TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

European Union Agency for Railways

Swedish Transport Agency

Checks required to demonstrate technical compatibility for Trafikverket ERTMS network, and classification of types in RINF

Background

According to the interoperability directive (EU) 2016/797, checks might be required to demonstrate the technical compatibility of the control command and signalling subsystems in the area of use of a vehicle. The necessity of these checks should be considered as a temporary measure on TSI level to increase the confidence on the technical compatibility between the subsystems. Crucial requirements for ERTMS interoperability is ETCS System compatibility (ESC) and Radio System Compatibilty (RSC). The European Union Agency for railways (hereafter called the Agency) shall set up and manage the set of checks to demonstrate the technical compatibility of an on-board subsystem with the trackside subsystem

Infrastucture Managers, in Sweden The Swedish Transport Administration (Trafikverket), shall specify and deliver to the Agency checks for different ESC and RSC types (tests or other types e.g. analysis) and to classify the infrastructure in ESC and RSC types in the register of infrastructure (RINF).

Preparation of the case, consultation

In order to identify the ESC/RSC and to prepare for classification of infrastructure in RINF, Trafikverket internally set up a working group of representatives from different departments of the organisation. The group has met 9 times over the autumn 2019, and consists of the following members:

- Rose-Marie Johansson, Fredrik Jönsson, Per-Erik Ingels, Marika Thalén, Mathias Hofrén (department Maintenance)
- Hallner Pipsa, Magnus Jacobsson, Peter Kotti (department Information, Communication, Technology)
- Håkan Henningsson, Jan Byström, Andreas Wik, Heléne Jarefors (the ERTMS programme).

During one of the meetings also representatives from the Agency participated: Begona Domingo, Juan Hernandez Fernandez and Christian Klecha. The final proposal has been reconciled with Caroline Kinneryd at the Swedish Transport Agency.

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Definition of ESC and RSC checks

The purpose of this chapter is to define the ETCS System Compatibility (ESC) and Radio System Compatibility (RSC) checks for Trafikverket (in Sweden) ERTMS network.

The definition of ESC and RSC checks fulfils the requirements set out in the technical specification for interoperability for the command control and signalling subsystem (Commission Implementing Regulation EU 2019/776), clause 6.1.2.4 concerning ESC and clause 6.1.2.5 concerning RSC.

Principles for ESC and RSC activities

ESC checks are incorporated in order to make evident a specific combination of ETCS onboard and ETCS trackside implementations are compatible although each subsystem have already made evident the subsystem requirements are fulfilled.

RSC checks are incorporated in order to make evident a specific combination of GSM-R onboard and GSM-R trackside implementations are compatible although each subsystem have already made evident the subsystem requirements are fulfilled.

Trafikverket considers the following three steps necessary to make evident the compatibility both for ETCS and GSM-R:

1. Compatibility analysis, the analysis of a specific ETCS trackside to ETCS onboard case and its characteristics

2. Compatibility lab tests, tailored to the needs based on the compatibility analysis. The lab tests shall be selected from reference [1], appendix A included.

3. Complementary compatibility field tests tailored to the needs based on the compatibility analysis and the compatibility lab tests. The field tests shall be selected from the reference [1], appendix A included.

Furthermore, it is mandatory that the stakeholders involved in the ESC and RSC activities all agree upon the scope of the checks.

Applicability

ESC checks are applicable for trackside ETCS level 2 and ETCS level 3 (Regional). Level NTC (STM) is out of the scope of this ESC-/RSC-checks document, since NTC is a national product. (However, transitions between these levels is within the scope of the checks).

Trafikverket ETCS trackside infrastructure is facilitated by two different trackside suppliers.

The ESC checks specified in Appendix 1 shall be used for both trackside suppliers. This is applicable for both compatibility lab and complementary field tests.

ESC checks shall always be tailored to the specific needs of the pertinent trackside to onboard subsystems case. Depending on the status of the trackside and onboard to be checked, not all of the checks is required to be performed (e.g. upgrade of trackside or onboard). Based on the checks specified in Appendix 1 a consolidation of the checks for a specific ETCS trackside to ETCS onboard combination shall be made through analysis.

The ESC checks specified in Appendix 1 and tailored to the needs of the specific case shall be executed in each of the trackside suppliers test environment.

RSC checks are applicable on Trafikverket GSM-R infrastructure.

Prerequisites

The ETCS onboard system shall successfully have passed tests in accordance with Subset-076 before commencement of ESC and RSC checks.

Responsibilities

Each of the involved stakeholders is always responsible for actions, alterations, remedies, etc. for the ETCS onboard and the ETCS trackside respectively, even if no issues or topics remain after fully completing the agreed ESC and RSC checks.

ESC checks

Detailed ESC checks is specified in Appendix 1 of this document.

RSC checks

Detailed RSC checks is specified in Appendix 2 of this document.

RINF regulation – new parameters ESC/RSC

The purpose of this chapter is for Trafikverket to classify each section of line and the necessary checks for ESC/RSC types, for demonstrating technical compatibility between vehicle and networks.

The RINF regulation (Commission Implementing Regulation (EU) 2019/777), states that:

> *Data relating to parameters relevant for the checking of vehicle-route compatibility should be collected and inserted by 16 January 2020 at the latest and as soon as practicable.*

Sweden consist of *one* railway network divided into several ESC/RSC types. ERTMS lines in Sweden will be classified into three different “ESC-X” types and one RSC type (voice and data). For the time being, Trafikverket consider the following three ESC types to be registered in RINF [preliminary identifiers received from ERA within brackets]:

- ESC for Hitachi L2 [ESC-SE-01-HiL2]
- ESC for Bombardier Transportation RCS L2 [ESC-SE-02-BoL2]
- ESC for L3. [ESC-SE-03-L3]

Trafikverket need two more ESC-types, since we very soon will upgrade the ETCS track side equipment for both suppliers. It is the same ESC checks that is needed to be executed for these new identifers, tailored to the needs of the specific ETCS trackside to ETCS onboard case. We need the following two new types:

- ESC-SE-04-HiL2B3
- ESC-SE-05-BoL2B3

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Class B systems in Sweden (i.e. existing traffic management system) are classified in RINF according to the following: ATC-lines are classified “ATC 2” and the line Linköping-Västervik is classified “ATC R”.

Communication and implementation

This document will be submitted to the Agency once it has been approved: esc-rsc@era.europa.eu

The technical document for ESC/RSC will be available in the Agency Webpage, in the CCS TSI Section under technical documents.

When performing the checks, the following documents shall be used:

- Principles for demonstration of ETCS system compatibility
- Principles for demonstration of Radio System compatibility.

Modification, submission of changes

The Swedish Transport Administration, Trafikverket, will submit to the Agency any changes on the referred checks for our network. This document will be updated and submitted to the Agency by using the same email address and referring to the modified ESC/RSC type.

Contact information

For any questions to Trafikverket related to ESC/RSC, please contact one of the following persons:

- Helene Jarefors helene.jarefors@trafikverket.se
- Håkan Henningsson hakan.henningsson@trafikverket.se

Done at Borlänge 2019-12-21

On behalf of the Swedish Transport Administration

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Appendix 1. ETCS System Compatibility (ESC) checks

Onboard additional functions checks

It shall be checked if the ETCS onboard includes additional functions (in relation to the functions specified in the relevant TSI CCS) which might influence ESC. If such additional functions are included, specific ESC checks shall be added as required.

ESC checks to be conducted in lab tests and/or complementary field tests

ESC checks in accordance with reference [1], appendix A included, and tailored to the needs of the specific ETCS trackside to ETCS onboard case, shall be performed in appropriate test environments:

- For Bombardier L2 trackside: Trafikverket lab at Bombardier premisis.
- For Bombardier L3 trackside: No lab available.
- For Hitachi L2 trackside: Trafikverket lab at Hitachi premisis.
- For complementary L2 field tests: Trafikverket test track Åby-Katrineholm.
- For L3 field tests: Trafikverket pilot line Västerdalsbanan.

For ESC checks conducted both by lab and complementary field tests it is mandatory to use Trafikverket operational GSM-R network.

Reference

[1] ERTMS19-0593 (TRV 2019/27834) “ERTMS Swedish Trackside – Generic OBU Compatibility”, 2020-03-27 ver. 2.4. Appendix A embedded: “Test record TBD OBU VS. TBD TRACKSIDE according to Swedish trackside – Generic OBU compatibility test specification”.

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Appendix 2. Radio System Compatibility (RSC) checks

RSC checks

CAB-radio

Below is listed two questions related to interference filter protection. Q1 is for ordinary vehicles, whereas Q2 is for vehicles with cramped space or portable GSM-R equipment. Choose which question is relevant, i.e. answer either Q1 or Q2.

1. a) Does the CAB-radio fulfil at least the protection requirements that are stipulated in EIRENE SRS ver. 16.0.0 (ETSI specification TS 102 933-1 V2.1.1) for radio modules? [yes/no]

If you have answered “yes” to Q1 a), you need not answer Q1 b). The answer to Q1 is then “yes”. If you answered “no” to Q1 a), you need to answer Q1 b):

1. b) Is the existing CAB-radio protected with a filter, according to Document GSM-R Terminal filter Technical Specification TRV 2014/71742 [2], "Type 1 Passive downlink and uplink Band pass filter”? [yes/no]

If the answer to Q1 b) is “yes” , the answer to Q1 is “yes”.
If the answer to Q1 b) is “no”, the answer to Q1 is “no”.

2. Is the GSM-R equipment protected with a filter, according to Document GSM-R Terminal filter Technical Specification TRV 2014/71742 [2], "Type 2 Passive Low pass filter”? [yes/no]

If either Q1 or Q2 is answered with “no”, please refer to text “Criteria” below.

EDOR (ETCS Data Only Radio)

3. Is the EDOR protected in accordance with Document GSM-R Terminal filter Technical Specification TRV 2014/71742 [2],”Type 1 Passive downlink and uplink Band pass filter”? [yes/no]

If question 3 is answered with “no”, please refer to text “Criteria” below.

Criteria

For vehicles with GSM-R equipment (CAB and EDOR) that do not meet the above RSC-checks, the railway undertaking (RU) shall perform a risk evaluation and assessment according to Regulation (EU) No 402/2013[1] of their alternative solution to the interference issue. The risk evaluation and assessment shall describe how the RU has managed the common traffic safety risks that are identified in the risk analysis TRV 2015/9709 [3].

Any TSI compliant vehicle with a “no answer”, will get the RSC Statement.
However, the “no answer” highlight the need for more documentation[2] related to safe

[1] Commission Implementing regulation (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009, in the wording of Commission Implementing Regulation (EU) 2015/1136 of 13 July 2015.
[2] Output documents after applying Regulation (EU) No 402/2013.

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integration of the vehicle into the Swedish railway system.

RSC checks incorporated in ESC checks

RSC checks are conducted through ESC checks since it is mandatory to use Trafikverket operational GSM-R network during such checks.

Reference

[2] TRV 2014/71742 “GSM-R Terminal filter Technical Specification”. 2014-11-10 ver. 1. The document is available on the webb page of Trafikverket (Swedish Transport Administration).

[3] TRV 2015/9709 “Riskanalys Mobiloperatörernas förändrade tillståndsvillkors påverkan på GSM-R”, appendix included. Rapport 2015-02-10 ver. 1.0, Jonas Lindh.