (for interoperability constituents and/or subsystems) shall be updated;
2. if the deviation is due to errors in this TSI or in specifications referenced therein,

the procedure set out in art 7 of the Interoperability Directive shall be initiated.

To support ERA to improve the ETCS specifications and the process for EC certification and verification, and to facilitate the European deployment of ETCS, the documentation of compatibility tests described above and the reports of the tests performed by suppliers of the ETCS on-board and trackside as part of their product validation processes shall be made transparent for the system authority ERA. ERA shall organise an efficient processing of the information received in order to facilitate the Change Control Management process for improvement/further development of the specifications, including the test specifications.

Commented [CA7]: Added by ERA after October workshop

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 ~~Track-side~~ Subsystems or parts of ~~it~~them

Upgrading or renewing the Control-Command and Signalling ~~Track-side~~ Subsystems may concern any or all of the ~~following~~parts constituting them, as specified in section 2.2.~~:~~

~~1. Train protection~~

~~Voice R~~radio communication

~~2. Data radio communication~~

~~3. Train detection~~

The~~se~~ different parts of the Control-Command and Signalling ~~Track-side~~ Subsystems may therefore be upgraded or renewed separately, if interoperability is not jeopardised. ~~The work involved will concern:~~

~~1. GSM-R functions and interfaces~~

~~2. ERTMS/ETCS functions and interfaces~~

~~3. Train detection system compatibility with rolling stock~~

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

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~~s~~, 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[10] the availability of an STM cannot be ensured, the Member State concerned shall inform the Committee 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 ~~ERTMS/~~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. ~~Class B equipment may be used on-board as a fallback arrangement for a Class A system. However an infrastructure manager is not entitled to require the interoperable trains running on such a line to have class B systems on board.~~

~~In addition, t~~Track-side 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 track-side.

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10 *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.*

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. ~~This cannot be a requirement for interoperability.~~ Being equipped with a Class B system in addition to Class A shall not be a requirement for the compatibility of a vehicle with ~~the network~~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 ~~ERTMS/~~ETCS equipment or connected via a non- standard interface, or
3. independently from the ~~ERTMS/~~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.

7.2.6. Conditions for mandatory and optional functions

The applicant for EC Verification of a Control-command and Signalling Track-side subsystem shall check whether Control-command and Signalling Track-side 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.~~Depending on the characteristics of the Control-Command and Signalling Trackside Sub-system and its interfaces with other sub-systems, some trackside functionalities not classified as mandatory may have necessarily to be implemented in certain applications to comply with the essential requirements.~~

The trackside implementation of national or optional functions must 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 train integrity supervision on-board;
2. An ETCS Level 1 Trackside application with infill requires corresponding in-fill functionality on-board if the release speed is set to zero for safety reasons (e.g. protection of danger points).
3. When ETCS ~~requires~~ needs data transmission by radio, the data radio communication part as specified in this TSI is required~~transmission services of GSM-R must fulfil the ETCS data transmission requirements~~.
4. An on-board ~~assembly~~subsystem, which incorporates a KER STM, may make it necessary to implement the K-interface.

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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;

~~2.~~3. ETCS 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 section equipped with ~~Class A interfaces~~GSM-R (even if superimposed to a Class B 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 already in service 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;

~~2.~~3. ETCS needs data radio communication.~~.~~

7.4. ETCS specific implementation rules

~~*7.3.3.*~~*7.4.1.* ~~*7.3.3 High speed network*~~*Track-side installations*

It is mandatory to fit ETCS track-side ~~when~~in each of the following cases:

~~3.~~4. Installing for the first time the train protection part of a Control-Command and Signalling Track-side Subsystem. ~~(with or without a Class B system), or~~This does not apply if the new installation is on extensions or on short connections between existing lines/stations only equipped with legacy systems, such that trains cannot perform service exclusively on these extensions or connections;

5. upgrading the existing train protection part of a Control-Command and Signalling Track-side Subsystem, where this would change ~~the~~ its 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.

~~It is recommended that ETCS be installed whenever the infrastructure or energy sub-system of a section of line already in service is to be upgraded, renewed or maintained, provided the installation of ETCS on that section of line represents less than 10% of the total upgrade/renewal/maintenance investment.~~

~~7.3.4.~~7.4.2. ~~*ERTMS –*~~*On-board* ~~*implementation*~~*installations*

~~7.3.4.1. New vehicles~~

Without prejudice to [Commission Regulation/Decision on the new ERTMS EDP], in case of first authorisation (in the meaning of art 22 and 24 of Interoperability Directive) ~~New~~ vehicles ~~authorised to be placed in service for the first time~~ shall be equipped with ~~ERTMS~~ ETCS in ~~line either with the set of specifications #1 or the set of specifications #2 listed in~~accordance ~~with~~ with ~~Table A2 of~~ Annex A of this TSI.

~~From 1 January 2018, new vehicles authorised to be placed in service for the first time shall be equipped with ERTMS only in line with the set of specifications # 2 listed in Table A2 of Annex A.~~

The requirement to be equipped with ~~ERTMS~~ ETCS does not apply to new and upgraded or renewed

1. mobile railway infrastructure construction and maintenance equipment,
2. ~~new~~ shunting locomotives~~, or~~
3. other ~~new~~ vehicles not intended for high-speed service, if they are intended exclusively for national service ~~operated outside the corridors defined in section 7.3.4 and outside the lines ensuring the connections to the main European ports, marshalling yards, freight terminals and freight transport areas defined in section 7.3.5~~, or ~~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.

From 1 January 2018 the set of specifications # 1 listed in Annex A of this TSI is not applicable any more for first authorisation of vehicles, with the exception of upgrade of existing ETCS on-board installations.

~~7.3.3.2. 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.~~

~~7.3.5.~~7.4.3. ~~7.3.3.3.~~ *Additional requirements*

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

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

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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 ~~ERTMS~~ETCS.

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~~7.3.6.~~7.5. Train detection systems specific implementation rules

In the context of this TSI, train detection system means the equipment installed track-side, which detects the presence or absence of vehicles either on an entire line of route or on a local section 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 ~~infrastructure~~Control-command and Signalling ~~Trcak~~Track-side.

Implementing a train detection system that is compliant with the requirements of the Control-Command and Signalling Subsystems TSI can be done independently of the installation of ~~ERTMS/~~ETCS or GSM-R, but can be dependent on the Class B signalling systems or on special requirements, e.g., for level crossing equipment.

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 track-side or on-board systems;
3. renewing the train detection system, where this is required by the upgrade or renewal of track-side 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.

~~7.3.7.~~7.6. Specific cases

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~~7.3.7.1.~~*7.6.1. Introduction*

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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 sections ~~7.2.9.2 to 7.2.9.7~~below should be read in conjunction with the relevant sections 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 section of Chapter 4 are not subject to a specific case, those requirements have not been duplicated in sections ~~7.2.9.2 to 7.2.9.7~~below and continue to apply unmodified.

7.6.2. List of specific cases

~~7.3.7.2.~~7.6.2.1. Belgium

Specific case	Category	Notes
4.2.10 Track-side Train Detection Systems Index 77, section 3.1.2.4: 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 Track-side Train Detection Systems Index 77, section 3.1.8: The weight of an isolated vehicle or a trainset is at least 40t. If the weight of an isolated vehicle or a trainset is inferior to 90t, the vehicle should 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

~~7.3.7.3.~~7.6.2.2. UK

Specific case	Category	Notes
4.2.10 Track-side Train Detection Systems Index 77, section 3.1.2.4: 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 Track-side Train Detection Systems Index 77, Section 3.1.3.1: The minimum wheel rim width (B_R) for 1600 mm track gauge network is 127 mm	T3	Applicable in Northern Ireland
4.2.10 Track-side Train Detection Systems Index 77, Section 3.1.3.3: The minimum flange thickness (S_d) for 1600 mm track gauge network is 24 mm	T3	Applicable in Northern Ireland
4.2.10 - Track-side Train Detection Systems Index 77, section 3.1.4.1: In addition to the requirements in section 3.1.4.1, sanding for traction purposes on multiple units: a) is not permitted ahead of the leading axle below 40km/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	

4.2.12 ~~ERTMS/~~ETCS DMI (Driver Machine Interface) Index 51: 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 ~~as soon as the open point related to the DMI specification is closed~~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
4.2.12 ~~ERTMS/~~ETCS DMI (Driver Machine Interface) Index 51: 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.~~as soon as the open point related to the DMI specification is closed.~~ There is no impact on interoperability

~~7.3.7.4.~~7.6.2.3. France

Specific case	Category	Notes
4.2.10 Track-side Train Detection Systems Index 77, section 3.1.2.4: The distance between first and last axle L - (b1 + b2) (Fig.1) is at least 15 000 mm	T3	This Specific Case is linked with the use of TVM
4.2.10 Track-side Train Detection Systems Index 77, section 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 - Track-side Train Detection Systems Index 77, section 3.1.8: The weight of an isolated vehicle or a trainset is at least 40t. If the weight of an isolated vehicle or a trainset is inferior to 90t, the vehicle should 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
4.2.10 - Track-side Train Detection Systems Index 77, section 3.1.3.2: Dimension D (figure 2) is not less than: 450 mm independently of the speed	~~5 years~~T3	

~~7.3.7.5.~~7.6.2.4. Poland

Specific case	Category	Notes
4.2.10 Track-side Train Detection Systems Index 77, section 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

~~7.3.7.6.~~7.6.2.5. Lithuania, Latvia and Estonia

Specific case	Category	Notes
4.2.10 Track-side Train Detection Systems Index 77, section 3.1.3.3: The minimum flange thickness (S_d) for 1520 mm track gauge network is 20 mm	T3	This specific case is needed as long as ČME locomotives operate on 1520 mm network
4.2.10 Track-side Train Detection Systems Index 77, Section 3.1.3.4: The minimum flange height (S_h) for 1520 mm track gauge network is 26.25 mm	T3	This specific case is needed as long as ČME locomotives operate on 1520 mm network

~~7.3.7.7.~~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 in service 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

~~7.3.7.8.~~7.6.2.7. Luxemburg

Specific case	Category	Notes
4.2.10 Track-side Train Detection Systems Index 77, section 3.1.2.4: 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	

7.6.2.8. Germany

Specific case	Category	Notes
4.2.10 Track-side Train Detection Systems Index 77, section 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 section 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 Track-side Train Detection Systems Index 77, section 3.1.2.2: For speed not higher than 140 km/h, the distance a_i (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 1000 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 section 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.

~~**7.4. Rules for ERTMS**~~

~~*7.4.1. The ERTMS European Deployment Plan*~~

~~This section outlines the strategy (ERTMS European Deployment Plan) for implementing the TSI. It specifies the stages to be completed in order to make a gradual transition from the existing situation to the final situation in which compliance with the TSIs shall be the norm.~~

~~The ERTMS European Deployment Plan does not apply to lines located in the territory of a Member State when its rail network is separated or isolated by the sea or separated as a result of special geographical conditions or of different track gauge from the rail network of the rest of the Community.~~

7.4.2. ERTMS Trackside Implementation

The aim of the ERTMS European Deployment Plan is to ensure that locomotives, railcars and other railway vehicles equipped with ERTMS can gradually have access to an increasing number of lines, ports, terminals and marshalling yards without needing national equipment in addition to ERTMS.

This does not mean that existing Class B systems have to be removed from the lines included in the plan. However, by the date specified in the implementation plan, locomotives, railcars and other railway vehicles equipped with ERTMS must be given access to lines included in the deployment plan without requiring those vehicles to be equipped with a Class B system.

Terminal areas such as ports, or specific lines in a port, which are not equipped with a Class B system fulfil the requirements set out in section 7.3.2.2 provided railway vehicles are given access to these terminal areas without any requirement as regards equipment with an Automatic Train Protection system being imposed.

A line consisting of two or more tracks shall be considered equipped as soon as two of the tracks are equipped so as to allow traffic in both directions. When there is more than one line on a section of a corridor, at least one of the lines on this section must be equipped and the whole corridor shall be considered equipped as soon as at least one line is equipped over the whole length of the corridor.

7.4.2.1. Corridors

The six corridors described in section 7.3.4 shall be equipped with ERTMS according to the timetable indicated in that section[11].

7.4.2.2. Connection to the main European ports, marshalling yards, freight terminals and freight transport areas.

The ports, marshalling yards, freight terminals and freight transport areas listed in 7.3.5 shall be linked to at least one of the six corridors specified in 7.3.4 at the date and under the conditions specified in 7.3.5.

7.4.2.3. High speed network

It is mandatory to fit ERTMS/ETCS track-side when:

5. Installing for the first time the train protection part of a Control-Command and Signalling Track-side Subsystem (with or without a Class B system), or

6. upgrading the existing train protection part of a Control-Command and Signalling Track-side 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.

[11] Section 7.3.4 lays down the deadlines for equipping these corridors, with a view to building a consistent ERTMS network step by step. In a number of cases, there are voluntary agreements on an earlier deadline.

It is recommended that ERTMS/ETCS be installed whenever the infrastructure or energy sub-system of a section of line already in service is to be upgraded, renewed or maintained, provided the installation of ERTMS/ETCS on that section of line represents less than 10% of the total upgrade/renewal/maintenance investment.

7.4.2.4. EU-funded projects

Without prejudice to sections 7.3.2.1, 7.3.2.2 and 7.3.2.3, in the case of railway infrastructure projects receiving financial support from European Regional Development Funds and/or Cohesion Funds (Council Regulation (EC) No 1083/2006 of 11 July 2006 laying down general provisions on the European Regional Development Fund, the European Social Fund and the Cohesion Fund[12][13]) and/or the TEN-T funds (Decision 1692/96/EC of the European Parliament and of the Council) the fitting of ERTMS/ETCS is mandatory when:

1. installing for the first time the train protection part of a Control-Command and Signalling Subsystem or

2. upgrading the train protection part of a Control-Command and Signalling Subsystem already in service, where this changes the functions or the performance of the subsystem

7.4.2.5. Notification

For each corridor section described in 7.3.4, Member States shall either notify to the Commission a detailed timeline for equipping that corridor section with ERTMS or confirm that the corridor section is already equipped. The information shall be notified to the Commission no later than three years before the deadline for equipping that corridor section, as specified in 7.3.4.

For each port, marshalling yard, freight terminal or freight transport area listed in 7.3.5, Member States shall notify the specific lines to be used to connect it with one of the corridors listed in 7.3.4. This information shall be notified to the Commission no later than three years before the date specified in 7.3.5 and shall indicate the deadline for equipping this port, marshalling yard, freight terminal or freight transport area. If necessary, the European Commission may request adjustments, in particular to ensure consistency between equipped lines at the borders. Member States shall either notify to the Commission a detailed timeline for equipping these specific lines with ERTMS or confirm that these specific lines are already equipped. This information shall be notified to the Commission no later than three years before the date specified in 7.3.5 and shall indicate the deadline for equipping this port, marshalling yard, freight terminal or freight transport area.

The detailed timelines shall in particular indicate the date by which the tender for equipping of the line will be concluded, the procedures put in place in order to ensure interoperability with the neighbouring countries on the corridor and the main milestones relating to the

[12] OJ L 210, 31.7.2006, p. 25.
[13] OJ L 210, 31.7.2006, p. 25.

~~project. Every twelve months, Member States shall inform the Commission of the progress made in equipping these lines sending an updated timeline.~~

~~7.4.2.6. Delays~~

~~When a Member State reasonably expects delays in fulfilling the deadlines laid down in this Decision, it shall immediately inform the Commission. It shall send the Commission a file containing a technical description of the project and an up-to-date implementation plan. The file shall also explain the reasons for the delay and shall indicate the corrective measures the Member State has taken.~~

~~A deadline extension of no more than three years can be granted to a Member State when the delay is due to causes beyond the Member State's reasonable control such as failure of suppliers or problems regarding the authorisation process due to the absence of appropriate test vehicles. Such an extension can be advocated by a Member State only when the following conditions are fulfilled:~~

~~1. The notifications, if needed, referred to in section 7.3.2.5 were received in time and were comprehensive.~~

~~2. The file referred to in section 7.3.2.6, first paragraph, contains clear evidence that the causes for the delay were beyond Member State's control.~~

~~3. A competent authority is responsible for coordinating on-board and trackside suppliers and for integrating and testing of products.~~

~~4. Appropriate use has been made of existing laboratories.~~

~~5. Evidence is given that appropriate measures have been taken to minimise the additional delay.~~

~~The Commission shall examine the file sent to it and the measures proposed by the Member State and shall notify the result of its examination to the committee referred to in Article 29 of Directive 2008/57/EC.~~

~~*7.4.3. ERTMS - On-board implementation*~~

~~7.4.3.1. New vehicles~~

~~New vehicles authorised to be placed in service for the first time shall be equipped with ERTMS in line either with the set of specifications #1 or the set of specifications #2 listed in Table A2 of Annex A.~~

~~From 1 January 2018, new vehicles authorised to be placed in service for the first time shall be equipped with ERTMS only in line with the set of specifications # 2 listed in Table A2 of Annex A.~~

~~The requirement to be equipped with ERTMS does not apply to new mobile railway infrastructure construction and maintenance equipment, new shunting locomotives or other new vehicles not intended for high-speed service, if they are intended exclusively for national service operated outside the corridors defined in section 7.3.4 and outside the lines ensuring the connections to the main European ports, marshalling yards, freight terminals and freight~~

~~transport areas defined in section 7.3.5, or 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.~~

~~7.3.3.2. Upgrading and renewal of existing vehicles~~

~~It is mandatory to fit ERTMS/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.~~

~~7.3.3.3. Additional requirements~~

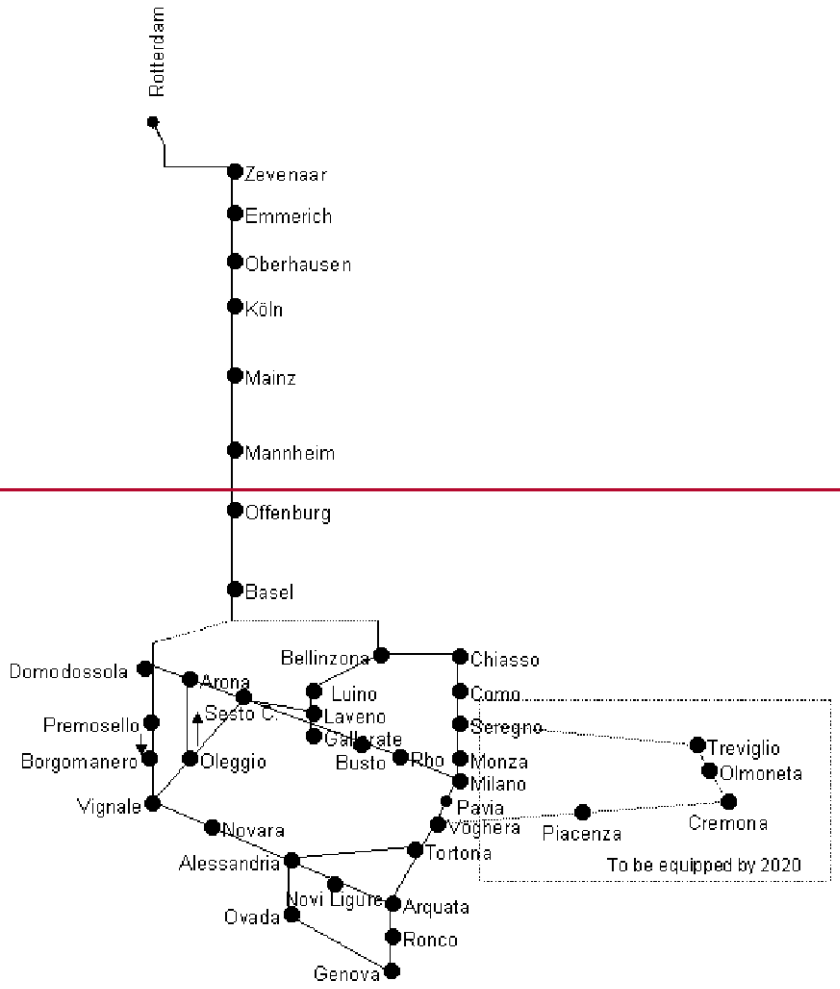
~~Member States may introduce additional requirements at national level, in particular with a view to~~

~~3) allowing only ERTMS-equipped vehicles to access ERTMS-equipped lines, so that existing national systems can be decommissioned;~~

~~4) 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 ERTMS.~~

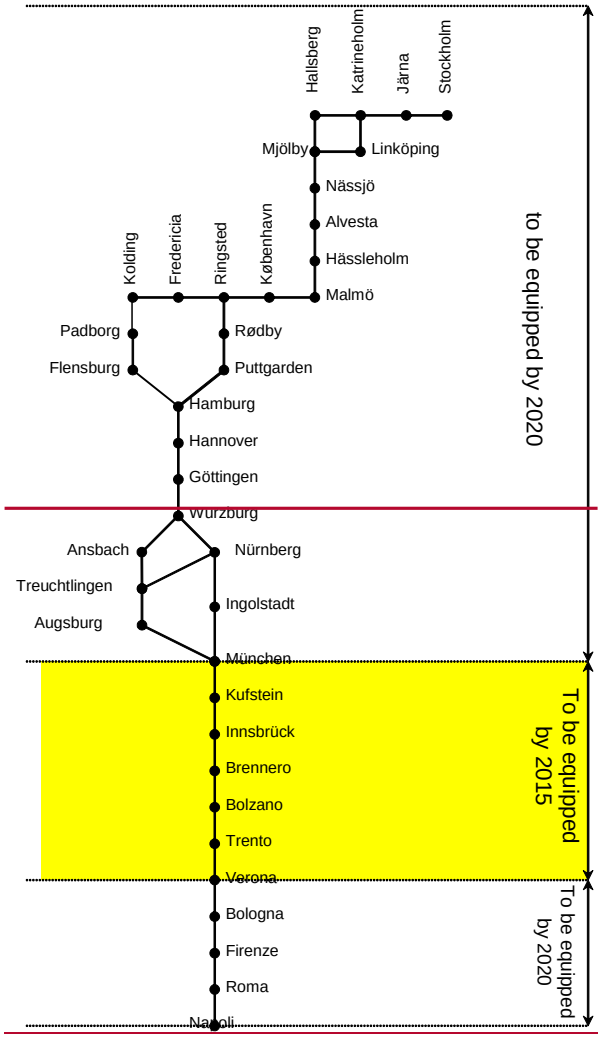
~~*7.4.4. Specific lines constituting the corridors*~~

~~**Corridor A – to be equipped by 2015**~~



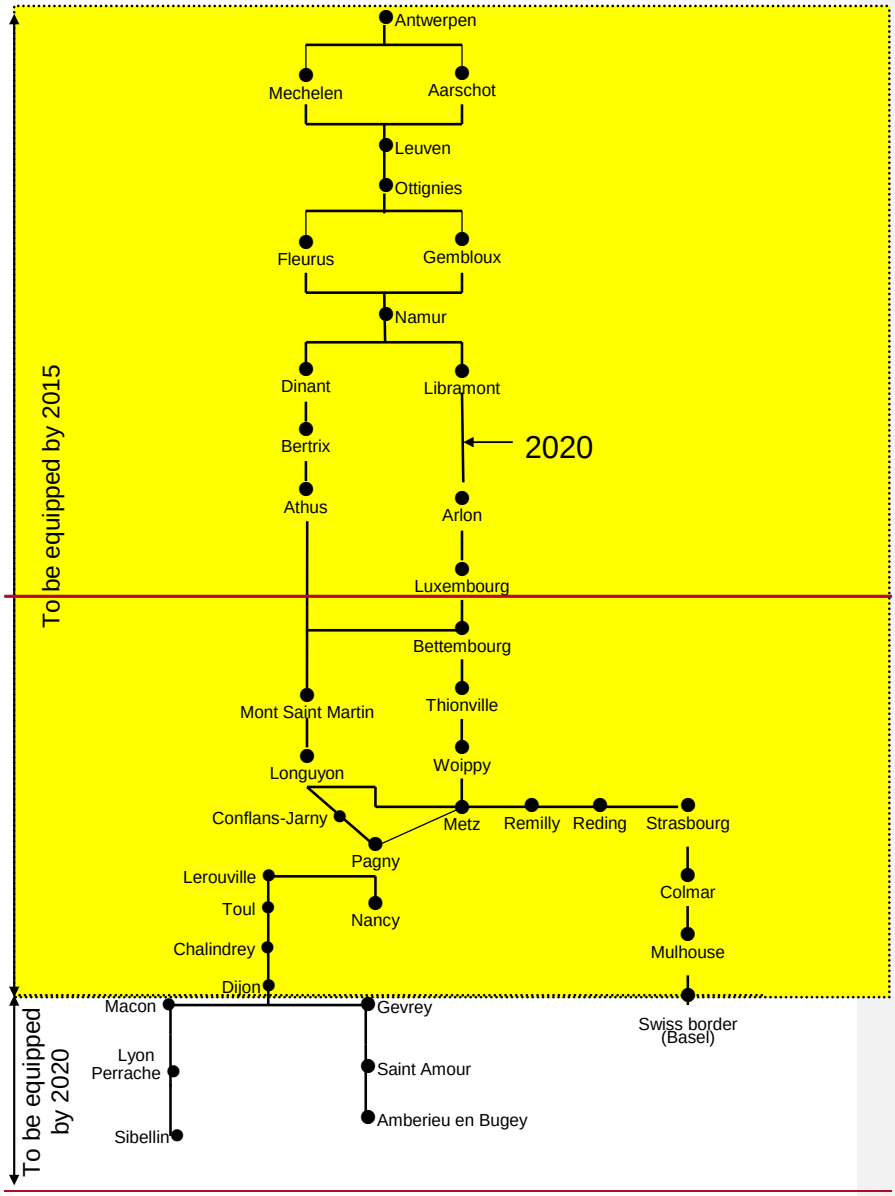
~~**Corridor B**~~[14]

[14] ~~Without prejudice of the legislation applicable to the Trans European high speed network, links can be provided through stretches of high speed lines, provided paths are allocated to freight trains. At least one ERTMS equipped link will be provided by 2020 between Denmark and Germany (Flensburg – Hamburg or Rødby – Puttgarden) but not necessarily two. The Brenner base tunnel will be equipped with ERTMS once the infrastructure work completed (target date 2020).~~


Hallsberg
Katrineholm
Järna
Stockholm
Mjölby
Linköping
Nässjö
Alvesta
Hässleholm
Malmö
Kolding
Fredericia
Ringsted
København
Padborg
Rødby
Flensburg
Puttgarden
Hamburg
Hannover
Göttingen
Würzburg
Ansbach
Nürnberg
Treuchtlingen
Ingolstadt
Augsburg
München
Kufstein
Innsbrück
Brennero
Bolzano
Trento
Verona
Bologna
Firenze
Roma
Napoli
to be equipped by 2020
To be equipped by 2015
To be equipped by 2020

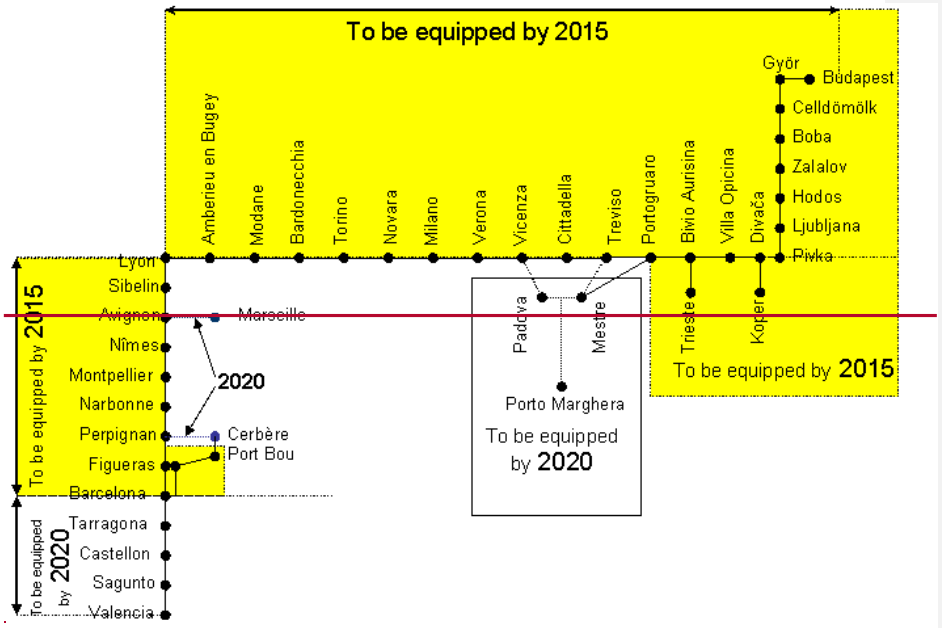
~~**Corridor C**~~[15]

[15] ~~A link between Nancy and Reding will be provided by 2020.~~

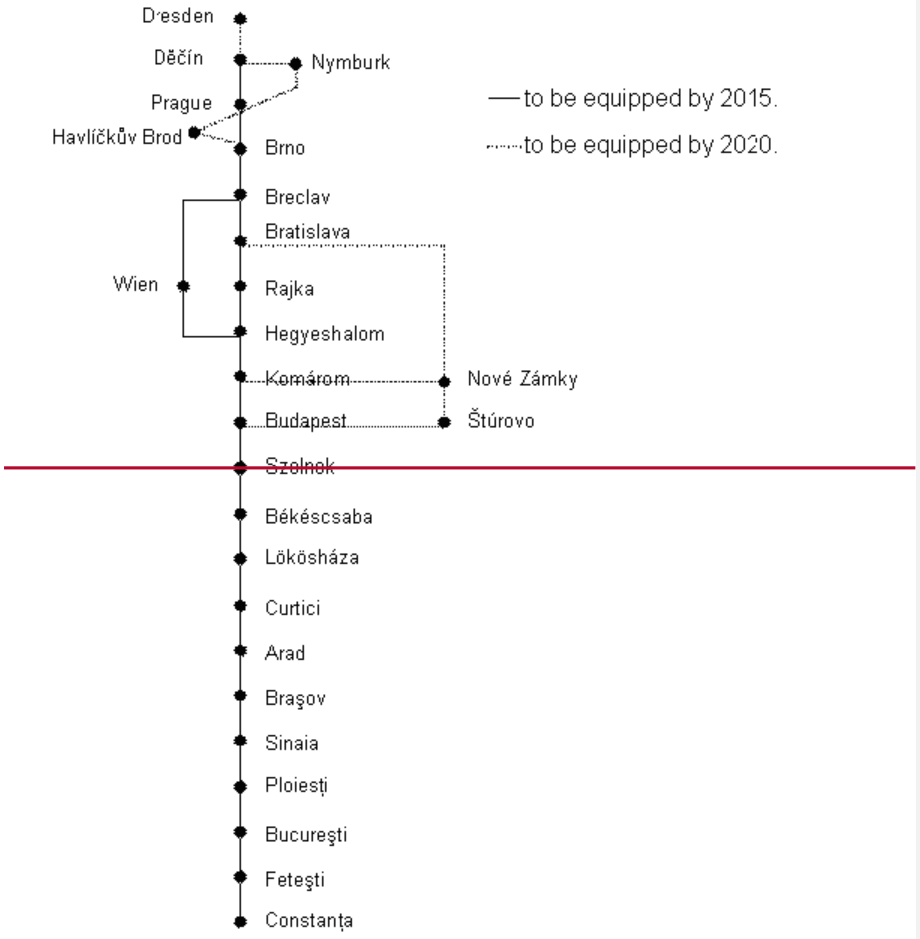

Antwerpen
Mechelen
Aarschot
Leuven
Ottignies
Fleurus
Gembloux
Namur
Dinant
Libramont
2020
Bertrix
Athus
Arlon
Luxembourg
To be equipped by 2015
Bettembourg
Mont Saint Martin
Thionville
Longuyon
Woippy
Conflans-Jarny
Metz
Remilly
Reding
Strasbourg
Pagny
Lerouville
Colmar
Toul
Nancy
Chalindrey
Mulhouse
Dijon
Macon
Gevrey
Swiss border (Basel)
Lyon Perrache
Saint Amour
Amberieu en Bugey
Sibellin
To be equipped by 2020

~~**Corridor D**~~[16]

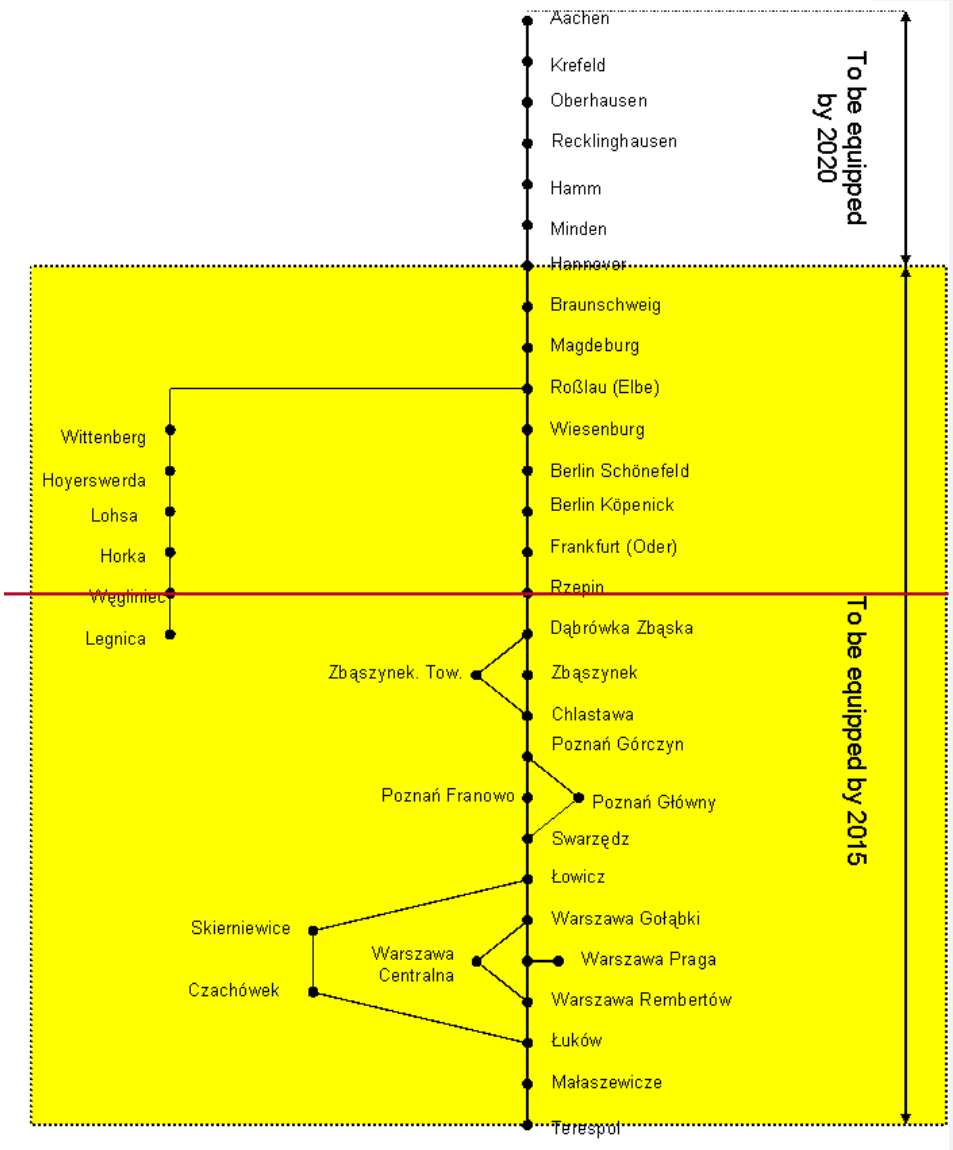
[16] ~~Two additional branches will be equipped by 2020: Montmélian – Grenoble – Valence and Lyon – Valence – Arles – Miramas (left bank of the Rhône).~~


To be equipped by 2015
Ambérieu en Bugey
Modane
Bardonecchia
Torino
Novara
Milano
Verona
Vicenza
Cittadella
Treviso
Portogruaro
Bivio Aurisina
Villa Opicina
Divača
Pivka
Ljubljana
Hodos
Zalalov
Boba
Celldömölk
Budapest
Győr
Trieste
Koper
To be equipped by 2015
Padova
Mestre
Porto Marghera
To be equipped by 2020
Lyon
Sibelin
Avignon
Marseille
Nîmes
Montpellier
Narbonne
Perpignan
Cerbère
Port Bou
Figueras
Barcelona
2020
To be equipped by 2015
Tarragona
Castellon
Sagunto
Valencia
To be equipped by 2020

~~Corridor E~~


Dresden
Děčín
Nymburk
Prague
Havlíčkův Brod
Brno
Breclav
Bratislava
Wien
Rajka
Hegyeshalom
Komárom
Nové Zámky
Budapest
Štúrovo
Szolnok
Békéscsaba
Lökösháza
Curtici
Arad
Braşov
Sinaia
Ploieşti
Bucureşti
Feteşti
Constanţa
to be equipped by 2015.
to be equipped by 2020.

~~Corridor F~~


Aachen
Krefeld
Oberhausen
Recklinghausen
Hamm
Minden
Hannover
Braunschweig
Magdeburg
Roßlau (Elbe)
Wiesenburg
Berlin Schönefeld
Berlin Köpenick
Frankfurt (Oder)
Rzepin
Dąbrówka Zbąska
Zbąszynek
Chlastawa
Poznań Górczyn
Poznań Główny
Swarzędz
Łowicz
Warszawa Gołąbki
Warszawa Praga
Warszawa Rembertów
Łuków
Małaszewicze
Terespol
Wittenberg
Hoyerswerda
Lohsa
Horka
Węglinie
Legnica
Zbąszynek. Tow.
Poznań Franowo
Skierniewice
Czachówek
Warszawa Centralna
To be equipped by 2020
To be equipped by 2015

7.4.5. Main European ports, marshalling yards, freight terminals and freight transport areas

Country	Freight transport area	Date	Remark
Belgium	Antwerpen	31.12.2015	A link to Rotterdam shall also be provided by 2020.
	Gent	31.12.2020	
	Zeebrugge	31.12.2020	
Bulgaria	Burgas	31.12.2020	The connection to corridor E implies equipping the Burgas-Sofia section and the Sofia-Vidin-Calafat and Calafat-Curtici sections in Romania (PP22).
Czech Republic	Praha	31.12.2015	
	Lovosice	31.12.2020	
Denmark	Taulov	31.12.2020	Connecting this terminal implies that the Flensburg-Padborg line is chosen to be an ERTMS equipped link – see corridor B footnote.
Germany	Dresden[17]	31.12.2020	By 2020, a direct link between corridor E and corridor F (from Dresden to Hannover) shall also be ensured.
	Lübeck	31.12.2020	
	Duisburg	31.12.2015	
	Hamburg[18]	31.12.2020	
	Köln	31.12.2015	
	München	31.12.2015	
	Hannover	31.12.2015	
	Rostock	31.12.2015	
	Ludwigshafen/ Mannheim	31.12.2015	
	Nürnberg	31.12.2020	

[17] Germany will do its best to equip the corridor E section, fromDresden to the Czech border at an earlier date.

[18] Germany will equip a rail link to Hamburg but the harbour area may be only partly equipped by 2020.

~~Country~~	~~Freight transport area~~	~~Date~~	~~Remark~~
~~Greece~~	~~Pireás~~	~~31.12.2020~~	~~The connection to Corridor E implies equipping the Kulata-Sofia section in Bulgaria.~~
~~Spain~~	~~Algeciras~~	~~31.12.2020~~	
	~~Madrid~~	~~31.12.2020~~	
	~~Pamplona~~	~~31.12.2020~~	~~Three connections are requested. A connection to Paris via Hendaye, a connection from Pamplona to Madrid and a connection from Pamplona to corridor D via Zaragoza.~~
	~~Zaragoza~~	~~31.12.2020~~	
	~~Tarragona~~	~~31.12.2020~~	
	~~Barcelona~~	~~31.12.2015~~	
	~~Valencia~~	~~31.12.2020~~	
~~France~~	~~Marseille~~	~~31.12.2020~~	
	~~Perpignan~~	~~31.12.2015~~	
	~~Avignon~~	~~31.12.2015~~	
	~~Lyon~~	~~31.12.2015~~	
	~~Le Havre~~	~~31.12.2020~~	
	~~Lille~~	~~31.12.2020~~	
	~~Dunkerque~~	~~31.12.2020~~	
	~~Paris~~	~~31.12.2020~~	~~By 2020 the following connections will be provided: i) Hendaye ii) Channel Tunnel iii) Dijon iv) Metz via Epernay and Châlons-en-Champagne.~~
~~Italy~~	~~La Spezia~~	~~31.12.2020~~	
	~~Genova~~	~~31.12.2015~~	
	~~Gioia Tauro~~	~~31.12.2020~~	
	~~Verona~~	~~31.12.2015~~	
	~~Milano~~	~~31.12.2015~~	

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~~Country~~	~~Freight transport area~~	~~Date~~	~~Remark~~
	~~Taranto~~	~~31.12.2020~~	
	~~Bari~~	~~31.12.2020~~	
	~~Padova~~	~~31.12.2015~~	
	~~Trieste~~	~~31.12.2015~~	
	~~Novara~~	~~31.12.2015~~	
	~~Venice~~	~~31.12.2020~~	
	~~Bologna~~	~~31.12.2020~~	
	~~Roma~~	~~31.12.2020~~	
~~Luxembourg~~	~~Bettembourg~~	~~31.12.2015~~	
~~Hungary~~	~~Budapest~~	~~31.12.2015~~	
~~Netherlands~~	~~Amsterdam~~	~~31.12.2020~~	
	~~Rotterdam~~	~~31.12.2015~~	~~A link to Antwerp shall also be provided by 2020.~~
~~Austria~~	~~Graz~~	~~31.12.2020~~	
	~~Wien~~	~~31.12.2020~~	
~~Poland~~	~~Gdynia~~	~~31.12.2015~~	
	~~Katowice~~	~~31.12.2020~~	
	~~Wroclaw~~	~~31.12.2015~~	~~By 2020 the Wroclaw-Legnica line, shall be equipped in order to ensure a direct link to the German border (Gorlitz).~~
	~~Gliwice~~	~~31.12.2015~~	
	~~Poznań~~	~~31.12.2015~~	
	~~Warszawa~~	~~31.12.2015~~	
~~Portugal~~	~~Sines~~	~~31.12.2020~~	
	~~Lisboa~~	~~31.12.2020~~	
~~Romania~~	~~Constanța~~	~~31.12.2015~~	

~~Country~~	~~Freight transport area~~	~~Date~~	~~Remark~~
~~Slovenia~~	~~Koper~~	~~31.12.2015~~	
	~~Ljubljana~~	~~31.12.2015~~	
~~Slovakia~~	~~Bratislava~~	~~31.12.2015~~	
~~UK~~	~~Bristol~~		~~This terminal will be connected as corridor C is extended to the Channel Tunnel~~

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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 2.

Table A 1

Reference in Chapter 4	Index number (see Table A 2)
4.1	
4.1a	1, 4
4.1b	32
4.1c	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

Reference in Chapter 4	Index number (see Table A 2)
4.2.3 c	31, 37 b, c, d
4.2.3 d	18, 21
4.2.4	
4.2.4 a	64, 65
4.2.4 b	66
4.2.4 c	67
4.2.4 d	68
4.2.4 e	73, 74
4.2.4 f	32, 33
4.2.4 g	48
4.2.4 h	69, 70
4.2.4 j	71, 72
4.2.4 k	75, 76
4.2.5	
4.2.5 a	64, 65
4.2.5 b	10, 39, 40
4.2.5c	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

Reference in Chapter 4	Index number (see Table A 2)
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	44
4.2.7	
4.2.7 a	12
4.2.7 b	62, 63
4.2.7 c	34
4.2.7 d	9
4.2.7 e	16
4.2.8	
4.2.8 a	11, 79
4.2.9	
4.2.9 a	23
4.2.10	
4.2.10 a	77 (section 3.1)
4.2.11	
4.2.11 a	77 (section 3.2)

Reference in Chapter 4	Index number (see Table A 2)
4.2.12	
4.2.12 a	6, 51
4.2.13	
4.2.13 a	32, 33, 51, 80
4.2.14	
4.2.14 a	5
4.2.15	
4.2.15 a	38

Specifications

One of the ~~two sets of specifications listed in~~three tables below (Table A-2.1, Table A-2.2 or Table A-2.3) ~~of~~ in this Annex shall be applied.

~~Documents referred to within a specification listed in Table A-2 shall be considered as being for information only, unless otherwise stated in Table A-2~~When a document listed in Table A-2 incorporates, by copying or by reference to, a clearly identified clause of another document, this clause, and only this, shall be considered a part of the document listed in Table A-2.

For the scope of this TSI, when a document listed in Table A-2 makes a "mandatory" or "normative" reference to a document not listed in Table A-2, the referenced document shall always be understood as an acceptable means of compliance with basic parameters (that can be used for certification of Interoperability Constituents and Subsystems and not requiring future revisions of the TSI) and not as a mandatory specification.

Note: specifications indicated as 'Reserved' in table A-2 are also listed as open points in Annex G when there is a need for notification of national rules to close the corresponding open points. Reserved documents not listed as open points are intended as improvements to the system.

Table A 2.1 - List of mandatory specifications

Index N	Set of specifications # 1 (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	

Index N	Set of specifications # 1 (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	

Index N	Set of specifications # 1 (ETCS baseline 2 and GSM-R baseline 1)			
	Reference	Name of Specification	Version	Notes
37 d	SUBSET-076-7	Scope of the test specifications	1.0.2	
37 e	Intentionally deleted			
38	06E068	ETCS Marker-board definition	2.0	
39	SUBSET-092-1	ERTMS EuroRadio Conformance Requirements	2.3.0	
40	SUBSET-092-2	ERTMS EuroRadio test cases safety layer	2.3.0	
41	Intentionally deleted			
42	Intentionally deleted			
43	SUBSET 085	Test specification for Eurobalise FFFIS	2.2.2	
44	Intentionally deleted			
45	SUBSET-101	Interface “K” Specification	1.0.0	
46	SUBSET-100	Interface “G” Specification	1.0.1	
47	Intentionally deleted			
48	Reserved	Test specification for mobile equipment GSM-R		Note 4
49	SUBSET-059	Performance requirements for STM	2.1.1	
50	SUBSET-103	Test specification for Euroloop	1.0.0	
51	Reserved	Ergonomic aspects of the DMI		
52	SUBSET-058	FFFIS STM Application layer	2.1.1	
53	Intentionally deleted			
54	Intentionally deleted			
55	Intentionally deleted			
56	Intentionally deleted			
57	Intentionally deleted			

Index N	Set of specifications # 1 (ETCS baseline 2 and GSM-R baseline 1)			
	Reference	Name of Specification	Version	Notes
58	Intentionally deleted			
59	Intentionally deleted			
60	Intentionally deleted			
61	Intentionally deleted			
62	Reserved	RBC-RBC Test specification for safe communication interface		
63	SUBSET-098	RBC-RBC Safe Communication Interface	1.0.0	
64	EN 301 515	Global System for Mobile Communication (GSM); Requirements for GSM operation on railways	2.3.0	Note 2
65	TS 102 281	Detailed requirements for GSM operation on railways	3.0.0	Note 3
66	TS 103 169	ASCI Options for Interoperability	1.1.1	
67	(MORANE) P 38 T 9001	FFFIS for GSM-R SIM Cards	5.0	
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	

Index N	Set of specifications # 1 (ETCS baseline 2 and GSM-R baseline 1)			
	Reference	Name of Specification	Version	Notes
76	(MORANE) F 12 T 6003	FIS for Presentation of Functional Numbers to Called and Calling Parties	4	
77	ERA/ERTMS/033281	Interfaces between CCS track-side and other subsystems	3.0	Note 7
78	Reserved	Safety requirements for ETCS DMI functions		
79	Not applicable	Not applicable		
80	Not applicable	Not applicable		
81	Not applicable	Not applicable		
82	Not applicable	Not applicable		

Table A 2.2 - List of mandatory specifications

Index N	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	

Index N	Set of specifications # 2 (ETCS baseline 3 Maintenance Release 1 and GSM-R baseline 1)			
	Reference	Name of Specification	Version	Notes
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	
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	

Index N	Set of specifications # 2 (ETCS baseline 3 Maintenance Release 1 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	3.0.0	
37 a	Intentionally deleted			
37 b	SUBSET-076-5-2	Test cases related to features	3.1.0	
37 c	SUBSET-076-6-3	Test sequences	3.0.0	
37 d	SUBSET-076-7	Scope of the test specifications	3.1.0	
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	
44	Intentionally deleted			Note 9
45	SUBSET-101	Interface “K” Specification	2.0.0	
46	SUBSET-100	Interface “G” Specification	2.0.0	

Index N	Set of specifications # 2 (ETCS baseline 3 Maintenance Release 1 and GSM-R baseline 1)			
	Reference	Name of Specification	Version	Notes
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	

Index N	Set of specifications # 2 (ETCS baseline 3 Maintenance Release 1 and GSM-R baseline 1)			
	Reference	Name of Specification	Version	Notes
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 track-side and other subsystems	3.0	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	SUBSET-119	Train Interface FFFIS		Note 12
82	SUBSET-120	FFFIS TI – Safety Analysis		Note 12

Table A 2.3 - List of mandatory specifications

Index N	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	3.2.0	
4	SUBSET-026	System Requirements Specification	3.5.0	
5	SUBSET-027	FIS Juridical Recording	3.2.0	
6	ERA_ERTMS_015560	ETCS Driver Machine interface	3.5.0	
7	SUBSET-034	Train Interface FIS	3.2.0	
8	SUBSET-035	Specific Transmission Module FFFIS	3.2.0	
9	SUBSET-036	FFFIS for Eurobalise	3.1.0	
10	SUBSET-037	EuroRadio FIS	3.2.0	
11	SUBSET-038	Offline key management FIS	3.1.0	
12	SUBSET-039	FIS for the RBC/RBC handover	3.2.0	
13	SUBSET-040	Dimensioning and Engineering rules	3.4.0	
14	SUBSET-041	Performance Requirements for Interoperability	3.2.0	
15	Intentionally deleted			
16	SUBSET-044	FFFIS for Euroloop	2.4.0	
17	Intentionally deleted			
18	Intentionally deleted			
19	SUBSET-047	Trackside-Trainborne FIS for Radio infill	3.0.0	
20	SUBSET-048	Trainborne FFFIS for Radio infill	3.0.0	
21	Intentionally deleted			

Index N	Set of specifications # 3 (ETCS baseline 3 Release 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	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	3.5.0	
28	Intentionally deleted			
29	SUBSET-102	Test specification for interface “K”	2.0.0	
30	Intentionally deleted			
31	Reserved SUBSET-094	Functional requirements for an onboard reference test facility		Note 13
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	Reserved SUBSET-076-5-2	Test cases related to features		Note 13

Index N	Set of specifications # 3 (ETCS baseline 3 Release 2 and GSM-R baseline 1)			
	Reference	Name of Specification	Version	Notes
37 c	Reserved SUBSET-076-6-3	Test sequences		Note 13
37 d	Reserved SUBSET-076-7	Scope of the test specifications		Note 13
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			Note 9
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			
52	SUBSET-058	FFFIS STM Application layer	3.2.0	
53	Intentionally deleted			
54	Intentionally deleted			
55	Intentionally deleted			

Index N	Set of specifications # 3 (ETCS baseline 3 Release 2 and GSM-R baseline 1)			
	Reference	Name of Specification	Version	Notes
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	
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	

Index N	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 track-side and other subsystems	3.0	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	SUBSET-119	Train Interface FFFIS		Note 12
82	SUBSET-120	FFFIS TI – Safety Analysis		Note 12
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 clauses of the specifications listed in section 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 clauses 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. The application guide will contain a catalogue of available harmonised test cases for the assessment of mobile equipment and networks, according to the steps indicated in section 6.1.2 of this TSI.

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: ~~the requirements on reliability/availability are now in the TSI (section 4.2.1.2)~~Intentionally deleted.

Note 9: ERA analysis showed there is no need for a mandatory specification for odometry interface.

Note 10: Only the (MI) requirements are mandated by TSI CCS.

Note 11: ~~Specifications to be managed through a technical opinion of the European Railway Agency~~Intentionally deleted

Note 12: Reference to these specifications will be published in the Application Guide, waiting for clarifications on the rolling stock side of the interface.

Note 13: Specifications to be managed through a technical opinion of the European Railway Agency

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Table A 3 - List of mandatory standards

The standards listed in the table below shall be applied in the certification process, 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	Railway applications —The specification and demonstration of reliability, availability, maintainability and safety (RAMS)	1999	1
A2	EN 50128	Railway applications — Communication, signalling and processing systems — Software for railway control and protection systems	2001 or 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 ~~— Part 1:~~	2010	1

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 (OJ C 345, 26.11.2013, p.3), where also published editorial corrigenda are indicated.

Annex B

Intentionally deleted

Annex C

Intentionally deleted

Annex D

Intentionally deleted

Annex E

Intentionally deleted

Annex F

Intentionally deleted

Annex G

Open Points

Open Point	Notes
Braking aspects	It only applies to ~~ERTMS/~~ETCS Baseline 2 (see Annex A, Table A2, Index 15). Resolved for ~~ERTMS/~~ETCS Baseline 3 (see Annex A, Table A 2, Indexes 4 and 13).
~~Index 28~~ Reliability/ availability requirements	Frequent occurrences of degraded situations caused by failures of control-command and signalling equipment will decrease the system safety.
Minimum wheel diameter for speed greater than 350 km/h	See Annex A, Table A 2, Index 77
Minimum axle distance for speed greater than 350 km/h	See Annex A, Table A 2, Index 77
Metal and inductive components free space between wheels	See Annex A, Table A 2, Index 77 This is not an open point for freight wagons
Characteristics of sand applied to tracks	See Annex A, Table A 2, Index 77
Combination of rolling stock characteristics influencing shunting impedance	See Annex A, Table A 2, Index 77
Electromagnetic interferences (traction current)	See Annex A, Table A 2, Index 77
Electromagnetic interferences (electromagnetic fields)	See Annex A, Table A 2, Index 77 This is not an open point for ~~power systems other than DC~~axle counters

Open Point	Notes
Vehicle Impedance	See Annex A, Table A 2, Index 77
Use of magnetic / eddy current brakes	See Annex A, Table A 2, Index 77